

MySQL Enterprise Monitor 2.3.21 Manual

Abstract

This manual documents the MySQL Enterprise Monitor version 2.3.21.

For notes detailing the changes in each release, see the [MySQL Enterprise Monitor 2.3 Release Notes](#).

For legal information, see the [Legal Notice](#).

For help with using MySQL, please visit either the [MySQL Forums](#) or [MySQL Mailing Lists](#), where you can discuss your issues with other MySQL users.

For additional documentation on MySQL products, including translations of the documentation into other languages, and downloadable versions in variety of formats, including HTML and PDF formats, see the [MySQL Documentation Library](#).

Document generated on: 2016-01-22 (revision: 6264)

Table of Contents

Preface and Legal Notices	xiii
1 MySQL Enterprise Monitor Introduction and Architecture	1
1.1 MySQL Enterprise Service Manager	2
1.2 MySQL Enterprise Monitor User Interface	3
1.3 MySQL Enterprise Advisors Collections	3
1.4 Monitored MySQL Server	4
1.5 MySQL Enterprise Monitor Agent	5
1.5.1 MySQL Enterprise Monitor Agent Basic Architecture	6
1.5.2 MySQL Enterprise Monitor Agent Proxy Service Architecture	7
1.5.3 MySQL Enterprise Monitor Agent Aggregator Service Architecture	7
2 Using and Configuring MySQL Enterprise Monitor User Interface	9
2.1 MySQL Enterprise Dashboard	10
2.2 The Monitor Tab	11
2.2.1 The Server Graphs and Critical Events	12
2.2.2 The Heat Chart	14
2.3 The Advisors Tab	16
2.3.1 Installing and Updating Advisors	18
2.3.2 Scheduling Rules	18
2.3.3 Editing Built-in Rules	21
2.4 The Events Tab	23
2.4.1 Closing an Event	25
2.4.2 Notification of Events	26
2.5 The Graphs Tab	26
2.5.1 Displaying Graphs	27
2.5.2 Setting an Interval	27
2.5.3 Setting a Time Span	27
2.5.4 Exporting Graph Images and Data	28
2.6 The Query Analyzer Tab	28
2.7 The Replication Tab	29
2.8 The Settings Tab	31
2.8.1 Global Settings	32
2.8.2 User Preferences	41
2.8.3 Manage Servers	42
2.8.4 Managing Users	47
2.8.5 Manage Notification Groups	48
2.8.6 Logs	49
2.8.7 Product Information	51
2.8.8 Import/Export	52
2.9 The What's New Tab	53
2.9.1 Setting What's New Configuration	54
2.10 Performance Tuning MySQL Enterprise Monitor User Interface for Large Installations	56
2.11 Troubleshooting the MySQL Enterprise Monitor User Interface	57
2.11.1 Diagnosing MySQL Enterprise Monitor User Interface Problems	57
2.11.2 Known MySQL Enterprise Monitor User Interface Problems and Workarounds	57
3 Using the Query Analyzer	59
3.1 Providing Query Analyzer Data	60
3.1.1 Using the MySQL Enterprise Plugin for Connector/J	62
3.1.2 Using the MySQL Enterprise Plugin for Connector/PHP	68
3.1.3 Using the MySQL Enterprise Plugin for Connector/Net	73
3.1.4 Using the MySQL Enterprise Agent Aggregator	76
3.1.5 Using the Agent Proxy	78

3.2 Query Analyzer User Interface	82
3.2.1 Getting Detailed Query Information	85
3.2.2 Using Graphs to Identify Queries	88
3.2.3 Query Analyzer Settings	88
3.2.4 Filtering Query Analyzer Data	90
3.2.5 Exporting Query Information	91
3.3 Troubleshooting Query Analyzer	92
4 Customizing MySQL Enterprise Monitor	95
4.1 Creating Advisors and Rules	95
4.1.1 Creating Advisors	95
4.1.2 Overview of Graph Creation	96
4.1.3 Overview of Rule Creation	97
4.1.4 Variables	98
4.1.5 Thresholds	98
4.1.6 Using Strings	99
4.1.7 Wiki Format	99
4.1.8 Creating a New Rule: An Example	100
4.1.9 Creating a New Graph: An Example	102
4.1.10 Creating a Custom Data Collection Item	102
4.2 Customizing Standard Advisors	103
4.3 Disabling and Unscheduling Rules	103
4.4 Advisor Blackout Periods	104
4.4.1 Scripting Blackouts	105
5 Installation Reference	107
5.1 Credentials Needed for Installation	108
5.1.1 Existing Users	109
5.1.2 Users Created During Installation	109
5.1.3 Users Created on First Log-in	109
5.2 Installing the Service Manager	109
5.2.1 Service Manager Installation Common Parameters	110
5.2.2 Installing the Service Manager on Unix and Linux	112
5.2.3 Installing the Service Manager on Windows	115
5.2.4 Starting/Stopping the MySQL Enterprise Monitor Service on Unix	117
5.2.5 Starting/Stopping the MySQL Enterprise Monitor Service on Windows	118
5.2.6 MySQL Enterprise Service Manager Configuration Settings and Advisor Installation ...	119
5.3 Monitor Agent Installation	121
5.3.1 Creating a MySQL User Account for the Monitor Agent	122
5.3.2 Installing the Monitor Agent on Unix and Linux	123
5.3.3 Installing the Agent on Microsoft Windows	128
5.3.4 Starting/Stopping the MySQL Enterprise Monitor Agent	132
5.3.5 Monitoring Multiple MySQL Servers	135
5.3.6 Configuring an Agent to Monitor a Remote MySQL Server	137
5.3.7 Monitoring Outside the Firewall with an SSH Tunnel	138
5.3.8 Generating a New UUID	138
5.3.9 Troubleshooting the Agent	139
5.4 Unattended Installation	141
5.4.1 Performing an Unattended Installation	141
5.4.2 MySQL Enterprise Service Manager Options	143
5.4.3 MySQL Enterprise Monitor Agent Options	148
5.5 Postinstallation Considerations	156
5.6 Installing SSL Certificates	156
5.7 Upgrading, Re-Installing or Changing Your Installation	158
5.7.1 Upgrading MySQL Enterprise Monitor	158
5.7.2 Changing Your MySQL Enterprise Monitor Installation	166

5.8 Uninstalling the MySQL Enterprise Monitor	168
5.8.1 Removing the MySQL Enterprise Monitor: Windows	168
5.8.2 Removing the MySQL Enterprise Monitor: Unix	169
A Licenses for Third-Party Components	173
A.1 Ant-Contrib License	174
A.2 ANTLR 2 License	175
A.3 ANTLR 3 License	176
A.4 Apache Commons BeanUtils v1.6 License	176
A.5 Apache Commons BeanUtils v1.7.0 and Later License	177
A.6 Apache Commons Chain	177
A.7 Apache Commons Codec	178
A.8 Apache Commons Collections License	178
A.9 Apache Commons DBCP License	178
A.10 Apache Commons Digester License	179
A.11 Apache Commons Exec	179
A.12 Apache Commons FileUpload License	179
A.13 Apache Commons HttpClient	179
A.14 Apache Commons IO License	180
A.15 Apache Commons Lang License	180
A.16 Apache Commons Logging License	180
A.17 Apache Commons Math License	180
A.18 Apache Commons Pool License	182
A.19 Apache Commons Validator License	182
A.20 Apache HttpComponents HttpClient License	182
A.21 Apache HttpComponents HttpCore License	183
A.22 Apache Jakarta ORO License	183
A.23 Apache JAMES Mime4J License	184
A.24 Apache License Version 2.0, January 2004	188
A.25 Apache log4j License	192
A.26 Apache Portable Runtime (APR) License	192
A.27 Apache Struts License	194
A.28 Apache Tiles	194
A.29 Apache Tomcat	195
A.30 Apache Tomcat Native Library License	195
A.31 ASM License	195
A.32 Code Generation Library License	196
A.33 cURL (libcurl) License	196
A.34 DOM4J License	197
A.35 Dropdown Check List License	197
A.36 dtoa.c License	198
A.37 Editline Library (libedit) License	198
A.38 Ehcache License	200
A.39 EZMorph License	201
A.40 FindGTest.cmake License	201
A.41 Fred Fish's Dbug Library License	202
A.42 FreeMarker License	202
A.43 getarg License	203
A.44 GLib License (for MySQL Enterprise Monitor)	204
A.45 GNU General Public License Version 2.0, June 1991	204
A.46 GNU Lesser General Public License Version 2.1, February 1999	210
A.47 GNU Libtool License	218
A.48 Google Controlling Master Thread I/O Rate Patch License	218
A.49 Google Perftools (TCMalloc utility) License	219
A.50 Google SMP Patch License	220

A.51 Guava (Google Core Libraries for Java) License	220
A.52 Hibernate Annotations License	220
A.53 Hibernate Commons Annotations License	221
A.54 Hibernate License	221
A.55 Java SNMP License	221
A.56 Javassist License	222
A.57 JCommon License	222
A.58 JDOM Project License	223
A.59 JFreeChart License	223
A.60 jQuery Form Example Plugin License	224
A.61 jQuery License	224
A.62 jQuery UI License	225
A.63 JSON-lib License	225
A.64 lib_sql.cc License	225
A.65 libevent License	226
A.66 Libffi License	227
A.67 libiconv License	227
A.68 libintl License	228
A.69 Libxml2 License	228
A.70 Linux-PAM License	229
A.71 LPeg Library License	230
A.72 Lua (liblua) License	230
A.73 LuaFileSystem Library License	231
A.74 md5 (Message-Digest Algorithm 5) License	231
A.75 nt_sercv (Windows NT Service class library) License	231
A.76 OGNL (Object-Graph Navigation Language) License	232
A.77 OpenPAM License	232
A.78 OpenSSL v1.0 License	233
A.79 PCRE License	234
A.80 Percona Multiple I/O Threads Patch License	235
A.81 PersistJS License	236
A.82 PNG Behavior License	236
A.83 PxtoEM License	236
A.84 Radeox RE	237
A.85 RegEX-Spencer Library License	237
A.86 RFC 3174 - US Secure Hash Algorithm 1 (SHA1) License	238
A.87 Richard A. O'Keefe String Library License	238
A.88 ROME License	239
A.89 SHA-1 in C License	239
A.90 Simple Logging Facade for Java (SLF4J) License	239
A.91 SNMP4J License	240
A.92 Spring Framework License	240
A.93 StringTemplate Template Engine License	241
A.94 TEA License	241
A.95 XWork License	241
A.96 zlib License	242
B MySQL Enterprise Monitor General Reference	243
B.1 MySQL Enterprise Monitor Limitations	243
B.2 Supported Browsers	244
B.3 Installation Requirements	244
B.4 Configuring Tomcat Parameters	245
B.5 Backing up MySQL Enterprise Service Manager	246
B.6 Migrating 1.3.x Historical Data to MySQL Enterprise Monitor 2.0	247
B.7 Improving Disk Space Usage with Purge in 2.1 and 2.2	250

B.8 Regular MySQL Enterprise Monitor Maintenance	251
B.9 Advisor/Graph Reference	251
B.9.1 Advisors	262
B.9.2 Graph Definition Reference	302
C MySQL Enterprise Monitor Component Reference	333
C.1 MySQL Enterprise Service Manager Reference	333
C.1.1 Configuring Tomcat Parameters	333
C.1.2 Creating a new SSL KeyStore	334
C.1.3 Log Files for the MySQL Enterprise Service Manager	334
C.1.4 The Management Information Base (MIB) File	335
C.1.5 The <code>config.properties</code> file	335
C.2 MySQL Enterprise Monitor Agent Reference	339
C.2.1 MySQL Enterprise Monitor Agent Configurable Options	340
C.2.2 MySQL Server (<code>agent-instance.ini</code>) Configuration	358
C.2.3 Agent Log and <code>pid</code> Files	359
D Data Collection Items	361
E Error codes	431
F MySQL Enterprise Monitor Frequently Asked Questions	441
G Files associated with configuring, debugging, and using MySQL Enterprise Monitor	449
H MySQL Enterprise Monitor Release Notes	451
MySQL Enterprise Monitor Glossary	453
Index	465

List of Figures

1.1 MySQL Enterprise Monitor Architecture	1
1.2 The MySQL Enterprise Service Manager Architecture	2
1.3 The MySQL Enterprise Monitor Architecture when using proxy and agent services for the same MySQL Server	7
1.4 The MySQL Enterprise Monitor Architecture when using aggregator and agent services for the same MySQL Server	8
2.1 MySQL Enterprise Monitor User Interface: The Graphs Screen	13
2.2 MySQL Enterprise Monitor User Interface: The Heat Chart	15
2.3 MySQL Enterprise Monitor User Interface: The Heat Chart Legend	15
2.4 MySQL Enterprise Monitor User Interface: Scheduling Dialog	19
2.5 MySQL Enterprise Monitor User Interface: Editing Rules	21
2.6 MySQL Enterprise Monitor User Interface: Events Screen	24
2.7 MySQL Enterprise Monitor User Interface: Query Analyzer	29
2.8 MySQL Enterprise Monitor User Interface: Replication Groups	30
2.9 MySQL Enterprise Monitor User Interface Settings: Outgoing Email	32
2.10 MySQL Enterprise Monitor User Interface Settings: SNMP Traps	33
2.11 MySQL Enterprise Monitor User Interface Settings: Server Locale	34
2.12 MySQL Enterprise Monitor User Interface Settings: Server Hostname	35
2.13 MySQL Enterprise Monitor User Interface Settings: Data Purge	35
2.14 MySQL Enterprise Monitor User Interface Settings: Remote Server Inventory Schedule	36
2.15 MySQL Enterprise Monitor User Interface Settings: My Oracle Support Credentials	37
2.16 MySQL Enterprise Monitor User Interface Settings: HTTP Proxy Settings	37
2.17 MySQL Enterprise Monitor User Interface Settings: Advisor Bundle	37
2.18 MySQL Enterprise Monitor User Interface Settings: LDAP Authentication	38
2.19 MySQL Enterprise Monitor User Interface Settings: Customize MySQL server name	40
2.20 MySQL Enterprise Monitor User Interface: User Preferences	41
2.21 MySQL Enterprise Monitor User Interface: Manage Servers	42
2.22 MySQL Enterprise Monitor User Interface: Server/Group Pop-up	44
2.23 MySQL Enterprise Monitor User Interface: Server Renaming	45
2.24 MySQL Enterprise Monitor User Interface: Manage Users	47
2.25 MySQL Enterprise Monitor User Interface: Manage Notification Groups	48
2.26 MySQL Enterprise Monitor User Interface: Edit Notification Group	49
2.27 MySQL Enterprise Monitor User Interface: Logs	50
2.28 The What's New Tab	53
2.29 What's New Configuration	55
3.1 MySQL Enterprise Monitor Architecture using Query Analyzer with Proxy	60
3.2 MySQL Enterprise Monitor Architecture using Query Analyzer Directly from Connector	61
3.3 MySQL Enterprise Monitor Architecture using Query Analyzer with Aggregator	62
3.4 The MySQL Enterprise Monitor Architecture using aggregator and agent services for the same MySQL Server	77
3.5 MySQL Enterprise Monitor User Interface: Standard Agent/Monitor Topology	80
3.6 MySQL Enterprise Monitor User Interface: Query Analyzer Agent/Monitor Topology	81
3.7 MySQL Enterprise Monitor User Interface: Query Analyzer	83
3.8 MySQL Enterprise Monitor User Interface: Canonical Query Tab for a Query	85
3.9 MySQL Enterprise Monitor User Interface: Example Query Tab for a Query	86
3.10 MySQL Enterprise Monitor User Interface: Explain Query Tab for a Query	87
3.11 MySQL Enterprise Monitor User Interface: Graphs Tab for a Query	87
3.12 MySQL Enterprise Monitor User Interface: Correlated Graphs	88
3.13 MySQL Enterprise Monitor User Interface: Query Analyzer Configuration	89
3.14 MySQL Enterprise Monitor User Interface: Query Analyzer Filter Options	90
5.1 MySQL Enterprise Monitor: Installing Monitor on Windows: Tomcat Server Options	116

5.2 MySQL Enterprise Monitor: Installing Monitor on Windows: Repository Configuration	117
5.3 MySQL Enterprise Monitor: Initial Dashboard Log-In	120
5.4 MySQL Enterprise Monitor: Installing Agent on Windows: Monitored Database Information	130
5.5 MySQL Enterprise Monitor: Installing Agent on Windows: MySQL Enterprise Service Manager Options	131
5.6 MySQL Enterprise Monitor: Server Update: Final Setup	162
B.1 MySQL Enterprise Monitor: Historical Data Migration Availability	248
B.2 MySQL Enterprise Monitor: Confirming Historical Data Migration	248
B.3 MySQL Enterprise Monitor: Historical Data Migration Progress	249

List of Tables

3.1 Query Analyzer Feeding Solution Comparison	62
3.2 Query Analyzer Connector/J Summary	63
3.3 MySQL Monitor Plugin for Connector/J Options	64
3.4 MySQL Monitor Plugin for Connector/J SSL Options	65
3.5 MySQL Enterprise Plugin for Connector/PHP Summary	68
3.6 MySQL Enterprise Plugin for Connector/PHP Options	70
3.7 Query Analyzer Connector/Net Summary	74
3.8 <code>mysql-monitor-agent</code> Aggregator Options	78
4.1 MySQL Enterprise Monitor: Wiki Formatting	100
5.1 MySQL Enterprise Service Manager Installer Options	143
5.2 MySQL Enterprise Monitor Agent Installer Options	148
5.3 Default Root Path (<code>\$INSTALL_ROOT</code>)	156
C.1 MySQL Enterprise Monitor: Log File Locations: Windows	334
C.2 MySQL Enterprise Monitor: Log File Locations: Unix	335
C.3 MySQL Enterprise Monitor: MIB File Locations	335
C.4 MySQL Enterprise Monitor: Default path of the <code>config.properties</code> File	335
C.5 Optional <code>config.properties</code> values	336
C.6 <code>mysql-monitor-agent</code> Help Options	341
C.7 <code>mysql-monitor-agent</code> Admin Options	341
C.8 <code>mysql-monitor-agent</code> Agent Options	342
C.9 <code>mysql-monitor-agent</code> Monitor Options	343
C.10 <code>mysql-monitor-agent</code> Proxy Options	343
C.11 <code>mysql-monitor-agent</code> Aggregator Options	343
C.12 <code>mysql-monitor-agent</code> Application Options	343
D.1 MySQL Monitor Data Items	361
E.1 MySQL Enterprise Dashboard: GUI Error Codes and Messages	431
E.2 MySQL Enterprise Monitor: Server Codes and Messages	437

Preface and Legal Notices

This manual documents the MySQL Enterprise Monitor version 2.3.21. For license information, see the [Legal Notices](#). This product may contain third-party code. For license information on third-party code, see [Appendix A, Licenses for Third-Party Components](#).

Legal Notices

Copyright © 2005, 2016, Oracle and/or its affiliates. All rights reserved.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish, or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

If this is software or related documentation that is delivered to the U.S. Government or anyone licensing it on behalf of the U.S. Government, then the following notice is applicable:

U.S. GOVERNMENT END USERS: Oracle programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, delivered to U.S. Government end users are "commercial computer software" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

This software or hardware is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications that may create a risk of personal injury. If you use this software or hardware in dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure its safe use. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software or hardware in dangerous applications.

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Intel and Intel Xeon are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. AMD, Opteron, the AMD logo, and the AMD Opteron logo are trademarks or registered trademarks of Advanced Micro Devices. UNIX is a registered trademark of The Open Group.

This software or hardware and documentation may provide access to or information about content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services unless otherwise set forth in an applicable agreement between you and Oracle. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services, except as set forth in an applicable agreement between you and Oracle.

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc>.

Access to Oracle Support

Oracle customers that have purchased support have access to electronic support through My Oracle Support. For information, visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info> or visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs> if you are hearing impaired.

This documentation is NOT distributed under a GPL license. Use of this documentation is subject to the following terms:

You may create a printed copy of this documentation solely for your own personal use. Conversion to other formats is allowed as long as the actual content is not altered or edited in any way. You shall not publish or distribute this documentation in any form or on any media, except if you distribute the documentation in a manner similar to how Oracle disseminates it (that is, electronically for download on a Web site with the software) or on a CD-ROM or similar medium, provided however that the documentation is disseminated together with the software on the same medium. Any other use, such as any dissemination of printed copies or use of this documentation, in whole or in part, in another publication, requires the prior written consent from an authorized representative of Oracle. Oracle and/or its affiliates reserve any and all rights to this documentation not expressly granted above.

Chapter 1 MySQL Enterprise Monitor Introduction and Architecture

Table of Contents

1.1 MySQL Enterprise Service Manager	2
1.2 MySQL Enterprise Monitor User Interface	3
1.3 MySQL Enterprise Advisors Collections	3
1.4 Monitored MySQL Server	4
1.5 MySQL Enterprise Monitor Agent	5
1.5.1 MySQL Enterprise Monitor Agent Basic Architecture	6
1.5.2 MySQL Enterprise Monitor Agent Proxy Service Architecture	7
1.5.3 MySQL Enterprise Monitor Agent Aggregator Service Architecture	7

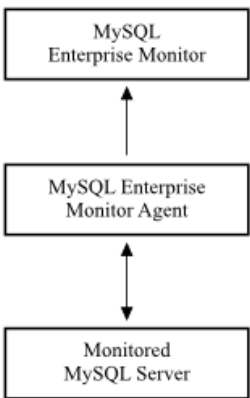
MySQL Enterprise Monitor is a companion product for MySQL Server that monitors your MySQL instances, notifies you of potential issues and problems, and advises you how to fix the issues. MySQL Enterprise Monitor can monitor all kinds of configurations, from a single MySQL instance that is important to your business, all the way up to a huge farm of database server machines powering a busy web site.

This section describes the basic components that make up the MySQL Enterprise Monitor product. These components can be installed in various configurations depending on your own database and network topology, to give you the best combination of reliable and responsive monitoring data, with minimal overhead on the database server machines. A typical MySQL Enterprise Monitor installation consists of:

- One or more MySQL [instances](#) to monitor. MySQL Enterprise Monitor can monitor both Community and Enterprise MySQL server releases.
- A [MySQL Enterprise Monitor Agent](#) for each monitored MySQL instance.
- A single MySQL Enterprise Service Manager, which collates information from the agents and provides the user interface to the collected data through the [Dashboard](#).

The structure of a typical MySQL Enterprise Monitor installation is shown in the following figure.

Figure 1.1 MySQL Enterprise Monitor Architecture



MySQL Enterprise Monitor can monitor one or more MySQL instances, on a single computer or spread across multiple host machines. The [agent](#), MySQL Enterprise Monitor Agent, collects variables, status, and health information from a MySQL instance and sends this information to the MySQL Enterprise Service Manager. You typically have multiple MySQL Enterprise Monitor Agent processes, one monitoring each MySQL instance.

The monitoring data is sent to the [MySQL Enterprise Service Manager](#), which collates information from all the agents. The MySQL Enterprise Service Manager checks whether the values of status values are within reasonable limits. When [thresholds](#) are reached, the server can trigger an [event](#) (including an [alarm](#) and [notification](#)) to highlight a potential issue, such as low memory, high CPU usage, or more complex conditions such as insufficient buffer sizes and status information. Each test and its associated threshold value form a [rule](#).

Each rule, together with its associated alarms and notifications, is known as a MySQL Enterprise Monitor [advisor](#). Advisors are a vital part of the MySQL Enterprise Service Manager, warning about potential problems and providing troubleshooting advice.

You interact with the MySQL Enterprise Service Manager through a web interface, powered by an included web server. This interface, the MySQL Enterprise Monitor User Interface, displays the information collected by the agents. You can view current status for individual MySQL servers or groups of servers. You control and configure all aspects of the service using the MySQL Enterprise Monitor User Interface.

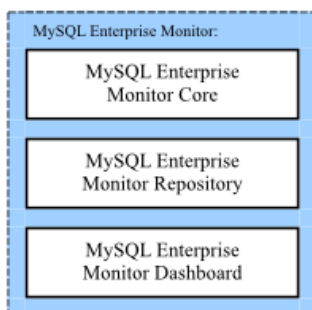
The MySQL Enterprise Monitor User Interface can display statistical and query information as graphs. For example, you can produce graphs over time of aspects such as server load, query numbers, or index usage information. The graphs help to pinpoint the timeframes and trends related to potential issues.

The MySQL Enterprise Monitor Agent can also collect detailed information about database queries, including the row counts and performance times for executing each query. You can correlate the detailed query data with the graph information to identify which queries were executing when you experienced an issue. A system called Query Analyzer presents the query data in various ways.

1.1 MySQL Enterprise Service Manager

The MySQL Enterprise Service Manager is the hub of MySQL Enterprise Monitor: it collects information, stores the information for display, generates warnings and alerts, sends emails and other notifications, and supports the MySQL Enterprise Monitor User Interface as the interface to the system.

Figure 1.2 The MySQL Enterprise Service Manager Architecture



You can consider the MySQL Enterprise Service Manager as being composed of three parts:

-

- The data collected by the MySQL Enterprise Service Manager is stored within the MySQL Enterprise Monitor repository. The repository uses a MySQL database, so that MySQL Enterprise Monitor can take advantage of MySQL features such as the InnoDB storage engine and partitioning systems.

You can optimize the configuration of the MySQL server depending on the hardware capacity, for example extending the cache memory for the InnoDB storage engine or the thread processes. The default configuration places both the MySQL server and the Tomcat service on the same machine. To dedicate more resources to the MySQL and Tomcat components, you can separate the two across two different machines.

- The MySQL Enterprise Monitor User Interface is a series of JSP pages displayed through the Tomcat service. These web pages display and control all the components of the system, including the different views of data, notification system, graphing engine and the configuration of the MySQL Enterprise Service Manager.

1.2 MySQL Enterprise Monitor User Interface

The MySQL Enterprise Monitor User Interface is a web-based interface to the MySQL Enterprise Service Manager. MySQL Enterprise Monitor User Interface provides a quick overview of the current status of your server, and lets you drill down into the current status, events, and historical information submitted by each MySQL Enterprise Monitor Agent.

The main features of the MySQL Enterprise Monitor User Interface include:

- A single page, **Monitor**, that gives an overview of the current health and status of all your servers, an overview of any events that are triggered, a heat chart for critical status information, and a customizable set of graphs.
- The **Heat Chart** table shows the current status of all your servers, using icons to highlight important issues. A heat chart is included on the main **Monitor** tab, and you can also keep a standalone **Heat Chart** open on your desktop to monitor your server states.
- The **Advisors** tab lets you create, edit, control, install, and schedule advisors within the system.
- The **Query Analyzer** helps you identify problem queries.
- The **Replication** view monitors the structure and health of your replication environment.
- The **Settings** tab lets you set the parameters for the server, including setting notification lists, configuring SNMP, and setting the intervals for removing old data.
- The **What's New?** tab gives a live connection to the My Oracle Support site, with news about the latest releases, critical fixes and patches, and any current [service requests](#).

For a more detailed overview of MySQL Enterprise Monitor User Interface, see [Section 2.1, “MySQL Enterprise Dashboard”](#).

1.3 MySQL Enterprise Advisors Collections

The MySQL Enterprise Advisors are organized into collections. These collections include advisors and definitions for graphs that you can view within the MySQL Enterprise Monitor User Interface.

Each MySQL Enterprise Advisors uses the information collected by the MySQL Enterprise Monitor Agent on each machine to test data values or configuration settings and send an event notification when a threshold is reached. Advisors can be a simple piece of advice, a warning, or a critical event. Within the

MySQL Enterprise Service Manager these events are displayed through either the events tab, or for critical items, a heat chart summarizing the current status of your MySQL servers.

The events can be displayed within the MySQL Enterprise Monitor User Interface, or can trigger additional notifications, such as an email or an SMS text message. The information provided by the advisors, and the collected data, are also exported through [SNMP](#) (Simple Network Management Protocol), so you can use SNMP traps within your existing network monitoring infrastructure.

A [schedule](#) determines how frequently each advisor is executed.

1.4 Monitored MySQL Server

MySQL Enterprise Monitor can monitor any MySQL server running MySQL 4.1 or higher. The advisors and rules provide specific support for different versions. For example, there are unique rules and graphs for different MySQL versions, and some rules provide advice about MySQL upgrades.

In addition to monitoring the internal operation of the MySQL server, the MySQL Enterprise Monitor Agent and MySQL Enterprise Service Manager can determine the [topology](#) of MySQL servers in a [replication](#) configuration, and monitor the replication status.

MySQL Enterprise Monitor uses a number of unique values known as [UUIDs](#) to identify the different components, including the MySQL instance being monitored. UUID values related to the MySQL instance and the host on which it runs are stored in a table `mysql.inventory` within the instance. MySQL Enterprise Monitor creates this table if it does not exist already.

- Each MySQL Server has a UUID, stored in the `mysql.inventory` table, that uniquely identifies the MySQL server to the rest of MEM. The server UUID is used to collate information about a single MySQL instance.
- Each host (the machine on which the agent is running) has a UUID to uniquely identify the host to the rest of MySQL Enterprise Monitor. This is used to collate the OS information (such as CPU, RAM and disk data). The host ID also determines whether the MySQL server is on the same host as it was before, to identify when data has been moved between machines, or when a machine has been upgraded. The host UUID is stored within the `hostid` row within the `mysql.inventory` table.
- Each agent has a UUID to identify the agent to MEM. The agent UUID is defined within the `agent-uuid` parameter within the agent configuration file.

These UUIDs are used in combination to register and collate information, and to determine the location and source of an issue.



Note

Because each host must be unique, be careful when restoring from a backup so you do not have hosts with duplicated SSH keys or UUIDs.

You can monitor any MySQL server, because the agent communicates with the MySQL server using the same protocol as any other client. For best results when using MySQL Enterprise Monitor Agent with your MySQL Server, follow these guidelines:

- Each instance must have a unique ID, as stored within the `mysql.inventory` table.
- Configure the MySQL server with a user that has the correct permissions and rights to be able to monitor the different parameters of the server. For instructions to create a suitable user, see [Section 5.3.1, “Creating a MySQL User Account for the Monitor Agent”](#).

1.5 MySQL Enterprise Monitor Agent

The MySQL Enterprise Monitor Agent performs the following tasks:

- Connects to a MySQL server and collects core information about it. The core data is called the [inventory](#). The inventory includes details such as the MySQL server version number, supported storage engines and replication configuration. The data in the inventory helps to determine what other kinds of data can be collected from the MySQL server.
- Collects a set of standard data items that constitute the bulk of the data sent to the MySQL Enterprise Service Manager. This includes all of the information about the configuration, database objects and other content.
- Collects information about the host operating system on which the agent is running, including CPU, RAM, and file system information and statistics.
- Collects query analyzer data by acting as a MySQL [Proxy](#), collecting, and forwarding MySQL queries from clients and sending the collected query execution information to the MySQL Enterprise Service Manager. This is known as the MySQL Enterprise Agent Proxy Service.
- Collects query analyzer data by acting as an [aggregator](#) of the query execution statistics for applications and languages that do not connect directly with the MySQL Enterprise Service Manager, but instead supply raw query-by-query statistics to the agent for distribution up to the MySQL Enterprise Service Manager. This is known as the MySQL Enterprise Agent Aggregator.
- Collects any custom data items that you can optionally configure to provide unique monitoring and statistical information for your MySQL server.



Note

The MySQL Enterprise Monitor Agent consists of a number of different components, such as the Aggregator and the Proxy. The documentation sometimes refers to these components by name to describe the functionality, configuration, and deployment of specific parts of the Agent.

The agent is a general purpose service that provides the basis for all this functionality and is the key component of MySQL Enterprise Monitor as it provides the MySQL Enterprise Service Manager with the information about each individual MySQL server.

Each MySQL Enterprise Monitor Agent requires a UUID to uniquely identify the MySQL Enterprise Monitor Agent to the MySQL Enterprise Service Manager. This UUID is independent of the UUID assigned to each monitored server. Do not copy the UUID from one instance of the agent to another, as that would cause duplicate agent UUID exceptions.

When the agent first starts, it performs the following operations:

- Loads the configuration information.
- Checks that the Agent UUID exists.
- Generates what it thinks the current Host ID should be.
- Starts the network thread and collector threads.
- Compares whether the instance we are connected to has the same Host ID, to make sure we are not starting on a copied instance wrongly.

- Registers with the MySQL Enterprise Service Manager and then sends a heartbeat signal.
- Receives a "list known data items" call from the Service Manager.
- Loads the list of data items, including any custom data items, to be read from the server.
- Responds to the Service Manager with the known items.
- Receives a "list instances" call from the Service Manager for certain data items.
- Runs the inventory process to determine the core information about the MySQL server.
- Responds to the Service Manager with the inventory.
- Receives schedule information for each data item from the MySQL Enterprise Service Manager in "collect data" tasks.
- Starts collecting data and sending it to the MySQL Enterprise Service Manager according to the schedule set during configuration.

Once running, each MySQL Enterprise Monitor Agent periodically collects information from the monitored MySQL server and sends it to MySQL Enterprise Service Manager.

1.5.1 MySQL Enterprise Monitor Agent Basic Architecture

The MySQL Enterprise Monitor Agent core architecture provides the basic chassis on which the other components operate. The main purpose of the core architecture is to support the connectivity to the MySQL server being monitored, and the communication ability with the MySQL Enterprise Service Manager to collect and send collected information, and receive configuration and other information from MySQL Enterprise Service Manager.

In addition to providing the main chassis for the MySQL Enterprise Agent Proxy Service component, the agent also performs a number of key operations in collecting information from the MySQL server that is being monitored. In particular, the core agent:

- Provides the direct monitoring of the MySQL server, including checking the server accessibility, configuration, obtaining the server ID, and setting up the environment to start collecting more detailed information. In addition to the information accessible by accessing variable and configuration information within the server, other configuration parameters, such as the replication configuration, is also recovered from the server.
- Collects the operating system specific information, including RAM, disk storage and other data.
- Collects the data from the server, including obtaining the values and configuration of the MySQL server, status variables and other information.
- Communicates with the MySQL Enterprise Service Manager. Data is collected at scheduled intervals according to the schedule set by the server. This information is then sent to the MySQL Enterprise Service Manager at a regular schedule that is designed reduce the effect of multiple agents on multiple machines simultaneously sending large blocks of data up to the MySQL Enterprise Service Manager at the same time.

These responsibilities are handled in addition to the MySQL Enterprise Agent Proxy Service service that provide information about queries for the query analyzer.

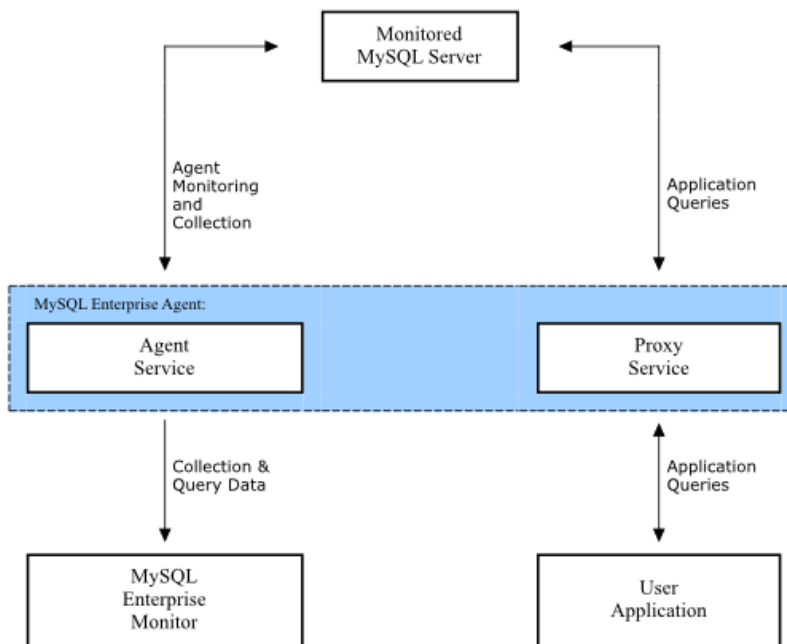
Because the MySQL Enterprise Monitor Agent and the MySQL Enterprise Service Manager may lose communication with each other (for example, due to transient network errors), the MySQL Enterprise

Monitor Agent can store the data that would normally be sent up to the MySQL Enterprise Service Manager. Once communication is re-established, the saved data is sent up to the server.

1.5.2 MySQL Enterprise Monitor Agent Proxy Service Architecture

When using MySQL Enterprise Monitor Agent as a proxy service, the queries from user applications are sent through the MySQL Enterprise Monitor Agent, which forwards them to a MySQL server, returning the query results while recording query statistical information. When operating in this mode, the agent acts as both the agent and proxy for the same monitored MySQL server, as shown in the following figure.

Figure 1.3 The MySQL Enterprise Monitor Architecture when using proxy and agent services for the same MySQL Server



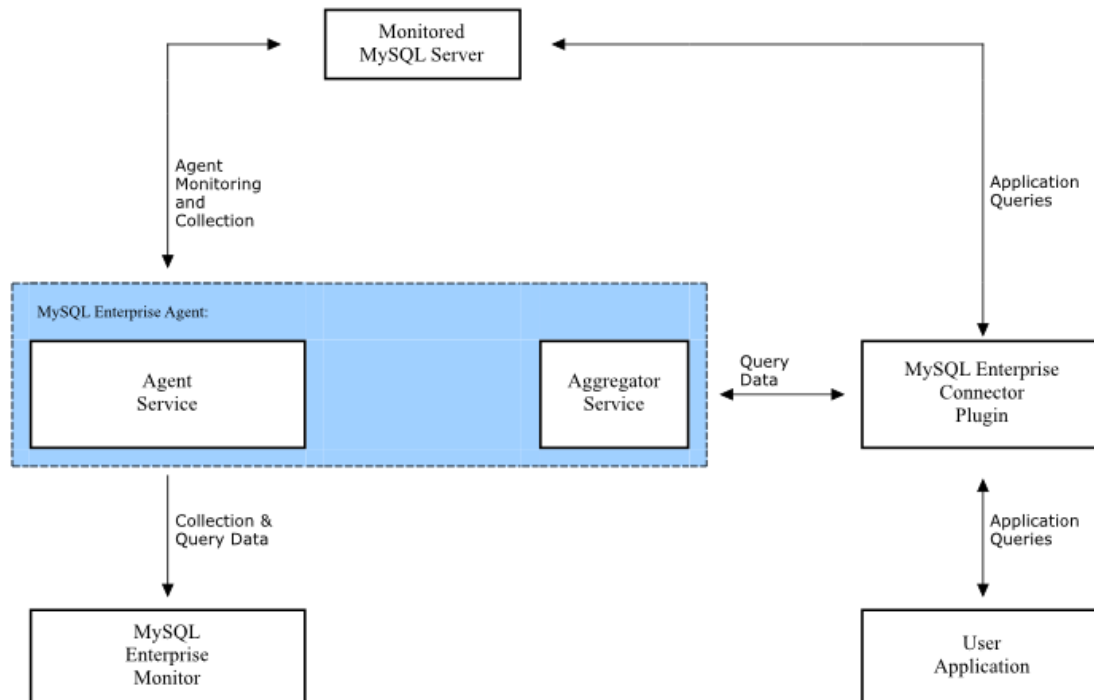
The figure shows a single MySQL Enterprise Monitor Agent and two of the components, the core agent service and the MySQL Enterprise Agent Proxy Service. The MySQL Enterprise Monitor Agent is connected to the single monitored MySQL server. In turn, the MySQL Enterprise Monitor Agent is connected to the MySQL Enterprise Service Manager to provide monitoring and query analyzer data, and to the user application, which uses the proxy service to supply query analyzer data.

1.5.3 MySQL Enterprise Monitor Agent Aggregator Service Architecture

The MySQL Enterprise Agent Aggregator supports an alternative method to the MySQL Enterprise Agent Proxy Service for communicating query data to the MySQL Enterprise Service Manager for use within the query analyzer. It is applicable for plugin components such as MySQL Enterprise Plugin for Connector/PHP, where many short-lived connections are difficult to monitor directly without introducing a performance or scalability bottleneck. These plugins relay query information from the corresponding connectors to the MySQL Enterprise Agent Aggregator.

The MySQL Enterprise Agent Aggregator collects and summarizes the raw query statistics from the connectors. It sends the resulting blocks of data up to MySQL Enterprise Service Manager along with the rest of the monitoring data collected by the MySQL Enterprise Monitor Agent. The following figure represents this layout.

Figure 1.4 The MySQL Enterprise Monitor Architecture when using aggregator and agent services for the same MySQL Server



The MySQL Enterprise Agent Aggregator is used only when collecting queries from the Enterprise Connector plugins. For more information, see [Section 3.1.4, “Using the MySQL Enterprise Agent Aggregator”](#).

Chapter 2 Using and Configuring MySQL Enterprise Monitor User Interface

Table of Contents

2.1 MySQL Enterprise Dashboard	10
2.2 The Monitor Tab	11
2.2.1 The Server Graphs and Critical Events	12
2.2.2 The Heat Chart	14
2.3 The Advisors Tab	16
2.3.1 Installing and Updating Advisors	18
2.3.2 Scheduling Rules	18
2.3.3 Editing Built-in Rules	21
2.4 The Events Tab	23
2.4.1 Closing an Event	25
2.4.2 Notification of Events	26
2.5 The Graphs Tab	26
2.5.1 Displaying Graphs	27
2.5.2 Setting an Interval	27
2.5.3 Setting a Time Span	27
2.5.4 Exporting Graph Images and Data	28
2.6 The Query Analyzer Tab	28
2.7 The Replication Tab	29
2.8 The Settings Tab	31
2.8.1 Global Settings	32
2.8.2 User Preferences	41
2.8.3 Manage Servers	42
2.8.4 Managing Users	47
2.8.5 Manage Notification Groups	48
2.8.6 Logs	49
2.8.7 Product Information	51
2.8.8 Import/Export	52
2.9 The What's New Tab	53
2.9.1 Setting What's New Configuration	54
2.10 Performance Tuning MySQL Enterprise Monitor User Interface for Large Installations	56
2.11 Troubleshooting the MySQL Enterprise Monitor User Interface	57
2.11.1 Diagnosing MySQL Enterprise Monitor User Interface Problems	57
2.11.2 Known MySQL Enterprise Monitor User Interface Problems and Workarounds	57

This chapter contains information about the main sections of MySQL Enterprise Monitor User Interface, how to use the interface, and how to set the different configuration and other settings.

You can open the Dashboard and connect to the MySQL Enterprise Monitor User Interface either using the standard HTTP protocol, or using an SSL connection (HTTPS). By default, you can connect to MySQL Enterprise Monitor User Interface using <http://host:18080>, where [host](#) is the hostname or IP address of the MySQL Enterprise Service Manager. The default SSL URL is <https://host:18443>. You can override these values during installation. To check the configured values, look at the [configuration_report.txt](#) file within your installation directory.

You can configure additional users to have access to your MySQL Enterprise Monitor User Interface. Each user can have a specific privilege level: read-only, restricted from using the Query Analyzer data,

or prevented from using any administrator features. For more information, see [Section 2.8.4, “Managing Users”](#).

**Note**

If you are connecting using SSL, the built-in certificate is self-signed and may be highlighted as 'unsafe' within the browser on initial connection. To prevent problems accessing the site, add an exception for the certificate to your browser for this server.

2.1 MySQL Enterprise Dashboard

The MySQL Enterprise Monitor User Interface provides you with information about your MySQL servers: a list of the latest MySQL Enterprise Advisors reports, server status information, alerts, and updated views of monitored MySQL servers. The **Monitor** screen gives a quick overview of the status of your MySQL servers.

You access the MySQL Enterprise Monitor User Interface through a standard web browser. For more details on the supported browsers, see [Section B.2, “Supported Browsers”](#).

The MySQL Enterprise Monitor User Interface page is divided into four sections: the header, the footer, the main bar, and a context-sensitive **Servers** list. These areas perform the following functions:

- **The Header**

The top of the screen shows the refresh cycle and [Help](#) and [Log Out](#) links. Click the [Help](#) link to open the documentation in a separate browser window. Choose [Log Out](#) if you wish to leave the Dashboard or to log in as a different user.

The **Refresh** selection configures the MySQL Enterprise Monitor User Interface page to automatically refresh and reload at a specific interval, for pages that you leave open for a long time and consult at a glance. Do not make the interval too short, or the load on the MySQL Enterprise Service Manager might affect overall performance.

- **The Footer**

The footer has external links to Oracle software download and support web sites, and information about the current user. You can remain connected to the Dashboard and contact technical support.

The footer also contains a link to the [Settings](#) page. For more information about the [Settings](#) page, see [Section 2.8.7, “Product Information”](#).

- **The Server Tree**

The tab on the left displays the Server tree, where you navigate to different groups or to specific servers. By default, the first group of servers is selected. This selection determines the information shown on the **Monitor** page.

If a server group is selected, the information presented on the **Monitor** page is aggregate information for this group; if only one server is selected, the information applies to that server only.

When you change your server selection, the information shown in the graphs and in the **Heat Chart** changes.

**Note**

For more information about server groups, see [Section 2.8.3.2, “Grouping Servers”](#).

The individual server, or server group, selected in the Server Tree also determines what information appears when the **Advisors** tab or the **Events** tab is selected.

- **The Main Section**

The main section of the page shows the relevant information for the selected task or option. For example, when the **Query Analyzer** tab is selected, the main section of the page shows the Query Analyzer data and a list of the current queries.

You can navigate to a number of pages that provide more detailed information. These pages include:

- **Monitor**: The overview page that shows a quick summary of the servers, their status, events, availability and load. The remainder of this chapter details the contents of this page.
- **Advisors**: Shows the various advisors configured in your installation and lets you schedule their execution on different servers, apply and manage rules and manage the advisor installation itself. For more information, see [Section 2.3, “The Advisors Tab”](#).
- **Events**: Provides an interface into the event system that highlights specific issues and problems on your monitored servers. For more information on using Events, see [Section 2.4, “The Events Tab”](#).
- **Graphs**: Lets you view and configure graphs covering various statistics. For details on how to view and use these graphs, see [Section 2.5, “The Graphs Tab”](#).
- **Query Analyzer**: Interfaces to the query monitoring system that monitors and tracks the individual queries that are being executed on a system. You can find problem queries that may need optimization or that may affect server load. For more information, see [Section 2.6, “The Query Analyzer Tab”](#).
- **Replication**: Provides information on the status and structure of your servers that use replication. For more information, see [Section 2.7, “The Replication Tab”](#).
- **Settings**: Controls the settings for the server, including email configuration, passwords, and server and user management. For more information, see [Section 2.8, “The Settings Tab”](#).
- **What's New?**: Provides the latest news and information about your installation directly from an Oracle Web site. For more information on the data provided, [Section 2.9, “The What's New Tab”](#).

2.2 The **Monitor** Tab

The **Monitoring** tab, which is shown first when you log in to MySQL Enterprise Monitor User Interface, provides a quick overview of your current monitoring information, and provides an instant health check for all of the MySQL servers across the enterprise.

From this page, you can:

- View monitoring data and all critical MySQL Advisor Rule violations for all or selected servers.
- Close and annotate MySQL Advisor Rule violations.
- Determine if there is a Monitor Agent that is not communicating with the Service Manager.
- Determine if there is a server that is in trouble or completely down.

- View indicator value graphs for key MySQL and operating system (OS) level metrics. Graph presentation defaults to a thumbnail view, but opens into a larger image upon being clicked.

Graphs are shown in the center of the page beneath the tabs. If applicable, you also see a list of critical events.

On the right is the color-coded **Heat Chart**, showing the advisors that are installed by default. The **Heat Chart** shows the most important advisors, allowing a quick overview of the state of your servers. You can open the **Heat Chart** in its own window by clicking the [Standalone Heat Chart](#) link. If applicable, you also see a list of critical events.

The [Show/Hide Legend](#) link toggles display of the explanations of the icons used in the **Heat Chart**.

**Note**

Find colorblind-accessible icons in the [alternate](#) directory. On Linux, this directory is immediately below the `/monitor/apache-tomcat/webapps/ROOT/web/resources/images/` directory. These images are stored in the same directory on Windows. To use them, back up the originals and then copy and paste the alternate set into the `images` directory.

When a specific server is selected in the [Server Tree](#), the [Meta Info](#) area beneath the legend shows details about this server. The information shown in this area is the host name, the MySQL version number, the number of scheduled rules, the operating system, and the CPU.

The [Meta Info](#) section also shows how long the agent has been running, when it last contacted the MySQL server it is monitoring, and the last time the agent contacted the dashboard. When you mouse over the date shown beside **Up Since**, a pop-up box displays the elapsed time since the server instance was last started. You can also mouse over the **Last MySQL Contact** and the **Last Agent Contact** dates.

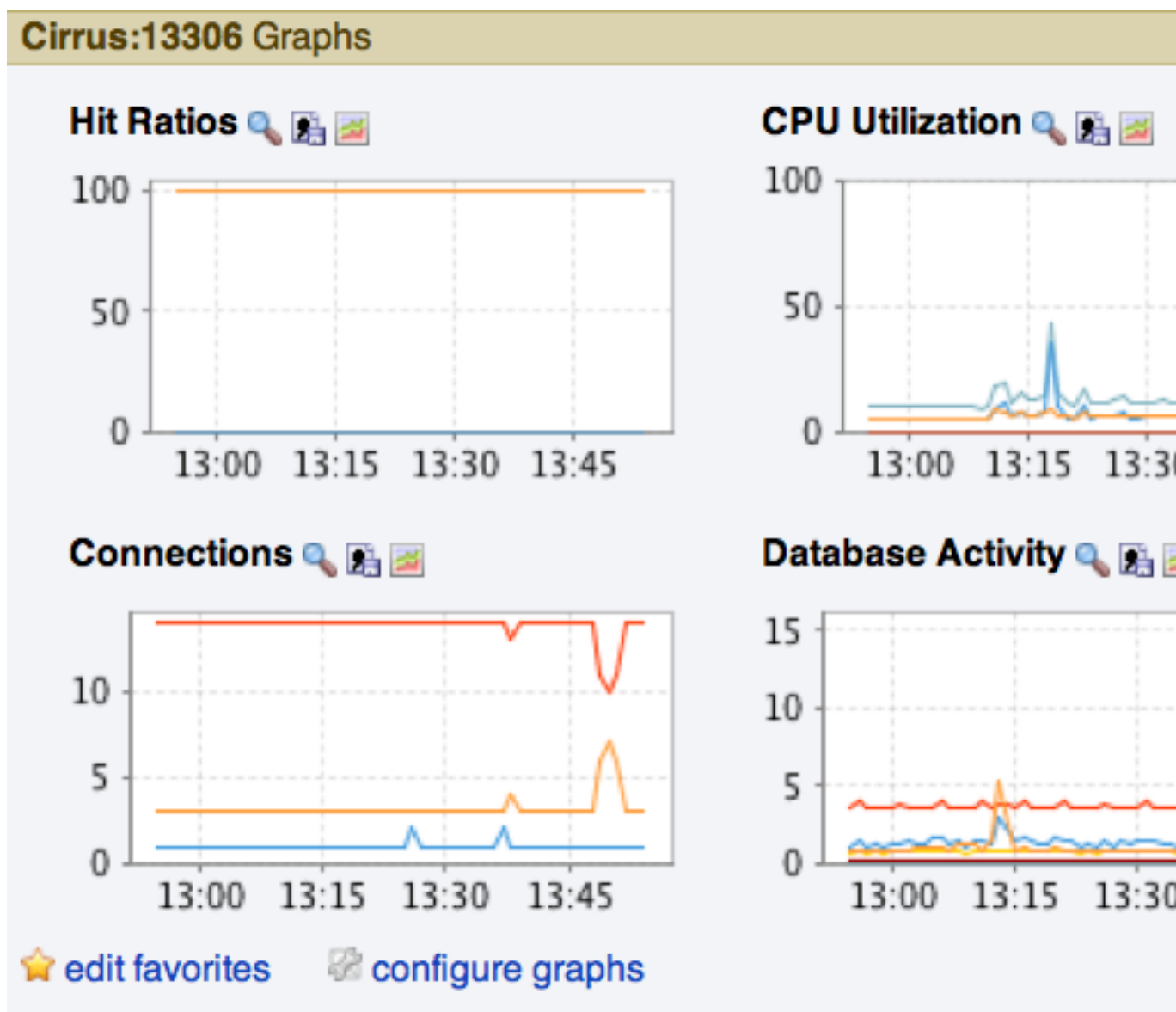
**Note**

In the case of remote monitoring, the agent runs on a different machine than the MySQL server that it is monitoring. The [Hostname](#), [MySQL](#), and [Rules](#) information applies to the system being monitored. The [OS](#) and [CPU](#) information applies to the machine on which the agent is running. For more information about remote monitoring, see [Section 5.3.6, “Configuring an Agent to Monitor a Remote MySQL Server”](#).

2.2.1 The Server Graphs and Critical Events

The center of the **Monitor** page gives a visual representation of the state of your servers.

Figure 2.1 MySQL Enterprise Monitor User Interface: The Graphs Screen



The graphs present information about the currently selected server or server group. The default graphs show the hit ratios, CPU utilization, connections, and database activity for a specific interval.

Graphs also let you drill down from overall usage information to the queries that were being executed on the server at the time. Click and drag on a graph to zoom in on the graph content and view the queries that were being executed during the specified period, to understand server performance and responsiveness. This information is only available when you configure query analysis, and enable query analysis for the servers you are monitoring. For more information, see [Section 2.6, “The Query Analyzer Tab”](#).

To set the interval, click the [configure graphs](#) link immediately below the graphs. In the resulting dialog box, choose the default interval for the x-axis of the graphs. Defining a shorter or longer interval gives you a shorter or longer term view of server activity. You can also adjust the thumbnail and full-size graph dimensions from this dialog box. Save any changes, and the chosen values become the defaults whenever you log in.

You can also choose the default graphs shown on the **Monitor** page. Click the [edit favorites](#) link and choose the graphs you want from the drop-down list box. To choose contiguous graphs, hold down the **Shift** key and click the desired graphs. To select graphs that are not in a sequence, click the desired graphs while holding down the **Ctrl** key. The **Monitor** page can display a maximum of six graphs. Save your changes, and these become the default graphs whenever you log in.

Color coding helps distinguish different aspects of each graph. With [Database Activity](#) for example, you can readily distinguish [SELECT](#) statements from [INSERT](#) statements.

Clicking a graph opens a detailed view with **Graph Display** and **Configure** tabs. Choose the **Configure** tab to temporarily change the way that a graph displays. Changes made from this tab only apply to the standalone graph while it is open. Persistent changes are made as described above.

Dismiss the enlarged graph by clicking the [hide](#) button.

Alerts from the event system are displayed immediately below the charts. For more information on the events display, see [Section 2.4, “The Events Tab”](#).

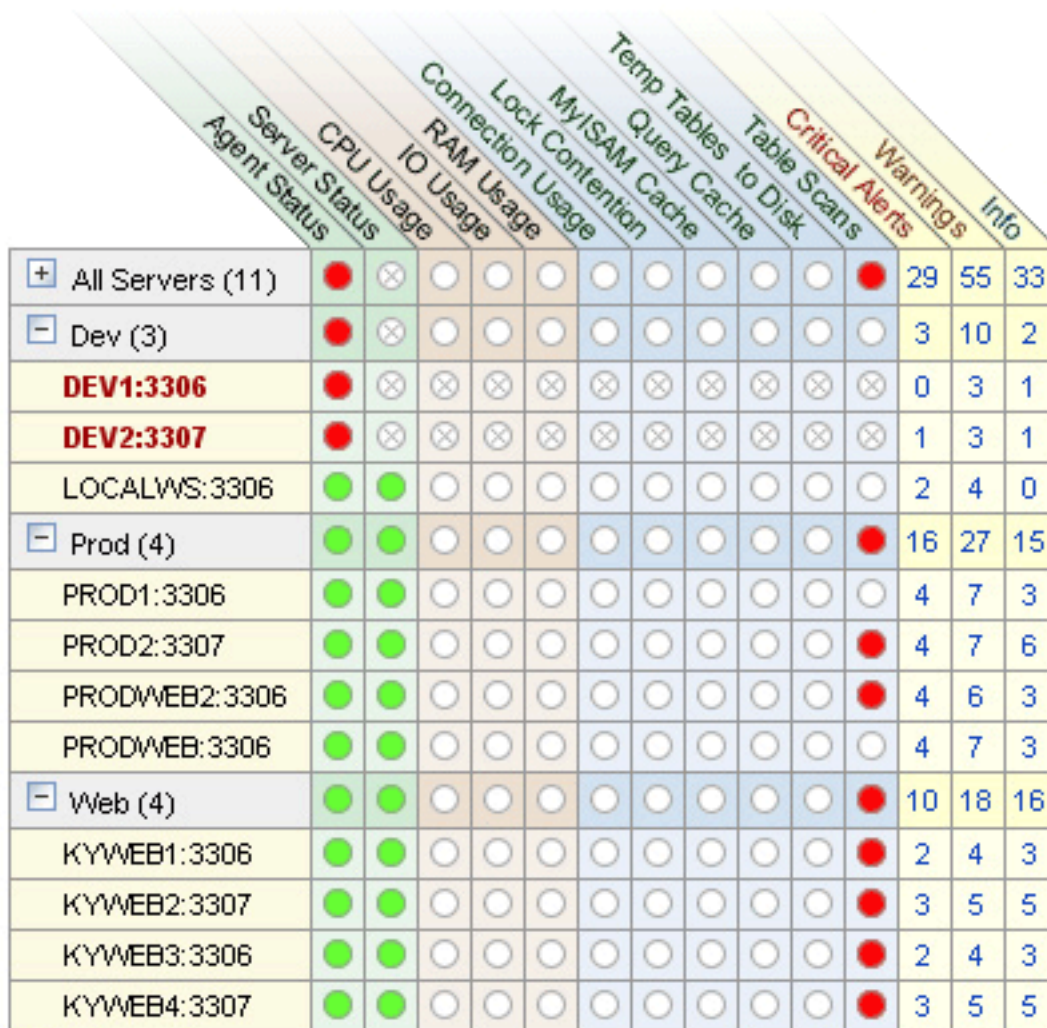
To export a graph, either a [.png](#) file of the graph image or a [.csv](#) file of the underlying data, use the two icons to the right of the graph label. See [Section 2.5.4, “Exporting Graph Images and Data”](#) for details about the export feature.

2.2.2 The Heat Chart

The **Heat Chart** is on the right side of the **Monitor** page and shows the status of critical rules. Monitored servers are organized by groups. To view the status of a specific server, click the **+** button next to the appropriate server group.

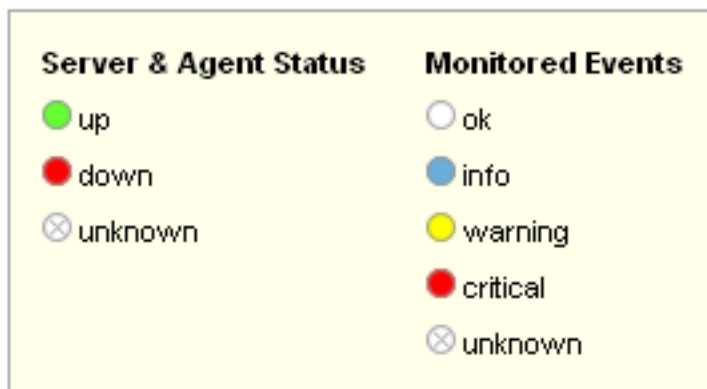
Whenever a new agent contacts the Service Manager for the first time, all the rules in the Heat Chart Advisor are automatically activated. These Advisors monitor the status of the server and agent, critical operating system indicators, and important events related to your MySQL servers. An example follows.

Figure 2.2 MySQL Enterprise Monitor User Interface: The Heat Chart



To interpret the Heat Chart, see the following legend.

Figure 2.3 MySQL Enterprise Monitor User Interface: The Heat Chart Legend



The status **unknown** typically applies when an agent is down and can no longer report the status of the server that it is monitoring. The status **unknown** can also apply if the data that should be collected is not available on the server being monitored.

You can open the Heat Chart in its own browser window by clicking the **Standalone Heat Chart** link immediately below the **Heat Chart** on the left. You can set the refresh rate to a different rate than the setting on the **Monitor** page.

In addition to showing the most important advisors, the **Heat Chart** also has columns that display the number of critical, warning, and informational alarms. Clicking the hyperlink in any one of these columns takes you to the **Events** tab, which gives more detailed information. For more information about events, see [Section 2.4, “The Events Tab”](#). Hovering over the heat chart also provides server counts within the tooltips pop-up.

When the Dashboard is first installed, no notification groups are associated with the Advisors shown in the Heat Chart. For more information on this topic, see [Section 5.2.6.3, “Installing, Updating or Upgrading Advisors After Initial Login”](#) and [Section 2.8.5, “Manage Notification Groups”](#).

2.3 The **Advisors** Tab



Note

MySQL Enterprise subscription, MySQL Enterprise Monitor, MySQL Replication Monitor, and MySQL Query Analyzer are only available to commercial customers. To learn more, see: <http://www.mysql.com/products/>.

MySQL Enterprise Advisors are a series of scripts that gather information from your MySQL servers via the **Service Manager** and the Monitor **Agents**, analyze that information based on custom **rules** included as part of MySQL Enterprise Monitor, and then offer alerts and advice when necessary. As new rules are introduced, the MySQL Enterprise Advisors can be updated over the Web.

The MySQL Enterprise Advisors are classified under the following categories (**advisor groups**):

- Administration:
 - Better manage databases.
 - Suggest improvements for smoother operation.
- Backup:
 - Confirm whether backup jobs succeed or fail.
 - Check how long various stages of backup jobs take.
 - Works with MySQL Enterprise Backup 3.5.3 and up. Relies on the logging feature described in the MySQL Enterprise Backup documentation at [Using the MySQL Enterprise Backup Logs](#).
- Cluster:
 - Shows the up/down status of MySQL Cluster data nodes.
 - Alert you when data node and index node memory runs low.
 - Alert you when Redo and Undo buffer and log space runs low.
- Heat Chart:

- Drive the status indicators in the [Heat Chart](#).
- Identify up/down status and performance issues.
- Memory Usage:
 - Indicate how efficiently you are using various memory caches, such as the InnoDB [buffer pool](#), MyISAM key cache, query cache, table cache, and thread cache.
- Performance:
 - Identify potential performance bottlenecks.
 - Make suggestions for improved database speed.
- Replication:
 - Identify replication bottlenecks.
 - Improve replication design.
- Schema:
 - Identify schema changes.
 - Find security loopholes.
- Security:
 - Protect MySQL servers.
 - Find security loopholes.
- Upgrade:
 - Checks if your current MySQL version has critical issues and requires an update.

An advisor category provides a set of rules designed to enforce MySQL best practices for that specific category. Rules can be targeted to run at the individual server or group level and, upon rule violation, provide alerts and expert advice on how to address and correct a problem before it becomes a costly outage.

The file `items-mysql-monitor.xml` contains supplementary information used to construct rules. On Windows, this file is in the `C:\Program Files\MySQL\Enterprise\Agent\share\mysql-monitor-agent` directory and on Unix, in the `/opt/mysql/enterprise/agent/share/mysql-monitor-agent` directory. For example, the following rule detects a `root` account with no password.

```
<ITEM>
  <NAME>no_root_password</NAME>
  <FIELD>no_password</FIELD>
  <SCOPE>table</SCOPE>
  <CODE>
    <![CDATA[SELECT COUNT(*) AS no_password FROM mysql.user WHERE user='root' AND password='']]>
  </CODE>
  <NAMESPACE>mysql</NAMESPACE>
  <RETURNS>INTEGER</RETURNS>
  <SOURCE>table</SOURCE>
  <INSTANCE>mysql.user</INSTANCE>
```


</ITEM>

Any MySQL Enterprise Monitor customer can use any of the available rules.

When the Dashboard is first installed, the only rules that are scheduled are those that belong to the **Heat Chart** group.

Go to the Advisors screen by logging in to the Dashboard and choosing the **Advisors** tab.

2.3.1 Installing and Updating Advisors

Instructions for installing Advisors are given in [Section 5.2.6.3, “Installing, Updating or Upgrading Advisors After Initial Login”](#), and following.

If your Service Manager can connect to the Internet, you can download the latest Advisors by navigating to the **Advisors** tab and finding the [Check for Updates](#) link. You can periodically update advisors in this way.



Note

If you do not have Internet access and cannot use the online update option, you can manually import advisors. This process is described in [Section 5.2.6.3, “Installing, Updating or Upgrading Advisors After Initial Login”](#).

2.3.2 Scheduling Rules

Once the MySQL Enterprise Advisors have been installed, you can configure which advisors you would like to run on a scheduled basis.

You can schedule rules by individual server or by group. This is done by first selecting the desired server or server group from the **Server** tree found on the left side of the screen. Next select the **Advisors** tab.

Opening the **Advisors** tab takes you to the [Current Schedule](#) page. If you only recently installed MySQL Enterprise Monitor, you only see the [Heat Chart](#) group of advisors. Clicking the **+** button shows all the rules in the Heat Chart group.

Clicking the **+** button beside any specific rule shows the servers that this rule is running on, its frequency, and its status. Initially, all the [Heat Chart](#) rules are enabled.

For a more complete description of a rule, click the rule's name. This opens a dialog box that gives detailed information about the rule.

To view the advisors other than the Heat Chart group, select the [Add to Schedule](#) link.

Rules are grouped by functionality and displayed in alphabetic order. To expand a group click the **+** button to the left of the advisor name.

To activate all the rules in a group, select the checkbox beside the group name. Then you can apply rules against a specific server or a group of servers. A message showing the selected server or server group is displayed below the [schedule](#) button. For example, if the [All Servers](#) group is selected in the server tree, then the message is “Schedule Advisors Against **All Servers**”.

To select a specific rule, expand the group tree by clicking the **+** button, then select the checkbox to the left of the rule. Click [schedule](#) to display the following dialog box:

Figure 2.4 MySQL Enterprise Monitor User Interface: Scheduling Dialog

Schedule

Schedule 23 rules against "bear:3306".

Use Default Frequency ☐ Use each rule's default frequency if available, otherwise use the frequency specified below.

Frequency Hours Minutes
 00 00

Notifications [No Notifications]

Use SNMP Traps ☒

Auto-Close ☒ Use Default (disabled) for Auto-Closing Events
☐ Enable Auto-Close Events
☐ Disable Auto-Close Events

Auto-Close Note

schedule cancel

The Schedule dialog box lets you configure the following fields:

- **Frequency:** Dictates how often the rule runs. The default value for different rules varies, but a rule can be set to run at any interval desired.



Warning

Set the frequency of each rule appropriately based on the tradeoff between resource usage and the chance and severity of the issue. Rule evaluation consumes system resources: CPU, memory, and disk space. While the amount consumed is small, frequently running all the rules against dozens of servers could put a significant load on the Service Manager. For example, unless you stop and restart your servers often, choose a low frequency for rules that check server configuration variables.

Another consideration is that certain status variables increase monotonically until a server is restarted. Examples of these are `Key_reads`, `Qcache_hits`, `Questions`, `Table_locks_waited`, and similar variables. The value returned

by `SHOW STATUS` for these variables is the value since the server was started (or since the last `FLUSH STATUS` command), which is not very useful for performance tuning, especially if the server has been running for an extended period of time. For performance tuning, it is much better to know the change in state (for example, delta) of these values over the last 10 minutes, 1 hour, or whatever time frame is appropriate for your application. The frequency at which you schedule a rule is the time frame used to calculate the delta values of these variables, and it is the delta that is used in expression evaluation, not the absolute value. Consequently, select a frequency that is appropriate for the metrics being used in the expression.

- **Notifications:** A listbox of users, notification groups, or both who are emailed when an advisor reaches an alert level. Single or multiple selections are allowed. For instructions on setting up notification groups see, [Section 2.8.5, “Manage Notification Groups”](#).
- **Use SNMP Traps:** Indicates that an SNMP trap should be raised for this rule. For details on the SNMP configuration within MySQL Enterprise Monitor, see [SNMP Trap configuration](#).
- **Auto-Close:** Specifies whether the rule should use the auto-close system. Events triggered by rules can be automatically closed when the situation that triggered the rule is no longer in effect. Some rules are configured with auto-close enabled by default. To determine which advisors this applies to, see [Section B.9, “Advisor/Graph Reference”](#). For more information on closing and auto-closing events, see [Section 2.4.1, “Closing an Event”](#).

You can configure individual rules to either use the default auto-close settings for the advisor, to enable auto-close events, or to disable auto-close events. If auto-close of events is enabled, specify any text to add to the event closure in the **Auto-Close Note** textbox.

Once you have set the schedule parameters, click the `schedule` button to schedule the advisor.

You can schedule multiple rules by selecting the checkbox next to each rule and clicking the `schedule` button is an effective way to schedule multiple rules.

When scheduling more than one rule, you can select a checkbox to use the default frequency of each rule, or choose a frequency that applies to all selected rules. When customizing the frequency, choose a value that is appropriate to all the rules selected.



Note

If the agent does not have the `SUPER` privilege and InnoDB-related rules are scheduled, a warning appears in the `DataCollection` log. This also occurs if `mysqld` is started with the `skip-innodb` option. For more information about agent rights, see [Section 5.3.1, “Creating a MySQL User Account for the Monitor Agent”](#).

2.3.2.1 Heat Chart Notifications

It is particularly important to set `Notifications` for the `Heat Chart` group of rules. From the `Current Schedule` page, click the `+` button beside a rule and then click a server. Doing this opens a window with three tabs: **Overview**, **Settings**, and **Advanced**.

The **Overview** tab shows which advisor group a rule belongs to, a description of its purpose, and a link to the history of this alert.

In the **Settings** tab you can adjust the frequency of this rule and also specify a notification group. To select more than one contiguous group press the `Shift` key and click the desired groups. (Some web browsers

require that you drag your selection.) To make non-contiguous selections, hold down the [Control](#) key and click the desired groups.

If you have set up global SNMP traps, check the [Use SNMP Traps](#) checkbox for a specific rule to make your Network Management System (NMS) handle events related to that rule. For more information about Simple Network Management Protocol (SNMP) see [Simple Network Management Protocol \(SNMP\) Traps](#).

The [Advanced](#) tab gives detailed information about how this rule is implemented.

2.3.3 Editing Built-in Rules

The frequency and thresholds defined for a rule are default recommendations. To edit these properties, choose the [Create/Edit Rule](#) link.

The following image shows the screen used to edit rules:

Figure 2.5 MySQL Enterprise Monitor User Interface: Editing Rules

The screenshot displays the 'Rule Definition' page in the MySQL Enterprise Monitor UI. At the top, there's a navigation bar with tabs: Monitor, Advisors, Events, Graphs, Query Analyzer, Replication, Settings, and What's New?. Below this is a sub-navigation bar with links: Current Schedule, Add to Schedule, Manage Rules, Check For Updates, and Import/Export. The main content area is titled 'Rule Definition' and contains a warning message: 'WARNING: You are editing a certified rule. You can modify its default frequency and alert thresholds. To make any other changes, go back to the main Manage Rules page and select "Copy" instead of "Edit."'.

The rule details are as follows:

- Rule Name:** Excessive Disk Temporary Table Usage Detected
- Advisor:** [New Advisor] (dropdown menu)
- New Advisor:** (empty text input field)
- Version:** 1.9

The **Expression** field contains the following SQL expression:

```
100-((%Created_tmp_disk_tables% / %Created_tmp_tables%)*100) < THRESHOLD
```

Below the expression, the **Thresholds** section shows three alert levels with their respective values:

- Critical Alert:** 50
- Warning Alert:** 75
- Info Alert:** 90

The **Variable Assignment** section contains a table with four rows, each representing a variable assignment:

Variable	Data Item	Instance	Action
%tmp_table_size%	mysql:variables:tmp_table_size	local	delete
%max_heap_table_size%	mysql:variables:max_heap_table_size	local	delete
%Created_tmp_tables%	mysql:status:Created_tmp_tables	local	delete
%Created_tmp_disk_table	mysql:status:Created_tmp_disk_tables	local	delete

At the bottom of the variable assignment table is an 'add row' button. Below this, the **Default Frequency** section shows two dropdown menus for 'Hours' (set to 00) and 'Minutes' (set to 05).

Beside the rule name is the [Advisor](#) drop-down list box, used for setting the advisor group. This list box shows existing groupings and any you have added. The [Expression](#) textarea shows the advisor rule, [Variable Assignment](#) the data item associated with variable(s) used in the rule and [Thresholds](#) determines when to trigger each alert type.

The three levels of [Thresholds](#) are [Info Alert](#), [Warning Alert](#), and [Critical Alert](#) indicating increasing levels of severity. Levels can be triggered by the expression result being equal to a certain value, greater than a certain value, or less than a certain value.

The data items that variables are associated with are operating system (OS) properties such as available RAM or MySQL characteristics such as the InnoDB buffer pool. To see all available data items drop down the **Data Item** list box. For a listing of these data items see [Appendix D, Data Collection Items](#).

In [Figure 2.5, “MySQL Enterprise Monitor User Interface: Editing Rules”](#), the drop-down **Data Item** list box within the **Variable Assignment** frame shows the various MySQL server status or operating system specific variables that you can use in expressions. The text boxes below **Thresholds** define the levels at which informational, warning, or critical alerts are issued.

To lower the threshold for an informational alert, simply increase the number given in the **Info Alert** text box.

When a data item can apply to multiple objects, specify through the **Instance** text box which instance to use for that item. In almost all cases, set this value to **local**. The exceptions are as follows:

- For CPU-related items set **Instance** to **cpu0**. Additional CPUs on a system are referred to as **cpu1**, **cpu2** and so on.
- There can be multiple disks mounted on a system. To refer to a specific drive, set **Instance** to the name of the mounted drive. On Windows this would be **C:**, **D:**, and so on. On Unix systems, use whatever is valid for the **df** command.
- For RAM-related items set **Instance** to **mem**.
- Where there are table-specific variables, specify the database name and table name in the **Instance** text box. This topic is discussed in detail in the following section.



Note

It is not possible to have a data item that is unrelated to an instance. This raises the error, **You must map "<variable>" to an instance**, and you cannot save the rule.

Since an agent can only collect data from one MySQL server, the **instance** entry for a variable in a rule does not need to specify which MySQL server to use; no matter how many servers are being monitored, there is always a one-to-one relationship between an agent and its monitored server.

However, on one server there could be multiple occurrences of a variable. For example, there are multiple possible occurrences of table-specific variables such as **Avg_row_length** because there can be multiple databases and tables defined in a MySQL server. In this case, the “instance” refers to the database and table that a data item should be associated with, specified in the form **databaseName.tableName**. So, for example, if you want to reference the **Avg_row_length** of the **mysql** database **user** table in an expression, select the **mysql:tablestatus:Avg_row_length** from the **Data Item** list box and specify **mysql.user** in the **Instance** text box.

On the other hand, in the case of a global server variable, there is only one possible target. For example, there can only be one instance of **delay_key_write** because this variable is global and applies to the server as a whole. In this case specify **local** in the **Instance** text box.

To save your changes click the **save** button at the bottom of the page.



Note

You can change only the thresholds and the frequency of built-in rules. So that rules function properly when updated, other changes are prohibited.

Should you wish to make other changes to a built-in rule, copy it and modify it as desired.

You can edit a rule even if it is currently scheduled. Your changes are preserved when new rules are imported using the [Check for Updates](#) link.

2.4 The **Events** Tab



Note

MySQL Enterprise subscription, MySQL Enterprise Monitor, MySQL Replication Monitor, and MySQL Query Analyzer are only available to commercial customers. To learn more, see: <http://www.mysql.com/products/>.

Once an advisor is scheduled, it runs at set intervals. If it finds nothing of interest, it creates no alerts or emails.

Events are defined using a number of different levels according to the severity of the alert. The seven levels are:

- **Failure:** Indicates a failure for the given rule or event. Usually, this indicates that the rule on which the event is based has failed, probably due to a typo or other error. Occasionally, it can indicate a failure to retrieve the required information for a given rule.
- **Critical:** The event is critical and requires immediate attention. Critical events normally indicate that a serious problem has occurred or is about to occur. Examine the event, determine the cause, and fix the issue as soon as possible.
- **Warning:** The event is something to be aware of, but does not affect the operation of your server.
- **Info:** The event is for informational purposes. Info events call attention to issues that do not affect the operation of your server, such as a minor configuration issue.
- **Success:** The rule executed successfully with no issues. The result of the rule is OK. It also signals when an event that was previously in a Critical or Failure state returns to normal.
- **Unknown:** The current status of the event/rule cannot be determined.
- **Closed:** The issue has been corrected and marked closed.

For convenience, the event states are also represented by icons, as defined in the following table. The table also shows the relative level of the alert from the highest (Critical) to the lowest (Unknown). The order represented here is used when identifying when an event has transitioned between levels (for example, from Success to Critical), hence triggering a notification, and when sorting events based on their current state.

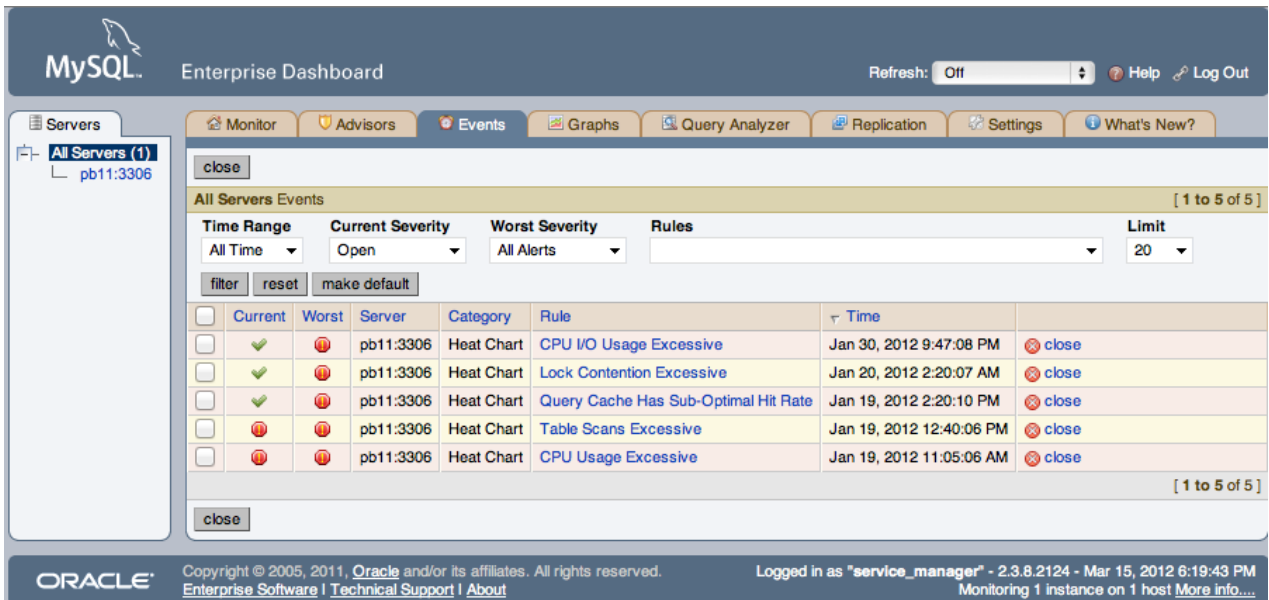
Icon	Description
	An octagonal red icon indicates a critical alert.
	A triangular yellow icon indicates a warning.
	A conversation bubble is an informational alert.
	A green tick beside an event indicates that the rule has run successfully and no alert created.
	A question mark icon indicates that the status of the rule is unknown.

When alerts are triggered, they appear on the **Events** screen. Alerts also appear on the **Monitor** screen in order of severity. The notification group or groups associated with a specific rule receive email notification

when an alert is triggered. For more information about creating notification groups, see [Section 2.8.5, “Manage Notification Groups”](#).

To view open events, click the **Events** tab. The tree-view on the left determines which server or server group these events belong to. Open events are shown in tabular format.

Figure 2.6 MySQL Enterprise Monitor User Interface: Events Screen



The event table has the following columns:

- **Current:** An icon indicating the current severity of the alert.
- **Worst:** An icon indicating the worst severity recorded for this alert.
- **Severity:** An icon indicating the severity of the alert.
- **Server:** The name of the server the alert applies to.
- **Category:** The category of the advisor.
- **Rule:** A short description of the rule that is violated.
- **Time:** The approximate time the event occurred.
- **Status:** The status of the event.
- **Unnamed Column:** Provides a link to the [Close](#) dialog box.

By default, all events are shown but the list of events can be filtered using the form displayed above the event list. The options include filtering by:

- Severity.
- Date (using a range with From/To).
- Advisor group.

- Specific rule.
- Status.

Choose the options you are interested in and click the **filter** button to refresh the display. To limit the number of items that appear on a page, choose a different value from the **Limit** drop-down list box.

The drop-down list box showing severity has the options: **All**, **Alerts**, **Critical**, **Warning**, **Info**, **Success**, and **Unknown**. Selecting the option **All** shows all alerts and also those rules that have run successfully.

A successful rule is one that has not been violated and is indicated by a green tick icon.

The **Alerts** shows only those rules that have been violated.

Columns can be sorted by clicking the individual column headings. The alerts shown in [Figure 2.6, “MySQL Enterprise Monitor User Interface: Events Screen”](#).

The server shown in [Figure 2.6, “MySQL Enterprise Monitor User Interface: Events Screen”](#), is filtered for **All**. Typically, when filtering by severity you choose **Alerts** and, if you see a **Critical**, **Warning**, or **Info** alert, use the **All** filter to see when the rule last ran successfully. Narrowing down the time-frame can help determine the cause of the alert.

Besides filtering for severity, you can filter for a specific time period using the **From** and **To** text boxes. You can also filter by specific rules or categories of rules. The **Status** drop-down list box lets you choose **All**, **Open**, or **Closed** events. To avoid excessive scrolling, you can also limit the number of events shown on a specific page.

For more information about an alert, click the rule name. A pop-up window appears, showing a description of the alert and the exact time of occurrence. This pop-up window provides links to useful resources and advice for resolution. You can also view the exact expression that generated the event.

2.4.1 Closing an Event

The creation of an event by an advisor rule signifies that an issue might require closer attention. Investigate the issue that triggered the event; rectify the issue or problem (or choose to ignore it); then close the event, when you are satisfied it does not have a significant impact on your servers.

Some of the advisors identify transient or temporary issues, such as a replication slave being unavailable. For these advisors, you can schedule events to automatically be closed when the event moves from notification status back to the **Ok** state.

You can configure auto-close functionality on all advisors through the **Advisors** tab when you schedule the advisor against one or more servers. When auto-close is enabled, the event remains open while the condition that triggered the event is still in effect. When the condition is no longer broken, the event is automatically closed with the configured auto-close test. You can still manually close such events before resolving the issue. For more information on scheduling rules, see [Section 2.3.2, “Scheduling Rules”](#).

To close an individual alert, click the **close** link in the **Operations/Notes** column. Document the resolution using the **Resolution Notes** text area and choose the **close** button. During the closing operation, you can also reconfigure the rule scheduling that triggered this event, and the auto-close settings. For more information on configuring rule scheduling and auto closing, see [Section 2.3.2, “Scheduling Rules”](#).

To close a number of alerts simultaneously, select the checkbox beside each alert to close and click the **close** button.

When closing individual or multiple events, a notification window indicates what operations have been completed. The events remain in the displayed event list, but the **close** link is instead a link to the [resolution notes](#). You can update the active list by clicking **filter** to re-filter the event display.

A historical list of all events, including closed events, is available by setting the **Current Severity** to [Closed](#). The list shows all of the closed events for a given time range and the servers selected in the server tree. Historical data is limited by the [purge data settings](#).

2.4.2 Notification of Events

Notification of an event takes place when a rule is executed and the severity level for a given rule changes from a lower status to a higher one. This occurs on the first change to each individual severity level until the event is closed.

For example, the table shows the severity levels raised during the lifecycle of a single event, showing when a notification is actually raised.

From Level	To Level	Notification Raised?
Ok	Info	Yes
Info	Warning	Yes
Warning	Info	No
Warning	Critical	Yes
Critical	Warning	No

If auto-close is enabled for a given rule, this notification sequence is still valid, but the event is automatically closed when the event reaches the [Ok](#) state. This re-enables notification when the advisor creates a new event.

SNMP notifications are sent each time a given rule is executed, regardless of the current or returned state. Auto-closed events cause SNMP traps with the [closed](#) alarm level.

2.5 The **Graphs** Tab



Note

MySQL Enterprise subscription, MySQL Enterprise Monitor, MySQL Replication Monitor, and MySQL Query Analyzer are only available to commercial customers. To learn more, see: <http://www.mysql.com/products/>.

Navigate to the **Graphs** tab by choosing the **Graphs** tab.

By default, four graphs are displayed on the [Monitor page](#). These graphs present information about the currently selected server or server group, showing the hit ratios, CPU utilization, connections, and database activity. Color coding helps distinguish different aspects of each graph.

From the **Monitor** tab, you can make permanent or temporary changes to the way a graph is displayed. For example, you can view the last hour's activity, or a specific period of time.

The **Monitor** tab is the only place where you make persistent changes to the way the graphs display. You can set the size of the thumbnails and the full-sized graphs and you can also set their refresh interval. For more information, see [Section 2.2.1, "The Server Graphs and Critical Events"](#).

As with the **Monitor** tab, the data shown in the graphs is determined by the server or group of servers selected in the server tree. Each graph is only displayed if there is appropriate data for the selected

servers; for example, only slave servers have a **Replication Slave Delay** graph, and the **Cluster** graphs only apply to MySQL Cluster servers.

The **Graphs** tab shows all the available graphs in a single column, and provides the capability of adjusting the scale of the graphs, allowing a more or less detailed view as the situation requires. Click on the **Graph Gallery** to view multiple graphs per column.

To ensure that you have the latest versions of the graphs, click on the **Check For Updates** link on the top left of this page.

All graphs support the ability to drag and select a specific area of the graph. When you select an area of the graph, the display changes to the **Query Analyzer** tab and displays the queries that were being executed during the selected time period. You can also zoom into the graph by selecting specific time periods. For more information on using the graphs to monitor the execution of specific queries, see [Section 3.2.2, “Using Graphs to Identify Queries”](#).

2.5.1 Displaying Graphs

The graphs on the **Monitor** tab are:

- Hit Ratios
- Database Activity
- Connections
- CPU Utilization

When the **Graphs** tab is first opened, no graphs are visible. To view a graph click the **+** button on the left or, to view all graphs, use the **expand all** button.

The larger size of graphs is the primary reason for viewing graphs on the **Graphs** tab rather than on the **Monitor** tab. Additionally, you can only show a maximum of six graphs on the **Monitor** tab; the remaining graphs can only be viewed from the default **Graphs** tab, or from within the **Graph Gallery**

2.5.2 Setting an Interval

Change the interval for a graph by choosing values from the **Hours** and **Minutes** drop-down list boxes. If necessary adjust the width and height of the graph and then click the **update** button. The changes to the time span apply to all the graphs on the **Graphs** tab but have *no* effect on the graphs on the **Monitor** tab.

To change the graphs both here and on the **Monitor** tab, use the [configure graphs](#) link on the top right. This opens a dialog box for setting the default interval for the x-axis. Save your changes, and the values chosen become the defaults whenever you log in. You can also change the defaults from the **Monitor** tab as described in [Section 2.2.1, “The Server Graphs and Critical Events”](#); defaults for other users are unchanged.

Use the **reset** button to restore the default value for the interval. Doing this will also reset the default size of the graphs.

2.5.3 Setting a Time Span

Setting a graph to display a time span gives you a historical perspective on server activity. For example, you can check what was happening at a specific point in time, or look at an extended period to determine patterns or trends.

In the **Time Display** drop-down list box select the **From/To** option. Choosing this option updates the display to include **To** and **From** text boxes.

Set the date you wish to start viewing from by manually entering the date in year, month, and day format (2007-03-14). However, it is much easier to click the calendar icon and choose a date from the drop-down calendar. Enter a terminating date in the same way. You can also choose the specific time of day by selecting the hour and minute.

If necessary, adjust the width and height of the graph and then click the **update** button. The changes to the time span apply to all the graphs on the **Graphs** page but have *no* effect on the graphs on the **Monitor** tab. You cannot change the time span of the graphs that appear on the **Monitor** tab. Changes apply only to the current user; defaults for other users are unchanged.

Use the **reset** button to cancel your changes.

2.5.4 Exporting Graph Images and Data

You can save graphs on the Dashboard pages in either **.csv** format (the raw data for the graph) or **.png** format (an image file showing the rendered graph). Where graphs are displayed on the **Monitor**, **Graphs**, and **Query Analyzer** pages, 2 icons to the right of the graph title let you export in these formats.

Hover over the icon to confirm which one corresponds to which format. Since **.png** files typically display in the browser rather than bringing up a Save dialog, either click the icon and save the image file on the resulting page, or bring up the context menu for the icon and choose **Save linked file** or the equivalent for your browser. (You might need to change the extension to **.png** in the Save dialog.)

For **.csv** files:

- The filename includes a timestamp showing the date and time that you export the graph data, in UTC format.
- If the graph covers any period when the MySQL server or Agent was down, no data is included in the CSV file for that period. (Rather than blank or zero values.)

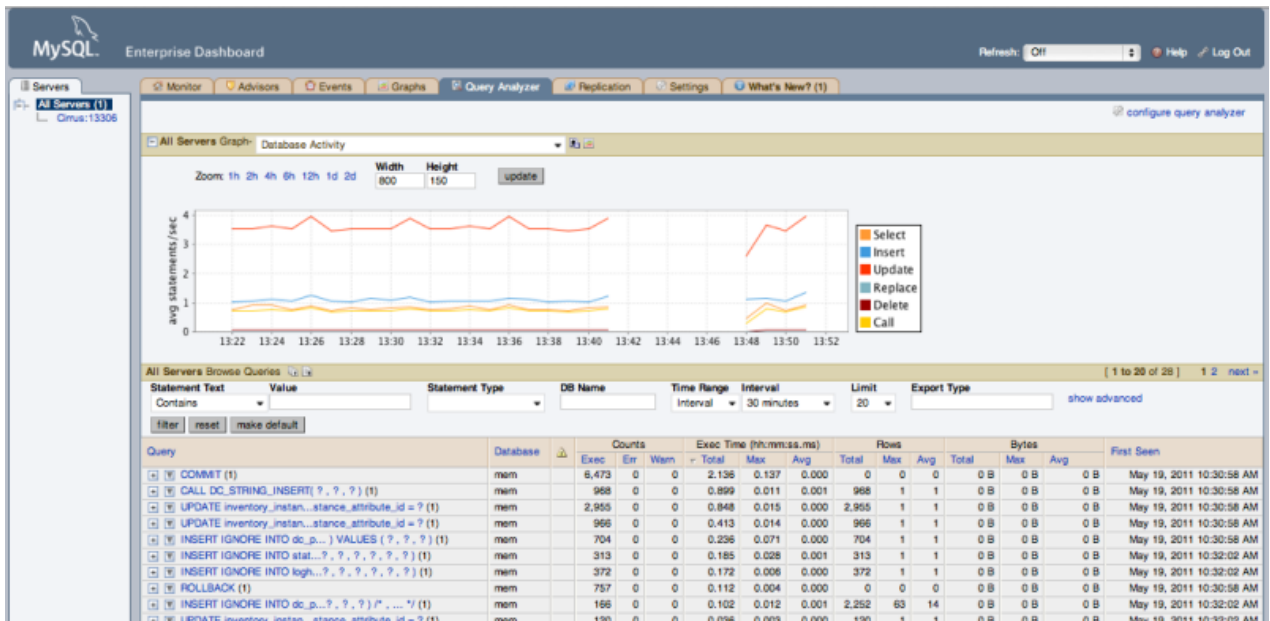
2.6 The Query Analyzer Tab

The MySQL **Query Analyzer** lets you monitor the statements being executed on a monitored server and retrieve information about the query, number of executions and the execution times of each query. Queries are **normalized**, removing unique data such as literal values, so that the generic queries can be counted and identified more easily.

Query Analyzer works by collecting information about SQL statements that your MySQL client application sends to the MySQL server, either by using the MySQL Enterprise Monitor Agent proxy service, or by using the MySQL Enterprise Monitor Plugin for a given Connector that sends the information directly to MySQL Enterprise Service Manager.

For more information using the Query Analyzer, including how to provide queries to MySQL Enterprise Service Manager, how to use the user interface, and how to drill down to find the queries and information that you need, see [Chapter 3, Using the Query Analyzer](#). For the meaning of each field on the Query Analyzer tab, see [Section 3.2, “Query Analyzer User Interface”](#).

Figure 2.7 MySQL Enterprise Monitor User Interface: Query Analyzer



2.7 The **Replication** Tab



Note

MySQL Enterprise subscription, MySQL Enterprise Monitor, MySQL Replication Monitor, and MySQL Query Analyzer are only available to commercial customers. To learn more, see: <http://www.mysql.com/products/>.

Navigate to the **Replication** page by choosing the **Replication** tab. This page summarizes the state of your **replication** servers; you can drill down to see details about any **master** or **slave**. Using this page helps you avoid running the **SHOW SLAVE STATUS** command over and over on multiple servers; for consistency, the **Replication** page uses some of the same keywords as the output from that command.



Note

Set up agents to monitor each master and slave server. Only servers that are monitored appear on this page.

The **Replication** page groups all master servers with their slaves. Masters and their slaves are autodiscovered and a grouping is created, based on the way that the servers are interconnected (known as the replication **topology**). This grouping shows up on the replication page and also in the **Heat Chart** on the **Monitor** tab. Scans run on a five minute interval, so depending upon the order of discovery, it can take as long as 2 polling intervals to create a complete group.

Figure 2.8 MySQL Enterprise Monitor User Interface: Replication Groups

Servers	Type	Threads IO SQL	Time Behind	Binary Logs Current File Position	Master Position Binary Log Position	Log Space Binary Logs Relay Logs	Last SQL Error	Last IO Error
Replication 1 (20)	TREE	✓						
AMaster	master	✓		mysql-bin.000005 3,155		14.06 KB		
AMasterSlave1	master/slave	✓	00:00:00	mysql-bin.000006 3,011	mysql-bin.000005 3,155	3.39 KB		
AMasterSlave2	slave	✓	00:00:00		mysql-bin.000004 2,413	15.29 KB	Error 'Table 'test.t1' doesn't exist' on query. De...	
AMasterSlave3	slave	✓	00:00:00		mysql-bin.000006 3,011	3.39 KB		
AMasterSlave4	slave	✓	00:00:00		mysql-bin.000006 3,011	3.39 KB		
AMasterSlave5	slave	✓	00:00:00		mysql-bin.000006 3,011	3.39 KB		
AMasterSlave6	slave	✓	00:00:00		mysql-bin.000006 3,011	3.39 KB		
AMasterSlave2	master/slave	✓	00:00:00	mysql-bin.000006 3,011	mysql-bin.000005 3,155	13.97 KB		
AMasterSlave1	slave	✓	00:00:00		mysql-bin.000006 3,011	3.39 KB		
AMasterSlave2	slave	✓	00:00:00		mysql-bin.000006 3,011	3.39 KB		
AMasterSlave3	slave	✓	00:00:00		mysql-bin.000006 3,011	3.39 KB		
AMasterSlave4	slave	✓	00:00:00		mysql-bin.000006 3,011	3.39 KB		
AMasterSlave5	slave	✓	00:00:00		mysql-bin.000006 3,011	3.39 KB		
AMasterSlave6	slave	✓	00:00:00		mysql-bin.000006 3,011	3.39 KB		
ASlave1	slave	✓	00:00:00		mysql-bin.000005 3,155	3.53 KB		
ASlave2	slave	✓	00:00:00		mysql-bin.000005 3,155	3.53 KB		
ASlave3	slave	✓	00:00:00		mysql-bin.000005 3,155	3.53 KB		
ASlave4	slave	✓	00:00:00		mysql-bin.000005 3,155	3.53 KB		
ASlave5	slave	✓	00:00:00		mysql-bin.000005 3,155	3.53 KB		

Discovery events are logged to the **Replication** log. To view this log, navigate to the **Settings** page and choose the **Logs** link. View all replication-related events by clicking the **Replication** link. This log can be a useful tool for debugging the replication [topology](#) discovery process.



Warning

For discovery to work properly, the agent must be installed on the same machine as the server you are monitoring. Do **not** use remote monitoring.

You can manage replication groups from the [Manage Servers](#) page in the same way as other groups. However, any slaves removed from a server group are automatically restored to that group. You can also add non-slaves to a replication grouping. For more information about server groupings see [Section 2.8.3.2, “Grouping Servers”](#).

Replication Page Details

Choose a value from the **Refresh** drop-down list box to set the rate at which information is updated. This refresh rate applies only to the information presented on this page: It is independent of the rate set for the **Monitor** tab.

The following columns describe replication [master](#) and [slave](#) servers:

- **Servers:** Displays the group name and any servers that are part of the group. Levels of indentation in this column show the relationship between master servers and their slaves. The icon next to each server indicates if the server is enabled for semi-synchronous replication or not. A gray “disabled”-style icon indicates that semi-synchronous replication is not available.
- **Type:** Indicates the [topology](#) of a server group or in the case of individual servers, whether a server is a [master](#), a combined [master/slave](#), or a [slave](#).
- **Threads:** Displays information about the two dedicated replication threads that run on the slave server. Both threads must be running for the slave to work properly. **IO** reports the status of the slave I/O thread. **SQL** reports the status of the slave SQL thread.
- **Time Behind:** The interval that the slave is behind the master, in `hh:mm:ss` format. This column is blank if a server is a master. Typically, you try to keep this value low.

- **Binary Logs**: Displays information about the [binary log](#) file. **Current File** shows the binary log file name. **Position** shows the current position in the binary log file.
- **Master Position**: Displays information about the binary log position from the master server. **Binary Log** shows the master binary log file name. **Position** shows the current position in the master binary log file.
- **Log Space**: Displays the sizes of log files related to replication. **Binary Logs** shows size information for the binary log files. **Relay Logs** shows size information for the relay log files.
- **Last SQL Error**: The most recent error encountered by the slave SQL thread.
- **Last IO Error**: The most recent error encountered by the slave I/O thread.
- **Unlabeled Column**: To edit a server group name, click on the applicable **rename group** link under this column.

Most column headings are active links; click the header to change the display order. Sorting works differently for different column groupings. Click the [Seconds Behind](#) header to order servers by the number of seconds they are behind their master. The server topology is respected regardless of sort order. For example, in a [TREE](#) topology, ordering occurs within branches only.

If the agent is down, servers show in bold red in the [Servers](#) column. The [Slave IO](#) and the [Slave SQL](#) columns display [stopped](#) in red text if these threads are not running. If an agent is down, the last known status of the IO or SQL threads is shown in italics.

Clicking a master server opens a dialog box that displays information about the server. The information shown includes:

- The number of slave servers.
- The binary log file name.
- The binary log position.
- Which databases are replicated and which not.

The dialog box also includes a link to hide or show the slave servers.

Clicking a slave server opens a dialog window showing extensive information about the slave.

Usage Notes

For information on the kinds of problems you might find while monitoring replication, and how to solve them, see [Troubleshooting Replication](#) and [Improving Replication Performance](#).

2.8 The Settings Tab



Note

MySQL Enterprise subscription, MySQL Enterprise Monitor, MySQL Replication Monitor, and MySQL Query Analyzer are only available to commercial customers. To learn more, see: <http://www.mysql.com/products/>.

The initial installation lets you configure your [My Oracle Support](#) credentials and outgoing email settings. This section explores the configuration settings in more detail, and shows how to manage servers, users, notification groups, Simple Network Management Protocol (SNMP) traps, log files, and the product information screen.

Knowledge of server management is a prerequisite for properly configuring advisors, which is explained in [Section 2.3, “The **Advisors** Tab”](#).

To get to the **Settings** tab, open the Dashboard and choose the **Settings** tab.

2.8.1 Global Settings

The **Global Settings** control the main configuration parameters for the entire MySQL Enterprise Monitor system, including your email notifications, data purge, and My Oracle Support credentials.

The **Global Settings** tab is divided into these sections:

- **Outgoing Email Settings**

Configures the settings for email notifications by MySQL Enterprise Service Manager. Configure the **From Address SMTP Server** settings. If your server requires authorization, complete the necessary server login details, and whether SSL is required.

Because alert notification via email is a key component of the MySQL Enterprise Monitor Advisor solution, consider configuring an SMTP account for at least one recipient. Choose the **Settings** tab and go to the [Global Settings](#) screen by clicking the appropriate link. Here you configure the email settings that apply to the currently logged-in user.

Find the [Outgoing Email Settings](#) on the left of this page.

Figure 2.9 MySQL Enterprise Monitor User Interface Settings: Outgoing Email

The screenshot shows the 'Outgoing Email Settings' form in the MySQL Enterprise Monitor user interface. The form is titled 'Outgoing Email Settings' and contains the following fields and options:

- ☐ **Enable Email Notifications**
- From Address** (ex. "MySQL Dashboard" <name@domain.com>): A text input field.
- SMTP Server**: A text input field.
- SMTP Server Login**: A text input field.
- ☐ **Disable JavaMail TLS/SSL**
- ☐ **Update Password On Save**
- SMTP Server Password** and **Confirm Password**: Two text input fields.
- On Save, Send Test Email Message to (optional)**: A text input field.
- save**: A button at the bottom left.

Ensure that the [Enable Email Notifications](#) checkbox is checked and enter information as appropriate.

The default value for the SMTP port is [25](#). If your mail server runs on a different port, specify the port, separated from the server name by a colon. For example, if your mail server runs on port 587, enter [email.myserver.com:587](#) into the **SMTP Server** text box.



Note

An email server must be available for sending email alerts.

The SMTP client uses Transport Layer Security (TLS) if the SMTP server supports it.

If your SMTP server incorrectly indicates that it supports TLS, check the **Disable JavaMail TLS/SSL** check box.

To enter the SMTP server password, check the **Update Password On Save** box first. When you return to this dialog to update settings other than the SMTP password, leave this box unchecked to avoid blanking out the saved password. If the SMTP password does change later, check the box again and enter the new password.

To test your configuration immediately, add an email address to the **On Save, Send Test Email Message to** box.

For more information, see [Outgoing Email Settings](#).

- **SNMP Traps**

The **SNMP Traps** section of the **Global Settings** tab lets you enable Simple Network Management Protocol so that your [Network Management System \(NMS\)](#) can handle MySQL Enterprise Monitor events. [SNMP](#) notifications are off by default. To enable the checkboxes that associate specific rules with SNMP traps, click the **Enable SNMP Notifications** checkbox first.

Figure 2.10 MySQL Enterprise Monitor User Interface Settings: SNMP Traps

The screenshot shows the 'SNMP Traps' configuration window. It has a title bar 'SNMP Traps' and a light blue background. At the top, there is a checkbox 'Enable SNMP Notifications'. Below it are two radio buttons: 'Use SNMPv1' (selected) and 'Use SNMPv2'. There are two sets of input fields: 'Target 1' and 'Target 2 (optional)', each with a text box and a 'Port' text box. Below these is a 'Community String' text box. Further down is a checkbox 'Use the remote MySQL agent host IP address as the SNMP trap agent address for Advisor traps (optional)'. Below that is a text box 'SNMP trap agent address for internally generated traps (optional)'. Then another checkbox 'On Save send test trap (optional)'. Under this checkbox are three sub-options: 'Up/Down Application', 'Advisor Event with a severity of' (with a dropdown menu showing 'Critical'), and 'Application Error'. At the bottom left is a 'save' button.

MySQL Enterprise Service Manager includes support for both SNMPv1 and SNMPv2. You can select the SNMP version to use by clicking the corresponding **Use SNMPv1** or **Use SNMPv2** radio button.

In the **Target 1** or **Target 2** text box enter the IP address or hostnames of your NMS listeners. The port number defaults to the well-known SNMP port, [162](#). If you are not using this port, enter the port that your Network Management System is listening on.

Enter the appropriate community string in the [Community String](#) text box. The default value for this string is [public](#).

For the trap address for Advisor traps, you can optionally elect to use the address of the agent that triggered the alert, rather than the address of the MySQL Enterprise Service Manager. To do this, click the **Use the remote MySQL agent host IP address as the SNMP trap agent address for Advisor traps**. For internally generated SNMP traps (that is, with MySQL Enterprise Service Manager) you can also specify an alternate address by putting the IP address in the **SNMP trap agent address for internally generated traps** box.

To ensure that the specified target is valid, check the [On Save, Send Test Trap](#) check box. The remaining check boxes configure how your NMS responds to MySQL Enterprise Monitor. Check the **Up/Down Application** check box to configure NMS for starting up or shutting down the MySQL Enterprise Monitor. For configuration of advisor events, choose a level of severity and check the **Advisor event with the severity of [Critical](#)** check box. Finally, choose the **Application Error** check box to configure NMS to support application error traps. Be sure to save your settings before exiting.

To enable [SNMP traps](#), check the [Enable SNMP Notifications](#) checkbox, then check the [Use SNMP Traps](#) checkbox for each rule that should result in an SNMP trap. For instructions on doing this, see [Section 2.3.2, “Scheduling Rules”](#).

The Management Information Base (MIB) file associated with SNMP trapping is called [MONITOR.MIB](#). For the location this file see [Section C.1.4, “The Management Information Base \(MIB\) File”](#).



Note

The MIB file supplied with MySQL Enterprise Service Manager is not directly compatible with OpenNMS. For a sample of the modifications to make, see the comments for Bug #41714.

• **Server Locale**

The [Server Locale](#) setting determines the language of notification for the following items:

- Email notifications.
- SNMP traps.
- The naming conventions for shared resources such as a replication group name prefix.

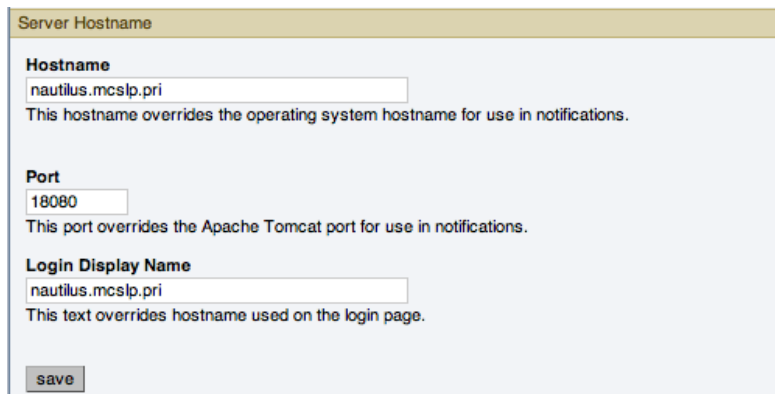
Figure 2.11 MySQL Enterprise Monitor User Interface Settings: Server Locale

The initial value in this drop down list box is the locale for the OS on which the Dashboard is running.

• **Server Hostname**

You can alter the hostname and port used to identify the MySQL Enterprise Service Manager when reporting notifications. This can be useful if the server hostname, and the hostname you want to use when connecting to your MySQL Enterprise Service Manager.

Figure 2.12 MySQL Enterprise Monitor User Interface Settings: Server Hostname



The screenshot shows a configuration window titled "Server Hostname". It contains three input fields: "Hostname" with the value "nautilus.mcslp.pri", "Port" with the value "18080", and "Login Display Name" with the value "nautilus.mcslp.pri". Below each field is a descriptive text: "This hostname overrides the operating system hostname for use in notifications.", "This port overrides the Apache Tomcat port for use in notifications.", and "This text overrides hostname used on the login page." respectively. A "save" button is located at the bottom left.

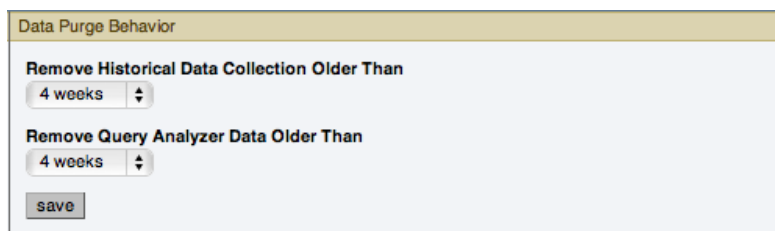
**Note**

Only change the **Port** setting if you have altered or redirected the original port used when installing MySQL Enterprise Service Manager. Entering the incorrect information does not affect the accessibility of your system, except when clicking links within the notification messages.

- **Data Purge Behavior**

The **Data Purge Behavior** section of the **Global Settings** tab lets you remove old log files and also old data from the repository. The default purge interval is **28 days**. To purge data, change this setting by choosing from the drop-down list. Choosing **52 weeks**, for example, removes all data that is older than a year.

Figure 2.13 MySQL Enterprise Monitor User Interface Settings: Data Purge



The screenshot shows a configuration window titled "Data Purge Behavior". It contains two drop-down menus: "Remove Historical Data Collection Older Than" and "Remove Query Analyzer Data Older Than", both set to "4 weeks". A "save" button is located at the bottom left.

**Warning**

Purging data permanently removes information from the repository. Since events are derived from data contained in the repository, they are purged along with the data.

Ensure that there is adequate disk space for the repository. If you are monitoring numerous servers and running many rules the size of the repository can increase rapidly. Choose purge behavior accordingly.

**Note**

The purge process is started approximately once every day, or when the MySQL Enterprise Monitor User Interface is restarted. If you change the purge

duration from a larger timespan to a smaller one, the data may start to be purged immediately.



Note

The system assumes that you will close events (or they will be auto-closed). The purge functionality only purges closed events and related data. Note that leaving events open for long time spans will use more data storage space.

You can configure the data purge behavior for a number of different systems individually:

- **Remove Historical Data Collection Older Than** configures the duration that the main data about your servers is retained. This includes all data collections, including CPU, memory and connections and activity statistics.
- **Remove Query Analyzer Data Older Than** configures the duration that the query analyzer statistics and information about individual queries is retained.

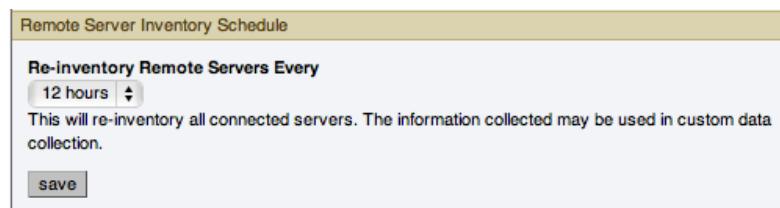
Notes for setting purge behavior:

- Purging can be carried out manually by enabling the `innodb_file_per_table` for the repository database and then using an `OPTIMIZE TABLE` operation to reclaim space from deleted rows in the table.
- If you set the purge value to a very low timespan value when the previous setting was quite high, then the space used for the data that was purged is not reclaimed from the InnoDB tablespaces. You can do this by running `OPTIMIZE TABLE` on the MySQL tables for MySQL Enterprise Service Manager to reclaim the space from the purged rows.

- **Remote Server Inventory Schedule**

MySQL Enterprise Monitor keeps track of all the databases and tables in a server, as well as the amount of RAM, disk space, and other items. A re-inventory updates this information in case you have added or dropped databases and tables. Depending upon the configuration of your system, this operation can tax resources. If you are monitoring many remote servers this is an operation you may want to perform in off-peak hours only.

Figure 2.14 MySQL Enterprise Monitor User Interface Settings: Remote Server Inventory Schedule



- **My Oracle Support Credentials**

You can specify the credentials for logging into the My Oracle Support site. These should match the user name and password that you have registered with Oracle for access to the support site.

Figure 2.15 MySQL Enterprise Monitor User Interface Settings: My Oracle Support Credentials
**Note**

Only administrators can change the [My Oracle Support Credentials](#) section; for other users, this section does not show up in the interface. For more information about different users and their rights see [Section 2.8.4, “Managing Users”](#). Specifying incorrect credentials results in the error message, “Your credentials do not appear to be valid.”

- **HTTP Proxy Settings**

You might want to update your HTTP Proxy Settings if your MySQL Enterprise Service Manager is not directly connected to the internet. The proxy settings are used when updating the information within the **What's New** tab. For more information, see [Section 2.9, “The What's New Tab”](#).

Figure 2.16 MySQL Enterprise Monitor User Interface Settings: HTTP Proxy Settings

- **Advisor Bundle**

You can update your Advisor Bundle and the associated rules and graphs by importing a new Advisor Bundle. To update your Advisor Bundle using a bundle file that you have previously downloaded:

Figure 2.17 MySQL Enterprise Monitor User Interface Settings: Advisor Bundle

1. Click **Choose File** and locate your Advisor Bundle on your computer.
2. Click **Save** to upload the updated bundle and validate the contents.

To update the Advisor Bundle automatically over the web, click the **update advisors** button.

- **LDAP Authentication**

You can configure LDAP Authentication to be used for the users that are provided access to the MySQL Enterprise Monitor User Interface. To use LDAP authentication, it must have been enabled and configured within the settings.

Figure 2.18 MySQL Enterprise Monitor User Interface Settings: LDAP Authentication

The configurable elements for LDAP authentication are:

- **Use LDAP for Authentication**

To enable LDAP authentication, click the **Use LDAP for Authentication** checkbox.

- **LDAP is Authoritative**

If you want to make LDAP the authoritative (only) authentication mechanism, check the **LDAP is Authoritative** checkbox. Note that if you select this option and the LDAP service is misconfigured, you can lock yourself out of MySQL Enterprise Monitor User Interface entirely.

- **Primary Server Hostname**

Hostname or IP address of the primary LDAP directory server.

- **Port Number**

Port number of the primary LDAP server. You must change this option to the port used for SSL connections if you have enabled encryption.

- **Secondary Server Hostname (optional)**

Hostname or IP address of the secondary/failover LDAP directory server.

- **Port Number**

Port number of the secondary/failover LDAP server. You must change this option to the port used for SSL connections if you have enabled encryption.

- **Encryption**

Encryption type required for communication with the LDAP server(s). Supported options are [None](#), [StartTLS](#), and [SSL](#).

- **Referrals**

Authentication should follow any referrals provided by the server. The default is to use whatever the LDAP directory server is configured to do. If you are using Microsoft Windows Active Directory, you must set this option to [Follow](#).

- **Authentication Mode**

The authentication mode to use. Choices are [Bind as User](#), which binds to the LDAP directory using the credentials given to login to MySQL Enterprise Service Manager. [Comparison](#) requires an LDAP login/password that can see the configured password attribute to make a comparison with the given credentials.

- **Update Password On Save** box and password fields

To enter the LDAP server password, check the **Update Password On Save** box first. When you return to this dialog to update settings other than the LDAP password, leave this box unchecked to avoid blanking out the saved password. If the LDAP password does change later, check the box again and enter the new password.

- **User Search Pattern**

Pattern specifying the LDAP search filter to use after substitution of the username, where [{0}](#) marks where the username should be substituted for the DN.

- **User Search Base (leave blank for top level)**

The entry to use as the base of the subtree containing users. If not specified, the search base is the top-level context.

- **Search entire subtree**

The search scope. Set to [true](#) to search the entire subtree rooted at the *User Search Base entry. The default value of [false](#) requests a single-level search including only the top level.

- **Map LDAP Roles to Application Roles**

Specifies whether MySQL Enterprise Service Manager should use the roles defined in LDAP to map to MySQL Enterprise Monitor application roles. If enabled, and LDAP is not configured to be authoritative, if a user authenticates successfully via LDAP and has a valid mapped role, they are granted permissions to the application. Roles are mapped according to the entries in the Application Role/LDAP Role(s) fields, which take comma-separated lists of LDAP roles to map to the given MySQL Enterprise Monitor roles.

If you select this option, you are provided with additional fields that let you configure how roles are looked up within the LDAP server.

For more information on LDAP authentication and integration with Tomcat, see [Tomcat Documentation](#).

- **Customize MySQL server name**

Figure 2.19 MySQL Enterprise Monitor User Interface Settings: Customize MySQL server name

Customize MySQL server name

Customize how MySQL server names are displayed in the application. Typically, MySQL server names are displayed as concatenations of the server name and a connection endpoint value (where a connection endpoint can be a port number, socket etc.).

Show MySQL server names as:

- ☒ Reported by agent (Default)
- ☐ Hostname only
- ☐ Transformed by substitution expression

Substitution Expression

Example: The expression
mysql=oracle transforms host.mysql.com to host.oracle.com

Display connection endpoint values:

- ☒ Always (Default)
- ☐ Never
- ☐ For non-default values

save

These settings change the way host names are displayed in the Dashboard, typically by shortening the names to avoid cluttering the display with repetitive information:

- The **Show MySQL server names as** field controls whether the Dashboard displays fully qualified domain names (the default); or only the host name, omitting the repetitive suffix such as `.company_name.com`; or host names transformed by a substitution expression, for example to turn a long multi-part host name into a short nickname.

The syntax for the substitution expression is a name-value pair separated by an equals sign, with a regular expression on the left side and the replacement text on the right side. The regular expression follows the Java syntax from <http://download.oracle.com/javase/6/docs/api/java/util/regex/Pattern.html>. To keep special characters (particularly dot) from being interpreted within the regular expression, escape them with `\` or make a single-item character class, `[.]` for example. If the right side contains

whitespace, a comma, or is an empty string, surround it with single or double quotation marks. You can use backreferences such as `$1`, `$2`, and so on to substitute parts of the regular expression into the replacement text; you cannot use the `$` character in the replacement text except as part of a backreference. You can include more than one replacement expression by separating them with commas. Some examples include:

```
dx521\example\com=Staging
dx984[.]example[.]com=Production
database-server-(.*)\example\com=$1
^database-server-= "[.]example[.]com$=", dx521="Staging DB", dx984="Production DB"
```

If you use incorrect syntax in the replacement expression, the original hostname is displayed with a suffix such as (!); this suffix varies depending on your locale setting.

- The **Display connection endpoint values** controls whether the detailed connection part of the hostname (such as the TCP/IP port number) is displayed. By default, it is always shown. You can set it to never be shown, or to only be shown if it is not the standard value. For TCP/IP connections, the default port is 3306. For socket connections, the default endpoint value is `/tmp/mysql.sock`.

2.8.2 User Preferences

On this tab, users can change their password, user name, and locale information.

Figure 2.20 MySQL Enterprise Monitor User Interface: User Preferences

The screenshot shows the 'User Preferences' tab in the MySQL Enterprise Monitor interface. The top navigation bar includes 'Monitor', 'Advisors', 'Events', 'Graphs', 'Query Analyzer', 'Replication', 'Settings', and 'What's New? (1)'. Below this, a sub-navigation bar lists 'Global Settings', 'User Preferences' (selected), 'Manage Servers', 'Manage Users', 'Manage Notification Groups', 'Logs', 'Product Information', and 'Import/Export'. The main content area is titled 'User Preferences' and contains the following fields:

- User Name:** A text box containing 'test-manager'.
- Role:** A dropdown menu with 'manager' selected.
- Password:** A text box with the instruction '(Leave empty to keep password unchanged)'.
- Confirm Password:** A text box.
- Timezone:** A dropdown menu with '(GMT+00:00) Western European Time - Atlantic/Canary' selected.
- Locale:** A dropdown menu with 'English (United States)' selected.
- save:** A button at the bottom left.

To change your password, enter a new value into the **Password** text box. To change your user name, enter a new value into the **Username** text box. Click the **save user properties** button to commit this change.

You can also adjust your time zone and locale information from this tab. The settings on this tab apply only to the user who is currently logged in.

The MySQL Enterprise Service Manager determines the default value for the locale by looking at your browser settings. Changing this value determines the language setting for any future logins to the Dashboard, overriding your browser settings.



Note

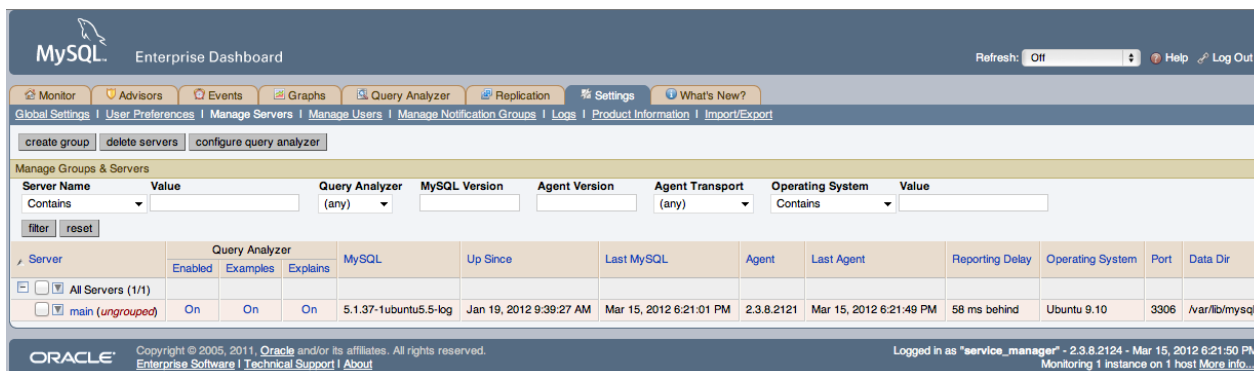
Be sure to set the correct time zone so that alerts are time stamped correctly.

This setting applies only to the specific user.

2.8.3 Manage Servers

Use the **Manage Servers** tab to get a list of the currently monitored servers connected to the MySQL Enterprise Service Manager, and view the current MySQL version and important configuration settings for each.

Figure 2.21 MySQL Enterprise Monitor User Interface: Manage Servers



The **Manage Servers** tab provides a list of servers, organized by groups, in a similar fashion to the main server navigation list. For each server, the following information is displayed:

- **Query Analyzer**

Shows the Query Analyzer configuration for the server, showing whether Query Analyzer is enabled, whether the recovery of example queries is enabled, and whether explain plans for queries have been enabled.

From this display, you can also control the Query Analyzer settings for each server by clicking the **Off** link for each server to change the settings. This brings up the **Configure Query Analyzer** pop-up window. For more information, see [Section 3.2.3, “Query Analyzer Settings”](#).

- **MySQL**

Shows the version number of the MySQL server being monitored.

- **Up Since**

Shows the time when the MySQL server was started (the server up time).

- **Last MySQL**

The last time communication with the MySQL server occurred.

- **Agent**

Shows the version number of the MySQL Enterprise Monitor Agent server being monitored.

- **Last Agent**

Shows the last time communication was received from the agent.

- **Port**

The configured MySQL port number.

- **Data Dir**

The data directory path for the MySQL server.

- **Reporting Delay**

The time between when the data was obtained by the agent when it was received by MySQL Enterprise Service Manager.

You can search and filter the server list by using the fields and pop-ups at the top of the list. You can filter using one or more of following techniques:

- To filter by server name, select the match type (**Contains**, **Regex**, **Doesn't Contain**, or **Negative Regex**), and enter a string or regular expression into the **Value** field.
- To filter based on whether the Query Analyzer functionality has been enabled or disabled, use the **Query Analyzer** pop-up.
- To filter by MySQL server version, you can enter either an explicit version number into the **MySQL Version** field, or you can additional symbols to restrict the versions to different ranges. The field supports the following statements:

Statement	Example	Description
Version Prefix	5.0	Shows all MySQL servers matching the specified version. For example, 5.0 matches any version of MySQL from 5.0.0 to 5.0.99
Explicit Version	5.0.84, =5.0.84	Shows all MySQL servers matching the specific version number.
> Version	> 5.0.84	Shows all versions greater than the specified version.
>= Version	>= 5.0.84	Shows all versions greater than or equal to the specified version.
< Version	< 5.0.84	Shows all versions less than the specified version.
<= Version	<= 5.0.84	Shows all versions less than or equal to the specified version.
String	enterprise, log	Shows all servers with the specified string in their version
! String or Version	!enterprise, !5.0.84	Shows all servers not having the specified string, or not matching the specified version.

You can combine multiple arguments to produce more complex formats. For example, to list all of the servers of 5.1 or higher that do not have enterprise in the version string, you could use `>=5.1 !enterprise`.

- **Agent Version**

Filters the list based on the MySQL Enterprise Monitor Agent version number. This can be useful if you want to know which means require an upgrade to a later version. The **Agent Version** field supports the same selection criteria as the **MySQL Version** field, allowing to select based on specific version numbers and strings.

- **Agent Transport**

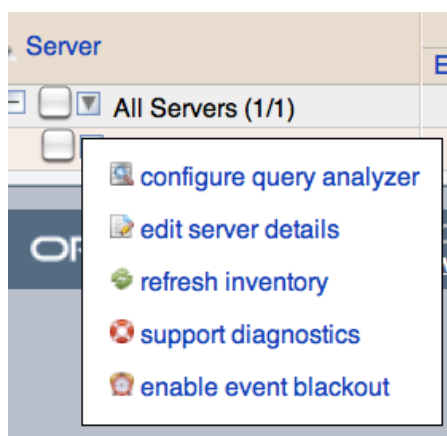
Filters the list based on the protocol the Agent uses to communicate with the MySQL Enterprise Service Manager. You can select either standard HTTP or HTTPS/SSL-based connections.

After you make your selection, use the **filter** button to filter the server list. To reset your selections to show everything, click **reset**.

Using the list of servers, you can create groups to more easily manage and monitor your servers according to the departments, applications or other groupings that you may want to use. For information on how to create and modify groups, see [Section 2.8.3.2, “Grouping Servers”](#).

You can also perform simple administration on the server within the MySQL Enterprise Monitor framework, including configuring the Query Analyzer, renaming the server (as it appears within MySQL Enterprise Service Manager) or the group name, and updating the information about the server (re-inventory). All of these operations are handled by using hovering over the triangle next to the server name or group.

Figure 2.22 MySQL Enterprise Monitor User Interface: Server/Group Pop-up



The pop-up provides a list of options, which are different depending on whether you select an individual server or a group. For a group of servers, you can rename the group, delete the group, or obtain a bundled version of the support diagnostics information. For individual servers, you can modify the Query Analyzer configuration, rename the server, refresh the server inventory, get the support diagnostics information, or turn the event blackout period on and off.

- To change the configuration of the Query Analyzer for the server, see [Section 3.2.3, “Query Analyzer Settings”](#). This option is not available for a group.
- To rename a server, choose **edit server details**, or to rename a group, choose **rename group**. For information on renaming a server, see [Section 2.8.3.1, “Renaming a Server”](#). To rename a group, change the name within the pop-up prompt provided.
- To re-inventory your MySQL server and update version and configuration information, click the triangle and choose **refresh inventory**. This triggers an update of the server information without affecting the schedule inventory process. You can use this when you have upgraded or made significant configuration changes to your server to update the inventory and ensure that the correct rules and advisors are being executed on your server.
- You can obtain the support diagnostics file for either individual servers, or entire server groups. To get a diagnostic report file, select **support diagnostics** from the pop-up menu. The information is provided as a Zip file that is downloaded to the machine. The information contained in the report includes detailed information about your server (or multiple servers if you selected a server group), including configuration,

hardware, MySQL options/variables and historical graphs. To view the information extracted, unzip the downloaded file and double-click the [index.html](#).

For generic information about your MySQL Enterprise Monitor installation, see [Diagnostic Report](#).



Note

Renaming a server using the **Manage Servers** tab overrides all other settings, including changes made within the agent configuration.

- Use the **[Enable | disable] event blackout** control to turn [blackout periods](#) on and off. The server name is greyed out while the blackout period is in effect. Only event reporting is affected; query analysis continues during the blackout period.

2.8.3.1 Renaming a Server

You can rename an existing server without losing the current historical data or configuration information. Renaming the server also lets you make its name more descriptive according to the server's role within your organization. For example, you might rename a server from the default host name to include the department and application for the MySQL server.

To rename a server, click the [rename](#) link next to the server. Enter information about the server, including the host name and registered IP addresses for the agent. Fill in the alternative name that you want to be displayed in the text box at the bottom of the window. You can also enter notes about the server, which are displayed as a tooltip in the Server tree when you hover over the note icon.

Figure 2.23 MySQL Enterprise Monitor User Interface: Server Renaming

View Server

host
bear.mcsip.pri
localhost

name
bear:3306

ip
192.168.0.22
192.168.0.2
127.0.0.1

port
3306

uuid
2b86b277-fb2b-492d-b946-3a2acaec0869

socket
/var/run/mysqld/mysqld.sock

data dir
/mnt/data1/mysql/db/

save cancel

2.8.3.2 Grouping Servers

To help with server management, the Service Manager lets you group servers in any fashion you choose. For example, you can manage servers according to purpose. For example, you might group servers by whether the servers handle Internet or intranet data, by whether they power finance or HR applications, or by physical location.

All monitored servers are automatically included in the top level server grouping, [All Servers](#). Other server groupings are replication groups or user-defined groups.

You can create a user-defined group by clicking the [Manage Servers](#) link. Add a group name and then click the [create group](#) button. The new group is displayed immediately.

Replication groups are automatically discovered by MySQL Enterprise Monitor and in this respect differ from user-defined groups. For more information about replication groups see [Section 2.7, “The Replication Tab”](#). However, like user-defined groups you can edit the name of a replication group and add other servers to it.

To add to a group, select the [add to group](#) link. Choose the server or servers to add, then complete the operation by clicking the [add to group](#) button. You can add a server to a group even if the agent is down.

To remove a server from a group expand the server group tree and click the [remove from group](#) link. To delete a server altogether see [Section 2.8.3.3, “Removing a Server From the Dashboard”](#).

**Note**

Slaves removed from a replication group are rediscovered and re-added to that group.

To delete an group, you can use the [Delete Group](#) link. This deletes the group and removes the servers from the deleted group.

**Warning**

You cannot delete automatically created groups, such as those built during replication discovery, unless the group is empty. If the group is not empty, you get a error.

There are three ways to modify an existing group; by renaming it, adding to it, or removing it. Select the [rename](#) link to change the name of a group and [add to group](#) to add servers. Deleting a group simply requires clicking the [remove all from group](#) link. This removes the server group but has no effect on individual servers.

2.8.3.3 Removing a Server From the Dashboard

To stop monitoring a MySQL server, stop the corresponding agent, then remove it from the Dashboard. (The agent must be stopped first, so the server is considered inactive in the Dashboard.)

For instructions on stopping an agent, see:

- Windows: [Section 5.3.4.1, “Starting/Stopping the Agent on Windows”](#)
- Unix: [Section 5.3.4.2, “Starting/Stopping the Agent on Unix”](#)

Once the agent is stopped, delete the monitored server. Deleting a server simply means that it no longer shows up in the Dashboard.

You can remove one or multiple servers at the same time. To remove a server or servers, click the checkbox next to each applicable server, then click the [delete servers](#) button. You are asked to confirm the deletion of the servers: click [delete](#) to delete the servers, or [cancel](#) to cancel the delete operation.

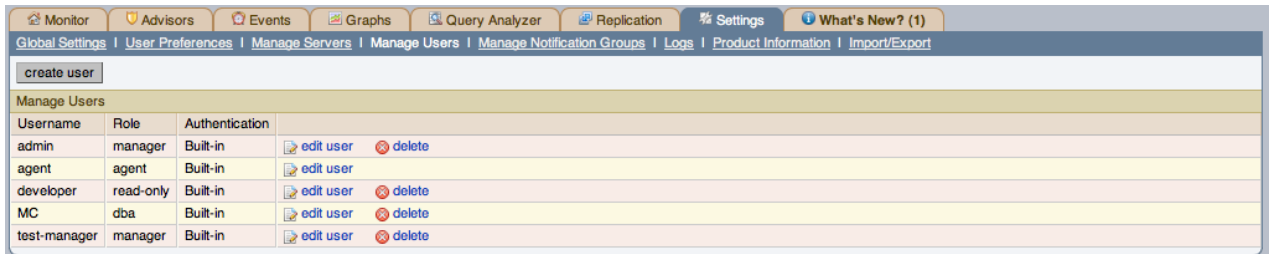
**Note**

You can remove a server from any group at any time. Removing the last server from a group also removes that group.

2.8.4 Managing Users

The **Manage Users** panel lets you create, delete and manage individual users that have access to MySQL Enterprise Service Manager.

Figure 2.24 MySQL Enterprise Monitor User Interface: Manage Users



To log in to the Dashboard a user account is required. There are four types of users with varying privileges:

- **manager** role

A user with the role of **manager** can perform all operations within MySQL Enterprise Service Manager, including changing the server configuration, adding and removing users, and viewing query analyzer and other data.

- **dba** role

Users with the **dba** role should be database administrators who are using MySQL Enterprise Monitor to monitor servers and queries. They have a similar set of privileges to those with the **manager**, except that they cannot do the following:

- Cannot add/remove or change users.
- Cannot change the My Oracle Support credentials used to communicate with the My Oracle Support website.
- Cannot change the HTTP proxy settings.
- Cannot change the Query Analyzer settings.
- Cannot update the Advisor bundle.
- Cannot change the LDAP authentication preferences.

In addition to these limitations, you can control for each user with the **dba** role whether:

- **View Query Analyzer tab**: Limits whether the user can see the Query Analyzer tab and its contents.
- **View action (example) queries**: Limits whether the user can see the values within queries shown within the query analyzer.

The setting for these abilities is provided when you select the **dba** role for a user.

- **read-only**

The **read-only** role is identical to the **dba** role, but is unable to make any changes to the configuration of MySQL Enterprise Monitor, although they can view the current settings.

- **agent**

The **agent** role is reserved for all users that you want to have access and ability to send agent information. You can use this if you want to provide individual logins for each agent.

The Administrator defined during installation as having the root role is unique; this user cannot be deleted.

If you are logged in as an **Administrator**, you can add a new user by choosing the **Manage Users** link from the **Settings** tab. To create a user click the **create user** button, select a role for the user, and enter a user name and password.

When a new user first logs in, a dialog box opens requesting time zone and locale information. To change this information later, use the **User Preferences** tab. For more information, see [Section 2.8.2, “User Preferences”](#).

If you installed the Advisors through the Dashboard, you have probably configured the settings for the root role user already. (See [Section 2.8.1, “Global Settings”](#) and following for more information about this topic.)



Warning

To receive support-related updates, configure the My Oracle Support credentials for at least one user. These settings were set up on the first login to the Dashboard. For information on changing these settings, see [Section 2.8.1, “Global Settings”](#).

To edit an existing user's information, select the **Manage Users** link, then select the user to edit. Make your desired changes in the fields provided, then save the changes.

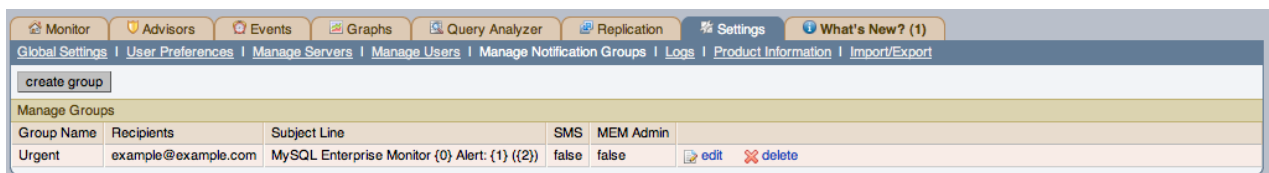
Users can be authenticated either using an internal authentication system, which stores the user, password and role information within MySQL Enterprise Monitor, or you can opt to use an external LDAP service. To use the LDAP service, you still create each user, and then select the **Authenticate this user using LDAP** checkbox within the **Edit User** window. The username entered is authenticated against the configured LDAP server. For more information on configuring the LDAP server to be used, see [LDAP Authentication](#).

To delete an existing user, click the **delete** link next to the user to delete.

2.8.5 Manage Notification Groups

The **Manage Notification Groups** panels lets you create and manage the notification groups used when different notifications and warnings are distributed.

Figure 2.25 MySQL Enterprise Monitor User Interface: Manage Notification Groups



Notification groups are collections of users who should be notified when advisor alerts occur. These users may have login credentials for the Dashboard but this is not a requirement.

You can create a group by clicking the **create group** link. Specify a group name and add recipients. When adding a user an email address must be specified. If you are adding multiple users separate them with commas.

To modify an existing notification group, select the [edit](#) link next to the group name. Deleting a group simply requires clicking the [delete](#) link.

Figure 2.26 MySQL Enterprise Monitor User Interface: Edit Notification Group

If a rule triggers an alarm, an email is sent to the members of the notification group specified when the rule was scheduled. For more information about scheduling rules see [Section 2.3.2, “Scheduling Rules”](#).

You can set the subject line of the email that is sent by editing the **Subject Line** field. You can insert the alarm level using the string `{0}`, the rule name that was triggered using `{1}`, and the server name that triggered it using `{2}`.

You can optionally set the emails that are generated when the notification occurs to be limited to the size of an SMS message. You can then use a notification group email address that forwards to an SMS service so that you can get notification on your phone with an SMS service. Selecting the checkbox next to **SMS** only changes the length and format of the message that is sent to be compatible with the SMS size limits.

You can also optionally select a notification group to be used when sending critical error messages (such as MySQL Enterprise Monitor Agent or MySQL Enterprise Service Manager failures) by selecting the checkbox next to **MEM Admin**.



Note

Ensure that there is a mail server available for sending out alerts, and that there is an account configured for receiving any alerts that are created. For SMS messages, you must configure an email address with a third-party service that forwards the notification emails to an SMS number. SMS sending functionality is not provided in MySQL Enterprise Service Manager.

2.8.6 Logs

Use the [Logs](#) link to inspect, reset, and filter the various log files associated with the MySQL Enterprise Service Manager. For information about these log files, see [Section C.1.3, “Log Files for the MySQL Enterprise Service Manager”](#). If a log entry represents a serious issue and the message is not self-explanatory, consult the applicable troubleshooting documentation: [Section 2.11, “Troubleshooting the MySQL Enterprise Monitor User Interface”](#) or [Section 5.3.9, “Troubleshooting the Agent”](#).

The following image is an example of this screen.

Figure 2.27 MySQL Enterprise Monitor User Interface: Logs

Global Settings User Preferences Manage Servers Manage Users Manage Notification Groups Logs Product Information Import/Export				
Monitor Advisers Events Graphs Query Analyzer Replication Settings What's New? (1)				
Logs				
Log Name	Threshold	Last Modified	Entries	
All	N/A	Mar 18, 2010 10:49:18 AM	60,384	clear all logs
Advisors	Info	Mar 17, 2010 9:39:52 AM	591	clear log edit log level
Agent Monitoring	Info	Mar 18, 2010 1:24:14 AM	6	clear log edit log level
Agent Tasks	Info	N/A	0	clear log edit log level
Data Collection	Info	N/A	0	clear log edit log level
Graphs	Info	Mar 17, 2010 9:39:51 AM	44	clear log edit log level
Groups	Info	Mar 17, 2010 9:39:50 AM	1	clear log edit log level
Infrastructure	Info	Mar 18, 2010 10:45:48 AM	28	clear log edit log level
Inventory	Info	Mar 17, 2010 9:39:55 AM	31	clear log edit log level
JDBC	Info	N/A	0	clear log edit log level
Misc	Info	Mar 16, 2010 10:53:51 AM	1	clear log edit log level
Migration	Info	Mar 16, 2010 3:23:56 PM	8	clear log edit log level
Notification	Info	N/A	0	clear log edit log level
Preferences	Info	N/A	0	clear log edit log level
Replication	Info	Mar 17, 2010 9:39:50 AM	1	clear log edit log level
Security	Info	Mar 18, 2010 10:49:18 AM	58,743	clear log edit log level
SQL	Info	Mar 17, 2010 3:55:21 PM	362	clear log edit log level
Timing	Info	Mar 18, 2010 10:46:15 AM	485	clear log edit log level
UI	Info	Mar 17, 2010 4:52:53 PM	1	clear log edit log level
Network	Info	Mar 16, 2010 11:21:45 AM	12	clear log edit log level
Xwork	Warning	Mar 18, 2010 10:42:59 AM	55	clear log edit log level
Apache	Warning	N/A	0	clear log edit log level
Catalina	Warning	N/A	0	clear log edit log level
Hibernate	Warning	Mar 17, 2010 9:39:54 AM	13	clear log edit log level
Freemarker	Warning	N/A	0	clear log edit log level
Spring	Warning	Mar 16, 2010 11:08:02 AM	2	clear log edit log level
EH Cache	Warning	N/A	0	clear log edit log level

The various categories of logs are shown in alphabetic order. The most recent changes to each log are shown in the **Last Modified** column. The number of entries in any specific log is shown under the **Entries** column.

To view detailed information, click the [Log Name](#). This opens a separate browser window showing the date, time, alert type, and accompanying message.

On this screen, you can filter log information by the message type and by time period.

To filter by message type, select from the options in the **level** drop-down box. These are, in order of decreasing severity:

- All.
- Error.
- Warning.
- Information.
- Trace.
- Debug.

You can also adjust the number of items that appear on each page.

Press the [clear all logs](#) link to remove all log entries. To remove entries of a specific kind, click the [clear logs](#) link associated with the specific log. A confirmation dialog box lets you back out of this operation and avoid accidentally removing log information.

To clear log files of a specific age, see the [Data Purge Behavior](#) section of the [Global Preferences](#) page. For more information on this topic see [Data Purge Behavior](#).

Use the [edit log level](#) link to change the type of error logged. The value selected from the [Edit Log Level](#) dialog box determines what appears under the **Threshold** column (second from the left in [Data Purge Behavior](#)).

Selecting [Error](#) from the list box creates the least number of log entries and [Debug](#) the most. Choosing [None](#) turns off logging altogether.

You can also download a compressed version of all the log files, as explained in [Section 2.8.7, “Product Information”](#).

2.8.7 Product Information

Use the [Product Information](#) link to view detailed information about the product status.

- **Enterprise Dashboard Server Info**

The **Enterprise Dashboard Server Info** section provides detailed information about the running of your MySQL Enterprise Service Manager, including information about the Java environment, hostname and version information.

The section also includes detailed information about the current status of your MySQL Enterprise Service Manager, showing information on the [agents](#), [rules](#), and outstanding status of the various components. The following information is provided in this section:

- **Pending Heartbeats**
- **Processed Heartbeats**
- **Pending Jobs**
- **Number of Agents**
- **Monitored mysqld Instances**
- **Build Version**
- **Advisor Version**
- **Number of Rules**
- **Number of Graphs**
- **Last Successful Email**
- **Last Email Failure**
- **Last Failure Message**

You can monitor the status of the email messages sent by MySQL Enterprise Service Manager by looking at the values of the **Last Successful Email** and **Last Email Failure** sections. Any failure by MySQL Enterprise Service Manager to send an email is reported, with the failure date recorded in **Last Email Failure**. You can examine the **Last Failure Message** field to determine the precise reason for the failure.

- **Readme**

The **Readme** section contains a copy of the text [Readme](#) file provided with each release, and provides release specific information about your MySQL Enterprise Service Manager installation.

- **Diagnostic Report**

The **Diagnostic Report** section includes a hyperlink, **Download diagnostic report**. The Zip file contains a variety of information and log files which can be used by support to determine and diagnose some problems with your MySQL Enterprise Monitor installation. The file is named according to your license number and the current date/time, for example `support-1234-6578-20100331T1026.zip`. The file includes, but is not limited to, the following items:

- `Replication 1.dot`: The calculated MySQL server replication structure.
- `java-threads.dot`: A list of the current Java threads and the dependencies.
- `java.props`: The current Java configuration properties.
- `java.threads`: A list of the current Java threads and their backtrace.
- `mysql-monitor.log`: The MySQL log file.
- `preferences.properties`: The MySQL Enterprise Monitor preferences.
- `query.instanceOverview.html`: An HTML list of the current query analyzer data.
- `root.csv`: A copy of your main MySQL Enterprise Monitor log file.
- `server.props`: A copy of your server properties.

This report is especially useful for debugging the MySQL Enterprise Service Manager and the MySQL Enterprise Monitor Agent.

When you select the report, a new page opens showing the report generation status. A message is provided once the generation has completed.

2.8.8 Import/Export

The **Import/Export** system lets you export or delete custom rules and graphs that have been imported into the system so that you can transfer them to another MySQL Enterprise Monitor User Interface instance. You can also use this screen to import new custom rules and graphs.

To export rules or graphs:

1. Select the rules or graphs that you want to export. You can select multiple items by selecting the checkbox against each rule or graph.
2. Click **export**.

The custom rules and graphs are saved using a filename of the form `custom-export-DATE-TIME.jar`, where `DATE` is the date of export in international format (`YYYYMMDD`) and `TIME` is the time (`HHMM`).

To delete rules or graphs:

1. Select the rules or graphs that you want to export. You can select multiple items by selecting the checkbox against each rule or graph.
2. Click **delete**.
3. A confirmation dialog asks you to confirm that the rule or graph should be deleted. Data collections and the corresponding rules are unscheduled from all servers on which the rules have been applied.

You cannot undo the operation; to re-enable the rules and graphs at a later date, export them first, then delete them so that you can re-import the custom graphs.

4. To confirm deletion, click **delete**. To cancel deletion, click **cancel**.

You can import custom rules and graphs by using the import function. You can use an XML file, or a previously exported **jar** file.

To import custom rules or graphs:

1. Click **Choose File**. This presents you with a custom dialog so that you can choose a file on your client computer to be uploaded to the MySQL Enterprise Monitor User Interface. Locate the file, and click **Choose**.
2. Click **import**.
3. A notification window appears indicating the number of graphs and rules imported.

For more information on writing new rules, custom data items, and creating new graphs, see [Chapter 4, Customizing MySQL Enterprise Monitor](#).

2.9 The **What's New** Tab

The **What's New** page provides a simplified interface for providing updates and news related to your My Oracle Support account. By default, the information is automatically updated every hour. To disable the updates or force an update, see [Section 2.9.1, "Setting What's New Configuration"](#).

Figure 2.28 The What's New Tab

MySQL Enterprise Dashboard

Help Log Out

Monitor Advisers Events Graphs Query Analyzer Replication Settings **What's New?**

configure what's new

Improved MySQL Query Analyzer!

Visually Correlate System Performance with Query Activity!

Source Location

- at com.mysql.jdbc.ConnectionImpl.executeQuery(ConnectionImpl.java:2690)
- at com.mysql.jdbc.StatementImpl.executeQuery(StatementImpl.java:2819)
- at com.mysql.jdbc.StatementImpl.executeQuery(StatementImpl.java:1465)
- at MySQLMonitorServlet.doConnectToMySQL(MySQLMonitorServlet.java:1465)

- Plugins for Connectors
 - Obtain Query Analyzer data directly from MySQL Connectors
 - Pinpoint the source-code location of problem queries
- Auto-close Events, LDAP support, read-only user role
- [For more information...](#)

[Click here for help configuring Query Analyzer](#)

ORACLE
MY ORACLE SUPPORT

Stay informed of your My Oracle Support Service Requests

[Click here to enter your My Oracle Support credentials](#)

Important Product-Related Announcements

Enterprise Monitor Release 2.3.3 Is Now GA!

Apr 22, 2011 2:43:08 PM

Enterprise Monitor Release 2.3.3 is now Generally Available (GA). This is a maintenance update to our previous 2.3.2 release. A detailed list of changes is in the [Change History](#) section of the documentation. Download it now from [My Oracle Support](#). It will be available on Oracle E-Delivery shortly after May 1.

Any feedback for the MySQL Enterprise Monitor development team?

Oct 15, 2009 10:22:33 AM

Are you using the Monitor? Are you using Query Analyzer? Anything you want us to fix, improve or add? [Take our very short survey](#) and give us your wish list and feedback.

Thanks in advance!

MySQL Server 5.0.80/5.0.81 Now Available

May 6, 2009 12:26:56 PM

MySQL Enterprise Server 5.0.80 and MySQL Community Server 5.0.81 have been released. Each version contains a number of enhancements, changes, and bug fixes. See the [Release Notes for MySQL Enterprise 5.0.80](#) and the [Release Notes for MySQL Community Server 5.0.81](#) for more information.

Welcome to the "What's New?" Live Feed!

This live feed will inform you about MySQL security issues, new releases of the MySQL server or Enterprise Monitor, and other important announcements. This RSS feed only works if the Monitor is able to connect to the internet. If you have problems connecting, you can configure HTTP proxy settings, or disable the [checking](#). More information on [configuring and troubleshooting this feed](#).

Copyright © 2005, 2011, Oracle and/or its affiliates. All rights reserved.
Enterprise Software | Technical Support | About

Logged in as "admin" - 2.3.4.2075 - May 18, 2011 4:48:11 PM
Monitoring 0 instances on 0 hosts [More info...](#)

The **What's New** tab is divided into three main sections:

- The area on the left-hand side of the page provides information about the major new features and functionality in MySQL Enterprise Monitor.
- **Open Support Issues** provides a quick interface to the list of currently open issues with MySQL Support as identified through the My Oracle Support web site. Issues that are currently marked in the system as “Customer Working” or “Solution Offered” are also added to the main MySQL Enterprise Dashboard above the Heat Chart.

To use the Open Support Issues functionality, set your My Oracle Support credentials within MySQL Enterprise Monitor User Interface, as explained in [Section 2.8.1, “Global Settings”](#).

- **Important Product Release Announcements** provides a list of news items from a Web-based news feed. The news feed contains important information, including, but not limited to:
 - New releases of MySQL Products, including MySQL Server and MySQL Enterprise Monitor.
 - End-of-life and support changes.
 - Urgent errors and notifications.

New (unread) items are indicated with a star icon. Unread items on the **What's New** page are also signified with a number in the tab title within the main Dashboard. Items are automatically marked as read when you visit the **What's New** page.

The announcements information is made available in two ways: through a Web connection where the information is updated at a set interval, or through information included with the MySQL Enterprise Advisors bundles.

**Note**

To poll the My Oracle Support site directly, your MySQL Enterprise Service Manager must have access to the My Oracle Support website. If your MySQL Enterprise Service Manager is not directly connected to the Internet, you can set an HTTP [proxy](#) to help access the information. For more information on configuring an HTTP proxy, see [Section 2.8.1, “Global Settings”](#).

**Note**

To turn off the display of open service requests and product notifications, use the [Configure What's New](#) link on the **What's New** tab, as explained in [Section 2.9.1, “Setting What's New Configuration”](#).

2.9.1 Setting What's New Configuration

To configure the operation and forcibly update the information on the **What's New** page, click the [configure what's new](#) button at the top-right of the **What's New** page.

Figure 2.29 What's New Configuration

The screenshot shows a dialog box titled "configure what's new" with a "Performance" tab. It contains three sections, each with a checked checkbox, a "Last Check" status, and a "Force check now?" section with "yes" and "no" radio buttons. The "no" radio button is selected in all three sections. At the bottom, there is a link for more information and "save" and "cancel" buttons.

Option	Checked	Last Check	Force check now?
Automatically check for Product-Related Announcements?	<input checked="" type="checkbox"/>	Mar 4, 2011 1:44:07 PM	<input type="radio"/> yes <input checked="" type="radio"/> no
Automatically check for updates to open My Oracle Support Issues?	<input checked="" type="checkbox"/>	never	<input type="radio"/> yes <input checked="" type="radio"/> no
Automatically check for Advisor Updates?	<input checked="" type="checkbox"/>	never	<input type="radio"/> yes <input checked="" type="radio"/> no

More information on [configuring and troubleshooting What's New.](#)

The configurable options are:

- **Automatically check for Product-Related Announcements?**

To disable the New Announcements updates, deselect the checkbox. Updates are enabled by default.

The last time an update of the New Announcements information was successfully executed is displayed below the title.

You can force an update of the New Announcements information by selecting the **yes** radio button next to **Force check now?**. A check will be executed when you click the **save** button to close the configuration dialog.

- **Automatically check for updates to open My Oracle Support Issues?**

To disable the Support Issues updates, deselect the checkbox. Updates are enabled by default.

The last time an update of the Support Issues information was successfully executed is displayed below the title.

You can force an update of the Support Issues information by selecting the **yes** radio button next to **Force check now?**. A check will be executed when you click the **save** button to close the configuration dialog.

- **Automatically check for Advisor Updates?**

The MySQL Enterprise Service Manager can automatically look for changes to your MySQL Enterprise Advisors information by polling an Oracle software download Web site.

To disable the Advisor updates, deselect the checkbox. Updates are enabled by default.

You can force a check for updates to the Advisor information by selecting the **yes** radio button next to **Force check now?**. A check will be executed when you click the **save** button to close the configuration dialog.

Click **save** to save your settings. If you selected any system to force an update, the update will take place in the background. To cancel your changes, click **cancel**.

2.10 Performance Tuning MySQL Enterprise Monitor User Interface for Large Installations

By using MySQL database technology to store and process monitoring data, MySQL Enterprise Monitor has enough capacity to monitor large MySQL installations featuring many busy database servers. A MySQL Enterprise Monitor system can scale along with your monitoring requirements, using many of the same scale-out and scale-up techniques you use for your MySQL-powered web sites and applications.

When your MySQL Enterprise Monitor configuration becomes “large”, typically roughly 200 or more Agent instances, use the following guidelines to help plan the capacity of the machines you use to run MySQL Enterprise Monitor, and to tune MySQL Enterprise Monitor, its [repository](#) database, and other underlying components.

- Consider which [rules](#) to apply to which servers rather than enabling all rules or applying them to all servers. Certain issues are more likely to occur for particular MySQL servers based on their configuration and workload.
- Devote a machine with 16GB or more of memory, 12GB or more for the [innodb_buffer_pool_size](#) configuration option, and 1GB for the [innodb_log_file_size](#) configuration option. Consider adjusting other InnoDB-related configuration values higher also. For information about InnoDB-specific tuning, see [Optimizing InnoDB Redo Logging](#), [Optimizing InnoDB Disk I/O](#), and [Optimizing InnoDB Configuration Variables](#).
- For a high-capacity MySQL Enterprise Monitor server, a fast RAID (0+1, 10) array with a number of spindles and fast disks (possibly SSDs) is ideal.
- When using MySQL 5.1 for the repository database (as is the case with the MySQL server bundled with MySQL Enterprise Monitor), enable the InnoDB Plugin for faster all-around InnoDB performance, if you are not using the InnoDB Plugin already. For setup instructions, see <http://dev.mysql.com/doc/refman/5.1/en/replacing-builtin-innodb.html>.
- Set [maxThreads](#) in the <Connector> element in [apache-tomcat/conf/server.xml](#) to at least the number of expected Agent instances, plus some extra slots for connections used by the Dashboard user interface. Adjust the <Connector> elements for plain HTTP, HTTPS/SSL, or both depending on the protocols you use with MySQL Enterprise Monitor User Interface.
- Consider adjusting the maximum size of the connection pool for the repository database instance. This setting is controlled by the parameter `dbpool.default.maxActive` in the `config.properties` file, whose location is listed in [Section C.1.5, “The config.properties file”](#). The `dbpool.ui.maxActive` parameter controls the connection pool for the Dashboard user interface; by default, the Service Manager uses 15% of the connections specified by `dbpool.default.maxActive` to accommodate the Dashboard user interface.

- Especially if you make extensive use of the [Query Analyzer](#), consider adjusting the [ehcache](#) parameters as described in [Section 2.11.2, “Known MySQL Enterprise Monitor User Interface Problems and Workarounds”](#).
- Consider increasing the maximum heap size of the JVM for the Service Manager. For example, 300 or more Agents might require 2-4GB of heap, along with sufficient CPU capacity to perform garbage collection on such a large heap.
- Expect to install the Service Manager and the repository database instance on separate machines.

2.11 Troubleshooting the MySQL Enterprise Monitor User Interface

This section describes different kinds of issues that you might experience with the MySQL Enterprise Monitor User Interface, and how to solve or avoid them.

2.11.1 Diagnosing MySQL Enterprise Monitor User Interface Problems

To diagnose any issues with the MySQL Enterprise Monitor User Interface, start by looking at the **Logs** link under the **Settings** tab, as described in [Section 2.8.6, “Logs”](#). This page consolidates troubleshooting information across all the MySQL Enterprise Monitor components.

2.11.2 Known MySQL Enterprise Monitor User Interface Problems and Workarounds

The message `An item was expired by the cache while it was locked (increase your cache timeout)` can be accompanied by a spike in CPU usage, gaps in data displayed by the Query Analyzer, or both. The workaround is to edit the `apache-tomcat/webapps/ROOT/WEB-INF/classes/com/mysql/etools/monitor/pom/hib/ehcache-mysql.xml` file and increase the value for `maxElementsInMemory` for the cache with the name `"com.mysql.etools.monitor.pom.hib.HibInstanceAttribute"` so that it is greater than the number of rows in the MySQL Enterprise Monitor `inventory_instance_attributes` table. This may also require configuring the service manager to have a larger maximum heap size, see [Section C.1.1, “Configuring Tomcat Parameters”](#).

Chapter 3 Using the Query Analyzer

Table of Contents

3.1 Providing Query Analyzer Data	60
3.1.1 Using the MySQL Enterprise Plugin for Connector/J	62
3.1.2 Using the MySQL Enterprise Plugin for Connector/PHP	68
3.1.3 Using the MySQL Enterprise Plugin for Connector/Net	73
3.1.4 Using the MySQL Enterprise Agent Aggregator	76
3.1.5 Using the Agent Proxy	78
3.2 Query Analyzer User Interface	82
3.2.1 Getting Detailed Query Information	85
3.2.2 Using Graphs to Identify Queries	88
3.2.3 Query Analyzer Settings	88
3.2.4 Filtering Query Analyzer Data	90
3.2.5 Exporting Query Information	91
3.3 Troubleshooting Query Analyzer	92

The MySQL [Query Analyzer](#) lets you monitor SQL statements executed on a MySQL server and see details about each query, as well as number of executions and execution times. Similar queries with different literal values are combined ([normalized](#)) for reporting purposes.

Query Analyzer collects information about SQL statements that a MySQL client application sends to the MySQL server. The client application must either route its database requests through the MySQL Enterprise Monitor Agent proxy service, or use the MySQL Enterprise Monitor [Plugin](#) for a given [Connector](#) that sends the information directly to MySQL Enterprise Service Manager. Once your MySQL client application is configured to communicate via the MySQL Enterprise Monitor Agent, queries are monitored and the normalized queries are sent to the MySQL Enterprise Monitor Agent.

For the different ways to enable Query Analysis, see [Section 3.1, “Providing Query Analyzer Data”](#). For the user interface of the Query Analyzer, see [Section 2.6, “The Query Analyzer Tab”](#) and [Section 3.2, “Query Analyzer User Interface”](#).



Important

The MySQL Proxy component and Query Analyzer require that clients connecting through MySQL Enterprise Monitor Agent use MySQL 5.0 or later. Clients that use the `libmysqlclient` library provided with MySQL 4.1 or earlier do not work with MySQL Enterprise Monitor Agent.

Once the data is collected, you view and monitor the queries, check the execution statistics, and filter and drill down on the information. By comparing the queries to the server graphs, you can correlate query execution with server status. For more information on viewing, filtering and reporting on the Query Analyzer data, see [Section 3.2, “Query Analyzer User Interface”](#).



Note

When MySQL Enterprise Monitor is not accessible from a [Connector/J](#) or [Connector/NET](#) query analyzer plugin, then the application performance will not be impacted. Over time, the plugin will determine that a backlog of reportable data exists, and fall back to consolidating it over longer ranges of time. But if more than 1,000 canonical queries are being used by the application (an unlikely scenario), then data will begin to be dropped.



Note

MySQL Enterprise subscription, MySQL Enterprise Monitor, MySQL Replication Monitor, and MySQL Query Analyzer are only available to commercial customers. To learn more, see: <http://www.mysql.com/products/>.

3.1 Providing Query Analyzer Data

The MySQL [Query Analyzer](#) can be fed information from a number of different sources, in each case with the provider supplying the statistical information about the queries, execution times, result counts and other data to be displayed and analyzed with the Query Analyzer tab within MySQL Enterprise Monitor User Interface.

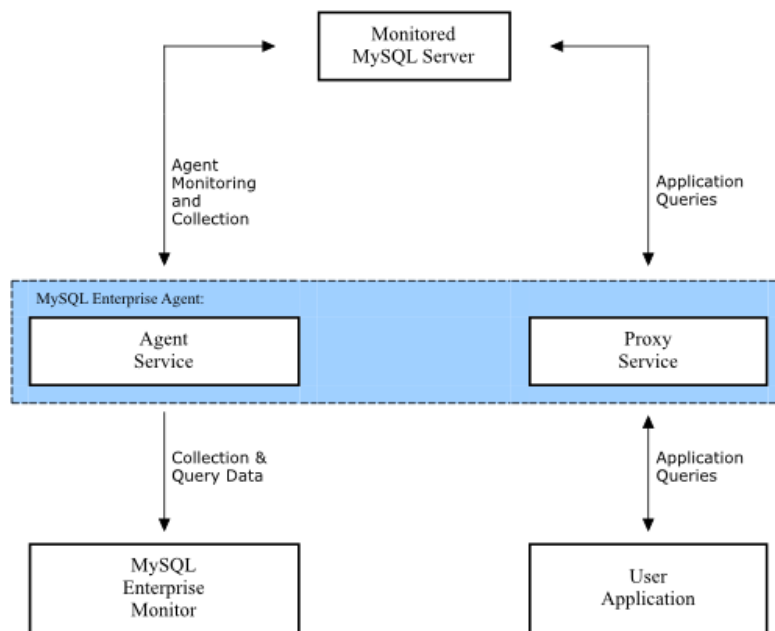
There are a number of different methods available for supplying query information to MySQL Enterprise Service Manager:

- Using the MySQL [Proxy](#) functionality built into MySQL Enterprise Monitor Agent. This is the method offered and supported since MySQL Enterprise Monitor 2.0.

When using the proxy, queries from the client application are directed through the proxy to the MySQL server, with all results from the MySQL server being returned from the proxy to the client application. While this transmission of information takes place, the proxy component keeps statistical information and supplies this information to MySQL Enterprise Service Manager for analysis.

The following figure shows the structure of this process in relation to the MySQL server containing the client application data, the client application, and the MySQL Enterprise Monitor components:

Figure 3.1 MySQL Enterprise Monitor Architecture using Query Analyzer with Proxy



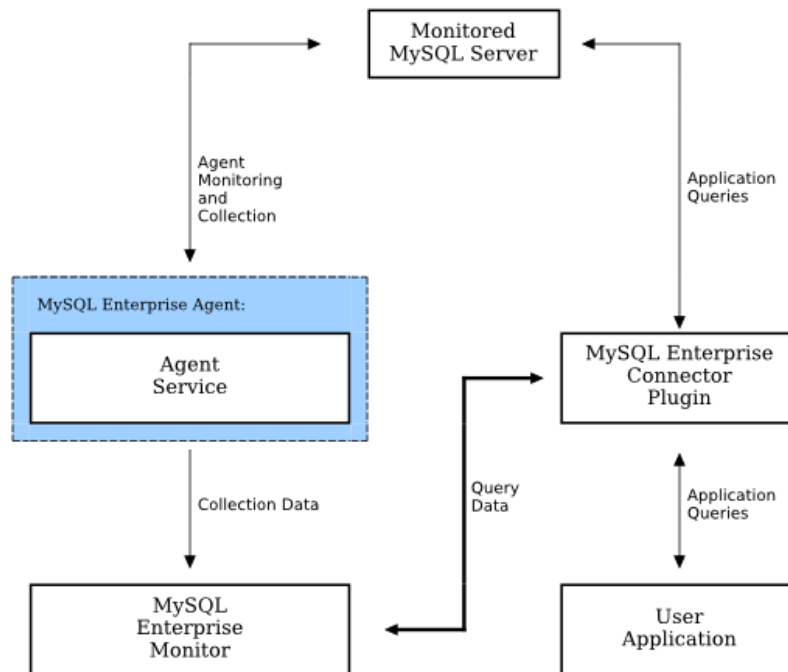
For more information on using this method, see [Section 3.1.5, “Using the Agent Proxy”](#).

- Use a MySQL [connector](#) with a corresponding MySQL Enterprise Monitor [Plugin](#) that provides tracing and statistical information directly to MySQL Enterprise Service Manager.

Using this method requires a connector that is capable of collecting and sending the query statistical data directly to MySQL Enterprise Service Manager. The connectors handles all of the collection of the basic query statistics, such as the execution time for each query, and the row counts, and provides this information to MySQL Enterprise Service Manager for analysis. This solution negates the need the proxy component, providing you with maximum speed between your application, connector and MySQL server containing your client application data.

The following figure shows the structure of this solution:

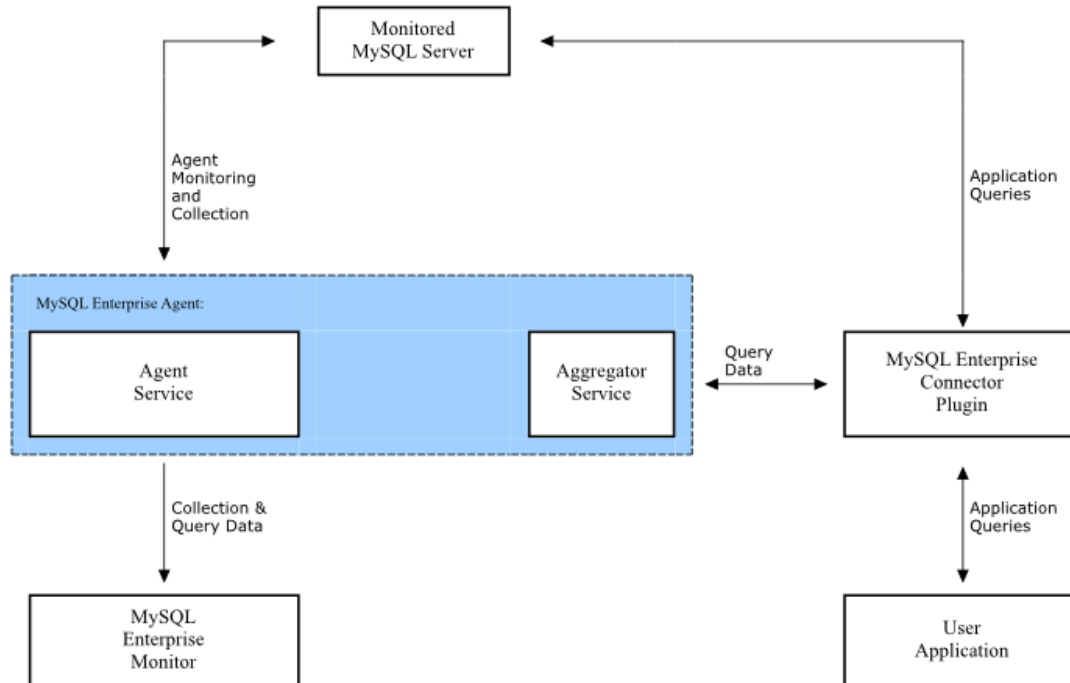
Figure 3.2 MySQL Enterprise Monitor Architecture using Query Analyzer Directly from Connector



For more information on using this method, see the following table for information on which connectors support this method of operation.

- Using a MySQL connector with a corresponding MySQL Enterprise Monitor Plugin that uses the aggregator functionality in MySQL Enterprise Monitor Agent to communicate information to MySQL Enterprise Service Manager.

Using the aggregator method, the MySQL Connector communicates raw statistical information about the queries and then sends this information to the MySQL Enterprise Monitor Agent, which aggregates the information into a format suitable for MySQL Enterprise Service Manager to perform the analysis and present the information.

Figure 3.3 MySQL Enterprise Monitor Architecture using Query Analyzer with Aggregator

For more information on using this method, see the following table for information on which connectors support this method of operation.

Different connectors support either the direct and aggregator methods of supplying statistical information through a plugin that provides the necessary code to communicate either directly with MySQL Enterprise Service Manager, or indirectly through the MySQL Enterprise Monitor Agent aggregator. The following table provides information on which connectors support the different functionality types.

Table 3.1 Query Analyzer Feeding Solution Comparison

Feature	C/Java	C/NET	C/PHP	Proxy
Uses Aggregator	No	No	Yes	No
Uses Proxy	No	No	No	Yes
Supports EXPLAIN	Yes	Yes	No	Yes

3.1.1 Using the MySQL Enterprise Plugin for Connector/J

The MySQL Enterprise Plugin for Connector/J lets you use the [Query Analyzer](#) to monitor MySQL queries from any application using the [Connector/J](#) JDBC driver. As described in [Section 3.2, "Query Analyzer User Interface"](#), the Query Analyzer can help you locate queries that are inefficient or slow. Tuning such queries helps to shorten load times for web pages, and improves overall system responsiveness and scalability.

Information about the queries is sent directly to the MySQL Enterprise Service Manager. Once you install the MySQL Enterprise Plugin for Connector/J, query analysis becomes available for your applications without requiring any modification to the application code.

Table 3.2 Query Analyzer Connector/J Summary

Feature	C/Java
Uses Aggregator	No
Uses Proxy	No
Supports EXPLAIN	Yes

Prerequisites

1. MySQL Connector/J version 5.1.12 or later.
2. JDK-1.5.0 or later.
3. MySQL Enterprise Service Manager version 2.2 or later.
4. The MySQL client application user must have `SELECT` privileges on the `mysql.inventory` table. This table contains the server `UUID`; it is required to report the Query Analyzer data to the MySQL Enterprise Service Manager. Use the `GRANT` statement. For example:

```
mysql> GRANT SELECT on mysql.inventory to 'user'@'localhost' IDENTIFIED BY 'password';
```

5. Apache Commons logging in the `CLASSPATH` of the application being analyzed. If you are not already using Commons Logging, modify the application's `CLASSPATH` as described in the following section to point to the JAR file bundled with the MySQL Enterprise Monitor product.

Installation

Place the JAR file `lib/c-java-mysql-enterprise-plugin-version.jar` in the application's `CLASSPATH` where it is visible to the version of MySQL Connector/J in use. Ideally, use the same location as MySQL Connector/J's JAR file, or in a parent classloader to that JAR file's location.

If the application being analyzed does not have Apache Commons Logging in the `CLASSPATH`, install the file `lib/required/commons-logging-1.1.1.jar` in the application's `CLASSPATH` as well. If no other component in your application uses Apache Commons Logging, install it in the same place where the Query Analyzer plugin was installed.

There is static shutdown() method on `com.mysql.etools.jdbc.StatementPerformanceCounters`, which can be used to cleanly shutdown the query analysis plugin when the application is going to be shutdown.

If the application in question is deployed in a J(2)EE application server, there is an included `ContextListener` distributed with the plugin which will call this method when the application's context is shutdown (or reloaded). Application Servers which support `@WebListener` (such as JEE6 and above) do not need to do any extra configuration, but users with older Application Servers need to add the following line to their application's `web.xml` file:

```
<listener>
  <listener-class>
```

```
com.mysql.etools.jdbc.ContextListener
</listener-class>
</listener>
```

The Connector/J plugin prior to version 1.0.81 can use a workaround by placing the plugin in the shared library loader of their Application Server, rather than in the `WEB-INF/lib` directory.

Configuration

Once the required JAR files are deployed, modify the connection URL for JDBC to use and configure the Query Analyzer plugin. Add the following properties and their corresponding values to the URL that is used by the application you are monitoring.

For more information on Connector/J properties, see [Connector/J \(JDBC\) Reference](#).

Table 3.3 MySQL Monitor Plugin for Connector/J Options

Property Name	Property Type	Default
<code>mysqlenterprise.disableSourceLocation</code>	boolean	false
<code>mysqlenterprise.serviceManagerConnectTime</code>	numeric	
<code>mysqlenterprise.serviceManagerPassword</code>	string	
<code>mysqlenterprise.serviceManagerResponseTime</code>	numeric	
<code>mysqlenterprise.serviceManagerUrl</code>	string	
<code>mysqlenterprise.serviceManagerUser</code>	string	

- `statementInterceptors = com.mysql.etools.jdbc.StatementPerformanceCounters`

Enables the operation of the plugin. Without this configuration option, query information is not provided to MySQL Enterprise Service Manager

- `mysqlenterprise.disableSourceLocation`

Introduced	2.3.10	
Permitted Values	Type	<code>boolean</code>
	Default	<code>false</code>

Whether to send stack traces with example queries to the service manager.

- `mysqlenterprise.serviceManagerUrl`

Permitted Values	Type	<code>string</code>
-------------------------	-------------	---------------------

Specifies the URL to the service manager. You can get this information from the configuration file created when MySQL Enterprise Service Manager was installed. You must include the full URL, including the port number. For example, `http://monitor.example.com:18080`.

- `mysqlenterprise.serviceManagerUser`

Permitted Values	Type	<code>string</code>
-------------------------	-------------	---------------------

Specifies the agent username to be used when communicating information to MySQL Enterprise Service Manager.

- `mysqlenterprise.serviceManagerPassword`

Permitted Values	Type	<code>string</code>
-------------------------	-------------	---------------------

Specifies the agent password to be used when communicating information to MySQL Enterprise Service Manager.

- **Optional**

- `mysqlenterprise.serviceManagerConnectTimeout`

Introduced	2.3.4	
Permitted Values	Type	<code>numeric</code>

The number of seconds to wait for a connection to be made to the service manager before timing out. The default is no timeout. Introduced in Connector/J version 1.0.0.61.

- `mysqlenterprise.serviceManagerResponseTimeout`

Introduced	2.3.4	
Permitted Values	Type	<code>numeric</code>

The number of milliseconds to wait for pending reads or writes to or from the Service Manager to complete before timing out. The default is no timeout. Introduced in Connector/J version 1.0.0.61.

To use SSL to communicate query information to the MySQL Enterprise Service Manager, configure the following properties. Out of the box, the plugin is configured to work with the self-signed certificates that ship with the MySQL Enterprise Monitor. Therefore, it provides confidentiality for the information that is sent by the plugin if the service manager URL starts with `https://`. However, as configured, the plugin does not prevent man-in-the-middle attacks, nor does it support client-side certificates for authentication. To enable these features, change the values of the following parameters:

Table 3.4 MySQL Monitor Plugin for Connector/J SSL Options

Property Name	Property Type	Default
<code>mysqlenterprise.clientCertificateKeystorePassword</code>	<code>string</code>	
<code>mysqlenterprise.clientCertificateKeystoreType</code>	<code>string</code>	
<code>mysqlenterprise.clientCertificateKeystoreURL</code>	<code>string</code>	
<code>mysqlenterprise.trustCertificateKeystorePassword</code>	<code>string</code>	
<code>mysqlenterprise.trustCertificateKeystoreType</code>	<code>numeric</code>	
<code>mysqlenterprise.trustCertificateKeystoreURL</code>	<code>string</code>	
<code>mysqlenterprise.verifySslCerts</code>	<code>boolean</code>	<code>false</code>
<code>mysqlenterprise.verifySslHostnames</code>	<code>boolean</code>	<code>false</code>

- `mysqlenterprise.verifySslHostnames`

Permitted Values	Type	<code>boolean</code>
	Default	<code>false</code>

If set to "true", host names presented in the SSL server certificate are verified following the same scheme as used by Firefox and Curl and specified by RFC 2818.

- `mysqlenterprise.verifySslCerts`

Permitted Values	Type	<code>boolean</code>
	Default	<code>false</code>

Specifies whether the plugin verifies that the certificate presented by the server was signed by a CA in the `trustCertificateKeystore`.

- `mysqlenterprise.trustCertificateKeystoreUrl`

Permitted Values	Type	<code>string</code>
-------------------------	-------------	---------------------

URL to the trusted root certificate KeyStore (if not specified, use Java defaults).

- `mysqlenterprise.trustCertificateKeystorePassword`

Permitted Values	Type	<code>string</code>
-------------------------	-------------	---------------------

Password for the certificate store.

- `mysqlenterprise.trustCertificateKeystoreType=[type]`

Permitted Values	Type	<code>numeric</code>
-------------------------	-------------	----------------------

KeyStore type for trusted root certificates (NULL or empty means use `JKS` default, standard keystore types supported by the JVM are `JKS` and `PKCS12`, your environment may have more available depending on what security products are installed and available to the JVM).

- `mysqlenterprise.clientCertificateKeystoreUrl`

Permitted Values	Type	<code>string</code>
-------------------------	-------------	---------------------

URL to the client certificate KeyStore (if not specified, use Java defaults)

- `mysqlenterprise.clientCertificateKeystorePassword=[password]`

Permitted Values	Type	<code>string</code>
-------------------------	-------------	---------------------

Password for the client certificate store.

- `mysqlenterprise.clientCertificateKeystoreType`

Permitted Values	Type	<code>string</code>
-------------------------	-------------	---------------------

KeyStore type for client certificates (NULL or empty means use `JKS` default, standard keystore types supported by the JVM are `JKS` and `PKCS12`, your environment may have more available depending on what security products are installed and available to the JVM).

For example, to configure a Connector/J to communicate with the MySQL Enterprise Service Manager localhost, on port 18080, using the agent username agent, and password PASSWORD, you would add the following options to your connection string (but define the option on a single line):

```
statementInterceptors=com.mysql.etools.jdbc.StatementPerformanceCounters
&serviceManagerUrl=http://localhost:18080/
&serviceManagerUser=agent
```



```
&serviceManagerPassword=PASSWORD
```

Remember that you must also add the application-specific options to the JDBC URL. For example, the following fragment connects to the MySQL database `test` on `localhost`, using the user and password of `mysqltest`, while also collecting query data and sending it to the MySQL Enterprise Service Manager on `localhost`:

```
import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.SQLException;

Connection conn = null;
...
try {
    conn =
        DriverManager.getConnection("jdbc:mysql://localhost/test?" +
            "user=mysqltest" +
            "&password=mysqltest" +
            "&statementInterceptors=com.mysql.etools.jdbc.StatementPerformanceCounters" +
            "&serviceManagerUrl=http://localhost:18080/" +
            "&serviceManagerUser=agent" +
            "&serviceManagerPassword=PASSWORD"
        );

    // Do something with the Connection

    ...
} catch (SQLException ex) {
    // handle any errors
}
```



Note

If a `DataSource` is in use (typically when using Glassfish, Weblogic, or Websphere), these properties must be passed as part of the URL property, they cannot be added to the `DataSource` configuration itself.

If an alternate logging system has not been selected for Connector/J, it is recommended that Connector/J's log factory is configured to use something other than the standard logger by adding the following property to the URL or `DataSource`:

- `logger=Log4JLogger` (for applications using Log4J)
- `logger=CommonsLogger` (for applications using Apache Commons Logging)
- `logger=Jdk14Logger` (for applications using Java 1.4 or later logging)

Further configuration of the plugin is done via the Enterprise Service Manager's user interface, using the **Query Analyzer** tab. From here, the capture of query performance data for a given MySQL instance that the plugin is being with can be enabled or disabled. Further, the level of detail that is captured; summary, examples (with source code locations) and `EXPLAIN` plans can be configured as well.

The Query Analyzer plugin checks the configuration once each minute (while it is reporting data it has collected), thus configuration changes are not immediate.

Usage

After you set up MySQL Enterprise Plugin for Connector/J, you monitor the performance of your Java applications through the **Query Analyzer** tab, as described in [Section 3.2, "Query Analyzer User Interface"](#).

Troubleshooting

Be aware of the following while using the MySQL Enterprise Plugin for Connector/J:

- When a Java application that is reporting queries terminates, you might lose the information about some queries because the queued query information has not been sent to MySQL Enterprise Service Manager. To work around this issue, add a sleep to your application to ensure the normal reporting schedule submits the outstanding queries. For example, you could add:

```
Thread.sleep(60000);
```

to your application, to pause before the application terminates.

3.1.2 Using the MySQL Enterprise Plugin for Connector/PHP

The MySQL Enterprise Plugin for Connector/PHP lets you use the [Query Analyzer](#) to monitor MySQL queries from PHP applications, such as PHP-enabled web pages. As described in [Section 3.2, “Query Analyzer User Interface”](#), the Query Analyzer can help you locate queries that are inefficient or slow. Tuning such queries helps to shorten load times for web pages, and improves overall system responsiveness and scalability.

The PHP query data is routed through the [aggregator](#) component of MySQL Enterprise Monitor Agent. Because PHP processes are typically short-lived, the Aggregator receives bursts of query information from the PHP plugin, aggregates and computes statistics, and periodically sends this data to the MySQL Enterprise Service Manager, where it is displayed on the **Query Analyzer** tab. You must have the MySQL Enterprise Agent Aggregator enabled and running to use Query Analyzer with PHP applications. See [Section 3.1.4, “Using the MySQL Enterprise Agent Aggregator”](#) for details about setting up the MySQL Enterprise Agent Aggregator.

Table 3.5 MySQL Enterprise Plugin for Connector/PHP Summary

Feature	C/PHP
Uses Aggregator	Yes
Uses Proxy	No
Supports EXPLAIN	No

Prerequisites

The MySQL Enterprise Plugin for Connector/PHP requires PHP 5.3.2 or above, with the MySQL native driver, `mysqlnd`, installed. This is the recommended configuration. If your PHP installation was not configured with the `mysqlnd` enabled, you must rebuild and install PHP from source using at least one of the following options:

- `--with-mysqli=mysqlnd`
- `--with-pdo-mysql=mysqlnd`
- `--with-mysql=mysqlnd`

The preceding options are supplied to the `configure` command, depending on which extension you are using (`mysql`, `mysqli` or `PDO_MYSQL`). If you use more than one extension, provide multiple options. Specifying any of the options listed rebuilds PHP with `mysqlnd` support. You also must enable the PHP JSON module.

For further information on MySQL Native Driver (`mysqlnd`), see [MySQL Native Driver](#).

The MySQL client application user, that makes PHP connections in your PHP code, must have `SELECT` privileges on the `mysql.inventory` table. This table contains the server `UUID`; it is required to report the Query Analyzer data to the MySQL Enterprise Service Manager. Use the `GRANT` statement. For example:

```
mysql> GRANT SELECT on mysql.inventory to 'user'@'localhost' IDENTIFIED BY 'password';
```

Installation

The plugin is provided as a regular PHP module (PHP extension), and installation follows those PHP standard procedures as described on <http://php.net/install.pecl>.

Download the MySQL Enterprise Plugin for Connector/PHP, then use the following step-by-step instructions to install and configure the MySQL Enterprise Plugin for Connector/PHP extension.

1. Locate your `php.ini` configuration file. If you do not know the location, you can view information about your PHP installation by creating a script containing:

```
<?php phpinfo(); ?>
```

Place the script within a directory configured for providing PHP web pages. Now load the page in your web browser to see a list of configuration and other information about your PHP installation.

Check the output for **Loaded Configuration File**. If the value is `(none)`, refer to the **Configuration File (php.ini) Path** and create a file called `php.ini` in there. If a **Scan this dir for additional .ini files** option is listed you can also create a file using any name you like, ending `.ini`, in that directory to set configuration options.

2. Identify whether or not your PHP build was built “thread safe” by checking the **Thread Safety** value in the output from the `phpinfo()` test. If your PHP build is thread safe, you need `mysqlenterprise_ts.so` on Linux and Unix, or `php_mysqlenterprise_ts.dll` on Microsoft Windows. If not, use `mysqlenterprise.so` on Linux, Unix, or `php_mysqlenterprise.dll` on Microsoft Windows.
3. Add an entry for the MySQL Enterprise Plugin for Connector/PHP module. You can use the full path:

```
extension=/path/to/mysqlenterprise.so
```

Alternatively, put the file into the directory identified by your `extension_dir` configuration option, and specify just the filename:

```
extension=mysqlenterprise.so
```



Note

If `mysqlnd` is loaded as a shared library (`mysqlnd.so`), then it *must* be loaded before `mysqlenterprise.so` as otherwise an error such as "PHP Warning: PHP Startup: Unable to load dynamic library '/mysqlenterprise.so' - /mysqlenterprise.so: undefined symbol: mysqlnd_plugin_register in Unknown on line 0" will be emitted by PHP. Either:

- If `php.ini` is used to load the PHP extensions, then list it first. For example:

```
extension=mysqlnd.so
extension=mysqlenterprise.so
```

- If individual ini files are used to load the PHP extensions, then note that the ini files are loaded alphabetically, so adjust accordingly so that `mysqlnd.so` is loaded first. For example, `/etc/php.d/` might contain:

```
mysqlnd.ini
mysqlzz_enterprise.ini
```

4. Restart your Web server application to reload PHP and the configured extensions.
5. Now reload the `phpinfo()` page that you created earlier, and inspect the listing for the `mysqlenterprise` module.



Caution

If you are using PHP on Microsoft Windows with the Apache web server (httpd) built from apache.org, note the following.

Historically, the Win32 Apache web server binary from apache.org is compiled with the legacy Microsoft Visual Studio 6 compiler (VC6). MySQL no longer supports VC6, and as a consequence the MySQL Enterprise Plugin for Connector/PHP for Microsoft Windows is compiled with the newer VC9 compiler. You can not use PHP as a loaded module with an Apache web server build that uses VC6. Alternative Apache builds exist that use VC9, so check your source and be sure that your binaries are both compiled using VC9. Or, instead of loading PHP as a module, you can run PHP in (Fast)CGI mode. See <http://windows.fyicenter.com/view.php?ID=68&R=71> for configuration details.

Note that PHP binaries for Microsoft Windows from php.net have compiled in `mysqlnd` support by default, since PHP 5.3.0.

Configuration

The configuration of the MySQL Enterprise Plugin for Connector/PHP is handled through the standard PHP configuration files, either globally using `php.ini`, or by using the per-directory options, as detailed in [PHP Configuration](#). The following table shows the available configurable options.



Note

Each PHP configuration option for MySQL Enterprise Monitor is prefixed by `mysqlenterprise.`

Table 3.6 MySQL Enterprise Plugin for Connector/PHP Options

Property Name	Property Type	Default
<code>aggregator_connect_timeout_sec</code>	integer	1
<code>aggregator_connect_timeout_usec</code>	integer	0
<code>aggregator_password</code>	string	
<code>aggregator_url</code>	string	<code>tcp://127.0.0.1:14000</code>
<code>aggregator_user</code>	string	
<code>debug_callback</code>	string	

Property Name	Property Type	Default
<code>disable_backtrace</code>	boolean	1
<code>log_file</code>	string	
<code>quan_enabled</code>	boolean	1

The following list describes these options in more detail:

- `mysqlenterprise.quan_enabled`

Permitted Values	Type	<code>boolean</code>
	Default	<code>1</code>

A boolean value specifying whether query analysis should be enabled.

PHP Category: `PHP_INI_PERDIR`

- `mysqlenterprise.aggregator_url`

Permitted Values	Type	<code>string</code>
	Default	<code>tcp://127.0.0.1:14000</code>

A string specifying the hostname and port for the MySQL Enterprise Agent Aggregator.

PHP Category: `PHP_INI_ALL`

- `mysqlenterprise.aggregator_user`

Permitted Values	Type	<code>string</code>
------------------	------	---------------------

The user name for communicating with the MySQL Enterprise Agent Aggregator. This is defined in the MySQL Enterprise Monitor dashboard, and is assigned the **Agent** role.



Note

This will only have an effect if the password (`mysqlenterprise.aggregator_password`) is also set.

PHP Category: `PHP_INI_SYSTEM`

- `mysqlenterprise.aggregator_password`

Permitted Values	Type	<code>string</code>
------------------	------	---------------------

The password for communicating with the MySQL Enterprise Agent Aggregator. This is defined in the MySQL Enterprise Monitor dashboard.



Note

This will only have an effect if the user (`mysqlenterprise.aggregator_user`) is also set.

PHP Category: `PHP_INI_SYSTEM`

- `mysqlenterprise.aggregator_connect_timeout_sec`

Permitted Values	Type	integer
	Default	1

Timeout in seconds when communicating with the MySQL Enterprise Agent Aggregator.



Note

The settings for `mysqlenterprise.aggregator_connect_timeout_sec` and `mysqlenterprise.aggregator_connect_timeout_usec` are combined (added together) to determine the timeout.

PHP Category: `PHP_INI_SYSTEM`

- `mysqlenterprise.aggregator_connect_timeout_usec`

Permitted Values	Type	integer
	Default	0

The microseconds part of the timeout when communicating with the MySQL Enterprise Agent Aggregator.



Note

The settings for `mysqlenterprise.aggregator_connect_timeout_sec` and `mysqlenterprise.aggregator_connect_timeout_usec` are combined (added together) to determine the timeout.

PHP Category: `PHP_INI_SYSTEM`

- `mysqlenterprise.disable_backtrace`

Permitted Values	Type	boolean
	Default	1

Whether a backtrace will be generated. A backtrace is helpful while locating the source of errors, but it will have a performance impact.

PHP Category: `PHP_INI_ALL`

- `mysqlenterprise.debug_callback`

Permitted Values	Type	string
------------------	------	--------

Name of the callback function to be invoked whenever data is sent to the agent. This callback is defined in the PHP application, and is a PHP function that requires one parameter. This parameter is an array of HTTP requests made to the aggregator.



Note

This should only be set while debugging MySQL Enterprise Monitor, and likely only used when support personal asks for it and defines how you should use this configuration option.

PHP Category: `PHP_INI_ALL`

- `mysqlenterprise.log_file`

Permitted Values	Type	<code>string</code>
------------------	------	---------------------

Opens a file to log all the Query Analyzer information sent to MySQL Enterprise Agent Aggregator while monitoring queries.



Note

This should only be enabled while debugging MySQL Enterprise Monitor because it will log every request, which may result in a large log file.

PHP Category: `PHP_INI_SYSTEM`

For example, you might configure your `php.ini` file with the following options:

```
extension = /usr/local/apache/php/lib/php/extensions/mysqlenterprise.so
mysqlenterprise.aggregator_url = tcp://aggregator:14000
mysqlenterprise.quan_enabled = 1
mysqlenterprise.debug_callback = cta_callback
mysqlenterprise.disable_backtrace = 1
mysqlenterprise.aggregator_user = username
mysqlenterprise.aggregator_password = "password"
```

The Aggregator-related options must be set, as MySQL Enterprise Plugin for Connector/PHP cannot function without a connection to the Aggregator.



Note

Restart your web server for the configuration options to take effect. Verify your desired settings are in effect by checking the output of the `phpinfo()` PHP function.

Usage

After you set up MySQL Enterprise Plugin for Connector/PHP, you monitor the performance of your PHP applications through the **Query Analyzer** tab, as described in [Section 3.2, “Query Analyzer User Interface”](#).

Troubleshooting

When the MySQL Enterprise Plugin for Connector/PHP connects to a MySQL server, it must be able to retrieve the **UUID** of that server. If there is a problem, for example if the `mysql.inventory` table does not exist or the MySQL user does not have privileges to read it, the problem is reported using the standard PHP error reporting mechanism. PHP classifies such a problem as an `E_WARNING`. Depending on how you have configured PHP error reporting, the associated messages might be displayed as part of the application output, stored in a PHP error log file, or discarded. For instructions to set up an Agent UUID, see [Section 5.3.8, “Generating a New UUID”](#). For specific details about PHP error reporting, see <http://php.net/errorfunc>.



Note

In PHP, the `error_log` PHP directive defines the location of the PHP error log, and its usage requires that the `log_errors` PHP directive is enabled.

3.1.3 Using the MySQL Enterprise Plugin for Connector/Net

The MySQL Enterprise Plugin for Connector/Net lets you use the [Query Analyzer](#) to monitor MySQL queries from any application using [Connector/Net](#), including both standalone and web-based applications. As described in [Section 3.2, “Query Analyzer User Interface”](#), the Query Analyzer can help you locate queries that are inefficient or slow. Tuning such queries helps to shorten load times for web pages, and improves overall system responsiveness and scalability.

Information about the queries is sent directly to the MySQL Enterprise Service Manager. Once you install the MySQL Enterprise Plugin for Connector/Net, query analysis becomes available for your applications without requiring any modification to the application code.

Table 3.7 Query Analyzer Connector/Net Summary

Feature	C/NET
Uses Aggregator	No
Uses Proxy	No
Supports EXPLAIN	Yes

Prerequisites

- You must be using Connector/Net version 6.2.3 or later.
- The MySQL client application user must have [SELECT](#) privileges on the `mysql.inventory` table. This table contains the server [UUID](#); it is required to report the Query Analyzer data to the MySQL Enterprise Service Manager. Use the [GRANT](#) statement. For example:

```
mysql> GRANT SELECT on mysql.inventory to 'user'@'localhost' IDENTIFIED BY 'password';
```

- Your application should already be using the `Mysql.data.dll` and have been built with the library requirement.
- If you are using the released builds of Connector/Net, you must include the `logging=true` option within your connection string.

Installation

Download the MySQL Enterprise Plugin for Connector/Net package. Extract the package using a suitable zip tool, and then place the plugin library, `MySQL.MonitorPlugin.dll`, in the same directory as your compiled application.

Configuration

If the application to profile does not have an `app.config` application configuration file, then make one.

To enable Query Analyzer functionality, register the trace listeners in the `System.Diagnostics` section of the `app.config` file. The following example shows the format of a typical configuration file:

```
<system.diagnostics>

  <sources>
```



```
<source name="mysql" switchName="SourceSwitch"
switchType="System.Diagnostics.SourceSwitch">

  <listeners>

    <add name="EMTrace" type="MySQL.EMTrace.EMTraceListener, MySQL.MonitorPlugin"
      initializeData=""
      Host="SERVERHOST:SERVERPORT"
      PostInterval="POSTINTERVAL"
      UserId="AGENTUSERID"
      Password="AGENTPASSWORD" />

  </listeners>

</source>

</sources>

<switches>

  <add name="SourceSwitch" value="All" />

</switches>

</system.diagnostics>
<system.data>

  <DbProviderFactories>

    <add name="MySQL Data Provider" invariant="MySQL.Data.MySqlClient"
      description=".Net Framework Data Provider for MySQL"
      type="MySQL.Data.MySqlClient.MySqlClientFactory, MySQL.Data, Version=6.2.1.0, \
      Culture=neutral, PublicKeyToken=c5687fc88969c44d" />

  </DbProviderFactories>

</system.data>
```

Within the configuration, set the values of the following parameters:

- **Host**

The hostname and port number, separated by a colon, of the MySQL Enterprise Service Manager that receives the Query Analyzer data.

- **PostInterval**

Query analyzer information is collected and then transmitted (“posted”) in a batch from your application to the MySQL Enterprise Service Manager. This value specifies the number of seconds between each transmission. Choose this value carefully. Too long and it might take some time for queries to appear in the Query Analyzer.

- **UserId**

The name of a user within MySQL Enterprise Service Manager that has rights to send agent information.

- **Password**

The password of a user within MySQL Enterprise Service Manager that has rights to send agent information.

To get extended information on queries and have that information available through the Dashboard, enable the Connector/Net usage advisor. The extended information identifies potential issues such as a query not using an index, or not accessing all columns from a result set.

To enable the usage advisor, add `usage advisor=true` to the connection string within your application. Enabling this option also automatically enables logging within Connector/Net. For more information, see [Connector/Net Connection String Options Reference](#).

During execution of the application during development within Visual Studio, a significant amount of output is displayed in the **Output** window. To view this same trace output when running the application outside Visual Studio, configure an additional listener by adding the following within the `system.diagnostics` section of your `app.config` file:

```
<trace autoflush="false" indentsize="4">
  <listeners>
    <add name="consoleListener" type="System.Diagnostics.ConsoleTraceListener" />
  </listeners>
</trace>
```

Usage

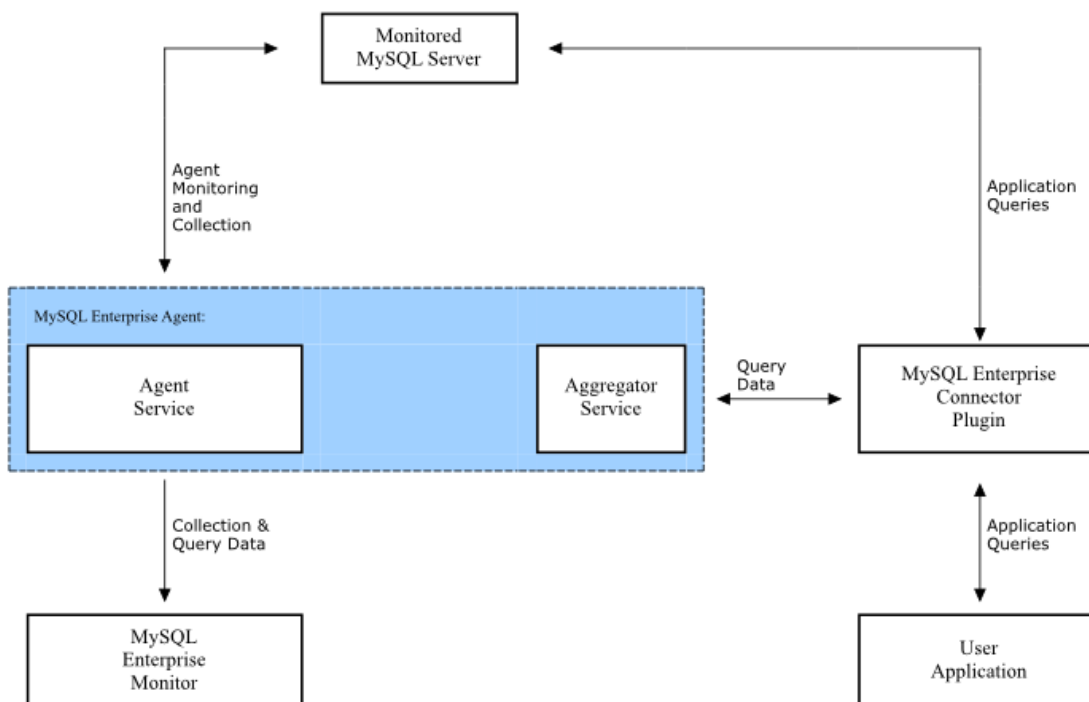
After you set up MySQL Enterprise Plugin for Connector/Net, you monitor the performance of your .NET applications through the **Query Analyzer** tab, as described in [Section 3.2, "Query Analyzer User Interface"](#).

3.1.4 Using the MySQL Enterprise Agent Aggregator

The optional [MySQL Enterprise Agent Aggregator](#) component of the MySQL Enterprise Monitor Agent collects query performance data from additional sources, such as an instrumented application server, user-written scripts, or possible future connectors. It combines and formats the query data for display within the [Query Analyzer](#) window, using multithreading to avoid performance bottlenecks. (The .NET and Java connectors bypass the aggregator; they do their own multithreaded processing internally.)

The following figure shows the data flow between your application, various MySQL Enterprise Monitor components, and the database server when you use the MySQL Enterprise Agent Aggregator.

Figure 3.4 The MySQL Enterprise Monitor Architecture using aggregator and agent services for the same MySQL Server



From the illustration, query data is provided by each individual MySQL Enterprise Plugin for Connectors as queries are executed through the corresponding connector. Query data is distributed up to the aggregator, which reports the corresponding Query Analyzer data to the MySQL Enterprise Service Manager.



Note

When using the aggregator service, the MySQL Enterprise Monitor Agent requires a variable amount of memory overhead to collect and pass on the data from connectors to the MySQL Enterprise Service Manager. The amount depends on the number and text size of executed SQL statements.

You can configure support for the aggregator during the installation of the MySQL Enterprise Monitor Agent. This sets the correct configuration information within the agent configuration files. If you do not configure the MySQL Enterprise Agent Aggregator during installation, the corresponding lines for configuration are commented out.

To re-enable the aggregator service in your agent:

1. Shut down the MySQL Enterprise Monitor Agent.
2. Uncomment the MySQL Enterprise Agent Aggregator lines from the `etc/mysql-monitor-agent.ini`:

```
# Aggregator Parameters
aggr-address=:14000
aggr-lua-script=lib/mysql-aggregator/lua/aggr.lua
aggr-mem-baseurl=http://memserver:18080/v2/rest
```

3. Add the `aggr` keyword to the plugins parameter. For example:

```
plugins=aggr,agent
```

4. Start the MySQL Enterprise Monitor Agent.

The key configuration option is `aggr-address`, which sets the address and port on which to listen for incoming aggregator information. The following table shows the list of available options for the aggregator.

Table 3.8 `mysql-monitor-agent` Aggregator Options

Format	Description	Introduced
<code>--aggr-address</code>	Listening address:port combination	2.3.0
<code>--aggr-flush-interval</code>	The interval in seconds between flushes of query data to the MySQL Enterprise Service Manager	2.3.0
<code>--aggr-lua-script</code>	Path to the Lua script	2.3.0
<code>--aggr-max-request-body-size</code>	Limits the maximum size of requests sent to the Aggregator, to avoid potential out-of-memory errors	2.3.8
<code>--aggr-mem-baseurl</code>	Base URL of the server	2.3.0
<code>--aggr-ssl-address</code>	Listening port:address combination for SSL connections	2.3.0
<code>--aggr-ssl-ca-file</code>	CA certificate file	2.3.0
<code>--aggr-ssl-cert-file</code>	Server certificate (PEM)	2.3.0
<code>--aggr-ssl-ciphers</code>	Supported ciphers for SSL	2.3.0
<code>--aggr-test-mode</code>	Start the aggregator in test mode	2.3.0

For more information on setting these options and others, see [Section C.2, “MySQL Enterprise Monitor Agent Reference”](#).

3.1.5 Using the Agent Proxy

There are three different ways of feeding [Query Analyzer](#) using the `proxy` component of the MySQL Enterprise Monitor Agent:

- Change your MySQL client application to talk to the `Proxy` port you configured during installation. This requires changing your MySQL client application code, and may require that you stop and restart your MySQL client application, but does not require any changes to the MySQL server. For more information, see [Section 3.1.5.1, “Enabling Query Analyzer by Changing the MySQL Client Application”](#).
- Change your MySQL server to listen on a different port, and configure the proxy to listen on the original MySQL server port. This does not require any changes to your MySQL client application, but requires shutting down and restarting the MySQL server, which might affect its cache and cause a temporary performance drop. For more information, see [Section 3.1.5.2, “Enabling Query Analyzer by Changing MySQL Server”](#).
- Use IP tables to redirect the network packets to the proxy.

Example 3.1 Routing with Proxy and IP tables on Linux

This example assumes that default ports are used, it's on localhost, the proxy is installed on to the database box itself, and that it will not work on an intermediary server.

Enabling (with `-I`):

```
sudo iptables -t nat -I PREROUTING -s ! 127.0.0.1 -p tcp --dport 3306 -j REDIRECT --to-ports 6446
```

Disabling (with `-D`):

```
sudo iptables -t nat -D PREROUTING -s ! 127.0.0.1 -p tcp --dport 3306 -j REDIRECT --to-ports 6446
```



Important

MySQL Query Analyzer gathers query performance information from a variety of sources. Query Analyzer uses a new agent plug-in to proxy your queries and collect performance data that is then transmitted to the Enterprise Monitor. This is a new role for the Agent: it is no longer just monitoring, it is now *optionally* between your MySQL client application and the MySQL server.

Depending upon your system load, it is possible to overload the proxy or have the proxy/agent consume system resources needed by mysql itself. In particular, the memory needed by the MySQL Agent for basic monitoring is fairly small and consistent and depends on the number of rules you have enabled. However, when the Query Analyzer is enabled, the Agent can use significantly more memory to monitor and analyze whatever queries you direct through it. In this case, the amount of memory used depends on the number of unique normalized queries, example queries and example [EXPLAINS](#) being processed plus the network bandwidth required to send this query performance data to the Service Manager. In general, the amount of memory used for the Query Analyzer is well-bounded, but under heavy load or, in some cases under older versions of linux, RAM usage by Query Analyzer could be too high for your environment and load.

Therefore, we advise you to use this release of Query Analyzer extensively in development, test and stage environments under load for an extended period of time before considering usage in a production environment. For all deployments:

1. Carefully monitor the Agent's resource consumption using the new graph **Memory Usage - Agent** graphs available on the **Graph** tab. You can also add an SMTP or SNMP notification to the new Heat Chart rule **MySQL Agent Memory Usage Excessive**.
2. If the amount of memory consumed is too high, consider sampling queries during nonpeak hours or monitoring only a subset of queries on this system.

Note: zone-specific memory usage is not available for 32-bit Solaris operating systems.

If you experience any problems with Query Analyzer, we are interested in working with you closely and quickly to resolve them. Please open a service request right away. We are working hard on optimizing Agent/proxy RAM usage.

Note that you must enable Query Analyzer within the proxy during agent installation. If you did not enable Query Analyzer during the installation of the agent, check the following elements within the main `mysql-monitor-agent.ini` configuration file:

- Add the `proxy` keyword to the `plugins` parameter. For example:

```
plugins=proxy,agent
```

- Ensure that the `quan.lua` items file is enabled in the `agent-item-files` configuration property:

```
agent-item-files = share/mysql-monitor-agent/items/quant.lua,share/mysql-monitor-agent/items/items-mysql-moni
```

- Check and set the `proxy-address`, `proxy-backend-addresses`, and `proxy-lua-script` settings are configured:

```
proxy-address=:6446
proxy-backend-addresses = 127.0.0.1:3306
proxy-lua-script         = share/mysql-monitor-agent/quant.lua
```

For more information on these configuration options, see [Section C.2.1, “MySQL Enterprise Monitor Agent Configurable Options”](#).

You might also need to make some additional changes to the security configuration on your server to ensure that queries are correctly reported to MySQL Enterprise Service Manager:

- Check the authorization for each user ID used in the connect strings for MySQL client applications that connect through the proxy. Each such user ID must be allowed to connect to the MySQL server from the host on which the agent is running. When the application connects to the server with the proxy as an intermediary, the client host name is the host name of the system running the agent.



Warning

Because the proxy is providing the immediate connectivity to the MySQL server, authentication must use the proxy hostname, not the client hostname.

To update your user credentials, use the `GRANT` statement. For example:

```
mysql> GRANT SELECT,UPDATE,INSERT on database.* to 'user'@'localhost' IDENTIFIED BY 'password';
```

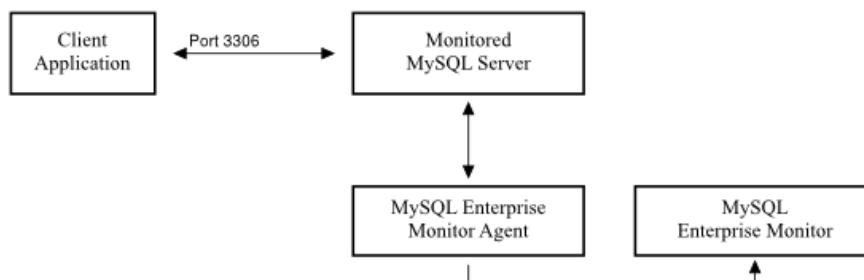
- The MySQL client application user must have `SELECT` privileges on the `mysql.inventory` table. This table contains the server `UUID`; it is required to report the Query Analyzer data to the MySQL Enterprise Service Manager. Use the `GRANT` statement. For example:

```
mysql> GRANT SELECT on mysql.inventory to 'user'@'localhost' IDENTIFIED BY 'password';
```

3.1.5.1 Enabling Query Analyzer by Changing the MySQL Client Application

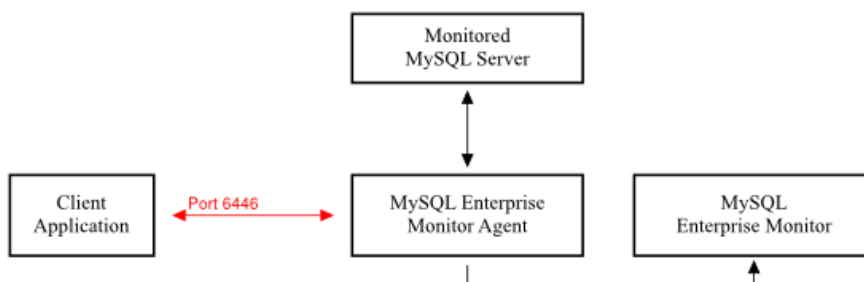
Generally, changing your MySQL client application is the easiest and recommended method. For example, given a typical structure like the one in the following figure, you would modify the client application so that it communicated to the proxy rather than directly with the MySQL server,

Figure 3.5 MySQL Enterprise Monitor User Interface: Standard Agent/Monitor Topology



The following figure shows an example of the structure when communicating through the proxy:

Figure 3.6 MySQL Enterprise Monitor User Interface: Query Analyzer Agent/Monitor Topology



To enable Query Analyzer within your MySQL client application:

1. Make sure that the MySQL Enterprise Service Manager and your MySQL Enterprise Monitor Agent are configured and running.
2. Confirm the configuration of your agent by examining the contents of the `etc/mysql-monitor-agent.ini` file within your installed Agent directory.

Queries are sent to the host specified in the `proxy-backend-addresses` parameter, and the agent listens for connections to be redirected to the server on the host name and port configured in the `proxy-address` parameter.

3. Now modify your MySQL client application to communicate with the address specified in the `proxy-address` parameter.

Alternatively, if you do not want to modify your application directly, you can use iptables or firewall rules to redirect queries from the original host/port combination to the agent's port.

Because connections to the MySQL server come from the proxy, not the original host, the user credentials must have a suitable `GRANT` statement for connections from `localhost`, or the host on which the agent and its proxy component run. The user name and password information are passed directly through the proxy from the client to the server.

4. Confirm that your MySQL client application still operates normally. There should be no difference between communicating directly with the MySQL server and communicating via the proxy.



Note

If you are using the `mysql` client to connect to the proxy and your backend servers, make sure that you are communicating with the proxy over the right port. By default, if you specify `localhost` as the host name, then `mysql` connects using the local Unix domain socket, rather than the TCP/IP socket.

You can enforce `mysql` to use the right port either by explicitly requesting the protocol type, or by using the IP address rather than `localhost`. For example, both of these command lines start the client using the right protocol:

```

shell> mysql --port=6446 --protocol=tcp
shell> mysql --port=6446 --host=127.0.0.1
  
```

**Note**

It is recommended that you use one agent and associated proxy per MySQL server instance. A single proxy is not able to forward queries to multiple MySQL server backends.

3.1.5.2 Enabling Query Analyzer by Changing MySQL Server

When enabling Query Analyzer by changing the MySQL Server, shut down your server, edit the MySQL configuration file, and then restart MySQL. Also, change your Agent configuration so that the proxy listens on the original MySQL TCP/IP port. To use this method, follow these steps:

1. Edit the `/etc/my.cnf` or other MySQL configuration file and change or add the `port` setting from its current value (default 3306), to another value. For example:

```
port = 3307
```

2. Shut down your MySQL Server.
3. Start your MySQL Server and confirm that is running.
4. Edit your MySQL Enterprise Monitor Agent configuration so that the proxy listens for connections on the original MySQL port:

```
proxy-address=:3306  
proxy-backend-addresses = 127.0.0.1:3307
```

5. Stop and restart MySQL Enterprise Monitor Agent.

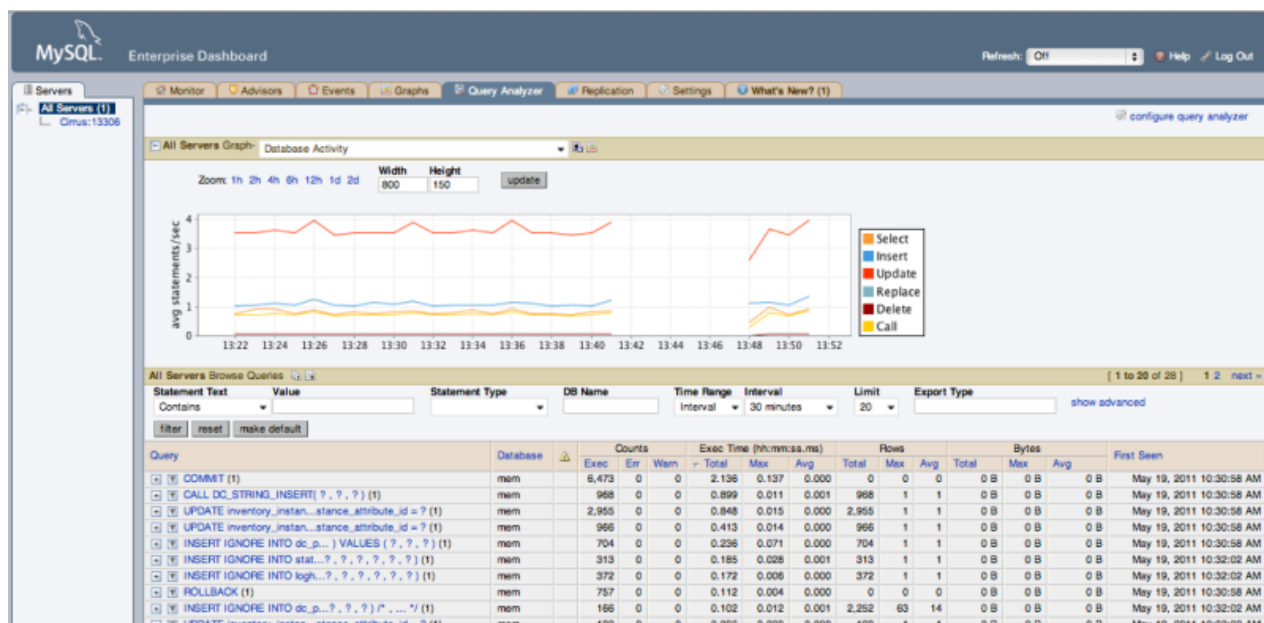
You can now connect to your MySQL server through the MySQL Enterprise Agent Proxy Service by connecting on the original port:

```
shell> mysql --host=127.0.0.1
```

3.2 Query Analyzer User Interface

To analyze the queries captured by the agent/proxy, change to the **Query Analyzer** tab. The following figure shows an example of the table on that page:

Figure 3.7 MySQL Enterprise Monitor User Interface: Query Analyzer



The main Query Analyzer table provides the summary information for all of the queries executed via the agent/proxy. The table tracks all the queries submitted to the server via the agent/proxy. The table shows a maximum of 20 rows, and you can page through the list of queries by using the page numbers, or the **next**, **previous**, **first**, and **last** buttons. To filter the list of queries that are displayed, or to change the number of queries, see [Section 3.2.4, “Filtering Query Analyzer Data”](#). To export the query information as a `.csv` file, see [Section 3.2.5, “Exporting Query Information”](#).

Each row within the table provides the statistical information for one [normalized query](#) statement. If you have configured multiple agent/proxies to accept and forward queries to different servers, then you can expand the server view. The summary information displayed is different depending on whether you have selected a server group or an individual server.

If you have selected a server group, then the information displayed is aggregated from across the entire group. The same query executed on multiple servers shows average, total and minimum/maximum information for that query across all the servers. If you select an individual server, then only queries executed on that server are included within the table.

For each row, the following columns are populated according to the selected filtering options. For example, if the filter is configured to show queries within the last 30 minutes (**Interval**), then only queries executed during that time are displayed, and the corresponding statistics, such as execution times, rows returned and bytes returned, reflect that 30 minute timespan.

- **Query:** The normalized version of the query. Normalization removes the query-specific data so that different queries with different data parameters are identified as the same basic query.

The information is shown as one query per row. Each query row is expandable, and can be expanded to show the execution times for individual servers for that query.

- **Database:** The default database in use at the time of the query. The database name might be blank, or might not match the database used within the query, if you used a qualified table name (for example, `select ... from db_name.table_name`) or if you issued a `USE` statement to switch databases after connecting.

- **Execution notices:** Highlights any specific issues experienced when running queries, including excessive table scans and bad index usage. These provide an immediate indication of a problem with a query that might require additional examination.
- **Counts:** The number of times that the query has been executed. The column is sub-divided into three further columns, showing the number of executions of the query (**Exec**), the number of times an error has been reported for the query (**Err**), and the number of times a warning has been produced (**Warn**).
- **Exec Time:** The execution time for all the matching queries. This is the time, for every invocation of the corresponding query, as calculated by comparing the time when the query was submitted and when the results were returned by the server. Times are expressed in HH:MM:SS.MS (hours, minutes, seconds, and milliseconds).

The **Exec Time** column is further subdivided into the following columns:

- **Total:** The cumulative execution time for all the executions of this query.
- **Max:** The maximum execution time for an execution of this query.
- **Avg:** The average execution time for the execution of this query.

When looking at the information provided in this query, compare the average and maximum execution times to see if there was a problem on a specific server or during a specific time period when the query took place, as this could indicate an issue that needs to be investigated.

**Note**

Due to limitations in the counters used for monitor queries on Microsoft Windows systems, the time reported for short queries might be reported 0.000. This will be fixed in a future release.

- **Rows:** The rows returned by the query. The column is sub-divided into the following columns:
 - **Total:** The sum total number of rows returned by all executions of the query.
 - **Max:** The maximum number of rows returned by a single execution of the query.
 - **Avg:** The average number of rows returned by all executions of the query.
- **Bytes:** The number of bytes returned by each query. The column is sub-divided into the following columns:
 - **Total:** The sum total bytes returned by all executions of the query.
 - **Max:** The maximum number of bytes returned by a single execution of the query.
 - **Avg:** The average number of bytes returned by all executions of the query.
- **First Seen:** The date and time the [normalized](#) version of this query was first seen, which might be earlier than the period specified by the filter.

You can sort the list of queries by clicking the column name. The direction of the sort (highest to lowest, or lowest to highest) is indicated by a triangle next to the currently selected column. The default is to sort the list of queries by the **Total Execution** time.

To help you and locate queries you can filter the list of queries using a variety of criteria. For more information on the filtering methods available, see [Section 3.2.4, "Filtering Query Analyzer Data"](#).

To simplify the identification of a given query, you can create a query alias. The alias is used in place of the normalized query text within the Query Analyzer table. To create an alias for a query, hover over the triangle [create alias](#) link against the query. The maximum length for a query alias is 255 characters.

3.2.1 Getting Detailed Query Information

Click on an individual query to see more detailed information about the individual query in a pop-up window, as shown in [Figure 3.8, “MySQL Enterprise Monitor User Interface: Canonical Query Tab for a Query”](#). The available tabs within this window depend on whether you have configured the more detailed query information. By default, you see the **Canonical Query** view.

You can also view **Example Query**, which provides more detailed data about a specific query, including the data and parameters submitted. You can also enable **Explain Query**, which lets you remotely execute an `EXPLAIN` statement with the specified query and view the resulting information. Finally, you can view any graph data produced during the execution of the query by using the **Graphs** tab.

- The **Canonical Query** tab:

Figure 3.8 MySQL Enterprise Monitor User Interface: Canonical Query Tab for a Query

Canonical Query | Example Query | Explain Query | Graphs

Overview of information collected and aggregated for queries of this form.

Alias
None specified.

Canonical Form
[truncated](#) | [full](#) | [formatted](#)

SELECT DISTINCT(machineid) FROM statmon_machine_statdate
WHERE DATEDIFF(CURDATE() , lo...

Execution Time Statistics

Max Time	Min Time	Avg Time	Total Time	Standard Deviation
0.251	0.057	0.078	1.251	0.049

Row Statistics

Max Rows	Min Rows	Avg Rows	Total Rows	Standard Deviation	Total Size	Max Size
8	8	8	128	4	784 B	49 B

Execution Summary

Executions	Errors	Warnings	Table Scans	Bad Index Used
16	0	0	16	

Time Span
From Mar 17, 2010 2:58:40 PM to Mar 17, 2010 3:13:40 PM.

First Seen
Mar 16, 2010 4:37:08 PM

[hide](#)

[expand »](#)

The canonical view for a query provides three different views of the query, which can be changed using the links under the **Canonical Form** section. The [truncated](#) version is a shortened version of the query. The [full](#) version of the query is the entire query statement. Normalization removes the constants from the individual queries so that queries following the same logical structure are identified as the same basic query.

In addition to the summary information given in the table, the **Execution Time Statistics** section provides you with more detailed execution time statistics, including the minimum time, maximum time,

average time, total time and the standard deviation. The standard deviation lets you determine whether a particular invocation of a query is outside the normal distribution of times for the given query.

The **Row Statistics** provide more detailed contents on the maximum, minimum, average, total, and standard deviation for the number of rows returned by the query, and the total size and maximum size of the data returned. The time period for the total and average figures is shown under the **Time Span** header.

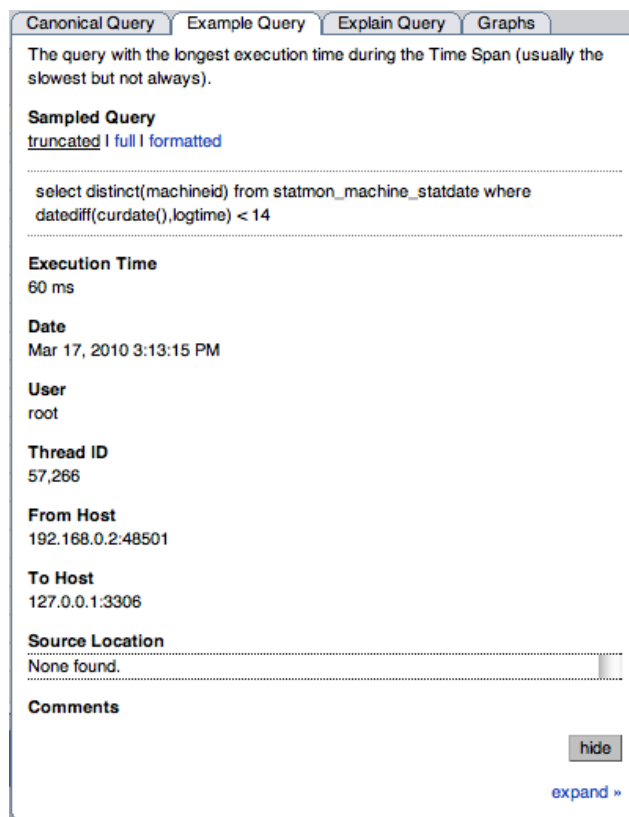
The **Execution Summary** section provides the summary data available in the main table, covering the execution count, and counts of the number of errors, warnings, queries that triggered table scans, and those that indicated a bad index use.

The **First Seen** reports when the normalized version of this query was first seen, whether or not this was within the indicated **Time Span**.

To close the query detail window, click the **Hide** button.

- The **Example Query** tab:

Figure 3.9 MySQL Enterprise Monitor User Interface: Example Query Tab for a Query



The **Example Query** tab provides detailed information about the most expensive query executed, as determined by the execution time.

In addition to the full query, with data, that was executed, the tab shows the execution time, data, user, thread ID, client host and execution host for the given query.

For queries from any of the MySQL Enterprise Plugin for Connectors, the **Source Location** contains the information from the Connector where the query was generated.

- The **Explain Query** tab:

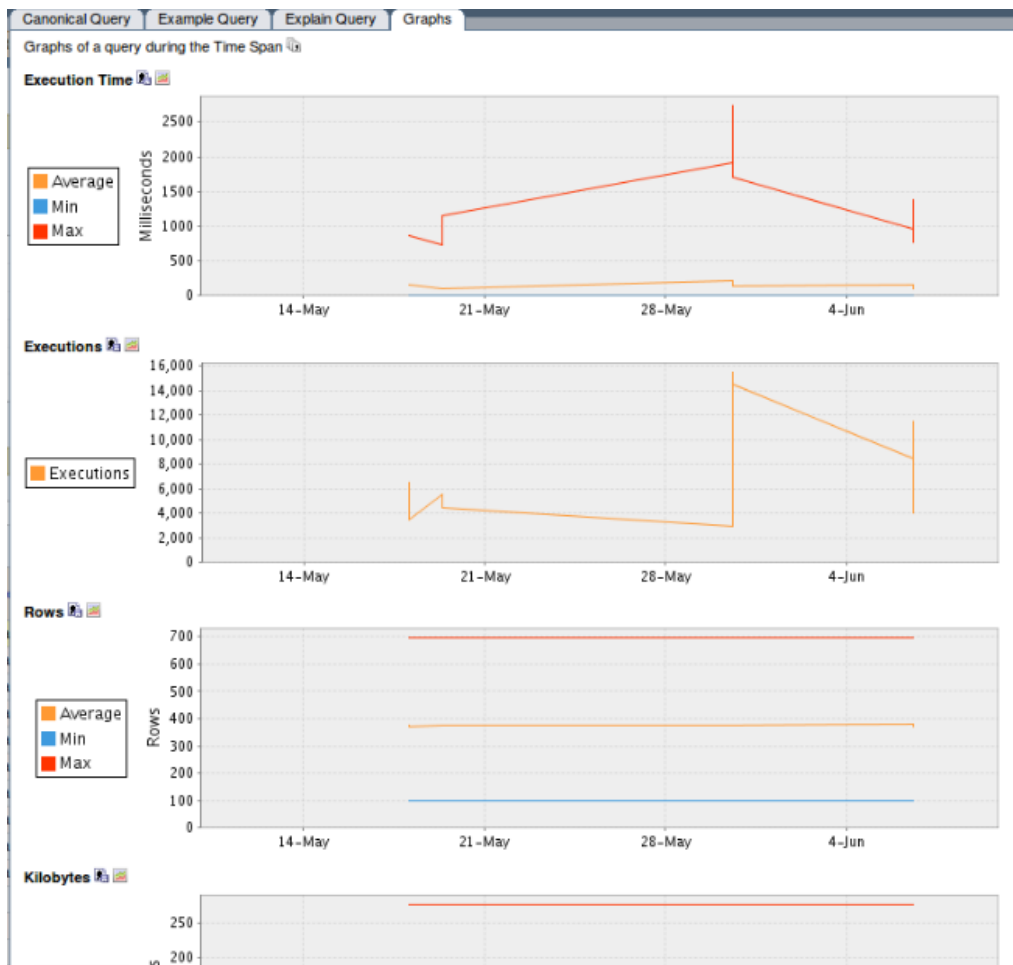
Figure 3.10 MySQL Enterprise Monitor User Interface: Explain Query Tab for a Query

Canonical Query Example Query Explain Query Graphs									
Explain a query that occurred during the Time Span (usually the slowest but not always).									
Explain									
id	select_type	table	type	possible_keys	key	key_len	ref	rows	extra
1	SIMPLE	media_photo_dates	ref	photodates	photodates	2	const	13137	Using where; Using index; Using temporary; Using filesort
1	SIMPLE	media_photo	eq_ref	PRIMARY	PRIMARY	4	intranet_mcsip.media_photo_dates.photoid	1	Using where; Distinct

The **Explain Query** tab lets you view the output from running the query with the [EXPLAIN](#) prefix. For more information, see [EXPLAIN Syntax](#).

- The **Graphs** tab:

Figure 3.11 MySQL Enterprise Monitor User Interface: Graphs Tab for a Query



The **Graphs** tab shows key graphs over the selected time period for the example query. Shown are graphs of the **Execution Time**, **Executions**, **Rows**, and **Kilobytes**. These can be used to identify deviations from the normal values. Unlike the query-correlation graphs, these graphs shown only the query statistics over the given time period.

3.2.2 Using Graphs to Identify Queries

The MySQL Enterprise Monitor User Interface supports correlated graphs so that you can compare the graphed execution parameters, such as the server load, thread statistics, or RAM usage, against the queries that were being executed by the server or servers being monitored at that time.

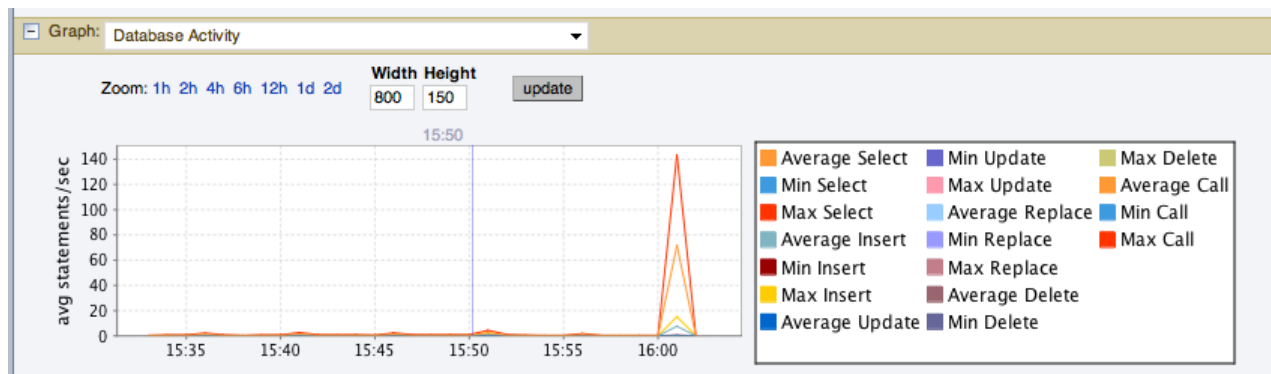
You can use the correlated graphs in two different ways:

- Drag and select an area on a graph as displayed within the **Monitor** overview tab, or the **Graphs** tab of the MySQL Enterprise Monitor User Interface. When using either of these two tabs, you can drag and select any region on a displayed graph, and the display changes to the **Query Analyzer** tab, displaying the corresponding zoomed graph, and the associated queries being executed during the selected period.
- Select a graph to be displayed within the **Query Analyzer** tab. Open the **Graph** section, and use the pop-up list to select the graph to be displayed. You can see an example of this in [Figure 3.12, “MySQL Enterprise Monitor User Interface: Correlated Graphs”](#).

When using the correlated graphs, selecting an area within the graph sets the start and end time within the query filtering selection. You can combine with other filtering options, such as the **Query Type**, to zero in on the queries to examine.

To use the graphs in this manner, select a starting point and click, while holding down the button, drag a selection area to set the time-range for the query display. The time range that you select is displayed above the graph as you select the area.

Figure 3.12 MySQL Enterprise Monitor User Interface: Correlated Graphs



To zoom in or out of the displayed graph, use the links next to the **Zoom** label. You can select to show just an hour of the graph material, or larger ranges up to two days. At all times, the area on the graph highlighted in blue is the actual date/time range selected within the list of analyzed queries.

To export the graph, either a [.png](#) file of the graph image or a [.csv](#) file of the underlying data, use the two icons to the right of the graph label. See [Section 2.5.4, “Exporting Graph Images and Data”](#) for details about the export feature.

3.2.3 Query Analyzer Settings

There are a number of settings related to the Query Analyzer data. You can configure the Query Analyzer operation by using the **configure query analyzer** link within the **Query Analyzer** tab, or through the **configure query analyzer** button within the **Manage Servers** tab within the **Settings** tab. Both methods provide you with the same dialog:

Figure 3.13 MySQL Enterprise Monitor User Interface: Query Analyzer Configuration

Setting	Important Information
<input checked="" type="checkbox"/> Enable Query Analyzer	This will impact query performance. Before enabling, see "Important: before you enable..."
<input checked="" type="checkbox"/> Enable Example Query	This may expose sensitive data (shows actual queries with actual parameters). Will increase monitoring overhead (including RAM used by the agent/proxy).
<input type="checkbox"/> Enable Example Explain	Not collected until requested, but some explains can be very expensive. Will increase monitoring overhead (including RAM used by the agent/proxy).
Auto-Explain Threshold 00:00:00.500	Explains will be generated for queries with a runtime above this threshold. (Format: hh:mm:ss.msec)

☐ Make this the default for all new servers. save cancel

Through either solution, the configuration options that you select are applied to the individual server or server group selected within the **Servers** navigation panel.

There are three configuration options available through either method:

- **Enable Query Analyzer** configures whether Query Analyzer is enabled for this server or server group. If selected, Query Analyzer will be enabled. To disable, select the check box.



Note

The Query Analyzer functionality might show as being enabled on a server, even if the modules within MySQL Enterprise Monitor Agent supplying Query analyzer data are not enabled.

If Query Analyzer is enabled, you can also configure the Example Query function by selecting the **Enable Example Query** checkbox. Enabling this option provides an additional tab when you open the **Canonical Query** window when clicking a query.

- **Enable Example Query** displays more information about individual queries. When enabled, queries and their data items (rather than the canonical form shown by default) are provided. Enabling this option could expose the full query statements and therefore could present a security issue.

With the **Example Query** option enabled, an additional tab is available within the query summary details. For more information, see [Section 3.2.1, "Getting Detailed Query Information"](#).

If you enable **Example Query**, you can also enable **Example Explain**. To enable this tab, select the **Enable Example Explain** checkbox.

- **Enable Example Explain** provides another tab when viewing a query where you can view the output from `EXPLAIN` output from MySQL for the selected query. This shows the full query and how the query was executed within the servers.

Enabling this option might add overhead to the execution of your server, as the server runs an `EXPLAIN` statement each time it identifies a long running query. For more information, see [Appendix F, MySQL Enterprise Monitor Frequently Asked Questions](#).

To enable or disable Query Analyzer for an individual server, go to the **Settings** tab and click the **Manage Servers** link. To configure all the properties, click the **configure query analyzer** link next to server you want modify.

Alternatively, for each server, the **Query Analyzer** column shows the current setting, On or Off, and whether the **Example** and **Explain** functionality is enabled. To change any setting, click the current status to toggle between the On/Off position.

To disable or enable Query Analyzer for the selected servers, use the **disable query analyzer** or **enable query analyzer** buttons within the **Settings** tab. You must have selected one or more servers from the list of available servers before selecting these buttons.

You can use the options that you have just selected as the default for all new servers that register with MySQL Enterprise Service Manager by using select the **Make this the default for all new servers** checkbox. By default, when a new server registers with MySQL Monitor, the server is automatically configured to supply Query Analyzer data. This can have impact on the performance of your monitor and agent as it increases the amount of information supplied to the MySQL Monitor.

Configuration of Query Analyzer occurs through the **configure defaults** button from within the **Query Analyzer** tab.

3.2.4 Filtering Query Analyzer Data

You can filter the queries shown within the Query Analyzer table by using the form at the top of the table. The different fields of the form are used to specify the parameters for the filter process. Once you have specified a filter, all the queries and related statistics shown within the Query Analyzer table are displayed in relation to the filter settings. For example, by default, the filter settings show the queries for the last 30 minutes. All the statistics shown are relative to the last 30 minutes, including average, maximum and execution counts.

The filter fields are:

The filtering functionality is available in a simple format, supporting simple statement and timing based filtering, and an advanced option allowing you to filter by specific columns within the Query Analyzer table.

Figure 3.14 MySQL Enterprise Monitor User Interface: Query Analyzer Filter Options

The screenshot shows a web-based filter form titled "All Servers Browse Queries". It contains several input fields and dropdown menus for filtering query data. The fields are organized into two rows. The first row includes "Statement Text" (with a dropdown set to "Contains"), "Value" (text input), "Statement Type" (dropdown set to "(any)"), "DB Name" (text input), "Time Range" (dropdown set to "Interval"), "Interval" (dropdown set to "30 minutes"), and "Limit" (dropdown set to "20"). There is a "hide advanced" link to the right. The second row includes "Notices" (dropdown), "Column" (text input), "Operator" (dropdown set to "="), "Value" (text input), "Column" (text input), "Operator" (dropdown set to "="), "Value" (text input), and "View" (dropdown set to "Group"). At the bottom left are three buttons: "filter", "reset", and "make default".

The basic filter options are:

- **Statement Text** and **Value** support text searching of the normalized query. For the search type you can specify either a basic text match (**Contains**), or a regular expression match (**Regex**). In addition to the basic text match, you can also search for a query that does not contain a particular string. For regular expression searches, you can specify whether the regular expression should match, or not match (negative regexp) the queries. Regular expressions are parsed using the standard MySQL `REGEXP ()` function. For more information, see [Regular Expressions](#).



Note

The search is performed against the canonical version of the query. You cannot search against specific text or values within the parameters of the query itself.

- **Statement Type**: Limits the search to statements of a particular type ([SELECT](#), [LITERAL](#), etc.).
- **DB Name**: Limits the queries to those executed within a specific database. The database match is performed using the [LIKE](#) match from the MySQL database, hence you can use the `%` and `_` characters to multiple and single character matches. For more information, see [Pattern Matching](#).
- The **Time Range** menu selects whether the time selection for filtering should be based on the time **interval** (only queries recorded within the displayed time period are shown, using the **Hours** and **Minutes** pop-up), or whether the selection should be based on a time period (**From/To**), where you can select the time range to be displayed.

Using the **Interval** mode shows queries within the given time period from the point the graph was updated. For example, if you select 30 minutes, then the queries shown were captured within the last 30 minutes. If you updated the display at 14:00, then the queries displayed would have been captured between 13:30 and 14:00. Using interval mode limits the timespan for the filter selection to a maximum of 23 hours and 59 minutes.

Using the **From/To** time range lets you show queries between specific dates and times. Using this mode you can show only the queries received during a specific time span, and you can display the query history for a much longer time period, for as long as you have been recording query analysis information.

- **Limit** specifies the number of queries to be displayed within each page.

To use the advanced filtering techniques, click [show advanced](#). This provides additional filters:

- **Notices**: Filters on the notices column, allowing you to filter the list to show only the queries that did not raise a notice, indicated a full table scan, or indicated that a bad index was used.
- Two column filters are provided, which allow you to filter the queries based on specific values within any of the columns shown in the Query Analyzer report list.

To use the column filters, you must specify the **Column** that you want to filter on, the **Operator** to use when performing the comparison and the **Value** that you want to compare.

For example, to filter by showing all the queries that return more than 100 rows on average, set the **Column** to [Average Rows](#), the **Operator** to `>=`, and the **Value** to 100.

- The **View** selection determines whether the information should be returned on a group basis, where an aggregate of the same query executed on all monitored servers is shown, or on a **Server** basis, where queries are summarized by individual server. If the latter option has been selected, the table includes an additional column showing the server.

All the filter settings that you specify are used collectively, that is, all the specified filter options are used to match against the list of queries.

When you have set your filter parameters, you can update the Query Analysis display by clicking the [filter](#) button. To reset the fields to the default settings click the [reset](#) button.

If you want to make the current filter options the default when viewing the **Query Analyzer** page, click the [make default](#) button. The settings are saved for the current user only.

3.2.5 Exporting Query Information

To get the text and details of the queries displayed on the **Query Analyzer** page, click one of the icons to the right of the **Browse Queries** label in the separator bar. The query information is exported as comma-separated data in a [.csv](#) file, with fields corresponding to the columns shown in the Dashboard, and the

time of the export encoded in the filename in UTC format. The icon representing a single page exports the query information for the currently displayed page only. The icon representing a stack of pages exports the query information for all available pages of query information.

Within the **Query Analyzer** popup, you can also export information about each data group as a `.csv` text file or a `.png` image file, using icons next to the labels on the left side. The output file is named according to the pattern `Statement_Report_Summary_%server/group%_%creationtimestamp%.csv` or `.png`. The data exported by these icons includes:

- Execution Time: Count
- Executions: Exec Time, Max Exec Time, Min Exec Time, Average Exec Time
- Rows: Rows, Max Rows, Min Rows, Average Rows
- Kilobytes: Bytes, Max Bytes, Average Bytes



Note

Microsoft Excel users on Windows users can import the `.csv` file as a spreadsheet. If the file contains English text, typically you can double-click it to open in Excel. If the file contains localized Japanese text, you must use the **File > Open** menu choice within Excel to open the file.

In the Safari browser, exported files containing localized data might contain `%NN` character sequences in their names, due to browser issues with UTF-8 and Base64 encodings.

3.3 Troubleshooting Query Analyzer

This section describes different kinds of issues that you might experience with the MySQL **Query Analyzer**, and how to solve or avoid them.

Limited or No Data

If the Query Analyzer page shows no queries or a smaller range than you expect, confirm that your system is correctly configured for Query Analysis:

- The Query Analyzer must be enabled for each monitored host; it is not enabled by default. Click the **configure query analyzer** button on the **Query Analyzer** page to check. For more information, see [Section 3.2.3, “Query Analyzer Settings”](#).
- Confirm that the agent is running by checking the Agent log and the status of the server within MySQL Enterprise Service Manager.
- Confirm the following in the agent configuration files:
 - The `plugins` parameter within the main configuration file, `mysql-monitor-agent.ini`, must contain the `proxy` plugin:

```
plugins=proxy,agent
```

- The `agent-item-files` parameter within the main configuration file, `mysql-monitor-agent.ini`, must specify the `share/mysql-monitor-agent/items/quan.lua` script:

```
agent-item-files = share/mysql-monitor-agent/items/quan.lua, share/mysql-monitor-agent/items/items-mys
```

- The proxy configuration parameters must point to the MySQL server where you want your queries to be sent. For example, if you are running your agent on the same host as your MySQL server then you might have the following lines in your `mysql-monitor-agent.ini` file:

```
proxy-address=:6446
proxy-backend-addresses = 127.0.0.1:3306
proxy-lua-script         = lib/mysql-monitor-agent/lua/quan.lua
```

The above configuration means:

- The agent/proxy listens on the current machine, using port 6446 (`proxy-address`).
- The agent/proxy sends all queries it receives to the host `127.0.0.1` on port `3306` (the standard MySQL port), as per the `proxy-backend-addresses` parameter.

You can see a sample complete configuration file (`mysql-monitor-agent.ini`), using the `127.0.0.1` as the MySQL backend server, and reporting to a MySQL Enterprise Service Manager called `monitor`:

```
[mysql-proxy]

plugins=proxy,agent
agent-mgmt-hostname = http://agent:password@monitor:18080/heartbeat
mysqld-instance-dir= etc/instances
agent-item-files = share/mysql-monitor-agent/items/quan.lua, share/mysql-monitor-agent/items/items-mysq
proxy-address=:6446
proxy-backend-addresses = 127.0.0.1:3306
proxy-lua-script       = lib/mysql-monitor-agent/lua/quan.lua

agent-uuid = a3113263-4993-4890-8235-cadef9617c4b
log-file = mysql-monitor-agent.log
pid-file=/opt/mysql/enterprise/agent/mysql-monitor-agent.pid
```

- Confirm that you can connect through the agent proxy to your backend MySQL server. You can do this by checking with the MySQL client. You must specify the same options as you would if you were connecting to the original server, including specifying the same user and password information:

```
shell> mysql -h 127.0.0.1 --port 6446 --user=root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 299239
Server version: 5.0.60-log Gentoo Linux mysql-5.0.60-r1

Type 'help;' or '\h' for help. Type '\c' to clear the buffer.

mysql>
```

- Check that your MySQL client application is configured to use the configured proxy port, instead of the real MySQL port when sending queries.
- If your Query Analyzer graphs stop working or contain gaps showing no activity, look in the Service Manager log for the message `An item was expired by the cache while it was locked (increase your cache timeout)`. For the action to take, see [Section 2.11, “Troubleshooting the MySQL Enterprise Monitor User Interface”](#).

Chapter 4 Customizing MySQL Enterprise Monitor

Table of Contents

4.1 Creating Advisors and Rules	95
4.1.1 Creating Advisors	95
4.1.2 Overview of Graph Creation	96
4.1.3 Overview of Rule Creation	97
4.1.4 Variables	98
4.1.5 Thresholds	98
4.1.6 Using Strings	99
4.1.7 Wiki Format	99
4.1.8 Creating a New Rule: An Example	100
4.1.9 Creating a New Graph: An Example	102
4.1.10 Creating a Custom Data Collection Item	102
4.2 Customizing Standard Advisors	103
4.3 Disabling and Unscheduling Rules	103
4.4 Advisor Blackout Periods	104
4.4.1 Scripting Blackouts	105

You can customize your MySQL Enterprise Monitor rules, advisors, and graphs, based on your organization's business rules, best practices, and the types of issues you can anticipate.

4.1 Creating Advisors and Rules

For common scenarios, reuse or edit the advisors, rules, and graphs provided by MySQL Enterprise. To create new advisors, rules, and graphs for your own needs, go to the **Advisors** tab and choose the [Create/Edit Rule](#) link, or go to the **Graphs** tab and choose the [Import/Export](#) link to create a graph.

4.1.1 Creating Advisors

Similar existing rules are grouped together in advisor groups.

The built-in advisor groups are:

- Administration
- Cluster
- Heat Chart
- Memory Usage
- Performance
- Replication
- Schema
- Security
- Upgrade

You can also create your own advisor group to suit your circumstances. Click the `create advisor` button. Enter an appropriate name and click the `add` button. The newly created group appears in the `Advisor` column.

The newly created advisor is added to the list box of advisors shown in [Figure 2.5, “MySQL Enterprise Monitor User Interface: Editing Rules”](#). You can now use this category of advisors when you create a new rule.

4.1.2 Overview of Graph Creation

Graphs are defined using XML, and then imported into MEM. The new custom graph will now be displayed with the built-in graphs, which are sorted by `name` within the graph tab.

For an example graph on how to create a graph, see [Section 4.1.9, “Creating a New Graph: An Example”](#).

The XML elements for creating a graph are as follows:

- **version**

The version number of the graph. Generally only important with the bundled graphs, and is only used internally.

- **uuid**

The unique id of the graph. Each revision (version) requires a new uuid, which is only used internally.

- **name**

The visible graph name, which is displayed within the graph listing. Note: graphs are sorted alphabetically.

- **frequency**

Optionally define the frequency for the graph, which defaults to 1 minute. May use seconds, minutes, hours, and days.

- **rangeLabel**

The Y-axis range label. For example, a graph about disk space usage may use `MB`.

- **series**

Each series contains a label and an expression. The label is the visible name of the series, and the simple expression defines it.

- **variables**

Each variables definition contains a name, instance, and `dcltem` element. The instance defines what the graph will act upon, and each `dcltem` element contains a `nameSpace`, `className`, and `attribName`:

- **nameSpace**

Namespace (type) of the data collection item.

- **className**

Class (namespace type) of the data collection item.

- **attribName**

Attribute name of the data collection item.

See the listing of [data collection items](#) for available nameSpace, className, and attribName items.

4.1.3 Overview of Rule Creation

You create rules using the same screen seen in [Figure 2.5, “MySQL Enterprise Monitor User Interface: Editing Rules”](#). To create a new rule with all-new settings, click the `create rule` button. To create a rule similar to an existing one, click the `copy rule` button. You can edit any rule element during the copying process, unlike editing an existing rule.

You can change the rule name, change the advisor group that a rule belongs to, and set your own version number. In [Figure 2.5, “MySQL Enterprise Monitor User Interface: Editing Rules”](#), you have already seen how to alter the threshold and frequency of a rule.



Note

If you do not specify a version number for the new rule, the version `1.0` is automatically added.

Most importantly, you can alter a rule's expression. Expressions are the core of a MySQL Enterprise Advisors and define the scenario being monitored. An expression can be as simple as a single server parameter or can be complex, combining multiple parameters with mathematical operations.

An expression has two main characteristics:

- An expression tests whether a best practice is being violated.
- The result of an expression must always be 1 or 0 (corresponding to true or false).

If an expression evaluates to true for a specific server, an alarm is raised, indicating that a best practice is not being followed. If an expression evaluates to false, the best practice is being followed and no alarm is raised.

For example, if you decide that enabling binary logging is a best practice for a production server (as Oracle recommends), then this best practice is violated if `log_bin` is `OFF`. Consequently, the expression for the “Binary Logging Not Enabled” rule is `“%log_bin% == OFF”`. If this evaluates to 1, an alarm is raised because the best practice is not being followed.

An expression is made up of one or more variables and zero or more mathematical operators. The MySQL Enterprise Monitor product uses the Java Expression Parser. The operators and functions consist of:

- The `IN()` operator.
- The MySQL functions `LEAST()`, `LOCATE()`, `ABS()`, `MOD()`, `NOW()` (returns time since UNIX epoch UTC in seconds), `UNIX_TIMESTAMP` (technically a no-op), and `INTERVAL [n] SECOND, MINUTE, HOUR, WEEK, MONTH`.
- The operators functions listed on this page: <http://www.singularsys.com/jep/doc/html/operators.html>.
- Comparisons with MySQL timestamps and datetimes collected by the agent in the standard MySQL format `'YYYY-MM-DD hh:mm:ss[.nanos]'`.
- The `IF` function: `IF (condition, true_expression, false_expression)` returns either `true_expression` or `false_expression`, depending on whether `condition` is true or false. This function uses short-circuit evaluation, so only one of the return expressions is evaluated.

- The `LEFT(string, length)` and `RIGHT(string, length)` functions.
- The `NUM(string)` function.

**Note**

The `CAST(expression as type)` function is not implemented. Instead, use `NUM(string)` to use strings as numbers.

- Other functions and operators may be implemented as needed to assist with custom rule creation. Open a [service request](#) if you have such a requirement.

For a complete list of the built-in variables used to create rules, see [Server Option and Variable Reference](#).

Creating an expression is dependent on variables defined in the **Variable Assignment** frame. This frame links variables used in the expression field with data gathered from the target MySQL server instance: server status variables, operating system status information, and table information. Variable names are associated with elements in the **Data Item** drop-down list. To define more than one variable, click the **add row** button. For a complete listing of the data collection items used in creating rules, see [Appendix D, Data Collection Items](#).

The remaining fields determine the information that you receive in a notification email or the informational pop-up window associated with each advisor.

**Note**

When saving a new rule, choose a unique name not used by any existing rule.

4.1.4 Variables

When MySQL Enterprise Monitor evaluates an expression, it replaces variables with values. For example, part of the expression for the “MyISAM Key Cache Has Sub-Optimal Hit Rate” rule calculates the hit rate as follows:

```
100-((%Key_reads% / %Key_read_requests%)*100)
```

If the current value of `%Key_reads%` is 4522 and the current value of `%Key_read_requests%` is 125989, the hit ratio is 96.4%:

```
100 - ((4522 / 125989) * 100)
```

By convention, the Advisors supplied by MySQL use ‘%’ as the delimiter, for example, `%Key_reads%`. This makes variables more readily identifiable.

Variables can be used in the [Description](#), [Advice](#), [Action](#), and [Links](#) attributes of a rule, as well as in expressions. This lets you report the current value of an expression. For instance, you can add the message, “The current value of Key_reads is %Key_reads%.” to the [Advice](#) text box. When this is displayed on the screen, the value of `%Key_reads%` is substituted into the text. If `%Key_reads%` has a value of `4522`, the message becomes “The current value of Key_reads is 4522.”

4.1.5 Thresholds

Each expression has a threshold value that triggers an alert. The `THRESHOLD` keyword associates that value with an alert level: either an [Info](#), [Warning](#), or [Critical](#) alert.

For example, the expression for the performance advisor, “Thread Cache Size May Not Be Optimal”, is:


```
100-((%Threads_created% / %Connections%) * 100) < THRESHOLD
```

The `THRESHOLD` is set at 95% for an Info level alert, 85% for a Warning alert, and 75% for a Critical alert, producing alerts of three different levels.

Expressions can be straightforward. The expression for “Binary Logging Not Enabled” (one of the Administration alerts) is:

```
%log_bin% == THRESHOLD
```

When the result is `OFF`, only one alert is triggered: a Warning level alert. You cannot just use the expression `%log_bin% == "OFF"`, because this would not test binary logging against a threshold and so would not result in an alert.

Specify precise conditions when each expression should be evaluated, to avoid false alarms. For example, the expression for the “MyISAM Key Cache Has Sub-Optimal Hit Rate” rule is:

```
(%Uptime% > 10800) && (%Key_read_requests% > 10000) && (100-((%Key_reads% / %Key_read_requests%) * 100) < 'THRESHOLD')
```

The first part of the expression, `(%Uptime% > 10800)`, delays evaluating this expression until the system has been running for 10800 seconds (3 hours). When a server starts up, it might take a while to reach a state that is representative of normal operations. For example, the `InnoDB` buffer pool, `MyISAM` key cache, and the SQL query cache might require some time to fill up with application data, after which the cached data boosts performance.

In addition, if some part of the system is not heavily used, an alert might be triggered based on limited data. For example, if your application does not use the `MyISAM` storage engine, the “MyISAM Key Cache Has Sub-Optimal Hit Rate” rule could be triggered based on very limited use of other `MyISAM` tables such as the `mysql.user` table. For this reason, this advisor has a second part: `(%Key_read_requests% > 10000)`. The rule is not evaluated unless there is plenty of activity associated with the key cache.

4.1.6 Using Strings

Enclose string values within double quotation marks in the `Expression` or the `Thresholds` text boxes. For example, the expression for the “Slave I/O Thread Not Running” rule is:

```
(%Slave_running% == "ON") && (%Slave_IO_Running% != THRESHOLD)
```

Similarly, the `Critical Alerts` threshold text box is set to a value of `"Yes"`.

When the expression is evaluated, either `"OFF"` or `"ON"` is substituted for `%Slave_running%`, and `"Yes"` or `"No"` for `%Slave_IO_Running%`, depending on the state of your system. If the slave is running but the I/O thread is not, the expression becomes:

```
("ON" == "ON") && ("No" != "Yes")
```

Without quotation marks, this expression would not evaluate to `TRUE` as it should.



Note

So that it is interpreted properly, the `==` operator is converted to `=` before being passed to the MySQL expression parser.

4.1.7 Wiki Format

When editing or defining a rule, you can enter text in Wiki format in the [Problem Description](#), [Advice](#), [Recommended Action](#), and [Links and Further Reading](#) text boxes. You can format and highlight text and add hyperlinks, using the notation listed in the following table.

Table 4.1 MySQL Enterprise Monitor: Wiki Formatting

Example	Description
<code>__bold__</code>	boldface text
<code>~~italic~~</code>	italicize text
<code>\\</code>	create a line break
<code>\\ \\</code>	create a double line break
<code>\\\\G</code>	create a backslash
<code>*item 1</code>	create a bulleted list item
<code>#item 1</code>	create a numbered list item
<code>_</code>	use the <code>'\'</code> to escape special characters
<code>{moreInfo:name url}</code>	create a hyperlink

So the following Wiki text:

```
Replication is a __very nice feature__ of MySQL.  Replication can be very
useful for solving problems in the following areas:
* Data Distribution
* Load Balancing
* Backup and Recovery
You can check replication status and start a slave using the following
commands: SHOW SLAVE STATUS \\\G\\START SLAVE;
{moreInfo:MySQL Manual: Replication
  FAQ|http://dev.mysql.com/doc/refman/5.6/en/faqs-replication.html}
```

Would be translated into the following HTML markup:

```
Replication is a <b>very nice feature</b> of MySQL.  Replication can be very
useful for solving problems in the following areas:
<ul>
  <li>Data distribution</li>
  <li>Load Balancing</li>
  <li>Backup and recovery</li>
</ul>You can check replication status and start a slave with the following
commands: SHOW SLAVE STATUS \G;<br/>START SLAVE;
<a href="http://dev.mysql.com/doc/refman/5.6/en/faqs-replication.html"
  target="_blank" >MySQL Manual: Replication FAQ</a>
```

4.1.8 Creating a New Rule: An Example

This section documents the steps to create a rule. Before creating a rule, review the preceding sections of this chapter.

This example is based on the bundled **Excessive Disk Temporary Table Usage Detected** rule that checks the frequency MySQL stores temporary tables on disk instead of memory. We decide that 50% or less of the table hits to disk should trigger a critical alert, and lesser numbers should produce informational and warning level alerts.

Begin by navigating to the **Advisors** tab and clicking the [manage rules](#) link. Then choose the [create rule](#) button.

Create your custom rule by following these steps:

1. Using the **Rule Name** text box, give the rule an appropriate name, in this case something such as "My Excessive Temporary Table Disk Usage".
2. From the **Advisor** drop down list box, choose an advisor group for your rule. The **Performance** group of rules might be suitable but if you wish, create your own group of advisors. For instructions on doing this, see [Section 4.1.1, "Creating Advisors"](#).
3. Enter the following expression in the **Expression** text area:

```
100-((%tmp_disk_tables% / %tmp_tables%)*100) < THRESHOLD
```

4. Set the Thresholds.
 - a. Set the **Info Alert** level to 50.
 - b. Set the **Warning Alert** level to 75.
 - c. Set the **Critical Alert** level to 90.
5. Define your first variable in the **Variable Assignment** frame.
 - a. In the **Variable** text box, enter `%tmp_tables%`, the variable used in the **Expression** text box above. The variable name can be whatever you choose to use in your expression.
 - b. In the **Data Item** drop down list box, find and select the `mysql:status:Created_tmp_tables` entry. (For a description of all the data items available, see [Appendix D, Data Collection Items](#).) This dynamic MySQL Enterprise Monitor value will be applied to the variable name you chose above, which is `%tmp_tables%` in our example.
 - c. In the **Instance** text box, enter `local`.
6. To add another variable, click **Add row** and define your second variable in the **Variable Assignment** frame as done above.
 - a. In the **Variable** text box, enter `%tmp_disk_tables%`, the variable used in the **Expression** text box above. The variable name can be whatever you choose to use in your expression.
 - b. In the **Data Item** drop down list box, find and select the `mysql:status:Created_tmp_disk_tables` entry. (For a description of all the data items available, see [Appendix D, Data Collection Items](#).) This dynamic MySQL Enterprise Monitor value will be applied to the variable name you chose above, which is `%tmp_disk_tables%` in our example.
 - c. In the **Instance** text box, enter `local`.
7. Add appropriate entries for the **Problem Description**, the **Advice**, and the **Links** text areas. Optionally, use **Wiki markup** for these text areas. You can also reference the variables you defined above, such as `%tmp_tables%` and `%tmp_disk_tables%` in our example, in these text areas.
8. Save the rule.

After you create the rule, schedule it against the server that you want to monitor. For instructions on scheduling rules, see [Section 2.3.2, "Scheduling Rules"](#).

4.1.9 Creating a New Graph: An Example

This section documents the steps to create a graph. Before creating a graph, review the preceding sections of this chapter as Graphs and Rules use similar components. And for an overview that's specific to graphs, see [Section 4.1.2, "Overview of Graph Creation"](#)

This example creates a graph that checks and compares disk usage, by displaying the usage and total available disk space over time.

Begin by navigating to the **Graphs** tab and clicking the [Import/Export](#) link. Then note the [Custom Rule/Graph Import](#) button. This is where the XML file that we create will be imported.

A definition to check disk space usage may look like the following:

```
<?xml version="1.0"?>
<com_mysql_merlin_server_graph_Design>
  <version>1.0</version>
  <uuid>a57c2bba-ea9b-102b-b396-94aca32bee29</uuid>
  <name>my filename usage test</name>
  <rangeLabel>MB</rangeLabel>
  <series>
    <label>used</label>
    <expression>used_fs/1024/1024</expression>
  </series>
  <series>
    <label>total size</label>
    <expression>total_fs/1024/1024</expression>
  </series>
  <variables>
    <name>used_fs</name>
    <dcItem>
      <nameSpace>os</nameSpace>
      <className>fs</className>
      <attribName>fs_used</attribName>
    </dcItem>
    <instance></instance>
  </variables>
  <variables>
    <name>total_fs</name>
    <dcItem>
      <nameSpace>os</nameSpace>
      <className>fs</className>
      <attribName>fs_total</attribName>
    </dcItem>
    <instance></instance>
  </variables>
</com_mysql_merlin_server_graph_Design>
```

Upon successfully loading a graph, a popup notification may say "1 graph imported" and this graph will immediately show up within the Graphs dashboard (like every other graph) under the name defined within the definition, which is "my filename usage test" in the example above.

4.1.10 Creating a Custom Data Collection Item

[Section 4.1.8, "Creating a New Rule: An Example"](#) shows how to create a custom rule and [Appendix D, Data Collection Items](#) shows the data items you can use in rule creation. In some circumstances, you might want to create a rule that uses a custom data collection item.

To create additional custom data collection items, edit the [share/mysql-monitor-agent/items/custom.xml](#) custom rule file added during installation. The [custom.xml](#) is installed automatically, but

is not modified during an upgrade installation. The rules file is listed last in the [agent-item-files](#) configuration parameter, so any rules and data collection items you add to this file supersede the standard data collection definitions.

After you make changes to the [custom.xml](#), restart the agent to load the custom definitions.

4.1.10.1 Modifying the Custom Data Item XML File

As an example, this section shows how to create a data item for monitoring the amount of free InnoDB tablespace. You can have multiple items in your [custom.xml](#) file, just specify additional [class](#) entries. The [custom.xml](#) file in the installation includes a sample entry. You can replace that entry, or add the following definition to the file:

```
<?xml version="1.0" encoding="utf-8"?>
<classes>
  <class>
    <namespace>mysql</namespace>
    <classname>innodb_min_free</classname>
    <query><![CDATA[SELECT MIN(substring_index(substring_index(table_comment," ",3),"",-1)/1024/1024)
      as Free FROM INFORMATION_SCHEMA.TABLES WHERE engine = 'InnoDB']]></query>
  </class>
</classes>
```

After saving the file, ensure that the [agent-item-files](#) parameter within the configuration includes the [custom.xml](#) file. For example:

```
[mysql-proxy]
...
agent-item-files = share/mysql-monitor-agent/items/quant.lua,share/mysql-monitor-agent/items/items-mysql-monitor
...
```

Restart the agent to put this change into effect. To do this, see:

- Windows: [Section 5.3.4.1, “Starting/Stopping the Agent on Windows”](#)
- Unix: [Section 5.3.4.2, “Starting/Stopping the Agent on Unix”](#)

Once the agent has restarted, the new data item is in the [Data Item](#) drop down list box on the [Rule Definition](#) page. Its fully qualified name is [mysql:innodb_min_free:Free](#).

4.2 Customizing Standard Advisors

You can override the standard rules and the data collection items that support them by adding entries to your [custom-items.xml](#) with different queries to collect information. To customize data collection for existing advisors, you can use the information in [Section 4.1, “Creating Advisors and Rules”](#).

4.3 Disabling and Uncheduling Rules

You can change a rule so that it no longer applies to a specific server or group of servers, or suspend a rule for a period of time.

To disable or unschedule an advisor, choose the [Current Schedule](#) screen of the **Advisors** tab.



Note

Advisors, even those that are unscheduled or disabled, still run during discovery mode when MySQL Enterprise Monitor starts, and when the dashboard runs the “inventory” process.

You can disable or unschedule one or more rules using the buttons on the upper or lower left of the screen. You can also change one rule at a time by clicking the [enabled](#) or [unschedule](#) hyperlink to the right of a rule.

To no longer run a rule against a specific server, expand the advisor group and the specific rule by clicking the [+](#) button and then the [unschedule](#) button. In the dialog window that opens, click the [unschedule](#) button. To back out of the operation, choose [cancel](#). To institute this rule again, use the [Add to Schedule](#) page.

To suspend a rule temporarily, use the [disable](#) button and follow the same process as for unscheduling. Once a rule is disabled, the link under the status column changes to red and reads [disabled](#). When a rule is disabled, data is no longer collected for that rule. To re-enable a disabled rule, click the [disabled](#) link or the [enable](#) button.

To alter multiple rules for one or more servers, select the appropriate checkbox and clicking the [unschedule](#), [enable](#), or [disable](#) button.

**Note**

Rules associated with the heat chart cannot be disabled or unscheduled, as they are required by MySQL Enterprise Monitor.

4.4 Advisor Blackout Periods

During maintenance periods for database servers, you can stop Monitor Agents from reporting their findings. During such a blackout period, rules are not evaluated and notifications are put on hold, but Monitor Agents continue to collect data. In this respect, blacked-out rules differ from disabled rules; data continues to be collected and stored in the repository.

To enable a blackout period, enter the following URL into the address bar of your browser, substituting the appropriate host name, port and server name:

```
http://localhost:18080/rest?command=blackout&server_name=SuSE:3306&blackout_state=true
```

Check the [configuration_report.txt](#) file for the host name and port to use. Specify the correct port for the Tomcat server. Specify the server to blackout using the name that appears in the Server Tree, including the colon and port number as shown in the preceding example.

When the HTTP authentication dialog box requesting your Dashboard user name and password opens, specify the credentials for the Manager user. Use the ID and password you specified when you initially logged in to the Dashboard.

You can also blackout a server group by entering the following URL into the address bar of your browser, substituting the appropriate host name, and server group name:

```
http://localhost:18080/rest?command=blackout&group_name=Finance&blackout_state=true
```

When the HTTP authentication dialog box opens, enter the administrator's credentials.

To confirm that a server is blacked out, check that its name is grayed out in the Dashboard.

To reactivate the blacked-out server or server group, use the appropriate URL and query string, changing the [blackout_state=true](#) name/value pair to [blackout_state=false](#). Again, this must be done by a user with administrative privileges.

**Note**

Restarting MySQL Enterprise Monitor does **not** reactivate a blacked out server.

4.4.1 Scripting Blackouts

You can write a script to black out a server, rather than opening a web browser and typing entries into the address bar. This section documents a sample blackout script that can be run from the command line.

Create the following file and save it as `blackout.pl`.

```
#!/usr/bin/perl

use LWP 5.64;

# USAGE: blackout.pl servicemanager:18080 admin password servername:3306 true

# $ARGV[0] = management server hostname:port
# $ARGV[1] = management server username
# $ARGV[2] = management server password
# $ARGV[3] = mysqld managed instance server name and port
# $ARGV[4] = blackout state (true/false)

my $browser = LWP::UserAgent->new;
$browser->credentials(
    $ARGV[0],
    ' ',
    $ARGV[1],
    $ARGV[2]
);

my $url = URI->new('http://'.$ARGV[0].'/rest');

$url->query_form( # And here the form data pairs:
    'command' => 'blackout',
    'server_name' => $ARGV[3],
    'blackout_state' => $ARGV[4]
);

my $response = $browser->post( $url );

if (!$response->is_success) {
    die $response->status_line . "\n";
}

if ($response->content =~ /UserUnauthorizedException/ ||
    $response->content =~ /ServerDoesNotExistException/) {
    die $response->content;
}
```

**Note**

Windows users can omit the initial `#!` line.

On Unix systems, use the `chmod +x blackout.pl` command to make the file executable.

At the command line, enter `blackout.pl servicemanager:18080 admin password servername:3306 true`.

Check the `configuration_report.txt` file for the host name and port to use. Specify the correct port for the Tomcat server. Specify the server to black out using the name that appears in the Server Tree,

including the colon and port number as shown in the preceding example. Specify the name of a user who is a Manager. A user with DBA rights cannot black out a server, and the script does not display any error in this case.

To confirm that a server is blacked out, check that its name is greyed out in the Dashboard. To end the blackout, run the same script, changing the final argument to `false`.

**Note**

Restarting MySQL Enterprise Monitor does **not** reactivate a blacked out server.

Chapter 5 Installation Reference

Table of Contents

5.1 Credentials Needed for Installation	108
5.1.1 Existing Users	109
5.1.2 Users Created During Installation	109
5.1.3 Users Created on First Log-in	109
5.2 Installing the Service Manager	109
5.2.1 Service Manager Installation Common Parameters	110
5.2.2 Installing the Service Manager on Unix and Linux	112
5.2.3 Installing the Service Manager on Windows	115
5.2.4 Starting/Stopping the MySQL Enterprise Monitor Service on Unix	117
5.2.5 Starting/Stopping the MySQL Enterprise Monitor Service on Windows	118
5.2.6 MySQL Enterprise Service Manager Configuration Settings and Advisor Installation	119
5.3 Monitor Agent Installation	121
5.3.1 Creating a MySQL User Account for the Monitor Agent	122
5.3.2 Installing the Monitor Agent on Unix and Linux	123
5.3.3 Installing the Agent on Microsoft Windows	128
5.3.4 Starting/Stopping the MySQL Enterprise Monitor Agent	132
5.3.5 Monitoring Multiple MySQL Servers	135
5.3.6 Configuring an Agent to Monitor a Remote MySQL Server	137
5.3.7 Monitoring Outside the Firewall with an SSH Tunnel	138
5.3.8 Generating a New UUID	138
5.3.9 Troubleshooting the Agent	139
5.4 Unattended Installation	141
5.4.1 Performing an Unattended Installation	141
5.4.2 MySQL Enterprise Service Manager Options	143
5.4.3 MySQL Enterprise Monitor Agent Options	148
5.5 Postinstallation Considerations	156
5.6 Installing SSL Certificates	156
5.7 Upgrading, Re-Installing or Changing Your Installation	158
5.7.1 Upgrading MySQL Enterprise Monitor	158
5.7.2 Changing Your MySQL Enterprise Monitor Installation	166
5.8 Uninstalling the MySQL Enterprise Monitor	168
5.8.1 Removing the MySQL Enterprise Monitor: Windows	168
5.8.2 Removing the MySQL Enterprise Monitor: Unix	169



Note

MySQL Enterprise subscription, MySQL Enterprise Monitor, MySQL Replication Monitor, and MySQL Query Analyzer are only available to commercial customers. To learn more, see: <http://www.mysql.com/products/>.

This chapter describes the process of installing the MySQL Enterprise Monitor on all operating systems.

Installation Sequence

A working installation requires installing:

- One MySQL Enterprise Service Manager. It stores its data in a database [repository](#). You can use an existing MySQL instance for the repository, or set up a separate instance as part of the MySQL Enterprise Service Manager installation. See [Section 5.2, “Installing the Service Manager”](#).

- The MySQL Enterprise Advisors. These are installed as part of the MySQL Enterprise Service Manager install, on the same machine.
- One or more MySQL Enterprise Monitor Agents, one for each MySQL server to monitor. See [Section 5.3, “Monitor Agent Installation”](#). Install the MySQL Enterprise Service Manager first, because the Agent installation asks for credentials and network settings that you choose as you install the MySQL Enterprise Service Manager.

To minimize network overhead, you usually install the Agent on the same machine that hosts the monitored MySQL server, but you can install it on any machine that has network access to both the monitored MySQL server and the MySQL Enterprise Monitor User Interface.

The Agent inspects a specific MySQL server, and transmits health and usage data back to the Service Manager. The Advisors interpret the results, which are displayed in the browser-based MySQL Enterprise Monitor User Interface.

After installing and starting the Service Manager and Agents, configure the settings in the MySQL Enterprise Monitor User Interface, as explained in [Section 5.2.6, “MySQL Enterprise Service Manager Configuration Settings and Advisor Installation”](#).

Installer Files

Depending on your configuration and environment, download these files from the [Oracle Software Delivery Cloud](#) web site. These include:

- MySQL Enterprise Service Manager, MySQL Enterprise Monitor User Interface, and Advisors for the platform that you intend to execute the MySQL Enterprise Service Manager on. For a new installation, this installer is named `mysqlmonitor-version-platform-installer.bin`. For an upgrade installation, this installer is named `mysqlmonitor-version-platform-update-installer.bin`.
- One or more MySQL Enterprise Monitor Agent, one for each MySQL Server to monitor. In the typical scenario, where you install the Agent on the same machine as each monitored MySQL server, make a list of the platforms your MySQL servers run on, then download the Agent installer package for each of those platforms. For a new Agent installation, this installer is named `mysqlmonitoragent-version-platform-installer.extension`. For an upgrade Agent installation, this installer is named `mysqlmonitoragent-version-platform-update-installer.extension`.

For information on the installation requirements for different platforms, see [Section B.3, “Installation Requirements”](#).

5.1 Credentials Needed for Installation

Before installing the MySQL Enterprise Monitor components, gather [credentials](#) (root user IDs and passwords) for all the MySQL servers you plan to monitor. The Agent installation requires a dedicated user ID in each monitored MySQL server; the installation can create this user for you, or you can create it yourself in advance, but either way requires a root login to the MySQL instance.



Note

With MySQL 5.5.16 and higher, you can configure these user IDs to authenticate using the [PAM Authentication plugin](#). Currently, MySQL Enterprise Monitor does not support authentication through the [Windows Native Authentication plugin](#). See [MySQL Enterprise Monitor 2.3 Release Notes](#) for details of the MySQL

Enterprise Monitor configurations that are and are not supported under the various authentication plugins.

Optionally, gather credentials for your [My Oracle Support](#) account, which you can specify in the MySQL Enterprise Monitor User Interface configuration step immediately after everything is installed and started.

The following sections outline the users associated with the MySQL Enterprise Monitor.

5.1.1 Existing Users

The **MySQL user**: For Monitor Agents to report the status of a MySQL server, they connect to a MySQL user with privileges to read any data on that server: [SHOW DATABASES](#), [REPLICATION CLIENT](#), [SUPER](#), [CREATE](#), and [SELECT](#). If you already have such a user on a MySQL server, specify its credentials when installing the Agent for that server. For details about this account, see [Section 5.3.1, “Creating a MySQL User Account for the Monitor Agent”](#).

The **My Oracle Support user**: These are the credentials you use to log in to the My Oracle Support web site. The **What's New** page accesses this account to receive updates and examine relevant service issues.

5.1.2 Users Created During Installation

The **Repository user**: This user is the only user in the [user](#) table in the [mysql](#) database in the bundled MySQL server. To avoid confusion with monitored MySQL servers, this server is referred to throughout this document as the [repository](#). The repository user can log in from [localhost](#) using the password specified during installation and has all privileges on all databases. These credentials are used to create the repository and its tables and to record data in them. During installation, the default value for the user name for this role is [service_manager](#). No default password is specified. You can use these credentials to manage the repository from the command line or when using a program such as MySQL Administrator.

At the end of MySQL Enterprise Service Manager installation, the file [configuration_report.txt](#) is created, and along with other configuration details, contains the credentials of the repository manager. Look for this file in the following directories:

- Windows: [C:\Program Files\MySQL\Enterprise\Monitor](#)
- Unix: [/opt/mysql/enterprise/monitor](#)

5.1.3 Users Created on First Log-in

The **Manager user**: This user is the administrator of the MySQL Enterprise Monitor User Interface. The first time you log in to the dashboard, log in as this user. You choose the ID and password for this user.

The **Agent user**: The Monitor Agent needs to report the status of the MySQL server it is monitoring. For this reason it needs to log in to the dashboard. You choose the ID and password for this user.



Note

The Monitor Agent communicates both with the Dashboard, and with the MySQL server it is monitoring. For a description of the agent as a MySQL user, see [Section 5.1.1, “Existing Users”](#).

5.2 Installing the Service Manager

The MySQL Enterprise Service Manager is the core element of the MySQL Enterprise Monitor. The installation process for this element also includes some supplemental components:

- Apache Tomcat (always)
- Java VM (always)
- MySQL Server, for repository (optional; you can use an existing MySQL instance instead)

**Note**

After installation, you can determine the version number of the various components by entering http://server_name:18080/main?command=list_versions into the web browser's address bar.

During installation, versions of MySQL and Tomcat are installed onto the machine, using default values for network ports that are different from standard installation for these applications. You can select different port numbers during installation, to avoid conflicts or to follow a company standard.

During installation, default values are shown for user names and ports, for your convenience. You can choose different values. The installer detects ports that are already in use and lets you select different ports.

**Warning**

The MySQL Enterprise Service Manager version 2.0 and higher requires agents using 2.0 or higher.

All the installations share the same basic configuration parameters that you confirm during installation. Before you start your installation, review the section on these common parameters, then the section specific to your installation platform:

- For details of the common parameters, see [Section 5.2.1, “Service Manager Installation Common Parameters”](#).
- For Unix/Linux, see [Section 5.2.2, “Installing the Service Manager on Unix and Linux”](#).
- For Windows, see [Section 5.2.3, “Installing the Service Manager on Windows”](#).

5.2.1 Service Manager Installation Common Parameters

All installations of the Service Manager install the Tomcat and MySQL applications using the same basic set of parameters. Although the defaults provided by the installation process are designed not to interfere with existing installations of either product, check these parameters before installation to ensure that you do not experience any problems.

A value must be assigned to all settings that are defined in the configuration file. This is different than passing these settings into the command-line, which may default to `true` when not passing in a value. Glib is used for option handling, and specifically `g_key_file_get_boolean()` to parse boolean values. This means that `false` and `0` represent boolean `false`, whereas `true` and `1` represent boolean `true`. For example:

Passing a value to `config.properties` may look like this:

```
log-use-syslog=1
```

Or to the command-line, like either of these:

```
$ ./mysqlmonitor-installer.bin --log-use-syslog
$ ./mysqlmonitor-installer.bin --log-use-syslog 1
```

The common parameters are divided into those applying to the location of the MySQL server, the Tomcat server, and the connection properties for the MySQL server (Repository Configuration):

- **Tomcat Server Options**

- Tomcat Server port: The default port that the Tomcat server uses when listening for connections. If you change this option, make the same change to the equivalent port number specified during the Agent installation. The default value is 18080.



Note

If you do not have a web server running on port 80, you can use this well-known port rather than 18080. Since port 80 is the default for a web server, you can then open the dashboard without specifying a port.

- Tomcat Shutdown port: The port used by the management scripts that is used to shut the Tomcat server down when you need to stop the Service Manager. The default value is 18005.
- Tomcat SSL Port: The standard port used to connect to the Service Manager when you want to use Secure Sockets Layer (SSL) encrypted communication. The default value is 18443.

- **MySQL Server selection**

- Using the bundled MySQL Server is preferred, but you may also choose to use your own MySQL Server to store repository data for the MySQL Enterprise Service Manager. The MySQL Server can be located on the same machine as the MySQL Enterprise Service Manager, or on a different machine. If you use your own MySQL Server, it must already be running when you start the installer.



Note

Configuring the MySQL Enterprise Service Manager repository to use a database that you plan to monitor will be problematic, because the MySQL Enterprise Service Manager statistics will interfere with your setup. Using the same host will function normally, although some monitored statistics are host specific.

The requirements for the MySQL Server are:

- MySQL 5.1.43 or higher.
- Partitioning enabled.
- InnoDB Storage Engine enabled. MySQL Enterprise Monitor operation relies on the InnoDB-related configuration options being set high enough to handle the monitoring traffic. For example, the bundled MySQL server includes the settings:

```
innodb_buffer_pool_size = 512M
innodb_log_file_size = 256M
innodb_flush_log_at_trx_commit = 2
innodb_support_xa = 0
innodb_file_per_table
innodb_max_dirty_pages_pct = 20
```

```
innodb_locks_unsafe_for_binlog = 1
```

Using too-low settings for the repository data could result in errors such as `Session is closed!` in the Tomcat log file.

Configure the MySQL server with suitable credentials to allow MySQL Enterprise Service Manager to create the database, tables and other settings. The user should have [ALL](#) privileges on the MySQL Enterprise Monitor repository, which is stored within the database `mem`, or you can provide full access to all tables. Also, ensure you have the [GRANT OPTION](#). For example, you might create a suitable user using the following [GRANT](#) statement:

```
mysql> GRANT ALL PRIVILEGES ON *.* TO 'service_manager'@'localhost'
-> IDENTIFIED BY 'password' WITH GRANT OPTION
```

• Repository Configuration (MySQL Server)

- **Repository Username** — if you are connecting to an existing MySQL database, specify the username and password that you configured with access to the MySQL Enterprise Monitor repository. If you install the bundled MySQL database, choose a username and password for the MySQL Enterprise Service Manager, and that user is created automatically during installation. In normal use, you do not need to access the repository database directly, but it might be required to resolve a [service request](#). The default value is `service_manager`.
- **Repository User password** — the password to use to connect to the MySQL database. Set it to a secure password so that the repository data is secure.
- **Use SSL when connecting to the database** — adds a line `mysql.use_ssl=true` to the `config.properties` file. The repository database must be configured for SSL connections, as described in [Building MySQL with SSL Support](#). You can add this line yourself to enable SSL connections after installation. You can also manually add any of the following items to `config.properties` to customize the SSL connections to the repository database:

```
mysql.verify_server_cert (default is false)
mysql.trust_cert_keystore_url (no default)
mysql.trust_cert_keystore_type (no default)
mysql.trust_cert_keystore_password (no default)
mysql.client_cert_keystore_url (no default)
mysql.client_cert_keystore_type (no default)
mysql.client_cert_keystore_password (no default)
```

These items correspond to similarly-named JDBC connection properties that are described in [Driver/ Datasource Class Names, URL Syntax and Configuration Properties for Connector/J](#).

The information that you configure during installation is recorded within the `configuration_report.txt` file within the installation directory for the Service Manager, with any passwords obscured. (Thus, be sure to record all passwords that you specify during the installation process.)

5.2.2 Installing the Service Manager on Unix and Linux

To install the Service Manager find the file named `mysqlmonitor-version-installer.bin` (where `version` indicates the version number, the OS, and the architecture). Ensure that this file is executable by typing:

```
shell> chmod +x mysqlmonitor-version-installer.bin
```

To install to the default directory (`/opt/mysql/enterprise/monitor`), login as `root`. An unprivileged user installs to the `/home/user_name/mysql/enterprise/monitor/` directory.

What follows describes installation from the command line. You can install the Service Manager graphically by running the installer from within a windows manager. In both cases, the steps are identical. You can also install the Service Manager in `unattended` mode. This is especially useful if you are doing multiple installations. For more information on this topic, see [Section 5.4, “Unattended Installation”](#).

1. Begin installation by typing:

```
shell> ./mysqlmonitor-version-installer.bin
```

2. First choose the language for the installation:

```
Language Selection

Please select the installation language
[1] English
[2] Japanese
Please choose an option [1] :
```

3. Throughout the installation process, you are asked the configuration questions for different options. Default values are shown between square brackets; to use the default press **Enter**. Otherwise, enter the new value and press **Enter**:

First, select the directory to install MySQL Enterprise Service Manager. The default is `/opt/mysql/enterprise/monitor/`. Make sure that the location you choose has enough space to hold the installation files and the database information that is created when MySQL Enterprise Service Manager is running.

```
Please specify the directory where the MySQL Enterprise Service Manager
will be installed.

Installation directory [/opt/mysql/enterprise/monitor/]:
```

4. Now set the Tomcat Server options. For more details on these parameters, see [Section 5.2.1, “Service Manager Installation Common Parameters”](#).

```
-----
Tomcat Server Options

Please specify the following parameters for the bundled Tomcat Server

Tomcat Server Port [18080]:

Tomcat Shutdown Port [18005]:

Tomcat SSL Port [18443]:
```

You will also be asked if SSL support is required. SSL support lets your agents and the monitor communicate with each other using SSL. Using SSL means that the data exchanged by the agent and MySQL Enterprise Service Manager are secure and can be used to monitor servers securely, or to monitor agents over a public connection.

You enable SSL by pressing **Y** when prompted during installation:

```
Is SSL support required?          [y/N]:
```

5. Set the repository (embedded MySQL server) configuration options. For more details on these parameters, see [Section 5.2.1, “Service Manager Installation Common Parameters”](#).

```
-----
Repository Configuration
Please specify the following parameters for the bundled MySQL server

Repository Username  [service_manager]:
Password :
Re-enter :
Bundled MySQL Database Port [13306]:
```

6. Before the final installation process, you receive the location of the file that contains a copy of all of the settings. Follow the instructions and store this report in a secure location. There is no password recovery feature.

```
-----
Configuration Report
Note:
The settings you specified will be saved here:
/opt/mysql/enterprise/monitor/configuration_report.txt
Press [Enter] to continue :
```

7. Confirm the installation process.

```
Setup is now ready to begin installing MySQL Enterprise Monitor
on your computer.

Do you want to continue? [Y/n]: Y

Please wait while Setup installs MySQL Enterprise Monitor
on your computer.
```

The installation process could take a few minutes to complete. Upon completion, you see:

```
Completed installing files

Setup has completed installing MySQL Enterprise files on your computer

Uninstalling the MySQL Enterprise files can be done by invoking:

/opt/mysql/enterprise/monitor/uninstall

To complete the installation, launch the MySQL Enterprise Dashboard and complete
the initial setup and product activation information. Refer to the readme file
```



```
for additional information and a list of known issues.
```

```
Press [Enter] to continue :
```

8. Finally, you can read the [Readme](#) file that contains important information about how to use and start your MySQL Enterprise Service Manager.

```
-----  
Setup has finished installing MySQL Enterprise Monitor on your computer.
```

```
View Readme File [Y/n]: n
```

Once the [Readme](#) file has been displayed, or if you did not elect to read the file, the installation provides information about how to continue with your installation.

```
Info: To access the MySQL Enterprise Monitor please visit the  
following page: http://localhost:18080/Auth.action
```

```
Press [Enter] to continue :
```

The Enterprise Dashboard does not start up automatically if you perform a [text](#) mode installation. For more information on starting and stopping MySQL Enterprise Service Manager, see [Section 5.2.4, “Starting/Stopping the MySQL Enterprise Monitor Service on Unix”](#).

5.2.3 Installing the Service Manager on Windows

On Windows, the installation modes are [win32](#) and [unattended](#) only. Use [unattended](#) mode to do multiple installations. For more information on this topic see [Section 5.4, “Unattended Installation”](#).



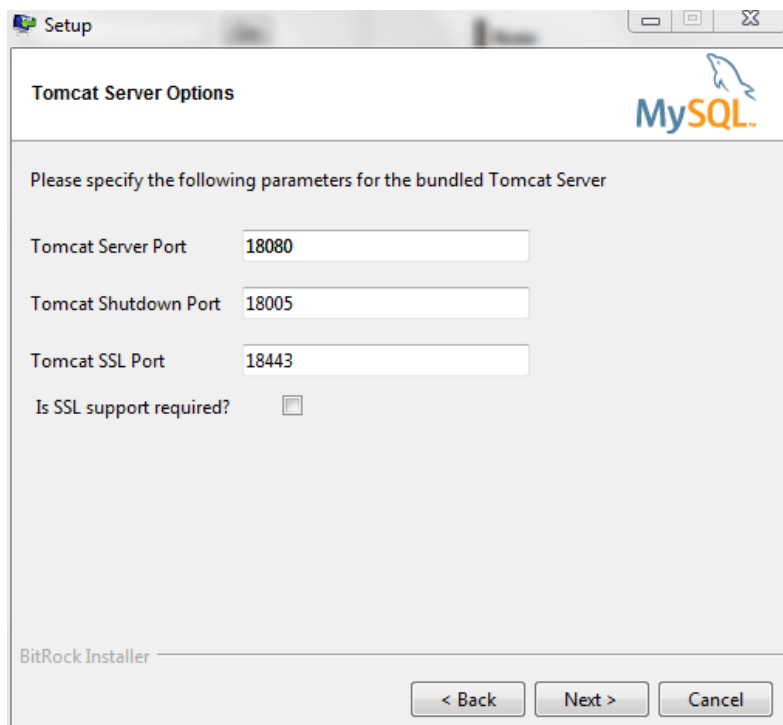
Note

To install the Service Manager as a Windows service, perform the installation as a privileged user.

On Windows Vista or later, if user account control is on, an operating system dialog box requests confirmation of the installation.

To install the Service Manager on Windows, find the executable file named [mysqlmonitor-version-windows-installer.exe](#) (where [version](#) represents the three-part version number).

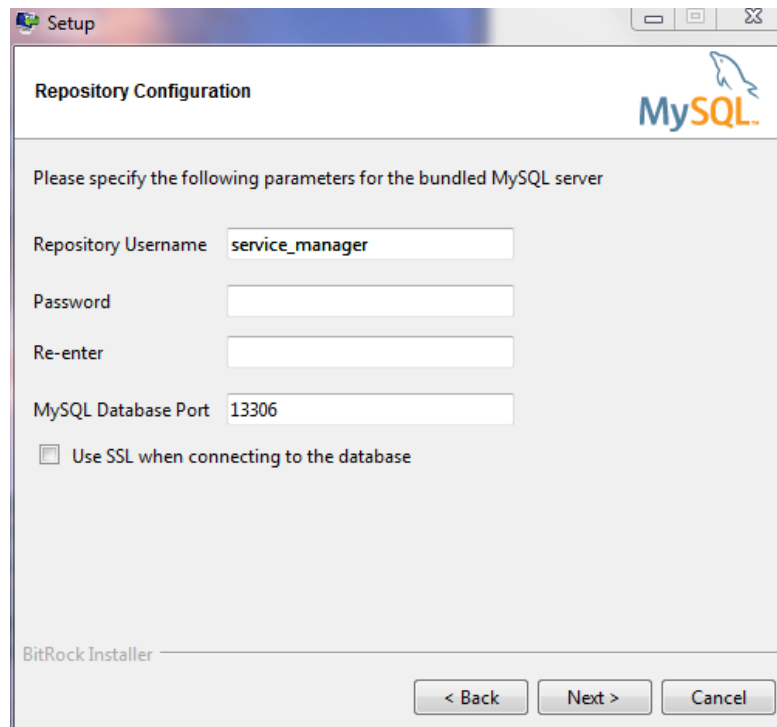
1. Double-click the MySQL Monitor installer. Select the language to use for the installer and click **OK**.
2. With the installation language selected, the remainder of the installation sets up the installation location and the main configuration parameters required by MySQL Enterprise Service Manager. Click **Next** to continue.
3. Select the installation directory to install the MySQL Enterprise Service Manager components. By default on Windows, the directory is [C:\Program Files\MySQL\Enterprise\Monitor](#). Click the button next to the installation directory field to select a directory using the File chooser, or type the directory manually. Click **Next** to continue.
4. Configure the options that set the network ports used by the Tomcat server. For more information, see [Section 5.2.1, “Service Manager Installation Common Parameters”](#). Click **Next** to continue.

Figure 5.1 MySQL Enterprise Monitor: Installing Monitor on Windows: Tomcat Server Options

5. Configure the repository settings, setting the user name, password and port for the bundled MySQL server that stores the information and statistics for your installation. For more information, see [Section 5.2.1, "Service Manager Installation Common Parameters"](#). Click **Next** to continue.

**Note**

If the Windows firewall is enabled, unblock ports for Apache/Tomcat and the MySQL server.

Figure 5.2 MySQL Enterprise Monitor: Installing Monitor on Windows: Repository Configuration

6. You receive information and a warning about the configuration options and how they are stored in the `configuration_report.txt` file, and its location. Record the full path to this file for future reference. Click **Next** to continue.
7. You are now prompted to start the installation process. Click **Next** to continue.
8. Once the installation is completed, you receive information on how to uninstall MySQL Enterprise Service Manager. Click **Next** to continue.
9. To complete the installation and set up your MySQL Enterprise Service Manager, login to the Dashboard. You can do this automatically by leaving the box checked on the final window before clicking **Finish**. To skip the Dashboard at this time, uncheck the box and click **Finish**.

For instructions on starting the MySQL Enterprise Monitor services under Windows, see [Section 5.2.5, “Starting/Stopping the MySQL Enterprise Monitor Service on Windows”](#).

5.2.4 Starting/Stopping the MySQL Enterprise Monitor Service on Unix

The services incorporated into the MySQL Enterprise Service Manager are:

- The MySQL Server.
- The Apache/Tomcat Server.

To start, stop, or restart the MySQL Enterprise Service Manager, run the script `/opt/mysql/enterprise/monitor/mysqlmonitorctl.sh` with the command-line parameter `start`, `stop`, or `restart`. To see the available options, issue the command `mysqlmonitorctl.sh help`.

The `help` parameter produces the following output:

```
usage: ./mysqlmonitorctl.sh help
./mysqlmonitorctl.sh (start|stop|status|restart)
./mysqlmonitorctl.sh (start|stop|status|restart) mysql
./mysqlmonitorctl.sh (start|stop|status|restart) tomcat

help      - this screen
start     - start the service(s)
stop      - stop the service(s)
restart   - restart or start the service(s)
status    - report the status of the service
```

To autostart all the Service Manager components, call the `mysqlmonitorctl.sh start` from your start-up script.

To start the service:

```
shell> ./mysqlmonitorctl.sh start
./mysqlmonitorctl.sh : mysql started
nohup: redirecting stderr to stdout
Starting mysqld daemon with databases from /opt/mysql/enterprise/monitor/mysql/data/
Using CATALINA_BASE:   /opt/mysql/enterprise/monitor/apache-tomcat
Using CATALINA_HOME:   /opt/mysql/enterprise/monitor/apache-tomcat
Using CATALINA_TMPDIR: /opt/mysql/enterprise/monitor/apache-tomcat/temp
Using JRE_HOME:        /opt/mysql/enterprise/monitor/java
```

If you try to start the service and it is already running, you are warned that the services are already running.

The `restart` command is equivalent to executing a `stop` and then `start` operation.

This script can also check the status of the Tomcat web server or the MySQL repository.

```
shell> ./mysqlmonitorctl.sh status
MySQL Network MySQL is running
MySQL Network Tomcat is running
```

After the Service Manager is installed, you can configure the Dashboard, as explained in [Section 5.2.6, “MySQL Enterprise Service Manager Configuration Settings and Advisor Installation”](#).

5.2.5 Starting/Stopping the MySQL Enterprise Monitor Service on Windows

You can choose to start up the MySQL Enterprise Service Manager on installation. The corresponding Windows services are called:

- MySQL Enterprise Tomcat
- MySQL Enterprise MySQL

You can stop or start these services from the Microsoft Management Console Services window.



Note

On Windows Vista or later, starting these services requires administrative privileges. To start or stop a service, right-click it and choose the Run as Administrator menu option. The same restriction applies to the pop-up menu options discussed in the following section, and to starting the services from the command line. To open an administrator `cmd` window, right-click the `cmd` icon and choose the Run as Administrator menu option.

To start or stop a service, right-click it and choose from the options in the pop-up menu.

To start or stop the services from the menu, navigate to the [Program, MySQL, MySQL Enterprise Monitor, Services](#) entry to stop or start the services.

to start the Tomcat service from the command line, type:

```
shell> sc start MySQLEnterpriseTomcat
```

or:

```
shell> net start MySQLEnterpriseTomcat
```

To stop this service type:

```
shell> sc stop MySQLEnterpriseTomcat
```

or:

```
shell> net stop MySQLEnterpriseTomcat
```

In similar fashion, you can stop or start the MySQL server from the command line. The service name is [MySQLEnterpriseMySQL](#).

You can also start, stop, and restart a specific service or both services using the [mysqlmonitorctl.bat](#) file. To execute this file, go to the command line and navigate to the [C:\Program Files\MySQL\Enterprise\Monitor](#) directory. Typing [mysqlmonitorctl.bat help](#) produces the following output:

```
usage: mysqlmonitorctl.bat help
       mysqlmonitorctl.bat (start|stop|restart|install|uninstall)
       mysqlmonitorctl.bat (start|stop|restart) tomcat
       mysqlmonitorctl.bat (start|stop|restart) mysql

help      - this screen
start     - start the service(s)
stop      - stop the service(s)
restart   - restart or start the service(s)
install   - install the service(s)
uninstall - uninstall the service(s)
```

To stop a specific service, pass the argument [tomcat](#) or [mysql](#) in addition to the status change argument. To change the status of both services, do not specify a service name. You can also uninstall the services using this batch file.

After the Service Manager is installed, you can configure the Dashboard, as explained in [Section 5.2.6, “MySQL Enterprise Service Manager Configuration Settings and Advisor Installation”](#).

5.2.6 MySQL Enterprise Service Manager Configuration Settings and Advisor Installation

The Enterprise Dashboard is the web-based interface to the Service Manager. The procedure for starting the dashboard is identical for all platforms. From the dashboard, you can configure the settings necessary for receiving updates from MySQL Enterprise.

If you installed the Service Manager using a graphical interface, you have the option of launching the dashboard on the final installation screen (as long as the [Launch MySQL Enterprise Monitor Now](#) checkbox is checked).

Otherwise, you can view the dashboard by typing <http://localhost:18080/Auth.action> into the address bar of your web browser. To see the host name and port to use, check the [configuration_report.txt](#) file.

Under Windows, you can also open the dashboard by choosing the [MySQL](#) menu item and finding the [MySQL Enterprise Monitor](#) entry. Under this entry, choose [Start Service Manager](#).

5.2.6.1 Initial Dashboard Log-In

If this is the first time logging in to the dashboard, you see a screen similar to the following:

Figure 5.3 MySQL Enterprise Monitor: Initial Dashboard Log-In

Welcome to the MySQL Enterprise Dashboard Setup.
To complete installation and configuration, please complete the form below. You can modify these values later on the Settings page.

Create Manager User	Create Agent User
The user and password for the Dashboard administrator. You can optionally add DBA, Read-only or additional Manager users on the Settings page.	The user and password for the Agent to login to the dashboard. You'll provide these credentials each time you install an Agent.
Username <input type="text"/>	Username <input type="text"/>
Password <input type="password"/>	Password <input type="password"/>
Confirm Password <input type="password"/>	Confirm Password <input type="password"/>

Online Updates
Using a direct internet connection or an HTTP proxy, the Dashboard can occasionally check for MySQL product updates, security alerts, and the status of any open My Oracle Support Service Requests (see below).
☒ Enable automatic checking for online updates
☐ Use HTTP Proxy

My Oracle Support Credentials
These credentials are used to retrieve and display your open Service Requests (for those with an active customer account only).
 My Oracle Support Login (Email Address)

 Password

 Confirm Password

Advisors	Data Purge Behavior
Current Advisors Version 2.3.4.2075	Remove Historical Data Collection Older Than 4 weeks
Advisor .jar File <input type="button" value="Choose File"/> No file chosen	Remove Query Analyzer Data Older Than 4 weeks

Complete Setup

ORACLE Copyright © 2005, 2011, Oracle and/or its affiliates. All rights reserved.
Enterprise Software | Technical Support | About

2.3.4.2075 - May 18, 2011 4:43:41 PM
Monitoring 0 instances on 0 hosts [More info...](#)

Use this screen to perform the following tasks:

- Set up your My Oracle Support credentials.
- Create a user name and password for the dashboard administrator.
- Create a user name and password for the Monitor Agent.

To import the Advisors file, click the **Browse** button and locate it. The advisor file is named, [AdvisorScript-version.jar](#). If you do not allow Internet access from the dashboard, you must install the advisors in this way. Although we strongly recommend that you install the Advisors at this point, you can also do so later. For instructions on doing this, see [Section 5.2.6.3, “Installing, Updating or Upgrading Advisors After Initial Login”](#).

In the **Create Manager User** section of this screen, enter credentials for the dashboard administrator. This creates the Manager user described in [Section 5.1.3, “Users Created on First Log-in”](#). Record the user name and password, as these credentials are required for any future login.

In the **Create Agent User** section of this screen, enter the credentials for the agent. This is the user described in [Section 5.1.3, “Users Created on First Log-in”](#). The agent must log in to report its findings. Record the agent's credentials; this information is required when installing the agent.

After specifying all settings, click the **complete setup** button. When you log in, a message reports how many graphs and advisors were imported.

5.2.6.2 Setting the Timezone and Locale

If this is the first time that you have launched the dashboard, you are asked to set your time zone and locale. Choose the appropriate values from the drop-down list boxes. Setting the time zone ensures that you have an accurate time reference for any notifications from the MySQL Enterprise Advisors.



Warning

Make sure to set the time zone (and the system clock) correctly because this setting affects the way the graphs display. To change the time zone or locale, see [Section 2.8.2, “User Preferences”](#).

The locale chosen determines the default language displayed when logging in to the Dashboard. This overrides the default browser settings whenever this specific user logs in.

After specifying your time zone and locale, the dashboard opens on the **Monitor** tab. For a detailed examination of the **Monitor** Screen, see [Section 2.1, “MySQL Enterprise Dashboard”](#).

5.2.6.3 Installing, Updating or Upgrading Advisors After Initial Login

The Advisors interpret the data sent by the Monitor Agents and display the results in the dashboard. A full set of Advisors is preinstalled with the Service Manager. You can download any new or updated Advisors from the My Oracle Support site.

If you did not install the Advisors when you first logged in to the MySQL Enterprise Monitor User Interface, open the dashboard, find the **Advisors** tab, and choose the [Check for Updates](#) link. Doing this downloads the latest version of the Advisors from an Oracle web site.

If you do not allow Internet access from the dashboard, install the Advisors from a local file. You need an advisor file named [AdvisorScript-version.jar](#). If you do not already have this file, download it from the My Oracle Support site. Download the Advisors file to a location that is accessible from the dashboard. Use the **Browse** button to find the Advisors file and then choose **import** to load the advisors.

5.3 Monitor Agent Installation

A [MySQL Enterprise Monitor Agent](#) monitors a MySQL server and sends data to the [Advisors](#). The data is interpreted and displayed in the [Dashboard](#). The following section describes how to install the Agent on all platforms.

**Note**

As of MySQL Enterprise Monitor Agent 2.3.13, the MySQL Enterprise Monitor Agent Installer no longer checks the [PATH](#) for a local MySQL Client installation. Instead, the Installer will use the bundled MySQL Client. And as of MySQL Enterprise Monitor Agent 2.3.13, the Installer bundles MySQL client version 5.6.

However, the MySQL Enterprise Monitor Agent Installer for Solaris 9 and Solaris 10 bundle MySQL Client version 5.1.

5.3.1 Creating a MySQL User Account for the Monitor Agent

The MySQL Enterprise Monitor Agent requires a user configured within each MySQL instance that is being monitored with suitable privileges to collect information about the server, including variable names, replication, and storage engine status information. The agent installer creates a suitable user for you during installation if you supply the installer with a user/password for a privileged user (such as the [root](#) user). This account information is used only during the installation to create the user, and is not written to any file. If you use this option, skip the remainder of this section.

Creating the Agent Account Manually

If you do not supply the root user information to the installer, create a user manually within your MySQL server and provide these credentials as the agent user/password combination during installation. The privileges required for this user account vary depending on the information you gather using the MySQL Enterprise Monitor Agent. The following privileges allow the Monitor Agent to perform its assigned duties without limitation:

- [SHOW DATABASES](#): The MySQL Enterprise Monitor Agent can gather inventory about the monitored MySQL server.
- [REPLICATION CLIENT](#): The MySQL Enterprise Monitor Agent can gather Replication master/slave status data. This privilege is only needed if you use the MySQL Replication Advisor Rules.
- [SELECT](#): The MySQL Enterprise Monitor Agent can collect statistics for table objects.
- [SUPER](#): The MySQL Enterprise Monitor Agent can execute [SHOW ENGINE INNODB STATUS](#) to collect data about InnoDB tables. This privilege is also required to obtain replication information using [SHOW MASTER STATUS](#), and to temporarily switch off replication when populating the `mysql.inventory` table used to identify the MySQL instance.
- [PROCESS](#): When monitoring a MySQL server running MySQL 5.1.24 or above with [InnoDB](#), the [PROCESS](#) privilege is required to execute [SHOW ENGINE INNODB STATUS](#).
- [INSERT](#): Required to create the UUID required by the agent.
- [CREATE](#): The MySQL Enterprise Monitor Agent can create tables. During discovery, the agent creates the table `inventory` within the `mysql` database that stores the UUID for the server. Without this table, the agent cannot determine the UUID of the server, which it sends along with other information to MySQL Enterprise Service Manager.

For example, the following [GRANT](#) statement gives the agent the required [SELECT](#), [REPLICATION CLIENT](#), [SHOW DATABASES](#) and [SUPER](#) rights:

```
GRANT SELECT, REPLICATION CLIENT, SHOW DATABASES, SUPER, PROCESS
ON *.*
TO 'mysqluser'@'localhost'
IDENTIFIED BY 'agent_password';
```


For security reasons, you might limit the `CREATE` and `INSERT` privileges to the agent so that it can only create tables within the `mysql` database:

```
GRANT CREATE, INSERT
ON mysql.*
TO 'mysqluser'@'localhost'
IDENTIFIED BY 'agent_password';
```

To let replication discovery work, grant the `SELECT` privilege on the `mysql.inventory` table for each user with replication privileges on the corresponding replication master. This is required to let the MySQL Enterprise Monitor Agent read the replication master UUID. For example:

```
GRANT SELECT
ON mysql.inventory
TO 'replicationuser'@'%'
IDENTIFIED BY 'replication_password';
```



Note

Perform this step *after* running the agent on the corresponding MySQL server to ensure that the `mysql.inventory` table is created correctly. Run the agent, shut the agent down, run the above `GRANT` statement, and then restart the agent.

If the agent cannot access the information from the table, a warning containing this information is written to the agent log.



Note

You might disable logging for the grant statement to prevent the grant information being replicated to the slaves. In this case, execute the statement `SET SQL_LOG_BIN=0` before executing the above `GRANT` statement.

In a typical configuration, the agent runs on the same machine as the MySQL server it is monitoring, so the host name is `localhost`. If the agent is running on a machine other than the one that hosts the monitored MySQL server, change `localhost` to the appropriate value. For more information about remote monitoring, see [Section 5.3.6, “Configuring an Agent to Monitor a Remote MySQL Server”](#).

5.3.2 Installing the Monitor Agent on Unix and Linux



Note

To install the MySQL Enterprise Monitor Agent on Linux systems, you must have the Linux Standards Base (LSB) initialization functions installed. To check the existence of the LSB components, look for an LSB package within your Linux package management environment. For example, on RedHat and other RPM-based distributions:

```
shell> rpm -qa | grep -i lsb
redhat-lsb-3.1-19.fc8.x86_64
```

Under Debian/Ubuntu:

```
shell> dpkg -l|grep -i lsb
ii  lsb-base                                3.2-20ubuntu4
    Linux Standard Base 3.2 init script function
ii  lsb-release                            3.2-20ubuntu4
    Linux Standard Base version reporting utilit
```

Alternatively, you can use the `lsb_release` command. Existence of this command normally indicates that the current distribution is LSB compliant.

To install the agent, navigate to the directory that contains the file `mysqlmonitoragent-version-installer.bin` (where `version` indicates the three-part version number, the OS, and the architecture). Ensure that this file is executable by typing:

```
shell> chmod +x mysqlmonitoragent-version-installer.bin
```



Note

To install to the default directory (`/opt/mysql/enterprise/agent`), log in as `root` first. Installing as an unprivileged user installs to the `/home/user_name/mysql/enterprise/agent` directory.

To automatically start the agent upon rebooting, you must install while logged in as `root`. If you install as an unprivileged user, you must start the agent yourself after each reboot.

The following section covers installation from the command line. You can install the Monitor Agent graphically by running the installer from within a windows manager. In both cases, the steps are identical.

You can also install the Monitor Agent in `unattended` mode, for example to do multiple installations. For more information on unattended installation, see [Section 5.4, “Unattended Installation”](#).



Note

To install multiple agents on the same machine, use the `servicename` option to the installer to set a unique service name each time. For more information, see `installer_servicename`

Begin installation from the command line by typing:

```
shell> ./mysqlmonitoragent-version-installer.bin --mode text
```

The following section shows the various options. Default values are indicated by square brackets; to select them, press `Enter`. Otherwise, enter a value of your choosing.

1. First, select the Language you want to use during the installation process:

```
Language Selection

Please select the installation language
[1] English
[2] Japanese
Please choose an option [1] :
```

2. Next, specify the directory in which to install the agent:

```
-----
Welcome to the MySQL Enterprise Monitor Agent Setup Wizard.
-----

Please specify the directory where MySQL Enterprise Monitor Agent will be installed

Installation directory [/opt/mysql/enterprise/agent]:
```

3. If the installer identifies that an existing version of the MySQL Enterprise Monitor Agent is installed, provide an alternative name for the installation. This defines the name of the file created in `/etc/init.d` used to start the agent. You can enter a different name to perform multiple installations.
4. Specify the MySQL server to monitor. First, specify whether to use a TCP/IP or a socket-based connection to communicate with the MySQL Server:

```
How will the agent connect to the database it is monitoring?

[1] TCP/IP
[2] Socket
Please choose an option [1] :
```

5. Choose one or more operations for this agent to perform:
 - Enable monitoring a MySQL Server: This is the main operation of monitoring the MySQL server in terms of performance, security and availability.
 - Enable the MySQL Enterprise Agent Aggregator: It is used for future Connector plugins or user-written methods of transmitting Query Analyzer data to the MySQL Enterprise Service Manager.
 - Enable the MySQL Enterprise Agent Proxy Service: To study Query Analyzer information by sending your queries through the MySQL Enterprise Agent Proxy Service, switch this option on.
6. If you chose to monitor a MySQL server, next you provide the connection options for communicating with the server.

If you selected TCP/IP, you enter the TCP/IP address and port number:

```
-----
Monitored Database Information
...
MySQL hostname or IP address [127.0.0.1]:

Validate MySQL hostname or IP address [Y/n]:

MySQL Port [3306]:
```

If you select Socket, then you provide the path name to the MySQL socket. Typical values are `/tmp/mysql.sock`, `/var/lib/mysql.sock`, or `/var/run/mysql.sock`.

```
-----
Monitored Database Information
...
MySQL Socket []:
```



Note

The monitor agent always associates “localhost” with the TCP/IP address 127.0.0.1, not the MySQL socket. This is in contrast to the MySQL Command

Line Tool, which connects via the MySQL socket by default on Unix, if the hostname “localhost” is specified.

If the MySQL server to monitor was started with the `--skip-networking` option, then you cannot connect to it via TCP/IP, as the server does not listen for TCP/IP connections. In this case, configure the monitor agent to use the MySQL socket. During installation, select “socket” rather than “TCP/IP” and then specify the MySQL socket name. Or, after installation, edit the `agent-instance.ini` configuration file. For further information, refer to [Section C.2.2, “MySQL Server \(agent-instance.ini\) Configuration”](#).

If the MySQL server to be monitored was started using the command option `--bind-address`, then the server only listens for connections on the IP address specified, that is, the IP address of the MySQL server. If the monitor agent was started using TCP/IP networking and the default address of 127.0.0.1, it cannot connect to the server to be monitored. Also, if “localhost” is specified as the host name during agent configuration, a connection is not established, as the server listens for connections on the address specified with the `--bind-address` option, not 127.0.0.1.

7. Specify the user credentials for the MySQL server that you want to monitor:

```
MySQL Username []: service_agent
MySQL Password :
Re-enter :
```

8. The installer can create the MySQL Enterprise Monitor Agent user on the MySQL server that is required to connect to the server and obtain statistical information. The installer can create an account for you, or you can use an existing account. If you want the installer to create the user, enter the credentials of a user (such as the `root` user) that has the privileges to create the new user and grant it the privileges to monitor the server.

9. If you want to use Query Analyzer with the MySQL Enterprise Agent Aggregator, configure the aggregator port and SSL settings. For more information on Query Analyzer, see [Section 2.6, “The Query Analyzer Tab”](#).

When MySQL Enterprise Agent Aggregator is enabled, the MySQL Enterprise Monitor Agent listens on a network port for connections from Connector plugins providing query analyzer data, forwarding the query analyzer information to MySQL Enterprise Service Manager. You can change the port number that MySQL Enterprise Monitor Agent listens for connections from connectors. If you configure the aggregator to support SSL connections, you must provide the location of the PEM and CA certificate files to be used for SSL support.

The default port is 14000 for non-SSL communication, and 14443 for SSL communication.

10. If you enable the MySQL Enterprise Agent Proxy Service for Query Analyzer, enter the configuration information. (the port on which the agent listens for queries).

```
-----
Query Analyzer Configuration
```

```
MySQL Proxy enables query monitoring and analysis by listening on a specified port for client connections t
```

```

Click here for more information.
[Y/n]:

Enable Proxy (recommended) [Y/n]:

Proxy Port [6446]:

Backend Host: 127.0.0.1    (cannot be changed)

Backend Port: 3306    (cannot be changed)

```

If you disable the Query Analyzer during installation, you can re-enable the Query Analyzer by manually editing the configuration file. For instructions, see [Section 2.6, “The Query Analyzer Tab”](#).

11. Enter the details of the MySQL Enterprise Service Manager to use with this agent. You can retrieve this configuration information from the `configuration_report.txt` file generated when you installed MySQL Enterprise Service Manager.

```

-----

MySQL Enterprise Monitor Options

Hostname or IP address []: 192.168.0.197

Tomcat Server Port [18080]:

Tomcat SSL Port [18443]:

```

The agent and MySQL Enterprise Service Manager support using SSL for communication. To enable SSL communication between the agent and the MySQL Enterprise Service Manager, reply **Y** to the following question.

```

Use SSL? [y/N]:

Agent Username [agent]:

Agent Password :

Re-enter :

-----

```

12. Before installation starts, you receive a summary of the installation settings that you specified:

```

Here are the settings you specified:

Installation directory: /opt/mysql/enterprise/agent

Monitored MySQL Database:
-----
Hostname or IP address: 127.0.0.1
Port: 3306
MySQL username: mysql_user
MySQL password: password

```

```

Query Analyzer Configuration
-----
Proxy Enabled: yes
Proxy Port: 6446

MySQL Enterprise Manager:
-----

Hostname or IP address: 192.168.0.197

Tomcat Server Port: 18080
Tomcat SSL Port: 18443
Use SSL: 0
Agent username: agent

Press [Enter] to continue :

-----

Setup is now ready to begin installing MySQL Enterprise Monitor Agent on your computer.

Do you want to continue? [Y/n]: y

```

13. The installer copies the necessary files and creates the configuration file required to run the agent:

```

-----
Please wait while Setup installs MySQL Enterprise Monitor Agent on your computer.

Installing
0% _____ 50% _____ 100%
#####

-----

Info to start MySQL Agent

The MySQL agent was successfully installed. To start the MySQL Agent please
invoke:
/opt/mysql/enterprise/agent/etc/init.d/mysql-monitor-agent start
Press [Enter] to continue :

-----

Setup has finished installing MySQL Enterprise Monitor Agent on your computer.

```

14. Finally, you can read the supplied [README](#) file. The README is the `share/doc/README_en.txt` file within the agent installation directory.

For information on starting the agent, see [Section 5.3.4.2, "Starting/Stopping the Agent on Unix"](#).

5.3.3 Installing the Agent on Microsoft Windows

To install the MySQL Enterprise Monitor Agent on Windows, double-click the `mysqlmonitoragent-version-windows-installer.exe` (where *version* indicates the three-part version number) installer.



Note

To install the agent as a Windows service, you must do the installation as a privileged user.

On Windows Vista or later, if user account control is on, an operating system dialog box requests confirmation of the installation.

You can install the Monitor Agent in [unattended](#) mode, for example, to do multiple installations. For more information on this topic, see [Section 5.4, “Unattended Installation”](#).

**Note**

To install multiple agents on the same machine, use the [servicename](#) option to the installer to install each agent with a unique service name. For more information, see [installer_servicename](#). If the installer identifies an existing installation and you do not specify an alternative service name, the installer stops.

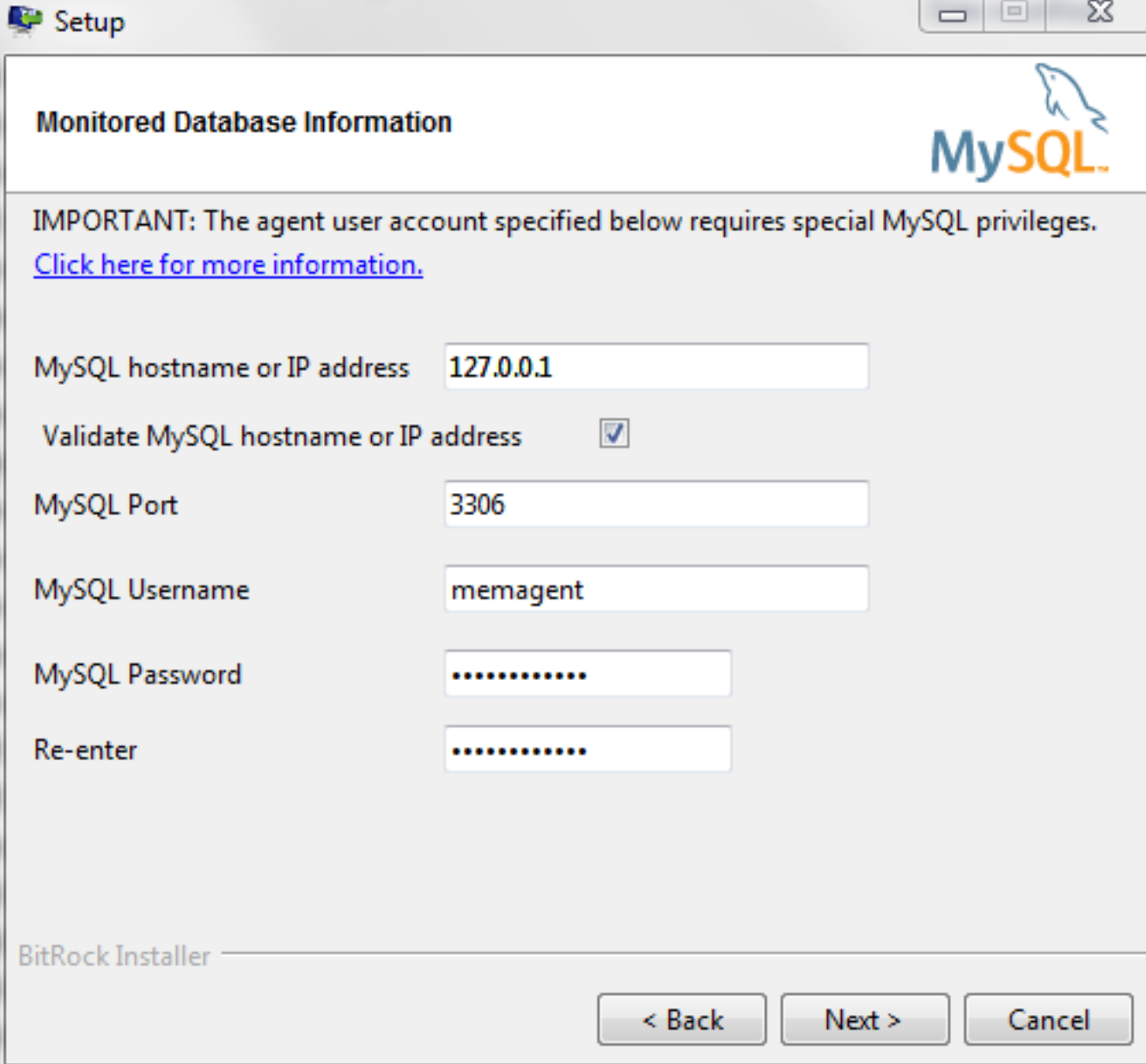
1. First, select the language for the MySQL Enterprise Monitor Agent installation. Click **OK** to continue installation.
2. Click **Next** to start the installation process.
3. Select the installation directory. The default installation directory is [C:\Program Files\MySQL\Enterprise\Agent](#). Select the installation directory, or type the new directory location. Click **Next** to continue the installation process.
4. Choose one or more operations for this agent to perform:
 - Enable monitoring a MySQL Server: This is the main operation of monitoring the MySQL server in terms of performance, security and availability.
 - Enable the MySQL Enterprise Agent Aggregator: It is used for future Connector plugins or user-written methods of transmitting query analyzer data to the MySQL Enterprise Service Manager.
 - Enable the MySQL Enterprise Agent Proxy Service: To study your query analyzer information by sending your queries through the MySQL Enterprise Agent Proxy Service, switch this option on.
5. You specify the information about the MySQL server that you want to monitor. Enter the IP address or host name of the host you want to monitor, and the port, user name and password to connect to the MySQL server. To confirm that the MySQL server is currently reachable using the information, ensure that the **Validate MySQL host name or IP address** checkbox is selected.

**Note**

Currently, on Windows, the monitor agent only includes support for connecting to the server to be monitored via TCP/IP, so you cannot monitor a server running with the [--skip-networking](#).

If the MySQL server to be monitored has been started using the command option [--bind-address](#), the server only listens for connections on the IP address specified, that is, the IP address of the MySQL server. If the monitor agent is started using TCP/IP networking and the default address of 127.0.0.1, it cannot connect to the server to be monitored. Also, if “localhost” is specified as the host name during agent configuration, a connection is not established, as the server listens for connections on the address specified with the [--bind-address](#) option, not 127.0.0.1.

Figure 5.4 MySQL Enterprise Monitor: Installing Agent on Windows: Monitored Database Information



The screenshot shows a Windows Setup window titled "Setup" with a standard Windows title bar. The main content area is titled "Monitored Database Information" and features the MySQL logo in the top right corner. A prominent message states: "IMPORTANT: The agent user account specified below requires special MySQL privileges. [Click here for more information.](#)". Below this, there are several input fields: "MySQL hostname or IP address" with the value "127.0.0.1", "Validate MySQL hostname or IP address" with a checked checkbox, "MySQL Port" with the value "3306", "MySQL Username" with the value "memagent", "MySQL Password" with masked characters, and "Re-enter" with masked characters. At the bottom left, it says "BitRock Installer". At the bottom right, there are three buttons: "< Back", "Next >", and "Cancel".

Setup

Monitored Database Information

MySQL

IMPORTANT: The agent user account specified below requires special MySQL privileges.
[Click here for more information.](#)

MySQL hostname or IP address 127.0.0.1

Validate MySQL hostname or IP address ☒

MySQL Port 3306

MySQL Username memagent

MySQL Password

Re-enter

BitRock Installer

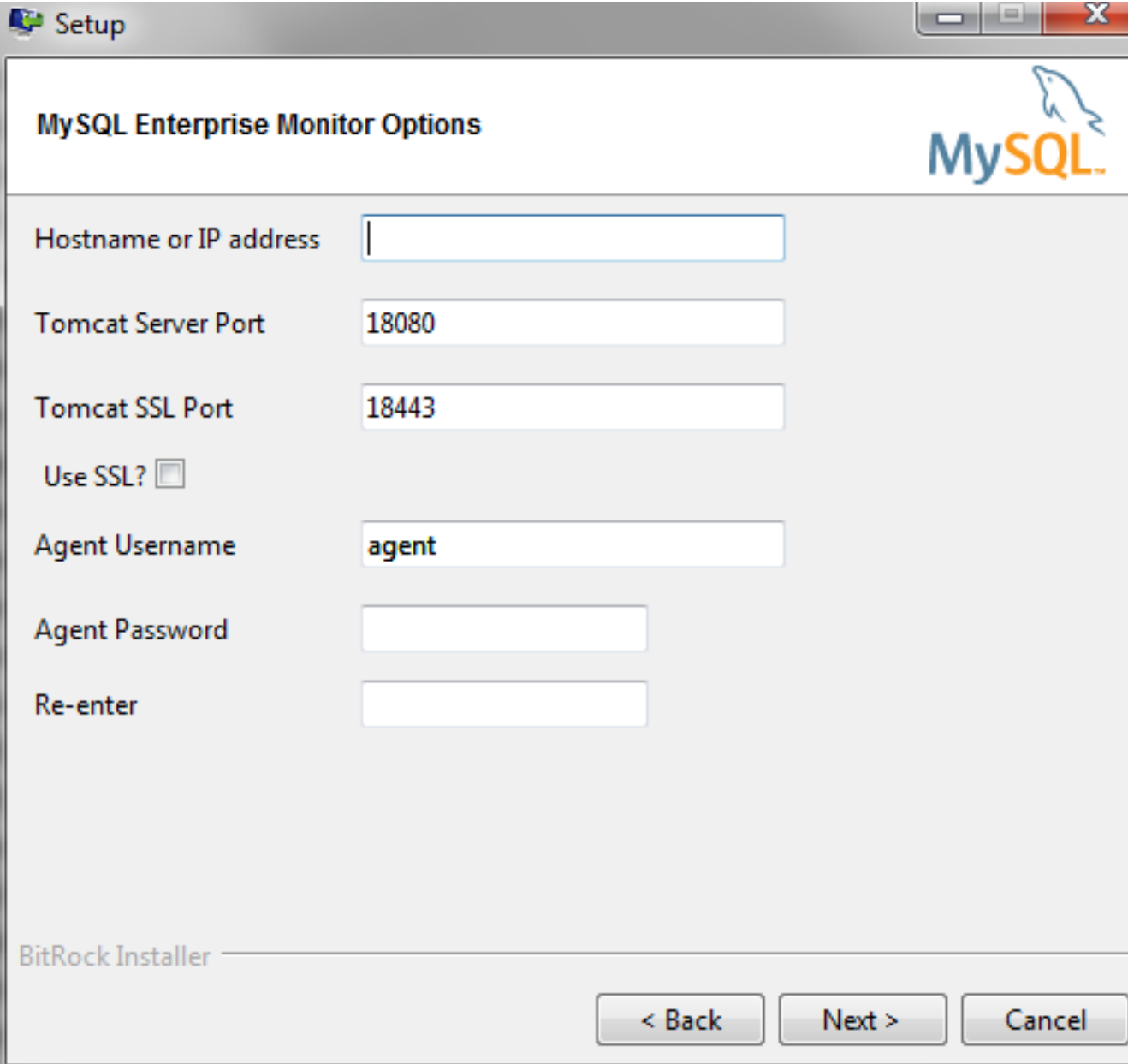
< Back Next > Cancel

Click **Next** to continue the installation.

6. The installer can create the MySQL Enterprise Monitor Agent user on the MySQL server that is required to connect to the server and obtain statistical information. The installer can create an account for you, or you can use an existing account. If you want the installer to create the user, enter the credentials of a user (such as the `root` user) that has the privileges to create the new user and grant it the privileges to monitor the server.
7. The MySQL Enterprise Service Manager that you want to use must be configured during installation. The host name, port and agent authentication information must be entered. If you have already

installed MySQL Enterprise Service Manager, you can locate the information in the installation report file created during installation. Enter the required information and then click **Next** to continue.

Figure 5.5 MySQL Enterprise Monitor: Installing Agent on Windows: MySQL Enterprise Service Manager Options



The screenshot shows a Windows setup window titled "Setup" with the subtitle "MySQL Enterprise Monitor Options". The MySQL logo is in the top right corner. The form contains the following fields and values:

Field	Value
Hostname or IP address	
Tomcat Server Port	18080
Tomcat SSL Port	18443
Use SSL?	<input type="checkbox"/>
Agent Username	agent
Agent Password	
Re-enter	

At the bottom, there are three buttons: "< Back", "Next >", and "Cancel". The "BitRock Installer" logo is in the bottom left corner.

8. To use Query Analyzer with the MySQL Enterprise Agent Aggregator, configure the aggregator port and SSL settings. For more information on Query Analyzer, see [Section 2.6, "The Query Analyzer Tab"](#).

When MySQL Enterprise Agent Aggregator is enabled, the MySQL Enterprise Monitor Agent listens on a network port for connections from Connector plugins providing query analyzer data, forwarding the query analyzer information to MySQL Enterprise Service Manager. You can change the port number that MySQL Enterprise Monitor Agent listens for connections from connectors. You can also configure

the aggregator to support SSL connections, in which case you must provide the location of the PEM and CA certificate files to be used for SSL support.

The default port is 14000 for non-SSL communication, and 14443 for SSL communication.

9. To use Query Analyzer with the MySQL Enterprise Agent Proxy Service, enable the MySQL Enterprise Monitor Agent Proxy service and configure the port and other information. If you disable the Proxy during installation, you must enable it later before you can use Query Analyzer. For more information on Query Analyzer, see [Section 2.6, “The Query Analyzer Tab”](#).

When Proxy is enabled, MySQL Enterprise Monitor Agent listens on a network port for client applications, and forwards the connections to the backend MySQL server. You can change the port number that MySQL Enterprise Monitor Agent listens for connections.

The default port is 6446.

10. You receive a Configuration Report containing the information that you have entered during the installation. Check the information provided in the report. If the information is correct, click **Next** to continue. If you see a problem, use **Back** to go back to the configuration screen and change the information.
11. You have a final opportunity to change the installation parameters. Click **Next** to start the installation process.
12. Once the agent is installed, you get a confirmation message. Click **Next** to finalize the installation.
13. You can start the MySQL Enterprise Monitor Agent automatically now that the installation is complete. To start the agent now, leave the checkbox selected. To start the agent separately, uncheck the checkbox. Click **Finish** to exit the installation.

Once the Monitor Agent is installed, you must start it. For information on how to start and stop the Agent, see [Section 5.3.4.1, “Starting/Stopping the Agent on Windows”](#).

5.3.4 Starting/Stopping the MySQL Enterprise Monitor Agent

The MySQL Enterprise Monitor Agent can be started and stopped at any time. When not running, information about the current status of your server is not available, and MySQL Enterprise Service Manager provides a warning if an agent and the MySQL server that it monitors is unavailable.



Warning

If you are using Query Analyzer, turning off the agent prevents your applications from communicating with the MySQL server. See [Section 2.6, “The Query Analyzer Tab”](#).

5.3.4.1 Starting/Stopping the Agent on Windows

You have the option of starting the Monitor Agent from the final installation screen. Otherwise you can do this by going to the [Start Menu](#) and under [Programs](#) find [MySQL](#) and then the [MySQL Enterprise Monitor Agent](#) entry. Simply select the [Start MySQL Enterprise Monitor Agent](#) option.



Note

On Windows Vista or later, starting the agent requires administrative privileges—you must be logged in as an administrator. To start or stop the agent right-click the menu item and choose the [Run as Administrator](#) menu option. The same restriction

applies to starting the agent from the command line. To open an administrator `cmd` window right-click the `cmd` icon and choose the Run as Administrator menu option.



Warning

To report its findings, the agent needs to be able to connect to the dashboard through the port specified during installation. The default value for this port is `18080`; ensure that this port is not blocked. If you need help troubleshooting the agent installation see, [Section 5.3.9, “Troubleshooting the Agent”](#).

Alternately, you can start the agent from the command line by entering:

```
shell> sc start MySQLEnterpriseMonitorAgent
```

or:

```
shell> net start MySQLEnterpriseMonitorAgent
```

You can also start the agent by issuing the command, `agentctl.bat start`. Stop the agent by passing the argument, `stop`. This batch file is found in the `Agent` directory.

For confirmation that the service is running you can open the Microsoft Management Console Services window. To do this go to the Control Panel, find [Administrative Tools](#) and click the link to [Services](#). Locate the service named `MySQL Enterprise Monitor Agent` and look under the **Status** column.

You can also start the agent from this window rather than from the `Start` menu or the command line. Simply right-click `MySQL Enterprise Monitor Agent` and choose `Start` from the pop-up menu. Starting the agent from this window opens an error dialog box if the agent cannot connect to the MySQL server it is monitoring. No error is displayed if the agent is unable to connect to the MySQL Enterprise Service Manager.

The pop-up menu for starting the agent also offers the option of stopping the agent. To stop the agent from the command line you only need type:

```
shell> sc stop MySQLEnterpriseMonitorAgent
```

or:

```
shell> net stop MySQLEnterpriseMonitorAgent
```



Note

`MySQLEnterpriseMonitorAgent` is the default name of the Monitor Agent service. If you have added an additional agent as described in [Section C.2.2, “MySQL Server \(agent-instance.ini\) Configuration”](#), replace `MySQLEnterpriseMonitorAgent` with the appropriate agent name.

5.3.4.2 Starting/Stopping the Agent on Unix

When installation is finished, you can start the monitor agent from the command line by typing:

```
shell> /opt/mysql/enterprise/agent/etc/init.d/mysql-monitor-agent start
```

For a non-`root` installation the command would be:

```
shell> /home/<user name>/mysql/enterprise/agent/etc/init.d/mysql-monitor-agent start
```

To stop the agent, use the `stop` command:

```
shell> ./mysql-monitor-agent stop
```

If the agent cannot be stopped because the `pid` file that contains the agent's process ID cannot be found, you can use `kill` to send a `TERM` signal to the running process:

```
shell> kill -TERM PID
```

If you run more than one agent on a specific machine, you must also specify the path to the `ini` file when you stop the agent. Executing `mysql-monitor-agent stop` without an `ini` file only stops the agent associated with the default `ini` file. Likewise, when checking the status of an agent, specify its `ini` file.

To verify that the agent is running, use the following command:

```
shell> ./mysql-monitor-agent status
```

The resulting message indicates whether the agent is running. If the agent is not running, use the following command to view the last ten entries in the agent log file:

```
shell> tail /opt/mysql/enterprise/agent/log/mysql-monitor-agent.log
```

For further information on troubleshooting the agent, see [Section 5.3.9, "Troubleshooting the Agent"](#).

Installation creates the directory `/opt/mysql/enterprise/agent` with the settings stored in the `mysql-monitor-agent.ini` file located directly below this directory in the `etc` directory. The `log` directory is also located immediately below the `agent` directory.

To see all the command-line options available when running the monitor agent, navigate to the `/opt/mysql/enterprise/agent/etc/init.d` directory and execute `mysql-monitor-agent help`, which displays the usage message:

```
Usage: ./mysql-monitor-agent {start|stop|restart|status} [ini-file-name]
```

The `ini-file-name` option only needs to be used if the `ini` file is not installed to the default location or you have changed the name of the `ini` file. You will need to use this option if you are installing more than one agent on the same machine. Pass the full path to the `ini` file. For example, after navigating to the `/opt/mysql/enterprise/agent/etc/init.d` directory, issue the command:

```
shell> ./mysql-monitor-agent start /opt/mysql/enterprise/agent/etc/new-mysql-monitor-agent.ini
```

If you installed the agent as `root`, on reboot the `mysql-monitor-agent` daemon starts up automatically. If you installed the agent as an unprivileged user, you must manually start the agent on reboot or write a script to perform this task. Likewise, if you added an additional agent as described in [Section C.2.2, "MySQL Server \(agent-instance.ini\) Configuration"](#), to start this agent on reboot, create a system initialization script appropriate to your operating system. To determine whether the agent is running, navigate to the `init.d` directory and issue the command `./mysql-monitor-agent status`.



Warning

To report its findings, the agent connects to the dashboard through the port specified during installation. The default value for this port is [18080](#); ensure that this port is not blocked. To troubleshoot the agent installation, see [Section 5.3.9, “Troubleshooting the Agent”](#).

5.3.5 Monitoring Multiple MySQL Servers

You can monitor multiple MySQL servers (either on the same machine, or across different machines) using two different methods:

- Using multiple copies of the MySQL Enterprise Monitor Agent to monitor each server individually. Using this method requires additional overhead to monitor each server, while also allowing you to supply Query Analyzer data.
- Using a single agent instance to monitor multiple MySQL servers. Query Analysis is not available for the additional servers. As the number of monitored servers increases, graphs might begin to lag (for >10 servers) or become blank (for >20 servers).

Using Multiple Agent Instances

To use multiple agents to monitor multiple MySQL servers you need to create a new configuration structure for both the agent and the MySQL server instances you need to monitor, including the binaries and configuration files, and then update the configuration to set the corresponding parameters to monitor the new server. Using this method lets you enable query analysis by redirecting requests to the target server using the built-in proxy service within the agent.

For example, the following directory structure shows the configuration directory for two agents monitoring a single MySQL server each:

```
./init.d
./init.d/mysql-monitor-agent
./instances
./instances/agent
./instances/agent/agent-instance.ini
./instances-second/agent
./instances-second/agent/agent-instance.ini
./mysql-monitor-agent.ini
./mysql-second-agent.ini
```

The `mysql-monitor-agent.ini` file contains the configuration for the first agent, with the MySQL servers monitored defined within the `instances` directory. The `mysql-second-agent.ini` file contains the configuration information for the second agent, with the MySQL servers monitor defined within the `instances-second` directory.

To set up multiple agents:

1. Make sure that the MySQL instance that you want to monitor has a suitable user to use for connecting to the server. For more information, see [Section 5.3.1, “Creating a MySQL User Account for the Monitor Agent”](#).
2. You need to generate a new UUID for the new agent:

```
shell> /opt/mysql/enterprise/agent/bin/mysql-proxy --plugins=agent --agent-generate-uuid
ee9296d7-f7cd-4fee-8b26-ead884ebf398
2009-03-05 11:49:37: (critical) shutting down normally
```

Keep a record of the UUID to update the configuration file.

Note, the agent should not be running when the UUID is generated.

3. Copy the main agent configuration file, which is by default in `/opt/mysql/enterprise/agent/etc/mysql-monitor-agent.ini`:

```
shell> cp mysql-monitor-agent.ini mysql-second-agent.ini
```

4. Edit the new configuration file, changing the following settings:

- Change the `mysqld-instance-dir` to the new directory for the individual MySQL server configuration files.
- Change the `proxy-address` to a different value than the first agent configuration.
- Change the `proxy-backend-addresses` to specify the IP address and MySQL port number for the MySQL server.
- Change the `agent-uuid` to the new value obtained in an earlier step.
- Change the `log-file` parameter to specify a different file to use when logging errors and problems. You cannot log to the same file from two different agents.
- Change the `pid-file` parameter to specify the file in which to store the process ID of the agent.

5. Copy an existing configuration directory and configuration files to the new directory:

```
shell> cp -R etc/instances etc/instances-second
```

6. Edit the configuration file, `instances/second/agent/agent-instance.ini` within the new directory, and set the `user`, `password` and either the `hostname` and `port`, or `socket` parameters.
7. With multiple instances, you start each agent individually, specifying the location of the main configuration file. For example, to start the original (default) service:

```
shell> /opt/mysql/enterprise/agent/etc/init.d/mysql-monitor-agent start /opt/mysql/monitor/agent/etc/mysql-
```

To start the second instance:

```
shell> /opt/mysql/enterprise/agent/etc/init.d/mysql-monitor-agent start /opt/mysql/monitor/agent/etc/mysql-
```

Using a Single Agent Instance



Warning

Do not use the single agent instance method if you intend to use Query Analyzer. If you set your application to use the proxy port provided by the single instance then the queries might not be directed to the correct server. Using Query Analyzer, the proxy, and the single agent instance method is not supported.



Warning

When using the single agent instance method, the agent attempts to determine the right information about the backend server that it is monitoring in order to use the

information when applying rule and advisor information. Currently, this operation is performed for only one of the servers in the list of configured servers. If the servers being monitoring are using different MySQL versions then the rules applied to the servers might be incorrect, and you could get wrong or misleading advice about issues or problems on a given server.

To use a single agent to monitor multiple instances, you can create additional directories and configuration files within the `instances` directory for the agent. For example, you can see the default structure of the agent configuration directory:

```
./init.d
./init.d/mysql-monitor-agent
./instances
./instances/agent
./instances/agent/agent-instance.ini
./mysql-monitor-agent.ini
```

Within the `instances` directory, you can add further directories, one for each monitored server. Each additional directory must have a suitable `agent-instance.ini` file containing the connection information for the new MySQL server instance. For example, the following structure demonstrates an agent monitoring four MySQL servers:

```
./init.d
./init.d/mysql-monitor-agent
./instances
./instances/agent
./instances/agent/agent-instance.ini
./instances/mysql2
./instances/mysql2/agent-instance.ini
./instances/mysql-rep
./instances/mysql-rep/agent-instance.ini
./instances/mysql-backup
./instances/mysql-backup/agent-instance.ini
./mysql-monitor-agent.ini
```

To add another MySQL monitored server, follow these steps:

1. Make sure that the MySQL instance that you want to monitor has a suitable user to use for connecting to the server. For more information, see [Section 5.3.1, “Creating a MySQL User Account for the Monitor Agent”](#).
2. Copy an existing configuration directory and configuration files to the new directory:

```
shell> cp -R etc/instances/agent etc/instances/mysql2
```

3. Edit the configuration file within the new directory, for example `mysql2/agent-instance.ini`, and set the `user`, `password` and either the `hostname` and `port`, or `socket` parameters.
4. Restart the agent:

```
shell> mysql-monitor-agent restart
```

5.3.6 Configuring an Agent to Monitor a Remote MySQL Server

Typically, the agent runs on the same machine as the MySQL server it is monitoring. Fortunately, this is not a requirement. If you want to monitor a MySQL server running on an operating system for which there is no agent available, you can install the agent on a machine other than the one hosting the MySQL server.

The process for installing an agent to monitor a MySQL server on a remote machine is identical to the process described in [Section 5.3, “Monitor Agent Installation”](#). Follow the directions given there, being careful to specify the correct IP address or host name for the MySQL Enterprise Service Manager and likewise for the MySQL server—since the agent is not running on the same machine as the MySQL server, it cannot be the default, `localhost`.

Don't forget that the agent must be given rights to log in to the MySQL server from a host other than `localhost` and that the port used by the MySQL server, typically `3306` must be open for remote access. For more information about the database credentials required by agents see, [Section 5.3.1, “Creating a MySQL User Account for the Monitor Agent”](#).

The agent also needs to be able to log in to the MySQL Enterprise Service Manager, typically using port `18080`, so ensure that the appropriate port is open.

**Note**

Remote agents do not report the OS information for either the host or the agent.

For replication autodiscovery, do **not** use remote monitoring with replication slaves or masters. The agent must be installed on the same machine as the server you are monitoring in order for discovery to work properly. For more information, see [Section 2.7, “The Replication Tab”](#).

5.3.7 Monitoring Outside the Firewall with an SSH Tunnel

If you run an SSH server on the machine that hosts the MySQL Enterprise Service Manager and an SSH client on the machine that hosts the agent, you can create an SSH tunnel so that the agent can bypass your firewall. First, you need to make an adjustment to the `hostname` value specified in the `[mysql-proxy]` section of the `.ini` file. (For more information about the contents and location of the `.ini` file see [Section C.2.1, “MySQL Enterprise Monitor Agent Configurable Options”](#).) Stop the agent and change the `hostname` value as shown in the following:

```
hostname = http://agent_name:password@localhost:18080/heartbeat
```

Replace the `agent_name` and `password` with suitable values. Likewise replace port `18080` if you are not running the dashboard on this port. Use `localhost` for the host name, since the agent is connecting through an SSH tunnel.

Next, execute the following command on the machine where the agent is running:

```
shell> ssh -L 18080:Dashboard_Host:18080 -l user_name -N Dashboard_Host
```

When prompted, enter the password for `user_name`.

If you are not running the MySQL Enterprise Service Manager on port `18080`, substitute the appropriate port number. Likewise, replace `Dashboard_Host` with the correct value. `user_name` represents a valid operating system user on the machine that hosts the MySQL Enterprise Service Manager.

Be sure to restart the agent so that the new value for the `hostname` takes effect. For instructions on restarting the agent see:

- Under Windows see, [Section 5.3.4.1, “Starting/Stopping the Agent on Windows”](#).
- Under Unix see, [Section 5.3.4.2, “Starting/Stopping the Agent on Unix”](#).

5.3.8 Generating a New UUID

For MySQL Enterprise Monitor to operate correctly, each agent must have a unique UUID in order to uniquely identify the agent with the MySQL Enterprise Service Manager.



Warning

Ensure that you do not reuse or duplicate a UUID. Running two agents with the same identification number yields unpredictable results

Go to the Agent installation directory and enter the following command:

```
shell> bin/mysql-proxy --plugins=agent --agent-generate-uuid
```

This should display a line similar to the following:

```
ee9296d7-f7cd-4fee-8b26-ead884ebf398
```

Paste this line into the `[mysql-proxy]` section of the `mysql-monitor-agent.ini` file for the `agent-uuid` parameter:

```
[mysql-proxy]
...
agent-uuid=ee9296d7-f7cd-4fee-8b26-ead884ebf398
```

In Windows, go to the command line and change to the MySQL Enterprise Monitor Agent installation directory and update the UUID by executing:

```
C:\> cd C:\Program Files\MySQL\Enterprise\Agent
C:\> mysql-monitor-agent -uf mysql-monitor-agent.ini
```

This updates the configuration file directly with the new UUID.

5.3.9 Troubleshooting the Agent

The first step in troubleshooting the agent is finding out whether it is running or not. To do this see:

- Windows: [Section 5.3.4.1, “Starting/Stopping the Agent on Windows”](#)
- Unix: [Section 5.3.4.2, “Starting/Stopping the Agent on Unix”](#)

Some additional tips are:

- To diagnose any issues with the agent, start by looking at the **Logs** link under the **Settings** tab, as described in [Section 2.8.6, “Logs”](#). This page consolidates troubleshooting information across all the MySQL Enterprise Monitor components.
- To run on start-up, the agent requires correct login credentials for the monitored MySQL server. Log in to the monitored MySQL server and check the agent's credentials. Compare the values of the `Host`, `User`, and `Password` fields in the `mysql.user` table with the values shown in the `[mysqld]` section of the `etc/instances/mysql/agent-instance.ini`. If incorrect credentials are specified in the `ini` file, simply correct them and restart the agent. Remember, changes to the `ini` file do not take effect until the agent is restarted.
- The agent will not start up if incorrect credentials are specified for the service manager login. Using incorrect credentials for logging in to the service manager creates an entry in the agent log file. For the location of this log file see [Section C.2.3, “Agent Log and pid Files”](#).
- If the agent starts up but no server appears in the dashboard, check the `hostname` specified in the `[mysql-proxy]` portion of the `mysql-monitor-agent.ini` file. Incorrect credentials, IP address,

or port will all cause the MySQL server to fail to appear in the dashboard. Also, ensure that the port specified in this file is not blocked on the machine hosting the MySQL Enterprise Service Manager.

- An easy way to confirm that the agent can log in to the service manager is to type http://Dashboard_Host:18080/heartbeat into the address bar of your web browser, substituting the appropriate host name and port. When the HTTP authentication dialog box opens, enter the agent user name and password. The following message indicates a successful login:

```
<exceptions>
<error>E0401: NullAgentPayloadException: []</error>
</exceptions>
```



Note

Despite the fact that the preceding listing shows an error, you have logged in successfully. This error appears *because* you have logged in but with no “payload”.

If you can log in successfully in the way described above and the agent is running, then there are errors in the `mysql-monitor-agent.ini` file. Compare the host name, port, agent name, and password found in the `ini` file with the values you entered into the address bar of your web browser.

- If HTTP authentication fails then you are using incorrect credentials for the agent. Attempting to log in to the service manager using incorrect credentials creates an entry in the agent log file. For the location of this log file see [Section C.2.3, “Agent Log and pid Files”](#).

If no HTTP authentication dialog box appears, and you are unable to connect at all, then the host name or port might be specified incorrectly. Confirm the values you entered against those described as the `Application hostname and port:` in the `configuration_report.txt` file. Failure to connect could also indicate that the port is blocked on the machine hosting the MySQL Enterprise Service Manager.

- To check if a blocked port is the problem, temporarily bring down your firewall. If the agent is then able to connect, open up the port specified during installation and restart the agent. If necessary you can monitor outside the firewall using an SSH tunnel. For more information, see [Section 5.3.7, “Monitoring Outside the Firewall with an SSH Tunnel”](#).
- You can also check the agent error log file to help determine any problems. An error such as the following might indicate a blocked port:

```
(critical) connection to merlin-server
'http://agent:test@172.11.1.1:18080/heartbeat' failed:
"connect() timed out!" error.
```

For the location of the agent error log file, see [Section C.2.3, “Agent Log and pid Files”](#).

- Setting the `log-level` entry in your `ini` file is also a good debugging technique. For more information on this subject see, [Section C.2.1, “MySQL Enterprise Monitor Agent Configurable Options”](#).
- Running the agent from the command line sometimes displays errors that fail to appear in the log file or on the screen when the agent is started from a menu option. To start the agent from the command line see the instructions given at the start of this section.
- If you have more than one agent running on the same machine, the `UUID` must be unique and the `log-file` and `pid-file` values must be different. For more information, see [Section C.2.2, “MySQL Server \(agent-instance.ini\) Configuration”](#).

- If the agent and the MySQL server it is monitoring are running on different machines, ensure that the correct `host` is specified for the agent account. The correct port, typically 3306, must also be open for remote login. For more information about remote monitoring see, [Section 5.3.6, “Configuring an Agent to Monitor a Remote MySQL Server”](#).
- The MySQL Enterprise Monitor Agent and MySQL Enterprise Service Manager use the unique host ID, stored within the `mysql.inventory` table on the monitored MySQL Server, to determine whether the instance being monitored is a clone. The host ID of the current server is checked against the stored value when the agent starts. If the generated host ID and stored host ID do not match, you get an error similar to the following in the agent log file:

```
%s: [%s] the hostid from mysql.inventory doesn't match our agent's host-id (%s != %s)
We assume that this is a cloned host and shutdown now.
Please TRUNCATE TABLE mysql.inventory on this mysql-instance and restart the agent.
If this is a master for replication, please also run SET SQL_LOG_BIN = 0; first.
```

To fix the problem, connect to the MySQL server using the credentials configured when you installed the agent, and then truncate the `mysql.inventory` table:

```
mysql> TRUNCATE mysql.inventory;
```

Now restart the agent, which recreates the `mysql.inventory` table with the updated instance UUID and hostid information.

- If the MySQL Enterprise Monitor Agent is restarted after being terminated ungracefully (for example, by the `kill` command), you might see a `DuplicateAgentUuidException` error until the original registration of the previous instance of the agent expires.

5.4 Unattended Installation

This section explains how to automate the install and upgrade procedures for the MySQL Enterprise Service Manager and MySQL Enterprise Monitor Agent components, to perform those operations across one or multiple machines without any user interaction.

To perform an unattended installation, specify the installation mode as `unattended` by using the `mode` command line option. In this mode, you specify all the installation parameters, such as the installation directory, and user, password, and network options, through command-line options. For convenient scripting, you can save these options in a text file and run the installer using the `optionfile` option.

Before performing an unattended installation, familiarize yourself with the options by doing at least one interactive MySQL Enterprise Monitor install. Read the regular installation instructions, since some tasks still remain after an unattended installation: you must configure the MySQL Enterprise settings, import the advisors, and start up all the services/daemons.

5.4.1 Performing an Unattended Installation

The basic process for performing an unattended installation is the same for both the MySQL Enterprise Monitor Agent and MySQL Enterprise Service Manager installers, with the only difference being the options supported by each installer. For information on the options for MySQL Enterprise Service Manager, see [Section 5.4.2, “MySQL Enterprise Service Manager Options”](#). For information on the options for MySQL Enterprise Monitor Agent, see [Section 5.4.3, “MySQL Enterprise Monitor Agent Options”](#).

There are two methods for installation: either specify the option on the command line, or use an options file containing the relevant options and their values.

For example, using the command-line method, you could install the MySQL Enterprise Monitor Agent using:

```
shell> mysqlmonitoragent-version-linux-glibc2.3-x86-64bit-installer.bin
--installdir /data0/mysql/agent
--mysqlhost 127.0.0.1 --mysqlport 3306 --mysqluser agent --mysqlpassword mysql --checkmysqlhost yes
--managerhost localhost --managerport 48080 --agentuser AGENTUSER --agentpassword PASSWORD
--proxyport 44044 --mode unattended --enableproxy 1
--createaccount 1 --rootuser ROOTUSER --rootpassword PASSWORD
```

For unattended installation using an option file, create a text file that contains the definition for the installation. The following example uses a sample configuration file named `options.server.txt`:

```
debugtrace=/opt/mysql/enterprise/install.debugtrace.monitor.log
mode=unattended
installdir=/opt/mysql/enterprise/monitor
tomcatport=8080
tomcatshutdownport=8005
tomcatsslport=8443
adminpassword=myadminpassword
dbport=3300
```

This file identifies a directory and file name for a log file, sets the `mode` to `unattended`, and uses the `installdir` option to specify an installation directory.



Note

Set the `installdir` and `debugtrace` options to values appropriate to your locale and operating system.

The only options that must be specified in an option file when installing the MySQL Enterprise Service Manager are `mode` (if not specified at the command line), `installdir`, and `adminpassword`.

Check the options in your option file closely before installation; problems during unattended installation do not produce any error messages.

Put the monitor installer file and the options file in the same directory.

The following examples show how to start the unattended installation from the command line.

On Windows within a command shell:

```
C:\> mysqlmonitor-version-windows-installer.exe --optionfile options.server.txt
```

On Unix, use a command-line of the form:

```
shell> mysqlmonitor-version-installer.bin --optionfile options.server.txt
```

When installing MySQL Enterprise Monitor Agent, the same basic process can be followed using the MySQL Enterprise Monitor Agent installer and the corresponding agent options.

As a minimum for the MySQL Enterprise Monitor Agent installation, specify the `mode` (if not specified at the command line), `mysqluser`, `installdir`, `mysqlpassword`, and `agentpassword` options. Create a file containing these values and use it with the `optionfile` option for unattended agent installation.

5.4.2 MySQL Enterprise Service Manager Options

The following options let you customize the installation process for MySQL Enterprise Service Manager. The MySQL Enterprise Service Manager supports using a bundled MySQL server, or a separate MySQL server provided by the user. To use your own MySQL server, the server must be installed and running before installation. For more information, see [Section 5.2.1, “Service Manager Installation Common Parameters”](#).

Table 5.1 MySQL Enterprise Service Manager Installer Options

Format	Description
<code>--adminpassword</code>	Password for the database repository
<code>--adminuser</code>	Username for the database repository
<code>--dbhost</code>	Hostname or IP address of the MySQL server
<code>--dbport</code>	TCP/IP port for the MySQL server
<code>--debuglevel</code>	Set the debug information level
<code>--debugtrace</code>	File for a debug trace of the installation
<code>--forceRestart</code>	Upgrade only. Restarts the services after the upgrade process completes.
<code>--help</code>	Display the list of valid options
<code>--installdir</code>	Installation directory
<code>--installer-language</code>	Language selection
<code>--mode</code>	Installation mode
<code>--mysql_installation_type</code>	MySQL server to be used by the MySQL Enterprise Monitor
<code>--mysql_ssl</code>	Use SSL when connecting to the database
<code>--optionfile</code>	Installation option file
<code>--tomcatport</code>	Server port for the Tomcat component
<code>--tomcatshutdownport</code>	Shutdown TCP/IP port for the Tomcat component
<code>--tomcatsslport [145]</code>	SSL TCP/IP port for the Tomcat component
<code>--unattendedmodeui</code>	Unattended mode user interface
<code>--usessl</code>	Enable SSL support
<code>--version</code>	Display the product information

- `--help`

Command-Line Format	<code>--help</code>
----------------------------	---------------------

Display the list of valid installer options.

- `--version`

Command-Line Format	<code>--version</code>
----------------------------	------------------------

Display product and version information.

- `--optionfile`

Command-Line Format	<code>--optionfile</code>
----------------------------	---------------------------

The path to the option file containing the information for the installation.

- `--mode`

Command-Line Format	<code>--mode</code>	
Permitted Values (Linux)	Type	<code>string</code>
	Default	<code>gtk</code>
	Valid Values	<code>gtk</code> (GTK (X Windows))
		<code>xwindow</code> (X Windows (native))
		<code>text</code> (Text (command-line))
		<code>unattended</code> (Unattended (no dialogs/prompts))
Permitted Values (OS X, <= 2.3.19)	Type	<code>string</code>
	Default	<code>osx</code>
	Valid Values	<code>osx</code> (Mac OS X (native))
		<code>text</code> (Text (command-line))
		<code>unattended</code> (Unattended (no dialogs/prompts))
Permitted Values (Unix)	Type	<code>string</code>
	Default	<code>xwindow</code>
	Valid Values	<code>xwindow</code> (X Windows (native))
		<code>text</code> (Text (command-line))
		<code>unattended</code> (Unattended (no dialogs/prompts))
Permitted Values (Windows)	Type	<code>string</code>
	Default	<code>win32</code>
	Valid Values	<code>win32</code> (Windows (native))
		<code>unattended</code> (Unattended (no dialogs/prompts))

The installation mode to use for this installation.

- `--debugtrace`

Command-Line Format	<code>--debugtrace</code>	
Permitted Values	Type	<code>string</code>

The filename to use for a debug trace of the installation.

- `--debuglevel`

Command-Line Format	<code>--debuglevel</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>2</code>
	Min Value	<code>0</code>
	Max Value	<code>4</code>

Set the debug information level for log data written to the file specified by [debugtrace](#).

- [--installer-language](#)

Command-Line Format	--installer-language	
Permitted Values	Type	string
	Default	en
	Valid Values	en (English) ja (Japanese)

The installer language.

- [--installdir](#)

Command-Line Format	--installdir	
Permitted Values (OS X, <= 2.3.19)	Type	string
	Default	/Applications/mysql/enterprise/monitor/
Permitted Values (Unix)	Type	string
	Default	/opt/mysql/enterprise/monitor/
Permitted Values (Windows)	Type	string
	Default	C:\Program Files\MySQL\Enterprise\Monitor

The installation directory for MySQL Enterprise Service Manager.

- [--tomcatport](#)

Command-Line Format	--tomcatport	
Permitted Values	Type	numeric
	Default	18080

The TCP/IP port for the MySQL Enterprise Service Manager. This port is used by MySQL Enterprise Monitor Agent and as the port for the interface to the MySQL Enterprise Monitor User Interface.

- [--tomcatshutdownport](#)

Command-Line Format	--tomcatshutdownport	
Permitted Values	Type	numeric
	Default	18005

The MySQL Enterprise Service Manager Tomcat shutdown port.

- [--tomcatsslport](#)

Command-Line Format	--tomcatsslport	
Permitted Values	Type	numeric
	Default	18443

The TCP/IP port to use for SSL communication to the MySQL Enterprise Service Manager.

- `--usessl`

Command-Line Format	<code>--usessl</code>	
Permitted Values	Type	<code>boolean</code>
	Default	<code>0</code>
	Valid Values	<code>0</code> (Do not use SSL for the user interface and monitoring agent) <code>1</code> (Use SSL for the user interface (https) and monitoring agent)

Enable SSL communication between MySQL Enterprise Monitor Agent and MySQL Enterprise Service Manager, and enforce https connections for the user interface.

- `--mysql_ssl`

Command-Line Format	<code>--mysql_ssl</code>	
Permitted Values	Type	<code>boolean</code>
	Default	<code>0</code>
	Valid Values	<code>0</code> (Do not use SSL when connecting to the database) <code>1</code> (Use SSL when connecting to the database)

Enable SSL for the connection between MySQL Enterprise Service Manager and the repository.

- `--adminuser`

Command-Line Format	<code>--adminuser</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>service_manager</code>

The user name to use for connecting to the database repository used by MySQL Enterprise Service Manager. If you install the bundled MySQL server, this user is configured in the new database. If you use an existing MySQL server, specify an existing user with rights to access the database.



Warning

The repository user name and password are stored in unencrypted form in the `config.properties` file. To locate this file on your operating system see [Section C.1.5, “The `config.properties` file”](#).

- `--unattendedmodeui`

Command-Line Format	<code>--unattendedmodeui</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>none</code>
	Valid Values	<code>none</code> (No dialogs)
		<code>minimal</code> (Critical dialogs)
		<code>minimalWithDialogs</code> (Minimal UI with dialogs)

The UI elements to use when performing an unattended installation. The options are `none`, show no UI elements during the installation; `minimal`, show minimal elements during installation; `minimalWithDialogs`, show minimal UI elements, but include the filled-dialog boxes.

- `--adminpassword`

Command-Line Format	<code>--adminpassword</code>	
Permitted Values	Type	<code>string</code>

The MySQL Enterprise Service Manager password for connecting to the MySQL database repository.

- `--mysql_installation_type`

Command-Line Format	<code>--mysql_installation_type</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>bundled</code>
	Valid Values	<code>bundled</code> (Use the bundled MySQL server) <code>existing</code> (Use an existing (user supplied) MySQL server)

Specifies whether the installer should configure MySQL Enterprise Service Manager to install the bundled MySQL server, or use a MySQL server that you have already installed to store the repository data.

- `--dbport`

Command-Line Format	<code>--dbport</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>13306</code>

The TCP/IP port for the MySQL database used to store MySQL Enterprise Service Manager repository data. If you install the bundled MySQL server, this is the port where the new database listens for connections. If you use an existing MySQL server, specify the port used for connections by that MySQL server.

- `--dbhost`

Command-Line Format	<code>--dbhost</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>127.0.0.1</code>

The hostname for the MySQL database. When installing MySQL Enterprise Service Manager to use an existing MySQL server, this should be the hostname of the server that will store the database repository.

- `--forceRestart`

Command-Line Format	<code>--forceRestart</code>	
Permitted Values	Type	<code>boolean</code>
	Default	<code>0</code>

	Valid Values	0 (Do not restart services)
		1 (Restart services)

Force a restart of MySQL Enterprise Service Manager, even if there is a change to the configuration file that would normally prevent the automatic restart of the server.

5.4.3 MySQL Enterprise Monitor Agent Options

To view all the options available for an unattended *agent* installation, invoke the agent installer file passing in the `help` option. The available options are detailed in the following table.

Table 5.2 MySQL Enterprise Monitor Agent Installer Options

Format	Description
<code>--agentpassword</code>	Password of the agent user for connecting to the monitored MySQL server
<code>--agentuser</code>	Username of the agent for connecting to the monitored MySQL server
<code>--aggregatorport</code>	TCP/IP port for the Aggregator component
<code>--aggregatorsslcafile</code>	CA certificate file for SSL support in the Aggregator component
<code>--aggregatorsslcertfile</code>	PEM certificate file for SSL support in the Aggregator component
<code>--aggregatorsslport</code>	SSL port for the Aggregator component
<code>--checkmysqlhost</code>	Validate the supplied MySQL hostname
<code>--createaccount</code>	Create an account on the monitored MySQL server to be used by the agent
<code>--debuglevel</code>	Set the debug information level
<code>--debugtrace</code>	File for a debug trace of the installation
<code>--enableagent</code>	Enable the agent to monitor a MySQL server
<code>--enableaggregator</code>	Enable the Aggregator to aggregate Query Analyzer data from an external source
<code>--enableproxy</code>	Enable query analyzer data to be captured using the proxy service
<code>--help</code>	Display the list of valid options
<code>--installdir</code>	Installation directory
<code>--installer-language</code>	Language selection
<code>--managerhost</code>	Hostname or IP address of the MySQL Enterprise Monitor server
<code>--managerport</code>	TCP/IP port of the MySQL Enterprise Monitor server
<code>--managersslport []</code>	TCP/IP port of the MySQL Enterprise Monitor server for SSL communication
<code>--mode</code>	Installation mode
<code>--mysqlconnmethod</code>	Connection method to the monitored MySQL server
<code>--mysqlhost</code>	MySQL hostname/IP address
<code>--mysqlpassword</code>	MySQL password for the monitored --mysqluser.
<code>--mysqlport</code>	TCP/IP port for the monitored MySQL server
<code>--mysqlsocket</code>	Unix socket/Named pipe for the monitored MySQL server

Format	Description
<code>--mysqluser</code>	MySQL Administrative username for the monitored MySQL server
<code>--optionfile</code>	Installation option file
<code>--proxyport</code>	TCP/IP port for the Proxy module
<code>--proxyuser</code>	User account for the proxy service
<code>--rootpassword</code>	Password for root user
<code>--rootuser</code>	User with root privileges on the monitored MySQL server
<code>--servicename</code>	Service name for the Agent
<code>--unattendedmodeui</code>	Unattended mode user interface
<code>--usessl</code>	Enable use of SSL communication with MySQL Enterprise Monitor server
<code>--version</code>	Display the product information

- `--agentpassword`

Command-Line Format	<code>--agentpassword</code>	
Permitted Values	Type	<code>string</code>

Specify the agent password to use to communicate with the MySQL Enterprise Service Manager.

- `--agentuser`

Command-Line Format	<code>--agentuser</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>agent</code>

Specify the agent username to use to communicate with the MySQL Enterprise Service Manager.

- `--aggregatorport`

Command-Line Format	<code>--aggregatorport</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>14000</code>

Specify the TCP/IP port to use to communicate with the MySQL Enterprise Service Manager. Enter the same TCP/IP port number as in the MySQL Enterprise Service Manager installation.

- `--aggregatorsslcafile`

Command-Line Format	<code>--aggregatorsslcafile</code>	
Permitted Values	Type	<code>string</code>

Specify the path to the CA certificate file for SSL support in the Aggregator component. Only needed when using SSL.

- `--aggregatorsslcertfile`

Command-Line Format	<code>--aggregatorsslcertfile</code>	
----------------------------	--------------------------------------	--

Permitted Values	Type	<code>string</code>
-------------------------	-------------	---------------------

Specify the path to the PEM certificate file for SSL support in the Aggregator component. Only needed when using SSL.

- `--aggregatorsslport`

Command-Line Format	<code>--aggregatorsslport</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>14443</code>

Specify the SSL port for the Aggregator component to use to communicate with the MySQL Enterprise Service Manager. Enter the same SSL port number as in the MySQL Enterprise Service Manager installation.

- `--checkmysqlhost`

Command-Line Format	<code>--checkmysqlhost</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>yes</code>
	Valid Values	<code>yes</code> (Check host)
		<code>no</code> (Do not check host)

Validate the MySQL hostname or IP address

- `--createaccount`

Command-Line Format	<code>--createaccount</code>	
Permitted Values	Type	<code>boolean</code>
	Default	<code>1</code>

Create the user account specified by the `agentuser` and `agentpassword` options to use when the agent connects to the monitored MySQL server. To use this option, you must also specify a suitable `root` account with privileges to create the new user using the `rootuser` and `rootpassword` options.

The user create will have the correct privileges for the agent to collect all the necessary information. For more information, see [Section 5.3.1, “Creating a MySQL User Account for the Monitor Agent”](#).

- `--debuglevel`

Command-Line Format	<code>--debuglevel</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>2</code>
	Min Value	<code>0</code>
	Max Value	<code>4</code>
		<code>150</code>

Set the debug information level for log data written to the file specified by `debugtrace`.

- `> --debugtrace`

Command-Line Format	<code>--debugtrace</code>	
Permitted Values	Type	<code>string</code>

Set the filename to use when recording debug information during the installation.

- `--enableagent`

Command-Line Format	<code>--enableagent</code>	
Permitted Values	Type	<code>boolean</code>
	Default	<code>1</code>

Enable the agent to monitor a MySQL server. If this option is set to false, the agent is installed without enabling the monitoring of MySQL server. You can use this to configure a proxy service using an agent for collecting Query Analyzer information.

- `--enableaggregator`

Command-Line Format	<code>--enableaggregator</code>	
Permitted Values	Type	<code>boolean</code>
	Default	<code>0</code>

Enable the optional Aggregator component that collects data from certain data sources, such as user-written scripts or instrumented application servers.

- `--enableproxy <enableproxy>`

Command-Line Format	<code>--enableproxy</code>	
Permitted Values	Type	<code>boolean</code>
	Default	<code>1</code>

Enable the Proxy service. The proxy service can be used to collect query data to use through the Query Analyzer. For more information, see [Section 3.1.5, “Using the Agent Proxy”](#).

- `--installdir`

Command-Line Format	<code>--installdir</code>	
Permitted Values (OS X, <= 2.3.19)	Type	<code>string</code>
	Default	<code>/Applications/mysql/enterprise/agent/</code>
Permitted Values (Unix)	Type	<code>string</code>
	Default	<code>/opt/mysql/enterprise/agent/</code>
Permitted Values (Windows)	Type	<code>string</code>
	Default	<code>C:\Program Files\MySQL\Enterprise\Agent</code>

Specify the directory into which to install the software.

- `--installer-language`

Command-Line Format	<code>--installer-language</code>	
----------------------------	-----------------------------------	--

Permitted Values	Type	<code>string</code>
	Default	<code>en</code>
	Valid Values	<code>en</code> (English)
		<code>ja</code> (Japanese)

Set the language to use for the installation process.

- `--managerhost`

Command-Line Format	<code>--managerhost</code>	
Permitted Values	Type	<code>string</code>

The hostname or IP address of the MySQL Enterprise Service Manager.

- `--managerport`

Command-Line Format	<code>--managerport</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>18080</code>

The port number of the MySQL Enterprise Service Manager.

-
- `--mode`

Command-Line Format	<code>--mode</code>	
Permitted Values (Linux)	Type	<code>string</code>
	Default	<code>gtk</code>
	Valid Values	<code>gtk</code> (GTK (X Windows))
		<code>xwindow</code> (X Windows (native))
		<code>text</code> (Text (command-line))
Permitted Values (OS X, <= 2.3.19)	<code>unattended</code> (Unattended (no dialogs/prompts))	
	Type	<code>string</code>
	Default	<code>osx</code>
	Valid Values	<code>osx</code> (Mac OS X (native))
		<code>text</code> (Text (command-line))
Permitted Values (Unix)	<code>unattended</code> (Unattended (no dialogs/prompts))	
	Type	<code>string</code>
	Default	<code>xwindow</code>
	Valid Values	<code>xwindow</code> (X Windows (native))
		<code>text</code> (Text (command-line))
Permitted Values (Windows)	<code>unattended</code> (Unattended (no dialogs/prompts))	
	Type	<code>string</code>
	Default	<code>win32</code>

	Valid Values	<code>win32</code> (Windows (native))
		<code>unattended</code> (Unattended (no dialogs/prompts))

Specify the installation mode to use for this installation.

- `--mysqlconnmeth`

Command-Line Format	<code>--mysqlconnmeth</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>tcpip</code>
	Valid Values	<code>tcpip</code> (Use TCP/IP)
		<code>socket</code> (Use Unix Socket/Named Pipe)

Specify the connection method to use to connect to MySQL. If you specify `tcpip`, the value of the `mysqlport` option is used. If you specify `socket`, the value of the `mysqlsocket` option is used to connect to the MySQL server to be monitored.

- `--mysqlhost`

Command-Line Format	<code>--mysqlhost</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>127.0.0.1</code>

Hostname or IP address of the MySQL server to be monitored.

- `--mysqlpassword`

Command-Line Format	<code>--mysqlpassword</code>	
Permitted Values	Type	<code>string</code>

Specify the password to use when connecting to the monitored MySQL instance.

- `--mysqlport`

Command-Line Format	<code>--mysqlport</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>3306</code>

The TCP/IP port to use when connecting to the monitored MySQL server.

- `--mysqlsocket`

Command-Line Format	<code>--mysqlsocket</code>	
Permitted Values	Type	<code>string</code>

Specify the filename of the MySQL socket to use when communicating with the monitored MySQL instance.

- `--mysqluser`

Command-Line Format	<code>--mysqluser</code>	
Permitted Values	Type	<code>string</code>

Specify the username to use when connecting to the monitored MySQL instance.

- `--optionfile <optionfile>`

Command-Line Format	<code>--optionfile</code>	
----------------------------	---------------------------	--

Specify the location of an option file containing the configuration options for this installation.

- `--proxyport`

Command-Line Format	<code>--proxyport</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>6446</code>

Specify the TCP/IP port to use for the MySQL Enterprise Agent Proxy Service, if you also specified the `--enableproxy` option.

- `--proxyuser`

Command-Line Format	<code>--proxyuser</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>root</code>

The OS user that the MySQL Enterprise Agent Proxy Service runs as. For example, you can specify a special account such as `daemon`. Applies to Unix and Linux, but not to Windows where the proxy runs as a service. For this option to work, run the installer as root and also specify the `--enableproxy` option.

- `--unattendedmodeui`

Command-Line Format	<code>--unattendedmodeui</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>none</code>
	Valid Values	<code>none</code> (No dialogs)
		<code>minimal</code> (Critical dialogs)
		<code>minimalWithDialogs</code> (Minimal UI with dialogs)

The UI elements to use when performing an unattended installation. The options are `none`, show no UI elements during the installation; `minimal`, show minimal elements during installation; `minimalWithDialogs`, show minimal UI elements, but include the filled-dialog boxes.

- `--use-external-glib`

Permitted Values	Type	<code>string</code>
-------------------------	-------------	---------------------

Specifies to use the `glib` library already present on the installation machine, and not to install the one bundled with MySQL Enterprise Monitor Agent.

- `--usessl`

Command-Line Format	<code>--usessl</code>	
Permitted Values	Type	<code>boolean</code>
	Default	<code>0</code>

Specifies whether SSL should be used to communicate with the MySQL Enterprise Service Manager.

- `--version`

Command-Line Format	<code>--version</code>	
----------------------------	------------------------	--

Display product information, including the version number of the installer.

- `--rootpassword`

Command-Line Format	<code>--rootpassword</code>	
Permitted Values	Type	<code>string</code>

The password of a root account for the installer to use to create the agent user.

- `--rootuser`

Command-Line Format	<code>--rootuser</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>root</code>

The root account for the installer to use to create the agent user.

- `--servicename`

Command-Line Format	<code>--servicename</code>	
Permitted Values (Linux)	Type	<code>string</code>
	Default	<code>mysql-monitor-agent</code>
Permitted Values (OS X, <= 2.3.19)	Type	<code>string</code>
	Default	<code>mysql.monitor.agent</code>
Permitted Values (Unix)	Type	<code>string</code>
	Default	<code>mysql-monitor-agent</code>
Permitted Values (Windows)	Type	<code>string</code>
	Default	<code>MySQL Enterprise Monitor Agent</code>

When the MySQL Enterprise Monitor Agent is installed, a new service is created (Windows), or on Unix a new startup script is created within the corresponding startup directory (for example `/etc/init.d`). When installing multiple agents on the same host, you can use this option to create each agent installation with a unique identifier. During an upgrade installation, you then use this identifier to specify which installation of the agent to update.

- `--help`

Command-Line Format	<code>--help</code>	
----------------------------	---------------------	--

Display the list of valid options to the installer.

5.5 Postinstallation Considerations

Depending upon your use of MySQL Enterprise Monitor, you might perform some or all of these tasks after installation:

- **Email settings:** Test email notification by deliberately triggering an alert.
- **Auto Startup:** On Unix systems, the MySQL Enterprise Service Manager does not automatically restart when the system is rebooted. To enable automatic startup, create a system initialization script appropriate to your operating system.
- **Log files:** Check the log files for any irregularities. For the locations of the various log files see [Section C.1.3, “Log Files for the MySQL Enterprise Service Manager”](#).
- **Agent Log file rotation:** Implement log file rotation for the monitor agent.
- **Back up the repository:** For details, see [Section B.5, “Backing up MySQL Enterprise Service Manager”](#).
- **Configuration backup:** Back up the `mysql-monitor-agent.ini` file and the associated `instances` directory and contents.

For more information about the `mysql-monitor-agent.ini` file see [Section C.2, “MySQL Enterprise Monitor Agent Reference”](#).

- **Configuration file:** Store the `configuration_report.txt` in a safe place. There is no mechanism for retrieving the password stored in this file.
- **Repository credentials:** The repository user name and password are stored in unencrypted form in the `config.properties` file. Take care to protect this file.
- **Disk management:** Remove installation files, and monitor the space used by the repository. Ensure that you have adequate disk space by regularly purging data. For more information, see [Data Purge Behavior](#).
- **Firewall changes:** Consider limiting or expanding access to the MySQL Enterprise Service Manager.
- **Open ports:** As with firewall changes, consider limiting or expanding access to the MySQL Enterprise Service Manager. The dashboard uses nonstandard ports, none of which are usually open by default.
- **Server upgrades:** See [Section 5.7.2.1, “Upgrading the Monitored MySQL Server”](#) for instructions on upgrading a server.
- **Repository access:** Add any other needed users.

5.6 Installing SSL Certificates

These instructions guide you through the process of installing SSL certificates for your MySQL Enterprise Monitor installation. The `$INSTALL_ROOT` represents the root path of your installation, which defaults to:

Table 5.3 Default Root Path (`$INSTALL_ROOT`)

Operating System	Default Path
Microsoft Windows	<code>C:\Program Files\MySQL\Enterprise\Monitor\</code>
Linux / Solaris	<code>home/mysql/enterprise/monitor/</code>
Mac OS X	<code>/Applications/mysql/enterprise/monitor/</code>

**Important**

The self-signed certificates delivered with your MySQL Enterprise Monitor installation are set to expire after 365 days. Every upgrade is delivered with new certificates set to expire 365 days after the day the upgrade package was built. In the unlikely event you are running a version of MySQL Enterprise Service Manager using the default certificates for more than a year, you must generate new certificates. If you do not generate new certificates, the SSL connection between MySQL Enterprise Service Manager and the repository will fail. This section describes how to generate those certificates.

Generating SSL Key and Certificate

To use SSL, you must generate a certificate and private key. These can be verified and signed through a third-party authority, such as Thawte or Entrust, or generated locally and self-signed. The recommended tool for locally-generated SSL key and certificates is the OpenSSL Toolkit. The OpenSSL libraries are delivered by default with UNIX, Linux and Mac OS X platforms, but must be obtained separately for Microsoft Windows from <http://slproweb.com/products/Win32OpenSSL.html>. The Windows installation also requires the [Visual C++ 2008 Redistributables](#) libraries.

**Important**

For security reasons, we recommend you install the latest, compatible version of the OpenSSL Toolkit.

If you intend to use a Certificate Authority to verify your organisation's identity and sign your certificate, you must generate a private key, which is used to create a Certificate Signing Request (CSR), and send the CSR file to the Certificate Authority.

To generate the RSA private key, run the following command:

```
openssl genrsa -out insertName.key 2048
```

This generates a 2048-bit, RSA private key.

To generate the Certificate Signing Request (CSR), run the following command:

```
openssl req -new -nodes -key insertName.key -out insertName.csr
```

This command prompts for input. Complete the fields as required.

**Important**

The [CN](#) field must correspond to the hostname. It is recommended that you use the fully-qualified server name, rather than [localhost](#).

If you intend to use a self-signed certificate, you can generate the key and certificate with a single command:

```
openssl req -x509 -newkey rsa:2048 -keyout key.pem -out cert.pem -days 365
```

This command generates a 2048-bit RSA key, [key.pem](#), and a certificate, [cert.pem](#), which is valid for 365 days.

MySQL Enterprise Service Manager

To install an SSL certificate for the MySQL Enterprise Service Manager:

Save the certificate and private key, both in PEM format, in the following location:

```
$INSTALL_ROOT/apache-tomcat/conf/ssl/tomcat.cert.pem  
$INSTALL_ROOT/apache-tomcat/conf/ssl/tomcat.key.pem
```

Restart the service manager.

If you are using a chained certificate implementation, you must add the following attribute to the `Connector` element of Tomcat's `server.xml`:

```
SSLCertificateChainFile="/opt/mysql/enterprise/monitor/apache-tomcat/conf/ssl/tomcat.int.pem
```

SSL for the Repository

For information on SSL and MySQL Server, see [Creating SSL and RSA Certificates and Keys](#).

5.7 Upgrading, Re-Installing or Changing Your Installation

You can upgrade MySQL Enterprise Monitor in a number of different ways:

- For instructions on upgrading your existing installation, see [Section 5.7.1, “Upgrading MySQL Enterprise Monitor”](#).
- For more information on re-installing an existing installation, see [Section 5.8, “Uninstalling the MySQL Enterprise Monitor”](#).
- To change an existing installation, such as changing the monitored server, see [Section 5.7.2, “Changing Your MySQL Enterprise Monitor Installation”](#).

5.7.1 Upgrading MySQL Enterprise Monitor

This section describes how to perform an update for the MySQL Enterprise Service Manager or the MySQL Enterprise Monitor Agent, when updates are available for these components.

Upgrade Restrictions

You cannot use the update installers to change to a different operating system or chip architecture. For example, you cannot update a 32-bit Linux installation to a 64-bit version using an update installer. Do a fresh installation instead.

You also cannot use the upgrader if you installed the MySQL server for the MySQL Enterprise Service Manager instance outside the MySQL Enterprise Service Manager installation directory.

The installation and configuration of MySQL Enterprise Monitor Agent must be standard before you start the installation. The update installer will not upgrade agents where you have changed or modified the filenames or directory layout of the installed agent, configuration files, or the startup files.



Important

The upgrade installer overwrites `items-mysql-monitor.xml`. On Windows, this file is in the `C:\Program Files\MySQL\Enterprise\Agent\share\mysql-monitor-agent` directory and on Unix, in the `/opt/mysql/enterprise/agent/share/mysql-monitor-agent` directory. Back this file up if you have made any changes to it.



Warning

The Upgrade installer for MySQL Enterprise Service Manager overwrites any changes you made to the `my.cnf` within your MySQL Enterprise Service Manager installation. Copy the existing `my.cnf` file before starting the upgrade installer.

SSL Considerations

The Upgrade installer for MySQL Enterprise Service Manager overwrites any changes you made to the CA certificate files within your MySQL Enterprise Service Manager installation. This includes `cacerts` for the bundled JRE, and `myKeystore` for the bundled Tomcat web server. These files are replaced with the bundled CA certificate files, so if custom changes exist (e.g., for an LDAP server with a self-signed certificate) then you must manually re-import the custom changes. These files are backed up during the upgrade, and the locations are logged within the `configuration_report.txt` log file.

The following example imports one root CA from the backed up file, and uses the default password for keystores in Java which is "changeit". The alias names and path locations may also be different.

```
$ pwd
/opt/mysql/enterprise/monitor/java/bin

$ ./keytool -importkeystore \
  -srckeystore /opt/mysql/enterprise/monitor/backup/java/lib/security/cacerts \
  -destkeystore /opt/mysql/enterprise/monitor/java/lib/security/cacerts \
  -srcstorepass changeit \
  -deststorepass changeit \
  -srcalias myorigrootca \
  -destalias myrootca
```

Version Considerations



Warning

The method you use for upgrading MySQL Enterprise Monitor components depends on the upgrade you are performing.

- To upgrade between major versions (for example, from MySQL Enterprise Monitor 1.3 to MySQL Enterprise Monitor 2.0), start by shutting down the MySQL Enterprise Service Manager and each connected MySQL Enterprise Monitor Agent. First, update the MySQL Enterprise Service Manager, then update the MySQL Enterprise Monitor Agent on each monitored client.
- To upgrade between the same major version, for example, MySQL Enterprise Monitor 2.2 to MySQL Enterprise Monitor 2.3, or a minor version, such as MySQL Enterprise Monitor 2.3.11 to MySQL Enterprise Monitor 2.3.12, you can shut down only the component (agent, or server) you are updating. Using this method, you can perform a 'rolling' upgrade, where you shut down a single MySQL Enterprise Monitor Agent, upgrade it to the latest agent version, and then restart the agent before moving on to the next monitored instance.

Running the Update Installer

The name of the update file varies, but it shows the target operating system, the version the update applies to, and the component name. (There are separate update installers for the Service Manager and the Agent.) For example, a file named `mysqlenterprisemanager-2.3.11-windows-update-installer.exe` updates MySQL Enterprise Service Manager on Windows to version 2.3.11.

You install an update in the same way that you initially installed the service manager or the agent; in `win32` or `unattended` mode on Windows; in `gtk`, `text`, `xwindow`, or `unattended` mode on Unix.

Run the installation file and choose the directory of your current installation and whether or not you wish to back up your current installation. The time required to complete the process varies depending upon the nature of the update.

You can run an unattended upgrade, the same way you run an unattended install. To see all the options you can specify during the upgrade process, run the update installer with the `--help` option.

Undoing an Upgrade

If you chose to back up your current installation, a directory named `backup` is created in the current installation directory. This directory contains copies of the directory or directories that are replaced during the update. In cases where only specific files are replaced, the `backup` directory may contain only these files. To undo the update, stop both the MySQL Enterprise Service Manager and MySQL Enterprise Monitor Agent, then overwrite the new files or directories with the originals found in the `backup` directory. You can delete or archive this directory after you confirm that the update was successful.

If you choose to back up your current installation, the installer checks that there is adequate disk space for your repository backup. If there is not enough space, you are given the option of choosing another location; you can also choose not to back up the repository.

Upgrading Advisors

To update your Advisors, see [Section 5.2.6.3, “Installing, Updating or Upgrading Advisors After Initial Login”](#).

5.7.1.1 Upgrading from MySQL Enterprise Monitor 1.3 to 2.x

To upgrade your existing installation from MySQL Enterprise Monitor 1.3 to MySQL Enterprise Monitor 2.0 or higher, upgrade both the MySQL Enterprise Service Manager and the MySQL Enterprise Monitor Agent on each machine that you are monitoring.

To perform the update process, use an `update` installer. This ensures that your current configuration information is migrated to the new version of MySQL Enterprise Service Manager.

Before you start the migration, shut down your MySQL Enterprise Service Manager and MySQL Enterprise Monitor Agent on each monitored host. Then, install the updated MySQL Enterprise Service Manager application to migrate the configuration and data of the main application and repository. Once the new MySQL Enterprise Service Manager is running, you can start to update and migrate each agent.

For more information on upgrading your MySQL Enterprise Service Manager, see [Upgrading to MySQL Enterprise Service Manager 2.x](#). For more information on upgrading an MySQL Enterprise Monitor Agent, see [Upgrading to MySQL Enterprise Monitor Agent 2.0](#).

Upgrading to MySQL Enterprise Service Manager 2.x

Upgrading MySQL Enterprise Service Manager from 1.x to 2.0 or higher requires one of the `update` installers. The update installer performs a number of operations during installation:

- A new database, required to support 2.0 functionality, is created.
- Your core dashboard, user, and rule information is migrated from the old database to the new database.
- The core configuration parameters for the MySQL Enterprise Service Manager are migrated from MySQL Enterprise Monitor 1.3 are migrated to MySQL Enterprise Monitor 2.x.

The installation of the new software using the update installer follows this basic sequence:

1. Request the installation language.
2. Confirm the location of the current MySQL Enterprise Service Manager installation.
3. Specify whether you want to keep a copy of the old server, application, and database files.
4. Configure the Tomcat server settings, including whether the new server should support SSL connections from agents.
5. If requested, the application and database information is backed up and upgraded, before the new application is installed.

The installation process is consistent for all platforms. The following example illustrates the process:

1. Double-click the update installer. The update installer has `update` in the file name.
2. Confirm the language to use when installing the software.

Click **OK**


3. An information screen shows the application you are installing. Click **Next** to continue.
4. Specify, or locate, the previous installation of MySQL Enterprise Service Manager. If you installed the server within the default location, the current version of the application is located automatically.
5. The installer can keep a backup copy of your existing application, including keeping a complete backup of the data stored within your MySQL Enterprise Monitor repository database.

Specify the location of the backup (default is to use the `backup` directory within your installation directory). Note that backing up the database in addition to the main application increases the installation time, as the files are copied. The more data in your repository, the longer the installation process takes.

6. Specify the Tomcat Server options. The Tomcat Server Port is the default port where you access the MySQL Enterprise Monitor User Interface. If you want to support agents using SSL to communicate to MySQL Enterprise Service Manager, check the **Is SSL support required?**
7. Confirm that you want to continue the installation. Once installation has started, the backup of your existing application (and database) starts. This process may take some time. Wait until the process completes.
8. Once the process has completed, you receive a notification of the installation process, including how to uninstall the application if you want to do so in the future. If any errors occurred, they are reported here.
9. The installation has now completed. You can automatically start the MySQL Enterprise Service Manager and view the attached Readme file by ensuring the checkboxes on this page are selected.
10. You can now quit the installer.

Once the installation is completed, the first time you login to MySQL Enterprise Monitor User Interface, provide your login credentials, if they do not already exist in the server configuration, or provide a copy of the Advisor jar suitable for your MySQL Enterprise Service Manager version.

Create Manager User	Create Agent User
<p>The user and password for the Dashboard administrator. You can optionally add DBA, Read-only or additional Manager users on the Settings page.</p> <p>Username</p> <input type="text"/> <p>Password</p> <input type="password"/> <p>Confirm Password</p> <input type="password"/>	<p>The user and password for the Dashboard agent. You can optionally add these credentials as additional users on the Settings page.</p> <p>Username</p> <input type="text"/> <p>Password</p> <input type="password"/> <p>Confirm Password</p> <input type="password"/>
Online Updates	
<p>Using a direct Internet connection or an HTTP proxy, the Dashboard can occasionally check for MySQL updates and open My Oracle Support Service Requests (see below).</p> <p><input checked="" type="checkbox"/> Enable automatic checking for online updates</p> <p><input type="checkbox"/> Use HTTP Proxy</p>	
My Oracle Support Credentials	
<p>These credentials are used to retrieve and display your open Service Requests (for those with an active subscription).</p> <p>My Oracle Support Login (Email Address)</p> <input type="text"/> <p>Password</p> <input type="password"/> <p>Confirm Password</p> <input type="password"/>	
Advisors	Data Purge Behavior
<p>Current Advisors Version 2.3.4.2075</p> <p>Advisor .jar File <input type="button" value="Choose File"/> No file chosen</p>	<p>Remove Historical Data 4 weeks <input type="button" value="v"/></p> <p>Remove Query Analysis 4 weeks <input type="button" value="v"/></p>
Complete Setup	
<input type="button" value="complete setup"/>	



Copyright © 2005, 2011, Oracle and/or its affiliates. All rights reserved.
[Enterprise Software](#) | [Technical Support](#) | [About](#)

MySQL Enterprise Monitor is now updated. Update each of your agents to MySQL Enterprise Monitor Agent 2.x to ensure that they are providing the correct information to MySQL Enterprise Service Manager.

Upgrading to MySQL Enterprise Monitor Agent 2.0

To upgrade an agent, use an [update](#) installer, which migrates your configuration information while it updates the application files.



Note

The agent log file, `mysql-monitor-agent.log`, if it exists, is preserved during the upgrade. A new log file, `mysql-monitor-agent.log` is used by MySQL Enterprise Monitor Agent 2.0.

The core sequence is the same on all platforms. The following section shows the update process on Linux:

1. Start the update installer.

```
shell> ./mysqlmonitoragent-2.0.0.7101-linux-glibc2.3-x86-32bit-update-installer.bin
```

For MySQL Enterprise Monitor Agent 2.2 and higher, If you have multiple instances of MySQL Enterprise Monitor Agent installed, you can specify a unique name for the agent, which is used to identify the agent startup script (in `/etc/init.d` and other configuration information. To specify the installation, use the `--servicename=mysql-monitor-agent` option.

2. Set the language for the installation process.

```
Language Selection

Please select the installation language
[1] English
[2] Japanese
Please choose an option [1] :
```

3. Confirm or update the location of the installation directory of the previous version.

```
-----
Welcome to the setup wizard for the MySQL Enterprise Monitor Agent Update
-----

Please specify the directory that contains the previous installation of
the MySQL Enterprise Monitor Agent

Installation directory [/opt/mysql/enterprise/agent]:
```

4. Specify whether you want to create a backup of the current application and configuration information, and if so, where the backup directory should be created.

```
-----
Current installation backup

Do you want to create a backup during the update process?

Backup the current installation [Y/n]: Y

Backup directory [/opt/mysql/enterprise/agent/patchbackup]:
```

5. Choose whether to enable the Query Analyzer. The Query Analyzer lets you monitor the execution statistics for individual queries executed through your MySQL servers. To enable it, specify the proxy port, MySQL server and MySQL server port that you want to use. If you do not enable Query Analyzer now, you can enable it later. See [Section 2.6, “The Query Analyzer Tab”](#).

```
-----
Query Analyzer Configuration

MySQL Proxy enables query monitoring and analysis by listening on the port
specified below for client connections that are then passed through to a
backend MySQL database server. It is not needed for basic monitoring
functionality, but is required for query monitoring and analysis.

...

Enable Proxy (recommended) [Y/n]:

Proxy Port [6446]:

Backend Host: 127.0.0.1    (cannot be changed)

Backend Port: 3306    (cannot be changed)
```

6. You are now ready to complete the installation. Confirm that you want to continue.

```
-----
Setup is now ready to begin installing MySQL Enterprise Monitor Agent Update on your computer.

Do you want to continue? [Y/n]:

-----
Please wait while Setup installs MySQL Enterprise Monitor Agent Update on your computer.

Installing
0% _____ 50% _____ 100%
#####

-----
Setup has finished installing MySQL Enterprise Monitor Agent Update on your computer.

Restart MySQL Enterprise Monitor Agent now [Y/n]:

View Readme File [Y/n]: n
```

Before connecting your MySQL Enterprise Monitor Agent to your MySQL server, update the grants for the MySQL Enterprise Monitor Agent. Connect to the MySQL server and run this statement to update the required grants:

```
GRANT CREATE, INSERT
ON mysql.*
TO 'mysqluser'@'localhost'
IDENTIFIED BY 'agent_password';
```

In the preceding command, replace the `mysqluser` and `agent_password` parameters with the values used for connecting your agent to your MySQL server.

Once the update agent has communicated with the MySQL Enterprise Service Manager, the core information about the agent and the MySQL server it is monitoring is migrated to the new data format required by MySQL Enterprise Service Manager 2.x. To migrate the existing stored data, see [Section B.6, “Migrating 1.3.x Historical Data to MySQL Enterprise Monitor 2.0”](#).

5.7.1.2 Upgrading to MySQL Enterprise Monitor 2.1

When upgrading to MySQL Enterprise Monitor 2.1, be aware of the following issues:

- During the upgrade process, if you previously had a Query Analyzer data purge value that was greater than the standard data purge value, the historical data collection purge period is set to the Query Analyzer purge period. This is logged in the upgrade log with the following notice:

```
getDataCollectionPurgeLifespan now: 4 weeks (was: 2 weeks)
```

5.7.1.3 Upgrading to MySQL Enterprise Monitor 2.2

When upgrading to MySQL Enterprise Monitor 2.2, be aware of the following issues:

- If you are upgrading to MySQL Enterprise Monitor 2.2, upgrade from MySQL Enterprise Monitor 2.0 or higher. If you are using MySQL Enterprise Monitor 1.3 or lower, upgrade to MySQL Enterprise Monitor 2.0 first before upgrading to MySQL Enterprise Monitor 2.2.
- Rules and advisors in MySQL Enterprise Monitor 2.2 now support auto-close functionality if the issue that raised the notification is no longer causing a problem. Review all your existing rules schedules and confirm whether the auto-close feature is useful in each case.
- The MySQL Enterprise Service Manager supports the use of a separate, self-managed, MySQL server in place of the MySQL server bundled with the MySQL Enterprise Service Manager installation for storing repository data. For more information, see [Section 5.2.1, “Service Manager Installation Common Parameters”](#).
- If you are upgrading a MySQL Enterprise Service Manager that uses a remote, self-managed MySQL database to store the MySQL Enterprise Monitor repository data, then perform the installation as follows:

1. Shut down MySQL Enterprise Service Manager.
2. Shut down the MySQL instance supporting your MySQL Enterprise Monitor repository.
3. Upgrade the MySQL server as you would any other MySQL server instance. See [Upgrading MySQL](#).

Ensure when performing the upgrade that the MySQL server instance is configured with support for InnoDB and that the InnoDB storage engine is enabled. Also ensure that support for partitioning is available within the server.

4. Run the `mysql_upgrade` to ensure that the system tables have been correctly updated.
 5. Restart the MySQL repository instance.
 6. Restart MySQL Enterprise Service Manager and confirm that it was able to connect to the MySQL server.
- When upgrading MySQL Enterprise Service Manager, the installer tries to determine if you are using a local MySQL server (as bundled with the MySQL Enterprise Service Manager) or a remote and self-managed MySQL server instance to store your repository data.

To determine whether the existing installation is using a local MySQL server, the installer examines the existing MySQL Enterprise Service Manager configuration file. If the value of the `mysql.server` configuration parameter is set to `127.0.0.1` or `localhost`, the installer assumes the MySQL server is local. If any value is identified, the installer assumes that the server is remote/self-managed and it does not upgrade the MySQL server component.

If the correct MySQL server version and supported functionality (partitioning) are not supported by the MySQL server you are using, the installer stops.

- The storage tables used for storing MySQL Enterprise Service Manager data, and the rules and methods required for purging old information, have changed in MySQL Enterprise Service Manager 2.2. You can improve the purging and disk space usage for these data tables by using the techniques shown in [Section B.7, “Improving Disk Space Usage with Purge in 2.1 and 2.2”](#).
- For MySQL Enterprise Monitor Agent installations, the installer can now create a user on your MySQL server with suitable credentials. To perform this operation, the installer requests the root login and password for your MySQL server so that the user and other details can be updated.

5.7.1.4 Upgrading to MySQL Enterprise Monitor 2.3

When upgrading to MySQL Enterprise Monitor 2.3, be aware of the following issues:

- By default, the upgrade preserves the choice you made for the [Use SSL](#) checkbox in the original installation. You can change this setting during the upgrade. If you enable SSL connections, the repository database you select during the upgrade must also have SSL enabled. (The bundled MySQL server is configured with SSL enabled.)

5.7.2 Changing Your MySQL Enterprise Monitor Installation

This section describes the best practices to employ when changing your MySQL Enterprise Monitor installation.

5.7.2.1 Upgrading the Monitored MySQL Server

When upgrading a monitored MySQL server, first stop the agent, as explained in:

- Unix and Linux: [Section 5.3.4.2, “Starting/Stopping the Agent on Unix”](#)
- Windows: [Section 5.3.4.1, “Starting/Stopping the Agent on Windows”](#)

Stop the MySQL server, then perform the upgrade.

To stop and restart the MySQL daemon under Unix or Linux see, [Section 5.2.4, “Starting/Stopping the MySQL Enterprise Monitor Service on Unix”](#).

For instructions on stopping and restarting the MySQL service under Windows, see [Section 5.2.5, “Starting/Stopping the MySQL Enterprise Monitor Service on Windows”](#).

Once the service/daemon is stopped, upgrade your MySQL server, using the instructions from the reference manual the new server version. When the upgrade is complete, restart the MySQL server.



Note

The agent's log file shows that the server was down during the upgrade process.

5.7.2.2 Changing the Server That an Agent Monitors

You need not reinstall the MySQL Enterprise Monitor Agent in order to change the MySQL server that it monitors. It is possible to adapt an existing agent so that it monitors a different server.

To do this you must stop the monitor agent and then remove the server that it is monitoring. To stop the agent see:

- Windows: [Section 5.3.4.1, “Starting/Stopping the Agent on Windows”](#)
- Unix: [Section 5.3.4.2, “Starting/Stopping the Agent on Unix”](#)

For instructions on removing a server see, [Section 2.8.3.3, “Removing a Server From the Dashboard”](#).

Once the agent is stopped and the server is removed from the Dashboard, you can change the `mysql-monitor-agent.ini`, or the `agent-instance.ini` file within the `agent instances` directory. To find this directory, examine the content of the `mysql-monitor-agent.ini` and check the value of the `mysqld-instance-dir` parameter.

To make changes to the monitored MySQL server, edit the `agent-instance.ini` file. Change the `user`, `password`, `hostname`, and `port` values if required. For more information, see [Section C.2.2, “MySQL Server \(agent-instance.ini\) Configuration”](#).

To change other settings, such as enabling proxy support (required for Query Analyzer), the management host, or the port number used by the agent, modify the `mysql-monitor-agent.ini` file. For more information, see [Section C.2.1, “MySQL Enterprise Monitor Agent Configurable Options”](#).

To restart the agent, see:

- Unix and Linux: [Section 5.3.4.2, “Starting/Stopping the Agent on Unix”](#).
- Windows: [Section 5.3.4.1, “Starting/Stopping the Agent on Windows”](#).



Note

When adapting an existing agent to monitor a remote server, make sure that the agent has the credentials for remote access and that the port on the remote MySQL server instance is open. For more information, see [Section 5.3.6, “Configuring an Agent to Monitor a Remote MySQL Server”](#).

If you have trouble starting the agent, check [Section 5.3.9, “Troubleshooting the Agent”](#).

Log in to the Dashboard and find your new server in the `All Servers` group.

5.7.2.3 Temporarily Suspending the Agent

When bringing down a monitored MySQL server, stop the agent first, to avoid generating a misleading “Server is unreachable” event.

For instance, if you stop the server to do a backup, follow these steps:

1. Stop the agent.
2. Stop the service/daemon.
3. Perform the backup.
4. Restart the service/daemon.
5. Restart the agent.

To stop or start the agent, see:

- Unix and Linux: [Section 5.3.4.2, “Starting/Stopping the Agent on Unix”](#).

- Windows: [Section 5.3.4.1, “Starting/Stopping the Agent on Windows”](#).

To stop the MySQL service/daemon, see the MySQL reference manual for your server version, on the web site <http://dev.mysql.com/doc>.

Or, to blackout all events associated with a specific server or group of servers, see [Section 4.4, “Advisor Blackout Periods”](#).

5.8 Uninstalling the MySQL Enterprise Monitor

Removing the MySQL Enterprise Monitor requires removing the MySQL Enterprise Service Manager and the MySQL Enterprise Monitor Agent Service. In some circumstances, such as when running multiple agents on one machine, you might remove only a single monitored server rather than the entire MySQL Enterprise Monitor Agent Service.

5.8.1 Removing the MySQL Enterprise Monitor: Windows

Removing the MySQL Enterprise Service Manager

Remove the MySQL Enterprise Service Manager by going to the [Control Panel](#) and choosing [Add or Remove Programs](#). Find the entry for [MySQL Enterprise Monitor](#) and remove it. During the uninstall process you will be given the option of saving existing data and log files. Choose this option if you plan to reinstall the MySQL Enterprise Monitor.

If you are not saving existing data, you can delete the [C:\Program Files\MySQL\Enterprise\Monitor](#) directory after removing MySQL Enterprise Service Manager.



Warning

If you did not remove existing data and log files when uninstalling MySQL Enterprise Service Manager, do **not** remove the [C:\Program Files\MySQL\Enterprise\Monitor](#) directory. Doing so will delete these files.

If you added the Tomcat/Apache web server to the list of Windows firewall exceptions, remove this service by opening the [Windows Firewall](#) from the [Control Panel](#). Choose the [Exceptions](#) tab and delete the [Tomcat/Apache](#) entry.

Removing MySQL Enterprise Monitor Services Only

When the MySQL Enterprise Service Manager is installed, the Tomcat/Apache and MySQL server services are started. You can remove these services without also removing your MySQL Enterprise Service Manager installation. For more information about these services, see [Section 5.2.5, “Starting/Stopping the MySQL Enterprise Monitor Service on Windows”](#).

Do this by finding the [MySQL Enterprise Monitor](#) menu option and choosing [Services](#) and then [Uninstall MySQL Enterprise Monitor Services](#). This removes all the services associated with MySQL Enterprise Service Manager.

To confirm that these services have been removed, check in the Microsoft Management Console Services window.

To reinstall these services, use the [Install MySQL Enterprise Monitor Services](#) menu option.

You can also remove services using the [mysqlmonitorctl.bat](#) file found in the [C:\Program Files\MySQL\Enterprise\Monitor](#) directory. To see the available options, go to the command line and

type: `mysqlnetworkctrl help`. This batch file is discussed in more detail in [Section 5.2.5, “Starting/Stopping the MySQL Enterprise Monitor Service on Windows”](#).

Removing the Monitor Agent

To remove the Monitor Agent itself, open the [Control Panel](#) and choose [Add or Remove Programs](#). Find the entry for [MySQL Enterprise Monitor Agent](#) and remove it. This executes the uninstall program located in the `C:\Program Files\MySQL\MySQL\Enterprise\Agent` directory.



Warning

To remove only one of the agents from a machine that is running several agents, do **not** remove the [MySQL Enterprise Monitor Agent](#) entry from the [Add or Remove Programs](#) menu. To remove a single agent, see [Removing a Single Agent](#).

Removing the Monitor Agent automatically deletes its associated `.log` and `.pid` files. After removing the Monitor Agent, you might need to remove the directories, `C:\Program Files\MySQL\Enterprise` and `C:\Program Files\MySQL\Enterprise\Agent`.

Removing the Monitor Agent this way removes the default service. If you are running additional Monitor Agents as described in [Section C.2.2, “MySQL Server \(agent-instance.ini\) Configuration”](#), you must remove those agents manually. See the next section for instructions on doing this.

Removing a Single Agent

To remove only one of the agents from a machine that is running several agents, do **not** remove the [MySQL Enterprise Monitor Agent](#) entry from the [Add or Remove Programs](#) menu. To remove a single agent and leave other agents intact, follow these steps:

1. Stop the agent.
2. Confirm the location of the log files.
3. Remove the agent as a service.
4. Remove/Archive the associated files.

It is best to stop the agent before removing it; for instructions on stopping an agent see, [Section 5.3.4.1, “Starting/Stopping the Agent on Windows”](#).

To confirm the location of the agent log files, check the `ini` file. For more information on this topic, see [Section C.2.1, “MySQL Enterprise Monitor Agent Configurable Options”](#).

Go to the command line and remove the MySQL Enterprise Monitor Agent as a Windows service by typing:

```
shell> sc delete AgentName
```

To confirm that the agent has been removed, check that there is no longer any entry for that agent in the Microsoft Management Console Services window.

Also remove or archive any log or configuration files associated with this agent. If you have installed any additional agents, remove them in the same way.

5.8.2 Removing the MySQL Enterprise Monitor: Unix

Removing the MySQL Enterprise Service Manager

To remove the MySQL Enterprise Service Manager, find the `uninstall` file in the `/opt/mysql/enterprise/monitor` directory.

Execute this file by typing:

```
shell> ./uninstall
```

During the uninstall process you will be given the option of saving existing data and log files. Choose this option if you plan to reinstall the MySQL Enterprise Monitor.

If you are not saving existing data, you can remove the `/opt/mysql/enterprise/monitor` directory after uninstalling the MySQL Enterprise Service Manager.



Warning

If you did not remove existing data and log files when uninstalling the MySQL Enterprise Monitor, do **not** remove the `/opt/mysql/enterprise/monitor` directory; doing so will delete these files.

On Red Hat Enterprise Linux 4 and Fedora Core 4, the uninstall script might not stop the Tomcat server. Do this manually if necessary. To do this, see [Section 5.2.4, “Starting/Stopping the MySQL Enterprise Monitor Service on Unix”](#).

Be careful not to accidentally stop any other Java processes running on your system.

On some Unix platforms, you might have to manually delete the `uninstall` application and the installation directory after you execute the uninstall process.

Removing the Monitor Agent

Prior to removal of the Monitor Agent Service, stop any agents by changing to the `init.d` directory and issuing the command `./mysql-monitor-agent stop`.

You will find the `uninstall` file in the `/opt/mysql/enterprise/agent` directory. Execute this file by navigating to this directory and typing:

```
shell> ./uninstall
```

Removing the Monitor Agent automatically deletes its associated `.log` and `.pid` files. After uninstalling the Monitor Agent, you can remove the `/opt/mysql/enterprise/agent` directory.

Removing the Monitor Agent this way removes the default service, and all the configuration files for different instances.

Removing a Single Agent

To remove only one of the agents from a machine that is running several agents, do **not** run the uninstall program. To remove a single agent and leave other agents intact, follow these steps:

1. Stop the agent.
2. Confirm the location of the log files.
3. Remove the agent as a service.

4. Remove/Archive associated files.

It is best to stop the agent before removing it; for instructions on stopping an agent, see [Section 5.3.4.2, “Starting/Stopping the Agent on Unix”](#).

To confirm the location of the agent log files, check the `ini` file. For more information on this topic, see [Section C.2.1, “MySQL Enterprise Monitor Agent Configurable Options”](#).

To remove the agent as a daemon, remove its entry in the `init.d` directory. Also remove or archive any log or configuration files associated with this agent.

If you have installed any additional agents, remove them in the same way.

Appendix A Licenses for Third-Party Components

Table of Contents

A.1 Ant-Contrib License	174
A.2 ANTLR 2 License	175
A.3 ANTLR 3 License	176
A.4 Apache Commons BeanUtils v1.6 License	176
A.5 Apache Commons BeanUtils v1.7.0 and Later License	177
A.6 Apache Commons Chain	177
A.7 Apache Commons Codec	178
A.8 Apache Commons Collections License	178
A.9 Apache Commons DBCP License	178
A.10 Apache Commons Digester License	179
A.11 Apache Commons Exec	179
A.12 Apache Commons FileUpload License	179
A.13 Apache Commons HttpClient	179
A.14 Apache Commons IO License	180
A.15 Apache Commons Lang License	180
A.16 Apache Commons Logging License	180
A.17 Apache Commons Math License	180
A.18 Apache Commons Pool License	182
A.19 Apache Commons Validator License	182
A.20 Apache HttpComponents HttpClient License	182
A.21 Apache HttpComponents HttpCore License	183
A.22 Apache Jakarta ORO License	183
A.23 Apache JAMES Mime4J License	184
A.24 Apache License Version 2.0, January 2004	188
A.25 Apache log4j License	192
A.26 Apache Portable Runtime (APR) License	192
A.27 Apache Struts License	194
A.28 Apache Tiles	194
A.29 Apache Tomcat	195
A.30 Apache Tomcat Native Library License	195
A.31 ASM License	195
A.32 Code Generation Library License	196
A.33 cURL (libcurl) License	196
A.34 DOM4J License	197
A.35 Dropdown Check List License	197
A.36 dtoa.c License	198
A.37 Editline Library (libedit) License	198
A.38 Ehcache License	200
A.39 EZMorph License	201
A.40 FindGTest.cmake License	201
A.41 Fred Fish's Dbug Library License	202
A.42 FreeMarker License	202
A.43 getarg License	203
A.44 GLib License (for MySQL Enterprise Monitor)	204
A.45 GNU General Public License Version 2.0, June 1991	204
A.46 GNU Lesser General Public License Version 2.1, February 1999	210
A.47 GNU Libtool License	218
A.48 Google Controlling Master Thread I/O Rate Patch License	218

A.49 Google Perftools (TCMalloc utility) License	219
A.50 Google SMP Patch License	220
A.51 Guava (Google Core Libraries for Java) License	220
A.52 Hibernate Annotations License	220
A.53 Hibernate Commons Annotations License	221
A.54 Hibernate License	221
A.55 Java SNMP License	221
A.56 Javassist License	222
A.57 JCommon License	222
A.58 JDOM Project License	223
A.59 JFreeChart License	223
A.60 jQuery Form Example Plugin License	224
A.61 jQuery License	224
A.62 jQuery UI License	225
A.63 JSON-lib License	225
A.64 lib_sql.cc License	225
A.65 libevent License	226
A.66 Libffi License	227
A.67 libiconv License	227
A.68 libintl License	228
A.69 Libxml2 License	228
A.70 Linux-PAM License	229
A.71 LPeg Library License	230
A.72 Lua (liblua) License	230
A.73 LuaFileSystem Library License	231
A.74 md5 (Message-Digest Algorithm 5) License	231
A.75 nt_serc (Windows NT Service class library) License	231
A.76 OGNL (Object-Graph Navigation Language) License	232
A.77 OpenPAM License	232
A.78 OpenSSL v1.0 License	233
A.79 PCRE License	234
A.80 Percona Multiple I/O Threads Patch License	235
A.81 PersistJS License	236
A.82 PNG Behavior License	236
A.83 PxtoEM License	236
A.84 Radeox RE	237
A.85 RegEX-Spencer Library License	237
A.86 RFC 3174 - US Secure Hash Algorithm 1 (SHA1) License	238
A.87 Richard A. O'Keefe String Library License	238
A.88 ROME License	239
A.89 SHA-1 in C License	239
A.90 Simple Logging Facade for Java (SLF4J) License	239
A.91 SNMP4J License	240
A.92 Spring Framework License	240
A.93 StringTemplate Template Engine License	241
A.94 TEA License	241
A.95 XWork License	241
A.96 zlib License	242

A.1 Ant-Contrib License

The following software may be included in this product: Ant-Contrib

```

Ant-Contrib
Copyright (c) 2001-2003 Ant-Contrib project. All rights reserved.
Licensed under the Apache 1.1 License Agreement, a copy of which is reproduced below.

The Apache Software License, Version 1.1

Copyright (c) 2001-2003 Ant-Contrib project. All rights reserved.

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions
are met:

1. Redistributions of source code must retain the above copyright
   notice, this list of conditions and the following disclaimer.

2. Redistributions in binary form must reproduce the above copyright
   notice, this list of conditions and the following disclaimer in
   the documentation and/or other materials provided with the
   distribution.

3. The end-user documentation included with the redistribution, if
   any, must include the following acknowledgement:
   "This product includes software developed by the
    Ant-Contrib project (http://sourceforge.net/projects/ant-contrib)."
   Alternately, this acknowledgement may appear in the software itself,
   if and wherever such third-party acknowledgements normally appear.

4. The name Ant-Contrib must not be used to endorse or promote
   products derived from this software without prior written
   permission. For written permission, please contact
   ant-contrib-developers@lists.sourceforge.net.

5. Products derived from this software may not be called "Ant-Contrib"
   nor may "Ant-Contrib" appear in their names without prior written
   permission of the Ant-Contrib project.

THIS SOFTWARE IS PROVIDED ``AS IS'' AND ANY EXPRESSED OR IMPLIED
WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES
OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE
DISCLAIMED. IN NO EVENT SHALL THE ANT-CONTRIB PROJECT OR ITS
CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT
LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF
USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND
ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY,
OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT
OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF
SUCH DAMAGE.

```

A.2 ANTLR 2 License

```

The following software may be included in this product:

ANTLR 2

ANTLR 2 License

We reserve no legal rights to the ANTLR--it is fully in the
public domain. An individual or company may do whatever they
wish with source code distributed with ANTLR or the code
generated by ANTLR, including the incorporation of ANTLR, or
its output, into commercial software.

We encourage users to develop software with ANTLR. However,

```

we do ask that credit is given to us for developing ANTLR. By "credit", we mean that if you use ANTLR or incorporate any source code into one of your programs (commercial product, research project, or otherwise) that you acknowledge this fact somewhere in the documentation, research report, etc... If you like ANTLR and have developed a nice tool with the output, please mention that you developed it using ANTLR. In addition, we ask that the headers remain intact in our source code. As long as these guidelines are kept, we expect to continue enhancing this system and expect to make other tools available as they are completed.

A.3 ANTLR 3 License

The following software may be included in this product:

ANTLR 3

ANTLR 3 License

[The BSD License]

Copyright (c) 2003-2007, Terence Parr

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- * Neither the name of the author nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

A.4 Apache Commons BeanUtils v1.6 License

The following software may be included in this product:

Apache Commons BeanUtils version 1.6

The Apache Software License, Version 1.1

Copyright (c) 1999-2003 The Apache Software Foundation. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The end-user documentation included with the redistribution, if any, must include the following acknowledgement:
"This product includes software developed by the
Apache Software Foundation (<http://www.apache.org/>)."
Alternately, this acknowledgement may appear in the software itself, if and wherever such third-party acknowledgements normally appear.
4. The names "The Jakarta Project", "Commons", and "Apache Software Foundation" must not be used to endorse or promote products derived from this software without prior written permission. For written permission, please contact apache@apache.org.
5. Products derived from this software may not be called "Apache" nor may "Apache" appear in their names without prior written permission of the Apache Group.

THIS SOFTWARE IS PROVIDED ``AS IS'' AND ANY EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE APACHE SOFTWARE FOUNDATION OR ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

=====

This software consists of voluntary contributions made by many individuals on behalf of the Apache Software Foundation. For more information on the Apache Software Foundation, please see <http://www.apache.org/>.

A.5 Apache Commons BeanUtils v1.7.0 and Later License

The following software may be included in this product:

```
Apache Commons BeanUtils v1.7.0 and Later

Component's NOTICE.txt file:
Apache Commons BeanUtils
Copyright 2000-2008 The Apache Software Foundation

This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.6 Apache Commons Chain

The following software may be included in this product:

```
Apache Commons Chain
```

```
Component's NOTICE.txt file:  
This product includes software developed by  
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.7 Apache Commons Codec

The following software may be included in this product:

```
The following software may be included in this product:  
Apache Commons Codec  
Copyright 2002-2009 The Apache Software Foundation  
  
This product includes software developed by  
The Apache Software Foundation (http://www.apache.org/).  
  
-----  
src/test/org/apache/commons/codec/language/DoubleMetaphoneTest.java contains test data  
from http://aspell.net/test/orig/.  
Copyright (C) 2002 Kevin Atkinson (kevina@gnu.org).  
  
Verbatim copying and distribution of this entire article is permitted in  
any medium, provided this notice is preserved.  
-----
```

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.8 Apache Commons Collections License

The following software may be included in this product:

```
Apache Commons Collections  
  
Component's NOTICE.txt file:  
Apache Commons Collections  
Copyright 2001-2008 The Apache Software Foundation  
  
This product includes software developed by  
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.9 Apache Commons DBCP License

The following software may be included in this product:

```
Apache Commons DBCP  
  
Component's NOTICE.txt file:  
Apache Commons DBCP  
Copyright 2001-2010 The Apache Software Foundation  
  
This product includes software developed by  
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.10 Apache Commons Digester License

The following software may be included in this product:

```
Apache Commons Digester

Component's NOTICE.txt file:
Apache Jakarta Commons Digester
Copyright 2001-2006 The Apache Software Foundation

This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.11 Apache Commons Exec

The following software may be included in this product:

```
Apache Commons Exec

Component's NOTICE.txt file:
Apache Commons Exec
Copyright 2005-2009 The Apache Software Foundation

This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.12 Apache Commons FileUpload License

The following software may be included in this product:

```
Apache Commons FileUpload

Component's NOTICE.txt file:
Apache Jakarta Commons FileUpload
Copyright 2002-2006 The Apache Software Foundation

This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.13 Apache Commons HttpClient

The following software may be included in this product:

```
Apache Commons HttpClient

Component's NOTICE.txt file:
Apache Jakarta HttpClient
Copyright 1999-2007 The Apache Software Foundation

This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.14 Apache Commons IO License

The following software may be included in this product:

```
Apache Commons IO

Component's NOTICE.txt file:
Apache Jakarta Commons IO
Copyright 2001-2007 The Apache Software Foundation

This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.15 Apache Commons Lang License

The following software may be included in this product:

```
Apache Commons Lang

Component's NOTICE.txt file (older version):
Apache Jakarta Commons Lang
Copyright 2001-2007 The Apache Software Foundation

This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).

Component's NOTICE.txt file (newer version):
Apache Commons Lang
Copyright 2001-2008 The Apache Software Foundation

This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.16 Apache Commons Logging License

The following software may be included in this product:

```
Apache Commons Logging

Component's NOTICE.txt file:
Apache Commons Logging
Copyright 2003-2007 The Apache Software Foundation

This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.17 Apache Commons Math License

The following software may be included in this product:

```
Apache Commons Math

Component's NOTICE.txt file:
Apache Commons Math
```

Copyright 2001-2008 The Apache Software Foundation

This product includes software developed by The Apache Software Foundation (<http://www.apache.org/>).

This product includes software translated from the `lmder`, `lmpar` and `qrsolv` Fortran routines from the Minpack package and distributed under the following disclaimer:

Minpack Copyright Notice (1999) University of Chicago. All rights reserved

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The end-user documentation included with the redistribution, if any, must include the following acknowledgment:
"This product includes software developed by the University of Chicago, as Operator of Argonne National Laboratory.

Alternately, this acknowledgment may appear in the software itself, if and wherever such third-party acknowledgments normally appear.

4. WARRANTY DISCLAIMER. THE SOFTWARE IS SUPPLIED "AS IS" WITHOUT WARRANTY OF ANY KIND. THE COPYRIGHT HOLDER, THE UNITED STATES, THE UNITED STATES DEPARTMENT OF ENERGY, AND THEIR EMPLOYEES:
(1) DISCLAIM ANY WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE OR NON-INFRINGEMENT, (2) DO NOT ASSUME ANY LEGAL LIABILITY OR RESPONSIBILITY FOR THE ACCURACY, COMPLETENESS, OR USEFULNESS OF THE SOFTWARE, (3) DO NOT REPRESENT THAT USE OF THE SOFTWARE WOULD NOT INFRINGE PRIVATELY OWNED RIGHTS, (4) DO NOT WARRANT THAT THE SOFTWARE WILL FUNCTION UNINTERRUPTED, THAT IT IS ERROR-FREE OR THAT ANY ERRORS WILL BE CORRECTED.
5. LIMITATION OF LIABILITY. IN NO EVENT WILL THE COPYRIGHT HOLDER, THE UNITED STATES, THE UNITED STATES DEPARTMENT OF ENERGY, OR THEIR EMPLOYEES: BE LIABLE FOR ANY INDIRECT, INCIDENTAL, CONSEQUENTIAL, SPECIAL OR PUNITIVE DAMAGES OF ANY KIND OR NATURE, INCLUDING BUT NOT LIMITED TO LOSS OF PROFITS OR LOSS OF DATA, FOR ANY REASON WHATSOEVER, WHETHER SUCH LIABILITY IS ASSERTED ON THE BASIS OF CONTRACT, TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY), OR OTHERWISE, EVEN IF ANY OF SAID PARTIES HAS BEEN WARNED OF THE POSSIBILITY OF SUCH LOSS OR DAMAGES.

This product includes software translated from the `odex` Fortran routine developed by E. Hairer and G. Wanner and distributed under the following license:

Copyright (c) 2004, Ernst Hairer

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS

```
FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS
OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL,
EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR
PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY
OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING
NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS
SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
```

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.18 Apache Commons Pool License

The following software may be included in this product:

```
Apache Commons Pool

Component's NOTICE.txt file:
Apache Commons Pool
Copyright 1999-2009 The Apache Software Foundation

This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.19 Apache Commons Validator License

The following software may be included in this product:

```
Apache Commons Validator

Component's NOTICE.txt file:
This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.20 Apache HttpComponents HttpClient License

The following software may be included in this product:

```
Apache HttpComponents HttpClient

Component's NOTICE.txt file:
Apache HttpComponents Client
Copyright 1999-2009 The Apache Software Foundation

This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).

This project contains annotations derived from JCIP-ANNOTATIONS
Copyright (c) 2005 Brian Goetz and Tim Peierls. See
http://www.jcip.net and the Creative Commons Attribution License
(http://creativecommons.org/licenses/by/2.5)
```

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.21 Apache HttpComponents HttpCore License

The following software may be included in this product:

```
Apache HttpComponents HttpCore

Component's NOTICE.txt file:
Apache HttpComponents Core - HttpCore
Copyright 2006-2009 The Apache Software Foundation

This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.22 Apache Jakarta ORO License

The following software may be included in this product:

```
Apache Jakarta ORO

The Apache Software License, Version 1.1

Copyright (c) 2000-2002 The Apache Software Foundation. All rights
reserved.

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions
are met:

1. Redistributions of source code must retain the above copyright
   notice, this list of conditions and the following disclaimer.

2. Redistributions in binary form must reproduce the above copyright
   notice, this list of conditions and the following disclaimer in
   the documentation and/or other materials provided with the
   distribution.

3. The end-user documentation included with the redistribution,
   if any, must include the following acknowledgment:
      "This product includes software developed by the
       Apache Software Foundation (http://www.apache.org/)."
   Alternately, this acknowledgment may appear in the software
   itself,
   if and wherever such third-party acknowledgments normally appear.

4. The names "Apache" and "Apache Software Foundation", "Jakarta-Oro"
   must not be used to endorse or promote products derived from this
   software without prior written permission. For written
   permission, please contact apache@apache.org.

5. Products derived from this software may not be called "Apache"
   or "Jakarta-Oro", nor may "Apache" or "Jakarta-Oro" appear in their
   name, without prior written permission of the Apache Software
   Foundation.

THIS SOFTWARE IS PROVIDED "AS IS" AND ANY EXPRESSED OR IMPLIED
WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES
OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE
DISCLAIMED. IN NO EVENT SHALL THE APACHE SOFTWARE FOUNDATION OR
ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
```

```
SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT
LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF
USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND
ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY,
OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT
OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF
SUCH DAMAGE.
```

```
=====

This software consists of voluntary contributions made by many
individuals on behalf of the Apache Software Foundation. For more
information on the Apache Software Foundation, please see
<http://www.apache.org/>.
```

A.23 Apache JAMES Mime4J License

The following software may be included in this product:

Apache JAMES Mime4J

Component's NOTICE.txt file:

```
=====
==      NOTICE file for use with the Apache License, Version 2.0,      ==
=====
```

Apache JAMES Mime4j

Copyright 2004-2008 The Apache Software Foundation

This product includes software developed at
The Apache Software Foundation (<http://www.apache.org/>).

This product may include/use software, JUnit (<http://www.junit.org/>),
developed by Kent Beck, Erich Gamma, and David Saff
License: Common Public License Version 1.0
(<http://www.opensource.org/licenses/cpl1.0.php>)

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

THIS PRODUCT ALSO INCLUDES THIRD PARTY SOFTWARE REDISTRIBUTED UNDER
THE FOLLOWING LICENSES:

JUnit, Common Public License Version 1.0 (junit-3.8.1.jar)
<http://junit.org>

THE ACCOMPANYING PROGRAM IS PROVIDED UNDER THE TERMS OF THIS COMMON
PUBLIC LICENSE ("AGREEMENT"). ANY USE, REPRODUCTION OR DISTRIBUTION OF
THE PROGRAM CONSTITUTES RECIPIENT'S ACCEPTANCE OF THIS AGREEMENT.

1. DEFINITIONS

"Contribution" means:

a) in the case of the initial Contributor, the initial code and
documentation distributed under this Agreement, and

b) in the case of each subsequent Contributor:

i) changes to the Program, and

ii) additions to the Program; where such changes and/or additions to
the Program originate from and are distributed by that particular
Contributor. A Contribution 'originates' from a Contributor if it was
added to the Program by such Contributor itself or anyone acting on
such Contributor's behalf. Contributions do not include additions to
the Program which:

(i) are separate modules of software distributed in conjunction with

the Program under their own license agreement, and (ii) are not derivative works of the Program.

"Contributor" means any person or entity that distributes the Program.

"Licensed Patents " mean patent claims licensable by a Contributor which are necessarily infringed by the use or sale of its Contribution alone or when combined with the Program.

"Program" means the Contributions distributed in accordance with this Agreement.

"Recipient" means anyone who receives the Program under this Agreement, including all Contributors.

2. GRANT OF RIGHTS

a) Subject to the terms of this Agreement, each Contributor hereby grants Recipient a non-exclusive, worldwide, royalty-free copyright license to reproduce, prepare derivative works of, publicly display, publicly perform, distribute and sublicense the Contribution of such Contributor, if any, and such derivative works, in source code and object code form.

b) Subject to the terms of this Agreement, each Contributor hereby grants Recipient a non-exclusive, worldwide, royalty-free patent license under Licensed Patents to make, use, sell, offer to sell, import and otherwise transfer the Contribution of such Contributor, if any, in source code and object code form. This patent license shall apply to the combination of the Contribution and the Program if, at the time the Contribution is added by the Contributor, such addition of the Contribution causes such combination to be covered by the Licensed Patents. The patent license shall not apply to any other combinations which include the Contribution. No hardware per se is licensed hereunder.

c) Recipient understands that although each Contributor grants the licenses to its Contributions set forth herein, no assurances are provided by any Contributor that the Program does not infringe the patent or other intellectual property rights of any other entity. Each Contributor disclaims any liability to Recipient for claims brought by any other entity based on infringement of intellectual property rights or otherwise. As a condition to exercising the rights and licenses granted hereunder, each Recipient hereby assumes sole responsibility to secure any other intellectual property rights needed, if any. For example, if a third party patent license is required to allow Recipient to distribute the Program, it is Recipient's responsibility to acquire that license before distributing the Program.

d) Each Contributor represents that to its knowledge it has sufficient copyright rights in its Contribution, if any, to grant the copyright license set forth in this Agreement.

3. REQUIREMENTS

A Contributor may choose to distribute the Program in object code form under its own license agreement, provided that:

a) it complies with the terms and conditions of this Agreement; and

b) its license agreement:

- i) effectively disclaims on behalf of all Contributors all warranties and conditions, express and implied, including warranties or conditions of title and non-infringement, and implied warranties or conditions of merchantability and fitness for a particular purpose;

ii) effectively excludes on behalf of all Contributors all liability for damages, including direct, indirect, special, incidental and consequential damages, such as lost profits;

iii) states that any provisions which differ from this Agreement are offered by that Contributor alone and not by any other party; and

iv) states that source code for the Program is available from such Contributor, and informs licensees how to obtain it in a reasonable manner on or through a medium customarily used for software exchange.

When the Program is made available in source code form:

a) it must be made available under this Agreement; and

b) a copy of this Agreement must be included with each copy of the Program.

Contributors may not remove or alter any copyright notices contained within the Program.

Each Contributor must identify itself as the originator of its Contribution, if any, in a manner that reasonably allows subsequent Recipients to identify the originator of the Contribution.

4. COMMERCIAL DISTRIBUTION

Commercial distributors of software may accept certain responsibilities with respect to end users, business partners and the like. While this license is intended to facilitate the commercial use of the Program, the Contributor who includes the Program in a commercial product offering should do so in a manner which does not create potential liability for other Contributors. Therefore, if a Contributor includes the Program in a commercial product offering, such Contributor ("Commercial Contributor") hereby agrees to defend and indemnify every other Contributor ("Indemnified Contributor") against any losses, damages and costs (collectively "Losses") arising from claims, lawsuits and other legal actions brought by a third party against the Indemnified Contributor to the extent caused by the acts or omissions of such Commercial Contributor in connection with its distribution of the Program in a commercial product offering. The obligations in this section do not apply to any claims or Losses relating to any actual or alleged intellectual property infringement. In order to qualify, an Indemnified Contributor must: a) promptly notify the Commercial Contributor in writing of such claim, and b) allow the Commercial Contributor to control, and cooperate with the Commercial Contributor in, the defense and any related settlement negotiations. The Indemnified Contributor may participate in any such claim at its own expense.

For example, a Contributor might include the Program in a commercial product offering, Product X. That Contributor is then a Commercial Contributor. If that Commercial Contributor then makes performance claims, or offers warranties related to Product X, those performance claims and warranties are such Commercial Contributor's responsibility alone. Under this section, the Commercial Contributor would have to defend claims against the other Contributors related to those performance claims and warranties, and if a court requires any other Contributor to pay any damages as a result, the Commercial Contributor must pay those damages.

5. NO WARRANTY

EXCEPT AS EXPRESSLY SET FORTH IN THIS AGREEMENT, THE PROGRAM IS PROVIDED ON AN "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, EITHER EXPRESS OR IMPLIED INCLUDING, WITHOUT LIMITATION, ANY WARRANTIES OR CONDITIONS OF TITLE, NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Each Recipient is solely responsible for determining the appropriateness of using and

distributing the Program and assumes all risks associated with its exercise of rights under this Agreement, including but not limited to the risks and costs of program errors, compliance with applicable laws, damage to or loss of data, programs or equipment, and unavailability or interruption of operations.

6. DISCLAIMER OF LIABILITY

EXCEPT AS EXPRESSLY SET FORTH IN THIS AGREEMENT, NEITHER RECIPIENT NOR ANY CONTRIBUTORS SHALL HAVE ANY LIABILITY FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING WITHOUT LIMITATION LOST PROFITS), HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OR DISTRIBUTION OF THE PROGRAM OR THE EXERCISE OF ANY RIGHTS GRANTED HEREUNDER, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

7. GENERAL

If any provision of this Agreement is invalid or unenforceable under applicable law, it shall not affect the validity or enforceability of the remainder of the terms of this Agreement, and without further action by the parties hereto, such provision shall be reformed to the minimum extent necessary to make such provision valid and enforceable.

If Recipient institutes patent litigation against a Contributor with respect to a patent applicable to software (including a cross-claim or counterclaim in a lawsuit), then any patent licenses granted by that Contributor to such Recipient under this Agreement shall terminate as of the date such litigation is filed. In addition, if Recipient institutes patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Program itself (excluding combinations of the Program with other software or hardware) infringes such Recipient's patent(s), then such Recipient's rights granted under Section 2(b) shall terminate as of the date such litigation is filed.

All Recipient's rights under this Agreement shall terminate if it fails to comply with any of the material terms or conditions of this Agreement and does not cure such failure in a reasonable period of time after becoming aware of such noncompliance. If all Recipient's rights under this Agreement terminate, Recipient agrees to cease use and distribution of the Program as soon as reasonably practicable. However, Recipient's obligations under this Agreement and any licenses granted by Recipient relating to the Program shall continue and survive.

Everyone is permitted to copy and distribute copies of this Agreement, but in order to avoid inconsistency the Agreement is copyrighted and may only be modified in the following manner. The Agreement Steward reserves the right to publish new versions (including revisions) of this Agreement from time to time. No one other than the Agreement Steward has the right to modify this Agreement. IBM is the initial Agreement Steward. IBM may assign the responsibility to serve as the Agreement Steward to a suitable separate entity. Each new version of the Agreement will be given a distinguishing version number. The Program (including Contributions) may always be distributed subject to the version of the Agreement under which it was received. In addition, after a new version of the Agreement is published, Contributor may elect to distribute the Program (including its Contributions) under the new version. Except as expressly stated in Sections 2(a) and 2(b) above, Recipient receives no rights or licenses to the intellectual property of any Contributor under this Agreement, whether expressly, by implication, estoppel or otherwise. All rights in the Program not expressly granted under this Agreement are reserved.

This Agreement is governed by the laws of the State of New York and

the intellectual property laws of the United States of America. No party to this Agreement will bring a legal action under this Agreement more than one year after the cause of action arose. Each party waives its rights to a jury trial in any resulting litigation.

Bnd, Bundle Tool <http://www.aqute.biz/Code/Bnd>, The Apache License, Version 2.0
ALL OTHERS JARS, BY APACHE SOFTWARE FOUNDATION
ALL OF THESE ARE LICENSED UNDER The Apache License, Version 2.0 EXCEPT:

Apache Commons Logging,
The Apache Software License, Version 1.1 (commons-logging-1.1.1.jar)

The Apache Software License, Version 1.1

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The end-user documentation included with the redistribution, if any, must include the following acknowledgment: "This product includes software developed by the Apache Software Foundation (<http://www.apache.org/>).". Alternately, this acknowledgment may appear in the software itself, if and wherever such third-party acknowledgments normally appear.
4. The names "Apache" and "Apache Software Foundation" must not be used to endorse or promote products derived from this software without prior written permission. For written permission, please contact apache@apache.org.
5. Products derived from this software may not be called "Apache", nor may "Apache" appear in their name, without prior written permission of the Apache Software Foundation.

THIS SOFTWARE IS PROVIDED ``AS IS'' AND ANY EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE APACHE SOFTWARE FOUNDATION OR ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

A.24 Apache License Version 2.0, January 2004

The following applies to all products licensed under the Apache 2.0 License: You may not use the identified files except in compliance with the Apache License, Version 2.0 (the "License.") You may obtain a copy of the License at <http://www.apache.org/licenses/LICENSE-2.0>. A copy of the license is also reproduced below. Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the

License.

Apache License Version 2.0, January 2004 <http://www.apache.org/licenses/>

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted" means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual,

worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

(a) You must give any other recipients of the Work or Derivative Works a copy of this License; and

(b) You must cause any modified files to carry prominent notices stating that You changed the files; and

(c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained

within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions. Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor

regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "[]" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright [yyyy] [name of copyright owner]

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at
<http://www.apache.org/licenses/LICENSE-2.0>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

A.25 Apache log4j License

The following software may be included in this product:

```
Apache log4j

Component's NOTICE.txt file:
Apache log4j
Copyright 2007 The Apache Software Foundation

This product includes software developed at
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.26 Apache Portable Runtime (APR) License

The following software may be included in this product:

Apache Portable Runtime (APR)

```
Apache Portable Runtime
Copyright (c) 2009 The Apache Software Foundation.

This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).

Portions of this software were developed at the National Center
for Supercomputing Applications (NCSA) at the University of
Illinois at Urbana-Champaign.

This software contains code derived from the RSA Data Security
Inc. MD5 Message-Digest Algorithm.

This software contains code derived from UNIX V7, Copyright(C)
Caldera International Inc.

This component is licensed under the Apache License Version 2.0, January
2004.

APACHE PORTABLE RUNTIME SUBCOMPONENTS:
The Apache Portable Runtime includes a number of subcomponents with
separate copyright notices and license terms. Your use of the source
code for the these subcomponents is subject to the terms and
conditions of the following licenses.
From strings/apr_fnmatch.c, include/apr_fnmatch.h, misc/unix/getopt.c,
file_io/unix/mktemp.c, strings/apr_strings.c:

/* * Copyright (c) 1987, 1993, 1994
The Regents of the University of California. All rights reserved.
*
Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions
are met:
1. Redistributions of source code must retain the above copyright
notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright
notice, this list of conditions and the following disclaimer in the
documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software
must display the following acknowledgement:
```

```
This product includes software developed by the University of
California, Berkeley and its contributors.
4. Neither the name of the University nor the names of its contributors
may be used to endorse or promote products derived from this software
without specific prior written permission.
*
THIS SOFTWARE IS PROVIDED BY THE REGENTS AND CONTRIBUTORS ``AS IS'' AND
ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE
IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE
ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS OR CONTRIBUTORS BE LIABLE
FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL
DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS
OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION)
HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT
LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY
OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF
SUCH DAMAGE.
From network_io/unix/inet_ntop.c, network_io/unix/inet_pton.c:

/* Copyright (c) 1996 by Internet Software Consortium.
*

Permission to use, copy, modify, and distribute this software for any
purpose with or without fee is hereby granted, provided that the above
copyright notice and this permission notice appear in all copies.
*

THE SOFTWARE IS PROVIDED "AS IS" AND INTERNET SOFTWARE CONSORTIUM DISCLAIMS
ALL WARRANTIES WITH REGARD TO THIS SOFTWARE INCLUDING ALL IMPLIED WARRANTIES
OF MERCHANTABILITY AND FITNESS. IN NO EVENT SHALL INTERNET SOFTWARE
CONSORTIUM BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, OR CONSEQUENTIAL
DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR
PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS
ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS
SOFTWARE.
From dso/aix/dso.c:

Based on libdl (dlfcn.c/dlfcn.h) which is
Copyright (c) 1992,1993,1995,1996,1997,1988
Jens-Uwe Mager, Helios Software GmbH, Hannover, Germany.
*
Not derived from licensed software.
*

Permission is granted to freely use, copy, modify, and redistribute
this software, provided that the author is not construed to be liable
for any results of using the software, alterations are clearly marked
as such, and this notice is not modified.
From strings/apr_strnatcmp.c, include/apr_strings.h:

strnatcmp.c - Perform 'natural order' comparisons of strings in C.
Copyright (C) 2000 by Martin Pool <mhp@humbug.org.au>

This software is provided 'as-is', without any express or implied
warranty. In no event will the authors be held liable for any damages
arising from the use of this software.

Permission is granted to anyone to use this software for any purpose,
including commercial applications, and to alter it and redistribute it
freely, subject to the following restrictions:

1. The origin of this software must not be misrepresented; you must not
claim that you wrote the original software. If you use this software
in a product, an acknowledgment in the product documentation would be
appreciated but is not required.
2. Altered source versions must be plainly marked as such, and must not be
misrepresented as being the original software.
3. This notice may not be removed or altered from any source distribution.
```

```
From strings/apr_snprintf.c:

*

cvt - IEEE floating point formatting routines.
Derived from UNIX V7, Copyright(C) Caldera International Inc.
*
Copyright(C) Caldera International Inc. 2001-2002. All rights reserved.
Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions are
met:

Redistributions of source code and documentation must retain the above
copyright notice, this list of conditions and the following disclaimer.

Redistributions in binary form must reproduce the above copyright
notice, this list of conditions and the following disclaimer in the
documentation and/or other materials provided with the distribution.

All advertising materials mentioning features or use of this software
must display the following acknowledgement:

This product includes software developed or owned by Caldera
International, Inc.

Neither the name of Caldera International, Inc. nor the names of other
contributors may be used to endorse or promote products derived from
this software without specific prior written permission.

USE OF THE SOFTWARE PROVIDED FOR UNDER THIS LICENSE BY CALDERA
INTERNATIONAL, INC. AND CONTRIBUTORS ``AS IS'' AND ANY EXPRESS OR IMPLIED
WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN
NO EVENT SHALL CALDERA INTERNATIONAL, INC. BE LIABLE FOR ANY DIRECT,
INDIRECT INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES
(INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR
SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION)
HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT,
STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN
ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE
POSSIBILITY OF SUCH DAMAGE.
```

Referenced license, [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.27 Apache Struts License

```
The following software may be included in this product:

Apache Struts

Component's NOTICE.txt file:
This product includes software developed by
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.28 Apache Tiles

```
The following software may be included in this product:
```


Apache Tiles

Component's NOTICE.txt file:

Apache Tiles

Copyright 1999-2007 The Apache Software Foundation

This product includes software developed at
The Apache Software Foundation (<http://www.apache.org/>).

This component is licensed under

[Section A.24, "Apache License Version 2.0, January 2004"](#).

A.29 Apache Tomcat

The following software may be included in this product:

Apache Tomcat

Component's NOTICE.txt file:

Apache Tomcat

Copyright 1999-2011 The Apache Software Foundation

This product includes software developed by
The Apache Software Foundation (<http://www.apache.org/>).

The Windows Installer is built with the Nullsoft
Scriptable Install System (NSIS), which is open
source software. The original software and related
information is available at
<http://nsis.sourceforge.net>.

Java compilation software for JSP pages is
provided by Eclipse, which is open source software.
The original software and related information is
available at
<http://www.eclipse.org>.

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.30 Apache Tomcat Native Library License

The following software may be included in this product:

Apache Tomcat Native Library

Component's NOTICE.txt file:

Apache Tomcat Native Library

Copyright 2002-2010 The Apache Software Foundation

This product includes software developed by
The Apache Software Foundation (<http://www.apache.org/>).

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.31 ASM License

The following software may be included in this product:

ASM

Copyright (c) 2000-2005 INRIA, France Telecom

```
All rights reserved.
```

```
Redistribution and use in source and binary forms, with or without  
modification, are permitted provided that the following conditions  
are met:
```

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

```
THIS SOFTWARE IS PROVIDED BY THE AUTHOR ``AS IS'' AND ANY EXPRESS  
OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED  
WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE  
ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY  
DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL  
DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE  
GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS  
INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER  
IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR  
OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN  
IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
```

A.32 Code Generation Library License

The following software may be included in this product:

```
cglib (Code Generation Library)
```

```
Component's NOTICE.txt file:
```

```
This product includes software developed by  
The Apache Software Foundation (http://www.apache.org/).
```

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.33 cURL (libcurl) License

The following software may be included in this product:

```
cURL (libcurl)
```

```
Use of any of this software is governed by the terms of the license below:
```

```
COPYRIGHT AND PERMISSION NOTICE
```

```
Copyright (c) 1996 - 2014, Daniel Stenberg, <daniel@haxx.se>.  
All rights reserved.
```

```
Permission to use, copy, modify, and distribute this software for any purpose  
with or without fee is hereby granted, provided that the above copyright  
notice and this permission notice appear in all copies.
```

```
THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR  
IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY,  
FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OF THIRD PARTY  
RIGHTS. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR  
ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT  
OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR  
THE USE OR OTHER DEALINGS IN THE SOFTWARE.
```

```
Except as contained in this notice, the name of a copyright holder shall not
```

be used in advertising or otherwise to promote the sale, use or other dealings in this Software without prior written authorization of the copyright holder.

A.34 DOM4J License

The following software may be included in this product:

Copyright 2001-2005 (C) MetaStuff, Ltd.
All Rights Reserved.

Redistribution and use of this software and associated documentation ("Software"), with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain copyright statements and notices. Redistributions must also contain a copy of this document.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name "DOM4J" must not be used to endorse or promote products derived from this Software without prior written permission of MetaStuff, Ltd. For written permission, please contact dom4j-info@metastuff.com.
4. Products derived from this Software may not be called "DOM4J" nor may "DOM4J" appear in their names without prior written permission of MetaStuff, Ltd. DOM4J is a registered trademark of MetaStuff, Ltd.
5. Due credit should be given to the DOM4J Project
<http://www.dom4j.org/>

THIS SOFTWARE IS PROVIDED BY METASTUFF, LTD. AND CONTRIBUTORS "AS IS" AND ANY EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL METASTUFF, LTD. OR ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

A.35 Dropdown Check List License

The following software may be included in this product:

Dropdown Check List (DDCL)

This component is dual licensed under the MIT and GPL licenses. For the avoidance of doubt, Oracle elects to use only the MIT License at this time for this component.

ui.dropdownchecklist

Copyright (c) 2008-2010 Adrian Tosca, Copyright (c) 2010-2011 Ittrium LLC
Dual licensed under the MIT (MIT-LICENSE.txt)

```
and GPL (GPL-LICENSE.txt) licenses.

Licensed like jQuery, see https://docs.jquery.com/Licensing

-----

Copyright (c) 2007 John Resig, http://jquery.com/

Permission is hereby granted, free of charge, to any person obtaining
a copy of this software and associated documentation files (the
"Software"), to deal in the Software without restriction, including
without limitation the rights to use, copy, modify, merge, publish,
distribute, sublicense, and/or sell copies of the Software, and to
permit persons to whom the Software is furnished to do so, subject to
the following conditions:

The above copyright notice and this permission notice shall be
included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND,
EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF
MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND
NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE
LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION
OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION
WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
```

A.36 dtoa.c License

The following software may be included in this product:

[dtoa.c](#)

```
The author of this software is David M. Gay.

Copyright (c) 1991, 2000, 2001 by Lucent Technologies.

Permission to use, copy, modify, and distribute this software for
any purpose without fee is hereby granted, provided that this entire
notice is included in all copies of any software which is or includes
a copy or modification of this software and in all copies of the
supporting documentation for such software.

THIS SOFTWARE IS BEING PROVIDED "AS IS", WITHOUT ANY EXPRESS OR
IMPLIED WARRANTY. IN PARTICULAR, NEITHER THE AUTHOR NOR LUCENT
MAKES ANY REPRESENTATION OR WARRANTY OF ANY KIND CONCERNING THE
MERCHANTABILITY OF THIS SOFTWARE OR ITS FITNESS FOR ANY PARTICULAR
PURPOSE.
```

A.37 Editline Library (libedit) License

The following software may be included in this product:

Editline Library (libedit)

Some files are:

```
Copyright (c) 1992, 1993
The Regents of the University of California. All rights reserved.

This code is derived from software contributed to
Berkeley by Christos Zoulas of Cornell University.
```

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. Neither the name of the University nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE REGENTS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Some files are:

Copyright (c) 2001 The NetBSD Foundation, Inc.
All rights reserved.

This code is derived from software contributed to The NetBSD Foundation
by Anthony Mallet.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE NETBSD FOUNDATION, INC. AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE FOUNDATION OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Some files are:

```
Copyright (c) 1997 The NetBSD Foundation, Inc.
All rights reserved.

This code is derived from software contributed to The NetBSD Foundation
by Jaromir Dolecek.

Redistribution and use in source and binary forms,
with or without modification, are permitted provided
that the following conditions are met:

1. Redistributions of source code must retain the
   above copyright notice, this list of conditions
   and the following disclaimer.
2. Redistributions in binary form must reproduce
   the above copyright notice, this list of conditions
   and the following disclaimer in the documentation
   and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE NETBSD FOUNDATION, INC.
AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED
WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED
WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A
PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL
THE FOUNDATION OR CONTRIBUTORS BE LIABLE FOR ANY
DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR
CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF
USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER
CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE
OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS
SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH
DAMAGE.
```

Some files are:

```
Copyright (c) 1998 Todd C. Miller <Todd.Miller@courtesan.com>

Permission to use, copy, modify, and distribute this
software for any purpose with or without fee is hereby
granted, provided that the above copyright notice and
this permission notice appear in all copies.

THE SOFTWARE IS PROVIDED "AS IS" AND TODD C. MILLER
DISCLAIMS ALL WARRANTIES WITH REGARD TO THIS SOFTWARE
INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY
AND FITNESS. IN NO EVENT SHALL TODD C. MILLER BE LIABLE
FOR ANY SPECIAL, DIRECT, INDIRECT, OR CONSEQUENTIAL
DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM
LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION
OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION,
ARISING OUT OF OR IN CONNECTION WITH THE USE OR
PERFORMANCE OF THIS SOFTWARE.
```

A.38 Ehcache License

The following software may be included in this product:

```
Ehcache
Copyright 2003-2010 Terracotta, Inc.
```

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.39 EZMorph License

The following software may be included in this product:

EZMorph

This component is licensed under [Section A.24, “Apache License Version 2.0, January 2004”](#).

A.40 FindGTest.cmake License

The following software may be included in this product:

```
FindGTest.cmake helper script (part of CMake)

Copyright 2009 Kitware, Inc.
Copyright 2009 Philip Lowman
Copyright 2009 Daniel Blezek

Distributed under the OSI-approved BSD License (the "License");
see accompanying file Copyright.txt for details.

This software is distributed WITHOUT ANY WARRANTY; without even the
implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
See the License for more information.
=====
(To distributed this file outside of CMake, substitute the full
License text for the above reference.)

Thanks to Daniel Blezek for the GTEST_ADD_TESTS code

Text of Copyright.txt mentioned above:

CMake - Cross Platform Makefile Generator
Copyright 2000-2009 Kitware, Inc., Insight Software Consortium
All rights reserved.

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions
are met:

* Redistributions of source code must retain the above copyright
  notice, this list of conditions and the following disclaimer.

* Redistributions in binary form must reproduce the above copyright
  notice, this list of conditions and the following disclaimer in the
  documentation and/or other materials provided with the distribution.

* Neither the names of Kitware, Inc., the Insight Software Consortium,
  nor the names of their contributors may be used to endorse or promote
  products derived from this software without specific prior written
  permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS
"AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT
LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR
A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT
HOLDER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT
LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE,
DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY
THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT
(INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE
```

OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

A.41 Fred Fish's Dbug Library License

The following software may be included in this product:

Fred Fish's Dbug Library

N O T I C E

Copyright Abandoned, 1987, Fred Fish

This previously copyrighted work has been placed into the public domain by the author and may be freely used for any purpose, private or commercial.

Because of the number of inquiries I was receiving about the use of this product in commercially developed works I have decided to simply make it public domain to further its unrestricted use. I specifically would be most happy to see this material become a part of the standard Unix distributions by AT&T and the Berkeley Computer Science Research Group, and a standard part of the GNU system from the Free Software Foundation.

I would appreciate it, as a courtesy, if this notice is left in all copies and derivative works. Thank you.

The author makes no warranty of any kind with respect to this product and explicitly disclaims any implied warranties of merchantability or fitness for any particular purpose.

The `dbug_analyze.c` file is subject to the following notice:

Copyright June 1987, Binayak Banerjee
All rights reserved.

This program may be freely distributed under the same terms and conditions as Fred Fish's Dbug package.

A.42 FreeMarker License

The following software may be included in this product:


```

FreeMarker

-----
Copyright (c) 2003 The Visigoth Software Society. All rights reserved.

Redistribution and use in source and binary forms,
with or without modification, are permitted provided
that the following conditions are met:

1. Redistributions of source code must retain the
   above copyright notice, this list of conditions
   and the following disclaimer.

2. The end-user documentation included with the
   redistribution, if any, must include the following
   acknowledgement:
      "This product includes software developed by the
       Visigoth Software Society (http://www.visigoths.org/)."
   Alternately, this acknowledgement may appear in the
   software itself, if and wherever such third-party
   acknowledgements normally appear.

3. Neither the name "FreeMarker", "Visigoth", nor any of
   the names of the project contributors may be used to
   endorse or promote products derived from this software
   without prior written permission. For written permission,
   please contact visigoths@visigoths.org.

4. Products derived from this software may not be called
   "FreeMarker" or "Visigoth" nor may "FreeMarker" or
   "Visigoth" appear in their names without prior written
   permission of the Visigoth Software Society.

THIS SOFTWARE IS PROVIDED "AS IS" AND ANY EXPRESSED OR
IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE
IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A
PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE
VISIGOTH SOFTWARE SOCIETY OR ITS CONTRIBUTORS BE LIABLE FOR
ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR
CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE,
DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED
AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT
LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED
OF THE POSSIBILITY OF SUCH DAMAGE.

-----

This software consists of voluntary contributions made
by many individuals on behalf of the Visigoth Software
Society. For more information on the Visigoth Software
Society, please see http://www.visigoths.org/

```

A.43 getarg License

The following software may be included in this product:

[getarg](#) Function ([getarg.h](#), [getarg.c](#) files)

```

Copyright (c) 1997 - 2000 Kungliga Tekniska Högskolan
(Royal Institute of Technology, Stockholm, Sweden).
All rights reserved.

Redistribution and use in source and binary forms, with

```

or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. Neither the name of the Institute nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE INSTITUTE AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE INSTITUTE OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

A.44 GLib License (for MySQL Enterprise Monitor)

The following software may be included in this product:

GLib

You are receiving a copy of the GLib library in both source and object code in the following:

./lib/charset.alias, ./lib/libglib*, ./lib/libgmodule*,
./lib/libgthread* and ./licenses/lgpl/glib-2.16.6.tar.gz
(or, for Windows: /bin/libglib*, /bin/libgmodule*,
/bin/libgthread*).

The terms of the Oracle license do NOT apply to the GLib library; it is licensed under the following license, separately from the Oracle programs you receive. If you do not wish to install this library, you may use the unattended install option --use-external-glib and we will not install the GLib libraries, source or licenses, but the Oracle program might not operate properly or at all without the library.

This component is licensed under [Section A.46, "GNU Lesser General Public License Version 2.1, February 1999"](#).

A.45 GNU General Public License Version 2.0, June 1991

The following applies to all products licensed under the GNU General Public License, Version 2.0: You may not use the identified files except in compliance with the GNU General Public License, Version 2.0 (the "License.") You may obtain a copy of the License at <http://www.gnu.org/licenses/gpl-2.0.txt>. A copy of the license is also reproduced below. Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND,

either express or implied. See the License for the specific language governing permissions and limitations under the License.

GNU GENERAL PUBLIC LICENSE
Version 2, June 1991

Copyright (C) 1989, 1991 Free Software Foundation, Inc.,
51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA
Everyone is permitted to copy and distribute verbatim
copies of this license document, but changing it is not
allowed.

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Lesser General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.

GNU GENERAL PUBLIC LICENSE TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed

under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

a) You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.

b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.

c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of

a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:

- a) Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
- b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
- c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND,

EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

```
<one line to give the program's name and a brief idea of what it
does.>
```

```
Copyright (C) <year> <name of author>
```

```
This program is free software; you can redistribute it and/or
modify it under the terms of the GNU General Public License as
published by the Free Software Foundation; either version
2 of the License, or (at your option) any later version.
```

```
This program is distributed in the hope that it will be useful,
but WITHOUT ANY WARRANTY; without even the implied warranty of
MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
GNU General Public License for more details.
```

```
You should have received a copy of the GNU General Public License
along with this program; if not, write to the Free Software
Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA
02110-1301 USA.
```

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

```
Gnomovision version 69, Copyright (C) year name of author
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details
type 'show w'. This is free software, and you are welcome
to redistribute it under certain conditions; type 'show c'
for details.
```

The hypothetical commands 'show w' and 'show c' should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than 'show w' and 'show c'; they could even be mouse-clicks or menu items--whatever suits your program.

You should also get your employer (if you work as a programmer) or your

school, if any, to sign a "copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the program 'Gnomovision' (which makes passes at compilers) written by James Hacker.

<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Lesser General Public License instead of this License.

A.46 GNU Lesser General Public License Version 2.1, February 1999

The following applies to all products licensed under the GNU Lesser General Public License, Version 2.1: You may not use the identified files except in compliance with the GNU Lesser General Public License, Version 2.1 (the "License"). You may obtain a copy of the License at <http://www.gnu.org/licenses/lgpl-2.1.html>. A copy of the license is also reproduced below. Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

GNU LESSER GENERAL PUBLIC LICENSE Version 2.1, February 1999

Copyright (C) 1991, 1999 Free Software Foundation, Inc.
51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA
Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

[This is the first released version of the Lesser GPL. It also counts as the successor of the GNU Library Public License, version 2, hence the version number 2.1.]

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users.

This license, the Lesser General Public License, applies to some specially designated software packages--typically libraries--of the Free Software Foundation and other authors who decide to use it. You can use it too, but we suggest you first think carefully about whether this license or the ordinary General Public License is the better strategy to use in any particular case, based on the explanations below.

When we speak of free software, we are referring to freedom of use, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish); that you receive source code or can get it if you want it; that you can change the software and use pieces of it in new free programs; and that you are informed that you can do these things.

To protect your rights, we need to make restrictions that forbid distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library or if you modify it.

For example, if you distribute copies of the library, whether gratis or for a fee, you must give the recipients all the rights that we gave you. You must make sure that they, too, receive or can get the source code. If you link other code with the library, you must provide complete object files to the recipients, so that they can relink them with the library after making changes to the library and recompiling it. And you must show them these terms so they know their rights.

We protect your rights with a two-step method: (1) we copyright the library, and (2) we offer you this license, which gives you legal permission to copy, distribute and/or modify the library.

To protect each distributor, we want to make it very clear that there is no warranty for the free library. Also, if the library is modified by someone else and passed on, the recipients should know that what they have is not the original version, so that the original author's reputation will not be affected by problems that might be introduced by others.

Finally, software patents pose a constant threat to the existence of any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits such linking only if the entire combination fits its criteria of freedom. The Lesser General Public License permits more lax criteria for linking other code with the library.

We call this license the "Lesser" General Public License because it does Less to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating

system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

GNU LESSER GENERAL PUBLIC LICENSE
TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License Agreement applies to any software library or other program which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Lesser General Public License (also called "this License"). Each licensee is addressed as "you".

A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

- a) The modified work must itself be a software library.

b) You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the

source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

a) Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if

the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

c) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

e) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

a) Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

b) Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

8. You may not copy, modify, sublicense, link with, or distribute the Library except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, link with, or distribute the Library is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

9. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.

10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further

restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties with this License.

11. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent license would not permit royalty-free redistribution of the Library by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Library.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply, and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

12. If the distribution and/or use of the Library is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Library under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

13. The Free Software Foundation may publish revised and/or new versions of the Lesser General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Library specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Library does not specify a license version number, you may choose any version ever published by the Free Software Foundation.

14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE LIBRARY AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE LIBRARY (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

How to Apply These Terms to Your New Libraries

If you develop a new library, and you want it to be of the greatest possible use to the public, we recommend making it free software that everyone can redistribute and change. You can do so by permitting redistribution under these terms (or, alternatively, under the terms of the ordinary General Public License).

To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

```
<one line to give the library's name and a brief idea of what it does.>
Copyright (C) <year>  <name of author>
```

```
This library is free software; you can redistribute it and/or
modify it under the terms of the GNU Lesser General Public
License as published by the Free Software Foundation; either
version 2.1 of the License, or (at your option) any later version.
```

```
This library is distributed in the hope that it will be useful,
but WITHOUT ANY WARRANTY; without even the implied warranty of
MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the GNU
Lesser General Public License for more details.
```

```
You should have received a copy of the GNU Lesser General Public
License along with this library; if not, write to the Free Software
Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA
02110-1301  USA
```

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the library, if necessary. Here is a sample; alter the names:

```
Yoyodyne, Inc., hereby disclaims all copyright interest in the
library `Frob' (a library for tweaking knobs) written by James
Random Hacker.
```

```
<signature of Ty Coon>, 1 April 1990
```

Ty Coon, President of Vice
That's all there is to it!

A.47 GNU Libtool License

The following software may be included in this product:

GNU Libtool (The GNU Portable Library Tool)

If you are receiving a copy of the Oracle software in source code, you are also receiving a copy of two files (ltmain.sh and ltdl.h) generated by the GNU Libtool in source code. If you received the Oracle software under a license other than a commercial (non-GPL) license, then the terms of the Oracle license do NOT apply to these files from GNU Libtool; they are licensed under the following licenses, separately from the Oracle programs you receive.

Oracle elects to use GNU General Public License version 2 (GPL) for any software where a choice of GPL or GNU Lesser/Library General Public License (LGPL) license versions are made available with the language indicating that GPL/LGPL or any later version may be used, or where a choice of which version of the GPL/LGPL is applied is unspecified.

From GNU Libtool:

ltmain.sh - Provide generalized library-building support services.

NOTE: Changing this file will not affect anything until you rerun configure.

Copyright (C) 1996, 1997, 1998, 1999, 2000, 2001, 2003, 2004, 2005, 2006, 2007 Free Software Foundation, Inc.

Originally by Gordon Matzigkeit, 1996

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details. You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301, USA.

As a special exception to the GNU General Public License, if you distribute this file as part of a program that contains a configuration script generated by Autoconf, you may include it under the same distribution terms that you use for the rest of that program.

This component is licensed under [Section A.45, "GNU General Public License Version 2.0, June 1991"](#)

A.48 Google Controlling Master Thread I/O Rate Patch License

The following software may be included in this product:

Google Controlling master thread I/O rate patch

Copyright (c) 2009, Google Inc.
All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- * Neither the name of the Google Inc. nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

A.49 Google Perftools (TCMalloc utility) License

The following software may be included in this product:

Google Perftools (TCMalloc utility)

Copyright (c) 1998-2006, Google Inc.
All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- * Neither the name of Google Inc. nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY

```
THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT
(INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE
OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
```

A.50 Google SMP Patch License

The following software may be included in this product:

Google SMP Patch

```
Google SMP patch
```

```
Copyright (c) 2008, Google Inc.
All rights reserved.
```

```
Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions
are met:
```

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- * Neither the name of the Google Inc. nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

```
THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS
"AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT
LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS
FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE
COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT,
INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING,
BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES;
LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER
CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT
LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN
ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE
POSSIBILITY OF SUCH DAMAGE.
```

A.51 Guava (Google Core Libraries for Java) License

The following software may be included in this product:

Guava (Google Core Libraries for Java)

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.52 Hibernate Annotations License

You are receiving a copy of the Hibernate Annotations library in both source and object code in the following `[MEM Server install dir]/apache-tomcat/webapps/ROOT/WEB-INF/lib/` folder. The terms of the Oracle license do NOT apply to the Hibernate Annotations library; it is licensed under the following license, separately from the Oracle programs you receive. If you do not wish to install this library, you may remove the files after installation, such as in the following example, but the Oracle program might not operate properly or at all without the library:

```
$ rm [MEM Server install dir]/apache-tomcat/webapps/ROOT/WEB-INF/lib/hibernate-annotations.jar
```

```
$ rm [MEM Server install dir]/licenses/lgpl/hibernate-annotations-3.4.0-ga-src.zip
```

The following software may be included in this product:

Hibernate Annotations

This component is licensed under [Section A.46, “GNU Lesser General Public License Version 2.1, February 1999”](#).

A.53 Hibernate Commons Annotations License

You are receiving a copy of the Hibernate Commons Annotations library in both source and object code in the following `[MEM Server install dir]/apache-tomcat/webapps/ROOT/WEB-INF/lib/` folder. The terms of the Oracle license do NOT apply to the Hibernate Commons Annotations library; it is licensed under the following license, separately from the Oracle programs you receive. If you do not wish to install this library, you may remove the files after installation, such as in the following example, but the Oracle program might not operate properly or at all without the library:

```
$ rm [MEM Server install dir]/apache-tomcat/webapps/ROOT/WEB-INF/lib/hibernate-commons-annotations.jar
$ rm [MEM Server install dir]/licenses/lgpl/hibernate-commons-annotations-3.1.0.GA-sources.jar
```

The following software may be included in this product:

Hibernate Commons Annotations

This component is licensed under [Section A.46, “GNU Lesser General Public License Version 2.1, February 1999”](#).

A.54 Hibernate License

You are receiving a copy of the Hibernate library in both source and object code in the following `[MEM Server install dir]/apache-tomcat/webapps/ROOT/WEB-INF/lib/` folder. The terms of the Oracle license do NOT apply to the Hibernate library; it is licensed under the following license, separately from the Oracle programs you receive. If you do not wish to install this library, you may remove the files after installation, such as in the following example, but the Oracle program might not operate properly or at all without the library:

```
$ rm [MEM Server install dir]/apache-tomcat/webapps/ROOT/WEB-INF/lib/hibernate3.jar
$ rm [MEM Server install dir]/licenses/lgpl/hibernate-3.3.2-ga-src.zip
```

The following software may be included in this product:

Hibernate

This component is licensed under [Section A.46, “GNU Lesser General Public License Version 2.1, February 1999”](#).

A.55 Java SNMP License

The following software may be included in this product:

```
Java SNMP Package
SNMP Package
```

```
Copyright (C) 2004, Jonathan Sevy <jsevy@cs.drexel.edu>
```

```
This is free software. Redistribution and use in source and binary forms, with
or without modification, are permitted provided that the following conditions
are met:
```

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

```
THIS SOFTWARE IS PROVIDED BY THE AUTHOR "AS IS" AND ANY EXPRESS OR IMPLIED
WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO
EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL,
EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT
OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS
INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE)
ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF
THE POSSIBILITY OF SUCH DAMAGE.
```

A.56 Javassist License

You are receiving a copy of the Javassist v3.9 library in both source and object code in the following [javassist-3.9.0-GA.jar](#) and [javassist-3.9.0-source.jar](#) JARs. The terms of the Oracle license do NOT apply to the Javassist v3.9 program; it is licensed under the following license, separately from the Oracle programs you receive. If you do not wish to install this program, you may remove the files after installation, such as in the following example, but the Oracle program might not operate properly or at all without the library:

```
$ rm [MEM Server install dir]/apache-tomcat/webapps/ROOT/WEB-INF/lib/javassist-3.9.0-GA.jar
$ rm [MEM Server install dir]/licenses/lgpl/javassist-3.9.0-source.jar
```

The following software may be included in this product:

```
Javassist 3.9.0
```

```
This component is licensed under Section A.46, "GNU Lesser General Public License Version 2.1, February 1999".
```

A.57 JCommon License

You are receiving a copy of the JCommon library in both source and object code in the following [\[MEM Server install dir\]/apache-tomcat/webapps/ROOT/WEB-INF/lib/](#) folder. The terms of the Oracle license do NOT apply to the JCommon library; it is licensed under the following license, separately from the Oracle programs you receive. If you do not wish to install this library, you may remove the files after installation, such as in the following example, but the Oracle program might not operate properly or at all without the library:

```
$ rm [MEM Server install dir]/apache-tomcat/webapps/ROOT/WEB-INF/lib/jcommon-1.0.16.jar
$ rm [MEM Server install dir]/licenses/jcommon-1.0.16-LICENSE
$ rm [MEM Server install dir]/licenses/lgpl/jcommon-1.0.16-src.zip
```

The following software may be included in this product:

JCommon

This component is licensed under [Section A.46, "GNU Lesser General Public License Version 2.1, February 1999"](#).

A.58 JDOM Project License

The following software may be included in this product:

JDOM

This product includes software developed by the JDOM Project (<http://www.jdom.org/>).

Copyright (C) 2000-2004 Jason Hunter & Brett McLaughlin.
All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions, and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions, and the disclaimer that follows these conditions in the documentation and/or other materials provided with the distribution.
3. The name "JDOM" must not be used to endorse or promote products derived from this software without prior written permission. For written permission, please contact <request_AT_jdom_DOT_org>.
4. Products derived from this software may not be called "JDOM", nor may "JDOM" appear in their name, without prior written permission from the JDOM Project Management <request_AT_jdom_DOT_org>.

In addition, we request (but do not require) that you include in the end-user documentation provided with the redistribution and/or in the software itself an acknowledgement equivalent to the following:

"This product includes software developed by the JDOM Project (<http://www.jdom.org/>)."

Alternatively, the acknowledgment may be graphical using the logos available at <http://www.jdom.org/images/logos>.

THIS SOFTWARE IS PROVIDED "AS IS" AND ANY EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE JDOM AUTHORS OR THE PROJECT CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

This software consists of voluntary contributions made by many individuals on behalf of the JDOM Project and was originally created by Jason Hunter and Brett McLaughlin. For more information on the JDOM Project, please see <<http://www.jdom.org/>>."

A.59 JFreeChart License

You are receiving a copy of the JFreeChart library in both source and object code in the following [\[MEM Server install dir\]/apache-tomcat/webapps/ROOT/WEB-INF/lib/](#) folder. The terms of the Oracle license do NOT apply to the JFreeChart library; it is licensed under the following license, separately from the Oracle programs you receive. If you do not wish to install this library, you may remove the files after installation, such as in the following example, but the Oracle program might not operate properly or at all without the library:

```
$ rm [MEM Server install dir]/apache-tomcat/webapps/ROOT/WEB-INF/lib/jfreechart-1.0.13.jar
$ rm [MEM Server install dir]/licenses/jfreechart-1.0.13-LICENSE
$ rm [MEM Server install dir]/licenses/lgpl/jfreechart-1.0.13.src.jar
```

The following software may be included in this product:

JFreeChart 1.0.13

This component is licensed under [Section A.46, “GNU Lesser General Public License Version 2.1, February 1999”](#).

A.60 jQuery Form Example Plugin License

The following software may be included in this product:

jQuery Form Example Plugin

This component is dual licensed under the BSD and GPL licenses. For the avoidance of doubt, Oracle elects to use only the BSD License at this time for this component.

Copyright (c) 2008-2009, Paul Mucur, <http://mucur.name>

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- * Neither the name of <http://mucur.name> nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

A.61 jQuery License

The following software may be included in this product:

jQuery

Copyright 2012 jQuery Foundation and other contributors
<http://jquery.com/>

```
Permission is hereby granted, free of charge, to any person obtaining
a copy of this software and associated documentation files (the
"Software"), to deal in the Software without restriction, including
without limitation the rights to use, copy, modify, merge, publish,
distribute, sublicense, and/or sell copies of the Software, and to
permit persons to whom the Software is furnished to do so, subject to
the following conditions:
```

```
The above copyright notice and this permission notice shall be
included in all copies or substantial portions of the Software.
```

```
THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND,
EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF
MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND
NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE
LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION
OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION
WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
```

A.62 jQuery UI License

The following software may be included in this product:

```
jQuery UI
```

```
Copyright (c) 2009 Paul Bakaus, http://jqueryui.com
```

```
This software consists of voluntary contributions made by many individuals
(AUTHORS.txt, http://jqueryui.com/about) For exact contribution history,
see the revision history and logs, available at
http://jquery-ui.googlecode.com/svn/
```

```
Permission is hereby granted, free of charge, to any person obtaining a
copy of this software and associated documentation files (the "Software"),
to deal in the Software without restriction, including without limitation
the rights to use, copy, modify, merge, publish, distribute, sublicense,
and/or sell copies of the Software, and to permit persons to whom the
Software is furnished to do so, subject to the following conditions:
```

```
The above copyright notice and this permission notice shall be included
in all copies or substantial portions of the Software.
```

```
THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND,
EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF
MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.
IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR
ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF
CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION
WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
```

A.63 JSON-lib License

The following software may be included in this product:

```
JSON-lib
```

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.64 lib_sql.cc License

The following software may be included in this product:

`lib_sql.cc`

```
Copyright (c) 2000
SWsoft company
```

```
This material is provided "as is", with absolutely no warranty
expressed or implied. Any use is at your own risk.
```

```
Permission to use or copy this software for any purpose is hereby
granted without fee, provided the above notices are retained on
all copies. Permission to modify the code and to distribute modified
code is granted, provided the above notices are retained, and a
notice that the code was modified is included with the above copyright
notice.
```

```
This code was modified by the MySQL team.
```

A.65 libevent License

The following software may be included in this product:

```
Copyright (c) 2000-2007 Niels Provos <provos@citi.umich.edu>
Copyright (c) 2007-2012 Niels Provos and Nick Mathewson
```

```
Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions
are met:
```

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

```
THIS SOFTWARE IS PROVIDED BY THE AUTHOR ``AS IS'' AND ANY EXPRESS OR
IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES
OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED.
IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT,
INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT
NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE,
DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY
THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT
(INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF
THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
```

```
=====
```

```
Portions of Libevent are based on works by others, also made available by
them under the three-clause BSD license above. The copyright notices are
available in the corresponding source files; the license is as above. Here's
a list:
```

```
log.c:
```

```
Copyright (c) 2000 Dug Song <dugsong@monkey.org>
Copyright (c) 1993 The Regents of the University of California.
```

```
strlcpy.c:
```

```
Copyright (c) 1998 Todd C. Miller <Todd.Miller@courtesan.com>
```

```
win32select.c:
```

```
Copyright (c) 2003 Michael A. Davis <mike@datanerds.net>
```

```
ht-internal.h:
```



```

Copyright (c) 2002 Christopher Clark

minheap-internal.h:
Copyright (c) 2006 Maxim Yegorushkin <maxim.yegorushkin@gmail.com>

=====

The arc4module is available under the following, sometimes called the
"OpenBSD" license:

Copyright (c) 1996, David Mazieres <dm@uun.org>
Copyright (c) 2008, Damien Miller <djm@openbsd.org>

Permission to use, copy, modify, and distribute this software for any
purpose with or without fee is hereby granted, provided that the above
copyright notice and this permission notice appear in all copies.

THE SOFTWARE IS PROVIDED "AS IS" AND THE AUTHOR DISCLAIMS ALL WARRANTIES
WITH REGARD TO THIS SOFTWARE INCLUDING ALL IMPLIED WARRANTIES OF
MERCHANTABILITY AND FITNESS. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR
ANY SPECIAL, DIRECT, INDIRECT, OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES
WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER IN AN
ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF
OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

```

A.66 Libffi License

The following software may be included in this product:

```

libffi - Copyright (c) 1996-2012 Anthony Green, Red Hat, Inc and others.
See source files for details.

Permission is hereby granted, free of charge, to any person obtaining
a copy of this software and associated documentation files (the
``Software''), to deal in the Software without restriction, including
without limitation the rights to use, copy, modify, merge, publish,
distribute, sublicense, and/or sell copies of the Software, and to
permit persons to whom the Software is furnished to do so, subject to
the following conditions:

The above copyright notice and this permission notice shall be
included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED ``AS IS'', WITHOUT WARRANTY OF ANY KIND,
EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF
MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.
IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY
CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT,
TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE
SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

```

A.67 libiconv License

You may be receiving a copy of the GNU LIBICONV Library with this MySQL product. The terms of the Oracle license do NOT apply to the GNU LIBICONV Library; it is licensed under the following license, separately from the Oracle programs you receive. If you do not wish to install this program, you may delete `[agent install dir]/lib/libiconv.*` and `[agent install dir]/licenses/lgpl/iconv` files.

The following software may be included in this product:

libiconv

This component is licensed under [Section A.46, “GNU Lesser General Public License Version 2.1, February 1999”](#).

A.68 libintl License

The following software may be included in this product:

libintl

```
Copyright (C) 1994 X Consortium
```

```
Permission is hereby granted, free of charge, to any person obtaining a copy of
this software and associated documentation files (the "Software"), to deal in
the Software without restriction, including without limitation the rights to
use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of
the Software, and to permit persons to whom the Software is furnished to do so,
subject to the following conditions:
```

```
The above copyright notice and this permission notice shall be included in all
copies or substantial portions of the Software.
```

```
THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR
IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS
FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE X CONSORTIUM
BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF
CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE
SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
```

```
Except as contained in this notice, the name of the X Consortium shall not be
used in advertising or otherwise to promote the sale, use or other dealings in
this Software without prior written authorization from the X Consortium.
```

```
FSF changes to this file are in the public domain.
```

```
Copyright 1996-2007 Free Software Foundation, Inc. Taken from GNU libtool, 2001
```

```
Originally by Gordon Matzigkeit <gord@gnu.ai.mit.edu>, 1996
```

```
This file is free software; the Free Software Foundation gives unlimited
permission to copy and/or distribute it, with or without modifications, as long
as this notice is preserved.
```

```
You are receiving a copy of the libintl library. The terms of the Oracle license
do NOT apply to the libintl library; it is licensed under the following license,
separately from the Oracle programs you receive. If you do not wish to install this
library, you may use the unattended install option --use-external-glib
(see Section 5.4.3, "MySQL Enterprise Monitor Agent Options" for more information)
and we will not install the GLib libraries, source or licenses,
but the Oracle program might not operate properly or at all without
the library.
```

This component is licensed under [Section A.46, “GNU Lesser General Public License Version 2.1, February 1999”](#).

A.69 Libxml2 License

The following software may be included in this product:

Libxml2

Except where otherwise noted in the source code (e.g.

the files hash.c, list.c and the trio files, which are covered by a similar licence but with different Copyright notices) all the files are:

Copyright (C) 1998-2003 Daniel Veillard. All Rights Reserved.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE DANIEL VEILLARD BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of Daniel Veillard shall not be used in advertising or otherwise to promote the sale, use or other dealings in this Software without prior written authorization from him.

A.70 Linux-PAM License

The following software may be included in this product:

Linux-PAM (pam-devel, Pluggable authentication modules for Linux)

Copyright Theodore Ts'o, 1996. All rights reserved.

(For the avoidance of doubt, Oracle uses and distributes this component under the terms below and elects not to do so under the GPL even though the GPL is referenced as an option below.)

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, and the entire permission notice in its entirety, including the disclaimer of warranties.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

ALTERNATIVELY, this product may be distributed under the terms of the GNU Public License, in which case the provisions of the GPL are required INSTEAD OF the above restrictions. (This clause is necessary due to a potential bad interaction between the GPL

```
and the restrictions contained in a BSD-style copyright.)
```

```
THIS SOFTWARE IS PROVIDED ``AS IS'' AND ANY EXPRESS OR IMPLIED  
WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES  
OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE  
DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT,  
INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES  
(INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR  
SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION)  
HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT,  
STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE)  
ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED  
OF THE POSSIBILITY OF SUCH DAMAGE.
```

A.71 LPEG Library License

The following software may be included in this product:

```
LPEG
```

```
Use of any of this software is governed by the terms of the license below:
```

```
Copyright © 2008 Lua.org, PUC-Rio.
```

```
Permission is hereby granted, free of charge, to any person obtaining a copy of  
this software and associated documentation files (the "Software"), to deal in  
the Software without restriction, including without limitation the rights to  
use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of  
the Software, and to permit persons to whom the Software is furnished to do so,  
subject to the following conditions:
```

```
The above copyright notice and this permission notice shall be included in all  
copies or substantial portions of the Software.
```

```
THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR  
IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS  
FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR  
COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER  
IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN  
CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
```

A.72 Lua (liblua) License

The following software may be included in this product:

```
Lua (liblua)
```

```
Copyright © 1994-2008 Lua.org, PUC-Rio.
```

```
Permission is hereby granted, free of charge, to any person obtaining  
a copy of this software and associated documentation files (the  
"Software"), to deal in the Software without restriction, including  
without limitation the rights to use, copy, modify, merge, publish,  
distribute, sublicense, and/or sell copies of the Software, and to  
permit persons to whom the Software is furnished to do so, subject  
to the following conditions:
```

```
The above copyright notice and this permission notice shall be  
included in all copies or substantial portions of the Software.
```

```
THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND,  
EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES
```

```
OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND
NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT
HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY,
WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING
FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR
OTHER DEALINGS IN THE SOFTWARE.
```

A.73 LuaFileSystem Library License

The following software may be included in this product:

```
LuaFileSystem
```

```
Copyright © 2003 Kepler Project.
```

```
Permission is hereby granted, free of charge, to any person obtaining
a copy of this software and associated documentation files (the
"Software"), to deal in the Software without restriction, including
without limitation the rights to use, copy, modify, merge, publish,
distribute, sublicense, and/or sell copies of the Software, and to
permit persons to whom the Software is furnished to do so, subject
to the following conditions:
```

```
The above copyright notice and this permission notice shall be
included in all copies or substantial portions of the Software.
```

```
THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND,
EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF
MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.
IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR
ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF
CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION
WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
```

A.74 md5 (Message-Digest Algorithm 5) License

The following software may be included in this product:

```
md5 (Message-Digest Algorithm 5)
```

```
This code implements the MD5 message-digest algorithm.
The algorithm is due to Ron Rivest. This code was
written by Colin Plumb in 1993, no copyright is claimed.
This code is in the public domain; do with it what you wish.
```

```
Equivalent code is available from RSA Data Security, Inc.
This code has been tested against that, and is equivalent,
except that you don't need to include two pages of legalese
with every copy.
```

```
The code has been modified by Mikael Ronstroem to handle
calculating a hash value of a key that is always a multiple
of 4 bytes long. Word 0 of the calculated 4-word hash value
is returned as the hash value.
```

A.75 nt_servc (Windows NT Service class library) License

The following software may be included in this product:

```
nt_servc (Windows NT Service class library)
```

```
Windows NT Service class library
Copyright Abandoned 1998 Irena Pancirov - Irnet Snc
This file is public domain and comes with NO WARRANTY of any kind
```

A.76 OGNL (Object-Graph Navigation Language) License

The following software may be included in this product:

OGNL (Object-Graph Navigation Language)

The OGNL packages are not available for direct, independent download - they are packaged with Struts releases, and maintained as part of that project under Apache v2.0 license.

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.77 OpenPAM License

The following software may be included in this product:

OpenPAM

```
Copyright (c) 2002-2003 Networks Associates Technology, Inc.
Copyright (c) 2004-2007 Dag-Erling Smørgrav
All rights reserved.
```

This software was developed for the FreeBSD Project by ThinkSec AS and Network Associates Laboratories, the Security Research Division of Network Associates, Inc. under DARPA/SPAWAR contract N66001-01-C-8035 ("CBOSS"), as part of the DARPA CHATS research program.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

A.78 OpenSSL v1.0 License

The following software may be included in this product:

OpenSSL v1.0

```

LICENSE ISSUES
=====
The OpenSSL toolkit stays under a dual license, i.e. both the conditions of
the OpenSSL License and the original SSLeay license apply to the toolkit. See
below for the actual license texts. Actually both licenses are BSD-style Open
Source licenses. In case of any license issues related to OpenSSL please
contact openssl-core@openssl.org.

OpenSSL License
-----
/ =====
Copyright (c) 1998-2008 The OpenSSL Project.
All rights reserved.
Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice,
this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice,
this list of conditions and the following disclaimer in the documentation
and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must
display the following acknowledgment: "This product includes software
developed by the OpenSSL Project for use in the OpenSSL Toolkit. (Link1 /)"
4. The names "OpenSSL Toolkit" and "OpenSSL Project" must not be used to
endorse or promote products derived from this software without prior written
permission. For written permission, please contact openssl-core@openssl.org.
5. Products derived from this software may not be called "OpenSSL" nor may
"OpenSSL" appear in their names without prior written permission of the
OpenSSL Project.
6. Redistributions of any form whatsoever must retain the following
acknowledgment: "This product includes software developed by the OpenSSL
Project for use in the OpenSSL Toolkit (Link2 /)"

THIS SOFTWARE IS PROVIDED BY THE OpenSSL PROJECT ``AS IS'' AND ANY EXPRESSED
OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES
OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN
NO EVENT SHALL THE OpenSSL PROJECT OR ITS CONTRIBUTORS BE LIABLE FOR ANY
DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES
(INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES;
LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND
ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT
(INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF
THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
=====
This product includes cryptographic software written by Eric Young
(eay@cryptsoft.com). This product includes software written by Tim Hudson
(tjh@cryptsoft.com).

Original SSLeay License
-----
/ Copyright (C) 1995-1998 Eric Young (eay@cryptsoft.com)
All rights reserved.
This package is an SSL implementation written by Eric Young
(eay@cryptsoft.com). The implementation was written so as to conform with
Netscapes SSL. This library is free for commercial and non-commercial use
as long as the following conditions are aheared to. The following conditions
apply to all code found in this distribution, be it the RC4, RSA, lhash,
DES, etc., code; not just the SSL code. The SSL documentation included with

```

this distribution is covered by the same copyright terms except that the holder is Tim Hudson (tjh@cryptsoft.com). Copyright remains Eric Young's, and as such any Copyright notices in the code are not to be removed. If this package is used in a product, Eric Young should be given attribution as the author of the parts of the library used. This can be in the form of a textual message at program startup or in documentation (online or textual) provided with the package. Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met: 1. Redistributions of source code must retain the copyright notice, this list of conditions and the following disclaimer. 2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution. 3. All advertising materials mentioning features or use of this software must display the following acknowledgement: "This product includes cryptographic software written by Eric Young (eay@cryptsoft.com)" The word 'cryptographic' can be left out if the routines from the library being used are not cryptographic related :-). 4. If you include any Windows specific code (or a derivative thereof) from the apps directory (application code) you must include an acknowledgement: "This product includes software written by Tim Hudson (tjh@cryptsoft.com)" THIS SOFTWARE IS PROVIDED BY ERIC YOUNG ``AS IS'' AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. The license and distribution terms for any publically available version or derivative of this code cannot be changed. i.e. this code cannot simply be copied and put under another distribution license [including the GNU Public License.]

A.79 PCRE License

The following software may be included in this product:

PCRE (Perl Compatible Regular Expressions) Library

PCRE LICENCE

PCRE is a library of functions to support regular expressions whose syntax and semantics are as close as possible to those of the Perl 5 language.

Release 7 of PCRE is distributed under the terms of the "BSD" licence, as specified below. The documentation for PCRE, supplied in the "doc" directory, is distributed under the same terms as the software itself.

The basic library functions are written in C and are freestanding. Also included in the distribution is a set of C++ wrapper functions.

THE BASIC LIBRARY FUNCTIONS

Written by: Philip Hazel
Email local part: ph10
Email domain: cam.ac.uk

University of Cambridge Computing Service,
Cambridge, England. Phone: +44 1223 334714.


```
Copyright (c) 1997-2006 University of Cambridge
All rights reserved.
```

```
THE C++ WRAPPER FUNCTIONS
-----
```

```
Contributed by:   Google Inc.
```

```
Copyright (c) 2006, Google Inc.
All rights reserved.
```

```
THE "BSD" LICENCE
-----
```

```
Redistribution and use in source and binary forms,
with or without modification, are permitted provided
that the following conditions are met:
```

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- * Neither the name of the University of Cambridge nor the name of Google Inc. nor the names of their contributors may be used to endorse or promote products derived from this software without specific prior written permission.

```
THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND
CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES,
INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE
DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS
BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY,
OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT
OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS;
OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF
LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING
NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF
THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
```

```
End
```

A.80 Percona Multiple I/O Threads Patch License

The following software may be included in this product:

Percona Multiple I/O threads patch

```
Copyright (c) 2008, 2009 Percona Inc
All rights reserved.
```

```
Redistribution and use of this software in source and binary forms,
with or without modification, are permitted provided that the
following conditions are met:
```

- * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- * Neither the name of Percona Inc. nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission of Percona Inc.

```
THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS
"AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT
LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS
FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE
COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT,
INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING,
BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES;
LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER
CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT
LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN
ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE
POSSIBILITY OF SUCH DAMAGE.
```

A.81 PersistJS License

The following software may be included in this product:

PersistJS

Copyright (c) 2008 Paul Duncan (paul@pablotron.org)

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

A.82 PNG Behavior License

The following software may be included in this product:

PNG Behavior

Notice that the PNG Behavior does not require any license. You may use it in any way you see fit as long as credit is given where credit is due. In other words, don't claim you create it and don't try to make money directly from it.

A.83 PxtoEM License

The following software may be included in this product:

PxtoEM

This component is dual licensed under the MIT and GPL licenses. For the avoidance of doubt, Oracle elects to use only the MIT License at this time for this component.

The MIT License
Copyright (c) 2008, Filament Group, Inc

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

The end-user documentation included with the redistribution, if any, must include the following acknowledgment:

"This product includes software developed by Filament Group, Inc (<https://www.filamentgroup.com/>) and its contributors", in the same place and form as other third-party acknowledgments. Alternately, this acknowledgment may appear in the software itself, in the same form and location as other such third-party acknowledgments.

A.84 Radeox RE

The following software may be included in this product:

Radeox RE

Copyright 2001-2004 Fraunhofer Gesellschaft, Munich, Germany
for it's Fraunhofer Institute Computer Architecture and
Software Technology (FIRST), Berlin, Germany

Licensed under the Apache License, Version 2.0 (the 'Licence');
you may not use this file except in the compliance with the
License. You may obtain a copy of the License at
<http://www.apache.org/licenses/LICENSE-2.0>

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.85 RegEX-Spencer Library License

The following software may be included in this product: Henry Spencer's Regular-Expression Library (RegEX-Spencer)

Copyright 1992, 1993, 1994 Henry Spencer. All rights reserved.
This software is not subject to any license of the American Telephone
and Telegraph Company or of the Regents of the University of California.

Permission is granted to anyone to use this software for any purpose on
any computer system, and to alter it and redistribute it, subject
to the following restrictions:

1. The author is not responsible for the consequences of use of this
software, no matter how awful, even if they arise from flaws in it.

2. The origin of this software must not be misrepresented, either by explicit claim or by omission. Since few users ever read sources, credits must appear in the documentation.
3. Altered versions must be plainly marked as such, and must not be misrepresented as being the original software. Since few users ever read sources, credits must appear in the documentation.
4. This notice may not be removed or altered.

A.86 RFC 3174 - US Secure Hash Algorithm 1 (SHA1) License

The following software may be included in this product:

RFC 3174 - US Secure Hash Algorithm 1 (SHA1)

RFC 3174 - US Secure Hash Algorithm 1 (SHA1)

Copyright (C) The Internet Society (2001). All Rights Reserved.

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and this paragraph are included on all such copies and derivative works. However, this document itself may not be modified in any way, such as by removing the copyright notice or references to the Internet Society or other Internet organizations, except as needed for the purpose of developing Internet standards in which case the procedures for copyrights defined in the Internet Standards process must be followed, or as required to translate it into languages other than English.

The limited permissions granted above are perpetual and will not be revoked by the Internet Society or its successors or assigns.

This document and the information contained herein is provided on an "AS IS" basis and THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.

A.87 Richard A. O'Keefe String Library License

The following software may be included in this product:

Richard A. O'Keefe String Library

The Richard O'Keefe String Library is subject to the following notice:

These files are in the public domain. This includes getopt.c, which is the work of Henry Spencer, University of Toronto Zoology, who says of it "None of this software is derived from Bell software. I had no access to the source for Bell's versions at the time I wrote it. This software is hereby explicitly placed in the public domain."

```
It may be used for any purpose on any machine by anyone." I would
greatly prefer it if *my* material received no military use.
```

```
The t_ctype.h file is subject to the following notice:
```

```
Copyright (C) 1998, 1999 by Pruet Boonma, all rights reserved.
Copyright (C) 1998 by Theppitak Karoonboonyanan, all rights reserved.
```

```
Permission to use, copy, modify, distribute and sell this software and its
documentation for any purpose is hereby granted without fee, provided that the above
copyright notice appear in all copies.
```

```
Smaphan Raruenrom and Pruet Boonma makes no representations about
the suitability of this software for any purpose. It is provided
"as is" without express or implied warranty.
```

A.88 ROME License

The following software may be included in this product:

ROME

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.89 SHA-1 in C License

The following software may be included in this product:

SHA-1 in C

```
SHA-1 in C
By Steve Reid <steve@edmweb.com>
100% Public Domain
```

A.90 Simple Logging Facade for Java (SLF4J) License

The following software may be included in this product:

```
Simple Logging Facade for Java (SLF4J)
```

```
Copyright (c) 2004-2008 QOS.ch
All rights reserved.
```

```
Permission is hereby granted, free of charge,
to any person obtaining a copy of this software
and associated documentation files (the "Software"),
to deal in the Software without restriction, including
without limitation the rights to use, copy, modify,
merge, publish, distribute, sublicense, and/or sell
copies of the Software, and to permit persons to whom
the Software is furnished to do so, subject to the
following conditions:
```

```
The above copyright notice and this permission notice
shall be included in all copies or substantial portions
of the Software.
```

```
THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY
OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT
LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS
FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO
```

```
EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE
FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN
AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM,
OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE
OR OTHER DEALINGS IN THE SOFTWARE.
```

A.91 SNMP4J License

The following software may be included in this product:

SNMP4J (The Object Oriented SNMP API for Java Managers and Agents)

Component's NOTICE.txt file:

```
=====
== NOTICE file corresponding to the section 4 d of ==
== the Apache License, Version 2.0, ==
== in this case for the SNMP4J distribution. ==
=====
```

This product includes software developed by
SNMP4J.org (<http://www.snmp4j.org/>).

Please read the different LICENSE files present in the
root directory of this distribution.

The names "SNMP4J" and "Apache Software Foundation"
must not be used to endorse or promote products derived
from this software without prior written permission.
For written permission, please contact
info@snmp4j.org (SNMP4J) or apache@apache.org.

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.92 Spring Framework License

The following software may be included in this product:

Spring Framework

Copyright (c) 2004-2009 Rod Johnson, Juergen Hoeller, Keith Donald, Colin Sampaleanu, Rob Harrop, Alef Arendsen, Thomas Risberg, Darren Davison, Dmitriy Kopylenko, Mark Pollack, Thierry Templier, Erwin Vervaet, Portia Tung, Ben Hale, Adrian Colyer, John Lewis, Costin Leau, Mark Fisher, Sam Brannen, Ramnivas Laddad, Arjen Poutsma, Chris Beams, Tareq Abedrabbo, Andy Clement

Component's NOTICE.txt file:

```
=====
== NOTICE file corresponding to section 4 d of the Apache License, ==
== Version 2.0, in this case for the Spring Framework distribution. ==
=====
```

This product includes software developed by
the Apache Software Foundation (<http://www.apache.org/>).

The end-user documentation included with a redistribution, if any,
must include the following acknowledgement:

"This product includes software developed by the Spring Framework
Project (<http://www.springframework.org/>)."

Alternatively, this acknowledgement may appear in the software itself,
if and wherever such third-party acknowledgements normally appear.

```
The names "Spring" and "Spring Framework" must not be used to
endorse or promote products derived from this software without
prior written permission. For written permission, please contact
rod.johnson@interface21.com or juergen.hoeller@interface21.com.
=====
```

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.93 StringTemplate Template Engine License

The following software may be included in this product:

```
StringTemplate Template Engine

Copyright (c) 2008, Terence Parr
All rights reserved.

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions
are met:
1. Redistributions of source code must retain the above copyright
   notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright
   notice, this list of conditions and the following disclaimer in
   the documentation and/or other materials provided with the distribution.
3. Neither the name of the author nor the names of its contributors may
   be used to endorse or promote products derived from this software
   without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS
"AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT
LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS
FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE
COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT,
INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING,
BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES;
LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER
CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT
LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN
ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE
POSSIBILITY OF SUCH DAMAGE.
```

A.94 TEA License

The following software may be included in this product:

```
TEA (a Tiny Encryption Algorithm)

Tiny Encryption Algorithm v2.0, from Lecture Notes in Computer Science
(Leuven, Belgium: Fast Software Encryption: Second International Workshop) -
presented by David Wheeler and Roger Needham of the Cambridge Computer
Laboratory in 1995.
```

A.95 XWork License

```
The following software may be included in this product:

XWork
```

```
Component's NOTICE.txt file:
Copyright 2002-2006,2009 The Apache Software Foundation.

Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

http://www.apache.org/licenses/LICENSE-2.0

Unless required by applicable law or agreed to in writing, software
distributed under the License is distributed on an "AS IS" BASIS,
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.

See the License for the specific language governing permissions and
limitations under the License.
```

This component is licensed under [Section A.24, "Apache License Version 2.0, January 2004"](#).

A.96 zlib License

The following software may be included in this product:

zlib

Oracle gratefully acknowledges the contributions of Jean-loup Gailly and Mark Adler in creating the zlib general purpose compression library which is used in this product.

```
zlib.h -- interface of the 'zlib' general purpose compression library
Copyright (C) 1995-2004 Jean-loup Gailly and Mark Adler

zlib.h -- interface of the 'zlib' general purpose compression library
version 1.2.3, July 18th, 2005
Copyright (C) 1995-2005 Jean-loup Gailly and Mark Adler

zlib.h -- interface of the 'zlib' general purpose compression library
version 1.2.5, April 19th, 2010
Copyright (C) 1995-2010 Jean-loup Gailly and Mark Adler

This software is provided 'as-is', without any express or implied warranty.
In no event will the authors be held liable for any damages arising from the
use of this software. Permission is granted to anyone to use this software
for any purpose, including commercial applications, and to alter it and
redistribute it freely, subject to the following restrictions:

1. The origin of this software must not be misrepresented; you must not
   claim that you wrote the original software. If you use this software
   in a product, an acknowledgment in the product documentation would
   be appreciated but is not required.
2. Altered source versions must be plainly marked as such, and must not
   be misrepresented as being the original software.
3. This notice may not be removed or altered from any source distribution.

Jean-loup Gailly jloup@gzip.org
Mark Adler madler@alumni.caltech.edu
```

Appendix B MySQL Enterprise Monitor General Reference

Table of Contents

B.1 MySQL Enterprise Monitor Limitations	243
B.2 Supported Browsers	244
B.3 Installation Requirements	244
B.4 Configuring Tomcat Parameters	245
B.5 Backing up MySQL Enterprise Service Manager	246
B.6 Migrating 1.3.x Historical Data to MySQL Enterprise Monitor 2.0	247
B.7 Improving Disk Space Usage with Purge in 2.1 and 2.2	250
B.8 Regular MySQL Enterprise Monitor Maintenance	251
B.9 Advisor/Graph Reference	251
B.9.1 Advisors	262
B.9.2 Graph Definition Reference	302

This appendix contains reference information for MySQL Enterprise Monitor.

B.1 MySQL Enterprise Monitor Limitations

The following items are known limitations within MySQL Enterprise Monitor:

- The maximum size for each data item stored within the `mysql.inventory` table is 64 bytes.
- The MySQL Enterprise Monitor Agent, when operating for Query Analyzer as a `proxy`, does not support clients using the MySQL protocol older than MySQL 5.0.
- The MySQL Enterprise Monitor Agent, when operating for Query Analyzer as a proxy, affects the authentication of clients. As the proxy is the real client connecting to the backend MySQL server, authenticate using the hostname of the proxy, not the original client.
- Fonts used for MySQL Enterprise Service Manager graphs might not be displayed properly if a required font is missing.

To specify a custom font, you set a custom property within the embedded MySQL Server to a known working font. Connect to your embedded MySQL Server using the information provided by the `configuration_report.txt` file. Once connected, execute the following statement:

```
mysql> INSERT INTO map_entries VALUES (1,'Helvetica','graph.font');
```

Replacing `Helvetica` with the font to use.

The font used for graph rendering is selected as follows, in this order:

1. The user override value.
 2. The MySQL Enterprise Service Manager default of Arial.
 3. The graph engine default of SansSerif.
- You cannot monitor more than one MySQL Enterprise Monitor User Interface instance hosted on the same machine simultaneously within the same browser, even if each MySQL Enterprise Monitor User Interface uses a different port for access. The effect of this limitation can be more significant on certain browsers.

- When monitoring multiple MySQL instances with one MySQL Enterprise Monitor Agent, if any of the MySQL instances are down when the agent is started, the agent does not attempt to reconnect to the servers. This could lead to indications that MySQL instances were down when in fact they were running and available. To avoid this problem, ensure all of the monitored instances are available before starting the agent.

B.2 Supported Browsers

The MySQL Enterprise Monitor User Interface is known to work within the following browser environments:

- Microsoft Internet Explorer 7.x, 8.x, 9.x, and higher.



Note

MySQL Enterprise Monitor User Interface is not compatible with the **Compatibility View** option within Internet Explorer 8.x, and higher. Disable this option before using MySQL Enterprise Monitor User Interface.

- Safari 3.2, 4.x, and higher.
- Firefox 3.0, 3.5, and higher.
- Google Chrome 4.0 and higher.

The MySQL Enterprise Monitor User Interface is known *not* to work within the following browser environments:

- Microsoft Internet Explorer 6.x and lower.
- Opera.

B.3 Installation Requirements

The Service Manager is available for Windows and a variety of Unix and Linux operating systems. In most cases, the standard operating system and packages are supported without further libraries and modules. All the required components are installed automatically.

• Windows Notes

- Installation requires approximately 260MB of disk space for MySQL Enterprise Service Manager.

• Unix/Linux Notes

- Installation requires approximately 450MB of disk space for MySQL Enterprise Service Manager.
- On FreeBSD, you must have [bind8](#) installed.

• General Notes

- MySQL Server 5.5.10 and greater depends on the [libaio](#) library being available on the server. Solaris and Windows enable AIO functionality by default.

This dependency affects the bundled MySQL Server.



Note

Disk-space usage requirements are approximate for the base application. During usage, the service manager records detailed information about your MySQL servers

and environment, and disk space usage increases with time to record this historical data. You can control how long information is stored once the service manager has been installed.

Running MySQL Enterprise Service Manager places a reasonable load on your system, and this load increases linearly as you add more agents monitoring more servers. Ideally, use a dedicated machine for MySQL Enterprise Service Manager rather than running it alongside other applications and services.

Minimum System Requirements

- 2 or more CPU cores
- 2 or more GB of RAM
- Disk I/O subsystem applicable for a write-intensive database

Recommended System Requirements (if monitoring 100 or more MySQL servers)

- 4 or more CPU cores
- 8 or more GB of RAM
- Disk I/O subsystem applicable for a write-intensive database (RAID10, RAID 0+1)

The Monitor Agent is available for a wide range of operating systems. For an up-to-date list please see the <http://www.mysql.com/products/enterprise/>. The agent can be used to monitor any MySQL server from version 4.0.x through 5.6.x.

B.4 Configuring Tomcat Parameters

The parameters for the Tomcat hosting system used to support MySQL Enterprise Service Manager and MySQL Enterprise Monitor User Interface can have an affect on the performance of the system.

The default settings for Java for Tomcat are as follows:

Initial heap size	-Xms	768MB
Maximum heap size	-Xmx	768MB
Java stack size	-Xss	128MB

You can change these parameters to higher values,by editing the `JAVA_OPTS` setting within the corresponding platform script.

- On Unix/Linux:

Edit the values within `apache-tomcat/bin/setenv.sh` file within your MySQL Enterprise Service Manager directory. Avoid setting maximum figures higher than the physical memory of your system as this may reduce, rather than increase the performance.

If you change these parameters, shut down and restart MySQL Enterprise Service Manager for the changes to take effect.

- Windows

Edit the `JAVA_OPTS` settings within the `apache-tomcat/bin/setenv.bat` file.

To enable the changes, re-install your service. Shut down your MySQL Enterprise Service Manager service and then reinstall the service by running:

```
shell> mysqlmonitorctl.bat uninstall
shell> mysqlmonitorctl.bat install
```

On all platforms, upgrading the MySQL Enterprise Service Manager service using the above methods should preserve any changes to [JAVA_OPTS](#).

If you change these parameters, restart MySQL Enterprise Service Manager for the changes to take effect.

B.5 Backing up MySQL Enterprise Service Manager

To back up the data stored within your MySQL Enterprise Service Manager, you can use any of the typical backup solutions, such as the MySQL Enterprise Backup product or the [mysqldump](#) command, to back up the [repository](#) database. Once this database grows to substantial size, you might find that the binary copy technique of the MySQL Enterprise Backup product is faster (especially for restoring) than a logical backup using the [mysqldump](#) command. For details, see <http://dev.mysql.com/doc/mysql-enterprise-backup/en/>.

To back up the MySQL Enterprise Monitor data, you specify the host name, user name, and password that were set during the installation of the MySQL Enterprise Service Manager. Locate this information in the [configuration_report.txt](#) file that was generated when MySQL Enterprise Service Manager was installed. The following example shows a typical report file:

```
MySQL Enterprise Monitor (Version 2.0.0.7088 : 20081031_152749_r7088)

Here are the settings you specified:
Application hostname and port: http://127.0.0.1:18080
Tomcat Ports: 18080 - 18443 (SSL)
MySQL Port : 13306

Repository Credentials (bundled MySQL):
-----
service_manager/Password

Use the following command to login to the MySQL Enterprise Monitor database:
mysql -uservice_manager -pPassword -P13306 -h127.0.0.1
```

The last line provides the information about how to connect to the server using the standard [mysql](#) command line client.

All the MySQL Enterprise Monitor repository information, including your configuration, rule and historical data is stored within the [mem](#) database.

To back up this information using [mysqldump](#), you might use the following command:

```
shell> mysqldump --single-transaction -uservice_manager -pPassword -P13306 -h127.0.0.1 mem >mem.dump
```

The above command creates a file, [mem.dump](#), containing all of the MySQL Enterprise Monitor data.

To ensure consistency in a recovery situation, you may also want to back up the agent configuration and metadata stored on each monitored MySQL server. To do this:

- Copy the [etc](#) subdirectory of each agent to a backup location. This directory contains the main configuration file, [mysql-monitor-agent.ini](#), and the configuration information for each server being monitored, which is stored within the [etc/instances](#) subdirectory.

- On each server being monitored, back up the `mysql.inventory` table, which contains the unique ID of the MySQL server.

In case the backup process makes the Service Manager unresponsive for a time, you might also adjust the `agent-backlog-timeout` setting as appropriate, to avoid losing data from the agents during a backup of the repository database.

B.6 Migrating 1.3.x Historical Data to MySQL Enterprise Monitor 2.0

You can migrate the data generated during a MySQL Enterprise Monitor 1.3.x installation using the Data Migration functionality of the **Server Configuration** panel.

To use the data migration feature, you must have installed MySQL Enterprise Service Manager using an *update* installer. The update installer performs the initial migration of your configuration, rules, schedule, and events data. The historical data is not migrated until you explicitly request the migration of information within the **Manage Servers** section of the **Settings** panel.

Data migration works on a single server, allowing you to select on which servers you want to migrate information. The migration is subject to the following:

- You must elect to migrate the data from each server individually.
- Migration takes approximately 5-6 hours, for each month, for each server. Therefore, if you have six months of data on 10 servers it could take between 300 and 360 hours (15 days) to migrate all of your historical data one server at a time.
- To limit the data migration, set the **Data Purge Behavior** within the **Settings** page, as shown in [Section 2.8.1, “Global Settings”](#). Only data more recent than the specified purge period is migrated. Data older than the purge period is ignored.
- To prevent performance issues, migrate only one or a small number of servers concurrently.
- You can start and stop the migration of the data at any time. As a general guide, avoid stopping the data migration process and allow it to complete unless:
 - Run out of disk space.
 - MySQL Enterprise Service Manager becomes too slow and unresponsive.
 - Migration never completes.

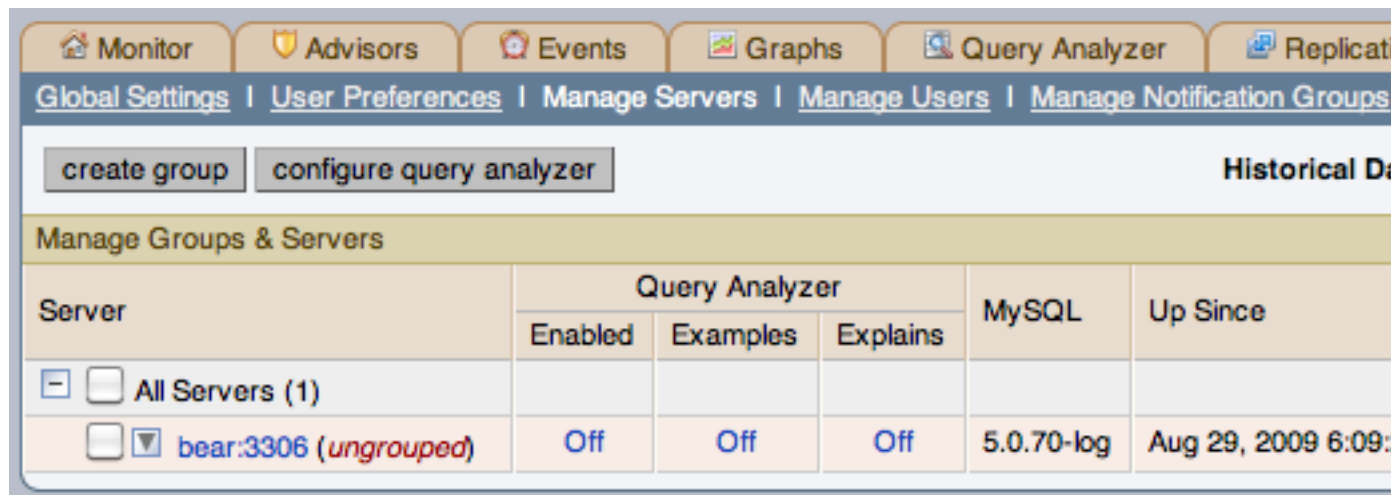
With the last item, where the migration never completes, occasionally there are some aspects of the data that cannot be migrated successfully. This prevents the migration process completing, but does not affect the conversion of any data that could be migrated.

Starting Historical Data Migration

To start data migration:

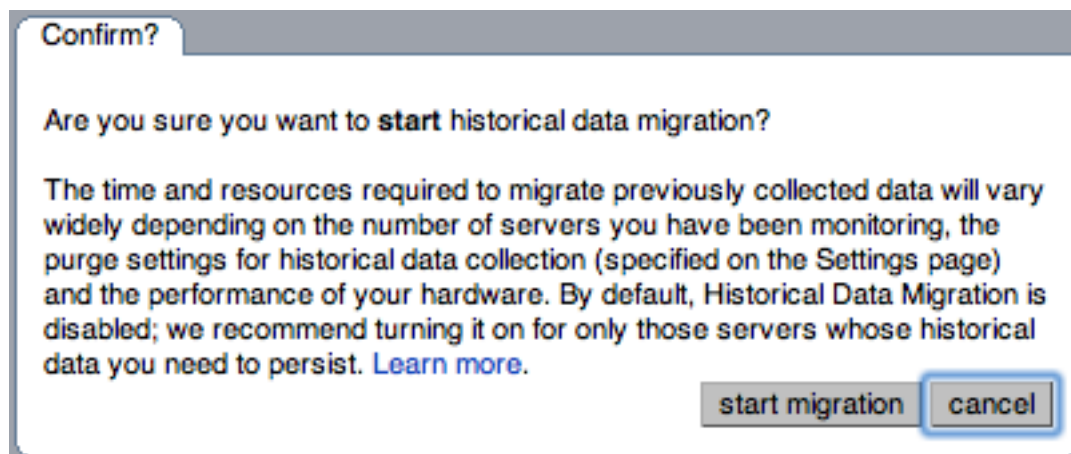
- Switch to the **Manage Servers** display of the **Settings** panel within MySQL Enterprise Monitor User Interface.
- Ensure that the data migration functionality has been enabled. The **Start** and **Stop** buttons next to **Historical Data Migration** are visible.

Figure B.1 MySQL Enterprise Monitor: Historical Data Migration Availability



- Select the servers you want to migrate by using the checkbox next to each server name. You can select one or more servers to migrate. Servers that are suitable for migration show their migration status within the **Migration Status** column. If the server cannot be migrated, [N/A](#) is shown.
- Click [Start](#) next to **Historical Data Migration**.
- To start the migration, click [start migration](#) in the confirmation dialog box. To cancel migration, click [cancel](#).
- The servers to migrate show [Queued for Migration](#) in the **Migration Status** column.

Figure B.2 MySQL Enterprise Monitor: Confirming Historical Data Migration



Monitoring Historical Data Migration

To check the migration status of any individual server, examine the **Migration Status** column for each server, as shown in the following figure:

Figure B.3 MySQL Enterprise Monitor: Historical Data Migration Progress

Migration Status
N/A
Migrating : 41 variables (50%) Start: Nov 19, 2008 1:51:28 PM
Migrating : 8 variables (9%) Start: Nov 19, 2008 1:51:27 PM

Note that the migration status is shown according to the state of migration at the time the page was loaded. The actual migration continues in the background, and the current state may not match the state of the migration at the time it is viewed.

Servers showing **Done** in the **Migration Status** column have already completed their migration.

You can check the overall migration status by examining the **Upgrade Status** display.

Stopping Historical Data Migration

You can stop the migration process for any server that is still migrating data. The migration can be restarted at any time without causing any problems.

To stop the historical data migration:

1. Select the servers you want to stop migrating by using the checkbox next to each server name. You can select one or more servers to stop migrating.
2. Click **Stop** next to **Historical Data Migration**.

You receive confirmation that the migration has been stopped, or a notification if migration has already completed.

Removing Old Data

Once data migration has been completed for all the servers you want to migrate, you may want to delete or remove access to the old data within your MySQL Enterprise Monitor repository. Data for MySQL Enterprise Monitor 1.3 was stored in a database called **merlin** within the MySQL repository. Data for MySQL Enterprise Monitor 2.0 is stored within a database called **mem**.

To create a backup of the old information, use **mysqldump**:

```
shell> mysqldump -uservice_manager -pPassword -P13306 -h127.0.0.1 merlin >data-1.3.sql
```

The above creates a file, **data-1.3.sql** containing all of the MySQL Enterprise Monitor 1.3 information.

If you remove access to the old data, then the data migration options for old servers are removed from the **Manage Servers** panel within MySQL Enterprise Service Manager. To remove access, **REVOKE** access to the **merlin** database:


```
mysql& REVOKE ALL on merlin.* FROM 'service_manager';
```

Revoking access to the old data does not reclaim any of the disk space used by the old data.

To delete the data from the database and free up the space being used by the historical information, [DROP](#) the [merlin](#) database:

```
mysql& DROP DATABASE merlin;
```

Once all the data has been migrated you can hide the migration user interface by clicking the [hide migration interface](#) button.

B.7 Improving Disk Space Usage with Purge in 2.1 and 2.2

In MySQL Enterprise Monitor 2.1, the data received by the MySQL Enterprise Service Manager from MySQL Enterprise Monitor Agent instances is inserted into tables, with the information within the tables purged periodically to remove the old data, according to the defined purging interval.

In installations with a large volume of data, the purging of old information can take a considerable amount of time, slowing down the MySQL Enterprise Service Manager and using up valuable disk space.

In MySQL Enterprise Monitor 2.2, the tables used for storing this information are changed, and the older tables are used only when viewing historical information. The information within the table is not purged until all of the table data is older than the specified purge period, when the old tables are dropped.



Note

The following instructions are designed to reduce the disk space usage for customers that are either using MySQL Enterprise Monitor 2.1 currently, or that have already upgraded an existing MySQL Enterprise Monitor 2.1 installation to MySQL Enterprise Monitor 2.2. When you perform a new (not upgrade) installation of MySQL Enterprise Monitor 2.2, these steps are not required.

To reduce the space used by the tables in both 2.1 and 2.2 until the data is finally purged, follow these steps:

1. If you are running MySQL Enterprise Monitor 2.1, upgrade to MySQL Enterprise Monitor 2.2 using an upgrade installer. This migrates the existing table data and prepare you for the next stage.



Warning

Performing a upgrade installation from MySQL Enterprise Monitor 2.1 to MySQL Enterprise Monitor 2.2 requires approximately 150% of your current disk space requirements while the information is migrated. Once the migration is complete, your disk space usage returns to a value slightly higher than within your MySQL Enterprise Monitor 2.1 installation.

2. Start up your MySQL Enterprise Service Manager and MySQL Enterprise Monitor Agent instances.
3. Connect to the MySQL server being used by your MySQL Enterprise Service Manager. You can find a sample [mysql](#) command for connecting to your server within the [configuration_report.txt](#) file within your MySQL Enterprise Service Manager installation.
4. Once connected to MySQL, change to the [mem](#) database:

```
mysql> use mem;
```


5. Now execute the following `ALTER TABLE` statements to change the original InnoDB tables to use MyISAM:

```
ALTER TABLE dc_ng_double_age0 ENGINE=MYISAM;  
ALTER TABLE dc_ng_double_age1 ENGINE=MYISAM;  
ALTER TABLE dc_ng_double_age2 ENGINE=MYISAM;  
ALTER TABLE dc_ng_double_now ENGINE=MYISAM;  
ALTER TABLE dc_ng_long_age0 ENGINE=MYISAM;  
ALTER TABLE dc_ng_long_age1 ENGINE=MYISAM;  
ALTER TABLE dc_ng_long_age2 ENGINE=MYISAM;  
ALTER TABLE dc_ng_long_now ENGINE=MYISAM;  
ALTER TABLE dc_ng_string_now ENGINE=MYISAM;
```

**Note**

Please keep in mind the following points when running these statements

- Performing this operation should not affect the operation of your MySQL Enterprise Service Manager, since new data is written into different tables.
- The time required to perform the conversion depends on the size of your original tables. It may take a considerable amount of time if you have a large volume of old data.
- You need slightly more than twice the amount of disk space currently being used by the tables until the conversion completes.

Once the conversion has completed, you can continue to use your MySQL Enterprise Service Manager without restarting or any further administration. The existing old table data is removed as soon as the data in the old table is older than your selected purging interval. The new MyISAM tables should take up approximately 60% of the space of the InnoDB tables.

B.8 Regular MySQL Enterprise Monitor Maintenance

MySQL Enterprise Monitor is generally self-managing and does not need much maintenance. To keep your MySQL Enterprise Monitor running efficiently, automate or manually perform these maintenance tasks:

- Set the purge interval for your data to an appropriate value according to duration and history of data that you want to keep. For more information, see [Data Purge Behavior](#).
- Check, and delete, the contents of the temporary directory with your MySQL Enterprise Service Manager installation directory.

B.9 Advisor/Graph Reference

Administration

- **Advisors**

- [32-Bit Binary Running on 64-Bit AMD Or Intel System](#)
- [Attempted Connections To The Server Have Failed](#)
- [Binary Log Debug Information Disabled](#)
- [Binary Logging Is Limited](#)
- [Binary Logging Not Enabled](#)

- Binary Logging Not Synchronized To Disk At Each Write
- Binary Logs Automatically Removed Too Quickly
- Database May Not Be Portable Due To Identifier Case Sensitivity
- Default Value Being Used For max_prepared_stmt_count
- Event Scheduler Disabled
- Excessive Percentage Of Attempted Connections To The Server Have Failed
- General Query Log Enabled
- Host Cache Size Not Sufficient
- In-Memory Temporary Table Size Limited By Maximum Heap Table Size
- Incorrect InnoDB Flush Method On Windows
- InnoDB Fast Shutdown Enabled
- InnoDB File Format Check Disabled Or Incorrect
- InnoDB INFORMATION_SCHEMA Plugins Missing
- InnoDB Status Truncation Detected
- InnoDB Strict Mode Is Off
- InnoDB Tablespace Cannot Automatically Expand
- InnoDB Transaction Logs Not Sized Correctly
- Key Buffer Size Greater Than 4 GB
- Maximum Connection Limit Nearing Or Reached
- Multiple Threads Used When Repairing MyISAM Tables
- MySQL Server Has Been Restarted
- Next-Key Locking Disabled For InnoDB But Binary Logging Enabled
- No Value Set For MyISAM Recover Options
- Query Cache Not Available
- Table Cache Set Too Low For Startup
- Time Zone Data Not Loaded
- Warnings Not Being Logged
- XA Distributed Transaction Support Enabled For InnoDB

Agent

- **Graphs**

- [Agent Reporting Delay \[302\]](#)
- [Memory Usage - Agent \[318\]](#)

Backup

- **Advisors**

- [Incremental MySQL Enterprise Backups Not Enabled](#)
- [Last Full MySQL Enterprise Backup Too Old](#)
- [MySQL Enterprise Backup Failed](#)
- [MySQL Enterprise Backup Lock Time Excessive](#)
- [MySQL Enterprise Backup Succeeded](#)

- **Graphs**

- [Backup Locked Time \[302\]](#)
- [Backup Run Time \[302\]](#)

Cluster

- **Advisors**

- [Cluster Data Node Data Memory Getting Low](#)
- [Cluster Data Node Has Been Restarted](#)
- [Cluster Data Node Index Memory Getting Low](#)
- [Cluster Data Node Redo Buffer Space Getting Low](#)
- [Cluster Data Node Redo Log Space Getting Low](#)
- [Cluster Data Node Undo Buffer Space Getting Low](#)
- [Cluster Data Node Undo Log Space Getting Low](#)
- [Cluster Data Nodes Not Running](#)
- [Cluster DiskPageBuffer Hit Ratio Is Low](#)
- [Cluster Has Stopped](#)

Heat chart

- **Advisors**

- [Agent Host Time Out of Sync Relative to Dashboard](#)
- [Connection Usage Excessive](#)
- [CPU I/O Usage Excessive](#)

- [CPU Usage Excessive](#)
- [Lock Contention Excessive](#)
- [MyISAM Key Cache Has Sub-Optimal Hit Rate](#)
- [MySQL Agent Memory Usage Excessive](#)
- [MySQL Agent Not Communicating With Database Server](#)
- [MySQL Agent Not Reachable](#)
- [MySQL Server Not Reachable](#)
- [Query Cache Has Sub-Optimal Hit Rate](#)
- [RAM Usage Excessive](#)
- [Table Scans Excessive](#)
- [Temporary Tables To Disk Ratio Excessive](#)

Memory usage

- **Advisors**
 - [InnoDB Buffer Cache Has Sub-Optimal Hit Rate](#)
 - [Key Buffer Size May Not Be Optimal For Key Cache](#)
 - [Key Buffer Size May Not Be Optimal For System RAM](#)
 - [Query Cache Potentially Undersized](#)
 - [Table Cache Not Optimal](#)
 - [Thread Cache Size May Not Be Optimal](#)

Os

- **Graphs**
 - [CPU Utilization \[306\]](#)
 - [Disk IO Operations \[308\]](#)
 - [Disk IO Usage \[308\]](#)
 - [Disk Space Usage \[308\]](#)
 - [Load Average \[317\]](#)
 - [Memory Usage - OS Resident \[318\]](#)
 - [Memory Usage - OS Virtual \[318\]](#)
 - [Network - Interface Throughput \[320\]](#)

- [Swap IO Operations \[328\]](#)

Performance

• Advisors

- [Binary Log Usage Exceeding Disk Cache Memory Limits](#)
- [Data Flushed To Disk After Each SQL Statement](#)
- [Excessive Disk Temporary Table Usage Detected](#)
- [Excessive Number of Locked Processes](#)
- [Excessive Number of Long Running Processes](#)
- [Excessive Number of Long Running Processes Locked](#)
- [Flush Time Set To Non-Zero Value](#)
- [Indexes Not Being Used Efficiently](#)
- [InnoDB Buffer Pool Writes May Be Performance Bottleneck](#)
- [InnoDB Doublewrite Buffer Enabled](#)
- [InnoDB Flush Method May Not Be Optimal](#)
- [InnoDB Log Buffer Flushed To Disk After Each Transaction](#)
- [InnoDB Log Waits May Be Performance Bottleneck](#)
- [InnoDB Not Using Newest File Format](#)
- [MyISAM Concurrent Insert Setting May Not Be Optimal](#)
- [Prepared Statements Not Being Closed](#)
- [Prepared Statements Not Being Used Effectively](#)
- [Query Cache Is Excessively Fragmented](#)
- [Query Cache Not Enabled](#)
- [Slow Query Log Not Enabled](#)
- [Stored Procedures Found With SELECT * Syntax](#)
- [Table Lock Contention Excessive](#)
- [Thread Cache Not Enabled](#)
- [Thread Pool Stall Limit Too Low](#)
- [Thread Pooling Not Enabled](#)
- [Too Many Concurrent Queries Running](#)

Replication

- **Advisors**

- [Binary Log Checksums Disabled](#)
- [Binary Log File Count Exceeds Specified Limit](#)
- [Binary Log Row Based Images Excessive](#)
- [Binary Log Space Exceeds Specified Limit](#)
- [INSERT ON DUPLICATE KEY UPDATE Bug May Break Replication](#)
- [Master Not Verifying Checksums When Reading From Binary Log](#)
- [Slave Detection Of Network Outages Too High](#)
- [Slave Error: Unknown or Incorrect Time Zone](#)
- [Slave Execution Position Too Far Behind Read Position](#)
- [Slave Has Been Stopped](#)
- [Slave Has Experienced A Replication Error](#)
- [Slave Has Login Accounts With Inappropriate Privileges](#)
- [Slave Has Problem Communicating With Master](#)
- [Slave Has Stopped Replicating](#)
- [Slave I/O Thread Not Running](#)
- [Slave Master Info/Relay Log Info Not Crash Safe](#)
- [Slave Not Configured As Read Only](#)
- [Slave Not Verifying Checksums When Reading From Relay Log](#)
- [Slave Relay Log Space Is Very Large](#)
- [Slave Relay Logs Not Automatically Purged](#)
- [Slave SQL Processing Not Multi-Threaded](#)
- [Slave SQL Thread Not Running](#)
- [Slave SQL Thread Reading From Older Relay Log Than I/O Thread](#)
- [Slave Too Far Behind Master](#)
- [Slave Waiting To Free Relay Log Space](#)
- [Slave Without REPLICATION SLAVE Accounts](#)

Schema

- **Advisors**

- [AUTO_INCREMENT Field Limit Nearly Reached](#)
- [MyISAM Indexes Found with No Statistics](#)
- [Object Changed: Database Has Been Altered](#)
- [Object Changed: Database Has Been Created](#)
- [Object Changed: Database Has Been Dropped](#)
- [Object Changed: Function Has Been Created](#)
- [Object Changed: Function Has Been Dropped](#)
- [Object Changed: Index Has Been Created](#)
- [Object Changed: Index Has Been Dropped](#)
- [Object Changed: Table Has Been Altered](#)
- [Object Changed: Table Has Been Created](#)
- [Object Changed: Table Has Been Dropped](#)
- [Object Changed: User Has Been Dropped](#)
- [Object Changes Detected](#)
- [Server-Enforced Data Integrity Checking Disabled](#)
- [Server-Enforced Data Integrity Checking Not Strict](#)
- [Tables Found with No Primary or Unique Keys](#)

Security

• **Advisors**

- [Account Has An Overly Broad Host Specifier](#)
- [Account Has Global Privileges](#)
- [Account Has Old Insecure Password Hash](#)
- [Account Has Strong MySQL Privileges](#)
- [Account Requires Unavailable Authentication Plugins](#)
- [Insecure Password Authentication Option Is Enabled](#)
- [Insecure Password Generation Option Is Enabled](#)
- [LOCAL Option Of LOAD DATA Statement Is Enabled](#)
- [Non-Authorized User Has DB, Table, Or Index Privileges On All Databases](#)
- [Non-Authorized User Has GRANT Privileges On All Databases](#)

- [Non-Authorized User Has Server Admin Privileges](#)
- [Policy-Based Password Validation Does Not Perform Dictionary Checks](#)
- [Policy-Based Password Validation Is Weak](#)
- [Policy-Based Password Validation Not Enabled](#)
- [Privilege Alterations Detected: Privileges Granted](#)
- [Privilege Alterations Detected: Privileges Revoked](#)
- [Privilege Alterations Have Been Detected](#)
- [Root Account Can Login Remotely](#)
- [Root Account Without Password](#)
- [Server Contains Default "test" Database](#)
- [Server Has Accounts Without A Password](#)
- [Server Has Anonymous Accounts](#)
- [Server Has No Locally Authenticated Root User](#)
- [Server Includes A Root User Account](#)
- [SHA-256 Password Authentication Not Enabled](#)
- [Symlinks Are Enabled](#)
- [UDFs Loaded From Insecure Location](#)
- [User Has Rights To Database That Does Not Exist](#)
- [User Has Rights To Table That Does Not Exist](#)
- [Users Can View All Databases On MySQL Server](#)

Server - Activity

- **Graphs**
 - [Binlog IO Usage \[302\]](#)
 - [Binlog Space Usage \[303\]](#)
 - [Database Activity \[307\]](#)
 - [Database Transactions \[307\]](#)
 - [Network - Database Throughput \[320\]](#)
 - [Opened Tables \[321\]](#)
 - [Row Access Statistics \[326\]](#)

- [Row Accesses \[326\]](#)
- [Row Accesses Index Usage Ratio \[326\]](#)
- [Row Writes \[327\]](#)
- [Rows Returned \[327\]](#)
- [Slow Queries \[327\]](#)
- [Sort Activity \[328\]](#)
- [Table Lock Wait Ratio \[329\]](#)
- [Table Locks \[329\]](#)

Server - Activity - Connections

- **Graphs**
 - [Connections \[305\]](#)
 - [Connections - Aborted \[305\]](#)
 - [Connections - Maximum \[306\]](#)

Server - Activity - Prepared statements

- **Graphs**
 - [Prepared Statement API \[321\]](#)
 - [Prepared Statement API Invalidations \[321\]](#)
 - [Prepared Statement SQL \[322\]](#)
 - [Prepared Statement Utilization \[322\]](#)

Server - Activity - Statements

- **Graphs**
 - [Statement Errors and Warnings \[328\]](#)
 - [Statement Statistics \[328\]](#)

Server - Activity - Thread pool

- **Graphs**
 - [Thread Pool Current Threads \[330\]](#)
 - [Thread Pool Queue Age \[330\]](#)
 - [Thread Pool Queues \[330\]](#)
 - [Thread Pool Stall Rate \[330\]](#)
 - [Thread Pool Statement Activity \[331\]](#)

Server - Engine - Cluster**• Graphs**

- [Cluster Data Node Data Memory Use \[303\]](#)
- [Cluster Data Node DiskPageBuffer Hit Ratio \[303\]](#)
- [Cluster Data Node Index Memory Use \[303\]](#)
- [Cluster Data Node Redo Buffer Use \[304\]](#)
- [Cluster Data Node Redo Log Space Use \[304\]](#)
- [Cluster Data Node Undo Buffer Use \[304\]](#)
- [Cluster Data Node Undo Log Space Use \[304\]](#)
- [Cluster Data Nodes in Ready State \[305\]](#)

Server - Engine - Innodb**• Graphs**

- [InnoDB Adaptive Hash Index Memory \[309\]](#)
- [InnoDB Adaptive Hash Index Searches \[310\]](#)
- [InnoDB Buffer Pool \[310\]](#)
- [InnoDB Buffer Pool Page Activity \[310\]](#)
- [InnoDB Buffer Pool Pending Operations \[311\]](#)
- [InnoDB Change Buffer Activity \[311\]](#)
- [InnoDB Change Buffer Activity \[311\]](#)
- [InnoDB Change Buffer Usage \[312\]](#)
- [InnoDB Compression Time \[312\]](#)
- [InnoDB Data Dictionary Memory \[312\]](#)
- [InnoDB Datafile IO Usage \[312\]](#)
- [InnoDB Doublewrite Buffer Activity \[313\]](#)
- [InnoDB Open Files \[313\]](#)
- [InnoDB OS File Access \[313\]](#)
- [InnoDB Redo Log Checkpoint Lag \[314\]](#)
- [InnoDB Redo Log IO Usage \[314\]](#)
- [InnoDB Redo Log Pending Writes \[314\]](#)
- [InnoDB Row Details \[315\]](#)

- [InnoDB Row Lock Time \[315\]](#)
- [InnoDB Row Lock Time Statistics \[315\]](#)
- [InnoDB Row Lock Waits \[315\]](#)
- [InnoDB Row Locks Current \[316\]](#)
- [InnoDB Semaphores \[316\]](#)
- [InnoDB Transaction History \[316\]](#)
- [InnoDB Transaction Lock Memory \[317\]](#)
- [InnoDB Transactions \[317\]](#)
- [InnoDB Undo Logs \[317\]](#)

Server - Engine - Myisam

- **Graphs**
 - [MyISAM Data File IO Usage \[319\]](#)
 - [MyISAM Index File IO Usage \[319\]](#)
 - [MyISAM Key Buffer Activity \[319\]](#)
 - [MyISAM Key Buffer Usage \[320\]](#)

Server - Memory usage

- **Graphs**
 - [Binlog Cache Efficiency \[302\]](#)
 - [Connections - Cache \[306\]](#)
 - [Hit Ratios \[309\]](#)
 - [Temporary Tables \[329\]](#)

Server - Memory usage - Query cache

- **Graphs**
 - [Query Cache Average Free Block Size \[322\]](#)
 - [Query Cache Average Query Size \[322\]](#)
 - [Query Cache Efficiency \[323\]](#)
 - [Query Cache Fragmentation \[323\]](#)
 - [Query Cache Lowmem Prunes \[323\]](#)
 - [Query Cache Memory \[324\]](#)
 - [Query Cache Queries \[324\]](#)

Server - Replication**• Graphs**

- [Replication Master Semi-Sync Transactions \[324\]](#)
- [Replication Master Semi-Sync Wait Time Averages \[324\]](#)
- [Replication Master Semi-Sync Waiting Sessions \[325\]](#)
- [Replication Master Semi-Sync Waits \[325\]](#)
- [Replication Slave Delay \[325\]](#)
- [Replication Slave Relay Log Space Usage \[325\]](#)

Upgrade**• Advisors**

- [CREATE TABLE LIKE Does Not Require Any Privileges On Source Table](#)
- [Date-Handling Bugs Can Crash The Server](#)
- [Disabling Next-Key Locking In InnoDB Can Crash The Server](#)
- [Improper key_cache_block_size Setting Can Corrupt MyISAM Tables](#)
- [InnoDB Change Buffering Is Not Entirely Crash-Safe](#)
- [Malformed Password Packet In Connection Protocol Can Crash Server](#)
- [Missing Security Improvements In GRANT Options](#)
- [Multi-Byte Encoding Processing Can Lead To SQL Injection](#)
- [No Limit On Total Number Of Prepared Statements](#)
- [Row-based Replication Broken For UTF8 CHAR Columns Longer Than 85 Characters](#)
- [Security Risk with BINLOG Statement](#)
- [Stored Routine Runs In Definer's Rather Than Caller's Security Context](#)
- [UDF Support Can Be Used To Execute Arbitrary Code](#)
- [Use Of View Overrides Column Update Privileges On Underlying Table](#)
- [User Can Gain Privileges By Running Stored Routine Declared Using SQL SECURITY INVOKER](#)
- [User With Only ALTER Privilege On Partitioned Table Can Obtain SELECT Privilege Information](#)

B.9.1 Advisors

The following items describe individual advisors.

- **32-Bit Binary Running on 64-Bit AMD Or Intel System**

The chip architecture and operating system installed on a machine both impact the performance of software running on the system. While it is possible to run 32-bit software on many 64-bit systems, in general, software built to run on a 64-bit system runs better on such a system than software built to run on a 32-bit system.

Default frequency 06:00:00

Default auto-close enabled no

- **Account Has An Overly Broad Host Specifier**

The MySQL server has user accounts with overly broad host specifiers. A MySQL account is identified by both a username and a hostname, which are found in the User and Host columns of the mysql.user table. The User value is the name that a client must supply when connecting to the server. The Host value indicates the host or hosts from which the user is allowed to connect. If this is a literal hostname, the account is limited to connections only from that host. If the hostname contains the '%' wildcard character, the user can connect from any host that matches the wildcard character and potentially from any host at all.

From a security standpoint, literal host values are best and % is worst. Accounts that have Host values containing wildcards are more susceptible to attack than accounts with literal host values, because attackers can attempt to connect from a broader range of machines.

For example, if an account has user and host values of root and % , it means that you can connect as the root user from any machine if you know the password. By contrast, if the host name is localhost or 127.0.0.1, the attacker can only attempt to connect as the root user from the server host.

Default frequency 00:05:00

Default auto-close enabled no

- **Account Has Global Privileges**

A MySQL server may have user accounts with privileges on all databases and tables (*.*). In most cases global privileges should be allowed only for the MySQL root user, and possibly for users that you trust or use for backup purposes. Global privileges such as DROP, ALTER, DELETE, UPDATE, INSERT, and LOCK TABLES may be dangerous as they may cause other users to be affected adversely.

Default frequency 00:05:00

Default auto-close enabled no

- **Account Has Old Insecure Password Hash**

Prior to MySQL 4.1, password hashes computed by the PASSWORD() function were 16 bytes long. As of MySQL 4.1 (and later), PASSWORD() was modified to produce a longer 41-byte hash value to provide enhanced security.

Default frequency 06:00:00

Default auto-close enabled no

- **Account Has Strong MySQL Privileges**

Certain account privileges can be dangerous and should only be granted to trusted users when necessary. For example, the FILE privilege allows a user to read and write files on the database server

(which includes sensitive operating system files), the PROCESS privilege allows currently executing statements to be monitored, and the SHUTDOWN privilege allows a user to shut down the server. In addition, the GRANT privilege allows a user to grant privileges to others.

Default frequency 00:05:00

Default auto-close enabled no

- **Account Requires Unavailable Authentication Plugins**

MySQL now supports many forms of authentication as of the 5.5 release, including external authentication mechanisms using PAM, or Windows native authentication with commercial releases of MySQL version 5.5.16 or greater. If a user is configured to use an authentication plugin, and that plugin does not get loaded with server start, this will block access to the database for those users.

Default frequency 06:00:00

Default auto-close enabled yes

- **Agent Host Time Out of Sync Relative to Dashboard**

To maintain data consistency and to facilitate day-to-day system management operations, which often require comparing logs, files, and timestamps across servers, it is important that the server clocks across all your systems and data centers be synchronized with respect to each other relative to UTC time (which takes timezones into account). When the clock on one server is minutes or hours behind another server, any timestamps created in the databases or on the file systems of those two servers will differ by that amount. Thus if you depend on timestamps to test the freshness of some data item, or if you are trying to diagnose a problem and need to compare timestamps across systems, your task will be more complicated due to this time difference.

In addition, the data and graphs shown in the MySQL Enterprise Monitor Dashboard will be skewed by the difference in time between the machine hosting the Service Manager and the machines running the Agents. For example, if the time on an Agent machine is one hour behind the time on the Service Manager machine, the MySQL server that Agent is monitoring will appear to be down (see [Bug #45937](#)) and no data will appear in the graphs for that server for the first hour after the Agent is started.

Default frequency 00:05:00

Default auto-close enabled yes

- **Attempted Connections To The Server Have Failed**

Aborted connection attempts to MySQL may indicate an issue with respect to the server or network, or could be indicative of DoS or password-cracking attempts against the MySQL Server. The aborted-connects count is incremented when:

- A client does not have privileges to access a database
- A client uses the wrong password
- A malformed packet is received
- The connect_timeout variable is exceeded

Default frequency 00:05:00

Default auto-close enabled no

- **AUTO_INCREMENT Field Limit Nearly Reached**

Many applications need to generate unique numbers and sequences for identification purposes (e.g. customer IDs, bug or trouble ticket tags, membership or order numbers, etc). MySQL's mechanism for doing this is the AUTO_INCREMENT column attribute, which enables you to generate sequential numbers automatically.

However, the range of numbers that can be generated is limited by the underlying data type. For example, the maximum value possible for a TINYINT UNSIGNED column is 255. If you try to generate a number that exceeds the maximum allowed by the underlying data type (e.g. by inserting a NULL value into the AUTO_INCREMENT column), you will trigger database errors and your application may not behave properly.

Note that the primary purpose of AUTO_INCREMENT in MySQL is to generate a sequence of [positive](#) integers. The use of non-positive numbers in an AUTO_INCREMENT column is unsupported, so you may as well define those columns to be UNSIGNED, which effectively doubles their allowable range.

Default frequency 06:00:00

Default auto-close enabled no

- **Binary Log Checksums Disabled**

Binary logs written and read by the MySQL Server are now crash-safe, because only complete events (or transactions) are logged or read back. By default, the server logs the length of the event as well as the event itself and uses this information to verify that the event was written correctly.

You can also cause the server to write checksums for the events using CRC32 checksums by setting the [binlog_checksum](#) system variable, to add an extra level of safety to the logs and the replication process. To cause the server to read checksums from the binary log, use the [master_verify_checksum](#) system variable. The [slave_sql_verify_checksum](#) system variable causes the slave SQL thread to read checksums from the relay log.

Default frequency 06:00:00

Default auto-close enabled yes

- **Binary Log Debug Information Disabled**

The binary log captures DML, DDL, and security changes that occur and stores these changes in a binary format. The binary log enables point-in-time recovery, preventing data loss during a disaster recovery situation. It also enables you to review all alterations made to your database.

The [binlog_rows_query_log_events](#) system variable affects row-based logging only. When enabled, it causes a MySQL 5.6.2 or later server to write informational log events such as row query log events into its binary log. This information can be used for debugging and related purposes; such as obtaining the original query issued on the master when it cannot be reconstructed from the row updates.

These events are normally ignored by MySQL 5.6.2 and later programs reading the binary log and so cause no issues when replicating or restoring from backup. This is not true for a mysqld or mysqlbinlog from MySQL 5.6.1 or earlier: When the older version of the program reading the log encounters an informational log event, it fails, and stops reading at that point. To make the binary log readable by slave

replication MySQL servers and other readers (for example, mysqlbinlog) from a MySQL 5.6.1 or earlier distribution, [binlog_rows_query_log_events](#) must be disabled during logging.

Default frequency 06:00:00

Default auto-close enabled no

- **Binary Log File Count Exceeds Specified Limit**

The binary log captures DML, DDL, and security changes that occur and stores these changes in a binary format. The binary log enables replication as well as point-in-time recovery, preventing data loss during a disaster recovery situation. It also enables you to review all alterations made to your database. However, binary logs consume disk space and file system resources, and can be removed from a production server after they are no longer needed by the slaves connecting to this master server, and after they have been backed up.

Default frequency 06:00:00

Default auto-close enabled no

- **Binary Log Row Based Images Excessive**

As of MySQL Server 5.6, row-based replication now supports row image control. By logging only those columns required for uniquely identifying and executing changes on each row (as opposed to all columns) for each row change, it is possible to save disk space, network resources, and memory usage. You can determine whether full or minimal rows are logged by setting the [binlog_row_image](#) server system variable to one of the values [minimal](#) (log required columns only), [full](#) (log all columns), or [noblob](#) (log all columns except for unneeded BLOB or TEXT columns).

Default frequency 06:00:00

Default auto-close enabled yes

- **Binary Log Space Exceeds Specified Limit**

The binary log captures DML, DDL, and security changes that occur and stores these changes in a binary format. The binary log enables replication as well as point-in-time recovery, preventing data loss during a disaster recovery situation. It also enables you to review all alterations made to your database. However, binary logs consume disk space and can be removed from a production server after they are no longer needed by the slaves connecting to this master server, and after they have been backed up.

Default frequency 06:00:00

Default auto-close enabled no

- **Binary Log Usage Exceeding Disk Cache Memory Limits**

When binary log usage exceeds the binary log cache memory limits, it is performing excessive disk operations. For optimal performance, transactions that move through the binary log should be contained within the binary log cache.

Default frequency 00:05:00

Default auto-close enabled no

- **Binary Logging Is Limited**

The binary log captures DML, DDL, and security changes that occur and stores these changes in a binary format. The binary log enables point-in-time recovery, preventing data loss during a disaster recovery situation. It also enables you to review all alterations made to your database.

Binary logging can be limited to specific databases with the `--binlog-do-db` and the `--binlog-ignore-db` options. However, if these options are used, your point-in-time recovery options are limited accordingly, along with your ability to review alterations made to your system.

Default frequency 06:00:00

Default auto-close enabled no

- **Binary Logging Not Enabled**

The binary log captures DML, DDL, and security changes that occur and stores these changes in a binary format. The binary log enables point-in-time recovery, preventing data loss during a disaster recovery situation. It also enables you to review all alterations made to your database.

Default frequency 06:00:00

Default auto-close enabled no

- **Binary Logging Not Synchronized To Disk At Each Write**

By default, the binary log is not synchronized to disk at each write. If the server host, operating system, or MySQL server crash, there is a chance that the latest statements in the binary log are not written to disk. To prevent this, you can cause the binary log to be synchronized to disk after every Nth binary log entry using the `sync_binlog` global variable. 1 is the safest value, but also the slowest.

Default frequency 06:00:00

Default auto-close enabled no

- **Binary Logs Automatically Removed Too Quickly**

The binary log captures DML, DDL, and security changes that occur and stores these changes in a binary format. The binary log enables point-in-time recovery, preventing data loss during a disaster recovery situation. It is used on master replication servers as a record of the statements to be sent to slave servers. It also enables you to review all alterations made to your database.

However, the number of log files and the space they use can grow rapidly, especially on a busy server, so it is important to remove these files on a regular basis when they are no longer needed, as long as appropriate backups have been made. The `expire_logs_days` parameter enables automatic binary log removal.

Default frequency 12:00:00

Default auto-close enabled no

- **Cluster Data Node Data Memory Getting Low**

Advises when the amount of Data Memory configured for the data nodes starts to run low. Database inserts will start to fail if all of the memory is consumed.

Default frequency 00:05:00

Default auto-close enabled no

- **Cluster Data Node Has Been Restarted**

To perform useful work, the cluster data nodes must be up-and-running continuously. It is normal for a production system to run continuously for weeks, months, or longer. If a data node has been restarted recently, it may be the result of planned maintenance, but it may also be due to an unplanned event that should be investigated.

Default frequency 00:05:00

Default auto-close enabled no

- **Cluster Data Node Index Memory Getting Low**

Advises when the amount of Index Memory configured for the data nodes starts to run low. Database inserts will start to fail if all of the memory is consumed.

Default frequency 00:05:00

Default auto-close enabled no

- **Cluster Data Node Redo Buffer Space Getting Low**

Advises when the redo buffers start to fill up.

Default frequency 00:05:00

Default auto-close enabled no

- **Cluster Data Node Redo Log Space Getting Low**

Advises when the redo log spaces start to fill up.

Default frequency 00:05:00

Default auto-close enabled no

- **Cluster Data Node Undo Buffer Space Getting Low**

Advises when the undo buffers start to fill up.

Default frequency 00:05:00

Default auto-close enabled no

- **Cluster Data Node Undo Log Space Getting Low**

Advises when the undo log spaces start to fill up.

Default frequency 00:05:00

Default auto-close enabled no

- **Cluster Data Nodes Not Running**

Indicates how many data nodes are not running.

Default frequency 00:05:00

Default auto-close enabled no

- **Cluster DiskPageBuffer Hit Ratio Is Low**

Advises when the hit-rate for for the DiskPageBuffer falls below a threshold. May happen temporarily after restarting one or more data nodes. This is the average ratio since the last sample period.

Default frequency 00:05:00

Default auto-close enabled no

- **Cluster Has Stopped**

Indicates a cluster has completely stopped.

Default frequency 00:02:00

Default auto-close enabled no

- **Connection Usage Excessive**

Once the maximum connection limit for the MySQL server has been reached, no other user connections can be established and errors occur on the client side of the application.

Default frequency 00:01:00

Default auto-close enabled no

- **CPU I/O Usage Excessive**

CPU I/O usage should be low on a properly configured and well-tuned system. Excessive CPU I/O usage is often indicative of poor disk or network performance.

Default frequency 00:01:00

Default auto-close enabled no

- **CPU Usage Excessive**

CPU usage should be low-to-moderate on a properly configured and well-tuned system. Excessive CPU usage can be indicative of many problems: insufficient RAM, fragmented disks, poorly-tuned queries, etc.

Default frequency 00:01:00

Default auto-close enabled no

- **CREATE TABLE LIKE Does Not Require Any Privileges On Source Table**

Due to bug #25578, a user who does not have any access to a database can still clone the structure of tables in that database. Knowing the structure of tables in a database may give a determined hacker insight that allows him or her to proceed with other exploits.

This bug has been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **Data Flushed To Disk After Each SQL Statement**

MySQL updates its data files on disk with the `write()` system call after every SQL statement and lets the operating system handle the synchronizing to disk. You can force MySQL to flush everything to disk after every SQL statement with the `--flush` option, however, this will have an adverse effect on performance.

Default frequency 06:00:00

Default auto-close enabled no

- **Database May Not Be Portable Due To Identifier Case Sensitivity**

The case sensitivity of the underlying operating system determines the case sensitivity of database and table names. If you are using MySQL on only one platform, you don't normally have to worry about this. However, depending on how you have configured your server you may encounter difficulties if you want to transfer tables between platforms that differ in filesystem case sensitivity.

Default frequency 06:00:00

Default auto-close enabled no

- **Date-Handling Bugs Can Crash The Server**

Two bugs related to date-handling operations can crash the server leading to potential Denial of Service (DoS) attacks:

- `STR_TO_DATE(1,NULL)` caused a server crash (Bug#15828);
- Invalid arguments to `DATE_FORMAT()` caused a server crash (Bug#20729).

These bugs have been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **Default Value Being Used For `max_prepared_stmt_count`**

Prepared statements may increase performance in applications that execute similar statements more than once, primarily because the query is parsed only once. Prepared statements can also reduce network traffic because it is only necessary to send the data for the parameters for each execution rather than the whole statement.

However, prepared statements consume memory in the MySQL server until they are closed, so it is important to use them properly and to limit the number of statements that can be open at any one time. The default value for `max_prepared_stmt_count` may not be appropriate for your application and environment.

Default frequency 06:00:00

Default auto-close enabled no

- **Disabling Next-Key Locking In InnoDB Can Crash The Server**

Due to several bugs, the server could crash if next-key locking in InnoDB was disabled.

These bugs have been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **Event Scheduler Disabled**

The Event Scheduler is a very useful feature when enabled. It is a framework for executing SQL commands at specific times or at regular intervals. Conceptually, it is similar to the idea of the Unix crontab (also known as a "cron job") or the Windows Task Scheduler.

The basics of its architecture are simple. An event is a stored routine with a starting date and time, and a recurring tag. Once defined and activated, it will run when requested. Unlike triggers, events are not linked to specific table operations, but to dates and times. Using the event scheduler, the database administrator can perform recurring events with minimal hassle. Common uses are the cleanup of obsolete data, the creation of summary tables for statistics, and monitoring of server performance and usage.

Default frequency 00:05:00

Default auto-close enabled no

- **Excessive Disk Temporary Table Usage Detected**

If the space required to build a temporary table exceeds either `tmp_table_size` or `max_heap_table_size`, MySQL creates a disk-based table in the server's tmpdir directory. Also, tables that have TEXT or BLOB columns are automatically placed on disk.

For performance reasons it is ideal to have most temporary tables created in memory, leaving exceedingly large temporary tables to be created on disk.

Default frequency 00:05:00

Default auto-close enabled no

- **Excessive Number of Locked Processes**

Depending on the circumstances, storage engines, and other factors, one process may be using or accessing a resource (e.g. a table or row) required by another process in such a way that the second process cannot proceed until the first process releases the resource. In this case the second process is in a "locked" state until the resource is released. If many processes are in a locked state it may be a sign of serious trouble related to resource contention, or a long running session that is not releasing currently held locks when it should have.

Default frequency 00:01:00

Default auto-close enabled no

- **Excessive Number of Long Running Processes**

Most applications and databases are designed to execute queries very quickly. If many queries are taking a long time to execute (e.g. more than a few seconds) it can be a sign of trouble. In such cases queries may need to be tuned or rewritten, or indexes added to improve performance. In other cases the database schema may have to be redesigned.

Default frequency 00:01:00

Default auto-close enabled no

- **Excessive Number of Long Running Processes Locked**

Most applications and databases are designed to execute queries very quickly, and to avoid resource contention where one query is waiting for another to release a lock on some shared resource. If many queries are locked and taking a long time to execute (e.g. more than a few seconds), it can be a sign of performance trouble and resource contention. In such cases queries may need to be tuned or rewritten, or indexes added to improve performance. In other cases the database schema may have to be redesigned.

Default frequency 00:01:00

Default auto-close enabled no

- **Excessive Percentage Of Attempted Connections To The Server Have Failed**

Excess aborted connection attempts to MySQL may indicate an issue with respect to the server or network, or could be indicative of DoS or password-cracking attempts against the MySQL Server. The aborted-connects count is incremented when:

- A client does not have privileges to access a database
- A client uses the wrong password
- A malformed packet is received
- The connect_timeout variable is exceeded

Default frequency 00:05:00

Default auto-close enabled no

- **Flush Time Set To Non-Zero Value**

If `flush_time` is set to a non-zero value, all tables are closed every `flush_time` seconds to free up resources and synchronize unflushed data to disk. If your system is unreliable and tends to lock up or restart often, forcing out table changes this way degrades performance but can reduce the chance of table corruption or data loss. We recommend that this option be used only on Windows, or on systems with minimal resources.

Default frequency 06:00:00

Default auto-close enabled no

- **General Query Log Enabled**

The general query log is a general record of what mysqld is doing. The server writes information to this log when clients connect or disconnect, and it logs each SQL statement received from clients. The general query log can be very useful when you suspect an error in a client and want to know exactly what the client sent to mysqld.

However, the general query log should not be enabled in production environments because:

- It adds overhead to the server;
- It logs statements in the order they were received, not the order they were executed, so it is not reliable for backup/recovery;

- It grows fast and can use a lot of disk space;
- You cannot stop logging to the general query log without stopping the server (for versions previous to 5.1).

You should use the binary log instead.

Default frequency 06:00:00

Default auto-close enabled no

- **Host Cache Size Not Sufficient**

The MySQL server maintains a host cache in memory that contains IP address, host name, and error information about clients. It uses the host cache for several purposes:

- By caching the results of IP-to-host name lookups, the server avoids doing a DNS lookup for each client connection, thereby improving performance.
- The cache contains information about errors that occur during the connection process. Some errors are considered "blocking." If too many of these occur successively from a given host without a successful connection, the server blocks further connections from that host.

If the host cache is not large enough to handle all the hosts from which clients may connect, performance may suffer and you may lose information about client connection errors.

Default frequency 00:05:00

Default auto-close enabled no

- **Improper key_cache_block_size Setting Can Corrupt MyISAM Tables**

The server deducts some bytes from the `key_cache_block_size` option value and reduces it to the next lower 512 byte boundary. The resulting block size is not a power of two. Setting the `key_cache_block_size` system variable to a value that is not a power of two results in MyISAM table corruption.

This bug has been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **In-Memory Temporary Table Size Limited By Maximum Heap Table Size**

If the space required to build a temporary table exceeds either `tmp_table_size` or `max_heap_table_size`, MySQL creates a disk-based table in the server's `tmpdir` directory. For performance reasons it is ideal to have most temporary tables created in memory, leaving exceedingly large temporary tables to be created on disk. Many DBAs configure `tmp_table_size` appropriately, but forget that `max_heap_table_size` also plays a role.

Default frequency 06:00:00

Default auto-close enabled no

- **Incorrect InnoDB Flush Method On Windows**

If `innodb_file_per_table` is enabled and `innodb_flush_method` is not set to `unbuffered` on Windows, MySQL may not start and you may see operating system error code 87.

Default frequency 06:00:00

Default auto-close enabled no

- **Incremental MySQL Enterprise Backups Not Enabled**

Advises when MySQL Enterprise Backup is not using the incremental backup option.

Default frequency 06:00:00

Default auto-close enabled yes

- **Indexes Not Being Used Efficiently**

The target server does not appear to be using indexes efficiently. The values of `Handler_read_rnd_next` and `Handler_read_rnd` together - which reflect the number of rows read via full table scans - are high compared to the Handler variables which denote index accesses - such as `Handler_read_key`, `Handler_read_next` etc. You should examine your tables and queries for proper use of indexes.

Default frequency 00:05:00

Default auto-close enabled no

- **InnoDB Buffer Cache Has Sub-Optimal Hit Rate**

Logical I/O is many times faster than physical I/O, and therefore a DBA should strive to keep physical I/O to a minimum. It is true that logical I/O is not free, and that the DBA should work to keep `all` I/O to a minimum, but it is best if most data access is performed in memory. When using InnoDB, most data access should occur in RAM, and therefore the InnoDB buffer cache hit rate should be high.

Default frequency 00:05:00

Default auto-close enabled no

- **InnoDB Buffer Pool Writes May Be Performance Bottleneck**

For optimal performance, InnoDB should not have to wait before writing pages into the InnoDB buffer pool.

Default frequency 00:05:00

Default auto-close enabled no

- **InnoDB Change Buffering Is Not Entirely Crash-Safe**

Due to bug #66819, InnoDB change buffer modifications are not entirely crash-safe. If a crash happens at a specific point when a change buffer entry is being merged into the page, the transaction log and the change buffer are left in an inconsistent state, so InnoDB will crash after a restart after reading the corresponding secondary index page.

This bug has been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **InnoDB Doublewrite Buffer Enabled**

InnoDB uses a novel file flush technique called *doublewrite*. It adds safety to recovery following an operating system crash or a power outage, and improves performance on most varieties of Unix by reducing the need for `fsync()` operations.

Doublewrite means that before writing pages to a data file, InnoDB first writes them to a contiguous tablespace area called the doublewrite buffer. Only after the write and the flush to the doublewrite buffer has completed does InnoDB write the pages to their proper positions in the data file. If the operating system crashes in the middle of a page write, during recovery InnoDB can find a good copy of the page from the doublewrite buffer.

Default frequency 06:00:00

Default auto-close enabled no

- **InnoDB Fast Shutdown Enabled**

Once you use the InnoDB Plugin on a set of database files, care must be taken to avoid crashes and corruptions when using those files with an earlier version of InnoDB, as might happen by opening the database with MySQL when the plugin is not installed. It is *strongly* recommended that you use a "slow shutdown" (`SET GLOBAL innodb_fast_shutdown=0`) when stopping the MySQL server when the InnoDB Plugin is enabled. This will ensure log files and other system information written by the plugin will not cause problems when using a prior version of InnoDB.

The reason "slow" shutdown (`innodb_fast_shutdown=0`) is recommended is because the InnoDB Plugin may write special records to the transaction undo log that will cause problems if the built-in InnoDB in MySQL attempts to read the log. Specifically, these special records will be written when a record in a COMPRESSED or DYNAMIC table is updated or deleted and the record contains columns stored off-page. The built-in InnoDB in MySQL cannot read these undo log records. Furthermore, the built-in InnoDB in MySQL will fail to roll back incomplete transactions that affect tables that it is unable to read (tables in COMPRESSED or DYNAMIC format).

Also note that a "normal" shutdown will not necessarily empty the undo log. A normal shutdown occurs when `innodb_fast_shutdown=1`, the default. When InnoDB is shut down, some active transactions may have uncommitted modifications, or they may be holding a read view that prevents the purging of some version information from the undo log. The next time InnoDB is started after a normal shutdown (`innodb_fast_shutdown=1`), it will roll back any incomplete transactions and purge old version information. Therefore, it is important to perform a "slow" shutdown (`innodb_fast_shutdown=0`) as part of the downgrade process.

Default frequency 12:00:00

Default auto-close enabled no

- **InnoDB File Format Check Disabled Or Incorrect**

To prevent possible crashes or data corruptions when the InnoDB Plugin opens an ib-file set, it will check that it can fully support the file formats in use within the ib-file set. If the system is restarted following a crash, or a "fast shutdown" (i.e., `innodb_fast_shutdown` is greater than zero), there may be on-disk data structures (such as redo or undo entries, or doublewrite pages) that are in a "too-new" format for the current software. During the recovery process, serious damage can be done to your data files if these data structures are accessed. The startup check of the file format occurs before any

recovery process begins, thereby preventing the problems described in the ["Possible Problems" section of the InnoDB Plugin documentation](#).

Setting `innodb_file_format_check` to OFF, or to a different format than the one in use, is very dangerous, as it permits the recovery process to run, possibly corrupting your database if the previous shutdown was a crash or "fast shutdown". You should only set `innodb_file_format_check` in this manner if you are sure that the previous shutdown was done with `innodb_fast_shutdown=0`, so that essentially no recovery process will occur.

Default frequency 12:00:00

Default auto-close enabled no

- **InnoDB Flush Method May Not Be Optimal**

Different values for `innodb_flush_method` can have a marked effect on InnoDB performance. In some versions of GNU/Linux and Unix, flushing files to disk by invoking `fsync()` (which InnoDB uses by default) or other similar methods, can be surprisingly slow. If you are dissatisfied with database write performance, you might try setting the `innodb_flush_method` parameter to `O_DIRECT` or `O_DSYNC`.

Default frequency 06:00:00

Default auto-close enabled no

- **InnoDB INFORMATION_SCHEMA Plugins Missing**

Several INFORMATION_SCHEMA tables -- `INNODB_CMP`, `INNODB_CMPMEM`, `INNODB_TRX`, `INNODB_LOCKS`, and `INNODB_LOCK_WAITS` -- contain live information about compressed InnoDB tables, the compressed InnoDB buffer pool, all transactions currently executing inside InnoDB, the locks that transactions hold and those that are blocking transactions waiting for access to a resource (a table or row). These tables are very useful for monitoring the activity and performance of the InnoDB Plugin storage engine.

However, these INFORMATION_SCHEMA tables are themselves plugins to the MySQL server. As such, they need to be INSTALLED as described in the InnoDB Plugin User's Guide. If they are not installed, you will not be able to use them to monitor the InnoDB storage engine.

Default frequency 12:00:00

Default auto-close enabled no

- **InnoDB Log Buffer Flushed To Disk After Each Transaction**

By default, InnoDB's log buffer is written out to the log file at each transaction commit and a flush-to-disk operation is performed on the log file, which enforces ACID compliance. In the event of a crash, if you can afford to lose a second's worth of transactions, you can achieve better performance by setting `innodb_flush_log_at_trx_commit` to either 0 or 2. If you set the value to 2, then only an operating system crash or a power outage can erase the last second of transactions. This can be very useful on slave servers, where the loss of a second's worth of data can be recovered from the master server if needed.

Default frequency 06:00:00

Default auto-close enabled no

- **InnoDB Log Waits May Be Performance Bottleneck**

For optimal performance, InnoDB should not have to wait before writing DML activity to the InnoDB log buffer.

Default frequency 00:05:00

Default auto-close enabled no

- **InnoDB Not Using Newest File Format**

The InnoDB Plugin has two new features that can be very useful -- [compressed tables](#) and [long variable-length columns stored off-page](#). Under the right circumstances, both of these features can improve the performance of your system. However, in order to take advantage of these new features you must configure InnoDB to use the new file format that enables them.

Default frequency 12:00:00

Default auto-close enabled no

- **InnoDB Status Truncation Detected**

InnoDB primarily uses the SHOW ENGINE INNODB STATUS command to dump diagnostics information. As this SHOW statement can output a lot of data when running in a system with very many concurrent sessions, the output is limited to 64 kilobytes in versions < 5.5.7, and 1 megabyte on versions greater than 5.5.7. You are running a version where the truncation limit should be 1 megabyte, however truncation is still occurring in your system, and the MEM Agent relies on this output to pass back a number of key InnoDB statistics.

However, InnoDB provides a startup option called innodb_status_file, which dumps the same output as SHOW ENGINE INNODB STATUS to a file called innodb_status.<mysql pid> in the datadir. The MEM Agent (in versions > 2.3.0) will read this file automatically if it exists before executing the SHOW statement.

Default frequency 00:05:00

Default auto-close enabled no

- **InnoDB Strict Mode Is Off**

To guard against ignored typos and syntax errors in SQL, or other unintended consequences of various combinations of operational modes and SQL commands, the InnoDB Plugin provides a "strict mode" of operations. In this mode, InnoDB will raise error conditions in certain cases, rather than issue a warning and process the specified command (perhaps with some unintended defaults). This is analogous to MySQL's sql_mode, which controls what SQL syntax MySQL will accept, and determines whether it will silently ignore errors, or validate input syntax and data values.

Using the new clauses and settings for ROW_FORMAT and KEY_BLOCK_SIZE on CREATE TABLE and ALTER TABLE commands and the CREATE INDEX command can be confusing when not running in strict mode. Unless you run in strict mode, InnoDB will ignore certain syntax errors and will create the table or index, with only a warning in the message log. However if InnoDB strict mode is on, such errors will generate an immediate error and the table or index will not be created, thus saving time by catching the error at the time the command is issued.

Default frequency 12:00:00

Default auto-close enabled no

- **InnoDB Tablespace Cannot Automatically Expand**

If the InnoDB tablespace is not allowed to automatically grow to meet incoming data demands and your application generates more data than there is room for, out-of-space errors will occur and your application may experience problems.

Default frequency 06:00:00

Default auto-close enabled no

- **InnoDB Transaction Logs Not Sized Correctly**

To avoid frequent checkpoint activity and reduce overall physical I/O, which can slow down write-heavy systems, the InnoDB transaction logs should be approximately 50-100% of the size of the InnoDB buffer pool, depending on the size of the buffer pool.

Default frequency 06:00:00

Default auto-close enabled no

- **Insecure Password Authentication Option Is Enabled**

Prior to MySQL 4.1, password hashes computed by the PASSWORD() function were 16 bytes long. As of MySQL 4.1 (and later), PASSWORD() was modified to produce a longer 41-byte hash value to provide enhanced security. However, in order to allow backward-compatibility with user tables that have been migrated from pre-4.1 systems, you can configure MySQL to accept logins for accounts that have password hashes created using the old, less-secure PASSWORD() function, but this is not recommended.

Default frequency 06:00:00

Default auto-close enabled no

- **Insecure Password Generation Option Is Enabled**

Prior to MySQL 4.1, password hashes computed by the PASSWORD() function were 16 bytes long. As of MySQL 4.1 (and later), PASSWORD() was modified to produce a longer 41-byte hash value to provide enhanced security. In order to allow backward-compatibility with older client programs, you can configure MySQL to generate short (pre-4.1) password hashes for new passwords, however, this is not recommended.

Default frequency 06:00:00

Default auto-close enabled no

- **INSERT ON DUPLICATE KEY UPDATE Bug May Break Replication**

For INSERT ... ON DUPLICATE KEY UPDATE statements where some AUTO_INCREMENT values were generated automatically for inserts and some rows were updated, one auto-generated value was lost per updated row, leading to faster exhaustion of the range of the AUTO_INCREMENT column. Affected versions of MySQL include 5.0.24 to 5.0.34, and 5.1.12 to 5.1.17 (inclusive).

Because the original problem can affect replication (different values on master and slave), it is recommended that the master and its slaves be upgraded to the current version.

Default frequency 06:00:00

Default auto-close enabled no

- **Key Buffer Size Greater Than 4 GB**

To minimize disk I/O, the MyISAM storage engine employs a key cache (or key buffer) to keep the most frequently accessed index blocks in memory. However, prior to MySQL version 5.0.52 this key buffer is limited in size to 4 GB, [even on 64-bit operating systems](#). If set to a larger value, mysqld may crash when it tries to increase the actual buffer beyond 4 GB. Note that key_buffer_size remains limited to 4GB on 64-bit Windows systems until MySQL version 5.1.31.

Default frequency 06:00:00

Default auto-close enabled no

- **Key Buffer Size May Not Be Optimal For Key Cache**

The key cache hit ratio represents the proportion of keys that are being read from the key cache in memory instead of from disk. This should normally be greater than 99% for optimum efficiency.

Default frequency 00:05:00

Default auto-close enabled no

- **Key Buffer Size May Not Be Optimal For System RAM**

The target server does not appear to have sufficient memory devoted to the key cache. On a dedicated server, this cache is commonly about 25%-50% of total RAM, when the MyISAM storage engine is in use within the database instance. This advisor also checks whether the Key Buffer usage has been greater than 75% full since the instance started, by default.

Default frequency 06:00:00

Default auto-close enabled no

- **Last Full MySQL Enterprise Backup Too Old**

Advises when the last successful full backup taken by MySQL Enterprise Backup is older than the threshold number of days.

Default frequency 06:00:00

Default auto-close enabled yes

- **LOCAL Option Of LOAD DATA Statement Is Enabled**

The LOAD DATA statement can load a file that is located on the server host, or it can load a file that is located on the client host when the LOCAL keyword is specified.

There are two potential security issues with supporting the LOCAL version of LOAD DATA statements:

- The transfer of the file from the client host to the server host is initiated by the MySQL server. In theory, a patched server could be built that would tell the client program to transfer a file of the server's choosing rather than the file named by the client in the LOAD DATA statement. Such a server could access any file on the client host to which the client user has read access.
- In a Web environment where the clients are connecting from a separate web server, a user could use LOAD DATA LOCAL to read any files that the web server process has read access to (assuming that a user could run any statement against the SQL server). In this environment, the client with respect to the MySQL server actually is the web server, not the remote program being run by the user who connects to the web server.

Default frequency 00:05:00

Default auto-close enabled no

- **Lock Contention Excessive**

Performance can be degraded if the percentage of table operations that have to wait for a lock is high compared to the overall number of locks. This can happen when using a table-level locking storage engine, such as MyISAM, instead of a row-level locking storage engine.

Default frequency 00:05:00

Default auto-close enabled no

- **Malformed Password Packet In Connection Protocol Can Crash Server**

Due to bug #28984, a malformed password packet in the connection protocol could cause the server to crash. This can lead to denial of service (DoS) attacks.

This bug has been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **Master Not Verifying Checksums When Reading From Binary Log**

Binary logs written and read by the MySQL Server are now crash-safe, because only complete events (or transactions) are logged or read back. By default, the server logs the length of the event as well as the event itself and uses this information to verify that the event was written correctly.

You can also cause the server to write checksums for the events using CRC32 checksums by setting the `binlog_checksum` system variable, to add an extra level of safety to the logs and the replication process. To cause the server to read checksums from the binary log, use the `master_verify_checksum` system variable. The `slave_sql_verify_checksum` system variable causes the slave SQL thread to read checksums from the relay log.

Default frequency 06:00:00

Default auto-close enabled yes

- **Maximum Connection Limit Nearing Or Reached**

Once the maximum connection limit for the MySQL server has been reached, no other user connections can be established and errors occur on the client side of the application.

Default frequency 00:05:00

Default auto-close enabled no

- **Missing Security Improvements In GRANT Options**

The GRANT statement is used to create MySQL user accounts and to grant rights to accounts. Due to bugs 15756 and 14385, rights may be granted erroneously in certain circumstances:

- In grant table comparisons, improper use of a latin1 collation caused some hostname matches to be true that should have been false (Bug#15756).
- GRANTs to users with wildcards in their host information could be erroneously applied to similar users with the same username and similar wildcards. For example, a privilege granted to foo@% is also applied to user foo@192.% (Bug#14385).

These bugs have been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **Multi-Byte Encoding Processing Can Lead To SQL Injection**

Due to bug 8378, the server incorrectly parsed strings escaped with the `mysql_real_escape_string()` C API function. As a result, even when the character set-aware `mysql_real_escape_string()` function was used, SQL injection was possible.

This bug has been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **Multiple Threads Used When Repairing MyISAM Tables**

Using multiple threads when repairing MyISAM tables can improve performance, but it can also lead to table and index corruption as reported by several bugs ([#11527](#), [#11684](#), [#18874](#)). Even though these bugs have been fixed, this feature is still considered beta-quality, as noted in the manual.

Default frequency 06:00:00

Default auto-close enabled no

- **MyISAM Concurrent Insert Setting May Not Be Optimal**

MyISAM uses table-level locking, which can adversely affect performance when there are many concurrent INSERT and SELECT statements because INSERTs will block all SELECTs until the INSERT is completed. However, MyISAM can be configured to allow INSERT and SELECT statements to run concurrently in certain situations.

- If `concurrent_insert` is set to 1 (the default, or `AUTO` as of MySQL 5.5.3 or later), MySQL allows INSERT and SELECT statements to run concurrently *for MyISAM tables that have no free blocks in the middle* of the data file.
- If `concurrent_insert` is set to 2 (available in MySQL 5.0.6 and later, or `ALWAYS` as of MySQL 5.5.3 or later), MySQL allows concurrent inserts *for all MyISAM tables*, even those that have holes. For a table with a hole, new rows are inserted at the end of the table if it is in use by another thread. Otherwise, MySQL acquires a normal write lock and inserts the row into the hole.

Note that setting `concurrent_insert` to 2 allows tables to grow even when there are holes in the middle. This can be bad for applications that delete large chunks of data but continue to issue many SELECTs, thus effectively preventing INSERTs from filling the holes.

Default frequency 06:00:00

Default auto-close enabled no

- **MyISAM Indexes Found with No Statistics**

The MySQL optimizer needs index statistics to help make choices about whether to use indexes to satisfy SQL queries. Having no statistics or outdated statistics limits the optimizer's ability to make smart and informed access plan choices.

Default frequency 12:00:00

Default auto-close enabled no

- **MyISAM Key Cache Has Sub-Optimal Hit Rate**

The key cache hit ratio represents the proportion of index values that are being read from the key cache in memory instead of from disk. This should normally be greater than 99% for optimum efficiency.

Default frequency 00:05:00

Default auto-close enabled no

- **MySQL Agent Memory Usage Excessive**

The memory needed by the MySQL Agent for basic monitoring is fairly small and consistent, and depends on the number of rules you have enabled. However, when the Query Analyzer is enabled, the Agent can use significantly more memory to monitor and analyze whatever queries you direct through it. In this case, the amount of memory used depends on the number of unique normalized queries, example queries and example explains being processed, plus the network bandwidth required to send query data to the Service Manager. In general, the amount of memory used for the Query Analyzer is small and well-bounded, but under some circumstances it can become excessive, especially on older versions of Linux.

Default frequency 00:01:00

Default auto-close enabled no

- **MySQL Agent Not Communicating With Database Server**

The MySQL Enterprise Service Agent must be able to communicate with the local MySQL database server in order to monitor the server and provide advice on enforcement of best practices.

Default frequency 00:01:00

Default auto-close enabled yes

- **MySQL Agent Not Reachable**

In order to monitor a MySQL server, a Service Agent must be running and communicating with the Service Manager. If the Agent cannot communicate with the Service Manager, the Service Manager has no way of knowing if the MySQL database server being monitored is running, and it cannot collect current statistics to properly evaluate the rules scheduled against that server.

Default frequency 00:00:01

Default auto-close enabled no

- **MySQL Enterprise Backup Failed**

When using MySQL Enterprise Backup with the `--user` and `--password` options to `mysqlbackup`, history tables are created within the `mysql.backup_history` and `mysql.backup_progress` tables. This advisor monitors for failures logged within these tables.

Default frequency 00:05:00

Default auto-close enabled no

- **MySQL Enterprise Backup Lock Time Excessive**

Advises when MySQL Enterprise Backup globally locks the database for longer than X seconds. Each threshold should be set to your own requirements for query response times whilst taking backups.

Default frequency 00:05:00

Default auto-close enabled no

- **MySQL Enterprise Backup Succeeded**

Advises when MySQL Enterprise Backup completes a backup successfully.

Default frequency 00:05:00

Default auto-close enabled yes

- **MySQL Server Has Been Restarted**

To perform useful work, a database server must be up-and-running continuously. It is normal for a production server to run continuously for weeks, months, or longer. If a server has been restarted recently, it may be the result of planned maintenance, but it may also be due to an unplanned event that should be investigated.

Default frequency 00:05:00

Default auto-close enabled no

- **MySQL Server Not Reachable**

To perform useful work, it must be possible to connect to the local MySQL database server. If the MySQL Enterprise Service Agent cannot communicate with the server, it is likely the server is not running.

Default frequency 00:01:00

Default auto-close enabled yes

- **Next-Key Locking Disabled For InnoDB But Binary Logging Enabled**

Next-key locking in InnoDB can be disabled, which may improve performance in some situations. However, this may result in inconsistent data when recovering from the binary logs in replication or recovery situations. Starting from MySQL 5.0.2, this option is even more unsafe than it was in version 4.1.x.

Default frequency 06:00:00

Default auto-close enabled no

- **No Limit On Total Number Of Prepared Statements**

Due to bug #16365, there is no limit to the number of prepared statements that can be open per connection. This can lead to a Denial Of Service (DoS) attack, as the server will crash with out-of-memory (OOM) errors when the amount of statements becomes very large.

This bug has been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **No Value Set For MyISAM Recover Options**

The `myisam-recover-options` option (named `myisam-recover` before MySQL 5.5.3) enables automatic MyISAM crash recovery should a MyISAM table become corrupt for some reason. If this option is not set, then a table will be "Marked as crashed" if it becomes corrupt, and no sessions will be able to SELECT from it, or perform any sort of DML against it.

Default frequency 06:00:00

Default auto-close enabled no

- **Non-Authorized User Has DB, Table, Or Index Privileges On All Databases**

Privileges such as SELECT, INSERT, ALTER, and so forth allow a user to view and change data, as well as impact system performance. Such operations should be limited to only those databases to which a user truly needs such access so the user cannot inadvertently affect other people's applications and data stores.

Default frequency 01:00:00

Default auto-close enabled no

- **Non-Authorized User Has GRANT Privileges On All Databases**

The `GRANT` privilege, when given on all databases as opposed to being limited to a few specific databases, enables a user to give to other users those privileges that the grantor possesses on all databases. It can be used for databases, tables, and stored routines. Such a privilege should be limited to as few users as possible. Users who do indeed need the GRANT privilege should have that privilege limited to only those databases they are responsible for, and not for all databases.

Default frequency 01:00:00

Default auto-close enabled no

- **Non-Authorized User Has Server Admin Privileges**

Certain privileges, such as SHUTDOWN and SUPER, are primarily used for server administration. Some of these privileges can have a dramatic effect on a system because they allow someone to shutdown the server or kill running processes. Such operations should be limited to a small set of users.

Default frequency 01:00:00

Default auto-close enabled no

- **Object Changed: Database Has Been Altered**

For development environments, changes to databases and objects may be a normal occurrence, but not for production environments. It is wise to know when any changes occur in a production environment with respect to any database structures and investigate the reasons for the changes.

Default frequency 00:10:00

Default auto-close enabled no

- **Object Changed: Database Has Been Created**

For development environments, changes to databases and objects may be a normal occurrence, but not for production environments. It is wise to know when any changes occur in a production environment with respect to any database structures and investigate the reasons for the changes.

Default frequency 00:10:00

Default auto-close enabled no

- **Object Changed: Database Has Been Dropped**

For development environments, changes to databases and objects may be a normal occurrence, but not for production environments. It is wise to know when any changes occur in a production environment with respect to any database structures and investigate the reasons for the changes.

Default frequency 00:10:00

Default auto-close enabled no

- **Object Changed: Function Has Been Created**

For development environments, changes to databases and objects may be a normal occurrence, but not for production environments. It is wise to know when any changes occur in a production environment with respect to any database structures and investigate the reasons for the changes.

Default frequency 00:10:00

Default auto-close enabled no

- **Object Changed: Function Has Been Dropped**

For development environments, changes to databases and objects may be a normal occurrence, but not for production environments. It is wise to know when any changes occur in a production environment with respect to any database structures or functions and investigate the reasons for the changes.

Default frequency 00:10:00

Default auto-close enabled no

- **Object Changed: Index Has Been Created**

For development environments, changes to databases and objects may be a normal occurrence, but not for production environments. It is wise to know when any changes occur in a production environment with respect to any database structures and investigate the reasons for the changes.

Default frequency 00:10:00

Default auto-close enabled no

- **Object Changed: Index Has Been Dropped**

For development environments, changes to databases and objects may be a normal occurrence, but not for production environments. It is wise to know when any changes occur in a production environment with respect to any database structures and investigate the reasons for the changes.

Default frequency 00:10:00

Default auto-close enabled no

- **Object Changed: Table Has Been Altered**

For development environments, changes to databases and objects may be a normal occurrence, but not for production environments. It is wise to know when any changes occur in a production environment with respect to database structures and investigate the reasons for the changes.

Default frequency 00:10:00

Default auto-close enabled no

- **Object Changed: Table Has Been Created**

For development environments, changes to databases and objects may be a normal occurrence, but not for production environments. It is wise to know when any changes occur in a production environment with respect to database structures and investigate the reasons for the changes.

Default frequency 00:10:00

Default auto-close enabled no

- **Object Changed: Table Has Been Dropped**

For development environments, changes to databases and objects may be a normal occurrence, but not for production environments. It is wise to know when changes occur in a production environment with respect to database structures and investigate the reasons for the changes.

Default frequency 00:10:00

Default auto-close enabled no

- **Object Changed: User Has Been Dropped**

For development environments, changes to databases and objects may be a normal occurrence, but not for production environments. It is wise to know when changes occur in a production environment with respect to database structures and investigate the reasons for the changes.

Default frequency 00:10:00

Default auto-close enabled no

- **Object Changes Detected**

For development environments, changes to databases and objects may be a normal occurrence, but not for production environments. It is wise to know when any changes occur in a production environment with respect to any database structures and investigate the reasons for the changes.

Default frequency 00:10:00

Default auto-close enabled no

- **Policy-Based Password Validation Does Not Perform Dictionary Checks**

When users create weak passwords (e.g. 'password' or 'abcd') it compromises the security of the server, making it easier for unauthorized people to guess the password and gain access to the server. Starting with MySQL Server 5.6, MySQL offers the 'validate_password' plugin that can be used to test passwords and improve security. With this plugin you can implement and enforce a policy for password strength (e.g. passwords must be at least 8 characters long, have both lowercase and uppercase letters, contain at least one special nonalphanumeric character, and do not match commonly-used words).

Default frequency 06:00:00

Default auto-close enabled no

- **Policy-Based Password Validation Is Weak**

When users create weak passwords (e.g. 'password' or 'abcd') it compromises the security of the server, making it easier for unauthorized people to guess the password and gain access to the server. Starting with MySQL Server 5.6, MySQL offers the 'validate_password' plugin that can be used to test passwords and improve security. With this plugin you can implement and enforce a policy for password strength (e.g. passwords must be at least 8 characters long, have both lowercase and uppercase letters, and contain at least one special nonalphanumeric character).

Default frequency 06:00:00

Default auto-close enabled no

- **Policy-Based Password Validation Not Enabled**

When users create weak passwords (e.g. 'password' or 'abcd') it compromises the security of the server, making it easier for unauthorized people to guess the password and gain access to the server. Starting with MySQL Server 5.6, MySQL offers the 'validate_password' plugin that can be used to test passwords and improve security. With this plugin you can implement and enforce a policy for password strength (e.g. passwords must be at least 8 characters long, have both lowercase and uppercase letters, and contain at least one special nonalphanumeric character).

Default frequency 06:00:00

Default auto-close enabled no

- **Prepared Statements Not Being Closed**

Prepared statements may increase performance in applications that execute similar statements more than once, primarily because the query is parsed only once. Prepared statements can also reduce network traffic because it is only necessary to send the data for the parameters for each execution rather than the whole statement.

However, prepared statements take time to prepare and consume memory in the MySQL server until they are closed, so it is important to use them properly. If you are not closing prepared statements when you are done with them, you are needlessly tying up memory that could be put to use in other ways.

Default frequency 00:05:00

Default auto-close enabled no

- **Prepared Statements Not Being Used Effectively**

Prepared statements may increase performance in applications that execute similar statements more than once, primarily because the query is parsed only once. Prepared statements can also reduce network traffic because it is only necessary to send the data for the parameters for each execution rather than the whole statement.

However, prepared statements take time to prepare and consume memory in the MySQL server until they are closed, so it is important to use them properly. If you are only executing a statement a few times, the overhead of creating a prepared statement may not be worthwhile.

Default frequency 00:05:00

Default auto-close enabled no

- **Privilege Alterations Detected: Privileges Granted**

For development environments, changes to database security privileges may be a normal occurrence, but for production environments it is wise to know when any security changes occur with respect to database privileges, and to ensure that those changes are authorized and required.

Default frequency 00:05:00

Default auto-close enabled no

- **Privilege Alterations Detected: Privileges Revoked**

For development environments, changes to database security privileges may be a normal occurrence, but for production environments it is wise to know when any security changes occur with respect to database privileges, and to ensure that those changes are authorized and required.

Default frequency 00:05:00

Default auto-close enabled no

- **Privilege Alterations Have Been Detected**

For development environments, changes to database security privileges may be a normal occurrence, but for production environments it is wise to know when any security changes occur with respect to database privileges, and to ensure that those changes are authorized and required.

Default frequency 00:05:00

Default auto-close enabled no

- **Query Cache Has Sub-Optimal Hit Rate**

When enabled, the query cache should experience a high degree of "hits", meaning that queries in the cache are being reused by other user connections. A low hit rate may mean that not enough memory is allocated to the cache, identical queries are not being issued repeatedly to the server, or that the statements in the query cache are invalidated too frequently by INSERT, UPDATE or DELETE statements.

This advisor triggers when more than 25% of the Query Cache is being used, and the ratio of Query Cache hits to Query Cache inserts is low.

Default frequency 00:05:00

Default auto-close enabled no

- **Query Cache Is Excessively Fragmented**

Enabling the query cache can significantly increase performance for SELECT queries that are identically executed across many connections, returning the same result set. However, performance can be adversely affected if the memory used for the query cache is excessively fragmented, causing the server to pause while it is removing entries from the cache or searching the free block list for a good block to use to insert a new query into the cache.

Default frequency 00:05:00

Default auto-close enabled no

- **Query Cache Not Available**

MySQL can cache the results of SELECT statements in memory so that they do not have to constantly be parsed and executed. If your application often runs the same queries over and over, caching the results can increase performance significantly. It's important to use a version or binary of MySQL that supports the query cache.

Default frequency 06:00:00

Default auto-close enabled no

- **Query Cache Not Enabled**

Enabling the query cache can significantly increase performance for SELECT queries that are executed often and have large result sets.

Default frequency 00:05:00

Default auto-close enabled no

- **Query Cache Potentially Undersized**

When the Query Cache is full, and needs to add more queries to the cache, it will make more room in the cache by freeing the least recently used queries from the cache, and then inserting the new queries. If this is happening often then you should increase the size of the cache to avoid this constant "swapping".

Default frequency 00:05:00

Default auto-close enabled no

- **RAM Usage Excessive**

A reasonable amount of free memory is required for a system to perform well. Without free memory, new processes and threads cannot start, and the operating system may do excessive paging (swapping blocks of memory to and from disk).

Default frequency 00:01:00

Default auto-close enabled no

- **Root Account Can Login Remotely**

By default, MySQL includes a root account with unlimited privileges that is typically used to administer the MySQL server. If possible, accounts with this much power should not allow remote logins in order

to limit access to only those users able to login to the machine on which MySQL is running. This helps prevent unauthorized users from accessing and changing the system.

Default frequency 00:05:00

Default auto-close enabled no

- **Root Account Without Password**

The root user account has unlimited privileges and is intended for administrative tasks. Privileged accounts should have strong passwords to prevent unauthorized users from accessing and changing the system.

Default frequency 00:05:00

Default auto-close enabled yes

- **Row-based Replication Broken For UTF8 CHAR Columns Longer Than 85 Characters**

Due to bug #37426, row-based replication breaks when CHAR() UTF8 fields with a length greater than 85 characters are used.

This bug has been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **Security Risk with BINLOG Statement**

Due to bug #31611, any user can execute BINLOG statements, which effectively gives them the ability to execute any SQL statement regardless of the privileges associated with their user account (i.e. as given by the GRANT statement). This allows any connected user to get any privileges they want, edit any data they want, add and drop tables, etc.

This bug has been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **Server Contains Default "test" Database**

By default, MySQL comes with a database named `test` that anyone can access. This database is intended only for testing and should be removed before moving into a production environment. Because the default `test` database can be accessed by any user and has permissive privileges, it should be dropped immediately as part of the installation process.

Default frequency 00:05:00

Default auto-close enabled no

- **Server Has Accounts Without A Password**

Accounts without passwords are particularly dangerous because an attacker needs to guess only a username. Assigning passwords to all accounts helps prevent unauthorized users from accessing the system.

Default frequency 00:05:00

Default auto-close enabled yes

- **Server Has Anonymous Accounts**

Anonymous MySQL accounts allow clients to connect to the server without specifying a username. Since anonymous accounts are well known in MySQL, removing them helps prevent unauthorized users from accessing the system.

Default frequency 00:05:00

Default auto-close enabled yes

- **Server Has No Locally Authenticated Root User**

MySQL 5.5 supports both built-in authentication and external authentication via other methods such as PAM (LDAP, Unix user authentication) and Windows native authentication. However, if all 'root' users are configured to use external authentication, if this external authentication were to fail (such as the LDAP server losing power), then all administrator access to the MySQL Server will be denied.

Default frequency 06:00:00

Default auto-close enabled no

- **Server Includes A Root User Account**

By default, MySQL includes a root account with unlimited privileges that is typically used to administer the MySQL server. There is no reason this account must be named 'root'. Accounts with this much power should not be easily discovered. Since the root account is well known in MySQL, changing its name helps prevent unauthorized users from accessing and changing the system.

Default frequency 00:05:00

Default auto-close enabled no

- **Server-Enforced Data Integrity Checking Disabled**

SQL Modes define what SQL syntax MySQL should support and what kind of data validation checks it should perform. If no SQL modes are enabled this means there is no form of server-enforced data integrity, which means incoming data that is invalid will not be rejected by the server, but instead will be changed to conform to the target column's default datatype. Note, however, that beginning with MySQL 4.1, any client can change its own session SQL mode value at any time.

Default frequency 06:00:00

Default auto-close enabled no

- **Server-Enforced Data Integrity Checking Not Strict**

SQL Modes define what SQL syntax MySQL should support and what kind of data validation checks it should perform. There are many possible options that can be used in conjunction with each other to specify varying degrees of syntax and data validation checks the MySQL server will perform. However, to ensure the highest level of confidence for data integrity, at least one of the following should be included in the list: [TRADITIONAL](#), [STRICT_TRANS_TABLES](#), or [STRICT_ALL_TABLES](#).

Note, however, that beginning with MySQL 4.1, any client can change its own session SQL mode value at any time.

Default frequency 06:00:00

Default auto-close enabled no

- **SHA-256 Password Authentication Not Enabled**

To help keep the server secure, each user's password is encrypted, and the stronger the encryption method, the more secure the server will be. Starting with MySQL Server 5.6, MySQL offers a new encryption algorithm that performs authentication using SHA-256 password hashing. This is stronger encryption than that available with native authentication (i.e. the standard encryption method).

Default frequency 06:00:00

Default auto-close enabled no

- **Slave Detection Of Network Outages Too High**

Slaves must deal with network connectivity outages that affect the ability of the slave to get the latest data from the master, and hence cause replication to fall behind. However, the slave notices the network outage only after receiving no data from the master for `slave_net_timeout seconds`. You may want to decrease `slave_net_timeout` so the outages -- and associated connection retries -- are detected and resolved faster. The default for this parameter is 3600 seconds (1 hour), which is too high for many environments.

Default frequency 06:00:00

Default auto-close enabled no

- **Slave Error: Unknown or Incorrect Time Zone**

In order to use time zone names in conjunction with certain statements, functions, and data types, you must configure the server to understand those names by loading information from the operating system's time zone files into a set of tables in the mysql database. However, while the MySQL installation procedure creates those time zone tables, it does not load them; they must be loaded manually after installation.

Default frequency 00:05:00

Default auto-close enabled no

- **Slave Execution Position Too Far Behind Read Position**

When a slave receives updates from its master, the I/O thread stores the data in local files known as relay logs. The slave's SQL thread reads the relay logs and executes the updates they contain. If the position from which the SQL thread is reading is way behind the position to which the I/O thread is currently writing, it is a sign that replication is getting behind and results of queries directed to the slave may not reflect the latest changes made on the master.

Default frequency 00:05:00

Default auto-close enabled no

- **Slave Has Been Stopped**

If replication on a slave has been stopped, it means the slave is not retrieving the latest statements from the master and it is not executing those statements on the slave.

Default frequency 00:01:00

Default auto-close enabled yes

- **Slave Has Experienced A Replication Error**

When a slave receives updates from its master it must apply those updates locally so the data on the slave matches that on the server. If an error occurs while applying an update on a slave, the data on the slave may not match that on the master and it is an indication that replication may be broken.

Default frequency 00:05:00

Default auto-close enabled no

- **Slave Has Login Accounts With Inappropriate Privileges**

Altering and dropping tables on a slave can break replication. Unless the slave also hosts non-replicated tables, there is no need for accounts with these privileges. As an alternative, you should set the `read_only` flag `ON` so the server allows no updates except from users that have the SUPER privilege or from updates performed by slave threads.

Default frequency 06:00:00

Default auto-close enabled no

- **Slave Has Problem Communicating With Master**

Slaves must connect to a master to get the latest data from the master. If they cannot connect, or periodically have trouble connecting, replication may fall behind (i.e. the slave may not have the latest data that was written to the master).

Default frequency 00:05:00

Default auto-close enabled no

- **Slave Has Stopped Replicating**

If neither the slave I/O thread nor the slave SQL threads are running, it means the slave is not getting the latest statements from the master and it is not executing those statements on the slave, and thus replication has stopped entirely.

Default frequency 00:01:00

Default auto-close enabled yes

- **Slave I/O Thread Not Running**

The slave I/O thread is the thread that retrieves statements from the master's binary log and records them into the slave's relay log. If this thread isn't running, it means the slave is not able to retrieve the latest data from the master.

Default frequency 00:01:00

Default auto-close enabled yes

- **Slave Master Info/Relay Log Info Not Crash Safe**

MySQL now supports logging of master connection information and of slave relay log information to tables as well as files. In order for replication to be crash-safe, that information must be logged to tables and those tables must each use a transactional storage engine such as InnoDB.

Default frequency 06:00:00

Default auto-close enabled yes

- **Slave Not Configured As Read Only**

Arbitrary or unintended updates to a slave may break replication or cause a slave to be inconsistent with respect to its master. Making a slave `read_only` can be useful to ensure that a slave accepts updates only from its master server and not from clients; it minimizes the possibility of unintended updates.

Default frequency 06:00:00

Default auto-close enabled no

- **Slave Not Verifying Checksums When Reading From Relay Log**

Binary logs written and read by the MySQL Server are now crash-safe, because only complete events (or transactions) are logged or read back. By default, the server logs the length of the event as well as the event itself and uses this information to verify that the event was written correctly.

You can also cause the server to write checksums for the events using CRC32 checksums by setting the `binlog_checksum` system variable, to add an extra level of safety to the logs and the replication process. To cause the server to read checksums from the binary log, use the `master_verify_checksum` system variable. The `slave_sql_verify_checksum` system variable causes the slave SQL thread to read checksums from the relay log.

Default frequency 06:00:00

Default auto-close enabled yes

- **Slave Relay Log Space Is Very Large**

When a slave receives updates from its master, the I/O thread stores the data in local files known as relay logs. The slave's SQL thread reads the relay logs and executes the updates they contain. After the SQL thread has executed all the updates in a relay log, the file is no longer needed and can be deleted to conserve disk space.

Default frequency 06:00:00

Default auto-close enabled no

- **Slave Relay Logs Not Automatically Purged**

When a slave receives updates from its master, the I/O thread stores the data in local files known as relay logs. The slave's SQL thread reads the relay logs and executes the updates they contain. After the SQL thread has executed all the updates in a relay log, the file is no longer needed and can be deleted to conserve disk space.

Default frequency 06:00:00

Default auto-close enabled no

- **Slave SQL Processing Not Multi-Threaded**

As of MySQL Server version 5.6, replication now supports parallel execution of transactions with multi-threading on the slave. When parallel execution is enabled, the slave SQL thread acts as the coordinator for a number of slave worker threads as determined by the value of the `slave_parallel_workers` server system variable.

Note that the current implementation of multi-threading on the slave assumes that data and updates are partitioned on a per-database basis, and that updates within a given database occur in the same relative order as they do on the master. However, it is not necessary to coordinate transactions between different databases. Transactions can then also be distributed per database, which means that a worker thread on the slave can process successive transactions on a given database without waiting for updates to other databases to complete.

Also note that since transactions on different databases can occur in a different order on the slave than on the master, simply checking for the most recently executed transaction is not a guarantee that all previous transactions on the master have been executed on the slave. This has implications for logging and recovery when using a multi-threaded slave.

Default frequency 06:00:00

Default auto-close enabled yes

- **Slave SQL Thread Not Running**

The slave SQL thread is the thread that reads statements from the slave's relay log and executes them to bring the slave in sync with the master. If this thread isn't running, it means the slave is not able to apply the latest changes it has read from the master, and results of queries directed to the slave may not reflect the latest changes made on the master.

Default frequency 00:01:00

Default auto-close enabled yes

- **Slave SQL Thread Reading From Older Relay Log Than I/O Thread**

When a slave receives updates from its master, the I/O thread stores the data in local files known as relay logs. The slave's SQL thread reads the relay logs and executes the updates they contain. If the SQL thread is reading from an older relay log than the one to which the I/O thread is currently writing, it is a sign that replication is getting behind and results of queries directed to the slave may not reflect the latest changes made on the master.

Default frequency 00:05:00

Default auto-close enabled no

- **Slave Too Far Behind Master**

If a slave is too far behind the master, results of queries directed to the slave may not reflect the latest changes made on the master.

Default frequency 00:01:00

Default auto-close enabled yes

- **Slave Waiting To Free Relay Log Space**

For slaves with limited disk space you can place a limit on how large the replication relay log can grow. When the limit is reached, the I/O thread stops reading binary log events from the master server until the SQL thread has caught up and deleted some unprocessed relay logs. While this protects MySQL from filling up the disk, it means replication is delayed and the slave will fall behind the master.

Default frequency 00:05:00

Default auto-close enabled no

- **Slave Without REPLICATION SLAVE Accounts**

If the master ever fails, you may want to use one of the slaves as the new master. An account with the REPLICATION SLAVE privilege must exist for a server to act as a replication master (so a slave can connect to it), so it's a good idea to create this account on your slaves to prepare it to take over for a master if needed.

Default frequency 06:00:00

Default auto-close enabled no

- **Slow Query Log Not Enabled**

The slow query log can be used to identify queries that take a long time to complete.

Default frequency 00:05:00

Default auto-close enabled no

- **Stored Procedures Found With SELECT * Syntax**

Best practices for SQL coding state that no query should be issued with SELECT *. Reasons include:

- To ensure that only the necessary columns are returned from a SQL statement, the actual column names should be specifically entered. This cuts down on unwanted network traffic as only columns necessary for query satisfaction are present.
- If the underlying table has columns added or removed, the query itself may malfunction if cursors or other such application objects are used.

Default frequency 06:00:00

Default auto-close enabled no

- **Stored Routine Runs In Definer's Rather Than Caller's Security Context**

Due to bug 18630, a stored routine created by one user and then made accessible to a different user using GRANT EXECUTE could be executed by that user with the privileges of the routine's definer.

This bug has been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **Symlinks Are Enabled**

You can move tables and databases from the database directory to other locations and replace them with symbolic links to the new locations. You might want to do this, for example, to move a database to a file system with more free space or to increase the speed of your system by spreading your tables to different disks.

However, symlinks can compromise security. This is especially important if you run mysqld as root, because anyone who has write access to the server's data directory could then delete any file in the system!

Default frequency 06:00:00

Default auto-close enabled no

- **Table Cache Not Optimal**

MySQL is multi-threaded, so there may be many clients issuing queries for a given table simultaneously. To minimize the problem with multiple client threads having different states on the same table, the table is opened independently by each concurrent thread.

The table cache is used to cache file descriptors for open tables and there is a single cache shared by all clients. Increasing the size of the table cache allows mysqld to keep more tables open simultaneously by reducing the number of file open and close operations that must be done. If the value of `Open_tables` is approaching the value of `table_cache`, this may indicate performance problems.

Default frequency 00:05:00

Default auto-close enabled no

- **Table Cache Set Too Low For Startup**

The table cache size controls the number of open tables that can occur at any one time on the server. MySQL will work to open and close tables as needed, however you should avoid having the table cache set too low, causing MySQL to constantly open and close tables to satisfy object access.

If the table cache limit has been exceeded by the number of tables opened in the first three hours of service, then the table cache size is likely set too low.

Default frequency 00:30:00

Default auto-close enabled no

- **Table Lock Contention Excessive**

Performance can be degraded if the percentage of table operations that have to wait for a lock is high compared to the overall number of locks. This can happen when using a table-level locking storage engine, such as MyISAM, instead of a row-level locking storage engine.

Default frequency 00:05:00

Default auto-close enabled no

- **Table Scans Excessive**

The target server does not appear to be using indexes efficiently. The values of `Handler_read_rnd_next` and `Handler_read_rnd` together - which reflect the number of rows read via full table scans - are high compared to the sum of Handler variables which denote all row accesses - such as `Handler_read_key`, `Handler_read_next` etc. You should examine your tables and queries for proper use of indexes.

Default frequency 00:05:00

Default auto-close enabled no

- **Tables Found with No Primary or Unique Keys**

A primary or unique key of a relational table uniquely identifies each record in the table. Except in very unusual circumstances, every database table should have one or more columns designated as the primary key or as a unique key, and it is common practice to declare one.

Default frequency 12:00:00

Default auto-close enabled no

- **Temporary Tables To Disk Ratio Excessive**

If the space required to build a temporary table exceeds either `tmp_table_size` or `max_heap_table_size`, MySQL creates a disk-based table in the server's `tmpdir` directory. Also, tables that have TEXT or BLOB columns are automatically placed on disk.

For performance reasons it is ideal to have most temporary tables created in memory, leaving exceedingly large temporary tables to be created on disk.

Default frequency 00:05:00

Default auto-close enabled no

- **Thread Cache Not Enabled**

Each connection to the MySQL database server runs in its own thread. Thread creation takes time, so rather than killing the thread when a connection is closed, the server can keep the thread in its thread cache and use it for a new connection later.

Default frequency 00:05:00

Default auto-close enabled no

- **Thread Cache Size May Not Be Optimal**

Each connection to the MySQL database server runs in its own thread. Thread creation takes time, so rather than killing the thread when a connection is closed, the server can keep the thread in its thread cache and use it for a new connection later.

Default frequency 00:05:00

Default auto-close enabled no

- **Thread Pool Stall Limit Too Low**

The `thread_pool_stall_limit` variable enables the thread pool to handle long-running statements. If a long-running statement was permitted to block a thread group, all other connections assigned to the group would be blocked and unable to start execution until the long-running statement completed. In the worst case, this could take hours or even days.

The value of `thread_pool_stall_limit` should be chosen such that statements that execute longer than its value are considered stalled. Stalled statements generate a lot of extra overhead since they involve extra context switches and in some cases even extra thread creations. On the other hand, setting

the `thread_pool_stall_limit` parameter too high means that long-running statements will block a number of short-running statements for longer than necessary. Short wait values permit threads to start more quickly. Short values are also better for avoiding deadlock situations. Long wait values are useful for workloads that include long-running statements, to avoid starting too many new statements while the current ones execute.

Default frequency 00:05:00

Default auto-close enabled no

- **Thread Pooling Not Enabled**

As of MySQL 5.5.16, commercial distributions of MySQL include a thread pool plugin that provides an alternative thread-handling model designed to reduce overhead and improve performance. It implements a thread pool that increases server performance by efficiently managing statement execution threads for large numbers of client connections.

With servers that have many concurrent active connections (generally, more than the number of CPUs within the machine) it can be beneficial for performance to enable the Thread Pool plugin. This keeps the number of actively executing threads within the server lower, generally leaving less contention for locks and resources, whilst still maintaining very high connection counts from applications.

Default frequency 00:05:00

Default auto-close enabled no

- **Time Zone Data Not Loaded**

The MySQL server supports multiple time zones and provides various date and time functions, including a function that converts a datetime value from one time zone to another (`CONVERT_TZ`). However, while the MySQL installation procedure creates the time zone tables in the `mysql` database, it does not load them; you must do so manually after installation. If the time zone tables are not loaded, certain time zone functions such as `CONVERT_TZ` will not work.

Default frequency 12:00:00

Default auto-close enabled no

- **Too Many Concurrent Queries Running**

Too many active queries indicates there is a severe load on the server, and may be a sign of lock contention or unoptimized SQL queries.

Default frequency 00:05:00

Default auto-close enabled no

- **UDF Support Can Be Used To Execute Arbitrary Code**

In versions 4.1 and 5.0 of MySQL, by default, User Defined Functions (UDFs) are loaded from the system library path (e.g. `/usr/lib`). It has been determined that the security filter used does not guard properly against certain attacks using existing system libraries. As a result, it is possible for users with privileged access to execute arbitrary code. This problem can also be exploited on systems that are not actively using UDFs, if any untrusted remote users have DBA privileges on MySQL. To properly protect against this problem, a new variable has been introduced, `plugin_dir`, which can be used to specify a different directory from which to load plugins.

Default frequency 12:00:00

Default auto-close enabled no

- **UDFs Loaded From Insecure Location**

User Defined Functions (UDFs) allow you to add features and extend the functionality of your MySQL server, but they also pose a danger if they can be loaded from an insecure location.

To protect against this problem the `plugin_dir` variable was introduced, which can be used to specify the directory from which to load plugins. If the value is non-empty, user-defined function object files must be located in that directory. If the value is empty, the UDF object files can be located in any directory that is searched by your system's dynamic linker, which does not guard properly against certain attacks using existing system libraries. As a result, it is possible for users with privileged access to execute arbitrary code. This problem can also be exploited on systems that are not actively using UDFs, if any untrusted remote users have DBA privileges on MySQL.

Default frequency 12:00:00

Default auto-close enabled no

- **Use Of View Overrides Column Update Privileges On Underlying Table**

Due to bug #27878, by using a view, a user who only has privileges to update a given column of a table is able to update any column of that table, even though the view is defined with SQL SECURITY INVOKER. Also, use of a view could allow a user to gain update privileges for tables in other databases.

This bug has been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **User Can Gain Privileges By Running Stored Routine Declared Using SQL SECURITY INVOKER**

Due to bug #27337, if a stored routine was declared using SQL SECURITY INVOKER, a user who invoked the routine could gain privileges. For example, a user without the CREATE privilege on a certain database could gain that privilege after invoking a stored routine.

This bug has been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **User Has Rights To Database That Does Not Exist**

When a database is dropped, user privileges on the database are not automatically dropped. This has security implications as that user will regain privileges if a database with the same name is created in the future, which may not be the intended result.

Default frequency 00:05:00

Default auto-close enabled no

- **User Has Rights To Table That Does Not Exist**

When a table is dropped, user privileges on the table are not automatically dropped. This has security implications as that user will regain privileges if a table with the same name in the same database is created in the future, which may not be the intended result.

Default frequency 00:05:00

Default auto-close enabled no

- **User With Only ALTER Privilege On Partitioned Table Can Obtain SELECT Privilege Information**

Due to bug #23675, a user with only the ALTER privilege on a partitioned table could obtain information about the table that should require the SELECT privilege.

This bug has been fixed in later versions of the MySQL server.

Default frequency 06:00:00

Default auto-close enabled no

- **Users Can View All Databases On MySQL Server**

The SHOW DATABASES privilege should be granted only to users who need to see all the databases on a MySQL Server. It is recommended that the MySQL Server be started with the `--skip-show-database` option enabled to prevent anyone from using the SHOW DATABASES statement unless they have been specifically granted the SHOW DATABASES privilege.

Note: If a user is granted any global privilege, such as CREATE TEMPORARY TABLES or LOCK TABLES, they are automatically given the ability to show databases unless the server is started with the `--skip-show-database` option enabled. DBAs should be aware of this fact, in the event that any applications make use of temporary tables.

Default frequency 00:05:00

Default auto-close enabled no

- **Warnings Not Being Logged**

Error conditions encountered by a MySQL server are always logged in the error log, but warning conditions are only logged if `log_warnings` is set to a value greater than 0. If warnings are not logged you will not get valuable information about aborted connections and various other communication errors. This is especially important if you use replication so you get more information about what is happening, such as messages about network failures and reconnections.

Default frequency 12:00:00

Default auto-close enabled no

- **XA Distributed Transaction Support Enabled For InnoDB**

XA Distributed Transaction support is turned on by default. If you are not using this feature, note that it adds an extra fsync for each transaction and may adversely affect performance.

Default frequency 06:00:00

Default auto-close enabled no

B.9.2 Graph Definition Reference

The following items describe individual graphs.

Agent Reporting Delay

Name	Agent Reporting Delay
Range Label	milliseconds
Series	Expression
Delay	<code>agent_delay</code>
Variables	Data Item
<code>agent_delay</code>	<code>mysql:Agent:agent.latency</code>

Backup Locked Time

Name	Backup Locked Time
Range Label	seconds
Series	Expression
Locked Time	<code>lock_time</code>
Variables	Data Item
<code>lock_time</code>	<code>mysql:meb_timing:lock_time</code>

Backup Run Time

Name	Backup Run Time
Range Label	seconds
Series	Expression
Total Time	<code>total_time</code>
Variables	Data Item
<code>total_time</code>	<code>mysql:meb_timing:total_time</code>

Binlog Cache Efficiency

Name	Binlog Cache Efficiency
Range Label	avg cache ops/sec
Series	Expression
Cache Writes	<code>(binlog_memory/60)</code>
Disk Writes	<code>(binlog_disk/60)</code>
Variables	Data Item
<code>binlog_disk</code>	<code>mysql:status:Binlog_cache_disk_use</code>
<code>binlog_memory</code>	<code>mysql:status:Binlog_cache_use</code>

Binlog IO Usage

Name	Binlog IO Usage
-------------	-----------------

Range Label	avg MB/sec
Series	Expression
Read	<code>((bytes_read / (1024*1024))/60)</code>
Total	<code>((bytes_read + bytes_written) / (1024*1024))/60)</code>
Write	<code>((bytes_written / (1024*1024))/60)</code>
Variables	Data Item
bytes_read	<code>mysql:binary_log_io:bytes_read</code>
bytes_written	<code>mysql:binary_log_io:bytes_written</code>

Binlog Space Usage

Name	Binlog Space Usage
Range Label	MB
Series	Expression
Total Size	<code>(fileSum / (1024*1024))</code>
Variables	Data Item
fileSum	<code>mysql:masterlogs:filesizesum</code>

Cluster Data Node Data Memory Use

Name	Cluster Data Node Data Memory Use
Range Label	MB
Series	Expression
Avail	<code>cluster_data_node_config_data_memory/1024/1024</code>
Used	<code>cluster_data_node_used_data_memory/1024/1024</code>
Variables	Data Item
cluster_data_node_config_data_memory	<code>mysql:cluster_data_node_data_memory:data_mem_total</code>
cluster_data_node_used_data_memory	<code>mysql:cluster_data_node_data_memory:data_mem_used</code>

Cluster Data Node DiskPageBuffer Hit Ratio

Name	Cluster Data Node DiskPageBuffer Hit Ratio
Range Label	%
Series	Expression
DiskPageBuffer	<code>(cluster_data_node_hits / (cluster_data_node_hits + cluster_data_node_miss)) * 100</code>
Variables	Data Item
cluster_data_node_hits	<code>mysql:cluster_data_node_diskpagebuffer_total_hits_peri</code>
cluster_data_node_miss	<code>mysql:cluster_data_node_diskpagebuffer_total_hits_peri</code>

Cluster Data Node Index Memory Use

Name	Cluster Data Node Index Memory Use
Range Label	MB
Series	Expression
Avail	<code>cluster_data_node_config_index_memory/1024/1024</code>
Used	<code>cluster_data_node_used_index_memory/1024/1024</code>
Variables	Data Item
<code>cluster_data_node_config_index_memory</code>	<code>mysql:cluster_data_node_index_memory:index_mem_total</code>
<code>cluster_data_node_used_index_memory</code>	<code>mysql:cluster_data_node_index_memory:index_mem_used</code>

Cluster Data Node Redo Buffer Use

Name	Cluster Data Node Redo Buffer Use
Range Label	MB
Series	Expression
Avail	<code>cluster_data_node_config_redo_buffer/1024/1024</code>
Used	<code>cluster_data_node_used_redo_buffer/1024/1024</code>
Variables	Data Item
<code>cluster_data_node_config_redo_buffer</code>	<code>mysql:cluster_data_node_redo_buffer:redo_buffer_total</code>
<code>cluster_data_node_used_redo_buffer</code>	<code>mysql:cluster_data_node_redo_buffer:redo_buffer_used</code>

Cluster Data Node Redo Log Space Use

Name	Cluster Data Node Redo Log Space Use
Range Label	MB
Series	Expression
Avail	<code>cluster_data_node_config_redo_logspace/1024/1024</code>
Used	<code>cluster_data_node_used_redo_logspace/1024/1024</code>
Variables	Data Item
<code>cluster_data_node_config_redo_logspace</code>	<code>mysql:cluster_data_node_redo_logspace:redo_logspace_total</code>
<code>cluster_data_node_used_redo_logspace</code>	<code>mysql:cluster_data_node_redo_logspace:redo_logspace_used</code>

Cluster Data Node Undo Buffer Use

Name	Cluster Data Node Undo Buffer Use
Range Label	MB
Series	Expression
Avail	<code>cluster_data_node_config_undo_buffer/1024/1024</code>
Used	<code>cluster_data_node_used_undo_buffer/1024/1024</code>
Variables	Data Item
<code>cluster_data_node_config_undo_buffer</code>	<code>mysql:cluster_data_node_undo_buffer:undo_buffer_total</code>
<code>cluster_data_node_used_undo_buffer</code>	<code>mysql:cluster_data_node_undo_buffer:undo_buffer_used</code>

Cluster Data Node Undo Log Space Use

Name	Cluster Data Node Undo Log Space Use
Range Label	MB
Series	Expression
Avail	<code>cluster_data_node_config_undo_logspace/1024/1024</code>
Used	<code>cluster_data_node_used_undo_logspace/1024/1024</code>
Variables	Data Item
<code>cluster_data_node_config_undo_logspace</code>	<code>mysql:cluster_data_node_undo_logspace:undo_logspace_to</code>
<code>cluster_data_node_used_undo_logspace</code>	<code>mysql:cluster_data_node_undo_logspace:undo_logspace_us</code>

Cluster Data Nodes in Ready State

Name	Cluster Data Nodes in Ready State
Range Label	# Nodes
Series	Expression
Nodes	<code>Ndb_number_of_ready_data_nodes</code>
Variables	Data Item
<code>Ndb_number_of_ready_data_nodes</code>	<code>mysql:status:Ndb_number_of_ready_data_nodes</code>

Connections

Displays the number of client connections by displaying the number of connected threads, active threads, and cached threads.

Name	Connections
Range Label	# connections
Series	Expression
Cached	<code>cached</code>
Running	<code>running</code>
Total	<code>connected</code>
Variables	Data Item
<code>cached</code>	<code>mysql:status:Threads_cached</code>
<code>connected</code>	<code>mysql:status:Threads_connected</code>
<code>running</code>	<code>mysql:status:Threads_running</code>

Connections - Aborted

Shows the number of client connections that have been aborted, either during connection, or aborted active connections. This information is useful to determine if your server is overloaded (and therefore aborting connections), or if there is a network fault. Aborted connections also indicate those which did not disconnect properly, for example during a timeout.

Name	Connections - Aborted
Range Label	total/min
Series	Expression
Clients	<code>clients</code>

Connections	<code>connections</code>
Variables	Data Item
clients	<code>mysql:status:Aborted_clients</code>
connections	<code>mysql:status:Aborted_connects</code>

Connections - Cache

Displays the thread cache information, comparing new thread creations against all database connections.

Name	Connections - Cache
Range Label	total/min
Series	Expression
Connections	<code>connections</code>
Threads Created	<code>tcreated</code>
Variables	Data Item
connections	<code>mysql:status:Connections</code>
tcreated	<code>mysql:status:Threads_created</code>

Connections - Maximum

Shows the maximum number of connections, and the maximum number of used connections.

Name	Connections - Maximum
Range Label	total
Series	Expression
Allowed	<code>max_connections_allowed</code>
Used	<code>max_connections_used</code>
Variables	Data Item
max_connections_allowed	<code>mysql:variables:max_connections</code>
max_connections_used	<code>mysql:status:Max_used_connections</code>

CPU Utilization

Displays the CPU usage statistics over time for the machine hosting the MySQL server. The graph shows the aggregate system, user, wait and idle times for your CPU(s). You can use this information to help determine your CPU utilization and whether you are getting the most efficient use of your CPU power.



Note

The FreeBSD and Windows operating systems do not provide information for the IO-wait component of these graphs, so they will always yield 0 in the CPU utilization graph.

Name	CPU Utilization
Range Label	%
Series	Expression
Kernel	<code>sys/(sys+user+wait+idle)*100</code>

Total	$(\text{sys} + \text{user} + \text{wait}) / (\text{sys} + \text{user} + \text{wait} + \text{idle}) * 100$
User	$\text{user} / (\text{sys} + \text{user} + \text{wait} + \text{idle}) * 100$
Wait I/O	$\text{wait} / (\text{sys} + \text{user} + \text{wait} + \text{idle}) * 100$
Variables	Data Item
idle	os:cpu:cpu_idle
sys	os:cpu:cpu_sys
user	os:cpu:cpu_user
wait	os:cpu:cpu_wait

Database Activity

Displays the database activity, by showing the individual counts over time of different DML statements per minute. For example, you can monitor the number of [SELECT](#) statements executed per minute over time and gain an understanding of your server throughput. This information can be used to monitor the activity level, and provide a useful quick reference for your server operation.

Name	Database Activity
Range Label	avg statements/sec
Series	Expression
Call	$((\text{call_proc}) / 60)$
Delete	$((\text{deletes} + \text{delete_multi}) / 60)$
Insert	$((\text{inserts} + \text{insert_selects}) / 60)$
Replace	$((\text{replaces} + \text{replace_selects}) / 60)$
Select	$(\text{selects} / 60)$
Update	$((\text{updates} + \text{update_multi}) / 60)$
Variables	Data Item
call_proc	mysql:status:Com_call_procedure
delete_multi	mysql:status:Com_delete_multi
deletes	mysql:status:Com_delete
insert_selects	mysql:status:Com_insert_select
inserts	mysql:status:Com_insert
replace_selects	mysql:status:Com_replace_select
replaces	mysql:status:Com_replace
selects	mysql:status:Com_select
update_multi	mysql:status:Com_update_multi
updates	mysql:status:Com_update

Database Transactions

Name	Database Transactions
Range Label	avg statements/sec
Series	Expression
Begin	$(\text{begin} / 60)$

Commit	<code>(commit/60)</code>
Release Savepoint	<code>(releaseSavepoint/60)</code>
Rollback	<code>(rollback/60)</code>
Rollback Savepoint	<code>(rollbackSavepoint/60)</code>
Savepoint	<code>(savepoint/60)</code>
Variables	Data Item
begin	<code>mysql:status:com_begin</code>
commit	<code>mysql:status:com_commit</code>
releaseSavepoint	<code>mysql:status:com_release_savepoint</code>
rollback	<code>mysql:status:com_rollback</code>
rollbackSavepoint	<code>mysql:status:com_rollback_to_savepoint</code>
savepoint	<code>mysql:status:com_savepoint</code>

Disk IO Operations

Name	Disk IO Operations
Range Label	avg ops/sec
Series	Expression
Read	<code>read / 60</code>
Total	<code>((read+write) / 60)</code>
Write	<code>write / 60</code>
Variables	Data Item
read	<code>os:disk:disk_reads</code>
write	<code>os:disk:disk_writes</code>

Disk IO Usage

Displays the disk usage activity, by showing the disk input and output ratios over time.



Note

The FreeBSD and Windows operating systems do not provide this information.

Name	Disk IO Usage
Range Label	avg MB/sec
Series	Expression
Read	<code>((read / (1024*1024))/60)</code>
Total	<code>((read+write) / (1024*1024))/60)</code>
Write	<code>((write / (1024*1024))/60)</code>
Variables	Data Item
read	<code>os:disk:disk_bytes_read</code>
write	<code>os:disk:disk_bytes_written</code>

Disk Space Usage

Name	Disk Space Usage
Range Label	GB
Series	Expression
Total Size	<code>(total / (1024*1024*1024))</code>
Used	<code>(used / (1024*1024*1024))</code>
Variables	Data Item
total	<code>os:fs:fs_total</code>
used	<code>os:fs:fs_used</code>

Hit Ratios

Shows the cache hit ratios (as a percentage) for the query cache, MyISAM and InnoDB tables, and the connection and thread cache information. The information provided by the hit ratios can provide indicators of whether your cache is working effectively, or is of a size suitable for the data that you are storing and retrieving. Low hit ratios indicate that your cache are inefficient and may need to be investigated.

Name	Hit Ratios
Range Label	%
Series	Expression
InnoDB Buffer	<code>100-((iReads / (iReadRequests+1))*100)</code>
Key Cache	<code>(100-((keyReads / (keyReadRequests+1))*100)) * (keyReadRequests >= keyReads)</code>
Query Cache	<code>(qHits/(qHits+qInserts+1))*100</code>
Thread Cache	<code>100-((tcreated / (connections+1))*100)</code>
Variables	Data Item
connections	<code>mysql:status:Connections</code>
iReadRequests	<code>mysql:status:Innodb_buffer_pool_read_requests</code>
iReads	<code>mysql:status:Innodb_buffer_pool_reads</code>
keyReadRequests	<code>mysql:status:Key_read_requests</code>
keyReads	<code>mysql:status:Key_reads</code>
qHits	<code>mysql:status:Qcache_hits</code>
qInserts	<code>mysql:status:Qcache_inserts</code>
tcreated	<code>mysql:status:Threads_created</code>

InnoDB Adaptive Hash Index Memory

Shows the size of the InnoDB adaptive hash index. These are used to hold the data from tables in memory providing the size of the indexes is small enough to fit in memory. The graph shows the memory usage of the adaptive hash index.

Name	InnoDB Adaptive Hash Index Memory
Range Label	MB
Series	Expression
Hash Node Size	<code>(hash_size * 16384) / 1024 / 1024</code>

Variables	Data Item
hash_size	mysql:innodbstatus:innodb_hash_node_heap

InnoDB Adaptive Hash Index Searches

Displays the number of InnoDB adaptive hash index searches and those searches not using the adaptive hash index. You can use this to determine if your adaptive hash index is being used correctly, and is of a suitable size of the information and tables that are being accessed.

Name	InnoDB Adaptive Hash Index Searches
Range Label	searches/sec
Series	Expression
Hash Searches	hash
Non-Hash Searches	nonhash
Variables	Data Item
hash	mysql:innodbstatus:innodb_hash_searches_per_sec
nonhash	mysql:innodbstatus:innodb_non_hash_searches_per_sec

InnoDB Buffer Pool

Displays the size and page usage of the InnoDB buffer pool, providing information on the cache usage and performance. The graph shows the buffer pool size, active pages, and the number of modified pages.

Name	InnoDB Buffer Pool
Range Label	MB
Series	Expression
Modified	$(\text{modified} * 16384) / (1024 * 1024)$
Old	$(\text{old} * 16384) / (1024 * 1024)$
Total Size	$(\text{size} * 16384) / (1024 * 1024)$
Used	$(\text{used} * 16384) / (1024 * 1024)$
Variables	Data Item
modified	mysql:innodbstatus:innodb_bp_modified_pages
old	mysql:innodbstatus:innodb_bp_old_db_pages
size	mysql:innodbstatus:innodb_bp_size
used	mysql:innodbstatus:innodb_bp_db_pages

InnoDB Buffer Pool Page Activity

Name	InnoDB Buffer Pool Page Activity
Range Label	avg pages/sec
Series	Expression
Created	created / 60
Read	reads / 60
Written	written / 60

Variables	Data Item
created	<code>mysql:innodbstatus:innodb_bp_pages_created</code>
reads	<code>mysql:innodbstatus:innodb_bp_pages_read</code>
written	<code>mysql:innodbstatus:innodb_bp_pages_written</code>

InnoDB Buffer Pool Pending Operations

Name	InnoDB Buffer Pool Pending Operations
Range Label	pending ops
Series	Expression
Reads	<code>reads</code>
Write Flush List	<code>write_flush_list</code>
Write LRU	<code>write_lru</code>
Write Single Page	<code>write_single_page</code>
Variables	Data Item
reads	<code>mysql:innodbstatus:innodb_bp_pending_pages</code>
write_flush_list	<code>mysql:innodbstatus:innodb_bp_pending_writes_flush_list</code>
write_lru	<code>mysql:innodbstatus:innodb_bp_pending_writes_lru</code>
write_single_page	<code>mysql:innodbstatus:innodb_bp_pending_writes_single_page</code>

InnoDB Change Buffer Activity

Name	InnoDB Change Buffer Activity
Range Label	avg operations/sec
Series	Expression
Inserts	<code>inserts / 60</code>
Merges	<code>merges / 60</code>
Variables	Data Item
inserts	<code>mysql:innodbstatus:innodb_ibuf_inserts</code>
merges	<code>mysql:innodbstatus:innodb_ibuf_merges</code>

InnoDB Change Buffer Activity

Name	InnoDB Change Buffer Activity
Range Label	avg operations/sec
Series	Expression
Delete Discarded	<code>delete_discarded / 60</code>
Delete Mark Discarded	<code>delete_mark_discarded / 60</code>
Delete Mark Merges	<code>delete_mark_merges / 60</code>
Delete Merges	<code>delete_merges / 60</code>
Insert Discarded	<code>insert_discarded / 60</code>
Insert Merges	<code>insert_merges / 60</code>

Variables	Data Item
delete_discarded	<code>mysql:innodbstatus:innodb_cbuf_delete_discarded</code>
delete_mark_discarded	<code>mysql:innodbstatus:innodb_cbuf_delete_mark_discarded</code>
delete_mark_merges	<code>mysql:innodbstatus:innodb_cbuf_delete_mark_merges</code>
delete_merges	<code>mysql:innodbstatus:innodb_cbuf_delete_merges</code>
insert_discarded	<code>mysql:innodbstatus:innodb_cbuf_insert_discarded</code>
insert_merges	<code>mysql:innodbstatus:innodb_cbuf_insert_merges</code>

InnoDB Change Buffer Usage

Name	InnoDB Change Buffer Usage
Range Label	MB
Series	Expression
Total Size	<code>(total * 16384) / (1024 * 1024)</code>
Used	<code>((total - free) * 16384) / (1024 * 1024)</code>
Variables	Data Item
free	<code>mysql:innodbstatus:innodb_ibuf_free_list_len</code>
total	<code>mysql:innodbstatus:innodb_ibuf_seg_size</code>

InnoDB Compression Time

Shows the time spent by InnoDB compressing and uncompressing data in compressed tables.

Name	InnoDB Compression Time
Range Label	secs per min
Series	Expression
Compressing	<code>compress</code>
Uncompressing	<code>uncompress</code>
Variables	Data Item
compress	<code>mysql:innodb_compression_time:compress_seconds</code>
uncompress	<code>mysql:innodb_compression_time:uncompress_seconds</code>

InnoDB Data Dictionary Memory

Name	InnoDB Data Dictionary Memory
Range Label	MB
Series	Expression
Dictionary Memory Allocated	<code>(dict)/(1024*1024)</code>
Variables	Data Item
dict	<code>mysql:innodbstatus:innodb_bp_dictionary_alloc</code>

InnoDB Datafile IO Usage

Name	InnoDB Datafile IO Usage
-------------	--------------------------

Range Label	avg MB/sec
Series	Expression
Read	<code>((bytes_read / (1024*1024))/60)</code>
Total	<code>((bytes_read + bytes_written) / (1024*1024))/60)</code>
Write	<code>((bytes_written / (1024*1024))/60)</code>
Variables	Data Item
bytes_read	<code>mysql:innodb_datafile_io:bytes_read</code>
bytes_written	<code>mysql:innodb_datafile_io:bytes_written</code>

InnoDB Doublewrite Buffer Activity

Name	InnoDB Doublewrite Buffer Activity
Range Label	avg/sec
Series	Expression
Pages Written	<code>pages_written/60</code>
Writes	<code>writes/60</code>
Variables	Data Item
pages_written	<code>mysql:status:Innodb_dblwr_pages_written</code>
writes	<code>mysql:status:Innodb_dblwr_writes</code>

InnoDB Open Files

Name	InnoDB Open Files
Range Label	total
Series	Expression
Currently Open	<code>open</code>
Max Allowed	<code>max</code>
Variables	Data Item
max	<code>mysql:variables:innodb_open_files</code>
open	<code>mysql:status:innodb_num_open_files</code>

InnoDB OS File Access

Displays the InnoDB I/O counts showing the number of `fsync`, read, and write operations used to support InnoDB tables.

Name	InnoDB OS File Access
Range Label	avg operations/sec
Series	Expression
File fsync()	<code>(fsync/60)</code>
File Reads	<code>(read/60)</code>
File Writes	<code>(write/60)</code>
Redo Log	<code>(log/60)</code>

Variables	Data Item
fsync	<code>mysql:innodbstatus:innodb_io_os_file_fsyncs</code>
log	<code>mysql:innodbstatus:innodb_log_io_total</code>
read	<code>mysql:innodbstatus:innodb_io_os_file_reads</code>
write	<code>mysql:innodbstatus:innodb_io_os_file_writes</code>

InnoDB Redo Log Checkpoint Lag

Name	InnoDB Redo Log Checkpoint Lag
Range Label	MB
Series	Expression
Not Checkpointed	<code>(lsn - checkpointed) / (1024 * 1024)</code>
Not Flushed	<code>(lsn - flushed) / (1024 * 1024)</code>
Total Redo Log Size	<code>(log_size * log_count) / (1024 * 1024)</code>
Variables	Data Item
checkpointed	<code>mysql:innodbstatus:innodb_log_checkpoint_lsn64</code>
flushed	<code>mysql:innodbstatus:innodb_log_flushed_lsn64</code>
log_count	<code>mysql:variables:innodb_log_files_in_group</code>
log_size	<code>mysql:variables:innodb_log_file_size</code>
lsn	<code>mysql:innodbstatus:innodb_log_sequence_lsn64</code>

InnoDB Redo Log IO Usage

Name	InnoDB Redo Log IO Usage
Range Label	avg MB/sec
Series	Expression
Read	<code>((bytes_read / (1024*1024))/60)</code>
Total	<code>((bytes_read + bytes_written) / (1024*1024))/60)</code>
Write	<code>((bytes_written / (1024*1024))/60)</code>
Variables	Data Item
bytes_read	<code>mysql:innodb_log_io:bytes_read</code>
bytes_written	<code>mysql:innodb_log_io:bytes_written</code>

InnoDB Redo Log Pending Writes

Name	InnoDB Redo Log Pending Writes
Range Label	I/O ops
Series	Expression
Checkpoint Writes	<code>checkpoint</code>
Log Writes	<code>log</code>
Variables	Data Item
checkpoint	<code>mysql:innodbstatus:innodb_log_pending_checkpoint_writes</code>

log	<code>mysql:innodbstatus:innodb_log_pending_log_writes</code>
------------	---

InnoDB Row Details

Shows the row counts per minute for individual SQL operations ([READ](#), [INSERT](#), [UPDATE](#) and [DELETE](#)).

Name	InnoDB Row Details
Range Label	avg rows/sec
Series	Expression
Rows Deleted	<code>(deleted/60)</code>
Rows Inserted	<code>(inserted/60)</code>
Rows Read	<code>(read/60)</code>
Rows Updated	<code>(updated/60)</code>
Variables	Data Item
deleted	<code>mysql:innodbstatus:innodb_rows_deleted</code>
inserted	<code>mysql:innodbstatus:innodb_rows_inserted</code>
read	<code>mysql:innodbstatus:innodb_rows_read</code>
updated	<code>mysql:innodbstatus:innodb_rows_updated</code>

InnoDB Row Lock Time

Name	InnoDB Row Lock Time
Range Label	milliseconds
Series	Expression
Total	<code>lock_time_total</code>
Variables	Data Item
lock_time_total	<code>mysql:status:Innodb_row_lock_time</code>

InnoDB Row Lock Time Statistics

Name	InnoDB Row Lock Time Statistics
Range Label	milliseconds
Series	Expression
Avg	<code>lock_time_avg</code>
Max	<code>lock_time_max</code>
Variables	Data Item
lock_time_avg	<code>mysql:status:Innodb_row_lock_time_avg</code>
lock_time_max	<code>mysql:status:Innodb_row_lock_time_max</code>

InnoDB Row Lock Waits

Name	InnoDB Row Lock Waits
Range Label	total
Series	Expression

Row Lock Waits	<code>row_lock_waits</code>
Variables	Data Item
<code>row_lock_waits</code>	<code>mysql:status:Innodb_row_lock_waits</code>

InnoDB Row Locks Current

Name	InnoDB Row Locks Current
Range Label	total
Series	Expression
Rows Locked	<code>rows_locked</code>
Rows Modified	<code>rows_modified</code>
Rows Waiting Lock	<code>rows_waited</code>
Variables	Data Item
<code>rows_locked</code>	<code>mysql:innodb_current_trxs:rows_locked_total</code>
<code>rows_modified</code>	<code>mysql:innodb_current_trxs:rows_modified_total</code>
<code>rows_waited</code>	<code>mysql:innodb_current_trxs:row_locks_current_waits</code>

InnoDB Semaphores

Displays the InnoDB semaphore status. The graph indicates the amount of time that different InnoDB threads have spent waiting due to the locks used to prevent the same structures being updated at the same time. A large number of threads waiting for the semaphores may be a result of disk I/O or connection problems inside InnoDB. You may want to modify your InnoDB thread concurrency.

Name	InnoDB Semaphores
Range Label	avg waits/sec
Series	Expression
OS Waits	<code>(oswaits/60)</code>
Spin Rounds	<code>(srounds/60)</code>
Spin Waits	<code>(swaits/60)</code>
Variables	Data Item
<code>oswaits</code>	<code>mysql:innodbstatus:innodb_sem_mutex_os_waits</code>
<code>srounds</code>	<code>mysql:innodbstatus:innodb_sem_mutex_rounds</code>
<code>swaits</code>	<code>mysql:innodbstatus:innodb_sem_mutex_spin_waits</code>

InnoDB Transaction History

The size of the InnoDB transaction history. A high number may indicate a large number of open (uncommitted) transactions.

Name	InnoDB Transaction History
Range Label	Undo Entries
Series	Expression
Undo Log Size	<code>hist_len</code>
Variables	Data Item

hist_len	<code>mysql:innodbstatus:innodb_trx_history_list_length</code>
-----------------	--

InnoDB Transaction Lock Memory

Name	InnoDB Transaction Lock Memory
Range Label	MB
Series	Expression
Total Lock Memory	<code>(bytes_total / (1024*1024))</code>
Variables	Data Item
bytes_total	<code>mysql:innodb_current_trxs:lock_memory_bytes_total</code>

InnoDB Transactions

The number of blocked, locked, and active transactions. You can use this to determine the contention on tables for InnoDB transactions.

Name	InnoDB Transactions
Range Label	total
Series	Expression
Committing	<code>committing</code>
Lock Waiting	<code>lock_waiting</code>
Rolling Back	<code>rolling_back</code>
Running	<code>running</code>
Variables	Data Item
committing	<code>mysql:innodb_transactions:committing_count</code>
lock_waiting	<code>mysql:innodb_transactions:lock_wait_count</code>
rolling_back	<code>mysql:innodb_transactions:rolling_back_count</code>
running	<code>mysql:innodb_transactions:running_count</code>

InnoDB Undo Logs

Name	InnoDB Undo Logs
Range Label	total
Series	Expression
Total	<code>total</code>
Used	<code>(total - avail)</code>
Variables	Data Item
avail	<code>mysql:status:innodb_available_undo_logs</code>
total	<code>mysql:variables:innodb_undo_logs</code>

Load Average

The load average of the server hosting the MySQL server. The load average shows the number of processes using or waiting for CPU time in the last 1, 5 and 15 minutes. Load averages showing a load higher than the number of CPU cores may indicate an overloaded server.

Name	Load Average
Range Label	Load Average
Series	Expression
1	<code>zero</code>
15	<code>two</code>
5	<code>one</code>
Variables	Data Item
one	<code>os:loadavg:1</code>
two	<code>os:loadavg:2</code>
zero	<code>os:loadavg:0</code>

Memory Usage - Agent

Displays the current amount of memory used by the agent, and by the Lua component of the agent.

Name	Memory Usage - Agent
Range Label	MB
Series	Expression
Agent	<code>agent_mem_size / 1024 / 1024</code>
Lua	<code>lua_mem_size / 1024 / 1024</code>
Variables	Data Item
agent_mem_size	<code>agent:proc:mem_resident</code>
lua_mem_size	<code>agent:lua:mem_size</code>

Memory Usage - OS Resident

Displays the RAM usage on the server for the monitored MySQL instance. You should compare the total and used RAM values to ensure that you are not exceeding your available RAM, which will lead to swapping and performance issues.

Name	Memory Usage - OS Resident
Range Label	MB
Series	Expression
Total	<code>ram_total/(1024*1024)</code>
Used	<code>(ram_total-ram_unused)/(1024*1024)</code>
Variables	Data Item
ram_total	<code>os:mem:ram_total</code>
ram_unused	<code>os:mem:ram_unused</code>

Memory Usage - OS Virtual

Displays the use of swap space on the server for the monitored MySQL instance. High swap usage may indicate that your server needs more RAM or that your MySQL configuration needs to be modified, as high levels of swap will have a negative impact on performance.

Name	Memory Usage - OS Virtual
-------------	---------------------------

Range Label	MB
Series	Expression
Total	<code>swap_total/(1024*1024)</code>
Used	<code>(swap_total-swap_unused)/(1024*1024)</code>
Variables	Data Item
swap_total	<code>os:mem:swap_total</code>
swap_unused	<code>os:mem:swap_unused</code>

MyISAM Data File IO Usage

Name	MyISAM Data File IO Usage
Range Label	avg MB/sec
Series	Expression
Read	<code>((bytes_read / (1024*1024))/60)</code>
Total	<code>((bytes_read + bytes_written) / (1024*1024))/60)</code>
Write	<code>((bytes_written / (1024*1024))/60)</code>
Variables	Data Item
bytes_read	<code>mysql:myisam_data_file_io:bytes_read</code>
bytes_written	<code>mysql:myisam_data_file_io:bytes_written</code>

MyISAM Index File IO Usage

Name	MyISAM Index File IO Usage
Range Label	avg MB/sec
Series	Expression
Read	<code>((bytes_read / (1024*1024))/60)</code>
Total	<code>((bytes_read + bytes_written) / (1024*1024))/60)</code>
Write	<code>((bytes_written / (1024*1024))/60)</code>
Variables	Data Item
bytes_read	<code>mysql:myisam_index_file_io:bytes_read</code>
bytes_written	<code>mysql:myisam_index_file_io:bytes_written</code>

MyISAM Key Buffer Activity

Name	MyISAM Key Buffer Activity
Range Label	avg cache ops/sec
Series	Expression
Disk Reads	<code>(reads/60)</code>
Disk Writes	<code>(writes/60)</code>
Read Requests	<code>(read_requests/60)</code>
Write Requests	<code>(write_requests/60)</code>

Variables	Data Item
read_requests	<code>mysql:status:Key_read_requests</code>
reads	<code>mysql:status:Key_reads</code>
write_requests	<code>mysql:status:Key_write_requests</code>
writes	<code>mysql:status:Key_writes</code>

MyISAM Key Buffer Usage

Displays the efficiency of the MyISAM key index buffer usage. On a system using a lot of MyISAM tables, low usage indicates that your MyISAM key buffer size is too high (reducing the RAM available for other buffering). High usage may indicate that you need to increase your MyISAM key buffer size to help improve performance.

Name	MyISAM Key Buffer Usage
Range Label	MB
Series	Expression
Modified	<code>(blk_size*not_flushed)/1024/1024</code>
Total Size	<code>key_buffer/1024/1024</code>
Used	<code>(key_buffer - (blk_size*unused))/1024/1024</code>
Variables	Data Item
blk_size	<code>mysql:variables:key_cache_block_size</code>
key_buffer	<code>mysql:variables:key_buffer_size</code>
not_flushed	<code>mysql:status:Key_blocks_not_flushed</code>
unused	<code>mysql:status:Key_blocks_unused</code>

Network - Database Throughput

Displays the total Kilobytes per minute of bytes transferred to/from the server by client applications. Spikes in this output may indicate an unusual application operation or connection.

Name	Network - Database Throughput
Range Label	avg kbytes/sec
Series	Expression
Received	<code>((bytesIn/1024)/60)</code>
Sent	<code>((bytesOut/1024)/60)</code>
Total	<code>((bytesIn+bytesOut)/1024)/60)</code>
Variables	Data Item
bytesIn	<code>mysql:status:Bytes_received</code>
bytesOut	<code>mysql:status:Bytes_sent</code>

Network - Interface Throughput

Name	Network - Interface Throughput
Range Label	avg kbytes/sec
Series	Expression

Received	<code>((read / 1024)/60)</code>
Sent	<code>((write / 1024)/60)</code>
Total	<code>((read+write) / 1024)/60)</code>
Variables	Data Item
read	<code>os:net:rx_bytes</code>
write	<code>os:net:tx_bytes</code>

Opened Tables

The number of tables in the open state per minute.

Name	Opened Tables
Range Label	total/min
Series	Expression
Opened Table Definitions	<code>openedTableDefs</code>
Opened Tables	<code>openedTables</code>
Variables	Data Item
openedTableDefs	<code>mysql:status:Opened_table_definitions</code>
openedTables	<code>mysql:status:Opened_tables</code>

Prepared Statement API

Name	Prepared Statement API
Range Label	total/min
Series	Expression
stmt_close	<code>(close_api - dealloc_sql)</code>
stmt_execute	<code>(execute_api - execute_sql)</code>
stmt_fetch	<code>fetch_api</code>
stmt_prepare	<code>((prepare_api - reprepare_api) - prepare_sql)</code>
Variables	Data Item
close_api	<code>mysql:status:Com_stmt_close</code>
dealloc_sql	<code>mysql:status:Com_dealloc_sql</code>
execute_api	<code>mysql:status:Com_stmt_execute</code>
execute_sql	<code>mysql:status:Com_execute_sql</code>
fetch_api	<code>mysql:status:Com_stmt_fetch</code>
prepare_api	<code>mysql:status:Com_stmt_prepare</code>
prepare_sql	<code>mysql:status:Com_prepare_sql</code>
reprepare_api	<code>mysql:status:Com_stmt_reprepare</code>

Prepared Statement API Invalidations

Name	Prepared Statement API Invalidations
Range Label	total/min

Series	Expression
stmt_reprepare	reprepare_api
Variables	Data Item
reprepare_api	mysql:status:Com_stmt_reprepare

Prepared Statement SQL

Name	Prepared Statement SQL
Range Label	total/min
Series	Expression
DEALLOCATE PREPARE	dealloc_sql
EXECUTE	execute_sql
PREPARE	prepare_sql
Variables	Data Item
dealloc_sql	mysql:status:Com_dealloc_sql
execute_sql	mysql:status:Com_execute_sql
prepare_sql	mysql:status:Com_prepare_sql

Prepared Statement Utilization

Name	Prepared Statement Utilization
Range Label	total
Series	Expression
Max Prepared Statements	max_allowed
Open Prepared Statements	open
Variables	Data Item
max_allowed	mysql:variables:max_prepared_stmt_count
open	mysql:status:Prepared_stmt_count

Query Cache Average Free Block Size

Name	Query Cache Average Free Block Size
Range Label	kBytes
Series	Expression
Average Free Block Size	free_memory/free_blocks/1024
Variables	Data Item
free_blocks	mysql:status:Qcache_free_blocks
free_memory	mysql:status:Qcache_free_memory

Query Cache Average Query Size

Name	Query Cache Average Query Size
Range Label	kBytes

Series	Expression
Average Query Size	<code>((size - free)/queries)/1024</code>
Min Block Size	<code>min_res_unit/1024</code>
Variables	Data Item
free	<code>mysql:status:Qcache_free_memory</code>
min_res_unit	<code>mysql:variables:query_cache_min_res_unit</code>
queries	<code>mysql:status:Qcache_queries_in_cache</code>
size	<code>mysql:variables:query_cache_size</code>

Query Cache Efficiency

Displays the hits, inserts and queries not cacheable in the query cache. Low cache hits may indicate that your queries are being expired from the cache before they can be used, which may mean they are unsuitable for storing in the query cache.

Name	Query Cache Efficiency
Range Label	avg cache ops/sec
Series	Expression
Hits	<code>(hits/60)</code>
Inserts	<code>(inserts/60)</code>
Not Cached	<code>(not_cached/60)</code>
Variables	Data Item
hits	<code>mysql:status:Qcache_hits</code>
inserts	<code>mysql:status:Qcache_inserts</code>
not_cached	<code>mysql:status:Qcache_not_cached</code>

Query Cache Fragmentation

Name	Query Cache Fragmentation
Range Label	# of Free Blocks
Series	Expression
Free Blocks	<code>QCache_free_blocks</code>
Variables	Data Item
QCache_free_blocks	<code>mysql:status:QCache_free_blocks</code>

Query Cache Lowmem Prunes

Displays the number of queries removed from the cache because the size of the query cache was not large enough to store the queries that can be cached. Try increasing your query cache size.

Name	Query Cache Lowmem Prunes
Range Label	avg cache ops/sec
Series	Expression
Lowmem Prunes	<code>(deletes/60)</code>

Variables	Data Item
deletes	<code>mysql:status:Qcache_lowmem_prunes</code>

Query Cache Memory

Displays the free space and total size of the query cache.

Name	Query Cache Memory
Range Label	MB
Series	Expression
Total Size	<code>size/(1024*1024)</code>
Used	<code>((size-free)/(1024*1024))</code>
Variables	Data Item
free	<code>mysql:status:Qcache_free_memory</code>
size	<code>mysql:variables:query_cache_size</code>

Query Cache Queries

Shows the number of queries stored in the query cache. In normal operation this should be a relatively constant figure. A large number of switches between high and low numbers may indicate that differently sized queries are being inserted into the query cache, and then later removed as a high number of smaller queries are added to the cache. Try increasing the size of your query cache.

Name	Query Cache Queries
Range Label	num queries
Series	Expression
Queries in Cache	<code>queries</code>
Variables	Data Item
queries	<code>mysql:status:Qcache_queries_in_cache</code>

Replication Master Semi-Sync Transactions

Name	Replication Master Semi-Sync Transactions
Range Label	# of trxs
Series	Expression
Transactions Acknowledged	<code>txrs_yes</code>
Transactions Unacknowledged	<code>txrs_no</code>
Variables	Data Item
txrs_no	<code>mysql:rpl_semi_sync_status:Rpl_semi_sync_master_no_tx</code>
txrs_yes	<code>mysql:rpl_semi_sync_status:Rpl_semi_sync_master_yes_tx</code>

Replication Master Semi-Sync Wait Time Averages

Name	Replication Master Semi-Sync Wait Time Averages
Range Label	milliseconds
Series	Expression

Average Slave Wait Time	<code>slave_waits / 1000</code>
Average Transaction Wait Time	<code>trx_waits / 1000</code>
Variables	Data Item
slave_waits	<code>mysql:rpl_semi_sync_status:Rpl_semi_sync_master_net_avg</code>
trx_waits	<code>mysql:rpl_semi_sync_status:Rpl_semi_sync_master_tx_avg</code>

Replication Master Semi-Sync Waiting Sessions

Name	Replication Master Semi-Sync Waiting Sessions
Range Label	# of sessions
Series	Expression
Waiting Sessions	<code>sessions_waiting</code>
Variables	Data Item
sessions_waiting	<code>mysql:rpl_semi_sync_status:Rpl_semi_sync_master_wait_s</code>

Replication Master Semi-Sync Waits

Name	Replication Master Semi-Sync Waits
Range Label	# waits
Series	Expression
Slave Waits	<code>slave_waits</code>
Transaction Waits	<code>trx_waits</code>
Variables	Data Item
slave_waits	<code>mysql:rpl_semi_sync_status:Rpl_semi_sync_master_net_wa</code>
trx_waits	<code>mysql:rpl_semi_sync_status:Rpl_semi_sync_master_tx_wai</code>

Replication Slave Delay

Displays the number of seconds behind the master for a given slave in a replication scenario. An increasing value means that your slave is unable to keep up with your master.

Name	Replication Slave Delay
Range Label	total seconds
Series	Expression
Seconds Behind Master	<code>sbehind</code>
Variables	Data Item
sbehind	<code>mysql:slavestatus:Seconds_Behind_Master</code>

Replication Slave Relay Log Space Usage

Name	Replication Slave Relay Log Space Usage
Range Label	MB
Series	Expression
Total Size	<code>(fileSum / (1024*1024))</code>

Variables	Data Item
fileSum	mysql:slavestatus:Relay_Log_Space

Row Access Statistics

Shows the average of the number of accesses for data for different query operations for all table reads, regardless of the storage engine being using, against the number of queries being executed.

Name	Row Access Statistics
Range Label	rows
Series	Expression
Average Rows Per Query	$((\text{first} + \text{key} + \text{next} + \text{prev} + \text{hread_rnd} + \text{hread_rnd_next} + \text{sort_rows}) / \text{questions})$
Variables	Data Item
first	mysql:status:Handler_read_first
hread_rnd	mysql:status:Handler_read_rnd
hread_rnd_next	mysql:status:Handler_read_rnd_next
key	mysql:status:Handler_read_key
next	mysql:status:Handler_read_next
prev	mysql:status:Handler_read_prev
questions	mysql:status:Questions
sort_rows	mysql:status:Sort_rows

Row Accesses

Displays the aggregated row access statistics per minute. Information is shown both in terms of the full table scans (which are expensive to perform), and index based accesses.

Name	Row Accesses
Range Label	avg rows/sec
Series	Expression
Rows Read via Full Scan	$((\text{hread_rnd} + \text{hread_rnd_next}) / 60)$
Rows Read via Indexes	$((\text{first} + \text{key} + \text{next} + \text{prev}) / 60)$
Variables	Data Item
first	mysql:status:Handler_read_first
hread_rnd	mysql:status:Handler_read_rnd
hread_rnd_next	mysql:status:Handler_read_rnd_next
key	mysql:status:Handler_read_key
next	mysql:status:Handler_read_next
prev	mysql:status:Handler_read_prev

Row Accesses Index Usage Ratio

Name	Row Accesses Index Usage Ratio
Range Label	%

Series	Expression
Index Usage	<code>(100-(((hread_rnd_next + hread_rnd) / (hread_rnd_next + hread_rnd + first + next + key + prev))*100))</code>
Variables	Data Item
first	<code>mysql:status:Handler_read_first</code>
hread_rnd	<code>mysql:status:Handler_read_rnd</code>
hread_rnd_next	<code>mysql:status:Handler_read_rnd_next</code>
key	<code>mysql:status:Handler_read_key</code>
next	<code>mysql:status:Handler_read_next</code>
prev	<code>mysql:status:Handler_read_prev</code>

Row Writes

Shows the number of delete, write (`INSERT`), and update operations on rows per minute on all tables regardless of storage engine.

Name	Row Writes
Range Label	avg rows/sec
Series	Expression
Rows Deleted	<code>(delete/60)</code>
Rows Inserted	<code>(write/60)</code>
Rows Updated	<code>(update/60)</code>
Variables	Data Item
delete	<code>mysql:status:Handler_delete</code>
update	<code>mysql:status:Handler_update</code>
write	<code>mysql:status:Handler_write</code>

Rows Returned

Name	Rows Returned
Range Label	avg rows/sec
Series	Expression
Rows Returned	<code>rows/60</code>
Variables	Data Item
rows	<code>mysql:statement_digest_statistics:total_rows_returned</code>

Slow Queries

Name	Slow Queries
Range Label	total/min
Series	Expression
Slow Queries	<code>slow_queries/60</code>
Variables	Data Item

slow_queries	<code>mysql:status:Slow_queries</code>
---------------------	--

Sort Activity

Shows the number of different sort operations performed on queries.

Name	Sort Activity
Range Label	total/min
Series	Expression
Merge Passes	<code>Sort_merge_passes</code>
Range	<code>Sort_range</code>
Scan	<code>Sort_scan</code>
Variables	Data Item
Sort_merge_passes	<code>mysql:status:Sort_merge_passes</code>
Sort_range	<code>mysql:status:Sort_range</code>
Sort_scan	<code>mysql:status:Sort_scan</code>

Statement Errors and Warnings

Name	Statement Errors and Warnings
Range Label	Count
Series	Expression
Errors	<code>errors</code>
Warnings	<code>warnings</code>
Variables	Data Item
errors	<code>mysql:statement_digest_statistics:total_errors</code>
warnings	<code>mysql:statement_digest_statistics:total_warnings</code>

Statement Statistics

Name	Statement Statistics
Range Label	milliseconds
Series	Expression
Avg Lock Time	<code>(total_lock_time/statements)</code>
Avg Response Time	<code>(total_wait_time/statements)</code>
Variables	Data Item
statements	<code>mysql:statement_digest_statistics:total_statements</code>
total_lock_time	<code>mysql:statement_digest_statistics:total_lock_time_ms</code>
total_wait_time	<code>mysql:statement_digest_statistics:total_wait_time_ms</code>

Swap IO Operations

Name	Swap IO Operations
Range Label	avg pages/sec

Series	Expression
Pages In	<code>in / 60</code>
Pages Out	<code>out / 60</code>
Total Pages	<code>((in+out) / 60)</code>
Variables	Data Item
in	<code>os:mem:swap_page_in</code>
out	<code>os:mem:swap_page_out</code>

Table Lock Wait Ratio

Shows the percentage of table locks that have had to wait before an operation can continue. High lock ratios can indicate high contention in your tables, with too many operations having to wait, affecting the performance.

Name	Table Lock Wait Ratio
Range Label	lock wait %
Series	Expression
Wait Ratio	<code>((lock_waits/lock_immediate)*100)</code>
Variables	Data Item
lock_immediate	<code>mysql:status:Table_locks_immediate</code>
lock_waits	<code>mysql:status:Table_locks_waited</code>

Table Locks

Shows the average number of table locks per second.

Name	Table Locks
Range Label	avg locks/sec
Series	Expression
Immediate	<code>(locks_immediate/60)</code>
Waited	<code>(locks_waited/60)</code>
Variables	Data Item
locks_immediate	<code>mysql:status:Table_locks_immediate</code>
locks_waited	<code>mysql:status:Table_locks_waited</code>

Temporary Tables

Displays the number of memory temporary tables and disk temporary tables. Disk temporary tables are slower to create, populate, and read back. You may want to increase your memory temporary table size or check your queries to determine whether the use of temporary tables can be minimized.

Name	Temporary Tables
Range Label	total/min
Series	Expression
Disk Temp Tables	<code>diskTempTables</code>

Memory Temp Tables	memoryTempTables
Variables	Data Item
diskTempTables	mysql:status:Created_tmp_disk_tables
memoryTempTables	mysql:status:Created_tmp_tables

Thread Pool Current Threads

Name	Thread Pool Current Threads
Range Label	thread count
Series	Expression
Active	active_threads
Consumable	consumer_thread
Reserved	reserve_threads
Stalled	stalled_threads
Total	total_threads
Variables	Data Item
active_threads	mysql:thread_pool_state:active_threads
consumer_threads	mysql:thread_pool_state:consumer_threads
reserve_threads	mysql:thread_pool_state:reserve_threads
stalled_threads	mysql:thread_pool_state:stalled_threads
total_threads	mysql:thread_pool_state:total_threads

Thread Pool Queue Age

Name	Thread Pool Queue Age
Range Label	milliseconds
Series	Expression
Oldest Query Wait Time	oldest_queued_ms
Variables	Data Item
oldest_queued_ms	mysql:thread_pool_state:oldest_queued_ms

Thread Pool Queues

Name	Thread Pool Queues
Range Label	# of statements
Series	Expression
High-Priority Queue	queued_queries
Low-Priority Queue	queued_trxs
Variables	Data Item
queued_queries	mysql:thread_pool_state:queued_queries
queued_trxs	mysql:thread_pool_state:queued_trxs

Thread Pool Stall Rate

Name	Thread Pool Stall Rate
Range Label	%
Series	Expression
Last Interval	<code>(stalled_queries_executed / queries_executed) * 100</code>
Since Start	<code>stalled_pct</code>
Variables	Data Item
queries_executed	<code>mysql:thread_pool_stats:queries_executed</code>
stalled_pct	<code>mysql:thread_pool_stats:stalled_pct</code>
stalled_queries_executed	<code>mysql:thread_pool_stats:stalled_queries_executed</code>

Thread Pool Statement Activity

Name	Thread Pool Statement Activity
Range Label	avg statements/sec
Series	Expression
Executed	<code>(executed / 60)</code>
Immediately Queued	<code>(queued / 60)</code>
Marked Stalled	<code>(stalled / 60)</code>
Variables	Data Item
executed	<code>mysql:thread_pool_stats:queries_executed</code>
queued	<code>mysql:thread_pool_stats:queries_queued</code>
stalled	<code>mysql:thread_pool_stats:stalled_queries_executed</code>

Appendix C MySQL Enterprise Monitor Component Reference

Table of Contents

C.1 MySQL Enterprise Service Manager Reference	333
C.1.1 Configuring Tomcat Parameters	333
C.1.2 Creating a new SSL KeyStore	334
C.1.3 Log Files for the MySQL Enterprise Service Manager	334
C.1.4 The Management Information Base (MIB) File	335
C.1.5 The <code>config.properties</code> file	335
C.2 MySQL Enterprise Monitor Agent Reference	339
C.2.1 MySQL Enterprise Monitor Agent Configurable Options	340
C.2.2 MySQL Server (<code>agent-instance.ini</code>) Configuration	358
C.2.3 Agent Log and <code>pid</code> Files	359

C.1 MySQL Enterprise Service Manager Reference

C.1.1 Configuring Tomcat Parameters

The parameters for the [Tomcat](#) hosting system that supports MySQL Enterprise Service Manager and MySQL Enterprise Monitor User Interface can have an affect on the performance of the system.

The default settings for Java for Tomcat are as follows:

Description	Parameter	Default Value
Initial heap size	-Xms	768MB
Maximum heap size	-Xmx	768MB
Java stack size	-Xss	128MB

You can change these parameters to higher values, by editing the `JAVA_OPTS` setting within the corresponding platform script.

- On Unix/Linux:

Edit the values within `apache-tomcat/bin/setenv.sh` file within your MySQL Enterprise Service Manager directory. Avoid setting maximum figures higher than the physical memory of your system as this may reduce, rather than increase the performance.

If you change these parameters, shut down and restart MySQL Enterprise Service Manager for the changes to take effect.

- Windows

Edit the `JAVA_OPTS` settings within the `apache-tomcat/bin/setenv.bat` file.

To enable the changes, re-install your service. Shut down your MySQL Enterprise Service Manager service and then reinstall the service by running:

```
shell> mysqlmonitorctl.bat uninstall
shell> mysqlmonitorctl.bat install
```

On all platforms, upgrading the MySQL Enterprise Service Manager service using the above methods should preserve any changes to [JAVA_OPTS](#).

If you are running the MySQL repository and the Tomcat service on the same machine, take the memory allocated to MySQL into consideration when setting these values.

C.1.2 Creating a new SSL KeyStore

The SSL certificate that is provided with the server during installation is a sample certificate only. To use SSL for communicating with your MySQL Enterprise Service Manager and MySQL Enterprise Monitor User Interface, replace the supplied certificate with your own certificate.

The certificate keystore is located in the [apache-tomcat/conf/myKeystore](#) file within your MySQL Enterprise Service Manager installation.

To create a new self-signed certificate, use the [keytool](#) command (provided with Java SE Security) to create a new certificate file:

```
shell> keytool -genkey -alias tomcat -keyalg RSA -validity 1825 -keystore newKeystore
```

You will be prompted to fill in the certificate information and to provide a unique password for the certificate.

The [-validity](#) specifies the length of the certificate created, specified in days. The [-alias](#) is required to ensure that the certificate is associated with [tomcat](#).

Once you have created the new keystore, shut down MySQL Enterprise Service Manager, copy the new keystore file to [apache-tomcat/conf/myKeystore](#), and restart MySQL Enterprise Service Manager.

If you have an existing certificate that you would like to import into your keystore, you need to import the certificate using the following command:

```
shell> keytool -import -alias tomcat -keystore newKeystore -file public.pem
```

For more information on using SSL certificates in Tomcat see [Apache Tomcat 6.0: SSL Configuration HOW-TO](#).

C.1.3 Log Files for the MySQL Enterprise Service Manager

This section shows the location of the log and configuration files associated with the various components that make up the MySQL Enterprise Service Manager. These files can prove useful for debugging purposes.

All log files except [catalina.out](#) are rotated to ensure they do not grow beyond 10MB in size.

Table C.1 MySQL Enterprise Monitor: Log File Locations: Windows

Component	File Location
Apache/Tomcat	C:\Program Files\MySQL\Enterprise\Monitor\apache-tomcat\logs\catalina.out
Repository	C:\Program Files\MySQL\Enterprise\Monitor\mysql\data
Configuration Report	C:\Program Files\MySQL\Enterprise\Monitor\configuration_report.txt

Component	File Location
Service Manager	C:\Program Files\MySQL\Enterprise\Monitor\apache-tomcat\logs\mysql-monitor.log

Table C.2 MySQL Enterprise Monitor: Log File Locations: Unix

Component	File Location
Apache/Tomcat	/opt/mysql/enterprise/monitor/apache-tomcat/logs/catalina.out
Repository	/opt/mysql/enterprise/monitor/mysql/data
Configuration Report	/opt/mysql/enterprise/monitor/configuration_report.txt
Service Manager	/opt/mysql/enterprise/monitor/apache-tomcat/logs/mysql-monitor.log

All of these logs are viewable within MySQL Enterprise Monitor User Interface. For more information, see [Section 2.8.6, “Logs”](#).

On all operating systems, the Apache/Tomcat, and Repository directories contain both access and error files.

C.1.4 The Management Information Base (MIB) File

A MIB file is a requirement for using SNMP traps. A table showing the location of this file follows.

Table C.3 MySQL Enterprise Monitor: MIB File Locations

Operating System	File Location
Windows	C:\Program Files\MySQL\Enterprise\Monitor\support-files\MONITOR.MIB
Unix	/opt/mysql/enterprise/monitor/support-files/MONITOR.MIB

C.1.5 The `config.properties` file

File location

The repository user name and password are stored in the `config.properties` file. The following table shows the location of this file on various operating systems:

Table C.4 MySQL Enterprise Monitor: Default path of the `config.properties` File

Operating System	File Location
Windows	C:\Program Files\MySQL\Enterprise\Monitor\apache-tomcat\webapps\ROOT\WEB-INF
Linux and Unix	/opt/mysql/enterprise/monitor/apache-tomcat/webapps/ROOT/WEB-INF

Make sure that the file is secured at the filesystem level so that it cannot be read by anybody but the administrator, or MySQL Enterprise Monitor.

Usage

A generated `config.properties` file will look similar to:

```
#SymmetricKey was auto generated.
#Wed Feb 27 17:32:14 PST 2013
mysql.port=13306
mysql.user=service_manager
quanal.collect=00\01\00
mysql.db=mem
default.maxActive=70
mysql.use_ssl=true
mysql.server=127.0.0.1
mysql.pass=133t
key=8E15928C7732FA85
mysql.verify_server_cert=false
```

The application has two connection pools, one to service agent traffic, and the other for the UI. You can configure them as one logical pool with a 85/15 (agent/ui) percentage split, and use "dbPool" as the pool name in the further settings. Or, you can configure each pool separately, where the pool names are "default" and "ui". Note that the names after the "." come verbatim from DBCP at <http://commons.apache.org/proper/commons-dbc/configuration.html>.

Table C.5 Optional `config.properties` values

Property Name	Property Type	Default
<code>data_collection_interval</code>	string	00:01:00
<code>dbpool.default.initialSize</code>	integer	20
<code>dbpool.default.maxActive</code>	integer	70
<code>dbpool.default.maxIdle</code>	integer	20
<code>dbpool.default.maxWaitMillis</code>	string	30 seconds
<code>dbpool.default.minEvictableIdleTimeMillis</code>	string	15 seconds
<code>dbpool.default.minIdle</code>	integer	0
<code>dbpool.default.timeBetweenEvictionRunsMillis</code>	string	5 seconds
<code>dbpool.ui.initialSize</code>	integer	5
<code>dbpool.ui.maxActive</code>	integer	15
<code>dbpool.ui.maxIdle</code>	integer	5
<code>dbpool.ui.maxWaitMillis</code>	string	30 seconds
<code>dbpool.ui.minEvictableIdleTimeMillis</code>	string	15 seconds
<code>dbpool.ui.minIdle</code>	integer	0
<code>dbpool.ui.timeBetweenEvictionRunsMillis</code>	string	5 seconds
<code>graph.cache.period.minutes</code>	string	1
<code>internal_perf_enable</code>	boolean	false
<code>internal_perf_server_id</code>	integer	
<code>notify_thread_pool_size</code>	integer	4
<code>quanal.collect</code>	string	00:01:00
<code>supportReport.retention.minutes</code>	string	6 hours
<code>thread_pool_size</code>	integer	8
<code>ui.javascript.useClientSideStorage</code>	boolean	false

- `graph.cache.period.minutes(1)`

Permitted Values	Type	<code>string</code>
	Default	<code>1</code>

Length of time that the graph images are cached in the service monitor.

- `notify_thread_pool_size(4)`

Permitted Values	Type	<code>integer</code>
	Default	<code>4</code>

SMTP and SNMP notifications are sent asynchronously, this controls how many threads are used for this process.

- `thread_pool_size(8)`

Permitted Values	Type	<code>integer</code>
	Default	<code>8</code>

Used to handle background jobs.

- `data_collection_interval(00:01:00)`

Permitted Values	Type	<code>string</code>
	Default	<code>00:01:00</code>

Defaults to one minute, and is never less than one minute. May be set to a value larger than one minute by use of the `data_collection_interval` property, in `hh:mm:ss` interval format.

- `internal_perf_enable(false)`

Permitted Values	Type	<code>boolean</code>
	Default	<code>false</code>

Enables internal performance monitoring for MySQL Enterprise Monitor (requires deploying some graphs from the `resources/` directory).

- `internal_perf_server_id(false)`

Permitted Values	Type	<code>integer</code>
	Default	

If `internal_perf_enable` is set to true, and MySQL Enterprise Service Manager can not read `mysql.inventory`, then use this ID instead.

- `quanal.collect(00:01:00)`

Permitted Values	Type	<code>string</code>
	Default	<code>00:01:00</code>

The rate that the service manager asks for query analysis data from the agent and plugins. It is expressed using the `hh:mm:ss` interval format.

- `ui.javascript.useClientSideStorage(false)`

Permitted Values	Type	boolean
	Default	false

Use this instead of cookies to store UI state (not login, but graph selection, etc.) Generally only needed if using a broken proxy that truncates cookie length.

- `supportReport.retention.minutes(6 hours)`

Permitted Values	Type	string
	Default	6 hours

The length of time that MySQL Enterprise Monitor will retain the reports generated when using "Support diagnostics" from "Manage Servers".

- `dbpool.ui.initialSize(5)`

Permitted Values	Type	integer
	Default	5

- `dbpool.ui.maxActive(15)`

Permitted Values	Type	integer
	Default	15

- `dbpool.ui.minIdle(0)`

Permitted Values	Type	integer
	Default	0

- `dbpool.ui.maxIdle(5)`

Permitted Values	Type	integer
	Default	5

- `dbpool.ui.maxWaitMillis(30 seconds)`

Permitted Values	Type	string
	Default	30 seconds

- `dbpool.ui.timeBetweenEvictionRunsMillis(5 seconds)`

Permitted Values	Type	string
	Default	5 seconds

- `dbpool.ui.minEvictableIdleTimeMillis(15 seconds)`

Permitted Values	Type	string
	Default	15 seconds

- `dbpool.default.initialSize(20)`

Permitted Values	Type	integer
	Default	20

- `dbpool.default.maxActive(70)`

Permitted Values	Type	integer
	Default	70

- `dbpool.default.minIdle(0)`

Permitted Values	Type	integer
	Default	0

- `dbpool.default.maxIdle(5)`

Permitted Values	Type	integer
	Default	20

- `dbpool.default.maxWaitMillis(30 seconds)`

Permitted Values	Type	string
	Default	30 seconds

- `dbpool.default.timeBetweenEvictionRunsMillis(5 seconds)`

Permitted Values	Type	string
	Default	5 seconds

- `dbpool.default.minEvictableIdleTimeMillis(15 seconds)`

Permitted Values	Type	string
	Default	15 seconds

C.2 MySQL Enterprise Monitor Agent Reference

The MySQL Enterprise Monitor Agent provides all of the information from a monitored MySQL server to MySQL Enterprise Service Manager. The MySQL Enterprise Monitor Agent can provide MySQL Enterprise Agent Proxy Service functionality for relaying query analyzer data.

The MySQL Enterprise Monitor Agent is configured through files located within the `etc` subdirectory under the agent installation directory.

Configuration is stored in multiple files, according to a predetermined file and directory layout. The primary configuration file contains specific information about the agent and how the agent communicates with MySQL Enterprise Service Manager. The main configuration is located within the `mysql-monitor-agent.ini` file.

Additional configuration files contain information about the MySQL server that is being monitored. You can configure which directory is used for storing this information within the `mysql-monitor-agent.ini` file. The default location is the `etc/instances` subdirectory within the MySQL Enterprise Monitor Agent directory.

The server you want to monitor should have a directory within the specified location, optionally using the name of the server you are monitoring, and within that directory, an `agent-instance.ini` file. This file contains the configuration information for connecting to the MySQL server, including the host name, port, user credentials and display name.

You can see an example of the file layout of the `etc` directory:

```
.
./init.d
./init.d/mysql-monitor-agent
./instances
./instances/agent
./instances/agent/agent-instance.ini
./mysql-monitor-agent.ini
```

For more information on the configuration of the `mysql-monitor-agent.ini` file, see [Section C.2.1, “MySQL Enterprise Monitor Agent Configurable Options”](#). For details on the content of the individual MySQL instance configuration files, see [Section C.2.2, “MySQL Server \(agent-instance.ini\) Configuration”](#).

C.2.1 MySQL Enterprise Monitor Agent Configurable Options

The `mysql-monitor-agent.ini` file contains the base configuration information for the MySQL Enterprise Monitor Agent. The file sets the core information about the supported functionality for the entire agent. Its format is shown in the following example:

```
# WARNING - The UUID defined below must be unique for each agent.
#
# To use this INI file as a template for configuring additional
# agents, do not simply copy and start a new agent without first
# modifying the UUID and adjusting other parameters as necessary.
#
# WARNING - If you are upgrading from a previous 1.x release, please
# note that we have changed the contents of the agent INI file and
# split the contents across two files:
#
# <installdir>/etc/mysql-monitor-agent.ini          - this file
# <installdir>/etc/instances/mysql/agent-instance.ini - new file
#
# Refer to the documentation for more detailed information and
# instructions.
#
# Version: 2.3.9.2137

[mysql-proxy]
```

```
# Common Parameters
plugins      = proxy,agent,aggr
keepalive    = true

log-file     = mysql-monitor-agent.log
pid-file     = /opt/mysql/enterprise/agent/mysql-monitor-agent.pid

# Agent Parameters
agent-mgmt-hostname = http://localhost:18080/heartbeat
agent-mgmt-username = agent
agent-mgmt-password = foo
agent-item-files    = share/mysql-monitor-agent/items/quant.lua, share/mysql-monitor-agent/items/items-mysql.lua
agent-uuid          = 68b4892c-1310-4f07-8924-3a8b3c0e850b
mysqld-instance-dir = etc/instances

# Aggregator Parameters
aggr-address      = :14000
aggr-lua-script   = lib/mysql-aggregator/lua/aggr.lua
aggr-mem-baseurl  = http://localhost:18080/v2/rest

# Proxy Parameters
proxy-address      = :6446
proxy-backend-addresses = 127.0.0.1:3306
proxy-lua-script   = lib/mysql-monitor-agent/lua/quant.lua
```



Note

Do not copy the agent configuration information from one machine to another without changing the `agent-uuid`. Each agent instance must have a unique agent id.

The main configuration information must be located within the `[mysql-proxy]` section of the configuration file. The main configurable parameters within this file are:



File names in configuration files

The MySQL Enterprise Monitor configuration files use the `glib file parser` to parse settings that define file names. This means that leading and trailing whitespace is stripped. The following escape characters are allowed: `\r`, `\n`, `\t`, `\s`, `\\`, and `\.`

The MySQL Enterprise Monitor Agent supports the following configurable options:

Table C.6 `mysql-monitor-agent` Help Options

Format	Description
<code>--help-admin</code>	Show options for the admin-module
<code>--help-agent</code>	Show agent options
<code>--help-all</code>	Show all help options
<code>--help-monitor</code>	Show monitor options
<code>--help-proxy</code>	Show options for the proxy-module

Table C.7 `mysql-monitor-agent` Admin Options

Format	Description
<code>--admin-address</code>	Defines the listening address and port for the admin module
<code>--admin-lua-script</code>	Script to execute by the admin module

Format	Description
<code>--admin-password</code>	Password for authentication for admin module
<code>--admin-username</code>	Username for authentication for admin module
<code>--proxy-address</code>	Listening address:port of the proxy server

Table C.8 `mysql-monitor-agent` Agent Options

Format	Description	Introduced
<code>--agent-backlog-timeout</code>	Maximum time in seconds that the agent keeps data when it cannot communicate with the Service Manager	
<code>--agent-collector-plugins</code>	Load the specified collector plugins	
<code>--agent-connect-timeout</code>	The timeout for the agent to connect to the MySQL server	
<code>--agent-DNS-cachetimeout</code>	The timeout for cache operations	
<code>--agent-force-uncorking</code>	Forcibly turn off corking (randomization of data collection intervals)	
<code>--agent-generate-uuid</code>	Generate a UUID for use with the agent-uuid	
<code>--agent-heartbeat-interval</code>	The interval for generating heartbeat operations	
<code>--agent-host-id</code>	The host ID for the agent	
<code>--agent-host-id-commandline</code>	The command to use to generate the agent host id	
<code>--agent-hostname</code>	Hostname of the agent host	
<code>--agent-IP-version</code>	IP version (4 or 6) to force	
<code>--agent-item-files</code>	List of data items for additional collections	
<code>--agent-master-uuid-discovery</code>	Disable the use of the master_uuid for topology discovery	
<code>--agent-max-response-size</code>	Maximum response size for agent data	
<code>--agent-mgmt-hostname</code>	URL of the management server	
<code>--agent-mgmt-password</code>	Password for the management server	
<code>--agent-mgmt-username</code>	User name with the management server	
<code>--agent-net-timeout</code>	The timeout for the agent for established connections to the MySQL server	
<code>--agent-report-network-fs</code>	Enable data collection for networked file systems	
<code>--agent-report-offset</code>	Set the second after the minute when the data is sent to the server	
<code>--agent-run-os-tests</code>	Run the operating system tests and shutdown	
<code>--agent-ssh-keygen-attempts</code>	Number of attempts that the agent should retry, for a failed ssh-keygen	2.3.10
<code>--agent-ssh-keygen-retry</code>	Time interval (in seconds) between attempts for a failed ssh-keygen attempt	2.3.10
<code>--agent-sync-attempts</code>	Synchronize the attempts to connect at resync	
<code>--agent-track-alloc</code>	Enable the tracking of the allocation sizes	
<code>--agent-uuid</code>	UUID of this agent	
<code>--mysqld-instance-dir</code>	Location of the MySQL instance configuration (mysql.cnf/ mysql.ini) files	

Table C.9 `mysql-monitor-agent` Monitor Options

Format	Description
<code>--monitor-interval</code>	Interval for executing queries against the backend
<code>--monitor-lua-script</code>	Script filename for the monitor
<code>--monitor-password</code>	Set the password for the monitored MySQL Server
<code>--monitor-username</code>	Set the username for the monitored MySQL Server

Table C.10 `mysql-monitor-agent` Proxy Options

Format	Description	Introduced
<code>--no-proxy</code>	Don't start the proxy module	
<code>--proxy-backend-addresses</code>	Address:port of the remote MySQL server	
<code>--proxy-connect-timeout []</code>	Defines the default timeout, for proxy connection operations	2.3.10
<code>--proxy-fix-bug-25371</code>	Enable the fix for Bug #25371 (for mysqld > 2.0.0.12) for older libmysql versions	
<code>--proxy-lua-script []</code>	Filename for Lua script for proxy operations	
<code>--proxy-pool-no-change-user</code>	Don't use the protocol CHANGE_USER to reset the connection when coming from the connection pool	
<code>--proxy-read-only-backend-addresses</code>	Address:port of the remote MySQL server (read-only)	
<code>--proxy-read-timeout []</code>	Defines the default timeout, for proxy read operations	2.3.10
<code>--proxy-skip-profiling</code>	Disabled profiling of queries	
<code>--proxy-write-timeout []</code>	Defines the default timeout, for proxy write operations	2.3.10

Table C.11 `mysql-monitor-agent` Aggregator Options

Format	Description	Introduced
<code>--aggr-address</code>	Listening address:port combination	2.3.0
<code>--aggr-flush-interval</code>	The interval in seconds between flushes of query data to the MySQL Enterprise Service Manager	2.3.0
<code>--aggr-lua-script</code>	Path to the Lua script	2.3.0
<code>--aggr-max-request-body-size</code>	Limits the maximum size of requests sent to the Aggregator, to avoid potential out-of-memory errors	2.3.8
<code>--aggr-mem-baseurl</code>	Base URL of the server	2.3.0
<code>--aggr-ssl-address</code>	Listening port:address combination for SSL connections	2.3.0
<code>--aggr-ssl-ca-file</code>	CA certificate file	2.3.0
<code>--aggr-ssl-cert-file</code>	Server certificate (PEM)	2.3.0
<code>--aggr-ssl-ciphers</code>	Supported ciphers for SSL	2.3.0
<code>--aggr-test-mode</code>	Start the aggregator in test mode	2.3.0

Table C.12 `mysql-monitor-agent` Application Options

Format	Description
<code>--basedir</code>	Specify the base directory to prepend to paths in the config

Format	Description
<code>--daemon</code>	Start in daemon-mode
<code>--defaults-file</code>	Specify the configuration file
<code>--keepalive</code>	Try to restart the proxy if a crash occurs
<code>--log-backtrace-on-crash</code>	Try to invoke the debug and generate a backtrace on crash
<code>--log-file</code>	Specify the file for logging error messages
<code>--log-level</code>	Logging level
<code>--log-use-syslog</code>	Log errors to syslog (UNIX/Linux only).
<code>--lua-cpath</code>	Set the LUA_CPATH
<code>--lua-path</code>	Set the LUA_PATH
<code>--max-open-files</code>	Specify the maximum number of open files to support
<code>--pid-file</code>	PID file to store the process ID (when in daemon mode)
<code>--plugin-dir</code>	Path to the plugin files
<code>--plugins</code>	List of plugins to load
<code>--user</code>	Specify the user to use when running mysql-monitor-agent
<code>--verbose-shutdown</code>	Report shutdown in the logs regardless of log level
<code>--version</code>	Show the version information

- `--help`

Command-Line Format	<code>--help</code>
----------------------------	---------------------

Show available help options.

- `--help-all`

Command-Line Format	<code>--help-all</code>
----------------------------	-------------------------

Show all help options.

- `--help-admin`

Command-Line Format	<code>--help-admin</code>
----------------------------	---------------------------

Show options for the admin-module.

- `--help-proxy`

Command-Line Format	<code>--help-proxy</code>
----------------------------	---------------------------

Show options for the proxy-module.

- `--help-monitor`

Command-Line Format	<code>--help-monitor</code>
----------------------------	-----------------------------

Show options for the monitor module.

- `--help-agent`

Command-Line Format	<code>--help-agent</code>
----------------------------	---------------------------

Show options for the agent module.

- `--admin-address=host:port`

Command-Line Format	<code>--admin-address</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>:4041</code>

Specify the host name (or IP address) and port for the administration port. The default is `localhost:4041`.

- `--admin-lua-script=script`

Command-Line Format	<code>--admin-lua-script</code>	
Permitted Values	Type	<code>file name</code>
	Default	

Specify the script to use for the administration module for the proxy.

- `--admin-password=pass`

Command-Line Format	<code>--admin-password</code>	
Permitted Values	Type	<code>string</code>
	Default	

Define the password to use to authenticate users wanting to connect to the administration module of `mysql-monitor-agent`. The administration module uses the MySQL protocol to request a username and password for connections.

- `--admin-username=user`

Command-Line Format	<code>--admin-username</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>root</code>

Define the username to use to authenticate users wanting to connect to the administration module of `mysql-monitor-agent`. The default username is `root`. The administration module uses the MySQL protocol to request a username and password for connections.

- `--agent-collector-plugins=user`

Command-Line Format	<code>--agent-collector-plugins</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>collect_lua</code>

A comma-separated list of the plugins to be used and loaded by the agent and used to provide collector items.

When monitoring servers you must have the `agent` plugin configured. To support Query Analyzer, you must also have the `proxy` module enabled. Plugins should be specified as a comma separated list of plugin names.

If you enabled Query Analyzer during installation of the agent, the default value is `proxy,agent`. If you disabled Query Analyzer during installation, the default value is `agent`.

- `--agent-connect-timeout=seconds`

Command-Line Format	<code>--agent-connect-timeout</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>10</code>

The timeout for the agent to connect to the MySQL server before a failure is reported.

- `--agent-DNS-cachetimeout=seconds`

Command-Line Format	<code>--agent-DNS-cachetimeout</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>0</code>
	Valid Values	<code>-1</code> (Never timeout)
		<code>0</code> (Don't cache)

The timeout for caching the IP address of a given DNS name. By default, the operating system caching of the address is used and no caching in the agent is performed at all. If you specify `-1`, caching is enabled and never times out. Any other positive value specifies the timeout value. If you specify this option in the `mysql-monitor-agent.ini` configuration file, the value is preserved during an upgrade install.

- `--agent-net-timeout=seconds`

Command-Line Format	<code>--agent-net-timeout</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>10</code>

The timeout for the agent to get a response from a MySQL server to which it is already connected before the failure is reported.

- `--agent-report-network-fs`

Command-Line Format	<code>--agent-report-network-fs</code>	
Permitted Values	Type	<code>boolean</code>
	Default	<code>off</code>

Enables data collection for network file systems. The reporting of network file system information is disabled because the latency in determining and reporting the information can delay the collection and reporting of other information. You must manually enable collection if you need or use advisor and graphs that perform custom data collection on networked file systems.

- `--agent-force-uncorking`

Command-Line Format	<code>--agent-force-uncorking</code>
----------------------------	--------------------------------------

Forcibly turn off the corking of responses sent to MySQL Enterprise Service Manager. The corking mechanism tries to randomize the reporting interval of data sent up to the server to prevent flooding the server with information.

You can combine this option with the `---agent-report-offset` to specify the offset when data is reported to the server. For more information, see [agent-report-offset](#).

The frequency of collecting the data is not modified by this setting.

- `--agent-generate-uuid`

Command-Line Format	<code>--agent-generate-uuid</code>
----------------------------	------------------------------------

Regenerates a UUID for the agent. You can use this to generate a new UUID if you have copied configuration information for an agent from one machine to another. To use:

```
shell> /opt/mysql/enterprise/agent/bin/mysql-monitor-agent --agent-generate-uuid
ee9296d7-f7cd-4fee-8b26-ead884ebf398
2009-03-05 11:49:37: (critical) shutting down normally
```

For more information, see [Section 5.3.5, “Monitoring Multiple MySQL Servers”](#).

- `--agent-heartbeat-interval=#`

Command-Line Format	<code>--agent-heartbeat-interval</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>3</code>

Specify the heartbeat interval. The agent sends heartbeat messages to MySQL Enterprise Service Manager to indicate that it is alive and still running and monitoring servers. The MySQL Enterprise Service Manager uses this information to help identify when an agent is available or not.

- `--agent-host-id=HOSTID`

Command-Line Format	<code>--agent-host-id</code>
----------------------------	------------------------------

Define the agent host ID. The host ID should be a unique identifier for the host on which the agent is running, and is different to the agent UUID. You can override the host ID for use within HA environments where you have two identical agent configurations, one on a live server, and one on a backup server to be brought into use if the primary server fails. The host ID is used to identify the host by the server, and during failover you want the host ID to remain constant as you monitor either the original or failover (replacement) server.

- `--agent-ip-version=VERSION`

Command-Line Format	<code>--agent-IP-version</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>any</code>
	Valid Values	<code>4</code>
		<code>6</code>

Specify the IP version to be used and supported by MySQL Enterprise Monitor Agent. By default, the agent supports both IPv4 and IPv6, or you can specify the version by specifying `4` or `6`. If you specify this option in the `mysql-monitor-agent.ini` configuration file, the value is preserved during an upgrade install.

- `--host-id-commandline`

Command-Line Format	<code>--agent-host-id-commandline</code>
----------------------------	--

Specify the command line to generate the host ID. By default, the host ID is generated by using a variety of methods configured for a specific platform, including using SSH keys and embedded host ID information. You can replace this with an alternative command-line

- `--agent-hostname`

Command-Line Format	<code>--agent-hostname</code>
----------------------------	-------------------------------

Override the automatically determined hostname. You can use this to specify an alternate hostname for the agent. This can be useful if your host has multiple hostnames and you want the machine identified by a specific hostname.



Note

Setting the hostname using the **Manage Servers** tab within MySQL Enterprise Monitor User Interface overrides this setting.

- `--agent-item-files`

Command-Line Format	<code>--agent-item-files</code>
----------------------------	---------------------------------

A comma-separated list of the item files used to load data items that are then collected and sent to MySQL Enterprise Service Manager. For more information, see [Section 4.1.10, “Creating a Custom Data Collection Item”](#).

The default value includes `share/mysql-monitor-agent/items/quan.lua` (which provides Query Analyzer data) and `share/mysql-monitor-agent/items/items-mysql-monitor.xml` (which provides the core agent monitoring data).

- `--agent-max-response-size`

Command-Line Format	<code>--agent-max-response-size</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>65536</code>

Specify the maximum size of the response packet sent to MySQL Enterprise Service Manager.

- `--agent-ssh-keygen-attempts`

Introduced	2.3.10	
Command-Line Format	<code>--agent-ssh-keygen-attempts</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>10</code>

Number of attempts that the agent should retry, for a failed ssh-keygen.

- `--agent-ssh-keygen-retry`

Introduced	2.3.10	
Command-Line Format	<code>--agent-ssh-keygen-retry</code>	
Permitted Values	Type	numeric
	Default	3

Time interval (in seconds) between attempts for a failed ssh-keygen attempt.

- `--agent-master-uuid-discovery`

Command-Line Format	<code>--agent-master-uuid-discovery</code>	
Permitted Values	Type	boolean
	Default	true

By default, the MySQL Enterprise Monitor Agent uses the [UUID](#) of the replication [master](#) to aid in identifying the replication [topology](#). Setting this option to false prevents the agent from accessing the [master.info](#) and using the UUID obtained from the replication master. Instead, the hostname and port information is used to determine the topology and match the instance and master information.

- `--agent-mgmt-hostname`

Command-Line Format	<code>--agent-mgmt-hostname</code>
----------------------------	------------------------------------

Set the URL of the MySQL Enterprise Service Manager where collected data is sent. The URL should include the username and password for the agents, for example: `http://agent:password@memserver:18080/heartbeat`.



Note

If you have the `http_proxy` environment variable configured within your environment, add the value of `agent-mgmt-hostname` to the `no_proxy` variable to ensure that data is correctly transmitted to MySQL Enterprise Service Manager and not redirected through the configured proxy address.

- `--agent-mgmt-username`

Command-Line Format	<code>--agent-mgmt-username</code>	
Permitted Values	Type	string

The username to be used when communicating with MySQL Enterprise Service Manager.

- `--agent-mgmt-password`

Command-Line Format	<code>--agent-mgmt-password</code>	
Permitted Values	Type	string

The password to be used when communicating with MySQL Enterprise Service Manager.

- `--agent-report-offset`

Command-Line Format	<code>--agent-report-offset</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>random</code>

The offset, in seconds, past the minute when data is sent up to MySQL Enterprise Service Manager. You can use this to harmonize or synchronize agent report across multiple machines, which can improve performance.

For example, if you set `--agent-report-offset=15`, then data is reported at 15 seconds past each minute. For example, at 12:00:15, 12:01:15, and so on.

- `--agent-run-os-tests`

Command-Line Format	<code>--agent-run-os-tests</code>
----------------------------	-----------------------------------

Runs the internal operating system tests, and then exits. Using this option generates a large body of information about the various operating system information that can be collected about the host. You can use this to determine whether the agent is collecting the right amount, quantity and quality of information to the server.

The following truncated example shows the format of the output:

```
2010-01-22 16:15:45: (critical) MySQL Monitor Agent 2.2.1.1138 started.
sigar-test-all.c.128 ():
  pid = 1353
sigar-test-all.c.110 ():
  mem.ram = 6080,
  mem.total = 6374154240,
  mem.used = 3356090368,
  mem.free = 3018063872,
  mem.actual_free = 3018063872,
  mem.actual_used = 3356090368
sigar-test-all.c.143 ():
  swap.total = 28523896832,
  swap.used = 710623232,
  swap.free = 27813273600
sigar-test-all.c.169 ():
  cpu.user = 24544920,
  cpu.sys = 136764840,
  cpu.nice = 0,
  cpu.idle = 1234759920,
  cpu.wait = 0,
  cpu.total = 349015500
sigar-test-all.c.194 ():
[0]
  cpu.user = 8516770,
  cpu.sys = 56838970,
  cpu.nice = 0,
  cpu.idle = 283667220,
  cpu.wait = 0,
  cpu.total = 349022960
[1]
  cpu.user = 6130420,
  cpu.sys = 12671090,
  cpu.nice = 0,
  ...
```

- `--agent-sync-attempts`

Command-Line Format	<code>--agent-sync-attempts</code>
----------------------------	------------------------------------

Attempt to synchronize with the server during the resynchronization.

- `--track-alloc`

Command-Line Format	<code>--agent-track-alloc</code>
----------------------------	----------------------------------

Track the memory allocation in the various modules of the agent to help monitor the memory usage.

- `--agent-uuid`

Command-Line Format	<code>--agent-uuid</code>	
Permitted Values	Type	<code>string</code>

Specify the agent UUID. A UUID is automatically generated for each agent during installation, with the UUID automatically added to the configuration. You can generate a new UUID using the `agent-generate-uuid` command line option.

If you are setting up multiple hosts and copying the configuration between hosts, make sure that the `agent-uuid` is unique. You can have the agent create a new UUID by leaving this configuration property blank.

- `--basedir`

Command-Line Format	<code>--basedir</code>	
Permitted Values	Type	<code>file name</code>

Specify a base directory that is prepended to all other filename configuration options. Use an absolute (not relative) directory name, otherwise `mysql-monitor-agent` generates an error during startup.

- `--defaults-file`

Command-Line Format	<code>--defaults-file</code>
----------------------------	------------------------------

Specify a file to use as the file with configuration information. If not specified, configuration options are only taken from the command line.

- `--event-threads=#`

Command-Line Format	<code>--event-threads</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>1</code>

Specify the number of event threads reserved to handle incoming requests.

- `--keepalive`

Command-Line Format	<code>--keepalive</code>
----------------------------	--------------------------

Creates an angel process surrounding the main `mysql-monitor-agent` that attempts to restart the true `mysql-monitor-agent` process in the event a crash or other failure.

If the agent stops unexpectedly, the angel revives the agent.

An expected shutdown is:

- MySQL Enterprise Monitor Agent terminates normally.
- Shutdown with `SIGTERM`.
- Startup errors.

If the angel receives one of `SIGHUP`, `SIGTERM`, or `SIGINT` signals, the signal is forwarded to the agent to initiate shutdown.

- `--agent-backlog-timeout=VALUE`

Command-Line Format	<code>--agent-backlog-timeout</code>	
Permitted Values	Type	<code>numeric</code>

The time in seconds that data is kept by the agent if the agent is unable to communicate with MySQL Enterprise Service Manager. Once the agent reconnects, the data is sent up to MySQL Enterprise Service Manager. Data older than the specified value is discarded. The default value is 600 seconds.

- `--aggr-address=host:port`

Command-Line Format	<code>--aggr-address</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>*:14000</code>

Specify the listening hostname, port, or both for the MySQL Enterprise Agent Aggregator.

- `--log-backtrace-on-crash`

Command-Line Format	<code>--log-backtrace-on-crash</code>	
----------------------------	---------------------------------------	--

Logs the backtrace to the error log and tries to initialize the debugger in the event of a failure.

- `--aggr-lua-script=SCRIPT`

Command-Line Format	<code>--aggr-lua-script</code>	
Permitted Values	Type	<code>string</code>

Specify the script to be used for MySQL Enterprise Agent Aggregator operations.

- `--aggr-max-request-body-size=bytes`

Introduced	2.3.8	
Command-Line Format	<code>--aggr-max-request-body-size</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>1048576</code>

Limits the maximum size of requests sent to the [Aggregator](#), to avoid potential out-of-memory errors on the system running the [Agent](#) (and its Aggregator component).

- `--aggr-mem-baseurl=URL`

Command-Line Format	<code>--aggr-mem-baseurl</code>	
Permitted Values	Type	string

Base URL of the MySQL Enterprise Service Manager to be used when sending aggregated queries collected from client plugins.

- `--aggr-ssl-address=host:port`

Command-Line Format	<code>--aggr-ssl-address</code>	
Permitted Values	Type	string
	Default	*:14001

The listening hostname, port, or both to be used when listening for SSL connections.

- `--aggr-ssl-ca-file=FILENAME`

Command-Line Format	<code>--aggr-ssl-ca-file</code>	
Permitted Values	Type	string

The CA chain file to be used for SSL communication.

- `--aggr-ssl-cert-file=FILENAME`

Command-Line Format	<code>--aggr-ssl-cert-file</code>	
Permitted Values	Type	string

The server certificate for the MySQL Enterprise Agent Aggregator. This should be in the form of a PEM file, consisting of a combination of the private key and the signing certificate.

- `--aggr-ssl-ciphers=STRING`

Command-Line Format	<code>--aggr-ssl-ciphers</code>	
Permitted Values	Type	string

List of the ciphers to be used for secure communication using SSL.

- `--aggr-test-mode`

Command-Line Format	<code>--aggr-test-mode</code>	
Permitted Values	Type	string

Start MySQL Enterprise Agent Aggregator in test mode.

- `--log-file=filename`

Command-Line Format	<code>--log-file</code>	
Permitted Values	Type	file name

Specify the name of a file to be used to record log information. If you do not specify a full path name, then the log file location is considered to be relative to the installation directory of the agent.

- `--log-level=level`

Command-Line Format	<code>--log-level</code>	
Permitted Values	Type	enumeration
	Default	critical
	Valid Values	error (Show error messages)
		warning (Show only warning messages)
		info (Show informational messages)
		message (Show information about agent and basic processing)
		critical (Show critical messages highlighting agent problems)
		debug (Show detailed information, including info provided to server)

The log level used when outputting error messages. Messages of that level (or lower) are output. For example, `message` also outputs `info`, `warning`, and `error` messages.



Warning

Be careful when setting the `log-level` to `debug`. Doing this rapidly increases the size of your `mysql-monitor-agent.log` file. To avoid disk space problems, put the log files on a different drive from your MySQL server and the MySQL Enterprise Monitor User Interface.

It is strongly recommended that you use a `log-level` of `critical` or `error` in a production server. Use the higher-levels to provide more detailed information only for debugging problems with your agent.

Under Windows, if you restart the agent from the command line after setting the `log-level` to `debug`, extensive debug information is displayed to the console as well as to the log file.

- `--log-use-syslog`

Command-Line Format	<code>--log-use-syslog</code>
----------------------------	-------------------------------

Causes errors to be sent to the syslog (Unix/Linux only).

- `--lua-cpath=path`

Command-Line Format	<code>--lua-cpath</code>	
Permitted Values	Type	file name

Specify the `LUA_CPATH` to be used when loading compiled modules or libraries for Lua scripts.

- `--lua-path=path`

Command-Line Format	<code>--lua-path</code>	
Permitted Values	Type	file name

Specify the `LUA_CPATH` to be used when loading modules for Lua.

- `--max-open-files=#`

Command-Line Format	<code>--max-open-files</code>	
Permitted Values	Type	<code>numeric</code>

The maximum number of open files and sockets supported by the `mysql-monitor-agent` process. Increase the value if required to run particular scripts.

- `--monitor-interval=#`

Command-Line Format	<code>--monitor-interval</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>1</code>
	Min Value	<code>1</code>

Execute queries against the backends at this interval. The default is 1.

- `--monitor-lua-script=SCRIPT`

Command-Line Format	<code>--monitor-lua-script</code>	
Permitted Values	Type	<code>string</code>

Filename of the Lua script to use for the monitor module.

- `--monitor-password=PASS`

Command-Line Format	<code>--monitor-password</code>	
Permitted Values	Type	<code>string</code>

The password for the monitoring user account.

- `--monitor-username=USER`

Command-Line Format	<code>--monitor-username</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>monitor</code>

The username for the monitoring user account.

- `--mysqld-instance-dir=PATH`

Command-Line Format	<code>--mysqld-instance-dir</code>	
Permitted Values	Type	<code>string</code>

The path to the configuration files for the MySQL instance.

- `--agent-IP-version=VER`

Command-Line Format	<code>--agent-IP-version</code>	
Permitted Values	Type	<code>numeric</code>
	Default	<code>any</code>

	Valid Values	4
		6

Explicitly sets the IP version to be used for addressing. By default, the agent uses either version. Set the value by specifying 4 (for IPv4) or 6 (for IPv6).

- `--aggr-flush-interval=seconds`

Command-Line Format	<code>--aggr-flush-interval</code>	
Permitted Values	Type	numeric
	Default	60

The interval at which queries are flushed to the MySQL Enterprise Service Manager. The default value is 60.

- `--no-proxy`

Command-Line Format	<code>--no-proxy</code>
----------------------------	-------------------------

Disable the proxy module.

- `--plugin-dir=path`

Command-Line Format	<code>--plugin-dir</code>	
Permitted Values	Type	file name

The directory to use when loading plugins for `mysql-monitor-agent`.

- `--plugins=plugin,...`

Command-Line Format	<code>--plugins</code>	
Permitted Values	Type	string

A comma-separated list of the plugins to be loaded.

- `--proxy-address=host:port`

Command-Line Format	<code>--proxy-address</code>	
Permitted Values	Type	string
	Default	:6446

The listening host name (or IP address) and port of the proxy service. The default is :6446 (all IPs on port 6446). The setting is used when employing Query Analysis as the address/port that you must configure your application to use in place of your normal MySQL server. By default this item is set during installation.

- `--proxy-read-only-backend-addresses=host:port`

Command-Line Format	<code>--proxy-read-only-backend-addresses</code>	
Permitted Values	Type	string

The listening host name (or IP address) and port of the proxy server for read-only connections. The default is for this information not to be set.

- `--proxy-backend-addresses=host:port`

Command-Line Format	<code>--proxy-backend-addresses</code>	
Permitted Values	Type	<code>string</code>
	Default	<code>127.0.0.1:3306</code>

The host name (or IP address) and port of the MySQL server to connect to. You can specify multiple backend servers by supplying multiple options. Clients are connected to each backend server in round-robin fashion. For example, if you specify two servers A and B, the first client connection goes to server A; the second client connection goes to server B; and the third client connection goes to server A.

- `--proxy-pool-no-change-user`

Command-Line Format	<code>--proxy-pool-no-change-user</code>
----------------------------	--

Disables the use of the MySQL protocol `CHANGE_USER` when re-using a connection from the pool of connections specified by the `backend-addresses` list.

- `--proxy-skip-profiling`

Command-Line Format	<code>--proxy-skip-profiling</code>
----------------------------	-------------------------------------

disables profiling of queries (tracking time statistics). The default is for tracking to be enabled.

- `--proxy-fix-bug-25371`

Command-Line Format	<code>--proxy-fix-bug-25371</code>
----------------------------	------------------------------------

Gets round an issue when connecting to a MySQL server later than 5.1.12 when using a MySQL client library of any earlier version.

-
-
-
-

- `--daemon`

Command-Line Format	<code>--daemon</code>
----------------------------	-----------------------

Starts the proxy in daemon mode.

- `--pid-file=file`

Command-Line Format	<code>--pid-file</code>	
Permitted Values	Type	<code>file name</code>

Sets the name of the file that stores the process ID. This is used by the script that shuts down the agent to identify the process to be shut down. The default value is the `mysql-monitor-agent.pid` file within the base installation directory as created by the agent

- `--user=user`

Command-Line Format	<code>--user</code>	
Permitted Values	Type	<code>string</code>

Run `mysql-monitor-agent` as the specified `user`.

- `--version`

Command-Line Format	<code>--version</code>	
----------------------------	------------------------	--

Show the version number.

- `--verbose-shutdown`

Command-Line Format	<code>--verbose-shutdown</code>	
Permitted Values	Type	<code>boolean</code>
	Default	<code>off</code>

By default, agent shutdown messages are only logged if you have set `log-level` to `message` or higher. You can force shutdown messages to be reported regardless of the log level using this option.

C.2.2 MySQL Server (`agent-instance.ini`) Configuration

This section provides reference information about the `agent-instance.ini` configuration file, supplementing the usage information in [Section 5.3, “Monitor Agent Installation”](#).

For each MySQL server that you want to monitor, create an `agent-instance.ini` file in the directory specified by the `mysqld-instance-dir` configuration parameter inside the main `mysql-monitor-agent.ini` file. This file contains the host name and user credentials for connecting to the MySQL server to monitor. The format of the file is as follows:

```
# To use this .ini file as a template for configuring additional
# instances to monitor, do not simply copy and re-start the agent
# without first modifying the parameters below to match the login
# credentials for the new instance.
#
# Refer to the documentation for more detailed information and
# instructions.

[mysqld]
user      = agent
password  = somepass
hostname  = 127.0.0.1
port      = 3306

[replication]
discovery-username = agentdiscovery
discovery-password = password
```

The individual configuration parameters can be defined as follows, as either a `[replication]` or `[mysqld]` option.

[mysqld]

- `hostname`: The host name of the MySQL server to monitor.
- `port`: The TCP/IP port of the MySQL server to monitor.

- `user`: The user ID that connects to the MySQL server to monitor.
- `password`: The password for the user ID specified by the `user` option.
- `connection-init-retry-attempts`: The number of times to retry when the initial connection to the monitored MySQL server fails. The default is 10. Do not specify this option and the following `connection-init-retry-delay-ms` option are only needed if some combination of database load and network traffic cause intermittent connection failures for the Agent, and you need to increase the default values.
- `connection-init-retry-delay-ms`: The number of milliseconds to wait before trying again after a connection failure.
- `socket`: To configure the agent to use sockets, during installation, select “socket” rather than “TCP/IP” from the menu, then specify the socket name. To switch to a socket connection after installation, edit the `agent-instance.ini` configuration file and add the line:

```
socket = /full/path/to/mysql.sock
```

- `inventory-schema`: If your system configuration does not allow creating tables inside the `mysql` schema, specify another schema to hold the inventory table that records the server UUID:

```
inventory-schema = schema_name
```

[replication]

Replication `topology` discovery for an instance is determined by the agent using the `master.info` file for the instance, extracting the username/password to connect to the master, and then retrieving the MySQL Enterprise Monitor generated `UUID` of the replication master. The MySQL Enterprise Monitor Agent can then match the slave and master in the replication topology.

- `agent-master-uuid-discovery`: To switch off the use of the master UUID entirely when determining the replication topology, see also `agent-master-uuid-discovery` option.
- `discovery-password`: Alternative password used for retrieving the master UUID.
- `discovery-username`: Alternative username used for retrieving the master UUID.
- `master-info-file`: A file path to the `master.info`, that will override the value in the database.

C.2.3 Agent Log and `pid` Files

The locations of the agent log files are as follows:

- Windows: `C:\Program Files\MySQL\Enterprise\Agent\mysql-monitor-agent.log`
- Unix: `/opt/mysql/enterprise/agent/mysql-monitor-agent.log`

On any platform, you can change the name and location of the agent log file. To confirm the location and the name, check the settings in the `mysql-monitor-agent.ini` file.

The maximum size of a log file may be limited to 2GB. If MySQL Enterprise Monitor Agent cannot add information to the configured logfile, information is sent to the standard output instead.

Because the log files can become quite large, you can use a tool such as `logrotate` (Unix/Linux) or `logadm` (Solaris) to automatically rotate the logs. The following example shows a sample `logrotate` definition:

```
/opt/mysql/enterprise/agent/mysql-monitor-agent.log {  
    rotate 5  
    daily  
    minsize 1G  
    postrotate  
        /usr/bin/killall -HUP mysql-monitor-agent  
    endscript  
}
```

The above rotates the log before it reaches 1GB in size, keeping up to 5 files at a time.

To use your own system, you can copy the log file, flush the contents, and then send the `SIGHUP` signal to the agent process. On Windows, shut down before copying the log, then restart the agent afterward.

The locations of the agent `pid` files are as follows:

- Windows: `C:\Program Files\MySQL\Enterprise\Agent\agent\mysql-monitor-agent.pid`
- Unix: `/opt/mysql/enterprise/agent/mysql-monitor-agent.pid`

On any platform, you can change the name and location of the agent log file. To confirm the location and the name, check the settings in the `mysql-monitor-agent.ini` file.

Appendix D Data Collection Items



Note

MySQL Enterprise subscription, MySQL Enterprise Monitor, MySQL Replication Monitor, and MySQL Query Analyzer are only available to commercial customers. To learn more, see: <http://www.mysql.com/products/>.

This appendix documents the [data collection items](#) used to create rules and graphs. These items are listed in the order that they appear in the **Data Item** drop-down list box when creating a rule definition. For more information about creating and editing rules, see [Section 2.3.3, “Editing Built-in Rules”](#) and [Section 4.1.3, “Overview of Rule Creation”](#).

Table D.1 MySQL Monitor Data Items

Namespace	Namespace Type	Attribute	Type	Description
agent	allocationstats	agent_dataitem_spec_alloc	long_counter	
agent	allocationstats	agent_dataitem_spec_free	long_counter	
agent	allocationstats	agent_item_attribute_alloc	long_counter	
agent	allocationstats	agent_item_attribute_free	long_counter	
agent	allocationstats	agent_item_class_alloc	long_counter	
agent	allocationstats	agent_item_class_config_alloc	long_counter	
agent	allocationstats	agent_item_class_config_free	long_counter	
agent	allocationstats	agent_item_class_free	long_counter	
agent	allocationstats	agent_item_classes_alloc	long_counter	
agent	allocationstats	agent_item_classes_free	long_counter	
agent	allocationstats	agent_item_instance_alloc	long_counter	
agent	allocationstats	agent_item_instance_free	long_counter	
agent	allocationstats	agent_item_instance_name_alloc	long_counter	
agent	allocationstats	agent_item_instance_name_free	long_counter	
agent	allocationstats	agent_item_namespaces_alloc	long_counter	
agent	allocationstats	agent_item_namespaces_free	long_counter	
agent	allocationstats	agent_item_value_alloc	long_counter	
agent	allocationstats	agent_item_value_free	long_counter	
agent	allocationstats	agent_mysqld_alloc	long_counter	
agent	allocationstats	agent_mysqld_free	long_counter	
agent	allocationstats	agent_plugin_alloc	long_counter	
agent	allocationstats	agent_plugin_free	long_counter	
agent	allocationstats	agent_target_alloc	long_counter	
agent	allocationstats	agent_target_free	long_counter	
agent	allocationstats	agent_task_alloc	long_counter	
agent	allocationstats	agent_task_free	long_counter	
agent	allocationstats	curl_mem_alloc	long_counter	
agent	allocationstats	curl_mem_bytes	long	

Namespace	Namespace Type	Attribute	Type	Description
agent	allocationstats	curl_mem_bytes_max	long	
agent	allocationstats	curl_mem_free	long_counter	
agent	allocationstats	job_response_alloc	long_counter	
agent	allocationstats	job_response_data_alloc	long_counter	
agent	allocationstats	job_response_data_free	long_counter	
agent	allocationstats	job_response_datum_alloc	long_counter	
agent	allocationstats	job_response_datum_free	long_counter	
agent	allocationstats	job_response_free	long_counter	
agent	allocationstats	job_response_string_alloc	long_counter	
agent	allocationstats	job_response_string_free	long_counter	
agent	allocationstats	job_task_alloc	long_counter	
agent	allocationstats	job_task_free	long_counter	
agent	allocationstats	network_backlog_alloc	long_counter	
agent	allocationstats	network_backlog_free	long_counter	
agent	allocationstats	network_backlog_node_alloc	long_counter	
agent	allocationstats	network_backlog_node_bytes	long	
agent	allocationstats	network_backlog_node_free	long_counter	
agent	allocationstats	scheduler_job_alloc	long_counter	
agent	allocationstats	scheduler_job_free	long_counter	
agent	allocationstats	xml_mem_alloc	long_counter	
agent	allocationstats	xml_mem_bytes	long	
agent	allocationstats	xml_mem_bytes_max	long	
agent	allocationstats	xml_mem_free	long_counter	
agent	chassisstats	glib_mem_alloc	long_counter	
agent	chassisstats	glib_mem_bytes	long	
agent	chassisstats	glib_mem_bytes_max	long	
agent	chassisstats	glib_mem_free	long_counter	
agent	chassisstats	lua_mem_alloc	long_counter	
agent	chassisstats	lua_mem_bytes	long	
agent	chassisstats	lua_mem_bytes_max	long	
agent	chassisstats	lua_mem_free	long_counter	
agent	lua	mem_size	long	
agent	proc	egid	long	
agent	proc	euid	long	
agent	proc	gid	long	
agent	proc	mem_major_faults	long_counter	
agent	proc	mem_minor_faults	long_counter	
agent	proc	mem_page_faults	long_counter	

Namespace	Namespace Type	Attribute	Type	Description
agent	proc	mem_resident	long	
agent	proc	mem_share	long	
agent	proc	mem_size	long	
agent	proc	name	string	
agent	proc	nice	long	
agent	proc	ppid	long	
agent	proc	priority	long	
agent	proc	processor	long	
agent	proc	state	long	
agent	proc	threads	long	
agent	proc	time_start_time	long	
agent	proc	time_sys	long_counter	
agent	proc	time_total	long_counter	
agent	proc	time_user	long_counter	
agent	proc	tty	long	
agent	proc	uid	long	
monitor	resourceBundle	subscription	string	
monitor	resourceBundle	version	string	
mysql	account_old_password	user	string	
mysql	active_count	active_count	long	
mysql	Agent	agent.latency	long	
mysql	Agent	agent.reachable	string	
mysql	Agent	host_id	string	
mysql	Agent	name	string	
mysql	Agent	quanDataOutOfBand	string	
mysql	Agent	version	string	
mysql	anonymous_user	user_count	long	
mysql	auto_increment_limit	table_list	string	
mysql	avail_count	avail_count	long	
mysql	broad_host_specifier	user	string	A list of users whose host in the mysql.user table meets the condition: WHERE host = '%'; a single string in wiki markup format.
mysql	cluster_data_node_data_memory	data_memory_total	long	

Namespace	Namespace Type	Attribute	Type	Description
mysql	cluster_data_node_data	data_memory_used	long	
mysql	cluster_data_node_index	index_memory_total	long	
mysql	cluster_data_node_index	index_memory_used	long	
mysql	cluster_data_node_redo	redo_buffer_total	long	
mysql	cluster_data_node_redo	redo_buffer_used	long	
mysql	cluster_data_node_redo	redo_logspace_total	long	
mysql	cluster_data_node_redo	redo_logspace_used	long	
mysql	cluster_data_node_undo	undo_buffer_total	long	
mysql	cluster_data_node_undo	undo_buffer_used	long	
mysql	cluster_data_node_undo	undo_logspace_total	long	
mysql	cluster_data_node_undo	undo_logspace_used	long	
mysql	cluster_data_nodes	not_started	string	
mysql	column	Default	string	The default value of the column.
mysql	column	Extra	string	Any additional information about the column.
mysql	column	Field	string	The name of the column.
mysql	column	Key	string	Whether the column is indexed.
mysql	column	Null	string	Whether NULL is allowed.
mysql	column	Type	string	The data type of the column.
mysql	committed_count	committed_count	long	
mysql	Database	Database	string	
mysql	Database	name	string	
mysql	Explain	extra	string	
mysql	Explain	id	long	
mysql	Explain	key	string	
mysql	Explain	key_len	string	
mysql	Explain	possible_keys	string	
mysql	Explain	ref	string	
mysql	Explain	rows	long	
mysql	Explain	select_type	string	
mysql	Explain	table	string	
mysql	Explain	type	string	

Namespace	Namespace Type	Attribute	Type	Description
mysql	falcon_database_io	logical_reads	long	
mysql	falcon_database_io	physical_reads	long	
mysql	falcon_record_cache_summary	total_recordcache_mb	double	
mysql	falcon_record_cache_summary	total_indexcache_mb	double	
mysql	falcon_system_memory_summary	free_memory_mb	double	
mysql	falcon_system_memory_summary	total_memory_mb	double	
mysql	falcon_transaction_summary	submitted_txns	long	
mysql	falcon_transaction_summary	retry_back_txns	long	
mysql	global_privileges	user	string	
mysql	grant_privileges	user_spec	string	
mysql	inappropriate_slave_privileges	privileges	string	
mysql	index	Cardinality	long	An estimate of the number of unique values (cardinality) in the index.
mysql	index	Collation	string	How the column is sorted in the index.
mysql	index	Column_name	string	The column name.
mysql	index	Comment	string	Remarks about the index.
mysql	index	Index_type	string	The index method used (BTREE, FULLTEXT, HASH, RTREE)
mysql	index	Key_name	string	The name of the index.
mysql	index	Non_unique	long	Whether the index can contain duplicates.
mysql	index	Null	string	Whether the column may contain NULL values.
mysql	index	Packed	string	Whether the key is packed.

Namespace	Namespace Type	Attribute	Type	Description
mysql	index	<code>Seq_in_index</code>	long	The column sequence number in the index, starting with 1
mysql	index	<code>Sub_part</code>	string	The number of indexed characters if the column is only partly indexed.
mysql	index	<code>Table</code>	string	The name of the table associated with the index.
mysql	innodb_active_transactions	<code>innodb_active_transactions</code>	long	
mysql	innodb_blocked_transactions	<code>innodb_blocked_transactions</code>	long	
mysql	innodb_compression_time	<code>innodb_compression_time</code>	long_counter	
mysql	innodb_compression_time	<code>innodb_compression_time</code>	long_counter	
mysql	innodb_lock_wait_transactions	<code>innodb_lock_wait_transactions</code>	long	
mysql	innodb_plugins	<code>innodb_plugin_list</code>	string	
mysql	innodbstatus	<code>innodb_bp_add_alloc</code>	long	The total memory allocated for the additional buffer pool measured in bytes.
mysql	innodbstatus	<code>innodb_bp_created_per_sec</code>	double	The number of buffer pool pages created per second.
mysql	innodbstatus	<code>innodb_bp_db_pages</code>	long	The current number of buffer pool pages.
mysql	innodbstatus	<code>innodb_bp_dictionary_alloc</code>	long	Size in bytes allocated to the data dictionary tables/indexes
mysql	innodbstatus	<code>innodb_bp_free_buffers</code>	long	The current number of free buffer pool pages.
mysql	innodbstatus	<code>innodb_bp_hit_rate</code>	long	The buffer pool hit rate.

Namespace	Namespace Type	Attribute	Type	Description
mysql	innodbstatus	innodb_bp_io_cur_pages	long	The number of Buffer Pool LRU list pages accessed total, for the last second
mysql	innodbstatus	innodb_bp_io_sum_pages	long	The number of Buffer Pool LRU list pages accessed total, for the last 50 seconds
mysql	innodbstatus	innodb_bp_io_unzip_cur_pages	long	The number of Buffer Pool unzip_LRU list pages accessed total, for the last second
mysql	innodbstatus	innodb_bp_io_unzip_sum_pages	long	The number of Buffer Pool unzip_LRU list pages accessed total, for the last 50 seconds
mysql	innodbstatus	innodb_bp_lru_len	long	The size in 16Kb pages of the Buffer Pool LRU list
mysql	innodbstatus	innodb_bp_modified_pages	long	The current number of pages modified.
mysql	innodbstatus	innodb_bp_not_young_hit_rate	long	The rate at which pages have been made not young for the past 15 seconds
mysql	innodbstatus	innodb_bp_old_db_pages	long	
mysql	innodbstatus	innodb_bp_pages_created	long_counter	The total number of pages created.
mysql	innodbstatus	innodb_bp_pages_evicted_no_avg_per_sec	double	The average number of

Namespace	Namespace Type	Attribute	Type	Description
				pages evicted without being accessed for the last 15 seconds
mysql	innodbstatus	<code>innodb_bp_pages_not_young</code>	<code>long_counter</code>	The number of pages made not young in the Buffer Pool LRU list
mysql	innodbstatus	<code>innodb_bp_pages_not_young_per_sec</code>	<code>double</code>	The per second average of the pages made young in the Buffer Pool LRU list for the last 15 seconds
mysql	innodbstatus	<code>innodb_bp_pages_read</code>	<code>long_counter</code>	The total number of pages read.
mysql	innodbstatus	<code>innodb_bp_pages_read_ahead_per_sec</code>	<code>double</code>	The average of read ahead operations per second for the last 15 seconds
mysql	innodbstatus	<code>innodb_bp_pages_written</code>	<code>long_counter</code>	The total number of pages written.
mysql	innodbstatus	<code>innodb_bp_pages_young</code>	<code>long_counter</code>	The number of pages made young in the Buffer Pool LRU list
mysql	innodbstatus	<code>innodb_bp_pages_young_per_sec</code>	<code>double</code>	
mysql	innodbstatus	<code>innodb_bp_pending_pages</code>	<code>long</code>	The number of pending page writes.
mysql	innodbstatus	<code>innodb_bp_pending_writes_flushed</code>	<code>long</code>	The number of pages to be flushed during checkpointing.
mysql	innodbstatus	<code>innodb_bp_pending_writes_lrul</code>	<code>long</code>	The number of old dirty pages to be written from

Namespace	Namespace Type	Attribute	Type	Description
				the bottom of the LRU list.
mysql	innodbstatus	innodb_bp_pending_writes_single_page	long	The number of pending independent page writes.
mysql	innodbstatus	innodb_bp_reads_per_sec	double	The number of buffer pool reads per second.
mysql	innodbstatus	innodb_bp_size	long	The total buffer pool size in bytes.
mysql	innodbstatus	innodb_bp_total_alloc	long	The total memory allocated for the buffer pool.
mysql	innodbstatus	innodb_bp_unzip_lru_len	long	The size in 16Kb pages of the Buffer Pool unzip_LRU list
mysql	innodbstatus	innodb_bp_written_per_sec	double	The number of buffer pool pages written per second.
mysql	innodbstatus	innodb_bp_young_hit_rate	long	The rate at which pages have been made young for the past 15 seconds
mysql	innodbstatus	innodb_bytes_per_read	long	The number of bytes per read.
mysql	innodbstatus	innodb_datetime	string	The date and time the SHOW ENGINE INNODB STATUS snapshot was taken.
mysql	innodbstatus	innodb_hash_node_heap	long	Number of buffer pool pages reserved for

Namespace	Namespace Type	Attribute	Type	Description
				the Adaptive Hash Index.
mysql	innodbstatus	<code>innodb_hash_searches_per_second</code>	double	The number of hash searches per second.
mysql	innodbstatus	<code>innodb_hash_table_size</code>	long	The size of the hash table.
mysql	innodbstatus	<code>innodb_hash_used_cells</code>	long	Number of buffer pool pages used for the Adaptive Hash Index.
mysql	innodbstatus	<code>innodb_ibuf_free_list_len</code>	long	The length of the free list for the Insert Buffer index
mysql	innodbstatus	<code>innodb_ibuf_inserts</code>	long_counter	The number of change buffer inserts.
mysql	innodbstatus	<code>innodb_ibuf_merged_recs</code>	long_counter	The number of change buffer merged records.
mysql	innodbstatus	<code>innodb_ibuf_merges</code>	long_counter	The number of change buffer merges.
mysql	innodbstatus	<code>innodb_ibuf_seg_size</code>	long	The Insert Buffer index header and tree size, in 16Kb page
mysql	innodbstatus	<code>innodb_ibuf_size</code>	long	The Insert Buffer index tree size, in 16Kb pages
mysql	innodbstatus	<code>innodb_io_ibuf_logs</code>	long	The number of pending log I/Os.
mysql	innodbstatus	<code>innodb_io_ibuf_reads</code>	long	The number of pending change buffer reads.
mysql	innodbstatus	<code>innodb_io_ibuf_syncs</code>	long	The number of pending synch operations.
mysql	innodbstatus	<code>innodb_io_os_file_fsyncs</code>	long_counter	The number of OS fsyncs.

Namespace	Namespace Type	Attribute	Type	Description
mysql	innodbstatus	innodb_io_os_file_reads	long_counter	The number of OS file reads.
mysql	innodbstatus	innodb_io_os_file_writes	long_counter	The number of OS file writes.
mysql	innodbstatus	innodb_io_pending_flush_bp	long	The number of pending buffer pool flush operations.
mysql	innodbstatus	innodb_io_pending_flush_log	long	The number of pending log flush operations.
mysql	innodbstatus	innodb_io_pending_reads	long	The number of I/O pending reads.
mysql	innodbstatus	innodb_io_pending_writes	long	The number of I/O pending writes.
mysql	innodbstatus	innodb_io_syncs_per_sec	double	The number of fsyncs() per second.
mysql	innodbstatus	innodb_log_checkpoint_file	long	The log file number the last checkpoint was performed on.
mysql	innodbstatus	innodb_log_checkpoint_lsn	long	The log sequence number of the last checkpoint.
mysql	innodbstatus	innodb_log_checkpoint_lsn64	long	The 64-bit variant of innodb_log_checkpoint_lsn (2.3.10+).
mysql	innodbstatus	innodb_log_flushed_file	long	The log file number the last checkpoint was performed on.
mysql	innodbstatus	innodb_log_flushed_lsn	long	The point up to which the log was last flushed.
mysql	innodbstatus	innodb_log_flushed_lsn64	long	The 64-bit variant of

Namespace	Namespace Type	Attribute	Type	Description
				innodb_log_flushed_lsn (2.3.10+).
mysql	innodbstatus	<code>innodb_log_io_per_sec</code>	double	The number of log I/Os per second.
mysql	innodbstatus	<code>innodb_log_io_total</code>	long_counter	The total number of log I/Os.
mysql	innodbstatus	<code>innodb_log_pending_checkpoint_writes</code>	long	The log pending checkpoint writes.
mysql	innodbstatus	<code>innodb_log_pending_log_writes</code>	long	The log pending log writes.
mysql	innodbstatus	<code>innodb_log_sequence_file</code>	long	The log sequence file number.
mysql	innodbstatus	<code>innodb_log_sequence_lsn</code>	long	The log sequence number.
mysql	innodbstatus	<code>innodb_log_sequence_lsn64</code>	long	The 64-bit variant of <code>innodb_log_sequence_lsn</code> (2.3.10+).
mysql	innodbstatus	<code>innodb_main_thd_log_flush_writes</code>	long_counter	Count of log flushes initiated within the main thread loop
mysql	innodbstatus	<code>innodb_main_thd_loops_background</code>	long_counter	Count of background loops the main thread has done
mysql	innodbstatus	<code>innodb_main_thd_loops_flush</code>	long_counter	Count of flush loops the main thread has done
mysql	innodbstatus	<code>innodb_main_thd_loops_one_second</code>	long_counter	Count of one second loops the main thread has done
mysql	innodbstatus	<code>innodb_main_thd_loops_sleeps</code>	long_counter	Count of sleeps the main thread has done

Namespace	Namespace Type	Attribute	Type	Description
				inside the one second loop
mysql	innodbstatus	<code>innodb_main_thd_loops_ten_sec</code>	<code>long_counter</code>	Count of ten second loops the main thread has done
mysql	innodbstatus	<code>innodb_non_hash_searches_per_sec</code>	<code>double</code>	The number of nonadaptive hash index searches.
mysql	innodbstatus	<code>innodb_per_sec_avg</code>	<code>double</code>	The number of seconds the averages for SHOW INNODB STATUS were calculated from.
mysql	innodbstatus	<code>innodb_reads_per_sec</code>	<code>double</code>	The number of reads per second.
mysql	innodbstatus	<code>innodb_row_queries_inside</code>	<code>long</code>	The number of queries executing inside InnoDB.
mysql	innodbstatus	<code>innodb_row_queries_queue</code>	<code>long</code>	The number of queries in the queue, waiting to enter InnoDB.
mysql	innodbstatus	<code>innodb_row_state</code>	<code>string</code>	The current state of the main InnoDB thread.
mysql	innodbstatus	<code>innodb_rows_deleted</code>	<code>long_counter</code>	The number of rows deleted from InnoDB tables.
mysql	innodbstatus	<code>innodb_rows_deleted_per_sec</code>	<code>double</code>	The number of rows deleted per second from InnoDB tables.
mysql	innodbstatus	<code>innodb_rows_inserted</code>	<code>long_counter</code>	The number of rows inserted into InnoDB tables.

Namespace	Namespace Type	Attribute	Type	Description
mysql	innodbstatus	<code>innodb_rows_inserted_per_sec</code>	<code>double</code>	The number of rows inserted per second into InnoDB tables.
mysql	innodbstatus	<code>innodb_rows_read</code>	<code>long_counter</code>	The number of rows read from InnoDB tables.
mysql	innodbstatus	<code>innodb_rows_read_per_sec</code>	<code>double</code>	The number of rows read per second from InnoDB tables.
mysql	innodbstatus	<code>innodb_rows_updated</code>	<code>long_counter</code>	The number of rows updated in InnoDB tables.
mysql	innodbstatus	<code>innodb_rows_updated_per_sec</code>	<code>double</code>	The number of rows updated per second in InnoDB tables.
mysql	innodbstatus	<code>innodb_sem_mutex_os_waits</code>	<code>long_counter</code>	The number of semaphore/mutex waits yielded to the OS.
mysql	innodbstatus	<code>innodb_sem_mutex_rounds</code>	<code>long_counter</code>	The number of semaphore/mutex round for the internal sync array.
mysql	innodbstatus	<code>innodb_sem_mutex_spin_waits</code>	<code>long_counter</code>	The number of semaphore/mutexspin waits for the internal sync array.
mysql	innodbstatus	<code>innodb_sem_os_reservation_count</code>	<code>long_counter</code>	The number of times a mutex wait was added to the internal sync array.
mysql	innodbstatus	<code>innodb_sem_os_signal_count</code>	<code>long_counter</code>	Performance.InnoDB
mysql	innodbstatus	<code>innodb_sem_rw_excl_os_waits</code>	<code>long_counter</code>	The number of exclusive (write) semaphore

Namespace	Namespace Type	Attribute	Type	Description
				waits yielded to the OS.
mysql	innodbstatus	<code>innodb_sem_rw_excl_rounds</code>	<code>long_counter</code>	Performance.InnoDB
mysql	innodbstatus	<code>innodb_sem_rw_excl_spins</code>	<code>long_counter</code>	Performance.InnoDB
mysql	innodbstatus	<code>innodb_sem_shared_os_waits</code>	<code>long_counter</code>	The number of shared (read) semaphore waits yielded to the OS.
mysql	innodbstatus	<code>innodb_sem_shared_rounds</code>	<code>long_counter</code>	Performance.InnoDB
mysql	innodbstatus	<code>innodb_sem_shared_spins</code>	<code>long_counter</code>	The number of shared (read) semaphore spin waits within the sync array.
mysql	innodbstatus	<code>innodb_sem_spins_per_wait_mutex</code>	<code>double</code>	Ratio of <code>innodb_sem_mutex_rounds</code> to <code>innodb_sem_mutex_spins</code> .
mysql	innodbstatus	<code>innodb_sem_spins_per_wait_rwlock_excl</code>	<code>double</code>	Ratio of RW-Exclusive spin rounds to <code>innodb_sem_rw_excl_spins</code> .
mysql	innodbstatus	<code>innodb_sem_spins_per_wait_rwlock_shared</code>	<code>double</code>	Ratio of RW-Shared spin rounds to <code>innodb_sem_shared_spins</code> .
mysql	innodbstatus	<code>innodb_trx_history_list_length</code>	<code>long</code>	The transaction history list length.
mysql	innodbstatus	<code>innodb_trx_id_counter</code>	<code>long_counter</code>	Decoded decimal representation of the hex transaction ID counter in the latest InnoDB
mysql	innodbstatus	<code>innodb_trx_id_counter1</code>	<code>long</code>	The transaction counter roll over variable.
mysql	innodbstatus	<code>innodb_trx_id_counter2</code>	<code>long</code>	The main transaction count.

Namespace	Namespace Type	Attribute	Type	Description
mysql	innodbstatus	<code>innodb_trx_id_counter_str</code>	string	The hex string based transaction ID counter in the latest InnoDB
mysql	innodbstatus	<code>innodb_trx_purge_done_trx2</code>	long	The transaction count that is already purged.
mysql	innodbstatus	<code>innodb_trx_total_lock_structs</code>	long	
mysql	innodbstatus	<code>innodb_writes_per_sec</code>	double	The number of InnoDB writes per second.
mysql	locked_processes	<code>num_locked</code>	long	
mysql	long_locked_processes	<code>avg_running_time</code>	double	
mysql	long_locked_processes	<code>sum_long_running</code>	long	
mysql	long_running_processes	<code>avg_running_time</code>	double	
mysql	long_running_processes	<code>sum_long_running</code>	long	
mysql	masterlogs	<code>File_size</code>	long	The size of a binary log file.
mysql	masterlogs	<code>filecount</code>	long	The number of binary log files.
mysql	masterlogs	<code>filesizesum</code>	long	The total size of all the binary log files.
mysql	masterlogs	<code>Log_name</code>	string	The name of the binary log file.
mysql	MasterStatus	<code>Binlog_Do_DB</code>	string	
mysql	MasterStatus	<code>Binlog_Ignore_DB</code>	string	
mysql	MasterStatus	<code>File</code>	string	
mysql	MasterStatus	<code>Position</code>	long	
mysql	meb_backup_history	<code>backup_destination</code>	string	
mysql	meb_backup_history	<code>collected_ts</code>	integer	
mysql	meb_backup_history	<code>collected_ts_counter</code>	integer	
mysql	meb_backup_history	<code>end_time_raw</code>	string	
mysql	meb_backup_history	<code>end_time_ts</code>	integer	
mysql	meb_backup_history	<code>exit_state</code>	string	
mysql	meb_backup_history	<code>last_error</code>	string	
mysql	meb_backup_history	<code>last_error_code</code>	integer	

Namespace	Namespace Type	Attribute	Type	Description
mysql	meb_backup_history	lock_time	float	
mysql	meb_backup_history	mysql_data_dir	string	
mysql	meb_backup_history	progress_log	string	
mysql	meb_backup_history	start_time_now	string	
mysql	meb_backup_history	start_time_ts	integer	
mysql	meb_backup_history	total_time	integer	
mysql	meb_backup_success_history	history_full_backup	string	
mysql	meb_incremental	total_increments	integer	
mysql	meb_timing	lock_time	float	
mysql	meb_timing	total_time	integer	
mysql	no_password	user	string	
mysql	no_root_password	no_password	long	
mysql	num_waiting_txns	num_waiting_txns	long	
mysql	prepared_count	prepared_count	long	
mysql	privileges_on_all_dbs	user_spec	string	
mysql	processlist	Command	string	The type of command the thread is executing.
mysql	processlist	db	string	The default database, if one is selected.
mysql	processlist	Host	string	The host name of the client issuing the statement.
mysql	processlist	Id	long	The connection identifier.
mysql	processlist	Info	string	The statement that the thread is executing.
mysql	processlist	State	string	An action, event, or state that indicates what the thread is doing.
mysql	processlist	Time	long	The time in seconds that the thread has been in its current state.

Namespace	Namespace Type	Attribute	Type	Description
mysql	processlist	User	string	The MySQL user who issued the statement.
mysql	repl_slave_privileges	repl_slaves	long	
mysql	rollback_count	rollback_count	long	
mysql	root_account_exists	root_account	long	
mysql	root_remote_login	remote_login	long	
mysql	Server	blackout	string	
mysql	Server	displayname	string	The display name of the server in the Dashboard.
mysql	Server	registration-complete	string	
mysql	Server	repl.group	long	
mysql	Server	repl.groupName	string	
mysql	Server	server.connected	long	Whether the server is connected.
mysql	Server	server.last_errno	string	
mysql	Server	server.last_error	string	The last MySQL server error message.
mysql	Server	server.reachable	long	Whether the server is reachable.
mysql	Server	server.version_numeric	long	The MySQL server version number.
mysql	Server	Time	long	
mysql	Server	transport	string	
mysql	Server	visible.displayname	string	
mysql	server_admin_privileges	server_spec	string	
mysql	SlaveStatus	Binlog_Do_DB	string	
mysql	SlaveStatus	Binlog_Ignore_DB	string	
mysql	SlaveStatus	Connect_Retry	long	
mysql	SlaveStatus	Exec_Master_Log_Pos	long	
mysql	SlaveStatus	File	string	
mysql	SlaveStatus	Last_Errno	long	
mysql	SlaveStatus	Last_Error	string	
mysql	SlaveStatus	Last_IO_Errno	long	

Namespace	Namespace Type	Attribute	Type	Description
mysql	SlaveStatus	Last_IO_Error	string	
mysql	SlaveStatus	Last_SQL_Errno	long	
mysql	SlaveStatus	Last_SQL_Error	string	
mysql	SlaveStatus	Master_Host	string	
mysql	SlaveStatus	Master_ip	string	
mysql	SlaveStatus	Master_Log_File	string	
mysql	SlaveStatus	Master_Port	long	
mysql	SlaveStatus	Master_SSL_Allowed	string	
mysql	SlaveStatus	Master_SSL_CA_File	string	
mysql	SlaveStatus	Master_SSL_CA_Path	string	
mysql	SlaveStatus	Master_SSL_Cert	string	
mysql	SlaveStatus	Master_SSL_Cipher	string	
mysql	SlaveStatus	Master_SSL_Key	string	
mysql	SlaveStatus	Master_SSL_Verify_Server_Cert	string	
mysql	SlaveStatus	Master_User	string	
mysql	SlaveStatus	Master_uuid	string	
mysql	SlaveStatus	Position	long	
mysql	SlaveStatus	Read_Master_Log_Pos	long	
mysql	SlaveStatus	Relay_Log_File	string	
mysql	SlaveStatus	Relay_Log_Pos	long	
mysql	SlaveStatus	Relay_Log_Space	long	
mysql	SlaveStatus	Relay_Master_Log_File	string	
mysql	SlaveStatus	Replicate_Do_DB	string	
mysql	SlaveStatus	Replicate_Do_Table	string	
mysql	SlaveStatus	Replicate_Ignore_DB	string	
mysql	SlaveStatus	Replicate_Ignore_Table	string	
mysql	SlaveStatus	Replicate_Wild_Do_Table	string	
mysql	SlaveStatus	Replicate_Wild_Ignore_Table	string	
mysql	SlaveStatus	Seconds_Behind_Master	long	
mysql	SlaveStatus	Skip_Counter	long	
mysql	SlaveStatus	Slave_IO_Running	string	
mysql	SlaveStatus	Slave_IO_State	string	
mysql	SlaveStatus	Slave_SQL_Running	string	
mysql	SlaveStatus	Until_Condition	string	
mysql	SlaveStatus	Until_Log_File	string	
mysql	SlaveStatus	Until_Log_Pos	long	
mysql	sp_with_select_star	routine	string	
mysql	Statement	bytes	long	

Namespace	Namespace Type	Attribute	Type	Description
mysql	Statement	comment	string	
mysql	Statement	connection_id	long	
mysql	Statement	database	string	
mysql	Statement	errors	long	
mysql	Statement	exec_time	long	
mysql	Statement	explain_plan	string	
mysql	Statement	host_from	string	
mysql	Statement	host_to	string	
mysql	Statement	no_good_index_used	long	
mysql	Statement	no_index_used	long	
mysql	Statement	query_type	string	
mysql	Statement	rows	long	
mysql	Statement	source_location	string	
mysql	Statement	text	string	
mysql	Statement	user	string	
mysql	Statement	warnings	long	
mysql	StatementAnalysisSupport	support_explain_min_exec_time_ms	long	
mysql	StatementAnalysisSupport	support_examples	string	
mysql	StatementAnalysisSupport	support_explain	string	
mysql	StatementAnalysisSupport	supported	string	
mysql	StatementAnalysisSupport	support_frequency	string	
mysql	StatementSummary	avg_exec_time	string	
mysql	StatementSummary	bytes	long	
mysql	StatementSummary	bytes_rel	long	
mysql	StatementSummary	count	long	
mysql	StatementSummary	count_rel	long	
mysql	StatementSummary	database	string	
mysql	StatementSummary	errors	long	
mysql	StatementSummary	exec_time	long	
mysql	StatementSummary	exec_time_rel	long	
mysql	StatementSummary	max_bytes	long	
mysql	StatementSummary	max_exec_time	long	
mysql	StatementSummary	max_rows	long	
mysql	StatementSummary	min_bytes	long	
mysql	StatementSummary	min_exec_time	long	
mysql	StatementSummary	min_rows	long	
mysql	StatementSummary	no_good_index_used	long	
mysql	StatementSummary	no_index_used	long	

Namespace	Namespace Type	Attribute	Type	Description
mysql	StatementSummary	query_type	string	
mysql	StatementSummary	rows	long	
mysql	StatementSummary	rows_rel	long	
mysql	StatementSummary	text	string	
mysql	StatementSummary	text_hash	string	
mysql	StatementSummary	warnings	long	
mysql	status	Aborted_clients	long_counter	Networking.Overview
mysql	status	Aborted_connects	long_counter	The number of failed attempts to connect to the MySQL server.
mysql	status	Binlog_cache_disk_use	long_counter	General.Logging
mysql	status	Binlog_cache_use	long_counter	The number of transactions that used the temporary binary log cache.
mysql	status	Bytes_received	long_counter	The number of bytes received from all clients.
mysql	status	Bytes_sent	long_counter	The number of bytes sent to all clients.
mysql	status	Com_admin_commands	long_counter	Count of admin commands.
mysql	status	Com_alter_db	long_counter	Count of ALTER DATABASE statements.
mysql	status	Com_alter_db_upgrade	long_counter	
mysql	status	Com_alter_event	long_counter	
mysql	status	Com_alter_function	long_counter	
mysql	status	Com_alter_procedure	long_counter	
mysql	status	Com_alter_server	long_counter	
mysql	status	Com_alter_table	long_counter	Count of ALTER TABLE statements.
mysql	status	Com_alter_tablespace	long_counter	

Namespace	Namespace Type	Attribute	Type	Description
mysql	status	Com_analyze	long_counter	Count of ANALYZE statements.
mysql	status	Com_assign_to_keycache	long_counter	
mysql	status	Com_backup_table	long_counter	Count of BACKUP TABLE statements.
mysql	status	Com_begin	long_counter	Count of BEGIN statements.
mysql	status	Com_binlog	long_counter	
mysql	status	Com_call_procedure	long_counter	Number of calls to stored procedures.
mysql	status	Com_change_db	long_counter	Count of CHANGE DATABASE statements.
mysql	status	Com_change_master	long_counter	Count of CHANGE MASTER statements.
mysql	status	Com_check	long_counter	Count of CHECK statements.
mysql	status	Com_checksum	long_counter	Count of CHECKSUM statements.
mysql	status	Com_commit	long_counter	Count of COMMIT statements.
mysql	status	Com_create_db	long_counter	Count of CREATE DATABASE statements.
mysql	status	Com_create_event	long_counter	
mysql	status	Com_create_function	long_counter	Count of CREATE FUNCTION statements.
mysql	status	Com_create_index	long_counter	Count of CREATE INDEX statements.
mysql	status	Com_create_procedure	long_counter	

Namespace	Namespace Type	Attribute	Type	Description
mysql	status	Com_create_server	long_counter	
mysql	status	Com_create_table	long_counter	Count of CREATE TABLE statements.
mysql	status	Com_create_trigger	long_counter	
mysql	status	Com_create_udf	long_counter	
mysql	status	Com_create_user	long_counter	Count of CREATE USER statements.
mysql	status	Com_create_view	long_counter	
mysql	status	Com_dealloc_sql	long_counter	Count of DEALLOCATE PREPARE statements.
mysql	status	Com_delete	long_counter	Count of DELETE statements.
mysql	status	Com_delete_multi	long_counter	Count of multi-table DELETE statements.
mysql	status	Com_do	long_counter	Count of DO statements.
mysql	status	Com_drop_db	long_counter	Count of DROP DATABASE statements.
mysql	status	Com_drop_event	long_counter	
mysql	status	Com_drop_function	long_counter	Count of DROP FUNCTION statements.
mysql	status	Com_drop_index	long_counter	Count of DROP INDEX statements.
mysql	status	Com_drop_procedure	long_counter	
mysql	status	Com_drop_server	long_counter	
mysql	status	Com_drop_table	long_counter	Count of DROP TABLE statements.
mysql	status	Com_drop_trigger	long_counter	
mysql	status	Com_drop_user	long_counter	Count of DROP USER statements.

Namespace	Namespace Type	Attribute	Type	Description
mysql	status	Com_drop_view	long_counter	
mysql	status	Com_empty_query	long_counter	
mysql	status	Com_execute_sql	long_counter	Count of EXECUTE statements.
mysql	status	Com_flush	long_counter	Count of FLUSH statements.
mysql	status	Com_grant	long_counter	Count of GRANT statements.
mysql	status	Com_ha_close	long_counter	Count of HANDLER CLOSE statements.
mysql	status	Com_ha_open	long_counter	Count of HANDLER OPEN statements.
mysql	status	Com_ha_read	long_counter	Count of HANDLER READ statements.
mysql	status	Com_help	long_counter	Count of HELP statements.
mysql	status	Com_insert	long_counter	Count of INSERT statements.
mysql	status	Com_insert_select	long_counter	Count of INSERT SELECT statements.
mysql	status	Com_install_plugin	long_counter	
mysql	status	Com_kill	long_counter	Count of KILL statements.
mysql	status	Com_load	long_counter	Count of LOAD statements.
mysql	status	Com_load_master_data	long_counter	Count of LOAD MASTER DATA statements.
mysql	status	Com_load_master_table	long_counter	Count of LOAD

Namespace	Namespace Type	Attribute	Type	Description
				MASTER TABLE statements.
mysql	status	Com_lock_tables	long_counter	Count of LOCK TABLES statements.
mysql	status	Com_optimize	long_counter	Count of OPTIMIZE statements.
mysql	status	Com_preload_keys	long_counter	Count of PRELOAD KEYS statements.
mysql	status	Com_prepare_sql	long_counter	Count of PREPARE statements.
mysql	status	Com_purge	long_counter	Count of PURGE statements.
mysql	status	Com_purge_before_date	long_counter	Count of PURGE BEFORE DATE statements.
mysql	status	Com_release_savepoint	long_counter	
mysql	status	Com_rename_table	long_counter	Count of RENAME TABLE statements.
mysql	status	Com_rename_user	long_counter	
mysql	status	Com_repair	long_counter	Count of REPAIR statements.
mysql	status	Com_replace	long_counter	Count of REPLACE statements.
mysql	status	Com_replace_select	long_counter	Count of REPLACE SELECT statements.
mysql	status	Com_reset	long_counter	Count of RESET statements.
mysql	status	Com_restore_table	long_counter	Count of RESTORE

Namespace	Namespace Type	Attribute	Type	Description
				TABLE statements.
mysql	status	Com_revoke	long_counter	Count of REVOKE statements.
mysql	status	Com_revoke_all	long_counter	Count of REVOKE ALL statements.
mysql	status	Com_rollback	long_counter	Count of ROLLBACK statements.
mysql	status	Com_rollback_to_savepoint	long_counter	
mysql	status	Com_savepoint	long_counter	Count of SAVEPOINT statements.
mysql	status	Com_select	long_counter	Count of SELECT statements.
mysql	status	Com_set_option	long_counter	Count of SET OPTION statements.
mysql	status	Com_show_authors	long_counter	
mysql	status	Com_show_binlog_events	long_counter	Count of SHOW BINLOG EVENTS statements.
mysql	status	Com_show_binlogs	long_counter	Count of SHOW BINLOGS statements.
mysql	status	Com_show_charsets	long_counter	Count of SHOW CHARSETS statements.
mysql	status	Com_show_collations	long_counter	Count of SHOW COLLATIONS statements.
mysql	status	Com_show_column_types	long_counter	Count of SHOW COLUMN TYPES statements.
mysql	status	Com_show_contributors	long_counter	

Namespace	Namespace Type	Attribute	Type	Description
mysql	status	Com_show_create_db	long_counter	Count of SHOW CREATE DATABASE statements.
mysql	status	Com_show_create_event	long_counter	
mysql	status	Com_show_create_func	long_counter	
mysql	status	Com_show_create_proc	long_counter	
mysql	status	Com_show_create_table	long_counter	Count of SHOW CREATE TABLE statements.
mysql	status	Com_show_create_trigger	long_counter	
mysql	status	Com_show_databases	long_counter	Count of SHOW DATABASES statements.
mysql	status	Com_show_engine_logs	long_counter	
mysql	status	Com_show_engine_mutex	long_counter	
mysql	status	Com_show_engine_status	long_counter	
mysql	status	Com_show_errors	long_counter	Count of SHOW ERRORS statements.
mysql	status	Com_show_events	long_counter	
mysql	status	Com_show_fields	long_counter	Count of SHOW FIELDS statements.
mysql	status	Com_show_function_status	long_counter	
mysql	status	Com_show_grants	long_counter	Count of SHOW GRANTS statements.
mysql	status	Com_show_innodb_status	long_counter	Count of SHOW INNODB STATUS statements.
mysql	status	Com_show_keys	long_counter	Count of SHOW KEYS statements.

Namespace	Namespace Type	Attribute	Type	Description
mysql	status	Com_show_logs	long_counter	Count of SHOW LOGS statements.
mysql	status	Com_show_master_status	long_counter	Count of SHOW MASTER STATUS statements.
mysql	status	Com_show_ndb_status	long_counter	Count of SHOW NDB STATUS statements.
mysql	status	Com_show_new_master	long_counter	Count of SHOW NEW MASTER statements.
mysql	status	Com_show_open_tables	long_counter	Count of SHOW OPEN TABLES statements.
mysql	status	Com_show_plugins	long_counter	
mysql	status	Com_show_privileges	long_counter	Count of SHOW PRIVILEGES statements.
mysql	status	Com_show_procedure_status	long_counter	
mysql	status	Com_show_processlist	long_counter	Count of SHOW PROCESSLIST statements.
mysql	status	Com_show_profile	long_counter	
mysql	status	Com_show_profiles	long_counter	
mysql	status	Com_show_slave_hosts	long_counter	Count of SHOW SLAVE HOSTS statements.
mysql	status	Com_show_slave_status	long_counter	Count of SHOW SLAVE STATUS statements.
mysql	status	Com_show_status	long_counter	Count of SHOW STATUS statements.
mysql	status	Com_show_storage_engines	long_counter	Count of SHOW STORAGE

Namespace	Namespace Type	Attribute	Type	Description
				ENGINES statements.
mysql	status	Com_show_table_status	long_counter	
mysql	status	Com_show_tables	long_counter	Count of SHOW TABLES statements.
mysql	status	Com_show_triggers	long_counter	Count of SHOW TRIGGERS statements.
mysql	status	Com_show_variables	long_counter	Count of SHOW VARIABLES statements.
mysql	status	Com_show_warnings	long_counter	Count of SHOW WARNINGS statements.
mysql	status	Com_slave_start	long_counter	Count of START SLAVE statements.
mysql	status	Com_slave_stop	long_counter	Count of STOP SLAVE statements.
mysql	status	Com_stmt_close	long_counter	Count of STATEMENT CLOSE statements.
mysql	status	Com_stmt_execute	long_counter	Count of STATEMENT EXECUTE statements.
mysql	status	Com_stmt_fetch	long_counter	Count of STATEMENT FETCH statements.
mysql	status	Com_stmt_prepare	long_counter	Count of STATEMENT PREPARE statements.
mysql	status	Com_stmt_reprepare	long_counter	
mysql	status	Com_stmt_reset	long_counter	Count of STATEMENT RESET statements.

Namespace	Namespace Type	Attribute	Type	Description
mysql	status	Com_stmt_send_long_data	long_counter	Count of STATEMENT SEND LONG DATA statements.
mysql	status	Com_truncate	long_counter	Count of TRUNCATE statements.
mysql	status	Com_uninstall_plugin	long_counter	
mysql	status	Com_unlock_tables	long_counter	Count of UNLOCK TABLES statements.
mysql	status	Com_update	long_counter	Count of UPDATE statements.
mysql	status	Com_update_multi	long_counter	Count of multi-table UPDATE statements.
mysql	status	Com_xa_commit	long_counter	Count of XA COMMIT statements.
mysql	status	Com_xa_end	long_counter	Count of XA END statements.
mysql	status	Com_xa_prepare	long_counter	Count of XA PREPARE statements.
mysql	status	Com_xa_recover	long_counter	Count of XA RECOVER statements.
mysql	status	Com_xa_rollback	long_counter	Count of XA ROLLBACK statements.
mysql	status	Com_xa_start	long_counter	Count of XA START statements.
mysql	status	Compression	string	General.Features
mysql	status	Connections	long_counter	The number of connection attempts.
mysql	status	Created_tmp_disk_tables	long_counter	General.Temporary
mysql	status	Created_tmp_files	long_counter	How many temporary files mysqld has created.

Namespace	Namespace Type	Attribute	Type	Description
mysql	status	Created_tmp_tables	long_counter	How many temporary tables mysqld has created.
mysql	status	Delayed_errors	long_counter	Performance.Delays
mysql	status	Delayed_insert_threads	long	The number of INSERT DELAYED thread handlers in use. For non-transactional tables only.
mysql	status	Delayed_writes	long_counter	The number of INSERT DELAYED rows written. For non-transactional tables only.
mysql	status	displayname	string	The display name of the server in the Dashboard.
mysql	status	Flush_commands	long_counter	The number of FLUSH statements executed.
mysql	status	groupname	string	The name of the group to which the server belongs.
mysql	status	Handler_commit	long_counter	The number of internal COMMIT statements.
mysql	status	Handler_delete	long_counter	The number of times that rows have been deleted from tables.
mysql	status	Handler_discover	long_counter	The number of times that tables have been discovered.

Namespace	Namespace Type	Attribute	Type	Description
mysql	status	Handler_prepare	long_counter	A counter for the prepare phase of two-phase commit operations.
mysql	status	Handler_read_first	long_counter	The number of times the first entry was read from an index.
mysql	status	Handler_read_key	long_counter	The number of requests to read a row based on a key.
mysql	status	Handler_read_next	long_counter	The number of requests to read the next row in key order.
mysql	status	Handler_read_prev	long_counter	The number of requests to read the previous row in key order.
mysql	status	Handler_read_rnd	long_counter	The number of requests to read a row based on a fixed position.
mysql	status	Handler_read_rnd_next	long_counter	The number of requests to read the next row in the data file.
mysql	status	Handler_rollback	long_counter	Miscellaneous.Handler
mysql	status	Handler_savepoint	long_counter	The number of requests for a storage engine to place a savepoint.
mysql	status	Handler_savepoint_rollback	long_counter	The number of requests for a storage engine to roll back to a savepoint.
mysql	status	Handler_update	long_counter	The number of requests to

Namespace	Namespace Type	Attribute	Type	Description
				update a row in a table.
mysql	status	Handler_write	long_counter	The number of requests to insert a row in a table.
mysql	status	Innodb_buffer_pool_pages_data	long	The number of pages containing data (dirty or clean)
mysql	status	Innodb_buffer_pool_pages_dirty	long	The number of pages currently dirty in the InnoDB buffer pool.
mysql	status	Innodb_buffer_pool_pages_flush	long_counter	The number of page flush requests in the InnoDB buffer pool.
mysql	status	Innodb_buffer_pool_pages_free	long	The number of InnoDB buffer pool pages free.
mysql	status	Innodb_buffer_pool_pages_latched	long	The number of latched pages in InnoDB buffer pool.
mysql	status	Innodb_buffer_pool_pages_mixed	long	Performance.InnoDB
mysql	status	Innodb_buffer_pool_pages_total	long	The total size of the InnoDB buffer pool, in pages.
mysql	status	Innodb_buffer_pool_read_ahead_random	long_counter	The number of random read-aheads initiated by InnoDB.
mysql	status	Innodb_buffer_pool_read_ahead_seq	long_counter	The number of sequential read-aheads initiated by InnoDB.
mysql	status	Innodb_buffer_pool_read_requests	long_counter	The number of logical read requests

Namespace	Namespace Type	Attribute	Type	Description
				InnoDB has done.
mysql	status	<code>Innodb_buffer_pool_reads</code>	<code>long_counter</code>	Performance.InnoDB
mysql	status	<code>Innodb_buffer_pool_wait_free</code>	<code>long_counter</code>	Number of waits for pages to be flushed.
mysql	status	<code>Innodb_buffer_pool_write_requests</code>	<code>long_counter</code>	The number of writes done to the InnoDB buffer pool.
mysql	status	<code>Innodb_data_fsyncs</code>	<code>long_counter</code>	The number of fsync() operations so far.
mysql	status	<code>Innodb_data_pending_fsyncs</code>	<code>long</code>	The current number of pending fsync() operations.
mysql	status	<code>Innodb_data_pending_reads</code>	<code>long</code>	The current number of pending reads.
mysql	status	<code>Innodb_data_pending_writes</code>	<code>long</code>	The number of pending writes.
mysql	status	<code>Innodb_data_read</code>	<code>long_counter</code>	The amount of data read so far, in bytes.
mysql	status	<code>Innodb_data_reads</code>	<code>long_counter</code>	The total number of data reads.
mysql	status	<code>Innodb_data_writes</code>	<code>long_counter</code>	The total number of data writes.
mysql	status	<code>Innodb_data_written</code>	<code>long_counter</code>	The amount of data written in bytes.
mysql	status	<code>Innodb_dblwr_pages_written</code>	<code>long_counter</code>	The number of doublewrite pages that have been written.
mysql	status	<code>Innodb_dblwr_writes</code>	<code>long_counter</code>	The number of doublewrite operations that

Namespace	Namespace Type	Attribute	Type	Description
				have been performed.
mysql	status	Innodb_log_waits	long_counter	Performance.InnoDB
mysql	status	Innodb_log_write_requests	long_counter	The number of log write requests.
mysql	status	Innodb_log_writes	long_counter	The number of physical writes to the log.
mysql	status	Innodb_os_log_fsyncs	long_counter	The number of fsync() writes done to the log file.
mysql	status	Innodb_os_log_pending_fsyncs	long	The number of pending log file fsync() operations.
mysql	status	Innodb_os_log_pending_writes	long	The number of pending log file writes.
mysql	status	Innodb_os_log_written	long_counter	The number of bytes written to the log file.
mysql	status	Innodb_page_size	long	The compiled-in InnoDB page size.
mysql	status	Innodb_pages_created	long_counter	The number of pages created.
mysql	status	Innodb_pages_read	long_counter	The number of pages read.
mysql	status	Innodb_pages_written	long_counter	The number of pages written.
mysql	status	Innodb_row_lock_current_waits	long	The number of row locks currently being waited for.
mysql	status	Innodb_row_lock_time	long_counter	The total time spent in acquiring row locks, in milliseconds.
mysql	status	Innodb_row_lock_time_avg	long	The average time to acquire a row lock, in milliseconds.

Namespace	Namespace Type	Attribute	Type	Description
mysql	status	Innodb_row_lock_time_max	long	The maximum time to acquire a row lock, in milliseconds.
mysql	status	Innodb_row_lock_waits	long_counter	The number of times a row lock had to be waited for.
mysql	status	Innodb_rows_deleted	long_counter	The number of rows deleted from InnoDB tables.
mysql	status	Innodb_rows_inserted	long_counter	The number of rows inserted into InnoDB tables.
mysql	status	Innodb_rows_read	long_counter	The number of rows read from InnoDB tables.
mysql	status	Innodb_rows_updated	long_counter	The number of rows updated in InnoDB tables.
mysql	status	Key_blocks_not_flushed	long	Performance.Keys
mysql	status	Key_blocks_unused	long	The number of unused blocks in the key cache.
mysql	status	Key_blocks_used	long	The number of used blocks in the key cache.
mysql	status	Key_read_requests	long_counter	The number of requests to read a key block from the cache.
mysql	status	Key_reads	long_counter	The number of physical reads of a key block from disk.
mysql	status	Key_write_requests	long_counter	The number of requests to write a key block to the cache.

Namespace	Namespace Type	Attribute	Type	Description
mysql	status	Key_writes	long_counter	The number of physical writes of a key block to disk.
mysql	status	Last_query_cost	long	Performance.Cost
mysql	status	Max_used_connections	long	Networking.Overview
mysql	status	Ndb_number_of_data_nodes	long	
mysql	status	Ndb_number_of_ready_data_nodes	long	
mysql	status	Not_flushed_delayed_rows	long	The number of rows waiting to be written in INSERT DELAY queues. For non-transactional tables only.
mysql	status	Open_files	long	The number of files that are open.
mysql	status	Open_streams	long	The number of streams that are open (used mainly for logging)
mysql	status	Open_table_definitions	long	
mysql	status	Open_tables	long	The number of tables that are open.
mysql	status	Opened_files	long_counter	
mysql	status	Opened_table_definitions	long_counter	
mysql	status	Opened_tables	long_counter	The number of tables that have been opened.
mysql	status	Prepared_stmt_count	long	The current number of prepared statements.
mysql	status	Qcache_free_blocks	long	The number of free memory blocks in the query cache.
mysql	status	Qcache_free_memory	long	The amount of free memory

Namespace	Namespace Type	Attribute	Type	Description
				for the query cache.
mysql	status	Qcache_hits	long_counter	The number of query cache hits.
mysql	status	Qcache_inserts	long_counter	The number of query cache inserts.
mysql	status	Qcache_lowmem_prunes	long_counter	Performance.Query Cache
mysql	status	Qcache_not_cached	long_counter	Performance.Query Cache
mysql	status	Qcache_queries_in_cache	long	The number of queries registered in the query cache.
mysql	status	Qcache_total_blocks	long	The total number of blocks in the query cache.
mysql	status	Queries	long_counter	
mysql	status	Questions	long_counter	The number of statements that clients have sent to the server.
mysql	status	Rpl_status	long	The status of fail-safe replication (not yet implemented)
mysql	status	Select_full_join	long_counter	Performance.Selects
mysql	status	Select_full_range_join	long_counter	The number of joins that used a range search on a reference table.
mysql	status	Select_range	long_counter	The number of joins that used ranges on the first table.
mysql	status	Select_range_check	long_counter	The number of joins without keys that check for key

Namespace	Namespace Type	Attribute	Type	Description
				usage after each row.
mysql	status	Select_scan	long_counter	The number of joins that did a full scan of the first table.
mysql	status	Slave_open_temp_tables	long	Networking.Replication
mysql	status	Slave_retried_transactions	long_counter	Networking.Replication
mysql	status	Slave_running	string	This is ON if this server is a slave that is connected to a master.
mysql	status	Slow_launch_threads	long_counter	Performance.Slow Items
mysql	status	Slow_queries	long_counter	The number of queries that have taken more than long_query_time seconds.
mysql	status	Sort_merge_passes	long_counter	The number of merge passes that the sort algorithm has had to do.
mysql	status	Sort_range	long_counter	The number of sorts that were done using ranges.
mysql	status	Sort_rows	long_counter	The number of sorted rows.
mysql	status	Sort_scan	long_counter	The number of sorts that were done by scanning the table.
mysql	status	Ssl_accept_renegotiates	long_counter	The number of renegotiates needed to establish the connection.
mysql	status	Ssl_accepts	long_counter	The number of attempted SSL connections.

Namespace	Namespace Type	Attribute	Type	Description
mysql	status	<code>Ssl_callback_cache_hits</code>	<code>long_counter</code>	The number of callback cache hits.
mysql	status	<code>Ssl_cipher</code>	<code>string</code>	SSL cipher to use (implies --ssl)
mysql	status	<code>Ssl_cipher_list</code>	<code>string</code>	The list of SSL cipher strings.
mysql	status	<code>Ssl_client_connects</code>	<code>long_counter</code>	The number of attempted connections to an SSL-enabled master.
mysql	status	<code>Ssl_connect_renegotiates</code>	<code>long_counter</code>	Number of renegotiates needed to connect to an SSL-enabled master.
mysql	status	<code>Ssl_ctx_verify_depth</code>	<code>long</code>	The SSL context verification depth.
mysql	status	<code>Ssl_ctx_verify_mode</code>	<code>long</code>	The SSL certificate verification mode used by the server.
mysql	status	<code>Ssl_default_timeout</code>	<code>long</code>	The SSL default timeout.
mysql	status	<code>Ssl_finished_accepts</code>	<code>long_counter</code>	The number of successful SSL connections to the server.
mysql	status	<code>Ssl_finished_connects</code>	<code>long_counter</code>	The number of successful SSL slave connections to the server.
mysql	status	<code>Ssl_session_cache_hits</code>	<code>long_counter</code>	The number of SSL session cache hits.
mysql	status	<code>Ssl_session_cache_misses</code>	<code>long_counter</code>	The number of SSL session cache misses.

Namespace	Namespace Type	Attribute	Type	Description
mysql	status	<code>Ssl_session_cache_mode</code>	<code>string</code>	The SSL session cache mode.
mysql	status	<code>Ssl_session_cache_overflows</code>	<code>long_counter</code>	The number of SSL cache overflows.
mysql	status	<code>Ssl_session_cache_size</code>	<code>long</code>	The size of the SSL session cache.
mysql	status	<code>Ssl_session_cache_timeouts</code>	<code>long_counter</code>	The number of session cache timeouts.
mysql	status	<code>Ssl_sessions_reused</code>	<code>long</code>	The number of SSL sessions from the cache that were reused.
mysql	status	<code>Ssl_used_session_cache_entries</code>	<code>long</code>	The number of SSL session cache entries used.
mysql	status	<code>Ssl_verify_depth</code>	<code>long</code>	Depth of verification for replication SSL connections.
mysql	status	<code>Ssl_verify_mode</code>	<code>long</code>	Mode of verification for replication SSL connections.
mysql	status	<code>Ssl_version</code>	<code>string</code>	The SSL version number.
mysql	status	<code>Table_locks_immediate</code>	<code>long_counter</code>	The number of times that a table lock was acquired immediately.
mysql	status	<code>Table_locks_waited</code>	<code>long_counter</code>	Performance.Locks
mysql	status	<code>Tc_log_max_pages_used</code>	<code>long</code>	General.Logging
mysql	status	<code>Tc_log_page_size</code>	<code>long</code>	General.Logging
mysql	status	<code>Tc_log_page_waits</code>	<code>long</code>	General.Logging
mysql	status	<code>Threads_cached</code>	<code>long</code>	The number of threads in the thread cache.

Namespace	Namespace Type	Attribute	Type	Description
mysql	status	<code>Threads_connected</code>	<code>long</code>	The number of currently open connections.
mysql	status	<code>Threads_created</code>	<code>long_counter</code>	The number of threads created to handle connections.
mysql	status	<code>Threads_running</code>	<code>long</code>	The number of threads that are not sleeping.
mysql	status	<code>Uptime</code>	<code>long</code>	The number of seconds the server has been up.
mysql	status	<code>Uptime_since_flush_status</code>	<code>long_counter</code>	
mysql	strong_privileges	<code>user</code>	<code>string</code>	
mysql	table	<code>num_rows</code>	<code>long</code>	MySQL Network.Table Data
mysql	table	<code>table_auto_increment</code>	<code>long</code>	The next AUTO_INCREMENT value.
mysql	table	<code>table_avg_row_length</code>	<code>long</code>	The average row length.
mysql	table	<code>table_collation</code>	<code>string</code>	The table's character set and collation.
mysql	table	<code>table_comment</code>	<code>string</code>	The table comment.
mysql	table	<code>table_create_time</code>	<code>string</code>	When the data file was created.
mysql	table	<code>table_data_free</code>	<code>long</code>	The number of allocated but unused bytes.
mysql	table	<code>table_data_length</code>	<code>long</code>	The length of the data file.
mysql	table	<code>table_engine</code>	<code>string</code>	The storage engine used by a table.
mysql	table	<code>table_index_length</code>	<code>long</code>	The length of the index file.

Namespace	Namespace Type	Attribute	Type	Description
mysql	table	<code>table_max_data_length</code>	long	The maximum length of the data file.
mysql	table	<code>table_name</code>	string	The name of a table.
mysql	table	<code>table_row_format</code>	string	The row storage format (Fixed, Dynamic, Compressed, Redundant, Compact)
mysql	table	<code>table_version</code>	long	The version number of the table's .frm file.
mysql	tables_no_myisam_index_stats	<code>index_stats</code>	string	
mysql	tables_no_unique_keys	<code>table_list</code>	string	
mysql	tablestatus	<code>Auto_increment</code>	long	The next AUTO_INCREMENT value.
mysql	tablestatus	<code>Avg_row_length</code>	long	The average row length.
mysql	tablestatus	<code>Check_time</code>	string	When the table was last checked.
mysql	tablestatus	<code>Checksum</code>	string	The live checksum value (if any)
mysql	tablestatus	<code>Collation</code>	string	The table's character set.
mysql	tablestatus	<code>Comment</code>	string	The comment used when creating the table.
mysql	tablestatus	<code>Create_options</code>	string	Extra options used with CREATE TABLE
mysql	tablestatus	<code>Create_time</code>	string	When the table was created.
mysql	tablestatus	<code>Data_free</code>	long	The number of allocated but unused bytes.

Namespace	Namespace Type	Attribute	Type	Description
mysql	tablestatus	Data_length	long	The length of the data file.
mysql	tablestatus	Engine	string	The storage engine for the table.
mysql	tablestatus	Index_length	long	The length of the index file.
mysql	tablestatus	Max_data_length	long	The maximum length of the data file.
mysql	tablestatus	Name	string	The table name.
mysql	tablestatus	Row_format	string	The row storage format (Fixed, Dynamic, Compressed, Redundant, Compact).
mysql	tablestatus	Rows	long	The number of rows in the table.
mysql	tablestatus	Update_time	string	When the data file was last updated.
mysql	tablestatus	Version	long	The version number of the table's .frm file.
mysql	test_database	Database (test)	string	
mysql	transactions_in_serial_log	transactions_in_serial_log	long	
mysql	trigger_with_select_star	trigger_defn	string	
mysql	user_on_missing_db	db_name	string	
mysql	user_on_missing_db	user	string	
mysql	user_on_missing_table	user	string	
mysql	variables	auto_increment_increment	long	Auto-increment columns are incremented by this value.
mysql	variables	auto_increment_offset	long	Offset added to auto-increment columns.
mysql	variables	autocommit	string	

Namespace	Namespace Type	Attribute	Type	Description
mysql	variables	<code>automatic_sp_privileges</code>	string	Creating and dropping stored procedures alters ACLs.
mysql	variables	<code>back_log</code>	long	The number of outstanding connection requests MySQL can have.
mysql	variables	<code>basedir</code>	string	General.Directories / Files
mysql	variables	<code>big_tables</code>	string	
mysql	variables	<code>binlog_cache_size</code>	long	Memory.Caches
mysql	variables	<code>binlog_direct_non_transactional_updates</code>	string	
mysql	variables	<code>binlog_format</code>	string	
mysql	variables	<code>bulk_insert_buffer_size</code>	long	Size of tree cache used in bulk insert optimization.
mysql	variables	<code>character_set_client</code>	string	Current client character set.
mysql	variables	<code>character_set_connection</code>	string	Current connection character set.
mysql	variables	<code>character_set_database</code>	string	The character set used by the default database.
mysql	variables	<code>character_set_filesystem</code>	string	Set the file system character set.
mysql	variables	<code>character_set_results</code>	string	Current result character set.
mysql	variables	<code>character_set_server</code>	string	SQL.Charsets
mysql	variables	<code>character_set_system</code>	string	The character set used by the server for storing identifiers.
mysql	variables	<code>character_sets_dir</code>	string	Directory where character sets are.

Namespace	Namespace Type	Attribute	Type	Description
mysql	variables	<code>collation_connection</code>	<code>string</code>	The collation of the connection.
mysql	variables	<code>collation_database</code>	<code>string</code>	The collation used by the default database.
mysql	variables	<code>collation_server</code>	<code>string</code>	Set the default collation.
mysql	variables	<code>completion_type</code>	<code>long</code>	Default completion type.
mysql	variables	<code>concurrent_insert</code>	<code>long</code>	Use concurrent insert with MyISAM.
mysql	variables	<code>connect_timeout</code>	<code>long</code>	Connections.Overview
mysql	variables	<code>datadir</code>	<code>string</code>	Path to the database root.
mysql	variables	<code>date_format</code>	<code>string</code>	The DATE format (For future)
mysql	variables	<code>datetime_format</code>	<code>string</code>	The DATETIME/ TIMESTAMP format (for future)
mysql	variables	<code>default_week_format</code>	<code>long</code>	The default week format used by WEEK() functions.
mysql	variables	<code>delay_key_write</code>	<code>string</code>	Type of DELAY_KEY_WRITE.
mysql	variables	<code>delayed_insert_limit</code>	<code>long</code>	General.Performance
mysql	variables	<code>delayed_insert_timeout</code>	<code>long</code>	General.Performance
mysql	variables	<code>delayed_queue_size</code>	<code>long</code>	General.Performance
mysql	variables	<code>div_precision_increment</code>	<code>long</code>	SQL.Formats
mysql	variables	<code>engine_condition_pushdown</code>	<code>string</code>	Push supported query conditions to the storage engine.
mysql	variables	<code>error_count</code>	<code>long</code>	

Namespace	Namespace Type	Attribute	Type	Description
mysql	variables	<code>event_scheduler</code>	<code>string</code>	
mysql	variables	<code>expire_logs_days</code>	<code>long</code>	General.Miscellaneous
mysql	variables	<code>flush</code>	<code>string</code>	Flush tables to disk between SQL commands.
mysql	variables	<code>flush_time</code>	<code>long</code>	A dedicated thread is created to flush all tables at the given interval.
mysql	variables	<code>foreign_key_checks</code>	<code>string</code>	
mysql	variables	<code>ft_boolean_syntax</code>	<code>string</code>	List of operators for MATCH ... AGAINST (... IN BOOLEAN MODE).
mysql	variables	<code>ft_max_word_len</code>	<code>long</code>	SQL.Full Text Search
mysql	variables	<code>ft_min_word_len</code>	<code>long</code>	SQL.Full Text Search
mysql	variables	<code>ft_query_expansion_limit</code>	<code>long</code>	Number of best matches to use for query expansion.
mysql	variables	<code>ft_stopword_file</code>	<code>string</code>	Use stopwords from this file instead of built-in list.
mysql	variables	<code>general_log</code>	<code>string</code>	
mysql	variables	<code>general_log_file</code>	<code>string</code>	
mysql	variables	<code>group_concat_max_len</code>	<code>long</code>	The maximum length of the result of function group_concat.
mysql	variables	<code>have_archive</code>	<code>string</code>	Whether mysqld supports archive tables.
mysql	variables	<code>have_bdb</code>	<code>string</code>	Is Berkeley DB supported.

Namespace	Namespace Type	Attribute	Type	Description
mysql	variables	<code>have_blackhole_engine</code>	<code>string</code>	Whether mysqld supports BLACKHOLE tables.
mysql	variables	<code>have_community_features</code>	<code>string</code>	
mysql	variables	<code>have_compress</code>	<code>string</code>	Availability of the zlib compression library.
mysql	variables	<code>have_crypt</code>	<code>string</code>	Availability of the crypt() system call.
mysql	variables	<code>have_csv</code>	<code>string</code>	Whether mysqld supports csv tables.
mysql	variables	<code>have_dynamic_loading</code>	<code>string</code>	Whether mysqld supports dynamic loading of plugins.
mysql	variables	<code>have_example_engine</code>	<code>string</code>	Whether mysqld supports EXAMPLE tables.
mysql	variables	<code>have_federated_engine</code>	<code>string</code>	Whether mysqld supports FEDERATED tables.
mysql	variables	<code>have_geometry</code>	<code>string</code>	Whether mysqld supports spatial data types.
mysql	variables	<code>have_innodb</code>	<code>string</code>	Whether mysqld supports InnoDB tables. No longer used as of MEM 2.3.13.
mysql	variables	<code>have_isam</code>	<code>string</code>	Whether mysqld

Namespace	Namespace Type	Attribute	Type	Description
				supports isam tables.
mysql	variables	<code>have_merge_engine</code>	<code>string</code>	Whether mysqld supports merge tables.
mysql	variables	<code>have_ndbcluster</code>	<code>string</code>	Whether mysqld supports NDB Cluster tables.
mysql	variables	<code>have_openssl</code>	<code>string</code>	Whether mysqld supports SSL connections.
mysql	variables	<code>have_partitioning</code>	<code>string</code>	
mysql	variables	<code>have_profiling</code>	<code>string</code>	
mysql	variables	<code>have_query_cache</code>	<code>string</code>	Whether mysqld supports query cache.
mysql	variables	<code>have_raid</code>	<code>string</code>	Whether mysqld supports the RAID option.
mysql	variables	<code>have_rtree_keys</code>	<code>string</code>	General.Features
mysql	variables	<code>have_ssl</code>	<code>string</code>	Whether the server supports an SSL connection.
mysql	variables	<code>have_symlink</code>	<code>string</code>	Is symbolic link support enabled.
mysql	variables	<code>hostname</code>	<code>string</code>	The name of the server host.
mysql	variables	<code>identity</code>	<code>long</code>	
mysql	variables	<code>ignore_builtin_innodb</code>	<code>string</code>	
mysql	variables	<code>init_connect</code>	<code>string</code>	Command(s) that are executed for each new connection.
mysql	variables	<code>init_file</code>	<code>string</code>	Read SQL commands

Namespace	Namespace Type	Attribute	Type	Description
				from this file at startup.
mysql	variables	<code>init_slave</code>	<code>string</code>	Command(s) that are executed when a slave connects to a master.
mysql	variables	<code>innodb_adaptive_flushing</code>	<code>string</code>	
mysql	variables	<code>innodb_adaptive_hash_index</code>	<code>string</code>	
mysql	variables	<code>innodb_additional_mem_pool_size</code>	<code>long</code>	Memory.Buffers
mysql	variables	<code>innodb_autoextend_increment</code>	<code>long</code>	Amount by which InnoDB auto-extends the data files for a tablespace, in megabytes.
mysql	variables	<code>innodb_autoinc_lock_mode</code>	<code>long</code>	
mysql	variables	<code>innodb_buffer_pool_awesome_mem</code>	<code>long</code>	Memory.Buffers
mysql	variables	<code>innodb_buffer_pool_size</code>	<code>long</code>	Memory.Buffers
mysql	variables	<code>innodb_change_buffering</code>	<code>string</code>	
mysql	variables	<code>innodb_checksums</code>	<code>string</code>	Enable InnoDB checksums validation.
mysql	variables	<code>innodb_commit_concurrency</code>	<code>long</code>	Helps in performance tuning in heavily concurrent environments.
mysql	variables	<code>innodb_concurrency_tickets</code>	<code>long</code>	Table Types.InnoDB
mysql	variables	<code>innodb_data_file_path</code>	<code>string</code>	Path to individual files and their sizes.
mysql	variables	<code>innodb_data_home_dir</code>	<code>string</code>	The common location for InnoDB tablespaces
mysql	variables	<code>innodb_doublewrite</code>	<code>string</code>	Enable InnoDB doublewrite buffer

Namespace	Namespace Type	Attribute	Type	Description
mysql	variables	innodb_fast_shutdown	long	Speeds up the shutdown process of the InnoDB storage engine by deferring cleanup operations until the server restarts.
mysql	variables	innodb_file_format	string	
mysql	variables	innodb_file_format_check	string	
mysql	variables	innodb_file_io_threads	long	Number of file I/O threads in InnoDB.
mysql	variables	innodb_file_per_table	string	Stores each InnoDB table and associated indexes in an .ibd file in the database directory.
mysql	variables	innodb_flush_log_at_trx_commit	long	Table Types.InnoDB
mysql	variables	innodb_flush_method	string	With which method to flush data.
mysql	variables	innodb_force_recovery	long	Table Types.InnoDB
mysql	variables	innodb_io_capacity	long	
mysql	variables	innodb_lock_wait_timeout	long	Table Types.InnoDB
mysql	variables	innodb_locks_unsafe_for_binlog	string	Table Types.InnoDB
mysql	variables	innodb_log_arch_dir	string	Where full logs should be archived.
mysql	variables	innodb_log_archive	string	Set to 1 to have logs archived.
mysql	variables	innodb_log_buffer_size	long	General.Logs
mysql	variables	innodb_log_file_size	long	Size of each log file in a log group.
mysql	variables	innodb_log_files_in_group	long	General.Logs

Namespace	Namespace Type	Attribute	Type	Description
mysql	variables	<code>innodb_log_group_home_dir</code>	string	Path to InnoDB log files.
mysql	variables	<code>innodb_max_dirty_pages_pct</code>	long	Percentage of dirty pages allowed in InnoDB buffer pool.
mysql	variables	<code>innodb_max_purge_lag</code>	long	Desired maximum length of the purge queue (0 = no limit)
mysql	variables	<code>innodb_mirrored_log_groups</code>	long	Number of identical copies of log groups to keep for the database.
mysql	variables	<code>innodb_old_blocks_pct</code>	long	
mysql	variables	<code>innodb_old_blocks_time</code>	long	
mysql	variables	<code>innodb_open_files</code>	long	The maximum number of files that InnoDB keeps open at the same time.
mysql	variables	<code>innodb_read_ahead_threshold</code>	long	
mysql	variables	<code>innodb_read_io_threads</code>	long	
mysql	variables	<code>innodb_rollback_on_timeout</code>	string	Unknown.Unknown
mysql	variables	<code>innodb_spin_wait_delay</code>	long	
mysql	variables	<code>innodb_stats_on_metadata</code>	string	
mysql	variables	<code>innodb_stats_sample_pages</code>	long	
mysql	variables	<code>innodb_strict_mode</code>	string	
mysql	variables	<code>innodb_support_xa</code>	string	Enable InnoDB support for the XA two-phase commit.
mysql	variables	<code>innodb_sync_spin_loops</code>	long	Count of spin-loop rounds in InnoDB mutexes
mysql	variables	<code>innodb_table_locks</code>	string	Enable InnoDB locking

Namespace	Namespace Type	Attribute	Type	Description
				in LOCK TABLES
mysql	variables	innodb_thread_concurrency	long	Table Types.InnoDB
mysql	variables	innodb_thread_sleep_delay	long	Table Types.InnoDB
mysql	variables	innodb_use_legacy_cardinality_algorithm	string	Applies only to MySQL 5.1 and earlier.
mysql	variables	innodb_use_sys_malloc	string	
mysql	variables	innodb_write_io_threads	long	
mysql	variables	insert_id	long	
mysql	variables	interactive_timeout	long	Connections.Overview
mysql	variables	join_buffer_size	long	The size of the buffer that is used for full joins.
mysql	variables	keep_files_on_create	string	
mysql	variables	key_buffer_size	long	The size of the buffer used for index blocks for MyISAM tables.
mysql	variables	key_cache_age_threshold	long	Memory.Caches
mysql	variables	key_cache_block_size	long	The default size of key cache blocks.
mysql	variables	key_cache_division_limit	long	The minimum percentage of warm blocks in the key cache.
mysql	variables	language	string	Client error messages in given language. May be given as a full path.
mysql	variables	large_files_support	string	Whether large files are supported.
mysql	variables	large_page_size	long	General.Features
mysql	variables	large_pages	string	Enable support for large pages.
mysql	variables	last_insert_id	long	

Namespace	Namespace Type	Attribute	Type	Description
mysql	variables	lc_time_names	string	General.Miscellaneous
mysql	variables	license	string	Type of license for the server.
mysql	variables	local_infile	string	Enable/disable LOAD DATA LOCAL INFILE (takes values 1 0)
mysql	variables	locked_in_memory	string	Whether mysqld is locked in memory with --memlock.
mysql	variables	log	string	Log connections and queries to file.
mysql	variables	log_bin	string	Enables binary log.
mysql	variables	log_bin_trust_function_creators	string	General.Logs
mysql	variables	log_bin_trust_routine_creators	string	(deprecated) Use log-bin-trust-function-creators.
mysql	variables	log_error	string	Error log file.
mysql	variables	log_output	string	
mysql	variables	log_queries_not_using_indexes	string	General.Logs
mysql	variables	log_slave_updates	string	General.Logs
mysql	variables	log_slow_queries	string	General.Logs
mysql	variables	log_update	string	General.Logs
mysql	variables	log_warnings	long	Log some not critical warnings to the log file.
mysql	variables	long_query_time	double	General.Performance
mysql	variables	low_priority_updates	string	For non-transactional tables, INSERT, DELETE, and UPDATE statements have lower priority than

Namespace	Namespace Type	Attribute	Type	Description
				SELECT statements.
mysql	variables	lower_case_file_system	string	General.Features
mysql	variables	lower_case_table_names	long	SQL.Overview
mysql	variables	max_allowed_packet	long	Max packetlength to send/ receive from to server.
mysql	variables	max_binlog_cache_size	long	General.Logs
mysql	variables	max_binlog_size	long	General.Logs
mysql	variables	max_connect_errors	long	Connections.Overview
mysql	variables	max_connections	long	The number of simultaneous clients allowed.
mysql	variables	max_delayed_threads	long	General.Performance
mysql	variables	max_error_count	long	Max number of errors/ warnings to store for a statement.
mysql	variables	max_heap_table_size	long	Don't allow creation of heap tables bigger than this.
mysql	variables	max_insert_delayed_threads	long	This variable is a synonym for max_delayed_threads .
mysql	variables	max_join_size	long	General.Performance
mysql	variables	max_length_for_sort_data	long	Max number of bytes in sorted records.
mysql	variables	max_prepared_stmt_count	long	Maximum number of prepared statements in the server.
mysql	variables	max_relay_log_size	long	General.Logs
mysql	variables	max_seeks_for_key	long	Limit assumed max number of seeks when looking up

Namespace	Namespace Type	Attribute	Type	Description
				rows based on a key.
mysql	variables	<code>max_sort_length</code>	long	The number of bytes to use when sorting BLOB or TEXT values.
mysql	variables	<code>max_sp_recursion_depth</code>	long	Maximum stored procedure recursion depth.
mysql	variables	<code>max_tmp_tables</code>	long	Maximum number of temporary tables a client can keep open at a time.
mysql	variables	<code>max_user_connections</code>	long	Connections.Overview
mysql	variables	<code>max_write_lock_count</code>	long	After this many write locks, allow some read locks to run in between.
mysql	variables	<code>min_examined_row_limit</code>	long	
mysql	variables	<code>multi_range_count</code>	long	General.Performance
mysql	variables	<code>myisam_data_pointer_size</code>	long	Default pointer size to be used for MyISAM tables.
mysql	variables	<code>myisam_max_extra_sort_file_size</code>	long	Deprecated option.
mysql	variables	<code>myisam_max_sort_file_size</code>	long	Table Types.MyISAM
mysql	variables	<code>myisam_mmap_size</code>	long	
mysql	variables	<code>myisam_recover_options</code>	string	The value of the --myisam-recover option.
mysql	variables	<code>myisam_repair_threads</code>	long	Table Types.MyISAM
mysql	variables	<code>myisam_sort_buffer_size</code>	long	Memory.Buffers
mysql	variables	<code>myisam_stats_method</code>	string	Specifies how MyISAM index statistics

Namespace	Namespace Type	Attribute	Type	Description
				collection code should treat NULLs.
mysql	variables	myisam_use_mmap	string	
mysql	variables	named_pipe	string	Indicates whether the server supports connections over named pipes.
mysql	variables	net_buffer_length	long	Buffer length for TCP/IP and socket communication.
mysql	variables	net_read_timeout	long	Connections. Networking
mysql	variables	net_retry_count	long	Connections. Networking
mysql	variables	net_write_timeout	long	Connections. Networking
mysql	variables	new	string	Use very new, possibly 'unsafe' functions.
mysql	variables	old	string	
mysql	variables	old_alter_table	string	
mysql	variables	old_passwords	string	Use old password encryption method (needed for 4.0 and older clients)
mysql	variables	open_files_limit	long	General. Directories / Files
mysql	variables	optimizer_prune_level	long	General. Features
mysql	variables	optimizer_search_depth	long	Maximum depth of search performed by the query optimizer.
mysql	variables	optimizer_switch	string	
mysql	variables	pid_file	string	Pid file used by safe_mysqld.
mysql	variables	plugin_dir	string	

Namespace	Namespace Type	Attribute	Type	Description
mysql	variables	port	long	Port number to use for connection.
mysql	variables	preload_buffer_size	long	The size of the buffer that is allocated when preloading indexes.
mysql	variables	prepared_stmt_count	long	The current number of prepared statements.
mysql	variables	profiling	string	
mysql	variables	profiling_history_size	string	
mysql	variables	protocol_version	long	The version of the client/server protocol used by the MySQL server.
mysql	variables	pseudo_thread_id	long	
mysql	variables	query_alloc_block_size	long	Allocation block size for query parsing and execution.
mysql	variables	query_cache_limit	long	Don't cache results that are bigger than this.
mysql	variables	query_cache_min_res_unit	long	Memory.Caches
mysql	variables	query_cache_size	long	The memory allocated to store results from old queries.
mysql	variables	query_cache_type	string	Query cache type.
mysql	variables	query_cache_wlock_invalidate	string	Invalidate queries in query cache on LOCK for write.
mysql	variables	query_prealloc_size	long	Persistent buffer for query parsing and execution.

Namespace	Namespace Type	Attribute	Type	Description
mysql	variables	<code>rand_seed1</code>	long	
mysql	variables	<code>rand_seed2</code>	long	
mysql	variables	<code>range_alloc_block_size</code>	long	Allocation block size for storing ranges during optimization.
mysql	variables	<code>read_buffer_size</code>	long	Memory.Buffers
mysql	variables	<code>read_only</code>	string	Make all nontemporary tables read only.
mysql	variables	<code>read_rnd_buffer_size</code>	long	Memory.Buffers
mysql	variables	<code>relay_log</code>	string	
mysql	variables	<code>relay_log_index</code>	string	
mysql	variables	<code>relay_log_info_file</code>	string	
mysql	variables	<code>relay_log_purge</code>	string	Determines whether relay logs are purged.
mysql	variables	<code>relay_log_space_limit</code>	long	Maximum space to use for all relay logs.
mysql	variables	<code>report_host</code>	string	
mysql	variables	<code>report_password</code>	string	
mysql	variables	<code>report_port</code>	long	
mysql	variables	<code>report_user</code>	string	
mysql	variables	<code>rpl_recovery_rank</code>	long	Not used.
mysql	variables	<code>secure_auth</code>	string	Disallow authentication for accounts that have old (pre-4.1) passwords.
mysql	variables	<code>secure_file_priv</code>	string	Unknown.Unknown
mysql	variables	<code>server_id</code>	long	General.Overview
mysql	variables	<code>shared_memory</code>	string	Whether the server allows shared-memory connections.
mysql	variables	<code>shared_memory_base_name</code>	string	The name of shared

Namespace	Namespace Type	Attribute	Type	Description
				memory to use for shared-memory connections.
mysql	variables	<code>skip_external_locking</code>	string	Skip system (external) locking.
mysql	variables	<code>skip_name_resolve</code>	string	
mysql	variables	<code>skip_networking</code>	string	Don't allow connection with TCP/IP.
mysql	variables	<code>skip_show_database</code>	string	Don't allow SHOW DATABASE commands.
mysql	variables	<code>slave_compressed_protocol</code>	string	Use compression on master/slave protocol.
mysql	variables	<code>slave_exec_mode</code>	string	
mysql	variables	<code>slave_load_tmpdir</code>	string	General.Replication
mysql	variables	<code>slave_net_timeout</code>	long	Connections.Networking
mysql	variables	<code>slave_skip_errors</code>	string	General.Replication
mysql	variables	<code>slave_transaction_retries</code>	long	General.Replication
mysql	variables	<code>slow_launch_time</code>	long	General.Performance
mysql	variables	<code>slow_query_log</code>	string	
mysql	variables	<code>slow_query_log_file</code>	string	
mysql	variables	<code>socket</code>	string	Socket file to use for connection.
mysql	variables	<code>sort_buffer_size</code>	long	Each thread that needs to do a sort allocates a buffer of this size.
mysql	variables	<code>sql_auto_is_null</code>	string	
mysql	variables	<code>sql_big_selects</code>	string	General.Features
mysql	variables	<code>sql_big_tables</code>	string	
mysql	variables	<code>sql_buffer_result</code>	string	
mysql	variables	<code>sql_log_bin</code>	string	
mysql	variables	<code>sql_log_off</code>	string	
mysql	variables	<code>sql_log_update</code>	string	

Namespace	Namespace Type	Attribute	Type	Description
mysql	variables	<code>sql_low_priority_updates</code>	string	
mysql	variables	<code>sql_max_join_size</code>	long	
mysql	variables	<code>sql_mode</code>	string	Set the SQL server mode.
mysql	variables	<code>sql_notes</code>	string	If set to 1, warnings of Note level are recorded.
mysql	variables	<code>sql_quote_show_create</code>	string	
mysql	variables	<code>sql_safe_updates</code>	string	
mysql	variables	<code>sql_select_limit</code>	long	
mysql	variables	<code>sql_slave_skip_counter</code>	long	
mysql	variables	<code>sql_warnings</code>	string	General.Miscellaneous
mysql	variables	<code>ssl_ca</code>	string	CA file in PEM format (check OpenSSL docs, implies --ssl)
mysql	variables	<code>ssl_capath</code>	string	CA directory (check OpenSSL docs, implies --ssl)
mysql	variables	<code>ssl_cert</code>	string	X509 certification in PEM format (implies --ssl)
mysql	variables	<code>ssl_cipher</code>	string	SSL cipher to use (implies --ssl)
mysql	variables	<code>ssl_key</code>	string	X509 key in PEM format (implies ssl)
mysql	variables	<code>storage_engine</code>	string	The default storage engine.
mysql	variables	<code>sync_binlog</code>	long	Synchronously flush binary log to disk after every #th event.
mysql	variables	<code>sync_frm</code>	string	Sync .frm to disk on create. Enabled by default.

Namespace	Namespace Type	Attribute	Type	Description
mysql	variables	<code>sync_replication</code>	long	Deprecated.
mysql	variables	<code>sync_replication_slave_id</code>	long	Deprecated.
mysql	variables	<code>sync_replication_timeout</code>	long	Deprecated.
mysql	variables	<code>system_time_zone</code>	string	The server system time zone.
mysql	variables	<code>table_cache</code>	long	Deprecated; use --table_open_cache instead.
mysql	variables	<code>table_definition_cache</code>	long	
mysql	variables	<code>table_lock_wait_timeout</code>	long	General.Miscellaneous
mysql	variables	<code>table_open_cache</code>	long	
mysql	variables	<code>table_type</code>	string	A synonym for storage_engine.
mysql	variables	<code>thread_cache_size</code>	long	How many threads to keep in a cache for reuse.
mysql	variables	<code>thread_handling</code>	string	
mysql	variables	<code>thread_stack</code>	long	The stack size for each thread.
mysql	variables	<code>time_format</code>	string	The TIME format (for future)
mysql	variables	<code>time_zone</code>	string	The current time zone.
mysql	variables	<code>timed_mutexes</code>	string	General.Miscellaneous
mysql	variables	<code>timestamp</code>	long	
mysql	variables	<code>tmp_table_size</code>	long	Memory.Overview
mysql	variables	<code>tmpdir</code>	string	Path for temporary files.
mysql	variables	<code>transaction_alloc_block_size</code>	long	Allocation block size for transactions to be stored in binary log.
mysql	variables	<code>transaction_prealloc_size</code>	long	Persistent buffer for transactions to be stored in binary log.

Namespace	Namespace Type	Attribute	Type	Description
mysql	variables	<code>tx_isolation</code>	<code>string</code>	The default transaction isolation level.
mysql	variables	<code>unique_checks</code>	<code>string</code>	
mysql	variables	<code>updatable_views_with_limit</code>	<code>string</code>	SQL.Overview
mysql	variables	<code>version</code>	<code>string</code>	Output version information and exit.
mysql	variables	<code>version_comment</code>	<code>string</code>	General.Overview
mysql	variables	<code>version_compile_machine</code>	<code>string</code>	The type of machine or architecture on which MySQL was built.
mysql	variables	<code>version_compile_os</code>	<code>string</code>	The type of operating system on which MySQL was built.
mysql	variables	<code>wait_timeout</code>	<code>long</code>	Connections.Overview
mysql	variables	<code>warning_count</code>	<code>long</code>	
mysql	waiting_db	<code>waiting_db</code>	<code>string</code>	
mysql	waiting_statement	<code>waiting_statement</code>	<code>string</code>	
mysql	waiting_thread	<code>waiting_thread</code>	<code>long</code>	
mysql	waiting_time	<code>waiting_time</code>	<code>long</code>	
mysql	waiting_user	<code>waiting_user</code>	<code>string</code>	
os	cpu	<code>cpu_cache_size</code>	<code>long</code>	The size of the CPU cache.
os	cpu	<code>cpu_idle</code>	<code>long_counter</code>	The CPU idle time.
os	cpu	<code>cpu_mhz</code>	<code>long</code>	The MHz rating of the CPU.
os	cpu	<code>cpu_name</code>	<code>string</code>	The CPU name.
os	cpu	<code>cpu_sys</code>	<code>long_counter</code>	CPU system / kernel time.
os	cpu	<code>cpu_user</code>	<code>long_counter</code>	CPU user space time.
os	cpu	<code>cpu_vendor</code>	<code>string</code>	The name of the CPU vendor.
os	cpu	<code>cpu_wait</code>	<code>long_counter</code>	CPU IO wait time.

Namespace	Namespace Type	Attribute	Type	Description
os	disk	disk_bytes_read	long_counter	The number of bytes read from disk.
os	disk	disk_bytes_written	long_counter	The number of bytes written to disk.
os	disk	disk_queue	long	The size of the disk IO queue.
os	disk	disk_reads	long_counter	The number of disk reads.
os	disk	disk_rtime	long	
os	disk	disk_servicetime	double	
os	disk	disk_snaptime	long	
os	disk	disk_time	long	
os	disk	disk_writes	long_counter	The number of disk writes.
os	disk	disk_wtime	long	
os	fs	fs_avail	long	
os	fs	fs_dev_name	string	
os	fs	fs_dir_name	string	
os	fs	fs_files	long	
os	fs	fs_flags	long	
os	fs	fs_free_files	long	
os	fs	fs_options	string	
os	fs	fs_sys_type_name	string	
os	fs	fs_total	long	
os	fs	fs_type_name	string	
os	fs	fs_unused	long	
os	fs	fs_used	long	
os	Host	host_id	string	The host unique identifier.
os	Host	name	string	
os	loadavg	0	double	
os	loadavg	1	double	
os	loadavg	2	double	
os	mem	ram_total	long	The total amount of available RAM.

Namespace	Namespace Type	Attribute	Type	Description
os	mem	ram_unused	long	The total amount of unused RAM.
os	mem	swap_page_in	long_counter	
os	mem	swap_page_out	long_counter	
os	mem	swap_total	long	The total amount of available swap memory.
os	mem	swap_unused	long	The total amount of unused swap memory.
os	net	address	string	The address of the network interface.
os	net	broadcast	string	The network interface broadcast address.
os	net	description	string	The network interface description.
os	net	destination	string	The network interface destination address.
os	net	flags	long	The network interface flags.
os	net	hwaddr	string	The network interface MAC address.
os	net	metric	long	Operating System.Net
os	net	mtu	long	The Maximum Transmission Unit.
os	net	name	string	The network interface name (eth0, eth1 etc.)
os	net	netmask	string	The network interface subnet mask.

Namespace	Namespace Type	Attribute	Type	Description
os	net	<code>rx_bytes</code>	<code>long_counter</code>	The number of bytes received.
os	net	<code>rx_dropped</code>	<code>long_counter</code>	The number of received packets dropped.
os	net	<code>rx_errors</code>	<code>long_counter</code>	The number of received packet errors.
os	net	<code>rx_frame</code>	<code>long_counter</code>	The number received packet frame errors.
os	net	<code>rx_overruns</code>	<code>long_counter</code>	The number of received packet overruns.
os	net	<code>rx_packets</code>	<code>long_counter</code>	The number of packets received.
os	net	<code>speed</code>	<code>long</code>	The network interface connection speed.
os	net	<code>tx_bytes</code>	<code>long_counter</code>	The number of bytes transmitted.
os	net	<code>tx_carrier</code>	<code>long_counter</code>	The number of carrier errors on network transmission.
os	net	<code>tx_collisions</code>	<code>long_counter</code>	The number of network transmission collisions.
os	net	<code>tx_dropped</code>	<code>long_counter</code>	The number of network transmissions dropped.
os	net	<code>tx_errors</code>	<code>long_counter</code>	The number of network transmission errors.
os	net	<code>tx_overruns</code>	<code>long_counter</code>	The number of network

Namespace	Namespace Type	Attribute	Type	Description
				transmission overruns.
os	net	tx_packets	long_counter	The number of packets transmitted.
os	net	type	string	The network interface type (ethernet, loopback etc.)
os	os	os_arch	string	The architecture of the OS / CPU.
os	os	os_description	string	Description of the OS.
os	os	os_machine	string	Machine CPU architecture.
os	os	os_name	string	The OS name.
os	os	os_patchlevel	string	The OS patch level.
os	os	os_vendor	string	The OS vendor.
os	os	os_vendor_code_name	string	The OS vendor code name.
os	os	os_vendor_name	string	The OS vendor name.
os	os	os_vendor_version	string	The OS vendor version number.
os	os	os_version	string	The OS version number.
util	LogHistogram	0	long_counter	
util	LogHistogram	1	long_counter	
util	LogHistogram	10	long_counter	
util	LogHistogram	11	long_counter	
util	LogHistogram	12	long_counter	
util	LogHistogram	13	long_counter	
util	LogHistogram	14	long_counter	
util	LogHistogram	15	long_counter	
util	LogHistogram	16	long_counter	
util	LogHistogram	17	long_counter	
util	LogHistogram	18	long_counter	

Namespace	Namespace Type	Attribute	Type	Description
util	LogHistogram	19	long_counter	
util	LogHistogram	2	long_counter	
util	LogHistogram	20	long_counter	
util	LogHistogram	21	long_counter	
util	LogHistogram	22	long_counter	
util	LogHistogram	23	long_counter	
util	LogHistogram	24	long_counter	
util	LogHistogram	25	long_counter	
util	LogHistogram	26	long_counter	
util	LogHistogram	27	long_counter	
util	LogHistogram	28	long_counter	
util	LogHistogram	29	long_counter	
util	LogHistogram	3	long_counter	
util	LogHistogram	30	long_counter	
util	LogHistogram	31	long_counter	
util	LogHistogram	32	long_counter	
util	LogHistogram	33	long_counter	
util	LogHistogram	34	long_counter	
util	LogHistogram	35	long_counter	
util	LogHistogram	36	long_counter	
util	LogHistogram	37	long_counter	
util	LogHistogram	38	long_counter	
util	LogHistogram	39	long_counter	
util	LogHistogram	4	long_counter	
util	LogHistogram	40	long_counter	
util	LogHistogram	41	long_counter	
util	LogHistogram	42	long_counter	
util	LogHistogram	43	long_counter	
util	LogHistogram	44	long_counter	
util	LogHistogram	45	long_counter	
util	LogHistogram	46	long_counter	
util	LogHistogram	47	long_counter	
util	LogHistogram	48	long_counter	
util	LogHistogram	49	long_counter	
util	LogHistogram	5	long_counter	
util	LogHistogram	50	long_counter	
util	LogHistogram	51	long_counter	
util	LogHistogram	52	long_counter	

Namespace	Namespace Type	Attribute	Type	Description
util	LogHistogram	53	long_counter	
util	LogHistogram	54	long_counter	
util	LogHistogram	55	long_counter	
util	LogHistogram	56	long_counter	
util	LogHistogram	57	long_counter	
util	LogHistogram	58	long_counter	
util	LogHistogram	59	long_counter	
util	LogHistogram	6	long_counter	
util	LogHistogram	60	long_counter	
util	LogHistogram	61	long_counter	
util	LogHistogram	62	long_counter	
util	LogHistogram	7	long_counter	
util	LogHistogram	8	long_counter	
util	LogHistogram	9	long_counter	
util	LogHistogram	base	long	
util	LogHistogram	nul	long_counter	

Appendix E Error codes

The following table documents error codes reported by the GUI and the messages associated with each code.

Table E.1 MySQL Enterprise Dashboard: GUI Error Codes and Messages

Error Code	Message
U0001	" <i>replaceable_value</i> " is a required field.
U0002	You must log in to access the requested resource.
U0003	You do not have permissions to access this resource.
U0004	The user field " <i>replaceable_value</i> " must not be null. Either the submission was broken or you have accessed this resource improperly.
U0005	A non-numeric value was submitted for the field " <i>replaceable_value</i> ". Either the submission was broken or you have accessed this resource improperly.
U0007	Unable to connect to download Advisors. <i>replaceable_value</i>
U0009	The uploaded Advisor jar was invalid.
U0010	The username and password combination was not found.
U0011	The user " <i>replaceable_value</i> " does not exist.
U0012	You may not log into the interface with agent credentials.
U0013	At least one agent is required to use the application.
U0014	At least one admin is required to use the application.
U0018	You must provide an admin password.
U0019	The admin passwords do not match.
U0020	You must provide an agent password.
U0021	The agent passwords do not match.
U0023	You must provide a non-zero interval.
U0024	" <i>replaceable_value</i> " is an invalid "To" date. Dates are in the format YYYY-MM-DD.
U0025	" <i>replaceable_value</i> " is an invalid "From" date. Dates are in the format YYYY-MM-DD.
U0026	Your "To" and "From" dates cannot be the same date.
U0027	You must provide a graph id for display.
U0028	You have exceeded the maximum number of graphs for display. You may only select <i>replaceable_value</i> graphs.
U0029	No graphs ids were found.
U0030	You must provide a non-zero interval.
U0031	Your full-sized width must be greater than or equal to <i>replaceable_value</i> .
U0032	" <i>replaceable_value</i> " is not a valid value for full-sized width.
U0033	Your full-sized height must be greater than or equal to <i>replaceable_value</i> .
U0034	" <i>replaceable_value</i> " is not a valid value for full-sized height.
U0035	Your thumbnail width must be greater than or equal to <i>replaceable_value</i> .
U0036	" <i>replaceable_value</i> " is not a valid value for thumbnail width.

Error Code	Message
U0037	Your thumbnail height must be greater than or equal to <i>replaceable_value</i> .
U0038	" <i>replaceable_value</i> " is not a valid value for thumbnail height.
U0039	You must select one or more events to close.
U0041	" <i>replaceable_value</i> " is an invalid "From" date. Dates are in the format YYYY-MM-DD.
U0042	" <i>replaceable_value</i> " is an invalid "To" date. Dates are in the format YYYY-MM-DD.
U0043	You must provide a non-zero interval.
U0044	Your width must be greater than or equal to <i>replaceable_value</i> .
U0045	" <i>replaceable_value</i> " is not a valid value for width.
U0046	Your height must be greater than or equal to <i>replaceable_value</i> .
U0047	" <i>replaceable_value</i> " is not a valid value for height.
U0048	You must provide a non-zero interval.
U0049	" <i>replaceable_value</i> " is an invalid "To" date. Dates are in the format YYYY-MM-DD.
U0050	" <i>replaceable_value</i> " is an invalid "From" date. Dates are in the format YYYY-MM-DD.
U0051	Your "To" and "From" dates cannot be the same date.
U0052	Your width must be greater than or equal to <i>replaceable_value</i> .
U0053	" <i>replaceable_value</i> " is not a valid value for width.
U0054	Your height must be greater than or equal to <i>replaceable_value</i> .
U0055	" <i>replaceable_value</i> " is not a valid value for height.
U0056	You must select one or more advisors.
U0057	No schedule was found with id " <i>replaceable_value</i> ".
U0058	You must select one or more rules to schedule.
U0059	There was a problem scheduling " <i>replaceable_value</i> " against " <i>replaceable_value</i> ".
U0060	No rule was found with the uuid " <i>replaceable_value</i> ".
U0061	Advisor name must not be empty.
U0062	Advisor " <i>replaceable_value</i> " already exists.
U0063	New advisor name must not be empty.
U0064	Advisor id must not be null.
U0065	No advisor was found with the id <i>replaceable_value</i> .
U0066	Rule uuid must not be null.
U0067	No rule was found with the uuid " <i>replaceable_value</i> ".
U0068	One or more variables is required to make a functioning rule.
U0069	Each defined variable must be mapped to an instance. The variable " <i>replaceable_value</i> " is missing the instance to collect against.
U0070	Please choose an existing Advisor or create a new one with a non-empty name.
U0071	The default frequency must be a non-zero value.
U0072	You must enter a rule name.

Error Code	Message
U0075	You must specify a file for upload.
U0077	You must provide an email address.
U0078	The provided email address appears to be invalid.
U0079	A valid SMTP server address must be given.
U0080	Your passwords do not match.
U0081	A valid SNMP target must be given.
U0082	A valid SNMP port must be given.
U0083	A valid SNMP community string must be given.
U0084	The given file could not be found.
U0086	An invalid file name was given.
U0088	An invalid SNMP severity level was given.
U0090	An invalid data life span was given.
U0091	An invalid re-inventory frequency was given.
U0093	The user name is missing.
U0095	An invalid time zone was given.
U0096	An invalid locale was given.
U0097	The group name is invalid.
U0098	The recipients list is empty.
U0099	Cannot find the e-mail target.
U0100	The given target id is invalid.
U0101	The group name must not be empty.
U0102	The server name must not be empty.
U0103	An invalid group id was given.
U0104	The group already exists.
U0105	This group name is already in use. Enter a different name.
U0106	Cannot find group with id <i>replaceable_value</i> .
U0107	Cannot find server with id <i>replaceable_value</i> .
U0108	An invalid server id was given.
U0109	Invalid Username
U0110	Invalid user role specified.
U0111	A user with the given name already exists.
U0112	The password must not be empty.
U0113	The user " <i>replaceable_value</i> " does not exist.
U0114	The log name must not be empty.
U0115	An invalid log level was given.
U0117	An invalid filter was set.
U0118	" <i>replaceable_value</i> " is an invalid "From" date. Dates are in the format YYYY-MM-DD.

Error Code	Message
U0119	" <i>replaceable_value</i> " is an invalid "To" date. Dates are in the format YYYY-MM-DD.
U0120	No event was found with the id " <i>replaceable_value</i> ".
U0121	No category was found with the id " <i>replaceable_value</i> ".
U0122	You must select one or more servers to add.
U0123	No log was found with the name " <i>replaceable_value</i> ".
U0124	No schedule was found with the id " <i>replaceable_value</i> ".
U0125	No notification group was found with the id " <i>replaceable_value</i> ".
U0126	Unable to retrieve Advisors at this time.
U0128	You must specify a file for upload.
U0129	The uploaded Graph XML was invalid.
U0130	The uploaded Graph had an insufficient version number, and was not loaded.
U0131	No group was found with the id " <i>replaceable_value</i> ".
U0132	No user was found with the name " <i>replaceable_value</i> ".
U0133	No log was found with the key " <i>replaceable_value</i> ".
U0134	An invalid e-mail address was given.
U0135	No user was found with the id " <i>replaceable_value</i> ".
U0136	No graph was found with the id " <i>replaceable_value</i> ".
U0137	You must provide a query summary id for display.
U0138	No query summary was found with the id " <i>replaceable_value</i> ".
U0139	" <i>replaceable_value</i> " is not a valid UUID.
U0140	You are not authorized to access this resource.
U0141	No graph was found with the uuid " <i>replaceable_value</i> ".
U0142	The target name is already in use.
U0143	No key was provided to sort on.
U0145	U0120 Unable to import Advisor Jar. You may download the jar manually from the My Oracle Support website and import it on this page.
U0146	Unable to schedule rule " <i>replaceable_value</i> " due to " <i>replaceable_value.replaceable_value</i> " data not being collected from server " <i>replaceable_value</i> ". It may be an unsupported collection for that server.
U0147	The requested feature, <i>replaceable_value</i> , has not been implemented.
U0148	You must select one or more servers.
U0149	You must provide a non-empty alias.
U0150	No server was found with the id " <i>replaceable_value</i> ".
U0151	Server already exists with name " <i>replaceable_value</i> ".
U0152	No server name provided
U0154	Query Analyzer Data purge value cannot be greater than Historic Data purge value.
U0156	The database cannot parse the regular expression: <i>replaceable_value</i> .
U0157	Query Explain support requires Query Example capture to be enabled.

Error Code	Message
U0159	This Role does not have permission to configure Query Analyzer. Please contact an Administrator.
U0162	The admin and agent usernames must be different.
U0163	The requested alias is too long; aliases must be less than <i>replaceable_value</i> characters.
U0164	<i>"replaceable_value"</i> is not a DNS resolvable hostname or IP address.
U0165	Heat chart rule <i>"replaceable_value"</i> scheduled against <i>"replaceable_value"</i> may not be unscheduled. This rule is required for the product to function properly.
U0166	Heat chart rule <i>"replaceable_value"</i> scheduled against <i>"replaceable_value"</i> may not be disabled. This rule is required for the product to function properly.
U0167	Bad graph identifier.
U0168	There is no graph with the given identifier.
U0169	Graph width <i>"replaceable_value"</i> is invalid.
U0170	Graph height <i>"replaceable_value"</i> is invalid.
U0171	Graph width <i>"replaceable_value"</i> is below minimum <i>"replaceable_value"</i> .
U0172	Graph height <i>"replaceable_value"</i> is below minimum <i>"replaceable_value"</i> .
U0173	Interval <i>"replaceable_value"</i> is not valid.
U0175	A HTTP proxy host is required; the port is optional.
U0176	Unable to parse the HTTP host <i>"replaceable_value"</i> .
U0177	Unable to parse the HTTP proxy port number <i>"replaceable_value"</i> .
U0178	An invalid hostname or port was given.
U0179	The HTTP proxy passwords must match.
U0180	You cannot change the role of the logged-in user.
U0181	No updates are available to install at this time.
U0182	There was an error formatting the Advisor Readme.
U0183	You must provide a primary hostname.
U0184	Invalid value for LDAP encryption.
U0185	Invalid value for LDAP referrals.
U0186	You must provide a login when not using anonymous binds.
U0187	You must provide a password attribute when using comparison mode.
U0188	You must provide a password digest when using comparison mode.
U0189	Unknown password digest provided.
U0190	LDAP passwords do not match.
U0191	User or role pattern required when using role mapping.
U0192	You must provide a role search pattern attribute.
U0193	You must provide at least one mapping for the "admin" role.
U0194	You must provide at least one mapping for the "dba" role.
U0195	You must provide at least one mapping for the "agent" role.
U0196	Disabling LDAP authentication for a user requires a new password to be created.

Error Code	Message
U0197	LDAP authentication can not be disabled when LDAP is configured to be authoritative.
U0198	The password can not be changed for users authenticated via LDAP.
U0200	The user name can not be changed when LDAP is authoritative.
U0201	You must provide at least one mapping for the "read-only" role.
U0202	<i>replaceable_value</i> heat chart {0,choice,1#rule 1<rules} against <i>replaceable_value</i> {1,choice,1#server 1<servers} will not be unscheduled. {0,choice,1#This rule is 1<These rules are} required for the product to function properly.
U0203	No schedules were found for the rule.
U0204	Delete without confirmation disallowed.
U0205	Nothing is selected.
U0206	No file was provided.
U0207	Unable to determine the type of this file.
U0208	Nothing is selected.
U0209	The selection is invalid.
U0210	A version (e.g., "1.0") is required.
U0211	<i>replaceable_value</i> heat chart {0,choice,1#rule 1<rules} against <i>replaceable_value</i> {1,choice,1#server 1<servers} will not be disabled. {0,choice,1#This rule is 1<These rules are} required for the product to function properly.
U0212	You must specify user search criteria.
U0213	You must choose user search by pattern or by criteria.
U0214	The uploaded Advisor jar is a Custom Rule/Graph Export Bundle, and must be uploaded to the Import/Export page.
U0215	Changing the frequency for this rule is not supported.
U0216	Notes provided were too long (limit 10000 characters)
U0217	No notes provided
U0218	No servers were selected, please select the servers you want to modify and try again.
U0219	The interval " <i>replaceable_value</i> " could not be parsed. Intervals must be in hh:mm:ss <i>replaceable_value</i> msec format.
U0220	You must provide at least one substitution expression when selecting the transform with substitution expression option.
U0221	Invalid entry in substitution expression field " <i>replaceable_value</i> ". Entry is not a well formed substitution expression.
U0222	Invalid entry in substitution expression field " <i>replaceable_value</i> ". The substitution pattern " <i>replaceable_value</i> " is not valid.
U0223	Invalid entry in substitution expression field " <i>replaceable_value</i> ". The substitution text " <i>replaceable_value</i> " is not valid.

The following table documents error codes reported by the Enterprise server and the messages associated with each code.

Table E.2 MySQL Enterprise Monitor: Server Codes and Messages

Error Code	Message
E0001	Internal Error: <i>replaceable_value</i>
E0100	Invalid user role " <i>replaceable_value</i> ". Only "manager", "dba", and "agent" are valid.
E0101	Invalid user name " <i>replaceable_value</i> ". User names must be alphanumeric and between 1-32 characters in length.
E0102	Invalid user password. Passwords must contain at least one number.
E0103	Can not delete manager user.
E0104	User can not change role.
E0105	User " <i>replaceable_value</i> " already exists.
E0106	User " <i>replaceable_value</i> " does not exist.
E0107	User role " <i>replaceable_value</i> " is not authorized.
E0108	User " <i>replaceable_value</i> " has been previously deleted and is disabled.
E0200	No mapping exists to map the user " <i>replaceable_value</i> " to a MySQL Network user.
E0201	A mapping already exists for the user " <i>replaceable_value</i> " to a MySQL Network user.
E0202	MySQL Network is currently unavailable or could not be reached.
E0203	MySQL Network reported no alerts.
E0204	MySQL Network Advisor returned no data. Reason: " <i>replaceable_value</i> ".
E0205	Your Advisors are currently up to date.
E0206	Your MySQL Enterprise trial expired after " <i>replaceable_value</i> ".
E0207	The MySQL Enterprise subscription key is not valid.
E0208	No MySQL Enterprise subscription information is installed.
E0209	The MySQL Enterprise subscription key has expired.
E0210	User: <i>replaceable_value</i> Requires role: <i>replaceable_value</i>
E0211	You do not have permissions to access this resource.
E0212	The import of a duplicate MySQL Enterprise subscription trial key was rejected.
E0213	Unable to decode key from file: <i>replaceable_value</i> .
E0300	Can not delete default group.
E0301	Group " <i>replaceable_value</i> " already exists.
E0302	Group " <i>replaceable_value</i> " does not exist.
E0303	Invalid group name " <i>replaceable_value</i> ". Group name must be alphanumeric and less than 128 characters.
E0304	Group element " <i>replaceable_value</i> " already exists.
E0305	Group element " <i>replaceable_value</i> " does not exist in the group " <i>replaceable_value</i> ".
E0400	Agent " <i>replaceable_value</i> " does not exist.
E0401	Agent payload parameter NULL.
E0402	Agent task " <i>replaceable_value</i> " does not exist.

Error Code	Message
E0403	There has been a problem de-serializing this agent's request. Please ensure all agents are version <i>replaceable_value</i> or greater.
E0500	Server " <i>replaceable_value</i> " already exists.
E0501	Server " <i>replaceable_value</i> " does not exist.
E0502	Server " <i>replaceable_value</i> " is actively being monitored and cannot be deleted. The last agent contact for this server was on <i>replaceable_value</i> .
E0503	Server " <i>replaceable_value</i> " is being migrated and cannot be deleted. Please halt the active migration first.
E0600	Database " <i>replaceable_value</i> " already exists.
E0601	Database " <i>replaceable_value</i> " does not exist.
E0700	Threshold " <i>replaceable_value</i> " already exists.
E0701	Threshold " <i>replaceable_value</i> " does not exist.
E0702	Data collection item does not exist.
E0703	serverName or groupName have to be set.
E0800	Data collection item does not exist.
E0801	Data collection is already occurring for " <i>replaceable_value</i> ".
E0802	Data collection does not exist for " <i>replaceable_value</i> ".
E0803	Invalid lifespan. Data life must be greater than 0 days.
E0804	Invalid namespace. Supported namespaces include "mysql" and "os". <i>replaceable_value</i>
E0805	Invalid instance. The instance must be a valid for data collection.
E0806	Invalid source. The source must be valid for data collection.
E0807	Invalid attribute. The attrib must be valid for data collection.
E0808	Invalid frequency: " <i>replaceable_value</i> ". The frequency must be at least 1 minute and be in the format HH:MM.
E0809	Invalid port. If the URI uses the MYSQL namespace it must include a server port.
E0810	Invalid server. The server " <i>replaceable_value</i> " must exist in the current inventory.
E0811	Invalid server. For an OS namespace, the server must not include the MySQL server port.
E0812	A SQL failure occurred while saving the data collection schedule. " <i>replaceable_value</i> " Please see the error logs for details.
E0813	Invalid server id " <i>replaceable_value</i> ".
E0814	No data items exist for server " <i>replaceable_value</i> ".
E0815	Value " <i>replaceable_value</i> " not valid for " <i>replaceable_value</i> ".
E0816	categoryName has to be set
E0817	You must specify either a server or group in the data collection schedule.
E0818	The server " <i>replaceable_value</i> " does not support item(s) " <i>replaceable_value</i> " required by monitor " <i>replaceable_value</i> ".
E0819	Invalid data type: " <i>replaceable_value</i> ".
E0900	Advisor id " <i>replaceable_value</i> " does not exist.

Error Code	Message
E0901	Advisor name " <i>replaceable_value</i> " does not exist.
E0902	Advisor XML is invalid.
E0903	Category " <i>replaceable_value</i> " does not exist.
E0904	Invalid server list.
E0905	SKIPPED " <i>replaceable_value</i> " for <i>replaceable_value</i> because Agent for <i>replaceable_value</i> is down.
E0906	SKIPPED " <i>replaceable_value</i> " for <i>replaceable_value</i> because mysqld on <i>replaceable_value</i> is down.
E0907	Category " <i>replaceable_value</i> " cannot be modified.
E0908	Category " <i>replaceable_value</i> " cannot be deleted.
E0909	Category " <i>replaceable_value</i> " already exists.
E0910	Advisor bundle version <i>replaceable_value</i> is incompatible with server version <i>replaceable_value</i> .
E0911	Heat chart rule " <i>replaceable_value</i> " scheduled against " <i>replaceable_value</i> " may not be unscheduled.
E0912	Heat chart rule " <i>replaceable_value</i> " scheduled against " <i>replaceable_value</i> " may not be disabled.
E1100	Graph time format " <i>replaceable_value</i> " is invalid. Must be in the format HH:MM:SS.
E1101	Graph size height and width must be specified.
E1102	Graph " <i>replaceable_value</i> " does not exist.
E1103	Graph " <i>replaceable_value</i> " already exists.
E1104	Graph " <i>replaceable_value</i> " contains a data collection item that can not be identified.
E1200	Failed to retrieve identity column.
E1201	Required parameter " <i>replaceable_value</i> " was NULL.
E1202	Only SELECT and SHOW commands are allowed via this interface.
E1203	Invalid timezone " <i>replaceable_value</i> ".
E1204	Invalid interval " <i>replaceable_value</i> ".
E1205	Could not find object " <i>replaceable_value</i> " in cache " <i>replaceable_value</i> ".
E1206	Feature is not implemented. Parameters: <i>replaceable_value</i>
E1300	Advisor " <i>replaceable_value</i> " already exists.
E1301	Advisor " <i>replaceable_value</i> " does not exist.
E1302	Schedule does not exist. " <i>replaceable_value</i> " " <i>replaceable_value</i> "
E1303	JEP error: expression : " <i>replaceable_value</i> ", message: " <i>replaceable_value</i> ".
E1304	Advisor " <i>replaceable_value</i> " contains a data collection item that can not be identified.
E1305	Alarm level " <i>replaceable_value</i> " is not valid.
E1306	Schedule already exists. " <i>replaceable_value</i> " " <i>replaceable_value</i> ".
E1307	Advisor " <i>replaceable_value</i> " is a read only MySQL Network certified Advisor. Please copy the rule before editing.

Error Code	Message
E1308	Advisor " <i>replaceable_value</i> " is currently scheduled against one or more monitored MySQL servers and cannot be removed.
E1309	Could not render text. " <i>replaceable_value</i> ".
E1310	No open event for " <i>replaceable_value</i> " on server " <i>replaceable_value</i> ". Perhaps already closed.
E1311	Alarm with id " <i>replaceable_value</i> " does not exist.
E1400	Invalid missed agent heartbeat threshold value.
E1401	Notification entry " <i>replaceable_value</i> " does not exist.
E1402	Agent " <i>replaceable_value</i> " is using session " <i>replaceable_value</i> " but session " <i>replaceable_value</i> " was requested.
E1403	Server name " <i>replaceable_value</i> " is in use by another agent with uuid " <i>replaceable_value</i> ".
E1500	Notification target " <i>replaceable_value</i> " does not exist.
E1501	Invalid email address " <i>replaceable_value</i> ".
E1502	Notification target " <i>replaceable_value</i> " already exists.
E1503	Invalid notification target name " <i>replaceable_value</i> ".
E1504	Invalid monitor name, it must not be empty.
E1505	No variable assignments given, you must define at least one.
E1506	SMTP authentication failed.
E1507	SMTP send failed
E1508	Invalid SNMP target " <i>replaceable_value</i> ".
E1509	Invalid SNMP trap type " <i>replaceable_value</i> ".
E1600	Log " <i>replaceable_value</i> " does not exist.
E1700	Authentication Mechanism was null
E1701	Unsupported Authentication Mechanism <i>replaceable_value</i>
E1702	Incorrect password for user <i>replaceable_value</i>
E1800	Invalid data type: " <i>replaceable_value</i> ", new value: " <i>replaceable_value</i> ".
E1801	Invalid value: " <i>replaceable_value</i> " for data type " <i>replaceable_value</i> " for item " <i>replaceable_value</i> ".
E1802	Invalid expression: " <i>replaceable_value</i> ", exception: " <i>replaceable_value</i> ", raw expression: " <i>replaceable_value</i> ". substitute values: " <i>replaceable_value</i> ".
E1900	History not found id: " <i>replaceable_value</i> ", schedule: " <i>replaceable_value</i> ", expression: " <i>replaceable_value</i> ".
E2000	Tag not found, id: " <i>replaceable_value</i> ".
E2101	Unable to collect " <i>replaceable_value</i> " on " <i>replaceable_value</i> " for instance " <i>replaceable_value</i> ".
E9000	<i>replaceable_value</i>
E9001	<i>replaceable_value</i> from: <i>replaceable_value</i>

Appendix F MySQL Enterprise Monitor Frequently Asked Questions



Note

MySQL Enterprise subscription, MySQL Enterprise Monitor, MySQL Replication Monitor, and MySQL Query Analyzer are only available to commercial customers. To learn more, see: <http://www.mysql.com/products/>.

FAQ Categories

- [General Usage \[441\]](#)
- [MySQL Monitor \[443\]](#)
- [MySQL Query Analyzer \[445\]](#)

General Usage

Questions

- [F.1: \[441\]](#) My MySQL Enterprise Service Manager is behind a firewall but it cannot communicate with the Oracle support web site. I normally use a proxy service to access external web sites. How do I configure the proxy settings for MySQL Enterprise Monitor User Interface?
- [F.2: \[442\]](#) How do I change the name of a server?
- [F.3: \[442\]](#) I have started a Data Migration of my old data for a server to MySQL Enterprise Service Manager 2.0, but I have noticed that the performance of the monitor server has degraded significantly. Can I stop the migration?
- [F.4: \[442\]](#) I have set the graphs to update every 5 minutes, and the page refresh to occur every minute. The page is refreshing correctly, but the graphs do not seem to update.
- [F.5: \[442\]](#) During query analysis, I am unable to obtain [EXAMPLE](#) or [EXPLAIN](#) information when examining the detail of the analyzed query within the **Query Analyzer** panel.
- [F.6: \[442\]](#) I have enabled [EXPLAIN](#) queries for Query Analyzer, but no queries with the [EXPLAIN](#) data are showing up in the display.
- [F.7: \[443\]](#) Does Query Analyzer work with all versions of MySQL and the MySQL Client Libraries?
- [F.8: \[443\]](#) Why do some rules appear to have a **Severity of Unknown**?
- [F.9: \[443\]](#) Can I run MySQL Enterprise Service Manager on machine with other applications running?
- [F.10: \[443\]](#) Why does the file `apache-tomcat/logs/tomcat.log` show error messages saying `This is very likely to create a memory leak.`? Is that anything to be concerned about?
- [F.11: \[443\]](#) Why does monitoring a MySQL instance with FEDERATED tables cause extra connections, and decreased performance?

Questions and Answers

F.1: My MySQL Enterprise Service Manager is behind a firewall but it cannot communicate with the Oracle support web site. I normally use a proxy service to access external web sites. How do I configure the proxy settings for MySQL Enterprise Monitor User Interface?

To configure a proxy service, edit the `apache-tomcat/conf/catalina.properties` file within the MySQL Enterprise Service Manager installation directory. Change the `http.proxyHost` and `http.proxyPort` properties:

```
http.proxyHost=proxy.example.com
http.proxyPort=8080
```

Restart the MySQL Enterprise Service Manager for the change to take effect:

```
shell> mysqlmonitorctl.sh restart
```

F.2: How do I change the name of a server?

Go to the **Manage Servers** panel within **Settings** and click **Rename server**.

Renaming the server in this way will override all other server naming, including changes to the agent configuration.

F.3: I have started a Data Migration of my old data for a server to MySQL Enterprise Service Manager 2.0, but I have noticed that the performance of the monitor server has degraded significantly. Can I stop the migration?

You can stop the migration of your historical data at any time. Go to the **Manage Servers** display of the **Settings** panel and click **Stop** next to each server that is being migrated. You can restart the migration at any point.

F.4: I have set the graphs to update every 5 minutes, and the page refresh to occur every minute. The page is refreshing correctly, but the graphs do not seem to update.

The graph refresh and page refresh are two different parameters. The graphs are updated according to their refresh period, regardless of the refresh period set for the main display page.

F.5: During query analysis, I am unable to obtain `EXAMPLE` or `EXPLAIN` information when examining the detail of the analyzed query within the **Query Analyzer** panel.

You must explicitly enable the `EXAMPLE` and `EXPLAIN` query functionality. Make sure that you have enabled both panels. See [Section 3.2.3, “Query Analyzer Settings”](#).

F.6: I have enabled `EXPLAIN` queries for Query Analyzer, but no queries with the `EXPLAIN` data are showing up in the display.

Query Analyzer only obtains `EXPLAIN` information when the MySQL Enterprise Monitor Agent identifies a long running query. If none of your queries exceed the defined threshold, then the `EXPLAIN` information is not obtained and provided to the Query Analyzer for display.

To change the query duration at which an `EXPLAIN` is triggered, you must edit the `share/mysql-proxy/quant.lua` file within the MySQL Enterprise Monitor Agent directory on each server. You need to change the value configured in the `auto_explain_min_exec_time_us`. The default is 500ms:

```
---
-- configuration
--
-- SET GLOBAL analyze_query.auto_filter = 0
if not proxy.global.config.quan then
    proxy.global.config.quan = {
        analyze_queries = true,    -- track all queries
        query_cutoff    = 160,    -- only show the first 160 chars of the query
        num_worst_queries = 5,
        auto_explain     = true,
```



```
        auto_explain_min_exec_time_us = 500 * 1000
    }
end
```

The value is expressed in microseconds, which is why the value must be multiplied by 1000. To reduce this value to 100ms, modify this line:

```
auto_explain_min_exec_time_us = 100 * 1000
```

These changes take effect without restarting MySQL Enterprise Monitor Agent.

F.7: Does Query Analyzer work with all versions of MySQL and the MySQL Client Libraries?

The MySQL Proxy component, and Query Analyzer, require that clients connecting through MySQL Enterprise Monitor Agent are using MySQL 5.0 or later. Clients that use the `libmysqlclient` library provided with MySQL 4.1 or earlier do not work with MySQL Enterprise Monitor Agent.

F.8: Why do some rules appear to have a **Severity of Unknown?**

Due to timing issues, certain rules such as “32-Bit Binary Running on 64-Bit AMD Or Intel System” and “Key Buffer Size Greater Than 4 GB” do not evaluate correctly due to timing issues. This is a known issue that is expected to be resolved in future versions of MySQL Enterprise Monitor.

F.9: Can I run MySQL Enterprise Service Manager on machine with other applications running?

You can, but Oracle recommends running your MySQL Enterprise Service Manager on a dedicated machine, especially when monitoring many agents.

F.10: Why does the file `apache-tomcat/logs/tomcat.log` show error messages saying **This is very likely to create a memory leak.? Is that anything to be concerned about?**

This message is sometimes produced by underlying components of the web stack on web application reload or shutdown, and is not a cause for concern. It is not practical to shut off these spurious messages within Tomcat.

F.11: Why does monitoring a MySQL instance with FEDERATED tables cause extra connections, and decreased performance?

When the agent starts, it executes a discovery process that performs a number of `INFORMATION_SCHEMA` queries that gather table information for rules. These `INFORMATION_SCHEMA` queries can be costly on instances with many tables, particularly with large numbers of FEDERATED tables to another instance, as each table has a new session opened for it on the target machine.

If you do not want these statements to execute on agent startup, any statement relating to the `INFORMATION_SCHEMA` can be removed from the agent's `share/mysql-proxy/items/items-mysql-monitor.xml` file. However, this will cause some of the rules provided with your subscription to not work, as they rely on this information.

MySQL Monitor

Questions

- [F.1: \[444\]](#) What is MySQL Enterprise Monitor?
- [F.2: \[444\]](#) What are the features and related benefits of the MySQL Enterprise Monitor?
- [F.3: \[444\]](#) What are the immediate benefits of implementing the MySQL Enterprise Monitor?

-
- **F.4: [444]** What are the long-term benefits of the MySQL Enterprise Monitor?
 - **F.5: [444]** How is the MySQL Enterprise Monitor installed and deployed?
 - **F.6: [444]** How is the Enterprise Monitor web application architected?
 - **F.7: [445]** What makes MySQL Enterprise unique?
 - **F.8: [445]** What versions of MySQL are supported by the MySQL Enterprise Monitor?
 - **F.9: [445]** What operating system platforms are supported by the MySQL Enterprise Monitor?
 - **F.10: [445]** What are the MySQL Enterprise Advisors and Advisor Rules?
 - **F.11: [445]** How are subscribers notified about the availability of new or updated MySQL Enterprise Monitor, MySQL Enterprise Advisors and Advisor Rules?

Questions and Answers

F.1: What is MySQL Enterprise Monitor?

Included as part of a MySQL Enterprise subscription, the MySQL Enterprise Monitor is a distributed, web-based application that helps customers reduce downtime, tighten security and increase throughput of their MySQL servers by telling them about problems in their database applications before they occur. It is downloadable from the Oracle Software Delivery Cloud web site and is deployed within the safety of the customer data center.

F.2: What are the features and related benefits of the MySQL Enterprise Monitor?

The MySQL Enterprise Monitor is like having a "Virtual DBA Assistant" at your side to recommend best practices to eliminate security vulnerabilities, improve replication, and optimize performance. For the complete features and benefits, visit the <http://www.mysql.com/products/enterprise/monitor-features.html>.

F.3: What are the immediate benefits of implementing the MySQL Enterprise Monitor?

Often MySQL installations are implemented with default settings that may not be best suited for specific applications or usage patterns. The MySQL Advisors go to work immediately in these environments to identify potential problems and proactively notify and advise DBAs on key MySQL settings that can be tuned to improve availability, tighten security, and increase the throughput of their existing MySQL servers.

F.4: What are the long-term benefits of the MySQL Enterprise Monitor?

Over time, the task of managing even medium-scale MySQL server farms becomes exponentially more complicated, especially as the load of users, connections, application queries, and objects on each MySQL server increases. The Enterprise Monitor continually monitors the dynamic security, performance, replication and schema relevant metrics of all MySQL servers, so as the number of MySQL continues to grow, DBAs are kept up to date on potential problems and proactive measures that can be implemented to ensure each server continues to operate at the highest levels of security, performance and reliability.

F.5: How is the MySQL Enterprise Monitor installed and deployed?

The Enterprise Monitor is powered by a distributed web application that is installed and deployed within the confines of the corporate firewall.

F.6: How is the Enterprise Monitor web application architected?

The Enterprise Monitor web application comprises three components:

-
- **Monitor Agent:** A lightweight C program that is installed on each of the monitored MySQL servers. Its purpose is to collect MySQL SQL and operating system metrics that allow the DBA to monitor the overall health, availability and performance of the MySQL server. The Monitor Agent is the only component within the application that touches or connects to the MySQL Server. It reports the data it collects via XML over HTTP to the centralized Service Manager.
 - **Service Manager:** The main server of the application. The Service Manager manages and stores the data collections that come in from each monitor agent. It analyzes these collections using MySQL provided best practice Advisor rules to determine the health, security, availability and performance of each of the monitored MySQL Servers. The Service Manager also provides the content for the Enterprise Dashboard which serves as the client user interface for the distributed web application.
 - **Repository:** A MySQL database that is used to stored data collections and application-level configuration data.

F.7: What makes MySQL Enterprise unique?

Of the products on the market that monitor MySQL, SQL code and OS specific metrics, the MySQL Enterprise Monitor is the only solution that is built and supported by the engineers at MySQL. Unlike other solutions that report on raw MySQL and OS level metrics, the MySQL Enterprise Monitor is designed to optimize the use of MySQL by proactively monitoring MySQL instances and providing notifications and 'MySQL DBA expertise in a box' advice on corrective measures DBAs can take before problems occur.

F.8: What versions of MySQL are supported by the MySQL Enterprise Monitor?

The MySQL Enterprise Monitor supports MySQL versions 5.1 and above.

F.9: What operating system platforms are supported by the MySQL Enterprise Monitor?

The Enterprise Monitor Service Manager is fully supported on most current versions of Linux, Windows and Windows Server Editions, and Solaris. The Monitor Agent supports any platform supported by the MySQL Enterprise server. For the complete list of MySQL Enterprise supported operating systems and CPUs, visit [MySQL Supported Platforms](#) and select [MySQL Enterprise Monitor](#).

F.10: What are the MySQL Enterprise Advisors and Advisor Rules?

The MySQL Enterprise Advisors are a set of best practice guidelines for the optimal use of MySQL. Advisors are spread across database specific disciplines and comprise a set of MySQL Advisor Rules that proactively monitor all MySQL servers and report on database application problems before they occur. Each Advisor Rule provides a detailed overview of the problem it is designed to identify, advise on how to correct the problem, specify commands to implement the recommended fix and links to additional resources for additional research into the issue at hand.

F.11: How are subscribers notified about the availability of new or updated MySQL Enterprise Monitor, MySQL Enterprise Advisors and Advisor Rules?

Customers will receive notifications of new and updated MySQL Enterprise Monitor and Advisors as they become available via the MySQL Enterprise Software Update Service. Notifications will be generated and sent based on the customer profile and the MySQL Enterprise subscription level.

MySQL Query Analyzer

Questions

- [F.1: \[446\]](#) What is the MySQL Query Analyzer?
- [F.2: \[446\]](#) How is the MySQL Query Analyzer installed and enabled?

-
- [F.3: \[446\]](#) What overhead can I expect when the MySQL Query Analyzer is installed and enabled?
 - [F.4: \[446\]](#) Can I leave the MySQL Query Analyzer enabled at all times?
 - [F.5: \[446\]](#) What are the main features and benefits of the MySQL Query Analyzer?
 - [F.6: \[447\]](#) What are the typical use cases of the MySQL Query Analyzer?
 - [F.7: \[447\]](#) How are subscribers notified about updates to the MySQL Query Analyzer application components?
 - [F.8: \[447\]](#) What makes the MySQL Query Analyzer unique?
 - [F.9: \[447\]](#) How can I get the MySQL Query Analyzer?
 - [F.10: \[447\]](#) Does Query Analyzer work with MySQL Cluster?
 - [F.11: \[447\]](#) Does Query Analyzer enable me to monitor the disk reads and writes during a query?
 - [F.12: \[447\]](#) How much degradation in performance does mysql-proxy introduce?
 - [F.13: \[447\]](#) Does the query analyzer look at all queries? Or only queries which would show up in the in the slow-queries log?
 - [F.14: \[448\]](#) Do the MySQL clients have to connect to the port of the mysql proxy to enable the Query Analyzer?

Questions and Answers

F.1: What is the MySQL Query Analyzer?

The MySQL Query Analyzer allows DBAs, developers and system administrators to improve application performance by collecting, monitoring, and analyzing queries as they run on their MySQL servers. <http://www.mysql.com/products/enterprise/query.html>

F.2: How is the MySQL Query Analyzer installed and enabled?

The Query Analyzer feature is installed with the Monitor Agent. It is enabled during agent installation and can be toggled between collection and pass-thru modes from the Query Analysis page of the Enterprise Monitor.

F.3: What overhead can I expect when the MySQL Query Analyzer is installed and enabled?

The average overhead when in active collection mode is in the 15-20% range. In pass-thru mode the overhead is minimal, weighing in at 1-5% on most MySQL systems of average load.

F.4: Can I leave the MySQL Query Analyzer enabled at all times?

We have customers who have the Query Analyzer enabled and collecting queries on their development and QA servers so they can tune their code and monitor the fixes as part of the development process. For production systems, Query collection and analysis can easily be toggled on when a slowdown occurs. To avoid collection mode overhead many users are using simple scripts to enable the Query Analyzer to sample queries during non-peak hours, typically during 30 minute windows. They can then view the collected queries using the date/time or interval filter options.

F.5: What are the main features and benefits of the MySQL Query Analyzer?

For the complete features and benefits, visit the <http://www.mysql.com/products/enterprise/monitor-features.html>

F.6: What are the typical use cases of the MySQL Query Analyzer?

The typical use cases for developers, DBAs and system administrators are:

- Developers – Monitor and tune application queries during development before they are promoted to production.
- DBAs and System Administrators – Identify problem SQL code as it runs in production and advise development teams on how to tune. This use case benefits the most from regular sampling of queries as they are running, most often during non-peak hours.

F.7: How are subscribers notified about updates to the MySQL Query Analyzer application components?

Customers will receive notifications of the MySQL Query Analyzer updates as they become available via the MySQL Enterprise Software Update and Alert Service. Notifications will be generated and sent based on the customer profile and the MySQL Enterprise subscription level.

F.8: What makes the MySQL Query Analyzer unique?

Other products (free, open source and commercial) that provide MySQL query monitoring are dependent on the MySQL Slow Query Log being enabled and available for sampling. While this provides some time savings over the DBA collecting and parsing the Log, the Slow Query Log comes with overhead and does not capture sub millisecond executions. The log data also grows very large very quickly.

The MySQL Query Analyzer collects queries and execution statistics with no dependence on the SQL Query Log, it captures all SQL statements sent to the MySQL server and provides an aggregated view into the most expensive queries in number of executions and total execution time. It is also fully supported as part of the MySQL Enterprise subscription.

F.9: How can I get the MySQL Query Analyzer?

The MySQL Query Analyzer is built into the MySQL Enterprise Monitor.

To experience the MySQL Enterprise Monitor for 30 days, visit the <http://www.mysql.com/trials/>

F.10: Does Query Analyzer work with MySQL Cluster?

Yes, providing that exact node is monitored with an agent and query analyzer has been enabled for that node. Note that you must be accessing your cluster data through a standard MySQL node for this to work.

F.11: Does Query Analyzer enable me to monitor the disk reads and writes during a query?

No, that information is not available to the query analyzer.

F.12: How much degradation in performance does mysql-proxy introduce?

At the very least it's equivalent to a network hop in latency. The degradation is directly related to your average query execution time. If your queries execute in microseconds (which can happen if served from query cache) then the degradation will be higher, and noticeable. We've seen some applications that actually do work when they execute queries, the degradation is much less, and in some limited cases because of scheduling, the application actually has better throughput.

F.13: Does the query analyzer look at all queries? Or only queries which would show up in the in the slow-queries log?

The Query Analyzer sees all queries routed through the agent/proxy that performs the query analysis and aggregate them directly.

F.14: Do the MySQL clients have to connect to the port of the mysql proxy to enable the Query Analyzer?

Yes, or you can re-direct them in various ways, by reconfiguring mysqld to listen to some other port, and the proxy to 3306, use iptables redirection, etc. We have some examples in the manual for the product on how to do it (semi)-transparently.

Appendix G Files associated with configuring, debugging, and using MySQL Enterprise Monitor

This links to the sections that discuss MySQL Enterprise Monitor generated files.

- Log files for the MySQL Enterprise Service Manager which includes `mysql-monitor.log` (service manager), `catalina.out` (Apache/Tomcat), and `configuration_report.txt` (during the installation or upgrade). See [Section C.1.3, “Log Files for the MySQL Enterprise Service Manager”](#).
- Agent log and `pid` files, which includes `mysql-monitor-agent.log` and `mysql-monitor-agent.pid`. See [Section C.2.3, “Agent Log and pid Files”](#).
- The Management Information Base (MIB) file, which is `MONITOR.MIB`. See [Section C.1.4, “The Management Information Base \(MIB\) File”](#).
- The Service Manager configuration file, which is `config.properties`. See [Section C.1.5, “The config.properties file”](#).
- The Service Manager may be started/stopped with `mysqlmonitorctl.sh` on Linux, and `mysqlmonitorctl.bat` on Microsoft Windows.
- The agent may be started/stopped with `mysql-monitor-agent` on Linux, and `agentctl.bat` on Microsoft Windows.

Appendix H MySQL Enterprise Monitor Release Notes

Release notes for MySQL Enterprise Monitor are published separately. See [MySQL Enterprise Monitor 2.3 Release Notes](#).

MySQL Enterprise Monitor Glossary

These terms are commonly used in information about the MySQL Enterprise Monitor product.

A

advisor

A **rule** and the **alarms** and **notifications** associated with it. Sets of advisors that perform related measurements are grouped together into **collections**. Advisors are a crucial aspect of the monitoring system. The MySQL Enterprise Monitor product comes with a number of **standard** advisors. Based on your organization's particular needs, you may create or adapt **custom** advisors.

See Also [Advisors tab](#), [alarm](#), [collection](#), [custom](#), [notification](#), [rule](#), [schedule](#), [standard](#).

advisor group

A collection of similar **advisors** shown on the **Advisors tab**. For example, there are predefined advisor groups such as [Administration](#), [Cluster](#), and [Heat Chart](#).

See Also [advisor](#), [Advisors tab](#).

Advisors tab

A page within the **UI** where you can manage **advisors**, both **standard** and **custom** ones. See [Section 2.3, “The Advisors Tab”](#).

See Also [advisor](#), [custom](#), [Dashboard](#), [standard](#).

Agent

The MySQL Enterprise Monitor component that actively collects data from MySQL server **instances**. The data is transmitted to the **Service Manager**. The Agent includes an optional subcomponent, the **Aggregator**, which can intercept query data as it passes between applications and the database, and again transmit that data to the Service Manager.

See Also [instance](#), [Service Manager](#).

Aggregator

An optional subcomponent of the **Agent**. It can intercept query data as it passes between applications and the database, and transmit that data to the **Service Manager**. To collect query data from applications requires using a MySQL Enterprise **Plugin** for the appropriate **Connector** based on the application language or framework.

See Also [Agent](#), [Connector](#), [plugin](#), [Service Manager](#).

alarm

The persistent record of an **event**, including its severity: **critical**, **warning**, or **informational**. Alarms are displayed in the **Heat Chart** and on the **Events tab**. Serious alarms produce **notifications**.

See Also [alert](#), [Critical](#), [event](#), [Informational](#), [notification](#), [Warning](#).

alert

A kind of **notification** caused by **rule** evaluation within an **advisor**. Displayed on the **Events tab**.

See Also [advisor](#), [alarm](#), [event](#), [Events tab](#), [notification](#), [SMTP](#), [Warning](#).

Apache

The web server that runs the **Tomcat** servlet container that powers the **UI**. The MySQL Enterprise Monitor **Service Manager** installation includes the Apache web server.

See Also [Dashboard](#), [Service Manager](#), [Tomcat](#).

asset

A component that the MySQL Enterprise Monitor product monitors, such as a MySQL server **instance**, or a CPU or file system within a server machine. Contrast with **metric**, which is a property within the component that is measured.

See Also [instance](#), [metric](#).

Asset Selector

The Groups shown in the **Asset Selector** are the ones you create and manage (on the [MySQL Instances Dashboard](#), or during Agent installation) and those that are discovered automatically from monitoring replication topologies. It is on the left side of many UI pages that controls content in the main-body of the page.

See Also [asset](#), [Dashboard](#), [graph](#).

autodiscovery

The mechanism that detects the set of **master**, **slave**, and **master/slave** servers in a **replication** configuration, and displays the **topology** in the **Server tree**.

See Also [Asset Selector](#), [master](#), [replication](#), [Server tree](#), [slave](#), [topology](#).

B

best practice

Within the MySQL Enterprise Monitor product, a best practice is a specific **rule** backed up by a **metric**. When a **threshold** value is reached, the **Service Manager** raises an **alarm**.

See Also [alarm](#), [metric](#), [rule](#), [Service Manager](#), [threshold](#).

blackout period

A time period where an **Agent** stops reporting information from a MySQL server **instance**. Typically, this is during a maintenance period when the database might go through an unusual workload that does not require raising any **alarms**.

See Also [Agent](#), [instance](#), [notification](#).

bottleneck

An aspect or component of a system whose capacity imposes a limit on performance. In MySQL Enterprise Monitor, you identify bottlenecks in areas such as I/O or memory usage using **graphs**, and use **advisors** to automatically raise **alerts** when problems occur.

See Also [advisor](#), [alert](#), [graph](#).

bundled

The “bundled MySQL server” refers to the MySQL server that can be installed along with the MySQL Enterprise Monitor product, to serve as the **repository** for the collected data.

See Also [repository](#).

C

C

The C programming language.

canonical query

A synonym for **normalized query**.

See Also [normalized query](#).

chain replication

In **replication**, a kind of **topology** where each server acts as a **master/slave** server, connected to at most two other servers.

See Also [circular replication](#), [master/slave](#), [replication](#), [topology](#).

circular replication

In a **replication** configuration, a **topology** where every server is both a **master** and a **slave**, connected to two other servers, forming a ring structure. Forms a **ring** structure.

See Also [replication](#), [ring replication](#), [topology](#).

collection

A set of related **advisors**.

See Also [advisor](#).

Connector

A software component (analogous to a “driver”) that provide connectivity to the MySQL server for client programs. MySQL comes with connectors for several programming languages and frameworks. The MySQL Enterprise Monitor product includes **plugins** for certain collectors, to help monitor **queries** sent by application programs and use that data within the **Query Analyzer**.

See Also [Connector/J](#), [Connector/Net](#), [Connector/PHP](#), [query](#), [Query Analyzer](#).

Connector/J

The **Connector** for applications written in the **Java** programming language. It communicates directly with the MySQL server without going through the **libmysqlclient** shared library.

See Also [Connector](#), [Java](#).

Connector/Net

The **Connector** for applications written with the **.NET** programming framework. It communicates directly with the MySQL server without going through the **libmysqlclient** shared library.

See Also [.NET](#), [Connector](#).

Connector/PHP

The **Connector** for applications written in the **PHP** programming language. The mechanism for communicating with the MySQL server may differ depending on the version of PHP involved.

See Also [Connector](#), [PHP](#).

credentials

The MySQL Enterprise Monitor product interfaces with many different databases and other kinds of servers. Each of these components can have its own login and security credentials. MySQL Enterprise Monitor pulls performance data from the MySQL servers that you monitor, stores the resulting data in a **repository** that is also a MySQL server, and sends alerts by communicating through other kinds of servers such as **SMTP** for e-mail alerts and **NMS** for **SNMP** traps. It pulls support-related data from the **My Oracle Support** site. You view the results in the **UI**, which is protected by its own login and optionally by **LDAP** authentication.

See Also [Dashboard](#), [LDAP](#), [NMS](#), [repository](#), [SMTP](#), [SNMP](#).

Critical

A high severity level for **alarms**. Within a **rule**, you can designate the **threshold** values that specify whether an alarm triggers a Critical, **Warning**, or **Informational** alert.

See Also [advisor](#), [alarm](#), [event](#), [Informational](#), [rule](#), [threshold](#), [Warning](#).

custom

User-created **rules** and **graphs**. Contrast with **standard**.

See Also [graph](#), [rule](#), [standard](#).

D

Dashboard

The MySQL Enterprise Dashboard is a web-based interface to the MySQL Enterprise **Service Manager**. The user interface consists of a series of tab pages. The back end is a **Java** application powered by the **Tomcat** server.

See Also [Advisors tab](#), [Events tab](#), [Graphs tab](#), [Monitor tab](#), [Query Analyzer tab](#), [Replication tab](#), [Service Manager](#), [Settings tab](#), [Tomcat](#), [What's New tab](#).

data collection item

Data values derived from server status variables, operating system status information, and MySQL table information. You can reference these items using mnemonic names in **expressions** when you create or edit **rules**.

See Also [expression](#), [rule](#).

E

event

A slightly more comprehensive synonym for **alarm**. Evaluating a **rule** generates an event. The result of an event can be “success” if everything is OK. An alarm is raised only if something goes wrong. You monitor events using the **Events tab**.

See Also [alarm](#), [alert](#), [Critical](#), [Events tab](#), [Informational](#), [notification](#), [Warning](#).

Events tab

A page within the **UI**, for monitoring **events**. See [Section 2.4, “The Events Tab”](#).

See Also [Dashboard](#), [event](#).

EXPLAIN plan

A textual report showing the internal mechanisms used by a **query**, and estimates for the “cost”, such as amount of data to process, involved in each step. Performance monitoring involves checking whether queries that are slow or frequently run could be sped up or made less resource-intensive, by examining the EXPLAIN plan to check if the MySQL optimizer has chosen the most efficient ways to process indexes, order join clauses, and so on. The MySQL Enterprise Monitor product includes a number of features for visualizing EXPLAIN plans. These features are language-dependent, relying on support in the various **Connectors** for programming languages and frameworks.

See Also [query](#).

expression

The part of a **rule** that tests a **metric** against a **threshold** value.

See Also [alarm](#), [metric](#), [rule](#), [threshold](#).

F

firewall

Additional considerations apply when the server you are monitoring is separated from the **Service Manager** by a firewall.

See Also [remote](#), [Service Manager](#), [SSL](#).

full table scan

An aspect of a [SELECT query](#) that often indicates a performance or scalability issue. The query scans every row in a table, rather than using an index to look up a subset of rows. It can be a non-issue for small tables that are cached in memory. It can be unavoidable when querying large tables to prepare reports. Performance issues are most likely when the table being scanned is involved in a join operation, when the query is run frequently, or when the result set only references a small fraction of the rows in the table.

To diagnose possible issues due to full table scans, choose a time period of heavy SQL activity from one of the **graphs**, use the **Query Analyzer** to locate queries that process large numbers of rows, and examine the **explain plan** for the queries. The notation in the explain plan that indicates a full table scan is [Type=ALL](#).

See Also [EXPLAIN plan](#), [graph](#), [query](#), [Query Analyzer](#).

G

graph

A visual representation of server activity, resources, or other **metrics** over time. You monitor graphs using the **Graphs tab**.

See Also [Graphs tab](#), [Heat Chart](#), [metric](#).

Graphs tab

A page within the **Dashboard** that displays **graphs** of server activity and resources. See [Section 2.5, “The Graphs Tab”](#).

See Also [Dashboard](#), [graph](#).

H

heartbeat

A periodic signal sent from each **agent** to the **Service Manager**, so that the Service Manager can verify that the agents are still running and able to connect. You typically use URLs containing “heartbeat” to verify a network connection between machines running different MySQL Enterprise Monitor components.

See Also [Agent](#), [Service Manager](#).

Heat Chart

A special chart that shows the status of critical rules. These rules are grouped together as an **advisor**, known as the Heat Chart Advisor. It can be displayed as part of the **Dashboard** or remain permanently open in its own window. See [Section 2.2.2, “The Heat Chart”](#).

See Also [advisor](#), [Dashboard](#).

host

A computer running one or more **instances** of **MySQL server**.

See Also [instance](#), [MySQL server](#).

I

Informational

A low severity level for **alarms**. Within a **rule**, you can designate the **threshold** values that specify the severity level that is triggered.

See Also [advisor](#), [Critical](#), [event](#), [rule](#), [threshold](#), [Warning](#).

instance

A `mysqld` daemon running on a MySQL server. There might be multiple instances running on the same server machine. An instance is one of the kinds of **asset** that the MySQL Enterprise Monitor product can monitor.

See Also [asset](#).

instrument

A persisted **instance** of a run-time **metric** evaluation. These may store the raw metric data, or the result of an expression or function against a metric. Instruments are generally stored for things that will show in the GUI, such as **graph** data.

See Also [graph](#), [metric](#).

inventory

Core information about a host or MySQL server **instance**. This data is collected by the **Agent**. The inventory includes details such as the MySQL server version number, supported storage engines and **replication** configuration. The data in the inventory helps to determine what other kinds of data can be collected from the hosts and MySQL servers.

See Also [Agent](#), [instance](#), [replication](#).

J

Java

The MySQL Enterprise **Plugin** for Connector/J enables any application using the Connector/J JDBC driver to supply **query analyzer** information directly to MySQL Enterprise Service Manager. Information is sent to the MySQL Enterprise Service Manager for analysis without any need to modify your applications.

The MySQL Enterprise Monitor product is also partly built on Java technology, using the **Tomcat** servlet container for the web-based GUI. It uses a JVM on the machine that runs the **Service Manager**, its performance is affected by the Tomcat configuration parameters, and during troubleshooting you might use diagnostic information from the Java environment.

See Also [Connector/J](#), [Dashboard](#), [JDBC](#), [plugin](#), [Query Analyzer](#), [Tomcat](#).

JDBC

The underlying database API used by many **Java** applications, including the **Connector/J** component.

See Also [Connector/J](#), [Java](#).

L

LDAP

An authentication mechanism that can control access to the **UI**. On Linux, Unix, and OS X systems, you might have a separate LDAP server where each user has their own **credentials**. On Windows systems, the LDAP protocol is used to connect to an Active Directory server for the same authentication purposes. Typically, you map LDAP roles to corresponding MySQL Enterprise Monitor **roles**, to enable groups of users to have basic or administrative access to the Dashboard without configuring each user individually, or giving them a new user ID and password, or requiring extra work to revoke access when they leave the organization.

See Also [credentials](#), [Dashboard](#), [role](#).

log file

The MySQL Enterprise Monitor product manages log files for the **Tomcat**, **repository**, and **Service Manager** components, as well as a configuration report pertaining to the initial installation. You can view each of these configuration files through the **UI**, or by examining the physical file.

See Also [Dashboard](#), [repository](#), [Service Manager](#), [Tomcat](#).

Lua

A programming language that is used for parts of the Agent, Aggregator, Service Manager, and Query Analyzer components. Although you do not need to know this language to operate the MySQL Enterprise Monitor product, sometimes you specify options containing file paths related to Lua scripts or libraries.

See Also [Agent](#), [Aggregator](#), [Query Analyzer](#), [Service Manager](#).

M

master

In a **replication** configuration, a database server that sends updates to a set of **slave** servers. It typically dedicates most of its resources to write operations, leaving user queries to the slaves. In complex **topologies**, a server can be both a master and a slave, known as a **master/slave**.

See Also [master/slave](#), [replication](#), [slave](#), [topology](#).

master/slave

In **replication**, a server that acts as a **slave** to receive updates from another server, and also acts as a **master** to propagate changes to another set of slave servers. Keeps the top-level master from having to service too many slaves, and allows certain kinds of changes to be propagated to a subset of slaves. This **topology** is represented as a **tree**, with all the intermediate nodes being master/slave servers.

See Also [master](#), [replication](#), [slave](#), [topology](#), [tree](#).

metric

Any property that is measured using a numeric value. Within MySQL Enterprise Monitor, such measurements can be displayed over time as a **graph**, or an **alert** can be sent when a **threshold** value is reached. Each metric is collected from an **asset**. For example, how much time is taken by a database query, or how full is the file system on a server machine.

See Also [alert](#), [asset](#), [graph](#), [threshold](#).

mixed replication

In a **replication** configuration, a kind of topology consisting of different combinations of **master**, **slave**, and dual-purpose **master/slave** servers.

See Also [chain replication](#), [circular replication](#), [master](#), [master/slave](#), [replication](#), [slave](#), [topology](#), [tree](#).

monitor

To view information about the state, health, activity, and history of a resource such as a MySQL server **instance**. Monitoring can help to diagnose problems, spot worrisome trends before they turn into problems, reassure when systems are operating normally, and notify when an operator needs to take corrective action. With MySQL Enterprise Monitor, the component you interact with during monitoring is the **UI**.

See Also [Dashboard](#), [instance](#).

Monitor tab

A page within the **UI** that provides a quick overview of your current monitoring information. It can serve as an instant health check for all the MySQL servers across the enterprise.

See Also [Dashboard](#).

My Oracle Support

The web site for filing bugs and **service requests** with Oracle Support. (Commercial customers such as MySQL Enterprise Monitor users now use the official Oracle support channel rather than the MySQL bug database.) In MySQL Enterprise Monitor, you interact with the support site through the **What's New tab**.

See Also [service request](#), [What's New tab](#).

MySQL server

The MySQL database **instance** running on a **host** computer. More than one MySQL instance can run on the same computer, either as separate `mysqld` processes or through virtualization.

See Also [instance](#).

N

.NET

A programming framework used by many Windows applications, including the **Connector/Net** component.

See Also [Connector/Net](#).

NMS

Acronym for Network Management System, a type of monitoring system that is separate from the MySQL Enterprise Monitor product. If your network has this kind of monitoring capability, MySQL Enterprise Monitor can notify the NMS of network issues by translating **events** into **SNMP** traps.

See Also [event](#), [SNMP](#).

normalized query

A condensed form of the query text used to treat similar queries as if they were identical, for monitoring performance. When MySQL Enterprise Monitor normalizes queries, it disregards differences in keyword capitalization, whitespace, and most comments. It replaces literal values with placeholders and transforms multi-row insert statements and [IN](#) clauses, to group similar statements with different parameters when measuring how much time is consumed by a particular type of query.

See Also [canonical query](#), [query](#).

notification

The e-mail or other form of communication triggered by an **alarm**. Notifications are defined using **Event Handlers**.

See Also [alarm](#).

notification group

A collection of users who should receive a **notification** when advisor **alerts** occur. These users might have login credentials for the **UI**, but this is not a requirement.

See Also [alert](#), [Dashboard](#), [notification](#).

P

PHP

A scripting language typically embedded within web pages.

See Also [Connector/PHP](#).

plugin

In the MySQL Enterprise Monitor product, a component that sits between the database and applications that use a particular language-based **Connector**. It collects query data from both standalone and web-based applications, for MySQL Enterprise Monitor to monitor. For example, there is the MySQL Enterprise Plugin for Connector/Net, and the MySQL Enterprise Plugin for Connector/J. The mechanism for transferring the data, such as whether the data flows through the **Aggregator** or the **Proxy**, depends on the particular connector.

See Also [Aggregator](#), [Connector](#), [proxy](#).

proxy

An optional subcomponent of the **Agent**. It can accept queries from user applications, forward them to a MySQL server, and return the query results back to the application. The agent records statistical information about the queries and results. You rearrange the TCP/IP ports so that the application communicates with the proxy instead of the database, either by changing the port where the application communicates with the database, or the port where the database listens.

See Also [Agent](#).

Q

QUAN

An abbreviation for **Query Analyzer** used in some keyword names.

See Also [Query Analyzer](#).

query

In the MySQL Enterprise Monitor context, any SQL statement whose performance might be monitored. Includes not just SQL [SELECT](#) queries, but also DML statements such as [INSERT](#), [UPDATE](#), and [DELETE](#), and DDL statements such as [CREATE TABLE](#) and [TRUNCATE TABLE](#).

See Also [normalized query](#), [slow query log](#).

Query Analyzer

The MySQL Enterprise Monitor component that tracks data about MySQL **queries** and summarizes that data using **graphs** and tables. You interact with it (for example, filtering the displayed queries or selecting a specific time period) using the **Query Analyzer tab** in the **UI**.

See Also [Dashboard](#), [graph](#), [query](#), [Query Analyzer tab](#).

Query Analyzer tab

A page within the **UI** that displays output and controls the options for the **Query Analyzer** component. See [Section 2.6, “The Query Analyzer Tab”](#) for an overview and [Chapter 3, Using the Query Analyzer](#) for usage information.

See Also [Dashboard](#), [Query Analyzer](#).

R

remote

Additional considerations apply when the server you are monitoring is separated from the **Service Manager**, for example by a wide-area network or by a **firewall**.

See Also [firewall](#), [SSL](#).

replication

A set of database features that mirrors the same data across a set of servers. Used for reliability in case of server failure, and to speed up queries by dividing the work across servers. Because replication involves so many aspects of reliability and performance, it is an important aspect to monitor and has a dedicated **Replication tab** in the **UI**.

See Also [Dashboard](#), [Replication tab](#), [topology](#).

Replication tab

A page within the **UI** that monitors aspects of **replication**. See [Section 2.7, “The **Replication Tab**”](#).

See Also [Dashboard](#), [replication](#).

repository

The database that stores the monitoring data collected by the MySQL Enterprise Monitor product. It can be a separate database **instance** that is part of the MySQL Enterprise Monitor installation (the **bundled** MySQL server), or you can use an existing database of your own. The bundled MySQL server is a level of MySQL database that is fully tested with the MySQL Enterprise Monitor product, and can be kept separate from your other databases to avoid any extra load on them. You might use an existing server that has spare capacity, fast storage devices, tuned configuration parameters, a backup system, or other conveniences that can benefit the MySQL Enterprise Monitor data storage as well.

See Also [bundled](#), [instance](#).

ring replication

See [circular replication](#).

role

A level of access privilege for the **UI**. One of [manager](#) (highest privilege), [dba](#), [read-only](#), or [agent](#) (specialized privilege for sending data). Each user account registered with the Dashboard must have one of these roles. Components such as the **Agent** and the **Aggregator** use the [agent](#) role. To simplify the process of granting **credentials** for large numbers of users, you can map **LDAP** roles to these MySQL Enterprise Monitor roles.

See Also [Agent](#), [Aggregator](#), [credentials](#), [Dashboard](#), [LDAP](#).

rule

A test consisting of an **expression** and one or more **threshold** values that correspond to different **alert levels**. When the value of the expression reaches one of the threshold values, an event is generated. Depending on how you configure the rule, the event can result in an **alarm**, a **notification**, or both.

See Also [advisor](#), [alarm](#), [event](#), [expression](#), [notification](#), [threshold](#).

S

schedule

Determines how often each **advisor** is evaluated.

See Also [advisor](#).

scope

A dynamic filter against an **asset** class.

See Also [asset](#).

Server tree

A section of the **UI** window that shows individual and groups of MySQL servers. Significant aspects of the Server Tree include the host names of the servers (including the port number if different than the default), and the tooltip information when you hover the mouse pointer over an item in the tree. Selecting one or more items in the tree determines the scope of the information displayed in **graphs**, **Heat Chart**, and so on the **Monitor tab**.

See Also [Dashboard](#), [graph](#), [Heat Chart](#), [Monitor tab](#).

Service Manager

The core MySQL Enterprise Monitor component that receives the monitoring data from the **Agent**, **Aggregator**, and **Query Analyzer** components. It displays this information through the GUI web-interface, and manages all the **advisors**, **rules**, and **alerts**.

See Also [advisor](#), [Agent](#), [Aggregator](#), [alert](#), [Dashboard](#), [Query Analyzer](#), [rule](#).

service request

Generic term for a bug that you have filed or a support request that you have opened, on the **My Oracle Support** site. Formerly, we referred to these as **support issues**.

See Also [My Oracle Support](#), [support issue](#).

Settings tab

A page in the **UI** where you see or change configuration settings for the **Service Manager**.

See Also [Dashboard](#), [Service Manager](#).

severity

A measure of the seriousness of an **alert**. Serious alerts trigger **alarms**.

See Also [alarm](#), [alert](#), [rule](#).

slave

In a **replication** configuration, a database server that receives updates from a **master** server. Typically used to service user queries, to minimize the query load on the master. In complex **topologies**, a server can be both a master and a slave, known as a **master/slave**.

See Also [master](#), [master/slave](#), [replication](#), [topology](#).

slow query log

A MySQL Server facility for tracking [queries](#) that consume considerable time and resources. MySQL Enterprise Monitor provides more information about query performance than the slow query log, and does not currently use the slow query log itself.

See Also [query](#).

SMTP

The e-mail protocol for sending **alerts** as e-mail messages. To send alerts this way, you configure e-mail settings similar to those in an e-mail client.

See Also [alert](#).

SNMP

A protocol for sending event **notifications** ("SNMP traps") to an **NMS**. The MySQL Enterprise Monitor product can turn notifications for selected rules into SNMP traps. In contrast to typical **alerts** that are only raised when some issue occurs, SNMP traps are broadcast for all state changes, so that corrective action can be cancelled when an issue is cleared.

See Also [alert](#), [NMS](#), [notification](#).

SSL

For MySQL Enterprise Monitor, the default port used for SSL connections is 18443. If you are connecting using SSL, the built-in MySQL Enterprise Monitor certificate is self-signed and may be highlighted as "unsafe" within the browser on initial connection. To prevent problems accessing the site, add an exception for the certificate to your browser for this server.

standard

The predefined **rules** and **graphs** supplied as part of the MySQL Enterprise Monitor product. Contrast with **custom**.

See Also [custom](#), [graph](#), [rule](#).

support issue

Former term for bugs and service requests. In the My Oracle Support system, now known as a **service request**, which is the preferred term.

See Also [service request](#).

T

table scan

See [full table scan](#).

threshold

The cutoff value in a **rule**. When the rule's **expression** passes this value, an **alert** is triggered. There can be different threshold values to trigger the different level alerts.

See Also [alert](#), [Critical](#), [expression](#), [Informational](#), [rule](#), [Warning](#).

Tomcat

A component of the **Service Manager**, the servlet engine that powers the **UI**.

See Also [Apache](#), [Dashboard](#), [Java](#), [Service Manager](#).

topology

In a **replication** configuration, the way in which the different **master**, **slave**, and dual-purpose **master/slave** servers are connected. In MySQL Enterprise Monitor, the configurations are classified in the **Replication Tab** as one of [TREE](#), [RING](#), or [MIXED](#).

See Also [master](#), [master/slave](#), [replication](#), [Replication tab](#), [slave](#).

tree

A data structure often used to represent relationships between MySQL servers. In the **UI**, servers are displayed in the **Server Tree** sidebar. In a **replication** configuration, setting up some machines as dual-purpose **master/slave** servers produces a nesting relationship that is represented in the Server Tree.

See Also [Asset Selector](#), [Dashboard](#), [master/slave](#), [replication](#), [Server tree](#).

U

UI

The UI is a web-based interface to the MySQL Enterprise **Service Manager**. The back end is a **Java** application powered by the **Tomcat** server.

See Also [Dashboard](#).

UUID

A unique identifier used to distinguish each MySQL **instance**, host machine, and **agent**. Because there is so much flexibility in spreading components across multiple systems or running multiple instances and agents on the same system, the combination of these different UUIDs identifies where information came from and the source of any issues. Always generate a new UUID for any one of these components, rather than copying or reusing an existing UUID value.

In MySQL Enterprise Monitor, the UUID for a MySQL server is stored in the table `mysql.inventory`. When a component such as the Agent or a Connector plugin connects to that MySQL server, the applicable MySQL user must have privileges to read this table.

See Also [Agent](#), [instance](#).

W

Warning

A medium severity level for **alarms**. Within a **rule**, you can designate the **threshold** values that specify for each severity level.

See Also [advisor](#), [alarm](#), [alert](#), [Critical](#), [event](#), [Informational](#), [notification](#), [rule](#), [threshold](#).

What's New tab

A page within the **UI** that provides updates and news related to MySQL Enterprise Monitor and your **My Oracle Support** account.

See Also [Dashboard](#), [My Oracle Support](#).

Index

Symbols

.NET connector plugin, 74

A

- admin option, 345, 345, 345, 345
- adminpassword option, 147
- adminuser option, 146
- advisor, 453
- advisor group, 453
- advisors
 - creating, 95
 - customizing, 103
 - log file, 49
- Advisors tab, 16, 453
- agent
 - configuring for each MySQL server, 358
 - installation, 121
 - log file, 49
 - proxy, 78
 - troubleshooting, 139
- Agent, 453
- agent option, 345, 346, 346, 346, 346, 346, 347, 347, 347, 347, 348, 348, 348, 349, 349, 349, 349, 349, 350, 350, 351, 352, 355
- agent-ssh-keygen-attempts option, 348
- agent-ssh-keygen-retry option, 349
- agent-instance.ini file, 358
- agentpassword option, 149
- agentuser option, 149
- aggr-address option, 352
- aggr-lua-script option, 352
- aggr-max-request-body-size option, 352
- aggr-mem-baseurl option, 353
- aggr-ssl-address option, 353
- aggr-ssl-ca-file option, 353
- aggr-ssl-cert option, 353
- aggr-ssl-ciphers option, 353
- aggr-test-mode option, 353
- aggr option, 356
- aggregator, 76
- Aggregator, 453
- aggregatorport option, 149
- aggregatorsslcafile option, 149
- aggregatorsslcertfile option, 149
- aggregatorsslport option, 150
- aggregator_connect_timeout_sec option, 71
- aggregator_connect_timeout_usec option, 72
- aggregator_password option, 71
- aggregator_url option, 71
- aggregator_user option, 71

- alarm, 453
- alert, 453
- Apache, 453
 - log file, 49
- architecture, 1
- asset, 453
- Asset Selector, 454
- autodiscovery, 454

B

- backups, 246
- basedir option, 351
- best practice, 454
- blackout period, 104, 454
- bottleneck, 454
- browsers, 244
- bundled, 454

C

- C, 454
- canonical query, 454
- Catalina
 - log file, 49
- catalina.out log file, 52
- chain replication, 454
- ChangeLog, 451
- changes
 - release notes, 451
- checkmysqlhost option, 150
- circular replication, 454
- clientCertificateKeystorePassword option, 66
- clientCertificateKeystoreType option, 66
- clientCertificateKeystoreUrl option, 66
- collection, 454
- config.properties file, 335
- configuration files, 334
- Connector, 455
- Connector/J, 62, 455
- Connector/Net, 74, 455
- Connector/PHP, 455
- createaccount option, 150
- credentials, 455
- Critical, 455
- custom, 455
- custom data collection item, 102

D

- daemon option, 357
- Dashboard, 455
- data collection item, 455
- data collection items, 361
- data_collection_interval option, 337
- dbhost option, 147

dbpool.default.initialSize option, 339
dbpool.default.maxActive option, 339
dbpool.default.maxIdle option, 339
dbpool.default.maxWaitMillis option, 339
dbpool.default.minEvictableIdleTimeMillis option, 339
dbpool.default.minIdle option, 339
dbpool.default.timeBetweenEvictionRunsMillis option, 339
dbpool.ui.initialSize option, 338
dbpool.ui.maxActive option, 338
dbpool.ui.maxIdle option, 338
dbpool.ui.maxWaitMillis option, 338
dbpool.ui.minEvictableIdleTimeMillis option, 338
dbpool.ui.minIdle option, 338
dbpool.ui.timeBetweenEvictionRunsMillis option, 338
--dbport option, 147
--debuglevel option, 144, 150
--debugtrace option, 144, 151
debug_callback option, 72
--defaults option, 351
deinstalling, 168
disableSourceLocation option, 64
disable_backtrace option, 72

E

--enableagent option, 151
--enableaggregator option, 151
--enableproxy option, 151
event, 456
--event option, 351
Events tab, 23, 456
EXPLAIN plan, 456
expression, 456
expressions, 98

F

FAQs, 441
firewall, 456
firewall issues, 138
--forceRestart option, 147
full table scan, 456

G

graph, 456
graph.cache.period.minutes option, 337
graphs
 creating, 95, 102
Graphs tab, 26, 457

H

heartbeat, 457
Heat Chart, 457
--help option, 143, 155, 344, 344, 344, 344, 344, 344

Hibernate
 log file, 49
host, 457
--host option, 348

I

Informational, 457
installation
 agent, 121
 postinstall tasks, 156
 service manager, 109
 unattended, 141
 uninstalling, 168
 upgrading, 158
--installdir option, 145, 151
--installer option, 145, 151
instance, 457
instrument, 457
internal_perf_enable option, 337
internal_perf_server_id option, 337
inventory, 457

J

Java, 457
Java connector plugin, 62
Java VM
 diagnostic report, 52
 installation, 109
 role in MySQL Enterprise Service Manager core,
 version and environment info, 51
JDBC, 458
 log file, 49

K

--keepalive option, 351

L

LDAP, 458
limitations, 243
Linux, 112, 117, 123, 133, 169, 244, 334
locale, 121
--log option, 352, 353, 354, 354
log file, 458
 Dashboard interface for all components, 49
 MySQL Enterprise Service Manager, 334
log_file option, 73
Lua, 458
--lua option, 354, 354
Lua scripting language,

M

--managerhost option, 152
--managerport option, 152

- managersslport option, 152
- master, 458
- master/slave, 458
- max option, 354
- metric, 458
- MIB file, 335
- migration, 247
- mixed replication, 459
- mode option, 144, 152
- monitor, 459
 - installation, 109
- monitor option, 355, 355, 355, 355
- Monitor tab, 459
- My Oracle Support, 459
- MySQL Enterprise Backup, 246
- MySQL Enterprise Monitor User Interface, 9
- MySQL Server
 - installation, 109
- MySQL server, 459
- mysql-monitor-agent.log file, 359
- mysql-monitor-agent.pid file, 359
- mysqlconnmethod option, 153
- mysqld option, 355
- mysqldump, 246
- mysqlenterprise.* options, 62, 68
- mysqlhost option, 153
- mysqlpassword option, 153
- mysqlport option, 153
- mysqlsocket option, 153
- mysqluser option, 153
- mysql_installation_type option, 147
- mysql_ssl option, 146

N

- .NET, 459
- Network timeouts, , ,
- NMS, 459
- no option, 356
- normalized query, 459
- notification, 459
- notification group, 459
- notify_thread_pool_size option, 337

O

- optionfile option, 143, 154
- overview, 1

P

- PHP, 460
- PHP connector plugin, 68
- pid option, 357
- plugin, 460
- plugin option, 356

- plugins option, 356
- port
 - agent administration, 345
- ports
 - agent, proxy, and MySQL server, 78
 - aggregator, 126, 149
 - aggregator SSL, 150
 - LDAP, 39
 - MySQL server, 357
 - MySQL server for monitoring, 153
 - MySQL server for repository, 147
 - proxy, 93, 126, 154, 356
 - service manager, 64, 145, 152
 - service manager SSL, SMTP, 32
 - SNMP, 33
 - special values for MySQL Enterprise Monitor, 110
 - Tomcat, 111, 145
 - Tomcat shutdown, 111, 145
 - Tomcat SSL, 111, 145
- postinstall tasks, 156
- proxy, 78, 460
- proxy-address option, 356
- proxy-backend-addresses option, 357
- proxy-connect-timeout option, 357
- proxy-fix-bug-25371 option, 357
- proxy-lua-script option, 357
- proxy-pool-no-change-user option, 357
- proxy-read-only-backend-addresses option, 356
- proxy-read-timeout option, 357
- proxy-skip-profiling option, 357
- proxy-write-timeout option, 357
- proxyport option, 154
- proxyuser option, 154

Q

- QUAN, 460
- quanal.collect option, 337
- quan_enabled option, 71
- query, 460
- Query Analyzer, 59, 460
 - .NET connector, 73
 - Dashboard tab, 28
 - Java connector, 62
 - PHP connector, 68
 - supplying query data, 60
 - troubleshooting, 92
- Query Analyzer tab, 82, 460

R

- release notes, 451
- remote, 460
- replication, 461

- log file, 49
- Replication tab, 29, 461
- repository, 461
- role, 461
- rootpassword option, 155
- rootuser option, 155
- rule, 461
- rules
 - blackout periods, 104
 - creating, 95, 100
 - disabling, 103
 - variable substitution, 98

S

- schedule, 461
- scope, 461
- Server tree, 461
- service manager
 - installation, 109
- Service Manager, 462
- service request, 462
- serviceManagerConnectTimeout option, 65
- serviceManagerPassword option, 65
- serviceManagerResponseTimeout option, 65
- serviceManagerUrl option, 64
- serviceManagerUser option, 64
- servicename option, 155
- Settings tab, 31, 462
- severity, 462
- slave, 462
- slow query log, 462
- SMTP, 462
- SNMP, 462
- SNMP traps, 335
- Source
 - service manager, 64
- SQL
 - log file, 49
- SSH tunnelling, 138
- SSL, 145, 150, , 462
- SSL keystore, 334
- standard, 462
- starting
 - MySQL Enterprise Monitor service, 117, 118
- statementInterceptors option, 64
- stopping
 - MySQL Enterprise Monitor service, 117, 118
- support issue, 463
- supportReport.retention.minutes option, 338

T

- third-party contributions, 174
- thread_pool_size option, 337

- threshold, 463
- thresholds, 98
- timezone, 121
- Tomcat, 463
 - catalina.out log file,
 - configuring parameters, 245, 333
 - installation, 109
 - log file, 49
 - ports, 111
 - role in MySQL Enterprise Service Manager core, 2
 - starting and stopping, 117, 118
- tomcatport option, 145
- tomcatshutdownport option, 145
- tomcatsslport option, 145
- topology, 463
- track option, 351
- tree, 463
- troubleshooting, 139
 - Query Analyzer, 92
- trustCertificateKeystorePassword option, 66
- trustCertificateKeystoreType option, 66
- trustCertificateKeystoreUrl option, 66

U

- UI, 463
- ui.javascript.useClientSideStorage option, 338
- unattended installation, 141
- unattendedmodeui option, 146, 154
- uninstalling, 168
- Unix, 112, 123, 133, 169, 244, 334
- upgrading, 158
- URLs
 - agent administration, 345
 - MySQL server, 357
 - service manager, 64
- use-external-glib option, 154
- user option, 357
- usessl option, 146, 155
- UUID, 138, 463

V

- variable substitution, 98
- verbose option, 358
- verifySslCerts option, 66
- verifySslHostnames option, 65
- version option, 143, 155, 358

W

- Warning, 463
- Web browsers, 244
- What's New tab, 53, 464
- Wiki markup, 99
- Windows, 115, 118, 128, 132, 168, 244, 334

X

XML file for custom data items, 103

