MySQL Installation Guide
Abstract

This is the MySQL Installation Guide from the MySQL 5.5 Reference Manual.

For legal information, see the Legal Notices.

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

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Chapter 1 Installing and Upgrading MySQL

This chapter describes how to obtain and install MySQL. A summary of the procedure follows and later sections provide the details. If you plan to upgrade an existing version of MySQL to a newer version rather than install MySQL for the first time, see Chapter 10, Upgrading MySQL, for information about upgrade procedures and about issues that you should consider before upgrading.

If you are interested in migrating to MySQL from another database system, see MySQL 5.5 FAQ: Migration, which contains answers to some common questions concerning migration issues.

If you are migrating from MySQL Enterprise Edition to MySQL Community Server, see Section 11.5, “Downgrading from MySQL Enterprise Edition to MySQL Community Server”.

Installation of MySQL generally follows the steps outlined here:

1. **Determine whether MySQL runs and is supported on your platform.**
   
   Please note that not all platforms are equally suitable for running MySQL, and that not all platforms on which MySQL is known to run are officially supported by Oracle Corporation. For information about those platforms that are officially supported, see https://www.mysql.com/support/supportedplatforms/database.html on the MySQL website.

2. **Choose which distribution to install.**
   
   Several versions of MySQL are available, and most are available in several distribution formats. You can choose from pre-packaged distributions containing binary (precompiled) programs or source code. When in doubt, use a binary distribution. Oracle also provides access to the MySQL source code for those who want to see recent developments and test new code. To determine which version and type of distribution you should use, see Section 2.1, “Which MySQL Version and Distribution to Install”.

3. **Download the distribution that you want to install.**
   
   For instructions, see Section 2.2, "How to Get MySQL". To verify the integrity of the distribution, use the instructions in Section 2.3, “Verifying Package Integrity Using MD5 Checksums or GnuPG”.

4. **Install the distribution.**
   
   To install MySQL from a binary distribution, use the instructions in Chapter 3, Installing MySQL on Unix/Linux Using Generic Binaries.
   
   To install MySQL from a source distribution or from the current development source tree, use the instructions in Chapter 4, Installing MySQL from Source.

5. **Perform any necessary postinstallation setup.**
   
   After installing MySQL, see Chapter 9, Postinstallation Setup and Testing for information about making sure the MySQL server is working properly. Also refer to the information provided in Section 9.4, “Securing the Initial MySQL Accounts”. This section describes how to secure the initial MySQL user accounts, which have no passwords until you assign passwords. The section applies whether you install MySQL using a binary or source distribution.

6. If you want to run the MySQL benchmark scripts, Perl support for MySQL must be available. See Chapter 13, Perl Installation Notes.

Instructions for installing MySQL on different platforms and environments is available on a platform by platform basis:
• **Unix, Linux, FreeBSD**

For instructions on installing MySQL on most Linux and Unix platforms using a generic binary (for example, a .tar.gz package), see Chapter 3, *Installing MySQL on Unix/Linux Using Generic Binaries*.

For information on building MySQL entirely from the source code distributions or the source code repositories, see Chapter 4, *Installing MySQL from Source*.

For specific platform help on installation, configuration, and building from source see the corresponding platform section:

- Linux, including notes on distribution specific methods, see Chapter 7, *Installing MySQL on Linux*.
- Solaris, including PKG and IPS formats, see Chapter 8, *Installing MySQL on Solaris*.
- IBM AIX, see Chapter 8, *Installing MySQL on Solaris*.
- FreeBSD, see *Installing MySQL on FreeBSD*.

• **Microsoft Windows**

For instructions on installing MySQL on Microsoft Windows, using either the MySQL Installer standalone MSI, or Zipped binary, see Chapter 5, *Installing MySQL on Microsoft Windows*.

For information about managing MySQL instances, see MySQL Notifier Overview.

For details and instructions on building MySQL from source code using Microsoft Visual Studio, see Chapter 4, *Installing MySQL from Source*.

• **OS X**

For installation on OS X, including using both the binary package and native PKG formats, see Chapter 6, *Installing MySQL on OS X*.

For information on making use of an OS X Launch Daemon to automatically start and stop MySQL, see Section 6.3, “Installing a MySQL Launch Daemon”.

For information on the MySQL Preference Pane, see Section 6.4, “Installing and Using the MySQL Preference Pane”.
Chapter 2 General Installation Guidance

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The immediately following sections contain the information necessary to choose, download, and verify your distribution. The instructions in later sections of the chapter describe how to install the distribution that you choose. For binary distributions, see the instructions at Chapter 3, Installing MySQL on Unix/Linux Using Generic Binaries or the corresponding section for your platform if available. To build MySQL from source, use the instructions in Chapter 4, Installing MySQL from Source.

2.1 Which MySQL Version and Distribution to Install

MySQL is available on a number of operating systems and platforms. For information about those platforms that are officially supported, see https://www.mysql.com/support/supportedplatforms/database.html on the MySQL website.

When preparing to install MySQL, decide which version and distribution format (binary or source) to use.

First, decide whether to install a development release or a General Availability (GA) release. Development releases have the newest features, but are not recommended for production use. GA releases, also called production or stable releases, are meant for production use. We recommend using the most recent GA release.

The naming scheme in MySQL 5.5 uses release names that consist of three numbers and an optional suffix; for example, mysql-5.5.1-m2. The numbers within the release name are interpreted as follows:

- The first number (5) is the major version number.
- The second number (5) is the minor version number. Taken together, the major and minor numbers constitute the release series number. The series number describes the stable feature set.
- The third number (1) is the version number within the release series. This is incremented for each new bugfix release. In most cases, the most recent version within a series is the best choice.

Release names can also include a suffix to indicate the stability level of the release. Releases within a series progress through a set of suffixes to indicate how the stability level improves. The possible suffixes are:

- mN (for example, m1, m2, m3, ...) indicates a milestone number. MySQL development uses a milestone model, in which each milestone introduces a small subset of thoroughly tested features. Following the releases for one milestone, development proceeds with another small number of releases that focuses
on the next set of features. From one milestone to the next, feature interfaces may change or features may even be removed, based on feedback provided by community members who try these early releases. Features within milestone releases may be considered to be of pre-production quality.

- **rc** indicates a Release Candidate (RC). Release candidates are believed to be stable, having passed all of MySQL's internal testing. New features may still be introduced in RC releases, but the focus shifts to fixing bugs to stabilize features introduced earlier within the series.

- Absence of a suffix indicates a General Availability (GA) or Production release. GA releases are stable, having successfully passed through the earlier release stages, and are believed to be reliable, free of serious bugs, and suitable for use in production systems.

Development within a series begins with milestone releases, followed by RC releases, and finally reaches GA status releases.

After choosing which MySQL version to install, decide which distribution format to install for your operating system. For most use cases, a binary distribution is the right choice. Binary distributions are available in native format for many platforms, such as RPM packages for Linux or DMG packages for OS X. Distributions are also available in more generic formats such as Zip archives or compressed *tar* files. On Windows, you can use the MySQL Installer to install a binary distribution.

Under some circumstances, it may be preferable to install MySQL from a source distribution:

- You want to install MySQL at some explicit location. The standard binary distributions are ready to run at any installation location, but you might require even more flexibility to place MySQL components where you want.

- You want to configure *mysqld* with features that might not be included in the standard binary distributions. Here is a list of the most common extra options used to ensure feature availability:
  - `-DWITH_LIBWRAP=1` for TCP wrappers support.
  - `-DWITH_ZLIB={system|bundled}` for features that depend on compression
  - `-DWITH_DEBUG=1` for debugging support

For additional information, see Section 4.7, “MySQL Source-Configuration Options”.

- You want to configure *mysqld* without some features that are included in the standard binary distributions. For example, distributions normally are compiled with support for all character sets. If you want a smaller MySQL server, you can recompile it with support for only the character sets you need.

- You want to read or modify the C and C++ code that makes up MySQL. For this purpose, obtain a source distribution.

- Source distributions contain more tests and examples than binary distributions.

## 2.2 How to Get MySQL

Check our downloads page at [https://dev.mysql.com/downloads/](https://dev.mysql.com/downloads/) for information about the current version of MySQL and for downloading instructions. For a complete up-to-date list of MySQL download mirror sites, see [https://dev.mysql.com/downloads/mirrors.html](https://dev.mysql.com/downloads/mirrors.html). You can also find information there about becoming a MySQL mirror site and how to report a bad or out-of-date mirror.

To obtain the latest development source, see Section 4.5, “Installing MySQL Using a Development Source Tree”.
2.3 Verifying Package Integrity Using MD5 Checksums or GnuPG

After downloading the MySQL package that suits your needs and before attempting to install it, make sure that it is intact and has not been tampered with. There are three means of integrity checking:

- MD5 checksums
- Cryptographic signatures using GnuPG, the GNU Privacy Guard
- For RPM packages, the built-in RPM integrity verification mechanism

The following sections describe how to use these methods.

If you notice that the MD5 checksum or GPG signatures do not match, first try to download the respective package one more time, perhaps from another mirror site.

2.3.1 Verifying the MD5 Checksum

After you have downloaded a MySQL package, you should make sure that its MD5 checksum matches the one provided on the MySQL download pages. Each package has an individual checksum that you can verify against the package that you downloaded. The correct MD5 checksum is listed on the downloads page for each MySQL product, and you will compare it against the MD5 checksum of the file (product) that you download.

Each operating system and setup offers its own version of tools for checking the MD5 checksum. Typically the command is named `md5sum`, or it may be named `md5`, and some operating systems do not ship it at all. On Linux, it is part of the GNU Text Utilities package, which is available for a wide range of platforms. You can also download the source code from http://www.gnu.org/software/textutils/. If you have OpenSSL installed, you can use the command `openssl md5 package_name` instead. A Windows implementation of the `md5` command line utility is available from http://www.fourmilab.ch/md5/. `winMd5Sum` is a graphical MD5 checking tool that can be obtained from http://www.nullriver.com/index/products/winmd5sum. Our Microsoft Windows examples will assume the name `md5.exe`.

Linux and Microsoft Windows examples:

```
shell> md5sum mysql-standard-5.5.62-linux-i686.tar.gz
aaab65abbec64d5e907dcd41b8699945  mysql-standard-5.5.62-linux-i686.tar.gz

shell> md5.exe mysql-installer-community-5.5.62.msi
aaab65abbec64d5e907dcd41b8699945  mysql-installer-community-5.5.62.msi
```

You should verify that the resulting checksum (the string of hexadecimal digits) matches the one displayed on the download page immediately below the respective package.

**Note**

Make sure to verify the checksum of the archive file (for example, the `.zip`, `.tar.gz`, or `.msi` file) and not of the files that are contained inside of the archive. In other words, verify the file before extracting its contents.

2.3.2 Signature Checking Using GnuPG

Another method of verifying the integrity and authenticity of a package is to use cryptographic signatures. This is more reliable than using MD5 checksums, but requires more work.

We sign MySQL downloadable packages with GnuPG (GNU Privacy Guard). GnuPG is an Open Source alternative to the well-known Pretty Good Privacy (PGP) by Phil Zimmermann. Most Linux distributions ship
Signature Checking Using GnuPG

with GnuPG installed by default. Otherwise, see http://www.gnupg.org/ for more information about GnuPG and how to obtain and install it.

To verify the signature for a specific package, you first need to obtain a copy of our public GPG build key, which you can download from http://pgp.mit.edu/. The key that you want to obtain is named mysql-

-----BEGIN PGP PUBLIC KEY BLOCK-----
Version: GnuPG
mQGiBD4+owrvBAC14GfufycEDSEIpeVw3sAfuddUtBoqOHH/nJKzyQU7b9bP1UW3C RODQgReyCITrdrwzykUGw2MeVGw2u2ZmDNABNppzWPwhDck9+6OmSLN9brz f2wVOu9CMyr2u2W0hyDUvHyYQA/BThQoAdgJ8W6/07o7V1W9/8VUhpQ0gwCqgvzV3 BQoRznNCRCwauvUzvHrCJa0ooK1+i1sJn2ZM1D1weFxmch575/+yeJkegNW hwaxkRwpwV4zJ1DRT+rzf2RzUe6vopyKQmo/hnEIUJHQqYtit0o8tgvxXNCQf7JY1V N2JhRkrBpB72wawKMNyhr0ceKbtGFs19k9356BaQyP/vB7hIwpxx6dZ71TnE ykXyBAcmPNNdPAkCmE42zO0OHODANwpUKP4371jaDmgToObZ9qnxAw+U0DI QJX6M6Bl0iL1001N1ysafAWEPODMKrpqk6x1i1ysNtPvld481808pFAnwqyfep yrvoxaqUEMEcmO3owvF8350Padas2sb3pjVhpxvhs6/62Qq7Q72XT1UWqumVns ZWfZ2SBfmbdpmvclmuy2Ab2zckXvNvpYGRAB31n3y9YWNa5s25j20+iGw EkeEACAwhCgHyCgFC4AAFQ4ACQCGCwkiwBWbCBhhUCqOGCAwUwAGMAAUXCWEY+uwUI787 5AAKCRMcmYtt70UHh9RZPJ9uvm0zlizCFN+DxhVaoFLJf7YVQCFborsc97meZYa whwohjB2zk0rbyIAA8TQEA8Q1BwLYCqHAwIFQIAAwQmAQBhM4aBaEAAh Kb BQ73Tadmvka2sYlaHoJEjzxtjCulhXMAIoNaNALyACSBNj9663xvka/fJuX5m A JWptemgDfJ zealhZxtFeEF1919860hobmBMRagxAnhAsbgtJxAdcDagYqAgDDBYCY AweC6gC4EP4AFAAK53ipoCPCRt71uACqGjH9NO1Qy4fbmaACEJdfq9Y9WTumgmc AOmG4JyuxacAKF+U8MYgOLEL+TR71MKEm96gloKEXEACAwhGCGCWkkwBMC BUBCAMCEFqDIAqQxaAlgACUZCUZSOroqjUFHclqgAARCMcY70UHhLT0AAJ9X r/ya/ymolop2n+491s8/uwMctsQCAqmOnQd1nhn2kzyBec3kByc3x9/wv2xqfJARhwEEAC AAYAF16A1uAMGCPQaBiccGoxHirwvFw/dtqk/xNC2VMd1q+ovoMqog11hXzF1 NsEsvavGa4m8SFBRge1+bvdrDoKhxiGuX48Rusjxvb6kTMY6jopwFvz9j3D H9y9pYrlha+a16yYSZKipoHfliMntY7NH0vOycNZS2/cIuAUCIFH/2NH8ZNT5CIF 1u3j8AAH7zizzp0lII1T8WlFpq4/c1/726CNrmj+sLmvj3Yu96ua6EdGKtCnptCycD 5HGKt+17Nd/7v56y6a6fepvuxNZlgB9t1I6MFSCyuuYj3JK3BZOUWBM053k ndqALGyqQc50A3a3JEGKVI4znHz2EVRWmxsFt5yW6oRTMxU7QSMQPLBNIKBAQQAQA1 BgcU1B2vqARCAhobdc638wdwCCAWXCXDwIcAQRWw/+jdp8dr9u335tlj3n4B c71c1cplkKVLPv7U7LgjzvLB0s8h14qksA+zl1e6s6mpuZskfl1f711ac9GGpM4 OM5vmRm9hWd1H1DzTfGdb+wdBkP+A07U9x0ghS7S8F3399sunIX6mM gXSC4L1D2ZjDS1g0k6b0kj+s3curlmp853yd3yaff9yUIbckxKnaapw17vz3D2duo p03FB+BNPKp4F2z+FalkGkFh4AldIQC3t3rY4vAk0eKLg0NaMU4s0Ygoa7v71T SxflntFMzazq3g5kq+YH0KUZ3G7887p+lLtygcyRm7Io7riQCBBCABACAG BQkWqvDaa0JEEZu4b/gk4UK9M9H/RmttCPC3JS5CRA2ZBASYLzD+rPeIUBpB WsEgB2ds1GJgbPh8L9rZ/PqoGh1flWMsMr2Wc0xMlwKJhOB6D UkbQhewogmedNVh1rBKHHJP/4/l86K0P01/c2XytKePMw7BFm3KhBD5CJ5t3/I+Z0h7 zf4Q0qsfj09e9PnmwBtpglbUmt7?bx7czEUBz1lMx6pZQkXIuNXYUL1v3hS WQsdEcurek6vjPXjD7XZ09W9C9tC95/777648uTZZeUossl5/1Ms/sMegexq/IxRZv J1Jl7j75sVosqZSchur16kojiY+Ypp6MfFhi17Izg1mk+ClvK2JASIDEAEACAeAF Ak5s3Q54FwAFsQACQAC9QlKcX4m8PzXzWJQF/be/U09mqfocsa2Mywhmp4N/4fD bwLkAL1Q3FQXw6HRhHJmeunj0uyKXchzRoi+DuXeHe17P1B2aQlubhbOq9e1KvKF TzuWwMQd1q6+Kolxw6x6Ckc31dxtZOW7b5yxcpcVBPIrRFGfGebJva2s85ydcMNg yGLAUA6Ocz4vehavM12GIDqYaY6+y6+YDvZ+CxwzdYu+HDV9HMrCde6moBn7jS5 RJzqXjPgoThiTa7vQ6/R5/2p5NvQ/H840gG6j0sfc2duUzcF/kheMRRFzuuKC OHQTPj1Jul+ggFpHTEU1DXIO3s6c9n0dePeveBvcsDbrnNQW4U4mBot4kWqGq AQi3ADUACTo1cIqSQAADAACKCCHRl5LiverleTfLF3A/90rqe+HC9UBQD/w1cxrYtxr y/MulpnRo9a1QflAP101tv1333/IxWf5FtCf0GrYcJsacggkZxXzKgq23A7PryUb zrQ0OSe5rL6y66v702Aw8u+fIkU68q7KteLqrL0dMy28rA9vVggK7VUTMV moysAvaLyalo7yvAaF2C2C1FKnot2L1VwQcmYBCwo7kPFGkExiuy2Zf1ycyYkQcPm HkVFG59x2Fe8rz2d4MVMXhpqSKGM036FLFVsewRg+wbtUplD557m/T2BFJ3/J35ra CSM8LEArTRq8agyip+X7M7M2e946awj0mGhBZb1vDvQ6d12jAz78+ticmXV2K iQl8BBAGqMBHDMQnDR1MK2OMAqHNAEaAOJECJuQvK618AvIIAfEF2j+ry7W0bDF 5oQe/yaYNULZn92FW/9z8BYur0ngKFGJidYMc81t1Risizl17JVuFsu3ZoncAPgK /5UTa9Y6K9LnMc7c5U7EhKlqg/FndM2ZV51YkIlc1QWosAbb+z1peeEd4G8u9j5s111 MOBI3b6rQaYAPoExKLX8dY4YFLVQGAQD0wQBVFZrpw16ATWBMG332MSc4kz4Q 6xKXEO7q6at3YbgAgAdNgyE6ca4deBpRX8189Yjg6DnOa1COn6O616L9fR1L rzqFq9y3rTcYUV1X8J9Y997+7/Lyx9BqNobQ2dKwXTM24uaEhObD10P5e2ce O214q6mJAsIDAECAwFk66p6qEFAwDaSDAQCAgGqLx1C4m8pXrAawhf/f90991z6
Signature Checking Using GnuPG
To import the build key into your personal public GPG keyring, use `gpg --import`. For example, if you have saved the key in a file named `mysql_pubkey.asc`, the import command looks like this:

```
shell> gpg --import mysql_pubkey.asc
```

You can also download the key from the public keyserver using the public key id, 5072E1F5:

```
shell> gpg --recv-keys 5072E1F5
```

If you want to import the key into your RPM configuration to validate RPM install packages, you should be able to import the key directly:
If you experience problems or require RPM specific information, see Section 2.3.4, “Signature Checking Using RPM”.

After you have downloaded and imported the public build key, download your desired MySQL package and the corresponding signature, which also is available from the download page. The signature file has the same name as the distribution file with an `.asc` extension, as shown by the examples in the following table.

<table>
<thead>
<tr>
<th>File Type</th>
<th>File Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution file</td>
<td>mysql-standard-5.5.62-linux-i686.tar.gz</td>
</tr>
<tr>
<td>Signature file</td>
<td>mysql-standard-5.5.62-linux-i686.tar.gz.asc</td>
</tr>
</tbody>
</table>

Make sure that both files are stored in the same directory and then run the following command to verify the signature for the distribution file:

```
shell> gpg --verify package_name.asc
```

If the downloaded package is valid, you will see a "Good signature" similar to:

```
shell> gpg --verify mysql-standard-5.5.62-linux-i686.tar.gz.asc
gpg: Signature made Tue 01 Feb 2011 02:38:30 AM CST using DSA key ID 5072E1F5
gpg: Good signature from "MySQL Release Engineering <mysql-build@oss.oracle.com>"
```

The **Good signature** message indicates that the file signature is valid, when compared to the signature listed on our site. But you might also see warnings, like so:

```
shell> gpg --verify mysql-standard-5.5.62-linux-i686.tar.gz.asc
gpg: Signature made Wed 23 Jan 2013 02:25:45 AM PST using DSA key ID 5072E1F5
gpg: checking the trustdb
```

That is normal, as they depend on your setup and configuration. Here are explanations for these warnings:

- **gpg: no ultimately trusted keys found**: This means that the specific key is not "ultimately trusted" by you or your web of trust, which is okay for the purposes of verifying file signatures.

- **WARNING: This key is not certified with a trusted signature! There is no indication that the signature belongs to the owner.**: This refers to your level of trust in your belief that you possess our real public key. This is a personal decision. Ideally, a MySQL developer would hand you the key in person, but more commonly, you downloaded it. Was the download tampered with? Probably not, but this decision is up to you. Setting up a web of trust is one method for trusting them.

See the GPG documentation for more information on how to work with public keys.

### 2.3.3 Signature Checking Using Gpg4win for Windows

The Section 2.3.2, “Signature Checking Using GnuPG” section describes how to verify MySQL downloads using GPG. That guide also applies to Microsoft Windows, but another option is to use a GUI tool like
**Gpg4win.** You may use a different tool but our examples are based on Gpg4win, and utilize its bundled **Kleopatra** GUI.

Download and install Gpg4win, and then load Kleopatra. The dialog should look similar to:

**Figure 2.1 Kleopatra: Initial Screen**

![Kleopatra: Initial Screen](image)

Next, add the MySQL Release Engineering certificate. Do this by clicking **File, Lookup Certificates on Server.** Type "Mysql Release Engineering" into the search box and press **Search**.

**Figure 2.2 Kleopatra: Lookup Certificates on Server Wizard: Finding a Certificate**

![Kleopatra: Lookup Certificates on Server Wizard: Finding a Certificate](image)

Select the "MySQL Release Engineering" certificate. The Fingerprint and Key-ID must be "5072E1F5", or choose **Details...** to confirm the certificate is valid. Now, import it by clicking **Import.** An import dialog will be displayed, choose **Okay,** and this certificate will now be listed under the **Imported Certificates** tab.
Next, configure the trust level for our certificate. Select our certificate, then from the main menu select **Certificates, Change Owner Trust**... We suggest choosing **I believe checks are very accurate** for our certificate, as otherwise you might not be able to verify our signature. Select **I believe checks are very accurate** to enable "full trust" and then press **OK**.

**Figure 2.3 Kleopatra: Change Trust level for MySQL Release Engineering**

Next, verify the downloaded MySQL package file. This requires files for both the packaged file, and the signature. The signature file must have the same name as the packaged file but with an appended `.asc` extension, as shown by the example in the following table. The signature is linked to on the downloads page for each MySQL product. You must create the `.asc` file with this signature.

**Table 2.2 MySQL Package and Signature Files for MySQL Installer for Microsoft Windows**

<table>
<thead>
<tr>
<th>File Type</th>
<th>File Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution file</td>
<td>mysql-installer-community-5.5.62.msi</td>
</tr>
<tr>
<td>Signature file</td>
<td>mysql-installer-community-5.5.62.msi.asc</td>
</tr>
</tbody>
</table>

Make sure that both files are stored in the same directory and then run the following command to verify the signature for the distribution file. Either drag and drop the signature (.asc) file into Kleopatra, or load the dialog from **File, Decrypt/Verify Files**, and then choose either the `.msi` or `.asc` file.
Figure 2.4 Kleopatra: The Decrypt and Verify Files Dialog

Click Decrypt/Verify to check the file. The two most common results will look like the following, and although the yellow warning looks problematic, the following means that the file check passed with success. You may now run this installer.

Figure 2.5 Kleopatra: the Decrypt and Verify Results Dialog: All operations completed

Seeing a red "The signature is bad" error means the file is invalid. Do not execute the MSI file if you see this error.
The Section 2.3.2, “Signature Checking Using GnuPG” section explains why you probably don't see a green Good signature result.

2.3.4 Signature Checking Using RPM

For RPM packages, there is no separate signature. RPM packages have a built-in GPG signature and MD5 checksum. You can verify a package by running the following command:

shell> rpm --checksig package_name.rpm

Example:

shell> rpm --checksig MySQL-server-5.5.62-0.glibc23.i386.rpm
MySQL-server-5.5.62-0.glibc23.i386.rpm: md5 gpg OK

Note

If you are using RPM 4.1 and it complains about (GPG) NOT OK (MISSING KEYS: GPG#5072e1f5), even though you have imported the MySQL public build key into your own GPG keyring, you need to import the key into the RPM keyring first. RPM 4.1 no longer uses your personal GPG keyring (or GPG itself). Rather, RPM maintains a separate keyring because it is a system-wide application and a user's GPG public keyring is a user-specific file. To import the MySQL public key into the RPM keyring, first obtain the key, then use rpm --import to import the key. For example:
Installation Layouts

shell> gpg --export -a 5072e1f5 > 5072e1f5.asc
shell> rpm --import 5072e1f5.asc

Alternatively, `rpm` also supports loading the key directly from a URL, and you can use this manual page:


If you need to obtain the MySQL public key, see Section 2.3.2, “Signature Checking Using GnuPG”.

2.4 Installation Layouts

The installation layout differs for different installation types (for example, native packages, binary tarballs, and source tarballs), which can lead to confusion when managing different systems or using different installation sources. The individual layouts are given in the corresponding installation type or platform chapter, as described following. Note that the layout of installations from vendors other than Oracle may differ from these layouts.

- Section 5.1, “MySQL Installation Layout on Microsoft Windows”
- Section 4.3, “MySQL Layout for Source Installation”
- Table 3.1, “MySQL Installation Layout for Generic Unix/Linux Binary Package”
- Table 7.1, “MySQL Installation Layout for Linux RPM Packages”
- Table 6.1, “MySQL Installation Layout on macOS”

2.5 Compiler-Specific Build Characteristics

In some cases, the compiler used to build MySQL affects the features available for use. The notes in this section apply for binary distributions provided by Oracle Corporation or that you compile yourself from source.

**icc (Intel C++ Compiler) Builds**

A server built with `icc` has these characteristics:

- SSL support is not included.
Chapter 3 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 Chapter 5, Installing MySQL on Microsoft Windows.

To obtain MySQL, see Section 2.2, “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, 5.5.62), and OS indicates the type of operating system for which the distribution is intended (for example, pc-linux-i686 or winx64).

Warnings

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

• 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

• 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.

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 3.1 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>mysqlld server, client and utility programs</td>
</tr>
</tbody>
</table>
Create a mysql User and Group

### Directory Contents of Directory

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

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 Chapter 4, *Installing MySQL from Source*.

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

```bash
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 Section 9.4, “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 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`. 

Obtain and Unpack the Distribution

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 Section 2.2, “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 xzvf /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 Chapter 9, Postinstallation Setup and Testing.
Chapter 4 Installing MySQL from Source

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Building MySQL from the source code enables you to customize build parameters, compiler optimizations, and installation location. For a list of systems on which MySQL is known to run, see https://www.mysql.com/support/supportedplatforms/database.html.

Before you proceed with an installation from source, check whether Oracle produces a precompiled binary distribution for your platform and whether it works for you. We put a great deal of effort into ensuring that our binaries are built with the best possible options for optimal performance. Instructions for installing binary distributions are available in Chapter 3, Installing MySQL on Unix/Linux Using Generic Binaries.

Warning
Building MySQL with nonstandard options may lead to reduced functionality, performance, or security.

Note
This section describes how to build MySQL from source using CMake. Before MySQL 5.5, source builds used the GNU autotools on Unix-like systems. Source builds on Windows used CMake, but the process was different from that described here. For source-building instructions for older versions of MySQL, see the MySQL 5.1 Reference Manual. If you are familiar with autotools but not CMake, you might find these transition instructions helpful: Autotools to CMake Transition Guide

4.1 Source Installation Methods

There are two methods for installing MySQL from source:

• Use a standard MySQL source distribution. To obtain a standard distribution, see Section 2.2, “How to Get MySQL”. For instructions on building from a standard distribution, see Section 4.4, “Installing MySQL Using a Standard Source Distribution”.

Standard distributions are available as compressed tar files, Zip archives, or RPM packages. Distribution files have names of the form mysql-VERSION.tar.gz, mysql-VERSION.zip, or mysql-VERSION.rpm, where VERSION is a number like 5.5.62. File names for source distributions can be distinguished from those for precompiled binary distributions in that source distribution names are generic and include no platform name, whereas binary distribution names include a platform name indicating the type of system for which the distribution is intended (for example, pc-linux-i686 or winx64).
4.2 Source Installation Prerequisites

Installation of MySQL from source requires several development tools. Some of these tools are needed no matter whether you use a standard source distribution or a development source tree. Other tool requirements depend on which installation method you use.

To install MySQL from source, the following system requirements must be satisfied, regardless of installation method:

- **CMake**, which is used as the build framework on all platforms. CMake can be downloaded from [http://www.cmake.org](http://www.cmake.org).

- A good `make` program. Although some platforms come with their own `make` implementations, it is highly recommended that you use GNU `make` 3.75 or higher. It may already be available on your system as `gmake`. GNU `make` is available from [http://www.gnu.org/software/make/](http://www.gnu.org/software/make/).

- A working ANSI C++ compiler. GCC 4.2.1 or later, Sun Studio 12 or later, Visual Studio 2008 or later, and many current vendor-supplied compilers are known to work.

- An SSL library is required for support of encrypted connections, entropy for random number generation, and other encryption-related operations. To specify the library explicitly, use the `WITH_SSL` option when you invoke CMake. For additional information, see Section 4.6, “Configuring SSL Library Support”.

- The `ncurses` library.

- Sufficient free memory. If you encounter problems such as “internal compiler error” when compiling large source files, it may be that you have too little memory. If compiling on a virtual machine, try increasing the memory allocation.

- Perl is needed if you intend to run test scripts. Most Unix-like systems include Perl. On Windows, you can use a version such as ActiveState Perl.

To install MySQL from a standard source distribution, one of the following tools is required to unpack the distribution file:

- For a `.tar.gz` compressed `tar` file: 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/](http://www.gnu.org/software/tar/).

- For a `.zip` Zip archive: WinZip or another tool that can read `.zip` files.

- For an `.rpm` RPM package: The `rpmbuild` program used to build the distribution unpacks it.

To install MySQL from a development source tree, the following additional tools are required:

- The Git revision control system is required to obtain the development source code. The [GitHub Help](https://github.com) provides instructions for downloading and installing Git on different platforms. MySQL officially joined GitHub in September, 2014. For more information about MySQL’s move to GitHub, refer to the announcement on the MySQL Release Engineering blog: [MySQL on GitHub](https://github.com/mysql)
MySQL Layout for Source Installation

- **bison** 2.1 or higher, available from http://www.gnu.org/software/bison/. (Version 1 is no longer supported.) Use the latest version of **bison** where possible; if you experience problems, upgrade to a later version, rather than revert to an earlier one.

  **bison** is available from http://www.gnu.org/software/bison/. **bison** for Windows can be downloaded from http://gnuwin32.sourceforge.net/packages/bison.htm. Download the package labeled “Complete package, excluding sources”. On Windows, the default location for **bison** is the `C:\Program Files \GnuWin32` directory. Some utilities may fail to find **bison** because of the space in the directory name. Also, Visual Studio may simply hang if there are spaces in the path. You can resolve these problems by installing into a directory that does not contain a space (for example `C:\GnuWin32`).

- On Solaris Express, **m4** must be installed in addition to **bison**. **m4** is available from http://www.gnu.org/software/m4/.

**Note**

If you have to install any programs, modify your **PATH** environment variable to include any directories in which the programs are located. See Setting Environment Variables.

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

4.3 MySQL Layout for Source Installation

By default, when you install MySQL after compiling it from source, the installation step installs files under `/usr/local/mysql`. The component locations under the installation directory are the same as for binary distributions. See Table 3.1, “MySQL Installation Layout for Generic Unix/Linux Binary Package”, and Section 5.1, “MySQL Installation Layout on Microsoft Windows”. To configure installation locations different from the defaults, use the options described at Section 4.7, “MySQL Source-Configuration Options”.

4.4 Installing MySQL Using a Standard Source Distribution

To install MySQL from a standard source distribution:

1. Verify that your system satisfies the tool requirements listed at Section 4.2, “Source Installation Prerequisites”.
2. Obtain a distribution file using the instructions in Section 2.2, “How to Get MySQL”.
3. Configure, build, and install the distribution using the instructions in this section.
4. Perform postinstallation procedures using the instructions in Chapter 9, Postinstallation Setup and Testing.

MySQL uses **CMake** as the build framework on all platforms. The instructions given here should enable you to produce a working installation. For additional information on using **CMake** to build MySQL, see How to Build MySQL Server with **CMake**.

If you start from a source RPM, use the following command to make a binary RPM that you can install. If you do not have `rpmbuild`, use `rpm` instead.

```
shell> rpmbuild --rebuild --clean MySQL-VERSION.src.rpm
```

The result is one or more binary RPM packages that you install as indicated in Section 7.1, “Installing MySQL on Linux Using RPM Packages”.

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The sequence for installation from a compressed `tar` file or Zip archive source distribution is similar to the process for installing from a generic binary distribution (see Chapter 3, *Installing MySQL on Unix/Linux Using Generic Binaries*), except that it is used on all platforms and includes steps to configure and compile the distribution. For example, with a compressed `tar` file source distribution on Unix, the basic installation command sequence looks like this:

```bash
# Preconfiguration setup
shell> groupadd mysql
shell> useradd -r -g mysql -s /bin/false mysql
# Beginning of source-build specific instructions
shell> tar zxvf mysql-VERSION.tar.gz
shell> cd mysql-VERSION
shell> mkdir bld
shell> cd bld
shell> cmake ..
shell> make
shell> make install
# End of source-build specific instructions
# Postinstallation setup
shell> cd /usr/local/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
```

A more detailed version of the source-build specific instructions is shown following.

**Note**

The procedure shown here does not set up any passwords for MySQL accounts. After following the procedure, proceed to Chapter 9, *Postinstallation Setup and Testing*, for postinstallation setup and testing.

- Perform Preconfiguration Setup
- Obtain and Unpack the Distribution
- Configure the Distribution
- Build the Distribution
- Install the Distribution
- Perform Postinstallation Setup

### Perform Preconfiguration Setup

On Unix, set up the `mysql` user and group that will be used to run and execute the MySQL server and own the database directory. For details, see Create a mysql User and Group. Then perform the following steps as the `mysql` user, except as noted.

### Obtain and Unpack the Distribution

Pick the directory under which you want to unpack the distribution and change location into it.
Configure the Distribution

Obtain a distribution file using the instructions in Section 2.2, “How to Get MySQL”.

Unpack the distribution into the current directory:

- To unpack a compressed tar file, tar can uncompress and unpack the distribution if it has z option support:

  shell> tar zxvf mysql-VERSION.tar.gz

  If your tar does not have z option support, use gunzip to unpack the distribution and tar to unpack it:

  shell> gunzip < mysql-VERSION.tar.gz | tar xvf -

  Alternatively, CMake can uncompress and unpack the distribution:

  shell> cmake -E tar zxvf mysql-VERSION.tar.gz

- To unpack a Zip archive, use WinZip or another tool that can read .zip files.

  Unpacking the distribution file creates a directory named mysql-VERSION.

Configure the Distribution

Change location into the top-level directory of the unpacked distribution:

shell> cd mysql-VERSION

Build outside of the source tree to keep the tree clean. If the top-level source directory is named mysql-src under your current working directory, you can build in a directory named bld at the same level. Create the directory and go there:

shell> mkdir bld
shell> cd bld

Configure the build directory. The minimum configuration command includes no options to override configuration defaults:

shell> cmake ../mysql-src

The build directory needs not be outside the source tree. For example, you can build in a directory named bld under the top-level source tree. To do this, starting with mysql-src as your current working directory, create the directory bld and then go there:

shell> mkdir bld
shell> cd bld

Configure the build directory. The minimum configuration command includes no options to override configuration defaults:

shell> cmake ..

If you have multiple source trees at the same level (for example, to build multiple versions of MySQL), the second strategy can be advantageous. The first strategy places all build directories at the same level, which requires that you choose a unique name for each. With the second strategy, you can use the
same name for the build directory within each source tree. The following instructions assume this second strategy.

On Windows, specify the development environment. For example, the following commands configure MySQL for 32-bit or 64-bit builds, respectively:

```shell
shell> cmake .. -G "Visual Studio 9 2008"
shell> cmake .. -G "Visual Studio 9 2008 Win64"
```

On macOS, to use the Xcode IDE:

```shell
shell> cmake .. -G Xcode
```

When you run `cmake`, you might want to add options to the command line. Here are some examples:

- `-DBUILD_CONFIG=mysql_release`: Configure the source with the same build options used by Oracle to produce binary distributions for official MySQL releases.
- `-DCMAKE_INSTALL_PREFIX=dir_name`: Configure the distribution for installation under a particular location.
- `-DCPACK_MONOLITHIC_INSTALL=1`: Cause `make package` to generate a single installation file rather than multiple files.
- `-DWITH_DEBUG=1`: Build the distribution with debugging support.

For a more extensive list of options, see Section 4.7, “MySQL Source-Configuration Options”.

To list the configuration options, use one of the following commands:

```shell
shell> cmake .. -L # overview
shell> cmake .. -LH # overview with help text
shell> cmake .. -LAH # all params with help text
shell> ccmake .. # interactive display
```

If `CMake` fails, you might need to reconfigure by running it again with different options. If you do reconfigure, take note of the following:

- If `CMake` is run after it has previously been run, it may use information that was gathered during its previous invocation. This information is stored in `CMakeCache.txt`. When `CMake` starts, it looks for that file and reads its contents if it exists, on the assumption that the information is still correct. That assumption is invalid when you reconfigure.

- Each time you run `CMake`, you must run `make` again to recompile. However, you may want to remove old object files from previous builds first because they were compiled using different configuration options.

To prevent old object files or configuration information from being used, run these commands in the build directory on Unix before re-running `CMake`:

```shell
shell> make clean
shell> rm CMakeCache.txt
```

Or, on Windows:

```shell
shell> devenv MySQL.sln /clean
shell> del CMakeCache.txt
```
Before asking on the MySQL Community Slack, check the files in the CMakeFiles directory for useful information about the failure. To file a bug report, please use the instructions in How to Report Bugs or Problems.

Build the Distribution

On Unix:

shell> make
shell> make VERBOSE=1

The second command sets VERBOSE to show the commands for each compiled source.

Use gmake instead on systems where you are using GNU make and it has been installed as gmake.

On Windows:

shell> devenv MySQL.sln /build RelWithDebInfo

If you have gotten to the compilation stage, but the distribution does not build, see Section 4.8, “Dealing with Problems Compiling MySQL”, for help. If that does not solve the problem, please enter it into our bugs database using the instructions given in How to Report Bugs or Problems. If you have installed the latest versions of the required tools, and they crash trying to process our configuration files, please report that also. However, if you get a command not found error or a similar problem for required tools, do not report it. Instead, make sure that all the required tools are installed and that your PATH variable is set correctly so that your shell can find them.

Install the Distribution

On Unix:

shell> make install

This installs the files under the configured installation directory (by default, /usr/local/mysql). You might need to run the command as root.

To install in a specific directory, add a DESTDIR parameter to the command line:

shell> make install DESTDIR="/opt/mysql"

Alternatively, generate installation package files that you can install where you like:

shell> make package

This operation produces one or more .tar.gz files that can be installed like generic binary distribution packages. See Chapter 3, Installing MySQL on Unix/Linux Using Generic Binaries. If you run CMake with -DCPACK_MONOLITHIC_INSTALL=1, the operation produces a single file. Otherwise, it produces multiple files.

On Windows, generate the data directory, then create a .zip archive installation package:

shell> devenv MySQL.sln /build RelWithDebInfo /project initial_database
shell> devenv MySQL.sln /build RelWithDebInfo /project package

You can install the resulting .zip archive where you like. See Section 5.6, “Installing MySQL on Microsoft Windows Using a noinstall ZIP Archive”.
Perform Postinstallation Setup

The remainder of the installation process involves setting up the configuration file, creating the core databases, and starting the MySQL server. For instructions, see Chapter 9, *Postinstallation Setup and Testing*.

**Note**
The accounts that are listed in the MySQL grant tables initially have no passwords. After starting the server, you should set up passwords for them using the instructions in Chapter 9, *Postinstallation Setup and Testing*.

### 4.5 Installing MySQL Using a Development Source Tree

This section describes how to install MySQL from the latest development source code, which is hosted on GitHub. To obtain the MySQL Server source code from this repository hosting service, you can set up a local MySQL Git repository.

On GitHub, MySQL Server and other MySQL projects are found on the MySQL page. The MySQL Server project is a single repository that contains branches for several MySQL series.

MySQL officially joined GitHub in September, 2014. For more information about MySQL's move to GitHub, refer to the announcement on the MySQL Release Engineering blog: *MySQL on GitHub*

- **Prerequisites for Installing from Development Source**
- **Setting Up a MySQL Git Repository**

**Prerequisites for Installing from Development Source**

To install MySQL from a development source tree, your system must satisfy the tool requirements listed at Section 4.2, “Source Installation Prerequisites”.

**Setting Up a MySQL Git Repository**

To set up a MySQL Git repository on your machine, use this procedure:

1. Clone the MySQL Git repository to your machine. The following command clones the MySQL Git repository to a directory named `mysql-server`. The initial download will take some time to complete, depending on the speed of your connection.

   ```bash
   ~$ git clone https://github.com/mysql/mysql-server.git
   Cloning into 'mysql-server'...
   remote: Counting objects: 1035465, done.
   remote: Total 1035465 (delta 0), reused 0 (delta 0)
   Receiving objects: 100% (1035465/1035465), 437.48 MiB | 5.10 MiB/s, done.
   Resolving deltas: 100% (855607/855607), done.
   Checking connectivity... done.
   Checking out files: 100% (21902/21902), done.
   ```

2. When the clone operation completes, the contents of your local MySQL Git repository appear similar to the following:

   ```bash
   ~$ cd mysql-server
   ~/mysql-server$ ls
   BUILD            COPYING             libmysqld    regex    tests
   BUILD-CMAKE      dbug                libservices  scripts  unittest
   client           Docs                man          sql       VERSION
   cmake            extra                mysql-test   sql-bench  vio
   CMakeLists.txt   include             mysys        sql-common  win
   ```
3. Use the `git branch -r` command to view the remote tracking branches for the MySQL repository.

```bash
~/mysql-server$ git branch -r
origin/5.5
origin/5.6
origin/5.7
origin/HEAD -> origin/5.7
origin/cluster-7.2
origin/cluster-7.3
origin/cluster-7.4
```

4. To view the branches that are checked out in your local repository, issue the `git branch` command. When you cloned the MySQL Git repository, the MySQL 5.7 branch was checked out automatically. The asterisk identifies the 5.7 branch as the active branch.

```bash
~/mysql-server$ git branch
* 5.7
```

5. To check out a different MySQL branch, run the `git checkout` command, specifying the branch name. For example, to check out the MySQL 5.5 branch:

```bash
~/mysql-server$ git checkout 5.5
Branch 5.5 set up to track remote branch 5.5 from origin.
Switched to a new branch '5.5'
```

6. Run `git branch` again to verify that the MySQL 5.5 branch is present. MySQL 5.5, which is the last branch you checked out, is marked by an asterisk indicating that it is the active branch.

```bash
~/mysql-server$ git branch
* 5.7
5.5
```

The `git checkout` command is also used to switch branches. For example, to make MySQL 5.7 the active branch again, you would run `git checkout 5.7`.

7. To obtain changes made after your initial setup of the MySQL Git repository, switch to the branch you want to update and issue the `git pull` command:

```bash
~/mysql-server$ git checkout 5.5
~/mysql-server$ git pull
```

To examine the commit history, use the `git log` option:

```bash
~/mysql-server$ git log
```

You can also browse commit history and source code on the GitHub MySQL site.

If you see changes or code that you have a question about, ask on the MySQL Community Slack. For information about contributing a patch, see Contributing to MySQL Server.

8. After you have cloned the MySQL Git repository and have checked out the branch you want to build, you can build MySQL Server from the source code. Instructions are provided in Section 4.4, “Installing MySQL Using a Standard Source Distribution”, except that you skip the part about obtaining and unpacking the distribution.

Be careful about installing a build from a distribution source tree on a production machine. The installation command may overwrite your live release installation. If you already have MySQL installed and do not want to overwrite it, run `CMake` with values for the `CMAKE_INSTALL_PREFIX`,
MYSQL_TCP_PORT, and MYSQL_UNIX_ADDR options different from those used by your production server. For additional information about preventing multiple servers from interfering with each other, see Running Multiple MySQL Instances on One Machine.

Play hard with your new installation. For example, try to make new features crash. Start by running make test. See The MySQL Test Suite.

### 4.6 Configuring SSL Library Support

An SSL library is required for support of encrypted connections, entropy for random number generation, and other encryption-related operations. Your system must support either OpenSSL or yaSSL:

- MySQL Enterprise Edition binary distributions are compiled using yaSSL.
- MySQL Community Edition binary distributions are compiled using yaSSL.
- MySQL Community Edition source distributions can be compiled using either OpenSSL or yaSSL.

If you compile MySQL from a source distribution, CMake configures the distribution to use yaSSL by default. To compile using OpenSSL instead, use this procedure:

1. Ensure that OpenSSL 1.0.1 or higher is installed on your system. If it is necessary to obtain OpenSSL, visit [http://www.openssl.org](http://www.openssl.org).

2. The WITH_SSL CMake option determines which SSL library to use for compiling MySQL (see Section 4.7, “MySQL Source-Configuration Options”). The default is `-DWITH_SSL=bundled`, which uses yaSSL. To use OpenSSL, add the `-DWITH_SSL=system` option to the CMake command you normally use to configure the MySQL source distribution. For example:

   ```
   cmake . -DWITH_SSL=system
   ```

   That command configures the distribution to use the installed OpenSSL library.

3. Compile and install the distribution.

   To check whether a mysqld server supports encrypted connections, examine the value of the have_ssl system variable:

   ```
   mysql> SHOW VARIABLES LIKE 'have_ssl';
   +---------------+-------+
   | Variable_name | Value |
   +---------------+-------+
   | have_ssl      | YES   |
   +---------------+-------+
   ```

   If the value is YES, the server supports encrypted connections. If the value is DISABLED, the server is capable of supporting encrypted connections but was not started with the appropriate --ssl-xxx options to enable encrypted connections to be used; see Configuring MySQL to Use Encrypted Connections.

### 4.7 MySQL Source-Configuration Options

The CMake program provides a great deal of control over how you configure a MySQL source distribution. Typically, you do this using options on the CMake command line. For information about options supported by CMake, run either of these commands in the top-level source directory:

```
make . -lH
ccmake .
```
You can also affect CMake using certain environment variables. See Chapter 12, MySQL Environment Variables.

For boolean options, the value may be specified as 1 or ON to enable the option, or as 0 or OFF to disable the option.

Many options configure compile-time defaults that can be overridden at server startup. For example, the CMAKE_INSTALL_PREFIX, MYSQL_TCP_PORT, and MYSQL_UNIX_ADDR options that configure the default installation base directory location, TCP/IP port number, and Unix socket file can be changed at server startup with the --basedir, --port, and --socket options for mysqld. Where applicable, configuration option descriptions indicate the corresponding mysqld startup option.

The following sections provide more information about CMake options.

• CMake Option Reference
• General Options
• Installation Layout Options
• Storage Engine Options
• Feature Options
• Compiler Flags
• CMake Options for Compiling NDB Cluster

CMake Option Reference

The following table shows the available CMake options. In the Default column, PREFIX stands for the value of the CMAKE_INSTALL_PREFIX option, which specifies the installation base directory. This value is used as the parent location for several of the installation subdirectories.

<table>
<thead>
<tr>
<th>Formats</th>
<th>Description</th>
<th>Default</th>
<th>Introduced</th>
<th>Removed</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUILD_CONFIG</td>
<td>Use same build options as official releases</td>
<td></td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>CMAKE_BUILD_TYPE</td>
<td>Type of build to produce</td>
<td>RelWithDebInfo</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>CMAKE_CXX_FLAGS</td>
<td>Flags for C++ Compiler</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMAKE_C_FLAGS</td>
<td>Flags for C Compiler</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMAKE_INSTALL_PREFIX</td>
<td>Installation base directory</td>
<td>/usr/local/mysql</td>
<td>5.5.8</td>
<td></td>
</tr>
<tr>
<td>COMPILATION_COMMENT</td>
<td>Comment about compilation environment</td>
<td></td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>CPACK_MONOLITHIC_INSTALL</td>
<td>Whether package build produces single file</td>
<td>OFF</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>DEFAULT_CHARSET</td>
<td>The default server character set</td>
<td>latin1</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>DEFAULT_COLLATION</td>
<td>The default server collation</td>
<td>latin1_swedish_c</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>ENABLED_LOCAL_INFILE</td>
<td>Whether to enable LOCAL for LOAD DATA</td>
<td>OFF</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>Formats</td>
<td>Description</td>
<td>Default</td>
<td>Introduced/Removed</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------------------------------------</td>
<td>---------</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td>ENABLED_PROFILING</td>
<td>Whether to enable query profiling code</td>
<td>ON</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>ENABLE_DEBUG_SYNC</td>
<td>Whether to enable Debug Sync support</td>
<td>ON</td>
<td>5.5.7 5.5.55</td>
<td></td>
</tr>
<tr>
<td>ENABLE_DOWNLOADS</td>
<td>Whether to download optional files</td>
<td>OFF</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>ENABLE_DTRACE</td>
<td>Whether to include DTrace support</td>
<td></td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>ENABLE_GCOV</td>
<td>Whether to include gcov support</td>
<td></td>
<td>5.5.14</td>
<td></td>
</tr>
<tr>
<td>IGNORE_AIO_CHECK</td>
<td>With -DBUILD_CONFIG=mysql_release, ignore libaio check</td>
<td>OFF</td>
<td>5.5.9</td>
<td></td>
</tr>
<tr>
<td>INSTALL_BINDIR</td>
<td>User executables directory</td>
<td>PREFIX/bin</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_DOCDIR</td>
<td>Documentation directory</td>
<td>PREFIX/docs</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_DOCREADMEDIR</td>
<td>README file directory</td>
<td>PREFIX/docs</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_INCLUDEDIR</td>
<td>Header file directory</td>
<td>PREFIX/include</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_INFODIR</td>
<td>Info file directory</td>
<td>PREFIX/docs</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_LAYOUT</td>
<td>Select predefined installation layout</td>
<td>STANDALONE</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_LIBDIR</td>
<td>Library file directory</td>
<td>PREFIX/lib</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_MANDIR</td>
<td>Manual page directory</td>
<td>PREFIX/man</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_MYSQLSHAREDIR</td>
<td>Shared data directory</td>
<td>PREFIX/share</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_MYSQLTESTDIR</td>
<td>mysql-test directory</td>
<td>PREFIX/mysql-test</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_PLUGINDIR</td>
<td>Plugin directory</td>
<td>PREFIX/lib/plugin</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_SBINDIR</td>
<td>Server executable directory</td>
<td>PREFIX/bin</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_SCRIPTDIR</td>
<td>Scripts directory</td>
<td>PREFIX/scripts</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_SECURE_FILE_PRIV</td>
<td>secure_file_priv default value for libmysqld</td>
<td></td>
<td>5.5.53</td>
<td></td>
</tr>
<tr>
<td>INSTALL_SECURE_FILE_PRIV</td>
<td>secure_file_priv default value for libmysqld</td>
<td></td>
<td>5.5.53</td>
<td></td>
</tr>
<tr>
<td>INSTALL_SHAREDIR</td>
<td>aclocal/mysql.m4 installation directory</td>
<td>PREFIX/share</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_SQLBENCHDIR</td>
<td>sql-bench directory</td>
<td>PREFIX</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>INSTALL_SUPPORTFILESDIR</td>
<td>Extra support files directory</td>
<td>PREFIX/support-files</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>MEMCACHED_HOME</td>
<td>Path to memcached</td>
<td>[none]</td>
<td>5.5.16-ndb-7.2.2</td>
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</tr>
<tr>
<td>MYSQL_DATADIR</td>
<td>Data directory</td>
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<tr>
<td>Formats</td>
<td>Description</td>
<td>Default</td>
<td>Introduced</td>
<td>Removed</td>
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<td>------------------------------------------</td>
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<td>---------</td>
<td>------------</td>
<td>---------</td>
</tr>
<tr>
<td>MYSQL_MAINTAINER_MODE</td>
<td>Whether to enable MySQL maintainer-specific development environment</td>
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<td>MYSQL_PROJECT_NAME</td>
<td>Windows/OS X project name</td>
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<td>MYSQL_TCP_PORT</td>
<td>TCP/IP port number</td>
<td>3306</td>
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<tr>
<td>MYSQL_UNIX_ADDR</td>
<td>Unix socket file</td>
<td>/tmp/mysql.sock</td>
<td>5.5.7</td>
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</tr>
<tr>
<td>ODBC_INCLUDES</td>
<td>ODBC includes directory</td>
<td></td>
<td></td>
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<tr>
<td>ODBC_LIB_DIR</td>
<td>ODBC library directory</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>REPRODUCIBLE_BUILD</td>
<td>Take extra care to create a build result independent of build location and time</td>
<td></td>
<td>5.5.57</td>
<td></td>
</tr>
<tr>
<td>SYSCONFDIR</td>
<td>Option file directory</td>
<td></td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>TMPDIR</td>
<td>tmpdir default value</td>
<td></td>
<td>5.5.36</td>
<td></td>
</tr>
<tr>
<td>WITHOUT_xxx_STORAGE_ENGINE</td>
<td>Exclude storage engine xxx from build</td>
<td></td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>WITH_ASAN</td>
<td>Enable AddressSanitizer</td>
<td>OFF</td>
<td>5.5.35</td>
<td></td>
</tr>
<tr>
<td>WITH_BUNDLED_LIBEVENT</td>
<td>Use bundled libevent when building ndbmemcache</td>
<td>ON</td>
<td>5.5.16-ndb-7.2.2</td>
<td></td>
</tr>
<tr>
<td>WITH_BUNDLED_MEMCACHED</td>
<td>Use bundled memcached when building ndbmemcache</td>
<td>ON</td>
<td>5.5.16-ndb-7.2.2</td>
<td></td>
</tr>
<tr>
<td>WITH_CLASSPATH</td>
<td>Classpath to use when building MySQL Cluster Connector for Java. Default is an empty string.</td>
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</tr>
<tr>
<td>WITH_DEBUG</td>
<td>Whether to include debugging support</td>
<td>OFF</td>
<td>5.5.7</td>
<td></td>
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<tr>
<td>WITH_EMBEDDED_SERVER</td>
<td>Whether to build embedded server</td>
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<td>5.5.7</td>
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<tr>
<td>WITH_EMBEDDED_SHARED_LIBRARY</td>
<td>Whether to build a shared embedded server library</td>
<td>OFF</td>
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<td></td>
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<tr>
<td>WITH_ERROR_INSERT</td>
<td>Enable error injection in the NDB storage engine. Should not be used for building binaries intended for production.</td>
<td>OFF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WITH_EXTRA_CHARSETS</td>
<td>Which extra character sets to include</td>
<td>all</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>WITH_LIBEDIT</td>
<td>Use bundled libedit library</td>
<td>ON</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>WITH_LIBWRAP</td>
<td>Whether to include libwrap (TCP wrappers) support</td>
<td>OFF</td>
<td>5.5.7</td>
<td></td>
</tr>
<tr>
<td>WITH_NDBCLUSTER</td>
<td>Build the NDB storage engine; alias for WITH_NDBCLUSTER_STORAGE_ENGINE</td>
<td>ON</td>
<td></td>
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<tr>
<td>WITH_NDBCLUSTER_STORAGE</td>
<td>Build the NDB storage engine</td>
<td>ON</td>
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</tbody>
</table>
### Formats

<table>
<thead>
<tr>
<th>Formats</th>
<th>Description</th>
<th>Default</th>
<th>Introduced/Removed</th>
</tr>
</thead>
<tbody>
<tr>
<td>WITH_NDBMTD</td>
<td>Build multithreaded data node.</td>
<td>ON</td>
<td></td>
</tr>
<tr>
<td>WITH_NDB_BINLOG</td>
<td>Enable binary logging by default by mysqld.</td>
<td>ON</td>
<td></td>
</tr>
<tr>
<td>WITH_NDB_DEBUG</td>
<td>Produce a debug build for testing or troubleshooting.</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td>WITH_NDB_JAVA</td>
<td>Enable building of Java and ClusterJ support. Enabled by default. Supported in MySQL Cluster only.</td>
<td>ON</td>
<td>5.5.27-ndb-7.2.9</td>
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<tr>
<td>WITH_NDB_PORT</td>
<td>Default port used by a management server built with this option. If this option was not used to build it, the management server's default port is 1186.</td>
<td>[none]</td>
<td></td>
</tr>
<tr>
<td>WITH_NDB_TEST</td>
<td>Include NDB API test programs.</td>
<td>OFF</td>
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</tr>
<tr>
<td>WITH_READLINE</td>
<td>Use bundled readline library</td>
<td>OFF</td>
<td>5.5.7</td>
</tr>
<tr>
<td>WITH_SSL</td>
<td>Type of SSL support</td>
<td>bundled</td>
<td>5.5.7</td>
</tr>
<tr>
<td>WITH_UNIT_TESTS</td>
<td>Compile MySQL with unit tests</td>
<td>ON</td>
<td></td>
</tr>
<tr>
<td>WITH_UNIXODBC</td>
<td>Enable unixODBC support</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td>WITH_VALGRIND</td>
<td>Whether to compile in Valgrind header files</td>
<td>OFF</td>
<td>5.5.6</td>
</tr>
<tr>
<td>WITH_ZLIB</td>
<td>Type of zlib support</td>
<td>bundled</td>
<td>5.5.7</td>
</tr>
<tr>
<td>WITH_xxx_STORAGE_ENGINE</td>
<td>Compile storage engine xxx statically into server</td>
<td></td>
<td>5.5.7</td>
</tr>
</tbody>
</table>

### General Options

- `-DBUILD_CONFIG=mysql_release`

  This option configures a source distribution with the same build options used by Oracle to produce binary distributions for official MySQL releases.

- `-DCMAKE_BUILD_TYPE=type`

  The type of build to produce:

  - **RelWithDebInfo**: Enable optimizations and generate debugging information. This is the default MySQL build type.

  - **Debug**: Disable optimizations and generate debugging information. This build type is also used if the `WITH_DEBUG` option is enabled. That is, `-DWITH_DEBUG=1` has the same effect as `-DCMAKE_BUILD_TYPE=Debug`.

- `-DCPACK_MONOLITHIC_INSTALL=bool`

  This option affects whether the `make package` operation produces multiple installation package files or a single file. If disabled, the operation produces multiple installation package files, which may be useful
if you want to install only a subset of a full MySQL installation. If enabled, it produces a single file for installing everything.

**Installation Layout Options**

The `CMAKE_INSTALL_PREFIX` option indicates the base installation directory. Other options with names of the form `INSTALL_.xxx` that indicate component locations are interpreted relative to the prefix and their values are relative pathnames. Their values should not include the prefix.

- `-DCMAKE_INSTALL_PREFIX=dir_name`
  
  The installation base directory.
  
  This value can be set at server startup with the `--basedir` option.

- `-DINSTALL_BINDIR=dir_name`
  
  Where to install user programs.

- `-DINSTALL_DOCDIR=dir_name`
  
  Where to install documentation.

- `-DINSTALL_DOCREADMEDIR=dir_name`
  
  Where to install README files.

- `-DINSTALL_INCLUDEDIR=dir_name`
  
  Where to install header files.

- `-DINSTALL_INFODIR=dir_name`
  
  Where to install Info files.

- `-DINSTALL_LAYOUT=name`
  
  Select a predefined installation layout:
  
  - `STANDALONE`: Same layout as used for `.tar.gz` and `.zip` packages. This is the default.
  - `RPM`: Layout similar to RPM packages.
  - `SVR4`: Solaris package layout.
  - `DEB`: DEB package layout (experimental).
  
  You can select a predefined layout but modify individual component installation locations by specifying other options. For example:

  ```
cmake . -DINSTALL_LAYOUT=SVR4 -DMYSQL_DATADIR=/var/mysql/data
  ```

- `-DINSTALL_LIBDIR=dir_name`
  
  Where to install library files.

- `-DINSTALL_MANDIR=dir_name`
  
  Where to install manual pages.
Installation Layout Options

- `-DINSTALL_MYSQLSHAREDIR=dir_name`
  Where to install shared data files.

- `-DINSTALL_MYSQLTESTDIR=dir_name`
  Where to install the `mysql-test` directory. As of MySQL 5.5.32, to suppress installation of this directory, explicitly set the option to the empty value (`-DINSTALL_MYSQLTESTDIR=`).

- `-DINSTALL_PLUGINDIR=dir_name`
  The location of the plugin directory.
  This value can be set at server startup with the `--plugin_dir` option.

- `-DINSTALL_SBINDIR=dir_name`
  Where to install the `mysqld` server.

- `-DINSTALL_SCRIPTDIR=dir_name`
  Where to install `mysql_install_db`.

- `-DINSTALL_SECURE_FILE_PRIVDIR=dir_name`
  The default value for the `secure_file_priv` system variable. The default value is platform specific and depends on the value of the `INSTALL_LAYOUT` CMake option; see the description of the `secure_file_priv` system variable in Server System Variables.
  This option was added in MySQL 5.5.53. To set the value for the libmysqld embedded server, use `INSTALL_SECURE_FILE_PRIV_EMBEDDEDDIR`.

- `-DINSTALL_SECURE_FILE_PRIV_EMBEDDEDDIR=dir_name`
  The default value for the `secure_file_priv` system variable, for the libmysqld embedded server. This option was added in MySQL 5.5.53.

- `-DINSTALL_SHAREDIR=dir_name`
  Where to install `aclocal/mysql.m4`.

- `-DINSTALL_SQLBENCHDIR=dir_name`
  Where to install the `sql-bench` directory. To suppress installation of this directory, explicitly set the option to the empty value (`-DINSTALL_SQLBENCHDIR=`).

- `-DINSTALL_SUPPORTFILES=dir_name`
  Where to install extra support files.

- `-DMYSQL_DATADIR=dir_name`
  The location of the MySQL data directory.
  This value can be set at server startup with the `--datadir` option.

- `-DMYSQL_DATADIR=dir_name`
  The location of the ODBC includes directory, and may be used while configuring Connector/ODBC.
Storage Engine Options

- **-DODBC_LIB_DIR=dir_name**
  The location of the ODBC library directory, and may be used while configuring Connector/ODBC.

- **-DSYSCONFDIR=dir_name**
  The default my.cnf option file directory.
  This location cannot be set at server startup, but you can start the server with a given option file using the `--defaults-file=file_name` option, where `file_name` is the full path name to the file.

- **-DTMPDIR=dir_name**
  The default location to use for the tmpdir system variable. If unspecified, the value defaults to `P_tmpdir` in `<stdio.h>`. This option was added in MySQL 5.6.16.

Storage Engine Options

Storage engines are built as plugins. You can build a plugin as a static module (compiled into the server) or a dynamic module (built as a dynamic library that must be installed into the server using the `INSTALL PLUGIN` statement or the `--plugin-load` option before it can be used). Some plugins might not support static or dynamic building.

The InnoDB, MyISAM, MERGE, MEMORY, and CSV engines are mandatory (always compiled into the server) and need not be installed explicitly.

To compile a storage engine statically into the server, use `-DWITH_engine_STORAGE_ENGINE=1`. Some permissible `engine` values are ARCHIVE, BLACKHOLE, EXAMPLE, FEDERATED, NDBCLUSTER (NDB), PARTITION (partitioning support), and PERFSCHEMA (Performance Schema). Examples:

```
-DWITH_ARCHIVE_STORAGE_ENGINE=1
-DWITH_BLACKHOLE_STORAGE_ENGINE=1
-DWITH_PERFSCHEMA_STORAGE_ENGINE=1
```

**Note**

`WITH_NDBCLUSTER_STORAGE_ENGINE` is supported only when building NDB Cluster using the NDB Cluster sources. It cannot be used to enable clustering support in other MySQL source trees or distributions. In MySQL NDB Cluster 7.2 source distributions, it is enabled by default. See Building NDB Cluster from Source on Linux, and Compiling and Installing NDB Cluster from Source on Windows, for more information.

To exclude a storage engine from the build, use `-DWITHOUT_engine_STORAGE_ENGINE=1`. Examples:

```
-DWITHOUT_EXAMPLE_STORAGE_ENGINE=1
-DWITHOUT_FEDERATED_STORAGE_ENGINE=1
-DWITHOUT_PARTITION_STORAGE_ENGINE=1
```

If neither `-DWITH_engine_STORAGE_ENGINE` nor `-DWITHOUT_engine_STORAGE_ENGINE` are specified for a given storage engine, the engine is built as a shared module, or excluded if it cannot be built as a shared module.

Feature Options

- **-DCOMPIILATION_COMMENT=string**
  A descriptive comment about the compilation environment.
• `-DEFAULT_CHARSET=charset_name`

The server character set. By default, MySQL uses the latin1 (cp1252 West European) character set.

`charset_name` may be one of binary, armSCII8, ascii, big5, cp1250, cp1251, cp1256, cp1257, cp850, cp852, cp932, dec8, eucjpms, euckr, gb2312, gbk, geostd8, greek, hebrew, hp8, keybcs2, koi8r, koi8u, latin1, latin2, latin5, latin7, macce, macroman, sjis, swe7, tis620, ucs2, ujis, utf8, utf8mb4, utf16, utf32. The permissible character sets are listed in the cmake/character_sets.cmake file as the value of CHARSETS_AVAILABLE.

This value can be set at server startup with the `--character_set_server` option.

• `-DEFAULT_COLLATION=collation_name`

The server collation. By default, MySQL uses latin1_swedish_ci. Use the SHOW COLLATION statement to determine which collations are available for each character set.

This value can be set at server startup with the `--collation_server` option.

• `-ENABLE_DEBUG_SYNC=bool`

**Note**

As of MySQL 5.5.55, `ENABLE_DEBUG_SYNC` is removed and enabling WITH_DEBUG enables Debug Sync.

Whether to compile the Debug Sync facility into the server. This facility is used for testing and debugging. This option is enabled by default, but has no effect unless MySQL is configured with debugging enabled. If debugging is enabled and you want to disable Debug Sync, use `-DENABLE_DEBUG_SYNC=0`.

When compiled in, Debug Sync is disabled by default at runtime. To enable it, start mysqld with the `--debug-sync-timeout=N` option, where `N` is a timeout value greater than 0. (The default value is 0, which disables Debug Sync.) `N` becomes the default timeout for individual synchronization points.

For a description of the Debug Sync facility and how to use synchronization points, see MySQL Internals: Test Synchronization.

• `-ENABLE_DOWNLOADS=bool`

Whether to download optional files. For example, with this option enabled, CMake downloads the Google Test distribution that is used by the test suite to run unit tests.

• `-ENABLE_DTRACE=bool`

Whether to include support for DTrace probes. For information about DTrace, see Tracing mysqld Using DTrace.

• `-ENABLE_GCOV=bool`

Whether to include gcov support (Linux only).

• `-ENABLED_LOCAL_INFILE=bool`

This option controls the compiled-in default LOCAL capability for the MySQL client library. Clients that make no explicit arrangements therefore have LOCAL capability disabled or enabled according to the ENABLED_LOCAL_INFILE setting specified at MySQL build time.
By default, the client library in MySQL binary distributions is compiled with `ENABLED_LOCAL_INFILE` enabled. If you compile MySQL from source, configure it with `ENABLED_LOCAL_INFILE` disabled or enabled based on whether clients that make no explicit arrangements should have `LOCAL` capability disabled or enabled, respectively.

`ENABLED_LOCAL_INFILE` controls the default for client-side `LOCAL` capability. For the server, the `local_infile` system variable controls server-side `LOCAL` capability. To explicitly cause the server to refuse or permit `LOAD DATA LOCAL` statements (regardless of how client programs and libraries are configured at build time or runtime), start `mysqld` with `local_infile` disabled or enabled, respectively. `local_infile` can also be set at runtime. See Security Issues with `LOAD DATA LOCAL`.

- `-DENABLED_PROFILING=bool`
  Whether to enable query profiling code (for the `SHOW PROFILE` and `SHOW PROFILES` statements).

- `-DIGNORE_AIO_CHECK=bool`
  If the `-DBUILD_CONFIG=mysql_release` option is given on Linux, the `libaio` library must be linked in by default. If you do not have `libaio` or do not want to install it, you can suppress the check for it by specifying `-DIGNORE_AIO_CHECK=1`.

- `-DMYSQL_MAINTAINER_MODE=bool`
  Whether to enable a MySQL maintainer-specific development environment. If enabled, this option causes compiler warnings to become errors.

- `-DMYSQL_PROJECT_NAME=name`
  For Windows or macOS, the project name to incorporate into the project file name. This option was added in MySQL 5.5.21.

- `-DMYSQL_TCP_PORT=port_num`
  The port number on which the server listens for TCP/IP connections. The default is 3306.

  This value can be set at server startup with the `--port` option.

- `-DMYSQL_UNIX_ADDR=file_name`
  The Unix socket file path on which the server listens for socket connections. This must be an absolute path name. The default is `/tmp/mysql.sock`.

  This value can be set at server startup with the `--socket` option.

- `-DREPRODUCIBLE_BUILD=bool`
  For builds on Linux systems, this option controls whether to take extra care to create a build result independent of build location and time.

  This option was added in MySQL 5.5.55.

- `-DWITH_ASAN=bool`
  Whether to enable AddressSanitizer, for compilers that support it. The default is off. This option was added in MySQL 5.5.35.

- `-DWITH_DEBUG=bool`
Whether to include debugging support.

Configuring MySQL with debugging support enables you to use the `--debug="d,parser_debug"` option when you start the server. This causes the Bison parser that is used to process SQL statements to dump a parser trace to the server's standard error output. Typically, this output is written to the error log.

As of MySQL 5.5.55, enabling `WITH_DEBUG` also enables Debug Sync. For a description of the Debug Sync facility and how to use synchronization points, see MySQL Internals: Test Synchronization.

- `-DWITH_EMBEDDED_SERVER=bool`
  Whether to build the libmysqld embedded server library.

- `-DWITH_EMBEDDED_SHARED_LIBRARY=bool`
  Whether to build a shared libmysqld embedded server library. This option was added in MySQL 5.5.37.

- `-DWITH_EXTRA_CHARSETS=name`
  Which extra character sets to include:
  - `all`: All character sets. This is the default.
  - `complex`: Complex character sets.
  - `none`: No extra character sets.

- `-DWITH_LIBEDIT=bool`
  Whether to use the libedit library bundled with the distribution.

- `-DWITH_LIBWRAP=bool`
  Whether to include libwrap (TCP wrappers) support.

- `-DWITH_READLINE=bool`
  Whether to use the readline library bundled with the distribution.

- `-DWITH_SSL=ssl_type`
  For support of encrypted connections, entropy for random number generation, and other encryption-related operations, MySQL must be built using an SSL library. This option specifies which SSL library to use:
  - `no`: No SSL support. This is the default before MySQL 5.5.56. As of 5.5.56, this is no longer a permitted value and the default is `bundled`.
  - `yes`: Use the system OpenSSL library if present, else the library bundled with the distribution.
  - `bundled`: Use the SSL library bundled with the distribution. This is the default as of MySQL 5.5.56.
  - `system`: Use the system OpenSSL library.

For additional information about configuring the SSL library, see Section 4.6, “Configuring SSL Library Support”.
• **-DWITH_UNIT_TESTS=**{ON|OFF}

If enabled, compile MySQL with unit tests. The default is ON unless the server is not being compiled.

• **-DWITH_UNIXODBC=1**

Enables unixODBC support, for Connector/ODBC.

• **-DWITH_VALGRIND=bool**

Whether to compile in the Valgrind header files, which exposes the Valgrind API to MySQL code. The default is OFF.

To generate a Valgrind-aware debug build, **-DWITH_VALGRIND=1** normally is combined with **-DWITH_DEBUG=1**. See Building Debug Configurations.

• **-DWITH_ZLIB=**{zlib_type}

Some features require that the server be built with compression library support, such as the COMPRESS() and UNCOMPRESS() functions, and compression of the client/server protocol. The WITH_ZLIB indicates the source of zlib support:

• **bundled**: Use the zlib library bundled with the distribution. This is the default.

• **system**: Use the system zlib library.

## Compiler Flags

• **-DCMAKE_C_FLAGS="flags"**

Flags for the C Compiler.

• **-DCMAKE_CXX_FLAGS="flags"**

Flags for the C++ Compiler.

To specify your own C and C++ compiler flags, for flags that do not affect optimization, use the CMAKE_C_FLAGS and CMAKE_CXX_FLAGS CMake options.

When providing your own compiler flags, you might want to specify CMAKE_BUILD_TYPE as well.

For example, to create a 32-bit release build on a 64-bit Linux machine, do this:

```bash
mkdir bld
cd bld
cmake .. -DCMAKE_C_FLAGS=-m32 \
-DCMAKE_CXX_FLAGS=-m32 \
-DCMAKE_BUILD_TYPE=RelWithDebInfo
```

If you set flags that affect optimization (**-O** number), you must set the CMAKE_C_FLAGS_build_type and/or CMAKE_CXX_FLAGS_build_type options, where build_type corresponds to the CMAKE_BUILD_TYPE value. To specify a different optimization for the default build type (RelWithDebInfo) set the CMAKE_C_FLAGS_RELWITHDEBINFO and CMAKE_CXX_FLAGS_RELWITHDEBINFO options. For example, to compile on Linux with **-O3** and with debug symbols, do this:

```bash
cmake .. -DCMAKE_C_FLAGS_RELWITHDEBINFO="-O3 -g" \
```
The following options are for use when building MySQL NDB Cluster 7.2 or later. These options are supported only with the MySQL NDB Cluster 7.2 and later NDB Cluster sources; they are not supported when using sources from the MySQL 5.5 Server tree.

-DMEMCACHED_HOME=dir_name

Perform the build using the memcached (version 1.6 or later) installed in the system directory indicated by dir_name. Files from this installation that are used in the build include the memcached binary, header files, and libraries, as well as the memcached_utilities library and the header file engine_testapp.h.

You must leave this option unset when building ndbmemcache using the bundled memcached sources (WITH_BUNDLED_MEMCACHED option); in other words, the bundled sources are used by default).

This option was added in MySQL NDB Cluster 7.2.2.

While additional CMake options—such as for SASL authorization and for providing dtrace support—are available for use when compiling memcached from external sources, these options are currently not enabled for the memcached sources bundled with NDB Cluster.

-DWITH_BUNDLED_LIBEVENT={ON|OFF}

Use the libevent included in the NDB Cluster sources when building NDB Cluster with ndbmemcached support (MySQL NDB Cluster 7.2.2 and later). Enabled by default. OFF causes the system's libevent to be used instead.

-DWITH_BUNDLED_MEMCACHED={ON|OFF}

Build the memcached sources included in the NDB Cluster source tree (MySQL NDB Cluster 7.2.3 and later), then use the resulting memcached server when building the ndbmemcache engine. In this case, make install places the memcached binary in the installation bin directory, and the ndbmemcache engine shared library file ndb_engine.so in the installation lib directory.

This option is ON by default.

-DWITH_CLASSPATH=path

Sets the classpath for building NDB Cluster Connector for Java. The default is empty. In MySQL NDB Cluster 7.2.9 and later, this option is ignored if -DWITH_NDB_JAVA=OFF is used.

-DWITH_ERROR_INSERT={ON|OFF}

Enables error injection in the NDB kernel. For testing only; not intended for use in building production binaries. The default is OFF.

-DWITH_NDBCLUSTER_STORAGE_ENGINE={ON|OFF}

Build and link in support for the NDB (NDBCLUSTER) storage engine in mysqld. The default is ON.

-DWITH_NDBCLUSTER={ON|OFF}

This is an alias for WITH_NDBCLUSTER_STORAGE_ENGINE.

-DWITH_NDBMTD={ON|OFF}
Build the multithreaded data node executable `ndbmtd`. The default is ON.

- `--WITH_NDB_BINLOG={ON|OFF}`
  Enable binary logging by default in the `mysqld` built using this option. ON by default.

- `--WITH_NDB_DEBUG={ON|OFF}`
  Enable building the debug versions of the NDB Cluster binaries. OFF by default.

- `--WITH_NDB_JAVA={ON|OFF}`
  Enable building NDB Cluster with Java support, including ClusterJ.
  This option was added in MySQL NDB Cluster 7.2.9, and is ON by default. If you do not wish to compile NDB Cluster with Java support, you must disable it explicitly by specifying `--WITH_NDB_JAVA=OFF` when running `CMake`. Otherwise, if Java cannot be found, configuration of the build fails.

- `--WITH_NDB_PORT=port`
  Causes the NDB Cluster management server (`ndb_mgmd`) that is built to use this port by default. If this option is unset, the resulting management server tries to use port 1186 by default.

- `--WITH_NDB_TEST={ON|OFF}`
  If enabled, include a set of NDB API test programs. The default is OFF.

### 4.8 Dealing with Problems Compiling MySQL

The solution to many problems involves reconfiguring. If you do reconfigure, take note of the following:

- If `CMake` is run after it has previously been run, it may use information that was gathered during its previous invocation. This information is stored in `CMakeCache.txt`. When `CMake` starts, it looks for that file and reads its contents if it exists, on the assumption that the information is still correct. That assumption is invalid when you reconfigure.

- Each time you run `CMake`, you must run `make` again to recompile. However, you may want to remove old object files from previous builds first because they were compiled using different configuration options.

To prevent old object files or configuration information from being used, run the following commands before re-running `CMake`:

On Unix:

```
shell> make clean
shell> rm CMakeCache.txt
```

On Windows:

```
shell> devenv MySQL.sln /clean
shell> del CMakeCache.txt
```

If you build outside of the source tree, remove and recreate your build directory before re-running `CMake`. For instructions on building outside of the source tree, see How to Build MySQL Server with CMake.

On some systems, warnings may occur due to differences in system include files. The following list describes other problems that have been found to occur most often when compiling MySQL:
To define which C and C++ compilers to use, you can define the `CC` and `CXX` environment variables. For example:

```
shell> CC=gcc
shell> CXX=g++
shell> export CC CXX
```

To specify your own C and C++ compiler flags, use the `CMAKE_C_FLAGS` and `CMAKE_CXX_FLAGS` CMake options. See Compiler Flags.

To see what flags you might need to specify, invoke `mysql_config` with the `--cflags` option.

To see what commands are executed during the compile stage, after using CMake to configure MySQL, run `make VERBOSE=1` rather than just `make`.

If compilation fails, check whether the `MYSQL_MAINTAINER_MODE` option is enabled. This mode causes compiler warnings to become errors, so disabling it may enable compilation to proceed.

If your compile fails with errors such as any of the following, you must upgrade your version of `make` to GNU `make`:

```
make: Fatal error in reader: Makefile, line 18:
Badly formed macro assignment
```

Or:

```
make: file `Makefile' line 18: Must be a separator (:)
```

Or:

```
pthread.h: No such file or directory
```

Solaris and FreeBSD are known to have troublesome `make` programs.

GNU `make` 3.75 is known to work.

The `sql_yacc.cc` file is generated from `sql_yacc.yy`. Normally, the build process does not need to create `sql_yacc.cc` because MySQL comes with a pregenerated copy. However, if you do need to re-create it, you might encounter this error:

```
"sql_yacc.yy", line xxx fatal: default action causes potential...
```

This is a sign that your version of `yacc` is deficient. You probably need to install a recent version of `bison` (the GNU version of `yacc`) and use that instead.

Versions of `bison` older than 1.75 may report this error:

```
sql_yacc.yy:#####: fatal error: maximum table size (32767) exceeded
```

The maximum table size is not actually exceeded; the error is caused by bugs in older versions of `bison`.

For information about acquiring or updating tools, see the system requirements in Chapter 4, Installing MySQL from Source.
4.9 MySQL Configuration and Third-Party Tools

Third-party tools that need to determine the MySQL version from the MySQL source can read the `VERSION` file in the top-level source directory. The file lists the pieces of the version separately. For example, if the version is MySQL 5.7.4-m14, the file looks like this:

```plaintext
MYSQL_VERSION_MAJOR=5
MYSQL_VERSION_MINOR=7
MYSQL_VERSION_PATCH=4
MYSQL_VERSION_EXTRA=-m14
```

If the source is not for a General Availability (GA) release, the `MYSQL_VERSION_EXTRA` value will be nonempty. For the example, the value corresponds to Milestone 14.

To construct a five-digit number from the version components, use this formula:

```plaintext
MYSQL_VERSION_MAJOR*10000 + MYSQL_VERSION_MINOR*100 + MYSQL_VERSION_PATCH
```
Chapter 5 Installing MySQL on Microsoft Windows

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Important
MySQL Community 5.5 Server requires the Microsoft Visual C++ 2008
Redistributable Package to run on Windows platforms. Users should make sure the
package has been installed on the system before installing the server. The package
is available at the Microsoft Download Center.

MySQL is available for Microsoft Windows, for both 32-bit and 64-bit versions. For supported Windows
platform information, see https://www.mysql.com/support/supportplatforms/database.html.
MySQL Installer Method

There are different methods to install MySQL on Microsoft Windows.

MySQL Installer Method

The simplest and recommended method is to download MySQL Installer (for Windows) and let it install and configure all of the MySQL products on your system. Here is how:


   **Note**
   Unlike the standard MySQL Installer, the smaller "web-community" version does not bundle any MySQL applications but it will download the MySQL products you choose to install.

2. Choose the appropriate **Setup Type** for your system. Typically you will choose **Developer Default** to install MySQL server and other MySQL tools related to MySQL development, helpful tools like MySQL Workbench. Or, choose the **Custom** setup type to manually select your desired MySQL products.

   **Note**
   Multiple versions of MySQL server can exist on a single system. You can choose one or multiple versions.

3. Complete the installation process by following the instructions. This will install several MySQL products and start the MySQL server.

MySQL is now installed. If you configured MySQL as a service, then Windows will automatically start MySQL server every time you restart your system.

   **Note**
   You probably also installed other helpful MySQL products like MySQL Workbench and MySQL Notifier on your system. Consider loading MySQL Workbench to check your new MySQL server connection, and MySQL Notifier Overview to view the connection's status. By default, these two programs automatically start after installing MySQL.

   This process also installs the MySQL Installer application on your system, and later you can use MySQL Installer to upgrade or reconfigure your MySQL products.

Additional Installation Information

It is possible to run MySQL as a standard application or as a Windows service. By using a service, you can monitor and control the operation of the server through the standard Windows service management tools. For more information, see Section 5.6.7, “Starting MySQL as a Windows Service”.

Generally, you should install MySQL on Windows using an account that has administrator rights. Otherwise, you may encounter problems with certain operations such as editing the PATH environment variable or accessing the Service Control Manager. When installed, MySQL does not need to be executed using a user with Administrator privileges.

For a list of limitations on the use of MySQL on the Windows platform, see Section 5.9, “Windows Platform Restrictions”.

In addition to the MySQL Server package, you may need or want additional components to use MySQL with your application or development environment. These include, but are not limited to:
MySQL on Windows Considerations

- To connect to the MySQL server using ODBC, you must have a Connector/ODBC driver. For more information, including installation and configuration instructions, see MySQL Connector/ODBC Developer Guide.

  **Note**
  MySQL Installer will install and configure Connector/ODBC for you.

- To use MySQL server with .NET applications, you must have the Connector/.NET driver. For more information, including installation and configuration instructions, see MySQL Connector/.NET Developer Guide.

  **Note**
  MySQL Installer will install and configure MySQL Connector/.NET for you.


MySQL for Windows is available in several distribution formats, detailed here. Generally speaking, you should use MySQL Installer. It contains more features and MySQL products than the older MSI, is simpler to use than the compressed file, and you need no additional tools to get MySQL up and running. MySQL Installer automatically installs MySQL Server and additional MySQL products, creates an options file, starts the server, and enables you to create default user accounts. For more information on choosing a package, see Section 5.2, “Choosing an Installation Package”.

- Binary installer distributions. There are two different installable distributions that come packaged as a Microsoft Windows Installer (MSI) package that you can install manually or automatically on your systems. The preferred MySQL Installer package includes MySQL Server and additional MySQL products including MySQL Workbench, MySQL Notifier, and MySQL for Excel. MySQL Installer can also be used to upgrade these product in the future. The older MSI package contains all the files you need to install and configure MySQL server, but no additional components.

  For instructions on installing MySQL using MySQL Installer, see Section 5.3, “MySQL Installer for Windows”.

- The standard binary distribution (packaged as a compressed file) contains all of the necessary files that you unpack into your chosen location. This package contains all of the files in the full Windows MSI Installer package, but does not include an installation program.

  For instructions on installing MySQL using the compressed file, see Section 5.6, “Installing MySQL on Microsoft Windows Using a noinstall ZIP Archive”.

- The source distribution format contains all the code and support files for building the executables using the Visual Studio compiler system.

  For instructions on building MySQL from source on Windows, see Chapter 4, *Installing MySQL from Source*.

**MySQL on Windows Considerations**

- **Large Table Support**

  If you need tables with a size larger than 4 GB, install MySQL on an NTFS or newer file system. Do not forget to use `MAX_ROWS` and `AVG_ROW_LENGTH` when you create tables. See CREATE TABLE Syntax.
Note

InnoDB tablespace files cannot exceed 4 GB on Windows 32-bit systems.

- MySQL and Virus Checking Software
  
  Virus-scanning software such as Norton/Symantec Anti-Virus on directories containing MySQL data and temporary tables can cause issues, both in terms of the performance of MySQL and the virus-scanning software misidentifying the contents of the files as containing spam. This is due to the fingerprinting mechanism used by the virus-scanning software, and the way in which MySQL rapidly updates different files, which may be identified as a potential security risk.
  
  After installing MySQL Server, it is recommended that you disable virus scanning on the main directory (\datadir) used to store your MySQL table data. There is usually a system built into the virus-scanning software to enable specific directories to be ignored.
  
  In addition, by default, MySQL creates temporary files in the standard Windows temporary directory. To prevent the temporary files also being scanned, configure a separate temporary directory for MySQL temporary files and add this directory to the virus scanning exclusion list. To do this, add a configuration option for the \tmpdir parameter to your my.ini configuration file. For more information, see Section 5.6.2, “Creating an Option File”.

- Running MySQL on a 4K Sector Hard Drive
  
  Running the MySQL server on a 4K sector hard drive on Windows is not supported with innodb_flush_method=async_unbuffered, which is the default setting. The workaround is to use innodb_flush_method=normal.

5.1 MySQL Installation Layout on Microsoft Windows

For MySQL 5.5 on Windows, the default installation directory is C:\Program Files\MySQL\MySQL Server 5.5 for installations performed with MySQL Installer or the MSI package. If you use the ZIP archive method to install MySQL, you may prefer to install in C:\mysql. However, the layout of the subdirectories remains similar (exceptions are indicated).

All of the files are located within this parent directory, using the structure shown in the following table.

**Table 5.1 Default MySQL Installation Layout for Microsoft Windows**

<table>
<thead>
<tr>
<th>Directory</th>
<th>Contents of Directory</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>bin, scripts</td>
<td>mysql server, client and utility programs</td>
<td></td>
</tr>
<tr>
<td>%ALLUSERSPROFILE%\MySQL\MySQL Server 5.5\</td>
<td>Log files, databases (Windows XP, Windows Server 2003)</td>
<td>The Windows system variable %ALLUSERSPROFILE% defaults to C:\Documents and Settings\All Users \Application Data.</td>
</tr>
<tr>
<td>%PROGRAMDATA%\MySQL\MySQL Server 5.5\</td>
<td>Log files, databases (Vista, Windows 7, Windows Server 2008, and newer)</td>
<td>The Windows system variable %PROGRAMDATA% defaults to C:\ProgramData.</td>
</tr>
<tr>
<td>data</td>
<td>Pristine templates</td>
<td></td>
</tr>
<tr>
<td>docs</td>
<td>Release documentation</td>
<td>With MySQL Installer, use the Modify operation to select this optional folder.</td>
</tr>
</tbody>
</table>
Choosing an Installation Package

<table>
<thead>
<tr>
<th>Directory</th>
<th>Contents of Directory</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>include</td>
<td>Include (header) files</td>
<td></td>
</tr>
<tr>
<td>lib</td>
<td>Libraries</td>
<td></td>
</tr>
<tr>
<td>share</td>
<td>Miscellaneous support files, including error messages, character set files, sample configuration files, SQL for database installation</td>
<td></td>
</tr>
<tr>
<td>mysql-test, scripts, and sql-bench</td>
<td>Debug binaries and test suite</td>
<td>ZIP archive only.</td>
</tr>
</tbody>
</table>

The packages create and set up the data directory that the installed server will use, but as of MySQL 5.5.5, it also creates a pristine “template” data directory named data under the installation directory. This directory can be useful when the machine will be used to run multiple instances of MySQL. After an installation has been performed using an MSI package, the template data directory can be copied to set up additional MySQL instances. See Running Multiple MySQL Instances on One Machine.

5.2 Choosing an Installation Package

For MySQL 5.5, there are multiple installation package formats to choose from when installing MySQL on Windows.

**Note**

MySQL Installer and the “Complete Package” methods for installing MySQL are similar, but different. The MySQL Installer is the newer and more advanced option, and it includes all functionality found within the “Complete Package.”

**Note**

Program Database (PDB) files (with file name extension pdb) provide information for debugging your MySQL installation in the event of a problem. These files are included in ZIP Archive distributions (but not MSI distributions) of MySQL.

- **MySQL Installer**: This package has a file name similar to mysql-installer-community-5.5.62.0.msi or mysql-installer-commercial-5.5.62.0.msi, and utilizes MSIs to automatically install MySQL server and other products. It will download and apply updates to itself, and for each of the installed products. It also configures the installed MySQL server.

MySQL Installer can install and manage (add, modify, upgrade, and remove) many other MySQL products, including:

- Applications – MySQL Workbench, MySQL for Visual Studio, MySQL Notifier, MySQL for Excel, MySQL Utilities
- Connectors – MySQL Connector/C, MySQL Connector/C++, MySQL Connector/NET, Connector/ODBC, MySQL Connector/Python, MySQL Connector/J
- Documentation – MySQL Manual (PDF format), samples and examples

MySQL Installer will run on all Windows platforms that are supported by MySQL (see https://www.mysql.com/support/supportedplatforms/database.html).
MySQL Installer is a standalone application designed to ease the complexity of installing and configuring MySQL products that run on Microsoft Windows. It supports the following MySQL products:

• MySQL Servers

MySQL Installer can install and manage multiple, separate MySQL server instances on the same host at the same time. For example, MySQL Installer can install, configure, and upgrade a separate instance of MySQL 5.6, MySQL 5.7, and MySQL 8.0 on the same host. MySQL Installer does not permit server upgrades between major and minor version numbers, but does permit upgrades within a release series (such as 5.7.18 to 5.7.19).

Note
MySQL Installer cannot install both Community and Commercial (Standard Edition and Enterprise Edition) releases of MySQL server on the same host. If you require both releases on the same host, consider using the ZIP archive distribution to install one of the releases.

• MySQL Applications

MySQL Workbench, MySQL Shell, MySQL Router, MySQL for Visual Studio, MySQL for Excel, MySQL Notifier, and MySQL Utilities.

• MySQL Connectors

MySQL Connector/.NET, MySQL Connector/Python, MySQL Connector/ODBC, MySQL Connector/J, MySQL Connector/C, and MySQL Connector/C++.
**Installation Requirements**

MySQL Installer requires Microsoft .NET Framework 4.5.2 or later. If this version is not installed on the host computer, you can download it by visiting the Microsoft website.

**MySQL Installer Community Release**

Download software from https://dev.mysql.com/downloads/installer/ to install the Community release of all MySQL products for Windows. Select one of the following MySQL Installer package options:

- **Web**: Contains MySQL Installer and configuration files only. The web package downloads only the MySQL products you select to install, but it requires an internet connection for each download. The size of this file is approximately 2 MB; the name of the file has the form `mysql-installer-community-web-VERSION.N.msi` where `VERSION` is the MySQL server version number such as 8.0 and `N` is the package number, which begins at 0.

- **Full or Current Bundle**: Bundles all of the MySQL products for Windows (including the MySQL server). The file size is over 300 MB, and the name has the form `mysql-installer-community-VERSION.N.msi` where `VERSION` is the MySQL Server version number such as 8.0 and `N` is the package number, which begins at 0.

**MySQL Installer Commercial Release**

Download software from https://edelivery.oracle.com/ to install the Commercial (Standard Edition or Enterprise Edition) release of MySQL products for Windows. The Commercial release includes all of the current and previous GA versions in the Community release (excludes development-milestone versions) and also includes the following products:

- Workbench SE/EE
- MySQL Enterprise Backup
- MySQL Enterprise Firewall

The Commercial release integrates with your My Oracle Support (MOS) account. For knowledge-base content and patches, see My Oracle Support.

**5.3.1 MySQL Installer Initial Setup**

- **Choosing a Setup Type**
- **Path Conflicts**
- **Check Requirements**
MySQL Installer Initial Setup

- **MySQL Installer Configuration Files**

When you download MySQL Installer for the first time, a setup wizard guides you through the initial installation of MySQL products. As the following figure shows, the initial setup is a one-time activity in the overall process. MySQL Installer detects existing MySQL products installed on the host during its initial setup and adds them to the list of products to be managed.

**Figure 5.1 MySQL Installer Process Overview**

MySQL Installer extracts configuration files (described later) to the hard drive of the host during the initial setup. Although MySQL Installer is a 32-bit application, it can install both 32-bit and 64-bit binaries.

The initial setup adds a link to the Start menu under the MySQL group. Click Start, All Programs, MySQL, MySQL Installer to open MySQL Installer.

**Choosing a Setup Type**

During the initial setup, you are prompted to select the MySQL products to be installed on the host. One alternative is to use a predetermined setup type that matches your setup requirements. By default, both GA and pre-release products are included in the download and installation with the Developer Default, Client only, and Full setup types. Select the Only install GA products option to restrict the product set to include GA products only when using these setup types.

Choosing one of the following setup types determines the initial installation only and does not limit your ability to install or update MySQL products for Windows later:

- **Developer Default**: Install the following products that compliment application development with MySQL:
  - **MySQL Server** (Installs the version that you selected when you downloaded MySQL Installer.)
  - **MySQL Shell**
  - **MySQL Router**
  - **MySQL Workbench**
  - **MySQL for Visual Studio**
  - **MySQL for Excel**
  - **MySQL Notifier**
  - **MySQL Connectors (.NET / Python / ODBC / Java / C / C++)**
  - **MySQL Utilities**
  - **MySQL Documentation**
MySQL Installer Initial Setup

- MySQL Samples and Examples

- **Server only**: Only install the MySQL server. This setup type installs the general availability (GA) or development release server that you selected when you downloaded MySQL Installer. It uses the default installation and data paths.

- **Client only**: Only install the most recent MySQL applications and MySQL connectors. This setup type is similar to the Development Default type, except that it does not include MySQL server or the client programs typically bundled with the server, such as `mysql` or `mysqladmin`.

- **Full**: Install all available MySQL products.

- **Custom** The custom setup type enables you to filter and select individual MySQL products from the MySQL Installer catalog.

Use the Custom setup type to install:

- A product or product version that is not available from the usual download locations. The catalog contains all product releases, including the other releases between pre-release (or development) and GA.

- An instance of MySQL server using an alternative installation path, data path, or both. For instructions on how to adjust the paths, see Section 5.3.2, “Setting Alternative Server Paths with MySQL Installer”.

- Two or more MySQL server versions on the same host at the same time (for example, 5.6, 5.7, and 8.0).

- A specific combination of products and features not offered as a predetermined setup type. For example, you can install a single product, such as MySQL Workbench, instead of installing all client applications for Windows.

### Path Conflicts

When the default installation or data folder (required by MySQL server) for a product to be installed already exists on the host, the wizard displays the Path Conflict step to identify each conflict and enable you to take action to avoid having files in the existing folder overwritten by the new installation. You see this step in the initial setup only when MySQL Installer detects a conflict.

To resolve the path conflict, do one of the following:

- Select a product from the list to display the conflict options. A warning symbol indicates which path is in conflict. Use the browse button to choose a new path and then click Next.

- Click Back to choose a different setup type or product version, if applicable. The Custom setup type enables you to select individual product versions.

- Click Next to ignore the conflict and overwrite files in the existing folder.

- Delete the existing product. Click Cancel to stop the initial setup and close MySQL Installer. Open MySQL Installer again from the Start menu and delete the installed product from the host using the Delete operation from the dashboard.

### Check Requirements

MySQL Installer uses entries in the `package-rules.xml` file to determine whether the prerequisite software for each product is installed on the host. When the requirements check fails, MySQL Installer
displays the **Check Requirements** step to help you update the host. The following figure identifies and describes the key areas of this step.

**Figure 5.2 Check Requirements**

![Diagram of Check Requirements](image)

**Description of Check Requirements Elements**

1. Shows the current step in the initial setup. Steps in this list may change slightly depending on the products already installed on the host, the availability of prerequisite software, and the products to be installed on the host.

2. Lists all pending installation requirements by product and indicates the status as follows:
   - A blank space in the **Status** column means that MySQL Installer can attempt to download and install the required software for you.
   - The word *Manual* in the **Status** column means that you must satisfy the requirement manually. Select each product in the list to see its requirement details.

3. Describes the requirement in detail to assist you with each manual resolution. When possible, a download URL is provided. After you download and install the required software, click **Check** to verify that the requirement has been met.

4. Provides the following set operations to proceed:
   - **Back** – Return to the previous step. This action enables you to select a different the setup type.
   - **Execute** – Have MySQL Installer attempt to download and install the required software for all items without a manual status. Manual requirements are resolved by you and verified by clicking **Check**.
   - **Next** – Do not execute the request to apply the requirements automatically and proceed to the installation without including the products that fail the check requirements step.
Setting Alternative Server Paths with MySQL Installer

- **Cancel** – Stop the installation of MySQL products. Because MySQL Installer is already installed, the initial setup begins again when you open MySQL Installer from the Start menu and click **Add** from the dashboard. For a description of the available management operations, see **Product Catalog**.

MySQL Installer Configuration Files

All MySQL Installer files are located within the `C:\Program Files (x86)` and `C:\ProgramData` folders. The following table describes the files and folders that define MySQL Installer as a standalone application.

<table>
<thead>
<tr>
<th>File or Folder</th>
<th>Description</th>
<th>Folder Hierarchy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MySQL Installer for Windows</strong></td>
<td>This folder contains all of the files needed to run MySQL Installer and MySQLInstallerConsole.exe, a command-line program with similar functionality.</td>
<td><code>C:\Program Files (x86)</code></td>
</tr>
<tr>
<td>Templates</td>
<td>The Templates folder has one file for each version of MySQL server. Template files contain keys and formulas to calculate some values dynamically.</td>
<td><code>C:\ProgramData\MySQL\MySQL Installer for Windows\Manifest</code></td>
</tr>
<tr>
<td>package-rules.xml</td>
<td>This file contains the prerequisites for every product to be installed.</td>
<td><code>C:\ProgramData\MySQL\MySQL Installer for Windows\Manifest</code></td>
</tr>
<tr>
<td>products.xml</td>
<td>The products file (or product catalog) contains a list of all products available for download.</td>
<td><code>C:\ProgramData\MySQL\MySQL Installer for Windows\Manifest</code></td>
</tr>
<tr>
<td><strong>Product Cache</strong></td>
<td>The Product Cache folder contains all standalone .msi files bundled with the full package or downloaded afterward.</td>
<td><code>C:\ProgramData\MySQL\MySQL Installer for Windows</code></td>
</tr>
</tbody>
</table>

5.3.2 Setting Alternative Server Paths with MySQL Installer

You can change the default installation path, the data path, or both when you install MySQL server. After you have installed the server, the paths cannot be altered without removing and reinstalling the server instance.

**To change paths for MySQL server**

1. Identify the MySQL server to change and display the **Advanced Options** link.
   a. Navigate to the **Select Products and Features** step by doing one of the following:
      i. If this is an **initial setup** of MySQL Installer, select the **Custom** setup type and click **Next**.
      ii. If MySQL Installer is installed already, launch it from the Start menu and then click **Add** from the dashboard.
b. Click **Edit** to apply a filter on the product list shown in **Available Products** (see **Locating Products to Install**).

c. With the server instance selected, use the arrow to move the selected server to the **Products/Features To Be Installed** list.

d. Click the server to select it. When you select the server, the **Advanced Options** link appears. For details, see the figure that follows.

2. Click **Advanced Options** to open a dialog box where you can enter alternative path names. After the path names are validated, click **Next** to continue with the configuration steps.

**Figure 5.3 Change MySQL Server Path**

![Figure 5.3 Change MySQL Server Path](image)

### 5.3.3 Installation Workflow with MySQL Installer

MySQL Installer provides a wizard-like tool to install and configure new MySQL products for Windows. Unlike the initial setup, which runs only once, MySQL Installer invokes the wizard each time you download or install a new product. For first-time installations, the steps of the initial setup proceed directly into the steps of the installation. For assistance with product selection, see **Locating Products to Install**.

**Note**

Full permissions are granted to the user executing MySQL Installer to all generated files, such as `my.ini`. This does not apply to files and directories for specific products, such as the MySQL server data directory in `%ProgramData%` that is owned by `SYSTEM`. 
Installation Workflow with MySQL Installer

Products installed and configured on a host follow a general pattern that might require your input during the various steps. If you attempt to install a product that is incompatible with the existing MySQL server version (or a version selected for upgrade), you are alerted about the possible mismatch.

MySQL Installer loads all selected products together using the following workflow:

- **Product download.** If you installed the full (not web) MySQL Installer package, all .msi files were loaded to the Product Cache folder during the initial setup and are not downloaded again. Otherwise, click Execute to begin the download. The status of each product changes from Downloading to Downloaded.

- **Product installation.** The status of each product in the list changes from Ready to Install, to Installing, and lastly to Complete. During the process, click Show Details to view the installation actions.

  If you cancel the installation at this point, the products are installed, but the server (if installed) is not yet configured. To restart the server configuration, open MySQL Installer from the Start menu and click the Reconfigure link next to the appropriate server in the dashboard.

- **Product configuration.** This step applies to MySQL Server, MySQL Router, and samples only. The status for each item in the list should indicate Ready to Configure.

  Click Next to start the configuration wizard for all items in the list. The configuration options presented during this step are specific to the version of database or router that you selected to install.

  Click Execute to begin applying the configuration options or click Back (repeatedly) to return to each configuration page. Click Finish to open the MySQL Installer dashboard.

- **Installation complete.** This step finalizes the installation for products that do not require configuration. It enables you to copy the log to a clipboard and to start certain applications, such as MySQL Workbench and MySQL Shell. Click Finish to open the MySQL Installer dashboard.

### 5.3.3.1 MySQL Server Configuration with MySQL Installer

MySQL Installer performs the initial configuration of the MySQL server. For example:

- For the MySQL 8.0 release series, a server can be configured to run as a standalone database, as a sandbox InnoDB cluster on a single host, or to create a production InnoDB cluster inside a local network (see High Availability).

- It creates the configuration file (my.ini) that is used to configure the MySQL server. The values written to this file are influenced by choices you make during the installation process. Some definitions are host dependent. For example, query_cache is enabled if the host has fewer than three cores.

  **Note**

  Query cache was deprecated in MySQL 5.7 and removed in MySQL 8.0 (and later).

- By default, a Windows service for the MySQL server is added.

- Provides default installation and data paths for MySQL server. For instructions on how to change the default paths, see Section 5.3.2, “Setting Alternative Server Paths with MySQL Installer”.

- It can optionally create MySQL server user accounts with configurable permissions based on general roles, such as DB Administrator, DB Designer, and Backup Admin. It optionally creates a Windows user named MysqlSys with limited privileges, which would then run the MySQL Server.
User accounts may also be added and configured in MySQL Workbench.

- Checking **Show Advanced Options** enables additional **Logging Options** to be set. This includes defining custom file paths for the error log, general log, slow query log (including the configuration of seconds it requires to execute a query), and the binary log.

During the configuration process, click **Next** to proceed to the next step or **Back** to return to the previous step. Click **Execute** at the final step to apply the server configuration.

The sections that follow describe the server configuration options that apply to MySQL server on Windows. The server version you installed will determine which steps and options you can configure. Configuring MySQL server may include some or all of the steps.

**High Availability**

MySQL Installer enables you to install, configure, and deploy MySQL Server as a standalone instance or as a member of a highly available cluster using MySQL Group Replication. In either case, MySQL Installer restricts the installation and configuration of the server (or servers) to the local Windows host computer.

- **Standalone MySQL Server / Classic MySQL Replication (default)**

  Select this option to configure one MySQL instance to run as a standalone database server. This option is ideal if you intend to set up classic replication later and then to include this server in your custom solution. The remaining configuration steps are described in the sections that follow, starting with **Type and Networking**.

- **InnoDB cluster**

  Select this option to create or extend an InnoDB cluster solution that is based on MySQL Group Replication (see **Introducing InnoDB Cluster**). You can configure (or reconfigure) a minimum of three server instances to perform a basic setup as a test-only sandbox cluster on a single computer or to create a production cluster inside a local network.

  **InnoDB Cluster Log Verbosity Level.** This configuration step includes an adjustable log that captures information during the configuration of each server instance in the production or sandbox cluster. The values are: **MINIMAL**, **MEDIUM** (default), and **DEBUG**. If the cluster configuration fails, use the **Reconfigure** action from the MySQL Installer dashboard to restart the configuration and then set the verbosity level to **DEBUG** to gather additional information during your next attempt.

MySQL Installer provides the following configuration variations to deploy an InnoDB cluster:

- **Set Up a Local Server Cluster for Testing Only**

  Select **Create a Sandbox InnoDB cluster for Testing** to enable this option. When prompted, define the number of server sandbox instances in the cluster, set a password for the root user, and adjust the InnoDB cluster log verbosity level as needed. For a more detailed description of the configuration, see **Deploying a Sandbox InnoDB Cluster with MySQL Installer**. This setup requires MySQL 5.7.17 or higher.

- **Create or Join an InnoDB cluster**

  To set up a highly available InnoDB cluster using MySQL Installer, you must have a minimum of three computers on a local network. If you require a more advanced setup, use MySQL Shell to configure some or all of the server instances in the cluster. For details about how to perform a local-network cluster setup, see **Setting up an InnoDB cluster with MySQL Installer**. This setup requires MySQL 8.0.0 or higher.
InnoDB cluster was designed to operate with MySQL Shell, which enables you to perform advanced cluster administration, and MySQL Router to automate the connections made between client applications and server instances. Neither MySQL Shell nor MySQL Router are required to deploy a cluster on Windows using MySQL Installer.

Deploying a Sandbox InnoDB Cluster with MySQL Installer

A sandbox deployment includes multiple server sandbox instances that run together on the same computer. Because all server instances reside on the same computer, a sandbox cluster does not meet the requirements of a highly available solution. Instead, this deployment option simulates an environment from which you can explore the techniques associated with InnoDB cluster administration.

When you select **Create a Sandbox InnoDB cluster for Testing**, a follow-on step prompts you to select a cluster consisting of three, five, seven, or nine MySQL server instances. Unlike the other server setups provided by MySQL Installer, the sandbox deployment skips the usual server configuration steps (except Authentication Method). The resulting cluster, named `sandboxCluster`, is available on selected ports that are configured for you.

**Note**
MySQL Installer deletes ports 3310 to 3390 during the configuration, if those ports were set for the sandbox InnoDB cluster manually using MySQL Shell.

Each sandbox instance is configured to run as a process (not a Windows service). You must start each instance in the sandbox cluster manually after restarting the computer.

After you create the test cluster, click the **Summary** tab to view the specific ports that apply to your cluster. To modify the number of server instances within the existing cluster or to adjust the logging level, use the **Reconfigure** quick action from the MySQL Installer dashboard.

**Warning**
MySQL Installer deletes all existing sandbox cluster data when the cluster is reconfigured or when the server instances within the sandbox cluster are upgraded.

MySQL Installer stores all sandbox InnoDB cluster configuration entries in the `installer_config.xml` file. By default, MySQL Installer creates the sandbox instances in `%userprofile%\MySQL\mysql-sandboxes` on the local host.

Setting up InnoDB Cluster with MySQL Installer

To create a single InnoDB cluster, select **InnoDB Cluster** as the High Availability option and then select **Create a New InnoDB Cluster**. Adjust the log verbosity level (as needed), and click **Next** to configure the first server instance. This setup process involves installing and running MySQL Installer on multiple computers.

Define the first server instance (or seed) by providing the following configuration information:

- **InnoDB Cluster Name:**
  
  The default cluster name is `myCluster`. If you intend to configure multiple clusters, replace the default name with one that is meaningful within your solution. Alphanumeric characters, spaces, and underscore (_) characters are valid for this field. The limit is 40 characters.

- **Cluster Admin User Name:**
The default cluster administrator name is **ic**. You can reuse the same MySQL administrative account across multiple clusters. You will be prompted for this account name (and password) later when you configure other server instances to join the cluster. The limit is 32 characters.

- **Cluster Admin Password:**

Enter a password for the cluster administrator account (minimum length is four characters). MySQL Installer will evaluate the strength of the MySQL password as you type. Use the **Repeat Password** field to confirm the password.

- **Host Address:**

Select the host name or IP address of the local host from the list. When joining additional server instances to the cluster, you will be prompted to identify the seed instance by the host name or IP address.

- **Server ID:**

The default value is **1**. This identifier is required to record the events of a server instance in the binary log. The ID of each server instance within a cluster must be unique; however, you can reuse the same number in a different cluster. The server ID you specify in this field also appears later in Advanced Options step. If you change the value in Advanced Option, the number is changed for the InnoDB cluster Setup too.

Click **Next** and then complete the remaining configuration steps, which are described in the sections that follow, starting with **Type and Networking**. After the seed instance is added and the cluster is created, it requires more instances for full tolerance. At this point, the status is **OK_NO_TOLERANCE**.

To add the second and third server instances to the cluster, you must use a separate computer inside the local network for each. Some of the configuration details of the seed instance are required to complete the join operation.

After you start MySQL Installer and install the server instance on the next computer, begin the configuration by selecting **InnoDB Cluster** as the High Availability option and then select **Add Local MySQL Server Instance to an InnoDB Cluster**. Adjust the **InnoDB Cluster Log Verbosity Level** (as needed) and then click **Next**.

Define the joining server instance by providing the following configuration information:

- **Seed Instance Address:**

Enter the host name or IP address of the computer that hosts the seed instance.

- **Seed Instance Port:**

The default value is **3306**, which is the port for classic MySQL. Use the same TCP port that you configured for the seed instance.

- **Cluster Admin User Name:**

The default cluster administrator name is **ic**. If you assigned a different name when you configured the seed instance, enter the alternative cluster administrator name.

- **Cluster Admin Password:**

Enter the password assigned to the cluster administrator account.
Installation Workflow with MySQL Installer

• **Host Address:**
  Select the host name or IP address of the local host from the list.

• **Server ID:**
  The default value is 1. This identifier is required to record the events of a server instance in the binary log. The ID of each server instance within a cluster must be unique; however, you can reuse the same number in a different cluster. The server ID you specify in this field also appears later in Advanced Options step. If you change the value in Advanced Option, the number is changed for the InnoDB cluster Setup too.

• **Test Connection**
  Use this button to verify the connection between the local server instance and the seed instance defined for the cluster. A valid connection is required to proceed.

Click **Next** and then complete the remaining configuration steps, which are described in the sections that follow, starting with **Type and Networking**.

With one seed instance and a second server instance in the cluster, the status is **OK_NO_TOLERANCE**. After you add the third server instance, the status is **OK**, which indicates that the cluster now is tolerant to the failure of one instance.

**Type and Networking**

• **Server Configuration Type**
  Choose the MySQL server configuration type that describes your setup. This setting defines the amount of system resources (memory) that will be assigned to your MySQL server instance.

  • **Development**: A machine that will host many other applications, and typically this is your personal workstation. This option configures MySQL to use the least amount of memory.

  • **Server**: Several other applications will be running on this machine, such as a web server. This option configures MySQL to use a medium amount of memory.

  • **Dedicated**: A machine that is dedicated to running the MySQL server. Because no other major applications will run on this server, such as a web server, this option configures MySQL to use the majority of available memory.

• **Connectivity**
  Connectivity options control how the connection to MySQL is made. Options include:

  • **TCP/IP**: You may enable TCP/IP Networking here as otherwise only local host connections are permitted. Also define the **Port** (for the classic MySQL protocol), **X Protocol Port** (for MySQL as a document store), and whether to open the firewall port for network access. If the port number is in use already, you will see the information icon (⚠️) next to the default value and **Next** is disabled until you provide a new port number.

  • **Named Pipe**: Enable and define the pipe name, similar to setting the **named_pipe** system variable. The default name is **MySQL**.

  • **Shared Memory**: Enable and then define the memory name, similar to setting the **shared_memory** system variable. The default name is **MySQL**.
Installation Workflow with MySQL Installer

- Advanced Configuration

Check **Show Advanced and Logging Options** to set custom logging and advanced options in later steps. The Logging Options step enables you to define custom file paths for the error log, general log, slow query log (including the configuration of seconds it requires to execute a query), and the binary log. The Advanced Options step enables you to set the unique server ID required when binary logging is enabled in a replication topology.

- MySQL Enterprise Firewall (Enterprise Edition only)

The **Enable Enterprise Firewall** check box is selected by default. For post-installation instructions, see MySQL Enterprise Firewall.

**Authentication Method**

The **Authentication Method** step is visible only during the installation or upgrade of MySQL 8.0.4 or higher. It introduces a choice between two server-side authentication options. The MySQL user accounts that you create in the next step will use the authentication method that you select in this step.

MySQL 8.0 connectors and community drivers that use `libmysqlclient` 8.0 now support the `mysql_native_password` default authentication plugin. However, if you are unable to update your clients and applications to support this new authentication method, you can configure the MySQL server to use `mysql_native_password` for legacy authentication. For more information about the implications of this change, see caching_sha2_password as the Preferred Authentication Plugin.

If you are installing or upgrading to MySQL 8.0.4 or higher, select one of the following authentication methods:

- Use Strong Password Encryption for Authentication (RECOMMENDED)

MySQL 8.0 supports a new authentication based on improved, stronger SHA256-based password methods. It is recommended that all new MySQL server installations use this method going forward.

**Important**

The `caching_sha2_password` authentication plugin on the server requires new versions of connectors and clients, which add support for the new MySQL 8.0 default authentication.

- Use Legacy Authentication Method (Retain MySQL 5.x Compatibility)

Using the old MySQL 5.x legacy authentication method should be considered only in the following cases:

- Applications cannot be updated to use MySQL 8.0 connectors and drivers.
- Recompilation of an existing application is not feasible.
- An updated, language-specific connector or driver is not available yet.

**Accounts and Roles**

- Root Account Password

Assigning a root password is required and you will be asked for it when performing other MySQL Installer operations. Password strength is evaluated when you repeat the password in the box provided. For descriptive information regarding password requirements or status, move your mouse pointer over the information icon (⚠️) when it appears.
• MySQL User Accounts (Optional)

Click **Add User** or **Edit User** to create or modify MySQL user accounts with predefined roles. Next, enter the required account credentials:

- **User Name**: MySQL user names can be up to 32 characters long.
- **Host**: Select *localhost* for local connections only or `<All Hosts (%)>` when remote connections to the server are required.
- **Role**: Each predefined role, such as *DB Admin*, is configured with its own set of privileges. For example, the *DB Admin* role has more privileges than the *DB Designer* role. The **Role** drop-down list contains a description of each role.
- **Password**: Password strength assessment is performed while you type the password. Passwords must be confirmed. MySQL permits a blank or empty password (considered to be insecure).

**MySQL Installer Commercial Release Only:** MySQL Enterprise Edition for Windows, a commercial product, also supports an authentication method that performs external authentication on Windows. Accounts authenticated by the Windows operating system can access the MySQL server without providing an additional password.

To create a new MySQL account that uses Windows authentication, enter the user name and then select a value for **Host** and **Role**. Click **Windows** authentication to enable the `authentication_windows` plugin. In the Windows Security Tokens area, enter a token for each Windows user (or group) who can authenticate with the MySQL user name. MySQL accounts can include security tokens for both local Windows users and Windows users that belong to a domain. Multiple security tokens are separated by the semicolon character (`;`) and use the following format for local and domain accounts:

- **Local account**
  
  Enter the simple Windows user name as the security token for each local user or group; for example, `finley;jeffrey;admin`.

- **Domain account**
  
  Use standard Windows syntax (*domain\domainuser*) or MySQL syntax (*domain\\domainuser*) to enter Windows domain users and groups.

  For domain accounts, you may need to use the credentials of an administrator within the domain if the account running MySQL Installer lacks the permissions to query the Active Directory. If this is the case, select **Validate Active Directory users with** to activate the domain administrator credentials.

  Windows authentication permits you to test all of the security tokens each time you add or modify a token. Click **Test Security Tokens** to validate (or revalidate) each token. Invalid tokens generate a descriptive error message along with a red `x` icon and red token text. When all tokens resolve as valid (green text without an `x` icon), you can click **OK** to save the changes.

**Windows Service**

On the Windows platform, MySQL server can run as a named service managed by the operating system and be configured to start up automatically when Windows starts. Alternatively, you can configure MySQL server to run as an executable program that requires manual configuration.

- **Configure MySQL server as a Windows service** (Selected by default.)

  When the default configuration option is selected, you can also select the following:
• **Start the MySQL Server at System Startup**

  When selected (default), the service startup type is set to Automatic; otherwise, the startup type is set to Manual.

• **Run Windows Service as**

  When **Standard System Account** is selected (default), the service logs on as Network Service.

  The **Custom User** option must have privileges to log on to Microsoft Windows as a service. The **Next** button will be disabled until this user is configured with the required privileges.

  A custom user account is configured in Windows by searching for "local security policy" in the Start menu. In the Local Security Policy window, select **Local Policies, User Rights Assignment**, and then **Log On As A Service** to open the property dialog. Click **Add User or Group** to add the custom user and then click **OK** in each dialog to save the changes.

• **Deselect the Windows Service option**

**Logging Options**

This step is available if the **Show Advanced Configuration** check box was selected during the **Type and Networking** step. To enable this step now, click **Back** to return to the **Type and Networking** step and select the check box.

Advanced configuration options are related to the following MySQL log files:

• **Error Log**

• **General Log**

• **Slow Query Log**

• **Bin Log**

  **Note**

  The binary log is enabled by default for MySQL 5.7 and higher.

**Advanced Options**

This step is available if the **Show Advanced Configuration** check box was selected during the **Type and Networking** step. To enable this step now, click **Back** to return to the **Type and Networking** step and select the check box.

The advanced-configuration options include:

• **Server ID**

  Set the unique identifier used in a replication topology. If binary logging is enabled, you must specify a server ID. The default ID value depends on the server version. For more information, see the description of the **--server-id** option.

  **Tip**

  If you specified an ID for a server instance of an InnoDB cluster, then MySQL Installer adjusts the ID (shown on this page) to match the previous identifier.
• **Table Names Case**
  
  You can set the following options during the initial and subsequent configuration the server. For the MySQL 8.0 release series, these options apply only to the initial configuration of the server.

  • **Lower Case**

    Sets the `lower_case_table_names` option value to 1 (default), in which table names are stored in lowercase on disk and comparisons are not case sensitive.

  • **Preserve Given Case**

    Sets the `lower_case_table_names` option value to 2, in which table names are stored as given but compared in lowercase.

**Apply Server Configuration**

All configuration settings are applied to the MySQL server when you click **Execute**. Use the **Configuration Steps** tab to follow the progress of each action; the icon for each toggles from white to green (with a check mark) on success. Otherwise, the process stops and displays an error message if an individual action times out. Click the **Log** tab to view the log.

When the installation completes successfully and you click **Finish**, MySQL Installer and the installed MySQL products are added to the Microsoft Windows Start menu under the **MySQL** group. Opening MySQL Installer loads the **dashboard** where installed MySQL products are listed and other MySQL Installer operations are available.

### 5.3.3.2 MySQL Router Configuration with MySQL Installer

MySQL Installer downloads and installs a suite of tools for developing and managing business-critical applications on Windows. The suite consist of applications, connectors, documentation, and samples.

During the **initial setup**, choose any predetermined setup type, except **Server only**, to install the latest GA version of the tools. Use the **Custom** setup type to install an individual tool or specific version. If MySQL Installer is installed on the host already, use the **Add** operation to select and install tools from the MySQL Installer dashboard.

**MySQL Router Configuration**

MySQL Installer provides a configuration wizard that can bootstrap an installed instance of MySQL Router 8.0 or later to route traffic between MySQL applications and an InnoDB cluster. When configured, MySQL Router runs as a local Windows service. For detailed information about using MySQL Router with an InnoDB cluster, see **Routing for MySQL InnoDB cluster**.

**Note**

You are prompted to configure MySQL Router after the initial installation and when you reconfigure an installed router explicitly. In contrast, the upgrade operation does not require or prompt you to configure the upgraded product.

To configure MySQL Router, do the following:

1. Set up InnoDB cluster. For instructions on how to configure a sandbox InnoDB cluster on the local host using MySQL Installer, see **High Availability**.

   For general InnoDB cluster information, see **InnoDB Cluster**.
2. Using MySQL Installer, download and install the MySQL Router application. After the installation finishes, the configuration wizard prompts you for information. Select the **Configure MySQL Router for InnoDB cluster** check box to begin the configuration and provide the following configuration values:

- **Hostname**: Host name of the primary (seed) server in the InnoDB cluster (**localhost** by default).
- **Port**: The port number of the primary (seed) server in the InnoDB cluster (**3310** by default).
- **Management User**: An administrative user with root-level privileges.
- **Password**: The password for the management user.

**Classic MySQL protocol connections to InnoDB cluster**

- **Read/Write**: Set the first base port number to one that is unused (between 80 and 65532) and the wizard will select the remaining ports for you.

The figure that follows shows an example of the MySQL Router configuration page, with the first base port number specified as 6446 and the remaining ports set by the wizard as 6447, 6448, and 6449.

![MySQL Router Configuration](image)

**Figure 5.4 MySQL Router Configuration**

3. Click **Next** and then **Execute** to apply the configuration. Click **Finish** to close MySQL Installer or return to the **MySQL Installer dashboard**.

After installing a production cluster with MySQL Router, the root account only exists in the user table as **root@localhost** (local), instead of **root@%** (remote). Regardless of where the router or client are located, even if both are located on the same host as the seed server, any connection that passes through the router is viewed by server as being remote, not local. As a result, a connection made to the server using the local host (see the example that follows), does not authenticate.
5.3.4 MySQL Installer Product Catalog and Dashboard

- Product Catalog
- MySQL Installer Dashboard
- Locating Products to Install
- Upgrading MySQL Installer

This section describes the MySQL Installer product catalog and the dashboard.

**Product Catalog**

The product catalog stores the complete list of released MySQL products for Microsoft Windows that are available to download from MySQL Downloads. By default, and when an Internet connection is present, MySQL Installer updates the catalog daily. You can also update the catalog manually from the dashboard (described later).

An up-to-date catalog performs the following actions:

- Populates the **Available Products** pane of the Select Products and Features step. This step appears when you select:
  - The **Custom** setup type during the **initial setup**.
  - The **Add** operation from the dashboard.
- Identifies when product updates are available for the installed products listed in the dashboard.

The catalog includes all development releases (Pre-Release), general releases (Current GA), and minor releases (Other Releases). Products in the catalog will vary somewhat, depending on the MySQL Installer release that you download.

**MySQL Installer Dashboard**

The MySQL Installer dashboard is the default view that you see when you start MySQL Installer after the **initial setup** finishes. If you closed MySQL Installer before the setup was finished, MySQL Installer resumes the initial setup before it displays the dashboard.
Description of MySQL Installer Dashboard Elements

1. MySQL Installer dashboard operations provide a variety of actions that apply to installed products or products listed in the catalog. To initiate the following operations, first click the operation link and then select the product or products to manage:

   - **Add**: This operation opens the Select Products and Features page. From there, you can filter the product in the product catalog, select one or more products to download (as needed), and begin the installation. For hints about using the filter, see Locating Products to Install.

   - **Modify**: Use this operation to add or remove the features associated with installed products. Features that you can modify vary in complexity by product. When the Program Shortcut check box is selected, the product appears in the Start menu under the MySQL group.

   - **Upgrade**: This operation loads the Select Products to Upgrade page and populates it with all the upgrade candidates. An installed product can have more than one upgrade version and requires a current product catalog.

Important server upgrade conditions:

   - MySQL Installer does not permit server upgrades between major release versions or minor release versions, but does permit upgrades within a release series, such as an upgrade from 5.7.18 to 5.7.19.

   - Upgrades between milestone releases (or from a milestone release to a GA release) are not supported. Significant development changes take place in milestone releases and you may encounter compatibility issues or problems starting the server.
For upgrades to MySQL 8.0.16 server and higher, a check box enables you to skip the upgrade check and process for system tables, while checking and processing data dictionary tables normally. MySQL Installer does not prompt you with the check box when the previous server upgrade was skipped or when the server was configured as a sandbox InnoDB cluster. This behavior represents a change in how MySQL Server performs an upgrade (see What the MySQL Upgrade Process Upgrades) and it alters the sequence of steps that MySQL Installer applies to the configuration process.

If you select **Skip system tables upgrade check and process. (Not recommended)**, MySQL Installer starts the upgraded server with the `--upgrade=MINIMAL` server option, which upgrades the data dictionary only. If you stop and then restart the server without the `--upgrade=MINIMAL` option, the server upgrades the system tables automatically, if needed.

The following information appears in the **Log** tab and log file after the upgrade configuration (with system tables skipped) is complete:

```
WARNING: The system tables upgrade was skipped after upgrading MySQL Server. The server will be started now with the --upgrade=MINIMAL option, but then each time the server is started it will attempt to upgrade the system tables, unless you modify the Windows service (command line) to add --upgrade=MINIMAL to bypass the upgrade.

FOR THE BEST RESULTS: Run mysqld.exe --upgrade=FORCE on the command line to upgrade the system tables manually.
```

To choose a new product version:

a. Click **Upgrade**. Confirm that the check box next to product name in the **Upgradeable Products** pane has a check mark. Deselect the products that you do not intend to upgrade at this time.

b. Click a product in the list to highlight it. This action populates the **Upgradeable Versions** pane with the details of each available version for the selected product: version number, published date, and a **Changes** link to open the release notes for that version.

MySQL Installer upgrades all of the selected products in one action. Click **Show Details** to view the actions performed by MySQL Installer.

- **Remove**: This operation opens the Remove Products page and populates it with the MySQL products installed on the host. Select the MySQL products you want to remove (uninstall) and then click **Execute** to begin the removal process. During the operation, an indicator shows the number of steps that are executed as a percentage of all steps.

To select products to remove, do one of the following:

- Select the check box for one or more products.
- Select the **Product** check box to select all products.
To remove a local MySQL server:

a. Determine whether the local data directory should be removed. If you retain the data directory, another server installation can reuse the data. This option is enabled by default (removes the data directory).

b. If the local server is a member of an InnoDB cluster, reconfigure the cluster as follows:
   
i. Type the administrator password for the cluster affected when the local server is removed and then click **Test Connection** to verify the credentials. MySQL Installer can perform the following actions, depending on the configuration of the existing cluster:
      
      • If the local server is a seed instance and the number of instances in the cluster is one, dissolve the cluster when you remove the local server.
      
      • If the local server is a seed instance and the number of instances in the cluster is greater than one, remove the instance from the cluster or dissolve the cluster when you remove the local server.
      
      • If the local server is a slave instance within the cluster and the number of instances in the cluster is greater than two, remove the local instance from the cluster. (A single slave instance within a cluster reverts to a seed instance automatically.)
      
      • If the local server is configured as a sandbox InnoDB cluster, remove all instances created for the sandbox server installation.
   
   ii. When prompted, do one of the following:
      
      • Select an action to apply to the cluster and click **Next**.
      
      • Click **Next** without selecting an action. In most cases, MySQL Group Replication can manage the cluster when the local server becomes unavailable. A warning message reminds you that skipping the step may result in an inconsistent InnoDB cluster configuration.
   
c. Click **Execute** to begin uninstalling the local server. Note that all products that you selected to remove are also uninstalled at this time.

d. (Optional) Click the **Log** tab to display the current actions performed by MySQL Installer.

2. The **Reconfigure** link in the Quick Action column next to each installed server loads the current configuration values for the server and then cycles through all configuration steps enabling you to change the options and values. You must provide credentials with root privileges to reconfigure these items. Click the **Log** tab to show the output of each configuration step performed by MySQL Installer.

On completion, MySQL Installer stops the server, applies the configuration changes, and restarts the server for you. For a description of each configuration option, see Section 5.3.3.1, “MySQL Server Configuration with MySQL Installer”. Installed Samples and Examples associated with a specific MySQL server version can be also be reconfigured to apply new feature settings, if any.

3. The **Catalog** link enables you to download the latest catalog of MySQL products manually and then to integrate those product changes with MySQL Installer. The catalog-download action does not perform an upgrade of the products already installed on the host. Instead, it returns to the dashboard and displays an arrow icon in the Version column for each installed product that has a newer version. Use the ** Upgrade** operation to install the newer product version.
You can also use the **Catalog** link to display the current change history of each product without downloading the new catalog. Select the **Do not update at this time** check box to view the change history only.

4. The MySQL Installer About icon (中新网) shows the current version of MySQL Installer and general information about MySQL. The version number is located above the **Back** button.

   **Tip**
   Always include this version number when reporting a problem with MySQL Installer.

   In addition to the About MySQL information (中新网), you can also select the following icons from the side panel:

   • License icon (中新网) for MySQL Installer.

   This product may include third-party software, used under license. If you are using a Commercial release of MySQL Installer, the icon opens the MySQL Installer Commercial License Information User Manual for licensing information, including licensing information relating to third-party software that may be included in this Commercial release. If you are using a Community release of MySQL Installer, the icon opens the MySQL Installer Community License Information User Manual for licensing information, including licensing information relating to third-party software that may be included in this Community release.

   • Resource links icon (中新网) to the latest MySQL product documentation, blogs, webinars, and more.

5. The MySQL Installer Options icon (中新网) includes the following tabs:

   • **Product Catalog**: Manages the daily automatic catalog updates. By default, catalog updates are scheduled at a fixed hour. When new products or product versions are available, MySQL Installer adds them to the catalog and then displays an arrow icon (中新网) next to the version number of installed products listed in the dashboard.

   Use this option to enable or disable automatic catalog updates and to reset the time of day when the MySQL Installer updates the catalog automatically. For specific settings, see the task named `ManifestUpdate` in the Windows Task Scheduler.

   • **Connectivity Settings**: Several operations performed by MySQL Installer require internet access. This option enables you to use a default value to validate the connection or to use a different URL, one selected from a list or added by you manually. With the **Manual** option selected, new URLs can be added and all URLs in the list can be moved or deleted. When the **Automatic** option is selected, MySQL Installer attempts to connect to each default URL in the list (in order) until a connection is made. If no connection can be made, it raises an error.

**Locating Products to Install**

MySQL products in the catalog are listed by category: MySQL Servers, Applications, MySQL Connectors, and Documentation. Only the latest GA versions appear in the **Available Products** pane by default. If you are looking for a pre-release or older version of a product, it may not be visible in the default list.
To change the default product list, click Add on the dashboard to open the Select Products and Features page, and then click Edit to open the filter dialog box (see the figure that follows). Modify the product values and then click Filter.

**Figure 5.6 Filter Available Products**

![Filter Available Products](image)

Reset one or more of the following values to filter the list of available products:

- **Text**: Filter by text.
- **Category**: All Software (default), MySQL Servers, Applications, MySQL Connectors, or Documentation (for samples and documentation).
- **Maturity**: Current Bundle (appears initially with the full package only), Pre-Release, Current GA, or Other Releases.

**Note**

The Commercial release of MySQL Installer does not display any MySQL products when you select the Pre-Release age filter. Products in development are available from the Community release of MySQL Installer only.

- **Already Downloaded** (the check box is deselected by default).
- **Architecture**: Any (default), 32-bit, or 64-bit.

**Upgrading MySQL Installer**

MySQL Installer remains installed on your computer, and like other software, MySQL Installer can be upgraded from the previous version. In some cases, other MySQL software may require that you upgrade MySQL Installer for compatibility. This section describes how to identify the current version of MySQL Installer and how to upgrade MySQL Installer manually.

**To locate the installed version of MySQL Installer:**

1. Start MySQL Installer from the search menu. The MySQL Installer dashboard opens.

2. Click the MySQL Installer About icon (). The version number is located above the Back button.

**To initiate an on-demand upgrade of MySQL Installer:**

1. Connect the computer with MySQL Installer installed to the internet.
2. Start MySQL Installer from the search menu. The MySQL Installer dashboard opens.

3. Click **Catalog** on the bottom of the dashboard to open the Update Catalog window.

4. Click **Execute** to begin the process. If the installed version of MySQL Installer can be upgraded, you will be prompted to start the upgrade.

5. Click **Next** to review all changes to the catalog and then click **Finish** to return to the dashboard.

6. Verify the (new) installed version of MySQL Installer (see the previous procedure).

### 5.3.5 MySQLInstallerConsole Reference

**MySQLInstallerConsole.exe** provides command-line functionality that is similar to MySQL Installer. It is installed when MySQL Installer is initially executed and then available within the MySQL Installer directory. Typically, that is in `C:\Program Files (x86)\MySQL\MySQL Installer\`, and the console must be executed with administrative privileges.

To use, invoke the command prompt with administrative privileges by choosing **Start, Accessories**, then right-click on **Command Prompt** and choose **Run as administrator**. And from the command line, optionally change the directory to where **MySQLInstallerConsole.exe** is located:

```
C:\> cd Program Files (x86)\MySQL\MySQL Installer for Windows
C:\Program Files (x86)\MySQL\MySQL Installer for Windows> MySQLInstallerConsole.exe help
```

```
WARNING: MySQLInstallerConsole.exe is a command-line tool. Using it requires a command prompt.

MySQL Installer is running in Community mode

Attempting to update manifest.
Initializing product requirements
Loading product catalog
Checking for product catalog snippets
Checking for product packages in the bundle
Categorizing product catalog
Finding all installed packages.
Your product catalog was last updated at 11/1/2016 4:10:38 PM

MySQL Installer is running in Community mode

```

The following commands are available:

- **Configure** - Configures one or more of your installed programs.
- **Help** - Provides list of available commands.
- **Install** - Install and configure one or more available MySQL programs.
- **List** - Provides an interactive way to list all products available.
- **Modify** - Modifies the features of installed products.
- **Remove** - Removes one or more products from your system.
- **Status** - Shows the status of all installed products.
- **Update** - Update the current product catalog.
- **Upgrade** - Upgrades one or more of your installed programs.

MySQLInstallerConsole.exe supports the following commands:

- **Note** - Configuration block values that contain a colon (":") must be wrapped in double quotes. For example, installldir="C:\MySQL\MySQL Server 8.0".

```
• configure [product1]:[setting]=[value]; [product2]:[setting]=[value]; [...]
```

Configure one or more MySQL products on your system. Multiple setting=value pairs can be configured for each product.
Switches include:

- `-showsettings`: Displays the available options for the selected product, by passing in the product name after `-showsettings`.

- `-silent`: Disable confirmation prompts.

```
C:\> MySQLInstallerConsole configure -showsettings server
C:\> MySQLInstallerConsole configure server:port=3307
```

- `help [command]`

Displays a help message with usage examples, and then exits. Pass in an additional command to receive help specific to that command.

```
C:\> MySQLInstallerConsole help
C:\> MySQLInstallerConsole help install
```

- `install [product]:[features]:[config block]:[config block]:[config block]; [...]`

Install one or more MySQL products on your system. If pre-release products are available, both GA and pre-release products are installed when the value of the `-type` switch is `Developer`, `Client`, or `Full`. Use the `-only_ga_products` switch to restrict the product set to GA products only when using these setup types.

Switches and syntax options include:

- `-only_ga_products`: Restricts the product set to include GA products only.

- `-type=[SetupType]`: Installs a predefined set of software. The "SetupType" can be one of the following:

  - **Developer**: Installs a complete development environment.
  - **Server**: Installs a single MySQL server
  - **Client**: Installs client programs and libraries
  - **Full**: Installs everything
  - **Custom**: Installs user selected products. This is the default option.

- `-showsettings`: Displays the available options for the selected product, by passing in the product name after `-showsettings`.

- `-silent`: Disable confirmation prompts.

- `[config block]`: One or more configuration blocks can be specified. Each configuration block is a semicolon separated list of key value pairs. A block can include either a "config" or "user" type key, where "config" is the default type if one is not defined.
Configuration block values that contain a colon character (:) must be wrapped in double quotes. For example, `installdir="C:\MySQL\MySQL Server 8.0"`.

Only one "config" type block can be defined per product. A "user" block should be defined for each user that should be created during the product’s installation.

**Note**

Adding users is not supported when a product is being reconfigured.

- **[feature]**: The feature block is a semicolon separated list of features, or an asterisk character (*) to select all features.

```sh
C:\> MySQLInstallerConsole install server;5.6.25:*:port=3307;serverid=2:type=user;username=foo;password=bar;role=DBManager
C:\> MySQLInstallerConsole install server;5.6.25;x64 -silent
```

An example that passes in additional configuration blocks, separated by `^` to fit:

```sh
C:\> MySQLInstallerConsole install server;5.6.25;x64:*:type=config;openfirewall=true; ^
generallog=true;binlog=true;serverid=3306;enable_tcpip=true;port=3306;rootpasswd=pass; ^
installdir="C:\MySQL\MySQL Server 5.6":type=user;datadir="C:\MySQL\data":username=foo;password=bar
```

- **list**

Lists an interactive console where all of the available MySQL products can be searched. Execute `MySQLInstallerConsole list` to launch the console, and enter in a substring to search.

```sh
C:\> MySQLInstallerConsole list
```

- **modify [product1:-removelist|+addlist] [product2:-removelist|+addlist] [..]**

Modifies or displays features of a previously installed MySQL product.

- **-silent**: Disable confirmation prompts.

```sh
C:\> MySQLInstallerConsole modify server
C:\> MySQLInstallerConsole modify server:+documentation
C:\> MySQLInstallerConsole modify server:-debug
```

- **remove [product1] [product2] [..]**

Removes one ore more products from your system.

- ***: Pass in * to remove all of the MySQL products.

- **-continue**: Continue the operation even if an error occurs.

- **-silent**: Disable confirmation prompts.

```sh
C:\> MySQLInstallerConsole remove *
C:\> MySQLInstallerConsole remove server
```

- **status**
Provides a quick overview of the MySQL products that are installed on the system. Information includes product name and version, architecture, date installed, and install location.

C:\> MySQLInstallerConsole status

- update

Downloads the latest MySQL product catalog to your system. On success, the download catalog will be applied the next time either MySQLInstaller or MySQLInstallerConsole is executed.

C:\> MySQLInstallerConsole update

Note
The Automatic Catalog Update GUI option executes this command from the Windows Task Scheduler.

- upgrade [product1:version] [product2:version] [...]

Upgrades one or more products on your system. Syntax options include:
- * : Pass in * to upgrade all products to the latest version, or pass in specific products.
- ! : Pass in ! as a version number to upgrade the MySQL product to its latest version.
- -silent : Disable confirmation prompts.

C:\> MySQLInstallerConsole upgrade *
C:\> MySQLInstallerConsole upgrade workbench:6.3.5
C:\> MySQL InstallerConsole upgrade workbench:!
C:\> MySQL InstallerConsole upgrade workbench:6.3.5 excel:1.3.2

5.4 Installing MySQL on Microsoft Windows Using an MSI Package

The MSI package is designed to install and configure MySQL in such a way that you can immediately get started using MySQL.

The MySQL Installation Wizard and MySQL Configuration Wizard are available in the Complete install package, which is recommended for most standard MySQL installations. Exceptions include users who need to install multiple instances of MySQL on a single server host and advanced users who want complete control of server configuration.

- For information on installing using the GUI MSI installer process, see Section 5.4.1, “Using the MySQL Installation Wizard”.
- For information on installing using the command line using the MSI package, see Section 5.4.2, “Automating MySQL Installation on Microsoft Windows Using the MSI Package”.
- If you have previously installed MySQL using the MSI package and want to remove MySQL, see Section 5.4.3, “Removing MySQL When Installed from the MSI Package”.

The workflow sequence for using the installer is shown in the figure below:
Note

Microsoft Windows XP and later include a firewall which specifically blocks ports. If you plan on using MySQL through a network port then you should open and create an exception for this port before performing the installation. To check and if necessary add an exception to the firewall settings:

1. First ensure that you are logged in as an Administrator or a user with Administrator privileges.
2. Go to the Control Panel, and double click the Windows Firewall icon.
3. Choose the Allow a program through Windows Firewall option and click the Add port button.
4. Enter MySQL into the Name text box and 3306 (or the port of your choice) into the Port number text box.
5. Also ensure that the **TCP** protocol radio button is selected.

6. If you wish, you can also limit access to the MySQL server by choosing the **Change scope** button.

7. Confirm your choices by clicking the **OK** button.

Additionally, when running the MySQL Installation Wizard on Windows Vista or newer, ensure that you are logged in as a user with administrative rights.

**Note**

When using Windows Vista or newer, you may want to disable User Account Control (UAC) before performing the installation. If you do not do so, then MySQL may be identified as a security risk, which will mean that you need to enable MySQL. You can disable the security checking by following these instructions:

1. Open **Control Panel**.

2. Under the **User Accounts and Family Safety**, select **Add or remove user accounts**.

3. Click the **Got to the main User Accounts page** link.

4. Click on **Turn User Account Control on or off**. You may be prompted to provide permission to change this setting. Click **Continue**.

5. Deselect or uncheck the check box next to **Use User Account Control (UAC) to help protect your computer**. Click **OK** to save the setting.

You will need to restart to complete the process. Click **Restart Now** to reboot the machine and apply the changes. You can then follow the instructions below for installing Windows.

### 5.4.1 Using the MySQL Installation Wizard

MySQL Installation Wizard is an installer for the MySQL server that uses the latest installer technologies for Microsoft Windows. The MySQL Installation Wizard, in combination with the MySQL Configuration Wizard, enables a user to install and configure a MySQL server that is ready for use immediately after installation.

The MySQL Installation Wizard is the standard installer for all MySQL server distributions, version 4.1.5 and higher. Users of previous versions of MySQL need to shut down and remove their existing MySQL installations manually before installing MySQL with the MySQL Installation Wizard. See Section 5.4.1.6, “Upgrading MySQL with the Installation Wizard”, for more information on upgrading from a previous version.

Microsoft has included an improved version of their Microsoft Windows Installer (MSI) in the recent versions of Windows. MSI has become the de-facto standard for application installations on Windows 2000, Windows XP, and Windows Server 2003. The MySQL Installation Wizard makes use of this technology to provide a smoother and more flexible installation process.

The Microsoft Windows Installer Engine was updated with the release of Windows XP; those using a previous version of Windows can reference this Microsoft Knowledge Base article for information on upgrading to the latest version of the Windows Installer Engine.
In addition, Microsoft has introduced the WiX (Windows Installer XML) toolkit recently. This is the first highly acknowledged Open Source project from Microsoft. We have switched to WiX because it is an Open Source project and it enables us to handle the complete Windows installation process in a flexible manner using scripts.

Improving the MySQL Installation Wizard depends on the support and feedback of users like you. If you find that the MySQL Installation Wizard is lacking some feature important to you, or if you discover a bug, please report it in our bugs database using the instructions given in How to Report Bugs or Problems.

5.4.1.1 Downloading and Starting the MySQL Installation Wizard

The MySQL installation packages can be downloaded from https://dev.mysql.com/downloads/. If the package you download is contained within a ZIP archive, you need to extract the archive first.

Note

If you are installing on Windows Vista or newer, it is best to open a network port before beginning the installation. To do this, first ensure that you are logged in as an Administrator, go to the Control Panel, and double-click the Windows Firewall icon. Choose the Allow a program through Windows Firewall option and click the Add port button. Enter MySQL into the Name text box and 3306 (or the port of your choice) into the Port number text box. Also ensure that the TCP protocol radio button is selected. If you wish, you can also limit access to the MySQL server by choosing the Change scope button. Confirm your choices by clicking the OK button. If you do not open a port prior to installation, you cannot configure the MySQL server immediately after installation. Additionally, when running the MySQL Installation Wizard on Windows Vista or newer, ensure that you are logged in as a user with administrative rights.

The process for starting the wizard depends on the contents of the installation package you download. If there is a setup.exe file present, double-click it to start the installation process. If there is an .msi file present, double-click it to start the installation process.

5.4.1.2 Choosing an Install Type

There are three installation types available: Typical, Complete, and Custom.

The Typical installation type installs the MySQL server, the mysql command-line client, and the command-line utilities. The command-line clients and utilities include mysqldump, myisamchk, and several other tools to help you manage the MySQL server.

The Complete installation type installs all components included in the installation package. The full installation package includes components such as the embedded server library, the benchmark suite, support scripts, and documentation.

The Custom installation type gives you complete control over which packages you wish to install and the installation path that is used. See Section 5.4.1.3, “The Custom Install Dialog”, for more information on performing a custom install.

If you choose the Typical or Complete installation types and click the Next button, you advance to the confirmation screen to verify your choices and begin the installation. If you choose the Custom installation type and click the Next button, you advance to the custom installation dialog, described in Section 5.4.1.3, “The Custom Install Dialog”.


5.4.1.3 The Custom Install Dialog

If you wish to change the installation path or the specific components that are installed by the MySQL Installation Wizard, choose the **Custom** installation type.

**Caution**

To avoid having user data removed unintentionally during an upgrade, do not use the server installation folder as the destination folder for the server data files, which you can configure in the MySQL Server 5.5 Setup dialog.

A tree view on the left side of the custom install dialog lists all available components. Components that are not installed have a red X icon; components that are installed have a gray icon. To change whether a component is installed, click that component's icon and choose a new option from the drop-down list that appears.

You can change the default installation path by clicking the **Change...** button to the right of the displayed installation path.

After choosing your installation components and installation path, click the **Next** button to advance to the confirmation dialog.

5.4.1.4 The Confirmation Dialog

After you choose an installation type and optionally choose your installation components, you advance to the confirmation dialog. Your installation type and installation path are displayed for you to review.

To install MySQL if you are satisfied with your settings, click the **Install** button. To change your settings, click the **Back** button. To exit the MySQL Installation Wizard without installing MySQL, click the **Cancel** button.

The final screen of the installer provides a summary of the installation and gives you the option to launch the MySQL Configuration Wizard, which you can use to create a configuration file, install the MySQL service, and configure security settings.

5.4.1.5 Changes Made by MySQL Installation Wizard

When you click the **Install** button, the MySQL Installation Wizard begins the installation process and makes certain changes to your system which are described in the sections that follow.

**Changes to the Registry**

The MySQL Installation Wizard creates one Windows registry key in a typical install situation, located in **HKEY_LOCAL_MACHINE\SOFTWARE\MySQL AB**.

The MySQL Installation Wizard creates a key named after the release series of the server that is being installed, such as **MySQL Server 5.5**. It contains two string values, **Location** and **Version**. The **Location** string contains the path to the installation directory. In a default installation it contains **C:\Program Files\MySQL\MySQL Server 5.5**. The **Version** string contains the release number. For example, for an installation of MySQL Server 5.5.62, the key contains a value of **5.5.62**.

These registry keys are used to help external tools identify the installed location of the MySQL server, preventing a complete scan of the hard-disk to determine the installation path of the MySQL server. The registry keys are not required to run the server, and if you install MySQL using the **noinstall** ZIP archive, the registry keys are not created.
Changes to the Start Menu

The MySQL Installation Wizard creates a new entry in the Windows Start menu under a common MySQL menu heading named after the release series of MySQL that you have installed. For example, if you install MySQL 5.5, the MySQL Installation Wizard creates a MySQL Server 5.5 section in the Start menu.

The following entries are created within the new Start menu section:

- **MySQL Command-Line Client**: This is a shortcut to the mysql command-line client and is configured to connect as the root user. The shortcut prompts for a root user password when you connect.

- **MySQL Server Instance Config Wizard**: This is a shortcut to the MySQL Configuration Wizard. Use this shortcut to configure a newly installed server, or to reconfigure an existing server.

- **MySQL Documentation**: This is a link to the MySQL server documentation that is stored locally in the MySQL server installation directory.

Changes to the File System

The MySQL Installation Wizard by default installs the MySQL 5.5 server to C:\Program Files\MySQL\MySQL Server 5.5, where Program Files is the default location for applications in your system, and 5.5 is the release series of your MySQL server. This is the recommended location for the MySQL server, replacing the former default location C:\mysql.

By default, all MySQL applications are stored in a common directory at C:\Program Files\MySQL, where Program Files is the default location for applications in your Windows installation. A typical MySQL installation on a developer machine might look like this:

```
C:\Program Files\MySQL\MySQL Server 5.5
C:\Program Files\MySQL\MySQL Workbench 5.1 OSS
```

This approach makes it easier to manage and maintain all MySQL applications installed on a particular system.

The default location of the data directory is the AppData directory configured for the user that installed the MySQL application.

5.4.1.6 Upgrading MySQL with the Installation Wizard

The MySQL Installation Wizard can perform server upgrades automatically using the upgrade capabilities of MSI. That means you do not need to remove a previous installation manually before installing a new release. The installer automatically shuts down and removes the previous MySQL service before installing the new version.

**Warning**

If you selected the server installation folder as the destination folder for your server data files during the previous installation, move or back up your data folder before beginning the upgrade on Windows. The Installation Wizard overwrites the data folder during the upgrade. Using the installation folder for data files is not recommended.

Automatic upgrades are available only when upgrading between installations that have the same major and minor version numbers. For example, you can upgrade automatically from MySQL 5.5.5 to MySQL 5.5.6, but not from MySQL 5.1 to MySQL 5.5.
5.4.2 Automating MySQL Installation on Microsoft Windows Using the MSI Package

The Microsoft Installer (MSI) supports both a *quiet* and a *passive* mode that can be used to install MySQL automatically without requiring intervention. You can use this either in scripts to automatically install MySQL or through a terminal connection such as Telnet where you do not have access to the standard Windows user interface. The MSI packages can also be used in combination with Microsoft's Group Policy system (part of Windows Server 2003 and Windows Server 2008) to install MySQL across multiple machines.

To install MySQL from one of the MSI packages automatically from the command line (or within a script), you need to use the `msiexec.exe` tool. For example, to perform a quiet installation (which shows no dialog boxes or progress):

```
shell> msiexec /i mysql-5.5.62.msi /quiet
```

The `/i` indicates that you want to perform an installation. The `/quiet` option indicates that you want no interactive elements.

To provide a dialog box showing the progress during installation, and the dialog boxes providing information on the installation and registration of MySQL, use `/passive` mode instead of `/quiet`:

```
shell> msiexec /i mysql-5.5.62.msi /passive
```

Regardless of the mode of the installation, installing the package in this manner performs a 'Typical' installation, and installs the default components into the standard location.

You can also use this method to uninstall MySQL by using the `/uninstall` or `/x` options:

```
shell> msiexec /x mysql-5.5.62.msi /uninstall
```

To install MySQL and configure a MySQL instance from the command line, see Section 5.5.13, “MySQL Server Instance Config Wizard: Creating an Instance from the Command Line”.

For information on using MSI packages to install software automatically using Group Policy, see How to use Group Policy to remotely install software in Windows Server 2003.

5.4.3 Removing MySQL When Installed from the MSI Package

To uninstall MySQL when you installed it using the MSI package, you must use the *Add/Remove Programs* tool within *Control Panel*. To do this:

1. Right-click the *start* menu and choose *Control Panel*.
2. If the Control Panel is set to category mode (you will see *Pick a category* at the top of the *Control Panel* window), double-click *Add or Remove Programs*. If the Control is set to classic mode, double-click the *Add or Remove Programs* icon.
3. Find MySQL in the list of installed software. MySQL Server is installed against release series numbers (MySQL 5.1, MySQL 5.5, etc.). Select the version that you want to remove and click *Remove*. 
4. You will be prompted to confirm the removal. Click **Yes** to remove MySQL.

When MySQL is removed using this method, only the installed components are removed. Any database information (including the tables and data), import or export files, log files, and binary logs produced during execution are kept in their configured location.

If you try to install MySQL again the information will be retained and you will be prompted to enter the password configured with the original installation.

If you want to delete MySQL completely:

- Delete the associated data directory. On Windows XP and Windows Server 2003, the default data directory is the configured AppData directory, which is `C:\Documents and Settings\All Users \Application Data\MySQL` by default.
- On Windows 7 and Windows Server 2008, the default data directory location is `C:\ProgramData \Mysql`.

**Note**
The `C:\ProgramData` directory is hidden by default. You must change your folder options to view the hidden file. Choose **Organize, Folder and search options, Show hidden folders.**

5.5 MySQL Server Instance Configuration Wizard

The MySQL Server Instance Configuration Wizard helps automate the process of configuring your server. It creates a custom MySQL configuration file (`my.ini` or `my.cnf`) by asking you a series of questions and then applying your responses to a template to generate the configuration file that is tuned to your installation.

The MySQL Server Instance Configuration Wizard is included with the MySQL 5.5 server. The MySQL Server Instance Configuration Wizard is only available for Windows.

5.5.1 Starting the MySQL Server Instance Configuration Wizard

The MySQL Server Instance Configuration Wizard is normally started as part of the installation process. You should only need to run the MySQL Server Instance Configuration Wizard again when you need to change the configuration parameters of your server.

If you chose not to open a port prior to installing MySQL on Windows Vista or newer, you can choose to use the MySQL Server Configuration Wizard after installation. However, you must open a port in the Windows Firewall. To do this see the instructions given in Section 5.4.1.1, “Downloading and Starting the MySQL Installation Wizard”. Rather than opening a port, you also have the option of adding MySQL as a program that bypasses the Windows Firewall. One or the other option is sufficient—you need not do both. Additionally, when running the MySQL Server Configuration Wizard on Windows Vista or newer, ensure that you are logged in as a user with administrative rights.
You can launch the MySQL Configuration Wizard by clicking the **MySQL Server Instance Config Wizard** entry in the **MySQL** section of the Windows **Start** menu.

Alternatively, you can navigate to the **bin** directory of your MySQL installation and launch the **MySQLInstanceConfig.exe** file directly.

The MySQL Server Instance Configuration Wizard places the **my.ini** file in the installation directory for the MySQL server. This helps associate configuration files with particular server instances.

To ensure that the MySQL server knows where to look for the **my.ini** file, an argument similar to this is passed to the MySQL server as part of the service installation:

```
--defaults-file="C:\Program Files\MySQL\MySQL Server 5.5\my.ini"
```

Here, **C:\Program Files\MySQL\MySQL Server 5.5** is replaced with the installation path to the MySQL Server. The **--defaults-file** option instructs the MySQL server to read the specified file for configuration options when it starts.

Apart from making changes to the **my.ini** file by running the MySQL Server Instance Configuration Wizard again, you can modify it by opening it with a text editor and making any necessary changes. You can also modify the server configuration with the [http://www.mysql.com/products/administrator/](http://www.mysql.com/products/administrator/) utility. For more information about server configuration, see **Server Command Options**.
MySQL clients and utilities such as the `mysql` and `mysqldump` command-line clients are not able to locate the `my.ini` file located in the server installation directory. To configure the client and utility applications, create a new `my.ini` file in the Windows installation directory (for example, `C:\WINDOWS`).

Under Windows Server 2003, Windows Server 2000, Windows XP, and Windows Vista, MySQL Server Instance Configuration Wizard will configure MySQL to work as a Windows service. To start and stop MySQL you use the `Services` application that is supplied as part of the Windows Administrator Tools.

### 5.5.2 Choosing a Maintenance Option

If the MySQL Server Instance Configuration Wizard detects an existing configuration file, you have the option of either reconfiguring your existing server, or removing the server instance by deleting the configuration file and stopping and removing the MySQL service.

To reconfigure an existing server, choose the **Re-configure Instance** option and click the **Next** button. Any existing configuration file is not overwritten, but renamed (within the same directory) using a timestamp (Windows) or sequential number (Linux). To remove the existing server instance, choose the **Remove Instance** option and click the **Next** button.

If you choose the **Remove Instance** option, you advance to a confirmation window. Click the **Execute** button. The MySQL Server Configuration Wizard stops and removes the MySQL service, and then deletes the configuration file. The server installation and its **data** folder are not removed.

If you choose the **Re-configure Instance** option, you advance to the **Configuration Type** dialog where you can choose the type of installation that you wish to configure.

### 5.5.3 Choosing a Configuration Type

When you start the MySQL Server Instance Configuration Wizard for a new MySQL installation, or choose the **Re-configure Instance** option for an existing installation, you advance to the **Configuration Type** dialog.
Choosing a Configuration Type

There are two configuration types available: Detailed Configuration and Standard Configuration. The Standard Configuration option is intended for new users who want to get started with MySQL quickly without having to make many decisions about server configuration. The Detailed Configuration option is intended for advanced users who want more fine-grained control over server configuration.

If you are new to MySQL and need a server configured as a single-user developer machine, the Standard Configuration should suit your needs. Choosing the Standard Configuration option causes the MySQL Configuration Wizard to set all configuration options automatically with the exception of Service Options and Security Options.

The Standard Configuration sets options that may be incompatible with systems where there are existing MySQL installations. If you have an existing MySQL installation on your system in addition to the installation you wish to configure, the Detailed Configuration option is recommended.

To complete the Standard Configuration, please refer to the sections on Service Options and Security Options in Section 5.5.10, “The Service Options Dialog”, and Section 5.5.11, “The Security Options Dialog”, respectively.
There are three different server types available to choose from. The server type that you choose affects the decisions that the MySQL Server Instance Configuration Wizard makes with regard to memory, disk, and processor usage.

**Figure 5.10 Server Type**

- **Developer Machine**: Choose this option for a typical desktop workstation where MySQL is intended only for personal use. It is assumed that many other desktop applications are running. The MySQL server is configured to use minimal system resources.

- **Server Machine**: Choose this option for a server machine where the MySQL server is running alongside other server applications such as FTP, email, and Web servers. The MySQL server is configured to use a moderate portion of the system resources.

- **Dedicated MySQL Server Machine**: Choose this option for a server machine that is intended to run only the MySQL server. It is assumed that no other applications are running. The MySQL server is configured to use all available system resources.

**Note**

By selecting one of the preconfigured configurations, the values and settings of various options in your `my.cnf` or `my.ini` will be altered accordingly. The
default values and options as described in the reference manual may therefore be different to the options and values that were created during the execution of the configuration wizard.

5.5.5 The Database Usage Dialog

The Database Usage dialog enables you to indicate the storage engines that you expect to use when creating MySQL tables. The option you choose determines whether the InnoDB storage engine is available and what percentage of the server resources are available to InnoDB.

Figure 5.11 Database Usage

- **Multifunctional Database**: This option enables both the InnoDB and MyISAM storage engines and divides resources evenly between the two. This option is recommended for users who use both storage engines on a regular basis.

- **Transactional Database Only**: This option enables both the InnoDB and MyISAM storage engines, but dedicates most server resources to the InnoDB storage engine. This option is recommended for users who use InnoDB almost exclusively and make only minimal use of MyISAM.

- **Non-Transactional Database Only**: This option disables the InnoDB storage engine completely and dedicates all server resources to the MyISAM storage engine. This option is recommended for users who do not use InnoDB.
The Configuration Wizard uses a template to generate the server configuration file. The **Database Usage** dialog sets one of the following option strings:

<table>
<thead>
<tr>
<th>Database Type</th>
<th>Option String</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multifunctional Database: MIXED</td>
<td></td>
</tr>
<tr>
<td>Transactional Database Only: INNODB</td>
<td></td>
</tr>
<tr>
<td>Non-Transactional Database Only: MYISAM</td>
<td></td>
</tr>
</tbody>
</table>

When these options are processed through the default template (my-template.ini) the result is:

```ini
Multifunctional Database:
default-storage-engine=InnoDB
_myisam_pct=50

Transactional Database Only:
default-storage-engine=InnoDB
_myisam_pct=5

Non-Transactional Database Only:
default-storage-engine=MyISAM
_myisam_pct=100
skip-innodb
```

The `_myisam_pct` value is used to calculate the percentage of resources dedicated to *MyISAM*. The remaining resources are allocated to *InnoDB*.

### 5.5.6 The InnoDB Tablespace Dialog

Some users may want to locate the *InnoDB* tablespace files in a different location than the MySQL server data directory. Placing the tablespace files in a separate location can be desirable if your system has a higher capacity or higher performance storage device available, such as a RAID storage system.
To change the default location for the InnoDB tablespace files, choose a new drive from the drop-down list of drive letters and choose a new path from the drop-down list of paths. To create a custom path, click the ... button.

If you are modifying the configuration of an existing server, you must click the Modify button before you change the path. In this situation you must move the existing tablespace files to the new location manually before starting the server.

5.5.7 The Concurrent Connections Dialog

To prevent the server from running out of resources, it is important to limit the number of concurrent connections to the MySQL server that can be established. The Concurrent Connections dialog enables you to choose the expected usage of your server, and sets the limit for concurrent connections accordingly. It is also possible to set the concurrent connection limit manually.
Figure 5.13 Concurrent Connections

- **Decision Support (DSS)/OLAP**: Choose this option if your server does not require a large number of concurrent connections. The maximum number of connections is set at 100, with an average of 20 concurrent connections assumed.

- **Online Transaction Processing (OLTP)**: Choose this option if your server requires a large number of concurrent connections. The maximum number of connections is set at 500.

- **Manual Setting**: Choose this option to set the maximum number of concurrent connections to the server manually. Choose the number of concurrent connections from the drop-down box provided, or enter the maximum number of connections into the drop-down box if the number you desire is not listed.

5.5.8 The Networking and Strict Mode Options Dialog

Use the Networking Options dialog to enable or disable TCP/IP networking and to configure the port number that is used to connect to the MySQL server.
TCP/IP networking is enabled by default. To disable TCP/IP networking, uncheck the box next to the Enable TCP/IP Networking option.

Port 3306 is used by default. To change the port used to access MySQL, choose a new port number from the drop-down box or type a new port number directly into the drop-down box. If the port number you choose is in use, you are prompted to confirm your choice of port number.

Set the Server SQL Mode to either enable or disable strict mode. Enabling strict mode (default) makes MySQL behave more like other database management systems. If you run applications that rely on MySQL’s old “forgiving” behavior, make sure to either adapt those applications or to disable strict mode. For more information about strict mode, see Server SQL Modes.

### 5.5.9 The Character Set Dialog

The MySQL server supports multiple character sets and it is possible to set a default server character set that is applied to all tables, columns, and databases unless overridden. Use the Character Set dialog to change the default character set of the MySQL server.
Figure 5.15 Character Set

- **Standard Character Set**: Choose this option if you want to use *latin1* as the default server character set. *latin1* is used for English and many Western European languages.

- **Best Support For Multilingualism**: Choose this option if you want to use *utf8* as the default server character set. This is a Unicode character set that can store characters from many different languages.

- **Manual Selected Default Character Set / Collation**: Choose this option if you want to pick the server's default character set manually. Choose the desired character set from the provided drop-down list.

### 5.5.10 The Service Options Dialog

On Windows platforms, the MySQL server can be installed as a Windows service. When installed this way, the MySQL server can be started automatically during system startup, and even restarted automatically by Windows in the event of a service failure.

The MySQL Server Instance Configuration Wizard installs the MySQL server as a service by default, using the service name *MySQL*. If you do not wish to install the service, uncheck the box next to the **Install As Windows Service** option. You can change the service name by picking a new service name from the drop-down box provided or by entering a new service name into the drop-down box.
The Security Options Dialog

**Note**

Service names can include any legal character except forward (/) or backward (\) slashes, and must be less than 256 characters long.

**Warning**

If you are installing multiple versions of MySQL onto the same machine, you *must* choose a different service name for each version that you install. If you do not choose a different service for each installed version then the service manager information will be inconsistent and this will cause problems when you try to uninstall a previous version.

If you have already installed multiple versions using the same service name, you must manually edit the contents of the **HKEY_LOCAL_MACHINE\SYSTEM \CurrentControlSet\Services** parameters within the Windows registry to update the association of the service name with the correct server version.

Typically, when installing multiple versions you create a service name based on the version information. For example, you might install MySQL 5.x as `mysql5`, or specific versions such as MySQL 5.5.0 as `mysql50500`.

To install the MySQL server as a service but not have it started automatically at startup, uncheck the box next to the **Launch the MySQL Server Automatically** option.

### 5.5.11 The Security Options Dialog

The content of the security options portion of the MySQL Server Instance Configuration Wizard will depend on whether this is a new installation, or modifying an existing installation.

- **Setting the root password for a new installation**

  *It is strongly recommended that you set a root password for your MySQL server,* and the MySQL Server Instance Config Wizard requires by default that you do so. If you do not wish to set a root password, uncheck the box next to the **Modify Security Settings** option.
Figure 5.16 Security Options

- To set the root password, enter the desired password into both the New root password and Confirm boxes.

Setting the root password for an existing installation

If you are modifying the configuration of an existing configuration, or you are installing an upgrade and the MySQL Server Instance Configuration Wizard has detected an existing MySQL system, then you must enter the existing password for root before changing the configuration information.
If you want to change the current root password, enter the desired new password into both the **New root password** and **Confirm** boxes.

To permit root logins from across the network, check the box next to the **Enable root access from remote machines** option. This decreases the security of your root account.

To create an anonymous user account, check the box next to the **Create An Anonymous Account** option. Creating an anonymous account can decrease server security and cause login and permission difficulties. For this reason, it is not recommended.

### 5.5.12 The Confirmation Dialog

The final dialog in the MySQL Server Instance Configuration Wizard is the **Confirmation Dialog**. To start the configuration process, click the **Execute** button. To return to a previous dialog, click the **Back** button. To exit the MySQL Server Instance Configuration Wizard without configuring the server, click the **Cancel** button.
After you click the **Execute** button, the MySQL Server Instance Configuration Wizard performs a series of tasks and displays the progress onscreen as the tasks are performed.

The MySQL Server Instance Configuration Wizard first determines configuration file options based on your choices using a template prepared by MySQL developers and engineers. This template is named `my-template.ini` and is located in your server installation directory.

The MySQL Configuration Wizard then writes these options to the corresponding configuration file.

If you chose to create a service for the MySQL server, the MySQL Server Instance Configuration Wizard creates and starts the service. If you are reconfiguring an existing service, the MySQL Server Instance Configuration Wizard restarts the service to apply your configuration changes.

If you chose to set a root password, the MySQL Configuration Wizard connects to the server, sets your new root password, and applies any other security settings you may have selected.

After the MySQL Server Instance Configuration Wizard has completed its tasks, it displays a summary. Click the **Finish** button to exit the MySQL Server Configuration Wizard.
5.5.13 MySQL Server Instance Config Wizard: Creating an Instance from the Command Line

In addition to using the GUI interface to the MySQL Server Instance Config Wizard, you can also create instances automatically from the command line.

To use the MySQL Server Instance Config Wizard on the command line, you need to use the `MySQLInstanceConfig.exe` command that is installed with MySQL in the `bin` directory within the installation directory. `MySQLInstanceConfig.exe` takes a number of command-line arguments to set the properties that would normally be selected through the GUI interface, and then creates a new configuration file (`my.ini`) by combining these selections with a template configuration file to produce the working configuration file.

The main command line options are provided in the table below. Some of the options are required, while some options are optional.

**Table 5.3 MySQL Server Instance Config Wizard Required Command-Line Options**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-n PRODUCTNAME</code></td>
<td>The name of the instance when installed</td>
</tr>
<tr>
<td><code>-p PATH</code></td>
<td>Path of the base directory for installation. This is equivalent to the directory when using the <code>basedir</code> configuration parameter</td>
</tr>
<tr>
<td><code>-v VERSION</code></td>
<td>The version tag to use for this installation</td>
</tr>
</tbody>
</table>

**Table 5.4 MySQL Server Instance Config Wizard Action-Specifier Command-Line Options**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-i</code></td>
<td>Install an instance</td>
</tr>
<tr>
<td><code>-r</code></td>
<td>Remove an instance</td>
</tr>
<tr>
<td><code>-s</code></td>
<td>Stop an existing instance</td>
</tr>
<tr>
<td><code>-q</code></td>
<td>Perform the operation quietly</td>
</tr>
<tr>
<td><code>-lFILENAME</code></td>
<td>Save the installation progress in a logfile</td>
</tr>
</tbody>
</table>

**Table 5.5 MySQL Server Instance Config Wizard Configuration File Command-Line Options**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-tFILENAME</code></td>
<td>Path to the template config file that will be used to generate the installed configuration file</td>
</tr>
<tr>
<td><code>-cFILENAME</code></td>
<td>Path to a config file to be generated</td>
</tr>
</tbody>
</table>

The `-t` and `-c` options work together to set the configuration parameters for a new instance. The `-t` option specifies the template configuration file to use as the basic configuration, which are then merged with the configuration parameters generated by the MySQL Server Instance Config Wizard into the configuration file specified by the `-c` option.

A sample template file, `my-template.ini` is provided in the toplevel MySQL installation directory. The file contains elements are replaced automatically by the MySQL Server Instance Config Wizard during configuration.

If you specify a configuration file that already exists, the existing configuration file will be saved in the file with the original, with the date and time added. For example, the `mysql.ini` will be copied to `mysql 2009-10-27 1646.ini.bak`. 
The parameters that you can specify on the command line are listed in the table below.

### Table 5.6 MySQL Server Instance Config Wizard Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ServiceName=$</td>
<td>Specify the name of the service to be created</td>
</tr>
<tr>
<td>AddBinToPath={yes</td>
<td>no}</td>
</tr>
<tr>
<td>ServerType={DEVELOPMENT</td>
<td>SERVER</td>
</tr>
<tr>
<td>DatabaseType={MIXED</td>
<td>INNODB</td>
</tr>
<tr>
<td>ConnectionUsage={DSS</td>
<td>OLTP}</td>
</tr>
<tr>
<td>ConnectionCount=#</td>
<td>Specify the number of concurrent connections to support. For more information, see Section 5.5.4, “The Server Type Dialog”</td>
</tr>
<tr>
<td>SkipNetworking={yes</td>
<td>no}</td>
</tr>
<tr>
<td>Port=#</td>
<td>Specify the network port number to use for network connections. For more information, see Section 5.5.8, “The Networking and Strict Mode Options Dialog”</td>
</tr>
<tr>
<td>StrictMode={yes</td>
<td>no}</td>
</tr>
<tr>
<td>Charset=$</td>
<td>Specify the default character set. For more information, see Section 5.5.9, “The Character Set Dialog”</td>
</tr>
<tr>
<td>RootPassword=$</td>
<td>Specify the root password</td>
</tr>
<tr>
<td>RootCurrentPassword=$</td>
<td>Specify the current root password then stopping or reconfiguring an existing service</td>
</tr>
</tbody>
</table>

**Note**

When specifying options on the command line, you can enclose the entire command-line option and the value you are specifying using double quotation marks. This enables you to use spaces in the options. For example, "-c:\mysql.ini".

The following command installs a MySQL Server 5.5 instance from the directory C:\Program Files \MySQL\MySQL Server 5.5 using the service name MySQL55 and setting the root password to 1234.

```shell
MySQLInstanceConfig.exe -i -q "-lC:\mysql_install_log.txt" »
"-MySQL Server 5.5" "-pC:\Program Files\MySQL\MySQL Server 5.5" -v5.5.62 »
"-tmy-template.ini" "-cC:\mytest.ini" ServerType=DEVELOPMENT DatabaseType=MIXED »
ConnectionUsage=DSS Port=3311 ServiceName=MySQL55 RootPassword=1234
```

In the above example, a log file will be generated in `mysql_install_log.txt` containing the information about the instance creation process. The log file generated by the above example is shown below:
Installing MySQL on Microsoft Windows Using a `noinstall` ZIP Archive

Welcome to the MySQL Server Instance Configuration Wizard 1.0.16.0
Date: 2009-10-27 17:07:21

Installing service ...

Product Name: MySQL Server 5.5
Version: 5.5.62
Installation Path: C:\Program Files\MySQL\MySQL Server 5.5\

Creating configuration file C:\mytest.ini using template my-template.ini.
Options:
DEVELOPMENT
MIXED
DSS
STRICTMODE

Variables:
port: 3311
default-character-set: latin1
basedir: "C:/Program Files/MySQL/MySQL Server 5.5/*
datadir: "C:/Program Files/MySQL/MySQL Server 5.5/Data/*"

Creating Windows service entry.
Service name: "MySQL55"
Parameters: "C:\Program Files\MySQL\MySQL Server 5.5\bin\mysqld" --defaults-file="C:\mytest.ini" MySQL55.
Windows service MySQL55 installed.

When using the command line, the return values in the following table indicate an error performing the specified option.

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Configuration template file cannot be found</td>
</tr>
<tr>
<td>3</td>
<td>The Windows service entry cannot be created</td>
</tr>
<tr>
<td>4</td>
<td>Could not connect to the Service Control Manager</td>
</tr>
<tr>
<td>5</td>
<td>The MySQL service cannot be started</td>
</tr>
<tr>
<td>6</td>
<td>The MySQL service cannot be stopped</td>
</tr>
<tr>
<td>7</td>
<td>The security settings cannot be applied</td>
</tr>
<tr>
<td>8</td>
<td>The configuration file cannot be written</td>
</tr>
<tr>
<td>9</td>
<td>The Windows service entry cannot be removed</td>
</tr>
</tbody>
</table>

Table 5.7 Return Value from MySQL Server Instance Config Wizard

You can perform an installation of MySQL automatically using the MSI package. For more information, see Section 5.4.2, “Automating MySQL Installation on Microsoft Windows Using the MSI Package”.

5.6 Installing MySQL on Microsoft Windows Using a `noinstall` ZIP Archive

Users who are installing from the `noinstall` package can use the instructions in this section to manually install MySQL. The process for installing MySQL from a ZIP Archive package is as follows:

1. Extract the archive to the desired install directory
2. Create an option file
3. Choose a MySQL server type
4. Start the MySQL server
5. Secure the default user accounts

This process is described in the sections that follow.

5.6.1 Extracting the Install Archive

To install MySQL manually, do the following:

1. If you are upgrading from a previous version please refer to Section 10.5, "Upgrading MySQL on Windows", before beginning the upgrade process.
2. Make sure that you are logged in as a user with administrator privileges.
3. Choose an installation location. Traditionally, the MySQL server is installed in `C:\mysql`. The MySQL Installation Wizard installs MySQL under `C:\Program Files\MySQL`. If you do not install MySQL at `C:\mysql`, you must specify the path to the install directory during startup or in an option file. See Section 5.6.2, "Creating an Option File".

   **Note**
   The MySQL Installer installs MySQL under `C:\Program Files\MySQL`.

4. Extract the install archive to the chosen installation location using your preferred file-compression tool. Some tools may extract the archive to a folder within your chosen installation location. If this occurs, you can move the contents of the subfolder into the chosen installation location.

5.6.2 Creating an Option File

If you need to specify startup options when you run the server, you can indicate them on the command line or place them in an option file. For options that are used every time the server starts, you may find it most convenient to use an option file to specify your MySQL configuration. This is particularly true under the following circumstances:

- The installation or data directory locations are different from the default locations (`C:\Program Files\MySQL\MySQL Server 5.5` and `C:\Program Files\MySQL\MySQL Server 5.5\data`).
- You need to tune the server settings, such as memory, cache, or InnoDB configuration information.

When the MySQL server starts on Windows, it looks for option files in several locations, such as the Windows directory, `C:\`, and the MySQL installation directory (for the full list of locations, see Using Option Files). The Windows directory typically is named something like `C:\WINDOWS`. You can determine its exact location from the value of the `WINDIR` environment variable using the following command:

```
C:\> echo %WINDIR%
```

MySQL looks for options in each location first in the `my.ini` file, and then in the `my.cnf` file. However, to avoid confusion, it is best if you use only one file. If your PC uses a boot loader where `C:` is not the boot drive, your only option is to use the `my.ini` file. Whichever option file you use, it must be a plain text file.

**Note**
When using the MySQL Installer to install MySQL Server, it will create the `my.ini` at the default location. And as of MySQL Server 5.5.27, the user running MySQL Installer is granted full permissions to this new `my.ini`. 

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In other words, be sure that the MySQL Server user has permission to read the *my.ini* file.

You can also make use of the example option files included with your MySQL distribution; see Server Configuration Defaults.

An option file can be created and modified with any text editor, such as Notepad. For example, if MySQL is installed in *E:\mysql* and the data directory is in *E:\mydata\data*, you can create an option file containing a *[mysqld]* section to specify values for the *basedir* and *datadir* options:

```
[mysqld]
# set basedir to your installation path
basedir=E:/mysql
# set datadir to the location of your data directory
datadir=E:/mydata/data
```

Microsoft Windows path names are specified in option files using (forward) slashes rather than backslashes. If you do use backslashes, double them:

```
[mysqld]
# set basedir to your installation path
basedir=E:\mysql
# set datadir to the location of your data directory
datadir=E:\mydata\data
```

The rules for use of backslash in option file values are given in Using Option Files.

The data directory is located within the *AppData* directory for the user running MySQL.

If you would like to use a data directory in a different location, you should copy the entire contents of the *data* directory to the new location. For example, if you want to use *E:\mydata* as the data directory instead, you must do two things:

1. Move the entire *data* directory and all of its contents from the default location (for example *C:\Program Files\MySQL\MySQL Server 5.5\data*) to *E:\mydata*.

2. Use a *--datadir* option to specify the new data directory location each time you start the server.

### 5.6.3 Selecting a MySQL Server Type

The following table shows the available servers for Windows in MySQL 5.5.

<table>
<thead>
<tr>
<th>Binary</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mysqld</td>
<td>Optimized binary with named-pipe support</td>
</tr>
<tr>
<td>mysqld-debug</td>
<td>Like <em>mysqld</em>, but compiled with full debugging and automatic memory allocation checking</td>
</tr>
</tbody>
</table>

All of the preceding binaries are optimized for modern Intel processors, but should work on any Intel i386-class or higher processor.

Each of the servers in a distribution support the same set of storage engines. The *SHOW ENGINES* statement displays which engines a given server supports.

All Windows MySQL 5.5 servers have support for symbolic linking of database directories.
MySQL supports TCP/IP on all Windows platforms. MySQL servers on Windows also support named pipes, if you start the server with the *named_pipe* system variable enabled. It is necessary to enable this variable explicitly because some users have experienced problems with shutting down the MySQL server when named pipes were used. The default is to use TCP/IP regardless of platform because named pipes are slower than TCP/IP in many Windows configurations.

### 5.6.4 Starting the Server for the First Time

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

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

**Note**

MySQL server will automatically start after using MySQL Installer, and MySQL Notifier can be used to start/stop/restart at any time.

The examples in these sections assume that MySQL is installed under the default location of `C:\Program Files\MySQL\MySQL Server 5.5`. Adjust the path names shown in the examples if you have MySQL installed in a different location.

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

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

For information about which server binary to run, see Section 5.6.3, "Selecting a MySQL Server Type".

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

To start the server, enter this command:

```
C:\> "C:\Program Files\MySQL\MySQL Server 5.5\bin\mysqld" --console
```

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

```
InnoDB: The first specified datafile c:\ibdata\ibdata1 did not exist:
InnoDB: a new database to be created!
InnoDB: Setting file c:\ibdata\ibdata1 size to 209715200
InnoDB: Database physically writes the file full: wait...
InnoDB: Log file c:\iblogs\ib_logfile0 did not exist: new to be created
InnoDB: Setting log file c:\iblogs\ib_logfile0 size to 31457280
InnoDB: Log file c:\iblogs\ib_logfile1 did not exist: new to be created
InnoDB: Setting log file c:\iblogs\ib_logfile1 size to 31457280
InnoDB: Log file c:\iblogs\ib_logfile2 did not exist: new to be created
InnoDB: Setting log file c:\iblogs\ib_logfile2 size to 31457280
InnoDB: Doublewrite buffer not found: creating new
InnoDB: Doublewrite buffer created
InnoDB: creating foreign key constraint system tables
InnoDB: foreign key constraint system tables created
011024 10:58:25 InnoDB: Started
```
When the server finishes its startup sequence, you should see something like this, which indicates that the server is ready to service client connections:

```
mysqld: ready for connections
Version: '5.5.62' socket: '' port: 3306
```

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

If you omit the `--console` option, the server writes diagnostic output to the error log in the data directory (C:\Program Files\MySQL\MySQL Server 5.5\data by default). The error log is the file with the `.err` extension, and may be set using the `--log-error` option.

**Note**

The accounts that are listed in the MySQL grant tables initially have no passwords. After starting the server, you should set up passwords for them using the instructions in Section 9.4, “Securing the Initial MySQL Accounts”.

### 5.6.5 Starting MySQL from the Windows Command Line

The MySQL server can be started manually from the command line. This can be done on any version of Windows.

**Note**

MySQL Notifier can also be used to start/stop/restart the MySQL server.

To start the `mysqld` server from the command line, you should start a console window (or “DOS window”) and enter this command:

```
C:\> "C:\Program Files\MySQL\MySQL Server 5.5\bin\mysqld"
```

The path to `mysqld` may vary depending on the install location of MySQL on your system.

You can stop the MySQL server by executing this command:

```
C:\> "C:\Program Files\MySQL\MySQL Server 5.5\bin\mysqladmin" -u root shutdown
```

**Note**

If the MySQL root user account has a password, you need to invoke `mysqladmin` with the `-p` option and supply the password when prompted.

This command invokes the MySQL administrative utility `mysqladmin` to connect to the server and tell it to shut down. The command connects as the MySQL root user, which is the default administrative account in the MySQL grant system.

**Note**

Users in the MySQL grant system are wholly independent from any operating system users under Microsoft Windows.

If `mysqld` doesn't start, check the error log to see whether the server wrote any messages there to indicate the cause of the problem. By default, the error log is located in the C:\Program Files\MySQL\MySQL Server 5.5\data directory. It is the file with a suffix of `.err`, or may be specified by passing in the --
log-error option. Alternatively, you can try to start the server with the --console option; in this case, the server may display some useful information on the screen that will help solve the problem.

The last option is to start mysql with the --standalone and --debug options. In this case, mysql writes a log file C:\mysql.trace that should contain the reason why mysql doesn't start. See The DBUG Package.

Use mysql --verbose --help to display all the options that mysql supports.

### 5.6.6 Customizing the PATH for MySQL Tools

To make it easier to invoke MySQL programs, you can add the path name of the MySQL bin directory to your Windows system PATH environment variable:

- On the Windows desktop, right-click the My Computer icon, and select Properties.
- Next select the Advanced tab from the System Properties menu that appears, and click the Environment Variables button.
- Under System Variables, select Path, and then click the Edit button. The Edit System Variable dialogue should appear.
- Place your cursor at the end of the text appearing in the space marked Variable Value. (Use the End key to ensure that your cursor is positioned at the very end of the text in this space.) Then enter the complete path name of your MySQL bin directory (for example, C:\Program Files\MySQL\MySQL Server 5.5\bin)

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>There must be a semicolon separating this path from any values present in this field.</td>
</tr>
</tbody>
</table>

Dismiss this dialogue, and each dialogue in turn, by clicking OK until all of the dialogues that were opened have been dismissed. You should now be able to invoke any MySQL executable program by typing its name at the DOS prompt from any directory on the system, without having to supply the path. This includes the servers, the mysql client, and all MySQL command-line utilities such as mysqladmin and mysqldump.

You should not add the MySQL bin directory to your Windows PATH if you are running multiple MySQL servers on the same machine.

<table>
<thead>
<tr>
<th>Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>You must exercise great care when editing your system PATH by hand; accidental deletion or modification of any portion of the existing PATH value can leave you with a malfunctioning or even unusable system.</td>
</tr>
</tbody>
</table>

### 5.6.7 Starting MySQL as a Windows Service

On Windows, the recommended way to run MySQL is to install it as a Windows service, so that MySQL starts and stops automatically when Windows starts and stops. A MySQL server installed as a service can also be controlled from the command line using SC commands, NET commands, or the graphical Services utility. Generally, to install MySQL as a Windows service you should be logged in using an account that has administrator rights.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>MySQL Notifier can also be used to monitor the status of the MySQL service.</td>
</tr>
</tbody>
</table>
Starting MySQL as a Windows Service

The Services utility (the Windows Service Control Manager) can be found in the Windows Control Panel. To avoid conflicts, it is advisable to close the Services utility while performing server installation or removal operations from the command line.

Installing the service

Before installing MySQL as a Windows service, you should first stop the current server if it is running by using the following command:

```
C:\> "C:\Program Files\MySQL\MySQL Server 5.5\bin\mysqladmin" -u root shutdown
```

**Note**

If the MySQL root user account has a password, you need to invoke `mysqladmin` with the `-p` option and supply the password when prompted.

This command invokes the MySQL administrative utility `mysqladmin` to connect to the server and tell it to shut down. The command connects as the MySQL root user, which is the default administrative account in the MySQL grant system.

**Note**

Users in the MySQL grant system are wholly independent from any operating system users under Windows.

Install the server as a service using this command:

```
C:\> "C:\Program Files\MySQL\MySQL Server 5.5\bin\mysqld" --install
```

The service-installation command does not start the server. Instructions for that are given later in this section.

To make it easier to invoke MySQL programs, you can add the path name of the MySQL bin directory to your Windows system `PATH` environment variable:

- On the Windows desktop, right-click the My Computer icon, and select Properties.

- Next select the Advanced tab from the System Properties menu that appears, and click the Environment Variables button.

- Under System Variables, select Path, and then click the Edit button. The Edit System Variable dialogue should appear.

- Place your cursor at the end of the text appearing in the space marked Variable Value. (Use the End key to ensure that your cursor is positioned at the very end of the text in this space.) Then enter the complete path name of your MySQL bin directory (for example, `C:\Program Files\MySQL\MySQL Server 5.5\bin`), and there should be a semicolon separating this path from any values present in this field. Dismiss this dialogue, and each dialogue in turn, by clicking OK until all of the dialogues that were opened have been dismissed. You should now be able to invoke any MySQL executable program by typing its name at the DOS prompt from any directory on the system, without having to supply the path. This includes the servers, the `mysql` client, and all MySQL command-line utilities such as `mysqladmin` and `mysqldump`.

You should not add the MySQL bin directory to your Windows PATH if you are running multiple MySQL servers on the same machine.
Warning
You must exercise great care when editing your system PATH by hand; accidental deletion or modification of any portion of the existing PATH value can leave you with a malfunctioning or even unusable system.

The following additional arguments can be used when installing the service:

- You can specify a service name immediately following the --install option. The default service name is MySQL.

- If a service name is given, it can be followed by a single option. By convention, this should be --defaults-file=file_name to specify the name of an option file from which the server should read options when it starts.

  The use of a single option other than --defaults-file is possible but discouraged. --defaults-file is more flexible because it enables you to specify multiple startup options for the server by placing them in the named option file.

- You can also specify a --local-service option following the service name. This causes the server to run using the LocalService Windows account that has limited system privileges. This account is available only for Windows XP or newer. If both --defaults-file and --local-service are given following the service name, they can be in any order.

For a MySQL server that is installed as a Windows service, the following rules determine the service name and option files that the server uses:

- If the service-installation command specifies no service name or the default service name (MySQL) following the --install option, the server uses the service name of MySQL and reads options from the [mysqld] group in the standard option files.

- If the service-installation command specifies a service name other than MySQL following the --install option, the server uses that service name. It reads options from the [mysqld] group and the group that has the same name as the service in the standard option files. This enables you to use the [mysqld] group for options that should be used by all MySQL services, and an option group with the service name for use by the server installed with that service name.

- If the service-installation command specifies a --defaults-file option after the service name, the server reads options the same way as described in the previous item, except that it reads options only from the named file and ignores the standard option files.

As a more complex example, consider the following command:

```
C:\> "C:\Program Files\MySQL\MySQL Server 5.5\bin\mysqld"
   --install MySQL --defaults-file=C:\my-opts.cnf
```

Here, the default service name (MySQL) is given after the --install option. If no --defaults-file option had been given, this command would have the effect of causing the server to read the [mysqld] group from the standard option files. However, because the --defaults-file option is present, the server reads options from the [mysqld] option group, and only from the named file.

Note
On Windows, if the server is started with the --defaults-file and --install options, --install must be first. Otherwise, mysqld.exe will attempt to start the MySQL server.
Starting MySQL as a Windows Service

You can also specify options as Start parameters in the Windows Services utility before you start the MySQL service.

Finally, before trying to start the MySQL service, make sure the user variables %TEMP% and %TMP% (and also %TMPDIR%, if it has ever been set) for the operating system user who is to run the service are pointing to a folder to which the user has write access. The default user for running the MySQL service is LocalSystem, and the default value for its %TEMP% and %TMP% is C:\Windows\Temp, a directory LocalSystem has write access to by default. However, if there are any changes to that default setup (for example, changes to the user who runs the service or to the mentioned user variables, or the --tmpdir option has been used to put the temporary directory somewhere else), the MySQL service might fail to run because write access to the temporary directory has not been granted to the proper user.

Starting the service

After a MySQL server instance has been installed as a service, Windows starts the service automatically whenever Windows starts. The service also can be started immediately from the Services utility, or by using an sc start mysqld_service_name or NET START mysqld_service_name command. SC and NET commands are not case-sensitive.

When run as a service, mysqld has no access to a console window, so no messages can be seen there. If mysqld does not start, check the error log to see whether the server wrote any messages there to indicate the cause of the problem. The error log is located in the MySQL data directory (for example, C:\Program Files\MySQL\MySQL Server 5.5\data). It is the file with a suffix of .err.

When a MySQL server has been installed as a service, and the service is running, Windows stops the service automatically when Windows shuts down. The server also can be stopped manually using the Services utility, the sc stop mysqld_service_name command, the NET START mysqld_service_name command, or the mysqladmin shutdown command.

You also have the choice of installing the server as a manual service if you do not wish for the service to be started automatically during the boot process. To do this, use the --install-manual option rather than the --install option:

```
C:\> "C:\Program Files\MySQL\MySQL Server 5.5\bin\mysqld" --install-manual
```

Removing the service

To remove a server that is installed as a service, first stop it if it is running by executing SC STOP mysqld_service_name or NET STOP mysqld_service_name. Then use SC DELETE mysqld_service_name to remove it:

```
C:\> SC DELETE mysql
```

Alternatively, use the mysqld --remove option to remove the service.

```
C:\> "C:\Program Files\MySQL\MySQL Server 5.5\bin\mysqld" --remove
```

If mysqld is not running as a service, you can start it from the command line. For instructions, see Section 5.6.5, “Starting MySQL from the Windows Command Line”.

If you encounter difficulties during installation, see Section 5.7, “Troubleshooting a Microsoft Windows MySQL Server Installation”.

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For more information about stopping or removing a Windows service, see Starting Multiple MySQL Instances as Windows Services.

5.6.8 Testing The MySQL Installation

You can test whether the MySQL server is working by executing any of the following commands:

```
C:\> "C:\Program Files\MySQL\MySQL Server 5.5\bin\mysqlshow"
C:\> "C:\Program Files\MySQL\MySQL Server 5.5\bin\mysqlshow" -u root mysql
C:\> "C:\Program Files\MySQL\MySQL Server 5.5\bin\mysqladmin" version status proc
C:\> "C:\Program Files\MySQL\MySQL Server 5.5\bin\mysql" test
```

If `mysqld` is slow to respond to TCP/IP connections from client programs, there is probably a problem with your DNS. In this case, start `mysqld` with the `--skip-name-resolve` option and use only `localhost` and IP addresses in the `Host` column of the MySQL grant tables. (Be sure that an account exists that specifies an IP address or you may not be able to connect.)

You can force a MySQL client to use a named-pipe connection rather than TCP/IP by specifying the `--pipe` or `--protocol=PIPE` option, or by specifying . (period) as the host name. Use the `--socket` option to specify the name of the pipe if you do not want to use the default pipe name.

If you have set a password for the `root` account, deleted the anonymous account, or created a new user account, then to connect to the MySQL server you must use the appropriate `--u` and `--p` options with the commands shown previously. See Connecting to the MySQL Server Using Command Options.

For more information about `mysqlshow`, see `mysqlshow — Display Database, Table, and Column Information`.

5.7 Troubleshooting a Microsoft Windows MySQL Server Installation

When installing and running MySQL for the first time, you may encounter certain errors that prevent the MySQL server from starting. This section helps you diagnose and correct some of these errors.

Your first resource when troubleshooting server issues is the error log. The MySQL server uses the error log to record information relevant to the error that prevents the server from starting. The error log is located in the data directory specified in your `my.ini` file. The default data directory location is `C:\Program Files\MySQL\MySQL Server 5.5\data`, or `C:\ProgramData\MySQL\Mysql on Windows 7 and Windows Server 2008`. The `C:\ProgramData` directory is hidden by default. You need to change your folder options to see the directory and contents. For more information on the error log and understanding the content, see The Error Log.

For information regarding possible errors, also consult the console messages displayed when the MySQL service is starting. Use the `SC START mysqld_service_name` or `NET START mysqld_service_name` command from the command line after installing `mysqld` as a service to see any error messages regarding the starting of the MySQL server as a service. See Section 5.6.7, “Starting MySQL as a Windows Service”.

The following examples show other common error messages you might encounter when installing MySQL and starting the server for the first time:

- If the MySQL server cannot find the `mysql` privileges database or other critical files, it displays these messages:

  System error 1067 has occurred.
  Fatal error: Can't open and lock privilege tables:
  Table 'mysql.user' doesn't exist
These messages often occur when the MySQL base or data directories are installed in different locations than the default locations (C:\Program Files\MySQL\MySQL Server 5.5 and C:\Program Files\MySQL\MySQL Server 5.5\data, respectively).

This situation can occur when MySQL is upgraded and installed to a new location, but the configuration file is not updated to reflect the new location. In addition, old and new configuration files might conflict. Be sure to delete or rename any old configuration files when upgrading MySQL.

If you have installed MySQL to a directory other than C:\Program Files\MySQL\MySQL Server 5.5, ensure that the MySQL server is aware of this through the use of a configuration (my.ini) file. Put the my.ini file in your Windows directory, typically C:\WINDOWS. To determine its exact location from the value of the WINDIR environment variable, issue the following command from the command prompt:

C:\> echo %WINDIR%

You can create or modify an option file with any text editor, such as Notepad. For example, if MySQL is installed in E:\mysql and the data directory is D:\MySQLdata, you can create the option file and set up a [mysqld] section to specify values for the basedir and datadir options:

```ini
[mysqld]
# set basedir to your installation path
basedir=E:/mysql
# set datadir to the location of your data directory
datadir=D:/MySQLdata
```

Microsoft Windows path names are specified in option files using (forward) slashes rather than backslashes. If you do use backslashes, double them:

```ini
[mysqld]
# set basedir to your installation path
basedir=C:\Program Files\MySQL\MySQL Server 5.5
# set datadir to the location of your data directory
datadir=D:\MySQLdata
```

The rules for use of backslash in option file values are given in Using Option Files.

If you change the datadir value in your MySQL configuration file, you must move the contents of the existing MySQL data directory before restarting the MySQL server.

See Section 5.6.2, “Creating an Option File”.

• If you reinstall or upgrade MySQL without first stopping and removing the existing MySQL service and install MySQL using the MySQL Installer, you might see this error:

```
Error: Cannot create Windows service for MySql. Error: 0
```

This occurs when the Configuration Wizard tries to install the service and finds an existing service with the same name.

One solution to this problem is to choose a service name other than mysql when using the configuration wizard. This enables the new service to be installed correctly, but leaves the outdated service in place. Although this is harmless, it is best to remove old services that are no longer in use.

To permanently remove the old mysql service, execute the following command as a user with administrative privileges, on the command line:
If the `SC` utility is not available for your version of Windows, download the `delsrv` utility from [http://www.microsoft.com/windows2000/techinfo/reskit/tools/existing/delsrv-o.asp](http://www.microsoft.com/windows2000/techinfo/reskit/tools/existing/delsrv-o.asp) and use the `delsrv mysql` syntax.

### 5.8 Windows Postinstallation Procedures

GUI tools exist that perform most of the tasks described in this section, including:

- **MySQL Installer**: Used to install and upgrade MySQL products.
- **MySQL Workbench**: Manages the MySQL server and edits SQL statements.
- **MySQL Notifier**: Starts, stops, or restarts the MySQL server, and monitors its status.
- **MySQL for Excel**: Edits MySQL data with Microsoft Excel.

On Windows, you need not create the data directory and the grant tables. MySQL distributions for Windows include the grant tables with a set of preinitialized accounts in the `mysql` database under the data directory.

Regarding passwords, if you installed MySQL using the MySQL Installer, you may have already assigned passwords to the accounts. (See Section 5.3, “MySQL Installer for Windows”.) Otherwise, use the password-assignment procedure given in Section 9.4, “Securing the Initial MySQL Accounts”.

Before assigning passwords, you might want to try running some client programs to make sure that you can connect to the server and that it is operating properly. Make sure that the server is running (see Section 5.6.4, “Starting the Server for the First Time”). You can also set up a MySQL service that runs automatically when Windows starts (see Section 5.6.7, “Starting MySQL as a Windows Service”).

These instructions assume that your current location is the MySQL installation directory and that it has a `bin` subdirectory containing the MySQL programs used here. If that is not true, adjust the command path names accordingly.

If you installed MySQL using MySQL Installer (see Section 5.3, “MySQL Installer for Windows”), the default installation directory is `C:\Program Files\MySQL\MySQL Server 5.5`:

```bash
C:\> cd "C:\Program Files\MySQL\MySQL Server 5.5"
```

A common installation location for installation from a ZIP archive is `C:\mysql`:

```bash
C:\> cd C:\mysql
```

Alternatively, add the `bin` directory to your `PATH` environment variable setting. That enables your command interpreter to find MySQL programs properly, so that you can run a program by typing only its name, not its path name. See Section 5.6.6, “Customizing the PATH for MySQL Tools”.

With the server running, issue the following commands to verify that you can retrieve information from the server. The output should be similar to that shown here.

Use `mysqlshow` to see what databases exist:
The list of installed databases may vary, but will always include the minimum of `mysql` and `information_schema`.

The preceding command (and commands for other MySQL programs such as `mysql`) may not work if the correct MySQL account does not exist. For example, the program may fail with an error, or you may not be able to view all databases. If you installed MySQL using MySQL Installer, the root user will have been created automatically with the password you supplied. In this case, you should use the `-u root` and `-p` options. (You must use those options if you have already secured the initial MySQL accounts.) With `-p`, the client program prompts for the root password. For example:

```bash
C:\> bin\mysqlshow -u root -p
Enter password: (enter root password here)
```

If you specify a database name, `mysqlshow` displays a list of the tables within the database:

```bash
C:\> bin\mysqlshow mysql
Database: mysql
```
Use the `mysql` program to select information from a table in the `mysql` database:

```
C:\> bin\mysql -e "SELECT User, Host, plugin FROM mysql.user" mysql
```

<table>
<thead>
<tr>
<th>User</th>
<th>Host</th>
<th>plugin</th>
</tr>
</thead>
<tbody>
<tr>
<td>root</td>
<td>localhost</td>
<td>mysql_native_password</td>
</tr>
</tbody>
</table>

For more information about `mysql` and `mysqlshow`, see `mysql — The MySQL Command-Line Client`, and `mysqlshow — Display Database, Table, and Column Information`.

## 5.9 Windows Platform Restrictions

The following restrictions apply to use of MySQL on the Windows platform:

- **Process memory**
  
  On Windows 32-bit platforms, it is not possible by default to use more than 2GB of RAM within a single process, including MySQL. This is because the physical address limit on Windows 32-bit is 4GB and the default setting within Windows is to split the virtual address space between kernel (2GB) and user/applications (2GB).

  Some versions of Windows have a boot time setting to enable larger applications by reducing the kernel application. Alternatively, to use more than 2GB, use a 64-bit version of Windows.

- **File system aliases**

  When using *MyISAM* tables, you cannot use aliases within Windows link to the data files on another volume and then link back to the main MySQL *datadir* location.

  This facility is often used to move the data and index files to a RAID or other fast solution, while retaining the main *frm* files in the default data directory configured with the *datadir* option.

- **Limited number of ports**

  Windows systems have about 4,000 ports available for client connections, and after a connection on a port closes, it takes two to four minutes before the port can be reused. In situations where clients connect to and disconnect from the server at a high rate, it is possible for all available ports to be used up before closed ports become available again. If this happens, the MySQL server appears to be unresponsive even though it is running. Ports may be used by other applications running on the machine as well, in which case the number of ports available to MySQL is lower.


- **DATA DIRECTORY and INDEX DIRECTORY**

  The *DATA DIRECTORY* and *INDEX DIRECTORY* options for *CREATE TABLE* are ignored on Windows, because MySQL does not support Windows symbolic links. These options also are ignored on systems that have a nonfunctional *realpath()* call.

- **DROP DATABASE**

  You cannot drop a database that is in use by another session.
• **Case-insensitive names**

File names are not case-sensitive on Windows, so MySQL database and table names are also not case-sensitive on Windows. The only restriction is that database and table names must be specified using the same case throughout a given statement. See [Identifier Case Sensitivity](#).

• **Directory and file names**

On Windows, MySQL Server supports only directory and file names that are compatible with the current ANSI code pages. For example, the following Japanese directory name will not work in the Western locale (code page 1252):

```sql
datadir="C:/私たちのプロジェクトのデータ"
```

The same limitation applies to directory and file names referred to in SQL statements, such as the data file path name in `LOAD DATA`.

• **The \ path name separator character**

Path name components in Windows are separated by the `\` character, which is also the escape character in MySQL. If you are using `LOAD DATA` or `SELECT ... INTO OUTFILE`, use Unix-style file names with `/` characters:

```sql
mysql> LOAD DATA INFILE 'C:/tmp/skr.txt' INTO TABLE skr;
mysql> SELECT * INTO OUTFILE 'C:/tmp/skr.txt' FROM skr;
```

Alternatively, you must double the `\` character:

```sql
mysql> LOAD DATA INFILE 'C:\tmp\skr.txt' INTO TABLE skr;
mysql> SELECT * INTO OUTFILE 'C:\tmp\skr.txt' FROM skr;
```

• **Problems with pipes**

Pipes do not work reliably from the Windows command-line prompt. If the pipe includes the character `^Z / CHAR(24)`, Windows thinks that it has encountered end-of-file and aborts the program.

This is mainly a problem when you try to apply a binary log as follows:

```bash
C:\> mysqlbinlog binary_log_file | mysql --user=root
```

If you have a problem applying the log and suspect that it is because of a `^Z / CHAR(24)` character, you can use the following workaround:

```bash
C:\> mysqlbinlog binary_log_file --result-file=/tmp/bin.sql
C:\> mysql --user=root --execute "source /tmp/bin.sql"
```

The latter command also can be used to reliably read any SQL file that may contain binary data.
Chapter 6 Installing MySQL on OS X

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For a list of OS X versions that the MySQL server supports, see https://www.mysql.com/support/supportedplatforms/database.html.

MySQL for OS X is available in a number of different forms:

• Native Package Installer, which uses the native OS X installer (DMG) to walk you through the installation of MySQL. For more information, see Section 6.2, “Installing MySQL on OS X Using Native Packages”. You can use the package installer with OS X. The user you use to perform the installation must have administrator privileges.

• Compressed TAR archive, which uses a file packaged using the Unix tar and gzip commands. To use this method, you will need to open a Terminal window. You do not need administrator privileges using this method, as you can install the MySQL server anywhere using this method. For more information on using this method, you can use the generic instructions for using a tarball, Chapter 3, Installing MySQL on Unix/Linux Using Generic Binaries.

In addition to the core installation, the Package Installer also includes Section 6.3, “Installing a MySQL Launch Daemon” and Section 6.4, “Installing and Using the MySQL Preference Pane”, both of which simplify the management of your installation.

For additional information on using MySQL on OS X, see Section 6.1, “General Notes on Installing MySQL on OS X”.

6.1 General Notes on Installing MySQL on OS X

You should keep the following issues and notes in mind:

• As of MySQL server 5.5.45, the DMG bundles a launchd daemon instead of the deprecated startup item. Startup items do not function as of OS X 10.10 (Yosemite), so using launchd is preferred. The available MySQL preference pane under OS X System Preferences was also updated to use launchd.

• You may need (or want) to create a specific mysql user to own the MySQL directory and data. You can do this through the Directory Utility, and the mysql user should already exist. For use in single user mode, an entry for _mysql (note the underscore prefix) should already exist within the system /etc/passwd file.

• Because the MySQL package installer installs the MySQL contents into a version and platform specific directory, you can use this to upgrade and migrate your database between versions. You will need to either copy the data directory from the old version to the new version, or alternatively specify an alternative datadir value to set location of the data directory. By default, the MySQL directories are installed under /usr/local/.
Installing MySQL on OS X Using Native Packages

- You might want to add aliases to your shell's resource file to make it easier to access commonly used programs such as `mysql` and `mysqladmin` from the command line. The syntax for `bash` is:

  ```bash
  alias mysql=/usr/local/mysql/bin/mysql
  alias mysqladmin=/usr/local/mysql/bin/mysqladmin
  ```

  For `tcsh`, use:

  ```bash
  alias mysql /usr/local/mysql/bin/mysql
  alias mysqladmin /usr/local/mysql/bin/mysqladmin
  ```

  Even better, add `/usr/local/mysql/bin` to your `PATH` environment variable. You can do this by modifying the appropriate startup file for your shell. For more information, see Invoking MySQL Programs.

- After you have copied over the MySQL database files from the previous installation and have successfully started the new server, you should consider removing the old installation files to save disk space. Additionally, you should also remove older versions of the Package Receipt directories located in `/Library/Receipts/mysql-VERSION.pkg`.

- Prior to OS X 10.7, MySQL server was bundled with OS X Server.

## 6.2 Installing MySQL on OS X Using Native Packages

The package is located inside a disk image (`.dmg`) file that you first need to mount by double-clicking its icon in the Finder. It should then mount the image and display its contents.

#### Note

Before proceeding with the installation, be sure to stop all running MySQL server instances by using either the MySQL Manager Application (on OS X Server), the preference pane, or `mysqladmin shutdown` on the command line.

When installing from the package version, you can also install the MySQL preference pane, which will enable you to control the startup and execution of your MySQL server from System Preferences. For more information, see Section 6.4, “Installing and Using the MySQL Preference Pane”.

When installing using the package installer, the files are installed into a directory within `/usr/local` matching the name of the installation version and platform. For example, the installer file `mysql-5.5.62-osx10.9-x86_64.dmg` installs MySQL into `/usr/local/mysql-5.5.62-osx10.9-x86_64/`. The following table shows the layout of the installation directory.

### Table 6.1 MySQL Installation Layout on OS X

<table>
<thead>
<tr>
<th>Directory</th>
<th>Contents of Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>bin, scripts</td>
<td><code>mysqld</code> server, client and utility programs</td>
</tr>
<tr>
<td>data</td>
<td>Log files, databases</td>
</tr>
<tr>
<td>docs</td>
<td>Helper documents, like the Release Notes and build information</td>
</tr>
<tr>
<td>include</td>
<td>Include (header) files</td>
</tr>
<tr>
<td>lib</td>
<td>Libraries</td>
</tr>
<tr>
<td>man</td>
<td>Unix manual pages</td>
</tr>
</tbody>
</table>
Installing MySQL on OS X Using Native Packages

<table>
<thead>
<tr>
<th>Directory</th>
<th>Contents of Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>mysql-test</td>
<td>MySQL test suite</td>
</tr>
<tr>
<td>share</td>
<td>Miscellaneous support files, including error messages,</td>
</tr>
<tr>
<td></td>
<td>sample configuration files, SQL for database installation</td>
</tr>
<tr>
<td>sql-bench</td>
<td>Benchmarks</td>
</tr>
<tr>
<td>support-files</td>
<td>Scripts and sample configuration files</td>
</tr>
<tr>
<td>/tmp/mysql.sock</td>
<td>Location of the MySQL Unix socket</td>
</tr>
</tbody>
</table>

During the package installer process, a symbolic link from `/usr/local/mysql` to the version/platform specific directory created during installation will be created automatically.

1. Download and open the MySQL package installer, which is provided on a disk image (.dmg) that includes the main MySQL installation package file. Double-click the disk image to open it.

2. Double-click the MySQL installer package. It will be named according to the version of MySQL you have downloaded. For example, if you have downloaded MySQL server 5.5.62, double-click `mysql-5.5.62-osx-10.9-x86_64.pkg`.

3. You will be presented with the opening installer dialog. Click **Continue** to begin installation.
4. If you have downloaded the community version of MySQL, you will be shown a copy of the relevant GNU General Public License. Click **Continue** and then **Agree** to continue.

5. From the **Installation Type** page you can either click **Install** to execute the installation wizard using all defaults, click **Customize** to alter which components to install (MySQL server, Preference Pane, Launchd Support -- all enabled by default).

**Note**

Although the **Change Install Location** option is visible, the installation location cannot be changed.
Figure 6.3 MySQL Package Installer: Installation Type
6. Click **Install** to begin the installation process.

7. Once the installation has been completed successfully, you will be shown an **Install Succeeded** message with a short summary. Now, **Close** the wizard and begin using the MySQL server.
MySQL server is now installed, but it is not loaded (started) by default. Use either launchctl from the command line, or start MySQL by clicking "Start" using the MySQL preference pane. For additional information, see Section 6.3, “Installing a MySQL Launch Daemon”, and Section 6.4, “Installing and Using the MySQL Preference Pane”.

### 6.3 Installing a MySQL Launch Daemon

OS X uses launch daemons to automatically start, stop, and manage processes and applications such as MySQL.

**Note**

Before MySQL 5.5.45, the OS X builds installed startup items instead of launchd daemons. However, startup items do not function as of OS X 10.10 (Yosemite). The OS X builds now install launchd daemons.

By default, the installation package (DMG) on OS X installs a launchd file named `/Library/LaunchDaemons/com.oracle.oss.mysql.mysql.mysqld.plist` that contains a plist definition similar to:

```xml
<?xml version="1.0" encoding="utf-8"?>
<!DOCTYPE plist PUBLIC "-//Apple Computer//DTD PLIST 1.0//EN" "http://www.apple.com/DTDs/PropertyList-1.0.dtd">
<plist version="1.0">
```
Installing a MySQL Launch Daemon

Note

Some users report that adding a plist DOCTYPE declaration causes the launchd operation to fail, despite it passing the lint check. We suspect it’s a copy-n-paste error. The md5 checksum of a file containing the above snippet is 60d7963a0bb2994b69b8b9c123db09df.

To enable the launchd service, you can either:

- Click Start MySQL Server from the MySQL preference pane.
Figure 6.6 MySQL Preference Pane: Location
• Or, manually load the launchd file.

```
shell> cd /Library/LaunchDaemons
shell> sudo launchctl load -F com.oracle.oss.mysql.mysqld.plist
```

**Note**

When upgrading MySQL server, the launchd installation process will remove the old startup items that were installed with MySQL server 5.5.44 and below.

### 6.4 Installing and Using the MySQL Preference Pane

The MySQL Installation Package includes a MySQL preference pane that enables you to start, stop, and control automated startup during boot of your MySQL installation.

This preference pane is installed by default, and is listed under your system’s *System Preferences* window.
To install the MySQL Preference Pane:

1. Download and open the MySQL package installer, which is provided on a disk image (.dmg) that includes the main MySQL installation package.

   **Note**

   Before MySQL 5.5.45, OS X packages included the deprecated startup items instead of launchd daemons, and the preference pane managed that instead of launchd.
2. Go through the process of installing the MySQL server, as described in the documentation at Section 6.2, “Installing MySQL on OS X Using Native Packages”.

3. Click **Customize** at the **Installation Type** step. The “Preference Pane” option is listed there and enabled by default.
4. Complete the MySQL server installation process.

**Note**

The MySQL preference pane only starts and stops MySQL installation installed from the MySQL package installation that have been installed in the default location.

Once the MySQL preference pane has been installed, you can control your MySQL server instance using the preference pane. To use the preference pane, open the **System Preferences**... from the Apple menu. Select the MySQL preference pane by clicking the MySQL icon within the preference panes list.
Figure 6.11 MySQL Preference Pane: Location
The MySQL Preference Pane shows the current status of the MySQL server, showing **stopped** (in red) if the server is not running and **running** (in green) if the server has already been started. The preference pane also shows the current setting for whether the MySQL server has been set to start automatically.

- **To start the MySQL server using the preference pane:**
  
  Click **Start MySQL Server**. You may be prompted for the username and password of a user with administrator privileges to start the MySQL server.

- **To stop the MySQL server using the preference pane:**
  
  Click **Stop MySQL Server**. You may be prompted for the username and password of a user with administrator privileges to stop the MySQL server.

- **To automatically start the MySQL server when the system boots:**
  
  Check the check box next to **Automatically Start MySQL Server on Startup**.

- **To disable automatic MySQL server startup when the system boots:**
  
  Uncheck the check box next to **Automatically Start MySQL Server on Startup**.

You can close the **System Preferences...** window once you have completed your settings.
Chapter 7 Installing MySQL on Linux

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  7.3.1 Basic Steps for MySQL Server Deployment with Docker ................................................. 141
  7.3.2 More Topics on Deploying MySQL Server with Docker .................................................. 144
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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 3, Installing MySQL on Unix/Linux Using Generic Binaries.

• Extracting and compiling MySQL from a source distribution. For details, see Chapter 4, Installing MySQL from Source.

• Installing using a precompiled RPM package. For details, see Section 7.1, “Installing MySQL on Linux Using RPM Packages”.

• Installing using a precompiled Debian package. For details, see Section 7.2, “Installing MySQL on Linux Using Debian Packages”.

• Deploying MySQL Server with Docker. For details, see Section 7.3, “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 7.4, “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.

7.1 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 Section 2.2, “How to Get MySQL”.

For non-RPM Linux distributions, you can install MySQL using a .tar.gz package. See Chapter 3, *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 7.1 MySQL Installation Layout for Linux RPM Packages

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

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.
Installing MySQL on Linux Using RPM Packages

- **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 7.2 MySQL Linux RPM Package Platforms**

<table>
<thead>
<tr>
<th><strong>PLATFORM</strong> Value</th>
<th>Intended Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>glibc23</td>
<td>Platform independent, should run on any Linux distribution that supports glibc 2.3</td>
</tr>
<tr>
<td>rhel4, rhel5</td>
<td>Red Hat Enterprise Linux 4 or 5</td>
</tr>
<tr>
<td>e16</td>
<td>Enterprise Linux 6</td>
</tr>
<tr>
<td>sles10, sles11</td>
<td>SuSE Linux Enterprise Server 10 or 11</td>
</tr>
</tbody>
</table>

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

To see all files in an RPM package (for example, a MySQL-server 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 Section 2.3, “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 Section 9.5, “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 3, 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 Chapter 9, 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 mysql. See File Not Found and Similar Errors

### 7.2 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 Section 2.2, “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>
<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;

```
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
```

7.3 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 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.

7.3.1 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
Basic Steps for MySQL Server Deployment with Docker

- 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
```

<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>3157d7f55f8d</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:

```
shell> 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:

```
shell> docker logs mysql1 2>&1 | grep GENERATED
GENERATED ROOT PASSWORD: Axegh3kAJayDLaRuBemecis&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:

```bash
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:

```sql
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:

```bash
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
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
car-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:

```bash
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:

```bash
docker start mysql1
```

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

```bash
docker restart mysql1
```

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

```bash
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 7.3.2, “More Topics on Deploying MySQL Server with Docker”.

7.3.2 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/mysqldadmin
  • /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_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
shell> docker inspect mysql1
...
"Mounts": [
  {
    "Type": "volume",
    "Name": "4f2d463cfc4bddd4b098c97d7da3337195ed2c6572bc0b89f7e845d27652",
    "Source": "/var/lib/docker/volumes/4f2d463cfc4bddd4b098c97d7da3337195ed2c6572bc0b89f7e845d27652/_data",
    "Destination": "/var/lib/mysql",
    "Driver": "local",
    "Mode": "",
    "RW": true,
    "Propagation": ""
  }
],
...
```

The output shows that the source folder `/var/lib/docker/volumes/4f2d463cfc4bddd4b098c97d7da3337195ed2c6572bc0b89f7e845d27652/_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:

```shell
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=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:

```
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 5.5 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 mysqld-container` command.
7.4 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
```

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.
Installing MySQL on Linux Using Native Package Managers

--- Running transaction check
---> Package mysql.x86_64 0:5.1.48-2.fc13 set to be updated
---> Package mysql-liba.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

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.

```
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
  libmysqldclient15off 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
  libmysqldclient15off 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 ...
Setting up mysql-common ...
(Reading database ... 121260 files and directories currently installed.) ...
Processing 1 added doc-base file(s)...
Registering documents with scrollkeeper...
Setting up libdbd-daemon-perl (0.43-1) ...
Setting up libplrpc-perl (0.2020-1) ...
Setting up libdbi-perl (1.607-1) ...
Setting up libmysqldclient15off (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.
```

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):
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:

```bash
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:

```bash
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:

```bash
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 Section 9.1, “Initializing the Data Directory”). Alternatively, use the configuration interface to perform those tasks:

```bash
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 8 Installing MySQL on Solaris

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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 8.1, “Installing MySQL on Solaris Using a Solaris PKG”.

• To use a standard tar binary installation, use the notes provided in Chapter 3, 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/S99mysqld.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.

### 8.1 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-5.5.62-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-5.5.62-solaris10-x86_64.pkg
```

The following packages are available:

```
1  mysql     MySQL Community Server (GPL)  (i86pc)  5.5.62
```

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
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
pkgrm mysql
pkgadd -d mysql-5.5.62-solaris10-x86_64.pkg
mysql_safe &
mysql_upgrade
```

You should check the notes in `Chapter 10, Upgrading MySQL` before performing any upgrade.
Chapter 9 Postinstallation Setup and Testing

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This section discusses tasks that you should perform after installing MySQL:

- If necessary, initialize the data directory and create the MySQL grant tables. For some MySQL installation methods, data directory initialization may be done for you automatically:
  - Installation on Windows
  - Installation on Linux using a server RPM distribution.
  - Installation using the native packaging system on many platforms, including Debian Linux, Ubuntu Linux, Gentoo Linux, and others.
  - Installation on OS X using a DMG distribution.

For other platforms and installation types, you must initialize the data directory manually. These include installation from generic binary and source distributions on Unix and Unix-like system, and installation from a ZIP Archive package on Windows. For instructions, see Section 9.1, "Initializing the Data Directory".

- For instructions, see Section 9.2, "Starting the Server", and Section 9.3, "Testing the Server".

- Assign passwords to any initial accounts in the grant tables, if that was not already done during data directory initialization. Passwords prevent unauthorized access to the MySQL server. You may also wish to restrict access to test databases. For instructions, see Section 9.4, "Securing the Initial MySQL Accounts".

- Optionally, arrange for the server to start and stop automatically when your system starts and stops. For instructions, see Section 9.5, "Starting and Stopping MySQL Automatically".

- Optionally, populate time zone tables to enable recognition of named time zones. For instructions, see MySQL Server Time Zone Support.

When you are ready to create additional user accounts, you can find information on the MySQL access control system and account management in Access Control and Account Management.

9.1 Initializing the Data Directory

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 Chapter 9, 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 Section 9.3, “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 Access Control and Account Management.
Problems Running mysql_install_db

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 Section 9.4, “Securing the Initial MySQL Accounts”.

If you have trouble with mysql_install_db at this point, see Section 9.1.1, “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 Section 9.5, “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.

9.1.1 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
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:

  ```shell
  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:

  ```shell
  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/
  ```
Starting the Server

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 Chapter 12, MySQL 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.

9.2 Starting the Server

This section describes how to start the server on Unix and Unix-like systems. (For Windows, see Section 5.6.4, “Starting the Server for the First Time”.) For some suggested commands that you can use to test whether the server is accessible and working properly, see Section 9.3, “Testing the Server”.

Start the MySQL server like this:

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

It is important that the MySQL server be run using an unprivileged (non-root) login account. To ensure this if you run mysqld_safe as root, include the --user option as shown. Otherwise, execute the program while logged in as mysql, in which case you can omit the --user option from the command.

For further instructions for running MySQL as an unprivileged user, see How to Run MySQL as a Normal User.
Troubleshooting Problems Starting the MySQL Server

If the command fails immediately and prints `mysqld ended`, look for information in the error log (which by default is the `host_name.err` file in the data directory).

If the server is unable to access the data directory it starts or read the grant tables in the `mysql` database, it writes a message to its error log. Such problems can occur if you neglected to create the grant tables by initializing the data directory before proceeding to this step, or if you ran the command that initializes the data directory without the `--user` option. Remove the data directory and run the command with the `--user` option.

If you have other problems starting the server, see Section 9.2.1, “Troubleshooting Problems Starting the MySQL Server”. For more information about `mysqld_safe`, see `mysqld_safe — MySQL Server Startup Script`.

You can set up new accounts using the `bin/mysql_setpermission` script if you install the DBI and DBD::mysql Perl modules. See `mysql_setpermission — Interactively Set Permissions in Grant Tables`. For Perl module installation instructions, see Chapter 13, `Perl Installation Notes`.

If you would like to use `mysqlaccess` and have the MySQL distribution in some nonstandard location, you must change the location where `mysqlaccess` expects to find the `mysql` client. Edit the `bin/mysqlaccess` script at approximately line 18. Search for a line that looks like this:

```
$MYSQL     = '/usr/local/bin/mysql';    # path to mysql executable
```

Change the path to reflect the location where `mysql` actually is stored on your system. If you do not do this, a `Broken pipe` error will occur when you run `mysqlaccess`.

9.2.1 Troubleshooting Problems Starting the MySQL Server

This section provides troubleshooting suggestions for problems starting the server. For additional suggestions for Windows systems, see Section 5.7, “Troubleshooting a Microsoft Windows MySQL Server Installation”.

If you have problems starting the server, here are some things to try:

- Check the error log to see why the server does not start.
- Specify any special options needed by the storage engines you are using.
- Make sure that the server knows where to find the data directory.
- Make sure that the server can access the data directory. The ownership and permissions of the data directory and its contents must be set such that the server can read and modify them.
- Verify that the network interfaces the server wants to use are available.

Some storage engines have options that control their behavior. You can create a `my.cnf` file and specify startup options for the engines that you plan to use. If you are going to use storage engines that support transactional tables (InnoDB, NDB), be sure that you have them configured the way you want before starting the server:

If you are using InnoDB tables, see `InnoDB Configuration`.

Storage engines will use default option values if you specify none, but it is recommended that you review the available options and specify explicit values for those for which the defaults are not appropriate for your installation.
Troubleshooting Problems Starting the MySQL Server

When the `mysqld` server starts, it changes location to the data directory. This is where it expects to find databases and where it expects to write log files. The server also writes the pid (process ID) file in the data directory.

The data directory location is hardwired in when the server is compiled. This is where the server looks for the data directory by default. If the data directory is located somewhere else on your system, the server will not work properly. You can determine what the default path settings are by invoking `mysqld` with the `--verbose` and `--help` options.

If the default locations do not match the MySQL installation layout on your system, you can override them by specifying options to `mysqld` or `mysqld_safe` on the command line or in an option file.

To specify the location of the data directory explicitly, use the `--datadir` option. However, normally you can tell `mysqld` the location of the base directory under which MySQL is installed and it looks for the data directory there. You can do this with the `--basedir` option.

To check the effect of specifying path options, invoke `mysqld` with those options followed by the `--verbose` and `--help` options. For example, if you change location to the directory where `mysqld` is installed and then run the following command, it shows the effect of starting the server with a base directory of `/usr/local`:

```
shell> ./mysqld --basedir=/usr/local --verbose --help
```

You can specify other options such as `--datadir` as well, but `--verbose` and `--help` must be the last options.

Once you determine the path settings you want, start the server without `--verbose` and `--help`.

If `mysqld` is currently running, you can find out what path settings it is using by executing this command:

```
shell> mysqladmin variables
```

Or:

```
shell> mysqladmin -h host_name variables
```

`host_name` is the name of the MySQL server host.

If you get `Errcode 13` (which means `Permission denied`) when starting `mysql`, this means that the privileges of the data directory or its contents do not permit server access. In this case, you change the permissions for the involved files and directories so that the server has the right to use them. You can also start the server as `root`, but this raises security issues and should be avoided.

Change location to the data directory and check the ownership of the data directory and its contents to make sure the server has access. For example, if the data directory is `/usr/local/mysql/var`, use this command:

```
shell> ls -la /usr/local/mysql/var
```

If the data directory or its files or subdirectories are not owned by the login account that you use for running the server, change their ownership to that account. If the account is named `mysql`, use these commands:
Even with correct ownership, MySQL might fail to start up if there is other security software running on your system that manages application access to various parts of the file system. In this case, reconfigure that software to enable `mysqld` to access the directories it uses during normal operation.

If the server fails to start up correctly, check the error log. Log files are located in the data directory (typically `C:\Program Files\MySQL\MySQL Server 5.5\data` on Windows, `/usr/local/mysql/data` for a Unix/Linux binary distribution, and `/usr/local/var` for a Unix/Linux source distribution). Look in the data directory for files with names of the form `host_name.err` and `host_name.log`, where `host_name` is the name of your server host. Then examine the last few lines of these files. You can use `tail` to display them:

```shell
shell> tail host_name.err
shell> tail host_name.log
```

The error log should contain information that indicates why the server could not start.

If either of the following errors occur, it means that some other program (perhaps another `mysqld` server) is using the TCP/IP port or Unix socket file that `mysqld` is trying to use:

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

Use `ps` to determine whether you have another `mysqld` server running. If so, shut down the server before starting `mysqld` again. (If another server is running, and you really want to run multiple servers, you can find information about how to do so in Running Multiple MySQL Instances on One Machine.)

If no other server is running, try to execute the command `telnet your_host_name tcp_ip_port_number`. (The default MySQL port number is 3306.) Then press Enter a couple of times. If you do not get an error message like `telnet: Unable to connect to remote host: Connection refused`, some other program is using the TCP/IP port that `mysqld` is trying to use. You will need to track down what program this is and disable it, or else tell `mysqld` to listen to a different port with the `--port` option. In this case, you will also need to specify the port number for client programs when connecting to the server using TCP/IP.

Another reason the port might be inaccessible is that you have a firewall running that blocks connections to it. If so, modify the firewall settings to permit access to the port.

If the server starts but you cannot connect to it, you should make sure that you have an entry in `/etc/hosts` that looks like this:

```
127.0.0.1 localhost
```

If you cannot get `mysqld` to start, you can try to make a trace file to find the problem by using the `--debug` option. See The DBUG Package.

### 9.3 Testing the Server

After the data directory is initialized and you have started the server, perform some simple tests to make sure that it works satisfactorily. This section assumes that your current location is the MySQL installation directory and that it has a `bin` subdirectory containing the MySQL programs used here. If that is not true, adjust the command path names accordingly.
Alternatively, add the bin directory to your PATH environment variable setting. That enables your shell (command interpreter) to find MySQL programs properly, so that you can run a program by typing only its name, not its path name. See Setting Environment Variables.

Use mysqladmin to verify that the server is running. The following commands provide simple tests to check whether the server is up and responding to connections:

```
shell> bin/mysqladmin version
shell> bin/mysqladmin variables
```

If you cannot connect to the server, specify a -u root option to connect as root. If you have assigned a password for the root account already, you'll also need to specify -p on the command line and enter the password when prompted. For example:

```
shell> bin/mysqladmin -u root -p version
Enter password: (enter root password here)
```

The output from mysqladmin version varies slightly depending on your platform and version of MySQL, but should be similar to that shown here:

```
shell> bin/mysqladmin version
mysqladmin Ver 14.12 Distrib 5.5.62, for pc-linux-gnu on i686
... Server version 5.5.62 Protocol version 10
Connection Localhost via UNIX socket UNIX socket /var/lib/mysql/mysql.sock
Uptime: 14 days 5 hours 5 min 21 sec
Threads: 1 Questions: 366 Slow queries: 0
Opens: 0 Flush tables: 1 Open tables: 19
Queries per second avg: 0.000
```

To see what else you can do with mysqladmin, invoke it with the --help option.

Verify that you can shut down the server (include a -p option if the root account has a password already):

```
shell> bin/mysqladmin -u root shutdown
```

Verify that you can start the server again. Do this by using mysqld_safe or by invoking mysqld directly. For example:

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

If mysqld_safe fails, see Section 9.2.1, “Troubleshooting Problems Starting the MySQL Server”.

Run some simple tests to verify that you can retrieve information from the server. The output should be similar to that shown here.

Use mysqlshow to see what databases exist:

```
shell> bin/mysqlshow
```

<table>
<thead>
<tr>
<th>Databases</th>
</tr>
</thead>
<tbody>
<tr>
<td>information_schema</td>
</tr>
<tr>
<td>mysql</td>
</tr>
</tbody>
</table>
The list of installed databases may vary, but always includes at least `mysql` and `information_schema`.

If you specify a database name, `mysqlshow` displays a list of the tables within the database:

```
shell> bin/mysqlshow mysql
Database: mysql
+---------------------------+
|          Tables           |
+---------------------------+
| columns_priv              |
| db                        |
| event                     |
| func                      |
| general_log               |
| help_category             |
| help_keyword              |
| help_relation             |
| help_topic                |
| host                      |
| ndb_binlog_index          |
| plugin                    |
| proc                      |
| procs_priv                |
| proxies_priv              |
| servers                   |
| slow_log                  |
| tables_priv               |
| time_zone                 |
| time_zone_leap_second     |
| time_zone_name            |
| time_zone_transition      |
| time_zone_transition_type |
| user                      |
+---------------------------+
```

Use the `mysql` program to select information from a table in the `mysql` database:

```
shell> bin/mysql -e "SELECT User, Host, plugin FROM mysql.user" mysql
+-----------------+-------+------------------------+
| User | Host | plugin                |
+-----------------+-------+------------------------+
| root | localhost | mysql_native_password |
+-----------------+-------+------------------------+
```

At this point, your server is running and you can access it. To tighten security if you have not yet assigned passwords to the initial account or accounts, follow the instructions in Section 9.4, “Securing the Initial MySQL Accounts”.

For more information about `mysql`, `mysqladmin`, and `mysqlshow`, see `mysql — The MySQL Command-Line Client`, `mysqladmin — Client for Administering a MySQL Server`, and `mysqlshow — Display Database, Table, and Column Information`.

### 9.4 Securing the Initial MySQL Accounts

The MySQL installation process involves initializing the data directory, including the grant tables in the `mysql` system database that define MySQL accounts. For details, see Section 9.1, “Initializing the Data Directory”.
This section describes how to assign passwords to the initial accounts created during the MySQL installation procedure, if you have not already done so.

The `mysql.user` grant table defines the initial MySQL user accounts and their access privileges:

- Some accounts have the user name `root`. These are superuser accounts that have all privileges and can do anything. If these `root` accounts have empty passwords, anyone can connect to the MySQL server as `root` without a password and be granted all privileges.

- On Windows, `root` accounts are created that permit connections from the local host only. Connections can be made by specifying the host name `localhost`, the IP address `127.0.0.1`, or the IPv6 address `::1`. If the user selects the Enable root access from remote machines option during installation, the Windows installer creates another `root` account that permits connections from any host.

- On Unix, each `root` account permits connections from the local host. Connections can be made by specifying the host name `localhost`, the IP address `127.0.0.1`, the IPv6 address `::1`, or the actual host name or IP address.

  An attempt to connect to the host `127.0.0.1` normally resolves to the `localhost` account. However, this fails if the server is run with the `--skip-name-resolve` option, so the `127.0.0.1` account is useful in that case. The `::1` account is used for IPv6 connections.

- If accounts for anonymous users were created, these have an empty user name. The anonymous accounts have no password, so anyone can use them to connect to the MySQL server.

- On Windows, there is one anonymous account that permits connections from the local host. Connections can be made by specifying a host name of `localhost`.

- On Unix, each anonymous account permits connections from the local host. Connections can be made by specifying a host name of `localhost` for one of the accounts, or the actual host name or IP address for the other.

- The `'root'@'localhost'` account also has a row in the `mysql.proxies_priv` table that enables granting the PROXY privilege for `''@''`, that is, for all users and all hosts. This enables `root` to set up proxy users, as well as to delegate to other accounts the authority to set up proxy users. See Proxy Users.

To display which accounts exist in the `mysql.user` system table and check whether their passwords are empty, use the following statement:

```
mysql> SELECT User, Host, Password FROM mysql.user;
```

<table>
<thead>
<tr>
<th>User</th>
<th>Host</th>
<th>Password</th>
</tr>
</thead>
<tbody>
<tr>
<td>root</td>
<td>localhost</td>
<td></td>
</tr>
<tr>
<td>root</td>
<td>myhost.example.com</td>
<td></td>
</tr>
<tr>
<td>root</td>
<td>127.0.0.1</td>
<td></td>
</tr>
<tr>
<td>root</td>
<td>::1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>localhost</td>
<td></td>
</tr>
<tr>
<td></td>
<td>myhost.example.com</td>
<td></td>
</tr>
</tbody>
</table>

This output indicates that there are several `root` and anonymous-user accounts, none of which have passwords. The output might differ on your system, but the presence of accounts with empty passwords means that your MySQL installation is unprotected until you do something about it:

- Assign a password to each MySQL `root` account that does not have one.
Assigning root Account Passwords

• To prevent clients from connecting as anonymous users without a password, either assign a password to each anonymous account or remove the accounts.

In addition, the `mysql.db` table contains rows that permit all accounts to access the `test` database and other databases with names that start with `test_`. This is true even for accounts that otherwise have no special privileges such as the default anonymous accounts. This is convenient for testing but inadvisable on production servers. Administrators who want database access restricted only to accounts that have permissions granted explicitly for that purpose should remove these `mysql.db` table rows.

The following instructions describe how to set up passwords for the initial MySQL accounts, first for the root accounts, then for the anonymous accounts. The instructions also cover how to remove anonymous accounts, should you prefer not to permit anonymous access at all, and describe how to remove permissive access to test databases. Replace `new_password` in the examples with the password that you want to use. Replace `host_name` with the name of the server host. You can determine this name from the output of the preceding `SELECT` statement. For the output shown, `host_name` is `myhost.example.com`.

You need not remove anonymous entries in the `mysql.proxies_priv` table, which are used to support proxy users. See Proxy Users.

Note
For additional information about setting passwords, see Assigning Account Passwords. If you forget your root password after setting it, see How to Reset the Root Password.

To set up additional accounts, see Adding Accounts, Assigning Privileges, and Dropping Accounts.

You might want to defer setting the passwords until later, to avoid the need to specify them while you perform additional setup or testing. However, be sure to set them before using your installation for production purposes.

Note
On Windows, you can also perform the process described in this section using the Configuration Wizard (see Section 5.5.11, “The Security Options Dialog”). On all platforms, the MySQL distribution includes `mysql_secure_installation`, a command-line utility that automates much of the process of securing a MySQL installation. MySQL Workbench is available on all platforms, and also offers the ability to manage user accounts (see MySQL Workbench).

• Assigning root Account Passwords
• Assigning Anonymous Account Passwords
• Removing Anonymous Accounts
• Securing Test Databases

Assigning root Account Passwords

A root account password can be set several ways. The following discussion demonstrates three methods:

• Use the `SET PASSWORD` statement
• Use the `UPDATE` statement
Assigning root Account Passwords

- Use the `mysqladmin` command-line client program

To assign passwords using `SET PASSWORD`, connect to the server as `root` and issue a `SET PASSWORD` statement for each `root` account listed in the `mysql.user` system table.

For Windows, do this:

```
shell> mysql -u root
mysql> SET PASSWORD FOR 'root'@'localhost' = PASSWORD('new_password');
mysql> SET PASSWORD FOR 'root'@'127.0.0.1' = PASSWORD('new_password');
mysql> SET PASSWORD FOR 'root'@'::1' = PASSWORD('new_password');
mysql> SET PASSWORD FOR 'root'@'%' = PASSWORD('new_password');
```

The last statement is unnecessary if the `mysql.user` table has no `root` account with a host value of `%`.

For Unix, do this:

```
shell> mysql -u root
mysql> SET PASSWORD FOR 'root'@'localhost' = PASSWORD('new_password');
mysql> SET PASSWORD FOR 'root'@'127.0.0.1' = PASSWORD('new_password');
mysql> SET PASSWORD FOR 'root'@'::1' = PASSWORD('new_password');
mysql> SET PASSWORD FOR 'root'@'host_name' = PASSWORD('new_password');
```

You can also use a single statement that assigns a password to all `root` accounts by using `UPDATE` to modify the `mysql.user` table directly. This method works on any platform:

```
shell> mysql -u root
mysql> UPDATE mysql.user SET Password = PASSWORD('new_password')
    -> WHERE User = 'root';
mysql> FLUSH PRIVILEGES;
```

The `FLUSH` statement causes the server to reread the grant tables. Without it, the password change remains unnoticed by the server until you restart it.

To assign passwords to the `root` accounts using `mysqladmin`, execute the following commands:

```
shell> mysqladmin -u root password "new_password"
shell> mysqladmin -u root -h host_name password "new_password"
```

Those commands apply both to Windows and to Unix. The double quotation marks around the password are not always necessary, but you should use them if the password contains spaces or other characters that are special to your command interpreter.

The `mysqladmin` method of setting the `root` account passwords does not work for the `root'@'127.0.0.1'` or `root'@'::1'` account. Use the `SET PASSWORD` method shown earlier.

After the `root` passwords have been set, you must supply the appropriate password whenever you connect as `root` to the server. For example, to shut down the server with `mysqladmin`, use this command:

```
shell> mysqladmin -u root -p shutdown
Enter password: (enter root password here)
```

The `mysql` commands in the following instructions include a `-p` option based on the assumption that you have assigned the `root` account passwords using the preceding instructions and must specify that password when connecting to the server.
Assigning Anonymous Account Passwords

To assign passwords to the anonymous accounts, connect to the server as root, then use either `SET PASSWORD` or `UPDATE`.

To use `SET PASSWORD` on Windows, do this:

```shell
shell> mysql -u root -p
Enter password: (enter root password here)
mysql> SET PASSWORD FOR ''@'localhost' = PASSWORD('new_password');
```

To use `SET PASSWORD` on Unix, do this:

```shell
shell> mysql -u root -p
Enter password: (enter root password here)
mysql> SET PASSWORD FOR ''@'localhost' = PASSWORD('new_password');
mysql> SET PASSWORD FOR ''@'host_name' = PASSWORD('new_password');
```

To set the anonymous-user account passwords with a single `UPDATE` statement, do this (on any platform):

```shell
shell> mysql -u root -p
Enter password: (enter root password here)
mysql> UPDATE mysql.user SET Password = PASSWORD('new_password')
  -> WHERE User = '';
mysql> FLUSH PRIVILEGES;
```

The `FLUSH` statement causes the server to reread the grant tables. Without it, the password change remains unnoticed by the server until you restart it.

Removing Anonymous Accounts

If you prefer to remove any anonymous accounts rather than assigning them passwords, do so as follows on Windows:

```shell
shell> mysql -u root -p
Enter password: (enter root password here)
mysql> DROP USER ''@'localhost';
```

On Unix, remove the anonymous accounts like this:

```shell
shell> mysql -u root -p
Enter password: (enter root password here)
mysql> DROP USER ''@'localhost';
mysql> DROP USER ''@'host_name';
```

Securing Test Databases

By default, the `mysql.db` table contains rows that permit access by any user to the test database and other databases with names that start with test_. (These rows have an empty `User` column value, which for access-checking purposes matches any user name.) This means that such databases can be used even by accounts that otherwise possess no privileges. If you want to remove any-user access to test databases, do so as follows:

```shell
shell> mysql -u root -p
```
The `FLUSH` statement causes the server to reread the grant tables. Without it, the privilege change remains unnoticed by the server until you restart it.

With the preceding change, only users who have global database privileges or privileges granted explicitly for the `test` database can use it. However, if you prefer that the database not exist at all, drop it:

```
mysql> DROP DATABASE test;
```

### 9.5 Starting and Stopping MySQL Automatically

This section discusses methods for starting and stopping the MySQL server.

Generally, you start the `mysqld` server in one of these ways:

- Invoke `mysqld` directly. This works on any platform.
- On Windows, you can set up a MySQL service that runs automatically when Windows starts. See Section 5.6.7, “Starting MySQL as a Windows Service”.
- On Unix and Unix-like systems, you can invoke `mysqld_safe`, which tries to determine the proper options for `mysqld` and then runs it with those options. See `mysqld_safe` — MySQL Server Startup Script.
- On systems that use System V-style run directories (that is, `/etc/init.d` and run-level specific directories), invoke `mysql.server`. This script is used primarily at system startup and shutdown. It usually is installed under the name `mysql`. The `mysql.server` script starts the server by invoking `mysqld_safe`. See `mysql.server` — MySQL Server Startup Script.
- On OS X, install a launchd daemon to enable automatic MySQL startup at system startup. The daemon starts the server by invoking `mysqld_safe`. For details, see Section 6.3, “Installing a MySQL Launch Daemon”. A MySQL Preference Pane also provides control for starting and stopping MySQL through the System Preferences. See Section 6.4, “Installing and Using the MySQL Preference Pane”.
- On Solaris, use the service management framework (SMF) system to initiate and control MySQL startup.

The `mysqld_safe` and `mysql.server` scripts, Solaris SMF, and the OS X Startup Item (or MySQL Preference Pane) can be used to start the server manually, or automatically at system startup time. `mysql.server` and the Startup Item also can be used to stop the server.

The following table shows which option groups the server and startup scripts read from option files.

<table>
<thead>
<tr>
<th>Script</th>
<th>Option Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>mysqld</code></td>
<td><code>[mysqld], [server], [mysqld-major_version]</code></td>
</tr>
<tr>
<td><code>mysqld_safe</code></td>
<td><code>[mysqld], [server], [mysqld_safe]</code></td>
</tr>
<tr>
<td><code>mysql.server</code></td>
<td><code>[mysqld], [mysql.server], [server]</code></td>
</tr>
</tbody>
</table>

`[mysqld-major_version]` means that groups with names like `[mysqld-5.1]` and `[mysqld-5.5]` are read by servers having versions 5.1.x, 5.5.x, and so forth. This feature can be used to specify options that can be read only by servers within a given release series.
For backward compatibility, `mysql.server` also reads the `[mysql_server]` group and `mysqld_safe` also reads the `[safe_mysqld]` group. However, you should update your option files to use the `[mysql.server]` and `[mysqld_safe]` groups instead.

For more information on MySQL configuration files and their structure and contents, see Using Option Files.
Chapter 10 Upgrading MySQL

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This section describes the steps to upgrade a MySQL installation.

Upgrading is a common procedure, as you pick up bug fixes within the same MySQL release series or significant features between major MySQL releases. You perform this procedure first on some test systems to make sure everything works smoothly, and then on the production systems.

Note

In the following discussion, MySQL commands that must be run using a MySQL account with administrative privileges include \texttt{-u root} on the command line to specify the MySQL root user. Commands that require a password for root also include a \texttt{-p} option. Because \texttt{-p} is followed by no option value, such commands prompt for the password. Type the password when prompted and press Enter.

SQL statements can be executed using the \texttt{mysql} command-line client (connect as root to ensure that you have the necessary privileges).

10.1 Before You Begin

Review the information in this section before upgrading. Perform any recommended actions.

- Protect your data by creating a backup. The backup should include the \texttt{mysql} system database, which contains the MySQL system tables. See Database Backup Methods.
- Review Section 10.2, “Upgrade Paths” to ensure that your intended upgrade path is supported.
- Review Section 10.3, “Changes in MySQL 5.5” for changes that you should be aware of before upgrading. Some changes may require action.
- Review What Is New in MySQL 5.5 for deprecated and removed features. An upgrade may require changes with respect to those features if you use any of them.
- Review Server and Status Variables and Options Added, Deprecated, or Removed in MySQL 5.7. If you use deprecated or removed variables, an upgrade may require configuration changes.
- Review the Release Notes for information about fixes, changes, and new features.
- If you use replication, review Upgrading a Replication Setup.
Upgrade procedures vary by platform and how the initial installation was performed. Use the procedure that applies to your current MySQL installation:

- For binary and package-based installations on non-Windows platforms, refer to Section 10.4, “Upgrading MySQL Binary or Package-based Installations on Unix/Linux”.
- For installations on Windows, refer to Section 10.5, “Upgrading MySQL on Windows”.
- If your MySQL installation contains a large amount of data that might take a long time to convert after an in-place upgrade, it may be useful to create a test instance for assessing the conversions that are required and the work involved to perform them. To create a test instance, make a copy of your MySQL instance that contains the `mysql` database and other databases without the data. Run the upgrade procedure on the test instance to assess the work involved to perform the actual data conversion.
- Rebuilding and reinstalling MySQL language interfaces is recommended when you install or upgrade to a new release of MySQL. This applies to MySQL interfaces such as PHP `mysql` extensions and the Perl `DBD::mysql` module.

### 10.2 Upgrade Paths

- Upgrade is only supported between General Availability (GA) releases.
- Upgrade from MySQL 5.1 to 5.5 is supported. Upgrading to the latest release is recommended before upgrading to the next version. For example, upgrade to the latest MySQL 5.1 release before upgrading to MySQL 5.5.
- Upgrade that skips versions is not supported. For example, upgrading directly from MySQL 5.0 to 5.5 is not supported.
- Upgrade within a release series is supported. For example, upgrading from MySQL 5.5.x to 5.5.y is supported. Skipping a release is also supported. For example, upgrading from MySQL 5.5.x to 5.5.z is supported.

### 10.3 Changes in MySQL 5.5

Before upgrading to MySQL 5.5, review the changes described in this section to identify those that apply to your current MySQL installation and applications. Perform any recommended actions.

Changes marked as **Incompatible change** are incompatibilities with earlier versions of MySQL, and may require your attention before upgrading. Our aim is to avoid these changes, but occasionally they are necessary to correct problems that would be worse than an incompatibility between releases. If an upgrade issue applicable to your installation involves an incompatibility, follow the instructions given in the description. Sometimes this involves dumping and reloading tables, or use of a statement such as `CHECK TABLE` or `REPAIR TABLE`.

For dump and reload instructions, see Section 10.7, “Rebuilding or Repairing Tables or Indexes”. Any procedure that involves `REPAIR TABLE` with the `USE_FRM` option must be done before upgrading. Use of this statement with a version of MySQL different from the one used to create the table (that is, using it after upgrading) may damage the table. See `REPAIR TABLE Syntax`.

- Configuration Changes
- Server Changes
- InnoDB Changes
- SQL Changes
Configuration Changes

- **Incompatible change**: The InnoDB Plugin is included in MySQL 5.5 releases. It becomes the built-in version of InnoDB in MySQL Server, replacing the version previously included as the built-in InnoDB engine. InnoDB Plugin is also available in MySQL 5.1 as of 5.1.38, but it is an optional storage engine that must be enabled explicitly using two server options:

  ```
  [mysqld]
  ignore-built-in-innodb
  plugin-load=innodb-ha_innodb_plugin.so
  ```

  If you were using InnoDB Plugin in MySQL 5.1 by means of those options, you must remove them after an upgrade to 5.5 or the server will fail to start.

  In addition, in InnoDB Plugin, the innodb_file_io_threads system variable has been removed and replaced with innodb_read_io_threads and innodb_write_io_threads. If you upgrade from MySQL 5.1 to MySQL 5.5 and previously explicitly set innodb_file_io_threads at server startup, you must change your configuration. Either remove any reference to innodb_file_io_threads or replace it with references to innodb_read_io_threads and innodb_write_io_threads.

- **Incompatible change**: In MySQL 5.5, the server includes a plugin services interface that complements the plugin API. The services interface enables server functionality to be exposed as a “service” that plugins can access through a function-call interface. The libmysqlservices library provides access to the available services and dynamic plugins now must be linked against this library (use the -lmysqlservices flag). For an example showing how to configure for CMake, see MySQL Services for Plugins.

Server Changes

- On Linux systems, the libaio library may be needed. Install it first, if it is not already present on your system.

- As of MySQL 5.5.32, for new installations, the url columns in the mysql database help tables are now created as type TEXT to accommodate longer URLs. For upgrades, mysql_upgrade does not update the columns. Modify them manually using these statements:

  ```
  ALTER TABLE mysql.help_category MODIFY url TEXT NOT NULL;
  ALTER TABLE mysql.help_topic MODIFY url TEXT NOT NULL;
  ```

- **Incompatible change**: As of MySQL 5.5.3, due to work done for Bug #989, FLUSH TABLES is not permitted when there is an active LOCK TABLES ... READ. To provide a workaround for this restriction, FLUSH TABLES has a new variant, FLUSH TABLES tbl_list WITH READ LOCK, that enables tables to be flushed and locked in a single operation. As a result of this change, applications that previously used this statement sequence to lock and flush tables will fail:

  ```
  LOCK TABLES tbl_list READ;
  FLUSH TABLES tbl_list;
  ```

  Such applications should now use this statement instead:

  ```
  FLUSH TABLES tbl_list WITH READ LOCK;
  ```

- **Incompatible change**: As of MySQL 5.5.7, the server requires that a new grant table, proxies_priv, be present in the mysql database. If you are upgrading to 5.5.7 from a previous MySQL release rather
than performing a new installation, the server will find that this table is missing and exit during startup with the following message:

```
Table 'mysql.proxies_priv' doesn't exist
```

To create the `proxies_priv` table, start the server with the `--skip-grant-tables` option to cause it to skip the normal grant table checks, then run `mysql_upgrade`. For example:

```
mysqld --skip-grant-tables &
mysql_upgrade
```

Then stop the server and restart it normally.

You can specify other options on the `mysqld` command line if necessary. Alternatively, if your installation is configured so that the server normally reads options from an option file, use the `--defaults-file` option to specify the file (enter each command on a single line):

```
mysqld --defaults-file=/usr/local/mysql/etc/my.cnf
   --skip-grant-tables &
mysql_upgrade
```

With the `--skip-grant-tables` option, the server does no password or privilege checking, so any client can connect and effectively have all privileges. For additional security, use the `--skip-networking` option as well to prevent remote clients from connecting.

### Note

This problem is fixed in MySQL 5.5.8; the server treats a missing `proxies_priv` table as equivalent to an empty table. However, after starting the server, you should still run `mysql_upgrade` to create the table.

- **Incompatible change**: As of MySQL 5.5.7, InnoDB always uses the fast truncation technique, equivalent to `DROP TABLE` and `CREATE TABLE`. It no longer performs a row-by-row delete for tables with parent-child foreign key relationships. `TRUNCATE TABLE` returns an error for such tables. Modify your SQL to issue `DELETE FROM table_name` for such tables instead.

- **Incompatible change**: Prior to MySQL 5.5.7, if you flushed the logs using `FLUSH LOGS` or `mysqladmin flush-logs` and `mysqld` was writing the error log to a file (for example, if it was started with the `--log-error` option), it renames the current log file with the suffix `-old`, then created a new empty log file. This had the problem that a second log-flushing operation thus caused the original error log file to be lost unless you saved it under a different name. For example, you could use the following commands to save the file:

  ```
  mysqladmin flush-logs
  mv host_name.err-old backup-directory
  ```

To avoid the preceding file-loss problem, no renaming occurs as of MySQL 5.5.7; the server merely closes and reopens the log file. To rename the file, you can do so manually before flushing. Then flushing the logs reopens a new file with the original file name. For example, you can rename the file and create a new one using the following commands:

```
mv host_name.err host_name.err-old
mysqladmin flush-logs
mv host_name.err-old backup-directory
```
Server Changes

• **Incompatible change**: As of MySQL 5.5.6, handling of `CREATE TABLE IF NOT EXISTS ... SELECT` statements has been changed for the case that the destination table already exists:

  - Previously, for `CREATE TABLE IF NOT EXISTS ... SELECT`, MySQL produced a warning that the table exists, but inserted the rows and wrote the statement to the binary log anyway. By contrast, `CREATE TABLE ... SELECT (without IF NOT EXISTS)` failed with an error, but MySQL inserted no rows and did not write the statement to the binary log.

  - MySQL now handles both statements the same way when the destination table exists, in that neither statement inserts rows or is written to the binary log. The difference between them is that MySQL produces a warning when `IF NOT EXISTS` is present and an error when it is not.

This change in handling of `IF NOT EXISTS` results in an incompatibility for statement-based replication from a MySQL 5.1 master with the original behavior and a MySQL 5.5 slave with the new behavior. Suppose that `CREATE TABLE IF NOT EXISTS ... SELECT` is executed on the master and the destination table exists. The result is that rows are inserted on the master but not on the slave. (Row-based replication does not have this problem.)

To address this issue, statement-based binary logging for `CREATE TABLE IF NOT EXISTS ... SELECT` is changed in MySQL 5.1 as of 5.1.51:

  - If the destination table does not exist, there is no change: The statement is logged as is.

  - If the destination table does exist, the statement is logged as the equivalent pair of `CREATE TABLE IF NOT EXISTS` and `INSERT ... SELECT` statements. (If the `SELECT` in the original statement is preceded by `IGNORE` or `REPLACE`, the `INSERT` becomes `INSERT IGNORE` or `REPLACE`, respectively.)

This change provides forward compatibility for statement-based replication from MySQL 5.1 to 5.5 because when the destination table exists, the rows will be inserted on both the master and slave. To take advantage of this compatibility measure, the 5.1 server must be at least 5.1.51 and the 5.5 server must be at least 5.5.6.

To upgrade an existing 5.1-to-5.5 replication scenario, upgrade the master first to 5.1.51 or higher. Note that this differs from the usual replication upgrade advice of upgrading the slave first.

A workaround for applications that wish to achieve the original effect (rows inserted regardless of whether the destination table exists) is to use `CREATE TABLE IF NOT EXISTS` and `INSERT ... SELECT` statements rather than `CREATE TABLE IF NOT EXISTS ... SELECT` statements.

Along with the change just described, the following related change was made: Previously, if an existing view was named as the destination table for `CREATE TABLE IF NOT EXISTS ... SELECT`, rows were inserted into the underlying base table and the statement was written to the binary log. As of MySQL 5.1.51 and 5.5.6, nothing is inserted or logged.

• **Incompatible change**: Prior to MySQL 5.5.6, if the server was started with `character_set_server` set to `utf16`, it crashed during full-text stopword initialization. Now the stopword file is loaded and searched using `latin1` if `character_set_server` is `ucs2`, `utf16`, or `utf32`. If any table was created with `FULLTEXT` indexes while the server character set was `ucs2`, `utf16`, or `utf32`, it should be repaired using this statement:

  ```
  REPAIR TABLE tbl_name QUICK;
  ```

• **Incompatible change**: As of MySQL 5.5.5, all numeric operators and functions on integer, floating-point and `DECIMAL` values throw an "out of range" error (`ER_DATA_OUT_OF_RANGE`) rather than returning an
incorrect value or NULL, when the result is out of the supported range for the corresponding data type. See Out-of-Range and Overflow Handling.

• **Incompatible change:** In very old versions of MySQL (prior to 4.1), the TIMESTAMP data type supported a display width, which was silently ignored beginning with MySQL 4.1. This is deprecated in MySQL 5.1, and removed altogether in MySQL 5.5. These changes in behavior can lead to two problem scenarios when trying to use `TIMESTAMP(N)` columns with a MySQL 5.5 or later server:

  • When importing a dump file (for example, one created using `mysqldump`) created in a MySQL 5.0 or earlier server into a server from a newer release series, a `CREATE TABLE` or `ALTER TABLE` statement containing `TIMESTAMP(N)` causes the import to fail with a syntax error.

    To fix this problem, edit the dump file in a text editor to replace any instances of `TIMESTAMP(N)` with `TIMESTAMP` prior to importing the file. Be sure to use a plain text editor for this, and not a word processor; otherwise, the result is almost certain to be unusable for importing into the MySQL server.

  • When trying replicate any `CREATE TABLE` or `ALTER TABLE` statement containing `TIMESTAMP(N)` from a master MySQL server that supports the `TIMESTAMP(N)` syntax to a MySQL 5.5.3 or higher slave, the statement causes replication to fail. Similarly, when you try to restore from a binary log written by a server that supports `TIMESTAMP(N)` to a MySQL 5.5.3 or higher server, any `CREATE TABLE` or `ALTER TABLE` statement containing `TIMESTAMP(N)` causes the backup to fail. This holds true regardless of the logging format.

    It may be possible to fix such issues using a hex editor, by replacing any width arguments used with `TIMESTAMP`, and the parentheses containing them, with space characters (hexadecimal 20). Be sure to use a programmer's binary hex editor and not a regular text editor or word processor for this; otherwise, the result is almost certain to be a corrupted binary log file. To guard against accidental corruption of the binary log, you should always work on a copy of the file rather than the original.

You should try to handle potential issues of these types proactively by updating with `ALTER TABLE` any `TIMESTAMP(N)` columns in your databases so that they use `TIMESTAMP` instead, before performing any upgrades.

• **Incompatible change:** As of MySQL 5.5.3, the Unicode implementation has been extended to provide support for supplementary characters that lie outside the Basic Multilingual Plane (BMP). Noteworthy features:

  • `utf16` and `utf32` character sets have been added. These correspond to the UTF-16 and UTF-32 encodings of the Unicode character set, and they both support supplementary characters.

  • The `utf8mb4` character set has been added. This is similar to `utf8`, but its encoding allows up to four bytes per character to enable support for supplementary characters.

  • The `ucs2` character set is essentially unchanged except for the inclusion of some newer BMP characters.

In most respects, upgrading to MySQL 5.5 should present few problems with regard to Unicode usage, although there are some potential areas of incompatibility. These are the primary areas of concern:

• For the variable-length character data types (`VARCHAR` and the `TEXT` types), the maximum length in characters is less for `utf8mb4` columns than for `utf8` columns.

• For all character data types (`CHAR`, `VARCHAR`, and the `TEXT` types), the maximum number of characters that can be indexed is less for `utf8mb4` columns than for `utf8` columns.
Consequently, if you want to upgrade tables from utf8 to utf8mb4 to take advantage of supplementary-character support, it may be necessary to change some column or index definitions.

For additional details about the new Unicode character sets and potential incompatibilities, see Unicode Support, and Converting Between 3-Byte and 4-Byte Unicode Character Sets.

- **Incompatible change**: As of MySQL 5.5.3, the server includes dtoa, a library for conversion between strings and numbers by David M. Gay. In MySQL, this library provides the basis for improved conversion between string or DECIMAL values and approximate-value (FLOAT or DOUBLE) numbers.

Because the conversions produced by this library differ in some cases from previous results, the potential exists for incompatibilities in applications that rely on previous results. For example, applications that depend on a specific exact result from previous conversions might need adjustment to accommodate additional precision.

For additional information about the properties of dtoa conversions, see Type Conversion in Expression Evaluation.

- **Incompatible change**: In MySQL 5.5, several changes were made regarding the language and character set of error messages:
  
  - The --language option for specifying the directory for the error message file is now deprecated. The new lc_messages_dir and lc_messages system variables should be used instead, and the server treats --language as an alias for lc_messages_dir.
  
  - The language system variable has been removed and replaced with the new lc_messages_dir and lc_messages system variables. lc_messages_dir has only a global value and is read only. lc_messages has global and session values and can be modified at runtime, so the error message language can be changed while the server is running, and individual clients each can have a different error message language by changing their session lc_messages value to a different locale name.
  
  - Error messages previously were constructed in a mix of character sets. This issue is resolved by constructing error messages internally within the server using UTF-8 and returning them to the client in the character set specified by the character_set_results system variable. The content of error messages therefore may in some cases differ from the messages returned previously.

For more information, see Setting the Error Message Language, and Error Message Character Set.

- **Incompatible change**: MySQL 5.5 implements new functions used to calculate row placement for tables partitioned by KEY and LINEAR KEY. Tables that were created using KEY or LINEAR KEY partitioning in MySQL 5.1 can be upgraded in MySQL 5.5.31 and later using ALTER TABLE ... PARTITION BY ALGORITHM=2 [LINEAR] KEY (...). (Bug #14521864, Bug #66462)

### InnoDB Changes

As of MySQL 5.5.62, the zlib library version bundled with MySQL was raised from version 1.2.3 to version 1.2.11.

The zlib compressBound() function in zlib 1.2.11 returns a slightly higher estimate of the buffer size required to compress a given length of bytes than it did in zlib version 1.2.3. The compressBound() function is called by InnoDB functions that determine the maximum row size permitted when creating compressed InnoDB tables or inserting rows into compressed InnoDB tables. As a result, CREATE TABLE ... ROW_FORMAT=COMPRESSED or INSERT operations with row sizes very close to the maximum row size that were successful in earlier releases could now fail.
If you have compressed InnoDB tables with large rows, it is recommended that you test compressed table CREATE TABLE statements on a MySQL 5.5 test instance prior to upgrading.

**SQL Changes**

- **Incompatible change**: Previously, the parser accepted an INTO clause in nested SELECT statements, which is invalid because such statements must return their results to the outer context. As of MySQL 5.5.3, this syntax is no longer permitted and statements that use it must be changed.

- **Incompatible change**: In MySQL 5.5.3, several changes were made to alias resolution in multiple-table DELETE statements so that it is no longer possible to have inconsistent or ambiguous table aliases.

  - In MySQL 5.1.23, alias declarations outside the table_references part of the statement were disallowed for the USING variant of multiple-table DELETE syntax, to reduce the possibility of ambiguous aliases that could lead to ambiguous statements that have unexpected results such as deleting rows from the wrong table.

    As of MySQL 5.5.3, alias declarations outside table_references are disallowed for all multiple-table DELETE statements. Alias declarations are permitted only in the table_references part.

    Incorrect:

    ```sql
    DELETE FROM t1 AS a2 USING t1 AS a1 INNER JOIN t2 AS a2;
    DELETE t1 AS a2 FROM t1 AS a1 INNER JOIN t2 AS a2;
    ```

    Correct:

    ```sql
    DELETE FROM t1 USING t1 AS a1 INNER JOIN t2 AS a2;
    DELETE t1 FROM t1 AS a1 INNER JOIN t2 AS a2;
    ```

- Previously, for alias references in the list of tables from which to delete rows in a multiple-table delete, the default database is used unless one is specified explicitly. For example, if the default database is db1, the following statement does not work because the unqualified alias reference a2 is interpreted as having a database of db1:

    ```sql
    DELETE a1, a2 FROM db1.t1 AS a1 INNER JOIN db2.t2 AS a2
    WHERE a1.id=a2.id;
    ```

    To correctly match an alias that refers to a table outside the default database, you must explicitly qualify the reference with the name of the proper database:

    ```sql
    DELETE a1, db2.a2 FROM db1.t1 AS a1 INNER JOIN db2.t2 AS a2
    WHERE a1.id=db2.a2.id;
    ```

    As of MySQL 5.5.3, alias resolution does not require qualification and alias references should not be qualified with the database name. Qualified names are interpreted as referring to tables, not aliases.

    Statements containing alias constructs that are no longer permitted must be rewritten.

- Some keywords may be reserved in MySQL 5.5 that were not reserved in MySQL 5.1. See Keywords and Reserved Words. This can cause words previously used as identifiers to become illegal. To fix affected statements, use identifier quoting. See Schema Object Names.
10.4 Upgrading MySQL Binary or Package-based Installations on Unix/Linux

This section describes how to upgrade MySQL binary and package-based installations on Unix/Linux. In-place and logical upgrade methods are described.

- In-Place Upgrade
- Logical Upgrade

Note
A logical upgrade is recommended when upgrading from a previous version. For example, use this method when upgrading from 5.1 to 5.5.

In-Place Upgrade

An in-place upgrade involves shutting down the old MySQL server, replacing the old MySQL binaries or packages with the new ones, restarting MySQL on the existing data directory, and upgrading any remaining parts of the existing installation that require upgrading.

Note
If you upgrade an installation originally produced by installing multiple RPM packages, upgrade all the packages, not just some. For example, if you previously installed the server and client RPMs, do not upgrade just the server RPM.

To perform an in-place upgrade:

1. If you use XA transactions with InnoDB, run XA RECOVER before upgrading to check for uncommitted XA transactions. If results are returned, either commit or rollback the XA transactions by issuing an XA COMMIT or XA ROLLBACK statement.

2. If you use InnoDB, configure MySQL to perform a slow shutdown by setting innodb_fast_shutdown to 0. For example:

   ```
   mysql -u root -p --execute="SET GLOBAL innodb_fast_shutdown=0"
   ```

   With a slow shutdown, InnoDB performs a full purge and change buffer merge before shutting down, which ensures that data files are fully prepared in case of file format differences between releases.

3. Shut down the old MySQL server. For example:

   ```
   mysqladmin -u root -p shutdown
   ```

4. Upgrade the MySQL binary installation or packages. If upgrading a binary installation, unpack the new MySQL binary distribution package. See Obtain and Unpack the Distribution. For package-based installations, install the new packages.

5. Start the MySQL 5.5 server, using the existing data directory. For example:

   ```
   mysqld_safe --user=mysql --datadir=/path/to/existing-datadir
   ```

6. Run mysql_upgrade. For example:
Logical Upgrade

`mysql_upgrade` -u root -p

`mysql_upgrade` examines all tables in all databases for incompatibilities with the current version of MySQL. `mysql_upgrade` also upgrades the `mysql` system database so that you can take advantage of new privileges or capabilities.

**Note**

`mysql_upgrade` does not upgrade the contents of the time zone tables or help tables. For upgrade instructions, see MySQL Server Time Zone Support, and Server-Side Help Support.

7. Shut down and restart the MySQL server to ensure that any changes made to the system tables take effect. For example:

   ```
   mysqladmin -u root -p shutdown
   mysqld_safe --user=mysql --datadir=/path/to/existing-datadir &
   ```

Logical Upgrade

A logical upgrade involves exporting SQL from the old MySQL instance using a backup or export utility such as `mysqldump`, installing the new MySQL server, and applying the SQL to your new MySQL instance.

To perform a logical upgrade:

1. Review the information in Section 10.1, “Before You Begin”.

2. Export your existing data from the previous MySQL installation:

   ```
   mysqldump -u root -p
   --add-drop-table --routines --events
   --all-databases --force > data-for-upgrade.sql
   ```

   **Note**

   Use the `--routines` and `--events` options with `mysqldump` (as shown above) if your databases include stored programs. The `--all-databases` option includes all databases in the dump, including the `mysql` database that holds the system tables.

3. Shut down the old MySQL server. For example:

   ```
   mysqladmin -u root -p shutdown
   ```

4. Install MySQL 5.5. For installation instructions, see Chapter 1, Installing and Upgrading MySQL.

5. Initialize a new data directory, as described at Section 9.1, “Initializing the Data Directory”. For example:

   ```
   scripts/mysql_install_db --user=mysql --datadir=/path/to/5.5-datadir
   ```

6. Start the MySQL 5.5 server, using the new data directory. For example:

   ```
   mysqld_safe --user=mysql --datadir=/path/to/5.5-datadir &
   ```
7. Load the previously created dump file into the new MySQL server. For example:

```
mysql -u root -p --force < data-for-upgrade.sql
```

8. Run `mysql_upgrade`. For example:

```
mysql_upgrade -u root -p
```

`mysql_upgrade` examines all tables in all databases for incompatibilities with the current version of MySQL. `mysql_upgrade` also upgrades the `mysql` system database so that you can take advantage of new privileges or capabilities.

**Note**

`mysql_upgrade` does not upgrade the contents of the time zone tables or help tables. For upgrade instructions, see MySQL Server Time Zone Support, and Server-Side Help Support.

9. Shut down and restart the MySQL server to ensure that any changes made to the system tables take effect. For example:

```
mysqladmin -u root -p shutdown
mysqld_safe --user=mysql --datadir=/path/to/5.5-datadir &
```

### 10.5 Upgrading MySQL on Windows

There are two approaches for upgrading MySQL on Windows:

- Using MySQL Installer
- Using the Windows ZIP archive distribution

The approach you select depends on how the existing installation was performed. Before proceeding, review Chapter 10, Upgrading MySQL for additional information on upgrading MySQL that is not specific to Windows.

**Note**

Whichever approach you choose, always back up your current MySQL installation before performing an upgrade. See Database Backup Methods.

Upgrades between milestone releases (or from a milestone release to a GA release) are not supported. Significant development changes take place in milestone releases and you may encounter compatibility issues or problems starting the server. For instructions on how to perform a logical upgrade with a milestone release, see Logical Upgrade.

**Note**

MySQL Installer does not support upgrades between Community releases and Commercial releases. If you require this type of upgrade, perform it using the ZIP archive approach.

### Upgrading MySQL with MySQL Installer

Performing an upgrade with MySQL Installer is the best approach when the current server installation was performed with it and the upgrade is within the current release series. MySQL Installer does not support
upgrades between release series, such as from 5.1 to 5.5, and it does not provide an upgrade indicator to prompt you to upgrade. For instructions on upgrading between release series, see Upgrading MySQL Using the Windows ZIP Distribution.

To perform an upgrade using MySQL Installer:

1. Start MySQL Installer.

2. From the dashboard, click Catalog to download the latest changes to the catalog. The installed server can be upgraded only if the dashboard displays an arrow next to the version number of the server.

3. Click Upgrade. All products that have a newer version now appear in a list.

   Note
   MySQL Installer deselects the server upgrade option for milestone releases (Pre-Release) in the same release series. In addition, it displays a warning to indicate that the upgrade is not supported, identifies the risks of continuing, and provides a summary of the steps to perform a logical upgrade manually. You can reselect server upgrade and proceed at your own risk.

4. Deselect all but the MySQL server product, unless you intend to upgrade other products at this time, and click Next.

5. Click Execute to start the download. When the download finishes, click Next to begin the upgrade operation.

6. Configure the server.

   Note
   MySQL Workbench 6.3 is the last Workbench version to fully support MySQL Server 5.5.

Upgrading MySQL Using the Windows ZIP Distribution

To perform an upgrade using the Windows ZIP archive distribution:

1. Download the latest Windows distribution of MySQL from https://dev.mysql.com/downloads/.

2. If the server is running, stop it. If the server is installed as a service, stop the service with the following command from the command prompt:

   C:\> SC STOP mysqld_service_name

   Alternatively, use NET STOP mysqld_service_name.

   If you are not running the MySQL server as a service, use mysqladmin to stop it. For example, before upgrading from MySQL 5.1 to 5.5, use mysqladmin from MySQL 5.1 as follows:

   C:\> "C:\Program Files\MySQL\MySQL Server 5.1\bin\mysqladmin" -u root shutdown

   Note
   If the MySQL root user account has a password, invoke mysqladmin with the -p option and enter the password when prompted.
3. If you are using the MySQL Installation Wizard, start the wizard as described in Section 5.4.1, “Using the MySQL Installation Wizard”.

4. If you are upgrading MySQL from a ZIP archive, extract the archive. You may either overwrite your existing MySQL installation (usually located at \C:\mysql), or install it into a different directory, such as \C:\mysql5. Overwriting the existing installation is recommended. However, for upgrades (as opposed to installing for the first time), you must remove the data directory from your existing MySQL installation to avoid replacing your current data files. To do so, follow these steps:
   a. Unzip the ZIP archive in some location other than your current MySQL installation
   b. Remove the data directory
   c. Move the data directory from the current MySQL installation to the location of the just-removed data directory
   d. Remove the current MySQL installation
   e. Move the unzipped installation to the location of the just-removed installation

5. Restart the server. For example, use the `SC START mysql_service_name` or `NET START mysql_service_name` command if you run MySQL as a service, or invoke `mysqld` directly otherwise.

6. As Administrator, run `mysql_upgrade` to check your tables, attempt to repair them if necessary, and update your grant tables if they have changed so that you can take advantage of any new capabilities. See `mysql_upgrade — Check and Upgrade MySQL Tables`.

7. If you encounter errors, see Section 5.7, “Troubleshooting a Microsoft Windows MySQL Server Installation”.

10.6 Upgrade Troubleshooting

- If problems occur, such as that the new `mysqld` server does not start or that you cannot connect without a password, verify that you do not have an old `my.cnf` file from your previous installation. You can check this with the `--print-defaults` option (for example, `mysqld --print-defaults`). If this command displays anything other than the program name, you have an active `my.cnf` file that affects server or client operation.

- If, after an upgrade, you experience problems with compiled client programs, such as `Commands out of sync` or unexpected core dumps, you probably have used old header or library files when compiling your programs. In this case, check the date for your `mysql.h` file and `libmysqlclient.a` library to verify that they are from the new MySQL distribution. If not, recompile your programs with the new headers and libraries. Recompilation might also be necessary for programs compiled against the shared client library if the library major version number has changed (for example, from `libmysqlclient.so.15` to `libmysqlclient.so.16`).

- If you have created a user-defined function (UDF) with a given name and upgrade MySQL to a version that implements a new built-in function with the same name, the UDF becomes inaccessible. To correct this, use `DROP FUNCTION` to drop the UDF, and then use `CREATE FUNCTION` to re-create the UDF with a different nonconflicting name. The same is true if the new version of MySQL implements a built-in function with the same name as an existing stored function. See Function Name Parsing and Resolution, for the rules describing how the server interprets references to different kinds of functions.

10.7 Rebuilding or Repairing Tables or Indexes
This section describes how to rebuild or repair tables or indexes, which may be necessitated by:

- Changes to how MySQL handles data types or character sets. For example, an error in a collation might have been corrected, necessitating a table rebuild to update the indexes for character columns that use the collation.

- Required table repairs or upgrades reported by CHECK TABLE, mysqlcheck, or mysql_upgrade.

Methods for rebuilding a table include:

- Dump and Reload Method
- ALTER TABLE Method
- REPAIR TABLE Method

**Dump and Reload Method**

If you are rebuilding tables because a different version of MySQL will not handle them after a binary (in-place) upgrade or downgrade, you must use the dump-and-reload method. Dump the tables *before* upgrading or downgrading using your original version of MySQL. Then reload the tables *after* upgrading or downgrading.

If you use the dump-and-reload method of rebuilding tables only for the purpose of rebuilding indexes, you can perform the dump either before or after upgrading or downgrading. Reloading still must be done afterward.

If you need to rebuild an InnoDB table because a CHECK TABLE operation indicates that a table upgrade is required, use mysqldump to create a dump file and mysql to reload the file. If the CHECK TABLE operation indicates that there is a corruption or causes InnoDB to fail, refer to Forcing InnoDB Recovery for information about using the innodb_force_recovery option to restart InnoDB. To understand the type of problem that CHECK TABLE may be encountering, refer to the InnoDB notes in CHECK TABLE Syntax.

To rebuild a table by dumping and reloading it, use mysqldump to create a dump file and mysql to reload the file:

```bash
mysqldump db_name t1 > dump.sql
mysql db_name < dump.sql
```

To rebuild all the tables in a single database, specify the database name without any following table name:

```bash
mysqldump db_name > dump.sql
mysql db_name < dump.sql
```

To rebuild all tables in all databases, use the `--all-databases` option:

```bash
mysqldump --all-databases > dump.sql
mysql < dump.sql
```

**ALTER TABLE Method**

To rebuild a table with ALTER TABLE, use a “null” alteration; that is, an ALTER TABLE statement that “changes” the table to use the storage engine that it already has. For example, if `t1` is an InnoDB table, use this statement:
ALTER TABLE t1 ENGINE = InnoDB;

If you are not sure which storage engine to specify in the ALTER TABLE statement, use SHOW CREATE TABLE to display the table definition.

**REPAIR TABLE Method**

The REPAIR TABLE method is only applicable to MyISAM, ARCHIVE, and CSV tables.

You can use REPAIR TABLE if the table checking operation indicates that there is a corruption or that an upgrade is required. For example, to repair a MyISAM table, use this statement:

REPAIR TABLE t1;

mysqlcheck --repair provides command-line access to the REPAIR TABLE statement. This can be a more convenient means of repairing tables because you can use the --databases or --all-databases option to repair all tables in specific databases or all databases, respectively:

mysqlcheck --repair --databases db_name ...
mysqlcheck --repair --all-databases

**10.8 Copying MySQL Databases to Another Machine**

In cases where you need to transfer databases between different architectures, you can use mysqldump to create a file containing SQL statements. You can then transfer the file to the other machine and feed it as input to the mysql client.

**Note**

You can copy the .frm, .MYI, and .MYD files for MyISAM tables between different architectures that support the same floating-point format. (MySQL takes care of any byte-swapping issues.) See The MyISAM Storage Engine.

Use mysqldump --help to see what options are available.

The easiest (although not the fastest) way to move a database between two machines is to run the following commands on the machine on which the database is located:

mysqladmin -h 'other_hostname' create db_name
mysqldump db_name | mysql -h 'other_hostname' db_name

If you want to copy a database from a remote machine over a slow network, you can use these commands:

mysqladmin create db_name
mysqldump -h 'other_hostname' --compress db_name | mysql db_name

You can also store the dump in a file, transfer the file to the target machine, and then load the file into the database there. For example, you can dump a database to a compressed file on the source machine like this:

mysqldump --quick db_name | gzip > db_name.gz

Transfer the file containing the database contents to the target machine and run these commands there:
You can also use `mysqldump` and `mysqlimport` to transfer the database. For large tables, this is much faster than simply using `mysqldump`. In the following commands, `DUMPDIR` represents the full path name of the directory you use to store the output from `mysqldump`.

First, create the directory for the output files and dump the database:

```bash
mkdir DUMPDIR
mysqldump --tab=DUMPDIR db_name
```

Then transfer the files in the `DUMPDIR` directory to some corresponding directory on the target machine and load the files into MySQL there:

```bash
mysqladmin create db_name  # create database
cat DUMPDIR/*.sql | mysql db_name  # create tables in database
mysqlimport db_name DUMPDIR/*.txt  # load data into tables
```

Do not forget to copy the `mysql` database because that is where the grant tables are stored. You might have to run commands as the MySQL root user on the new machine until you have the `mysql` database in place.

After you import the `mysql` database on the new machine, execute `mysqladmin flush-privileges` so that the server reloads the grant table information.
Chapter 11 Downgrading MySQL

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This section describes the steps to downgrade a MySQL installation.

Downgrading is a less common operation than upgrade. Downgrading is typically performed because of a compatibility or performance issue that occurs on a production system, and was not uncovered during initial upgrade verification on the test systems. As with the upgrade procedure verification on the test systems. As with the upgrade procedure Chapter 10, Upgrading MySQL), perform and verify the downgrade procedure on some test systems first, before using it on a production system.

Note
In the following discussion, MySQL commands that must be run using a MySQL account with administrative privileges include \texttt{-u root} on the command line to specify the MySQL root user. Commands that require a password for root also include a \texttt{-p} option. Because \texttt{-p} is followed by no option value, such commands prompt for the password. Type the password when prompted and press Enter.

SQL statements can be executed using the \texttt{mysql} command-line client (connect as \texttt{root} to ensure that you have the necessary privileges).

11.1 Before You Begin

Review the information in this section before downgrading. Perform any recommended actions.

- Protect your data by taking a backup. The backup should include the \texttt{mysql} database, which contains the MySQL system tables. See Database Backup Methods.
- Review Section 11.2, “Downgrade Paths” to ensure that your intended downgrade path is supported.
- Review Section 11.3, “Downgrade Notes” for items that may require action before downgrading.

Note
The downgrade procedures described in the following sections assume you are downgrading with data files created or modified by the newer MySQL version. However, if you did not modify your data after upgrading, downgrading using backups taken before upgrading to the new MySQL version is recommended. Many of the changes described in Section 11.3, “Downgrade Notes” that require action are not applicable when downgrading using backups taken before upgrading to the new MySQL version.
• Use of new features, new configuration options, or new configuration option values that are not supported by a previous release may cause downgrade errors or failures. Before downgrading, reverse changes resulting from the use of new features and remove configuration settings that are not supported by the release you are downgrading to.

11.2 Downgrade Paths

• Downgrade is only supported between General Availability (GA) releases.

• Downgrade from MySQL 5.5 to 5.1 is supported using the logical downgrade method.

• Downgrade that skips versions is not supported. For example, downgrading directly from MySQL 5.5 to 5.0 is not supported.

• Downgrade within a release series is supported. For example, downgrading from MySQL 5.5.z to 5.5.y is supported. Skipping a release is also supported. For example, downgrading from MySQL 5.5.z to 5.5.x is supported.

11.3 Downgrade Notes

Before downgrading from MySQL 5.5, review the information in this section. Some items may require action before downgrading.

• System Tables. The mysql.proc.comment column definition changed between MySQL 5.1 and 5.5. After downgrading from 5.5 to 5.1, this table is seen as corrupt and in need of repair. Running mysql_upgrade from the version of MySQL to which you downgraded (as documented in the downgrade procedures) reverts the mysql.proc.comment column definition.

• InnoDB. MySQL 5.5 uses InnoDB Plugin as the built-in version of InnoDB. MySQL 5.1 includes InnoDB Plugin as of 5.1.38, but as an option that must be enabled explicitly. See the Release Notes for MySQL 5.1.38.

• InnoDB. In MySQL 5.5.14, the length limit for index prefix keys is increased from 767 bytes to 3072 bytes, for InnoDB tables using ROW_FORMAT=DYNAMIC or ROW_FORMAT=COMPRESSED. See Limits on InnoDB Tables for details. If you downgrade from one of these releases or higher, to an earlier release with a lower length limit, the index prefix keys could be truncated at 767 bytes or the downgrade could fail. This issue could only occur if the configuration option innodb_large_prefix was enabled on the server being downgraded.

• Tables partitioned by [LINEAR] KEY. MySQL 5.5 implements new functions used to calculate row placement for tables partitioned by KEY and LINEAR KEY. Tables that were created using KEY or LINEAR KEY partitioning in MySQL 5.5 cannot be used by a MySQL 5.1 server. In MySQL 5.5.31 and later, you can downgrade such tables with ALTER TABLE ... PARTITION BY ALGORITHM=1 [LINEAR] KEY (...) to make them compatible with MySQL 5.1.

11.4 Downgrading MySQL Binary and Package Installations on Unix/Linux

This section describes how to downgrade MySQL binary and package-based installations on Unix/Linux. In-place and logical downgrade methods are described.

• In-Place Downgrade

• Logical Downgrade
In-Place Downgrade

In-place downgrade involves shutting down the new MySQL version, replacing the new MySQL binaries or packages with the old ones, and restarting the old MySQL version on the existing data directory.

In-place downgrade is supported for downgrades between GA releases within the same release series.

To perform an in-place downgrade:

1. Review the information in Section 11.1, “Before You Begin”.

2. If you use XA transactions with InnoDB, run XA RECOVER before downgrading to check for uncommitted XA transactions. If results are returned, either commit or rollback the XA transactions by issuing an XA COMMIT or XA ROLLBACK statement.

3. If you use InnoDB, configure MySQL to perform a slow shutdown by setting innodb_fast_shutdown to 0. For example:

   ```
   mysql -u root -p --execute="SET GLOBAL innodb_fast_shutdown=0"
   ```

   With a slow shutdown, InnoDB performs a full purge and change buffer merge before shutting down, which ensures that data files are fully prepared in case of file format differences between releases.

4. Shut down the newer MySQL server. For example:

   ```
   mysqladmin -u root -p shutdown
   ```

5. After the slow shutdown, remove the InnoDB redo log files (the ib_logfile* files) from the data directory to avoid downgrade issues related to redo log file format changes that may have occurred between releases.

   ```
   rm ib_logfile*
   ```

6. Downgrade the MySQL binaries or packages in-place by replacing the newer binaries or packages with the older ones.

7. Start the older (downgraded) MySQL server, using the existing data directory. For example:

   ```
   mysqld_safe --user=mysql --datadir=/path/to/existing-datadir
   ```

8. Run mysql_upgrade. For example:

   ```
   mysql_upgrade -u root -p
   ```

9. Shut down and restart the MySQL server to ensure that any changes made to the system tables take effect. For example:

   ```
   mysqladmin -u root -p shutdown
   mysqld_safe --user=mysql --datadir=/path/to/existing-datadir
   ```

Logical Downgrade

Logical downgrade involves using mysql dump to dump all tables from the new MySQL version, and then loading the dump file into the old MySQL version.
Logical downgrades are supported for downgrades between releases within the same release series and for downgrades to the previous release level. Only downgrades between General Availability (GA) releases are supported. Before proceeding, review Section 11.1, “Before You Begin”.

To perform a logical downgrade:

1. Review the information in Section 11.1, “Before You Begin”.

2. Dump all databases. For example:

   mysql dump -u root -p
   --add-drop-table --routines --events
   --all-databases --force > data-for-downgrade.sql

3. Shut down the newer MySQL server. For example:

   mysqladmin -u root -p shutdown

4. Initialize an older MySQL instance, with a new data directory. For example:

   scripts/mysql_install_db --user=mysql

5. Start the older MySQL server, using the new data directory. For example:

   mysql_safe --user=mysql --datadir=/path/to/new-datadir

6. Load the dump file into the older MySQL server. For example:

   mysql -u root -p --force < data-for-upgrade.sql

7. Run mysql_upgrade. For example:

   mysql_upgrade -u root -p

8. Shut down and restart the MySQL server to ensure that any changes made to the system tables take effect. For example:

   mysqladmin -u root -p shutdown
   mysql_safe --user=mysql --datadir=/path/to/new-datadir

### 11.5 Downgrading from MySQL Enterprise Edition to MySQL Community Server

This section describes the steps required to downgrade from MySQL Enterprise Edition to MySQL Community Edition. This can be done at any time, and is required at the expiration of a MySQL Enterprise Edition subscription if you wish to continue using MySQL Server.

When you perform such a downgrade, all commercially licensed components of the MySQL Enterprise Edition subscription must be uninstalled. These components and related considerations are described in the rest of this section.
Note

The issues described in this section are in addition to any that may be encountered as a result of any upgrade or downgrade of the MySQL Server version (such as between MySQL 5.5 and 5.1). Information about upgrading and downgrading between MySQL release series can be found elsewhere in this chapter; see Chapter 10, *Upgrading MySQL*, and Chapter 11, *Downgrading MySQL*.

MySQL Enterprise Database Server. All commercial versions of MySQL Database Server must be uninstalled.

Commercially licensed extensions. All commercially licensed MySQL Enterprise Database Server extensions must be uninstalled. This includes the following commercial extensions:

- *MySQL External Authentication for Windows*: Following uninstallation of this plugin, existing MySQL user accounts must be re-created using local authentication. See Access Control and Account Management, for more information.

- *MySQL External Authentication for PAM*: Following uninstallation of this plugin, existing MySQL user accounts must be re-created using local authentication. See Access Control and Account Management, for more information.

- *MySQL Enterprise Thread Pool*: Following uninstallation of this plugin, existing MySQL servers revert to default thread and connection handling.

- *MySQL Enterprise Audit*: Following uninstallation of this plugin, no logging of user logins or query activity occurs.

- *MySQL High Availability*: Following uninstallation of this plugin, automated failover is no longer available.

MySQL Enterprise Backup. MySQL Enterprise Backup must be uninstalled. Uninstalling this application has the effects listed here:

- Automated backup scripts no longer work.

- Existing backup images taken with MySQL Enterprise Backup can no longer be used for recovery.

- Third-party integration with multimedia systems such as NetBackup, Tivoli, and Oracle Secure Backup no longer works.

MySQL Enterprise Monitor, MySQL Query Analyzer, agents. MySQL Enterprise Monitor, MySQL Query Analyzer, and all server-side agents must be uninstalled. Uninstalling these applications and agents has the following effects:

- Automated SNMP and SMTP alerts no longer work.

- All historical MySQL, OS monitoring, query, and performance metrics as well as all trending data are lost.

- All environment-specific monitoring templates, custom advisors, graphs and scripts are also lost.

11.6 Downgrade Troubleshooting

If you downgrade from one release series to another, there may be incompatibilities in table storage formats. In this case, use `mysqldump` to dump your tables before downgrading. After downgrading, reload the dump file using `mysql` or `mysqlimport` to re-create your tables. For examples, see Section 10.8, “Copying MySQL Databases to Another Machine”.

A typical symptom of a downward-incompatible table format change when you downgrade is that you cannot open tables. In that case, use the following procedure:

1. Stop the older MySQL server that you are downgrading to.
2. Restart the newer MySQL server you are downgrading from.
3. Dump any tables that were inaccessible to the older server by using `mysqldump` to create a dump file.
4. Stop the newer MySQL server and restart the older one.
5. Reload the dump file into the older server. Your tables should be accessible.
Chapter 12 MySQL Environment Variables

This section lists environment variables that are used directly or indirectly by MySQL. Most of these can also be found in other places in this manual.

Options on the command line take precedence over values specified in option files and environment variables, and values in option files take precedence over values in environment variables. In many cases, it is preferable to use an option file instead of environment variables to modify the behavior of MySQL. See Using Option Files.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTHENTICATION_PAM_LOG</td>
<td>PAM authentication plugin debug logging settings.</td>
</tr>
<tr>
<td>CC</td>
<td>The name of your C compiler (for running CMake).</td>
</tr>
<tr>
<td>CXX</td>
<td>The name of your C++ compiler (for running CMake).</td>
</tr>
<tr>
<td>CC</td>
<td>The name of your C compiler (for running CMake).</td>
</tr>
<tr>
<td>DBI_USER</td>
<td>The default user name for Perl DBI.</td>
</tr>
<tr>
<td>DBI_TRACE</td>
<td>Trace options for Perl DBI.</td>
</tr>
<tr>
<td>HOME</td>
<td>The default path for the mysql history file is $HOME/.mysql_history.</td>
</tr>
<tr>
<td>LD_RUN_PATH</td>
<td>Used to specify the location of libmysqlclient.so.</td>
</tr>
<tr>
<td>LIBMYSQL_ENABLE_CLEARTEXT_PLUGIN</td>
<td>Enable mysql_clear_password authentication plugin; see Client-Side Cleartext Pluggable Authentication.</td>
</tr>
<tr>
<td>MYSQL_DEBUG</td>
<td>Debug trace options when debugging.</td>
</tr>
<tr>
<td>MYSQL_GROUP_SUFFIX</td>
<td>Option group suffix value (like specifying --defaults-group-suffix).</td>
</tr>
<tr>
<td>MYSQL_HISTFILE</td>
<td>The path to the mysql history file. If this variable is set, its value overrides the default for $HOME/.mysql_history.</td>
</tr>
<tr>
<td>MYSQL_HOME</td>
<td>The path to the directory in which the server-specific my.cnf file resides.</td>
</tr>
<tr>
<td>MYSQL_HOST</td>
<td>The default host name used by the mysql command-line client.</td>
</tr>
<tr>
<td>MYSQL_PS1</td>
<td>The command prompt to use in the mysql command-line client.</td>
</tr>
<tr>
<td>MYSQL_PWD</td>
<td>The default password when connecting to mysqld. Using this is insecure. See End-User Guidelines for Password Security.</td>
</tr>
<tr>
<td>MYSQL_TCP_PORT</td>
<td>The default TCP/IP port number.</td>
</tr>
<tr>
<td>MYSQL_UNIX_PORT</td>
<td>The default Unix socket file name; used for connections to localhost.</td>
</tr>
<tr>
<td>PATH</td>
<td>Used by the shell to find MySQL programs.</td>
</tr>
<tr>
<td>TMPDIR</td>
<td>The directory in which temporary files are created.</td>
</tr>
<tr>
<td>TZ</td>
<td>This should be set to your local time zone. See Time Zone Problems.</td>
</tr>
<tr>
<td>UMASK</td>
<td>The user-file creation mode when creating files. See note following table.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>UMASK_DIR</td>
<td>The user-directory creation mode when creating directories. See note following table.</td>
</tr>
<tr>
<td>USER</td>
<td>The default user name on Windows when connecting to mysql.</td>
</tr>
</tbody>
</table>

For information about the `mysql` history file, see `mysql Client Logging`.

The default `UMASK` and `UMASK_DIR` values are 0660 and 0700, respectively. MySQL assumes that the value for `UMASK` or `UMASK_DIR` is in octal if it starts with a zero. For example, setting `UMASK=0600` is equivalent to `UMASK=384` because 0600 octal is 384 decimal.

The `UMASK` and `UMASK_DIR` variables, despite their names, are used as modes, not masks:

- If `UMASK` is set, `mysqld` uses `(UMASK | 0600)` as the mode for file creation, so that newly created files have a mode in the range from 0600 to 0666 (all values octal).

- If `UMASK_DIR` is set, `mysqld` uses `(UMASK_DIR | 0700)` as the base mode for directory creation, which then is AND-ed with `~(UMASK & 0666)`, so that newly created directories have a mode in the range from 0700 to 0777 (all values octal). The AND operation may remove read and write permissions from the directory mode, but not execute permissions.
Chapter 13 Perl Installation Notes

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The Perl DBI module provides a generic interface for database access. You can write a DBI script that works with many different database engines without change. To use DBI, you must install the DBI module, as well as a DataBase Driver (DBD) module for each type of database server you want to access. For MySQL, this driver is the DBD::mysql module.

Perl, and the DBD::MySQL module for DBI must be installed if you want to run the MySQL benchmark scripts; see The MySQL Benchmark Suite. They are also required for the NDB Cluster ndb_size.pl utility; see ndb_size.pl — NDBCLUSTER Size Requirement Estimator.

Note
Perl support is not included with MySQL distributions. You can obtain the necessary modules from http://search.cpan.org for Unix, or by using the ActiveState ppm program on Windows. The following sections describe how to do this.

The DBI/DBD interface requires Perl 5.6.0, and 5.6.1 or later is preferred. DBI does not work if you have an older version of Perl. You should use DBD::mysql 4.009 or higher. Although earlier versions are available, they do not support the full functionality of MySQL 5.5.

13.1 Installing Perl on Unix

MySQL Perl support requires that you have installed MySQL client programming support (libraries and header files). Most installation methods install the necessary files. If you install MySQL from RPM files on Linux, be sure to install the developer RPM as well. The client programs are in the client RPM, but client programming support is in the developer RPM.

The files you need for Perl support can be obtained from the CPAN (Comprehensive Perl Archive Network) at http://search.cpan.org.

The easiest way to install Perl modules on Unix is to use the CPAN module. For example:

```
shell> perl -MCPAN -e shell
cpan> install DBI
cpan> install DBD::mysql
```

The DBD::mysql installation runs a number of tests. These tests attempt to connect to the local MySQL server using the default user name and password. (The default user name is your login name on Unix, and ODBC on Windows. The default password is “no password.”) If you cannot connect to the server with those values (for example, if your account has a password), the tests fail. You can use force install DBD::mysql to ignore the failed tests.

DBI requires the Data::Dumper module. It may be installed; if not, you should install it before installing DBI.
It is also possible to download the module distributions in the form of compressed \texttt{tar} archives and build the modules manually. For example, to unpack and build a DBI distribution, use a procedure such as this:

1. Unpack the distribution into the current directory:

   
   \begin{verbatim}
   shell> gunzip < DBI-VERSION.tar.gz | tar xvf -
   \end{verbatim}

   This command creates a directory named \texttt{DBI-VERSION}.

2. Change location into the top-level directory of the unpacked distribution:

   
   \begin{verbatim}
   shell> cd DBI-VERSION
   \end{verbatim}

3. Build the distribution and compile everything:

   
   \begin{verbatim}
   shell> perl Makefile.PL
   shell> make
   shell> make test
   shell> make install
   \end{verbatim}

   The \texttt{make test} command is important because it verifies that the module is working. Note that when you run that command during the \texttt{DBD::mysql} installation to exercise the interface code, the MySQL server must be running or the test fails.

   It is a good idea to rebuild and reinstall the \texttt{DBD::mysql} distribution whenever you install a new release of MySQL. This ensures that the latest versions of the MySQL client libraries are installed correctly.

   If you do not have access rights to install Perl modules in the system directory or if you want to install local Perl modules, the following reference may be useful: \url{http://learn.perl.org/faq/perlfaq8.html#How-do-I-keep-my-own-module-library-directory-}

13.2 Installing ActiveState Perl on Windows

On Windows, you should do the following to install the MySQL \texttt{DBD} module with ActiveState Perl:

1. Get ActiveState Perl from \url{http://www.activestate.com/Products/ActivePerl/} and install it.

2. Open a console window.

3. If necessary, set the \texttt{HTTP_proxy} variable. For example, you might try a setting like this:

   
   \begin{verbatim}
   C:\> set HTTP_proxy=my.proxy.com:3128
   \end{verbatim}

4. Start the PPM program:

   
   \begin{verbatim}
   C:\> C:\perl\bin\ppm.pl
   \end{verbatim}

5. If you have not previously done so, install \texttt{DBI}:

   
   \begin{verbatim}
   ppm> install DBI
   \end{verbatim}

6. If this succeeds, run the following command:

   
   \begin{verbatim}
   ppm> install DBD-mysql
   \end{verbatim}
This procedure should work with ActiveState Perl 5.6 or higher.

If you cannot get the procedure to work, you should install the ODBC driver instead and connect to the MySQL server through ODBC:

```perl
use DBI;
$dbh= DBI->connect("DBI:ODBC:$dsn",$user,$password) ||
    die "Got error $DBI::errstr when connecting to $dsn\n";
```

### 13.3 Problems Using the Perl DBI/DBD Interface

If Perl reports that it cannot find the `../mysql/mysql.so` module, the problem is probably that Perl cannot locate the `libmysqlclient.so` shared library. You should be able to fix this problem by one of the following methods:

- Copy `libmysqlclient.so` to the directory where your other shared libraries are located (probably `/usr/lib` or `/lib`).
- Modify the `-L` options used to compile `DBD::mysql` to reflect the actual location of `libmysqlclient.so`.
- On Linux, you can add the path name of the directory where `libmysqlclient.so` is located to the `/etc/ld.so.conf` file.
- Add the path name of the directory where `libmysqlclient.so` is located to the `LD_RUN_PATH` environment variable. Some systems use `LD_LIBRARY_PATH` instead.

Note that you may also need to modify the `-L` options if there are other libraries that the linker fails to find. For example, if the linker cannot find `libc` because it is in `/lib` and the link command specifies `-L/usr/lib`, change the `-L` option to `-L/lib` or add `-L/lib` to the existing link command.

If you get the following errors from `DBD::mysql`, you are probably using `gcc` (or using an old binary compiled with `gcc`):

```
/usr/bin/perl: can't resolve symbol '__moddi3'
/usr/bin/perl: can't resolve symbol '__divdi3'
```

Add `-L/usr/lib/gcc-lib/... -lgcc` to the link command when the `mysql.so` library gets built (check the output from `make` for `mysql.so` when you compile the Perl client). The `-L` option should specify the path name of the directory where `libgcc.a` is located on your system.

Another cause of this problem may be that Perl and MySQL are not both compiled with `gcc`. In this case, you can solve the mismatch by compiling both with `gcc`.