Starting and Stopping MySQL

Abstract

This is the Starting and Stopping MySQL extract from the MySQL 5.6 Reference Manual.

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

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

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Preface and Legal Notices

This is the Starting and Stopping MySQL extract from the MySQL 5.6 Reference Manual.

Legal Notices

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Chapter 1 Installing MySQL on Unix/Linux Using Generic Binaries

Oracle provides a set of binary distributions of MySQL. These include generic binary distributions in the form of compressed `tar` files (files with a `.tar.gz` extension) for a number of platforms, and binaries in platform-specific package formats for selected platforms.

This section covers the installation of MySQL from a compressed `tar` file binary distribution. For other platform-specific package formats, see the other platform-specific sections. For example, for Windows distributions, see Installing MySQL on Microsoft Windows.

To obtain MySQL, see How to Get MySQL.

MySQL compressed `tar` file binary distributions have names of the form `mysql-`*`VERSION`*`-`*`OS`*`.tar.gz`, where *`VERSION`* is a number (for example, `5.6.33`), and *`OS`* indicates the type of operating system for which the distribution is intended (for example, `pc-linux-i686` or `winx64`).

> **Warning**
>
> If you have previously installed MySQL using your operating system native package management system, such as `yum` or `apt-get`, you may experience problems installing using a native binary. Make sure your previous MySQL installation has been removed entirely (using your package management system), and that any additional files, such as old versions of your data files, have also been removed. You should also check for configuration files such as `/etc/my.cnf` or the `/etc/mysql` directory and delete them.
>
> For information about replacing third-party packages with official MySQL packages, see the related Apt guide or Yum guide.

> **Warning**
>
> MySQL has a dependency on the `libaio` library. Data directory initialization and subsequent server startup steps will fail if this library is not installed locally. If necessary, install it using the appropriate package manager. For example, on Yum-based systems:
>
> ```
> shell> yum search libaio  # search for info
> shell> yum install libaio # install library
> ```
>
> Or, on APT-based systems:
>
> ```
> shell> apt-cache search libaio # search for info
> shell> apt-get install libaio1 # install library
> ```

If you run into problems and need to file a bug report, please use the instructions in How to Report Bugs or Problems.

On Unix, to install a compressed `tar` file binary distribution, unpack it at the installation location you choose (typically `/usr/local/mysql`). This creates the directories shown in the following table.

Table 1.1 MySQL Installation Layout for Generic Unix/Linux Binary Package

Directory	Contents of Directory
`bin`, `scripts`	`mysqld` server, client and utility programs

Directory	Contents of Directory
`data`	Log files, databases
`docs`	MySQL manual in Info format
`man`	Unix manual pages
`include`	Include (header) files
`lib`	Libraries
`share`	Miscellaneous support files, including error messages, sample configuration files, SQL for database installation
`sql-bench`	Benchmarks

Debug versions of the `mysqld` binary are available as `mysqld-debug`. To compile your own debug version of MySQL from a source distribution, use the appropriate configuration options to enable debugging support. See Installing MySQL from Source.

To install and use a MySQL binary distribution, the command sequence looks like this:

```
shell> groupadd mysql
shell> useradd -r -g mysql -s /bin/false mysql
shell> cd /usr/local
shell> tar zxvf /path/to/mysql-VERSION-OS.tar.gz
shell> ln -s full-path-to-mysql-VERSION-OS mysql
shell> cd mysql
shell> chown -R mysql .
shell> chgrp -R mysql .
shell> scripts/mysql_install_db --user=mysql
shell> chown -R root .
shell> chown -R mysql data
shell> bin/mysqld_safe --user=mysql &
# Next command is optional
shell> cp support-files/mysql.server /etc/init.d/mysql.server
```

> **Note**
>
> This procedure assumes that you have `root` (administrator) access to your system. Alternatively, you can prefix each command using the `sudo` (Linux) or `pfexec` (OpenSolaris) command.

> **Note**
>
> The procedure does not assign passwords to MySQL accounts. To do so, use the instructions in Securing the Initial MySQL Accounts.

As of MySQL 5.6.8, `mysql_install_db` creates a default option file named `my.cnf` in the base installation directory. This file is created from a template included in the distribution package named `my-default.cnf`. For more information, see Using a Sample Default Server Configuration File.

A more detailed version of the preceding description for installing a binary distribution follows.

Create a mysql User and Group

If your system does not already have a user and group to use for running `mysqld`, you may need to create one. The following commands add the `mysql` group and the `mysql` user. You might want to call the user and group something else instead of `mysql`. If so, substitute the appropriate name in the following instructions. The syntax for `useradd` and `groupadd` may differ slightly on different versions of Unix, or they may have different names such as `adduser` and `addgroup`.

```
shell> groupadd mysql
shell> useradd -r -g mysql -s /bin/false mysql
```

> **Note**
>
> Because the user is required only for ownership purposes, not login purposes, the `useradd` command uses the `-r` and `-s /bin/false` options to create a user that does not have login permissions to your server host. Omit these options if your `useradd` does not support them.

Obtain and Unpack the Distribution

Pick the directory under which you want to unpack the distribution and change location into it. The example here unpacks the distribution under `/usr/local`. The instructions, therefore, assume that you have permission to create files and directories in `/usr/local`. If that directory is protected, you must perform the installation as `root`.

```
shell> cd /usr/local
```

Obtain a distribution file using the instructions in How to Get MySQL. For a given release, binary distributions for all platforms are built from the same MySQL source distribution.

Unpack the distribution, which creates the installation directory. `tar` can uncompress and unpack the distribution if it has `z` option support:

```
shell> tar zxvf /path/to/mysql-VERSION-OS.tar.gz
```

The `tar` command creates a directory named `mysql-VERSION-OS`.

To install MySQL from a compressed `tar` file binary distribution, your system must have GNU `gunzip` to uncompress the distribution and a reasonable `tar` to unpack it. If your `tar` program supports the `z` option, it can both uncompress and unpack the file.

GNU `tar` is known to work. The standard `tar` provided with some operating systems is not able to unpack the long file names in the MySQL distribution. You should download and install GNU `tar`, or if available, use a preinstalled version of GNU tar. Usually this is available as `gnutar`, `gtar`, or as `tar` within a GNU or Free Software directory, such as `/usr/sfw/bin` or `/usr/local/bin`. GNU `tar` is available from http://www.gnu.org/software/tar/.

If your `tar` does not have `z` option support, use `gunzip` to unpack the distribution and `tar` to unpack it. Replace the preceding `tar` command with the following alternative command to uncompress and extract the distribution:

```
shell> gunzip < /path/to/mysql-VERSION-OS.tar.gz | tar xvf -
```

Next, create a symbolic link to the installation directory created by `tar`:

```
shell> ln -s full-path-to-mysql-VERSION-OS mysql
```

The `ln` command makes a symbolic link to the installation directory. This enables you to refer more easily to it as `/usr/local/mysql`. To avoid having to type the path name of client programs always when you are working with MySQL, you can add the `/usr/local/mysql/bin` directory to your `PATH` variable:

```
```

```
shell> export PATH=$PATH:/usr/local/mysql/bin
```

Perform Postinstallation Setup

The remainder of the installation process involves setting distribution ownership and access permissions, initializing the data directory, starting the MySQL server, and setting up the configuration file. For instructions, see Postinstallation Setup and Testing.

Chapter 2 Starting the Server for the First Time on Windows

This section gives a general overview of starting the MySQL server. The following sections provide more specific information for starting the MySQL server from the command line or as a Windows service.

The information here applies primarily if you installed MySQL using the `Noinstall` version, or if you wish to configure and test MySQL manually rather than with the GUI tools.

> **Note**
>
> The MySQL server will automatically start after using the MySQL Installer, and the MySQL Notifier GUI can be used to start/stop/restart at any time.

The examples in these sections assume that MySQL is installed under the default location of `C:\Program Files\MySQL\MySQL Server 5.6`. Adjust the path names shown in the examples if you have MySQL installed in a different location.

Clients have two options. They can use TCP/IP, or they can use a named pipe if the server supports named-pipe connections.

MySQL for Windows also supports shared-memory connections if the server is started with the `--shared-memory` option. Clients can connect through shared memory by using the `--protocol=MEMORY` option.

For information about which server binary to run, see Selecting a MySQL Server Type.

Testing is best done from a command prompt in a console window (or “DOS window”). In this way you can have the server display status messages in the window where they are easy to see. If something is wrong with your configuration, these messages make it easier for you to identify and fix any problems.

To start the server, enter this command:

```
C:\> "C:\Program Files\MySQL\MySQL Server 5.6\bin\mysqld" --console
```

For a server that includes `InnoDB` support, you should see the messages similar to those following as it starts (the path names and sizes may differ):

```
InnoDB: The first specified datafile c:\ibdata\ibdata1 did not exist:
InnoDB: a new database to be created!
InnoDB: Setting file c:\ibdata\ibdata1 size to 209715200
InnoDB: Database physically writes the file full: wait...
InnoDB: Log file c:\iblogs\ib_logfile0 did not exist: new to be created
InnoDB: Setting log file c:\iblogs\ib_logfile0 size to 31457280
InnoDB: Log file c:\iblogs\ib_logfile1 did not exist: new to be created
InnoDB: Setting log file c:\iblogs\ib_logfile1 size to 31457280
InnoDB: Log file c:\iblogs\ib_logfile2 did not exist: new to be created
InnoDB: Setting log file c:\iblogs\ib_logfile2 size to 31457280
InnoDB: Doublewrite buffer not found: creating new
InnoDB: Doublewrite buffer created
InnoDB: creating foreign key constraint system tables
InnoDB: foreign key constraint system tables created
011024 10:58:25  InnoDB: Started
```

When the server finishes its startup sequence, you should see something like this, which indicates that the server is ready to service client connections:

```
mysqld: ready for connections
```

```
Version: '5.6.33'  socket: ''  port: 3306
```

The server continues to write to the console any further diagnostic output it produces. You can open a new console window in which to run client programs.

If you omit the `--console` option, the server writes diagnostic output to the error log in the data directory (`C:\Program Files\MySQL\MySQL Server 5.6\data` by default). The error log is the file with the `.err` extension, and may be set using the `--log-error` option.

> **Note**
>
> The accounts that are listed in the MySQL grant tables initially have no passwords. After starting the server, you should set up passwords for them using the instructions in Securing the Initial MySQL Accounts.

Chapter 3 MySQL Notifier

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MySQL Notifier is a tool that enables you to monitor and adjust the status of your local and remote MySQL server instances through an indicator that resides in the system tray. MySQL Notifier also gives quick access to MySQL Workbench through its context menu.

The MySQL Notifier is installed by MySQL Installer, and (by default) will start-up when Microsoft Windows is started.

To install, download and execute the MySQL Installer, be sure the MySQL Notifier product is selected, then proceed with the installation. See the MySQL Installer manual for additional details.

For notes detailing the changes in each release of MySQL Notifier, see the MySQL Notifier Release Notes.

Visit the MySQL Notifier forum for additional MySQL Notifier help and support.

Features include:

- Start, Stop, and Restart instances of the MySQL Server.
- Automatically detects (and adds) new MySQL Server services. These are listed under **Manage Monitored Items**, and may also be configured.
- The Tray icon changes, depending on the status. It's green if all monitored MySQL Server instances are running, or red if at least one service is stopped. The **Update MySQL Notifier tray icon based on service status** option, which dictates this behavior, is enabled by default for each service.
- Links to other applications like MySQL Workbench, MySQL Installer, and the MySQL Utilities. For example, choosing **Manage Instance** will load the MySQL Workbench Server Administration window for that particular instance.
- If MySQL Workbench is also installed, then the **Manage Instance** and **SQL Editor** options are available for local (but not remote) MySQL instances.
- Monitors both local and remote MySQL instances.

3.1 MySQL Notifier Usage

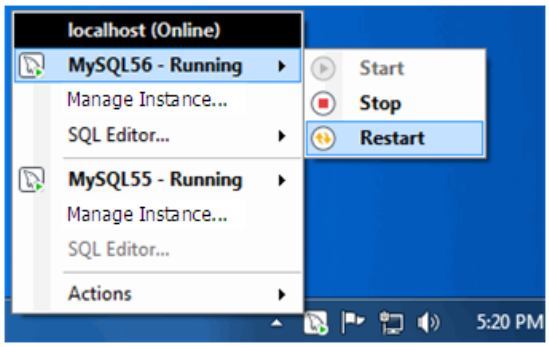
MySQL Notifier resides in the system tray and provides visual status information for your MySQL server instances. A green icon is displayed at the top left corner of the tray icon if the current MySQL server is running, or a red icon if the service is stopped.

MySQL Notifier automatically adds discovered MySQL services on the local machine, and each service is saved and configurable. By default, the **Automatically add new services whose name contains** option is enabled and set to `mysql`. Related **Notifications Options** include being notified when new services are either discovered or experience status changes, and are also enabled by default. And uninstalling a service will also remove the service from MySQL Notifier.

Clicking the system tray icon will reveal several options, as the follow figures show:

The Service Instance menu is the main MySQL Notifier window, and enables you to Stop, Start, and Restart the MySQL server.

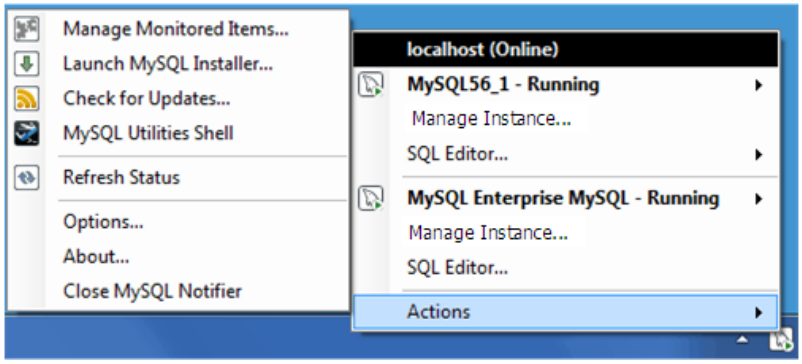
Figure 3.1 MySQL Notifier Service Instance menu



The **Actions** menu includes several links to external applications (if they are installed), and a **Refresh Status** option to manually refresh the status of all monitored services (in both local and remote computers) and MySQL instances.

> **Note**
>
> The main menu will not show the **Actions** menu when there are no services being monitored by MySQL Notifier.

Figure 3.2 MySQL Notifier Actions menu

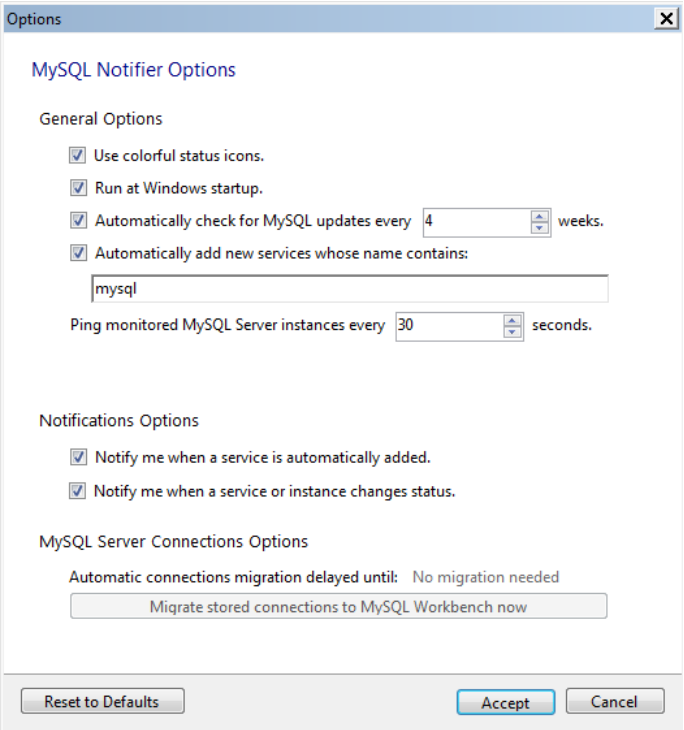


The **Actions**, **Options** menu configures MySQL Notifier and includes options to:

- **Use colorful status icons**: Enables a colorful style of icons for the tray of MySQL Notifier.
- **Run at Windows Startup**: Allows the application to be loaded when Microsoft Windows starts.
- **Automatically Check For Updates Every** # **Weeks**: Checks for a new version of MySQL Notifier, and runs this check every # weeks.
- **Automatically add new services whose name contains:** The text used to filter services and add them automatically to the monitored list of the local computer running MySQL Notifier, and on remote computers already monitoring Windows services.
- **Ping monitored MySQL Server instances every** # **seconds**: The interval (in seconds) to ping monitored MySQL Server instances for status changes. Longer intervals might be necessary if the list of monitored remote instances is large.

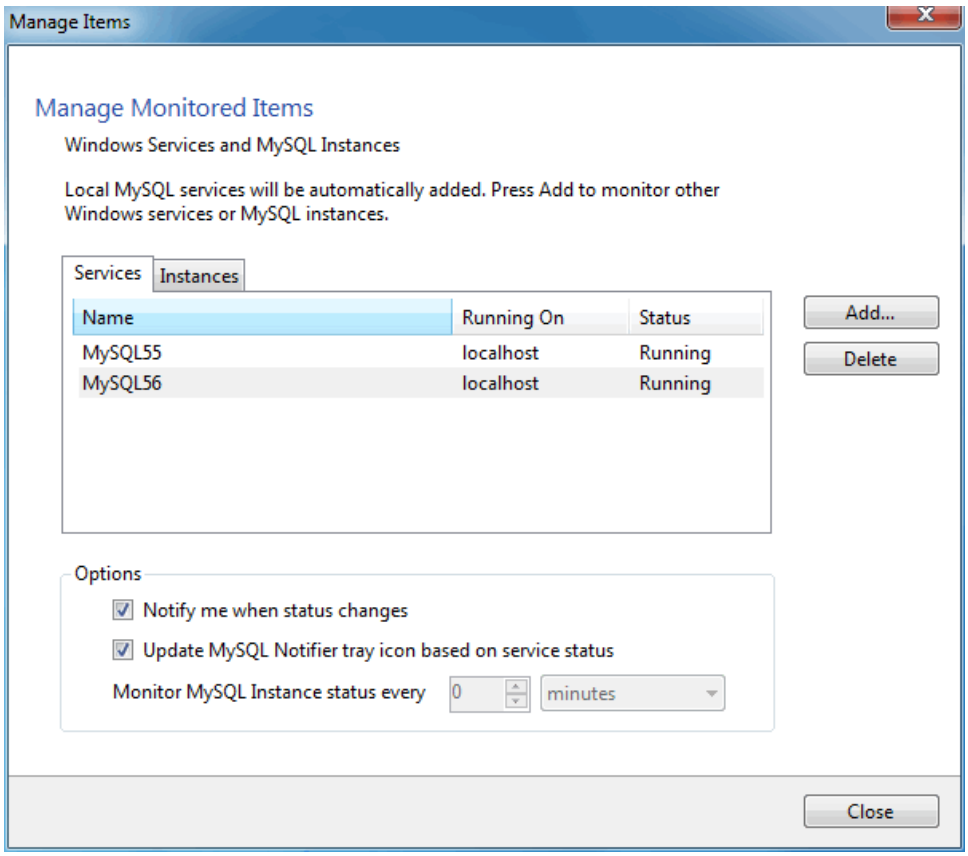
- **Notify me when a service is automatically added**: Will display a balloon notification from the taskbar when a newly discovered service is added to the monitored services list.
- **Notify me when a service changes status**: Will display a balloon notification from the taskbar when a monitored service changes its status.
- **Automatic connections migration delayed until:** When there are connections to migrate, postpone the migration by one hour, one day, one week, one month, or indefinitely.

Figure 3.3 MySQL Notifier Options menu



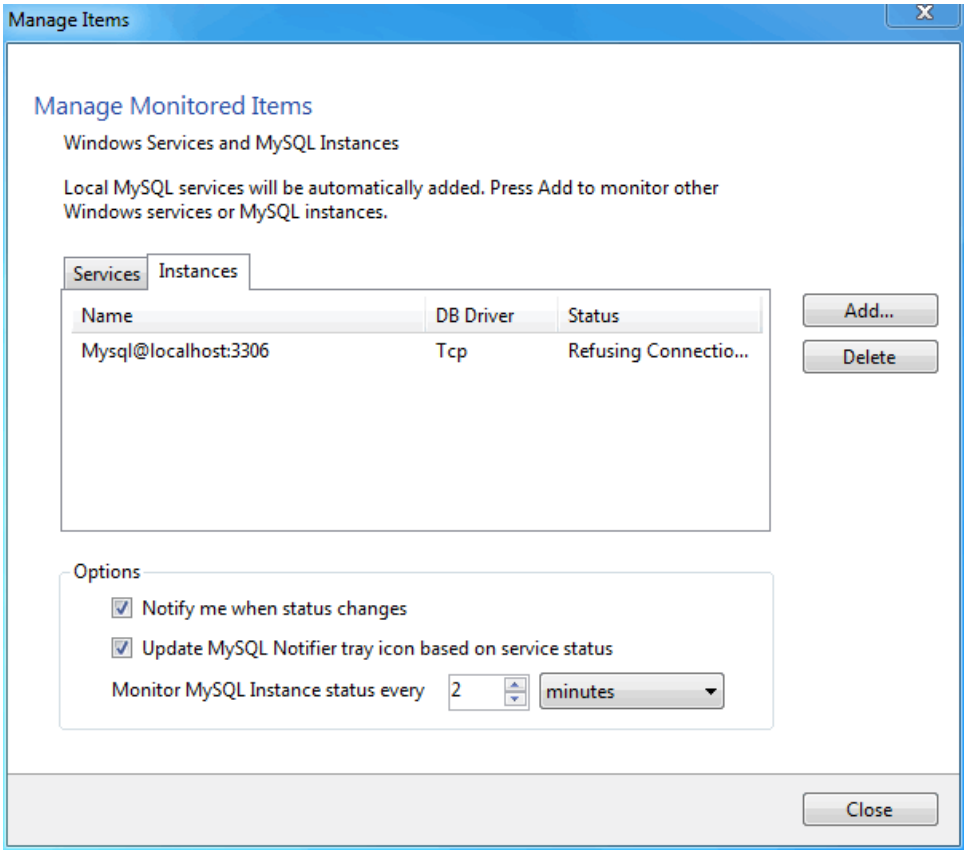
The **Actions**, **Manage Monitored Items** menu enables you to configure the monitored services and MySQL instances. First, with the **Services** tab open:

Figure 3.4 MySQL Notifier Manage Services menu



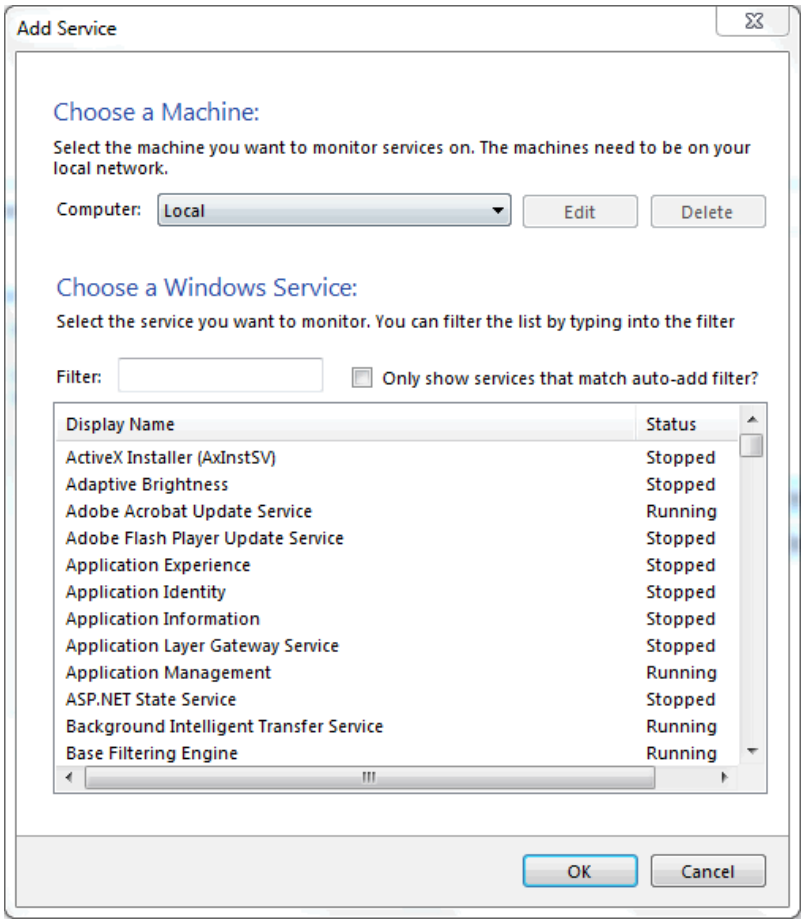
The **Instances** tab is similar:

Figure 3.5 MySQL Notifier Manage Instances menu



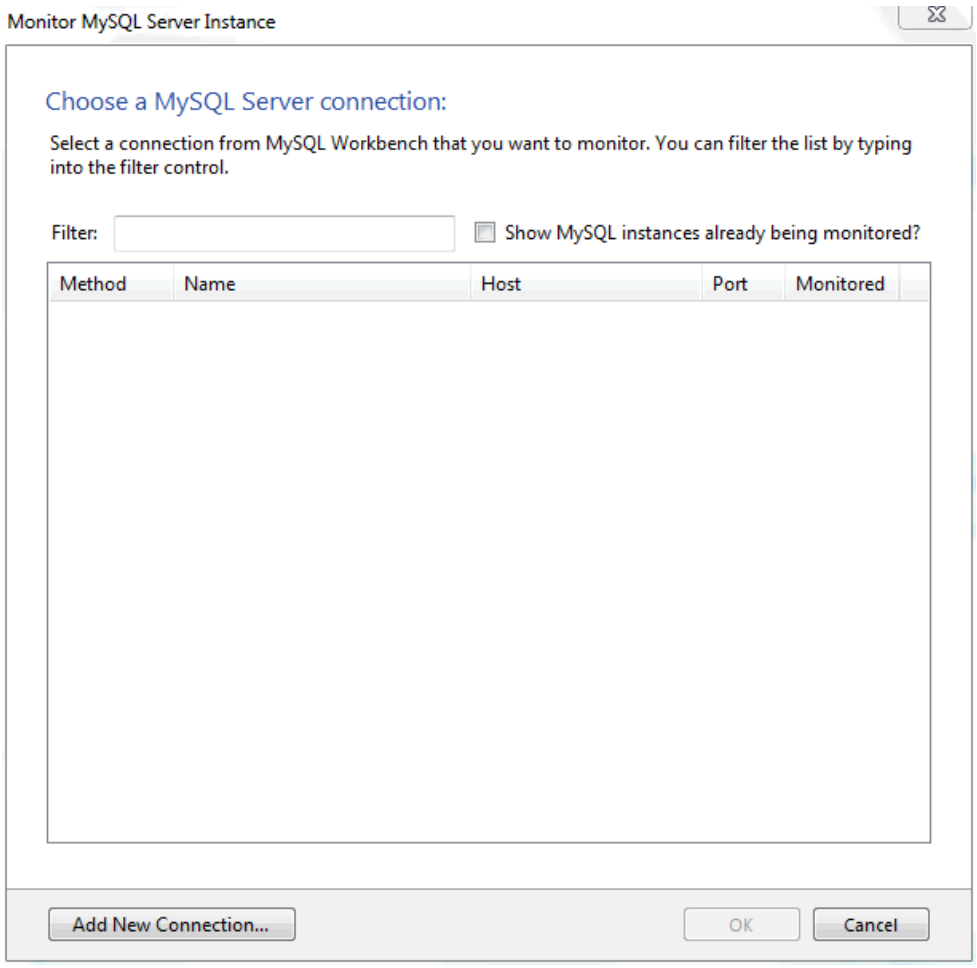
Adding a service or instance (after clicking **Add** in the **Manage Monitored Items** window) enables you to select a running Microsoft Windows service or instance connection, and configure MySQL Notifier to monitor it. Add a new service or instance by clicking service name from the list, then **OK** to accept. Multiple services and instances may be selected.

Figure 3.6 MySQL Notifier Adding new services



Add instances:

Figure 3.7 MySQL Notifier Adding new instances



Troubleshooting

For issues that are not documented here, visit the MySQL Notifier Support Forum for MySQL Notifier help and support.

- *Problem*: attempting to start/stop/restart a MySQL service might generate an error similar to "The Service **MySQL*VERSION*** failed the most recent status change request with the message "The service **mysql*VERSION*** was not found in the Windows Services".

  Explanation: this is a case-sensitivity issue, in that the service name is **MySQL*VERSION*** compared to having **mysql*VERSION*** in the configuration file.

  Solution: either update your MySQL Notifier configuration file with the correct information, or stop MySQL Notifier and delete this configuration file. The MySQL Notifier configuration file is located at `%APPDATA%\Oracle\MySQL Notifier\settings.config` where `%APPDATA%` is a variable and depends on your system. A typical location is "C:\Users*YourUsername*\AppData\Running\Oracle\MySQL Notifier\settings.config" where *YourUsername* is your system's user name. In this file, and within the ServerList section, change the ServerName values from lowercase to the actual service names. For example, change **mysql*VERSION*** to **MySQL*VERSION***, save, and then restart MySQL Notifier. Alternatively, stop MySQL Notifier, delete this file, then restart MySQL Notifier.

- *Problem*: when connecting to a remote computer for the purpose of monitoring a remote Windows service, the **Add Service** dialog does not always show all the services shown in the Windows Services console.

  Explanation: this behavior is governed by the operating system and the outcome is expected when working with nondomain user accounts. For a complete description of the behavior, see the User Account Control and WMI article from Microsoft.

  Solution: when the remote computer is in a compatible domain, it is recommended that domain user accounts are used to connect through WMI to a remote computer. For detailed setup instructions using WMI, see Section 3.2, “Setting Up Remote Monitoring in MySQL Notifier”.

  Alternatively, when domain user accounts are not available, Microsoft provides a less secure workaround that should only be implemented with caution. For more information, see the Description of User Account Control and remote restrictions in Windows Vista KB article from Microsoft.

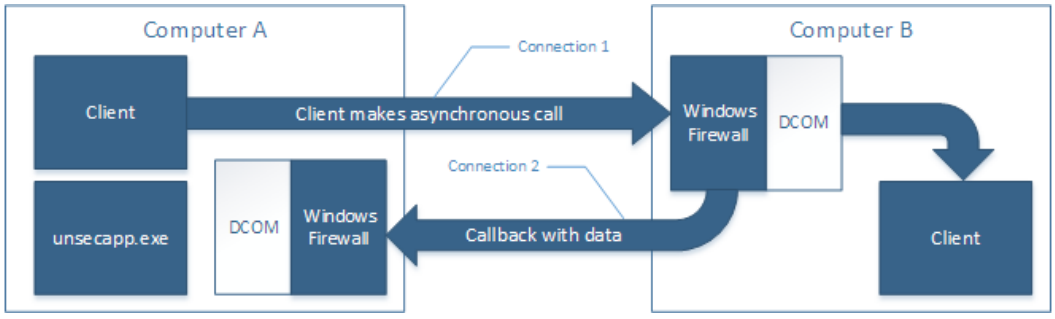
3.2 Setting Up Remote Monitoring in MySQL Notifier

MySQL Notifier uses Windows Management Instrumentation (WMI) to manage and monitor services on remote computers. This section explains how it works and how to set up your system to monitor remote MySQL instances.

In order to configure WMI, it is important to understand that the underlying Distributed Component Object Model (DCOM) architecture is doing the WMI work. Specifically, MySQL Notifier is using asynchronous notification queries on remote Microsoft Windows hosts as .NET events. These events send an asynchronous callback to the computer running MySQL Notifier so it knows when a service status has changed on the remote computer. Asynchronous notifications offer the best performance compared to semisynchronous notifications or synchronous notifications that use timers.

Asynchronous notification requires the remote computer to send a callback to the client computer (thus opening a reverse connection), so the Windows Firewall and DCOM settings must be properly configured for the communication to function properly.

Figure 3.8 MySQL Notifier Distributed Component Object Model (DCOM)



Most of the common errors thrown by asynchronous WMI notifications are related to Windows Firewall blocking the communication, or to DCOM / WMI settings not being set up properly. For a list of common errors with solutions, see Common Errors.

The following steps are required to make WMI function. These steps are divided between two machines. A single host computer that runs MySQL Notifier (Computer A), and multiple remote machines that are being monitored (Computer B).

Computer running MySQL Notifier (Computer A)

1. Enable remote administration by either editing the **Group Policy Editor**, or using `NETSH`:

Using the **Group Policy Editor**:

a. Click **Start**, click **Run**, type `GPEDIT.MSC`, and then click **OK**.

b. Under the **Local Computer Policy** heading, expand **Computer Configuration**.

c. Expand **Administrative Templates**, then **Network**, **Network Connections**, and then **Windows Firewall**.

d. If the computer is in the domain, then double-click **Domain Profile**; otherwise, double-click **Standard Profile**.

e. Double-click **Windows Firewall: Allow inbound remote administration exception** to open a configuration window.

f. Check the **Enabled** option button and then click **OK**.

Using the `NETSH` command:

> **Note**
>
> The "netsh firewall" command is deprecated as of Microsoft Server 2008 and Vista, and replaced with "netsh advfirewall firewall".

a. Open a command prompt window with Administrative rights (you can right-click the Command Prompt icon and select **Run as Administrator**).

b. Execute the following command:

```
NETSH advfirewall firewall set service RemoteAdmin enable
```

2. Open the DCOM port TCP 135:

a. Open a command prompt window with Administrative rights (you can right-click the Command Prompt icon and select **Run as Administrator**).

b. Execute the following command:

```
NETSH advfirewall firewall add rule name=DCOM_TCP135 protocol=TCP localport=135 dir=in action=allow
```

3. Add the client application that contains the sink for the callback (`MySqlNotifier.exe`) to the Windows Firewall Exceptions List (use either the Windows Firewall configuration or `NETSH`):

Using the Windows Firewall configuration:

a. In the Control Panel, double-click **Windows Firewall**.

b. In the Windows Firewall window's left panel, click **Allow a program or feature through Windows Firewall**.

c. In the Allowed Programs window, click **Change Settings** and do one of the following:

- If `MySqlNotifier.exe` is in the Allowed programs and features list, make sure it is checked for the type of networks the computer connects to (Private, Public or both).
- If `MySqlNotifier.exe` is not in the list, click **Allow another program...**.

i. In the **Add a Program** window, select the `MySqlNotifier.exe` if it exists in the Programs list, otherwise click Browse... and go to the directory where `MySqlNotifier.exe` was installed to select it, then click **Add**.

ii. Make sure `MySqlNotifier.exe` is checked for the type of networks the computer connects to (Private, Public or both).

Using the `NETSH` command:

a. Open a command prompt window with Administrative rights (you can right-click the Command Prompt icon and click **Run as Administrator**).

b. Execute the following command, where you change "*`[YOUR_INSTALL_DIRECTORY]`*":

```
NETSH advfirewall firewall add rule name=MySqlNotifier program=[YOUR_INSTALL_DIRECTORY]\MySqlNotifier.ex
```

4. If Computer B is either a member of `WORKGROUP` or is in a different domain that is untrusted by Computer A, then the callback connection (Connection 2) is created as an Anonymous connection. To grant Anonymous connections DCOM Remote Access permissions:

a. Click **Start**, click **Run**, type `DCOMCNFG`, and then click **OK**.

b. In the Component Services dialog box, expand Component Services, expand Computers, and then right-click **My Computer** and click **Properties**.

c. In the My Computer Properties dialog box, click the **COM Security** tab.

d. Under Access Permissions, click **Edit Limits**.

e. In the Access Permission dialog box, select **ANONYMOUS LOGON name** in the Group or user names box. In the Allow column under Permissions for User, select **Remote Access**, and then click **OK**.

Monitored Remote Computer (Computer B)

If the user account that is logged on to the computer running the MySQL Notifier (Computer A) is a local administrator on the remote computer (Computer B), such that the same account is an administrator on Computer B, you can skip to the "Allow for remote administration" step.

Setting DCOM security to allow a non-administrator user to access a computer remotely:

1. Grant "DCOM remote launch" and activation permissions for a user or group:

a. Click **Start**, click **Run**, type `DCOMCNFG`, and then click **OK**.

b. In the Component Services dialog box, expand Component Services, expand Computers, and then right-click **My Computer** and click **Properties**.

c. In the My Computer Properties dialog box, click the **COM Security** tab.

d. Under Launch and Activation Permission, click **Edit Limits**.

e. In the **Launch and Activation Permission** dialog box, follow these steps if your name or your group does not appear in the Groups or user names list:

i. In the **Launch and Activation Permission** dialog box, click **Add**.

ii. In the Select Users or Groups dialog box, add your name and the group in the **Enter the object names to select** box, and then click **OK**.

f. In the **Launch and Activation Permission** dialog box, select your user and group in the Group or user names box. In the Allow column under Permissions for User, select **Remote Launch**, select **Remote Activation**, and then click **OK**.

Grant DCOM remote access permissions:

a. Click **Start**, click **Run**, type `DCOMCNFG`, and then click **OK**.

b. In the Component Services dialog box, expand Component Services, expand Computers, and then right-click **My Computer** and click **Properties**.

c. In the My Computer Properties dialog box, click the **COM Security** tab.

d. Under Access Permissions, click **Edit Limits**.

e. In the Access Permission dialog box, select **ANONYMOUS LOGON name** in the Group or user names box. In the Allow column under Permissions for User, select **Remote Access**, and then click **OK**.

2. Allowing non-administrator users access to a specific WMI namespace:

a. In the Control Panel, double-click **Administrative Tools**.

b. In the Administrative Tools window, double-click **Computer Management**.

c. In the Computer Management window, expand the **Services and Applications** tree.

d. Right-click the WMI Control icon and select **Properties**.

e. In the WMI Control Properties window, click the **Security** tab.

f. In the Security tab, select the namespace and click **Security**. Root/CIMV2 is a commonly used namespace.

g. Locate the appropriate account and check **Remote Enable** in the Permissions list.

3. Allow for remote administration by either editing the **Group Policy Editor** or using `NETSH`:

Using the **Group Policy Editor**:

a. Click **Start**, click **Run**, type `GPEDIT.MSC`, and then click **OK**.

b. Under the Local Computer Policy heading, double-click **Computer Configuration**.

c. Double-click **Administrative Templates**, then **Network**, **Network Connections**, and then **Windows Firewall**.

d. If the computer is in the domain, then double-click **Domain Profile**; otherwise, double-click **Standard Profile**.

e. Click **Windows Firewall: Allow inbound remote administration exception**.

f. On the Action menu either select **Edit**, or double-click the selection from the previous step.

g. Check the **Enabled** radio button, and then click **OK**.

Using the `NETSH` command:

a. Open a command prompt window with Administrative rights (you can right-click the Command Prompt icon and click Run as Administrator).

b. Execute the following command:

```
NETSH advfirewall firewall set service RemoteAdmin enable
```

4. Confirm that the user account you are logging in with uses the `Name` value and not the `Full Name` value:

a. In the **Control Panel**, double-click **Administrative Tools**.

b. In the **Administrative Tools** window, double-click **Computer Management**.

c. In the **Computer Management** window, expand the **System Tools** then **Local Users and Groups**.

d. Click the **Users** node, and on the right side panel locate your user and make sure it uses the **Name** value to connect, and not the **Full Name** value.

Common Errors

- `0x80070005`
  - DCOM Security was not configured properly (see Computer B, the `Setting DCOM security...` step).
  - The remote computer (Computer B) is a member of WORKGROUP or is in a domain that is untrusted by the client computer (Computer A) (see Computer A, the `Grant Anonymous connections DCOM Remote Access permissions` step).
- `0x8007000E`
  - The remote computer (Computer B) is a member of WORKGROUP or is in a domain that is untrusted by the client computer (Computer A) (see Computer A, the `Grant Anonymous connections DCOM Remote Access permissions` step).
- `0x80041003`
  - Access to the remote WMI namespace was not configured properly (see Computer B, the `Allowing non-administrator users access to a specific WMI namespace` step).
- `0x800706BA`
  - The DCOM port is not open on the client computers (Computer A) firewall. See the `Open the DCOM port TCP 135` step for Computer A.
  - The remote computer (Computer B) is inaccessible because its network location is set to Public. Make sure you can access it through the Windows Explorer.

Chapter 4 The Server Shutdown Process

The server shutdown process takes place as follows:

1. The shutdown process is initiated.

   This can occur initiated several ways. For example, a user with the `SHUTDOWN` privilege can execute a `mysqladmin shutdown` command. `mysqladmin` can be used on any platform supported by MySQL. Other operating system-specific shutdown initiation methods are possible as well: The server shuts down on Unix when it receives a `SIGTERM` signal. A server running as a service on Windows shuts down when the services manager tells it to.

2. The server creates a shutdown thread if necessary.

   Depending on how shutdown was initiated, the server might create a thread to handle the shutdown process. If shutdown was requested by a client, a shutdown thread is created. If shutdown is the result of receiving a `SIGTERM` signal, the signal thread might handle shutdown itself, or it might create a separate thread to do so. If the server tries to create a shutdown thread and cannot (for example, if memory is exhausted), it issues a diagnostic message that appears in the error log:

   ```
   Error: Can't create thread to kill server
   ```

3. The server stops accepting new connections.

   To prevent new activity from being initiated during shutdown, the server stops accepting new client connections by closing the handlers for the network interfaces to which it normally listens for connections: the TCP/IP port, the Unix socket file, the Windows named pipe, and shared memory on Windows.

4. The server terminates current activity.

   For each thread associated with a client connection, the server breaks the connection to the client and marks the thread as killed. Threads die when they notice that they are so marked. Threads for idle connections die quickly. Threads that currently are processing statements check their state periodically and take longer to die. For additional information about thread termination, see KILL Syntax, in particular for the instructions about killed `REPAIR TABLE` or `OPTIMIZE TABLE` operations on `MyISAM` tables.

   For threads that have an open transaction, the transaction is rolled back.

   > **Note**
   >
   > If a thread is updating a nontransactional table, an operation such as a multiple-row `UPDATE` or `INSERT` may leave the table partially updated because the operation can terminate before completion.

   If the server is a master replication server, it treats threads associated with currently connected slaves like other client threads. That is, each one is marked as killed and exits when it next checks its state.

   If the server is a slave replication server, it stops the I/O and SQL threads, if they are active, before marking client threads as killed. The SQL thread is permitted to finish its current statement (to avoid causing replication problems), and then stops. If the SQL thread is in the middle of a transaction at this point, the server waits until the current replication event group (if any) has finished executing, or until the user issues a `KILL QUERY` or `KILL CONNECTION` statement. See also STOP SLAVE Syntax.

Since nontransactional statements cannot be rolled back, in order to guarantee crash-safe replication, only transactional tables should be used.

> **Note**
>
> To guarantee crash safety on the slave, you must run the slave with `--relay-log-recovery` enabled.

See also Replication Relay and Status Logs).

5. The server shuts down or closes storage engines.

   At this stage, the server flushes the table cache and closes all open tables.

   Each storage engine performs any actions necessary for tables that it manages. `InnoDB` flushes its buffer pool to disk (unless `innodb_fast_shutdown` is 2), writes the current LSN to the tablespace, and terminates its own internal threads. `MyISAM` flushes any pending index writes for a table.

6. The server exits.

Chapter 5 MySQL Server and Server-Startup Programs

Table of Contents

This section describes mysqld, the MySQL server, and several programs that are used to start the server.

5.1 mysqld — The MySQL Server

mysqld, also known as MySQL Server, is the main program that does most of the work in a MySQL installation. MySQL Server manages access to the MySQL data directory that contains databases and tables. The data directory is also the default location for other information such as log files and status files.

When MySQL server starts, it listens for network connections from client programs and manages access to databases on behalf of those clients.

The mysqld program has many options that can be specified at startup. For a complete list of options, run this command:

```
shell> mysqld --verbose --help
```

MySQL Server also has a set of system variables that affect its operation as it runs. System variables can be set at server startup, and many of them can be changed at runtime to effect dynamic server reconfiguration. MySQL Server also has a set of status variables that provide information about its operation. You can monitor these status variables to access runtime performance characteristics.

For a full description of MySQL Server command options, system variables, and status variables, see The MySQL Server. For information about installing MySQL and setting up the initial configuration, see Installing and Upgrading MySQL.

5.2 mysqld_safe — MySQL Server Startup Script

mysqld_safe is the recommended way to start a mysqld server on Unix. mysqld_safe adds some safety features such as restarting the server when an error occurs and logging runtime information to an error log file. A description of error logging is given later in this section.

mysqld_safe tries to start an executable named mysqld. To override the default behavior and specify explicitly the name of the server you want to run, specify a --mysqld or --mysqld-version option to mysqld_safe. You can also use --ledir to indicate the directory where mysqld_safe should look for the server.

Many of the options to mysqld_safe are the same as the options to mysqld. See Server Command Options.

Options unknown to mysqld_safe are passed to mysqld if they are specified on the command line, but ignored if they are specified in the [mysqld_safe] group of an option file. See Using Option Files.

mysqld_safe reads all options from the [mysqld], [server], and [mysqld_safe] sections in option files. For example, if you specify a [mysqld] section like this, mysqld_safe will find and use the --log-error option:

```
[mysqld]
log-error=error.log
```

For backward compatibility, mysqld_safe also reads [safe_mysqld] sections, but to be current you should rename such sections to [mysqld_safe].

mysqld_safe supports the following options. It also reads option files and supports the options for processing them described at Command-Line Options that Affect Option-File Handling.

Table 5.1 mysqld_safe Options

Format	Description
--basedir	Path to MySQL installation directory
--core-file-size	Size of core file that mysqld should be able to create
--datadir	Path to data directory
--defaults-extra-file	Read named option file in addition to usual option files
--defaults-file	Read only named option file
--help	Display help message and exit
--ledir	Path to directory where server is located
--log-error	Write error log to named file
--malloc-lib	Alternative malloc library to use for mysqld
--mysqld	Name of server program to start (in ledir directory)
--mysqld-version	Suffix for server program name
--nice	Use nice program to set server scheduling priority
--no-defaults	Read no option files
--open-files-limit	Number of files that mysqld should be able to open
--pid-file	Path name of process ID file
--plugin-dir	Directory where plugins are installed
--port	Port number on which to listen for TCP/IP connections
--skip-kill-mysqld	Do not try to kill stray mysqld processes
--skip-syslog	Do not write error messages to syslog; use error log file
--socket	Socket file on which to listen for Unix socket connections
--syslog	Write error messages to syslog
--syslog-tag	Tag suffix for messages written to syslog
--timezone	Set TZ time zone environment variable to named value
--user	Run mysqld as user having name user_name or numeric user ID user_id

- `--help`

  Display a help message and exit.

- `--basedir=dir_name`

The path to the MySQL installation directory.

- `--core-file-size=size`

  The size of the core file that `mysqld` should be able to create. The option value is passed to `ulimit -c`.

- `--datadir=dir_name`

  The path to the data directory.

- `--defaults-extra-file=file_name`

  The name of an option file to be read in addition to the usual option files. This must be the first option on the command line if it is used. If the file does not exist or is otherwise inaccessible, the server will exit with an error.

- `--defaults-file=file_name`

  The name of an option file to be read instead of the usual option files. This must be the first option on the command line if it is used.

- `--ledir=dir_name`

  If `mysqld_safe` cannot find the server, use this option to indicate the path name to the directory where the server is located.

- `--log-error=file_name`

  Write the error log to the given file. See The Error Log.

- `--malloc-lib=[lib_name]`

  The name of the library to use for memory allocation instead of the system `malloc()` library. Any library can be used by specifying its path name, but there is a shortcut form to enable use of the `tcmalloc` library that is shipped with binary MySQL distributions for Linux in MySQL 5.6. It is possible that the shortcut form will not work under certain configurations, in which case you should specify a path name instead.

  > **Note**
  >
  > As of MySQL 5.6.31, MySQL distributions no longer include a `tcmalloc` library.

  The `--malloc-lib` option works by modifying the `LD_PRELOAD` environment value to affect dynamic linking to enable the loader to find the memory-allocation library when `mysqld` runs:

  - If the option is not given, or is given without a value (`--malloc-lib=`), `LD_PRELOAD` is not modified and no attempt is made to use `tcmalloc`.
  - If the option is given as `--malloc-lib=tcmalloc`, `mysqld_safe` looks for a `tcmalloc` library in `/usr/lib` and then in the MySQL `pkglibdir` location (for example, `/usr/local/mysql/lib` or whatever is appropriate). If `tmalloc` is found, its path name is added to the beginning of the `LD_PRELOAD` value for `mysqld`. If `tcmalloc` is not found, `mysqld_safe` aborts with an error.
  - If the option is given as `--malloc-lib=/path/to/some/library`, that full path is added to the beginning of the `LD_PRELOAD` value. If the full path points to a nonexistent or unreadable file, `mysqld_safe` aborts with an error.

- For cases where mysqld_safe adds a path name to LD_PRELOAD, it adds the path to the beginning of any existing value the variable already has.

Linux users can use the libtcmalloc_minimal.so included in binary packages by adding these lines to the my.cnf file:

```
[mysqld_safe]
malloc-lib=tcmalloc
```

Those lines also suffice for users on any platform who have installed a tcmalloc package in /usr/lib. To use a specific tcmalloc library, specify its full path name. Example:

```
[mysqld_safe]
malloc-lib=/opt/lib/libtcmalloc_minimal.so
```

- --mysqld=*prog_name*

  The name of the server program (in the ledir directory) that you want to start. This option is needed if you use the MySQL binary distribution but have the data directory outside of the binary distribution. If mysqld_safe cannot find the server, use the --ledir option to indicate the path name to the directory where the server is located.

- --mysqld-version=*suffix*

  This option is similar to the --mysqld option, but you specify only the suffix for the server program name. The base name is assumed to be mysqld. For example, if you use --mysqld-version=debug, mysqld_safe starts the mysqld-debug program in the ledir directory. If the argument to --mysqld-version is empty, mysqld_safe uses mysqld in the ledir directory.

- --nice=*priority*

  Use the nice program to set the server's scheduling priority to the given value.

- --no-defaults

  Do not read any option files. This must be the first option on the command line if it is used.

- --open-files-limit=*count*

  The number of files that mysqld should be able to open. The option value is passed to ulimit -n.

  > **Note**
  >
  > You must start mysqld_safe as root for this to function properly.

- --pid-file=*file_name*

  The path name of the process ID file.

- --plugin-dir=*dir_name*

  The path name of the plugin directory.

- --port=*port_num*

  The port number that the server should use when listening for TCP/IP connections. The port number must be 1024 or higher unless the server is started by the root system user.

- `--skip-kill-mysqld`

  Do not try to kill stray `mysqld` processes at startup. This option works only on Linux.

- `--socket=path`

  The Unix socket file that the server should use when listening for local connections.

- `--syslog`, `--skip-syslog`

  `--syslog` causes error messages to be sent to `syslog` on systems that support the `logger` program. `--skip-syslog` suppresses the use of `syslog`; messages are written to an error log file.

  When `syslog` is used, the `daemon.err` syslog facility/severity is used for all log messages.

- `--syslog-tag=tag`

  For logging to `syslog`, messages from `mysqld_safe` and `mysqld` are written with identifiers of `mysqld_safe` and `mysqld`, respectively. To specify a suffix for the identifiers, use `--syslog-tag=tag`, which modifies the identifiers to be `mysqld_safe-tag` and `mysqld-tag`.

- `--timezone=timezone`

  Set the `TZ` time zone environment variable to the given option value. Consult your operating system documentation for legal time zone specification formats.

- `--user={user_name|user_id}`

  Run the `mysqld` server as the user having the name `user_name` or the numeric user ID `user_id`. (“User” in this context refers to a system login account, not a MySQL user listed in the grant tables.)

If you execute `mysqld_safe` with the `--defaults-file` or `--defaults-extra-file` option to name an option file, the option must be the first one given on the command line or the option file will not be used. For example, this command will not use the named option file:

```
mysql> mysqld_safe --port=port_num --defaults-file=file_name
```

Instead, use the following command:

```
mysql> mysqld_safe --defaults-file=file_name --port=port_num
```

The `mysqld_safe` script is written so that it normally can start a server that was installed from either a source or a binary distribution of MySQL, even though these types of distributions typically install the server in slightly different locations. (See Installation Layouts.) `mysqld_safe` expects one of the following conditions to be true:

- The server and databases can be found relative to the working directory (the directory from which `mysqld_safe` is invoked). For binary distributions, `mysqld_safe` looks under its working directory for `bin` and `data` directories. For source distributions, it looks for `libexec` and `var` directories. This condition should be met if you execute `mysqld_safe` from your MySQL installation directory (for example, `/usr/local/mysql` for a binary distribution).
- If the server and databases cannot be found relative to the working directory, `mysqld_safe` attempts to locate them by absolute path names. Typical locations are `/usr/local/libexec` and `/usr/local/var`. The actual locations are determined from the values configured into the distribution at the time it was built. They should be correct if MySQL is installed in the location specified at configuration time.

Because mysqld_safe tries to find the server and databases relative to its own working directory, you can install a binary distribution of MySQL anywhere, as long as you run mysqld_safe from the MySQL installation directory:

```
shell> cd mysql_installation_directory
shell> bin/mysqld_safe &
```

If mysqld_safe fails, even when invoked from the MySQL installation directory, specify the --ledir and --datadir options to indicate the directories in which the server and databases are located on your system.

In MySQL 5.6.5 and later, mysqld_safe tries to use the sleep and date system utilities to determine how many times it has attempted to start this second, and—if these are present and this is greater than 5 times—is forced to wait 1 full second before starting again. This is intended to prevent excessive CPU usage in the event of repeated failures. (Bug #11761530, Bug #54035)

When you use mysqld_safe to start mysqld, mysqld_safe arranges for error (and notice) messages from itself and from mysqld to go to the same destination.

There are several mysqld_safe options for controlling the destination of these messages:

- --log-error=*file_name*: Write error messages to the named error file.
- --syslog: Write error messages to syslog on systems that support the logger program.
- --skip-syslog: Do not write error messages to syslog. Messages are written to the default error log file (*host_name*.err in the data directory), or to a named file if the --log-error option is given.

If none of these options is given, the default is --skip-syslog.

If --log-error and --syslog are both given, a warning is issued and --log-error takes precedence.

When mysqld_safe writes a message, notices go to the logging destination (syslog or the error log file) and stdout. Errors go to the logging destination and stderr.

5.3 mysql.server — MySQL Server Startup Script

MySQL distributions on Unix include a script named mysql.server, which starts the server using mysqld_safe. It can be used on systems such as Linux and Solaris that use System V-style run directories to start and stop system services. It is also used by the OS X Startup Item for MySQL.

To start or stop the server manually using the mysql.server script, invoke it with start or stop arguments:

```
shell> mysql.server start
shell> mysql.server stop
```

Before mysql.server starts the server, it changes location to the MySQL installation directory, and then invokes mysqld_safe. To run the server as some specific user, add an appropriate user option to the [mysqld] group of the /etc/my.cnf option file, as shown later in this section. (It is possible that you must edit mysql.server if you've installed a binary distribution of MySQL in a nonstandard location. Modify it to change location into the proper directory before it runs mysqld_safe. If you do this, your modified version of mysql.server may be overwritten if you upgrade MySQL in the future, so you should make a copy of your edited version that you can reinstall.)

mysql.server stop stops the server by sending a signal to it. You can also stop the server manually by executing mysqladmin shutdown.

To start and stop MySQL automatically on your server, you must add start and stop commands to the appropriate places in your /etc/rc* files.

If you use the Linux server RPM package (MySQL-server-*VERSION*.rpm), or a native Linux package installation, the mysql.server script may be installed in the /etc/init.d directory with the name mysql. See Installing MySQL on Linux Using RPM Packages from Oracle, for more information on the Linux RPM packages.

Some vendors provide RPM packages that install a startup script under a different name such as mysqld.

If you install MySQL from a source distribution or using a binary distribution format that does not install mysql.server automatically, you can install it manually. The script can be found in the support-files directory under the MySQL installation directory or in a MySQL source tree. Copy it to the /etc/init.d directory with the name mysql, and then make it executable:

```
shell> cp mysql.server /etc/init.d/mysql
shell> chmod +x /etc/init.d/mysql
```

> **Note**
>
> Older Red Hat systems use the /etc/rc.d/init.d directory rather than /etc/init.d. Adjust the preceding commands accordingly. Alternatively, first create /etc/init.d as a symbolic link that points to /etc/rc.d/init.d:

```
shell> cd /etc
shell> ln -s rc.d/init.d .
```

After installing the script, the commands needed to activate it to run at system startup depend on your operating system. On Linux, you can use chkconfig:

```
shell> chkconfig --add mysql
```

On some Linux systems, the following command also seems to be necessary to fully enable the mysql script:

```
shell> chkconfig --level 345 mysql on
```

On FreeBSD, startup scripts generally should go in /usr/local/etc/rc.d/. The rc(8) manual page states that scripts in this directory are executed only if their base name matches the *.sh shell file name pattern. Any other files or directories present within the directory are silently ignored. In other words, on FreeBSD, you should install the mysql.server script as /usr/local/etc/rc.d/mysql.server.sh to enable automatic startup.

As an alternative to the preceding setup, some operating systems also use /etc/rc.local or /etc/init.d/boot.local to start additional services on startup. To start up MySQL using this method, append a command like the one following to the appropriate startup file:

```
/bin/sh -c 'cd /usr/local/mysql; ./bin/mysqld_safe --user=mysql &'
```

For other systems, consult your operating system documentation to see how to install startup scripts.

mysql.server reads options from the [mysql.server] and [mysqld] sections of option files. For backward compatibility, it also reads [mysql_server] sections, but to be current you should rename such sections to [mysql.server].

You can add options for mysql.server in a global /etc/my.cnf file. A typical /etc/my.cnf file might look like this:

```
[mysqld]
datadir=/usr/local/mysql/var
socket=/var/tmp/mysql.sock
port=3306
user=mysql
[mysql.server]
basedir=/usr/local/mysql
```

The mysql.server script supports the following options. If specified, they *must* be placed in an option file, not on the command line. mysql.server supports only start and stop as command-line arguments.

Table 5.2 mysql.server Options

Format	Description
--basedir	Path to MySQL installation directory
--datadir	Path to MySQL data directory
--pid-file	File in which server should write its process ID
--service-startup-timeout	How long to wait for server startup

- --basedir=*dir_name*

  The path to the MySQL installation directory.

- --datadir=*dir_name*

  The path to the MySQL data directory.

- --pid-file=*file_name*

  The path name of the file in which the server should write its process ID.

  If this option is not given, mysql.server uses a default value of *host_name*.pid. The PID file value passed to mysqld_safe overrides any value specified in the [mysqld_safe] option file group. Because mysql.server reads the [mysqld] option file group but not the [mysqld_safe] group, you can ensure that mysqld_safe gets the same value when invoke using mysql.server as when invoked manually by putting the same pid-file setting in both the [mysqld_safe] and [mysqld] groups.

- --service-startup-timeout=*seconds*

  How long in seconds to wait for confirmation of server startup. If the server does not start within this time, mysql.server exits with an error. The default value is 900. A value of 0 means not to wait at all for startup. Negative values mean to wait forever (no timeout).

5.4 mysqld_multi — Manage Multiple MySQL Servers

mysqld_multi is designed to manage several mysqld processes that listen for connections on different Unix socket files and TCP/IP ports. It can start or stop servers, or report their current status.

mysqld_multi searches for groups named [mysqldN] in my.cnf (or in the file named by the --defaults-file option). N can be any positive integer. This number is referred to in the following discussion as the option group number, or GNR. Group numbers distinguish option groups from one another and are used as arguments to mysqld_multi to specify which servers you want to start, stop, or obtain a status report for. Options listed in these groups are the same that you would use in the [mysqld] group used for starting mysqld. (See, for example, Starting and Stopping MySQL Automatically.) However, when using multiple servers, it is necessary that each one use its own value for options such as the Unix socket file and TCP/IP port number. For more information on which options must be unique per server in a multiple-server environment, see Running Multiple MySQL Instances on One Machine.

To invoke mysqld_multi, use the following syntax:

```
shell> mysqld_multi [options] {start|stop|reload|report} [GNR[,GNR] ...]
```

start, stop, reload (stop and restart), and report indicate which operation to perform. (reload is available as of MySQL 5.6.3.) You can perform the designated operation for a single server or multiple servers, depending on the GNR list that follows the option name. If there is no list, mysqld_multi performs the operation for all servers in the option file.

Each GNR value represents an option group number or range of group numbers. The value should be the number at the end of the group name in the option file. For example, the GNR for a group named [mysqld17] is 17. To specify a range of numbers, separate the first and last numbers by a dash. The GNR value 10-13 represents groups [mysqld10] through [mysqld13]. Multiple groups or group ranges can be specified on the command line, separated by commas. There must be no whitespace characters (spaces or tabs) in the GNR list; anything after a whitespace character is ignored.

This command starts a single server using option group [mysqld17]:

```
shell> mysqld_multi start 17
```

This command stops several servers, using option groups [mysqld8] and [mysqld10] through [mysqld13]:

```
shell> mysqld_multi stop 8,10-13
```

For an example of how you might set up an option file, use this command:

```
shell> mysqld_multi --example
```

mysqld_multi searches for option files as follows:

- With --no-defaults, no option files are read.
- With --defaults-file=*file_name*, only the named file is read.
- Otherwise, option files in the standard list of locations are read, including any file named by the --defaults-extra-file=*file_name* option, if one is given. (If the option is given multiple times, the last value is used.)

Option files read are searched for [mysqld_multi] and [mysqldN] option groups. The [mysqld_multi] group can be used for options to mysqld_multi itself. [mysqldN] groups can be used for options passed to specific mysqld instances.

The [mysqld] or [mysqld_safe] groups can be used for common options read by all instances of mysqld or mysqld_safe. You can specify a --defaults-file=*file_name* option to use a different

configuration file for that instance, in which case the [mysqld] or [mysqld_safe] groups from that file will be used for that instance.

mysqld_multi supports the following options.

- --help

  Display a help message and exit.

- --example

  Display a sample option file.

- --log=*file_name*

  Specify the name of the log file. If the file exists, log output is appended to it.

- --mysqladmin=*prog_name*

  The mysqladmin binary to be used to stop servers.

- --mysqld=*prog_name*

  The mysqld binary to be used. You can specify mysqld_safe as the value for this option. If you use mysqld_safe to start the server, you can include the mysqld or ledir options in the corresponding [mysqld*N*] option group. These options indicate the name of the server that mysqld_safe should start and the path name of the directory where the server is located. (See the descriptions for these options in Section 5.2, “mysqld_safe — MySQL Server Startup Script”.) Example:

  ```
  [mysqld38]
  mysqld = mysqld-debug
  ledir  = /opt/local/mysql/libexec
  ```

- --no-log

  Print log information to stdout rather than to the log file. By default, output goes to the log file.

- --password=*password*

  The password of the MySQL account to use when invoking mysqladmin. The password value is not optional for this option, unlike for other MySQL programs.

- --silent

  Silent mode; disable warnings.

- --tcp-ip

  Connect to each MySQL server through the TCP/IP port instead of the Unix socket file. (If a socket file is missing, the server might still be running, but accessible only through the TCP/IP port.) By default, connections are made using the Unix socket file. This option affects stop and report operations.

- --user=*user_name*

  The user name of the MySQL account to use when invoking mysqladmin.

- --verbose

  Be more verbose.

- `--version`

  Display version information and exit.

Some notes about `mysqld_multi`:

- **Most important**: Before using `mysqld_multi` be sure that you understand the meanings of the options that are passed to the `mysqld` servers and *why* you would want to have separate `mysqld` processes. Beware of the dangers of using multiple `mysqld` servers with the same data directory. Use separate data directories, unless you *know* what you are doing. Starting multiple servers with the same data directory does *not* give you extra performance in a threaded system. See Running Multiple MySQL Instances on One Machine.

- > **Important**
  >
  > Make sure that the data directory for each server is fully accessible to the Unix account that the specific `mysqld` process is started as. *Do not* use the Unix `root` account for this, unless you *know* what you are doing. See How to Run MySQL as a Normal User.

- Make sure that the MySQL account used for stopping the `mysqld` servers (with the `mysqladmin` program) has the same user name and password for each server. Also, make sure that the account has the `SHUTDOWN` privilege. If the servers that you want to manage have different user names or passwords for the administrative accounts, you might want to create an account on each server that has the same user name and password. For example, you might set up a common `multi_admin` account by executing the following commands for each server:

  ```
  shell> mysql -u root -S /tmp/mysql.sock -p
  Enter password:
  mysql> CREATE USER 'multi_admin'@'localhost' IDENTIFIED BY 'multipass';
  mysql> GRANT SHUTDOWN ON *.* TO 'multi_admin'@'localhost';
  ```

  See The MySQL Access Privilege System. You have to do this for each `mysqld` server. Change the connection parameters appropriately when connecting to each one. The host name part of the account name must permit you to connect as `multi_admin` from the host where you want to run `mysqld_multi`.

- The Unix socket file and the TCP/IP port number must be different for every `mysqld`. (Alternatively, if the host has multiple network addresses, you can use `--bind-address` to cause different servers to listen to different interfaces.)

- The `--pid-file` option is very important if you are using `mysqld_safe` to start `mysqld` (for example, `--mysqld=mysqld_safe`) Every `mysqld` should have its own process ID file. The advantage of using `mysqld_safe` instead of `mysqld` is that `mysqld_safe` monitors its `mysqld` process and restarts it if the process terminates due to a signal sent using `kill -9` or for other reasons, such as a segmentation fault. The `mysqld_safe` script might require that you start it from a certain place. This means that you might have to change location to a certain directory before running `mysqld_multi`. If you have problems starting, please see the `mysqld_safe` script. Check especially the lines:

  ```
  ----------------------------------------------------------------
  MY_PWD=`pwd`
  # Check if we are starting this relative (for the binary release)
  if test -d $MY_PWD/data/mysql -a \
     -f ./share/mysql/english/errmsg.sys -a \
     -x ./bin/mysqld
  ----------------------------------------------------------------
  ```

The test performed by these lines should be successful, or you might encounter problems. See Section 5.2, “mysqld_safe — MySQL Server Startup Script”.

- You might want to use the --user option for mysqld, but to do this you need to run the mysqld_multi script as the Unix superuser (root). Having the option in the option file doesn't matter; you just get a warning if you are not the superuser and the mysqld processes are started under your own Unix account.

The following example shows how you might set up an option file for use with mysqld_multi. The order in which the mysqld programs are started or stopped depends on the order in which they appear in the option file. Group numbers need not form an unbroken sequence. The first and fifth [mysqldN] groups were intentionally omitted from the example to illustrate that you can have “gaps” in the option file. This gives you more flexibility.

```
# This is an example of a my.cnf file for mysqld_multi.
# Usually this file is located in home dir ~/.my.cnf or /etc/my.cnf
[mysqld_multi]
mysqld     = /usr/local/mysql/bin/mysqld_safe
mysqladmin = /usr/local/mysql/bin/mysqladmin
user       = multi_admin
password   = my_password
[mysqld2]
socket     = /tmp/mysql.sock2
port       = 3307
pid-file   = /usr/local/mysql/data2/hostname.pid2
datadir    = /usr/local/mysql/data2
language   = /usr/local/mysql/share/mysql/english
user       = unix_user1
[mysqld3]
mysqld     = /path/to/mysqld_safe
ledir      = /path/to/mysqld-binary/
mysqladmin = /path/to/mysqladmin
socket     = /tmp/mysql.sock3
port       = 3308
pid-file   = /usr/local/mysql/data3/hostname.pid3
datadir    = /usr/local/mysql/data3
language   = /usr/local/mysql/share/mysql/swedish
user       = unix_user2
[mysqld4]
socket     = /tmp/mysql.sock4
port       = 3309
pid-file   = /usr/local/mysql/data4/hostname.pid4
datadir    = /usr/local/mysql/data4
language   = /usr/local/mysql/share/mysql/estonia
user       = unix_user3

[mysqld6]
socket     = /tmp/mysql.sock6
port       = 3311
pid-file   = /usr/local/mysql/data6/hostname.pid6
datadir    = /usr/local/mysql/data6
language   = /usr/local/mysql/share/mysql/japanese
user       = unix_user4
```

See Using Option Files.