

MySQL and Linux/Unix

Abstract

This is the MySQL Linux extract from the MySQL 5.5 Reference Manual.

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Chapter 1 Installing MySQL on Unix/Linux Using Generic Binaries

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

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

To obtain MySQL, see [How to Get MySQL](#).

MySQL compressed `tar` file binary distributions have names of the form `mysql-VERSION-OS.tar.gz`, where `VERSION` is a number (for example, `5.5.65`), and `OS` indicates the type of operating system for which the distribution is intended (for example, `pc-linux-i686` or `winx64`).

Warning

If you have previously installed MySQL using your operating system native package management system, such as `yum` or `apt-get`, you may experience problems installing using a native binary. Make sure your previous MySQL installation has been removed entirely (using your package management system), and that any additional files, such as old versions of your data files, have also been removed. You should also check for configuration files such as `/etc/my.cnf` or the `/etc/mysql` directory and delete them.

Warning

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

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

Or, on APT-based systems:

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

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

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

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

Directory	Contents of Directory
<code>bin, scripts</code>	<code>mysqld</code> server, client and utility programs
<code>data</code>	Log files, databases
<code>docs</code>	MySQL manual in Info format

Directory	Contents of Directory
man	Unix manual pages
include	Include (header) files
lib	Libraries
share	Miscellaneous support files, including error messages, sample configuration files, SQL for database installation
sql-bench	Benchmarks

Note

SLES 11: as of MySQL 5.5.57, 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> groupadd mysql
shell> useradd -r -g mysql -s /bin/false mysql
shell> cd /usr/local
shell> tar zxvf /path/to/mysql-VERSION-OS.tar.gz
shell> ln -s full-path-to-mysql-VERSION-OS mysql
shell> cd mysql
shell> chown -R mysql .
shell> chgrp -R mysql .
shell> scripts/mysql_install_db --user=mysql
shell> chown -R root .
shell> chown -R mysql data
# Next command is optional
shell> cp support-files/my-medium.cnf /etc/my.cnf
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](#).

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

Create a mysql User and Group

If your system does not already have a user and group to use for running `mysqld`, you may need to create one. The following commands add the `mysql` group and the `mysql` user. You might want to call the

user and group something else instead of `mysql`. If so, substitute the appropriate name in the following instructions. The syntax for `useradd` and `groupadd` may differ slightly on different versions of Unix, or they may have different names such as `adduser` and `addgroup`.

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

Note

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

Obtain and Unpack the Distribution

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

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

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

Unpack the distribution, which creates the installation directory. Then create a symbolic link to that directory. `tar` can uncompress and unpack the distribution if it has `z` option support:

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

The `tar` command creates a directory named `mysql-VERSION-OS`. The `ln` command makes a symbolic link to that directory. This enables you to refer more easily to the installation directory as `/usr/local/mysql`.

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

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

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

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

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. The recommended method is to use one of the distributions from Oracle. If you choose this method, there are several options available:

- Installing from a generic binary package in `.tar.gz` format. For details, see [Chapter 1, *Installing MySQL on Unix/Linux Using Generic Binaries*](#).
- Extracting and compiling MySQL from a source distribution. For details, see [Installing MySQL from Source](#).
- Installing using a precompiled RPM package. For details, see [Section 2.1, “Installing MySQL on Linux Using RPM Packages”](#).
- Installing using a precompiled Debian package. For details, see [Section 2.2, “Installing MySQL on Linux Using Debian Packages”](#).
- Deploying MySQL Server with Docker. For details, see [Section 2.3, “Deploying MySQL on Linux with Docker”](#)
- Installing using Oracle's Unbreakable Linux Network (ULN). For details, see [Installing MySQL Using Unbreakable Linux Network \(ULN\)](#).

As an alternative, you can use the native package manager within your Linux distribution to automatically download and install MySQL for you. Native package installations can take care of the download and dependencies required to run MySQL, but the MySQL version will often be some versions behind the currently available release. You will also normally be unable to install development releases, as these are not usually made available in the native repository. For more information on using the native package installers, see [Section 2.4, “Installing MySQL on Linux Using Native Package Managers”](#).

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 RPM Packages

Note

To install or upgrade to MySQL 5.5.31, be sure to read the special instructions at the end of this section.

The recommended way to install MySQL on RPM-based Linux distributions is by using the RPM packages. The RPMs that we provide to the community should work on all versions of Linux that support RPM packages and use `glibc 2.3`. To obtain RPM packages, see [How to Get MySQL](#).

For non-RPM Linux distributions, you can install MySQL using a `.tar.gz` package. See [Chapter 1, Installing MySQL on Unix/Linux Using Generic Binaries](#).

Installations created from our Linux RPM distributions result in files under the system directories shown in the following table.

Table 2.1 MySQL Installation Layout for Linux RPM Packages

Directory	Contents of Directory
<code>/usr/bin</code>	Client programs and scripts
<code>/usr/sbin</code>	The <code>mysqld</code> server
<code>/var/lib/mysql</code>	Log files, databases
<code>/var/lib/mysql-files</code>	Value of <code>secure_file_priv</code>
<code>/usr/share/info</code>	MySQL manual in Info format
<code>/usr/share/man</code>	Unix manual pages
<code>/usr/include/mysql</code>	Include (header) files
<code>/usr/lib/mysql</code>	Libraries
<code>/usr/share/mysql</code>	Miscellaneous support files, including error messages, character set files, sample configuration files, SQL for database installation
<code>/usr/share/sql-bench</code>	Benchmarks

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 instructions in this manual do not necessarily apply to installing them. The vendor's instructions should be consulted instead. Because of these differences, RPM packages built by Oracle check whether such RPMs built by other vendors are installed. If so, the RPM does not install and produces a message explaining this.

Conflicts can arise when an RPM from another vendor is already installed, such as when a vendor's conventions about which files belong with the server and which belong with the client library differ from the breakdown used for Oracle packages. In such cases, attempts to install an Oracle RPM with `rpm -i` may result in messages that files in the RPM to be installed conflict with files from an installed package (denoted `mysql-libs` in the following paragraphs).

Each MySQL release provides a `MySQL-shared-compat` package that is meant to replace `mysql-libs` and provides a replacement-compatible client library for older MySQL series. `MySQL-shared-compat` is set up to make `mysql-libs`

obsolete, but `rpm` explicitly refuses to replace obsoleted packages when invoked with `-i` (unlike `-U`), which is why installation with `rpm -i` produces a conflict.

`MySQL-shared-compat` can safely be installed alongside `mysql-libs` because libraries are installed to different locations. Therefore, it is possible to install `MySQL-shared-compat` first, then manually remove `mysql-libs` before continuing with the installation. After `mysql-libs` is removed, the dynamic linker stops looking for the client library in the location where `mysql-libs` puts it, and the library provided by the `MySQL-shared-compat` package takes over.

Another alternative is to install packages using `yum`. In a directory containing all RPM packages for a MySQL release, `yum install MySQL*rpm` installs them in the correct order and removes `mysql-libs` in one step without conflicts.

In most cases, you need install only the `MySQL-server` and `MySQL-client` packages to get a functional standard MySQL installation. The other packages are not required for a standard installation.

RPMs for NDB Cluster. Standard MySQL server RPMs built by MySQL do not provide support for the `NDBCLUSTER` storage engine.

Important

When upgrading an NDB Cluster RPM installation, you must upgrade *all* installed RPMs, including the `Server` and `Client` RPMs.

For more information about installing NDB Cluster from RPMs, see [NDB Cluster Installation](#).

For upgrades, if your installation was originally produced by installing multiple RPM packages, it is best to upgrade all the installed packages, not just some. For example, if you previously installed the server and client RPMs, do not upgrade just the server RPM.

If the data directory exists at RPM installation time, the installation process does not modify existing data. This has the effect, for example, that accounts in the grant tables are not initialized to the default set of accounts.

If you get a dependency failure when trying to install MySQL packages (for example, `error: removing these packages would break dependencies: libmysqlclient.so.10 is needed by ...`), you should also install the `MySQL-shared-compat` package, which includes the shared libraries for older releases for backward compatibility.

The following list shows the available RPM packages. The names shown here use a suffix of `.glibc23.i386.rpm`, but particular packages can have different suffixes, described later. If you plan to install multiple RPM packages, you may wish to download the RPM Bundle `tar` file instead, which contains multiple RPM packages so that you need not download them separately.

- `MySQL-server-VERSION.glibc23.i386.rpm`

The MySQL server. You need this unless you only want to connect to a MySQL server running on another machine.

- `MySQL-client-VERSION.glibc23.i386.rpm`

The standard MySQL client programs. You probably always want to install this package.

- `MySQL-devel-VERSION.glibc23.i386.rpm`

The libraries and include files needed to compile other MySQL clients, such as the Perl MySQL module. Install this RPM if you intend to compile C API applications.

- `MySQL-shared-VERSION.glibc23.i386.rpm`

The shared libraries (`libmysqlclient.so*`) that certain languages and applications need to dynamically load and use MySQL. It contains single-threaded and thread-safe libraries. Install this RPM if you intend to compile or run C API applications that depend on the shared client library. Prior to MySQL 5.5.6, if you install this package, do not install the `MySQL-shared-compat` package.

- `MySQL-shared-compat-VERSION.glibc23.i386.rpm`

The shared libraries for older releases. It contains single-threaded and thread-safe libraries. Install this package if you have applications installed that are dynamically linked against older versions of MySQL but you want to upgrade to the current version without breaking the library dependencies. Before MySQL 5.5.6, `MySQL-shared-compat` also includes the libraries for the current release, so if you install it, you should not also install `MySQL-shared`. As of 5.5.6, `MySQL-shared-compat` does not include the current library version, so there is no conflict.

As of MySQL 5.5.23, the `MySQL-shared-compat` RPM package enables users of Red Hat-provided `mysql-*--5.1` RPM packages to migrate to Oracle-provided `MySQL-*--5.5` packages. `MySQL-shared-compat` replaces the Red Hat `mysql-libs` package by replacing `libmysqlclient.so` files of the latter package, thus satisfying dependencies of other packages on `mysql-libs`. This change affects only users of Red Hat (or Red Hat-compatible) RPM packages. Nothing is different for users of Oracle RPM packages.

- `MySQL-embedded-VERSION.glibc23.i386.rpm`

The embedded MySQL server library.

- `MySQL-test-VERSION.glibc23.i386.rpm`

The MySQL test suite.

- `MySQL-VERSION.src.rpm`

The source code for all of the previous packages. It can also be used to rebuild the RPMs on other architectures (for example, SPARC).

In RPM package names, the suffix (following the `VERSION` value) has the following syntax:

```
.PLATFORM.CPU.rpm
```

The `PLATFORM` and `CPU` values indicate the type of system for which the package is built. `PLATFORM` indicates the platform and `CPU` indicates the processor type or family.

All packages are dynamically linked against `glibc` 2.3. The `PLATFORM` value indicates whether the package is platform independent or intended for a specific platform, as shown in the following table.

Table 2.2 MySQL Linux RPM Package Platforms

<code>PLATFORM</code> Value	Intended Use
<code>glibc23</code>	Platform independent, should run on any Linux distribution that supports <code>glibc</code> 2.3
<code>rhel4, rhel5</code>	Red Hat Enterprise Linux 4 or 5
<code>el6</code>	Enterprise Linux 6
<code>sles10, sles11</code>	SuSE Linux Enterprise Server 10 or 11

In MySQL 5.5, only `glibc23` packages are available currently.

The `CPU` value indicates the processor type or family for which the package is built, as shown in the following table.

Table 2.3 MySQL Linux RPM Package CPU Identifiers

<code>CPU</code> Value	Intended Processor Type or Family
<code>i386, i586, i686</code>	Pentium processor or better, 32 bit
<code>x86_64</code>	64-bit x86 processor
<code>ia64</code>	Itanium (IA-64) processor

To see all files in an RPM package (for example, a `MySQL-server-VERSION.glibc23.i386.rpm`), run a command like this (modify the platform and CPU identifiers appropriately for your system):

```
shell> rpm -qpl MySQL-server-VERSION.glibc23.i386.rpm
```

To perform a standard minimal installation, install the server and client RPMs:

```
shell> rpm -i MySQL-server-VERSION.glibc23.i386.rpm
shell> rpm -i MySQL-client-VERSION.glibc23.i386.rpm
```

To install only the client programs, install just the client RPM:

```
shell> rpm -i MySQL-client-VERSION.glibc23.i386.rpm
```

RPM provides a feature to verify the integrity and authenticity of packages before installing them. To learn more about this feature, see [Verifying Package Integrity Using MD5 Checksums or GnuPG](#).

The server RPM places data under the `/var/lib/mysql` directory. The RPM also creates a login account for a user named `mysql` (if one does not exist) to use for running the MySQL server, and creates the appropriate entries in `/etc/init.d/` to start the server automatically at boot time. (This means that if you have performed a previous installation and have made changes to its startup script, you may want to make a copy of the script so that you can reinstall it after you install a newer RPM.) See [Starting and Stopping MySQL Automatically](#), for more information on how MySQL can be started automatically at system startup.

In MySQL 5.5.5 and later, during a new installation using RPM packages, the server boot scripts are installed, but the MySQL server is not started at the end of the installation, since the status of the server during an unattended installation is not known.

In MySQL 5.5.5 and later, during an upgrade installation using RPM packages, if the MySQL server is running when the upgrade occurs, the MySQL server is stopped, the upgrade occurs, and the MySQL server is restarted. If the MySQL server is not already running when the RPM upgrade occurs, the MySQL server is not started at the end of the installation.

If something goes wrong, you can find more information in the binary installation section. See [Chapter 1, Installing MySQL on Unix/Linux Using Generic Binaries](#).

Note

The accounts created in the MySQL grant tables for an RPM installation initially have no passwords. After starting the server, you should assign passwords to them using the instructions in [Postinstallation Setup and Testing](#).

An RPM installation creates a user named `mysql` and a group named `mysql` on the system using the `useradd`, `groupadd`, and `usermod` commands. Those commands require appropriate administrative

privileges, which is required for locally managed users and groups (as listed in the `/etc/passwd` and `/etc/group` files) by the RPM installation process being run by `root`.

If you log in as the `mysql` user, you may find that MySQL displays “Invalid (old?) table or database name” errors that mention `.mysqlgui`, `lost+found`, `.mysqlgui`, `.bash_history`, `.fonts.cache-1`, `.lesshst`, `.mysql_history`, `.profile`, `.viminfo`, and similar files created by MySQL or operating system utilities. You can safely ignore these error messages or remove the files or directories that cause them if you do not need them.

For nonlocal user management (LDAP, NIS, and so forth), the administrative tools may require additional authentication (such as a password), and will fail if the installing user does not provide this authentication. Even if they fail, the RPM installation will not abort but succeed, and this is intentional. If they failed, some of the intended transfer of ownership may be missing, and it is recommended that the system administrator then manually ensures some appropriate user and group exists and manually transfers ownership following the actions in the RPM spec file.

In MySQL 5.5.31, the RPM spec file has been updated, which has the following consequences:

- For a non-upgrade installation (no existing MySQL version installed), it possible to install MySQL using `yum`.
- For upgrades, it is necessary to clean up any earlier MySQL installations. In effect, the update is performed by removing the old installations and installing the new one.

Additional details follow.

For a non-upgrade installation of MySQL 5.5.31, it is possible to install using `yum`:

```
shell> yum install MySQL-server-NEWVERSION.glibc23.i386.rpm
```

For upgrades to MySQL 5.5.31, the upgrade is performed by removing the old installation and installing the new one. To do this, use the following procedure:

1. Remove the existing 5.5.X installation. `OLDVERSION` is the version to remove.

```
shell> rpm -e MySQL-server-OLDVERSION.glibc23.i386.rpm
```

Repeat this step for all installed MySQL RPMs.

2. Install the new version. `NEWVERSION` is the version to install.

```
shell> rpm -ivh MySQL-server-NEWVERSION.glibc23.i386.rpm
```

Alternatively, the removal and installation can be done using `yum`:

```
shell> yum remove MySQL-server-OLDVERSION.glibc23.i386.rpm
shell> yum install MySQL-server-NEWVERSION.glibc23.i386.rpm
```

For some Linux distributions, it might be necessary to increase the limit on number of file descriptors available to `mysqld`. See [File Not Found and Similar Errors](#)

2.2 Installing MySQL on Linux Using Debian Packages

Oracle provides Debian packages for installation on Debian or Debian-like Linux systems. To obtain a package, see [How to Get MySQL](#).

Note

Debian distributions of MySQL are also provided by other vendors. Be aware that they may differ from those built by us 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.

Debian package files have names in `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 2.4 MySQL Installation Packages for Linux CPU Identifiers

<i>CPU</i> Value	Intended Processor Type or Family
<code>i686</code>	Pentium processor or better, 32 bit
<code>x86_64</code>	64-bit x86 processor

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

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

The Debian package installs files in the `/opt/mysql/server-5.5` directory.

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

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

2.3 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 to it 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.

2.3.1 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.

- [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](#)

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:

```
shell> docker images
REPOSITORY          TAG                IMAGE ID           CREATED           SIZE
mysql/mysql-server  latest            3157d7f55f8d     4 weeks ago     241MB
```

Starting a MySQL Server Instance

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

```
docker run --name=mysql11 -d mysql/mysql-server:tag
```

The `--name` option, for supplying a custom name for your server container (`mysql11` 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:

```
shell> docker ps
CONTAINER ID   IMAGE                COMMAND                  CREATED        STATUS
a24888f0d6f4  mysql/mysql-server  "/entrypoint.sh my..."  14 seconds ago  Up 13 seconds (health: starti
```

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 mysql11
```

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:

```
shell> docker logs mysql11 2>&1 | grep GENERATED
GENERATED ROOT PASSWORD: Axegh3kAJyDLaRuBemecis&EShOs
```

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). After you have connected a `mysql` client to the server, you should 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
bash-4.2#
```

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.p
ca-key.pem   client-cert.pem  ib_buffer_pool  ib_logfile1  ibtmp1   mysql.sock  performance_schema  public_
```

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 2.3.2, “More Topics on Deploying MySQL Server with Docker”](#).

2.3.2 More Topics on Deploying MySQL Server with Docker

- [The Optimized MySQL Installation for Docker](#)
- [Configuring the MySQL Server](#)
- [Persisting Data and Configuration Changes](#)
- [Running Additional Initialization Scripts](#)
- [Connect to MySQL from an Application in Another Docker Container](#)
- [Server Error Log](#)
- [Docker Environment Variables](#)

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 mysql11 -d mysql/mysql-server --character-set-server=utf8mb4 --collation-server=utf8mb4_col
```

The command starts your MySQL Server with `utf8mb4` as the default character set and `utf8mb4_col` 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/scripts/,dst=/docker-entrypoint-initdb.d/ \  
-d mysql/mysql-server:tag
```

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:

```
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:

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

```
docker run --name=myappl --network=my-custom-net -d myappl
```

The `myappl` 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 `myappl` container to connect to host `mysql1` in its own container:

```
docker exec -it myappl 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 5.5 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.

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.
- The boolean variables including `MYSQL_RANDOM_ROOT_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_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 EXISTS` 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 5.5 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 mysql-d-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` being true.

- `MYSQL_ALLOW_EMPTY_PASSWORD`. 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` being true.

2.4 Installing MySQL on Linux Using Native Package Managers

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 package installations can take care of the download and dependencies required to run MySQL, but the MySQL version will often be some way behind the currently available release. You will also normally be unable to install development releases, as these are not usually made available in the native repository.

Distribution specific instructions are shown below:

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

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:

```
root-shell> yum install mysql mysql-server mysql-libs mysql-server
Loaded plugins: presto, refresh-packagekit
Setting up Install Process
Resolving Dependencies
```

```

--> Running transaction check
----> Package mysql.x86_64 0:5.1.48-2.fc13 set to be updated
----> Package mysql-libs.x86_64 0:5.1.48-2.fc13 set to be updated
----> Package mysql-server.x86_64 0:5.1.48-2.fc13 set to be updated
--> Processing Dependency: perl-DBD-MySQL for package: mysql-server-5.1.48-2.fc13.x86_64
--> Running transaction check
----> Package perl-DBD-MySQL.x86_64 0:4.017-1.fc13 set to be updated
--> Finished Dependency Resolution
Dependencies Resolved

=====
Package                Arch          Version           Repository        Size
=====
Installing:
mysql                  x86_64        5.1.48-2.fc13     updates           889 k
mysql-libs             x86_64        5.1.48-2.fc13     updates           1.2 M
mysql-server          x86_64        5.1.48-2.fc13     updates           8.1 M
Installing for dependencies:
perl-DBD-MySQL        x86_64        4.017-1.fc13     updates           136 k
Transaction Summary
=====
Install      4 Package(s)
Upgrade      0 Package(s)
Total download size: 10 M
Installed size: 30 M
Is this ok [y/N]: y
Downloading Packages:
Setting up and reading Presto delta metadata
Processing delta metadata
Package(s) data still to download: 10 M
(1/4): mysql-5.1.48-2.fc13.x86_64.rpm | 889 kB    00:04
(2/4): mysql-libs-5.1.48-2.fc13.x86_64.rpm | 1.2 MB   00:06
(3/4): mysql-server-5.1.48-2.fc13.x86_64.rpm | 8.1 MB   00:40
(4/4): perl-DBD-MySQL-4.017-1.fc13.x86_64.rpm | 136 kB   00:00
-----
Total                               201 kB/s | 10 MB    00:52
Running rpm_check_debug
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing      : mysql-libs-5.1.48-2.fc13.x86_64           1/4
  Installing      : mysql-5.1.48-2.fc13.x86_64              2/4
  Installing      : perl-DBD-MySQL-4.017-1.fc13.x86_64      3/4
  Installing      : mysql-server-5.1.48-2.fc13.x86_64       4/4
Installed:
  mysql.x86_64 0:5.1.48-2.fc13          mysql-libs.x86_64 0:5.1.48-2.fc13
  mysql-server.x86_64 0:5.1.48-2.fc13
Dependency Installed:
  perl-DBD-MySQL.x86_64 0:4.017-1.fc13
Complete!

```

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**

On Debian and related distributions, there are two packages, [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:
  dbshell libipc-sharedcache-perl tinyca procmail postfix-mysql postfix-pgsql
  postfix-ldap postfix-pcre sasl2-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 [
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 libdbi-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-5.5*
mysql-5.5.46.ebuild
mysql-5.5.47.ebuild
```

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

```
root-shell> emerge =dev-db/mysql-5.5.46
```

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-5.5.46
```

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
```

Chapter 3 Installing MySQL on Solaris

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3.1 Installing MySQL on Solaris Using a Solaris PKG 24

Note

MySQL 5.5 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/5.5.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:

```
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:

```
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-5.5.65-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-5.5.65-solaris10-x86_64.pkg
The following packages are available:
  1  mysql      MySQL Community Server (GPL)
      (i86pc) 5.5.65
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-5.5.65-solaris10-x86_64.pkg
shell> mysql_safe &
shell> mysql_upgrade
```

You should check the notes in [Upgrading 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:

```
# cd /usr/ports/databases/mysql55-server
# make
...
# cd /usr/ports/databases/mysql55-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:

```
# cd /usr/ports/databases/mysql55-server
# make deinstall
...
# cd /usr/ports/databases/mysql55-client
# make deinstall
...
```

- If you get problems with the current date in MySQL, setting the `TZ` variable should help. See [MySQL Program Environment Variables](#).

Chapter 5 Initializing the Data Directory

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After MySQL is installed, the data directory must be initialized, including the tables in the `mysql` system database:

- For some MySQL installation methods, data directory initialization is automatic, as described in [Postinstallation Setup and Testing](#).
- For other installation methods, you must initialize the data directory manually. These include installation from generic binary and source distributions on Unix and Unix-like systems, and installation from a ZIP Archive package on Windows.

This section describes how to initialize the data directory manually for MySQL installation methods for which data directory initialization is not automatic. For some suggested commands that enable testing whether the server is accessible and working properly, see [Testing the Server](#).

In the examples shown here, the server is intended 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 (see [Create a mysql User and Group](#)), or substitute the name of a different existing login account that you plan to use for running the server.

1. Change location to the top-level directory of your MySQL installation, represented here by `BASEDIR`:

```
cd BASEDIR
```

`BASEDIR` is likely to be something like `/usr/local/mysql` or `/usr/local`. The following steps assume that you have changed location to this directory.

You will find several files and subdirectories in the `BASEDIR` directory. The most important for installation purposes are the `bin` and `scripts` subdirectories, which contain the server as well as client and utility programs.

2. If necessary, ensure that the distribution contents are accessible to `mysql`. If you installed the distribution as `mysql`, no further action is required. If you installed the distribution as `root`, its contents will be owned by `root`. Change its ownership to `mysql` by executing the following commands as `root` in the installation directory. The first command changes the owner attribute of the files to the `mysql` user. The second changes the group attribute to the `mysql` group.

```
chown -R mysql .  
chgrp -R mysql .
```

3. If necessary, 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 the first time you install MySQL. For upgrades to 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:

```
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. Otherwise, you should execute the program while logged in as `mysql`, in which case you can omit the `--user` option from the command.

The `mysql_install_db` command creates 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` does not identify the correct locations for the installation directory or data directory. For example (enter the command on a single line):

```
scripts/mysql_install_db --user=mysql
--basedir=/opt/mysql/mysql
--datadir=/opt/mysql/mysql/data
```

If you do not want to have the `test` database, you can remove it after starting the server, using the instructions in [Securing the Initial MySQL Accounts](#).

If you have trouble with `mysql_install_db` at this point, see [Section 5.1, "Problems Running mysql_install_db"](#).

4. After initializing the data directory, you can establish the final installation ownership settings. To leave the installation owned by `mysql`, no action is required here. Otherwise, most of the MySQL installation can be owned by `root` if you like. The exception is that the data directory must be owned by `mysql`. To accomplish this, run the following commands as `root` in the installation directory. For some distribution types, the data directory might be named `var` rather than `data`; adjust the second command accordingly.

```
chown -R root .
chown -R mysql data
```

If the plugin directory (the directory named by the `plugin_dir` system variable) is writable by the server, it may be possible for a user to write executable code to a file in the directory using `SELECT ... INTO DUMPFILE`. This can be prevented by making the plugin directory read only to the server or by setting the `secure_file_priv` system variable at server startup to a directory where `SELECT` writes can be performed safely.

5. In the absence of any option files, the server starts with its default settings. (See [Server Configuration Defaults](#).) If you installed MySQL using a source distribution, you may want to optionally copy one of the provided configuration files from the `support-files` directory into your `/etc` directory. There are different sample configuration files for different use cases, server types, and CPU and RAM configurations. To use one of these standard files, copy it to `/etc/my.cnf`, or `/etc/mysql/my.cnf` and edit and check the configuration before starting your MySQL server for the first time.

You can also create `my.cnf` yourself and place into it the options the server should use at startup. (See [Using Option Files](#).) For example, you can use an option file to set the `secure_file_priv` system variable.

If you do not copy one of the standard configuration files or create your own, the MySQL server starts with its default settings.

6. To arrange for MySQL to start automatically at system boot time, 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.

```
mv data/mysql data/mysql.old
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:

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

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

```
scripts/mysql_install_db --user=mysql
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 differ 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:

```
scripts/mysql_install_db --user=mysql
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.