MySQL and Linux/Unix
Abstract

This is the MySQL Linux extract from the MySQL 5.6 Reference Manual.

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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.

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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 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, 5.6.44), 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, 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

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

<table>
<thead>
<tr>
<th>Directory</th>
<th>Contents of Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>bin, scripts</td>
<td>mysql server, client and utility programs</td>
</tr>
<tr>
<td>data</td>
<td>Log files, databases</td>
</tr>
</tbody>
</table>
### Directory and Contents of Directory

<table>
<thead>
<tr>
<th>Directory</th>
<th>Contents of Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>docs</td>
<td>MySQL manual in Info format</td>
</tr>
<tr>
<td>include</td>
<td>Include (header) files</td>
</tr>
<tr>
<td>lib</td>
<td>Libraries</td>
</tr>
<tr>
<td>mysql-test</td>
<td>Test suite</td>
</tr>
<tr>
<td>man</td>
<td>Unix manual pages</td>
</tr>
<tr>
<td>share</td>
<td>Error messages, dictionary, and SQL for database installation</td>
</tr>
<tr>
<td>sql-bench</td>
<td>Benchmarks</td>
</tr>
<tr>
<td>support-files</td>
<td>Miscellaneous support files, including sample configuration files</td>
</tr>
</tbody>
</table>

**Note**

*SLES 11*: as of MySQL 5.6.37, 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.

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
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> scripts/mysql_install_db --user=mysql
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` (Solaris) 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 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`.

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

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

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 Installing MySQL on Linux

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Linux supports a number of different solutions for installing MySQL. We recommend that you use one of
the distributions from Oracle, for which several methods for installation are available:

Table 2.1 Linux Installation Methods and Information

<table>
<thead>
<tr>
<th>Type</th>
<th>Setup Method</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apt</td>
<td>Enable the MySQL Apt repository</td>
<td>Documentation</td>
</tr>
<tr>
<td>Yum</td>
<td>Enable the MySQL Yum repository</td>
<td>Documentation</td>
</tr>
<tr>
<td>Zypper</td>
<td>Enable the MySQL SLES repository</td>
<td>Documentation</td>
</tr>
<tr>
<td>RPM</td>
<td>Download a specific package</td>
<td>Documentation</td>
</tr>
<tr>
<td>DEB</td>
<td>Download a specific package</td>
<td>Documentation</td>
</tr>
<tr>
<td>Generic</td>
<td>Download a generic package</td>
<td>Documentation</td>
</tr>
<tr>
<td>Source</td>
<td>Compile from source</td>
<td>Documentation</td>
</tr>
<tr>
<td>Docker</td>
<td>Use Docker Hub</td>
<td>Documentation</td>
</tr>
<tr>
<td>Oracle Unbreakable Linux Network</td>
<td>Use ULN channels</td>
<td>Documentation</td>
</tr>
</tbody>
</table>

As an alternative, you can use the package manager on your system to automatically download and
install MySQL with packages from the native software repositories of your Linux distribution. These native
packages are often several versions behind the currently available release. You will also normally be
unable to install development milestone releases (DMRs), as these are not usually made available in the
native repositories. For more information on using the native package installers, see Section 2.7, “Installing
MySQL on Linux from the Native Software Repositories”.

Note
For many Linux installations, you will want to set up MySQL to be started
automatically when your machine starts. Many of the native package installations
perform this operation for you, but for source, binary and RPM solutions you may
need to set this up separately. The required script, `mysql.server`, can be found in the `support-files` directory under the MySQL installation directory or in a MySQL source tree. You can install it as `/etc/init.d/mysql` for automatic MySQL startup and shutdown. See `mysql.server — MySQL Server Startup Script`.

### 2.1 Installing MySQL on Linux Using the MySQL Yum Repository

The MySQL Yum repository for Oracle Linux, Red Hat Enterprise Linux, and CentOS provides RPM packages for installing the MySQL server, client, MySQL Workbench, MySQL Utilities, MySQL Router, MySQL Shell, Connector/ODBC, Connector/Python and so on (not all packages are available for all the distributions; see Installing Additional MySQL Products and Components with Yum for details).

**Before You Start**

As a popular, open-source software, MySQL, in its original or re-packaged form, is widely installed on many systems from various sources, including different software download sites, software repositories, and so on. The following instructions assume that MySQL is not already installed on your system using a third-party-distributed RPM package; if that is not the case, follow the instructions given in Upgrading MySQL with the MySQL Yum Repository or Section 2.2, “Replacing a Third-Party Distribution of MySQL Using the MySQL Yum Repository”.

### Steps for a Fresh Installation of MySQL

Follow the steps below to install the latest GA release of MySQL (from the MySQL 5.7 series currently) with the MySQL Yum repository:

**Adding the MySQL Yum Repository**

First, add the MySQL Yum repository to your system's repository list. This is a one-time operation, which can be performed by installing an RPM provided by MySQL. Follow these steps:


b. Select and download the release package for your platform.

c. Install the downloaded release package with the following command, replacing `platform-and-version-specific-package-name` with the name of the downloaded RPM package:

```shell
sudo yum localinstall platform-and-version-specific-package-name.rpm
```

For an EL6-based system, the command is in the form of:

```shell
sudo yum localinstall mysql57-community-release-el6-{version-number}.noarch.rpm
```

For an EL7-based system:

```shell
sudo yum localinstall mysql57-community-release-el7-{version-number}.noarch.rpm
```

The installation command adds the MySQL Yum repository to your system's repository list and downloads the GnuPG key to check the integrity of the software packages. See Signature Checking Using GnuPG for details on GnuPG key checking.
Selecting a Release Series

You can check that the MySQL Yum repository has been successfully added by the following command:

```
shell> yum repolist enabled | grep "mysql.*-community.*"
```

**Note**

Once the MySQL Yum repository is enabled on your system, any system-wide update by the `yum update` command will upgrade MySQL packages on your system and also replace any native third-party packages, if Yum finds replacements for them in the MySQL Yum repository; see Upgrading MySQL with the MySQL Yum Repository and, for a discussion on some possible effects of that on your system, see Upgrading the Shared Client Libraries.

### Selecting a Release Series

When using the MySQL Yum repository, the latest GA series (currently MySQL 5.7) is selected for installation by default. If this is what you want, you can skip to the next step, Installing MySQL.

Within the MySQL Yum repository, different release series of the MySQL Community Server are hosted in different subrepositories. The subrepository for the latest GA series (currently MySQL 5.7) is enabled by default, and the subrepositories for all other series (for example, the MySQL 5.6 series) are disabled by default. Use this command to see all the subrepositories in the MySQL Yum repository, and see which of them are enabled or disabled:

```
shell> yum repolist all | grep mysql
```

To install the latest release from the latest GA series, no configuration is needed. To install the latest release from a specific series other than the latest GA series, disable the subrepository for the latest GA series and enable the subrepository for the specific series before running the installation command. If your platform supports `yum-config-manager`, you can do that by issuing these commands, which disable the subrepository for the 5.7 series and enable the one for the 5.6 series:

```
shell> sudo yum-config-manager --disable mysql57-community
shell> sudo yum-config-manager --enable mysql56-community
```

Besides using `yum-config-manager` command, you can also select a release series by editing manually the `/etc/yum.repos.d/mysql-community.repo` file. This is a typical entry for a release series' subrepository in the file:

```
[mysql57-community]
name=MySQL 5.7 Community Server
baseurl=http://repo.mysql.com/yum/mysql-5.7-community/el/6/$basearch/
enabled=1
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-mysql
```

Find the entry for the subrepository you want to configure, and edit the `enabled` option. Specify `enabled=0` to disable a subrepository, or `enabled=1` to enable a subrepository. For example, to install MySQL 5.6, make sure you have `enabled=0` for the above subrepository entry for MySQL 5.7, and have `enabled=1` for the entry for the 5.6 series:

```
# Enable to use MySQL 5.6
```
Installing MySQL

You should only enable subrepository for one release series at any time. When subrepositories for more than one release series are enabled, the latest series will be used by Yum.

Verify that the correct subrepositories have been enabled and disabled by running the following command and checking its output:

```
shell> yum repolist enabled | grep mysql
```

**Installing MySQL**

Install MySQL by the following command:

```
shell> sudo yum install mysql-community-server
```

This installs the package for MySQL server (`mysql-community-server`) and also packages for the components required to run the server, including packages for the client (`mysql-community-client`), the common error messages and character sets for client and server (`mysql-community-common`), and the shared client libraries (`mysql-community-libs`).

**Starting the MySQL Server**

Start the MySQL server with the following command:

```
shell> sudo service mysqld start
```

This is a sample output of the above command:

```
Starting mysqld:[ OK ]
```

You can check the status of the MySQL server with the following command:

```
shell> sudo service mysqld status
```

This is a sample output of the above command:

```
mysqld (pid 3066) is running.
```

**Securing the MySQL Installation**

The program `mysql_secure_installation` allows you to perform important operations like setting the root password, removing anonymous users, and so on. Always run it to secure your MySQL installation:

```
shell> mysql_secure_installation
```

It is important to remember the root password you set. See `mysql_secure_installation — Improve MySQL Installation Security` for details.

For more information on the postinstallation procedures, see `Postinstallation Setup and Testing`. 

---

[mysql56-community]
name=MySQL 5.6 Community Server
baseurl=http://repo.mysql.com/yum/mysql-5.6-community/el/6/$basearch/
enabled=1
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-mysql
Installing Additional MySQL Products and Components with Yum

You can use Yum to install and manage individual components of MySQL. Some of these components are hosted in sub-repositories of the MySQL Yum repository: for example, the MySQL Connectors are to be found in the MySQL Connectors Community sub-repository, and the MySQL Workbench in MySQL Tools Community. You can use the following command to list the packages for all the MySQL components available for your platform from the MySQL Yum repository:

```
shell> sudo yum --disablerepo=\* --enablerepo='mysql*-community*' list available
```

Install any packages of your choice with the following command, replacing `package-name` with name of the package:

```
shell> sudo yum install package-name
```

For example, to install MySQL Workbench:

```
shell> sudo yum install mysql-workbench-community
```

To install the shared client libraries:

```
shell> sudo yum install mysql-community-libs
```

Updating MySQL with Yum

Besides installation, you can also perform updates for MySQL products and components using the MySQL Yum repository. See Upgrading MySQL with the MySQL Yum Repository for details.

2.2 Replacing a Third-Party Distribution of MySQL Using the MySQL Yum Repository

For supported Yum-based platforms (see Section 2.1, “Installing MySQL on Linux Using the MySQL Yum Repository”, for a list), you can replace a third-party distribution of MySQL with the latest GA release (from the MySQL 5.7 series currently) from the MySQL Yum repository. According to how your third-party distribution of MySQL was installed, there are different steps to follow:

Replacing a Native Third-Party Distribution of MySQL

If you have installed a third-party distribution of MySQL from a native software repository (that is, a software repository provided by your own Linux distribution), follow these steps:

Back Up Your Database

To avoid loss of data, always back up your database before trying to replace your MySQL installation using the MySQL Yum repository. See Backup and Recovery, on how to back up your database.
Adding the MySQL Yum Repository

Add the MySQL Yum repository to your system’s repository list by following the instructions given in Adding the MySQL Yum Repository.

Replacing the Native Third-Party Distribution by a Yum Update

By design, the MySQL Yum repository will replace your native, third-party MySQL with the latest GA release (from the MySQL 5.7 series currently) from the MySQL Yum repository when you perform a `yum update` command on the system, or a `yum update mysql-server`.

After updating MySQL using the Yum repository, applications compiled with older versions of the shared client libraries should continue to work. However, if you want to recompile applications and dynamically link them with the updated libraries, see Upgrading the Shared Client Libraries, for some special considerations.

Replacing a Nonnative Third-Party Distribution of MySQL

If you have installed a third-party distribution of MySQL from a nonnative software repository (that is, a software repository not provided by your own Linux distribution), follow these steps:

Backing Up Your Database

To avoid loss of data, always back up your database before trying to replace your MySQL installation using the MySQL Yum repository. See Backup and Recovery, on how to back up your database.

Stopping Yum from Receiving MySQL Packages from Third-Party, Nonnative Repositories

Before you can use the MySQL Yum repository for installing MySQL, you must stop your system from receiving MySQL packages from any third-party, nonnative Yum repositories.

For example, if you have installed MariaDB using their own software repository, get a list of the installed MariaDB packages using the following command:

```
shell> yum list installed mariadb\*
```

This is a sample output for the command:

<table>
<thead>
<tr>
<th>Package Name</th>
<th>Version</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>MariaDB-common.1686</td>
<td>10.0.4-1</td>
<td>@mariadb</td>
</tr>
<tr>
<td>MariaDB-compat.1686</td>
<td>10.0.4-1</td>
<td>@mariadb</td>
</tr>
<tr>
<td>MariaDB-server.1686</td>
<td>10.0.4-1</td>
<td>@mariadb</td>
</tr>
</tbody>
</table>

From the command output, we can identify the installed packages (MariaDB-common, MariaDB-compat, and MariaDB-server) and the source of them (a nonnative software repository named mariadb).

As another example, if you have installed Percona using their own software repository, get a list of the installed Percona packages using the following command:

```
shell> yum list installed Percona\*
```

This is a sample output for the command:

<table>
<thead>
<tr>
<th>Package Name</th>
<th>Version</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percona-Server-client-55.i686</td>
<td>5.5.39-rel136.0.el6</td>
<td>@percona-release-1386</td>
</tr>
<tr>
<td>Percona-Server-server-55.i686</td>
<td>5.5.39-rel136.0.el6</td>
<td>@percona-release-1386</td>
</tr>
</tbody>
</table>
Uninstalling the Nonnative Third-Party MySQL Distribution of MySQL

From the command output, we can identify the installed packages (Percona-Server-client, Percona-Server-server, Percona-Server-shared, and percona-release.noarch) and the source of them (a nonnative software repository named percona-release).

If you are not sure which third-party MySQL fork you have installed, this command should reveal it and list the RPM packages installed for it, as well as the third-party repository that supplies the packages:

```shell
shell> yum --disablerepo=\* provides mysql\*
```

The next step is to stop Yum from receiving packages from the nonnative repository. If the `yum-config-manager` utility is supported on your platform, you can, for example, use this command for stopping delivery from MariaDB:

```shell
shell> sudo yum-config-manager --disable mariadb
```

And use this command for stopping delivery from Percona:

```shell
shell> sudo yum-config-manager --disable percona-release
```

You can perform the same task by removing the entry for the software repository existing in one of the repository files under the `/etc/yum.repos.d/` directory. This is how the entry typically looks like for MariaDB:

```
[mariadb] name = MariaDB
baseurl = [base URL for repository]
gpgkey = [URL for GPG key]
gpgcheck =1
```

The entry is usually found in the file `/etc/yum.repos.d/MariaDB.repo` for MariaDB—delete the file, or remove entry from it (or from the file in which you find the entry).

---

### Note

This step is not necessary for an installation that was configured with a Yum repository release package (like Percona) if you are going to remove the release package (`percona-release.noarch` for Percona), as shown in the uninstall command for Percona in Step 3 below.

---

Uninstalling the Nonnative Third-Party MySQL Distribution of MySQL

The nonnative third-party MySQL distribution must first be uninstalled before you can use the MySQL Yum repository to install MySQL. For the MariaDB packages found in Step 2 above, uninstall them with the following command:

```shell
shell> sudo yum remove MariaDB-common MariaDB-compat MariaDB-server
```

For the Percona packages we found in Step 2 above:

```shell
shell> sudo yum remove Percona-Server-client-55 Percona-Server-server-55 Percona-Server-shared-55.i686 percona-release
```
Installing MySQL with the MySQL Yum Repository

Then, install MySQL with the MySQL Yum repository by following the instructions given in Section 2.1, “Installing MySQL on Linux Using the MySQL Yum Repository”:

Important

• If you have chosen to replace your third-party MySQL distribution with a newer version of MySQL from the MySQL Yum repository, remember to run `mysql_upgrade` after the server starts, to check and possibly resolve any incompatibilities between the old data and the upgraded software. `mysql_upgrade` also performs other functions; see `mysql_upgrade — Check and Upgrade MySQL Tables` for details.

• For EL7-based platforms: See Compatibility Information for EL7-based platforms [9].

2.3 Installing MySQL on Linux Using the MySQL APT Repository

The MySQL APT repository provides `deb` packages for installing and managing the MySQL server, client, and other components on Debian and Ubuntu platforms.

Instructions for using the MySQL APT Repository are available in A Quick Guide to Using the MySQL APT Repository.

2.4 Installing MySQL on Linux Using the MySQL SLES Repository

The MySQL SLES repository provides RPM packages for installing and managing the MySQL server, client, and other components on SUSE Enterprise Linux Server.

Instructions for using the MySQL SLES repository are available in A Quick Guide to Using the MySQL SLES Repository.

Note

The MySQL SLES repository is now in development release. We encourage you to try it and provide us with feedback. Please report any bugs or inconsistencies you observe to our Bugs Database.

2.5 Installing MySQL on Linux Using RPM Packages from Oracle

The recommended way to install MySQL on RPM-based Linux distributions is by using the RPM packages provided by Oracle. There are two sources for obtaining them, for the Community Edition of MySQL:

• From the MySQL software repositories:

  • The MySQL Yum repository (see Section 2.1, “Installing MySQL on Linux Using the MySQL Yum Repository” for details).

  • The MySQL SLES repository (see Section 2.4, “Installing MySQL on Linux Using the MySQL SLES Repository” for details).

• From the MySQL Downloads page in the MySQL Developer Zone.
Note

RPM distributions of MySQL are also provided by other vendors. Be aware that they may differ from those built by Oracle in features, capabilities, and conventions (including communication setup), and that the installation instructions in this manual do not necessarily apply to them. The vendor's instructions should be consulted instead.

If you have such a third-party distribution of MySQL running on your system and now want to migrate to Oracle's distribution using the RPM packages downloaded from the MySQL Developer Zone, see Compatibility with RPM Packages from Other Vendors below. The preferred method of migration, however, is to use the MySQL Yum repository or MySQL SLES repository.

There are two kinds of RPM packages for installing MySQL 5.6:

- The older kind: Their package names started with `MYSQL-`. They are available from the MySQL Downloads page in the MySQL Developer Zone. The instructions given in this section are for using these packages.

- The newer kind: Their package names started with `mysql-community-` or `mysql-commercial-`. They are available from the MySQL Yum repository and MySQL SLES repository. If, instead of configuring your system to install these RPM directly from the MySQL repositories (which is recommended), you are downloading the packages from the repositories and then installing them manually in separate steps, use the installation commands given for the MySQL 5.7 RPMs in Installing MySQL on Linux Using RPM Packages from Oracle, but consult this section for information like installation layout, server initialization, root password, and so on.

RPM packages for MySQL are listed in the following tables:

### Table 2.2 RPM Packages for MySQL Community Edition

<table>
<thead>
<tr>
<th>Package Name</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>MySQL-server</td>
<td>Database server and related tools</td>
</tr>
<tr>
<td>MySQL-client</td>
<td>MySQL client applications and tools</td>
</tr>
<tr>
<td>MySQL-devel</td>
<td>Development header files and libraries for MySQL database client applications</td>
</tr>
<tr>
<td>MySQL-shared</td>
<td>Shared libraries for MySQL database client applications</td>
</tr>
<tr>
<td>MySQL-shared-compat</td>
<td>Shared compatibility libraries for previous MySQL installations</td>
</tr>
<tr>
<td>MySQL-embedded</td>
<td>MySQL embedded library</td>
</tr>
<tr>
<td>MySQL-test</td>
<td>Test suite for the MySQL server</td>
</tr>
</tbody>
</table>

Dependency relationships exist among some of the packages. If you plan to install many of the packages, you may wish to download the RPM bundle `tar` file instead, which contains all the RPM packages listed above, so that you need not download them separately.
The full names for the RPMs have the following syntax:

```
packagename-version-distribution-arch.rpm
```

The `distribution` and `arch` values indicate the Linux distribution and the processor type for which the package was built. See the table below for lists of the distribution identifiers:

### Table 2.3 MySQL Linux RPM Package Distribution Identifiers

<table>
<thead>
<tr>
<th><code>distribution</code> Value</th>
<th>Intended Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>el6, el7</td>
<td>Red Hat Enterprise Linux/Oracle Linux/CentOS 5, 6, or 7</td>
</tr>
<tr>
<td>sles11, sles12</td>
<td>SUSE Linux Enterprise Server 11 or 12</td>
</tr>
<tr>
<td>linux_glibc2.5</td>
<td>Distribution independent; run on any RPM-based Linux distribution</td>
</tr>
</tbody>
</table>

To see all files in an RPM package (for example, `MySQL-server`), use the following command:

```
shell> rpm -qpl MySQL-server-version-distribution-arch.rpm
```

In most cases, you need to install the `MySQL-server` and `MySQL-client` to get a functional, standard MySQL installation. To perform such a standard, minimal installation, go to the folder that contains all those packages (and, preferably, no other RPM packages with similar names), and issue the following command (replace `yum` with `zypper` for SLES systems):

```
shell> yum install MySQL-{server,client}-*
```

While it is much preferable to use a high-level package management tool like `yum` to install the packages, users who prefer direct `rpm` commands can replace the `yum install` command with the `rpm -Uvh` command; however, using `rpm -Uvh` instead makes the installation process more prone to failure, due to potential dependency issues the installation process might run into.

To install only the client programs, you can skip installing the `MySQL-server` package; issue the following command (replace `yum` with `zypper` for SLES systems):

```
shell> yum install MySQL-client-*
```

A standard installation of MySQL using the RPM packages result in files and resources created under the system directories, shown in the following table.

### Table 2.4 MySQL Installation Layout for Linux RPM Packages from the MySQL Developer Zone

<table>
<thead>
<tr>
<th>Files or Resources</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client programs and scripts</td>
<td>/usr/bin</td>
</tr>
<tr>
<td><code>mysqld</code> server</td>
<td>/usr/sbin</td>
</tr>
<tr>
<td>Data directory</td>
<td>/var/lib/mysql</td>
</tr>
<tr>
<td>Error log file</td>
<td>For RHEL, Oracle Linux, or CentOS: /var/lib/mysql/host_name.err</td>
</tr>
<tr>
<td></td>
<td>For SLES: /var/log/mysql/mysqld.log</td>
</tr>
<tr>
<td>System V init script</td>
<td>/etc/init.d/mysql</td>
</tr>
<tr>
<td>Systemd service</td>
<td>mysql</td>
</tr>
<tr>
<td>Pid file</td>
<td>/var/lib/mysql/host_name.pid</td>
</tr>
</tbody>
</table>
Files or Resources | Location
--- | ---
Unix manual pages | /usr/share/man
Include (header) files | /usr/include/mysql
Libraries | /usr/lib/mysql
Socket | /var/lib/mysql/mysql.sock
Miscellaneous support files (for example, error messages, and character set files) | /usr/share/mysql

The installation also creates a user named **mysql** and a group named **mysql** on the system.

MySQL is not automatically started at the end of the installation process. Use the following command to start MySQL:

```shell>
    service mysql start
```

At the initial start up of the server, the server is initialized if the data directory of the server is empty. `mysql_install_db` is invoked with the `--random-passwords` option, which assigns a random password to the MySQL root accounts and sets the "password expired" flag for those accounts. It will be necessary after installation to start the server, connect as root using the initial random password, and assign a new root password. Until this is done, root cannot do anything else. This must be done for each root account you intend to use. To change the password, you can use the SET PASSWORD statement (for example, with the mysql client). You can also use `mysqladmin` or `mysql_secure_installation`. For additional details (including where to find the assigned random root password), see `mysql_install_db — Initialize MySQL Data Directory`. (Install operations using RPMs for Unbreakable Linux Network are unaffected because they do not run `mysql_install_db`.)

During an upgrade installation using RPM packages, if the MySQL server is running when the upgrade occurs then the MySQL server is stopped, the upgrade occurs, and the MySQL server is restarted. One exception: if the edition also changes during an upgrade (such as community to commercial, or vice-versa), then MySQL server is not restarted.

If something goes wrong during installation, you might find debug information in the error log file `/var/lib/mysql/host_name.err`.

**Compatibility with RPM Packages from Other Vendors.** If you have installed packages for MySQL from your Linux distribution's local software repository, it is much preferable to install the new, directly-downloaded packages from Oracle using the package management system of your platform (yum or zypper), as described above. The command replaces old packages with new ones to ensure compatibility of old applications with the new installation; for example, the old MySQL-sahred package is replaced with the MySQL-shared-compat package, which provides a replacement-compatible client library for applications that were using your older MySQL installation. If there was an older version of MySQL-shared-compat on the system, it also gets replaced.

If you have installed third-party packages for MySQL that are NOT from your Linux distribution's local software repository (for example, packages directly downloaded from a vendor other than Oracle), you should uninstall all those packages before installing the new, directly-downloaded packages from Oracle. This is because conflicts may arise between those vendor's RPM packages and Oracle's: for example, a vendor's convention about which files belong with the server and which belong with the client library may differ from that used for Oracle packages. Attempts to install an Oracle RPM may then result in messages saying that files in the RPM to be installed conflict with files from an installed package.

**Debug Package.** A special variant of MySQL Server compiled with the debug package has been included in the server RPM packages. It performs debugging and memory allocation checks and produces
a trace file when the server is running. To use that debug version, start MySQL with `/usr/sbin/mysqld-debug`, instead of starting it as a service or with `/usr/sbin/mysqld`. See The DBUG Package for the debug options you can use.

**Note**

The default plugin directory for debug builds changed from `/usr/lib64/mysql/plugin` to `/usr/lib64/mysql/plugin/debug` in 5.6.39. Previously, it was necessary to change `plugin_dir` to `/usr/lib64/mysql/plugin/debug` for debug builds.

**Rebuilding RPMs from source SRPMs.** Source code SRPM packages for MySQL are available for download. They can be used as-is to rebuild the MySQL RPMs with the standard `rpmbuild` tool chain.

**Important**

**RPMs for NDB Cluster.** Standard MySQL server RPMs built by MySQL do not provide support for the `NDBCLUSTER` storage engine. For more information about installing NDB Cluster from RPMs, see NDB Cluster Installation.

### 2.6 Installing MySQL on Linux Using Debian Packages from Oracle

Oracle provides Debian packages for installing MySQL on Debian or Debian-like Linux systems. The packages are available through two different channels:

- The MySQL APT Repository, supporting Debian and Ubuntu platforms. For details, see Section 2.3, “Installing MySQL on Linux Using the MySQL APT Repository”.

- The MySQL Developer Zone's Download Area. For details, see How to Get MySQL. The following are some information on the Debian packages available there and the instructions for installing them:

  - You may also need to install the `libaio` library if it is not already present on your system:

    ```shell
    sudo apt-get install libaio1
    ```

  - **For Debian 7 and 8, and Ubuntu 12, 14, and 15:**

    - Various Debian packages are provided in the MySQL Developer Zone for installing different components of MySQL. The preferred method is to use the tarball bundle, which contains the packages needed for a basic setup of MySQL. The tarball bundles have names in the format of `mysql-server_MVER-DVER_CPU.deb-bundle.tar`. `MVER` is the MySQL version and `DVER` is the Linux distribution version. The `CPU` value indicates the processor type or family for which the package is built, as shown in the following table:

    **Table 2.5 MySQL Debian 7 and 8, and Ubuntu 12, 14, and 15 Installation Packages CPU Identifiers**

    | CPU Value | Intended Processor Type or Family |
    |-----------|-----------------------------------|
    | i386      | Pentium processor or better, 32 bit |
    | amd64     | 64-bit x86 processor |

    - After downloading the tarball, unpack it with the following command:

      ```shell
      tar -xvf mysql-server_MVER-DVER_CPU.deb-bundle.tar
      ```
• In general, install the **deb** packages unpacked from the tarball with the command (see explanations below for the extra steps required for installing the server package):

  ```shell
  sudo dpkg -i package-name.deb
  ```

There are four packages to install:

• The database common files (install this package before the other ones):

  ```shell
  sudo dpkg -i mysql-common_MVER-DVER_CPU.deb
  ```

• The MySQL server:

  Install first the package for the database common files (see the last bullet), and then pre-configure your server installation by the following command:

  ```shell
  sudo dpkg-preconfigure mysql-community-server_MVER-DVER_CPU.deb
  ```

  You will be asked to provide a password for the root user for your MySQL installation. You might also be asked other questions regarding the installation.

  **Important**

  Make sure you remember the root password you set. Users who want to set a password later can leave the **password** field blank in the dialogue box and just press **OK**. However, it is very important that you set the password soon using the program **mysql_secure_installation**, as people can gain anonymous access to your MySQL server until you have secured the database's root account with a password.

Next, install the server package with the following command:

  ```shell
  sudo dpkg -i mysql-community-server_MVER-DVER_CPU.deb
  ```

• The MySQL client:

  ```shell
  sudo dpkg -i mysql-community-client_MVER-DVER_CPU.deb
  ```

• The MySQL shared client library:

  ```shell
  sudo dpkg -i libmysqlclient18_MVER-DVER_CPU.deb
  ```

Here are where the files are installed on the system:

• All configuration files (like **my.cnf**) are under **/etc**

• All binaries, libraries, headers, etc., are under **/usr**

• The data directory is under **/var**

• **For Debian 6:**

  • Debian package files directly downloaded from the MySQL Developer Zone have names in the **mysql-MVER-DVER-CPU.deb** format. **MVER** is the MySQL version and **DVER** is the Debian version. The **CPU** value indicates the processor type or family for which the package is built, as shown in the following table:
Table 2.6 MySQL Debian 6 Installation Package CPU Identifiers

<table>
<thead>
<tr>
<th>CPU Value</th>
<th>Intended Processor Type or Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>i686</td>
<td>Pentium processor or better, 32 bit</td>
</tr>
<tr>
<td>x86_64</td>
<td>64-bit x86 processor</td>
</tr>
</tbody>
</table>

- After downloading a Debian package, use the following command to install it:

  `dpkg -i mysql-MVER-DVER-CPU.deb`

  The Debian package installs files under the `/opt/mysql/server-5.6` directory.

  **Note**

  Debian distributions of MySQL are also provided by other vendors. Be aware that they may differ from those built by Oracle in features, capabilities, and conventions (including communication setup), and that the instructions in this manual do not necessarily apply to installing them. The vendor's instructions should be consulted instead.

2.7 Installing MySQL on Linux from the Native Software Repositories

Many Linux distributions include a version of the MySQL server, client tools, and development components in their native software repositories and can be installed with the platforms' standard package management systems. This section provides basic instructions for installing MySQL using those package management systems.

  **Important**

  Native packages are often several versions behind the currently available release. You will also normally be unable to install development milestone releases (DMRs), as these are not usually made available in the native repositories. Before proceeding, we recommend that you check out the other installation options described in Chapter 2, *Installing MySQL on Linux*.

Distribution specific instructions are shown below:

- **Red Hat Linux, Fedora, CentOS**

  **Note**

  For a number of Linux distributions, you can install MySQL using the MySQL Yum repository instead of the platform's native software repository. See Section 2.1, "Installing MySQL on Linux Using the MySQL Yum Repository" for details.

  For Red Hat and similar distributions, the MySQL distribution is divided into a number of separate packages, `mysql` for the client tools, `mysql-server` for the server and associated tools, and `mysql-libs` for the libraries. The libraries are required if you want to provide connectivity from different languages and environments such as Perl, Python and others.

  To install, use the `yum` command to specify the packages that you want to install. For example:

  `yum install mysql mysql-server mysql-libs mysql-server`
MySQL and the MySQL server should now be installed. A sample configuration file is installed into `/etc/my.cnf`. An init script, to start and stop the server, will have been installed into `/etc/init.d/mysqld`. To start the MySQL server use `service`:

```
root-shell> service mysqld start
```

To enable the server to be started and stopped automatically during boot, use `chkconfig`:

```
root-shell> chkconfig --levels 235 mysqld on
```
Which enables the MySQL server to be started (and stopped) automatically at the specified the run levels.

The database tables will have been automatically created for you, if they do not already exist. You should, however, run `mysql_secure_installation` to set the root passwords on your server.

- **Debian, Ubuntu, Kubuntu**

  **Note**

  For Debian, Ubuntu, and Kubuntu, MySQL can be installed using the MySQL APT Repository instead of the platform’s native software repository. See Section 2.3, “Installing MySQL on Linux Using the MySQL APT Repository” for details.

On Debian and related distributions, there are two packages for MySQL in their software repositories, `mysql-client` and `mysql-server`, for the client and server components respectively. You should specify an explicit version, for example `mysql-client-5.1`, to ensure that you install the version of MySQL that you want.

To download and install, including any dependencies, use the `apt-get` command, specifying the packages that you want to install.

  **Note**

  Before installing, make sure that you update your `apt-get` index files to ensure you are downloading the latest available version.

A sample installation of the MySQL packages might look like this (some sections trimmed for clarity):

```
root-shell> apt-get install mysql-client-5.1 mysql-server-5.1
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  linux-headers-2.6.28-11 linux-headers-2.6.28-11-generic
Use 'apt-get autoremove' to remove them.
The following extra packages will be installed:
  bsd-mailx libdbd-mysql-perl libdbi-perl libhtml-template-perl
  libmysqlclient15off libmysqlclient16 libnet-daemon-perl libplrpc-perl mailx
  mysql-common postfix
Suggested packages:
  dbishell libipc-sharedcache-perl tinyca procmail postfix mysql postfix-pgsql
  postfix-ldap postfix-pcre asasl2-bin resolvconf postfix-cdb
The following NEW packages will be installed:
  bsd-mailx libdbd-mysql-perl libdbi-perl libhtml-template-perl
  libmysqlclient15off libmysqlclient16 libnet-daemon-perl libplrpc-perl mailx
  mysql-client-5.1 mysql-common mysql-server-5.1 postfix
0 upgraded, 13 newly installed, 0 to remove and 182 not upgraded.
Need to get 1907kB/25.3MB of archives.
After this operation, 59.5MB of additional disk space will be used.
Do you want to continue [Y/n]? Y
Get: 1 http://gb.archive.ubuntu.com jaunty-updates/main mysql-common 5.1.30really5.0.75-0ubuntu10.5 [63.6kB]
Get: 2 http://gb.archive.ubuntu.com jaunty-updates/main libmysqlclient15off 5.1.30really5.0.75-0ubuntu10.5 [1843kB]
Fetched 1907kB in 9s (205kB/s)
Preconfiguring packages ...
Selecting previously deselected package mysql-common.
(Reading database ... 121260 files and directories currently installed.)
... Processing 1 added doc-base file(s)...
Registering documents with scrollkeeper...
Setting up libnet-daemon-perl (0.43-1) ...
Setting up libplrpc-perl (0.2020-1) ...
Setting up libdbd-perl (1.607-1) ...
Setting up libmysqlclient15off (5.1.30really5.0.75-0ubuntu10.5) ...
Setting up libdbd-mysql-perl (4.008-1) ...
Setting up libmysqlclient16 (5.1.31-lubuntu2) ...
Setting up mysql-client-5.1 (5.1.31-lubuntu2) ...
Setting up mysql-server-5.1 (5.1.31-lubuntu2) ...
  * Stopping MySQL database server mysqld
  ...done.
100825 11:46:15  InnoDB: Started; log sequence number 0 46409
100825 11:46:15  InnoDB: Starting shutdown...
100825 11:46:17  InnoDB: Shutdown completed; log sequence number 0 46409
100825 11:46:17  [Warning] Forcing shutdown of 1 plugins
  * Starting MySQL database server mysqld
  ...done.
  * Checking for corrupt, not cleanly closed and upgrade needing tables.
  ...
Processing triggers for libc6 ...
ldconfig deferred processing now taking place

Note

The `apt-get` command will install a number of packages, including the MySQL server, in order to provide the typical tools and application environment. This can mean that you install a large number of packages in addition to the main MySQL package.

During installation, the initial database will be created, and you will be prompted for the MySQL root password (and confirmation). A configuration file will have been created in `/etc/mysql/my.cnf`. An init script will have been created in `/etc/init.d/mysql`.

The server will already be started. You can manually start and stop the server using:

```
root-shell> service mysql [start|stop]
```

The service will automatically be added to the 2, 3 and 4 run levels, with stop scripts in the single, shutdown and restart levels.

**Gentoo Linux**

As a source-based distribution, installing MySQL on Gentoo involves downloading the source, patching the Gentoo specifics, and then compiling the MySQL server and installing it. This process is handled automatically by the `emerge` command.

The MySQL server and client tools are provided within a single package, `dev-db/mysql`. You can obtain a list of the versions available to install by looking at the portage directory for the package:

```
root-shell> ls /usr/portage/dev-db/mysql/mysql-5.6*
mysql-5.6.27.ebuild
mysql-5.6.27-r1.ebuild
mysql-5.6.28.ebuild
```

To install a specific MySQL version, you must specify the entire atom. For example:

```
root-shell> emerge =dev-db/mysql-5.6.27-r1
```
After installation, you should initialize the data directory and set the password for the MySQL root user (see Chapter 5, Initializing the Data Directory). Alternatively, use the configuration interface to perform those tasks:

```
root-shell> emerge --config =dev-db/mysql-5.6.27-r1
```

During installation, a sample configuration file is created for you in `/etc/mysql/my.cnf`, and an init script is created in `/etc/init.d/mysql`.

To enable MySQL to start automatically at the normal (default) run levels, use this command:

```
root-shell> rc-update add mysql default
```

### 2.8 Deploying MySQL on Linux with Docker

The Docker deployment framework supports easy installation and configuration of MySQL Server. This section explains how to use a MySQL Server Docker image.

You need to have Docker installed on your system before you can use a MySQL Server Docker image. See Install Docker for instructions.

**Important**

You need to either run `docker` commands with `sudo`, or create a `docker` usergroup, and then add it to any users who want to run `docker` commands. See details [here](#). Because Docker containers are always run with root privileges, you should understand the Docker daemon attack surface and properly mitigate the related risks.

The instructions for using the MySQL Docker container are divided into two sections.

#### 2.8.1 Basic Steps for MySQL Server Deployment with Docker

**Warning**

The MySQL Docker images maintained by the MySQL team are built specifically for Linux platforms. Other platforms are not supported, and users using these MySQL Docker images on them are doing so at their own risk. See the discussion [here](#) for some known limitations for running these containers on non-Linux operating systems.

- Downloading a MySQL Server Docker Image
- Starting a MySQL Server Instance
- Connecting to MySQL Server from within the Container
- Container Shell Access
- Stopping and Deleting a MySQL Container
- More Topics on Deploying MySQL Server with Docker
Basic Steps for MySQL Server Deployment with Docker

**Downloading a MySQL Server Docker Image**

Downloading the server image in a separate step is not strictly necessary; however, performing this step before you create your Docker container ensures your local image is up to date. To download the MySQL Community Server image, run this command:

```
docker pull mysql/mysql-server:tag
```

The `tag` is the label for the image version you want to pull (for example, `5.5`, `5.6`, `5.7`, `8.0`, or `latest`). If :`tag` is omitted, the `latest` label is used, and the image for the latest GA version of MySQL Community Server is downloaded. Refer to the list of tags for available versions on the `mysql/mysql-server` page in the Docker Hub.

You can list downloaded Docker images with this command:

```
docker images
```

<table>
<thead>
<tr>
<th>REPOSITORY</th>
<th>TAG</th>
<th>IMAGE ID</th>
<th>CREATED</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>mysql/mysql-server</td>
<td>latest</td>
<td>3157d7f5f8d</td>
<td>4 weeks ago</td>
<td>241MB</td>
</tr>
</tbody>
</table>

**Starting a MySQL Server Instance**

Start a new Docker container for the MySQL Server with this command:

```
docker run --name=mysql1 -d mysql/mysql-server:tag
```

The `--name` option, for supplying a custom name for your server container (mysql1 in the example), is optional; if no container name is supplied, a random one is generated. If the Docker image of the specified name and tag has not been downloaded by an earlier `docker pull` or `docker run` command, the image is now downloaded. After download completes, initialization for the container begins, and the container appears in the list of running containers when you run the `docker ps` command; for example:

```
docker ps
```

<table>
<thead>
<tr>
<th>CONTAINER ID</th>
<th>IMAGE</th>
<th>COMMAND</th>
<th>CREATED</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a24888f0d6f4</td>
<td>mysql/mysql-server</td>
<td>&quot;/entrypoint.sh my...&quot;</td>
<td>14 seconds ago</td>
<td>Up 13 seconds (health: starting)</td>
</tr>
</tbody>
</table>

The container initialization might take some time. When the server is ready for use, the `STATUS` of the container in the output of the `docker ps` command changes from `(health: starting)` to `(healthy)`.

The `-d` option used in the `docker run` command above makes the container run in the background. Use this command to monitor the output from the container:

```
docker logs mysql1
```

Once initialization is finished, the command’s output is going to contain the random password generated for the root user; check the password with, for example, this command:

```
docker logs mysql1 2>&1 | grep GENERATED
```

GENERATED ROOT PASSWORD: Axegh3kA7yDLaRuBemecis6EShOs

**Connecting to MySQL Server from within the Container**

Once the server is ready, you can run the `mysql` client within the MySQL Server container you just started, and connect it to the MySQL Server. Use the `docker exec -it` command to start a `mysql` client inside the Docker container you have started, like the following:

```
docker exec -it mysql1 mysql -uroot -p
```

When asked, enter the generated root password (see the last step in Starting a MySQL Server Instance above on how to find the password). Because the `MYSQL_ONETIME_PASSWORD` option is true by default,
after you have connected a mysql client to the server, you must reset the server root password by issuing this statement:

```
mysql> ALTER USER 'root'@'localhost' IDENTIFIED BY 'newpassword';
```

Substitute `newpassword` with the password of your choice. Once the password is reset, the server is ready for use.

## Container Shell Access

To have shell access to your MySQL Server container, use the `docker exec -it` command to start a bash shell inside the container:

```
shell> docker exec -it mysql1 bash
```

You can then run Linux commands inside the container. For example, to view contents in the server's data directory inside the container, use this command:

```
bash-4.2# ls /var/lib/mysql
auto.cnf    ca.pem      client-key.pem  ib_logfile0  ibdata1  mysql       mysql.sock.lock    private_key.pem  server-cert.pem  sys
ca-key.pem  client-cert.pem  ib_buffer_pool  ib_logfile1  ibtmp1  mysql.sock  performance_schema  public_key.pem   server-key.pem
```

## Stopping and Deleting a MySQL Container

To stop the MySQL Server container we have created, use this command:

```
docker stop mysql1
```

`docker stop` sends a SIGTERM signal to the `mysqld` process, so that the server is shut down gracefully.

Also notice that when the main process of a container (`mysqld` in the case of a MySQL Server container) is stopped, the Docker container stops automatically.

To start the MySQL Server container again:

```
docker start mysql1
```

To stop and start again the MySQL Server container with a single command:

```
docker restart mysql1
```

To delete the MySQL container, stop it first, and then use the `docker rm` command:

```
docker stop mysql1

docker rm mysql1
```

If you want the Docker volume for the server's data directory to be deleted at the same time, add the `-v` option to the `docker rm` command.

## More Topics on Deploying MySQL Server with Docker

For more topics on deploying MySQL Server with Docker like server configuration, persisting data and configuration, server error log, and container environment variables, see Section 2.8.2, "More Topics on Deploying MySQL Server with Docker".

### 2.8.2 More Topics on Deploying MySQL Server with Docker

- The Optimized MySQL Installation for Docker
The Optimized MySQL Installation for Docker

Docker images for MySQL are optimized for code size, which means they only include crucial components that are expected to be relevant for the majority of users who run MySQL instances in Docker containers. A MySQL Docker installation is different from a common, non-Docker installation in the following aspects:

- Included binaries are limited to:
  - /usr/bin/my_print_defaults
  - /usr/bin/mysql
  - /usr/bin/mysql_config
  - /usr/bin/mysql_install_db
  - /usr/bin/mysql_tzinfo_to_sql
  - /usr/bin/mysql_upgrade
  - /usr/bin/mysqladmin
  - /usr/bin/mysqlcheck
  - /usr/bin/mysqldump
  - /usr/sbin/mysqld

- All binaries are stripped; they contain no debug information.

Configuring the MySQL Server

When you start the MySQL Docker container, you can pass configuration options to the server through the `docker run` command; for example, for the MySQL Server:

```
docker run --name mysql1 -d mysql/mysql-server --character-set-server=utf8mb4 --collation-server=utf8mb4_coll
```

The command starts your MySQL Server with `utf8mb4` as the default character set and `utf8mb4_coll` as the default collation for your databases.

Another way to configure the MySQL Server is to prepare a configuration file and mount it at the location of the server configuration file inside the container. See Persisting Data and Configuration Changes for details.

Persisting Data and Configuration Changes

Docker containers are in principle ephemeral, and any data or configuration are expected to be lost if the container is deleted or corrupted (see discussions here). Docker volumes, however, provides a mechanism...
to persist data created inside a Docker container. At its initialization, the MySQL Server container creates a Docker volume for the server data directory. The JSON output for running the `docker inspect` command on the container has a `Mount` key, whose value provides information on the data directory volume:

```
shell> docker inspect mysql1
...
"Mounts": [
  {
    "Type": "volume",
    "Name": "4f2d463cfc4bdd4baebcb098c97d7da3337195ed2c6572bc0b89f7e845d27652",
    "Source": "/var/lib/docker/volumes/4f2d463cfc4bdd4baebcb098c97d7da3337195ed2c6572bc0b89f7e845d27652/_data",
    "Destination": "/var/lib/mysql",
    "Driver": "local",
    "Mode": 
    "RW": true,
    "Propagation": ""
  }
],
...
```

The output shows that the source folder `/var/lib/docker/volumes/4f2d463cfc4bdd4baebcb098c97d7da3337195ed2c6572bc0b89f7e845d27652/_data`, in which data is persisted on the host, has been mounted at `/var/lib/mysql`, the server data directory inside the container.

Another way to preserve data is to bind-mount a host directory using the `--mount` option when creating the container. The same technique can be used to persist the configuration of the server. The following command creates a MySQL Server container and bind-mounts both the data directory and the server configuration file:

```
docker run --name=mysql1 --mount type=bind,src=/path-on-host-machine/my.cnf,dst=/etc/my.cnf --mount type=bind,src=/path-on-host-machine/datadir,dst=/var/lib/mysql -d mysql/mysql-server:tag
```

The command mounts `/path-on-host-machine/my.cnf` at `/etc/my.cnf` (the server configuration file inside the container), and `/path-on-host-machine/datadir` at `/var/lib/mysql` (the data directory inside the container). The following conditions must be met for the bind-mounting to work:

- The configuration file `/path-on-host-machine/my.cnf` must already exist, and it must contain the specification for starting the server using the user `mysql`:

  ```
  [mysqld]
  user=mysql
  ```

  You can also include other server configuration options in the file.

- The data directory `/path-on-host-machine/datadir` must already exist. For server initialization to happen, the directory must be empty. You can also mount a directory prepopulated with data and start the server with it; however, you must make sure you start the Docker container with the same configuration as the server that created the data, and any host files or directories required are mounted when starting the container.

### Running Additional Initialization Scripts

If there are any `.sh` or `.sql` scripts you want to run on the database immediately after it has been created, you can put them into a host directory and then mount the directory at `/docker-entrypoint-initdb.d/` inside the container. For example, for a MySQL Server container:

```
docker run --name=mysql1 --mount type=bind,src=/path-on-host-machine/initdb.d,dst=/docker-entrypoint-initdb.d -d mysql/mysql-server:tag
```
More Topics on Deploying MySQL Server with Docker

- homosexual, and that the data directory you mount is not
  empty, as no server initialization is going to be attempted then (see Persisting
  Data and Configuration Changes for more details). Any pre-existing contents in
  the folder, including any old server settings, are not modified during the container
  startup.

Docker Environment Variables

When you create a MySQL Server container, you can configure the MySQL instance by using the --env option (\-e in short) and specifying one or more of the following environment variables.

Notes

- None of the variables below has any effect if the data directory you mount is not
  empty, as no server initialization is going to be attempted then (see Persisting
  Data and Configuration Changes for more details). Any pre-existing contents in
  the folder, including any old server settings, are not modified during the container
  startup.

Connect to MySQL from an Application in Another Docker Container

By setting up a Docker network, you can allow multiple Docker containers to communicate with each other, so that a client application in another Docker container can access the MySQL Server in the server container. First, create a Docker network:

```bash
docker network create my-custom-net
```

Then, when you are creating and starting the server and the client containers, use the --network option to put them on network you created. For example:

```bash
docker run --name=mysql1 --network=my-custom-net -d mysql/mysql-server
docker run --name=myapp1 --network=my-custom-net -d myapp
```

The myapp1 container can then connect to the mysql1 container with the mysql1 hostname and vice versa, as Docker automatically sets up a DNS for the given container names. In the following example, we run the mysql client from inside the myapp1 container to connect to host mysql1 in its own container:

```bash
docker exec -it myapp1 mysql --host=mysql1 --user=myuser --password
```

For other networking techniques for containers, see the Docker container networking section in the Docker Documentation.

Server Error Log

When the MySQL Server is first started with your server container, a server error log is NOT generated if either of the following conditions is true:

- A server configuration file from the host has been mounted, but the file does not contain the system variable log_error (see Persisting Data and Configuration Changes on bind-mounting a server configuration file).
- A server configuration file from the host has not been mounted, but the Docker environment variable MYSQL_LOG_CONSOLE is true (the variable’s default state for MySQL 5.6 server containers is false). The MySQL Server’s error log is then redirected to stderr, so that the error log goes into the Docker container’s log and is viewable using the docker logs mysqld-container command.

To make MySQL Server generate an error log when either of the two conditions is true, use the --log-error option to configure the server to generate the error log at a specific location inside the container. To persist the error log, mount a host file at the location of the error log inside the container as explained in Persisting Data and Configuration Changes. However, you must make sure your MySQL Server inside its container has write access to the mounted host file.
• The boolean variables including `MYSQL_RANDOM_ROOT_PASSWORD`, `MYSQL_ONETIME_PASSWORD`, `MYSQL_ALLOW_EMPTY_PASSWORD`, and `MYSQL_LOG_CONSOLE` are made true by setting them with any strings of nonzero lengths. Therefore, setting them to, for example, "0", "false", or "no" does not make them false, but actually makes them true. This is a known issue of the MySQL Server containers.

• `MYSQL_RANDOM_ROOT_PASSWORD`: When this variable is true (which is its default state, unless `MYSQL_ROOT_PASSWORD` or `MYSQL_ALLOW_EMPTY_PASSWORD` is set to true), a random password for the server’s root user is generated when the Docker container is started. The password is printed to `stdout` of the container and can be found by looking at the container’s log (see Starting a MySQL Server Instance).

• `MYSQL_ONETIME_PASSWORD`: When the variable is true (which is its default state, unless `MYSQL_ROOT_PASSWORD` is set or `MYSQL_ALLOW_EMPTY_PASSWORD` is set to true), the root user’s password is set as expired and must be changed before MySQL can be used normally.

• `MYSQL_DATABASE`: This variable allows you to specify the name of a database to be created on image startup. If a user name and a password are supplied with `MYSQL_USER` and `MYSQL_PASSWORD`, the user is created and granted superuser access to this database (corresponding to `GRANT ALL`). The specified database is created by a `CREATE DATABASE IF NOT EXIST` statement, so that the variable has no effect if the database already exists.

• `MYSQL_USER, MYSQL_PASSWORD`: These variables are used in conjunction to create a user and set that user’s password, and the user is granted superuser permissions for the database specified by the `MYSQL_DATABASE` variable. Both `MYSQL_USER` and `MYSQL_PASSWORD` are required for a user to be created—if any of the two variables is not set, the other is ignored. If both variables are set but `MYSQL_DATABASE` is not, the user is created without any privileges.

  **Note**
  There is no need to use this mechanism to create the root superuser, which is created by default with the password set by either one of the mechanisms discussed in the descriptions for `MYSQL_ROOT_PASSWORD` and `MYSQL_RANDOM_ROOT_PASSWORD`, unless `MYSQL_ALLOW_EMPTY_PASSWORD` is true.

• `MYSQL_ROOT_HOST`: By default, MySQL creates the 'root'@'localhost' account. This account can only be connected to from inside the container as described in Connecting to MySQL Server from within the Container. To allow root connections from other hosts, set this environment variable. For example, the value `172.17.0.1`, which is the default Docker gateway IP, allows connections from the host machine that runs the container. The option accepts only one entry, but wildcards are allowed (for example, `MYSQL_ROOT_HOST=172.*.*.*` or `MYSQL_ROOT_HOST=%`).

• `MYSQL_LOG_CONSOLE`: When the variable is true (the variable’s default state for MySQL 5.6 server containers is `false`), the MySQL Server’s error log is redirected to `stderr`, so that the error log goes into the Docker container’s log and is viewable using the `docker logs mysqld-container` command.

  **Note**
  The variable has no effect if a server configuration file from the host has been mounted (see Persisting Data and Configuration Changes on bind-mounting a configuration file).

• `MYSQL_ROOT_PASSWORD`: This variable specifies a password that is set for the MySQL root account.
Warning

Setting the MySQL root user password on the command line is insecure. As an alternative to specifying the password explicitly, you can set the variable with a container file path for a password file, and then mount a file from your host that contains the password at the container file path. This is still not very secure, as the location of the password file is still exposed. It is preferable to use the default settings of `MYSQL_RANDOM_ROOT_PASSWORD=true` and `MYSQL_ONETIME_PASSWORD=true` being both true.

- `MYSQL.AllowEmptyPassword` Set it to true to allow the container to be started with a blank password for the root user.

Warning

Setting this variable to true is insecure, because it is going to leave your MySQL instance completely unprotected, allowing anyone to gain complete superuser access. It is preferable to use the default settings of `MYSQL_RANDOM_ROOT_PASSWORD=true` and `MYSQL_ONETIME_PASSWORD=true` being both true.

2.8.3 Deploying MySQL on Windows and Other Non-Linux Platforms with Docker

Warning

The MySQL Docker images provided by Oracle are built specifically for Linux platforms. Other platforms are not supported, and users running the MySQL Docker images from Oracle on them are doing so at their own risk. This section discusses some known issues for the images when used on non-Linux platforms.

Known Issues for using the MySQL Server Docker images from Oracle on Windows include:

- If you are bind-mounting on the container’s MySQL data directory (see Persisting Data and Configuration Changes for details), you have to set the location of the server socket file with the `--socket` option to somewhere outside of the MySQL data directory; otherwise, the server will fail to start. This is because the way Docker for Windows handles file mounting does not allow a host file from being bind-mounted on the socket file.

2.9 Installing MySQL on Linux with Juju

The Juju deployment framework supports easy installation and configuration of MySQL servers. For instructions, see https://jujucharms.com/mysql/.
Chapter 3 Installing MySQL on Solaris

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Note

MySQL 5.6 supports Solaris 10 (Update 11 and later), and Solaris 11 (Update 3 and later).

MySQL on Solaris is available in a number of different formats.

• For information on installing using the native Solaris PKG format, see Section 3.1, “Installing MySQL on Solaris Using a Solaris PKG”.

• To use a standard tar binary installation, use the notes provided in Chapter 1, Installing MySQL on Unix/Linux Using Generic Binaries. Check the notes and hints at the end of this section for Solaris specific notes that you may need before or after installation.

To obtain a binary MySQL distribution for Solaris in tarball or PKG format, https://dev.mysql.com/downloads/mysql/5.6.html.

Additional notes to be aware of when installing and using MySQL on Solaris:

• If you want to use MySQL with the mysql user and group, use the groupadd and useradd commands:

```bash
groupadd mysql
useradd -g mysql -s /bin/false mysql
```

• If you install MySQL using a binary tarball distribution on Solaris, because the Solaris tar cannot handle long file names, use GNU tar (gtar) to unpack the distribution. If you do not have GNU tar on your system, install it with the following command:

```bash
pkg install archiver/gnu-tar
```

• You should mount any file systems on which you intend to store InnoDB files with the forcedirectio option. (By default mounting is done without this option.) Failing to do so will cause a significant drop in performance when using the InnoDB storage engine on this platform.

• If you would like MySQL to start automatically, you can copy support-files/mysql.server to /etc/init.d and create a symbolic link to it named /etc/rc3.d/S99mysql.server.

• If too many processes try to connect very rapidly to mysqld, you should see this error in the MySQL log:

```
Error in accept: Protocol error
```

You might try starting the server with the --back_log=50 option as a workaround for this.

• To configure the generation of core files on Solaris you should use the coreadm command. Because of the security implications of generating a core on a setuid() application, by default, Solaris does not support core files on setuid() programs. However, you can modify this behavior using coreadm.
If you enable `setuid()` core files for the current user, they will be generated using the mode 600 and owned by the superuser.

### 3.1 Installing MySQL on Solaris Using a Solaris PKG

You can install MySQL on Solaris using a binary package using the native Solaris PKG format instead of the binary tarball distribution.

To use this package, download the corresponding `mysql-VERSION-solaris10-PLATFORM.pkg.gz` file, then uncompress it. For example:

```
shell> gunzip mysql-5.6.44-solaris10-x86_64.pkg.gz
```

To install a new package, use `pkgadd` and follow the onscreen prompts. You must have root privileges to perform this operation:

```
shell> pkgadd -d mysql-5.6.44-solaris10-x86_64.pkg
```

The following packages are available:

```
  1  mysql MySQL Community Server (GPL)
      (i86pc) 5.6.44
```

Select package(s) you wish to process (or 'all' to process all packages). (default: all) [?,??,q]:

The PKG installer installs all of the files and tools needed, and then initializes your database if one does not exist. To complete the installation, you should set the root password for MySQL as provided in the instructions at the end of the installation. Alternatively, you can run the `mysql_secure_installation` script that comes with the installation.

By default, the PKG package installs MySQL under the root path `/opt/mysql`. You can change only the installation root path when using `pkgadd`, which can be used to install MySQL in a different Solaris zone. If you need to install in a specific directory, use a binary `tar` file distribution.

The `pkg` installer copies a suitable startup script for MySQL into `/etc/init.d/mysql`. To enable MySQL to startup and shutdown automatically, you should create a link between this file and the init script directories. For example, to ensure safe startup and shutdown of MySQL you could use the following commands to add the right links:

```
shell> ln /etc/init.d/mysql /etc/rc3.d/S91mysql
shell> ln /etc/init.d/mysql /etc/rc0.d/K02mysql
```

To remove MySQL, the installed package name is `mysql`. You can use this in combination with the `pkgrm` command to remove the installation.

To upgrade when using the Solaris package file format, you must remove the existing installation before installing the updated package. Removal of the package does not delete the existing database information, only the server, binaries and support files. The typical upgrade sequence is therefore:

```
shell> mysqladmin shutdown
shell> pkgrm mysql
shell> pkgadd -d mysql-5.6.44-solaris10-x86_64.pkg
shell> mysqld_safe &
shell> mysql_upgrade
```

You should check the notes in [Upgrading or Downgrading MySQL](#) before performing any upgrade.
Chapter 4 Installing MySQL on FreeBSD

This section provides information about installing MySQL on variants of FreeBSD Unix.

You can install MySQL on FreeBSD by using the binary distribution provided by Oracle. For more information, see Chapter 1, Installing MySQL on Unix/Linux Using Generic Binaries.

The easiest (and preferred) way to install MySQL is to use the mysql-server and mysql-client ports available at http://www.freebsd.org/. Using these ports gives you the following benefits:

- A working MySQL with all optimizations enabled that are known to work on your version of FreeBSD.
- Automatic configuration and build.
- Startup scripts installed in /usr/local/etc/rc.d.
- The ability to use pkg_info -L to see which files are installed.
- The ability to use pkg_delete to remove MySQL if you no longer want it on your machine.

The MySQL build process requires GNU make (gmake) to work. If GNU make is not available, you must install it first before compiling MySQL.

To install using the ports system:

```bash
# cd /usr/ports/databases/mysql56-server
# make
...
# cd /usr/ports/databases/mysql56-client
# make
...
```

The standard port installation places the server into /usr/local/libexec/mysqld, with the startup script for the MySQL server placed in /usr/local/etc/rc.d/mysql-server.

Some additional notes on the BSD implementation:

- To remove MySQL after installation using the ports system:

```bash
# cd /usr/ports/databases/mysql56-server
# make deinstall
...
# cd /usr/ports/databases/mysql56-client
# make deinstall
...
```

- If you get problems with the current date in MySQL, setting the TZ variable should help. See MySQL Program Environment Variables.
After installing MySQL, the data directory, including the tables in the mysql system database, must be initialized. For some MySQL installation methods, data directory initialization can be done automatically, as described in Postinstallation Setup and Testing. For other installation methods, including installation from generic binary and source distributions, you must initialize the data directory yourself.

This section describes how to initialize the data directory on Unix and Unix-like systems. (For Windows, see Windows Postinstallation Procedures.) For some suggested commands that you can use to test whether the server is accessible and working properly, see Testing the Server.

In the examples shown here, the server is going to run under the user ID of the mysql login account. This assumes that such an account exists. Either create the account if it does not exist, or substitute the name of a different existing login account that you plan to use for running the server. For information about creating the account, see Creating a mysql System User and Group, in Chapter 1, Installing MySQL on Unix/Linux Using Generic Binaries.

1. Change location into the top-level directory of your MySQL installation directory, which is typically /usr/local/mysql:

   shell> cd /usr/local/mysql

   You will find several files and subdirectories inside the folder, including the bin and scripts subdirectories, which contain the server as well as the client and utility programs.

2. Initialize the data directory, including the mysql database containing the initial MySQL grant tables that determine how users are permitted to connect to the server.

   Typically, data directory initialization need be done only after you first installed MySQL. If you are upgrading an existing installation, you should run mysql_upgrade instead (see mysql_upgrade — Check and Upgrade MySQL Tables). However, the command that initializes the data directory does not overwrite any existing privilege tables, so it should be safe to run in any circumstances. Use the server to initialize the data directory; for example:

   shell> scripts/mysql_install_db --user=mysql

   It is important to make sure that the database directories and files are owned by the mysql login account so that the server has read and write access to them when you run it later. To ensure this if you run mysql_install_db as root, include the --user option as shown.

   The mysql_install_db command initializes the server’s data directory. Under the data directory, it creates directories for the mysql database that holds the grant tables and the test database that you can use to test MySQL. The program also creates privilege table entries for the initial account or accounts. test_. For a complete listing and description of the grant tables, see The MySQL Access Privilege System.

   It might be necessary to specify other options such as --basedir or --datadir if mysql_install_db cannot identify the correct locations for the installation directory or data directory. For example:
3. To specify options that the MySQL server should use at startup, put them in a /etc/my.cnf or /etc/mysql/my.cnf file. See Server Configuration Defaults. If you do not do this, the server starts with its default settings.

4. If you want MySQL to start automatically when you boot your machine, see Starting and Stopping MySQL Automatically.

Data directory initialization creates time zone tables in the mysql database but does not populate them. To do so, use the instructions in MySQL Server Time Zone Support.

5.1 Problems Running mysql_install_db

The purpose of the mysql_install_db program is to initialize the data directory, including the tables in the mysql system database. It does not overwrite existing MySQL privilege tables, and it does not affect any other data.

To re-create your privilege tables, first stop the mysqld server if it is running. Then rename the mysql directory under the data directory to save it, and run mysql_install_db. Suppose that your current directory is the MySQL installation directory and that mysql_install_db is located in the bin directory and the data directory is named data. To rename the mysql database and re-run mysql_install_db, use these commands.

shell> mv data/mysql data/mysql.old
shell> scripts/mysql_install_db --user=mysql

When you run mysql_install_db, you might encounter the following problems:

• mysql_install_db fails to install the grant tables

You may find that mysql_install_db fails to install the grant tables and terminates after displaying the following messages:

Starting mysqld daemon with databases from XXXXXX
mysqld ended

In this case, you should examine the error log file very carefully. The log should be located in the directory XXXXXX named by the error message and should indicate why mysqld did not start. If you do not understand what happened, include the log when you post a bug report. See How to Report Bugs or Problems.
• **There is a `mysqld` process running**

This indicates that the server is running, in which case the grant tables have probably been created already. If so, there is no need to run `mysql_install_db` at all because it needs to be run only once, when you first install MySQL.

• **Installing a second `mysqld` server does not work when one server is running**

This can happen when you have an existing MySQL installation, but want to put a new installation in a different location. For example, you might have a production installation, but you want to create a second installation for testing purposes. Generally the problem that occurs when you try to run a second server is that it tries to use a network interface that is in use by the first server. In this case, you should see one of the following error messages:

```
Can't start server: Bind on TCP/IP port:  
Address already in use
Can't start server: Bind on unix socket...
```

For instructions on setting up multiple servers, see [Running Multiple MySQL Instances on One Machine](#).

• **You do not have write access to the `/tmp` directory**

If you do not have write access to create temporary files or a Unix socket file in the default location (the `/tmp` directory) or the `TMPDIR` environment variable, if it has been set, an error occurs when you run `mysql_install_db` or the `mysqld` server.

You can specify different locations for the temporary directory and Unix socket file by executing these commands prior to starting `mysql_install_db` or `mysqld`, where `some_tmp_dir` is the full path name to some directory for which you have write permission:

```
shell>  TMPDIR=/some_tmp_dir/
shell>  MYSQL_UNIX_PORT=/some_tmp_dir/mysql.sock
shell>  export TMPDIR MYSQL_UNIX_PORT
```

Then you should be able to run `mysql_install_db` and start the server with these commands:

```
shell>  scripts/mysql_install_db --user=mysql
shell>  bin/mysqld_safe --user=mysql &
```

If `mysql_install_db` is located in the `scripts` directory, modify the first command to `scripts/mysql_install_db`.

See [How to Protect or Change the MySQL Unix Socket File](#) and [MySQL Program Environment Variables](#).

There are some alternatives to running the `mysql_install_db` program provided in the MySQL distribution:

• If you want the initial privileges to be different from the standard defaults, use account-management statements such as `CREATE USER`, `GRANT`, and `REVOKE` to change the privileges *after* the grant tables have been set up. In other words, run `mysql_install_db`, and then use `mysql -u root mysql` to connect to the server as the MySQL root user so that you can issue the necessary statements. (See [Account Management Statements](#).)
To install MySQL on several machines with the same privileges, put the `CREATE USER`, `GRANT`, and `REVOKE` statements in a file and execute the file as a script using `mysql` after running `mysql_install_db`. For example:

```
shell> scripts/mysql_install_db --user=mysql
shell> bin/mysql -u root < your_script_file
```

This enables you to avoid issuing the statements manually on each machine.

- It is possible to re-create the grant tables completely after they have previously been created. You might want to do this if you are just learning how to use `CREATE USER`, `GRANT`, and `REVOKE` and have made so many modifications after running `mysql_install_db` that you want to wipe out the tables and start over.

To re-create the grant tables, stop the server if it is running and remove the `mysql` database directory. Then run `mysql_install_db` again.