Oracle Enterprise Manager for MySQL Database 12.1.0.2.0

Abstract

This manual documents Oracle Enterprise Manager for MySQL Database 12.1.0.2.0.

For legal information, see the Legal Notice.

Document generated on: 2015-05-04 (revision: 5675)

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Preface and Legal Notices

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Chapter 1 Installing Oracle Enterprise Manager for MySQL Database

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Oracle Enterprise Manager for MySQL Database extends Oracle Enterprise Manager to enable monitoring of MySQL servers.

Note

Although Oracle Enterprise Manager for MySQL Database is based on MySQL Enterprise Monitor, it does not contain the following MySQL Enterprise Monitor functionality:

- Query Analyzer
- Support for monitoring MySQL Cluster
- All Advisors and graphs. Oracle Enterprise Manager for MySQL Database contains a subset of the MySQL Enterprise Monitor Advisors and graphs.
- Replication topology diagrams.

Important

Oracle Enterprise Manager for MySQL Database is commercially licensed and is available in MySQL Enterprise Edition and select Commercial Editions. Learn more at http://www.mysql.com/products/.

This chapter describes how to install Oracle Enterprise Manager for MySQL Database.

To install and deploy the plug-in, you must do the following:

1. Ensure the prerequisites are installed and correctly configured. For more information, see Section 1.1, “Prerequisites”.
2. Download the plug-in and deploy it on the OMS and Management Agent as described in the Oracle Enterprise Manager Cloud Control Administrator's Guide.

   Oracle Enterprise Manager for MySQL Database is available from the following locations:

   - The **Self Update** section of Oracle Enterprise Manager 12.1.0.4 (or higher).
   - Oracle Software Delivery Cloud - available in the MySQL Database Product Pack.
   - My Oracle Support - download from the **Patches/Updates** tab. (Product: Enterprise Manager for MySQL Database)

3. Configure a MySQL target in OMS. Adding a target triggers the collection of metrics from the Management Agent. A subset of the collected data is displayed in the target homepage. For more information, see Section 1.3, “Configuring a MySQL Target”.

1.1 Prerequisites

This section describes the prerequisites for a successful Oracle Enterprise Manager for MySQL Database installation.

- Oracle Enterprise Manager Cloud Control 12.1.0.4 (or higher) for OMS (12.1.0.4.0 and Patch 20392036), Enterprise Manager Repository, and Management Agent (12.1.0.4.0 + Patch 20613931). Ensure the agent can successfully communicate with your Oracle Enterprise Manager Server and can upload data.
- MySQL 5.5 or higher.
- Supported platforms: The plugin can be deployed on OEM Management Agents on the following Operating Systems:
  - Solaris (SPARC)
  - Solaris Operating System (x86-64)
  - Linux x86 (32-bit), glib2.4 or higher
  - Linux x86-64 (64-bit), glib2.4 or higher
  - Microsoft Windows x86-64 (64-bit)

Important

Consult the MySQL Supported Platforms list for more information. HP-UX, AIX, FreeBSD and Mac OS X are not supported.

- The user installing the Oracle Enterprise Manager Agent must, at least, belong to the MySQL user group of the monitored database.
- The Oracle Enterprise Manager Agent requires a user on the monitored MySQL instance. This user requires the following privileges:
  - SELECT
  - REPLICATION CLIENT
  - SHOW DATABASES
  - SUPER
  - PROCESS ON

  The following example shows how to create these rights for a user named `monitoring`, assuming a local agent with a socket connection:

```
GRANT SELECT, REPLICATION CLIENT, SHOW DATABASES, SUPER, PROCESS ON *.*
 TO  'monitoring'@‘localhost' IDENTIFIED BY 'password’;"
```

- For optimal performance, ensure that the monitored MySQL database is on a different machine from the OMS and Enterprise Manager Repository.

- Ensure the MyOracle Support credentials are set up using the SYSMAN user.
- Ensure that the Software Library (also known as the local store) is configured. Updates are downloaded to the local store before they are deployed.

1.2 Obtaining and Installing the Plugin

For instructions on how to obtain, install, upgrade, and deploy the plugin, consult the following Oracle Enterprise Manager documentation, http://docs.oracle.com/cd/E24628_01/doc.121/e24473/plugin_mngr.htm.

1.3 Configuring a MySQL Target

You must configure a MySQL target that is monitored by Enterprise Manager Cloud Control. Metrics are not collected until the MySQL database is added as a target.

Note

When adding a target, if the plug-in is not deployed on that target, the system automatically deploys the plug-in to the Management Agent on the target host.

1. From the **Setup** menu, select **Add Target**, and select **Add Targets Manually**.
2. In the **Add Targets Manually** page, select **Add Targets Declaratively by Specifying Target Monitoring Properties** .
3. In the **Target Type** field, select **MySQL Database**.

   The **Monitoring Agent** field is displayed enabling you to search for a monitoring agent.

   Click the search icon next to the **Monitoring Agent** field.
4. The **Search and Select Targets** page is displayed.

   In the **Target Type** field, select **Agent** and click **Search**.
5. A list of available agents is returned.
6. Select the agent and click **Select**.

   The **Search and Select Targets** page closes and **Monitoring Agent** field on the **Add Targets Manually** page is populated with the name of the selected Monitoring Agent.
7. On the **Add Targets Manually** page, click **Add Manually**.

   The **Add MySQL Database** page is displayed.
8. Complete the following fields:
   - **Target Name**: A unique name for the target. This value is displayed in the **All Targets** page.
   - **MySQL User**: The username used to connect to the database. See Section 1.1, “Prerequisites” for more information on configuring this user.
   - **MySQL Password**: The password of the MySQL user.
   - **Confirm MySQL Password**: Re-enter the MySQL user password.

- **Host**: The hostname of the MySQL database. This can be an IP address or fully-qualified name. If the database is local, you can specify `localhost`. Specify a value only if TCP/IP is the connection method used. Default host is localhost.
- **Port**: The port used to connect to the database. Specify a value only if TCP/IP is the connection method used. Default port is 3306.
- **Socket**: The socket used to connect to the database. Specify a value only if socket is the connection method used.

9. Click OK to save the target.
10. Click **Targets** and select **All Targets**to return to the **All Targets** page.

    The new target is displayed as **MySQL Database** in the **Databases** Target Type.

Important

Do not attempt to access the new target until a green arrow is displayed for the new target in the **Target Status** column.

It is also possible to monitor a remote MySQL database without deploying an agent or plug-in to that host. To remotely monitor a MySQL database, repeat these steps with an existing agent and, on the **Add MySQL Database** page, add the details for the remote database.

Remote monitoring does not allow monitoring of the host machine, only of the MySQL database running on that host.

1.4 Modifying Target Credentials and Properties

It is possible to change the credentials and connection properties after setting up the target. These properties can be changed from the command line and from the OMS dashboard.

Modifying the Target Instance Definition from the Command Line

You can modify the target instance definition from the command line using the `modify_target` verb with the `-type="oracle_omys_database"` parameter.

For more information on the `modify_target` verb, see Target Data Verbs in the Oracle Enterprise Manager Cloud Control Administrator's Guide.

The following target properties can be modified:

- Username: set using the `-credentials` parameter with the `oracle_omys_database_username` property.
- Password: set using the `-credentials` parameter with the `oracle_omys_database_password` property.
- Host name: set using the `-properties` parameter with the `oracle_omys_database_host` property.
- Port: set using the `-properties` parameter with the `oracle_omys_database_port` property.
- Socket: set using the `-properties` parameter with the `oracle_omys_database_socket` property.

The following example changes the properties and credentials of an existing target instance definition:

```
$ emcli modify_target -name="targetExample:3306" -type="oracle_omys_database"
  -credentials="oracle_omys_database_username=root;oracle_omys_database_password:password1"
  -properties="oracle_omys_database_host=example2;oracle_omys_database_port=9999"
  -on_agent
```

where:

- `-name` defines the name of the target to modify.
- `-type` defines the type of the monitored instance. `oracle_omys_database` defines a MySQL database type.
- `-credentials` changes the username and password to `root` and `password1`, respectively.
- `-properties` changes the host and port number to `example2` and `9999`, respectively.
- `-on_agent` propagates the changes to the Management Agent collecting this target's metrics.

Modifying the Target Instance Definition from the OMS Dashboard

To change the credentials used to log on to the monitored MySQL database, do the following:

1. Click **Setup** to expand the menu.
2. From the **Security** menu, select **Monitoring Credentials.**

   The **Monitoring Credentials** page is displayed.
3. Select **MySQL Database** from the list of target types and click the **Manage Monitoring Credentials** button.

   The **MySQL Database Monitoring Credentials** page is displayed.
4. Select the target you want to edit, and click **Set Credentials**.
5. Edit the credentials as required and click **Save**.

   The new credentials are saved.

To edit the connection details, do the following:

1. Navigate to the target page of the target you want to edit.
2. From the target's configuration menu, select **Target Setup** and click **Monitoring Configuration**.

   The **Monitoring Configuration** page is displayed.
3. Edit the Host, Port, or Socket as required and click **OK** to save your changes.

1.5 Oracle MySQL Discovery

It is possible to discover MySQL instances automatically, using OMS Auto Discovery.

To configure Auto Discovery for Oracle MySQL, do the following:

1. From the **Setup** menu, select **Add Target**, **Configure Auto Discovery**.

   The **Setup Discovery** Page is displayed.

2. From the **Targets on Hosts** table, select the host to auto-discover.
3. Click **Discovery Modules**.

   The **Discovery Modules: hostname** page is displayed.
4. Select the **Oracle MySQL Discovery** module.
5. Click **OK** to save your changes and continue.

   The **Setup Discovery** page is displayed again.

   

   Note

   It can take some time for the instances to be discovered.
6. From the **Setup** menu, select **Auto Discover Results** from the **Add Target** menu.

   The target(s) added in the previous step are listed in the **Targets on Hosts** tab.
7. Select the host and click **Promote**.

   The **Promote Unmanaged Target** page is displayed.
8. Populate the fields as required.

   

   Note

   The **Properties** section is auto-populated if the permissions and users are set up correctly. If the permissions are incorrect, or the process is running under another user's account, some of these values do not auto-populate.

   If both Port and Socket are populated, Port takes precedence over Socket. If you want to use socket only, you must delete the value in the **Port** and **Host** fields.
9. Click **Promote**.

   The **Confirmation** dialog displays the progress of the promotion and prompts when finished.
10. Click **OK** and open the **All Targets** page to locate the new target.

Auto Discovery Target Naming

The target is named according to the following rules:

- Hostname:PortNumber - If the target is listening on TCP
- Hostname:SocketPath - If the target is listening over a socket.
- Hostname.pid - If neither port number nor socket can be resolved, the process identifier (pid) of the monitored MySQL instance is used.

Important

If the Hostname.pid naming convention is used, and the MySQL instance is restarted, a new unmanaged target is added to the results list because a new process id is assigned causing the name of the target to change.

Hostnames generated using this method are not deleted from the results list if the MySQL server is restarted and the new, generated name added to the list. You must manage the old, generated hostnames manually.

1.6 Deleting a Target

To delete a target, do the following:

1. Navigate to the remotely-monitored target's homepage.
2. From the **MySQL Database** menu, select **Remove Target** from the **Target Setup** menu.
3. Follow the instructions on screen to remove the selected target.

Note

Removing a target does not undeploy the plug-in from the management agent, but stops the collection of metrics from that host.

1.7 Logging

This section describes the Oracle Enterprise Manager for MySQL Database logging. For information on the Oracle Management Service or Management Agent logs, see Locating and Configuring Enterprise Manager Log Files.

Oracle Enterprise Manager Agent uses the log4j library for all agent and plugin logging. The logging configuration is defined by the properties of the `log4j.properties` file.

Log files specific to the Oracle Enterprise Manager for MySQL Database plugin are written to the following location of your OEM Agent installation:

```
/plugins/oracle.mysql.omys.agent.plugin_versionNumber/scripts/
oracle_omys_database/logs
```

The log configuration is stored in the following directory of your OEM Agent installation:

```
/plugins/oracle.mysql.omys.agent.plugin_versionNumber/scripts/
oracle_omys_database/etc
```

where `versionNumber` is the version of the plugin.

The auto-discovery plugin's logging is also configured by a `log4j.properties` configuration. By default this file is created in the `/plugins/oracle.mysql.omys.discovery.plugin_versionNumber/scripts/oracle_omys_database/etc` directory of your Management Agent installation.

The default auto-discovery log output directory is: `/plugins/oracle.mysql.omys.discovery.plugin_versionNumber/scripts/oracle_omys_database/logs`

`versionNumber` is the version of the plugin.

The following is an example of the `log4j.properties` file:

```
log4j.rootCategory = INFO, file
```

```
#log4j.logger.com.mysql.etools.emplugin.collection.availability = DEBUG
#log4j.logger.com.mysql.etools.emplugin.collection.discovery = DEBUG
#log4j.logger.com.mysql.etools.emplugin.collection.assets = DEBUG

log4j.logger.com.mysql.etools.agent.collection.os.StandardHostIdProvider = WARN
log4j.logger.org.springframework.beans.factory.support.DefaultListableBeanFactory = WARN
log4j.logger.org.springframework.context.support.ClassPathXmlApplicationContext = WARN
log4j.logger.org.springframework.scheduling.concurrent.ThreadPoolTaskScheduler = WARN
log4j.logger.com.mysql.etools.schedule.Scheduler = WARN
log4j.logger.org.springframework.beans.factory.xml.XmlBeanDefinitionReader = WARN
log4j.logger.org.springframework.jdbc.support.SQLErrorCodesFactory = WARN
log4j.logger.com.mysql.etools.agent.collection.SigarExecutor = WARN
log4j.logger.org.springframework.jdbc.datasource.SingleConnectionDataSource = WARN
log4j.logger.com.mysql.etools.springboard.Springboard = WARN

log4j.appender.file = org.apache.log4j.RollingFileAppender
log4j.appender.file.layout = org.apache.log4j.PatternLayout
log4j.appender.file.layout.ConversionPattern = %d %5p [%t:%c] %m%n
log4j.appender.file.Append = true
log4j.appender.file.MaxFileSize = 10MB
log4j.appender.file.MaxBackupIndex = 10
log4j.appender.file.File = ${logging.path}/myoem.log
```

A general log and collection-type logs are generated for each monitored MySQL instance. The collection-type logs, defined by the `log4j.logger.com.mysql.etools.emplugin.collection.*` properties, which are commented out by default, log details of availability, metrics, response times, and so on. One log file is generated for each collection type. The general log, defined by the `log4j.logger.*` properties, logs details of the plugin behavior, errors, status messages and so on. The log files rollover at 10MB and up to 10 files per log type are retained. Logs older than the 10-file limit are deleted.

It is not recommended to edit the log properties unless requested to do so by your Support representative.

The `log4j.appender.*` properties define the logging properties and output.

Chapter 2 Working with the MySQL Database Target Page

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This chapter provides an overview of Oracle Enterprise Manager for MySQL Database target page.

The following topics are described:

- Section 2.1, “Viewing the MySQL Database Target Homepage”
- Section 2.2, “MySQL Database Homepage Menu”
- Section 2.3, “MySQL Database Homepage Regions”

2.1 Viewing the MySQL Database Target Homepage

The MySQL Database target page enables you to gather monitoring and metrics information specific to MySQL targets.

To open the Oracle Enterprise Manager for MySQL Database target page, do the following:

1. Select **All Targets** from the **Targets** menu.

   The **All Targets** page is displayed.

2. Expand the **Databases** section of the **Target Type** section and select **MySQL Database**.

   The list of available MySQL Database targets is filtered to display only the available MySQL hosts.

3. Select the target.

   The MySQL Database target page is displayed:

Figure 2.1 MySQL Database Target Homepage

2.2 MySQL Database Homepage Menu

The **MySQL Database** menu on the MySQL Target page contains standard Enterprise Manager Cloud Control menu choices and several menus customized for the MySQL Database plug-in. Only those menus customized for the MySQL Database plug-in are described here:

- Performance sub-menu: opens graph pages for the following:
  - Connections
  - Statements
  - InnoDB Buffer Pool
  - InnoDB File I/O
  - Tables/Rows
  - Query Cache

For more information, see Chapter 3, *Performance Pages*.

2.3 MySQL Database Homepage Regions

This section describes the regions displayed on the MySQL Database target homepage. The following regions are available:

- Section 2.3.1, “Availability History”
- Section 2.3.2, “Configuration Summary”
- Section 2.3.3, “Connections”
- Section 2.3.4, “Transaction Activity”
- Section 2.3.5, “Row Activity”
- Section 2.3.6, “InnoDB Buffer Pool Usage (pages)”

- Section 2.3.7, “Response Time (ms)”
- Section 2.3.8, “Statement Activity”
- Section 2.3.9, “Incidents and Problems”

2.3.1 Availability History

The Availability History region displays the MySQL Database's uptime in graph format. It displays the uptime as a percentage of time monitored and as a bar chart.

Figure 2.2 Availability History

2.3.2 Configuration Summary

The **Configuration Summary** region displays the configuration details of the monitored host. It displays such details as the hostname, MySQL version, and so on.

The following configuration elements are listed:

- **Host**: hostname of the MySQL instance.
- **Version**: the MySQL version.
- **TCP/IP Port**: the TCP/IP port used by the MySQL instance.
- **UNIX Socket**: the UNIX domain socket, if available.
- **Base Directory**: the installation directory of the MySQL instance.
- **Data Directory**: the data directory of the MySQL instance.
- **Temp Directory**: the temp directory of the MySQL instance.
- **Up Since**: time since the management agent first made contact with the MySQL instance.
- **Monitored By**: the full name of the Monitoring Agent's host machine.

2.3.3 Connections

The **Connections** region displays the number of connections (y-axis) over time (x-axis).

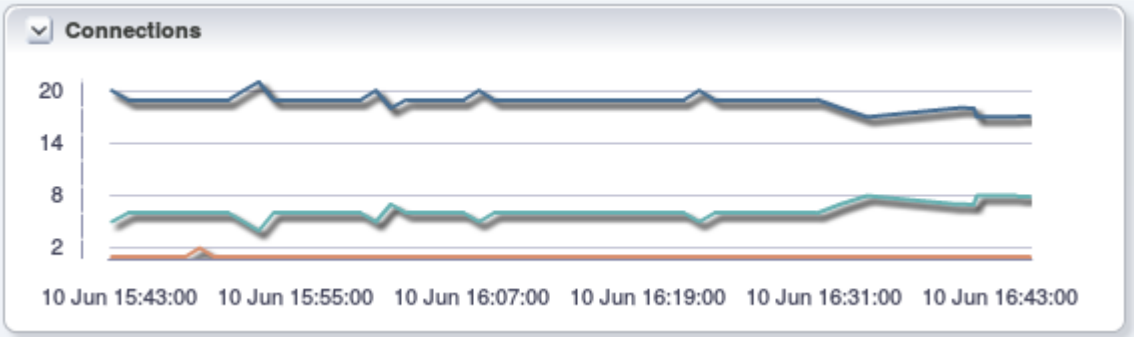
The graphs are broken down into the following:

- Cached connections.
- Current connections.

- Running connections.

If you hover the cursor over one of the lines, a tooltip displays details of the connection type.

Figure 2.3 Connections



2.3.4 Transaction Activity

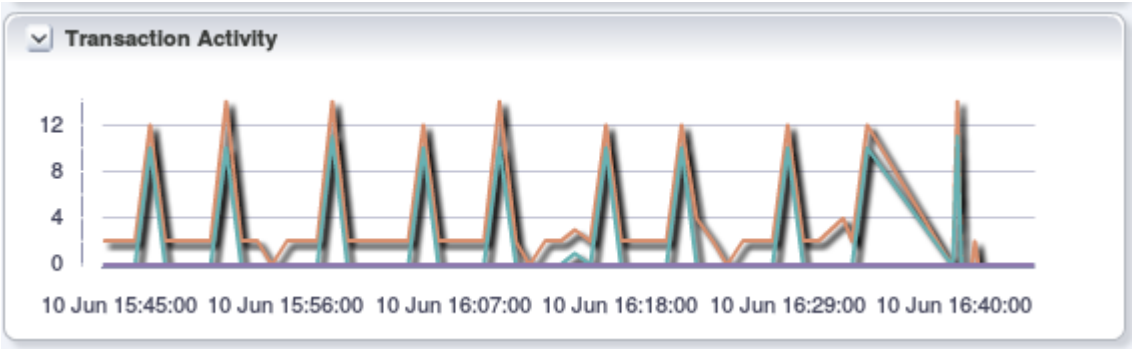
The **Transaction Activity** region displays the number of transactions (y-axis) over time (x-axis).

The graph is broken down into the following transaction types:

- Commit (Delta)
- Rollback (Delta)
- Release Savepoint (Delta)
- Rollback to Savepoint (Delta)
- Savepoint (Delta)
- Begin (Delta)

If you hover the cursor over one of the lines, a tooltip displays details of the transaction type.

Figure 2.4 Transaction Activity



2.3.5 Row Activity

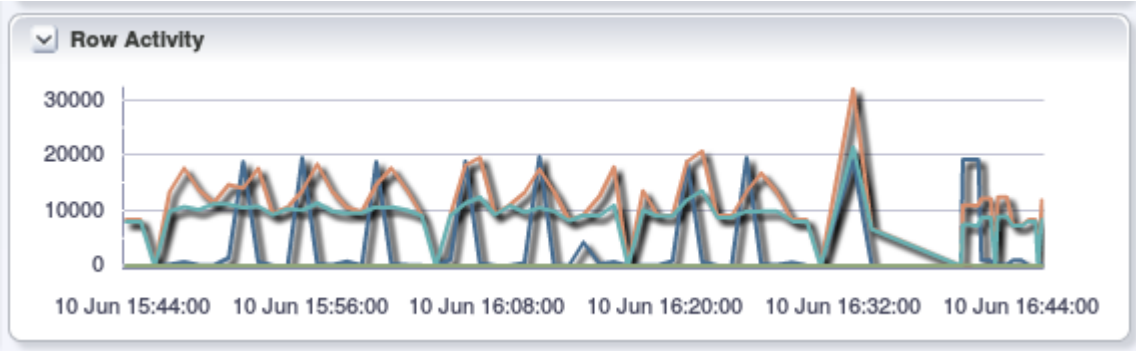
The **Row Activity** region displays the number of row-based actions (y-axis) over time (x-axis).

The graph is broken down into the following transaction types:

- Write (Delta)

- Rows Read Via Scan (Delta)
- Rows Read Via Indexes (Delta)
- Update (Delta)
- Delete (Delta)

Figure 2.5 Row Activity



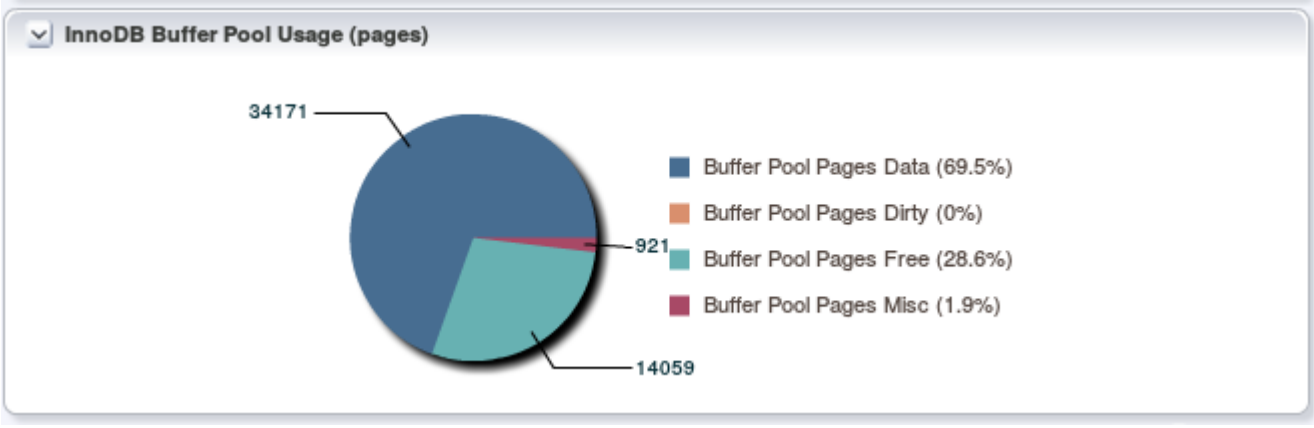
2.3.6 InnoDB Buffer Pool Usage (pages)

The **InnoDB Buffer Pool Usage (pages)** region displays the usage in a pie chart.

The following metrics are displayed as percentages:

- Buffer Pool Pages Data
- Buffer Pool Pages Dirty
- Buffer Pool Pages Free
- Buffer Pool Pages Misc.

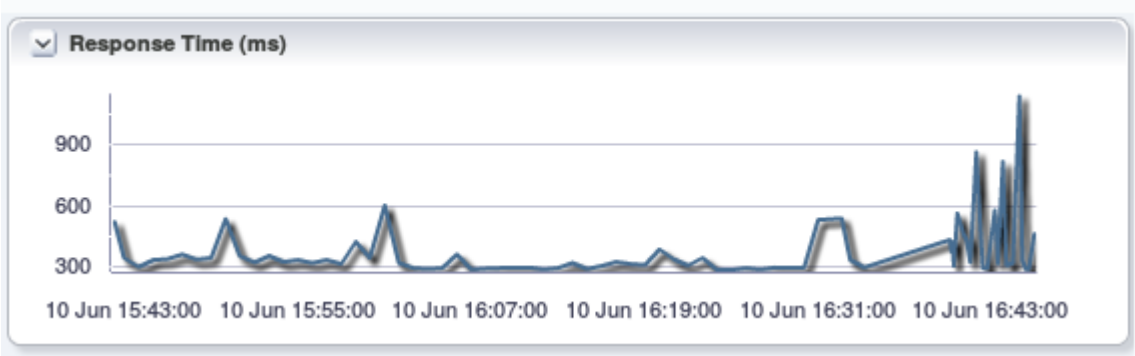
Figure 2.6 InnoDB Buffer Pool Usage (pages)



2.3.7 Response Time (ms)

The **response Time (ms)** region graphs the response time of the Availability Ping metric, in milliseconds. This metric performs a full connection to the database and executes a ping statement for each availability check.

Figure 2.7 Response Time (ms)

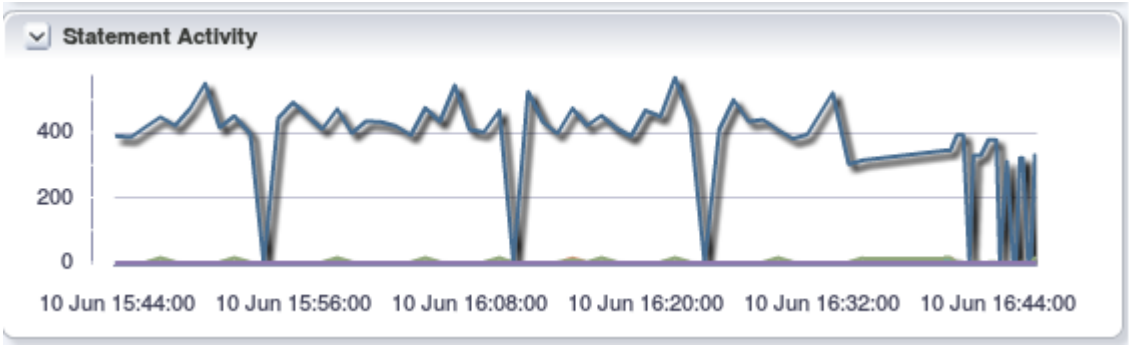


2.3.8 Statement Activity

The **Statement Activity** region displays the number of statement executions (x-axis) over time (y-axis). The following statement types are graphed:

- All Deletes (Delta)
- All Inserts (Delta)
- All Replaces (Delta)
- All Updates (Delta)
- Call Procedure (Delta)
- Select (Delta)

Figure 2.8 Statement Activity



2.3.9 Incidents and Problems

The **Incidents and Problems** region is an Oracle Enterprise Manager (OEM) default component. Consult your OEM documentation for more information.

Chapter 3 Performance Pages

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The Performance pages are available from the **Performance** sub-menu of the **MySQL Database** menu. These pages display specific aspects of your MySQL performance.

The following Performance pages are available:

- Section 3.1, “Connections”
- Section 3.2, “Statements”
- Section 3.3, “InnoDB Buffer Pool”
- Section 3.4, “InnoDB File I/O”
- Section 3.5, “Tables / Rows”
- Section 3.6, “Query Cache”

Each of the performance pages graphs the performance of a specific metric, or set of metrics, over a 24-hour window. They also display configuration information.

Each graph region also contains links to week and month overviews of the collected data. Click the appropriate link to display the week or month graph.

Each metric is graphed with a separate line. Each point on the line represents the data collected according to the defined Collection Schedule. If the Collection Schedule is defined as 5 minutes, each point on the graph is separated by 5 minutes.

To see data on each individual collection point, hover the cursor over the line. A tooltip is displayed listing the data type, the time the data was collected, and the value of the metric collected.

3.1 Connections

The Connections page displays the connections and network statistics for the monitored MySQL instance.

Table 3.1 Connections Performance Page Regions

Graph	Description
Current Connections	Graphs the number of current, running and cached connections.
Total Connections	Graphs the total number of connection attempts, successful or not, to the monitored instance.
Network Usage	Graphs the network usage in bytes sent and received.
Slowly Launched Threads	Graphs the slow launched threads.

Graph	Description
Connections Aborted	Graphs the number of aborted clients and connections per collection.
Max Used	Graphs the maximum number of connections in use simultaneously since the monitored instance started.
Connection Configuration	Lists the connection-specific system variables and their values.
Thread Configuration	Lists the thread-specific system variables and their values.

3.2 Statements

Table 3.2 Statements Performance Page Regions

Graph	Description
DML Statements	Graphs the number and type of DML statements. The following statement types are graphed: SELECT, INSERT, UPDATE, REPLACE, DELETE and Call Procedures.
Transaction Statements	Graphs the number and type of Transaction statements. The following transaction statements are graphed: BEGIN, COMMIT, ROLLBACK, SAVEPOINT, ROLLBACK TO SAVEPOINT and RELEASE SAVEPOINT.
Row Activity	Graphs the type of row activity and the number of rows acted upon.
Index Usage Ratio	Graphs the change in rows read by indexes versus rows read by table scans.
Temporary Tables	Graphs the number of temporary tables created in the database and on disk.
Sort Activity	Graphs the number of sort merge passes, the number of sorts done using ranges, and the number of sorts performed by scanning tables.
Statement Configuration	Lists the statement-specific system variables and their values.
Optimizer Configuration	Lists the optimizer-specific system variables and their values.

3.3 InnoDB Buffer Pool

Table 3.3 InnoDB Buffer Pool Performance Page Regions

Graph	Description
Buffer Usage	Graphs the amount of megabytes in the InnoDB buffer pool which contain data and the number of megabytes held in dirty pages.
Row Requests	Graphs the number of logical read requests, logical read requests read from disk, and writes done to the buffer pool.
Page Activity	Graphs the number of buffer pool pages read, written and created.
Waits for Free Pages	Graphs the number of times writes to the buffer pool waited for clean pages to become available.
Pages Flushed	Graphs the number of buffer pool page-flush requests.
Pages Latched	Graphs the number of buffer pool pages latched.
Young Page Activity	Graphs the number of pages made young and not young in the LRU list.

Graph	Description
Pending Operations	Graphs the number of pending reads, LRU writes, single-page writes and pages to be flushed during checkpointing.
Page Read Ahead	Graphs the number of pages reads into the buffer pool by the read ahead thread and the number of pages evicted.
Compression Time	Graphs the time, in seconds, spent compressing or uncompressing buffer pool pages.
Current Usage	Pie chart which displays how the buffer pool is currently used.
InnoDB Buffer Configuration	Lists the buffer-pool-specific system variables and their values.

3.4 InnoDB File I/O

Table 3.4 InnoDB File I/O Performance Page Regions

Name	Description
Data File IO Activity (bytes)	Graphs the amount of data read and written, in bytes.
Data File IO Activity (ops)	Graphs the number of fsync() operations, data reads and writes.
Average Bytes Per Read	Graphs the average bytes per read.
Double Write Activity	Graphs the number of doublewrite operations and the number of pages written for doublewrite operations.
Redo Log IO Activity (bytes)	Graphs the number of bytes written to the log file.
Redo Log IO Activity (ops)	Graphs the number of log write requests and the number of physical log writes.
Redo Log Waits	Graphs the number of times the log buffer was too small and had to be flushed.
Pending IO	Graphs the number of pending asynchronous I/O read/write requests,
Pending Flushes	Graphs the number of pending buffer and redo log flush operations.
Open Files	Graphs the number of open files in InnoDB.
InnoDB IO Configuration	Lists the InnoDB IO-specific system variables and their values.

3.5 Tables / Rows

Table 3.5 Tables / Rows Performance Page Regions

Name	Description
Opened Tables	Graphs the number of cached frm files and the total number of opened tables.
Currently Open Tables	Graphs the number of tables open in the table cache.
Temporary Tables	Graphs the number of temporary tables created, and the number of temporary tables converted to disk-based tables.

Name	Description
Table Locks	Graphs the number of times a table lock request was granted immediately and the number of times it could not be granted immediately.
Table Scan Ratio	Graphs the ratio of rows read via indexes versus rows read via table scan.
Row Reads	Graphs the average of rows read via indexes per second and the rows read via scan.
Row Writes	Graphs the number of requests to write, update or delete a row.
Sorts	Graphs the number of sorts performed using ranges and scans.
Rows Sorted	Graphs the number of sorted rows.
Sort Merge Passes	Graphs the number of merge passes performed by the sort algorithm.
Table Configuration	Lists the table-specific system variables and their values.

3.6 Query Cache

Table 3.6 Query Cache Performance Page Regions

Name	Description
Efficiency	Graphs the number of Query Cache hits, inserts and non-cached queries.
Queries in Cache	Graphs the number of queries registered in the Query Cache.
Free Memory (MB)	Graphs the amount of free memory allocated to the Query Cache.
Average Free Block Size (KB)	Graphs the average size, in kilobytes, of the free blocks within the Query Cache.
Low Memory Prunes	Graphs the number of queries deleted from the Query Cache due to low memory.
Fragmentation	Graphs the number of free blocks in the Query Cache.
Query Cache Configuration	Lists the Query Cache-specific system variables and their values.

Chapter 4 Metrics

Table of Contents

This chapter describes the Oracle Enterprise Manager for MySQL Database metrics.

The following topics are described:

4.1 Metrics Page

This section describes the **All Metrics** page of the Oracle Enterprise Manager for MySQL Database.

The following topics are described:

4.2 Admin Statement Activity Metrics

Lists the Admin Statement Activity metrics and provides a brief description of each.

Table 4.1 Admin Statement Activity Metrics

Name	Description
Admin Commands (Delta)	The total number of times a COM_PING, or COM_CHANGE_USER have executed on the protocol.
Analyze (Delta)	The total number of ANALYZE TABLE statements executed.
Assign To Keycache (Delta)	The total number of CACHE INDEX statements executed.
Backup Table (Delta)	The total number of BACKUP TABLE statements executed.
Binlog (Delta)	The total number of BINLOG statements executed.
Change Master (Delta)	The total number of CHANGE MASTER statements executed.
Check (Delta)	The total number of CHECK TABLE statements executed.
Checksum (Delta)	The total number of CHECKSUM TABLE statements executed.
Flush (Delta)	The total number of FLUSH statements executed.
Install Plugin (Delta)	The total number of INSTALL PLUGIN statements executed.
Kill (Delta)	The total number of KILL statements executed.
Optimize (Delta)	The total number of OPTIMIZE TABLE statements executed.
Preload Keys (Delta)	The total number of LOAD INDEX INTO CACHE statements executed.
Purge (Delta)	The total number of PURGE BINARY LOGS statements executed.
Purge Before Date (Delta)	The total number of PURGE BINARY LOGS BEFORE statements executed.
Repair (Delta)	The total number of REPAIR TABLE statements executed.
Restore Table (Delta)	The total number of RESTORE TABLE statements executed.
Slave Start (Delta)	The total number of START SLAVE statements executed.
Slave Stop (Delta)	The total number of STOP SLAVE statements executed.
Uninstall Plugin (Delta)	The total number of UNINSTALL PLUGIN statements executed.

4.3 Binary Logs Summary Metrics

Lists the Binary Logs Summary metrics and provides a brief description of each.

Table 4.2 Binary Logs Summary Metrics

Name	Description
Count (Total)	Number of binlog files.
Size (Total)	Total space used by the binlog file.
Binary Log File Count	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.
Binary Log Space	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

Name	Description
	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.

4.4 Connection Activity Metrics

Lists the Connection Activity metrics and provides a brief description of each.

Table 4.3 Connection Activity Metrics

Name	Description
Aborted Clients (Delta)	The number of connections that were aborted because the client died without closing the connection properly.
Aborted Connects (Delta)	The number of failed attempts to connect to the MySQL server.
Bytes Received (Delta)	The number of bytes received from all clients.
Bytes Sent (Delta)	The number of bytes sent to all clients.
Connections (Delta)	The number of connection attempts (successful or not) to the MySQL server.
Max Used Connections (Total)	The maximum number of connections that have been in use simultaneously since the server started.
Failed Attempted Connections To The Server (Rate)	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

4.5 DDL Statement Activity Metrics

Lists the DDL Statement Activity metrics and provides a brief description of each.

Table 4.4 DDL Statement Activity Metrics

Name	Description
Alter DB (Delta)	The total number of ALTER DATABASE statements executed.
Alter DB Upgrade (Delta)	The total number of ALTER DATABASE ... UPGRADE DATA DIRECTORY NAME statements executed.
Alter Event (Delta)	The total number of ALTER EVENT statements executed.
Alter Function (Delta)	The total number of ALTER FUNCTION statements executed.
Alter Procedure (Delta)	The total number of ALTER PROCEDURE statements executed.
Alter Server (Delta)	The total number of ALTER SERVER statements executed.
Alter Table (Delta)	The total number of ALTER TABLE statements executeds.
Alter Tablespace (Delta)	The total number of ALTER TABLESPACE statements executed.
Create DB (Delta)	The total number of CREATE DATABASE statements executed.
Create Event (Delta)	The total number of CREATE EVENT statements executed.
Create Function (Delta)	The total number of CREATE FUNCTION statements executed for stored functions.

Name	Description
Create Index (Delta)	The total number of CREATE INDEX statements executed.
Create Procedure (Delta)	The total number of CREATE PROCEDURE statements executed.
Create Server (Delta)	The total number of CREATE SERVER statements executed.
Create Table (Delta)	The total number of CREATE TABLE statements executed.
Create Trigger (Delta)	The total number of CREATE TRIGGER statements executed.
Create Udf (Delta)	The total number of CREATE FUNCTION statements executedfor user defined functions.
Create User (Delta)	The total number of CREATE USER statements executed.
Create View (Delta)	The total number of CREATE VIEW statements executed.
Drop DB (Delta)	The total number of DROP DATABASE statements executed.
Drop Event (Delta)	The total number of DROP EVENT statements executed.
Drop Function (Delta)	The total number of DROP FUNCTION statements executed.
Drop Index (Delta)	The total number of DROP INDEX statements executed.
Drop Procedure (Delta)	The total number of DROP PROCEDURE statements executed.
Drop Server (Delta)	The total number of DROP SERVER statements executed.
Drop Table (Delta)	The total number of DROP TABLE statements executed.
Drop Trigger (Delta)	The total number of DROP TRIGGER statements executed.
Drop User (Delta)	The total number of DROP USER statements executed.
Drop View (Delta)	The total number of DROP VIEW statements executed.
Grant (Delta)	The total number of GRANT statements executed.
Rename Table (Delta)	The total number of RENAME TABLE statements executed.
Rename User (Delta)	The total number of RENAME USER statements executed.
Truncate (Delta)	The total number of TRUNCATE TABLE statements executed.

4.6 DML Statement Activity Metrics

Lists the DML Statement Activity metrics and provides a brief description of each.

Table 4.5 DML Statement Activity Metrics

Name	Description
Call Procedure (Delta)	The total number of CALL statements executed.
Change DB (Delta)	The total number of USE statements executed.
Dealloc SQL (Delta)	The total number of DEALLOCATE PREPARE statements executed.
Delete (Delta)	The total number of DELETE statements executed.
Delete Multi (Delta)	The total number of multi-table DELETE statements executed.
Do Number (Delta)	The total number of DO statements executed.
Empty Query (Delta)	The total number of empty queries executed.
Execute SQL (Delta)	The total number of EXECUTE statements executed.
Ha Close (Delta)	The total number of HANDLER CLOSE statements executed.
Ha Open (Delta)	The total number of HANDLER OPEN statements executed.

Name	Description
Ha Read (Delta)	The total number of HANDLER READ statements executed.
Help (Delta)	The total number of HELP statements executed.
Insert (Delta)	The total number of INSERT statements executed.
Insert Select (Delta)	The total number of INSERT ... SELECT statements executed.
Load (Delta)	The total number of LOAD DATA INFILE statements executed.
Lock Tables (Delta)	The total number of LOCK TABLE statements executed.
Prepare SQL (Delta)	The total number of PREPARE statements executed.
Replace (Delta)	The total number of REPLACE statements executed.
Replace Select (Delta)	The total number of REPLACE ... SELECT statements executed.
Reset (Delta)	The total number of RESET statements executed.
Resignal (Delta)	The total number of RESIGNAL statements executed.
Select (Delta)	The total number of SELECT statements executed.
Set Option (Delta)	The total number of SET statements executed.
Signal (Delta)	The total number of SIGNAL statements executed.
Stmt Close (Delta)	The total number of DEALLOCATE PREPARE statements, ormysql_stmt_close() calls, executed.
Stmt Execute (Delta)	The total number of EXECUTE statements, or mysql_stmt_execute() calls, executed.
Stmt Fetch (Delta)	The total number of mysql_stmt_fetch() calls executed.
Stmt Prepare (Delta)	The total number of PREPARE statements, mysql_stmt_prepare() calls, executed.
Stmt Reprepare (Delta)	The total number of re-prepare operations executed for prepared statements.
Stmt Reset (Delta)	The total number of mysql_stmt_reset() calls executed.
Stmt Send Long Data (Delta)	The total number of mysql_stmt_send_long_data calls executed.
Unlock Tables (Delta)	The total number of UNLOCK TABLES statements executed.
Update (Delta)	The total number of UPDATE statements executed.
Update Multi (Delta)	The total number of multi-table UPDATE statements executed.
Prepared Statements Not Being Closed (Rate)	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.
Prepared Statements Not Being Used Effectively (Rate)	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

Name	Description
	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.
All INSERT Statements (Delta)	The sum of INSERT and INSERT ... SELECT statements within the last interval.
All UPDATE Statements (Delta)	The sum of single table and multi-table UPDATE statements within the last interval.
All REPLACE Statements (Delta)	The sum of REPLACE and REPLACE ... SELECT statements within the last interval.
All DELETE statements (Delta)	The sum of single table and multi-table DELETE statements within the last interval.

4.7 Handler Activity Metrics

Lists the Handler Activity metrics and provides a brief description of each.

Table 4.6 Handler Activity Metrics

Name	Description
Commit (Delta)	The number of internal COMMIT statements.
Delete (Delta)	The number of times that rows have been deleted from tables.
Discover (Delta)	A counter for the prepare phase of two-phase commit operations.
External Lock (Delta)	The server increments this variable for each call to its external_lock() function, which generally occurs at the beginning and end of access to a table instance.
Mrr Init (Delta)	The number of times the server uses a storage engine's own Multi-Range Read implementation for table access.
Prepare (Delta)	The number of times the first entry in an index was read.
Read First (Delta)	The number of requests to read a row based on a index key value. If this value is high, it suggests that the server is doing a lot of full index scans.
Read Key (Delta)	The number of requests to read the last key in an index. If this value is high, it is a good indication that your tables are properly indexed for your queries.
Read Last (Delta)	The number of requests to read the last key in an index.
Read Next (Delta)	The number of requests to read the next row in key order. This value is incremented if you are querying an index column with a range constraint or if you are doing an index scan.
Read Prev (Delta)	The number of requests to read the previous row in key order. This read method is mainly used to optimize ORDER BY ... DESC.
Read Rnd (Delta)	The number of requests to read a row based on a fixed position. This value is high if you are doing a lot of queries that require sorting of the result.
Read Rnd Next (Delta)	The number of requests to read the next row in the data file. This value is high if you are doing a lot of table scans.
Rollback (Delta)	The number of requests for a storage engine to perform a rollback operation.
Savepoint (Delta)	The number of requests for a storage engine to place a savepoint.
Savepoint Rollback (Delta)	The number of requests for a storage engine to rollback to a savepoint.
Update (Delta)	The number of requests to update a row in a table.

Name	Description
Write (Delta)	The number of requests to insert a row in a table.
Indexes Not Being Used Efficiently (Rate)	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.
Rows Read Via Indexes (Delta)	Rows read via the storage engine handler layer that used indexes in the last interval.
Rows Read Via Indexes (Per Sec Avg)	Average of rows read per second via the storage engine handler layer that used indexes in the last interval.
Rows Read Via Scan (Delta)	Rows read via the storage engine handler layer that used a table scan in the last interval.
Rows Read Via Scan (Per Sec Avg)	Average of rows read per second via the storage engine handler layer that used a table scan.
Index Usage Ratio (Delta)	The ratio of rows read via indexes vs rows read via table scan in the last interval.

4.8 InnoDB Activity Metrics

Lists the InnoDB Activity metrics and provides a brief description of each.

Table 4.7 InnoDB Activity Metrics

Name	Description
Available Undo Logs (Total)	The total number of available InnoDB undo logs. Supplements the innodb_undo_logs system variable, which reports the number of active undo logs.
Buffer Pool Bytes Data (Total)	The total number of bytes in the InnoDB buffer pool containing data. The number includes both dirty and clean pages. For more accurate memory usage calculations than with Innodb_buffer_pool_pages_data, when compressed tables cause the buffer pool to hold pages of different sizes.
Buffer Pool Bytes Dirty (Total)	The total current number of bytes held in dirty pages in the InnoDB buffer pool. For more accurate memory usage calculations than with Innodb_buffer_pool_pages_dirty, when compressed tables cause the buffer pool to hold pages of different sizes.
Buffer Pool Dump Status (Total)	The progress of an operation to record the pages held in the InnoDB buffer pool, triggered by the setting of innodb_buffer_pool_dump_at_shutdown or innodb_buffer_pool_dump_now.
Buffer Pool Load Status (Total)	The progress of an operation to warm up the InnoDB buffer pool by reading in a set of pages corresponding to an earlier point in time, triggered by the setting of innodb_buffer_pool_load_at_startup or innodb_buffer_pool_load_now.
Buffer Pool Pages Data (Total)	The number of pages containing data (dirty or clean).
Buffer Pool Pages Dirty (Total)	The number of pages currently dirty.

Name	Description
Buffer Pool Pages Flushed (Delta)	The number of buffer pool page-flush requests.
Buffer Pool Pages Free (Total)	The number of free pages.
Buffer Pool Pages Latched (Total)	The number of latched pages in InnoDB buffer pool.
Buffer Pool Pages Misc (Total)	The number of pages that are busy because they have been allocated for administrative overhead such as row locks or the adaptive hash index.
Buffer Pool Pages Total (Total)	The total size of the buffer pool, in pages.
Buffer Pool Read Ahead (Delta)	The number of pages read into the InnoDB buffer pool by the read-ahead background thread.
Buffer Pool Read Ahead Evicted (Delta)	The number of pages read into the InnoDB buffer pool by the read-ahead background thread that were subsequently evicted without having been accessed by queries.
Buffer Pool Read Requests (Delta)	The number of logical read requests InnoDB has done.
Buffer Pool Reads (Delta)	The number of logical reads that InnoDB could not satisfy from the buffer pool, and had to read directly from the disk.
Buffer Pool Wait Free (Delta)	Normally, writes to the InnoDB buffer pool happen in the background. However, if it is necessary to read or create a page and no clean pages are available, it is also necessary to wait for pages to be flushed first. This counter counts instances of these waits.
Buffer Pool Write Requests (Delta)	The number writes done to the InnoDB buffer pool.
Data Fsyncs (Delta)	The number of fsync() operations so far.
Data Pending Fsyncs (Total)	The current number of pending fsync() operations.
Data Pending Reads (Total)	The current number of pending reads.
Data Pending Writes (Total)	The current number of pending writes.
Data Read (Delta)	The amount of data read since the server was started.
Data Reads (Delta)	The total number of data reads.
Data Writes (Delta)	The total number of data writes.
Data Written (Delta)	The amount of data written so far, in bytes.
Dblwr Pages Written (Delta)	The number of pages that have been written for doublewrite operations.
Dblwr Writes (Delta)	The number of doublewrite operations that have been performed.
Have Atomic Builtins (Total)	Indicates whether the server was built with atomic instructions.
Log Waits (Delta)	The number of times that the log buffer was too small and a wait was required for it to be flushed before continuing.

Name	Description
Log Write Requests (Delta)	The number of log write requests.
Log Writes (Delta)	The number of physical writes to the log file.
Os Log Fsyncs (Delta)	The number of fsync() writes done to the log file.
Os Log Pending Fsyncs (Total)	The number of pending log file fsync() operations.
Os Log Pending Writes (Total)	The number of pending log file writes.
Os Log Written (Delta)	The number of bytes written to the log file.
Pages Created (Delta)	The number of pages created.
Page Size (Total)	The compiled-in InnoDB page size.
Pages Read (Delta)	The number of pages read.
Pages Written (Delta)	The number of pages written.
Row Lock Current Waits (Total)	The number of row locks currently being waited for.
Row Lock Time (Delta)	The total time spent in acquiring row locks, in milliseconds.
Row Lock Time Avg (Total)	The average time to acquire a row lock, in milliseconds.
Row Lock Time Max (Total)	The maximum time to acquire a row lock, in milliseconds.
Row Lock Waits (Delta)	The number of times a row lock had to be waited for.
Rows Deleted (Delta)	The number of rows deleted from InnoDB tables.
Rows Inserted (Delta)	The number of rows inserted into InnoDB tables.
Rows Read (Delta)	The number of rows read from InnoDB tables.
Rows Updated (Delta)	The number of rows updated in InnoDB tables.
Truncated Status Writes (Delta)	The number of times output from the SHOW ENGINE INNODB STATUS statement has been truncated.
InnoDB Buffer Cache 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.
InnoDB Buffer Pool Writes Bottleneck (Rate)	For optimal performance, InnoDB should not have to wait before writing pages into the InnoDB buffer pool.
InnoDB Log Waits Bottleneck (Rate)	For optimal performance, InnoDB should not have to wait before writing DML activity to the InnoDB log buffer.
Buffer Pool Megabytes Data	The total number of megabytes in the InnoDB buffer pool containing data.
Buffer Pool Megabytes Dirty	The total current number of megabytes held in dirty pages in the InnoDB buffer pool.

4.9 InnoDB Adaptive Hash Activity Metrics

Lists the InnoDB Adaptive Hash Activity metrics and provides a brief description of each.

Table 4.8 InnoDB Adaptive Hash Activity Metrics

Name	Description
Hash Node Heap (Total)	The total number of (16Kb) pages allocated to the InnoDB adaptive hash index.
Hash Searches Per Sec (Total)	The per second average of the searches within InnoDB satisifiedby the adapative hash index.
Hash Table Size (Total)	The total number of array cells allocated to the InnoDB adaptive hash index.
Hash Used Cells (Total)	The total number of cells within the hash index array that are in use. This variable is no longer available as of MySQL version 5.1.28.
Non Hash Searches Per Sec (Total)	The per second average of the searches within InnoDB not satisified by the adaptive hash index.

4.10 InnoDB Bufferpool Activity Metrics

Lists the InnoDB Bufferpool Activity metrics and provides a brief description of each.

Table 4.9 InnoDB Bufferpool Activity Metrics

Name	Description
Additional Alloc (Total)	The total memory allocated for the InnoDB additional pool in bytes.
Compress Seconds (Delta)	The total time in seconds spent compressing InnoDB buffer pool pages.
Created Per Sec (Total)	The per second average number of InnoDB buffer pool pages created per second.
DB Pages (Total)	The total size in pages of the InnoDB buffer pool LRU list.
Dictionary Alloc (Total)	The total memory allocated for the InnoDB data dictionary in bytes.
Free Pages (Total)	The total size in pages of the InnoDB buffer pool free list.
Hit Rate (Total)	The InnoDB buffer pool page hit rate for pages read from the buffer pool memory vs from disk storage.
Io Cur Pages (Total)	The total number of InnoDB buffer pool LRU list pages accessed, for the last second.
Io Sum Pages (Total)	The total number of InnoDB buffer pool LRU list pages accessed, for the last 50 seconds.
Io Unzip Cur Pages (Total)	The total number of InnoDB buffer pool unzip_LRU list pages accessed, for the last second.
Io Unzip Sum Pages (Total)	The total number of Buffer Pool unzip_LRU list pages accessed, for the last 50 seconds.
Lru Len (Total)	The total size in pages of the InnoDB buffer pool LRU list.
Modified Pages (Total)	The current number of pages modified in the InnoDB buffer pool.
Not Young Hit Rate (Total)	The average rate at which InnoDB buffer pool pages have been made not young, for the past 15 seconds.
Old DB Pages (Total)	The total size in pages of the InnoDB buffer pool old LRU list.

Name	Description
Pages Created (Delta)	The total number of pages created within the InnoDB buffer pool.
Pages Evicted No Access Per Sec (Total)	The per second average of the pages evicted without being accessed from the InnoDB buffer pool, for the last 15 seconds.
Pages Not Young (Delta)	The total number of pages made not young in the InnoDB buffer pool LRU list.
Pages Not Young Per Sec (Total)	The per second average of the pages made not young in the InnoDB buffer pool LRU list, for the last 15 seconds.
Pages Random Read Ahead Per Sec (Total)	The per second average of random read ahead operations, for the last 15 seconds.
Pages Read (Delta)	The total number of pages read from the InnoDB buffer pool.
Pages Read Ahead Per Sec (Total)	The per second average of read ahead operations, for the last 15 seconds.
Pages Written (Delta)	The total number of pages written from the InnoDB buffer pool.
Pages Young (Delta)	The total number of pages made young in the InnoDB buffer pool LRU list.
Pages Young Per Sec (Total)	The per second average of the pages made young in the InnoDB buffer pool LRU list, for the last 15 seconds.
Pending Reads (Total)	The number of InnoDB buffer pool pages waiting to be read in to the buffer pool.
Pending Writes Flush List (Total)	The number of InnoDB buffer pool pages to be flushed during checkpointing.
Pending Writes Lru (Total)	The number of old dirty pages within the InnoDB buffer pool to be written from the bottom of the LRU list.
Pending Writes Single Page (Total)	The number of pending independent page writes within the InnoDB buffer pool.
Reads Per Sec (Total)	The per second average number of InnoDB buffer pool page reads per second.
Size Pages (Total)	The total size in pages allocated to the InnoDB buffer pool.
Total Alloc (Total)	The total memory allocated for the InnoDB buffer pool in bytes.
Uncompress Seconds (Delta)	The total time in seconds spent uncompressing InnoDB buffer pool pages.
Unzip Lru Len (Total)	The total size in pages of the InnoDB buffer pool unzip_LRU list.
Written Per Sec (Total)	The per second average number of InnoDB buffer pool page writes per second.
Young Hit Rate (Total)	The average rate at which InnoDB buffer pool pages have been made young, for the past 15 seconds.

4.11 InnoDB Insert Buffer Activity Metrics

Lists the InnoDB Insert Buffer Activity metrics and provides a brief description of each.

Table 4.10 InnoDB Insert Buffer Activity Metrics

Name	Description
Delete Discarded (Delta)	The total number of purge merged operations discarded.
Delete Mark Discarded (Delta)	The total number of deleted merged operations discarded.

Name	Description
Delete Mark Merges (Delta)	The total number of deleted records merged by change buffering.
Delete Merges (Delta)	The total number of times the InnoDB secondary index delete buffer was merged to the InnoDB datafiles.
Free List Len (Total)	The number of pages free within the InnoDB secondary index insert buffer.
Inserts (Delta)	The total number of inserts to the InnoDB secondary index insert buffer.
Inserts Discarded (Delta)	The total number of insert merged operations discarded
Merged Recs (Delta)	The total number of records merged from the InnoDB secondaryindex insert buffer to the InnoDB datafiles.
Merges (Delta)	The total number of times the InnoDB secondary index insert buffer was merged to the InnoDB datafiles.
Seg Size (Total)	The total size, in pages, of the InnoDB secondary index insert buffer.
Size (Total)	The number of pages used within the InnoDB secondary index insert buffer.

4.12 InnoDB Io Activity Metrics

Lists the InnoDB Io Activity metrics and provides a brief description of each.

Table 4.11 InnoDB Io Activity Metrics

Name	Description
Bytes Per Read (Total)	The average bytes per read within InnoDB for the snapshot interval.
Open Files (Total)	The number of open files within InnoDB.
Os File Fsyncs (Delta)	The total number of fsync() operations performed by InnoDB.
Os File Reads (Delta)	The total number of files reads performed by read threadswithin InnoDB.
Os File Writes (Delta)	The total number of file writes performed by write threadswithin InnoDB.
Pending Flushes Bp (Total)	The number of pending buffer flush operations within InnoDB.
Pending Flushes Log (Total)	The number of pending redo log flush operations within InnoDB.
Pending Ibuf Reads (Total)	The number of pending asynchronous read requests for the secondary index insert buffer within InnoDB.
Pending Reads (Total)	The number of pending normal asynchronous IO read requests for data within InnoDB.
Pending Redo Log (Total)	The number of pending IO requests (read or write) for theInnoDB redo logs.
Pending Sync (Total)	The number of pending synchronous IO requests (from user threads rather than background threads) within InnoDB.
Pending Writes (Total)	The number of pending normal asynchronous IO write requests for data within InnoDB.
Reads Per Sec (Total)	The average number of file reads per second within InnoDB for the snapshot interval.
Syncs Per Sec (Total)	The average number of fsync() operations per second within InnoDB for the snapshot interval.

Name	Description
Writes Per Sec (Total)	The average number of file writes per second within InnoDB for the snapshot interval.

4.13 InnoDB Log Activity Metrics

Lists the InnoDB Log Activity metrics and provides a brief description of each.

Table 4.12 InnoDB Log Activity Metrics

Name	Description
Checkpoint File (Total)	The low order 32bit value for the redo log sequence numberwithin InnoDB, up to which checkpointing (flushing from the buffer to disk) has completed. This is only available prior to the 5.1.x plugin and 5.5.x.
Checkpoint Lsn (Total)	The redo log sequence number within InnoDB, up to whichcheckpointing (flushing from the buffer to disk) has completed. On versions prior to the 5.1.x plugin and 5.5.x this is the high order 32bit value, on later versions it is the full 64bit LSN value up to which checkpoints have completed.
Flushed File (Total)	The low order 32bit value for the redo log sequence numberwithin InnoDB, up to which the redo log buffer has been flushed to theredo log files. This is only available prior to the 5.1.x plugin and 5.5.x.
Flushed Lsn (Total)	The redo log sequence number within InnoDB, up to which theredo log buffer has been flushed to the redo log files. On versions prior to the 5.1.x plugin and 5.5.x this is the high order 32bit value, on later versions it is the full 64bit LSN value up to which the buffer has been flushed.
Io Per Sec (Total)	The per second average number of IO operations for theInnoDB redo logs.
Io Total (Delta)	The total number of IO operations for the InnoDB redo logs.
Pages Flushed Lsn (Total)	The redo log sequence number within InnoDB, up to which the buffer pool has been flushed to the data files.
Pending Checkpoint Writes (Total)	The total number of currently pending checkpoint writeswithin InnoDB.
Pending Log Writes (Total)	The total number of writes pending to the InnoDB redo logs.
Sequence File (Total)	The low order 32bit value for the redo log sequence numberwithin InnoDB. This is only available prior to the 5.1.x plugin and 5.5.x.
Sequence Number (Total)	The current redo log sequence number within InnoDB. On versions prior to the 5.1.x plugin and 5.5.x this is the high order 32bit value, on later versions it is the full 64bit LSN value.

4.14 InnoDB Row Activity Metrics

Lists the InnoDB Row Activity metrics and provides a brief description of each.

Table 4.13 InnoDB Row Activity Metrics

Name	Description
Row Queries Inside (Total)	The number of queries executing inside InnoDB.

Name	Description
Row Queries Queue (Total)	The number of queries in the queue, waiting to enter InnoDB.
Rows Deleted (Delta)	The number of rows deleted from InnoDB tables.
Rows Deleted Per Sec (Delta)	The number of rows deleted per second by InnoDB.
Rows Inserted (Delta)	The number of rows inserted into InnoDB tables.
Rows Inserted Per Sec (Delta)	The number of rows inserted per second by InnoDB.
Rows Read (Delta)	The number of rows read from InnoDB tables.
Rows Read Per Sec (Delta)	The number of rows read per second by InnoDB.
Rows Updated (Delta)	The number of rows updated in InnoDB tables.
Rows Updated Per Sec (Delta)	The number of rows updated per second by InnoDB.

4.15 InnoDB Semaphore Activity Metrics

Lists the InnoDB Semaphore Activity metrics and provides a brief description of each.

Table 4.14 InnoDB Semaphore Activity Metrics

Name	Description
Mutex Os Waits (Delta)	The number of InnoDB semaphore/mutex waits yielded to the OS.
Mutex Rounds (Delta)	The number of InnoDB semaphore/mutex spin rounds for the internal sync array.
Mutex Spin Waits (Delta)	The number of InnoDB semaphore/mutex spin waits for the internal sync array.
Os Reservation Count (Delta)	The number of times an InnoDB semaphore/mutex wait was added to the internal sync array.
Os Signal Count (Delta)	The number of times an InnoDB thread was signaled using the internal sync array.
Rw Excl Os Waits (Delta)	The number of exclusive (write) semaphore waits yielded to the OSby InnoDB.
Rw Excl Rounds (Delta)	The number of exclusive (write) semaphore spin rounds within the InnoDB sync array.
Rw Excl Spins (Delta)	The number of exclusive (write) semaphore spin waits within the InnoDB sync array.
Rw Shared Os Waits (Delta)	The number of shared (read) semaphore waits yielded to the OSby InnoDB.
Rw Shared Rounds (Delta)	The number of shared (read) semaphore spin rounds within the InnoDB sync array.
Rw Shared Spins (Delta)	The number of shared (read) semaphore spin waits within the InnoDB sync array.
Spins Per Wait Mutex (Delta)	The ratio of InnoDB semaphore/mutex spin rounds to mutex spin waits for the internal sync array.
Spins Per Wait Rw Excl (Delta)	The ratio of InnoDB exclusive (write) semaphore/mutex spin rounds to spin waits within the internal sync array.

Name	Description
Spins Per Wait Rw Shared (Delta)	The ratio of InnoDB shared (read) semaphore/mutex spin rounds to spin waits within the internal sync array.

4.16 InnoDB Thread Activity Metrics

Lists the InnoDB Thread Activity metrics and provides a brief description of each.

Table 4.15 InnoDB Thread Activity Metrics

Name	Description
Main Thd Log Flush Writes (Delta)	The number of times InnoDB redo logs are written and synced to disk by the master thread.
Main Thd Loops Background (Delta)	The number of times the InnoDB main thread did background tasks, such as flushing dirty pages, purging and insert buffer merging, more aggresively when the server is idle.
Main Thd Loops Flush (Delta)	The number of times the InnoDB main thread aggressively flusheddirty pages, whilst there was no server activity.
Main Thd Loops One Sec (Delta)	The number of times the InnoDB main thread has entered itsone second loop structure, to flush dirty pages or drop tablesin the background or insert buffer merging.
Main Thd Loops Sleeps (Delta)	The number of times the InnoDB main thread was put to sleep, due to no flushing being required within the one second loop.
Main Thd Loops Srv Active (Delta)	The number of times the InnoDB main thread has entered itsactive loop structure.
Main Thd Loops Srv Idle (Delta)	The number of times the InnoDB main thread has entered itsidle loop structure.
Main Thd Loops Srv Shutdown (Delta)	The number of times the InnoDB main thread has entered itsshutdown loop structure.
Main Thd Loops Ten Sec (Delta)	The number of times the InnoDB main thread has entered itsten second loop structure, to manage purge operations.
Main Thd State (Total)	The current state of the main InnoDB thread.

4.17 InnoDB Transaction Activity Metrics

Lists the InnoDB Transaction Activity metrics and provides a brief description of each.

Table 4.16 InnoDB Transaction Activity Metrics

Name	Description
Committing Count (Total)	The total number of transactions currently committing within InnoDB.
Current Lock Wait Count Total (Total)	The total number of rows lock waits within all currently running transactions.
Latest Deadlock (Total)	The latest deadlock reported by SHOW ENGINE INNODB STATUS.
Latest Foreign Key Error (Total)	The latest foreign key error reported by SHOW ENGINE INNODB STATUS.
Lock Memory Bytes Total (Total)	The total number of bytes allocated for lock memory for all currently running transactions.

Name	Description
Lock Wait Count (Total)	The total number of transactions waiting for row locks within InnoDB.
Rolling Back Count (Total)	The total number of transactions currently rolling back within InnoDB.
Rows Locked Total (Total)	The total number of rows locked within all currently running transactions.
Rows Modified Total (Total)	The total number of rows modified within all currently running transactions.
Running Count (Total)	The total number of transactions currently running within InnoDB.
Trx History List Length (Total)	The number of transactions that currently have undo spaceallocated to them (unpurged).
Trx Id Counter1 (Total)	The low order 32bit value for the internal transaction counter within InnoDB. This is only available prior to the 5.1.x plugin and 5.5.x.
Trx Id Counter2 (Total)	The second 32bit internal transaction counter within InnoDB. This is only available prior to the 5.1.x plugin and 5.5.x.
Trx Id Counter Str (Total)	The hexidecimal representation of the internal InnoDB transaction counter, available only on 5.5.x+, or 5.1.x with the plugin.
Trx Purge Done Trx2 (Total)	The transaction counter to which the InnoDB purge process has completed.
Trx Total Lock Structs (Total)	The total number of lock structs in use by all transactions within InnoDB.

4.18 Insert Delayed Activity Metrics

Lists the Insert Delayed Activity metrics and provides a brief description of each.

Table 4.17 Insert Delayed Activity Metrics

Name	Description
Errors (Delta)	The number of rows written with INSERT DELAYED for which some error occurred (probably duplicate key).
Insert Threads (Total)	The number of INSERT DELAYED handler threads in use.
Not Flushed Delayed Rows (Delta)	The number of rows waiting to be written in INSERT DELAYED queues.
Writes (Delta)	The number of INSERT DELAYED rows written.

4.19 Instance Activity Metrics

Lists the Instance Activity metrics and provides a brief description of each.

Table 4.18 Instance Activity Metrics

Name	Description
Flush Commands (Delta)	The number of executed FLUSH statements.
Opened Files (Delta)	The number of files that have been opened with my_open() (a mysys library function).

Name	Description
Open Files (Total)	The number of files that are open. This count includes regular files opened by the server. It does not include other types of files such as sockets or pipes.
Open Streams (Delta)	The number of streams that are open (used mainly for logging).
Prepared Stmt Count (Total)	The current number of prepared statements. (The maximum number of statements is given by the max_prepared_stmt_count system variable.).
Queries (Delta)	The number of statements executed by the server. This variable includes statements executed within stored programs, unlike the Questions variable.
Questions (Delta)	The number of statements executed by the server. This includes only statements sent to the server by clients and not statements executed within stored programs, unlike the Queries variable.
Uptime (Total)	The number of seconds that the server has been up.
Uptime Since Flush Status (Total)	The number of seconds since the most recent FLUSH STATUS statement.
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.

4.20 NDB Activity Metrics

Lists the NDB Activity metrics and provides a brief description of each.

Table 4.19 NDB Activity Metrics

Name	Description
Conflict Fn Max (Delta)	This variable shows the number of times that a row was not applied on the current SQL node due to 'greatest timestamp wins' conflict resolution since the last time that this mysqld was started.
Conflict Fn Old (Delta)	This variable shows the number of times that a row was not applied as the result of 'same timestamp wins' conflict resolution on a given mysqld since the last time it was restarted.
Number Of Data Nodes (Total)	If the server is part of a MySQL Cluster, the value of this variable is the number of data nodes in the cluster.
Number Of Ready Data Nodes (Total)	The number of running MySQL Cluster data nodes.

4.21 Performance Schema Activity Metrics

Lists the Performance Schema Activity metrics and provides a brief description of each.

Table 4.20 Performance Schema Activity Metrics

Name	Description
Cond Classes Lost (Delta)	How many instruments of type cond could not be loaded.
Cond Instances Lost (Delta)	How many instances of object type cond could not be created.

Name	Description
File Classes Lost (Delta)	How many instruments of type file could not be loaded.
File Handles Lost (Delta)	How many instances of object type file could not be opened.
File Instances Lost (Delta)	How many instances of object type file could not be created.
Hosts Lost (Delta)	How many hosts were lost.
Locker Lost (Delta)	How many events are lost or not recorded.
Mutex Classes Lost (Delta)	How many instruments of type mutex could not be loaded.
Mutex Instances Lost (Delta)	How many instances of object type mutest could not be created.
Rwlock Classes Lost (Delta)	How many instruments of type rwlock could not be loaded.
Rwlock Instances Lost (Delta)	How many instances of object type rwlock could not be created.
Table Handles Lost (Delta)	How many instances of object type table could not be opened.
Table Instances Lost (Delta)	How many instances of object type table could not be created.
Thread Classes Lost (Delta)	How many instruments of type thread could not be loaded.
Thread Instances Lost (Delta)	How many instances of object type thread could not be created.

4.22 Query Cache Activity Metrics

Lists the Query Cache Activity metrics and provides a brief description of each.

Table 4.21 Query Cache Activity Metrics

Name	Description
Free Blocks (Total)	The number of free memory blocks in the Query Cache.
Free Memory (Total)	The amount of free memory (in bytes) for the Query Cache.
Hits (Delta)	The number of Query Cache hits.
Inserts (Delta)	The number of queries added to the Query Cache.
Lowmem Prunes (Delta)	The number of queries that were deleted from the Query Cache because of low memory.
Not Cached (Delta)	The number of noncached queries (not cacheable, or not cached due to the query_cache_type setting).
Queries In Cache (Total)	The number of queries registered in the Query Cache.
Total Blocks (Total)	The total number of blocks in the Query Cache.
Average Free Block Size (KB)	The average size in kilobytes of free blocks within the Query Cache.
Used Blocks	The number of used memory blocks in the Query Cache.
Free Memory (MB)	The amount of free memory in megabytes within the Query Cache.

4.23 Replication Master Activity Metrics

Lists the Replication Master Activity metrics and provides a brief description of each.

Table 4.22 Replication Master Activity Metrics

Name	Description
Binlog File (Total)	The name of the current binary log file.
Binlog File Position (Total)	The file position of the current binary log file.
Cache Disk Use (Delta)	The number of transactions that used the binary log cache but that exceeded the value of binlog_cache_size and used a temporary file to store changes from the transaction.
Cache Use (Delta)	The number of transactions that used the binary log cache.
Executed Gtid Set (Total)	The latest GTID set within the binary log files.
Semi Sync Master Clients (Total)	The number of semisynchronous slaves.
Semi Sync Master Net Avg Wait Time (Total)	The average time in microseconds the master waited for a slave reply.
Semi Sync Master Net Waits (Delta)	The total number of times the master waited for slave replies.
Semi Sync Master Net Wait Time (Delta)	The total time in microseconds the master waited for slave replies.
Semi Sync Master No Times (Delta)	The number of times the master turned off semisynchronous replication.
Semi Sync Master No Tx (Delta)	The number of commits that were not acknowledged successfully by a slave.
Semi Sync Master Status (Total)	Whether semisynchronous replication currently is operational on the master.
Semi Sync Master Timefunc Failures (Delta)	The number of times the master failed when calling time functions such as gettimeofday().
Semi Sync Master Tx Avg Wait Time (Delta)	The average time in microseconds the master waited for each transaction.
Semi Sync Master Tx Waits (Delta)	The total number of times the master waited for transactions.
Semi Sync Master Tx Wait Time (Delta)	The total time in microseconds the master waited for transactions.
Semi Sync Master Wait Pos Backtraverse (Delta)	The total number of times the master waited for an event with binary coordinates lower than events waited for previously.
Semi Sync Master Wait Sessions (Total)	The number of sessions currently waiting for slave replies.
Semi Sync Master Yes Tx (Delta)	The number of commits that were acknowledged successfully by a slave.
Show Master Status (Delta)	The total number of SHOW MASTER STATUS statements executed.
Show New Master (Delta)	The total number of SHOW NEW MASTER statements executed.

Name	Description
Show Slave Hosts (Delta)	The total number of SHOW SLAVE HOSTS statements executed.
Status (Total)	The status of fail-safe replication.
Exceeded Binary Log Space Limit (Rate)	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.

4.24 Replication Slave Activity Metrics

Lists the Replication Slave Activity metrics and provides a brief description of each.

Table 4.23 Replication Slave Activity Metrics

Name	Description
Change Master (Delta)	The total number of CHANGE MASTER statements executed.
Exec Master Log Pos (Total)	The position in the current master binary file up to which the SQL thread has read and executed.
Executed Gtid Set (Total)	The set of global transaction IDs for all received transactions subsequently executed on this slave. Empty if GTIDs are not in use.
Heartbeat Period (Total)	The replication heartbeat interval (in seconds) for the slave.
Io Running (Total)	Whether the slave I/O thread is started and has connected successfully to the master.
Io State (Total)	The current informational state for the slave I/O thread.
Last Errno (Total)	The error number of the last error that caused the SQL thread to stop.
Last Error (Total)	The error message of the last error that caused the SQL thread to stop.
Last Io Errno (Total)	The error numberof the last error that caused the I/O thread to stop.
Last Io Error (Total)	The error message of the last error that caused the I/O thread to stop.
Last SQL Errno (Total)	The error number of the last error that caused the SQL thread to stop.
Last SQL Error (Total)	The error message of the last error that caused the SQL thread to stop.
Master Log File (Total)	The name of the master binary log file from which the I/O thread is currently reading.
Open Temp Tables (Total)	The number of temporary tables that the slave SQL thread currently has open.
Read Master Log Pos (Total)	The position in the current master binary log file up to which the I/O thread has read.
Received Heartbeats (Delta)	The total number of heartbeats received by the slave since the last time that the slave was restarted or reset, or a CHANGE MASTER TO statement was issued.
Relay Log File (Total)	The name of the relay log file from which the SQL thread is currently reading and executing.
Relay Log Pos (Total)	The position in the current relay log file up to which the SQL thread has read and executed.
Relay Log Space (Total)	The total combined size of all existing relay log files.

Name	Description
Relay Master Log File (Total)	The name of the master binary log file containing the most recent event executed by the SQL thread.
Retried Transactions (Delta)	The total number of times since startup that the replication slave SQL thread has retried transactions.
Retrieved Gtid Set (Total)	The set of global transaction IDs corresponding to all transactions received by this slave. Empty if GTIDs are not in use.
Running (Total)	This is ON if this server is a replication slave that is connected to a replication master, and both the I/O and SQL threads are running; otherwise, it is OFF.
Seconds Behind Master (Total)	The time difference in seconds between the slave SQL thread and the slave I/O thread, based on the timestamps stored in the relay log events. NULL if the slave SQL thread is not running, or if the slave I/O thread is not running or not connected to the master.
Semi Sync Slave Status (Total)	Whether semisynchronous replication currently is operational on the slave. This is ON if the plugin has been enabled and the slave I/O thread is running, OFF otherwise.
Show Slave Status (Delta)	The total number of SHOW SLAVE STATUS statements executed.
Skip Counter (Total)	The current value of the sql_slave_skip_counter system variable.
Slave Start (Delta)	The total number of START SLAVE statements executed.
Slave Stop (Delta)	The total number of STOP SLAVE statements executed.
SQL Remaining Delay (Total)	The number of seconds before the slave SQL thread will applythe next event within the relay logs.
SQL Running (Total)	Whether the slave SQL thread is started.
SQL Running State (Total)	The current informational state for the slave SQL thread.
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.
Slave Execution Position 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.
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.
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.

Name	Description
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).
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.
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.
Slave Relay Log Space	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.
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.
Slave Seconds 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.
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.

4.25 Secure Connections Activity Metrics

Lists the Secure Connections Activity metrics and provides a brief description of each.

Table 4.24 Secure Connections Activity Metrics

Name	Description
Accept Renegotiates (Delta)	The number of negotiates needed to establish the connection.
Accepts (Delta)	The number of accepted SSL connections.
Callback Cache Hits (Delta)	The number of callback cache hits.
Cipher (Total)	The current SSL cipher (empty for non-SSL connections).
Cipher List (Total)	The list of possible SSL ciphers.
Client Connects (Delta)	The number of SSL connection attempts to an SSL-enabled master.
Connect Renegotiates (Delta)	The number of negotiates needed to establish the connection to an SSL-enabled master.

Name	Description
Ctx Verify Depth (Total)	The SSL context verification depth --how many certificates in the chain are tested.
Ctx Verify Mode (Total)	The SSL context verification mode.
Default Timeout (Total)	The default SSL timeout.
Finished Accepts (Delta)	The number of successful SSL connections to the server.
Finished Connects (Delta)	The number of successful slave connections to an SSL-enabled master.
Session Cache Hits (Delta)	The number of SSL session cache hits.
Session Cache Misses (Delta)	The number of SSL session cache misses.
Session Cache Mode (Total)	The SSL session cache mode.
Session Cache Overflows (Delta)	The number of SSL session cache overflows.
Session Cache Size (Total)	The SSL session cache size.
Session Cache Timeouts (Delta)	The number of SSL session cache timeouts.
Sessions Reused (Delta)	How many SSL connections were reused from the cache.
Used Session Cache Entries (Delta)	How many SSL session cache entries were used.
Verify Depth (Total)	The verification depth for replication SSL connections.
Verify Mode (Total)	The verification mode for replication SSL connections.
Version (Total)	The SSL version identifier.

4.26 Show Statement Activity Metrics

Lists the Show Statement Activity metrics and provides a brief description of each.

Table 4.25 Show Statement Activity Metrics

Name	Description
Show Authors (Delta)	The total number of SHOW AUTHORS statements executed.
Show Binlog Events (Delta)	The total number of SHOW BINLOG EVENTS statements executed.
Show Binlogs (Delta)	The total number of SHOW BINARY LOGS statements executed.
Show Charsets (Delta)	The total number of SHOW CHARACTER SET statements executed.
Show Collations (Delta)	The total number of SHOW COLLATION statements executed.
Show Column Types (Delta)	The total number of SHOW COLUMNS statements executed.
Show Contributors (Delta)	The total number of SHOW CONTRIBUTORS statements executed.
Show Create DB (Delta)	The total number of SHOW CREATE DATABASE statements executed.

Name	Description
Show Create Event (Delta)	The total number of SHOW CREATE EVENT statements executed.
Show Create Func (Delta)	The total number of SHOW CREATE FUNCTION statements executed.
Show Create Proc (Delta)	The total number of SHOW CREATE PROCEDURE statements executed.
Show Create Table (Delta)	The total number of SHOW CREATE TABLE statements executed.
Show Create Trigger (Delta)	The total number of SHOW CREATE TRIGGER statements executed.
Show Databases (Delta)	The total number of SHOW DATABASES statements executed.
Show Engine Logs (Delta)	The total number of SHOW ENGINE ... LOGS statements executed.
Show Engine Mutex (Delta)	The total number of SHOW ENGINE ... MUTEX statements executed.
Show Engine Status (Delta)	The total number of SHOW ENGINE ... STATUS statements executed.
Show Errors (Delta)	The total number of SHOW ERRORS statements executed.
Show Events (Delta)	The total number of SHOW EVENTS statements executed.
Show Fields (Delta)	The total number of SHOW FIELDS statements executed.
Show Function Code (Delta)	The total number of SHOW FUNCTION CODE statements executed.
Show Function Status (Delta)	The total number of SHOW FUNCTION STATUS statements executed.
Show Grants (Delta)	The total number of SHOW GRANTS statements executed.
Show InnoDB Status (Delta)	The total number of SHOW INNODB STATUS statements executed.
Show Keys (Delta)	The total number of SHOW KEYS | INDEX | INDEXES statements executed.
Show Logs (Delta)	The total number of SHOW LOGS statements executed.
Show Master Status (Delta)	The total number of SHOW MASTER STATUS statements executed.
Show New Master (Delta)	The total number of SHOW NEW MASTER statements executed.
Show Open Tables (Delta)	The total number of SHOW OPEN TABLES statements executed.
Show Plugins (Delta)	The total number of SHOW PLUGINS statements executed.
Show Privileges (Delta)	The total number of SHOW PRIVILEGES statements executed.
Show Procedure Code (Delta)	The total number of SHOW PROCEDURE CODE statements executed.
Show Procedure Status (Delta)	The total number of SHOW PROCEDURE STATUS statements executed.
Show Processlist (Delta)	The total number of SHOW PROCESSLIST statements executed.
Show Profile (Delta)	The total number of SHOW PROFILE statements executed.
Show Profiles (Delta)	The total number of SHOW PROFILES statements executed.

Name	Description
Show Relaylog Events (Delta)	The total number of SHOW RELAYLOG EVENTS statements executed.
Show Slave Hosts (Delta)	The total number of SHOW SLAVE HOSTS statements executed.
Show Slave Status (Delta)	The total number of SHOW SLAVE STATUS statements executed.
Show Status (Delta)	The total number of SHOW STATUS statements executed.
Show Storage Engines (Delta)	The total number of SHOW STORAGE ENGINES statements executed.
Show Tables (Delta)	The total number of SHOW TABLES statements executed.
Show Table Status (Delta)	The total number of SHOW TABLE STATUS statements executed.
Show Triggers (Delta)	The total number of SHOW TRIGGERS statements executed.
Show Variables (Delta)	The total number of SHOW VARIABLES statements executed.
Show Warnings (Delta)	The total number of SHOW WARNINGS statements executed.

4.27 Slow Query Logging Activity Metrics

Lists the Slow Query Logging Activity metrics and provides a brief description of each.

Table 4.26 Slow Query Logging Activity Metrics

Name	Description
Slow Queries (Delta)	The number of queries that have taken more than long_query_time seconds

4.28 Table Activity Metrics

Lists the Table Activity metrics and provides a brief description of each.

Table 4.27 Table Activity Metrics

Name	Description
Created Tmp Disk Tables (Delta)	The total number of temporary tables that were converted to disk based tables, due to exceeding either tmp_table_size or max_heap_table_size.
Created Tmp Files (Delta)	How many temporary files mysqld has created.
Created Tmp Tables (Delta)	The total number of temporary tables created.
Opened Table Definitions (Delta)	The number of .frm files that have been cached.
Opened Tables (Delta)	The total number of tables that have been opened.
Open Table Definitions (Total)	The number of currently cached .frm files.
Open Tables (Total)	The current number of tables held open in the table cache.
Sort Merge Passes (Delta)	The number of merge passes that the sort algorithm has had to do.

Name	Description
Sort Range (Delta)	The number of sorts that were done using ranges.
Sort Rows (Delta)	The number of sorted rows.
Sort Scan (Delta)	The number of sorts that were done by scanning the table.
Table Locks Immediate (Delta)	The number of times that a request for a table lock could be granted immediately.
Table Locks Waited (Delta)	The number of times that a request for a table lock could not be granted immediately and a wait was needed.
Temporary Disk Table (Rate)	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.
Table Cache Not Optimal (Rate)	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.
Table Lock Contention (Rate)	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.

4.29 Threads Activity Metrics

Lists the Threads Activity metrics and provides a brief description of each.

Table 4.28 Threads Activity Metrics

Name	Description
Cached (Total)	The number of threads in the thread cache.
Connected (Total)	The number of currently open connections.
Created (Delta)	The number of threads created to handle connections.
Running (Total)	The number of threads that are not sleeping.
Slow Launch Threads (Delta)	The number of threads that have taken more than slow_launch_time seconds to create.
Connection Limit Usage (Rate)	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.
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

Name	Description
	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.
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.

4.30 Trx Statement Activity Metrics

Lists the Trx Statement Activity metrics and provides a brief description of each.

Table 4.29 Trx Statement Activity Metrics

Name	Description
Begin (Delta)	The total number of BEGIN | START TRANSACTION statements executed.
Commit (Delta)	The total number of COMMIT statements executed.
Release Savepoint (Delta)	The total number of RELEASE SAVEPOINT statements executed.
Rollback (Delta)	The total number of ROLLBACK statements executed.
Rollback To Savepoint (Delta)	The total number of ROLLBACK TO SAVEPOINT statements executed.
Savepoint (Delta)	The total number of SAVEPOINT statements executed.
XA Commit (Delta)	The total number of XA COMMIT statements executed.
XA End (Delta)	The total number of XA END statements executed.
XA Prepare (Delta)	The total number of XA PREPARE statements executed.
XA Recover (Delta)	The total number of XA RECOVER statements executed.
XA Rollback (Delta)	The total number of XA ROLLBACK statements executed.
XA Start (Delta)	The total number of XA START statements executed.

4.31 XA Activity Metrics

Lists the XA Activity metrics and provides a brief description of each.

Table 4.30 XA Activity Metrics

Name	Description
Log Max Pages Used (Total)	For the memory-mapped implementation of the log that is used by mysqld when it acts as the transaction coordinator for recovery of internal XA transactions, this variable indicates the largest number of pages used for the log since the server started.
Log Page Size (Total)	The page size used for the memory-mapped implementation of the XA recovery log.
Log Page Waits (Delta)	For the memory-mapped implementation of the recovery log, this variable increments each time the server was not able to commit a transaction and had to wait for a free page in the log.

Chapter 5 Configuration Metrics

Table of Contents

This chapter describes the Oracle Enterprise Manager for MySQL Database configuration metrics.

The following topics are described:

5.1 Configuration Metrics Page

This section describes the metrics within the **Configuration** pages of the Oracle Enterprise Manager for MySQL Database.

The following topics are described:

5.2 Binary Logs Configuration Metrics

Lists the Binary Logs configuration metrics and provides a brief description of each.

Table 5.1 Binary Logs Configuration Metrics

Name	Description
Binlog Cache Size (Total)	The size of the cache to hold changes to the binary log during a transaction. A binary log cache is allocated for each client if the server supports any transactional storage engines and if the server has the binary log enabled.
Binlog Checksum (Total)	Causes the master to write checksums for events written to the binary log. Set to NONE to disable, or the name of the algorithm to be used for generating checksums; currently, only CRC32 checksums are supported.
Binlog Direct Non Transactional Updates Enabled (Total)	Causes updates to nontransactional tables to be written directly to the binary log, rather than to the transaction cache.
Binlog Do DB (Total)	Whether the MySQL server is currently only filtering binary log updates to specific databases only.
Binlog Format (Total)	This variable sets the binary logging format, and can be any one of STATEMENT, ROW, or MIXED.
Binlog Ignore DB (Total)	Whether the MySQL server is currently ignoring updates to the binary log for specific databases.
Binlog Max Flush Queue Time (Total)	How long in microseconds to keep reading transactions from the flush queue before proceeding with the group commit (and syncing the log to disk, if sync_binlog is greater than 0). If the value is 0 (the default), there is no timeout and the server keeps reading new transactions until the queue is empty.
Binlog Order Commits Enabled (Total)	If this variable is enabled (the default), transactions are committed in the same order they are written to the binary log. If disabled, transactions may be committed in parallel. In some cases, disabling this variable might produce a performance increment.
Binlog Row Image (Total)	When using ROW based or MIXED binary logging, whether to log the full before - pre change - image of the row, or a minimial image of the row if possible (given a unique key on the table), or to only exclude BLOB/TEXT columns from the before image of the row.
Binlog Rows Query Log Events Enabled (Total)	Causes the 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.
Binlog Stmt Cache Size (Total)	Determines the size of the cache for the binary log to hold nontransactional statements issued during a transaction. Separate binary log transaction and statement caches are allocated for each client if the server supports any transactional storage engines and if the server has the binary log enabled.
Binlog Trusts Function Creators Enabled (Total)	This variable applies when binary logging is enabled and controls whether stored function creators can be trusted not to create stored functions that will cause unsafe events to be written to the binary log.
Expire Logs Days (Total)	The number of days for automatic binary log file removal.
Log Bin Basename (Total)	Holds the name and complete path to the binary log file.
Log Bin Enabled (Total)	Whether the binary log is enabled.
Log Bin Index (Total)	The index file for binary log file names.
Log Bin Use V1 Row Events Enabled (Total)	Version 2 binary log row events are used by default beginning with MySQL Cluster NDB 7.2.1; however, Version 2 events cannot be read by previous

Name	Description
	MySQL Cluster releases. Setting --log-bin-use-v1-row-events to 1 causes mysqld to write the binary log using Version 1 logging events, which is the only version of binary log events used in previous releases, and thus produce binary logs that can be read by older slaves.
Max Binlog Cache Size (Total)	If a transaction requires more than this many bytes of memory, the server generates a Multi-statement transaction required more than 'max_binlog_cache_size' bytes of storage error.
Max Binlog Size (Total)	If a write to the binary log causes the current log file size to exceed the value of this variable, the server rotates the binary logs.
Max Binlog Stmt Cache Size (Total)	If nontransactional statements within a transaction require more than this many bytes of memory, the server generates an error. max_binlog_stmt_cache_size sets the size for the statement cache only; the upper limit for the transaction cache is governed exclusively by the max_binlog_cache_size system variable.
SQL Log Bin Enabled (Total)	If disabled, no logging is done to the binary log for the client.
Sync Binlog (Total)	If the value of this variable is greater than 0, the MySQL server synchronizes its binary log to disk (using fdatasync()) after every sync_binlog writes to the binary log.

5.3 Capabilities Configuration Metrics

Lists the Capabilities configuration metrics and provides a brief description of each.

Table 5.2 Capabilities Configuration Metrics

Name	Description
Compress Enabled (Total)	True if the zlib compression library is available to the server, false if not.
Crypt Enabled (Total)	True if the crypt() system call is available to the server, false if not.
Csv Enabled (Total)	True if mysqld supports CSV tables, false if not.
Dynamic Loading Enabled (Total)	True if mysqld supports dynamic loading of plugins, false if not.
Event Scheduler Enabled (Total)	Enable or disable, and start or stop, the event scheduler.
Geometry Types Enabled (Total)	True if the server supports spatial data types, false if not.
InnoDB Enabled (Total)	True if mysqld supports InnoDB tables. false if --skip-innodb is used.
Ndbcluster Enabled (Total)	True if mysqld supports NDBCLUSTER tables, false if --skip-ndbcluster is used.
Openssl Enabled (Total)	True if mysqld supports SSL connections, false if not.
Partitioning Enabled (Total)	True if mysqld supports partitioning.
Profiling Enabled (Total)	True if statement profiling is enabled, false if not.
Query Cache Enabled (Total)	True if mysqld supports the query cache, false if not.

Name	Description
Rtree Keys Enabled (Total)	True if RTREE indexes are available, false if not.
Ssl Enabled (Total)	True if mysqld supports SSL connections, false if not.
Symlink Enabled (Total)	True if symbolic link support is enabled, false if not.

5.4 Character Set Configuration Metrics

Lists the Character Set configuration metrics and provides a brief description of each.

Table 5.3 Character Set Configuration Metrics

Name	Description
Client (Total)	The character set for statements that arrive from the client.
Connection (Total)	The character set used for literals that do not have a character set introducer and for number-to-string conversion.
Database (Total)	The character set used by the default database.
Directory (Total)	The directory where character sets are installed.
Filesystem (Total)	The file system character set.
Results (Total)	The character set used for returning query results such as result sets or error messages to the client.
Server Default (Total)	The server's default character set.
System (Total)	The character set used by the server for storing identifiers.

5.5 Collation Configuration Metrics

Lists the Collation configuration metrics and provides a brief description of each.

Table 5.4 Collation Configuration Metrics

Name	Description
Connection (Total)	The collation of the connection character set.
Database (Total)	The collation used by the default database.
Server Default (Total)	The server's default collation.

5.6 Connection Configuration Metrics

Lists the Connection configuration metrics and provides a brief description of each.

Table 5.5 Connection Configuration Metrics

Name	Description
Back Log (Total)	The number of outstanding connection requests MySQL can have.
Connect Timeout (Total)	The number of seconds that the MySQL server waits for a connect packet before responding with 'Bad handshake'.
Init Connect (Total)	A string to be executed by the server for each client that connects.
Interactive Timeout (Total)	The number of seconds the server waits for activity on an interactive connection before closing it.

Name	Description
Max Connect Errors (Total)	If there are more than this number of interrupted connections from a host, that host is blocked from further connections.
Max Connections (Total)	The maximum permitted number of simultaneous client connections.
Max User Connections (Total)	The maximum number of simultaneous connections permitted to any given MySQL user account.
Net Buffer Length (Total)	Each client thread is associated with a connection buffer and result buffer. Both begin with a size given by net_buffer_length but are dynamically enlarged up to max_allowed_packet bytes as needed.
Net Read Timeout (Total)	The number of seconds to wait for more data from a connection before aborting the read.
Net Retry Count (Total)	If a read on a communication port is interrupted, retry this many times before giving up.
Net Write Timeout (Total)	The number of seconds to wait for a block to be written to a connection before aborting the write.
Skip Name Resolve Enabled (Total)	Whether MySQL should resolve host names when checking client connections.
Wait Timeout (Total)	The number of seconds the server waits for activity on a noninteractive connection before closing it.

5.7 Connection Buffers Configuration Metrics

Lists the Connection Buffers configuration metrics and provides a brief description of each.

Table 5.6 Connection Buffers Configuration Metrics

Name	Description
Bulk Insert Buffer Size (Total)	Limits the size (in bytes) of the special tree-like cache MyISAM uses tomake bulk inserts faster for INSERT ... SELECT, INSERT ... VALUES (...), (...), ..., and LOAD DATA INFILE, when adding data to nonempty tables, per thread.
Join Buffer Size (Total)	The minimum size (in bytes) of the buffer that is used for plain index scans, range index scans, and joins that do not use indexes and thus perform full table scans.
Max Allowed Packet (Total)	The maximum size (in bytes) of one packet or any generated / intermediate string from connections to the MySQL server.
Net Buffer Length (Total)	Each client connection is associated with a connection buffer and result buffer. Both begin with a size given by net_buffer_length (in bytes) but are dynamically enlarged up to max_allowed_packet bytes as needed.
Preload Buffer Size (Total)	The size of the buffer that is allocated when preloading indexes.
Query Alloc Block Size (Total)	The allocation size of memory blocks that are allocated for objects created during statement parsing and execution. If you have problems with memory fragmentation, it might help to increase this parameter.
Query Prealloc Size (Total)	The size of the persistent buffer used for statement parsing and execution.
Read Buffer Size (Total)	Each thread that does a sequential scan allocates a buffer of this size (in bytes) for each table it scans.

Name	Description
Read Rnd Buffer Size (Total)	The size (in bytes) for reading rows in sorted order following a key-sorting operation, to avoid disk seeks.
Sort Buffer Size (Total)	Each session that needs to do a sort allocates a buffer of this size (in bytes).
Stored Program Cache (Total)	Sets a soft upper limit for the number of cached stored routines per connection. The value of this variable is specified in terms of the number of stored routines held in each of the two caches maintained by the MySQL Server for, respectively, stored procedures and stored functions.
Thread Stack (Total)	The stack size for each connection thread.
Transaction Alloc Block Size (Total)	The size (in bytes) by which to increase the per-transaction memory pool use for connection transactions.
Transaction Prealloc Size (Total)	The initial size (in bytes) of the per-transaction memory pool from which various transaction-related allocations take memory.

5.8 Environment Configuration Metrics

Lists the Environment configuration metrics and provides a brief description of each.

Table 5.7 Environment Configuration Metrics

Name	Description
Basedir (Total)	The MySQL installation base directory.
Core File Enabled (Total)	Whether to write a core file if the server crashes.
Datadir (Total)	The MySQL data directory.
Hostname (Total)	The server sets this variable to the server host name at startup.
Ignore DB Dirs (Total)	A comma-separated list of names that are not considered as database directories in the data directory.
Init File (Total)	The name of the file specified with the --init-file option when you start the server.
Keep Files On Create Enabled (Total)	If a MyISAM table is created with a DATA DIRECTORY or INDEX DIRECTORY option and an existing .MYD or .MYI file is found, MyISAM always returns an error.
Large Files Support Enabled (Total)	Whether mysqld was compiled with options for large file support.
Large Pages Enabled (Total)	Whether large page support is enabled (via the --large-pages option).
Large Page Size (Total)	If large page support is enabled, this shows the size of memory pages.
Locked In Memory Enabled (Total)	Whether mysqld was locked in memory with --memlock.
Lower Case File System Enabled (Total)	Whether the file system where the data directory is locatedis case sensitive or not.
New Mode Enabled (Total)	This variable was used in MySQL 4.0 to turn on some 4.1 behaviors, and is retained for backward compatibility.
Old Mode Enabled (Total)	When enabled, changes the default scope of index hints to that used prior to MySQL 5.1.17. That is, index hints with no FOR clause apply only to how

Name	Description
	indexes are used for row retrieval and not to resolution of ORDER BY or GROUP BY clauses.
Open Files Limit (Total)	The maximum number of file descriptors available to mysqld.
Pid File (Total)	The path name of the process ID file.
Plugin Dir (Total)	The path name of the plugin directory.
Skip External Locking Enabled (Total)	This is OFF if mysqld uses external locking, ON if external locking is disabled.
SQL Mode (Total)	Sql modes define what SQL syntax MySQL should support and what kind of data validation checks it should perform.
Tmpdir (Total)	The path of the directory to use for creating temporary files.

5.9 Host Cache Configuration Metrics

Lists the Host Cache configuration metrics and provides a brief description of each.

Table 5.8 Host Cache Configuration Metrics

Name	Description
Host Cache Size (Total)	The size of the internal host cache. Setting the size to 0 disables the host cache. Changing the cache size at runtime implicitly causes a FLUSH HOSTS operation to clear the host cache and truncate the host_cache table.

5.10 InnoDB Configuration Configuration Metrics

Lists the InnoDB Configuration configuration metrics and provides a brief description of each.

Table 5.9 InnoDB Configuration Configuration Metrics

Name	Description
Adaptive Flushing Enabled (Total)	Whether an heuristic to determine when to flush dirty pages in the buffer pool should be used.
Adaptive Flushing Lwm (Total)	Low water mark representing percentage of redo log capacity at which adaptive flushing is enabled.
Adaptive Hash Index Enabled (Total)	Whether InnoDB adaptive hash indexes are enabled or disabled.
Adaptive Max Sleep Delay (Total)	Allows InnoDB to automatically adjust the value of innodb_thread_sleep_delay up or down according to the current workload.
Additional Mem Pool Size (Total)	The size in bytes of a memory pool InnoDB uses to store data dictionary information and other internal data structures.
Autoextend Increment (Total)	The increment size (in MB) for extending the size of an auto-extending shared tablespace file when it becomes full.
Autoinc Lock Mode (Total)	The locking mode to use for generating auto-increment values.
Buffer Pool Dump At Shutdown Enabled (Total)	Whether to record the pages cached in the InnoDB buffer pool when the MySQL server is shut down, to shorten the warmup process at the next restart.

Name	Description
Buffer Pool Dump Now Enabled (Total)	Immediately records the pages cached in the InnoDB buffer pool.
Buffer Pool Filename (Total)	Specifies the file that holds the list of page numbers produced by innodb_buffer_pool_dump_at_shutdown or innodb_buffer_pool_dump_now.
Buffer Pool Instances (Total)	The number of regions that the InnoDB buffer pool is divided into. For systems with buffer pools in the multi-gigabyte range, dividing the buffer pool into separate instances can improve concurrency, by reducing contention as different threads read and write to cached pages.
Buffer Pool Load At Startup Enabled (Total)	Specifies that, on MySQL server startup, the InnoDB buffer pool is automatically warmed up by loading the same pages it held at an earlier time.
Buffer Pool Load Now Enabled (Total)	Immediately warms up the InnoDB buffer pool by loading a set of data pages, without waiting for a server restart.
Buffer Pool Load On Abort Enabled (Total)	Interrupts the process of restoring InnoDB buffer pool contents triggered by innodb_buffer_pool_load_at_startup or innodb_buffer_pool_load_now.
Buffer Pool Size (Total)	The size in bytes of the memory buffer InnoDB uses to cache data and indexes of its tables.
Change Buffering (Total)	Whether InnoDB performs change buffering, an optimization that delays write operations to secondary indexes so that the I/O operations can be performed sequentially.
Change Buffer Max Size (Total)	Maximum size for the InnoDB change buffer, as a percentage of the total size of the buffer pool. You might increase this value for a MySQL server with heavy insert, update, and delete activity, or decrease it for a MySQL server with unchanging data used for reporting.
Checksum Algorithm (Total)	Specifies how to generate and verify the checksum stored in each disk block of each InnoDB tablespace. Replaces the innodb_checksums option.
Checksums Enabled (Total)	Whether InnoDB uses checksum validation on all pages read from the disk to ensure extra fault tolerance against broken hardware or data files.
Commit Concurrency (Total)	The number of threads that can commit at the same time within InnoDB.
Compression Failure Threshold Pct (Total)	Sets the cutoff point at which MySQL begins adding padding within compressed pages to avoid expensive compression failures. A value of zero disables the mechanism that monitors compression efficiency and dynamically adjusts the padding amount.
Compression Level (Total)	Specifies the level of zlib compression to use for InnoDB compressed tables and indexes.
Compression Pad Pct Max (Total)	Specifies the maximum percentage that can be reserved as free space within each compressed page, allowing room to reorganize the data and modification log within the page when a compressed table or index is updated and the data might be recompressed.
Compression Per Index Enabled (Total)	Enables per-index compression-related statistics in the INFORMATION_SCHEMA.INNODB_CMP_PER_INDEX table.
Concurrency Tickets (Total)	The number of threads that can enter InnoDB concurrently.
Data File Path (Total)	The paths to individual InnoDB data files and their sizes.

Name	Description
Data Home Dir (Total)	The common part of the directory path for all InnoDB data files in the shared tablespace.
Disable Sort File Cache Enabled (Total)	Disables caching of sort files on Linux and Solaris when creating indexes.
Doublewrite Enabled (Total)	Whether to enabled doublewrite buffering (writing the data twice, to a buffer then the data file) within InnoDB.
Fast Shutdown (Total)	Speeds up the shutdown process of the InnoDB storage engine.
File Format (Total)	The file format to use for new InnoDB tables.
File Format Check Enabled (Total)	Whether InnoDB checks the file format tag in the shared tablespace on server start for version compatibility.
File Format Max (Total)	The file format tag InnoDB sets in in the shared tablespace (for example, Antelope or Barracuda).
File Per Table Enabled (Total)	Whether each InnoDB table should be stored in an .ibd file in the database dir instead of the central tablespace (ibdata*) files.
Flushing Avg Loops (Total)	Number of iterations for which InnoDB keeps the previously calculated snapshot of the flushing state, controlling how quickly adaptive flushing responds to changing workloads.
Flush Log At Timeout (Total)	Write and flush the logs every N seconds. This setting has an effect only when innodb_flush_log_at_trx_commit has a value of 2.
Flush Log At Trx Commit (Total)	Defines how InnoDB should flush it's transaction redo log bufferand files.
Flush Method (Total)	Defines how InnoDB flushes both data and redo log files to disk.
Flush Neighbors Enabled (Total)	Specifies whether flushing a page from the InnoDB buffer pool also flushes other dirty pages in the same extent.
Force Load Corrupted Enabled (Total)	Lets InnoDB load tables at startup that are marked as corrupted. Use only during troubleshooting, to recover data that is otherwise inaccessible. When troubleshooting is complete, turn this setting back off and restart the server.
Force Recovery (Total)	The crash recovery mode that InnoDB should be started with, should not be used in normal operations.
Foreign Key Checks Enabled (Total)	Whether foreign key constraint checking is enabled/disbaled globally.
Ignore Builtin InnoDB Enabled (Total)	Whether the server was started with the --ignore-builtin-innodb option.
Io Capacity (Total)	The maximum number of I/O operations per second that InnoDB will perform.
Io Capacity Max (Total)	The limit up to which InnoDB is allowed to extend the innodb_io_capacity setting, per buffer pool instance, in case of emergency. Its default value is twice the default value of innodb_io_capacity, with a lower limit of 2000.
Large Prefix Enabled (Total)	Enable this option to allow index key prefixes longer than 767 bytes (up to 3072 bytes), for InnoDB tables that use the DYNAMIC and COMPRESSED row formats.
Locks Unsafe For Binlog Enabled (Total)	Affects how InnoDB uses gap locking for searches and index scans.
Lock Wait Timeout (Total)	The timeout in seconds an InnoDB transaction may wait for a row lock before giving up.

Name	Description
Log Buffer Size (Total)	The size in bytes of the buffer that InnoDB uses to write to the log files on disk.
Log Compressed Pages Enabled (Total)	Whether to log the compressed version of pages to the redo logs or not.
Log Files In Group (Total)	The number of redo log files in the InnoDB redo log group.
Log File Size (Total)	The size in bytes of each InnoDB redo log file in a redo log group.
Log Group Home Dir (Total)	The directory path to the InnoDB redo log files.
Lru Scan Depth (Total)	Specifies, per buffer pool instance, how far down the buffer pool LRU list the page_cleaner thread scans looking for dirty pages to flush.
Max Dirty Pages Pct (Total)	InnoDB tries to write pages from the buffer pool so that the percentage of dirty (not yet written) pages will not exceed this value.
Max Dirty Pages Pct Lwm (Total)	Low water mark representing percentage of dirty pages where preflushing is enabled to control the dirty page ratio.
Max Purge Lag (Total)	How long InnoDB should delay INSERT, UPDATE, and DELETE operations when purge operations are lagging.
Max Purge Lag Delay (Total)	Specifies the maximum delay in milliseconds for the delay imposed by the innodb_max_purge_lag configuration option.
Mirrored Log Groups (Total)	The number of identical copies of log groups to keep for the database.
Monitor Disable (Total)	Turns off one or more counters in the information_schema.innodb_metrics table.
Monitor Enable (Total)	Turns on one or more counters in the information_schema.innodb_metrics table.
Monitor Reset (Total)	Resets to zero the count value for one or more counters in the information_schema.innodb_metrics table.
Monitor Reset All (Total)	Resets all values (minimum, maximum, and so on) for one or more counters in the information_schema.innodb_metrics table.
Old Blocks Pct (Total)	Specifies the approximate percentage of the InnoDB buffer pool used for the old block sublist.
Old Blocks Time (Total)	Specifies how long in milliseconds a block inserted into the old sublist of the InnoDB buffer pool must stay there after its first access before it can be moved to the new sublist.
Online Alter Log Max Size (Total)	Specifies an upper limit on the size of the temporary log files used during online DDL operations for InnoDB tables.
Open Files (Total)	The maximum number of .ibd files that InnoDB can keep open at one time.
Page Size (Total)	Specifies the page size for all InnoDB tablespaces in a MySQL instance. This value is set when the instance is created and remains constant afterwards. You can specify page size using the values 16k (the default), 8k, or 4k.
Print All Deadlocks Enabled (Total)	When this option is enabled, information about all deadlocks in InnoDB user transactions is recorded in the mysqld error log.
Purge Batch Size (Total)	The granularity of changes, expressed in units of InnoDB redo log records, that trigger a purge operation, flushing the changed buffer pool blocks to disk.
Purge Threads (Total)	The number of background threads devoted to the InnoDB purge operation.

Name	Description
Random Read Ahead Enabled (Total)	Enables the random read-ahead technique for optimizing InnoDB I/O.
Read Ahead Threshold (Total)	The sensitivity of linear read-ahead that InnoDB uses to prefetch pages into the buffer cache.
Read Io Threads (Total)	The number of I/O threads for read operations in InnoDB.
Read Only Enabled (Total)	Starts the server in read-only mode. For distributing database applications or data sets on read-only media. Can also be used in data warehouses to share the same data directory between multiple instances.
Replication Delay (Total)	The replication thread delay (in ms) on a slave server if innodb_thread_concurrency is reached.
Rollback On Timeout Enabled (Total)	Whether InnoDB should rollback the entire transaction if a lock wait timeout is occurs, or just the last statement.
Sort Buffer Size (Total)	Specifies the sizes of several buffers used for sorting data during creation of an InnoDB index.
Spin Wait Delay (Total)	The maximum delay between polls for a spin lock.
Stats Auto Recalc Enabled (Total)	Causes InnoDB to automatically recalculate persistent statistics after the data in a table is changed substantially. The threshold value is currently 10% of the rows in the table.
Stats Method (Total)	How the server treats NULL values when collecting statistics about the distribution of index values for InnoDB tables.
Stats On Metadata Enabled (Total)	Whether InnoDB should update statistics during metadata statements such as SHOW TABLE STATUS, or when accessing the INFORMATION_SCHEMA tables TABLES or STATISTICS.
Stats Persistent (Total)	Specifies whether the InnoDB index statistics produced by the ANALYZE TABLE command are stored on disk, remaining consistent until a subsequent ANALYZE TABLE. Otherwise, the statistics are recalculated more frequently, such as at each server restart, which can lead to variations in query execution plans.
Stats Persistent Sample Pages (Total)	The number of index pages to sample when estimating cardinality and other statistics for an indexed column, such as those calculated by ANALYZE TABLE, for tables with persistent statistics.
Stats Sample Transient Pages (Total)	The number of InnoDB index pages to sample for index distribution statistics such as are calculated by ANALYZE TABLE.
Status File (Total)	Whether InnoDB should report the output of SHOW ENGINE INNODB STATUSto an innodb_status.<pid> file in the datadir.
Strict Mode Enabled (Total)	Whether InnoDB returns errors rather than warnings for exceptional conditions.
Support XA Enabled (Total)	Enables InnoDB support for two-phase commit in XA transactions.
Sync Array Size (Total)	Splits an internal data structure used to coordinate threads, for higher concurrency in workloads with large numbers of waiting threads.
Sync Spin Loops (Total)	The number of times a thread waits for an InnoDB mutex to be freed before the thread is suspended.
Table Locks Enabled (Total)	Whether InnoDB should honor LOCK TABLES if autocommit = 0.

Name	Description
Thread Concurrency (Total)	The maximum number of operating system threads concurrently allowed inside InnoDB for transactions.
Thread Sleep Delay (Total)	How long InnoDB threads sleep before joining the InnoDB queue, in microseconds.
Timed Mutexes Enabled (Total)	Whether mutex waits within InnoDB are timed or not.
Undo Directory (Total)	The relative or absolute directory path where InnoDB creates separate tablespaces for the undo logs.
Undo Logs (Total)	Defines how many rollback segments in the system tablespace that InnoDB uses within a transaction.
Undo Tablespaces (Total)	The number of tablespace files that the undo logs are divided between, when you use a non-zero innodb_undo_logs setting.
Unique Checks Enabled (Total)	Whether uniqueness checks for secondary indexes are performed within InnoDB.
Use Native Aio Enabled (Total)	Whether to use the (Linux only) OS asynchronous IO subsystem.
Use Sys Malloc Enabled (Total)	Whether InnoDB uses the operating system memory allocator or its own.
Write Io Threads (Total)	The number of I/O threads for write operations in InnoDB.

5.11 InnoDB Fulltext Configuration Metrics

Lists the InnoDB Fulltext configuration metrics and provides a brief description of each.

Table 5.10 InnoDB Fulltext Configuration Metrics

Name	Description
Aux Table (Total)	Specifies the qualified name of an InnoDB table containing a FULLTEXT index.
Cache Size (Total)	Size of the cache that holds a parsed document in memory while creating an InnoDB FULLTEXT index.
Enable Stopword (Total)	Specifies that a set of stopwords is associated with an InnoDB FULLTEXT index at the time the index is created.
Max Token Size (Total)	Maximum length of words that are stored in an InnoDB FULLTEXT index.
Min Token Size (Total)	Minimum length of words that are stored in an InnoDB FULLTEXT index.
Num Word Optimize (Total)	Number of words to process during each OPTIMIZE TABLE operation on an InnoDB FULLTEXT index.
Optimize Fulltext Only Enabled (Total)	Changes the way the OPTIMIZE TABLE statement operates on InnoDB tables. Intended to be enabled temporarily, during maintenance operations for InnoDB tables with FULLTEXT indexes.
Server Stopword Table (Total)	Name of the table containing a list of words to ignore when creating an InnoDB FULLTEXT index, in the format db_name/table_name.
Sort Pll Degree (Total)	Number of threads used in parallel to index and tokenize text in an InnoDB FULLTEXT index, when building a search index for a large table.
User Stopword Table (Total)	Name of the table containing a list of words to ignore when creating an InnoDB FULLTEXT index, in the format db_name/table_name.

5.12 InnoDB Memcached Configuration Configuration Metrics

Lists the InnoDB Memcached Configuration configuration metrics and provides a brief description of each.

Table 5.11 InnoDB Memcached Configuration Configuration Metrics

Name	Description
Bk Commit Interval (Total)	Specifies how often to auto-commit idle connections that use the InnoDB memcached interface.
Disable Rowlock Enabled (Total)	Disables row locks for opvia the InnoDB memcached interface.
Enable Binlog Enabled (Total)	Enables binary logging of changes made via the InnoDB Memcached API.
Enable Mdl Enabled (Total)	Locks the table used by the InnoDB memcached plugin, so that it cannot be dropped or altered by DDL through the SQL interface.
Engine Lib Name (Total)	Specifies the shared library that implements the InnoDB memcached plugin.
Engine Lib Path (Total)	The path of the directory containing the shared library that implements the InnoDB memcached plugin.
Options (Total)	Space-separated options that are passed to the underlying memcached daemon on startup.
Read Batch Size (Total)	Specifies how many memcached read operations (get) to perform before doing a COMMIT to start a new transaction.
Trx Level (Total)	Lets you control the transaction isolation level on queries processed by the memcached interface. 0 = READ UNCOMMITTED, 1 = READ COMMITTED, 2 = REPEATABLE READ 3 = SERIALIZABLE.
Write Batch Size (Total)	Specifies how many memcached write operations, such as add, set, or incr, to perform before doing a COMMIT to start a new transaction.

5.13 Insert Delayed Configuration Metrics

Lists the Insert Delayed configuration metrics and provides a brief description of each.

Table 5.12 Insert Delayed Configuration Metrics

Name	Description
Insert Limit (Total)	After inserting delayed_insert_limit delayed rows, the INSERT DELAYED handler thread checks whether there are any SELECT statements pending.
Insert Timeout (Total)	How many seconds an INSERT DELAYED handler thread should wait for INSERT statements before terminating.
Max Delayed Threads (Total)	Do not start more than this number of threads to handle INSERT DELAYED statements.
Queue Size (Total)	This is a per-table limit on the number of rows to queue when handling INSERT DELAYED statements.

5.14 Localization Configuration Metrics

Lists the Localization configuration metrics and provides a brief description of each.

Table 5.13 Localization Configuration Metrics

Name	Description
Date Format (Total)	This variable is unused.
Datetime Format (Total)	This variable is unused.
Default Week Format (Total)	The default mode value to use for the WEEK() function.
Language (Total)	The directory where error messages are located.
Messages (Total)	The locale to use for error messages.
Messages Dir (Total)	The directory where error messages are located.
System Time Zone (Total)	The server system time zone.
Time Format (Total)	The format to use for times, this variable is currentlyunused.
Time Names (Total)	This variable specifies the locale that controls the language used to display day and month names and abbreviations.
Time Zone (Total)	The timezone set for the instance.

5.15 Logging Configuration Metrics

Lists the Logging configuration metrics and provides a brief description of each.

Table 5.14 Logging Configuration Metrics

Name	Description
General Log Enabled (Total)	This option enables logging to the general query log, which contains entries that record client connections and SQL statements received from clients.
General Log File (Total)	The name of the general query log file.
Log Error (Total)	Log errors and startup messages to this file.
Log Output (Total)	This option determines the destination for general query log and slow query log output.
Log Warnings (Total)	Print out warnings such as Aborted connection... to the error log.
SQL Log Disabled (Total)	If set to true, no logging is done to the general query log for this client.

5.16 Metadata Configuration Metrics

Lists the Metadata configuration metrics and provides a brief description of each.

Table 5.15 Metadata Configuration Metrics

Name	Description
License (Total)	The type of license the MySQL server has
Protocol Version (Total)	The version of the client/server protocol used by the MySQL server
Version (Total)	The version number for the MySQL server
Version Comment (Total)	The description of the MySQL server version built
Version Compile Machine (Total)	The type of machine or architecture on which MySQL was built

Name	Description
Version Compile Os (Total)	The type of operating system on which MySQL was built

5.17 Myisam Configuration Metrics

Lists the Myisam configuration metrics and provides a brief description of each.

Table 5.16 Myisam Configuration Metrics

Name	Description
Concurrent Insert (Total)	Permits INSERT and SELECT statements to run concurrently for MyISAM tables that have no free blocks in the middle of the data file.
Delay Key Write (Total)	Delayed key writing causes key buffers not to be flushed between writes for MyISAM tables.
Keep Files On Create Enabled (Total)	Whether to overwrite MyISAM MYD/MYI files or return an error if no DATA DIRECTORY / INDEX DIRECTORY option is set, and the files already exist.
Key Buffer Size (Total)	The size of the buffer used for MyISAM index blocks.
Key Cache Age Threshold (Total)	Controls the demotion of buffers from the hot sublist of a MyISAM key cache to the warm sublist.
Key Cache Block Size (Total)	The size in bytes of blocks in the MyISAM key cache.
Key Cache Division Limit (Total)	The division point between the hot and warm sublists of the MyISAM key cache buffer list.
Myisam Data Pointer Size (Total)	The default pointer size, in bytes, to be used by CREATE TABLE for MyISAM tables when no MAX_ROWS option is specified.
Myisam Max Sort File Size (Total)	The maximum size of the temporary file that MySQL is permitted to use while re-creating a MyISAM index (during REPAIR TABLE, ALTER TABLE, or LOAD DATA INFILE).
Myisam Mmap Size (Total)	The maximum amount of memory to use for memory mapping compressed MyISAM files.
Myisam Recover Options (Total)	Sets the MyISAM storage engine recovery mode.
Myisam Repair Threads (Total)	If this value is greater than 1, MyISAM table indexes are created in parallel (each index in its own thread) during the Repair by sorting process.
Myisam Sort Buffer Size (Total)	The size of the buffer that is allocated when sorting MyISAM indexes during a REPAIR TABLE or when creating indexes with CREATE INDEX or ALTER TABLE.
Myisam Stats Method (Total)	How the server treats NULL values when collecting statistics about the distribution of index values for MyISAM tables.
Myisam Use Mmap Enabled (Total)	Use memory mapping for reading and writing MyISAM tables.
Skip External Locking Enabled (Total)	Do not use external locking (system locking) to lock MyISAMtable files.

5.18 Myisam Full Text Configuration Metrics

Lists the Myisam Full Text configuration metrics and provides a brief description of each.

Table 5.17 Myisam Full Text Configuration Metrics

Name	Description
Boolean Syntax (Total)	The list of operators supported by boolean full-text searches performed using IN BOOLEAN MODE.
Max Word Len (Total)	The maximum length of the word to be included in a FULLTEXT index.
Min Word Len (Total)	The minimum length of the word to be included in a FULLTEXT index.
Query Expansion Limit (Total)	The number of top matches to use for full-text searches performed using WITH QUERY EXPANSION.
Stopword File (Total)	The file from which to read the list of stopwords for full-text searches. The server looks for the file in the data directory unless an absolute path name is given to specify a different directory. All the words from the file are used; comments are not honored. By default, a built-in list of stopwords is used (as defined in the storage/myisam/ft_static.c file). Setting this variable to the empty string ('') disables stopword filtering.

5.19 NDB Configuration Metrics

Lists the NDB configuration metrics and provides a brief description of each.

Table 5.18 NDB Configuration Metrics

Name	Description
Engine Condition Pushdown Enabled (Total)	The engine condition pushdown optimization enables processing for certain comparisons to be 'pushed down' to the storage engine level for more efficient execution.
NDB Autoincrement Prefetch Size (Total)	Determines the probability of gaps in an autoincremented column.

5.20 Networking Configuration Metrics

Lists the Networking configuration metrics and provides a brief description of each.

Table 5.19 Networking Configuration Metrics

Name	Description
Bind Address (Total)	The network interface(s) that MySQL is bound to.
Named Pipe Enabled (Total)	On Windows only, indicates whether the server supports connections over named pipes.
Port (Total)	The number of the port on which the server listens for TCP/IP connections.
Shared Memory Base Name (Total)	On Windows only, the name of shared memory to use for shared-memory connections.
Shared Memory Enabled (Total)	On Windows only, indicates whether the server the server permits shared-memory connections.
Skip Name Resolve Enabled (Total)	Whether to not resolve host names when checking client connections, and use only IP addresses instead.
Skip Networking Enabled (Total)	Whether to not listen for TCP/IP connections at all.

Name	Description
Socket (Total)	On Unix platforms, this variable is the name of the socket file that is used for local client connections.

5.21 Optimizer Configuration Metrics

Lists the Optimizer configuration metrics and provides a brief description of each.

Table 5.20 Optimizer Configuration Metrics

Name	Description
End Markers In Json Enabled (Total)	Whether optimizer JSON output should add end markers.
Eq Range Index Dive Limit (Total)	Indicates the number of equality ranges in an equality comparison condition when the optimizer should switch from using index dives to index statistics in estimating the number of qualifying rows.
Max Length For Sort Data (Total)	The maximum size of parameter values that can be sent with the mysql_stmt_send_long_data() C API function.
Max Seeks For Key (Total)	Limit the assumed maximum number of seeks when looking up rows based on a key.
Max Sort Length (Total)	The number of bytes to use when sorting data values. Only the first max_sort_length bytes of each value are used; the rest are ignored.
Prune Level Enabled (Total)	Controls the heuristics applied during query optimization to prune less-promising partial plans from the optimizer search space.
Range Alloc Block Size (Total)	The size of blocks (in bytes) that are allocated when doing range optimization.
Search Depth (Total)	The maximum depth of search performed by the query optimizer.
Switch Value (Total)	The optimizer_switch system variable enables control over optimizer behavior.
Trace (Total)	Controls how to enable optimizer tracing.
Trace Features (Total)	Enables or disables selected optimizer tracing features.
Trace Limit (Total)	The maximum cumulative size of stored optimizer traces.
Trace Max Mem Size (Total)	The maximum cumulative size of stored optimizer traces.
Trace Offset (Total)	The offset of optimizer traces to display.

5.22 Password Validation Configuration Metrics

Lists the Password Validation configuration metrics and provides a brief description of each.

Table 5.21 Password Validation Configuration Metrics

Name	Description
Dictionary File (Total)	The path name of the dictionary file used by the validate_password plugin for checking passwords.
Length (Total)	The minimum number of characters that passwords checked by the validate_password plugin must have.

Name	Description
Mixed Case Count (Total)	The minimum number of lowercase and uppercase characters that passwords checked by the validate_password plugin must have if the password policy is MEDIUM or stronger.
Number Count (Total)	The minimum number of numeric (digit) characters that passwords checked by the validate_password plugin must have if the password policy is MEDIUM or stronger.
Policy (Total)	The password policy enforced by the validate_password plugin.
Special Char Count (Total)	The minimum number of numeric (digit) characters that passwords checked by the validate_password plugin must have if the password policy is MEDIUM or stronger.

5.23 Performance Schema Configuration Metrics

Lists the Performance Schema configuration metrics and provides a brief description of each.

Table 5.22 Performance Schema Configuration Metrics

Name	Description
Accounts Size (Total)	The number of rows in the accounts table.
Digests Size (Total)	The maximum number of rows in the events_statements_summary_by_digest table.
Enabled (Total)	The value of this variable is ON or OFF to indicate whether the Performance Schema is enabled. By default, the value is OFF.At server startup, you can specify this variable with no value or a value of 1 to enable it, or with a value of 0 to disable it.
Events Stages History Long Size (Total)	The number of rows in the events_stages_history_long table.
Events Stages History Size (Total)	The number of rows in the events_stages_history table.
Events Statements History Long Size (Total)	The number of rows in the events_statements_history_long table.
Events Statements History Size (Total)	The number of rows in the events_statements_history table.
Events Waits History Long Size (Total)	The number of rows in the events_waits_history_long table.
Events Waits History Size (Total)	The number of rows per thread in the events_waits_history table.
Hosts Size (Total)	The number of rows in the hosts table.
Max Cond Classes (Total)	The maximum number of condition instruments.
Max Cond Instances (Total)	The maximum number of instrumented condition objects.
Max File Classes (Total)	The maximum number of file instruments.
Max File Handles (Total)	The maximum number of opened file objects. The value of performance_schema_max_file_handles should be greater than the value of open_files_limit: open_files_limit affects the maximum number of open file

Name	Description
	handles the server can support and performance_schema_max_file_handles affects how many of these file handles can be instrumented.
Max File Instances (Total)	The maximum number of instrumented file objects.
Max Mutex Classes (Total)	The maximum number of mutex instruments.
Max Mutex Instances (Total)	The maximum number of instrumented mutex objects.
Max Rwlock Classes (Total)	The maximum number of rwlock instruments.
Max Rwlock Instances (Total)	The maximum number of instrumented rwlock objects.
Max Socket Classes (Total)	The maximum number of socket instruments.
Max Socket Instances (Total)	The maximum number of instrumented socket objects.
Max Stage Classes (Total)	The maximum number of stage instruments.
Max Statement Classes (Total)	The maximum number of statement instruments. The default value is calculated at server build time based on the number of commands in the client/server protocol and the number of SQL statement types supported by the server.
Max Table Handles (Total)	The maximum number of opened table objects.
Max Table Instances (Total)	The maximum number of instrumented table objects.
Max Thread Classes (Total)	The maximum number of thread instruments.
Max Thread Instances (Total)	The maximum number of instrumented thread objects. The max_connections and max_delayed_threads system variables affect how many threads are run in the server. performance_schema_max_thread_instances affects how many of these running threads can be instrumented. If you increase max_connections or max_delayed_threads, you should consider increasing performance_schema_max_thread_instances so that performance_schema_max_thread_instances is greater than the sum of max_connections and max_delayed_threads.
Session Connect Attrs Size (Total)	The amount of preallocated memory per thread used to hold connection attribute strings.
Setup Actors Size (Total)	The number of rows in the setup_actors table.
Setup Objects Size (Total)	The number of rows in the setup_objects table.
Users Size (Total)	The number of rows in the users table.

5.24 Query Cache Configuration Metrics

Lists the Query Cache configuration metrics and provides a brief description of each.

Table 5.23 Query Cache Configuration Metrics

Name	Description
Limit (Total)	The maximum size (in bytes) of result sets to cache withinthe Query Cache. Result sets larger than this size will not be cached.
Min Res Unit (Total)	The minimum size (in bytes) for blocks allocated by the query cache.
Query Cache Enabled (Total)	Whether the MySQL server supports the Query Cache or not.
Size (Total)	The total amount of memory (in bytes) to allocate for caching query results within the Query Cache.
Type (Total)	Controls how the query cache decides whether to cache SELECTstatements, based on the SQL_NO_CACHE and SQL_CACHE keywords.
Wlock Invalidate Enabled (Total)	Causes acquisition of a WRITE lock for a table to invalidate any queries in the Query Cache that refer to the table.

5.25 Replication Master Configuration Metrics

Lists the Replication Master configuration metrics and provides a brief description of each.

Table 5.24 Replication Master Configuration Metrics

Name	Description
Auto Increment Increment (Total)	Controls the interval between successive column values withinall AUTO_INCREMENT columns within the MySQL server.
Auto Increment Offset (Total)	Determines the starting point for the AUTO_INCREMENT column values within the MySQL server.
Enforce Gtid Consistency Enabled (Total)	Allows execution of only those statements that can be logged in a transactionally safe manner.
Gtid Executed (Total)	Contains a representation of the set of all transactions that are logged in the binary log.
Gtid Mode (Total)	Shows whether GTIDs are enabled.
Gtid Next (Total)	Specifies whether and how the next GTID is obtained.
Gtid Owned (Total)	Holds a list of all GTIDs along with their owners.
Gtid Purged (Total)	The set of all transactions that have been purged from the binary log.
Info Repository (Total)	The setting of this variable determines whether the slave logs master status and connection information to a FILE (master.info), or to a TABLE (mysql.slave_master_info).
Recovery Rank (Total)	null
Repl Uuid (Total)	The MySQL server's UUID, this variable is only available on versions > 5.6.1.
Semi Sync Master Enabled (Total)	Whether semisynchronous replication is enabled on the master MySQL server.
Semi Sync Master Timeout (Total)	How long the master waits on a commit (in milliseconds) for acknowledgment from a slave before timing out and reverting to asynchronous replication.
Semi Sync Master Trace Level (Total)	The semisynchronous replication debug trace level on the master.
Semi Sync Master Wait No Slave Enabled (Total)	Whether the master waits for the timeout to expire before reverting to normal replication even if the slave count drops to zero during the timeout period.

Name	Description
Server Id (Total)	The server ID, used in replication to give each master and slave a unique identity.
Verify Checksum Enabled (Total)	Enabling this option causes the master to verify events from the binary log using checksums, and to stop with an error in the event of a mismatch.

5.26 Replication Slave Configuration Metrics

Lists the Replication Slave configuration metrics and provides a brief description of each.

Table 5.25 Replication Slave Configuration Metrics

Name	Description
Allow Batching Enabled (Total)	Whether or not batched updates are enabled on replication slaves.
Auto Position Enabled (Total)	The set of global transaction IDs for all received transactions subsequently executed on this slave. Empty if GTIDs are not in use.
Checkpoint Group (Total)	Sets the maximum number of transactions that can be processed by a multi-threaded slave before a checkpoint operation is called to update its status as shown by SHOW SLAVE STATUS. Setting this option has no effect on slaves for which multithreading is not enabled.
Checkpoint Period (Total)	Sets the maximum time (in milliseconds) that is allowed to pass before a checkpoint operation is called to update the status of a multi-threaded slave as shown by SHOW SLAVE STATUS. Setting this variable has no effect on slaves for which multithreading is not enabled.
Compressed Protocol Enabled (Total)	Whether to use compression for the slave/master protocol if both the slave and the master support it.
Connect Retry (Total)	The number of seconds between connect retries to the master.
Exec Mode (Total)	Controls whether IDEMPOTENT or STRICT mode is used in replication conflict resolution and error checking.
Gtid Mode (Total)	Shows whether GTIDs are enabled.
Init Slave (Total)	A string to be executed by a slave server each time the SQL thread starts. The format of the string is the same as for the init_connect variable.
Load Tmpdir (Total)	The name of the directory where the slave creates temporary files for replicating LOAD DATA INFILE statements.
Log Slave Updates Enabled (Total)	Whether the slave should log the updates performed by its SQL thread to its own binary log.
Master Bind Address (Total)	When a replication slave has multiple network interfaces, determines which of the slave's network interfaces is chosen for connecting to the master.
Master Host (Total)	The master host that the slave is connected to.
Master Inet Address (Total)	The internet address as determined by the collecting agent, so as to mimic the DNS lookup as close as possible to what the mysql server would have done.
Master Info File (Total)	The name and location of the master.info file.
Master Port (Total)	The port used to connect to the master.
Master Retry Count (Total)	The number of times that the slave tries to connect to the master before giving up. Reconnects are attempted at intervals set by the

Name	Description
	MASTER_CONNECT_RETRY option of the CHANGE MASTER TO statement (default 60).
Master Server Id (Total)	The server_id variable value from the master.
Master Server Inv Uuid (Total)	The uuid from the master mysql.inventory table, generated by MySQL Enterprise Monitor.
Master Server Repl Uuid (Total)	The master servers server_uuid variable.
Master Ssl Allowed Enabled (Total)	Whether slave's the master server allows SSL connections.
Master Ssl Ca File (Total)	The path to a file that contains a list of trusted SSL CAsfor use when connecting to the slave's master.
Master Ssl Ca Path (Total)	The path to a directory that contains trusted SSL CA certificates in PEM format for use when connecting to the slave's master.
Master Ssl Cert (Total)	The name of the SSL certificate file to use for establishing a secure connection to the slave's master.
Master Ssl Cipher (Total)	A list of permissible ciphers to use for SSL encryption when connecting to the slave's master.
Master Ssl Crl (Total)	The name of the file containing a Certificate Revocation List.
Master Ssl Crl Path (Total)	TThe path to a directory that contains Certificate Revocation List files.
Master Ssl Key (Total)	The name of the SSL key file to use for establishing a secure connection to the slave's master.
Master Ssl Verify Server Cert Enabled (Total)	Whether the slave should verify the Common Name value in the certificate that the master sends to it against the host name that the slave uses for connecting to the master. The connection is rejected if there is a mismatch.
Master User (Total)	The user name of the account used to connect to the master.
Max Allowed Packet (Total)	Sets the maximum packet size for the slave SQL and I/O threads, so that large updates using row-based replication do not cause replication to fail because an update exceeded max_allowed_packet.
Max Relay Log Size (Total)	The size at which the server rotates relay log files automatically.
Net Timeout (Total)	The number of seconds to wait for more data from a master/slave connection before aborting the read.
Parallel Workers (Total)	Sets the number of slave worker threads for executing replication events (transactions) in parallel. Setting this variable to 0 (the default) disables parallel execution.
Pending Jobs Size Max (Total)	For multithreaded slaves, this variable sets the maximum amount of memory (in bytes) available to slave worker queues holding events not yet applied.
Read Only Enabled (Total)	When this property is enabled, the server permits no updates except from users that have the SUPER privilege.
Relay Log (Total)	The name of the relay log file.
Relay Log Basename (Total)	Holds the name and complete path to the relay log file.
Relay Log Index (Total)	The name to use for the slave relay log index file.

Name	Description
Relay Log Info File (Total)	The name to use for the file in which the slave records information about the relay logs.
Relay Log Info Repository (Total)	Determines whether the slave's position in the relay logs is written to a FILE (relay-log.info) or to a TABLE (mysql.slave_relay_log_info).
Relay Log Purge Enabled (Total)	Disables or enables automatic purging of relay log files as soon as they are not needed any more.
Relay Log Recovery Enabled (Total)	Enables automatic relay log recovery immediately following server startup, which means that the replication slave discards all unprocessed relay logs and retrieves them from the replication master.
Relay Log Space Limit (Total)	The maximum amount of space to use for all relay logs.
Replicate Do DB (Total)	Whether the slave SQL thread should restrict replication to statements where the default database (the one selected by USE) is one of those listed.
Replicate Do Table (Total)	Whether the slave SQL thread should restrict replication to the specified table(s).
Replicate Ignore DB (Total)	Whether the slave SQL thread should not replicate any statement where the default database (the one selected by USE) is one of those listed.
Replicate Ignore Server Ids (Total)	Whether the slave should ignore events from 0 or more masters using the IGNORE_SERVER_IDS option in a CHANGE MASTER TO statement.
Replicate Ignore Table (Total)	Whether the slave SQL thread should not replicate any statement that updates the specified table(s), even if any other tables might be updated by the same statement.
Replicate Wild Do Table (Total)	Whether the slave thread should restrict replication to statements where any of the updated tables match the specified database and table name patterns.
Replicate Wild Ignore Table (Total)	Whether the slave thread should not replicate a statement where any table matches the given wildcard pattern.
Report Host (Total)	The host name or IP address of the slave to be reported to the master during slave registration.
Report Password (Total)	The account password of the slave to be reported to the master during slave registration.
Report Port (Total)	The TCP/IP port number for connecting to the slave, to be reported to the master during slave registration.
Report User (Total)	The account user name of the slave to be reported to the master during slave registration.
Rows Search Algorithms (Total)	When preparing batches of rows for row-based logging and replication using slave_allow_batching, this option controls how the rows are searched for matches - that is, whether or not hashing is used for searches using a primary or unique key, some other key, or no key at all.
Semi Sync Slave Enabled (Total)	Whether semisynchronous replication is enabled on the slave.
Semi Sync Slave Trace Level (Total)	The semisynchronous replication debug trace level on the slave.
Server Id (Total)	The server ID, used in replication to give each master and slave a unique identity.

Name	Description
Skip Counter (Total)	The number of events from the master that a slave server should skip.
Skip Errors (Total)	Tells the slave SQL thread to continue replication when a statement returns any of the errors listed in the variable value.
SQL Delay (Total)	The length of time the slave SQL thread should delay applyingevents from the relay logs when using time delayed replication.
SQL Verify Checksum Enabled (Total)	When preparing batches of rows for row-based logging and replication using slave_allow_batching, this option controls how the rows are searched for matches - that is, whether or not hashing is used for searches using a primary or unique key, some other key, or no key at all.
Sync Master Info (Total)	If the value of this variable is greater than 0, a replication slave synchronizes its master.info file to disk (using fdatasync()) after every sync_master_info events.
Sync Relay Log (Total)	If the value of this variable is greater than 0, the MySQL server synchronizes its relay log to disk (using fdatasync()) after every sync_relay_log writes to the relay log.
Sync Relay Log Info (Total)	If the value of this variable is greater than 0, a replication slave synchronizes its relay-log.info file to disk (using fdatasync()) after every sync_relay_log_info transactions.
Transaction Retries (Total)	How many times the slave SQL thread should retry a transaction because of an InnoDB deadlock or because the transaction's execution time exceeded InnoDB's innodb_lock_wait_timeout.
Type Conversions (Total)	Controls the type conversion mode in effect on the slave when using row-based replication.
Until Condition (Total)	Whether the slave was started with a START SLAVE UNTIL condition.
Until Log File (Total)	The master or relay log file that the slave will stop executing at, if started with a START SLAVE UNTIL condition.
Until Log Pos (Total)	The master or relay log position that the slave will stopexecuting at, if started with a START SLAVE UNTIL condition.

5.27 Secure Connections Configuration Metrics

Lists the Secure Connections configuration metrics and provides a brief description of each.

Table 5.26 Secure Connections Configuration Metrics

Name	Description
Ca (Total)	The path to a file that contains a list of trusted SSL CAs.
Ca Path (Total)	The name of the SSL certificate file to use for establishing a secure connection.
Cert (Total)	The name of the SSL certificate file to use for establishing a secure connection.
Cipher (Total)	A list of permissible ciphers to use for SSL encryption. For greatest portability, cipher_list should be a list of one or more cipher names, separated by colons.
Crl (Total)	The path to a file containing certificate revocation lists in PEM format. Revocation lists work for MySQL distributions compiled against OpenSSL (but not yaSSL).
Crl Path (Total)	The path to a directory that contains files containing certificate revocation lists in PEM format. Revocation lists work for MySQL distributions compiled against OpenSSL (but not yaSSL).

Name	Description
Key (Total)	The name of the SSL key file to use for establishing a secure connection.

5.28 Security Configuration Metrics

Lists the Security configuration metrics and provides a brief description of each.

Table 5.27 Security Configuration Metrics

Name	Description
Automatic Sp Privileges Enabled (Total)	When this variable has a value of 1 (the default), the server automatically grants the EXECUTE and ALTER ROUTINE privileges to the creator of a stored routine, if the user cannot already execute and alter or drop the routine.
Disconnect On Expired Password Enabled (Total)	Controls how the server handles clients with expired passwords.
Local Infile Enabled (Total)	Whether LOCAL is supported for LOAD DATA INFILE statements.
Old Passwords Enabled (Total)	Whether the server should use pre-4.1-style passwords for MySQL user accounts.
Secure Auth Enabled (Total)	Disallow authentication by clients that attempt to use accounts that have old (pre-4.1) passwords.
Secure File Privileges (Total)	If set to the name of a directory, it limits the effect of the LOAD_FILE() function and the LOAD DATA and SELECT ... INTO OUTFILE statements to work only with files in that directory.
Sha256 Password Private Key Path (Total)	The path name of the RSA private key file for the sha256_password authentication plugin. If the file is named as a relative path, it is interpreted relative to the server data directory. The file must be in PEM format. Because this file stores a private key, its access mode should be restricted so that only the MySQL server can read it.
Sha256 Password Public Key Path (Total)	The path name of the RSA public key file for the sha256_password authentication plugin. If the file is named as a relative path, it is interpreted relative to the server data directory. The file must be in PEM format. Because this file stores a public key, copies can be freely distributed to client users.
Skip Show Database Enabled (Total)	With this option, the SHOW DATABASES statement is permitted only to users who have the SHOW DATABASES privilege, and the statement displays all database names.
Validate User Plugins Enabled (Total)	If this variable is enabled (the default), the server checks each user account and produces a warning if conditions are found that would make the account unusable.

5.29 Slow Query Logging Configuration Metrics

Lists the Slow Query Logging configuration metrics and provides a brief description of each.

Table 5.28 Slow Query Logging Configuration Metrics

Name	Description
Log Queries Not Using Indexes Enabled (Total)	If you are using this option with the slow query log enabled, queries that are expected to retrieve all rows are logged.

Name	Description
Log Slow Admin Statements Enabled (Total)	Log slow administrative statements such as OPTIMIZE TABLE, ANALYZE TABLE, and ALTER TABLE to the slow query log.
Log Slow Queries Enabled (Total)	This option enables logging to the slow query log, which contains entries for all queries that have taken more than long_query_time seconds to execute.
Log Slow Slave Statements Enabled (Total)	When the slow query log is enabled, this option enables logging for queries that have taken more than long_query_time seconds to execute on the slave.
Log Throttle Queries Not Using Indexes Enabled (Total)	If log_queries_not_using_indexes is enabled, the log_throttle_queries_not_using_indexes variable limits the number of such queries per minute that can be written to the slow query log.
Long Query Time (Total)	If a query takes longer than this many seconds, the server increments the Slow_queries status variable.
Min Examined Row Limit (Total)	Queries that examine fewer than this number of rows are not logged to the slow query log.
Slow Query Log File (Total)	The name of the slow query log file

5.30 Statement Processing Configuration Metrics

Lists the Statement Processing configuration metrics and provides a brief description of each.

Table 5.29 Statement Processing Configuration Metrics

Name	Description
Auto Is Null Enabled (Total)	If this variable is set to 1, then after a statement that successfully inserts an automatically generated AUTO_INCREMENT value, you can find that value by issuing a statement of the following form: SELECT * FROM tbl_name WHERE auto_col IS NULL If the statement returns a row, the value returned is the same as if you invoked the LAST_INSERT_ID() function.
Big Selects Enabled (Total)	If set to 0, MySQL aborts SELECT statements that are likely to take a very long time to execute (that is, statements for which the optimizer estimates that the number of examined rows exceeds the value of max_join_size). This is useful when an inadvisable WHERE statement has been issued.
Buffer Result Enabled (Total)	If set to 1, sql_buffer_result forces results from SELECT statements to be put into temporary tables. This helps MySQL free the table locks early and can be beneficial in cases where it takes a long time to send results to the client.
Div Precision Increment (Total)	Indicates the number of digits by which to increase the scale of the result of division operations performed with the / operator.
Group Concat Max Len (Total)	The maximum permitted result length in bytes for the GROUP_CONCAT() function.
Max Error Count (Total)	The maximum number of error, warning, and note messages to be stored for display by the SHOW ERRORS and SHOW WARNINGS statements.
Max Join Size (Total)	Do not permit statements that probably need to examine more than max_join_size rows (for single-table statements) or row combinations (for multiple-table statements) or that are likely to do more than max_join_size disk seeks.

Name	Description
Max Prepared Stmt Count (Total)	Limits the total number of prepared statements in the server.
Max Sp Recursion Depth (Total)	The number of times that any given stored procedure may be called recursively. Stored procedure recursion increases the demand on thread stack space. If you increase the value of max_sp_recursion_depth, it may be necessary to increase thread stack size by increasing the value of thread_stack at server startup.
Max Write Lock Count (Total)	After this many write locks, permit some pending read lock requests to be processed in between.
Notes Enabled (Total)	If set to 1 (the default), warnings of Note level increment warning_count and the server records them. If set to 0, Note warnings do not increment warning_count and the server does not record them.
Quote Show Create Enabled (Total)	If set to 1 (the default), the server quotes identifiers for SHOW CREATE TABLE and SHOW CREATE DATABASE statements. If set to 0, quoting is disabled.
Safe Updates Enabled (Total)	If set to 1, MySQL aborts UPDATE or DELETE statements that do not use a key in the WHERE clause or a LIMIT clause. This makes it possible to catch UPDATE or DELETE statements where keys are not used properly and that would probably change or delete a large number of rows.
Select Limit (Total)	The maximum number of rows to return from SELECT statements. The default value for a new connection is the maximum number of rows that the server permits per table.
Warnings Enabled (Total)	This variable controls whether single-row INSERT statements produce an information string if warnings occur.

5.31 Table Configuration Configuration Metrics

Lists the Table Configuration configuration metrics and provides a brief description of each.

Table 5.30 Table Configuration Configuration Metrics

Name	Description
Big Tables Enabled (Total)	Enable large result sets by saving all temporary sets in files.
Default Storage Engine (Total)	Sets the default storage engine for tables.
Default Tmp Storage Engine (Total)	Sets the default storage engine for temporary tables (created with CREATE TEMPORARY TABLE).
Explicit Defaults For Timestamp Enabled (Total)	Sets whether TIMESTAMP columns should have an explicit DEFAULT clause.
Flush Enabled (Total)	Whether to flush (synchronize) all changes to disk after each SQL statement.
Flush Time (Total)	How often (in seconds) to close all tables, to free up resources and synchronize unflushed data to disk, for low resourcesystems.
Lock Wait Timeout (Total)	This timeout applies to all statements that use metadata locks. These include DML and DDL operations on tables, views, stored procedures, and stored

Name	Description
	functions, as well as LOCK TABLES, FLUSH TABLES WITH READ LOCK, and HANDLER statements.
Lower Case File System Enabled (Total)	describes the case sensitivity of file names on the file system where the data directory is located. OFF means file names are case sensitive, ON means they are not case sensitive.
Lower Case Table Names (Total)	Whether table names are stored in lowercase or uppercase on disk, and whether comparisons are case sensitive or not.
Low Priority Updates Enabled (Total)	When enabled, all INSERT, UPDATE, DELETE, and LOCK TABLE WRITE statements wait until there is no pending SELECT or LOCK TABLE READ on the affected table. This affects only storage engines that use only table-level locking (such as MyISAM, MEMORY, and MERGE).
Max Heap Table Size (Total)	The maximum size to which user-created MEMORY tables are permitted to grow.
Max Tmp Tables (Total)	The maximum number of temporary tables a client can keep open at the same time. (This variable does not yet do anything.).
Metadata Locks Cache Size (Total)	The size of the metadata locks cache. The server uses this cache to avoid creation and destruction of synchronization objects.
Metadata Locks Hash Instances (Total)	The set of metadata locks can be partitioned into separate hashes to permit connections accessing different objects to use different locking hashes and reduce contention.
Old Alter Table Enabled (Total)	Whether to revert to using a temporary table, copying over the data, and then renaming the temporary table to the original, as used by MySQL 5.0 and earlier.
Open Files Limit (Total)	Changes the number of file descriptors available to mysqld.
Sync Frm Enabled (Total)	If this variable is set to 1, when any nontemporary table is created its .frm file is synchronized to disk (using fdatasync()).
Table Definition Cache (Total)	The number of table definitions that can be stored in the definition cache.
Table Open Cache (Total)	The number of concurrently open tables for all threads allowed.
Table Open Cache Instances (Total)	The number of open tables cache instances (default 1). To improve scalability by reducing contention among sessions, the open tables cache can be partitioned into several smaller cache instances of size table_open_cache / table_open_cache_instances .
Tmp Table Size (Total)	The maximum size to which in-memory temporary tables are permitted to grow before being automatically converting to an on-disk temporary table.
Updatable Views With Limit Enabled (Total)	If this variable is set to 1, when any nontemporary table is created its .frm file is synchronized to disk (using fdatasync()).

5.32 Thread Pool Configuration Metrics

Lists the Thread Pool configuration metrics and provides a brief description of each.

Table 5.31 Thread Pool Configuration Metrics

Name	Description
Algorithm (Total)	This variable controls which algorithm the thread pool plugin uses. A value of 0 (the default) uses a conservative low-concurrency algorithm which is most well tested and is known to produce very good results. A value of 1 increases the concurrency and uses a more aggressive algorithm which at times has been known to perform 5-10% better on optimal thread counts, but has degrading performance as the number of connections increases.
High Priority Connection (Total)	This variable affects queuing of new statements prior to execution. If the value is 0 (false, the default), statement queuing uses both the low-priority and high-priority queues. If the value is 1 (true), queued statements always go to the high-priority queue.
Max Unused Threads (Total)	The maximum permitted number of unused threads in the thread pool. This variable makes it possible to limit the amount of memory used by sleeping threads.
Prio Kickup Timer (Total)	This variable affects statements waiting for execution in the low-priority queue. The value is the number of milliseconds before a waiting statement is moved to the high-priority queue.
Size (Total)	The number of thread groups in the thread pool. This is the most important parameter controlling thread pool performance. It affects how many statements can execute simultaneously.
Stall Limit (Total)	The value is the amount of time a statement has to finish after starting to execute before it becomes defined as stalled, at which point the thread pool permits the thread group to begin executing another statement.

5.33 Threads Configuration Metrics

Lists the Threads configuration metrics and provides a brief description of each.

Table 5.32 Threads Configuration Metrics

Name	Description
Cache Size (Total)	How many threads the server should cache for reuse.
Concurrency (Total)	This variable is specific to Solaris systems, for which mysqld invokes the thr_setconcurrency() with the variable value.
Handling (Total)	The thread-handling model used by the server for connection threads. The permissible values are no-threads (the server uses a single thread) and one-thread-per-connection.
Slow Launch Time (Total)	If creating a thread takes longer than this many seconds, the server increments the Slow_launch_threads status variable.
Stack Size (Total)	The stack size for each thread.

5.34 Transactions Configuration Metrics

Lists the Transactions configuration metrics and provides a brief description of each.

Table 5.33 Transactions Configuration Metrics

Name	Description
Autocommit Enabled (Total)	The autocommit mode. If set to 1, all changes to a table take effect immediately. If set to 0, you must use COMMIT to accept a transaction or ROLLBACK to cancel it.
Completion Type (Total)	Affects transactions that begin with START TRANSACTION or BEGIN and end with COMMIT or ROLLBACK. Sets whether the server should start a newtransaction immediately after a COMMIT/ROLLBACK (by setting to CHAIN), or disconnect after completing a COMMIT/ROLLBACK (by setting to RELEASE), otherwisedo not implicity start a new transaction (by setting to NO_CHAIN, the default).
Isolation (Total)	The default transaction isolation level.
Read Only Enabled (Total)	The default transaction access mode. The value can be OFF (read/write, the default) or ON (read only).

Chapter 6 MySQL Compliance Framework

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For more information on the Oracle Enterprise Manager's Compliance Framework, see Oracle Enterprise Manager Cloud Control Compliance Management

This chapter documents the following MySQL Compliance Standards:

- Section 6.1, “MySQL Administration Standard Rules”
- Section 6.2, “MySQL Performance Standard Rules”
- Section 6.3, “MySQL Replication Standard Rules”
- Section 6.4, “MySQL Schema Standard Rules”
- Section 6.5, “MySQL Security Standard Rules”

6.1 MySQL Administration Standard Rules

The following are the MySQL Administration Standard compliance rules:

- 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
- Event Scheduler Disabled
- General Query Log Enabled
- In-Memory Temporary Table Size Limited By Maximum Heap Table Size
- InnoDB Strict Mode Is Off
- InnoDB System Tablespace Cannot Automatically Expand
- InnoDB Transaction Logs Not Sized Correctly
- Warnings Not Being Logged

Binary Log Debug Information Disabled

Description 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.

Severity MinorWarning

Advice Investigate whether writing informational log events such as row query log events into your binary log is appropriate for your environment (i.e. whether all the servers and other log readers such as mysqlbinlog that will read your logs are MySQL 5.6.2 and later). If so, turn this feature on to capture extra information in your logs. You can dynamically set the value of the binlog_rows_query_log_events system variable to 'ON', but be sure to put the new value in the [mysqld] section of your my.cnf/my.ini file so it remains in effect when you restart the server.

Binary Logging Is Limited

Description 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.

Severity MinorWarning

Advice Review the --binlog-do-db and the --binlog-ignore-db settings in your my.cnf/my.ini file to be sure you are capturing updates to all important databases. They are currently set as follows on server : --binlog-do-db : %binlog_do_db% --binlog-ignore-db : %binlog_ignore_db%

Binary Logging Not Enabled

Description 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.

Severity MinorWarning

Advice Enable binary logging for point-in-time recovery by setting the log-bin configuration variable in the [mysqld] section of your my.cnf/my.ini file.

Binary Logging Not Synchronized To Disk At Each Write

Description By default, the binary log contents are not synchronized to disk. If the server host machine or operating system crash, there is a chance that the latest events in the binary log are not persisted on disk.

You can alter this behavior using the sync_binlog server variable. If the value of this variable is greater than 0, the MySQL server synchronizes its binary log to disk (using fdatasync()) after sync_binlog commit groups are written to the binary log. The default value of sync_binlog is 0, which does no synchronizing to disk - in this case, the server relies on the operating system to flush the binary log's contents from time to time as for any other file. A value of 1 is the safest choice because in the event of a crash you lose at most one commit group from the binary log. However, it is also the slowest choice (unless the disk has a battery-backed cache, which makes synchronization very fast).

Severity MinorWarning

Advice Set sync_binlog = 1 within the [mysqld] section of your my.cnf/my.ini file to ensure the greatest safety for recovering from hardware, OS, and MySQL server crashes.

Binary Logs Automatically Removed Too Quickly

Description 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.

Severity MinorWarning

Advice Investigate why binary logs are automatically removed every %expire_logs_days% days. This may be an appropriate setting for your environment, but is unusually low, so be sure that your backup plan and execution is sufficient to support your disaster recovery scenarios. If necessary, increase the setting of expire_logs_days to a value that ensures safe and secure operations in your environment while also minimizing disk usage, and be sure that the binary logs go at least as far back as your last full backup. Be sure to also update the value of expire_logs_days in your my.cnf/my.ini file so it is set properly when the server is restarted.

Database May Not Be Portable Due To Identifier Case Sensitivity

Description 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.

Severity MinorWarning

Advice Set lower_case_table_names=1 in your my.cnf/my.ini file and restart your MySQL server. Note that if you plan to set the lower_case_table_names system variable to 1 on Unix, you must first convert your old database and table names to lowercase before restarting mysqld with the new variable setting.

Event Scheduler Disabled

Description 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.

Severity MinorWarning

Advice Enable the Event Scheduler and use it to automate recurring events. Add the line event_scheduler=1 to the [mysqld] section of your my.cnf/my.ini file so the variable is set properly when the server is restarted.

General Query Log Enabled

Description 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 should use the binary log instead.

Severity MinorWarning

Advice Disable the general query log: Remove the log option from your my.cnf/my.ini file, or remove the --log option from the script that starts your MySQL server.

In-Memory Temporary Table Size Limited By Maximum Heap Table Size

Description 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.

Severity MinorWarning

Advice Consider setting max_heap_table_size to be equal to or larger than tmp_table_size . The variable tmp_table_size is currently set to %tmp_table_size% and max_heap_table_size is set to %max_heap_table_size% .

InnoDB Strict Mode Is Off

Description To guard against ignored typos and syntax errors in SQL, or other unintended consequences of various combinations of operational modes and SQL commands, InnoDB 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.

Severity MinorWarning

Advice Investigate why the innodb_strict_mode variable is set to OFF. Add innodb_strict_mode=1 to your my.cnf/my.ini file so it is set properly when the server is restarted.

InnoDB System Tablespace Cannot Automatically Expand

Description If the InnoDB system 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.

Severity MinorWarning

Advice Configure the InnoDB system tablespace to automatically extend by including the autoextend keyword in your innodb_data_file_path variable in your my.cnf/my.ini file. To help ensure low levels of fragmentation, set the autoextend increment (the amount of space that the InnoDB tablespace will grow) to an amount that is large in size.

InnoDB Transaction Logs Not Sized Correctly

Description 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.

Severity MinorWarning

Advice Increase the size of your InnoDB transaction logs. Note, however, that larger transaction logs can mean increased crash recovery times, and more intense checkpointing periods, as more data must be flushed from the buffer pool and logs to the tablespace datafiles. With this in mind, the maximum recommended size is 1 GB per log file. To change the size of your log files, make a clean shutdown of MySQL, alter the value of innodb_log_file_size accordingly within your my.cnf/my.ini file, move the current ib_logfile* files from the data directory to another location, and restart MySQL so the new log files can be created automatically.

Warnings Not Being Logged

Description 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.

Severity MinorWarning

Advice Investigate why log_warnings is set to 0. Unless there are clear and compelling reasons not to log warnings, set log_warnings to a value greater than 0. However, when choosing a value for log_warnings, please be aware of Bug #42851 and Bug #46265 . When using binary logging with certain statements, it is possible that setting log_warnings = 2 can flood the error log with warnings about those statements. In those cases, check whether you can use Row Based Logging, as that format is always safe.

6.2 MySQL Performance Standard Rules

The following are the MySQL Performance Standard compliance rules:

- InnoDB Flush Method May Not Be Optimal
- InnoDB Log Buffer Flushed To Disk After Each Transaction

InnoDB Flush Method May Not Be Optimal

Description 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.

Severity MinorWarning

Advice Review your setting of the innodb_flush_method variable based on your application, operating system, and storage environment. It is currently set to %flush_method% . The default (fdatasync) may be best. O_DIRECT can be good for I/O, especially within "local filesystems", as it also avoids doublewrite buffering. However, O_DIRECT is bad for network attached storage such as SAN/NFS. O_DSYNC can cause extra overhead above the default of fdatasync and there have been problems with it on many varieties of Unix. However, at least one user has reported that using O_DSYNC on NetBSD makes a huge difference.

InnoDB Log Buffer Flushed To Disk After Each Transaction

Description 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.

Severity MinorWarning

Advice Set innodb_flush_log_at_trx_commit=2 in your my.cnf/my.ini file and restart your MySQL server. WARNING: A value of 1 is required for ACID compliance. If you set the value to 2, then an operating system crash or a power outage may erase the last second of transactions. This may not be critical for your application or environment, though, especially if this is a slave server and the loss of a second's worth of data can be recovered from the master.

6.3 MySQL Replication Standard Rules

The following are the MySQL Replication Standard compliance rules:

- Binary Log Checksums Disabled
- Binary Log Row Based Images Excessive
- Master Not Verifying Checksums When Reading From Binary Log
- Slave Detection Of Network Outages Too High
- Slave Not Configured As Read Only
- Slave Not Verifying Checksums When Reading From Relay Log
- Slave SQL Processing Not Multi-Threaded

Binary Log Checksums Disabled

Description 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.

Severity MinorWarning

Advice Investigate why binlog_checksum is set to %binlog_checksum%. Turn on checksums by issuing a SET GLOBAL binlog_checksum = CRC32 statement. Add binlog_checksum = CRC32 to your my.cnf/my.ini file to be sure checksums are enabled the next time the server is started.

Binary Log Row Based Images Excessive

Description 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).

Severity MinorWarning

Advice Investigate why binlog_row_image is set to %binlog_row_image%. Log only those columns required for uniquely identifying and executing changes on each row by issuing a SET GLOBAL binlog_row_image = minimal . Add binlog_row_image = minimal to your my.cnf/my.ini file to be sure the new setting is in effect the next time the server is started.

Master Not Verifying Checksums When Reading From Binary Log

Description 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.

Severity MinorWarning

Advice Investigate why master_verify_checksum is set to %verify_checksum%. Turn on server verification of checksums by issuing a SET GLOBAL master_verify_checksum = ON statement. Add master_verify_checksum = ON to your my.cnf/my.ini file to be sure server checksum verification is enabled the next time the server is started. However, keep in mind that this will add overhead on the master, as the master will need to read the binary log event and verify that the checksum for the event on disk matches what it has in memory. You may want to measure your database performance on a test system before and after making this change to be sure the overhead is acceptable before deploying the change in production.

Slave Detection Of Network Outages Too High

Description 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.

Severity MinorWarning

Advice Set slave_net_timeout=60 (or whatever value is reasonable to detect network connectivity outages in your environment) in the [mysqld] section of your my.cnf/my.ini file. The current value of slave_net_timeout is %net_timeout%.

Slave Not Configured As Read Only

Description 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.

Severity MinorWarning

Advice Set read_only=1 in your my.cnf/my.ini file to ensure that a slave accepts updates only from its master server and not from clients, and restart your MySQL server.

Slave Not Verifying Checksums When Reading From Relay Log

Description 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.

Severity MinorWarning

Advice Investigate why slave_sql_verify_checksum is set to %sql_verify_checksum%. Turn on slave verification of checksums by issuing a SET GLOBAL slave_sql_verify_checksum = ON statement. Add slave_sql_verify_checksum = ON to your my.cnf/my.ini file to be sure slave checksum verification is enabled the next time the server is started.

Slave SQL Processing Not Multi-Threaded

Description 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. However, as of MySQL Server 5.7.5, you can ensure that the order in which transactions were committed to the binary log on the master is preserved on the slave using the slave_preserve_commit_order option variable: MySQL

Manual: Replication Slave Options and Variables . Finally, note that beginning with MySQL Server 5.7.2, there is also support for intra-schema parallelization (LOGICAL_CLOCK): MySQL Manual: Replication Slave Options and Variables .

Severity MinorWarning

Advice Investigate why slave_parallel_workers is set to %parallel_workers%. Turn on parallel execution of transactions on a slave by issuing a SET GLOBAL slave_parallel_workers = n statement, where n depends on your specific environment. Add slave_parallel_workers = n to your my.cnf/my.ini file to be sure parallel execution of transactions is enabled the next time the server is started.

6.4 MySQL Schema Standard Rules

The following are the MySQL Schema Standard compliance rules:

- Server-Enforced Data Integrity Checking Disabled
- Server-Enforced Data Integrity Checking Not Strict

Server-Enforced Data Integrity Checking Disabled

Description 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 that any client can change its own session SQL mode value at any time.

Severity MinorWarning

Advice Ensure that the sql_mode variable contains one of the following in order to obtain the highest level of data integrity: TRADITIONAL, STRICT_TRANS_TABLES, or STRICT_ALL_TABLES . After setting sql_mode to the desired value in your my.cnf/my.ini file, restart your MySQL server.

Server-Enforced Data Integrity Checking Not Strict

Description 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 that any client can change its own session SQL mode value at any time.

Severity MinorWarning

Advice Ensure that the sql_mode variable contains one of the following in order to obtain the highest level of data integrity: TRADITIONAL, STRICT_TRANS_TABLES, or STRICT_ALL_TABLES . It is currently set to '%sql_mode%'. After setting sql_mode to the desired value in your my.cnf/my.ini file, restart your MySQL server.

6.5 MySQL Security Standard Rules

The following are the MySQL Security Standard compliance rules:

- LOCAL Option Of LOAD DATA Statement Is Enabled
- Symlinks Are Enabled

LOCAL Option Of LOAD DATA Statement Is Enabled

Description 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.

Severity Warning

Advice Start the MySQL Server with the --local-infile option disabled (--local-infile=0), or add " local-infile = 0 " to your my.cnf/my.ini file.

Symlinks Are Enabled

Description 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!

Severity Warning

Advice Disable the use of symlinks by starting MySQL with the --skip-symbolic-links option or adding skip-symbolic-links to your my.cnf/my.ini file and restarting the server.

Appendix A Oracle Enterprise Manager for MySQL Database Release Notes

Table of Contents

A.1 Abstract

This chapter lists the changes to the Oracle Enterprise Manager for MySQL Database product, beginning with the most recent release. Each release section covers added or changed functionality, bug fixes, and known issues, if applicable.

A.2 Changes in Oracle Enterprise Manager for MySQL Database 12.1.0.2.0 (2015-05-01)

Functionality Added or Changed

- The compliance framework for MySQL Configuration Metrics is added in this release. See Chapter 6, *MySQL Compliance Framework* for more information.
- The following metrics are added in this release. These are computed metrics which evaluate based on pre-defined thresholds.
  - Replication Master Activity
    - Exceeded Binary Log Space Limit
  - Replication Slave Activity
    - Slave Error: Unknown or Incorrect Time Zone
    - Slave Execution Position Behind Read Position
    - Slave Has Been Stopped
    - Slave Has Experienced A Replication Error
    - Slave Has Problem Communicating With Master
    - Slave Has Stopped Replicating
    - Slave I/O Thread Not Running
    - Slave Relay Log Space
    - Slave Seconds Behind Master
    - Slave SQL Thread Not Running
    - Slave Waiting To Free Relay Log Space
  - Response

    - Status (up/down)
- Binary Logs Summary
    - Binary Log File Count
    - Binary Log Space
- Connection Activity
    - Failed Attempted Connections To The Server
- DML Statement Activity
    - Prepared Statements Not Being Closed
    - Prepared Statements Not Being Used Effectively
- Handler Activity
    - Indexes Not Being Used Efficiently
- Instance Activity
    - MySQL Server Has Been Restarted
- InnoDB Activity
    - InnoDB Buffer Cache Sub-Optimal Hit
    - InnoDB Buffer Pool Writes Bottleneck
    - InnoDB Log Waits Bottleneck
- Performance Schema Activity
    - Host Cache Size
- Table Activity
    - Table Cache Not Optimal
    - Table Lock Contention
    - Temporary Disk Table
- Threads Activity
    - Connection Limit Usage (Rate)
    - Thread Pooling Not Enabled
    - Too Many Concurrent Queries Running
- Trx Statement Activity
    - XA Distributed Transaction Support For InnoDB

Bugs Fixed

- All thresholds used the > (greater than) operator. This is replaced with != (not equal to).

Appendix B Licenses for Third-Party Components

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Oracle Enterprise Manager for MySQL Database 1.0

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    its purpose remains meaningful.

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    be optional: if the application does not supply it, the square
    root function must still compute square roots.)

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