Starting and Stopping MySQL

Abstract

This is the Starting and Stopping MySQL extract from the MySQL 5.7 Reference Manual.

For legal information, see the Legal Notices.

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

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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 on Unix/Linux platforms. For Linux-generic binary distribution installation instructions with a focus on MySQL security features, refer to the Secure Deployment Guide. For other platform-specific binary package formats, see the other platform-specific sections in this manual. For example, for Windows distributions, see Installing MySQL on Microsoft Windows. See How to Get MySQL on how to obtain MySQL in different distribution formats.

MySQL compressed `tar` file binary distributions have names of the form `mysql-VERSION-OS.tar.gz`, where *`VERSION`* is a number (for example, `5.7.44`), and *`OS`* indicates the type of operating system for which the distribution is intended (for example, `pc-linux-i686` or `winx64`).

Warnings

- If you have previously installed MySQL using your operating system native package management system, such as Yum or APT, 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.

- MySQL has a dependency on the `libaio` library. Data directory initialization and subsequent server startup steps fail if this library is not installed locally. If necessary, install it using the appropriate package manager. For example, on Yum-based systems:

  ```
  $> yum search libaio  # search for info
  $> yum install libaio # install library
  ```

  Or, on APT-based systems:

  ```
  $> apt-cache search libaio # search for info
  $> apt-get install libaio1 # install library
  ```

- *For MySQL 5.7.19 and later:* Support for Non-Uniform Memory Access (NUMA) has been added to the generic Linux build, which has a dependency now on the `libnuma` library; if the library has not been installed on your system, use you system's package manager to search for and install it (see the preceding item for some sample commands).

- **SLES 11**: As of MySQL 5.7.19, the Linux Generic tarball package format is EL6 instead of EL5. As a side effect, the MySQL client `bin/mysql` needs `libtinfo.so.5`.

> A workaround is to create a symlink, such as `ln -s libncurses.so.5.6 /lib64/libtinfo.so.5` on 64-bit systems or `ln -s libncurses.so.5.6 /lib/libtinfo.so.5` on 32-bit systems.

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`	`mysqld` server, client and utility programs
`docs`	MySQL manual in Info format
`man`	Unix manual pages
`include`	Include (header) files
`lib`	Libraries
`share`	Error messages, dictionary, and SQL for database installation
`support-files`	Miscellaneous support files

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:

```
$> groupadd mysql
$> useradd -r -g mysql -s /bin/false mysql
$> cd /usr/local
$> tar zxvf /path/to/mysql-VERSION-OS.tar.gz
$> ln -s full-path-to-mysql-VERSION-OS mysql
$> cd mysql
$> mkdir mysql-files
$> chown mysql:mysql mysql-files
$> chmod 750 mysql-files
$> bin/mysqld --initialize --user=mysql
$> bin/mysql_ssl_rsa_setup
$> bin/mysqld_safe --user=mysql &
# Next command is optional
$> 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` (Solaris) command.

The `mysql-files` directory provides a convenient location to use as the value for the `secure_file_priv` system variable, which limits import and export operations to a specific directory. See Server System Variables.

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 them. 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/Linux, or they may have different names such as `adduser` and `addgroup`.

```
$> groupadd mysql
$> 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`.

```
$> 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:

```
$> 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:

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

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

```
$> 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:

```
$> export PATH=$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.

The examples in these sections assume that MySQL is installed under the default location of `C:\Program Files\MySQL\MySQL Server 5.7`. 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` system variable enabled. 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.

> **Note**
>
> The database must be initialized before MySQL can be started. For additional information about the initialization process, see Initializing the Data Directory.

To start the server, enter this command:

```
C:\> "C:\Program Files\MySQL\MySQL Server 5.7\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: '5.7.44'  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 5.7\data` by default). The error log is the file with the `.err` extension, and may be set using the `--log-error` option.

> **Note**
>
> The initial `root` account in the MySQL grant tables has no password. After starting the server, you should set up a password for it using the instructions in Securing the Initial MySQL Account.

Chapter 3 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 Statement, 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. 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 source replication server, it treats threads associated with currently connected replicas 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 replica, 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 Statement. 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 replica, you must run the replica with `--relay-log-recovery` enabled.

See also Relay Log and Replication Metadata Repositories).

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.

To provide information to management processes, the server returns one of the exit codes described in the following list. The phrase in parentheses indicates the action taken by systemd in response to the code, for platforms on which systemd is used to manage the server.

- 0 = successful termination (no restart done)
- 1 = unsuccessful termination (no restart done)
- 2 = unsuccessful termination (restart done)

Chapter 4 Server and Server-Startup Programs

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

4.1 mysqld — The MySQL Server

`mysqld`, also known as MySQL Server, is a single multithreaded program that does most of the work in a MySQL installation. It does not spawn additional processes. 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.

> **Note**
>
> Some installation packages contain a debugging version of the server named `mysqld-debug`. Invoke this version instead of `mysqld` for debugging support, memory allocation checking, and trace file support (see Creating Trace 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:

```
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.

4.2 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. A description of error logging is given later in this section.

> **Note**
>
> For some Linux platforms, MySQL installation from RPM or Debian packages includes systemd support for managing MySQL server startup and shutdown. On

> these platforms, `mysqld_safe` is not installed because it is unnecessary. For more information, see Managing MySQL Server with systemd.
>
> One implication of the non-use of `mysqld_safe` on platforms that use systemd for server management is that use of `[mysqld_safe]` or `[safe_mysqld]` sections in option files is not supported and might lead to unexpected behavior.

`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` finds and uses 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` accepts options on the command line and in option files, as described in the following table. For information about option files used by MySQL programs, see Using Option Files.

Table 4.1 mysqld_safe Options

Option Name	Description	Introduced	Deprecated
--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		

Option Name	Description	Introduced	Deprecated
--malloc-lib	Alternative malloc library to use for mysqld		
--mysqld	Name of server program to start (in ledir directory)		
--mysqld-safe-log-timestamps	Timestamp format for logging	5.7.11	
--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 server 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		Yes
--socket	Socket file on which to listen for Unix socket connections		
--syslog	Write error messages to syslog		Yes
--syslog-tag	Tag suffix for messages written to syslog		Yes
--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`

Command-Line Format	`--help`

Command-Line Format	`--help`

Display a help message and exit.

- `--basedir=dir_name`

Command-Line Format	`--basedir=dir_name`
Type	Directory name

Command-Line Format	`--basedir=dir_name`
Type	Directory name

The path to the MySQL installation directory.

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

Command-Line Format	`--core-file-size=size`
Type	String

Command-Line Format	`--core-file-size=size`
Type	String

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

- `--datadir=dir_name`

Command-Line Format	`--datadir=dir_name`
Type	Directory name

Command-Line Format	`--datadir=dir_name`
Type	Directory name

The path to the data directory.

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

Command-Line Format	`--defaults-extra-file=file_name`
Type	File name

Command-Line Format	`--defaults-extra-file=file_name`

Type	File name

Read this option file in addition to the usual option files. If the file does not exist or is otherwise inaccessible, the server exits with an error. If *file_name* is not an absolute path name, it is interpreted relative to the current directory. This must be the first option on the command line if it is used.

For additional information about this and other option-file options, see Command-Line Options that Affect Option-File Handling.

- `--defaults-file=file_name`

Command-Line Format	`--defaults-file=file_name`
Type	File name

Use only the given option file. If the file does not exist or is otherwise inaccessible, the server exits with an error. If *file_name* is not an absolute path name, it is interpreted relative to the current directory. This must be the first option on the command line if it is used.

For additional information about this and other option-file options, see Command-Line Options that Affect Option-File Handling.

- `--ledir=dir_name`

Command-Line Format	`--ledir=dir_name`
Type	Directory name

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

As of MySQL 5.7.17, this option is accepted only on the command line, not in option files. On platforms that use systemd, the value can be specified in the value of `MYSQLD_OPTS`. See Managing MySQL Server with systemd.

- `--log-error=file_name`

Command-Line Format	`--log-error=file_name`
Type	File name

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

- `--mysqld-safe-log-timestamps`

Command-Line Format	`--mysqld-safe-log-timestamps=type`
Introduced	5.7.11
Type	Enumeration
Default Value	`utc`
Valid Values	`system`

	legacy

This option controls the format for timestamps in log output produced by mysqld_safe. The following list describes the permitted values. For any other value, mysqld_safe logs a warning and uses UTC format.

- UTC, utc

  ISO 8601 UTC format (same as --log_timestamps=UTC for the server). This is the default.

- SYSTEM, system

  ISO 8601 local time format (same as --log_timestamps=SYSTEM for the server).

- HYPHEN, hyphen

  YY-MM-DD h:mm:ss format, as in mysqld_safe for MySQL 5.6.

- LEGACY, legacy

  YYMMDD hh:mm:ss format, as in mysqld_safe prior to MySQL 5.6.

This option was added in MySQL 5.7.11.

- --malloc-lib=[*lib_name*]

Command-Line Format	--malloc-lib=[lib-name]
Type	String

The name of the library to use for memory allocation instead of the system malloc() library. As of MySQL 5.7.15, the option value must be one of the directories /usr/lib, /usr/lib64, /usr/lib/i386-linux-gnu, or /usr/lib/x86_64-linux-gnu. Prior to MySQL 5.7.15, 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 5.7. It is possible for the shortcut form not to work under certain configurations, in which case you should specify a path name instead.

> **Note**
>
> As of MySQL 5.7.13, 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.
- Prior to MySQL 5.7.31, 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.

As of MySQL 5.7.31, `tcmalloc` is not a permitted value for the `--malloc-lib` option.

- 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.

> **Note**
>
> On systems that manage the server using systemd, `mysqld_safe` is not available. Instead, specify the allocation library by setting `LD_PRELOAD` in `/etc/sysconfig/mysql`.

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`

Command-Line Format	`--mysqld=file_name`
Type	File 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.

As of MySQL 5.7.15, this option is accepted only on the command line, not in option files. On platforms that use systemd, the value can be specified in the value of `MYSQLD_OPTS`. See Managing MySQL Server with systemd.

- `--mysqld-version=suffix`

Command-Line Format	`--mysqld-version=suffix`
Type	String

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.

As of MySQL 5.7.15, this option is accepted only on the command line, not in option files. On platforms that use systemd, the value can be specified in the value of `MYSQLD_OPTS`. See Managing MySQL Server with systemd.

- `--nice=priority`

Command-Line Format	`--nice=priority`
Type	Numeric

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

- `--no-defaults`

Command-Line Format	`--no-defaults`
Type	String

Do not read any option files. If program startup fails due to reading unknown options from an option file, `--no-defaults` can be used to prevent them from being read. This must be the first option on the command line if it is used.

For additional information about this and other option-file options, see Command-Line Options that Affect Option-File Handling.

- `--open-files-limit=count`

Command-Line Format	`--open-files-limit=count`
Type	String

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`

Command-Line Format	`--pid-file=file_name`
Type	File name

The path name that `mysqld` should use for its process ID file.

From MySQL 5.7.2 to 5.7.17, `mysqld_safe` has its own process ID file, which is always named `mysqld_safe.pid` and located in the MySQL data directory.

- `--plugin-dir=dir_name`

Type	Directory name

The path name of the plugin directory.

- `--port=port_num`

Command-Line Format	`--port=number`
Type	Numeric

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` operating system user.

- `--skip-kill-mysqld`

Command-Line Format	`--skip-kill-mysqld`

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

- `--socket=path`

Command-Line Format	`--socket=file_name`
Type	File name

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

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

Command-Line Format	`--syslog`
Deprecated	Yes

Command-Line Format	`--skip-syslog`
Deprecated	Yes

`--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 for error logging, the `daemon.err` facility/severity is used for all log messages.

Using these options to control `mysqld` logging is deprecated as of MySQL 5.7.5. Use the server `log_syslog` system variable instead. To control the facility, use the server `log_syslog_facility` system variable. See Error Logging to the System Log.

- `--syslog-tag=tag`

Deprecated	Yes

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`.

Using this option to control `mysqld` logging is deprecated as of MySQL 5.7.5. Use the server `log_syslog_tag` system variable instead. See Error Logging to the System Log.

- `--timezone=timezone`

Command-Line Format	`--timezone=timezone`
Type	String

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}`

Command-Line Format	`--user={user_name|user_id}`
Type	String
Type	Numeric

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 is not used. For example, this command does 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:

```
cd mysql_installation_directory
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.

mysqld_safe tries to use the sleep and date system utilities to determine how many times per second it has attempted to start. If these utilities are present and the attempted starts per second is greater than 5, mysqld_safe waits 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.

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.

> **Note**
>
> Controlling mysqld logging from mysqld_safe is deprecated as of MySQL 5.7.5. Use the server's native syslog support instead. For more information, see Error Logging to the System Log.

4.3 mysql.server — MySQL Server Startup Script

MySQL distributions on Unix and Unix-like system include a script named mysql.server, which starts the MySQL 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 macOS Startup Item for MySQL.

mysql.server is the script name as used within the MySQL source tree. The installed name might be different (for example, mysqld or mysql). In the following discussion, adjust the name mysql.server as appropriate for your system.

> **Note**
>
> For some Linux platforms, MySQL installation from RPM or Debian packages includes systemd support for managing MySQL server startup and shutdown. On these platforms, mysql.server and mysqld_safe are not installed because

> they are unnecessary. For more information, see Managing MySQL Server with systemd.

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

```
mysql.server start
mysql.server stop
```

`mysql.server` changes location to the MySQL installation directory, then invokes `mysqld_safe`. To run the server as some specific user, add an appropriate `user` option to the `[mysqld]` group of the global `/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; 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 `mysqld` or `mysql`. See Installing MySQL on Linux Using RPM Packages from Oracle, for more information on the Linux RPM packages.

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

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

  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`:

  ```
  chkconfig --add mysql
  ```

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

  ```
  chkconfig --level 345 mysql on
  ```

- On FreeBSD, startup scripts generally should go in `/usr/local/etc/rc.d/`. Install the `mysql.server` script as `/usr/local/etc/rc.d/mysql.server.sh` to enable automatic startup. 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.

- 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 `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 options shown in the following table. 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 4.2 mysql.server Option-File Options

Option Name	Description	Type
`basedir`	Path to MySQL installation directory	Directory name
`datadir`	Path to MySQL data directory	Directory name
`pid-file`	File in which server should write its process ID	File name
`service-startup-timeout`	How long to wait for server startup	Integer

- `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. The server creates the file in the data directory unless an absolute path name is given to specify a different directory.

  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 invoked from `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).

4.4 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.

> **Note**
>
> For some Linux platforms, MySQL installation from RPM or Debian packages includes systemd support for managing MySQL server startup and shutdown. On these platforms, `mysqld_multi` is not installed because it is unnecessary. For information about using systemd to handle multiple MySQL instances, see Managing MySQL Server with systemd.

`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:

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

`start`, `stop`, `reload` (stop and restart), and `report` indicate which operation to perform. 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]`:

```
mysqld_multi start 17
```

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

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

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

```
mysqld_multi --example
```

`mysqld_multi` searches for option files as follows:

- With `--no-defaults`, no option files are read.

Command-Line Format	`--no-defaults`
Type	Boolean
Default Value	`false`

- With `--defaults-file=file_name`, only the named file is read.

Command-Line Format	`--defaults-file=filename`
Type	File name
Default Value	`[none]`

- 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.)

Command-Line Format	`--defaults-extra-file=filename`
Type	File name
Default Value	`[none]`

For additional information about these and other option-file options, see Command-Line Options that Affect Option-File Handling.

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 are used for that instance.

`mysqld_multi` supports the following options.

- `--help`

Command-Line Format	`--help`
Type	Boolean
Default Value	`false`

Display a help message and exit.

- `--example`

Command-Line Format	`--example`
Type	Boolean
Default Value	`false`

Display a sample option file.

- `--log=file_name`

Command-Line Format	`--log=path`
Type	File name

Default Value	`/var/log/mysqld_multi.log`

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

- `--mysqladmin=prog_name`

Command-Line Format	`--mysqladmin=file`
Type	File name
Default Value	`[none]`

The `mysqladmin` binary to be used to stop servers.

- `--mysqld=prog_name`

Command-Line Format	`--mysqld=file`
Type	File name
Default Value	`[none]`

The `mysqld` binary to be used. Note that you can specify `mysqld_safe` as the value for this option also. If you use `mysqld_safe` to start the server, you can include the `mysqld` or `ledir` options in the corresponding `[mysqldN]` 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 4.2, “mysqld_safe — MySQL Server Startup Script”.) Example:

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

- `--no-log`

Command-Line Format	`--no-log`
Type	Boolean
Default Value	`false`

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

- `--password=password`

Command-Line Format	`--password=string`
Type	String
Default Value	`[none]`

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

- `--silent`

Command-Line Format	`--silent`

Type	Boolean
Default Value	`false`

Silent mode; disable warnings.

- `--tcp-ip`

Command-Line Format	`--tcp-ip`
Type	Boolean
Default Value	`false`

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`

Command-Line Format	`--user=name`
Type	String
Default Value	`root`

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

- `--verbose`

Command-Line Format	`--verbose`
Type	Boolean
Default Value	`false`

Be more verbose.

- `--version`

Command-Line Format	`--version`
Type	Boolean
Default Value	`false`

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:

  ```
  $> 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 Access Control and Account Management. You have to do this for each `mysqld` server. Change the connection parameters appropriately when connecting to each one. Note that 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 set the `bind_address` system variable 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.

- 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.