MySQL Installation Guide

MySQL Installation Guide

Abstract

This is the MySQL Installation Guide from the MySQL 5.0 Reference Manual.

Document generated on: 2009-06-02 (revision: 15165)

For more information on the terms of this license, for details on how the MySQL documentation is built and produced, or if you are interested in doing a translation, please contact the Documentation Team.

For additional licensing information, including licenses for libraries used by MySQL, see Preface, Notes, Licenses.

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

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

Installing and Upgrading MySQL

Chapter 1. MySQL Installation Overview

This chapter describes how to obtain and install MySQL. You can choose to install MySQL Enterprise or MySQL Community Server:

- MySQL Enterprise is Sun Microsystems, Inc.'s commercial offering for modern enterprise businesses. It includes MySQL Enterprise Server and the services provided by MySQL Network. To install MySQL Enterprise, see Chapter 3, *Installing MySQL Enterprise*.

- MySQL Community Server is for users who are comfortable configuring and administering MySQL by themselves. To install MySQL Community Server, see Chapter 4, *Installing MySQL Community Server*.

If you plan to upgrade an existing version of MySQL to a newer version rather than install MySQL for the first time, see Section 18.1, "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, you may wish to read MySQL 5.1 FAQ — Migration, which contains answers to some common questions concerning migration issues.

Chapter 2. Determining your current MySQL version

To determine the version and release of your currently installed MySQL installation, there are a number of options.

- Using a command client (mysql), the server version of the MySQL server to which you are connected is shown once you are connected. The server version information includes community or enterprise accordingly.

  For example, here is the output from a MySQL Community Server edition installed on Linux:

  ```
  Welcome to the MySQL monitor.  Commands end with ; or \g.
  Your MySQL connection id is 6
  Server version: 5.0.27-standard MySQL Community Edition - Standard (GPL)
  Type 'help;' or '\h' for help. Type '\c' to clear the buffer.
  mysql>
  ```

  This is an example of the output from MySQL Enterprise Server on Windows:

  ```
  Welcome to the MySQL monitor.  Commands end with ; or \g.
  Your MySQL connection id is 2
  Server version: 5.0.28-enterprise-gpl-nt MySQL Enterprise Server (GPL)
  Type 'help;' or '\h' for help. Type '\c' to clear the buffer.
  ```

- You may also determine the version information using the version variables. Both the version and version_comment variables contain version information for the server to which you are connected. Use the SHOW VARIABLES statement to obtain the information you want, as shown in this example:

  ```
  mysql> SHOW VARIABLES LIKE "%version%";
  +-------------------------+------------------------------------------+
  | Variable_name           | Value                                    |
  +-------------------------+------------------------------------------+
  | protocol_version        | 10                                       |
  | version                 | 5.0.27-standard                          |
  | version_comment         | MySQL Community Edition - Standard (GPL) |
  | version_compile_machine | i686                                     |
  | version_compile_os      | pc-linux-gnu                             |
  +-------------------------+------------------------------------------+
  5 rows in set (0.04 sec)
  ```

  > **Note**
  >
  > MySQL Administrator shows the server version within the **SERVER INFORMATION** tab. However, only the value of version is shown.

- The STATUS command displays the version as well as version comment information. For example:

  ```
  mysql> STATUS;
  --------------
  ./client/mysql  Ver 14.12 Distrib 5.0.29, for pc-linux-gnu (i686) using readline 5.0
  Connection id:          8
  Current database:
  Current user:           mc@localhost
  SSL:                    Not in use
  Current pager:          /usr/bin/less
  Using outfile:          ''
  Using delimiter:        ;
  Server version:         5.0.27-standard MySQL Community Edition - Standard (GPL)
  Protocol version:       10
  Connection:             Localhost via UNIX socket
  Server characterset:    latin1
  Db     characterset:    latin1
  Client characterset:    latin1
  Conn.  characterset:    latin1
  UNIX socket:            /tmp/mysql.sock
  Uptime:                 1 day 3 hours 58 min 43 sec
  Threads: 2  Questions: 17  Slow queries: 0  Opens: 11  Flush tables: 1  Open tables: 6  Queries per second avg: 0.0
  --------------
  ```

Chapter 3. Installing MySQL Enterprise

3.1. Overview of MySQL Enterprise Installation

To obtain MySQL Enterprise, visit http://www.mysql.com/products/enterprise/. The platforms that are officially supported for MySQL Enterprise are listed at http://www.mysql.com/support/supportedplatforms.html.

To install MySQL Enterprise, install the main distribution plus the latest available service pack or hot-fix. You only need to install the latest service pack or hot-fix - this will include all updates since the previous main distribution release Enterprise Installer. For platforms that do not yet have an Enterprise Installer, use the Community Server instructions (see Chapter 4, *Installing MySQL Community Server*).

Chapter 4. Installing MySQL Community Server

4.1. Overview of MySQL Community Server Installation

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 MySQL AB. For a list of platforms on which MySQL Community Server runs, see Operating Systems Supported by MySQL Community Server.

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. We also provide public access to our current source tree for those who want to see our most recent developments and help us test new code. To determine which version and type of distribution you should use, see Choosing Which MySQL Distribution to Install.

3. **Download the distribution that you want to install.** For instructions, see Chapter 5, *How to Get MySQL*. To verify the integrity of the distribution, use the instructions in Chapter 6, *Verifying Package Integrity Using MD5 Checksums or* `GnuPG`.

4. **Install the distribution.** To install MySQL from a binary distribution, use the instructions in Chapter 8, *Standard MySQL Installation Using a Binary Distribution*. To install MySQL from a source distribution or from the current development source tree, use the instructions in Chapter 16, *MySQL Installation Using a Source Distribution*.

   If you encounter installation difficulties, see Chapter 19, *Operating System-Specific Notes*, for information on solving problems for particular platforms.

5. **Perform any necessary post-installation setup.** After installing MySQL, read Chapter 17, *Post-Installation Setup and Testing*. This section contains important information about making sure the MySQL server is working properly. It also 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 21, *Perl Installation Notes*.

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 8, *Standard MySQL Installation Using a Binary Distribution*. To build MySQL from source, use the instructions at Chapter 16, *MySQL Installation Using a Source Distribution*.

Chapter 5. How to Get MySQL

Check our downloads page at http://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 http://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.

Our main mirror is located at http://mirrors.sunsite.dk/mysql/.

Chapter 6. Verifying Package Integrity Using MD5 Checksums or `GnuPG`

After you have downloaded the MySQL package that suits your needs and before you attempt to install it, you should 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. If you repeatedly cannot successfully verify the integrity of the package, please notify us about such incidents, including the full package name and the download site you have been using, at <webmaster@mysql.com> or <build@mysql.com>. Do not report downloading problems using the bug-reporting system.

6.1. 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 with the following command, where *package_name* is the name of the package you downloaded:

```
shell> md5sum package_name
```

Example:

```
shell> md5sum mysql-standard-5.0.84-linux-i686.tar.gz
aaab65abbec64d5e907dcd41b8699945  mysql-standard-5.0.84-linux-i686.tar.gz
```

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` or `.tar.gz` file) and not of the files that are contained inside of the archive.

Note that not all operating systems support the `md5sum` command. On some, it is simply called `md5`, and others 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 download the source code from http://www.gnu.org/software/textutils/ as well. 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.

6.2. 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. See http://www.gnupg.org/ for more information about `GnuPG` and how to obtain and install it on your system. Most Linux distributions ship with `GnuPG` installed by default. For more information about `GnuPG`, see http://www.openpgp.org/.

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://keyserver.pgp.com/. The key that you want to obtain is named `build@mysql.com`. Alternatively, you can cut and paste the key directly from the following text:

```
-----BEGIN PGP PUBLIC KEY BLOCK-----
Version: GnuPG v1.0.6 (GNU/Linux)
Comment: For info see http://www.gnupg.org
mQGiBD4+owwRBAC14GIfUfCyEDSIePvEW3SAFUdJBtoQHH/nJKZyQT7h9bPlUWC3
RODjQReyCITRrdwyrKUGku2FmeVGwn2u2WmDMNABLnpprWPkBdCk96+OmSLN9brZ
```

```
fw2vOUgCmYv2hW0hyDHuvYlQA/BThQoADgj8AW6/0Lo7V1W9/8VuHP0gQwCgvzV3
BqOxRznNCRCRxAuAuVztHRcEAJooQK1+iSiunZMYD1WufeXfshc57S/+yeJkegNW
hxwR9pRWVArNYJdDRT+rf2RUe3vpquKNQU/hnEIUHJRQqYHo8gTxvxXNQc7fJYLV
K2HtkrPbP72vwsEKMYhhr0eKCBtLGfls9krjJ6sBgACyP/Vb7hiPwxh6rDZ7ITnE
kYpXBACmWpP8NJTkamEnPCia2ZoOHODANwpUkP43I7jsDmgtobZX9qnrAXw+uNDI
QJEXM6FSbi0LLtZciNlYsafwAPEOMDKpMqAK6IyisNtPvaLd8lH0bPAnWqcyefep
rv0sxxqUEMcM3o7wwgfN83POkDasDbs3pjwPhxvhz6//62zQJ7Q7TXlTUUwgUGFj
a2FnZSBzaWduaW5nIGtleSAod3d3Lm15c3FsLmNvbSkgPGJ1aWxkQG15c3FsLmNv
bT6IXQQTEQIAHQUCR6yUtAUJDTBYgAULBwoDBAMVAwIDFgIBAheAAAoJEIxxjTtQ
cuH1rpIAn38+BlBI815Dou9VXMIAsQEk4G3tAJ9+Cz69Y/Xwm611lzteJrCAA32+
aYhMBBMRAgAMBQI+PqPRBYMJZgC7AAoJEElQ4SqycpHyJOEAn1mxHijft00bKXvu
cSo/pECUmppiAJ41M9MRVj5VcdH/KN/KjRtW6tHFPYhMBBMRAgAMBQI+QoIDBYMJ
YiKJAAoJELb1zU3GuiQ/lpEAoIhpp6BozKI8p6eaabzF5MlJH58pAKCu/ROofK8J
Eg2aLos+5zEYrB/LsohGBBARAgAGBQI/rOOvAAoJEK/FI0h4g3QP9pYAoNtSISDD
AAU2HafyAYlLD/yUC4hKAJ0czMsBLbo0M/xPaJ6Ox9Q5Hmw2uIhGBBARAgAGBQI/
tEN3AAoJEIWWr6swc05mxsMAnRag9X61Ygu1kbfBiqDku4czTd9pAJ4q5W8KZ0+2
ujTrEPN55NdWtnXj4YhGBBARAgAGBQJDW7PqAAoJEIvYLm8wuUtcf3QAnRCyqF0C
pMCTdIGc7bDO5I7CIMhTAJ0UTGx0O1d/VwvdDiKWj45N2tNbYIhGBBMRAgAGBQJE
8TMmAAoJEPZJxPRgk1MMCnEAoIm2pP0sICVh9Yo0YYGAqORrTOL3AJwIbcy+e8HM
NSoNV5u51RnrVKie34hMBBARAgAMBQJBgcsBBYMGItmLAAoJEBhZ0B9ne6HsQo0A
nA/LCTQ3P5kvJvDhg1DsfVTFnJxpAJ49WFjg/kIcaN5iPlJfaBAITZI3H4hMBBAR
AgAMBQJBgcs0BYMGItlYAAoJEIHC9+viE7aSIiMAnRVTVVAfMXvJhV6D5uHfWeeD
046TAJ4kjwP2bHyd6DjCymq+BdEDz63axohMBBARAgAMBQJBgctiBYMGItkqAAoJ
EGtw7Nldw/RzCaoAmwWM6+Rj1zl4D/PIys5nW48Hql3hAJ0bLOBthv96g+7oUy9U
j09Uh411F4hMBBARAgAMBQJB0JMkBYMF1BFoAAoJEH0lygrBKafCYlUAoIb1r5D6
qMLMPMO1krHk3MNbX5b5AJ4vryx5fw6iJctC5GWJ+Y8ytXab34hMBBARAgAMBQJC
K1u6BYMFeUjSAAoJEOYbpIkV67mr8xMAoJMy+UJC0sqXMPSxh3BUsdcmtFS+AJ9+
Z15LpoOnAidTT/K9iODXGViK6ohMBBIRAgAMBQJAK1k6BYMHektSAAoJEDyhHzSU
+vhhJlwAnA/gOdwOThjO8O+dFtdbpKuImfXJAJOTL53QKp92EzscZSz491D2YkoE
qohMBBIRAgAMBQJAPfq6BYMHZqnSAAoJEPLXXGPjnGWcst8AoLQ3MJWqttMNHDbl
xSyzXhFGhRU8AJ4ukRzfNJqElQHQ00ZM2WnCVNzOUIhMBBIRAgAMBQJBDgqEBYMG
lpoIAAoJEDnKK/Q9aopf/N0AniE2fcCKO1wDIwusuGVlC+JvnnWbAKDDoUSEYuNn
5qzRbrzWW5zBno/Nb4hMBBIRAgAMBQJCgKU0BYMFI/9YAAoJEAQNwIV8g5+o4yQA
nA9QOFLV5POCddyUMqB/fnctuO9eAJ4sJbLKP/Z3SAiTpKrNo+XZRxauqIhMBBMR
AgAMBQI+TU2EBYMJV1cIAAoJEC27dr+t1MkzBQwAoJU+RuTVSn+TI+uWxUpT82/d
s5NkAJ9bnNodffyMMK7GyMiv/TzifiTD+4hMBBMRAgAMBQJB14B2BYMFzSQWAAoJ
EGbv28jNgv0+P7wAn13uu8YkhwfNMJJhWdpK2/qM/4AQAJ40drnKW2qJ5EEIJwtx
pwapgrzWiYhMBBMRAgAMBQJCGIEOBYMFjCN+AAoJEHbBAxyiMW6hoO4An0Ith3Kx
5/sixbjZR9aEjoePGTNKAJ94SldLiESaYaJx2lGIlD9bbVoHQYhdBBMRAgAdBQJH
rJTPBQkNMFioBQsHCgMEAxUDAgMWAgECF4AACgkQjHGNolBy4fV0KgCgsLpG2wP0
rc3s07Fync9g7MfairMAoIUefSNKrGTsTxvLeyH4DLzJW/QFiHsEMBECADsFAkJ3
NfU0HQBPb3BzLi4uIHNob3VsZCBoYXZlIGGJlZW4gbG9jYWwhIEknbSAqc28qIHNO
dXBpZC4uLgAKCRA5yiv0PWqKX+9HAJ0WjTx/rqgouKQCrOV/2IOU+jMQQCfYSC8
JgsIIeN8aiyuStTdYrk0VWCIjwQwEQIATwUCRW8Av0gdAFNob3VsZCBoYXZlIGGJl
ZW4gYSBsb2NhbCBzaWduYXR1cmUsIG9yIHNvbWV0aGluZyAtIFdURiB3YXMgSSB0
aGlua2luZz8ACgkQOcor9D1qil+g+wCfcFWoo5qU14XTE9K8tH3Q+xGWeYYAnjii
KxjtOXc0ls+BlqXxbfZ9uqBsiQIiBBABAgAMBQJBgcuFBYMGItkHAAoJEKrj5s5m
oURoqC8QAIISudocbJRhrTAROOPoMsReyp46Jdp3iLloFDGcPfkZSBwWh8L+cJjh
dycIwwSeZlD2h9S5Tc4EnoE0khsS6wBpuAuih5s//coRqIIiLKEdhTmNqulkCH5m
imCzc5zXWZDW0hpLr2InGsZMuh2QCwAkB4RTBM+r18cUXMLV4YHKyjIVaDhsiPP/
MKUj6rJNsUDmDq1GiJdOjySjtCFjYADlQYSD7zcd1vpqQLThnZBESvEoCqumEfOP
xemNU6xAB0CL+pUpB40pE6Un6Krr5h6yZxYZ/N5vzt0Y3B5UUMkgYDSpjbulNvaU
TFiOxEU3gJvXc1+h0BsxM7FwBZnuMA8LEA+UdQb76YcyuFBcROhmcEUTiducLu84
E2BZ2NSBdymRQKSinhvXsEWlH6Txm1gtJLynYsvPi4B4JxKbb+awnFPusL8W+gfz
jbygeKdyqzYgKj3M79R3geaY7Q75Kxl1UogiOKcbI5VZvg47OQCWeeERnejqEAdx
EQiwGA/ARhVOP/ll0LQA7jg2P1xTtrBqqC2ufDB+v+jhXaCXxstKSWllTbv/b0d6
454UaOUV7RisN39pE2zFvJvY7bwfiwbUJVmYLm4rWJAEOJLIDtDRtt2h8JahDObm
3CWkpadjw57S5v1c/mn+xV9yTgVx5YUfC/788L1HNKXfeVDq8zbAiQIiBBMBAgAM
BQJCnwocBYMFBZpwAAoJENjCCglaJFfPIT4P/25zvPp8ixqV85igs3rRqMBtBsj+
5EoEW6DJnlGhoi26yf1nasC2frVasWG7i4JIm0U3WfLZERGDjR/nqlOCEqsP5gS3
43N7r4UpDkBsYh0WxH/ZtST5llFK3zd7XgtxvqKL98l/OSgijH2W2SJ9DGpjtO+T
iegq7igtJzw7Vax9z/LQH2xhRQKZR9yernwMSYaJ72i9SyWbK3k0+e95fGnlR5pF
zlGq320rYHgD7v9yoQ2t1klsAxK6e3b7Z+RiJG6cAU8o8F0kGxjWzF4v8Dlop7S+
IoRdB0Bap01ko0KLyt3+g4/33/2UxsW50BtfqcvYNJvU4bZns1YSqAgDOOanBhg8
Ip5XPlDxH6J/3997n5JNj/nk5ojfd8nYfe/5TjflWNiput6tZ7frEki1wl6pTNbv
V9CleLUJMSXfDZyHtUXmiP9DKNpsucCUeBKWRKLqnsHLkLYydsIeUJ8+ciKc+EWh
FxEY+Ml72cXAaz5BuW9L8KHNzZfez/ZJabiARQpFfjOwAnmhzJ9r++TEKRLEr96
taUI9/8nVPvT6LnBpcM38Td6dJ639YvuH3ilAqmPPw50YvglIEe4BUYD5r52Seqc
8XQowouGOuBX4vs7zgWFuYA/s9ebfGaIw+uJd/56Xl9ll6q5CghqB/yt1EceFEnF
CAjQc2SeRo6qzx22uQINBD4+ox0QCADv4Yl/Fsx1jjCyU+eMf2sXg3ap9awQ3+XF
pmglhzdrozTZYKceXpqFPb+0ErbDVAjhgW15HjuAK+2Bvo7Ukd986jYd8uZENGJG
N3UNMIep7JfsIeFyCGP901GVbZnSXlAURyZX1TRWGndoV9YLhSN+zctT6GQBbMTv
NoPlwf0nvK//rG5lXDjXXHSHhSqxNxYy7SIzUHMQupfUNjsvCg8Rv871GRt/h+Yt
7XUTMhoJrg+oBFdBlzh2FKKcy3ordfgGtGwpN+jMG7VqxJsPwiVt/m9Jgdu4Tmn/
WggPOeSD+nyRb7cXG5avJxyKoVNw3PbXnLJff0tcWeUvMpRv8XkbAAMFB/4vCqpr
wIatF+w4AnGKbrcId+3LmZRzmtRKdOyUZgQg4JHUF5Bq7I9ls8OwMP0xnV1pJp9q
cW/AUbouXH3GRTu3Or68ouhaSbi7nF/e+fnlWOdJ3VpD15CdRxeIvhycEahNs5Yj
f0RzLOCyXMF0L74w+NxBNwDunolRWw/qgAHcVBaDni25SjQRzxuwzxvcS/jYua5B
Pk10ocbAexdM+2XSSWThtCTg5qMeyLLUExqGlPbuNaMmUyIlz4hYnSaCGQoe33bq
z/KZ91/keR1DVzK+zPm2vJUjcXHvxd5Jh9C+67CqnYfXf2lcYSSDSfop1Q56l11a
F7vRgY0/DXKNYlPUiEwEGBECAAwFAkeslPwFCQ0wWN8ACgkQjHGNO1By4fWlzgCf
Qj3rkfcljYZOuLOn50J7PFuF7FoAnjwWGhwVi9+Fm2B5RZvpo++BBkdP
=Xquv
-----END PGP PUBLIC KEY BLOCK-----
```

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
gpg: key 5072E1F5: public key "MySQL Package signing key (www.mysql.com) <build@mysql.com>" imported
gpg: Total number processed: 1
gpg:               imported: 1
gpg: no ultimately trusted keys found
```

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

```
shell> gpg --recv-keys 5072E1F5
gpg: requesting key 5072E1F5 from hkp server subkeys.pgp.net
gpg: key 5072E1F5: "MySQL Package signing key (www.mysql.com) <build@mysql.com>" 2 new signatures
gpg: no ultimately trusted keys found
gpg: Total number processed: 1
gpg:           new signatures: 2
```

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:

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

If you experience problems, try exporting the key from `gpg` and importing:

```
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 cas use this manual page:

```
shell> rpm --import http://dev.mysql.com/doc/refman/5.0/en/checking-gpg-signature.html
```

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.

Distribution file	`mysql-standard-5.0.84-linux-i686.tar.gz`
Signature file	`mysql-standard-5.0.84-linux-i686.tar.gz.asc`

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
```

Example:

```
shell> gpg --verify mysql-standard-5.0.84-linux-i686.tar.gz.asc
gpg: Signature made Tue 12 Jul 2005 23:35:41 EST using DSA key ID 5072E1F5
gpg: Good signature from "MySQL Package signing key (www.mysql.com) <build@mysql.com>"
```

The `Good signature` message indicates that everything is all right. You can ignore any `insecure memory` warning you might obtain.

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

6.3. 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-5.0.84-0.glibc23.i386.rpm
MySQL-server-5.0.84-0.glibc23.i386.rpm: md5 gpg OK
```

> **Note**
>
> If you are using RPM 4.1 and it shows the error `(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, it maintains its own 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 as described in Section 6.2, "Signature Checking Using `GnuPG`". Then use `rpm --import` to import the key. For example, if you have saved the public key in a file named `mysql_pubkey.asc`, import it using this command:

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

If you need to obtain the MySQL public key, see Section 6.2, "Signature Checking Using GnuPG".

Chapter 7. Installation Layouts

This section describes the default layout of the directories created by installing binary or source distributions provided by Sun Microsystems, Inc. A distribution provided by another vendor might use a layout different from those shown here.

For MySQL 5.0 on Windows, the default installation directory is `C:\Program Files\MySQL\MySQL Server 5.0`. (Some Windows users prefer to install in `C:\mysql`, the directory that formerly was used as the default. However, the layout of the subdirectories remains the same.) The installation directory has the following subdirectories:

Directory	Contents
`bin`	Client programs and the `mysqld` server
`data`	Log files, databases
`Docs`	Manual in CHM format
`examples`	Example programs and scripts
`include`	Include (header) files
`lib`	Libraries
`scripts`	Utility scripts
`share`	Error message files

Installations created from our Linux RPM distributions result in files under the following system directories:

Directory	Contents
`/usr/bin`	Client programs and scripts
`/usr/sbin`	The `mysqld` server
`/var/lib/mysql`	Log files, databases
`/usr/share/info`	Manual in Info format
`/usr/share/man`	Unix man pages
`/usr/include/mysql`	Include (header) files
`/usr/lib/mysql`	Libraries
`/usr/share/mysql`	Error message and character set files
`/usr/share/sql-bench`	Benchmarks

On Unix, a `tar` file binary distribution is installed by unpacking it at the installation location you choose (typically `/usr/local/mysql`) and creates the following directories in that location:

Directory	Contents
`bin`	Client programs and the `mysqld` server
`data`	Log files, databases
`docs`	Manual in Info format
`man`	Unix manual pages
`include`	Include (header) files
`lib`	Libraries
`scripts`	`mysql_install_db`
`share/mysql`	Error message files
`sql-bench`	Benchmarks

A source distribution is installed after you configure and compile it. By default, the installation step installs files under `/usr/local`, in the following subdirectories:

Directory	Contents
`bin`	Client programs and scripts
`include/mysql`	Include (header) files

Docs	Manual in Info, CHM formats
man	Unix manual pages
lib/mysql	Libraries
libexec	The mysqld server
share/mysql	Error message files
sql-bench	Benchmarks and crash-me test
var	Databases and log files

Within its installation directory, the layout of a source installation differs from that of a binary installation in the following ways:

- The mysqld server is installed in the libexec directory rather than in the bin directory.

- The data directory is var rather than data.

- mysql_install_db is installed in the bin directory rather than in the scripts directory.

- The header file and library directories are include/mysql and lib/mysql rather than include and lib.

You can create your own binary installation from a compiled source distribution by executing the scripts/make_binary_distribution script from the top directory of the source distribution.

Chapter 8. Standard MySQL Installation Using a Binary Distribution

The next several sections cover the installation of MySQL on platforms where we offer packages using the native packaging format of the respective platform. (This is also known as performing a binary installation.) However, binary distributions of MySQL are available for many other platforms as well. See Chapter 15, *Installing MySQL from `tar.gz` Packages on Other Unix-Like Systems*, for generic installation instructions for these packages that apply to all platforms.

See Chapter 4, *Installing MySQL Community Server*, for more information on what other binary distributions are available and how to obtain them.

Chapter 9. Installing MySQL on Windows

A native Windows distribution of MySQL has been available since version 3.21 and represents a sizable percentage of the daily downloads of MySQL. This section describes the process for installing MySQL on Windows.

> **Note**
>
> If you are upgrading MySQL from an existing installation older than MySQL 4.1.5, you must first perform the procedure described in Section 9.14, "Upgrading MySQL on Windows".

To run MySQL on Windows, you need the following:

- A Windows operating system such as 2000, XP, Vista, or Windows Server 2003. Only 32-bit and 64-bit versions of Windows 2000 and later are supported. Windows 95/98/ME and versions of Windows older than these are no longer supported.

  A Windows operating system permits you to run the MySQL server as a service. See Section 9.11, "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`.

- TCP/IP protocol support.

- Enough space on the hard drive to unpack, install, and create the databases in accordance with your requirements (generally a minimum of 200 megabytes is recommended.)

For a list of limitations within the Windows version of MySQL, see Windows Platform Limitations.

There may also be other requirements, depending on how you plan to use MySQL:

- If you plan to connect to the MySQL server via ODBC, you need a Connector/ODBC driver. See Connectors and APIs.

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

MySQL for Windows is available in several distribution formats:

- Binary distributions are available that contain a setup program that installs everything you need so that you can start the server immediately. Another binary distribution format contains an archive that you simply unpack in the installation location and then configure yourself. For details, see Section 9.1, "Choosing An Installation Package".

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

Generally speaking, you should use a binary distribution that includes an installer. It is simpler to use than the others, and you need no additional tools to get MySQL up and running. The installer for the Windows version of MySQL, combined with a GUI Configuration Wizard, automatically installs MySQL, creates an option file, starts the server, and secures the default user accounts.

> **Caution**
>
> Using 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 because of 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`) being used to store your MySQL table data. There is usually a system built into the virus scanning software to allow certain directories to be specifically ignored during virus scanning.
>
> In addition, by default, MySQL creates temporary files in the standard Windows temporary directory. To prevent the temporary files also being scanned, you should configure a separate temporary directory for MySQL temporary files and add this 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 9.7, "Creating an Option File".

The following section describes how to install MySQL on Windows using a binary distribution. To use an installation package that does not include an installer, follow the procedure described in Section 9.5, "Installing MySQL from a Noinstall Zip Archive". To install using a source distribution, see Section 16.6, "Installing MySQL from Source on Windows".

MySQL distributions for Windows can be downloaded from http://dev.mysql.com/downloads/. See Chapter 5, *How to Get MySQL*.

9.1. Choosing An Installation Package

For MySQL 5.0, there are three installation packages to choose from when installing MySQL on Windows:

- **The Essentials package.** This package has a file name similar to `mysql-essential-5.0.84-win32.msi` and contains the minimum set of files needed to install MySQL on Windows, including the Configuration Wizard. This package does not include optional components such as the embedded server and benchmark suite.

- **The Complete package.** This package has a file name similar to `mysql-5.0.84-win32.zip` and contains all files needed for a complete Windows installation, including the Configuration Wizard. This package includes optional components such as the embedded server and benchmark suite.

- **The no-install archive.** This package has a file name similar to `mysql-noinstall-5.0.84-win32.zip` and contains all the files found in the Complete install package, with the exception of the Configuration Wizard. This package does not include an automated installer, and must be manually installed and configured.

The Essentials package is recommended for most users. It is provided as an `.msi` file for use with the Windows Installer. The Complete and Noinstall distributions are packaged as Zip archives. To use them, you must have a tool that can unpack `.zip` files.

Your choice of install package affects the installation process you must follow. If you choose to install either the Essentials or Complete install packages, see Section 9.2, "Installing MySQL with the Automated Installer". If you choose to install MySQL from the Noinstall archive, see Section 9.5, "Installing MySQL from a Noinstall Zip Archive".

9.2. Installing MySQL with the Automated Installer

New MySQL users can use the MySQL Installation Wizard and MySQL Configuration Wizard to install MySQL on Windows. These are designed to install and configure MySQL in such a way that new users can immediately get started using MySQL.

The MySQL Installation Wizard and MySQL Configuration Wizard are available in the Essentials and Complete install packages. They are 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.

9.3. 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, allows 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 9.3.6, "Upgrading MySQL with the Installation Wizard", for more information on upgrading from a previous version.

The Microsoft Windows Installer (MSI) is the standard for application installations on Windows 2000 and later versions. 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, which is the first highly acknowledged Open Source project from Microsoft. We have switched to WiX because it is an Open Source project and it allows 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. 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.

9.3.1. Downloading and Starting the MySQL Installation Wizard

MySQL installation packages can be downloaded from http://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 it is best to open a network port for MySQL to use before beginning the installation. To do this, first ensure that you are logged in as an Administrator, then 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 other 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, 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.

9.3.2. Choosing an Installation Type

There are three installation types available: **Typical**, **Complete**, and **Custom**.
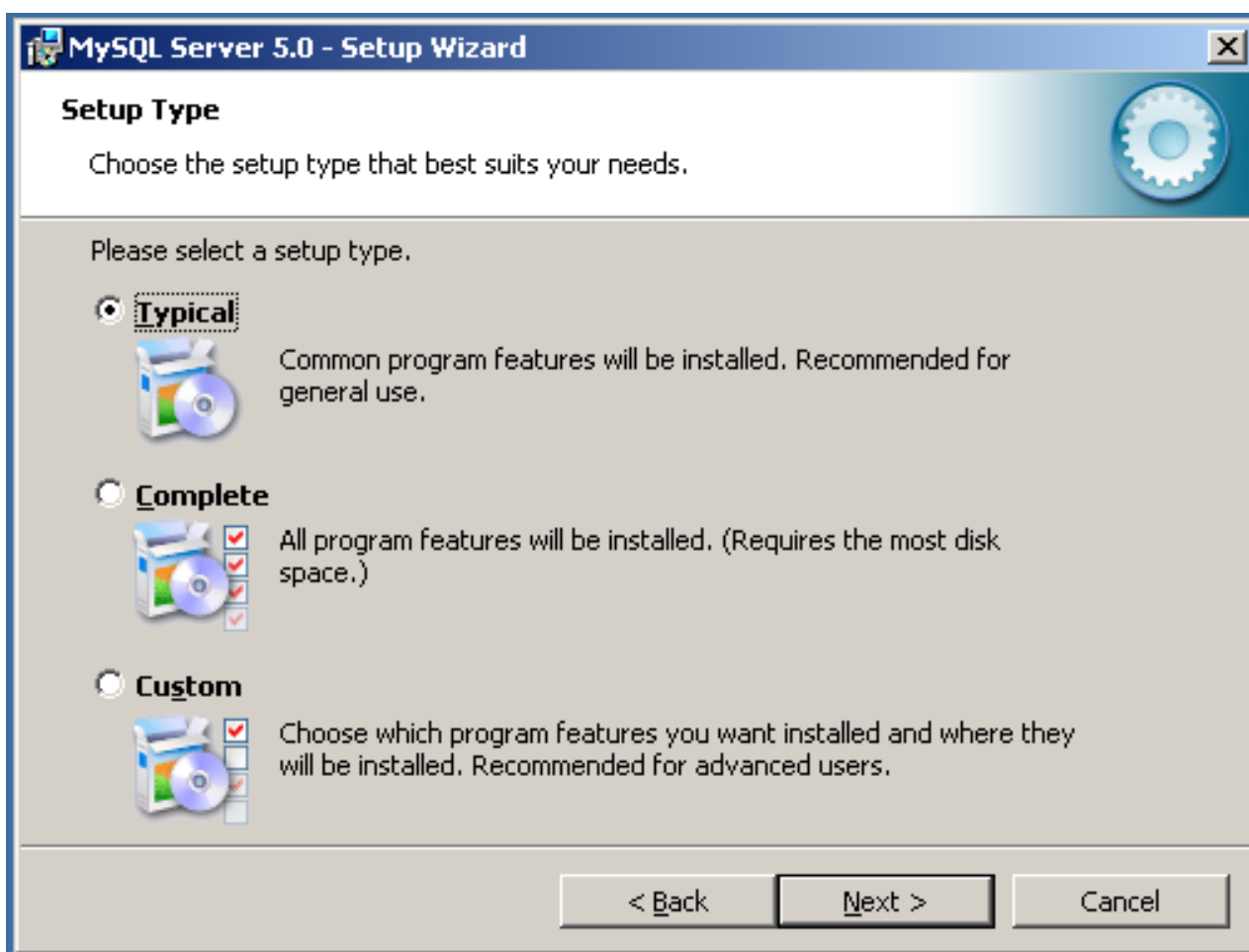
The **Typical** installation type installs the MySQL server, the `mysql` command-line client, and the command-line utilities. The command-line clients and utilities include `mysqldump`, `myisamchk`, and several other tools to help you manage the MySQL server.

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 9.3.3, "The Custom Installation 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 9.3.3, "The Custom Installation Dialog".

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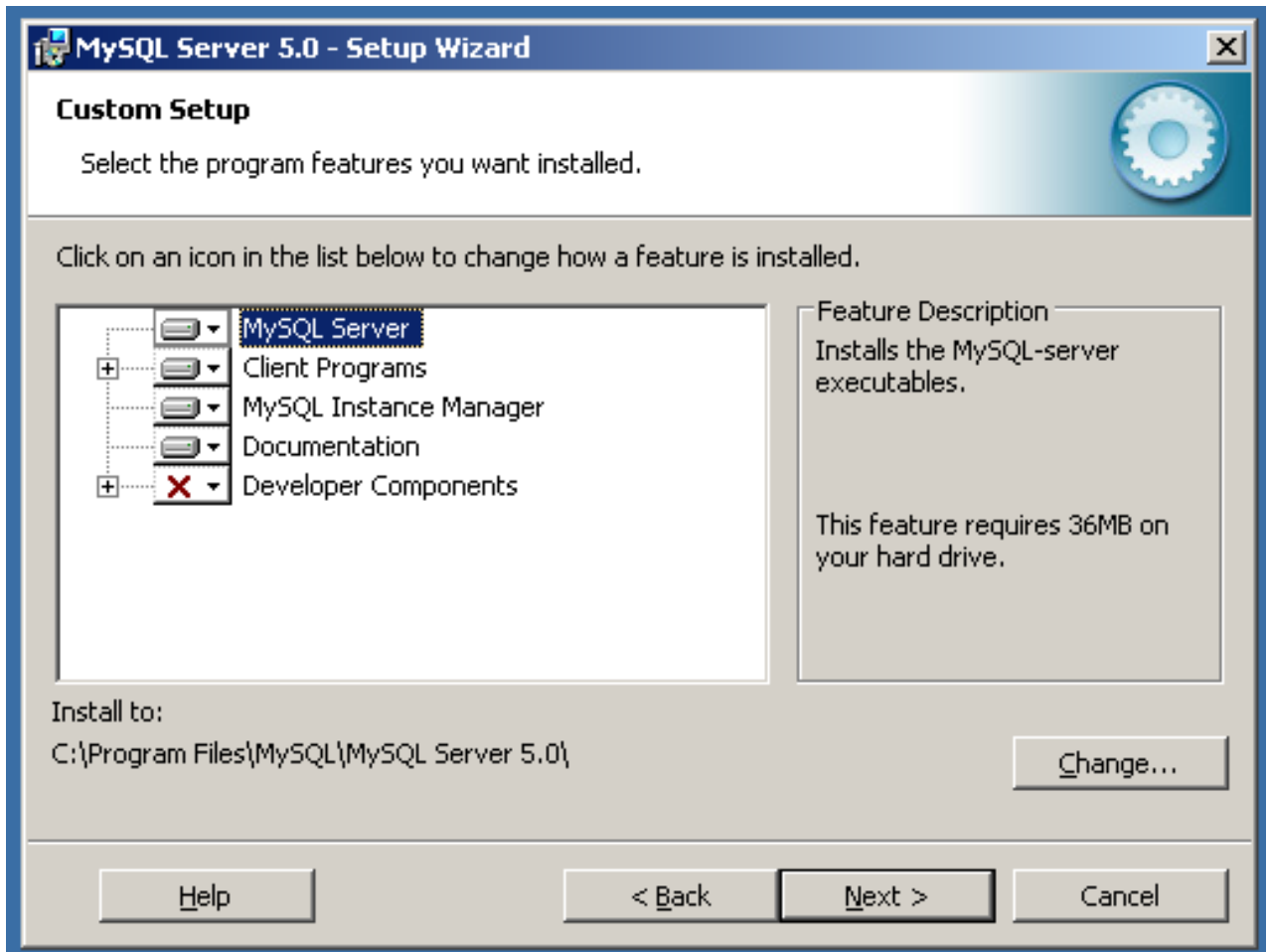
A tree view on the left side of the custom install dialog lists all available components. Components that are not installed have a red X icon; components that are installed have a gray icon. To change whether a component is installed, click on that component's icon and choose a new option from the drop-down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

9.3.4. The Confirmation Dialog

Once 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.
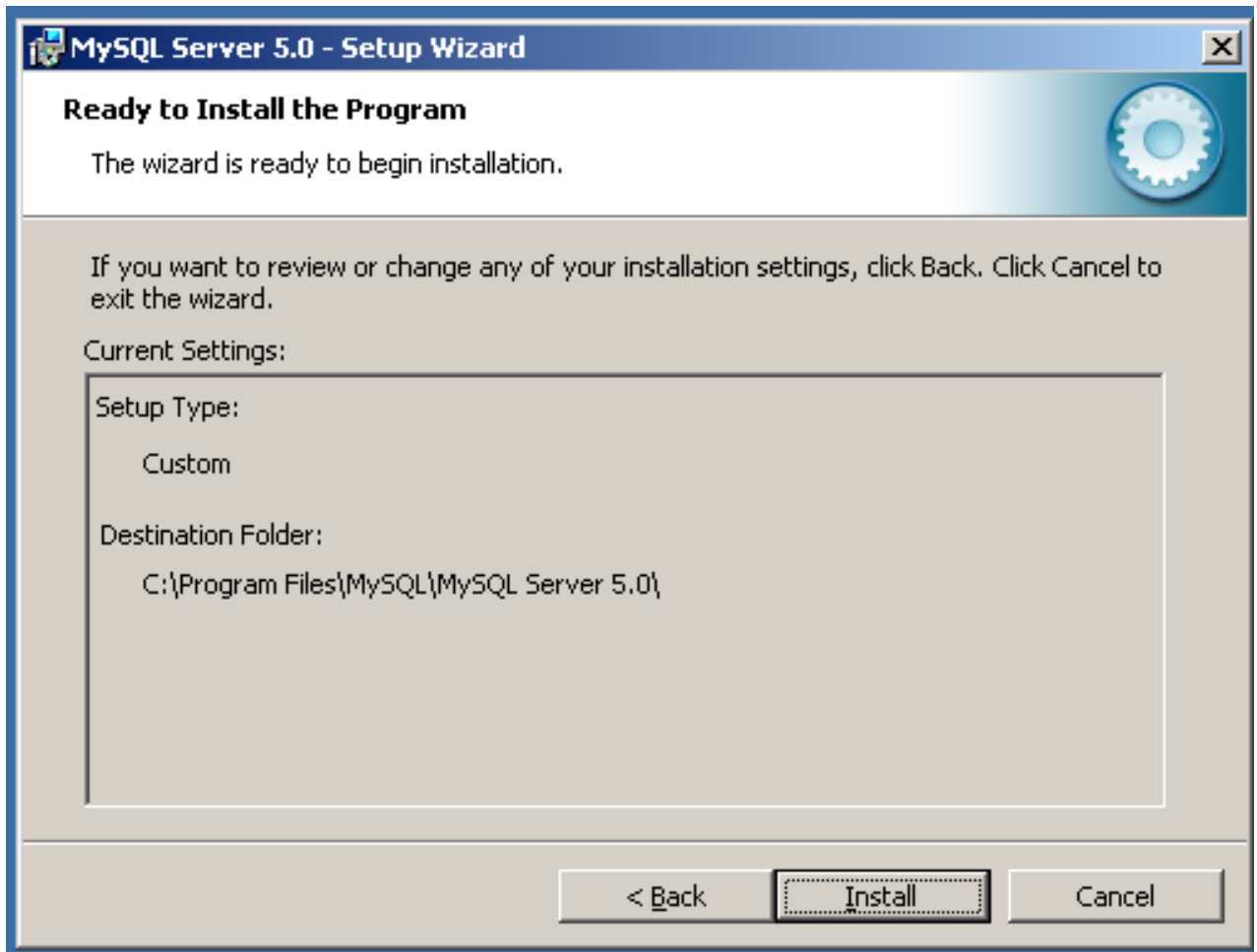
To install MySQL if you are satisfied with your settings, click the INSTALL button. To change your settings, click the BACK button. To exit the MySQL Installation Wizard without installing MySQL, click the CANCEL button.

After installation is complete, you have the option of registering with the MySQL web site. Registration gives you access to post in the MySQL forums at forums.mysql.com, along with the ability to report bugs at bugs.mysql.com and to subscribe to our newsletter. 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.

9.3.5. Changes Made by MySQL Installation Wizard

Once 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 major version of the server that is being installed, such as `MySQL Server 5.0`. 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 5.0\`. The `Version` string contains the release number. For example, for an installation of MySQL Server 5.0.84, the key contains a value of `5.0.84`.

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 major version of MySQL that you have installed. For example, if you install MySQL 5.0, the MySQL Installation Wizard creates a MySQL Server 5.0 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. This option is not available when the MySQL server is installed using the Essentials installation package.

Changes to the File System

The MySQL Installation Wizard by default installs the MySQL 5.0 server to `C:\Program Files\MySQL\MySQL Server 5.0`, where *Program Files* is the default location for applications in your system, and *5.0* is the major version 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 5.0
C:\Program Files\MySQL\MySQL Administrator 1.0
C:\Program Files\MySQL\MySQL Query Browser 1.0
```

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

9.3.6. 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.

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 4.1.5 to MySQL 4.1.6, but not from MySQL 4.1 to MySQL 5.0.

See Section 9.14, "Upgrading MySQL on Windows".

9.4. 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 5.0 server. The MySQL Server Instance Configuration Wizard is only available for Windows.

9.4.1. 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, 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 9.3.1, "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 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 5.0\my.ini"
```

Here, `C:\Program Files\MySQL\MySQL Server 5.0` 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 MySQL 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 and Windows XP, 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.

9.4.2. 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.

9.4.3. 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.
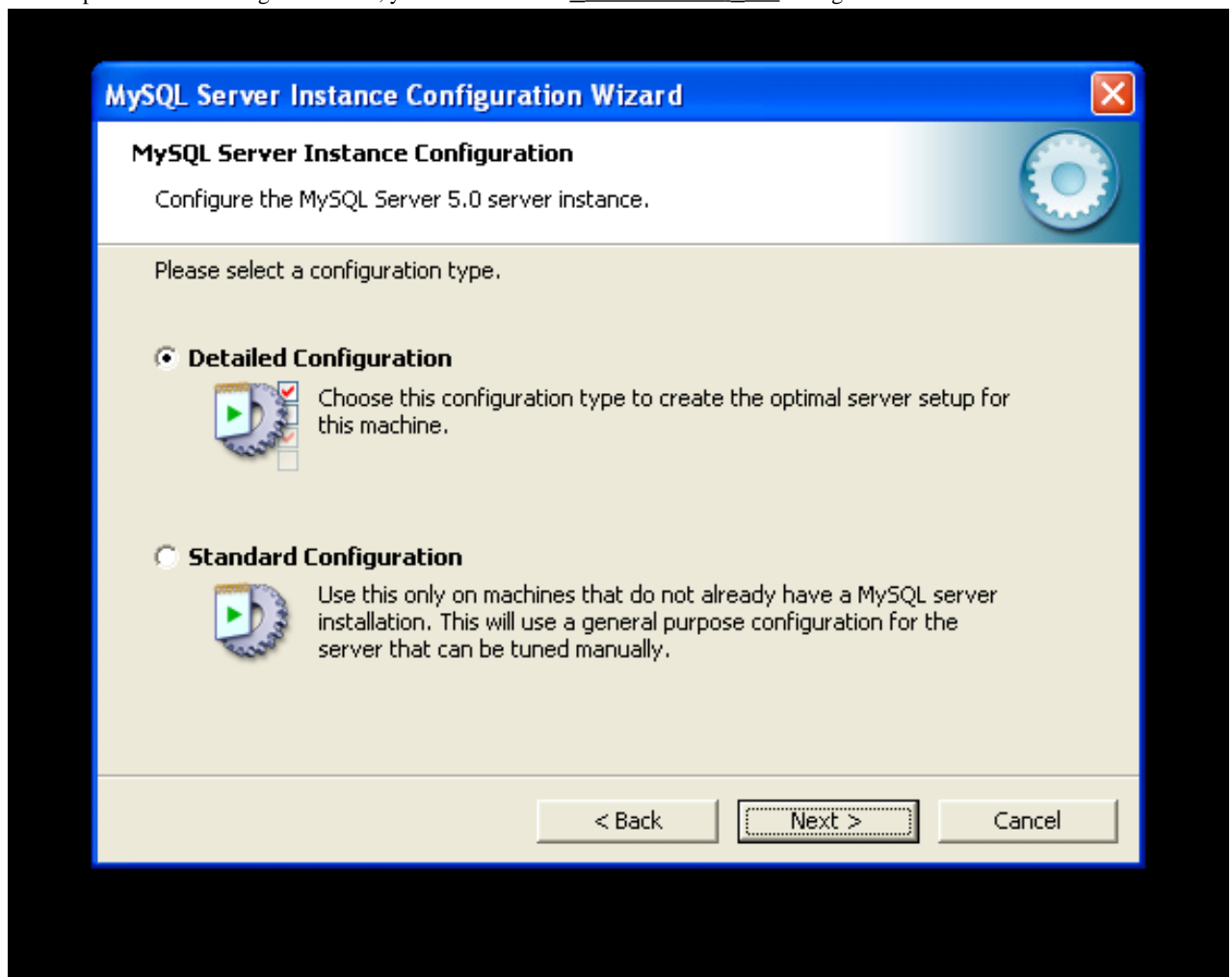
There are two configuration types available: Detailed Configuration and Standard Configuration. The Standard Configuration option is intended for new users who want to get started with MySQL quickly without having to make many decisions about server configuration. The Detailed Configuration option is 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 Config-

uration option is recommended.

To complete the Standard Configuration, please refer to the sections on Service Options and Security Options in Section 9.4.10, "The Service Options Dialog", and Section 9.4.11, "The Security Options Dialog", respectively.

9.4.4. The Server Type Dialog

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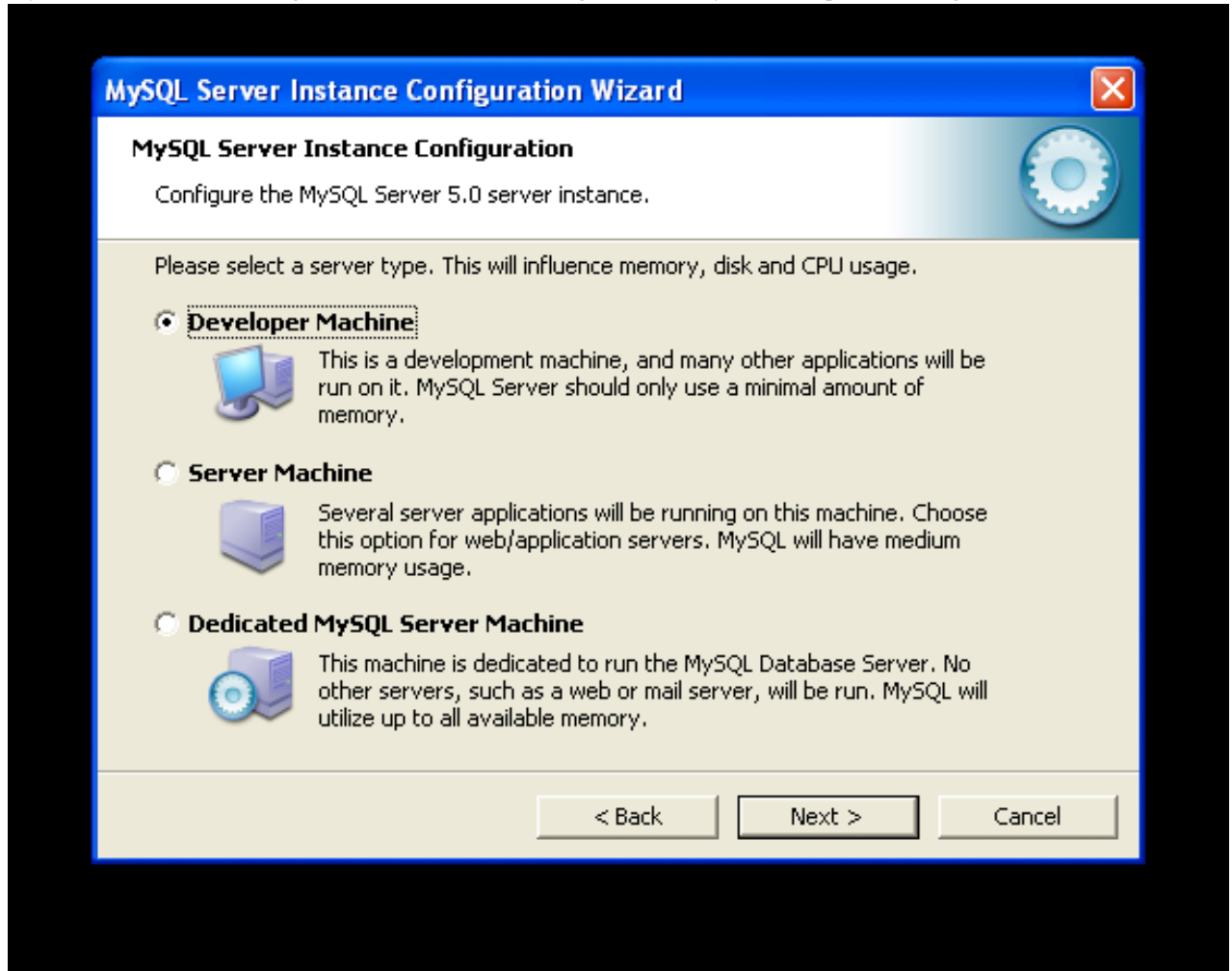
- Developer Machine: Choose this option for a typical desktop workstation where MySQL is intended only for personal use. It is assumed that many other desktop applications are running. The MySQL server is configured to use minimal system resources.

- 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.

9.4.5. The Database Usage Dialog

The DATABASE USAGE dialog allows 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`.

- 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:

```
Multifunctional Database:        MIXED
Transactional Database Only:     INNODB
Non-Transactional Database Only: MYISAM
```

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

```
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`.

9.4.6. 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.
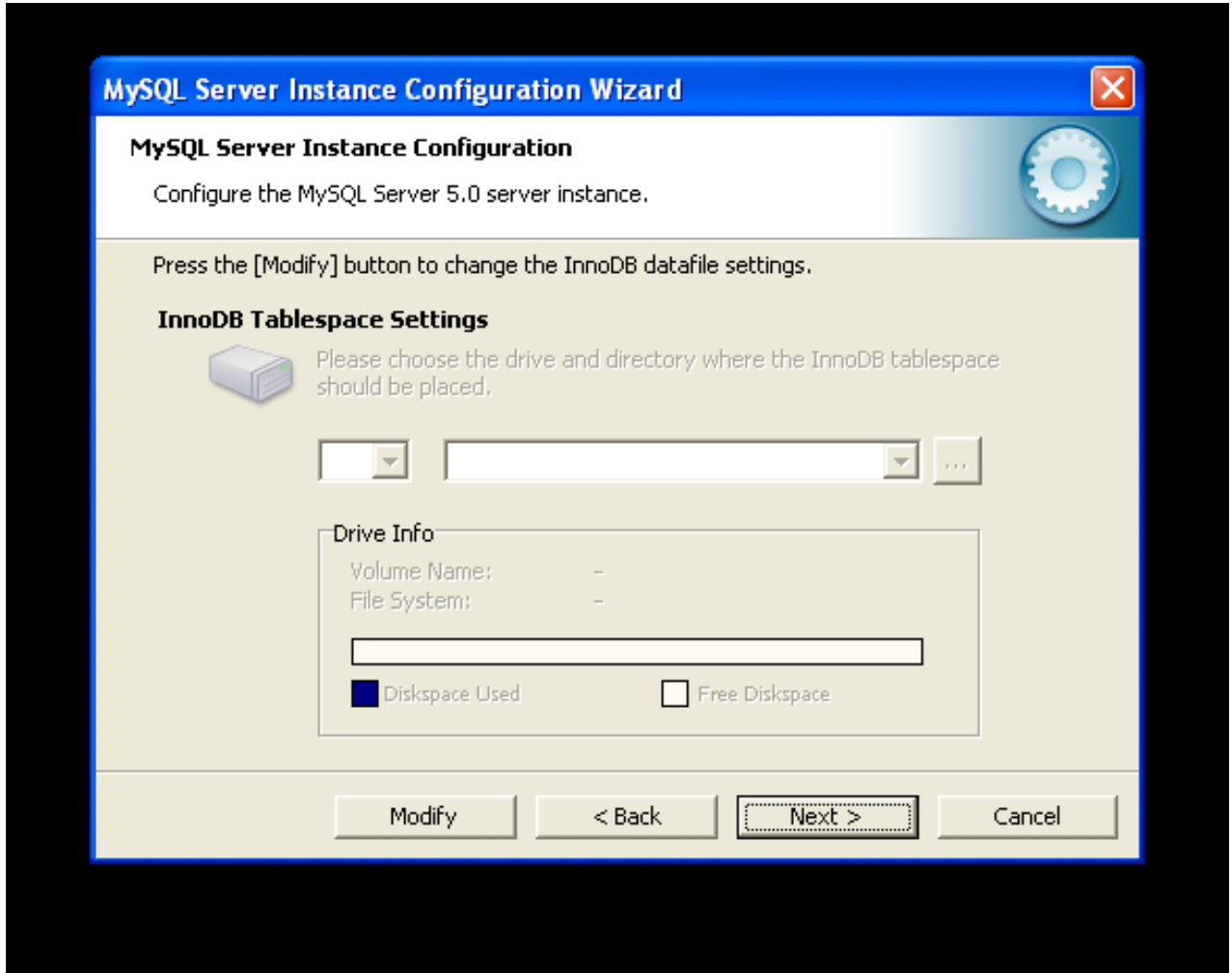
To change the default location for the `InnoDB` tablespace files, choose a new drive from the drop-down list of drive letters and choose a new path from the drop-down list of paths. To create a custom path, click the ... button.

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.

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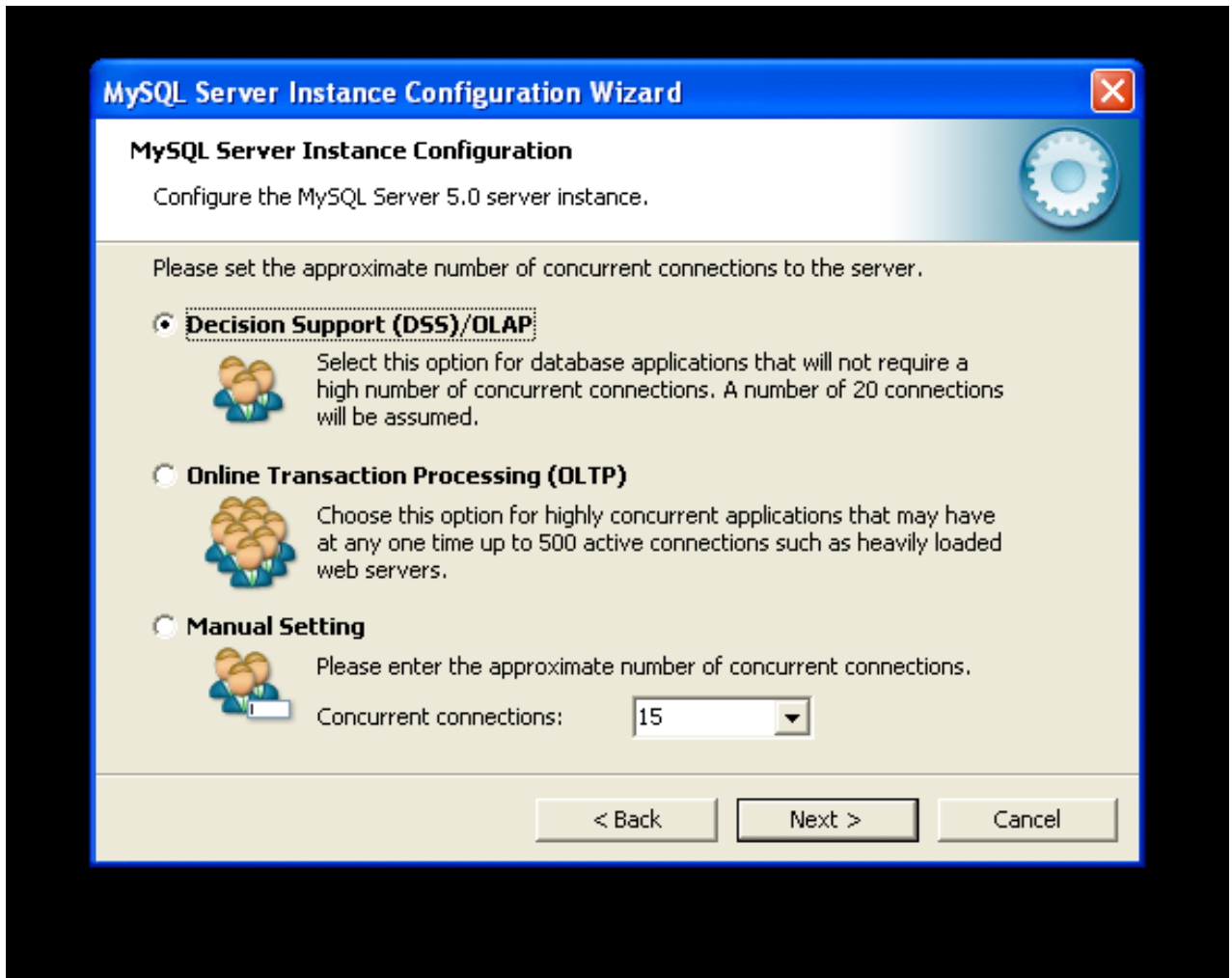
- Decision Support (DSS)/OLAP: Choose this option if your server does not require a large number of concurrent connections. The maximum number of connections is set at 100, with an average of 20 concurrent connections assumed.

- 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.

9.4.8. 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.
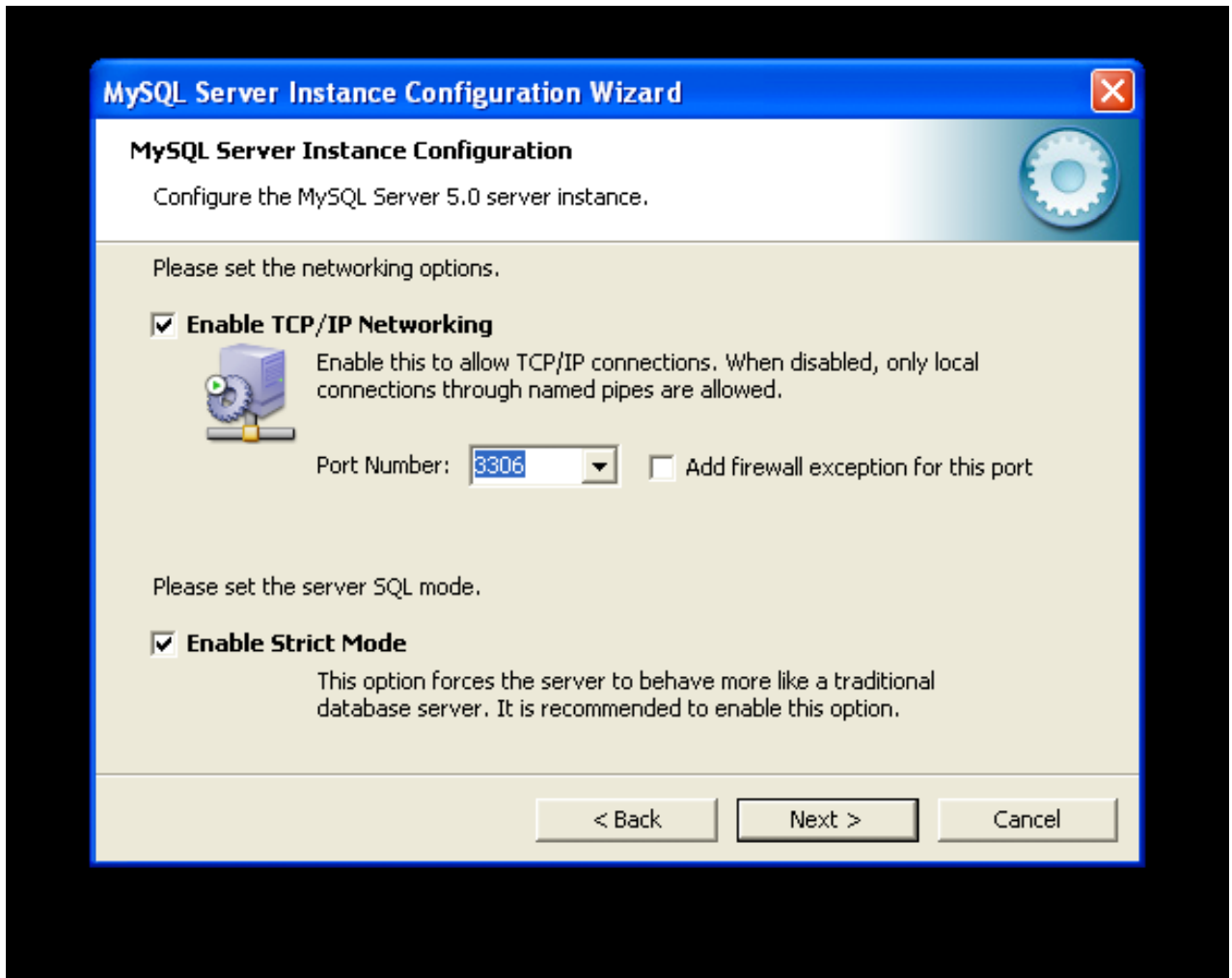
TCP/IP networking is enabled by default. To disable TCP/IP networking, uncheck the box next to the Enable TCP/IP Networking option.

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.

9.4.9. 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.
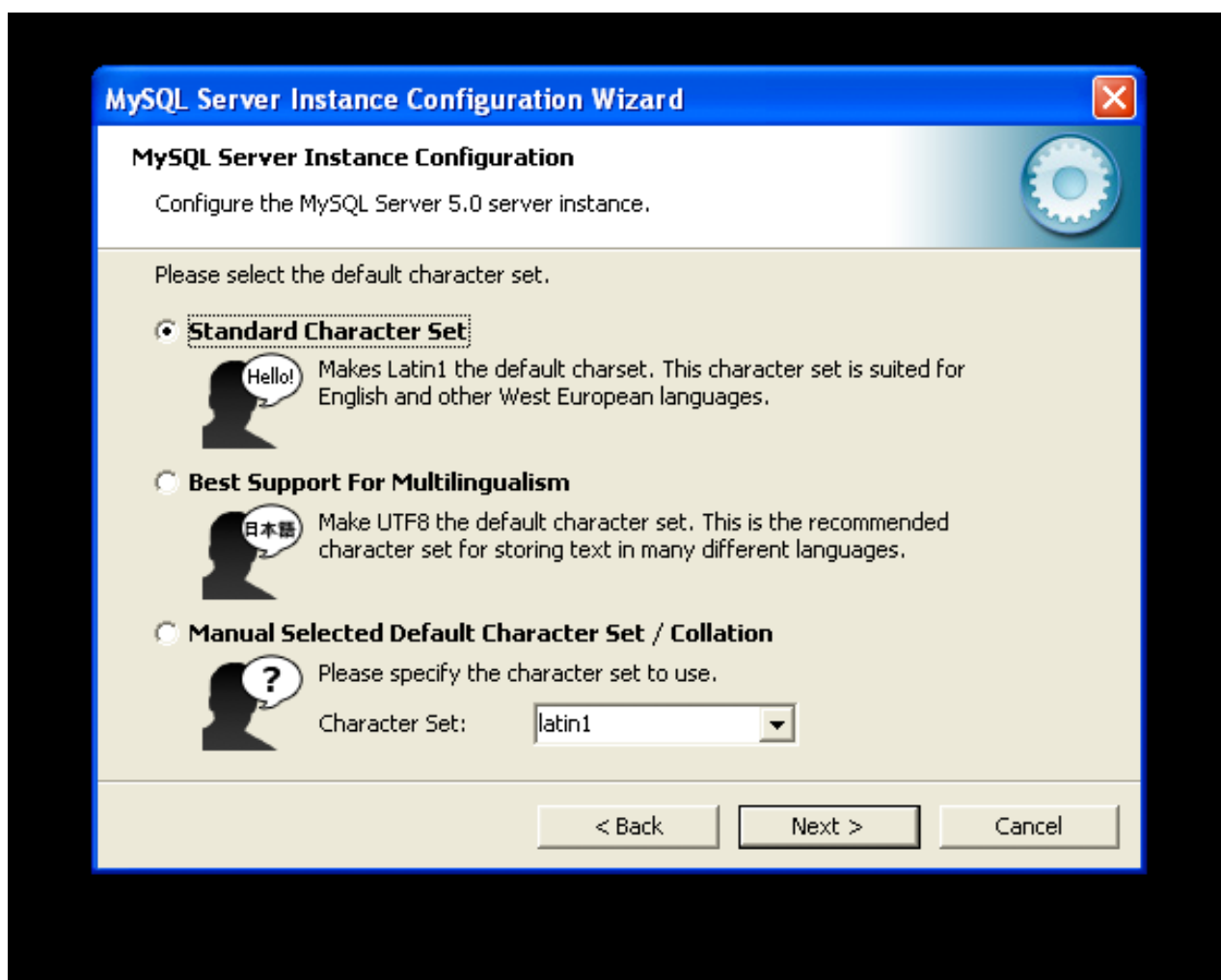
- Standard Character Set: Choose this option if you want to use `latin1` as the default server character set. `latin1` is used for English and many Western European languages.

- 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.

9.4.10. 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.

> **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 5.0.56 as `mysql50056`.

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.

9.4.11. The Security Options Dialog

It is strongly recommended that you set a `root` *password for your MySQL server*, and the MySQL Server Instance Configuration 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.

To set the `root` password, enter the desired password into both the New root password and Confirm boxes. If you are reconfiguring an existing server, you need to enter the existing `root` password into the Current root password box.

To prevent `root` logins from across the network, check the box next to the Root may only connect from localhost option. This increases 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.

9.4.12. 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.

9.5. Installing MySQL from 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 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.

9.6. Extracting the Install Archive

To install MySQL manually, do the following:

1. If you are upgrading from a previous version please refer to Section 9.14, "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 9.7, "Creating an Option File".

4. Extract the install archive to the chosen installation location using your preferred Zip archive 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.

9.7. 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 5.0` and `C:\Program Files\MySQL\MySQL Server 5.0\data`).

- You need to tune the server settings.

When the MySQL server starts on Windows, it looks for options in two files: the `my.ini` file in the Windows directory, and the `C:\my.cnf` file. 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:

```
shell> echo %WINDIR%
```

MySQL looks for options 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.

You can also make use of the example option files included with your MySQL distribution; see Preconfigured Option Files.

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
```

Note that Windows path names are specified in option files using (forward) slashes rather than backslashes. If you do use backslashes, you must 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
```

On Windows, the MySQL installer places the data directory directly under the directory where you install 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 MySQL is installed in `C:\Program Files\MySQL\MySQL Server 5.0`, the data directory is by default in `C:\Program Files\MySQL\MySQL Server 5.0\data`. 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 `C:\Program Files\MySQL\MySQL Server 5.0\data` to `E:\mydata`.

2. Use a `--datadir` option to specify the new data directory location each time you start the server.

9.8. Selecting a MySQL Server Type

The following table shows the available servers for Windows in MySQL 5.0.

Binary	Description
`mysqld-nt`	Optimized binary with named-pipe support
`mysqld`	Optimized binary without named-pipe support
`mysqld-debug`	Like `mysqld-nt`, but compiled with full debugging and automatic memory allocation checking

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 5.0 servers have support for symbolic linking of database directories.

MySQL supports TCP/IP on all Windows platforms. MySQL servers on Windows support named pipes as indicated in the following list. However, the default is to use TCP/IP regardless of platform. (Named pipes are slower than TCP/IP in many Windows configurations.)

Use of named pipes is subject to these conditions:

• Named pipes are enabled only if you start the server with the `--enable-named-pipe` option. It is necessary to use this option explicitly because some users have experienced problems with shutting down the MySQL server when named pipes were used.

• Named-pipe connections are allowed only by the `mysqld-nt` and `mysqld-debug` servers.

> **Note**
>
> Most of the examples in this manual use `mysqld` as the server name. If you choose to use a different server, such as `mysqld-nt`, make the appropriate substitutions in the commands that are shown in the examples.

9.9. 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.

The examples in these sections assume that MySQL is installed under the default location of `C:\Program Files\MySQL\MySQL Server 5.0`. Adjust the path names shown in the examples if you have MySQL installed in a different location.

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

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

For information about which server binary to run, see Section 9.8, "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:

```
shell> "C:\Program Files\MySQL\MySQL Server 5.0\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: '5.0.84'  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 5.0\data by default). The error log is the file with the .err extension.

> **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 17, *Post-Installation Setup and Testing*.

9.10. 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.

To start the mysqld server from the command line, you should start a console window (or "DOS window") and enter this command:

```
shell> "C:\Program Files\MySQL\MySQL Server 5.0\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:

```
shell> "C:\Program Files\MySQL\MySQL Server 5.0\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 that users in the MySQL grant system are wholly independent from any login users under 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. The error log is located in the C:\Program Files\MySQL\MySQL Server 5.0\data directory. It is the file with a suffix of .err. You can also try to start the server as mysqld --console; in this case, you may get some useful information on the screen that may help solve the problem.

The last option is to start `mysqld` with the `--standalone` and `--debug` options. In this case, `mysqld` writes a log file `C:\mysqld.trace` that should contain the reason why `mysqld` doesn't start. See MySQL Internals: Porting.

Use `mysqld --verbose --help` to display all the options that `mysqld` supports.

9.11. Starting MySQL as a Windows Service

On Windows, the recommended way to run MySQL is to install it as a Windows service, whereby 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 `NET` commands, or with the graphical `Services` utility. Generally, to install MySQL as a Windows service you should be logged in using an account that has administrator rights.

The `Services` utility (the Windows `Service Control Manager`) can be found in the Windows Control Panel (under Administrative Tools on Windows 2000, XP, Vista, and Server 2003). To avoid conflicts, it is advisable to close the `Services` utility while performing server installation or removal operations from the command line.

Before installing MySQL as a Windows service, you should first stop the current server if it is running by using the following command:

```
shell> "C:\Program Files\MySQL\MySQL Server 5.0\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 that users in the MySQL grant system are wholly independent from any login users under Windows.

Install the server as a service using this command:

```
shell> "C:\Program Files\MySQL\MySQL Server 5.0\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 on 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 5.0\bin`), Note that 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 in MySQL 5.0 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

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. Also, in MySQL 5.0, use of an option different from `--defaults-file` is not supported until 5.0.3.

- As of MySQL 5.0.1, 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 a 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 allows 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 only from the `[mysqld]` group of the named file and ignores the standard option files.

As a more complex example, consider the following command:

```
shell> "C:\Program Files\MySQL\MySQL Server 5.0\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.

You can also specify options as Start parameters in the Windows `Services` utility before you start the MySQL service.

Once a MySQL server 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 a `NET START MySQL` command. The `NET` command is 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 5.0\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 by using the `Services` utility, the `NET STOP MySQL` 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:

```
shell> "C:\Program Files\MySQL\MySQL Server 5.0\bin\mysqld" --install-manual
```

To remove a server that is installed as a service, first stop it if it is running by executing `NET STOP MySQL`. Then use the `--remove` option to remove it:

```
shell> "C:\Program Files\MySQL\MySQL Server 5.0\bin\mysqld" --remove
```

If `mysqld` is not running as a service, you can start it from the command line. For instructions, see Section 9.10, "Starting MySQL from the Windows Command Line".

Please see Section 9.13, "Troubleshooting a MySQL Installation Under Windows", if you encounter difficulties during installation.

9.12. Testing The MySQL Installation

You can test whether the MySQL server is working by executing any of the following commands:

```
shell> "C:\Program Files\MySQL\MySQL Server 5.0\bin\mysqlshow"
shell> "C:\Program Files\MySQL\MySQL Server 5.0\bin\mysqlshow" -u root mysql
shell> "C:\Program Files\MySQL\MySQL Server 5.0\bin\mysqladmin" version status proc
shell> "C:\Program Files\MySQL\MySQL Server 5.0\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 numbers in the `Host` column of the MySQL grant tables.

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.

Note that if you have set a password for the `root` account, deleted the anonymous account, or created a new user account, then you must use the appropriate `-u` and `-p` options with the commands shown above in order to connect with the MySQL Server. See Connecting to the MySQL Server.

For more information about `mysqlshow`, see `mysqlshow`.

9.13. Troubleshooting a MySQL Installation Under Windows

When installing and running MySQL for the first time, you may encounter certain errors that prevent the MySQL server from starting. The purpose of this section is to help 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 5.0\data`. See The Error Log.

Another source of information regarding possible errors is the console messages displayed when the MySQL service is starting. Use the `NET START MySQL` 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 9.11, "Starting MySQL as a Windows Service".

The following examples show other common error messages you may 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, you may see these messages:

```
System error 1067 has occurred.
Fatal error: Can't open privilege tables: Table 'mysql.host' 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 5.0` and `C:\Program Files\MySQL\MySQL Server 5.0\data`, respectively).

This situation may 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, there may be old and new configuration files that 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 5.0`, you need to ensure that the MySQL server is aware of this through the use of a configuration (`my.ini`) file. The `my.ini` file needs to be located in your Windows directory, typically `C:\WINDOWS`. You can determine its exact location from the value of the `WINDIR` environment variable by issuing the following command from the command prompt:

```
shell> echo %WINDIR%
```

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 `D:\MySQLdata`, you can create the option file and set up 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=D:/MySQLdata
```

Note that Windows path names are specified in option files using (forward) slashes rather than backslashes. If you do use backslashes, you must double them:

```
[mysqld]
# set basedir to your installation path
basedir=C:\\Program Files\\MySQL\\MySQL Server 5.0
# set datadir to the location of your data directory
datadir=D:\\MySQLdata
```

> **MySQL Enterprise**
> For expert advice on the start-up options appropriate to your circumstances, subscribe to the MySQL Enterprise Monitor. For more information, see http://www.mysql.com/products/enterprise/advisors.html.

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 9.7, "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 Configuration Wizard, you may 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 allows 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:

```
shell> sc delete mysql
[SC] DeleteService SUCCESS
```

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 and use the `delsrv mysql` syntax.

9.14. Upgrading MySQL on Windows

This section lists some of the steps you should take when upgrading MySQL on Windows.

1. Review Section 18.1, "Upgrading MySQL", for additional information on upgrading MySQL that is not specific to Windows.

2. You should always back up your current MySQL installation before performing an upgrade. See Database Backups.

3. Download the latest Windows distribution of MySQL from http://dev.mysql.com/downloads/.

4. Before upgrading MySQL, you must stop the server. If the server is installed as a service, stop the service with the following command from the command prompt:

```
shell> NET STOP MySQL
```

If you are not running the MySQL server as a service, use the following command to stop it:

```
shell> "C:\Program Files\MySQL\MySQL Server 5.0\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.

5. When upgrading to MySQL 5.0 from a version previous to 4.1.5, or when upgrading from a version of MySQL installed from a Zip archive to a version of MySQL installed with the MySQL Installation Wizard, you must manually remove the previous installation and MySQL service (if the server is installed as a service).

To remove the MySQL service, use the following command:

```
shell> C:\mysql\bin\mysqld --remove
```

If you do not remove the existing service, the MySQL Installation Wizard may fail to properly install the new MySQL service.

6. If you are using the MySQL Installation Wizard, start the wizard as described in Section 9.3, "Using the MySQL Installation Wizard".

7. If you are installing 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.

8. If you were running MySQL as a Windows service and you had to remove the service earlier in this procedure, reinstall the service. (See Section 9.11, "Starting MySQL as a Windows Service".)

9. Restart the server. For example, use `NET START MySQL` if you run MySQL as a service, or invoke `mysqld` directly otherwise.

10. If you encounter errors, see Section 9.13, "Troubleshooting a MySQL Installation Under Windows".

9.15. MySQL on Windows Compared to MySQL on Unix

MySQL for Windows has proven itself to be very stable. The Windows version of MySQL has the same features as the corresponding Unix version, with the following exceptions:

- **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. Note that 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.

  For more information about this problem, see http://support.microsoft.com/default.aspx?scid=kb;en-us;196271.

- **Concurrent reads**

  MySQL depends on the `pread()` and `pwrite()` system calls to be able to mix `INSERT` and `SELECT`. Currently, we use mutexes to emulate `pread()` and `pwrite()`. We intend to replace the file level interface with a virtual interface in the future so that we can use the `readfile()`/`writefile()` interface to get more speed. The current implementation limits the number of open files that MySQL 5.0 can use to 2,048, which means that you cannot run as many concurrent threads on Windows as on Unix.

- **Blocking read**

  MySQL uses a blocking read for each connection. That has the following implications if named-pipe connections are enabled:

  - A connection is not disconnected automatically after eight hours, as happens with the Unix version of MySQL.

  - If a connection hangs, it is not possible to break it without killing MySQL.

  - `mysqladmin kill` does not work on a sleeping connection.

  - `mysqladmin shutdown` cannot abort as long as there are sleeping connections.

  We plan to fix this problem in the future.

- **`ALTER TABLE`**

  While you are executing an `ALTER TABLE` statement, the table is locked from being used by other threads. This has to do with the fact that on Windows, you can't delete a file that is in use by another thread. In the future, we may find some way to work around this problem.

- **`DROP TABLE`**

  `DROP TABLE` on a table that is in use by a `MERGE` table does not work on Windows because the `MERGE` handler does the table mapping hidden from the upper layer of MySQL. Because Windows does not allow dropping files that are open, you first must flush all `MERGE` tables (with `FLUSH TABLES`) or drop the `MERGE` table before dropping the table.

- **`DATA DIRECTORY` and `INDEX DIRECTORY`**

The `DATA DIRECTORY` and `INDEX DIRECTORY` options for `CREATE TABLE` are ignored on Windows, because Windows doesn't support symbolic links. These options also are ignored on systems that have a non-functional `realpath()` call.

- **DROP DATABASE**

  You cannot drop a database that is in use by some thread.

- **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):

  ```
  datadir="C:/ç»´å#°ç#¾ç§#å#³ä°#ä¸æ##ç»´å#°ç#¾ç§#"
  ```

  The same limitation applies to directory and file names referred to in SQL statements, such as the data file path name in `LOAD DATA INFILE`.

- **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 INFILE` or `SELECT ... INTO OUTFILE`, use Unix-style file names with "/" characters:

  ```
  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:

  ```
  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:

  ```
  shell> 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:

  ```
  shell> mysqlbinlog binary_log_file --result-file=/tmp/bin.sql
  shell> mysql --user=root --execute "source /tmp/bin.sql"
  ```

  The latter command also can be used to reliably read in any SQL file that may contain binary data.

- **Access denied for user error**

  If MySQL cannot resolve your host name properly, you may get the following error when you attempt to run a MySQL client program to connect to a server running on the same machine:

  ```
  Access denied for user 'some_user'@'unknown'
  to database 'mysql'
  ```

  To fix this problem, you should create a file named `\windows\hosts` containing the following information:

  ```
  127.0.0.1       localhost
  ```

Chapter 10. Installing MySQL from RPM Packages on Linux

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. We also provide RPMs with binaries that are statically linked to a patched version of `glibc` 2.2, but only for the x86 (32-bit) architecture. To obtain RPM packages, see Chapter 5, *How to Get MySQL*.

For non-RPM Linux distributions, you can install MySQL using a `.tar.gz` package. See Chapter 15, *Installing MySQL from `tar.gz` Packages on Other Unix-Like Systems*.

We do provide some platform-specific RPMs; the difference between a platform-specific RPM and a generic RPM is that a platform-specific RPM is built on the targeted platform and is linked dynamically whereas a generic RPM is linked statically with LinuxThreads.

> **Note**
>
> RPM distributions of MySQL often are provided by other vendors. Be aware that they may differ in features and capabilities from those built by us, and that the instructions in this manual do not necessarily apply to installing them. The vendor's instructions should be consulted instead.

If you have problems with an RPM file (for example, if you receive the error `Sorry, the host 'xxxx' could not be looked up`), see Section 19.1.2, "Linux Binary Distribution Notes".

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

For upgrades, if your installation was originally produced by installing multiple RPM packages, it is best to 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.

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 both the shared libraries for backward compatibility (`libmysqlclient.so.12` for MySQL 4.0 and `libmysqlclient.so.10` for MySQL 3.23).

Some Linux distributions still ship with MySQL 3.23 and they usually link applications dynamically to save disk space. If these shared libraries are in a separate package (for example, `MySQL-shared`), it is sufficient to simply leave this package installed and just upgrade the MySQL server and client packages (which are statically linked and do not depend on the shared libraries). For distributions that include the shared libraries in the same package as the MySQL server (for example, Red Hat Linux), you could either install our 3.23 `MySQL-shared` RPM, or use the `MySQL-shared-compat` package instead. (Do not install both.)

The RPM packages shown in the following list are available. The names shown here use a suffix of `.glibc23.i386.rpm`, but particular packages can have different suffixes, as described later. Packages that have `community` in the names are Community Server builds, available from MySQL 5.0.27 on.

- `MySQL-server-VERSION.glibc23.i386.rpm`, `MySQL-server-community-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`, `MySQL-client-community-VERSION.glibc23.i386.rpm`

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

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

  Tests and benchmarks. Requires Perl and the `DBI` and `DBD::mysql` modules.

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

  The libraries and include files that are needed if you want to compile other MySQL clients, such as the Perl modules.

- `MySQL-debuginfo-VERSION.glibc23.i386.rpm`,
  `MySQL-community-debuginfo-VERSION.glibc23.i386.rpm`

  This package contains debugging information. `debuginfo` RPMs are never needed to use MySQL software; this is true both for the server and for client programs. However, they contain additional information that might be needed by a debugger to analyze a crash.

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

This package contains 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. If you install this package, do not install the `MySQL-shared-compat` package.

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

  This package includes the shared libraries for MySQL 3.23, 4.0, and so on, up to the current release. It contains single-threaded and thread-safe libraries. Install this package instead of `MySQL-shared` 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.

- `MySQL-clustermanagement-communityVERSION.glibc23.i386.rpm`, `MySQL-cluster-storage-communityVERSION.glibc23.i386.rpm`, `MySQL-clustertools-communityVERSION.glibc23.i386.rpm`, `MySQL-clusterextra-communityVERSION.glibc23.i386.rpm`

  Packages that contain additional files for MySQL Cluster installations. These are platform-specific RPMs, in contrast to the platform-independent `ndb-xxx` RPMs.

  > **Note**
  >
  > The `MySQL-clustertools` RPM requires a working installation of perl and the `DBI` and `HTML::Template` packages. See Chapter 21, *Perl Installation Notes*, and `ndb_size.pl`, for more information.

- `MySQL-ndb-management-VERSION.glibc23.i386.rpm`, `MySQL-ndb-storage-VERSION.glibc23.i386.rpm`, `MySQL-ndb-tools-VERSION.glibc23.i386.rpm`, `MySQL-ndb-extra-VERSION.glibc23.i386.rpm`

  Packages that contain additional files for MySQL Cluster installations. These are platform-independent RPMs, in contrast to the platform-specific `clusterxxx-community` RPMs.

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

  This package includes the MySQL test suite.

- `MySQL-VERSION.src.rpm`

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

The suffix of RPM package names (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`, if present, indicates the platform, and `CPU` indicates the processor type or family.

If the `PLATFORM` value is missing (for example, `MySQL-server-VERSION.i386.rpm`), the package is statically linked against a version of `glibc` 2.2 that has been patched to handle larger numbers of threads with larger stack sizes than the stock library.

If `PLATFORM` is present, the package is dynamically linked against `glibc` 2.3 and the `PLATFORM` value indicates whether the package is platform independent or intended for a specific platform, as shown in the following table.

`glibc23`	Platform independent, should run on any Linux distribution that supports `glibc` 2.3
`rhel3`, `rhel4`	Red Hat Enterprise Linux 3 or 4
`sles9`, `sles10`	SuSE Linux Enterprise Server 9 or 10

The `CPU` value indicates the processor type or family for which the package is built.

`i386`	x86 processor, 386 and up
`i586`	x86 processor, Pentium and up
`x86_64`	64-bit x86 processor
`ia64`	Itanium (IA-64) processor

To see all files in an RPM package (for example, a `MySQL-server` RPM), run a command like this:

```
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. If you would like to learn more about this feature, see Chapter 6, *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 don't lose it when you install a newer RPM.) See Section 17.2.2, "Starting and Stopping MySQL Automatically", for more information on how MySQL can be started automatically on system startup.

If you want to install the MySQL RPM on older Linux distributions that do not support initialization scripts in `/etc/init.d` (directly or via a symlink), you should create a symbolic link that points to the location where your initialization scripts actually are installed. For example, if that location is `/etc/rc.d/init.d`, use these commands before installing the RPM to create `/etc/init.d` as a symbolic link that points there:

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

However, all current major Linux distributions should support the new directory layout that uses `/etc/init.d`, because it is required for LSB (Linux Standard Base) compliance.

If the RPM files that you install include `MySQL-server`, the `mysqld` server should be up and running after installation. You should be able to start using MySQL.

If something goes wrong, you can find more information in the binary installation section. See Chapter 15, *Installing MySQL from tar.gz Packages on Other Unix-Like Systems*.

> **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 17, *Post-Installation Setup and Testing*.

During RPM installation, a user named `mysql` and a group named `mysql` are created on the system. This is done using the `useradd`, `groupadd`, and `usermod` commands. Those commands require appropriate administrative privileges, which is ensured 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`.

For non-local 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 andgroup exists and manually transfers ownership following the actions in the RPM spec file.

Chapter 11. Installing MySQL on Mac OS X

You can install MySQL on Mac OS X 10.3.x ("Panther") or newer using a Mac OS X binary package in PKG format instead of the binary tarball distribution. Please note that older versions of Mac OS X (for example, 10.1.x or 10.2.x) are **not** supported by this package.

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.

To obtain MySQL, see Chapter 5, *How to Get MySQL*.

> **Note**
>
> Before proceeding with the installation, be sure to shut down all running MySQL server instances by either using the MySQL Manager Application (on Mac OS X Server) or via `mysqladmin shutdown` on the command line.

To actually install the MySQL PKG file, double-click on the package icon. This launches the Mac OS X Package Installer, which guides you through the installation of MySQL.

Due to a bug in the Mac OS X package installer, you may see this error message in the destination disk selection dialog:

```
You cannot install this software on this disk. (null)
```

If this error occurs, simply click the `Go Back` button once to return to the previous screen. Then click `Continue` to advance to the destination disk selection again, and you should be able to choose the destination disk correctly. We have reported this bug to Apple and it is investigating this problem.

The Mac OS X PKG of MySQL installs itself into `/usr/local/mysql-VERSION` and also installs a symbolic link, `/usr/local/mysql`, that points to the new location. If a directory named `/usr/local/mysql` exists, it is renamed to `/usr/local/mysql.bak` first. Additionally, the installer creates the grant tables in the `mysql` database by executing `mysql_install_db`.

The installation layout is similar to that of a `tar` file binary distribution; all MySQL binaries are located in the directory `/usr/local/mysql/bin`. The MySQL socket file is created as `/tmp/mysql.sock` by default. See Chapter 7, *Installation Layouts*.

MySQL installation requires a Mac OS X user account named `mysql`. A user account with this name should exist by default on Mac OS X 10.2 and up.

If you are running Mac OS X Server, a version of MySQL should already be installed. The following table shows the versions of MySQL that ship with Mac OS X Server versions.

Mac OS X Server Version	MySQL Version
10.2-10.2.2	3.23.51
10.2.3-10.2.6	3.23.53
10.3	4.0.14
10.3.2	4.0.16
10.4.0	4.1.10a

This manual section covers the installation of the official MySQL Mac OS X PKG only. Make sure to read Apple's help information about installing MySQL: Run the "Help View" application, select "Mac OS X Server" help, do a search for "MySQL," and read the item entitled "Installing MySQL."

For preinstalled versions of MySQL on Mac OS X Server, note especially that you should start `mysqld` with `safe_mysqld` instead of `mysqld_safe` if MySQL is older than version 4.0.

If you previously used Marc Liyanage's MySQL packages for Mac OS X from http://www.entropy.ch, you can simply follow the update instructions for packages using the binary installation layout as given on his pages.

If you are upgrading from Marc's 3.23.x versions or from the Mac OS X Server version of MySQL to the official MySQL PKG, you also need to convert the existing MySQL privilege tables to the current format, because some new security privileges have been added. See `mysql_upgrade`.

If you want MySQL to start automatically during system startup, you also need to install the MySQL Startup Item. It is part of the Mac OS X installation disk images as a separate installation package. Simply double-click the MySQLStartupItem.pkg icon and follow the instructions to install it. The Startup Item need be installed only once. There is no need to install it each time you up-

grade the MySQL package later.

The Startup Item for MySQL is installed into `/Library/StartupItems/MySQLCOM`. (Before MySQL 4.1.2, the location was `/Library/StartupItems/MySQL`, but that collided with the MySQL Startup Item installed by Mac OS X Server.) Startup Item installation adds a variable `MYSQLCOM=-YES-` to the system configuration file `/etc/hostconfig`. If you want to disable the automatic startup of MySQL, simply change this variable to `MYSQLCOM=-NO-`.

On Mac OS X Server, the default MySQL installation uses the variable `MYSQL` in the `/etc/hostconfig` file. The MySQL Startup Item installer disables this variable by setting it to `MYSQL=-NO-`. This avoids boot time conflicts with the `MYSQLCOM` variable used by the MySQL Startup Item. However, it does not shut down a running MySQL server. You should do that yourself.

After the installation, you can start up MySQL by running the following commands in a terminal window. You must have administrator privileges to perform this task.

If you have installed the Startup Item, use this command:

```
shell> sudo /Library/StartupItems/MySQLCOM/MySQLCOM start
(Enter your password, if necessary)
(Press Control-D or enter "exit" to exit the shell)
```

If you don't use the Startup Item, enter the following command sequence:

```
shell> cd /usr/local/mysql
shell> sudo ./bin/mysqld_safe
(Enter your password, if necessary)
(Press Control-Z)
shell> bg
(Press Control-D or enter "exit" to exit the shell)
```

You should be able to connect to the MySQL server, for example, by running `/usr/local/mysql/bin/mysql`.

> **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 17, *Post-Installation Setup and Testing*.

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:

```
alias mysql=/usr/local/mysql/bin/mysql
alias mysqladmin=/usr/local/mysql/bin/mysqladmin
```

For `tcsh`, use:

```
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.

If you are upgrading an existing installation, note that installing a new MySQL PKG does not remove the directory of an older installation. Unfortunately, the Mac OS X Installer does not yet offer the functionality required to properly upgrade previously installed packages.

To use your existing databases with the new installation, you'll need to copy the contents of the old data directory to the new data directory. Make sure that neither the old server nor the new one is running when you do this. 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`.

Chapter 12. Installing MySQL on Solaris

To obtain a binary MySQL distribution for Solaris in tarball or PKG format, http://dev.mysql.com/downloads/mysql/5.0.html.

If you install MySQL using a binary tarball distribution on Solaris, you may run into trouble even before you get the MySQL distribution unpacked, as the Solaris `tar` cannot handle long file names. This means that you may see errors when you try to unpack MySQL.

If this occurs, you must use GNU `tar` (`gtar`) to unpack the distribution.

You can install MySQL on Solaris using a binary package in PKG format instead of the binary tarball distribution. Before installing using the binary PKG format, you should create the `mysql` user and group, for example:

```
groupadd mysql
useradd -g mysql mysql
```

Some basic PKG-handling commands follow:

- To add a package:

  ```
  pkgadd -d package_name.pkg
  ```

- To remove a package:

  ```
  pkgrm package_name
  ```

- To get a full list of installed packages:

  ```
  pkginfo
  ```

- To get detailed information for a package:

  ```
  pkginfo -l package_name
  ```

- To list the files belonging to a package:

  ```
  pkgchk -v package_name
  ```

- To get packaging information for an arbitrary file:

  ```
  pkgchk -l -p file_name
  ```

For additional information about installing MySQL on Solaris, see Section 19.3, "Solaris Notes".

Chapter 13. Installing MySQL on i5/OS

The i5/OS POWER MySQL package was created in cooperation with IBM. MySQL works within the Portable Application Solution Environment (PASE) on the System i series of hardware and will also provide database services for the Zend Core for i5/OS.

MySQL for i5/OS is provided as a save file (`.savf`) package that can be downloaded and installed directly without any additional installation steps required.

MySQL is only supported on i5/OS V5R4 or later releases. The i5/OS PASE must be installed for MySQL to operate. You must be able to login as a user in `*SECOFR` class.

You should the installation notes and tips for i5/OS before starting installation. See i5/OS Installation Notes.

> **Note**
>
> The installation package will use an existing configuration if you have previously installed MySQL (which is identified by looking for the file `/etc/my.cnf`). The values for the data directory (`DATADIR`) and owner of the MySQL files (`USRPRF`) specified during the installation will be ignored, and the values determined from the `/etc/my.cnf` will be used instead.
>
> If you want to change these parameters during a new install, you should temporarily rename `/etc/my.cnf`, install MySQL using the new parameters you want to use, and then merge your previous `/etc/my.cnf` configuration settings with the new `/etc/my.cnf` file that is created during installation.

To install MySQL on i5/OS, follow these steps:

1. Create a user profile `MYSQL`. The `MYSQL` user profile will own all the MySQL files and databases and be the active user used when the MySQL server is running. The profile should be disabled so that you cannot log in as the MySQL user. To create a user profile, use `CRTUSRPRF`:

   ```
   CRTUSRPRF USRPRF(MYSQL) STATUS(*DISABLED) TEXT('MySQL user id')
   ```

2. On the System i machine, create a save file that will be used to receive the downloaded installation save file. The file should be located within the General Purpose Library (`QGPL`):

   ```
   CRTSAVF FILE(QGPL/MYSQLINST)
   ```

3. Download the MySQL installation save file in 32-bit (`mysql-5.0.42-i5os-power-32bit.savf`) or 64-bit (`mysql-5.0.42-i5os-power-64bit.savf`) from MySQL Downloads.

4. You need to FTP the downloaded `.savf` file directly into the `QGPL/MYSQLINST` file on the System i server. You can do this through FTP using the following steps after logging in to the System i machine:

   ```
   ftp> bin
   ftp> cd qgpl
   ftp> put mysql-5.0.42-i5os-power.savf mysqlinst
   ```

5. Log into the System i server using a user in the `*SECOFR` class, such as the `QSECOFR` user ID.

6. You need to restore the installation library stored in the `.savf` save file:

   ```
   RSTLIB MYSQLINST DEV(*SAVF) SAVF(QGPL/MYSQLINST)
   ```

7. You need to execute the installation command, `MYSQLINST/INSMYSQL`. You can specify three parameter settings during installation:

   - `DIR('/opt/mysql')` sets the installation location for the MySQL files. The directory will be created if it does not already exist.

   - `DATADIR('/QOpenSys/mysal/data')` sets the location of the directory that will be used to store the database files and binary logs. The default setting is `/QOpenSys/mysql/data`. Note that if the installer detects an existing installation (due to the existence of `/etc/my.cnf`), then this parameter will be ignored.

   - `USRPRF(MYSQL)` sets the user profile that will own the files that are installed. The profile will be created if it does not already exist.

   MySQL can be installed anywhere, for this example we will assume MySQL has been installed into `/opt/mysql`. The `MYSQL` user profile that was created earlier in this sequence should be used for the profile:

```
MYSQLINST/INSMYSQL DIR('/opt/mysql') DATADIR('/opt/mysqldata') USRPRF(MYSQL)
```

If you are updating an installation over an existing MySQL installation, you should use the same parameter values that were used when MySQL was originally installed.

The installation copies all the necessary files into a directory matching the package version (for example `mysql-5.0.42-i5os-power-32bit`), sets the ownership on those files, sets up the MySQL environment and creates the MySQL configuration file (in `/etc/my.cnf`) completing all the steps in a typical binary installation process automatically. If this is a new installation of MySQL, or if the installer detects that this is a new version (because the `/etc/my.cnf` file does not exist), then the initial core MySQL databases will also be created during installation.

8. Once the installation has completed, you can delete the installation file:

```
DLTLIB LIB(MYSQLINST)
```

To start MySQL:

1. Log into the System i server using a user within the `*SECOFR` class, such as the `QSECOFR` user ID.

    > **Note**
    >
    > You should start `mysqld_safe` using a user that in the PASE environment has the id=0 (the equivalent of the stand-ard Unix `root` user). If you do not use a user with this ID then the system will be unable to change the user when ex-ecuting `mysqld` as set using `--user` option. If this happens, `mysqld` may be unable to read the files located within the MySQL data directory and the execution will fail.

2. Enter the PASE environment using `call qp2term`.

3. Start the MySQL server by changing to the installation directory and running `mysqld_safe`, specifying the user name used to install the server. The installer conveniently installs a symbolic link to the installation directory (`mysql-5.0.42-i5os-power-32bit`) as `/opt/mysql/mysql`:

```
> cd /opt/mysql/mysql
> bin/mysqld_safe --user=mysql &
```

You should see a message similar to the following:

```
Starting mysqld daemon with databases »
     from /opt/mysql/mysql-enterprise-5.0.42-i5os-power-32bit/data
```

If you are having problems starting MySQL server, see Section 17.2.3, "Starting and Troubleshooting the MySQL Server".

To stop MySQL:

1. Log into the System i server using the `*SECOFR` class, such as the `QSECOFR` user ID.

2. Enter the PASE environment using `call qp2term`.

3. Stop the MySQL server by changing into the installation directory and running `mysqladmin`, specifying the user name used to install the server:

```
> cd /opt/mysql/mysql
> bin/mysqladmin -u root shutdown
```

If the session that you started and stopped MySQL are the same, you may get the log output from `mysqld`:

```
   STOPPING server from pid file »
     /opt/mysql/mysql-enterprise-5.0.42-i5os-power-32bit/data/I5DBX.RCHLAND.IBM.COM.pid
   070718 10:34:20  mysqld ended
```

If the sessions used to start and stop MySQL are different, you will not receive any confirmation of the shutdown.

Note and tips

- A problem has been identified with the installation process on DBCS systems. If you are having problems install MySQL on a DBCS system, you need to change your job's coded character set identifier (`CSSID`) to 37 (`EBCDIC`) before executing the install command, `INSMYSQL`. To do this, determine your existing `CSSID` (using `DSPJOB` and selecting option 2), execute `CHG-JOB CSSID(37)`, run `INSMYSQL` to install MySQL and then execute `CHGJOB` again with your original `CSSID.`

- If you want to use the Perl scripts that are included with MySQL, you need to download the iSeries Tools for Developers (5799-PTL). See http://www-03.ibm.com/servers/enable/site/porting/tools/.

Chapter 14. Installing MySQL on NetWare

Porting MySQL to NetWare was an effort spearheaded by Novell. Novell customers should be pleased to note that NetWare 6.5 ships with bundled MySQL binaries, complete with an automatic commercial use license for all servers running that version of NetWare.

MySQL for NetWare is compiled using a combination of Metrowerks CodeWarrior for NetWare and special cross-compilation versions of the GNU autotools.

The latest binary packages for NetWare can be obtained at http://dev.mysql.com/downloads/. See Chapter 5, *How to Get MySQL*.

To host MySQL, the NetWare server must meet these requirements:

- The latest Support Pack of NetWare 6.5 must be installed.

- The system must meet Novell's minimum requirements to run the respective version of NetWare.

- MySQL data and the program binaries must be installed on an NSS volume; traditional volumes are not supported.

To install MySQL for NetWare, use the following procedure:

1. If you are upgrading from a prior installation, stop the MySQL server. This is done from the server console, using the following command:

   ```
   SERVER:  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.

2. Log on to the target server from a client machine with access to the location where you are installing MySQL.

3. Extract the binary package Zip file onto the server. Be sure to allow the paths in the Zip file to be used. It is safe to simply extract the file to SYS:\.

   If you are upgrading from a prior installation, you may need to copy the data directory (for example, SYS:MYSQL\DATA), as well as my.cnf, if you have customized it. You can then delete the old copy of MySQL.

4. You might want to rename the directory to something more consistent and easy to use. The examples in this manual use SYS:MYSQL to refer to the installation directory.

   Note that MySQL installation on NetWare does not detect if a version of MySQL is already installed outside the NetWare release. Therefore, if you have installed the latest MySQL version from the Web (for example, MySQL 4.1 or later) in SYS:\MYSQL, you must rename the folder before upgrading the NetWare server; otherwise, files in SYS:\MYSQL are overwritten by the MySQL version present in NetWare Support Pack.

5. At the server console, add a search path for the directory containing the MySQL NLMs. For example:

   ```
   SERVER:  SEARCH ADD SYS:MYSQL\BIN
   ```

6. Initialize the data directory and the grant tables, if necessary, by executing mysql_install_db at the server console.

7. Start the MySQL server using mysqld_safe at the server console.

8. To finish the installation, you should also add the following commands to autoexec.ncf. For example, if your MySQL installation is in SYS:MYSQL and you want MySQL to start automatically, you could add these lines:

   ```
   #Starts the MySQL 5.0.x database server
   SEARCH ADD SYS:MYSQL\BIN
   MYSQLD_SAFE
   ```

   If you are running MySQL on NetWare 6.0, we strongly suggest that you use the --skip-external-locking option on the command line:

   ```
   #Starts the MySQL 5.0.x database server
   SEARCH ADD SYS:MYSQL\BIN
   ```

```
MYSQLD_SAFE --skip-external-locking
```

It is also necessary to use CHECK TABLE and REPAIR TABLE instead of myisamchk, because myisamchk makes use of external locking. External locking is known to have problems on NetWare 6.0; the problem has been eliminated in NetWare 6.5. Note that the use of MySQL on Netware 6.0 is not officially supported.

mysqld_safe on NetWare provides a screen presence. When you unload (shut down) the mysqld_safe NLM, the screen does not go away by default. Instead, it prompts for user input:

```
*<NLM has terminated; Press any key to close the screen>*
```

If you want NetWare to close the screen automatically instead, use the --autoclose option to mysqld_safe. For example:

```
#Starts the MySQL 5.0.x database server
SEARCH ADD SYS:MYSQL\BIN
MYSQLD_SAFE --autoclose
```

The behavior of mysqld_safe on NetWare is described further in mysqld_safe.

9. When installing MySQL, either for the first time or upgrading from a previous version, download and install the latest and appropriate Perl module and PHP extensions for NetWare:

  • Perl: http://forge.novell.com/modules/xfcontent/downloads.php/perl/Modules/

  • PHP: http://forge.novell.com/modules/xfcontent/downloads.php/php/Modules/

If there was an existing installation of MySQL on the NetWare server, be sure to check for existing MySQL startup commands in autoexec.ncf, and edit or delete them as necessary.

> **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 17, *Post-Installation Setup and Testing*.

Chapter 15. Installing MySQL from `tar.gz` Packages on Other Unix-Like Systems

This section covers the installation of MySQL binary distributions that are provided for various platforms in the form of compressed `tar` files (files with a `.tar.gz` extension). See MySQL Binaries Compiled by MySQL AB, for a detailed list.

To obtain MySQL, see Chapter 5, *How to Get MySQL*.

MySQL `tar` file binary distributions have names of the form `mysql-VERSION-OS.tar.gz`, where *VERSION* is a number (for example, `5.0.84`), and *OS* indicates the type of operating system for which the distribution is intended (for example, `pc-linux-i686`).

In addition to these generic packages, we also offer binaries in platform-specific package formats for selected platforms. See Chapter 8, *Standard MySQL Installation Using a Binary Distribution*, for more information on how to install these.

You need the following tools to install a MySQL `tar` file binary distribution:

- GNU `gunzip` to uncompress the distribution.

- A reasonable `tar` to unpack the distribution. GNU `tar` is known to work. Some operating systems come with a preinstalled version of `tar` that is known to have problems. For example, Mac OS X `tar` and Sun `tar` are known to have problems with long file names. On Mac OS X, you can use the preinstalled `gnutar` program. On other systems with a deficient `tar`, you should install GNU `tar` first.

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

The basic commands that you must execute to install and use a MySQL binary distribution are:

```
shell> groupadd mysql
shell> useradd -g mysql mysql
shell> cd /usr/local
shell> gunzip < /path/to/mysql-VERSION-OS.tar.gz | tar xvf -
shell> ln -s full-path-to-mysql-VERSION-OS mysql
shell> cd mysql
shell> chown -R mysql .
shell> chgrp -R mysql .
shell> scripts/mysql_install_db --user=mysql
shell> chown -R root .
shell> chown -R mysql data
shell> bin/mysqld_safe --user=mysql &
```

> **Note**
>
> This procedure does not set up any passwords for MySQL accounts. After following the procedure, proceed to Chapter 17, *Post-Installation Setup and Testing*.

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

1. Add a login user and group for `mysqld` to run as:

   ```
   shell> groupadd mysql
   shell> useradd -g mysql mysql
   ```

   These commands add the `mysql` group and the `mysql` user. The syntax for `useradd` and `groupadd` may differ slightly on different versions of Unix, or they may have different names such as `adduser` and `addgroup`.

   You might want to call the user and group something else instead of `mysql`. If so, substitute the appropriate name in the following steps.

2. Pick the directory under which you want to unpack the distribution and change location into it. In the following example, we unpack 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
   ```

3. Obtain a distribution file using the instructions in Chapter 5, *How to Get MySQL*. For a given release, binary distributions for all platforms are built from the same MySQL source distribution.

4. Unpack the distribution, which creates the installation directory. Then create a symbolic link to that directory:

```
shell> gunzip < /path/to/mysql-VERSION-OS.tar.gz | tar xvf -
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 lets you refer more easily to the installation directory as `/usr/local/mysql`.

With GNU `tar`, no separate invocation of `gunzip` is necessary. You can replace the first line with the following alternative command to uncompress and extract the distribution:

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

5. Change location into the installation directory:

```
shell> cd mysql
```

You will find several files and subdirectories in the `mysql` directory. The most important for installation purposes are the `bin` and `scripts` subdirectories:

- The `bin` directory contains client programs and the server. You should add the full path name of this directory to your `PATH` environment variable so that your shell finds the MySQL programs properly. See Chapter 20, *Environment Variables*.

- The `scripts` directory contains the `mysql_install_db` script used to initialize the `mysql` database containing the grant tables that store the server access permissions.

6. Ensure that the distribution contents are accessible to `mysql`. If you unpacked the distribution as `mysql`, no further action is required. If you unpacked 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:

```
shell> chown -R mysql .
shell> chgrp -R mysql .
```

The first command changes the owner attribute of the files to the `mysql` user. The second changes the group attribute to the `mysql` group.

7. If you have not installed MySQL before, you must create the MySQL data directory and initialize the grant tables:

```
shell> scripts/mysql_install_db --user=mysql
```

If you run the command as `root`, include the `--user` option as shown. If you run the command while logged in as that user, you can omit the `--user` option.

The command should create the data directory and its contents with `mysql` as the owner.

After creating or updating the grant tables, you need to restart the server manually.

8. 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:

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

9. If you want MySQL to start automatically when you boot your machine, you can copy `support-files/mysql.server` to the location where your system has its startup files. More information can be found in the `support-files/mysql.server` script itself and in Section 17.2.2, "Starting and Stopping MySQL Automatically".

10. 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`. For Perl module installation instructions, see Chapter 21, *Perl Installation Notes*.

11. If you would like to use `mysqlaccess` and have the MySQL distribution in some non-standard 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`.

After everything has been unpacked and installed, you should test your distribution. To start the MySQL server, use the following command:

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

If you run the command as `root`, you must use the `--user` option as shown. The value of the option is the name of the login account that you created in the first step to use for running the server. If you run the command while logged in as `mysql`, you can omit the `--user` option.

If the command fails immediately and prints `mysqld ended`, you can find some information in the *host_name*`.err` file in the data directory.

More information about `mysqld_safe` is given in `mysqld_safe`.

> **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 17, *Post-Installation Setup and Testing*.

Chapter 16. MySQL Installation Using a Source Distribution

Before you proceed with an installation from source, first check whether our binary is available 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.

To obtain a source distribution for MySQL, Chapter 5, *How to Get MySQL*. If you want to build MySQL from source on Windows, see Section 16.6, "Installing MySQL from Source on Windows".

MySQL source distributions are provided as compressed `tar` archives and have names of the form `mysql-VERSION.tar.gz`, where *VERSION* is a number like `5.0.84`.

You need the following tools to build and install MySQL from source:

- GNU `gunzip` to uncompress the distribution.

- A reasonable `tar` to unpack the distribution. GNU `tar` is known to work. Some operating systems come with a preinstalled version of `tar` that is known to have problems. For example, the `tar` provided with early versions of Mac OS X `tar`, SunOS 4.x and Solaris 8 and earlier are known to have problems with long file names. On Mac OS X, you can use the preinstalled `gnutar` program. On other systems with a deficient `tar`, you should install GNU `tar` first.

- A working ANSI C++ compiler. `gcc` 2.95.2 or later, SGI C++, and SunPro C++ are some of the compilers that are known to work. `libg++` is not needed when using `gcc`. `gcc` 2.7.x has a bug that makes it impossible to compile some perfectly legal C++ files, such as `sql/sql_base.cc`. If you have only `gcc` 2.7.x, you must upgrade your `gcc` to be able to compile MySQL. `gcc` 2.8.1 is also known to have problems on some platforms, so it should be avoided if a newer compiler exists for the platform. `gcc` 2.95.2 or later is recommended.

- A good `make` program. GNU `make` is always recommended and is sometimes required. (BSD `make` fails, and vendor-provided `make` implementations may fail as well.) If you have problems, we recommend GNU `make` 3.75 or newer.

- `libtool` 1.5.24 or later is also recommended.

If you are using a version of `gcc` recent enough to understand the `-fno-exceptions` option, it is *very important* that you use this option. Otherwise, you may compile a binary that crashes randomly. We also recommend that you use `-fe-lide-constructors` and `-fno-rtti` along with `-fno-exceptions`. When in doubt, do the following:

```
CFLAGS="-O3" CXX=gcc CXXFLAGS="-O3 -felide-constructors \
        -fno-exceptions -fno-rtti" ./configure \
        --prefix=/usr/local/mysql --enable-assembler \
        --with-mysqld-ldflags=-all-static
```

On most systems, this gives you a fast and stable binary.

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

16.1. Source Installation Overview

The basic commands that you must execute to install a MySQL source distribution are:

```
shell> groupadd mysql
shell> useradd -g mysql mysql
shell> gunzip < mysql-VERSION.tar.gz | tar -xvf -
shell> cd mysql-VERSION
shell> ./configure --prefix=/usr/local/mysql
shell> make
shell> make install
shell> cp support-files/my-medium.cnf /etc/my.cnf
shell> cd /usr/local/mysql
shell> chown -R mysql .
shell> chgrp -R mysql .
shell> bin/mysql_install_db --user=mysql
shell> chown -R root .
shell> chown -R mysql var
shell> bin/mysqld_safe --user=mysql &
```

If you start from a source RPM, do the following:

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

This makes a binary RPM that you can install. For older versions of RPM, you may have to replace the command `rpmbuild` with `rpm` instead.

> **Note**
>
> This procedure does not set up any passwords for MySQL accounts. After following the procedure, proceed to Chapter 17, *Post-Installation Setup and Testing*, for post-installation setup and testing.

A more detailed version of the preceding description for installing MySQL from a source distribution follows:

1. Add a login user and group for `mysqld` to run as:

    ```
    shell> groupadd mysql
    shell> useradd -g mysql mysql
    ```

    These commands add the `mysql` group and the `mysql` user. The syntax for `useradd` and `groupadd` may differ slightly on different versions of Unix, or they may have different names such as `adduser` and `addgroup`.

    You might want to call the user and group something else instead of `mysql`. If so, substitute the appropriate name in the following steps.

2. Perform the following steps as the `mysql` user, except as noted.

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

4. Obtain a distribution file using the instructions in Chapter 5, *How to Get MySQL*.

5. Unpack the distribution into the current directory:

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

    This command creates a directory named `mysql-VERSION`.

    With GNU `tar`, no separate invocation of `gunzip` is necessary. You can use the following alternative command to uncompress and extract the distribution:

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

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

    ```
    shell> cd mysql-VERSION
    ```

    Note that currently you must configure and build MySQL from this top-level directory. You cannot build it in a different directory.

7. Configure the release and compile everything:

    ```
    shell> ./configure --prefix=/usr/local/mysql
    shell> make
    ```

    When you run `configure`, you might want to specify other options. Run `./configure --help` for a list of options. Section 16.2, "Typical `configure` Options", discusses some of the more useful options.

    If `configure` fails and you are going to send mail to a MySQL mailing list to ask for assistance, please include any lines from `config.log` that you think can help solve the problem. Also include the last couple of lines of output from `configure`. To file a bug report, please use the instructions in How to Report Bugs or Problems.

    If the compile fails, see Section 16.4, "Dealing with Problems Compiling MySQL", for help.

8. Install the distribution:

    ```
    shell> make install
    ```

    You might need to run this command as `root`.

    If you want to set up an option file, use one of those present in the `support-files` directory as a template. For example:

    ```
    shell> cp support-files/my-medium.cnf /etc/my.cnf
    ```

    You might need to run this command as `root`.

If you want to configure support for `InnoDB` tables, you should edit the `/etc/my.cnf` file, remove the `#` character before the option lines that start with `innodb_...`, and modify the option values to be what you want. See Using Option Files, and `InnoDB` Configuration.

9.   Change location into the installation directory:

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

10.   If you ran the `make install` command as `root`, the installed files will be owned by `root`. Ensure that the installation is accessible to `mysql` by executing the following commands as `root` in the installation directory:

```
shell> chown -R mysql .
shell> chgrp -R mysql .
```

The first command changes the owner attribute of the files to the `mysql` user. The second changes the group attribute to the `mysql` group.

11.   If you have not installed MySQL before, you must create the MySQL data directory and initialize the grant tables:

```
shell> bin/mysql_install_db --user=mysql
```

If you run the command as `root`, include the `--user` option as shown. If you run the command while logged in as `mysql`, you can omit the `--user` option.

The command should create the data directory and its contents with `mysql` as the owner.

After using `mysql_install_db` to create the grant tables for MySQL, you must restart the server manually. The `mysqld_safe` command to do this is shown in a later step.

12.   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:

```
shell> chown -R root .
shell> chown -R mysql var
```

13.   If you want MySQL to start automatically when you boot your machine, you can copy `support-files/mysql.server` to the location where your system has its startup files. More information can be found in the `support-files/mysql.server` script itself; see also Section 17.2.2, "Starting and Stopping MySQL Automatically".

14.   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`. For Perl module installation instructions, see Chapter 21, *Perl Installation Notes*.

After everything has been installed, you should test your distribution. To start the MySQL server, use the following command:

```
shell> /usr/local/mysql/bin/mysqld_safe --user=mysql &
```

If you run the command as `root`, you should use the `--user` option as shown. The value of the option is the name of the login account that you created in the first step to use for running the server. If you run the command while logged in as that user, you can omit the `--user` option.

If the command fails immediately and prints `mysqld ended`, you can find some information in the *host_name*`.err` file in the data directory.

More information about `mysqld_safe` is given in `mysqld_safe`.

> **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 17, *Post-Installation Setup and Testing*.

16.2. Typical `configure` Options

The `configure` script gives you a great deal of control over how you configure a MySQL source distribution. Typically you do this using options on the `configure` command line. You can also affect `configure` using certain environment variables. See Chapter 20, *Environment Variables*. For a full list of options supported by `configure`, run this command:

```
shell> ./configure --help
```

A list of the available `configure` options is provided in the table below.

Table 16.1. Build (`configure`) Reference

Formats	Description	Default	Introduced	Removed
--bindir=DIR	User executables	EPREFIX/bin		
--build=BUILD	Configure for building on BUILD	guessed		
--cache-file=FILE	Cache test results in FILE	disabled		
-C	Alias for `--cache-file=config.cache'			
--config-cache				
--datadir=DIR	Read-only architecture-independent data	PREFIX/share		
--disable-FEATURE	Do not include FEATURE			
--disable-dependency-tracking	Disable dependency tracking			
--disable-grant-options	Disable GRANT options		5.0.34	
--disable-largefile	Omit support for large files			
--disable-libtool-lock	Disable libtool lock			
--disable-profiling	Build a version without query profiling code		5.0.37	5.0.45
--enable-FEATURE	Enable FEATURE			
--enable-assembler	Use assembler versions of some string functions if available			
--enable-dependency-tracking	Do not reject slow dependency extractors			
--enable-fast-install	Optimize for fast installation	yes		
--enable-local-infile	Enable LOAD DATA LOCAL INFILE	disabled		
--enable-shared	Build shared libraries	yes		
--enable-static	Build static libraries	yes		
--enable-thread-safe-client	Compile the client with threads			
--exec-prefix=EPREFIX	Install architecture-dependent files in EPREFIX			
-h	Display this help and exit			
--help				
--help=short	Display options specific to this package			
--help=recursive	Display the short help of all the included packages			
--host=HOST	Cross-compile to build programs to run on HOST			
--includedir=DIR	C header files	PREFIX/include		
--infodir=DIR	Info documentation	PREFIX/info		
--libdir=DIR	Object code libraries	EPREFIX/lib		
--libexecdir=DIR	Program executables	EPREFIX/libexec		
--localstatedir=DIR	Modifiable single-machine data	PREFIX/var		
--mandir=DIR	man documentation	PREFIX/man		
-n	Do not create output files			
--no-create				
--oldincludedir=DIR	C header files for non-gcc	/usr/include		
--prefix=PREFIX	Install architecture-independent files in PREFIX			
--program-prefix=PREFIX	Prepend PREFIX to installed program			

Formats	Description	Default	Introduced	Removed
	names			
--program-suffix=SUFFIX	Append SUFFIX to installed program names			
--program-transform-name=PROGRAM	run sed PROGRAM on installed program names			
-q	Do not print `checking...' messages			
--quiet				
--sbindir=DIR	System admin executables	EPREFIX/sbin		
--sharedstatedir=DIR	Modifiable architecture-independent data	PREFIX/com		
--srcdir=DIR	Find the sources in DIR	configure directory or ..		
--sysconfdir=DIR	Read-only single-machine data	PREFIX/etc		
--target=TARGET	Configure for building compilers for TARGET			
-V	Display version information and exit			
--version				
--with-PACKAGE	Use PACKAGE			
--with-archive-storage-engine	Enable the Archive Storage Engine	no		
--with-berkeley-db	Use BerkeleyDB located in DIR	no		
--with-berkeley-db-includes	Find Berkeley DB headers in DIR			
--with-berkeley-db-libs	Find Berkeley DB libraries in DIR			
--with-big-tables	Support tables with more than 4 G rows even on 32 bit platforms		5.0.4	
--with-blackhole-storage-engine	Enable the Blackhole Storage Engine	no	5.0.4	
--with-charset	Default character set			
--with-client-ldflags	Extra linking arguments for clients			
--with-collation	Default collation			
--with-comment	Comment about compilation environment			
--with-csv-storage-engine	Enable the CSV Storage Engine	yes		
--with-darwin-mwcc	Use Metrowerks CodeWarrior wrappers on OS X/Darwin		5.0.6	
--with-embedded-privilege-control	Build parts to check user's privileges (only affects embedded library)			
--with-embedded-server	Build the embedded server			
--with-example-storage-engine	Enable the Example Storage Engine	no		
--with-extra-charsets	Use charsets in addition to default			
--with-gnu-ld	Assume the C compiler uses GNU ld	no		
--with-isam	Enable the ISAM table type			
--with-lib-ccflags	Extra CC options for libraries			
--with-libwrap=DIR	Compile in libwrap (tcp_wrappers) support			
--with-low-memory	Try to use less memory to compile to avoid memory limitations			
--with-machine-type	Set the machine type, like "powerpc"		5.0.44	
--with-max-indexes=N	Sets the maximum number of indexes per table	64		
--with-mit-threads	Always use included thread lib			
--with-mysqld-ldflags	Extra linking arguments for mysqld			
--with-mysqld-libs	Extra libraries to link with for mysqld		5.0.44	
--with-mysqld-user	What user the mysqld daemon shall			

Formats	Description	Default	Introduced	Removed
	be run as			
--with-mysqlfs	Include the corba-based MySQL file system			
--with-mysqlmanager	Build the mysqlmanager binary	Build if server is built		
--with-named-curses-libs	Use specified curses libraries			
--with-named-thread-libs	Use specified thread libraries			
--with-ndb-ccflags	Extra CC options for ndb compile		5.0.3	
--with-ndb-docs	Include the NDB Cluster ndbapi and mgmapi documentation			
--with-ndb-port	Port for NDB Cluster management server			
--with-ndb-port-base	Port for NDB Cluster management server		5.0.3	
--with-ndb-sci=DIR	Provide MySQL with a custom location of sci library			
--with-ndb-shm	Include the NDB Cluster shared memory transporter			
--with-ndb-test	Include the NDB Cluster ndbapi test programs			
--with-ndbcluster	Include the NDB Cluster table handler	no		
--with-openssl=DIR	Include the OpenSSL support			
--with-openssl-includes	Find OpenSSL headers in DIR			
--with-openssl-libs	Find OpenSSL libraries in DIR			
--with-other-libc=DIR	Link against libc and other standard libraries installed in the specified non-standard location			
--with-pic	Try to use only PIC/non-PIC objects	Use both		
--with-pstack	Use the pstack backtrace library			
--with-pthread	Force use of pthread library			
--with-raid	Enable RAID Support			
--with-server-suffix	Append value to the version string			
--with-system-type	Set the system type, like "sun-solaris10"		5.0.44	
--with-tags	Include additional configurations	automatic		
--with-tcp-port	Which port to use for MySQL services	3306		
--with-unix-socket-path	Where to put the unix-domain socket			
--with-vio	Include the Virtual IO support			
--with-yassl	Include the yaSSL support		5.0.6	
--with-zlib-dir=no|bundled|DIR	Provide MySQL with a custom location of compression library			
--without-PACKAGE	Do not use PACKAGE			
--without-bench	Skip building of the benchmark suite			
--without-debug	Build a production version without debugging code			
--without-docs	Skip building of the documentation			
--without-extra-tools	Skip building utilities in the tools directory			
--without-geometry	Do not build geometry-related parts			
--without-innodb	Do not include the InnoDB table handler			
--without-libedit	Use system libedit instead of bundled			

Formats	Description	Default	Introduced	Removed
	copy			
--without-man	Skip building of the man pages			
--without-ndb-debug	Disable special ndb debug features		5.0.3	
--without-query-cache	Do not build query cache			
--without-readline	Use system readline instead of bundled copy			
--without-server	Only build the client			
--without-uca	Skip building of the national Unicode collations		5.0.3	

Some of the `configure` options available are described here. For options that may be of use if you have difficulties building MySQL, see Section 16.4, "Dealing with Problems Compiling MySQL".

- To compile just the MySQL client libraries and client programs and not the server, use the `--without-server` option:

```
shell> ./configure --without-server
```

  If you have no C++ compiler, some client programs such as `mysql` cannot be compiled because they require C++.. In this case, you can remove the code in `configure` that tests for the C++ compiler and then run `./configure` with the `--without-server` option. The compile step should still try to build all clients, but you can ignore any warnings about files such as `mysql.cc`. (If `make` stops, try `make -k` to tell it to continue with the rest of the build even if errors occur.)

- If you want to build the embedded MySQL library (`libmysqld.a`), use the `--with-embedded-server` option.

- If you don't want your log files and database directories located under `/usr/local/var`, use a `configure` command something like one of these:

```
shell> ./configure --prefix=/usr/local/mysql
shell> ./configure --prefix=/usr/local \
          --localstatedir=/usr/local/mysql/data
```

  The first command changes the installation prefix so that everything is installed under `/usr/local/mysql` rather than the default of `/usr/local`. The second command preserves the default installation prefix, but overrides the default location for database directories (normally `/usr/local/var`) and changes it to `/usr/local/mysql/data`.

  You can also specify the installation directory and data directory locations at server startup time by using the `--basedir` and `--datadir` options. These can be given on the command line or in an MySQL option file, although it is more common to use an option file. See Using Option Files.

- If you are using Unix and you want the MySQL socket file location to be somewhere other than the default location (normally in the directory `/tmp` or `/var/run`), use a `configure` command like this:

```
shell> ./configure \
          --with-unix-socket-path=/usr/local/mysql/tmp/mysql.sock
```

  The socket file name must be an absolute path name. You can also change the location of `mysql.sock` at server startup by using a MySQL option file. See How to Protect or Change the MySQL Unix Socket File.

- If you want to compile statically linked programs (for example, to make a binary distribution, to get better performance, or to work around problems with some Red Hat Linux distributions), run `configure` like this:

```
shell> ./configure --with-client-ldflags=-all-static \
          --with-mysqld-ldflags=-all-static
```

- If you are using `gcc` and don't have `libg++` or `libstdc++` installed, you can tell `configure` to use `gcc` as your C++ compiler:

```
shell> CC=gcc CXX=gcc ./configure
```

  When you use `gcc` as your C++ compiler, it does not attempt to link in `libg++` or `libstdc++`. This may be a good thing to do even if you have those libraries installed. Some versions of them have caused strange problems for MySQL users in the past.

  The following list indicates some compilers and environment variable settings that are commonly used with each one.

- gcc 2.7.2:

```
CC=gcc CXX=gcc CXXFLAGS="-O3 -felide-constructors"
```

- gcc 2.95.2:

```
CFLAGS="-O3 -mpentiumpro" CXX=gcc CXXFLAGS="-O3 -mpentiumpro \
-felide-constructors -fno-exceptions -fno-rtti"
```

- pgcc 2.90.29 or newer:

```
CFLAGS="-O3 -mpentiumpro -mstack-align-double" CXX=gcc \
CXXFLAGS="-O3 -mpentiumpro -mstack-align-double \
-felide-constructors -fno-exceptions -fno-rtti"
```

In most cases, you can get a reasonably optimized MySQL binary by using the options from the preceding list and adding the following options to the `configure` line:

```
--prefix=/usr/local/mysql --enable-assembler \
--with-mysqld-ldflags=-all-static
```

The full `configure` line would, in other words, be something like the following for all recent `gcc` versions:

```
CFLAGS="-O3 -mpentiumpro" CXX=gcc CXXFLAGS="-O3 -mpentiumpro \
-felide-constructors -fno-exceptions -fno-rtti" ./configure \
--prefix=/usr/local/mysql --enable-assembler \
--with-mysqld-ldflags=-all-static
```

The binaries we provide on the MySQL Web site at http://dev.mysql.com/downloads/ are all compiled with full optimization and should be perfect for most users. See MySQL Binaries Compiled by MySQL AB. There are some configuration settings you can tweak to build an even faster binary, but these are only for advanced users. See How Compiling and Linking Affects the Speed of MySQL.

If the build fails and produces errors about your compiler or linker not being able to create the shared library `libmysqlclient.so.N` (where `N` is a version number), you can work around this problem by giving the `--disable-shared` option to `configure`. In this case, `configure` does not build a shared `libmysqlclient.so.N` library.

- By default, MySQL uses the `latin1` (cp1252 West European) character set. To change the default set, use the `--with-charset` option:

```
shell> ./configure --with-charset=CHARSET
```

`CHARSET` may be one of `binary`, `armscii8`, `ascii`, `big5`, `cp1250`, `cp1251`, `cp1256`, `cp1257`, `cp850`, `cp852`, `cp866`, `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`. See The Character Set Used for Data and Sorting. (Additional character sets might be available. Check the output from `./configure --help` for the current list.)

The default collation may also be specified. MySQL uses the `latin1_swedish_ci` collation by default. To change this, use the `--with-collation` option:

```
shell> ./configure --with-collation=COLLATION
```

To change both the character set and the collation, use both the `--with-charset` and `--with-collation` options. The collation must be a legal collation for the character set. (Use the `SHOW COLLATION` statement to determine which collations are available for each character set.)

> **Warning**
>
> If you change character sets after having created any tables, you must run `myisamchk -r -q --set-collation=collation_name` *on every MyISAM table*. Your indexes may be sorted incorrectly otherwise. This can happen if you install MySQL, create some tables, and then reconfigure MySQL to use a different character set and reinstall it.

With the `configure` option `--with-extra-charsets=LIST`, you can define which additional character sets should be compiled into the server. `LIST` is one of the following:

- A list of character set names separated by spaces

- `complex` to include all character sets that can't be dynamically loaded

- `all` to include all character sets into the binaries

Clients that want to convert characters between the server and the client should use the `SET NAMES` statement. See Session System Variables, and Connection Character Sets and Collations.

- To configure MySQL with debugging code, use the `--with-debug` option:

```
shell> ./configure --with-debug
```

This causes a safe memory allocator to be included that can find some errors and that provides output about what is happening. See MySQL Internals: Porting.

As of MySQL 5.0.25, using `--with-debug` to configure 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.

- If your client programs are using threads, you must compile a thread-safe version of the MySQL client library with the `--enable-thread-safe-client` configure option. This creates a `libmysqlclient_r` library with which you should link your threaded applications. See How to Make a Threaded Client.

- Some features require that the server be built with compression library support, such as the `COMPRESS()` and `UNCOM-PRESS()` functions, and compression of the client/server protocol. The `--with-zlib-dir=no|bundled|DIR` option provides control for compression library support. The value `no` explicitly disables compression support. `bundled` causes the `zlib` library bundled in the MySQL sources to be used. A `DIR` path name specifies where to find the compression library sources.

- It is possible to build MySQL 5.0 with large table support using the `--with-big-tables` option, beginning with MySQL 5.0.4.

  This option causes the variables that store table row counts to be declared as `unsigned long long` rather than `unsigned long`. This enables tables to hold up to approximately 1.844E+19 $((2^{32})^2)$ rows rather than 2^{32} (~4.295E+09) rows. Previously it was necessary to pass `-DBIG_TABLES` to the compiler manually in order to enable this feature.

- Run `configure` with the `--disable-grant-options` option to cause the `--bootstrap`, `--skip-grant-tables`, and `--init-file` options for `mysqld` to be disabled. For Windows, the `configure.js` script recognizes the `DISABLE_GRANT_OPTIONS` flag, which has the same effect. The capability is available as of MySQL 5.0.34.

- In MySQL Community Server, this option enables the statement profiling capability exposed by the `SHOW PROFILE` and `SHOW PROFILES` statements. (See `SHOW PROFILES` Syntax.) The option was added in MySQL 5.0.37.

- See Chapter 19, *Operating System-Specific Notes*, for options that pertain to particular operating systems.

- See Using SSL Connections, for options that pertain to configuring MySQL to support secure (encrypted) connections.

16.3. Installing from the Development Source Tree

> **Caution**
>
> You should read this section only if you are interested in helping us test our new code. If you just want to get MySQL up and running on your system, you should use a standard release distribution (either a binary or source distribution).

To obtain the most recent development source tree, you first need to download and install Bazaar. You can obtain Bazaar from the Bazaar VCS Website. Bazaar is supported by any platform that supports Python, and is therefore compatible with any Linux, Unix, Windows or Mac OS X host. Instructions for downloading and installing Bazaar on the different platforms are available on the Bazaar website.

All MySQL projects are hosted on Launchpad. MySQL projects, including MySQL server, MySQL Workbench and others are available from the Sun/MySQL Engineering page. For the repositories related only to MySQL server, see the MySQL Server page.

To build under Unix/Linux, you must have the following tools installed:

- GNU `make`, available from http://www.gnu.org/software/make/. Although some platforms come with their own `make` implementations, it is highly recommended that you use GNU `make`. It may already be available on your system as `gmake`.

- autoconf 2.58 (or newer), available from http://www.gnu.org/software/autoconf/.

- automake 1.8.1, available from http://www.gnu.org/software/automake/.

- libtool 1.5, available from http://www.gnu.org/software/libtool/.

- m4, available from http://www.gnu.org/software/m4/.

- bison, available from http://www.gnu.org/software/bison/. You should use the latest version of bison where possible. Version 1.75 and version 2.1 are known to work. There have been reported problems with bison 1.875. If you experience problems, upgrade to a later, rather than earlier, version. 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.

To build under Windows you will need a copy of Microsoft Visual C++ 2005 Express Edition, Visual Studio .Net 2003 (7.1), or Visual Studio 2005 (8.0) compiler system.

Once you have the necessary tools installed, you first need to create a local branch of the MySQL source code on your machine:

1. To obtain a copy of the MySQL source code, you must create a new Bazaar branch. If you do not already have a Bazaar repository directory set up, you need to initialize a new directory:

   ```
   shell> mkdir mysql-server
   shell> bzr init-repo --trees mysql-server
   ```

   Once you have an initialized directory, you can branch from the public MySQL server repositories. To create a branch of a specific version:

   ```
   shell> cd mysql-server
   shell> bzr branch lp:mysql-server/5.0 mysql-5.0
   ```

   The initial download will take some time to complete, depending on the speed of your connection. Please be patient. Once you have downloaded the first tree, additional trees should take significantly less time to download.

   When building from the Bazaar branch, you may want to create a copy of your active branch so that you can make configuration and other changes without affecting the original branch contents. You can achieve this by branching from the original branch:

   ```
   shell> bzr branch mysql-5.0 mysql-5.0-build
   ```

Once you have the local branch, you can start to build MySQL server from the source code. On Windows, the build process is different from Unix/Linux. To continue building MySQL on Windows, see Section 16.6, "Installing MySQL from Source on Windows".

On Unix/Linux you need to use the autoconf system to create the configure script so that you can configure the build environment before building.

1. The following example shows the typical commands required to configure a source tree. The first cd command changes location into the top-level directory of the tree; replace mysql-5.0 with the appropriate directory name.

   > **Note**
   >
   > For MySQL 5.1.12 and earlier, you must separately configure the INNODB storage engine. You can do this by running the following command from the main source directory:

   ```
   shell> cd mysql-5.0
   shell> (cd bdb/deist; sh s_all)
   shell> (cd innobase; autoreconf --force --install)
   shell> autoreconf --force --install
   shell> ./configure  # Add your favorite options here
   shell> make
   ```

   Or you can use BUILD/autorun.sh as a shortcut for the following sequence of commands:

```
shell> aclocal; autoheader
shell> libtoolize --automake --force
shell> automake --force --add-missing; autoconf
shell> (cd bdb/deist; sh s_all)
shell> (cd innobase; aclocal; autoheader; autoconf; automake)
```

The command line that changes directory into the `storage/innobase` directory is used to configure the `InnoDB` storage engine. You can omit this lines if you do not require `InnoDB` support.

If you get some strange errors during this stage, verify that you have the correct version of the `libtool` installed.

A collection of our standard configuration scripts is located in the `BUILD/` subdirectory. For example, you may find it more convenient to use the `BUILD/compile-pentium-debug` script than the preceding set of shell commands. To compile on a different architecture, modify the script by removing flags that are Pentium-specific, or use another script that may be more appropriate. These scripts are provided on an "as-is" basis. They are not officially maintained and their contents may change from release to release.

2. When the build is done, run `make install`. Be careful with this on a production machine; the command may overwrite your live release installation. If you have another installation of MySQL, we recommend that you run `./configure` with different values for the `--prefix`, `--with-tcp-port`, and `--with-unix-socket-path` options than those used for your production server.

3. Play hard with your new installation and try to make the new features crash. Start by running `make test`. See MySQL Test Suite.

4. If you have gotten to the `make` stage, but the distribution does not compile, please enter the problem 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 GNU tools, and they crash trying to process our configuration files, please report that also. However, if you execute `aclocal` and get a `command not found` error or a similar problem, do not report it. Instead, make sure that all the necessary tools are installed and that your `PATH` variable is set correctly so that your shell can find them.

5. After initially copying the repository with `bzr` to obtain the source tree, you should use `pull` option to periodically update your local copy. To do this any time after you have set up the repository, use this command:

```
shell> bzr pull
```

6. You can examine the changeset comments for the tree by using the `log` option to `bzr`:

```
shell> bzr log
```

You can also browse changesets, comments, and source code online. To browse this information for MySQL 5.0, go to http://launchpad.net/mysql-server/.

If you see diffs or code that you have a question about, do not hesitate to send email to the MySQL `internals` mailing list. See MySQL Mailing Lists. Also, if you think you have a better idea on how to do something, send an email message to the list with a patch.

16.4. Dealing with Problems Compiling MySQL

All MySQL programs compile cleanly for us with no warnings on Solaris or Linux using `gcc`. On other systems, warnings may occur due to differences in system include files. See Section 16.5, "MIT-pthreads Notes", for warnings that may occur when using MIT-pthreads. For other problems, check the following list.

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

- If `configure` is run after it has previously been run, it may use information that was gathered during its previous invocation. This information is stored in `config.cache`. When `configure` starts up, 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 `configure`, 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 configuration information or object files from being used, run these commands before re-running `configure`:

```
shell> rm config.cache
shell> make clean
```

Alternatively, you can run `make distclean`.

The following list describes some of the problems when compiling MySQL that have been found to occur most often:

- If you get errors such as the ones shown here when compiling `sql_yacc.cc`, you probably have run out of memory or swap space:

```
Internal compiler error: program cc1plus got fatal signal 11
Out of virtual memory
Virtual memory exhausted
```

  The problem is that `gcc` requires a huge amount of memory to compile `sql_yacc.cc` with inline functions. Try running `configure` with the `--with-low-memory` option:

```
shell> ./configure --with-low-memory
```

  This option causes `-fno-inline` to be added to the compile line if you are using `gcc` and `-O0` if you are using something else. You should try the `--with-low-memory` option even if you have so much memory and swap space that you think you can't possibly have run out. This problem has been observed to occur even on systems with generous hardware configurations, and the `--with-low-memory` option usually fixes it.

- By default, `configure` picks `c++` as the compiler name and GNU `c++` links with `-lg++`. If you are using `gcc`, that behavior can cause problems during configuration such as this:

```
configure: error: installation or configuration problem:
C++ compiler cannot create executables.
```

  You might also observe problems during compilation related to `g++`, `libg++`, or `libstdc++`.

  One cause of these problems is that you may not have `g++`, or you may have `g++` but not `libg++`, or `libstdc++`. Take a look at the `config.log` file. It should contain the exact reason why your C++ compiler didn't work. To work around these problems, you can use `gcc` as your C++ compiler. Try setting the environment variable `CXX` to `"gcc -O3"`. For example:

```
shell> CXX="gcc -O3" ./configure
```

  This works because `gcc` compiles C++ source files as well as `g++` does, but does not link in `libg++` or `libstdc++` by default.

  Another way to fix these problems is to install `g++`, `libg++`, and `libstdc++`. However, we recommend that you not use `libg++` or `libstdc++` with MySQL because this only increases the binary size of `mysqld` without providing any benefits. Some versions of these libraries have also caused strange problems for MySQL users in the past.

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

```
making all in mit-pthreads
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.

- If you want to define flags to be used by your C or C++ compilers, do so by adding the flags to the `CFLAGS` and `CXXFLAGS` environment variables. You can also specify the compiler names this way using `CC` and `CXX`. For example:

```
shell> CC=gcc
shell> CFLAGS=-O3
shell> CXX=gcc
shell> CXXFLAGS=-O3
shell> export CC CFLAGS CXX CXXFLAGS
```

See MySQL Binaries Compiled by MySQL AB, for a list of flag definitions that have been found to be useful on various systems.

- If you get errors such as those shown here when compiling `mysqld`, `configure` did not correctly detect the type of the last argument to `accept()`, `getsockname()`, or `getpeername()`:

```
cxx: Error: mysqld.cc, line 645: In this statement, the referenced
    type of the pointer value ''length'' is ''unsigned long'',
    which is not compatible with ''int''.
new_sock = accept(sock, (struct sockaddr *)&cAddr, &length);
```

To fix this, edit the `config.h` file (which is generated by `configure`). Look for these lines:

```
/* Define as the base type of the last arg to accept */
#define SOCKET_SIZE_TYPE XXX
```

Change `XXX` to `size_t` or `int`, depending on your operating system. (You must do this each time you run `configure` because `configure` regenerates `config.h`.)

- 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 pre-generated 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 `bison` (the GNU version of `yacc`) and use that instead.

- On Debian Linux 3.0, you need to install `gawk` instead of the default `mawk` if you want to compile MySQL with Berkeley DB support.

- If you need to debug `mysqld` or a MySQL client, run `configure` with the `--with-debug` option, and then recompile and link your clients with the new client library. See MySQL Internals: Porting.

- If you get a compilation error on Linux (for example, SuSE Linux 8.1 or Red Hat Linux 7.3) similar to the following one, you probably do not have `g++` installed:

```
libmysql.c:1329: warning: passing arg 5 of `gethostbyname_r' from
incompatible pointer type
libmysql.c:1329: too few arguments to function `gethostbyname_r'
libmysql.c:1329: warning: assignment makes pointer from integer
without a cast
make[2]: *** [libmysql.lo] Error 1
```

By default, the `configure` script attempts to determine the correct number of arguments by using `g++` (the GNU C++ compiler). This test yields incorrect results if `g++` is not installed. There are two ways to work around this problem:

- Make sure that the GNU C++ `g++` is installed. On some Linux distributions, the required package is called `gpp`; on others, it is named `gcc-c++`.

- Use `gcc` as your C++ compiler by setting the `CXX` environment variable to `gcc`:

```
export CXX="gcc"
```

You must run `configure` again after making either of those changes.

16.5. MIT-pthreads Notes

This section describes some of the issues involved in using MIT-pthreads.

On Linux, you should *not* use MIT-pthreads. Use the installed LinuxThreads implementation instead. See Section 19.1, "Linux Notes".

If your system does not provide native thread support, you should build MySQL using the MIT-pthreads package. This includes older FreeBSD systems, SunOS 4.x, Solaris 2.4 and earlier, and some others. See Operating Systems Supported by MySQL Community Server.

MIT-pthreads is not part of the MySQL 5.0 source distribution. If you require this package, you need to download it separately from http://dev.mysql.com/Downloads/Contrib/pthreads-1_60_beta6-mysql.tar.gz

After downloading, extract this source archive into the top level of the MySQL source directory. It creates a new subdirectory named `mit-pthreads`.

- On most systems, you can force MIT-pthreads to be used by running `configure` with the `--with-mit-threads` option:

```
shell> ./configure --with-mit-threads
```

  Building in a non-source directory is not supported when using MIT-pthreads because we want to minimize our changes to this code.

- The checks that determine whether to use MIT-pthreads occur only during the part of the configuration process that deals with the server code. If you have configured the distribution using `--without-server` to build only the client code, clients do not know whether MIT-pthreads is being used and use Unix socket file connections by default. Because Unix socket files do not work under MIT-pthreads on some platforms, this means you need to use `-h` or `--host` with a value other than `local-host` when you run client programs.

- When MySQL is compiled using MIT-pthreads, system locking is disabled by default for performance reasons. You can tell the server to use system locking with the `--external-locking` option. This is needed only if you want to be able to run two MySQL servers against the same data files, but that is not recommended, anyway.

- Sometimes the pthread `bind()` command fails to bind to a socket without any error message (at least on Solaris). The result is that all connections to the server fail. For example:

```
shell> mysqladmin version
mysqladmin: connect to server at '' failed;
error: 'Can't connect to mysql server on localhost (146)'
```

  The solution to this problem is to kill the `mysqld` server and restart it. This has happened to us only when we have forcibly stopped the server and restarted it immediately.

- With MIT-pthreads, the `sleep()` system call isn't interruptible with `SIGINT` (break). This is noticeable only when you run `mysqladmin --sleep`. You must wait for the `sleep()` call to terminate before the interrupt is served and the process stops.

- When linking, you might receive warning messages like these (at least on Solaris); they can be ignored:

```
ld: warning: symbol `_iob' has differing sizes:
    (file /my/local/pthreads/lib/libpthread.a(findfp.o) value=0x4;
file /usr/lib/libc.so value=0x140);
    /my/local/pthreads/lib/libpthread.a(findfp.o) definition taken
ld: warning: symbol `__iob' has differing sizes:
    (file /my/local/pthreads/lib/libpthread.a(findfp.o) value=0x4;
file /usr/lib/libc.so value=0x140);
    /my/local/pthreads/lib/libpthread.a(findfp.o) definition taken
```

- Some other warnings also can be ignored:

```
implicit declaration of function `int strtoll(...)'
implicit declaration of function `int strtoul(...)'
```

- We have not been able to make `readline` work with MIT-pthreads. (This is not necessary, but may be of interest to some.)

16.6. Installing MySQL from Source on Windows

These instructions describe how to build binaries from source for MySQL 5.0 on Windows. Instructions are provided for building binaries from a standard source distribution or from the Bazaar tree that contains the latest development source.

> **Note**
>
> The instructions here are strictly for users who want to test MySQL on Microsoft Windows from the latest source distribution or from the Bazaar tree. For production use, we do not advise using a MySQL server built by yourself from source. Normally, it is best to use precompiled binary distributions of MySQL that are built specifically for optimal performance on Windows by Sun Microsystems, Inc. Instructions for installing binary distributions are available in Chapter 9, *Installing MySQL on Windows*.

To build MySQL on Windows from source, you must satisfy the following system, compiler, and resource requirements:

- Windows 2000, Windows XP, or newer version.

Windows Vista is supported when using Visual Studio 2005 provided you have installed the following updates:

- Microsoft Visual Studio 2005 Professional Edition - ENU Service Pack 1 (KB926601)

- Security Update for Microsoft Visual Studio 2005 Professional Edition - ENU (KB937061)

- Update for Microsoft Visual Studio 2005 Professional Edition - ENU (KB932232)

- To build from the standard source distribution, you will need CMake, which can be downloaded from http://www.cmake.org. After installing, modify your path to include the `cmake` binary.

- Microsoft Visual C++ 2005 Express Edition, Visual Studio .Net 2003 (7.1), or Visual Studio 2005 (8.0) compiler system.

- If you are using Visual C++ 2005 Express Edition, you must also install an appropriate Platform SDK. More information and links to downloads for various Windows platforms is available from http://www.microsoft.com/downloads/details.aspx?familyid=0baf2b35-c656-4969-ace8-e4c0c0716adb.

- If you are compiling from a Bazaar tree or making changes to the parser, you need `bison` for Windows, which can be downloaded from http://gnuwin32.sourceforge.net/packages/bison.htm. Download the package labeled "Complete package, excluding sources". After installing the package, modify your path to include the `bison` binary and ensure that this binary is accessible from Visual Studio.

- Cygwin might be necessary if you want to run the test script or package the compiled binaries and support files into a Zip archive. (Cygwin is needed only to test or package the distribution, not to build it.) Cygwin is available from http://cygwin.com.

- 3GB to 5GB of disk space.

The exact system requirements can be found here: http://msdn.microsoft.com/vstudio/Previous/2003/sysreqs/default.aspx and http://msdn.microsoft.com/vstudio/products/sysreqs/default.aspx

There are three solutions available for building from the source code on Windows:

- Build from the standard MySQL source distribution. For this you will need CMake and Visual C++ Express Edition or Visual Studio. Using this method you can select the storage engines that are included in your build. To use this method, see Section 16.6.1, "Building MySQL from the Standard Source Distribution".

- Build from the MySQL Windows source distribution. The Windows source distribution includes ready-made Visual Studio solution files that enable support for all storage engines (except NDB). To build using using method you only need Visual C++ Express Edition or Visual Studio. To use this method, see Section 16.6.2, "Building MySQL from a Windows Source Distribution".

- Build directly from the Bazaar source repository. For this you will need CMake, Visual C++ Express Edition or Visual Studio, and `bison`. For this method you need to create the distribution on a Unix system and then copy the generated files to your Windows build environment. To use this method, see Section 16.6.5, "Creating a Windows Source Package from the Bazaar Repository".

If you find something not working as expected, or you have suggestions about ways to improve the current build process on Windows, please send a message to the `win32` mailing list. See MySQL Mailing Lists.

16.6.1. Building MySQL from the Standard Source Distribution

You can build MySQL on Windows by using a combination of `cmake` and Microsoft Visual Studio .NET 2003 (7.1), Microsoft Visual Studio 2005 (8.0) or Microsoft Visual C++ 2005 Express Edition. You must have the appropriate Microsoft Platform SDK installed.

> **Note**
>
> To compile from the source code using CMake you must use the standard source distribution (for example, `mysql-5.0.45.tar.gz`). You build from the same distribution as used to build MySQL on Unix, Linux and other platforms. Do *not* use the Windows Source distributions as they do not contain the necessary configuration script and other files.

Follow this procedure to build MySQL:

1. If you are installing from a packaged source distribution, create a work directory (for example, `C:\workdir`), and unpack the source distribution there using `WinZip` or another Windows tool that can read `.zip` files. This directory is the work dir-

ectory in the following instructions.

2. If you are installing from a Bazaar tree, the root directory of that tree is the work directory in the following instructions.

3. Using a command shell, navigate to the work directory and run the following command:

```
C:\workdir>win\configure.js options
```

If you have associated the `.js` file extension with an application such as a text editor, then you may need to use the following command to force `configure.js` to be executed as a script:

```
C:\workdir>cscript win\configure.js options
```

These options are available for `configure.js`:

*   `WITH_INNOBASE_STORAGE_ENGINE`: Enable the `InnoDB` storage engine.

*   `WITH_PARTITION_STORAGE_ENGINE`: Enable user-defined partitioning.

*   `WITH_ARCHIVE_STORAGE_ENGINE`: Enable the `ARCHIVE` storage engine.

*   `WITH_BLACKHOLE_STORAGE_ENGINE`: Enable the `BLACKHOLE` storage engine.

*   `WITH_EXAMPLE_STORAGE_ENGINE`: Enable the `EXAMPLE` storage engine.

*   `WITH_FEDERATED_STORAGE_ENGINE`: Enable the `FEDERATED` storage engine.

*   `MYSQL_SERVER_SUFFIX=suffix`: Server suffix, default none.

*   `COMPILATION_COMMENT=comment`: Server comment, default "Source distribution".

*   `MYSQL_TCP_PORT=port`: Server port, default 3306.

*   `DISABLE_GRANT_OPTIONS`: Disables the the `--bootstrap`, `--skip-grant-tables`, and `--init-file` options for `mysqld`. This option is available as of MySQL 5.0.36.

For example (type the command on one line):

```
C:\workdir>win\configure.js WITH_INNOBASE_STORAGE_ENGINE »
            WITH_PARTITION_STORAGE_ENGINE MYSQL_SERVER_SUFFIX=-pro
```

4. From the work directory, execute the `win\build-vs8.bat` or `win\build-vs71.bat` file, depending on the version of Visual Studio you have installed. The script invokes CMake, which generates the `mysql.sln` solution file you will need to build MySQL using Visual Studio..

    You can also use `win\build-vs8_x64.bat` to build the 64-bit version of MySQL. However, you cannot build the 64-bit version with Visual Studio Express Edition. You must use Visual Studio 2005 (8.0) or higher.

5. From the work directory, open the generated `mysql.sln` file with Visual Studio and select the proper configuration using the CONFIGURATION menu. The menu provides Debug, Release, RelwithDebInfo, MinRelInfo options. Then select SOLUTION > Build to build the solution.

    The build process will take some time. Please be patient.

    Remember the configuration that you use in this step. It is important later when you run the test script because that script needs to know which configuration you used.

6. You should test you build before installation. See Section 16.6.4, "Testing a Windows Source Build".

7. To install, use the instructions in Section 16.6.3, "Installing MySQL from a Source Build on Windows".

16.6.2. Building MySQL from a Windows Source Distribution

The Windows source distribution includes the necessary solution file and the `vcproj` files required to build each component. Using this method you are not able to select the storage engines that are included in your build.

> **Note**
>
> VC++ workspace files for MySQL 4.1 and above are compatible with Microsoft Visual Studio 7.1 and tested by

▊ MySQL AB staff before each release.

Follow this procedure to build MySQL:

1. Create a work directory (for example, `C:\workdir`).

2. Unpack the source distribution in the aforementioned directory using `WinZip` or another Windows tool that can read `.zip` files.

3. Start Visual Studio .Net 2003 (7.1).

4. From the FILE menu, select Open Solution....

5. Open the `mysql.sln` solution you find in the work directory.

6. From the BUILD menu, select Configuration Manager....

7. In the ACTIVE SOLUTION CONFIGURATION pop-up menu, select the configuration to use. You likely want to use one of nt (normal server), Max nt (more engines and features), or Debug configuration.

8. From the BUILD menu, select Build Solution.

9. Debug versions of the programs and libraries are placed in the `client_debug` and `lib_debug` directories. Release versions of the programs and libraries are placed in the `client_release` and `lib_release` directories.

10. You should test you build before installation. See Section 16.6.4, "Testing a Windows Source Build".

11. To install, use the instructions in Section 16.6.3, "Installing MySQL from a Source Build on Windows".

16.6.3. Installing MySQL from a Source Build on Windows

When you are satisfied that the program you have built is working correctly, stop the server. Now you can install the distribution. There are two ways to do this, either by using the supplied installation script or by copying the files individually by hand.

To use the script method you must have Cygwin installed as the script is a Shell script. To execute the installation process, run the `make_win_bin_dist` script in the `scripts` directory of the MySQL source distribution (see `make_win_bin_dist`). This is a shell script, so you must have Cygwin installed if you want to use it. It creates a Zip archive of the built executables and support files that you can unpack to your desired installation location.

It is also possible to install MySQL by copying directories and files manually:

1. Create the directories where you want to install MySQL. For example, to install into `C:\mysql`, use these commands:

```
shell> mkdir C:\mysql
shell> mkdir C:\mysql\bin
shell> mkdir C:\mysql\data
shell> mkdir C:\mysql\share
shell> mkdir C:\mysql\scripts
```

If you want to compile other clients and link them to MySQL, you should also create several additional directories:

```
shell> mkdir C:\mysql\include
shell> mkdir C:\mysql\lib
shell> mkdir C:\mysql\lib\debug
shell> mkdir C:\mysql\lib\opt
```

If you want to benchmark MySQL, create this directory:

```
shell> mkdir C:\mysql\sql-bench
```

Benchmarking requires Perl support. See Chapter 21, *Perl Installation Notes*.

2. From the work directory, copy into the `C:\mysql` directory the following directories:

```
shell> cd \workdir
C:\workdir> copy client_release\*.exe C:\mysql\bin
C:\workdir> copy client_debug\mysqld.exe C:\mysql\bin\mysqld-debug.exe
C:\workdir> xcopy scripts\*.* C:\mysql\scripts /E
C:\workdir> xcopy share\*.* C:\mysql\share /E
```

If you want to compile other clients and link them to MySQL, you should also copy several libraries and header files:

```
C:\workdir> copy lib_debug\mysqlclient.lib C:\mysql\lib\debug
C:\workdir> copy lib_debug\libmysql.* C:\mysql\lib\debug
C:\workdir> copy lib_debug\zlib.* C:\mysql\lib\debug
C:\workdir> copy lib_release\mysqlclient.lib C:\mysql\lib\opt
C:\workdir> copy lib_release\libmysql.* C:\mysql\lib\opt
C:\workdir> copy lib_release\zlib.* C:\mysql\lib\opt
C:\workdir> copy include\*.h C:\mysql\include
C:\workdir> copy libmysql\libmysql.def C:\mysql\include
```

If you want to benchmark MySQL, you should also do this:

```
C:\workdir> xcopy sql-bench\*.* C:\mysql\bench /E
```

After installation, set up and start the server in the same way as for binary Windows distributions. See Chapter 9, *Installing MySQL on Windows*.

16.6.4. Testing a Windows Source Build

You should test the server that you have built from source before using the distribution.

To test the server you need to run the built `mysqld`. By default, using the source build examples, the MySQL base directory and data directory are `C:\mysql` and `C:\mysql\data`. If you want to test your server using the source tree root directory and its data directory as the base directory and data directory, you need to tell the server their path names. You can either do this on the command line with the `--basedir` and `--datadir` options, or by placing appropriate options in an option file. (See Using Option Files.) If you have an existing data directory elsewhere that you want to use, you can specify its path name instead.

When the server is running in standalone fashion or as a service based on your configuration, try to connect to it from the `mysql` interactive command-line utility.

You can also run the standard test script, `mysql-test-run.pl`. This script is written in Perl, so you'll need either Cygwin or ActiveState Perl to run it. You may also need to install the modules required by the script. To run the test script, change location into the `mysql-test` directory under the work directory, set the `MTR_VS_CONFIG` environment variable to the configuration you selected earlier (or use the `--vs-config` option), and invoke `mysql-test-run.pl`. For example (using Cygwin and the `bash` shell):

```
shell> cd mysql-test
shell> export MTS_VS_CONFIG=debug
shell> ./mysql-test-run.pl --force --timer
shell> ./mysql-test-run.pl --force --timer --ps-protocol
```

16.6.5. Creating a Windows Source Package from the Bazaar Repository

To create a Windows source package from the current Bazaar source tree, use the instructions here. This procedure must be performed on a system running a Unix or Unix-like operating system because some of the configuration and build steps require tools that work only on Unix. For example, the following procedure is known to work well on Linux.

1. Copy the Bazaar source tree for MySQL 5.0. For instructions on how to do this, see Section 16.3, "Installing from the Development Source Tree".

2. Configure and build the distribution so that you have a server binary to work with. One way to do this is to run the following command in the top-level directory of your source tree:

   ```
   shell> ./BUILD/compile-pentium-max
   ```

3. After making sure that the build process completed successfully, run the following utility script from top-level directory of your source tree:

   ```
   shell> ./scripts/make_win_src_distribution
   ```

   This script creates a Windows source package to be used on your Windows system. You can supply different options to the script based on your needs. See `make_win_src_distribution`, for a list of allowable options.

   By default, `make_win_src_distribution` creates a Zip-format archive with the name `mysql-VERSION-win-src.zip`, where *VERSION* represents the version of your MySQL source tree.

4. Copy or upload the Windows source package that you have just created to your Windows machine. To compile it, use the instructions in Section 16.6.2, "Building MySQL from a Windows Source Distribution".

16.7. Compiling MySQL Clients on Windows

In your source files, you should include `my_global.h` before `mysql.h`:

```
#include <my_global.h>
#include <mysql.h>
```

`my_global.h` includes any other files needed for Windows compatibility (such as `windows.h`) if you compile your program on Windows.

You can either link your code with the dynamic `libmysql.lib` library, which is just a wrapper to load in `libmysql.dll` on demand, or link with the static `mysqlclient.lib` library.

The MySQL client libraries are compiled as threaded libraries, so you should also compile your code to be multi-threaded.

Chapter 17. Post-Installation Setup and Testing

After installing MySQL, there are some issues that you should address. For example, on Unix, you should initialize the data directory and create the MySQL grant tables. On all platforms, an important security concern is that the initial accounts in the grant tables have no passwords. You should assign passwords to prevent unauthorized access to the MySQL server. Optionally, you can create time zone tables to enable recognition of named time zones.

The following sections include post-installation procedures that are specific to Windows systems and to Unix systems. Another section, Section 17.2.3, "Starting and Troubleshooting the MySQL Server", applies to all platforms; it describes what to do if you have trouble getting the server to start. Section 17.3, "Securing the Initial MySQL Accounts", also applies to all platforms. You should follow its instructions to make sure that you have properly protected your MySQL accounts by assigning passwords to them.

When you are ready to create additional user accounts, you can find information on the MySQL access control system and account management in The MySQL Access Privilege System, and MySQL User Account Management.

17.1. Windows Post-Installation Procedures

On Windows, the data directory and the grant tables do not have to be created. MySQL Windows distributions include the grant tables with a set of preinitialized accounts in the `mysql` database under the data directory. It is unnecessary to run the `mysql_install_db` script that is used on Unix. Regarding passwords, if you installed MySQL using the Windows Installation Wizard, you may have already assigned passwords to the accounts. (See Section 9.3, "Using the MySQL Installation Wizard".) Otherwise, use the password-assignment procedure given in Section 17.3, "Securing the Initial MySQL Accounts".

Before setting up 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 9.9, "Starting the Server for the First Time"), and then issue the following commands to verify that you can retrieve information from the server. The output should be similar to what is shown here:

```
shell> C:\mysql\bin\mysqlshow
+--------------------+
|     Databases      |
+--------------------+
| information_schema |
| mysql              |
| test               |
+--------------------+
shell> C:\mysql\bin\mysqlshow mysql
Database: mysql
+--------------------------+
|          Tables          |
+--------------------------+
| columns_priv             |
| db                       |
| func                     |
| help_category            |
| help_keyword             |
| help_relation            |
| help_topic               |
| host                     |
| proc                     |
| procs_priv               |
| tables_priv              |
| time_zone                |
| time_zone_leap_second    |
| time_zone_name           |
| time_zone_transition     |
| time_zone_transition_type|
| user                     |
+--------------------------+
shell> C:\mysql\bin\mysql -e "SELECT Host,Db,User FROM db" mysql
+------+-------+------+
| host | db    | user |
+------+-------+------+
| %    | test% |      |
+------+-------+------+
```

You may need to specify a different directory from the one shown; if you used the Windows Installation Wizard, then the default directory is `C:\Program Files\MySQL\MySQL Server 5.0`, and the `mysql` and `mysqlshow` client programs are in `C:\Program Files\MySQL\MySQL Server 5.0\bin`. See Section 9.3, "Using the MySQL Installation Wizard", for more information.

If you have already secured the initial MySQL accounts, you may need to use the `-u` and `-p` options to supply a user name and password to the `mysqlshow` and `mysql` client programs; otherwise the programs may fail with an error, or you may not be able to view all databases. For example, if you have assigned the password "secretpass" to the MySQL `root` account, then you can invoke `mysqlshow` and `mysql` as shown here:

```
shell> C:\mysql\bin\mysqlshow -uroot -psecretpass
```

```
+--------------------+
|     Databases      |
+--------------------+
| information_schema |
| mysql              |
| test               |
+--------------------+
shell> C:\mysql\bin\mysqlshow -uroot -psecretpass mysql
Database: mysql
+--------------------------+
|          Tables          |
+--------------------------+
| columns_priv             |
| db                       |
| func                     |
| help_category            |
| help_keyword             |
| help_relation            |
| help_topic               |
| host                     |
| proc                     |
| procs_priv               |
| tables_priv              |
| time_zone                |
| time_zone_leap_second    |
| time_zone_name           |
| time_zone_transition     |
| time_zone_transition_type|
| user                     |
+--------------------------+
shell> C:\mysql\bin\mysql -uroot -psecretpass -e "SELECT Host,Db,User FROM db" mysql
+------+-------+------+
| host | db    | user |
+------+-------+------+
| %    | test% |      |
+------+-------+------+
```

For more information about these programs, see `mysqlshow`, and `mysql`.

If you are running a version of Windows that supports services and you want the MySQL server to run automatically when Windows starts, see Section 9.11, "Starting MySQL as a Windows Service".

17.2. Unix Post-Installation Procedures

After installing MySQL on Unix, you need to initialize the grant tables, start the server, and make sure that the server works satisfactorily. You may also wish to arrange for the server to be started and stopped automatically when your system starts and stops. You should also assign passwords to the accounts in the grant tables.

On Unix, the grant tables are set up by the `mysql_install_db` program. For some installation methods, this program is run for you automatically:

- If you install MySQL on Linux using RPM distributions, the server RPM runs `mysql_install_db`.

- If you install MySQL on Mac OS X using a PKG distribution, the installer runs `mysql_install_db`.

Otherwise, you will need to run `mysql_install_db` yourself.

The following procedure describes how to initialize the grant tables (if that has not previously been done) and then start the server. It also suggests some commands that you can use to test whether the server is accessible and working properly. For information about starting and stopping the server automatically, see Section 17.2.2, "Starting and Stopping MySQL Automatically".

After you complete the procedure and have the server running, you should assign passwords to the accounts created by `mysql_install_db`. Instructions for doing so are given in Section 17.3, "Securing the Initial MySQL Accounts".

In the examples shown here, the server runs under the user ID of the `mysql` login account. This assumes that such an account exists. Either create the account if it does not exist, or substitute the name of a different existing login account that you plan to use for running the server.

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

   ```
   shell> cd BASEDIR
   ```

   BASEDIR is likely to be something like `/usr/local/mysql` or `/usr/local`. The following steps assume that you are located in this directory.

2. If necessary, run the `mysql_install_db` program to set up the initial MySQL grant tables containing the privileges that determine how users are allowed to connect to the server. You'll need to do this if you used a distribution type for which the

installation procedure doesn't run the program for you.

Typically, mysql_install_db needs to be run only the first time you install MySQL, so you can skip this step if you are upgrading an existing installation, However, mysql_install_db does not overwrite any existing privilege tables, so it should be safe to run in any circumstances.

To initialize the grant tables, use one of the following commands, depending on whether mysql_install_db is located in the bin or scripts directory:

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

It might be necessary to specify other options such as --basedir or --datadir if mysql_install_db does not use the correct locations for the installation directory or data directory. For example:

```
shell> bin/mysql_install_db --user=mysql \
        --basedir=/opt/mysql/mysql \
        --datadir=/opt/mysql/mysql/data
```

The mysql_install_db script creates the server's data directory. Under the data directory, it creates directories for the mysql database that holds all database privileges and the test database that you can use to test MySQL. The script also creates privilege table entries for root and anonymous-user accounts. The accounts have no passwords initially. A description of their initial privileges is given in Section 17.3, "Securing the Initial MySQL Accounts". Briefly, these privileges allow the MySQL root user to do anything, and allow anybody to create or use databases with a name of test or starting with test_.

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, the --user option should be used as shown if you run mysql_install_db as root. Otherwise, you should execute the script while logged in as mysql, in which case you can omit the --user option from the command.

mysql_install_db creates several tables in the mysql database, including user, db, host, tables_priv, columns_priv, func, and others. See The MySQL Access Privilege System, for a complete listing and description of these tables.

If you don't want to have the test database, you can remove it with mysqladmin -u root drop test after starting the server.

If you have trouble with mysql_install_db at this point, see Section 17.2.1, "Problems Running mysql_install_db".

3. Start the MySQL server:

```
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, the --user option should be used as shown if you run mysqld_safe as system root. Otherwise, you should execute the script while logged in to the system as mysql, in which case you can omit the --user option from the command.

Further instructions for running MySQL as an unprivileged user are given in How to Run MySQL as a Normal User.

If you neglected to create the grant tables before proceeding to this step, the following message appears in the error log file when you start the server:

```
mysqld: Can't find file: 'host.frm'
```

If you have other problems starting the server, see Section 17.2.3, "Starting and Troubleshooting the MySQL Server".

4. 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
```

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 5.0.84, for pc-linux-gnu on i686
...
Server version          5.0.84
```

```
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.

5. Verify that you can shut down the server:

    ```
    shell> bin/mysqladmin -u root shutdown
    ```

6. 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 --log &
    ```

    If `mysqld_safe` fails, see Section 17.2.3, "Starting and Troubleshooting the MySQL Server".

7. Run some simple tests to verify that you can retrieve information from the server. The output should be similar to what is shown here:

    ```
    shell> bin/mysqlshow
    +-----------+
    | Databases |
    +-----------+
    | mysql     |
    | test      |
    +-----------+
    shell> bin/mysqlshow mysql
    Database: mysql
    +---------------------------+
    |          Tables           |
    +---------------------------+
    | columns_priv              |
    | db                        |
    | func                      |
    | help_category             |
    | help_keyword              |
    | help_relation             |
    | help_topic                |
    | host                      |
    | proc                      |
    | procs_priv                |
    | tables_priv               |
    | time_zone                 |
    | time_zone_leap_second     |
    | time_zone_name            |
    | time_zone_transition      |
    | time_zone_transition_type |
    | user                      |
    +---------------------------+
    shell> bin/mysql -e "SELECT Host,Db,User FROM db" mysql
    +------+--------+------+
    | host | db     | user |
    +------+--------+------+
    | %    | test   |      |
    | %    | test_% |      |
    +------+--------+------+
    ```

8. There is a benchmark suite in the `sql-bench` directory (under the MySQL installation directory) that you can use to compare how MySQL performs on different platforms. The benchmark suite is written in Perl. It requires the Perl DBI module that provides a database-independent interface to the various databases, and some other additional Perl modules:

    ```
    DBI
    DBD::mysql
    Data::Dumper
    Data::ShowTable
    ```

    These modules can be obtained from CPAN (http://www.cpan.org/). See also Section 21.1, "Installing Perl on Unix".

    The `sql-bench/Results` directory contains the results from many runs against different databases and platforms. To run all tests, execute these commands:

    ```
    shell> cd sql-bench
    shell> perl run-all-tests
    ```

    If you don't have the `sql-bench` directory, you probably installed MySQL using RPM files other than the source RPM. (The source RPM includes the `sql-bench` benchmark directory.) In this case, you must first install the benchmark suite be-

fore you can use it. There are separate benchmark RPM files named `mysql-bench-VERSION.i386.rpm` that contain benchmark code and data.

If you have a source distribution, there are also tests in its `tests` subdirectory that you can run. For example, to run `auto_increment.tst`, execute this command from the top-level directory of your source distribution:

```
shell> mysql -vvf test < ./tests/auto_increment.tst
```

The expected result of the test can be found in the `./tests/auto_increment.res` file.

9. At this point, you should have the server running. However, none of the initial MySQL accounts have a password, so you should assign passwords using the instructions found in Section 17.3, "Securing the Initial MySQL Accounts".

The MySQL 5.0 installation procedure creates time zone tables in the `mysql` database. However, you must populate the tables manually using the instructions in MySQL Server Time Zone Support.

17.2.1. Problems Running `mysql_install_db`

The purpose of the `mysql_install_db` script is to generate new MySQL privilege tables. It does not overwrite existing MySQL privilege tables, and it does not affect any other data.

If you want 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 then run `mysql_install_db`. Suppose that your current directory is the MySQL installation directory and that `mysql_install_db` is located in the `bin` directory and the data directory is named `data`. To rename the `mysql` database and re-run `mysql_install_db`, use these commands.

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

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

*   **`mysql_install_db` fails to install the grant tables**

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

    ```
    Starting mysqld daemon with databases from XXXXXX
    mysqld ended
    ```

    In this case, you should examine the error log file very carefully. The log should be located in the directory XXXXXX named by the error message and should indicate why `mysqld` didn't 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 install MySQL the first time).

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

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

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

    For instructions on setting up multiple servers, see Running Multiple MySQL Servers on the Same 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), an error occurs when you run `mysql_install_db` or the `mysqld` server.

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

write permission:

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

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

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

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

See How to Protect or Change the MySQL Unix Socket File, and Chapter 20, *Environment Variables*.

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

- If you want the initial privileges to be different from the standard defaults, you can modify `mysql_install_db` before you run it. However, it is preferable to use `GRANT` and `REVOKE` to change the privileges *after* the grant tables have been set up. In other words, you can 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 `GRANT` and `REVOKE` statements.

  If you want to install MySQL on several machines with the same privileges, you can put the `GRANT` and `REVOKE` statements in a file and execute the file as a script using `mysql` after running `mysql_install_db`. For example:

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

  By doing this, you can avoid having to issue 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're just learning how to use `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, remove all the `.frm`, `.MYI`, and `.MYD` files in the `mysql` database directory. Then run the `mysql_install_db` script again.

- You can start `mysqld` manually using the `--skip-grant-tables` option and add the privilege information yourself using `mysql`:

  ```
  shell> bin/mysqld_safe --user=mysql --skip-grant-tables &
  shell> bin/mysql mysql
  ```

  From `mysql`, manually execute the SQL commands contained in `mysql_install_db`. Make sure that you run `mysqladmin flush-privileges` or `mysqladmin reload` afterward to tell the server to reload the grant tables.

  Note that by not using `mysql_install_db`, you not only have to populate the grant tables manually, you also have to create them first.

17.2.2. Starting and Stopping MySQL Automatically

Generally, you start the `mysqld` server in one of these ways:

- By invoking `mysqld` directly. This works on any platform.

- By running the MySQL server as a Windows service. The service can be set to start the server automatically when Windows starts, or as a manual service that you start on request. For instructions, see Section 9.11, "Starting MySQL as a Windows Service".

- By invoking `mysqld_safe`, which tries to determine the proper options for `mysqld` and then runs it with those options. This script is used on Unix and Unix-like systems. See `mysqld_safe`.

- By invoking `mysql.server`. This script is used primarily at system startup and shutdown on systems that use System V-style run directories, where it usually is installed under the name `mysql`. The `mysql.server` script starts the server by invoking `mysqld_safe`. See `mysql.server`.

- On Mac OS X, you can install a separate MySQL Startup Item package to enable the automatic startup of MySQL on system startup. The Startup Item starts the server by invoking `mysql.server`. See Chapter 11, *Installing MySQL on Mac OS X*, for details.

The `mysqld_safe` and `mysql.server` scripts and the Mac OS X Startup Item 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.

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

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

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

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

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

If you use the Linux server RPM package (`MySQL-server-VERSION.rpm`), the `mysql.server` script is installed in the `/etc/init.d` directory with the name `mysql`. You need not install it manually. See Chapter 10, *Installing MySQL from RPM Packages on Linux*, for more information on the Linux RPM packages.

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

If you install MySQL from a source distribution or using a binary distribution format that does not install `mysql.server` automatically, you can install it manually. The script can be found in the `support-files` directory under the MySQL installation directory or in a MySQL source tree.

To install `mysql.server` manually, copy it to the `/etc/init.d` directory with the name `mysql`, and then make it executable. Do this by changing location into the appropriate directory where `mysql.server` is located and executing these commands:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The following table shows which option groups the server and each startup script read from option files.

Script	Option Groups
`mysqld`	`[mysqld]`, `[server]`, `[mysqld-major_version]`
`mysqld_safe`	`[mysqld]`, `[server]`, `[mysqld_safe]`
`mysql.server`	`[mysqld]`, `[mysql.server]`, `[server]`

`[mysqld-major_version]` means that groups with names like `[mysqld-4.1]` and `[mysqld-5.0]` are read by servers having versions 4.1.x, 5.0.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 when using MySQL 5.0.

See Using Option Files.

17.2.3. Starting and Troubleshooting the MySQL Server

This section provides troubleshooting suggestions for problems starting the server on Unix. If you are using Windows, see Section 9.13, "Troubleshooting a MySQL Installation Under Windows".

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`, `BDB`, `NDB`), be sure that you have them configured the way you want before starting the server:

> **MySQL Enterprise**
> For expert advice on start-up options appropriate to your circumstances, subscribe to The MySQL Enterprise Monitor. For more information, see http://www.mysql.com/products/enterprise/advisors.html.

- If you are using `InnoDB` tables, see InnoDB Configuration.

- If you are using `BDB` (Berkeley DB) tables, see BDB Startup Options.

- If you are using MySQL Cluster, see MySQL Cluster 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.

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 don't 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 into 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 `mysqld`, this means that the privileges of the data directory or its contents do not allow the 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.

On Unix, change location into 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:

```
shell> chown -R mysql /usr/local/mysql/var
shell> chgrp -R mysql /usr/local/mysql/var
```

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 5.0\data` on Windows, `/usr/local/mysql/data` for a Unix binary distribution, and `/usr/local/var` for a Unix 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. On Unix, you can use `tail` to display them:

```
shell> tail host_name.err
shell> tail host_name.log
```

The error log should contain information that indicates why the server couldn't start. For example, you might see something like this in the log:

```
000729 14:50:10  bdb:   Recovery function for LSN 1 27595 failed
000729 14:50:10  bdb:   warning: ./test/t1.db: No such file or directory
000729 14:50:10  Can't init databases
```

This means that you did not start `mysqld` with the `--bdb-no-recover` option and Berkeley DB found something wrong with its own log files when it tried to recover your databases. To be able to continue, you should move the old Berkeley DB log files from the database directory to some other place, where you can later examine them. The BDB log files are named in sequence be-

ginning with `log.0000000001`, where the number increases over time.

If you are running `mysqld` with `BDB` table support and `mysqld` dumps core at startup, this could be due to problems with the `BDB` recovery log. In this case, you can try starting `mysqld` with `--bdb-no-recover`. If that helps, you should remove all `BDB` log files from the data directory and try starting `mysqld` again without the `--bdb-no-recover` option.

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 Servers on the Same 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 don't 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'll 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'll also need to specify the port number for client programs when connecting to the server via 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 allow access to the port.

If the server starts but you can't connect to it, you should make sure that you have an entry in `/etc/hosts` that looks like this:

```
127.0.0.1       localhost
```

This problem occurs only on systems that do not have a working thread library and for which MySQL must be configured to use MIT-pthreads.

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 MySQL Internals: Porting.

17.3. Securing the Initial MySQL Accounts

Part of the MySQL installation process is to set up the `mysql` database that contains the grant tables:

- Windows distributions contain preinitialized grant tables that are installed automatically.

- On Unix, the grant tables are populated by the `mysql_install_db` program. Some installation methods run this program for you. Others require that you execute it manually. For details, see Section 17.2, "Unix Post-Installation Procedures".

The grant tables define the initial MySQL user accounts and their access privileges. These accounts are set up as follows:

- Accounts with the user name `root` are created. These are superuser accounts that can do anything. The initial `root` account passwords are empty, so anyone can connect to the MySQL server as `root` — *without a password* — and be granted all privileges.

  - On Windows, one `root` account is created; this account allows connecting from the local host only. The Windows installer will optionally create an account allowing for connections from any host only if the user selects the **ENABLE ROOT ACCESS FROM REMOTE MACHINES** option during installation.

  - On Unix, both `root` accounts are for connections from the local host. Connections must be made from the local host by specifying a host name of `localhost` for one of the accounts, or the actual host name or IP number for the other.

- Two anonymous-user accounts are created, each with an empty user name. The anonymous accounts have no password, so anyone can use them to connect to the MySQL server.

  - On Windows, one anonymous account is for connections from the local host. It has no global privileges. (Before MySQL 5.1.16, it has all global privileges, just like the `root` accounts.) The other is for connections from any host and has all privileges for the `test` database and for other databases with names that start with `test`.

  - On Unix, both anonymous accounts are for connections from the local host. Connections must be made from the local host by specifying a host name of `localhost` for one of the accounts, or the actual host name or IP number for the other. These accounts have all privileges for the `test` database and for other databases with names that start with `test_`.

As noted, none of the initial accounts have passwords. This means that your MySQL installation is unprotected until you do something about it:

- If you want to prevent clients from connecting as anonymous users without a password, you should either assign a password to each anonymous account or else remove the accounts.

- You should assign a password to each MySQL `root` account.

The following instructions describe how to set up passwords for the initial MySQL accounts, first for the anonymous accounts and then for the `root` accounts. Replace "*newpwd*" in the examples with the actual password that you want to use. The instructions also cover how to remove the anonymous accounts, should you prefer not to allow anonymous access at all.

You might want to defer setting the passwords until later, so that you don't need to specify them while you perform additional setup or testing. However, be sure to set them before using your installation for production purposes.

Anonymous Account Password Assignment

To assign passwords to the anonymous accounts, connect to the server as `root` and then use either `SET PASSWORD` or `UPDATE`. In either case, be sure to encrypt the password using the `PASSWORD()` function.

To use `SET PASSWORD` on Windows, do this:

```
shell> mysql -u root
mysql> SET PASSWORD FOR ''@'localhost' = PASSWORD('newpwd');
mysql> SET PASSWORD FOR ''@'%' = PASSWORD('newpwd');
```

To use `SET PASSWORD` on Unix, do this:

```
shell> mysql -u root
mysql> SET PASSWORD FOR ''@'localhost' = PASSWORD('newpwd');
mysql> SET PASSWORD FOR ''@'host_name' = PASSWORD('newpwd');
```

In the second `SET PASSWORD` statement, replace *host_name* with the name of the server host. This is the name that is specified in the `Host` column of the non-`localhost` record for `root` in the `user` table. If you don't know what host name this is, issue the following statement before using `SET PASSWORD`:

```
mysql> SELECT Host, User FROM mysql.user;
```

Look for the record that has `root` in the `User` column and something other than `localhost` in the `Host` column. Then use that `Host` value in the second `SET PASSWORD` statement.

Anonymous Account Removal

If you prefer to remove the anonymous accounts instead, do so as follows:

```
shell> mysql -u root
mysql> DROP USER '';
```

The `DROP` statement applies both to Windows and to Unix. On Windows, if you want to remove only the anonymous account that has the same privileges as `root`, do this instead:

```
shell> mysql -u root
mysql> DROP USER ''@'localhost';
```

That account allows anonymous access but has full privileges, so removing it improves security.

`root` Account Password Assignment

You can assign passwords to the `root` accounts in several ways. The following discussion demonstrates three methods:

- Use the `SET PASSWORD` statement

- Use the `mysqladmin` command-line client program

- Use the `UPDATE` statement

To assign passwords using `SET PASSWORD`, connect to the server as `root` and issue `SET PASSWORD` statements. Be sure to en-

crypt the password using the `PASSWORD()` function.

For Windows, do this:

```
shell> mysql -u root
mysql> SET PASSWORD FOR 'root'@'localhost' = PASSWORD('newpwd');
mysql> SET PASSWORD FOR 'root'@'%' = PASSWORD('newpwd');
```

For Unix, do this:

```
shell> mysql -u root
mysql> SET PASSWORD FOR 'root'@'localhost' = PASSWORD('newpwd');
mysql> SET PASSWORD FOR 'root'@'host_name' = PASSWORD('newpwd');
```

In the second `SET PASSWORD` statement, replace *host_name* with the name of the server host. This is the same host name that you used when you assigned the anonymous account passwords.

If the `user` table contains an account with `User` and `Host` values of `'root'` and `'127.0.0.1'`, use an additional `SET PASSWORD` statement to set that account's password:

```
mysql> SET PASSWORD FOR 'root'@'127.0.0.1' = PASSWORD('newpwd');
```

To assign passwords to the `root` accounts using `mysqladmin`, execute the following commands:

```
shell> mysqladmin -u root password "newpwd"
shell> mysqladmin -u root -h host_name password "newpwd"
```

These commands apply both to Windows and to Unix. In the second command, replace *host_name* with the name of the server host. The double quotes 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 set the password for the `'root'@'127.0.0.1'` account. To do so, use `SET PASSWORD` as shown earlier.

You can also use `UPDATE` to modify the `user` table directly. The following `UPDATE` statement assigns a password to all `root` accounts:

```
shell> mysql -u root
mysql> UPDATE mysql.user SET Password = PASSWORD('newpwd')
    ->     WHERE User = 'root';
mysql> FLUSH PRIVILEGES;
```

The `UPDATE` statement applies both to Windows and to Unix.

After the passwords have been set, you must supply the appropriate password whenever you connect to the server. For example, if you want to use `mysqladmin` to shut down the server, you can do so using this command:

```
shell> mysqladmin -u root -p shutdown
Enter password: (enter root password here)
```

> **Note**
>
> If you forget your `root` password after setting it up, How to Reset the Root Password, covers the procedure for resetting it.

To set up additional accounts, you can use the `GRANT` statement. For instructions, see Adding User Accounts.

Chapter 18. Upgrading or Downgrading MySQL

18.1. Upgrading MySQL

As a general rule, to upgrade from one release series to another, you should go to the next series rather than skipping a series. To upgrade from a release series previous to MySQL 4.1, upgrade to each successive release series in turn until you have reached MySQL 4.1, and then proceed with the upgrade to MySQL 5.0. For example, if you currently are running MySQL 3.23 and wish to upgrade to a newer series, upgrade to MySQL 4.0 first before upgrading to 4.1, and so forth. For information on upgrading to MySQL 4.1 or earlier releases, see the *MySQL 3.23, 4.0, 4.1 Reference Manual*.

To upgrade from MySQL 4.1 to 5.0, use the items in the following checklist as a guide:

- Before any upgrade, back up your databases, including the `mysql` database that contains the grant tables. See Database Backups.

- Read *all* the notes in Section 18.1.2, "Upgrading from MySQL 4.1 to 5.0". These notes enable you to identify upgrade issues that apply to your current MySQL installation. Some incompatibilities discussed in that section require your attention *before* upgrading. Others should be dealt with *after* upgrading.

- Read MySQL Change History as well, which provides information about features that are new in MySQL 5.0 or differ from those found in MySQL 4.1.

- After you upgrade to a new version of MySQL, run `mysql_upgrade` (see `mysql_upgrade`). This program checks your tables, and attempts to repair them if necessary. It also updates your grant tables to make sure that they have the current structure so that you can take advantage of any new capabilities. (Some releases of MySQL introduce changes to the structure of the grant tables to add new privileges or features.)

- If you are running MySQL Server on Windows, see Section 9.14, "Upgrading MySQL on Windows".

- If you are using replication, see Upgrading a Replication Setup, for information on upgrading your replication setup.

- If you are upgrading an installation originally produced by installing multiple RPM packages, it is best to 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.

- MySQL 5.0.27 is the last version in MySQL 5.0 for which MySQL-Max binary distributions are provided, except for RPM distributions. For RPMs, MySQL 5.0.37 is the last release. After these versions, the features previously included in the `mysqld-max` server are included in `mysqld`.

  If you previously installed a MySQL-Max distribution that includes a server named `mysqld-max`, and then upgrade later to a non-Max version of MySQL, `mysqld_safe` still attempts to run the old `mysqld-max` server. If you perform such an upgrade, you should remove the old `mysqld-max` server manually to ensure that `mysqld_safe` runs the new `mysqld` server.

You can always move the MySQL format files and data files between different versions on systems with the same architecture as long as you stay within versions for the same release series of MySQL.

If you are cautious about using new versions, you can always rename your old `mysqld` before installing a newer one. For example, if you are using MySQL 4.1.13 and want to upgrade to 5.0.10, rename your current server from `mysqld` to `mysqld-4.1.13`. If your new `mysqld` then does something unexpected, you can simply shut it down and restart with your old `mysqld`.

If, after an upgrade, you experience problems with recompiled 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, you should 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.

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.

It is a good idea to rebuild and reinstall the Perl `DBD::mysql` module whenever you install a new release of MySQL. The same applies to other MySQL interfaces as well, such as PHP `mysql` extensions and the Python `MySQLdb` module.

18.1.1. Upgrading from MySQL 5.0 to 5.0.10 or Higher

After upgrading a 5.0 installation to 5.0.10 or higher, it is *necessary* to upgrade your grant tables. Otherwise, creating stored procedures and functions might not work. The procedure for doing this is described in `mysql_upgrade`.

18.1.2. Upgrading from MySQL 4.1 to 5.0

> **Note**
>
> It is good practice to back up your data before installing any new version of software. Although MySQL works very hard to ensure a high level of quality, you should protect your data by making a backup.
>
> To upgrade to 5.0 from any previous version, MySQL recommends that you dump your tables with `mysqldump` before upgrading and reload the dump file after upgrading.

In general, you should do the following when upgrading from MySQL 4.1 to 5.0:

- Read *all* the items in the following sections to see whether any of them might affect your applications:

    - Section 18.1, "Upgrading MySQL", has general update information.

    - The items in the change lists found later in this section enable you to identify upgrade issues that apply to your current MySQL installation.

    - The MySQL 5.0 change history describes significant new features you can use in 5.0 or that differ from those found in MySQL 4.1. Some of these changes may result in incompatibilities. See Changes in release 5.0.x (Production).

- Note particularly any changes that are marked **Known issue** or **Incompatible change**. These incompatibilities with earlier versions of MySQL may require your attention *before you upgrade*.

    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 any upgrade issue applicable to your installation involves an incompatibility that requires special handling, follow the instructions given in the incompatibility description. Often this will involve a dump and reload, or use of a statement such as `CHECK TABLE` or `REPAIR TABLE`.

    For dump and reload instructions, see Section 18.4, "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.

- After you upgrade to a new version of MySQL, run `mysql_upgrade` (see `mysql_upgrade`). This program checks your tables, and attempts to repair them if necessary. It also updates your grant tables to make sure that they have the current structure so that you can take advantage of any new capabilities. (Some releases of MySQL introduce changes to the structure of the grant tables to add new privileges or features.)

- Check Section 18.3, "Checking Whether Table Indexes Must Be Rebuilt", to see whether changes to character sets or collations were made that affect your table indexes. If so, you will need to rebuild the affected indexes using the instructions in Section 18.4, "Rebuilding or Repairing Tables or Indexes".

- If you are running MySQL Server on Windows, see Section 9.14, "Upgrading MySQL on Windows".

- MySQL 5.0 adds support for stored procedures. This support requires the `mysql.proc` table. To create this table, you should run the `mysql_upgrade` program as described in `mysql_upgrade`.

- MySQL 5.0 adds support for views. This support requires extra privilege columns in the `mysql.user` and `mysql.db` tables. To create these columns, you should run the `mysql_upgrade` program as described in `mysql_upgrade`.

- If you are using replication, see Upgrading a Replication Setup, for information on upgrading your replication setup.

> **MySQL Enterprise**
> MySQL Enterprise subscribers will find more information about upgrading in the Knowledge Base articles found at Upgrading. Access to the MySQL Knowledge Base collection of articles is one of the advantages of subscribing to MySQL Enterprise. For more information, see http://www.mysql.com/products/enterprise/advisors.html.

Several visible behaviors have changed between MySQL 4.1 and MySQL 5.0 to make MySQL more compatible with standard SQL. These changes may affect your applications.

The following lists describe changes that may affect applications and that you should watch out for when upgrading to MySQL 5.0.

Server Changes:

- **Incompatible change**: Character set changes were made in MySQL 5.0.48 that may require table indexes to be rebuilt. For de-

tails, see Section 18.3, "Checking Whether Table Indexes Must Be Rebuilt".

- **Incompatible change**: The indexing order for end-space in `TEXT` columns for `InnoDB` and `MyISAM` tables has changed. Starting from 5.0.3, `TEXT` indexes are compared as space-padded at the end (just as MySQL sorts `CHAR`, `VARCHAR` and `TEXT` fields). If you have an index on a `TEXT` column, you should run `CHECK TABLE` on it. If the check reports errors, rebuild the indexes: Dump and reload the table if it is an `InnoDB` table, or run `OPTIMIZE TABLE` or `REPAIR TABLE` if it is a `MyISAM` table.

- **Incompatible change**. For `BINARY` columns, the pad value and how it is handled has changed as of MySQL 5.0.15. The pad value for inserts now is `0x00` rather than space, and there is no stripping of the pad value for retrievals. For details, see The `BINARY` and `VARBINARY` Types.

- **Incompatible change**. As of MySQL 5.0.3, trailing spaces no longer are removed from values stored in `VARCHAR` and `VAR-BINARY` columns. The maximum lengths for `VARCHAR` and `VARBINARY` columns in MySQL 5.0.3 and later are 65,535 characters and 65,535 bytes, respectively.

  When a binary upgrade (filesystem-level copy of data files) to MySQL 5.0 is performed for a table with a `VARBINARY` column, the column is space-padded to the full allowable width of the column. This causes values in `VARBINARY` columns that do not occupy the full width of the column to include extra trailing spaces after the upgrade, which means that the data in the column is different.

  In addition, new rows inserted into a table upgraded in this way will be space padded to the full width of the column.

  This issue can be resolved as follows:

  1. For each table containing `VARBINARY` columns, execute the following statement, where *tbl_name* is the name of the table and *engine_name* is the name of the storage engine currently used by *tbl_name*:

     ```
     ALTER TABLE tbl_name ENGINE=engine_name;
     ```

     In other words, if the table named `mytable` uses the `MyISAM` storage engine, then you would use this statement:

     ```
     ALTER TABLE mytable ENGINE=MYISAM;
     ```

     This rebuilds the table so that it uses the 5.0 `VARBINARY` format.

  2. Then you must remove all trailing spaces from any `VARBINARY` column values. For each `VARBINARY` column *varbinary_column*, execute the following statement, where *tbl_name* is the name of the table containing the `VARBINARY` column:

     ```
     UPDATE tbl_name SET varbinary_column = RTRIM(varbinary_column);
     ```

     This is necessary and safe because trailing spaces are stripped before 5.0.3, meaning that any trailing spaces are erroneous.

  This problem does not occur (and thus these two steps are not required) for tables upgraded using the recommended procedure of dumping tables prior to the upgrade and reloading them afterwards.

  > **Note**
  >
  > If you create a table with new `VARCHAR` or `VARBINARY` columns in MySQL 5.0.3 or later, the table will not be usable if you downgrade to a version older than 5.0.3. Dump the table with `mysqldump` before downgrading and reload it after downgrading.

- **Incompatible change**: The implementation of `DECIMAL` was changed in MySQL 5.0.3. You should make your applications aware of this change. For information about this change, and about possible incompatibilities with old applications, see Precision Math, in particular, `DECIMAL` Data Type Changes.

  `DECIMAL` columns are stored in a more efficient format. To convert a table to use the new `DECIMAL` type, you should do an `ALTER TABLE` on it. (The `ALTER TABLE` also will change the table's `VARCHAR` columns to use the new `VARCHAR` data type properties, described in a separate item.)

  A consequence of the change in handling of the `DECIMAL` and `NUMERIC` fixed-point data types is that the server is more strict to follow standard SQL. For example, a data type of `DECIMAL(3,1)` stores a maximum value of 99.9. Before MySQL 5.0.3, the server allowed larger numbers to be stored. That is, it stored a value such as 100.0 as 100.0. As of MySQL 5.0.3, the server clips 100.0 to the maximum allowable value of 99.9. If you have tables that were created before MySQL 5.0.3 and that contain floating-point data not strictly legal for the data type, you should alter the data types of those columns. For example:

  ```
  ALTER TABLE tbl_name MODIFY col_name DECIMAL(4,1);
  ```

The behavior used by the server for `DECIMAL` columns in a table depends on the version of MySQL used to create the table. If your server is from MySQL 5.0.3 or higher, but you have `DECIMAL` columns in tables that were created before 5.0.3, the old behavior still applies to those columns. To convert the tables to the newer `DECIMAL` format, dump them with `mysqldump` and reload them.

- **Incompatible change:** MySQL 5.0.3 and up uses precision math when calculating with `DECIMAL` and integer columns (64 decimal digits) and for rounding exact-value numbers. Rounding behavior is well-defined, not dependent on the implementation of the underlying C library. However, this might result in incompatibilities for applications that rely on the old behavior. (For example, inserting .5 into an `INT` column results in 1 as of MySQL 5.0.3, but might be 0 in older versions.) For more information about rounding behavior, see Rounding Behavior, and Precision Math Examples.

- **Incompatible change**: `MyISAM` and `InnoDB` tables created with `DECIMAL` columns in MySQL 5.0.3 to 5.0.5 will appear corrupt after an upgrade to MySQL 5.0.6. (The same incompatibility will occur for these tables created in MySQL 5.0.6 after a downgrade to MySQL 5.0.3 to 5.0.5.) If you have such tables, check and repair them with `mysql_upgrade` after upgrading. See `mysql_upgrade`.

- **Incompatible change:** For user-defined functions, exact-value decimal arguments such as `1.3` or `DECIMAL` column values were passed as `REAL_RESULT` values prior to MySQL 5.0.3. As of 5.0.3, they are passed as strings with a type of `DECIMAL_RESULT`. If you upgrade to 5.0.3 and find that your UDF now receives string values, use the initialization function to coerce the arguments to numbers as described in UDF Argument Processing.

- **Incompatible change**: As of MySQL 5.0.3, the server by default no longer loads user-defined functions (UDFs) unless they have at least one auxiliary symbol (for example, an `xxx_init` or `xxx_deinit` symbol) defined in addition to the main function symbol. This behavior can be overridden with the `--allow-suspicious-udfs` option. See User-Defined Function Security Precautions.

- **Incompatible change**: As of MySQL 5.0.13, `InnoDB` rolls back only the last statement on a transaction timeout. As of MySQL 5.0.32, a new option, `--innodb_rollback_on_timeout`, causes `InnoDB` to abort and roll back the entire transaction if a transaction timeout occurs (the same behavior as in MySQL 4.1).

- **Incompatible change**: For `ENUM` columns that had enumeration values containing commas, the commas were mapped to `0xff` internally. However, this rendered the commas indistinguishable from true `0xff` characters in the values. This no longer occurs. However, the fix requires that you dump and reload any tables that have `ENUM` columns containing true `0xff` in their values: Dump the tables using `mysqldump` with the current server before upgrading from a version of MySQL 5.0 older than 5.0.36 to version 5.0.36 or newer.

- **Incompatible change**: The update log has been removed in MySQL 5.0. If you had enabled it previously, enable the binary log instead.

- **Incompatible change:** Support for the `ISAM` storage engine has been removed in MySQL 5.0. If you have any `ISAM` tables, you should convert them *before* upgrading. For example, to convert an `ISAM` table to use the `MyISAM` storage engine, use this statement:

```
ALTER TABLE tbl_name ENGINE = MyISAM;
```

Use a similar statement for every `ISAM` table in each of your databases.

- **Incompatible change**: Support for `RAID` options in `MyISAM` tables has been removed in MySQL 5.0. If you have tables that use these options, you should convert them before upgrading. One way to do this is to dump them with `mysqldump`, edit the dump file to remove the `RAID` options in the `CREATE TABLE` statements, and reload the dump file. Another possibility is to use `CREATE TABLE new_tbl ... SELECT raid_tbl` to create a new table from the `RAID` table. However, the `CREATE TABLE` part of the statement must contain sufficient information to re-create column attributes as well as indexes, or column attributes may be lost and indexes will not appear in the new table. See `CREATE TABLE` Syntax.

The `.MYD` files for `RAID` tables in a given database are stored under the database directory in subdirectories that have names consisting of two hex digits in the range from `00` to `ff`. After converting all tables that use `RAID` options, these `RAID`-related subdirectories still will exist but can be removed. Verify that they are empty, and then remove them manually. (If they are not empty, this indicates that there is some `RAID` table that has not been converted.)

- **Incompatible change**: Beginning with MySQL 5.0.42, when a `DATE` value is compared with a `DATETIME` value, the `DATE` value is coerced to the `DATETIME` type by adding the time portion as `00:00:00`. Previously, the time portion of the `DATETIME` value was ignored, or the comparison could be performed as a string comparison. To mimic the old behavior, use the `CAST()` function to cause the comparison operands to be treated as previously. For example:

```
date_col = CAST(NOW() AS DATE)
```

- **Incompatible change:** `SHOW CREATE VIEW` displays view definitions using an `AS alias_name` clause for each column. If a column is created from an expression, the default alias is the expression text, which can be quite long. As of MySQL 5.0.52, aliases for column names in `CREATE VIEW` statements are checked against the maximum column length of 64 charac-

ters (not the maximum alias length of 256 characters). As a result, views created from the output of `SHOW CREATE VIEW` fail if any column alias exceeds 64 characters. This can cause problems for replication or loading dump files. For additional information and workarounds, see Restrictions on Views.

- As of MySQL 5.0.25, the `lc_time_names` system variable specifies the locale that controls the language used to display day and month names and abbreviations. This variable affects the output from the `DATE_FORMAT()`, `DAYNAME()` and `MONTH-NAME()` functions. See MySQL Server Locale Support.

- In MySQL 5.0.6, binary logging of stored routines and triggers was changed. This change has implications for security, replication, and data recovery, as discussed in Binary Logging of Stored Programs.

- As of MySQL 5.0.28, `mysqld_safe` no longer implicitly invokes `mysqld-max` if it exists. Instead, it invokes `mysqld` unless a `--mysqld` or `--mysqld-version` option is given to specify another server explicitly. If you previously relied on the implicit invocation of `mysqld-max`, you should use an appropriate option now.

SQL Changes:

- **Known issue**: Prior to MySQL 5.0.46, the parser accepted invalid code in SQL condition handlers, leading to server crashes or unexpected execution behavior in stored programs. Specifically, the parser allowed a condition handler to refer to labels for blocks that enclose the handler declaration. This was incorrect because block label scope does not include the code for handlers declared within the labeled block.

  As of 5.0.46, the parser rejects this invalid construct, but if you upgrade in place (without dumping and reloading your databases), existing handlers that contain the construct still are invalid *even if they appear to function as you expect* and should be rewritten.

  To find affected handlers, use mysqldump to dump all stored procedures and functions, triggers, and events. Then attempt to reload them into an upgraded server. Handlers that contain illegal label references will be rejected.

  For more information about condition handlers and writing them to avoid invalid jumps, see `DECLARE` for Handlers.

- **Incompatible change:** The parser accepted statements that contained `/* ... */` that were not properly closed with `*/`, such as `SELECT 1 /* + 2`. As of MySQL 5.0.50, statements that contain unclosed `/*`-comments now are rejected with a syntax error.

  This fix has the potential to cause incompatibilities. Because of Bug#26302, which caused the trailing `*/` to be truncated from comments in views, stored routines, triggers, and events, it is possible that objects of those types may have been stored with definitions that now will be rejected as syntactically invalid. Such objects should be dropped and re-created so that their definitions do not contain truncated comments. If a stored object definition contains only a single statement (does not use a `BEGIN ... END` block) and contains a comment within the statement, the comment should be moved to follow the statement or the object should be rewritten to use a `BEGIN ... END` block. For example, this statement:

```
CREATE PROCEDURE p() SELECT 1 /* my comment */ ;
```

  Can be rewritten in either of these ways:

```
CREATE PROCEDURE p() SELECT 1; /* my comment */
CREATE PROCEDURE p() BEGIN SELECT 1 /* my comment */ ; END;
```

- **Incompatible change**: 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 FUNC-TION` to drop the UDF, and then use `CREATE FUNCTION` to re-create the UDF with a different non-conflicting name. If a new version of MySQL implements a built-in function with the same name as an existing stored function, you have two choices: Rename the stored function to use a non-conflicting name, or change calls to the function so that they use a database qualifier (that is, use `db_name.func_name()` syntax). See Function Name Parsing and Resolution, for the rules describing how the server interprets references to different kinds of functions.

- **Incompatible change:** Beginning with MySQL 5.0.12, natural joins and joins with `USING`, including outer join variants, are processed according to the SQL:2003 standard. The changes include elimination of redundant output columns for `NATURAL` joins and joins specified with a `USING` clause and proper ordering of output columns. The precedence of the comma operator also now is lower compared to `JOIN`, `LEFT JOIN`, and so forth.

  These changes make MySQL more compliant with standard SQL. However, they can result in different output columns for some joins. Also, some queries that appeared to work correctly prior to 5.0.12 must be rewritten to comply with the standard. For details about the scope of the changes and examples that show what query rewrites are necessary, see `JOIN` Syntax.

- **Incompatible change:** The namespace for triggers changed in MySQL 5.0.10. Previously, trigger names had to be unique per table. Now they must be unique within the schema (database). An implication of this change is that `DROP TRIGGER` syntax

now uses a schema name instead of a table name (schema name is optional and, if omitted, the current schema will be used).

When upgrading from a version of MySQL 5 older than 5.0.10 to MySQL 5.0.10 or newer, you must drop all triggers and re-create them or `DROP TRIGGER` will not work after the upgrade. Here is a suggested procedure for doing this:

1. Upgrade to MySQL 5.0.10 or later to be able to access trigger information in the `INFORMATION_SCHEMA.TRIGGERS` table. (This should work even for pre-5.0.10 triggers.)

2. Dump all trigger definitions using the following `SELECT` statement:

```
SELECT CONCAT('CREATE TRIGGER ', t.TRIGGER_SCHEMA, '.', t.TRIGGER_NAME,
              ' ', t.ACTION_TIMING, ' ', t.EVENT_MANIPULATION, ' ON ',
              t.EVENT_OBJECT_SCHEMA, '.', t.EVENT_OBJECT_TABLE,
              ' FOR EACH ROW ', t.ACTION_STATEMENT, '//' )
INTO OUTFILE '/tmp/triggers.sql'
FROM INFORMATION_SCHEMA.TRIGGERS AS t;
```

The statement uses `INTO OUTFILE`, so you must have the `FILE` privilege. The file will be created on the server host. Use a different file name if you like. To be 100% safe, inspect the trigger definitions in the `triggers.sql` file, and perhaps make a backup of the file.

3. Stop the server and drop all triggers by removing all `.TRG` files in your database directories. Change location to your data directory and issue this command:

```
shell> rm */*.TRG
```

4. Start the server and re-create all triggers using the `triggers.sql` file:

```
mysql> delimiter // ;
mysql> source /tmp/triggers.sql //
```

5. Use the `SHOW TRIGGERS` statement to check that all triggers were created successfully.

- **Incompatible change:** As of MySQL 5.0.15, the `CHAR()` function returns a binary string rather than a string in the connection character set. An optional `USING charset_name` clause may be used to produce a result in a specific character set instead. Also, arguments larger than 256 produce multiple characters. They are no longer interpreted modulo 256 to produce a single character each. These changes may cause some incompatibilities:

  - `CHAR(ORD('A')) = 'a'` is no longer true:

  ```
  mysql> SELECT CHAR(ORD('A')) = 'a';
  +----------------------+
  | CHAR(ORD('A')) = 'a' |
  +----------------------+
  |                    0 |
  +----------------------+
  ```

  To perform a case-insensitive comparison, you can produce a result string in a nonbinary character set by adding a `USING` clause or converting the result:

  ```
  mysql> SELECT CHAR(ORD('A') USING latin1) = 'a';
  +-----------------------------------+
  | CHAR(ORD('A') USING latin1) = 'a' |
  +-----------------------------------+
  |                                 1 |
  +-----------------------------------+
  mysql> SELECT CONVERT(CHAR(ORD('A')) USING latin1) = 'a';
  +--------------------------------------------+
  | CONVERT(CHAR(ORD('A')) USING latin1) = 'a' |
  +--------------------------------------------+
  |                                          1 |
  +--------------------------------------------+
  ```

  - `CREATE TABLE ... SELECT CHAR(...)` produces a `VARBINARY` column, not a `VARCHAR` column. To produce a `VARCHAR` column, use `USING` or `CONVERT()` as just described to convert the `CHAR()` result into a nonbinary character set.

  - Previously, the following statements inserted the value `0x00410041` (`'AA'` as a `ucs2` string) into the table:

  ```
  CREATE TABLE t (ucs2_column CHAR(2) CHARACTER SET ucs2);
  INSERT INTO t VALUES (CHAR(0x41,0x41));
  ```

  As of MySQL 5.0.15, the statements insert a single `ucs2` character with value `0x4141`.

- **Incompatible change:** By default, integer subtraction involving an unsigned value should produce an unsigned result. Tracking

of the "unsignedness" of an expression was improved in MySQL 5.0.13. This means that, in some cases where an unsigned subtraction would have resulted in a signed integer, it now results in an unsigned integer. One context in which this difference manifests itself is when a subtraction involving an unsigned operand would be negative.

Suppose that `i` is a `TINYINT UNSIGNED` column and has a value of 0. The server evaluates the following expression using 64-bit unsigned integer arithmetic with the following result:

```
mysql> SELECT i - 1 FROM t;
+----------------------+
| i - 1                |
+----------------------+
| 18446744073709551615 |
+----------------------+
```

If the expression is used in an `UPDATE t SET i = i - 1` statement, the expression is evaluated and the result assigned to `i` according to the usual rules for handling values outside the column range or 0 to 255. That is, the value is clipped to the nearest endpoint of the range. However, the result is version-specific:

- Before MySQL 5.0.13, the expression is evaluated but is treated as the equivalent 64-bit signed value (–1) for the assignment. The value of –1 is clipped to the nearest endpoint of the column range, resulting in a value of 0:

```
mysql> UPDATE t SET i = i - 1; SELECT i FROM t;
+------+
| i    |
+------+
|    0 |
+------+
```

- As of MySQL 5.0.13, the expression is evaluated and retains its unsigned attribute for the assignment. The value of 18446744073709551615 is clipped to the nearest endpoint of the column range, resulting in a value of 255:

```
mysql> UPDATE t SET i = i - 1; SELECT i FROM t;
+------+
| i    |
+------+
|  255 |
+------+
```

To get the older behavior, use `CAST()` to convert the expression result to a signed value:

```
UPDATE t SET i = CAST(i - 1 AS SIGNED);
```

Alternatively, set the `NO_UNSIGNED_SUBTRACTION` SQL mode. However, this will affect all integer subtractions involving unsigned values.

- **Incompatible change:** Before MySQL 5.0.12, `NOW()` and `SYSDATE()` return the same value (the time at which the statement in which the function occurs begins executing). As of MySQL 5.0.12, `SYSDATE()` returns the time at which it executes, which can differ from the value returned by `NOW()`. For information about the implications for binary logging, replication, and use of indexes, see the description for `SYSDATE()` in Date and Time Functions and for `SET TIMESTAMP` in SET Syntax. To restore the former behavior for `SYSDATE()` and cause it to be an alias for `NOW()`, start the server with the `--sysdate-is-now` option (available as of MySQL 5.0.20).

- **Incompatible change:** Before MySQL 5.0.13, `GREATEST(x,NULL)` and `LEAST(x,NULL)` return *x* when *x* is a non-`NULL` value. As of 5.0.13, both functions return `NULL` if any argument is `NULL`, the same as Oracle. This change can cause problems for applications that rely on the old behavior.

- **Incompatible change:** Before MySQL 5.0.8, conversion of `DATETIME` values to numeric form by adding zero produced a result in `YYYYMMDDHHMMSS` format. The result of `DATETIME+0` is now in `YYYYMMDDHHMMSS.000000` format.

- **Incompatible change:** In MySQL 5.0.6, the behavior of `LOAD DATA INFILE` and `SELECT ... INTO OUTFILE` has changed when the `FIELDS TERMINATED BY` and `FIELDS ENCLOSED BY` values both are empty. Formerly, a column was read or written using the display width of the column. For example, `INT(4)` was read or written using a field with a width of 4. Now columns are read and written using a field width wide enough to hold all values in the field. However, data files written before this change was made might not be reloaded correctly with `LOAD DATA INFILE` for MySQL 5.0.6 and up. This change also affects data files read by `mysqlimport` and written by `mysqldump --tab`, which use `LOAD DATA INFILE` and `SELECT ... INTO OUTFILE`. For more information, see `LOAD DATA INFILE` Syntax.

- **Incompatible change:** Before MySQL 5.0.2, `SHOW STATUS` returned global status values. The default as of 5.0.2 is to return session values, which is incompatible with previous versions. To issue a `SHOW STATUS` statement that will retrieve global status values for all versions of MySQL, write it like this:

```
SHOW /*!50002 GLOBAL */ STATUS;
```

- **Incompatible change:** User variables are not case sensitive in MySQL 5.0. In MySQL 4.1, `SET @x = 0; SET @X = 1; SELECT @x;` created two variables and returned `0`. In MySQL 5.0, it creates one variable and returns `1`. Replication setups that rely on the old behavior may be affected by this change.

- Some keywords are reserved in MySQL 5.0 that were not reserved in MySQL 4.1. See Reserved Words.

- The `LOAD DATA FROM MASTER` and `LOAD TABLE FROM MASTER` statements are deprecated. See `LOAD DATA FROM MASTER` Syntax, for recommended alternatives.

- As of MySQL 5.0.25, `TIMESTAMP` columns that are `NOT NULL` now are reported that way by `SHOW COLUMNS` and `IN-FORMATION_SCHEMA`, rather than as `NULL`.

- Comparisons made between `FLOAT` or `DOUBLE` values that happened to work in MySQL 4.1 may not do so in 5.0. Values of these types are imprecise in all MySQL versions, and you are *strongly advised* to avoid such comparisons as `WHERE col_name=some_double`, *regardless of the MySQL version you are using*. See Problems with Floating-Point Comparisons.

- As of MySQL 5.0.3, `BIT` is a separate data type, not a synonym for `TINYINT(1)`. See Overview of Numeric Types.

- MySQL 5.0.2 adds several SQL modes that allow stricter control over rejecting records that have invalid or missing values. See Server SQL Modes, and Constraints on Invalid Data. If you want to enable this control but continue to use MySQL's capability for storing incorrect dates such as `'2004-02-31'`, you should start the server with `--sql_mode="TRADITIONAL,ALLOW_INVALID_DATES"`.

- As of MySQL 5.0.2, the `SCHEMA` and `SCHEMAS` keywords are accepted as synonyms for `DATABASE` and `DATABASES`, respectively. (While "schemata" is grammatically correct and even appears in some MySQL 5.0 system database and table names, it cannot be used as a keyword.)

C API Changes:

- **Incompatible change**: Because the MySQL 5.0 server has a new implementation of the `DECIMAL` data type, a problem may occur if the server is used by older clients that still are linked against MySQL 4.1 client libraries. If a client uses the binary client/server protocol to execute prepared statements that generate result sets containing numeric values, an error will be raised: `'Using unsupported buffer type: 246'`

  This error occurs because the 4.1 client libraries do not support the new `MYSQL_TYPE_NEWDECIMAL` type value added in 5.0. There is no way to disable the new `DECIMAL` data type on the server side. You can avoid the problem by relinking the application with the client libraries from MySQL 5.0.

- **Incompatible change**: The `ER_WARN_DATA_TRUNCATED` warning symbol was renamed to `WARN_DATA_TRUNCATED` in MySQL 5.0.3.

- The `reconnect` flag in the `MYSQL` structure is set to 0 by `mysql_real_connect()`. Only those client programs which did not explicitly set this flag to 0 or 1 after `mysql_real_connect()` experience a change. Having automatic reconnection enabled by default was considered too dangerous (due to the fact that table locks, temporary tables, user variables, and session variables are lost after reconnection).

18.2. Downgrading MySQL

This section describes what you should do to downgrade to an older MySQL version in the unlikely case that the previous version worked better than the new one.

If you are downgrading within the same release series (for example, from 4.1.13 to 4.1.12) the general rule is that you just have to install the new binaries on top of the old ones. There is no need to do anything with the databases. As always, however, it is always a good idea to make a backup.

The following items form a checklist of things you should do whenever you perform a downgrade:

- Read the upgrading section for the release series from which you are downgrading to be sure that it does not have any features you really need. See Section 18.1, "Upgrading MySQL".

- If there is a downgrading section for that version, you should read that as well.

- To see which new features were added between the version to which you are downgrading and your current version, see the change logs (MySQL Enterprise Release Notes, MySQL Community Server Enhancements and Release Notes, and MySQL Change History).

- Check Section 18.3, "Checking Whether Table Indexes Must Be Rebuilt", to see whether changes to character sets or collations were made between your current version of MySQL and the version to which you are downgrading. If so and these changes affect your table indexes, you will need to rebuild the affected indexes using the instructions in Section 18.4, "Rebuilding or Repairing Tables or Indexes".

In most cases, you can move the MySQL format files and data files between different versions on the same architecture as long as you stay within versions for the same release series of MySQL.

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 18.5, "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.

It might also be the case that the structure of the system tables in the `mysql` database has changed and that downgrading introduces some loss of functionality or requires some adjustments. Here are some examples:

- Trigger creation requires the `TRIGGER` privilege as of MySQL 5.1. In MySQL 5.0, there is no `TRIGGER` privilege and `SUPER` is required instead. If you downgrade from MySQL 5.1 to 5.0, you will need to give the `SUPER` privilege to those accounts that had the `TRIGGER` privilege in 5.1.

- Triggers were added in MySQL 5.0, so if you downgrade from 5.0 to 4.1, you cannot use triggers at all.

18.2.1. Downgrading to MySQL 4.1

MySQL 4.1 does not support stored routines or triggers. If your databases contain stored routines or triggers, prevent them from being dumped when you use `mysqldump` by using the `--skip-routines` and `--skip-triggers` options. (See `mysqldump`.)

MySQL 4.1 does not support views. If your databases contain views, remove them with `DROP VIEW` before using `mysqldump`. (See `DROP VIEW` Syntax.)

After downgrading from MySQL 5.0, you may see the following information in the `mysql.err` file:

```
Incorrect information in file: './mysql/user.frm'
```

In this case, you can do the following:

1. Start MySQL 5.0.4 (or newer).

2. Run `mysql_fix_privilege_tables`, which will change the `mysql.user` table to a format that both MySQL 4.1 and 5.0 can use.

3. Stop the MySQL server.

4. Start MySQL 4.1.

If the preceding procedure fails, you should be able to do the following instead:

1. Start MySQL 5.0.4 (or newer).

2. Run `mysqldump --opt --add-drop-table mysql > /tmp/mysql.dump`.

3. Stop the MySQL server.

4. Start MySQL 4.1 with the `--skip-grant-tables` option.

5. Run `mysql mysql < /tmp/mysql.dump`.

6. Run `mysqladmin flush-privileges`.

18.3. Checking Whether Table Indexes Must Be Rebuilt

A binary upgrade or downgrade is one that installs one version of MySQL "in place" over an existing version, without dumping and reloading tables:

1. Stop the server for the existing version if it is running.

2. Install a different version of MySQL. This is an upgrade if the new version is higher than the original version, a downgrade if the version is lower.

3. Start the server for the new version.

In many cases, the tables from the previous version of MySQL can be used without change by the new version. However, sometimes modifications are made to the handling of character sets or collations that change the character sort order, which causes the ordering of entries in any index that uses an affected character set or collation to be incorrect. Such changes result in several possible problems:

- Comparison results that differ from previous results

- Inability to find some index values due to misordered index entries

- Misordered `ORDER BY` results

- Tables that `CHECK TABLE` reports as being in need of repair

The solution to these problems is to rebuild any indexes that use an affected character set or collation, either by dropping and recreating the indexes, or by dumping and reloading the entire table. For information about rebuilding indexes, see Section 18.4, "Rebuilding or Repairing Tables or Indexes".

To check whether a table has indexes that must be rebuilt, consult the following list. It indicates which versions of MySQL introduced character set or collation changes that require indexes to be rebuilt. Each entry indicates the version in which the change occurred and the character sets or collations that the change affects. If the change is associated with a particular bug report, the bug number is given.

The list applies both for binary upgrades and downgrades. For example, Bug#29461 was fixed in MySQL 5.0.48, so it applies to upgrades from versions older than 5.0.48 to 5.0.48 or newer, and also to downgrades from 5.0.48 or newer to versions older than 5.0.58.

If you have tables with indexes that are affected, rebuild the indexes using the instructions given in Section 18.4, "Rebuilding or Repairing Tables or Indexes".

In many cases, you can use `CHECK TABLE ... FOR UPGRADE` to identify tables for which index rebuilding is required. (It will report: `Table upgrade required. Please do "REPAIR TABLE `tbl_name`" to fix it!`) In these cases, you can also use `mysqlcheck --check-upgrade` or `mysql_upgrade`, which execute `CHECK TABLE`. However, the use of `CHECK TABLE` applies only after upgrades, not downgrades. Also, `CHECK TABLE` is not applicable to all storage engines. For details about which storage engines `CHECK TABLE` supports, see `CHECK TABLE` Syntax.

Changes that cause index rebuilding to be necessary:

- MySQL 5.0.48 (Bug#29461)

  Affects indexes for columns that use any of these character sets: `eucjpms`, `euc_kr`, `gb2312`, `latin7`, `macce`, `ujis`

  Affected tables can be detected by `CHECK TABLE ... FOR UPGRADE` as of MySQL 5.1.29, 6.0.8 (see Bug#39585).

- MySQL 5.0.48 (Bug#27562)

Affects indexes that use the `ascii_general_ci` collation for columns that contain any of these characters: `'` `'` GRAVE ACCENT, `'[` `'` LEFT SQUARE BRACKET, `'\` `'` REVERSE SOLIDUS, `']` `'` RIGHT SQUARE BRACKET, `'~` `'` TILDE

Affected tables can be detected by `CHECK TABLE ... FOR UPGRADE` as of MySQL 5.1.29, 6.0.8 (see Bug#39585).

- MySQL 5.1.21 (Bug#29461)

    Affects indexes for columns that use any of these character sets: `eucjpms`, `euc_kr`, `gb2312`, `latin7`, `macce`, `ujis`

    Affected tables can be detected by `CHECK TABLE ... FOR UPGRADE` as of MySQL 5.1.29, 6.0.8 (see Bug#39585).

- MySQL 5.1.23 (Bug#27562)

    Affects indexes that use the `ascii_general_ci` collation for columns that contain any of these characters: `'` `'` GRAVE ACCENT, `'[` `'` LEFT SQUARE BRACKET, `'\` `'` REVERSE SOLIDUS, `']` `'` RIGHT SQUARE BRACKET, `'~` `'` TILDE

    Affected tables can be detected by `CHECK TABLE ... FOR UPGRADE` as of MySQL 5.1.29, 6.0.8 (see Bug#39585).

- MySQL 5.1.24 (Bug#27877)

    Affects indexes that use the `utf8_general_ci` or `ucs2_general_ci` collation for columns that contain `'Ã#'` LATIN SMALL LETTER SHARP S (German).

    Affected tables can be detected by `CHECK TABLE ... FOR UPGRADE` as of MySQL 5.1.30, 6.0.8 (see Bug#40053).

- * MySQL 6.0.1 (WL#3664)

    Affects indexes that use the `latin2_czech_cs collation`.

    Affected tables can be detected by `CHECK TABLE ... FOR UPGRADE` as of MySQL 6.0.9 (see Bug#40054).

    MySQL 6.0.5 (Bug#33452)

    Affects indexes that use the `latin2_czech_cs collation`.

    Affected tables can be detected by `CHECK TABLE ... FOR UPGRADE` as of MySQL 6.0.9 (see Bug#40054).

- MySQL 6.0.5 (Bug#27877)

    Affects indexes that use the `utf8_general_ci` or `ucs2_general_ci` collation for columns that contain `'Ã#'` LATIN SMALL LETTER SHARP S (German).

    Affected tables can be detected by `CHECK TABLE ... FOR UPGRADE` as of MySQL 6.0.8 (see Bug#40053).

- MySQL 6.0.6 (Bug#25420)

    Affects indexes for columns that use the following collations, if the columns contain the indicated characters: `big5_chinese_ci`: `'~'` TILDE or `'` `'` GRAVE ACCENT; `cp866_general_ci`: `j` LATIN SMALL LETTER J; `gb2312_chinese_ci`: `'~'` TILDE; `gbk_chinese_ci`: `'~'` TILDE

    Affected tables can be detected by `CHECK TABLE ... FOR UPGRADE` as of MySQL 6.0.9 (see Bug#40054).

18.4. Rebuilding or Repairing Tables or Indexes

This section describes how to rebuild a table. This can be necessitated by changes to MySQL such as how data types are handled or changes to character set handling. For example, an error in a collation might have been corrected, necessitating a table rebuild to rebuild the indexes for character columns that use the collation. It might also be that a table repair or upgrade should be done as indicated by a table check operation such as that performed by `CHECK TABLE`, `mysqlcheck`, or `mysql_upgrade`.

Methods for rebuilding a table include dumping and reloading it, or using `ALTER TABLE` or `REPAIR TABLE`.

> **Note**
>
> If you are rebuilding tables because a different version of MySQL will not handle them after a binary upgrade or downgrade, you must use the dump-and-reload method. Dump the tables *before* upgrading or downgrading (using your original version of MySQL), and reload the tables *after* upgrading or downgrading (after installing the new version).
>
> If you use the dump-and-reload method of rebuilding tables only for the purpose of rebuilding indexes, you can per-

form the dump either before or after upgrading or downgrading. Reloading still must be done afterward.

To re-create a table by dumping and reloading it, use `mysqldump` to create a dump file and `mysql` to reload the file:

```
shell> mysqldump db_name t1 > dump.sql
shell> mysql db_name < dump.sql
```

To recreate all the tables in a single database, specify the database name without any following table name:

```
shell> mysqldump db_name > dump.sql
shell> mysql db_name < dump.sql
```

To recreate all tables in all databases, use the `--all-databases` option:

```
shell> mysqldump --all-databases > dump.sql
shell> mysql < dump.sql
```

To rebuild a table with `ALTER TABLE`, use a statement that "changes" the table to use the storage engine that it already has. For example, if `t1` is a `MyISAM` table, use this statement:

```
mysql> ALTER TABLE t1 ENGINE = MyISAM;
```

If you are not sure which storage engine to specify in the `ALTER TABLE` statement, use `SHOW CREATE TABLE` to display the table definition.

If you must rebuild a table because a table checking operation indicates that the table is corrupt or needs an upgrade, you can use `REPAIR TABLE` if that statement supports the table's storage engine. For example, to repair a `MyISAM` table, use this statement:

```
mysql> REPAIR TABLE t1;
```

For storage engines such as `InnoDB` that `REPAIR TABLE` does not support, use `mysqldump` to create a dump file and `mysql` to reload the file, as described earlier.

For specifics about which storage engines `REPAIR TABLE` supports, see `REPAIR TABLE` Syntax.

18.5. Copying MySQL Databases to Another Machine

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.

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.

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:

```
shell> mysqladmin -h 'other_hostname' create db_name
shell> 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:

```
shell> mysqladmin create db_name
shell> 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:

```
shell> mysqldump --quick db_name | gzip > db_name.gz
```

Transfer the file containing the database contents to the target machine and run these commands there:

```
shell> mysqladmin create db_name
shell> gunzip < db_name.gz | mysql db_name
```

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:

```
shell> mkdir DUMPDIR
shell> 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:

```
shell> mysqladmin create db_name          # create database
shell> cat DUMPDIR/*.sql | mysql db_name   # create tables in database
shell> 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 19. Operating System-Specific Notes

19.1. Linux Notes

This section discusses issues that have been found to occur on Linux. The first few subsections describe general operating system-related issues, problems that can occur when using binary or source distributions, and post-installation issues. The remaining subsections discuss problems that occur with Linux on specific platforms.

Note that most of these problems occur on older versions of Linux. If you are running a recent version, you may see none of them.

19.1.1. Linux Operating System Notes

MySQL needs at least Linux version 2.0.

> **Warning**
>
> We have seen some strange problems with Linux 2.2.14 and MySQL on SMP systems. We also have reports from some MySQL users that they have encountered serious stability problems using MySQL with kernel 2.2.14. If you are using this kernel, you should upgrade to 2.2.19 (or newer) or to a 2.4 kernel. If you have a multiple-CPU box, you should seriously consider using 2.4 because it gives you a significant speed boost. Your system should be more stable.

When using LinuxThreads, you should see a minimum of three `mysqld` processes running. These are in fact threads. There is one thread for the LinuxThreads manager, one thread to handle connections, and one thread to handle alarms and signals.

19.1.2. Linux Binary Distribution Notes

The Linux-Intel binary and RPM releases of MySQL are configured for the highest possible speed. We are always trying to use the fastest stable compiler available.

The binary release is linked with `-static`, which means you do not normally need to worry about which version of the system libraries you have. You need not install LinuxThreads, either. A program linked with `-static` is slightly larger than a dynamically linked program, but also slightly faster (3-5%). However, one problem with a statically linked program is that you can't use user-defined functions (UDFs). If you are going to write or use UDFs (this is something for C or C++ programmers only), you must compile MySQL yourself using dynamic linking.

A known issue with binary distributions is that on older Linux systems that use `libc` (such as Red Hat 4.x or Slackware), you get some (non-fatal) issues with host name resolution. If your system uses `libc` rather than `glibc2`, you probably will encounter some difficulties with host name resolution and `getpwnam()`. This happens because `glibc` (unfortunately) depends on some external libraries to implement host name resolution and `getpwent()`, even when compiled with `-static`. These problems manifest themselves in two ways:

- You may see the following error message when you run `mysql_install_db`:

  ```
  Sorry, the host 'xxxx' could not be looked up
  ```

  You can deal with this by executing `mysql_install_db --force`, which does not execute the `resolveip` test in `mysql_install_db`. The downside is that you cannot use host names in the grant tables: except for `localhost`, you must use IP numbers instead. If you are using an old version of MySQL that does not support `--force`, you must manually remove the `resolveip` test in `mysql_install_db` using a text editor.

- You also may see the following error when you try to run `mysqld` with the `--user` option:

  ```
  getpwnam: No such file or directory
  ```

  To work around this problem, start `mysqld` by using the `su` command rather than by specifying the `--user` option. This causes the system itself to change the user ID of the `mysqld` process so that `mysqld` need not do so.

Another solution, which solves both problems, is not to use a binary distribution. Obtain a MySQL source distribution (in RPM or `tar.gz` format) and install that instead.

On some Linux 2.2 versions, you may get the error `Resource temporarily unavailable` when clients make a great many new connections to a `mysqld` server over TCP/IP. The problem is that Linux has a delay between the time that you close a TCP/IP socket and the time that the system actually frees it. There is room for only a finite number of TCP/IP slots, so you encounter the resource-unavailable error if clients attempt too many new TCP/IP connections over a short period of time. For example, you may see the error when you run the MySQL `test-connect` benchmark over TCP/IP.

We have inquired about this problem a few times on different Linux mailing lists but have never been able to find a suitable resolution. The only known "fix" is for clients to use persistent connections, or, if you are running the database server and clients on the same machine, to use Unix socket file connections rather than TCP/IP connections.

19.1.3. Linux Source Distribution Notes

The following notes regarding `glibc` apply only to the situation when you build MySQL yourself. If you are running Linux on an x86 machine, in most cases it is much better for you to use our binary. We link our binaries against the best patched version of `glibc` we can find and with the best compiler options, in an attempt to make it suitable for a high-load server. For a typical user, even for setups with a lot of concurrent connections or tables exceeding the 2GB limit, our binary is the best choice in most cases. After reading the following text, if you are in doubt about what to do, try our binary first to determine whether it meets your needs. If you discover that it is not good enough, you may want to try your own build. In that case, we would appreciate a note about it so that we can build a better binary next time.

MySQL uses LinuxThreads on Linux. If you are using an old Linux version that doesn't have `glibc2`, you must install LinuxThreads before trying to compile MySQL. You can obtain LinuxThreads from http://dev.mysql.com/downloads/os-linux.html.

Note that `glibc` versions before and including version 2.1.1 have a fatal bug in `pthread_mutex_timedwait()` handling, which is used when `INSERT DELAYED` statements are issued. We recommend that you not use `INSERT DELAYED` before upgrading `glibc`.

Note that Linux kernel and the LinuxThread library can by default handle a maximum of 1,024 threads. If you plan to have more than 1,000 concurrent connections, you need to make some changes to LinuxThreads, as follows:

- Increase `PTHREAD_THREADS_MAX` in `sysdeps/unix/sysv/linux/bits/local_lim.h` to 4096 and decrease `STACK_SIZE` in `linuxthreads/internals.h` to 256KB. The paths are relative to the root of `glibc`. (Note that MySQL is not stable with 600-1000 connections if `STACK_SIZE` is the default of 2MB.)

- Recompile LinuxThreads to produce a new `libpthread.a` library, and relink MySQL against it.

There is another issue that greatly hurts MySQL performance, especially on SMP systems. The mutex implementation in LinuxThreads in `glibc` 2.1 is very poor for programs with many threads that hold the mutex only for a short time. This produces a paradoxical result: If you link MySQL against an unmodified LinuxThreads, removing processors from an SMP actually improves MySQL performance in many cases. We have made a patch available for `glibc` 2.1.3 to correct this behavior (http://dev.mysql.com/Downloads/Linux/linuxthreads-2.1-patch).

With `glibc` 2.2.2, MySQL uses the adaptive mutex, which is much better than even the patched one in `glibc` 2.1.3. Be warned, however, that under some conditions, the current mutex code in `glibc` 2.2.2 overspins, which hurts MySQL performance. The likelihood that this condition occurs can be reduced by re-nicing the `mysqld` process to the highest priority. We have also been able to correct the overspin behavior with a patch, available at http://dev.mysql.com/Downloads/Linux/linuxthreads-2.2.2.patch. It combines the correction of overspin, maximum number of threads, and stack spacing all in one. You need to apply it in the `linuxthreads` directory with `patch -p0 </tmp/linuxthreads-2.2.2.patch`. We hope it is included in some form in future releases of `glibc` 2.2. In any case, if you link against `glibc` 2.2.2, you still need to correct `STACK_SIZE` and `PTHREAD_THREADS_MAX`. We hope that the defaults is corrected to some more acceptable values for high-load MySQL setup in the future, so that the commands needed to produce your own build can be reduced to `./configure; make; make install`.

We recommend that you use these patches to build a special static version of `libpthread.a` and use it only for statically linking against MySQL. We know that these patches are safe for MySQL and significantly improve its performance, but we cannot say anything about their effects on other applications. If you link other applications that require LinuxThreads against the patched static version of the library, or build a patched shared version and install it on your system, you do so at your own risk.

If you experience any strange problems during the installation of MySQL, or with some common utilities hanging, it is very likely that they are either library or compiler related. If this is the case, using our binary resolves them.

If you link your own MySQL client programs, you may see the following error at runtime:

```
ld.so.1: fatal: libmysqlclient.so.#:
open failed: No such file or directory
```

This problem can be avoided by one of the following methods:

- Link clients with the `-Wl,r/full/path/to/libmysqlclient.so` flag rather than with `-Lpath`).

- Copy `libmysqlclient.so` to `/usr/lib`.

- Add the path name of the directory where `libmysqlclient.so` is located to the `LD_RUN_PATH` environment variable before running your client.

If you are using the Fujitsu compiler (`fcc/FCC`), you may have some problems compiling MySQL because the Linux header files are very `gcc` oriented. The following `configure` line should work with `fcc/FCC`:

```
CC=fcc CFLAGS="-O -K fast -K lib -K omitfp -Kpreex -D_GNU_SOURCE \
    -DCONST=const -DNO_STRTOLL_PROTO" \
CXX=FCC CXXFLAGS="-O -K fast -K lib \
    -K omitfp -K preex --no_exceptions --no_rtti -D_GNU_SOURCE \
    -DCONST=const -Dalloca=__builtin_alloca -DNO_STRTOLL_PROTO \
    '-D_EXTERN_INLINE=static __inline'" \
./configure \
    --prefix=/usr/local/mysql --enable-assembler \
    --with-mysqld-ldflags=-all-static --disable-shared \
    --with-low-memory
```

19.1.4. Linux Post-Installation Notes

`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 Section 17.2.2, "Starting and Stopping MySQL Automatically".

If MySQL cannot open enough files or connections, it may be that you have not configured Linux to handle enough files.

In Linux 2.2 and onward, you can check the number of allocated file handles as follows:

```
shell> cat /proc/sys/fs/file-max
shell> cat /proc/sys/fs/dquot-max
shell> cat /proc/sys/fs/super-max
```

If you have more than 16MB of memory, you should add something like the following to your init scripts (for example, `/etc/init.d/boot.local` on SuSE Linux):

```
echo 65536 > /proc/sys/fs/file-max
echo 8192 > /proc/sys/fs/dquot-max
echo 1024 > /proc/sys/fs/super-max
```

You can also run the `echo` commands from the command line as `root`, but these settings are lost the next time your computer restarts.

Alternatively, you can set these parameters on startup by using the `sysctl` tool, which is used by many Linux distributions (including SuSE Linux 8.0 and later). Put the following values into a file named `/etc/sysctl.conf`:

```
# Increase some values for MySQL
fs.file-max = 65536
fs.dquot-max = 8192
fs.super-max = 1024
```

You should also add the following to `/etc/my.cnf`:

```
[mysqld_safe]
open-files-limit=8192
```

This should allow the server a limit of 8,192 for the combined number of connections and open files.

The `STACK_SIZE` constant in LinuxThreads controls the spacing of thread stacks in the address space. It needs to be large enough so that there is plenty of room for each individual thread stack, but small enough to keep the stack of some threads from running into the global `mysqld` data. Unfortunately, as we have experimentally discovered, the Linux implementation of `mmap()` successfully unmaps a mapped region if you ask it to map out an address currently in use, zeroing out the data on the entire page instead of returning an error. So, the safety of `mysqld` or any other threaded application depends on the "gentlemanly" behavior of the code that creates threads. The user must take measures to make sure that the number of running threads at any given time is sufficiently low for thread stacks to stay away from the global heap. With `mysqld`, you should enforce this behavior by setting a reasonable value for the `max_connections` variable.

If you build MySQL yourself, you can patch LinuxThreads for better stack use. See Section 19.1.3, "Linux Source Distribution Notes". If you do not want to patch LinuxThreads, you should set `max_connections` to a value no higher than 500. It should be even less if you have a large key buffer, large heap tables, or some other things that make `mysqld` allocate a lot of memory, or if you are running a 2.2 kernel with a 2GB patch. If you are using our binary or RPM version, you can safely set `max_connections` at 1500, assuming no large key buffer or heap tables with lots of data. The more you reduce `STACK_SIZE` in LinuxThreads the more threads you can safely create. We recommend values between 128KB and 256KB.

If you use a lot of concurrent connections, you may suffer from a "feature" in the 2.2 kernel that attempts to prevent fork bomb attacks by penalizing a process for forking or cloning a child. This causes MySQL not to scale well as you increase the number of concurrent clients. On single-CPU systems, we have seen this manifest as very slow thread creation; it may take a long time to connect to MySQL (as long as one minute), and it may take just as long to shut it down. On multiple-CPU systems, we have observed a gradual drop in query speed as the number of clients increases. In the process of trying to find a solution, we have received a kernel patch from one of our users who claimed it helped for his site. This patch is available at http://dev.mysql.com/Downloads/Patches/linux-fork.patch. We have done rather extensive testing of this patch on both development and production systems. It has significantly improved MySQL performance without causing any problems and we recommend it to our users who still run high-load servers on 2.2 kernels.

This issue has been fixed in the 2.4 kernel, so if you are not satisfied with the current performance of your system, rather than patching your 2.2 kernel, it might be easier to upgrade to 2.4. On SMP systems, upgrading also gives you a nice SMP boost in addition to fixing the fairness bug.

We have tested MySQL on the 2.4 kernel on a two-CPU machine and found MySQL scales *much* better. There was virtually no slowdown on query throughput all the way up to 1,000 clients, and the MySQL scaling factor (computed as the ratio of maximum throughput to the throughput for one client) was 180%. We have observed similar results on a four-CPU system: Virtually no slowdown as the number of clients was increased up to 1,000, and a 300% scaling factor. Based on these results, for a high-load SMP server using a 2.2 kernel, we definitely recommend upgrading to the 2.4 kernel at this point.

We have discovered that it is essential to run the `mysqld` process with the highest possible priority on the 2.4 kernel to achieve maximum performance. This can be done by adding a `renice -20 $$` command to `mysqld_safe`. In our testing on a four-CPU machine, increasing the priority resulted in a 60% throughput increase with 400 clients.

We are currently also trying to collect more information on how well MySQL performs with a 2.4 kernel on four-way and eight-way systems. If you have access such a system and have done some benchmarks, please send an email message to `<benchmarks@mysql.com>` with the results. We will review them for inclusion in the manual.

If you see a dead `mysqld` server process with `ps`, this usually means that you have found a bug in MySQL or you have a corrupted table. See What to Do If MySQL Keeps Crashing.

To get a core dump on Linux if `mysqld` dies with a `SIGSEGV` signal, you can start `mysqld` with the `--core-file` option. Note that you also probably need to raise the core file size by adding `ulimit -c 1000000` to `mysqld_safe` or starting `mysqld_safe` with `--core-file-size=1000000`. See `mysqld_safe`.

19.1.5. Linux x86 Notes

MySQL requires `libc` 5.4.12 or newer. It is known to work with `libc` 5.4.46. `glibc` 2.0.6 and later should also work. There have been some problems with the `glibc` RPMs from Red Hat, so if you have problems, check whether there are any updates. The `glibc` 2.0.7-19 and 2.0.7-29 RPMs are known to work.

If you are using Red Hat 8.0 or a new `glibc` 2.2.x library, you may see `mysqld` die in `gethostbyaddr()`. This happens because the new `glibc` library requires a stack size greater than 128KB for this call. To fix the problem, start `mysqld` with the `--thread-stack=192K` option. (Use `-O thread_stack=192K` before MySQL 4.) This stack size is the default on MySQL 4.0.10 and above, so you should not see the problem.

If you are using `gcc` 3.0 and above to compile MySQL, you must install the `libstdc++v3` library before compiling MySQL; if you don't do this, you get an error about a missing `__cxa_pure_virtual` symbol during linking.

On some older Linux distributions, `configure` may produce an error like this:

```
Syntax error in sched.h. Change _P to __P in the
/usr/include/sched.h file.
See the Installation chapter in the Reference Manual.
```

Just do what the error message says. Add an extra underscore to the `_P` macro name that has only one underscore, and then try again.

You may get some warnings when compiling. Those shown here can be ignored:

```
mysqld.cc -o objs-thread/mysqld.o
mysqld.cc: In function `void init_signals()':
mysqld.cc:315: warning: assignment of negative value `-1' to
`long unsigned int'
mysqld.cc: In function `void * signal_hand(void *)':
mysqld.cc:346: warning: assignment of negative value `-1' to
`long unsigned int'
```

If `mysqld` always dumps core when it starts, the problem may be that you have an old `/lib/libc.a`. Try renaming it, and then remove `sql/mysqld` and do a new `make install` and try again. This problem has been reported on some Slackware installations.

If you get the following error when linking `mysqld`, it means that your `libg++.a` is not installed correctly:

```
/usr/lib/libc.a(putc.o): In function `_IO_putc':
putc.o(.text+0x0): multiple definition of `_IO_putc'
```

You can avoid using `libg++.a` by running `configure` like this:

```
shell> CXX=gcc ./configure
```

19.1.6. Linux SPARC Notes

In some implementations, `readdir_r()` is broken. The symptom is that the `SHOW DATABASES` statement always returns an empty set. This can be fixed by removing `HAVE_READDIR_R` from `config.h` after configuring and before compiling.

19.1.7. Linux Alpha Notes

We have tested MySQL 5.0 on Alpha with our benchmarks and test suite, and it appears to work well.

We currently build the MySQL binary packages on SuSE Linux 7.0 for AXP, kernel 2.4.4-SMP, Compaq C compiler (V6.2-505) and Compaq C++ compiler (V6.3-006) on a Compaq DS20 machine with an Alpha EV6 processor.

You can find the preceding compilers at http://www.support.compaq.com/alpha-tools/. By using these compilers rather than `gcc`, we get about 9-14% better MySQL performance.

For MySQL on Alpha, we use the `-arch generic` flag to our compile options, which ensures that the binary runs on all Alpha processors. We also compile statically to avoid library problems. The `configure` command looks like this:

```
CC=ccc CFLAGS="-fast -arch generic" CXX=cxx \
CXXFLAGS="-fast -arch generic -noexceptions -nortti" \
./configure --prefix=/usr/local/mysql --disable-shared \
    --with-extra-charsets=complex --enable-thread-safe-client \
    --with-mysqld-ldflags=-non_shared --with-client-ldflags=-non_shared
```

Some known problems when running MySQL on Linux-Alpha:

- Debugging threaded applications like MySQL does not work with `gdb 4.18`. You should use `gdb` 5.1 instead.

- If you try linking `mysqld` statically when using `gcc`, the resulting image dumps core at startup time. In other words, *do not* use `--with-mysqld-ldflags=-all-static` with `gcc`.

19.1.8. Linux PowerPC Notes

MySQL should work on MkLinux with the newest `glibc` package (tested with `glibc` 2.0.7).

19.1.9. Linux MIPS Notes

To get MySQL to work on Qube2 (Linux Mips), you need the newest `glibc` libraries. `glibc-2.0.7-29C2` is known to work. You must also use `gcc` 2.95.2 or newer).

19.1.10. Linux IA-64 Notes

To get MySQL to compile on Linux IA-64, we use the following `configure` command for building with `gcc` 2.96:

```
CC=gcc \
CFLAGS="-O3 -fno-omit-frame-pointer" \
CXX=gcc \
CXXFLAGS="-O3 -fno-omit-frame-pointer -felide-constructors \
    -fno-exceptions -fno-rtti" \
    ./configure --prefix=/usr/local/mysql \
    "--with-comment=Official MySQL binary" \
    --with-extra-charsets=complex
```

On IA-64, the MySQL client binaries use shared libraries. This means that if you install our binary distribution at a location other than `/usr/local/mysql`, you need to add the path of the directory where you have `libmysqlclient.so` installed either to the `/etc/ld.so.conf` file or to the value of your `LD_LIBRARY_PATH` environment variable.

See Problems Linking to the MySQL Client Library.

19.1.11. SELinux Notes

RHEL4 comes with SELinux, which supports tighter access control for processes. If SELinux is enabled (`SELINUX` in `/etc/selinux/config` is set to `enforcing`, `SELINUXTYPE` is set to either `targeted` or `strict`), you might encounter problems installing MySQL AB RPM packages.

Red Hat has an update that solves this. It involves an update of the "security policy" specification to handle the install structure of the RPMs provided by MySQL AB. For further information, see https://bugzilla.redhat.com/bugzilla/show_bug.cgi?id=167551 and http://rhn.redhat.com/errata/RHBA-2006-0049.html.

19.2. Mac OS X Notes

On Mac OS X, `tar` cannot handle long file names. If you need to unpack a `.tar.gz` distribution, use `gnutar` instead.

19.2.1. Mac OS X 10.x (Darwin)

MySQL should work without major problems on Mac OS X 10.x (Darwin).

Known issues:

- If you have problems with performance under heavy load, try using the `--skip-thread-priority` option to `mysqld`. This runs all threads with the same priority. On Mac OS X, this gives better performance, at least until Apple fixes its thread scheduler.

- The connection times (`wait_timeout`, `interactive_timeout` and `net_read_timeout`) values are not honored.

  This is probably a signal handling problem in the thread library where the signal doesn't break a pending read and we hope that a future update to the thread libraries will fix this.

Our binary for Mac OS X is compiled on Darwin 6.3 with the following `configure` line:

```
CC=gcc CFLAGS="-O3 -fno-omit-frame-pointer" CXX=gcc \
CXXFLAGS="-O3 -fno-omit-frame-pointer -felide-constructors \
    -fno-exceptions -fno-rtti" \
    ./configure --prefix=/usr/local/mysql \
    --with-extra-charsets=complex --enable-thread-safe-client \
    --enable-local-infile --disable-shared
```

See Chapter 11, *Installing MySQL on Mac OS X*.

19.2.2. Mac OS X Server 1.2 (Rhapsody)

For current versions of Mac OS X Server, no operating system changes are necessary before compiling MySQL. Compiling for the Server platform is the same as for the client version of Mac OS X.

For older versions (Mac OS X Server 1.2, a.k.a. Rhapsody), you must first install a pthread package before trying to configure MySQL.

See Chapter 11, *Installing MySQL on Mac OS X*.

19.3. Solaris Notes

For information about installing MySQL on Solaris using PKG distributions, see Chapter 12, *Installing MySQL on Solaris*.

On Solaris, you may run into trouble even before you get the MySQL distribution unpacked, as the Solaris `tar` cannot handle long file names. This means that you may see errors when you try to unpack MySQL.

If this occurs, you must use GNU `tar` (`gtar`) to unpack the distribution.

Sun native threads work only on Solaris 2.5 and higher. For Solaris 2.4 and earlier, MySQL automatically uses MIT-pthreads. See Section 16.5, "MIT-pthreads Notes".

If you get the following error from `configure`, it means that you have something wrong with your compiler installation:

```
checking for restartable system calls... configure: error can not
run test programs while cross compiling
```

In this case, you should upgrade your compiler to a newer version. You may also be able to solve this problem by inserting the fol-

lowing row into the `config.cache` file:

```
ac_cv_sys_restartable_syscalls=${ac_cv_sys_restartable_syscalls='no'}
```

If you are using Solaris on a SPARC, the recommended compiler is `gcc` 2.95.2 or 3.2. You can find this at http://gcc.gnu.org/. Note that `gcc` 2.8.1 does not work reliably on SPARC.

The recommended `configure` line when using `gcc` 2.95.2 is:

```
CC=gcc CFLAGS="-O3" \
CXX=gcc CXXFLAGS="-O3 -felide-constructors -fno-exceptions -fno-rtti" \
./configure --prefix=/usr/local/mysql --with-low-memory \
    --enable-assembler
```

If you have an UltraSPARC system, you can get 4% better performance by adding `-mcpu=v8 -Wa,-xarch=v8plusa` to the `CFLAGS` and `CXXFLAGS` environment variables.

If you have Sun's Forte 5.0 (or newer) compiler, you can run `configure` like this:

```
CC=cc CFLAGS="-Xa -fast -native -xstrconst -mt" \
CXX=CC CXXFLAGS="-noex -mt" \
./configure --prefix=/usr/local/mysql --enable-assembler
```

To create a 64-bit binary with Sun's Forte compiler, use the following configuration options:

```
CC=cc CFLAGS="-Xa -fast -native -xstrconst -mt -xarch=v9" \
CXX=CC CXXFLAGS="-noex -mt -xarch=v9" ASFLAGS="-xarch=v9" \
./configure --prefix=/usr/local/mysql --enable-assembler
```

To create a 64-bit Solaris binary using `gcc`, add `-m64` to `CFLAGS` and `CXXFLAGS` and remove `--enable-assembler` from the `configure` line.

In the MySQL benchmarks, we obtained a 4% speed increase on UltraSPARC when using Forte 5.0 in 32-bit mode, as compared to using `gcc` 3.2 with the `-mcpu` flag.

If you create a 64-bit `mysqld` binary, it is 4% slower than the 32-bit binary, but can handle more threads and memory.

When using Solaris 10 for x86_64, 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 get a problem with `fdatasync` or `sched_yield`, you can fix this by adding `LIBS=-lrt` to the `configure` line

For compilers older than WorkShop 5.3, you might have to edit the `configure` script. Change this line:

```
#if !defined(__STDC__) || __STDC__ != 1
```

To this:

```
#if !defined(__STDC__)
```

If you turn on `__STDC__` with the `-Xc` option, the Sun compiler can't compile with the Solaris `pthread.h` header file. This is a Sun bug (broken compiler or broken include file).

If `mysqld` issues the following error message when you run it, you have tried to compile MySQL with the Sun compiler without enabling the `-mt` multi-thread option:

```
libc internal error: _rmutex_unlock: rmutex not held
```

Add `-mt` to `CFLAGS` and `CXXFLAGS` and recompile.

If you are using the SFW version of `gcc` (which comes with Solaris 8), you must add `/opt/sfw/lib` to the environment variable `LD_LIBRARY_PATH` before running `configure`.

If you are using the `gcc` available from `sunfreeware.com`, you may have many problems. To avoid this, you should recompile `gcc` and GNU `binutils` on the machine where you are running them.

If you get the following error when compiling MySQL with `gcc`, it means that your `gcc` is not configured for your version of Solaris:

```
shell> gcc -O3 -g -O2 -DDBUG_OFF  -o thr_alarm ...
./thr_alarm.c: In function `signal_hand':
./thr_alarm.c:556: too many arguments to function `sigwait'
```

The proper thing to do in this case is to get the newest version of gcc and compile it with your current gcc compiler. At least for Solaris 2.5, almost all binary versions of gcc have old, unusable include files that break all programs that use threads, and possibly other programs as well.

Solaris does not provide static versions of all system libraries (libpthreads and libdl), so you cannot compile MySQL with --static. If you try to do so, you get one of the following errors:

```
ld: fatal: library -ldl: not found
undefined reference to `dlopen'
cannot find -lrt
```

If you link your own MySQL client programs, you may see the following error at runtime:

```
ld.so.1: fatal: libmysqlclient.so.#:
open failed: No such file or directory
```

This problem can be avoided by one of the following methods:

- Link clients with the -Wl,r/full/path/to/libmysqlclient.so flag rather than with -Lpath).

- Copy libmysqclient.so to /usr/lib.

- Add the path name of the directory where libmysqlclient.so is located to the LD_RUN_PATH environment variable before running your client.

If you have problems with configure trying to link with -lz when you don't have zlib installed, you have two options:

- If you want to be able to use the compressed communication protocol, you need to get and install zlib from ftp.gnu.org.

- Run configure with the --with-named-z-libs=no option when building MySQL.

If you are using gcc and have problems with loading user-defined functions (UDFs) into MySQL, try adding -lgcc to the link line for the UDF.

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

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

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

You might try starting the server with the --back_log=50 option as a workaround for this. (Use -O back_log=50 before MySQL 4.)

Solaris doesn't support core files for setuid() applications, so you can't get a core file from mysqld if you are using the --user option.

19.3.1. Solaris 2.7/2.8 Notes

Normally, you can use a Solaris 2.6 binary on Solaris 2.7 and 2.8. Most of the Solaris 2.6 issues also apply for Solaris 2.7 and 2.8.

MySQL should be able to detect new versions of Solaris automatically and enable workarounds for the following problems.

Solaris 2.7 / 2.8 has some bugs in the include files. You may see the following error when you use gcc:

```
/usr/include/widec.h:42: warning: `getwc' redefined
/usr/include/wchar.h:326: warning: this is the location of the previous
definition
```

If this occurs, you can fix the problem by copying /usr/include/widec.h to .../lib/gcc-lib/os/gcc-version/include and changing line 41 from this:

```
#if     !defined(lint) && !defined(__lint)
```

To this:

```
#if    !defined(lint) && !defined(__lint) && !defined(getwc)
```

Alternatively, you can edit `/usr/include/widec.h` directly. Either way, after you make the fix, you should remove `config.cache` and run `configure` again.

If you get the following errors when you run `make`, it is because `configure` didn't detect the `curses.h` file (probably because of the error in `/usr/include/widec.h`):

```
In file included from mysql.cc:50:
/usr/include/term.h:1060: syntax error before `,'
/usr/include/term.h:1081: syntax error before `;'
```

The solution to this problem is to do one of the following:

- Configure with `CFLAGS=-DHAVE_CURSES_H CXXFLAGS=-DHAVE_CURSES_H ./configure`.

- Edit `/usr/include/widec.h` as indicated in the preceding discussion and re-run `configure`.

- Remove the `#define HAVE_TERM` line from the `config.h` file and run `make` again.

If your linker cannot find `-lz` when linking client programs, the problem is probably that your `libz.so` file is installed in `/usr/local/lib`. You can fix this problem by one of the following methods:

- Add `/usr/local/lib` to `LD_LIBRARY_PATH`.

- Add a link to `libz.so` from `/lib`.

- If you are using Solaris 8, you can install the optional `zlib` from your Solaris 8 CD distribution.

- Run `configure` with the `--with-named-z-libs=no` option when building MySQL.

19.3.2. Solaris x86 Notes

On Solaris 8 on x86, `mysqld` dumps core if you remove the debug symbols using `strip`.

If you are using `gcc` on Solaris x86 and you experience problems with core dumps under load, you should use the following `configure` command:

```
CC=gcc CFLAGS="-O3 -fomit-frame-pointer -DHAVE_CURSES_H" \
CXX=gcc \
CXXFLAGS="-O3 -fomit-frame-pointer -felide-constructors \
    -fno-exceptions -fno-rtti -DHAVE_CURSES_H" \
./configure --prefix=/usr/local/mysql
```

This avoids problems with the `libstdc++` library and with C++ exceptions.

If this doesn't help, you should compile a debug version and run it with a trace file or under `gdb`. See MySQL Internals: Porting.

19.4. BSD Notes

This section provides information about using MySQL on variants of BSD Unix.

19.4.1. FreeBSD Notes

FreeBSD 4.x or newer is recommended for running MySQL, because the thread package is much more integrated. To get a secure and stable system, you should use only FreeBSD kernels that are marked `-RELEASE`.

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

- A working MySQL with all optimizations enabled that are known to work on your version of FreeBSD.

- Automatic configuration and build.

- Startup scripts installed in `/usr/local/etc/rc.d`.

- The ability to use `pkg_info -L` to see which files are installed.

- The ability to use `pkg_delete` to remove MySQL if you no longer want it on your machine.

It is recommended you use MIT-pthreads on FreeBSD 2.x, and native threads on FreeBSD 3 and up. It is possible to run with native threads on some late 2.2.x versions, but you may encounter problems shutting down `mysqld`.

Unfortunately, certain function calls on FreeBSD are not yet fully thread-safe. Most notably, this includes the `gethostby-name()` function, which is used by MySQL to convert host names into IP addresses. Under certain circumstances, the `mysqld` process suddenly causes 100% CPU load and is unresponsive. If you encounter this problem, try to start MySQL using the `--skip-name-resolve` option.

Alternatively, you can link MySQL on FreeBSD 4.x against the LinuxThreads library, which avoids a few of the problems that the native FreeBSD thread implementation has. For a very good comparison of LinuxThreads versus native threads, see Jeremy Zawodny's article *FreeBSD or Linux for your MySQL Server?* at http://jeremy.zawodny.com/blog/archives/000697.html.

Known problem when using LinuxThreads on FreeBSD is:

- The connection times (`wait_timeout`, `interactive_timeout` and `net_read_timeout`) values are not honored. The symptom is that persistent connections can hang for a very long time without getting closed down and that a 'kill' for a thread will not take affect until the thread does it a new command

  This is probably a signal handling problem in the thread library where the signal doesn't break a pending read. This is supposed to be fixed in FreeBSD 5.0

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

The recommended way to compile and install MySQL on FreeBSD with `gcc` (2.95.2 and up) is:

```
CC=gcc CFLAGS="-O2 -fno-strength-reduce" \
    CXX=gcc CXXFLAGS="-O2 -fno-rtti -fno-exceptions \
    -felide-constructors -fno-strength-reduce" \
    ./configure --prefix=/usr/local/mysql --enable-assembler
gmake
gmake install
cd /usr/local/mysql
bin/mysql_install_db --user=mysql
bin/mysqld_safe &
```

If you notice that `configure` uses MIT-pthreads, you should read the MIT-pthreads notes. See Section 16.5, "MIT-pthreads Notes".

If you get an error from `make install` that it can't find `/usr/include/pthreads`, `configure` didn't detect that you need MIT-pthreads. To fix this problem, remove `config.cache`, and then re-run `configure` with the `--with-mit-threads` option.

Be sure that your name resolver setup is correct. Otherwise, you may experience resolver delays or failures when connecting to `mysqld`. Also make sure that the `localhost` entry in the `/etc/hosts` file is correct. The file should start with a line similar to this:

```
127.0.0.1       localhost localhost.your.domain
```

FreeBSD is known to have a very low default file handle limit. See '*FILE*' NOT FOUND and Similar Errors. Start the server by using the `--open-files-limit` option for `mysqld_safe`, or raise the limits for the `mysqld` user in `/etc/login.conf` and rebuild it with `cap_mkdb /etc/login.conf`. Also be sure that you set the appropriate class for this user in the password file if you are not using the default (use `chpass mysqld-user-name`). See `mysqld_safe`.

FreeBSD limits the size of a process to 512MB, even if you have much more RAM available on the system. So you may get an error such as this:

```
Out of memory (Needed 16391 bytes)
```

In current versions of FreeBSD (at least 4.x and greater), you may increase this limit by adding the following entries to the `/boot/loader.conf` file and rebooting the machine (these are not settings that can be changed at run time with the `sysctl`

command):

```
kern.maxdsiz="1073741824" # 1GB
kern.dfldsiz="1073741824" # 1GB
kern.maxssiz="134217728" # 128MB
```

For older versions of FreeBSD, you must recompile your kernel to change the maximum data segment size for a process. In this case, you should look at the MAXDSIZ option in the LINT config file for more information.

If you get problems with the current date in MySQL, setting the TZ variable should help. See Chapter 20, *Environment Variables*.

19.4.2. NetBSD Notes

To compile on NetBSD, you need GNU make. Otherwise, the build process fails when make tries to run lint on C++ files.

19.4.3. OpenBSD 2.5 Notes

On OpenBSD 2.5, you can compile MySQL with native threads with the following options:

```
CFLAGS=-pthread CXXFLAGS=-pthread ./configure --with-mit-threads=no
```

19.4.4. BSD/OS Version 2.x Notes

If you get the following error when compiling MySQL, your ulimit value for virtual memory is too low:

```
item_func.h: In method
`Item_func_ge::Item_func_ge(const Item_func_ge &)':
item_func.h:28: virtual memory exhausted
make[2]: *** [item_func.o] Error 1
```

Try using ulimit -v 80000 and run make again. If this doesn't work and you are using bash, try switching to csh or sh; some BSDI users have reported problems with bash and ulimit.

If you are using gcc, you may also use have to use the --with-low-memory flag for configure to be able to compile sql_yacc.cc.

If you get problems with the current date in MySQL, setting the TZ variable should help. See Chapter 20, *Environment Variables*.

19.4.5. BSD/OS Version 3.x Notes

Upgrade to BSD/OS 3.1. If that is not possible, install BSDIpatch M300-038.

Use the following command when configuring MySQL:

```
env CXX=shlicc++ CC=shlicc2 \
./configure \
    --prefix=/usr/local/mysql \
    --localstatedir=/var/mysql \
    --without-perl \
    --with-unix-socket-path=/var/mysql/mysql.sock
```

The following is also known to work:

```
env CC=gcc CXX=gcc CXXFLAGS=-O3 \
./configure \
    --prefix=/usr/local/mysql \
    --with-unix-socket-path=/var/mysql/mysql.sock
```

You can change the directory locations if you wish, or just use the defaults by not specifying any locations.

If you have problems with performance under heavy load, try using the --skip-thread-priority option to mysqld. This runs all threads with the same priority. On BSDI 3.1, this gives better performance, at least until BSDI fixes its thread scheduler.

If you get the error virtual memory exhausted while compiling, you should try using ulimit -v 80000 and running make again. If this doesn't work and you are using bash, try switching to csh or sh; some BSDI users have reported problems with bash and ulimit.

19.4.6. BSD/OS Version 4.x Notes

BSDI 4.x has some thread-related bugs. If you want to use MySQL on this, you should install all thread-related patches. At least M400-023 should be installed.

On some BSDI 4.x systems, you may get problems with shared libraries. The symptom is that you can't execute any client programs, for example, `mysqladmin`. In this case, you need to reconfigure not to use shared libraries with the `--disable-shared` option to configure.

Some customers have had problems on BSDI 4.0.1 that the `mysqld` binary after a while can't open tables. This occurs because some library/system-related bug causes `mysqld` to change current directory without having asked for that to happen.

The fix is to either upgrade MySQL to at least version 3.23.34 or, after running `configure`, remove the line `#define HAVE_REALPATH` from `config.h` before running `make`.

Note that this means that you can't symbolically link a database directories to another database directory or symbolic link a table to another database on BSDI. (Making a symbolic link to another disk is okay).

19.5. Other Unix Notes

19.5.1. HP-UX Version 10.20 Notes

If you install MySQL using a binary tarball distribution on HP-UX, you may run into trouble even before you get the MySQL distribution unpacked, as the HP-UX `tar` cannot handle long file names. This means that you may see errors when you try to unpack MySQL.

If this occurs, you must use GNU `tar` (`gtar`) to unpack the distribution.

There are a couple of small problems when compiling MySQL on HP-UX. We recommend that you use `gcc` instead of the HP-UX native compiler, because `gcc` produces better code.

We recommend using `gcc` 2.95 on HP-UX. Don't use high optimization flags (such as `-O6`) because they may not be safe on HP-UX.

The following `configure` line should work with `gcc` 2.95:

```
CFLAGS="-I/opt/dce/include -fpic" \
CXXFLAGS="-I/opt/dce/include -felide-constructors -fno-exceptions \
-fno-rtti" \
CXX=gcc \
./configure --with-pthread \
    --with-named-thread-libs='-ldce' \
    --prefix=/usr/local/mysql --disable-shared
```

The following `configure` line should work with `gcc` 3.1:

```
CFLAGS="-DHPUX -I/opt/dce/include -O3 -fPIC" CXX=gcc \
CXXFLAGS="-DHPUX -I/opt/dce/include -felide-constructors \
    -fno-exceptions -fno-rtti -O3 -fPIC" \
./configure --prefix=/usr/local/mysql \
    --with-extra-charsets=complex --enable-thread-safe-client \
    --enable-local-infile  --with-pthread \
    --with-named-thread-libs=-ldce --with-lib-ccflags=-fPIC
    --disable-shared
```

19.5.2. HP-UX Version 11.x Notes

If you install MySQL using a binary tarball distribution on HP-UX, you may run into trouble even before you get the MySQL distribution unpacked, as the HP-UX `tar` cannot handle long file names. This means that you may see errors when you try to unpack MySQL.

If this occurs, you must use GNU `tar` (`gtar`) to unpack the distribution.

Because of some critical bugs in the standard HP-UX libraries, you should install the following patches before trying to run MySQL on HP-UX 11.0:

```
PHKL_22840 Streams cumulative
PHNE_22397 ARPA cumulative
```

This solves the problem of getting `EWOULDBLOCK` from `recv()` and `EBADF` from `accept()` in threaded applications.

If you are using `gcc` 2.95.1 on an unpatched HP-UX 11.x system, you may get the following error:

```
In file included from /usr/include/unistd.h:11,
                 from ../include/global.h:125,
                 from mysql_priv.h:15,
                 from item.cc:19:
/usr/include/sys/unistd.h:184: declaration of C function ...
```

```
/usr/include/sys/pthread.h:440: previous declaration ...
In file included from item.h:306,
                 from mysql_priv.h:158,
                 from item.cc:19:
```

The problem is that HP-UX does not define `pthreads_atfork()` consistently. It has conflicting prototypes in `/usr/include/sys/unistd.h`:184 and `/usr/include/sys/pthread.h`:440.

One solution is to copy `/usr/include/sys/unistd.h` into `mysql/include` and edit `unistd.h` and change it to match the definition in `pthread.h`. Look for this line:

```
extern int pthread_atfork(void (*prepare)(), void (*parent)(),
                                   void (*child)());
```

Change it to look like this:

```
extern int pthread_atfork(void (*prepare)(void), void (*parent)(void),
                                   void (*child)(void));
```

After making the change, the following `configure` line should work:

```
CFLAGS="-fomit-frame-pointer -O3 -fpic" CXX=gcc \
CXXFLAGS="-felide-constructors -fno-exceptions -fno-rtti -O3" \
./configure --prefix=/usr/local/mysql --disable-shared
```

If you are using HP-UX compiler, you can use the following command (which has been tested with `cc` B.11.11.04):

```
CC=cc CXX=aCC CFLAGS=+DD64 CXXFLAGS=+DD64 ./configure \
    --with-extra-character-set=complex
```

You can ignore any errors of the following type:

```
aCC: warning 901: unknown option: `-3': use +help for online
documentation
```

If you get the following error from `configure`, verify that you don't have the path to the K&R compiler before the path to the HP-UX C and C++ compiler:

```
checking for cc option to accept ANSI C... no
configure: error: MySQL requires an ANSI C compiler (and a C++ compiler).
Try gcc. See the Installation chapter in the Reference Manual.
```

Another reason for not being able to compile is that you didn't define the `+DD64` flags as just described.

Another possibility for HP-UX 11 is to use the MySQL binaries provided at http://dev.mysql.com/downloads/, which we have built and tested ourselves. We have also received reports that the HP-UX 10.20 binaries supplied by MySQL can be run successfully on HP-UX 11. If you encounter problems, you should be sure to check your HP-UX patch level.

19.5.3. IBM-AIX notes

Automatic detection of `xlC` is missing from Autoconf, so a number of variables need to be set before running `configure`. The following example uses the IBM compiler:

```
export CC="xlc_r -ma -O3 -qstrict -qoptimize=3 -qmaxmem=8192 "
export CXX="xlC_r -ma -O3 -qstrict -qoptimize=3 -qmaxmem=8192"
export CFLAGS="-I /usr/local/include"
export LDFLAGS="-L /usr/local/lib"
export CPPFLAGS=$CFLAGS
export CXXFLAGS=$CFLAGS
./configure --prefix=/usr/local \
            --localstatedir=/var/mysql \
            --sbindir='/usr/local/bin' \
            --libexecdir='/usr/local/bin' \
            --enable-thread-safe-client \
            --enable-large-files
```

The preceding options are used to compile the MySQL distribution that can be found at http://www-frec.bull.com/.

If you change the `-O3` to `-O2` in the preceding `configure` line, you must also remove the `-qstrict` option. This is a limitation in the IBM C compiler.

If you are using `gcc` to compile MySQL, you *must* use the `-fno-exceptions` flag, because the exception handling in `gcc` is not thread-safe! There are also some known problems with IBM's assembler that may cause it to generate bad code when used with

`gcc`.

We recommend the following `configure` line with `gcc` 2.95 on AIX:

```
CC="gcc -pipe -mcpu=power -Wa,-many" \
CXX="gcc -pipe -mcpu=power -Wa,-many" \
CXXFLAGS="-felide-constructors -fno-exceptions -fno-rtti" \
./configure --prefix=/usr/local/mysql --with-low-memory
```

The `-Wa,-many` option is necessary for the compile to be successful. IBM is aware of this problem but is in no hurry to fix it because of the workaround that is available. We don't know if the `-fno-exceptions` is required with `gcc` 2.95, but because MySQL doesn't use exceptions and the option generates faster code, we recommend that you should always use it with `gcc`.

If you get a problem with assembler code, try changing the `-mcpu=xxx` option to match your CPU. Typically `power2`, `power`, or `powerpc` may need to be used. Alternatively, you might need to use `604` or `604e`. We are not positive but suspect that `power` would likely be safe most of the time, even on a power2 machine.

If you don't know what your CPU is, execute a `uname  -m` command. It produces a string that looks like `000514676700`, with a format of `xxyyyyyymmss` where `xx` and `ss` are always `00`, `yyyyyy` is a unique system ID and `mm` is the ID of the CPU Planar. A chart of these values can be found at http://www16.boulder.ibm.com/pseries/en_US/cmds/aixcmds5/uname.htm.

This gives you a machine type and a machine model you can use to determine what type of CPU you have.

If you have problems with signals (MySQL dies unexpectedly under high load), you may have found an OS bug with threads and signals. In this case, you can tell MySQL not to use signals by configuring as follows:

```
CFLAGS=-DDONT_USE_THR_ALARM CXX=gcc \
CXXFLAGS="-felide-constructors -fno-exceptions -fno-rtti \
-DDONT_USE_THR_ALARM" \
./configure --prefix=/usr/local/mysql --with-debug \
    --with-low-memory
```

This doesn't affect the performance of MySQL, but has the side effect that you can't kill clients that are "sleeping" on a connection with `mysqladmin kill` or `mysqladmin shutdown`. Instead, the client dies when it issues its next command.

On some versions of AIX, linking with `libbind.a` makes `getservbyname()` dump core. This is an AIX bug and should be reported to IBM.

For AIX 4.2.1 and `gcc`, you have to make the following changes.

After configuring, edit `config.h` and `include/my_config.h` and change the line that says this:

```
#define HAVE_SNPRINTF 1
```

to this:

```
#undef HAVE_SNPRINTF
```

And finally, in `mysqld.cc`, you need to add a prototype for `initgroups()`.

```
#ifdef _AIX41
extern "C" int initgroups(const char *,int);
#endif
```

For 32-bit binaries, if you need to allocate a lot of memory to the `mysqld` process, it is not enough to just use `ulimit -d unlimited`. You may also have to modify `mysqld_safe` to add a line something like this:

```
export LDR_CNTRL='MAXDATA=0x80000000'
```

You can find more information about using a lot of memory at http://publib16.boulder.ibm.com/pseries/en_US/aixprggd/genprogc/lrg_prg_support.htm.

Users of AIX 4.3 should use `gmake` instead of the `make` utility included with AIX.

As of AIX 4.1, the C compiler has been unbundled from AIX as a separate product. We recommend using `gcc` 3.3.2, which can be obtained here: ftp://ftp.software.ibm.com/aix/freeSoftware/aixtoolbox/RPMS/ppc/gcc/

The steps for compiling MySQL on AIX with `gcc` 3.3.2 are similar to those for using `gcc` 2.95 (in particular, the need to edit `config.h` and `my_config.h` after running `configure`). However, before running `configure`, you should also patch the `curses.h` file as follows:

```
/opt/freeware/lib/gcc-lib/powerpc-ibm-aix5.2.0.0/3.3.2/include/curses.h.ORIG
        Mon Dec 26 02:17:28 2005
```

```
--- /opt/freeware/lib/gcc-lib/powerpc-ibm-aix5.2.0.0/3.3.2/include/curses.h
Mon Dec 26 02:40:13 2005
***************
*** 2023,2029 ****
  #endif /* _AIX32_CURSES */
! #if defined(__USE_FIXED_PROTOTYPES__) || defined(__cplusplus) || defined
(__STRICT_ANSI__)
  extern int delwin (WINDOW *);
  extern int endwin (void);
  extern int getcurx (WINDOW *);
--- 2023,2029 ----
  #endif /* _AIX32_CURSES */
! #if 0 && (defined(__USE_FIXED_PROTOTYPES__) || defined(__cplusplus)
|| defined
(__STRICT_ANSI__))
  extern int delwin (WINDOW *);
  extern int endwin (void);
  extern int getcurx (WINDOW *);
```

19.5.4. SunOS 4 Notes

On SunOS 4, MIT-pthreads is needed to compile MySQL. This in turn means you need GNU make.

Some SunOS 4 systems have problems with dynamic libraries and libtool. You can use the following configure line to avoid this problem:

```
./configure --disable-shared --with-mysqld-ldflags=-all-static
```

When compiling readline, you may get warnings about duplicate defines. These can be ignored.

When compiling mysqld, there are some implicit declaration of function warnings. These can be ignored.

19.5.5. Alpha-DEC-UNIX Notes (Tru64)

If you are using egcs 1.1.2 on Digital Unix, you should upgrade to gcc 2.95.2, because egcs on DEC has some serious bugs!

When compiling threaded programs under Digital Unix, the documentation recommends using the -pthread option for cc and cxx and the -lmach -lexc libraries (in addition to -lpthread). You should run configure something like this:

```
CC="cc -pthread" CXX="cxx -pthread -O" \
./configure --with-named-thread-libs="-lpthread -lmach -lexc -lc"
```

When compiling mysqld, you may see a couple of warnings like this:

```
mysqld.cc: In function void handle_connections()':
mysqld.cc:626: passing long unsigned int *' as argument 3 of
accept(int,sockadddr *, int *)'
```

You can safely ignore these warnings. They occur because configure can detect only errors, not warnings.

If you start the server directly from the command line, you may have problems with it dying when you log out. (When you log out, your outstanding processes receive a SIGHUP signal.) If so, try starting the server like this:

```
nohup mysqld [options] &
```

nohup causes the command following it to ignore any SIGHUP signal sent from the terminal. Alternatively, start the server by running mysqld_safe, which invokes mysqld using nohup for you. See mysqld_safe.

If you get a problem when compiling mysys/get_opt.c, just remove the #define _NO_PROTO line from the start of that file.

If you are using Compaq's CC compiler, the following configure line should work:

```
CC="cc -pthread"
CFLAGS="-O4 -ansi_alias -ansi_args -fast -inline speed \
        -speculate all -arch host"
CXX="cxx -pthread"
CXXFLAGS="-O4 -ansi_alias -ansi_args -fast -inline speed \
        -speculate all -arch host -noexceptions -nortti"
export CC CFLAGS CXX CXXFLAGS
./configure \
    --prefix=/usr/local/mysql \
    --with-low-memory \
    --enable-large-files \
    --enable-shared=yes \
    --with-named-thread-libs="-lpthread -lmach -lexc -lc"
gnumake
```

If you get a problem with `libtool` when compiling with shared libraries as just shown, when linking `mysql`, you should be able to get around this by issuing these commands:

```
cd mysql
/bin/sh ../libtool --mode=link cxx -pthread  -O3 -DDBUG_OFF \
    -O4 -ansi_alias -ansi_args -fast -inline speed \
    -speculate all \ -arch host  -DUNDEF_HAVE_GETHOSTBYNAME_R \
    -o mysql  mysql.o readline.o sql_string.o completion_hash.o \
    ../readline/libreadline.a -lcurses \
    ../libmysql/.libs/libmysqlclient.so  -lm
cd ..
gnumake
gnumake install
scripts/mysql_install_db
```

19.5.6. Alpha-DEC-OSF/1 Notes

If you have problems compiling and have DEC `CC` and `gcc` installed, try running `configure` like this:

```
CC=cc CFLAGS=-O CXX=gcc CXXFLAGS=-O3 \
./configure --prefix=/usr/local/mysql
```

If you get problems with the `c_asm.h` file, you can create and use a 'dummy' `c_asm.h` file with:

```
touch include/c_asm.h
CC=gcc CFLAGS=-I./include \
CXX=gcc CXXFLAGS=-O3 \
./configure --prefix=/usr/local/mysql
```

Note that the following problems with the `ld` program can be fixed by downloading the latest DEC (Compaq) patch kit from: ht-tp://ftp.support.compaq.com/public/unix/.

On OSF/1 V4.0D and compiler "DEC C V5.6-071 on Digital Unix V4.0 (Rev. 878)," the compiler had some strange behavior (undefined `asm` symbols). `/bin/ld` also appears to be broken (problems with `_exit undefined` errors occurring while link-ing `mysqld`). On this system, we have managed to compile MySQL with the following `configure` line, after replacing `/bin/ld` with the version from OSF 4.0C:

```
CC=gcc CXX=gcc CXXFLAGS=-O3 ./configure --prefix=/usr/local/mysql
```

With the Digital compiler "C++ V6.1-029," the following should work:

```
CC=cc -pthread
CFLAGS=-O4 -ansi_alias -ansi_args -fast -inline speed \
       -speculate all -arch host
CXX=cxx -pthread
CXXFLAGS=-O4 -ansi_alias -ansi_args -fast -inline speed \
         -speculate all -arch host -noexceptions -nortti
export CC CFLAGS CXX CXXFLAGS
./configure --prefix=/usr/mysql/mysql \
            --with-mysqld-ldflags=-all-static --disable-shared \
            --with-named-thread-libs="-lmach -lexc -lc"
```

In some versions of OSF/1, the `alloca()` function is broken. Fix this by removing the line in `config.h` that defines `'HAVE_ALLOCA'`.

The `alloca()` function also may have an incorrect prototype in `/usr/include/alloca.h`. This warning resulting from this can be ignored.

`configure` uses the following thread libraries automatically: `--with-named-thread-libs="-lpthread -lmach -lexc -lc"`.

When using `gcc`, you can also try running `configure` like this:

```
CFLAGS=-D_PTHREAD_USE_D4 CXX=gcc CXXFLAGS=-O3 ./configure ...
```

If you have problems with signals (MySQL dies unexpectedly under high load), you may have found an OS bug with threads and signals. In this case, you can tell MySQL not to use signals by configuring with:

```
CFLAGS=-DDONT_USE_THR_ALARM \
CXXFLAGS=-DDONT_USE_THR_ALARM \
./configure ...
```

This does not affect the performance of MySQL, but has the side effect that you can't kill clients that are "sleeping" on a connection with `mysqladmin kill` or `mysqladmin shutdown`. Instead, the client dies when it issues its next command.

With `gcc` 2.95.2, you may encounter the following compile error:

```
sql_acl.cc:1456: Internal compiler error in `scan_region',
at except.c:2566
Please submit a full bug report.
```

To fix this, you should change to the `sql` directory and do a cut-and-paste of the last `gcc` line, but change `-O3` to `-O0` (or add `-O0` immediately after `gcc` if you don't have any `-O` option on your compile line). After this is done, you can just change back to the top-level directory and run `make` again.

19.5.7. SGI Irix Notes

As of MySQL 5.0, we don't provide binaries for Irix any more.

If you are using Irix 6.5.3 or newer, `mysqld` is able to create threads only if you run it as a user that has `CAP_SCHED_MGT` privileges (such as `root`) or give the `mysqld` server this privilege with the following shell command:

```
chcap "CAP_SCHED_MGT+epi" /opt/mysql/libexec/mysqld
```

You may have to undefine some symbols in `config.h` after running `configure` and before compiling.

In some Irix implementations, the `alloca()` function is broken. If the `mysqld` server dies on some `SELECT` statements, remove the lines from `config.h` that define `HAVE_ALLOC` and `HAVE_ALLOCA_H`. If `mysqladmin create` doesn't work, remove the line from `config.h` that defines `HAVE_READDIR_R`. You may have to remove the `HAVE_TERM_H` line as well.

SGI recommends that you install all the patches on this page as a set: ht-tp://support.sgi.com/surfzone/patches/patchset/6.2_indigo.rps.html

At the very minimum, you should install the latest kernel rollup, the latest `rld` rollup, and the latest `libc` rollup.

You definitely need all the POSIX patches on this page, for pthreads support:

http://support.sgi.com/surfzone/patches/patchset/6.2_posix.rps.html

If you get the something like the following error when compiling `mysql.cc`:

```
"/usr/include/curses.h", line 82: error(1084):
invalid combination of type
```

Type the following in the top-level directory of your MySQL source tree:

```
extra/replace bool curses_bool < /usr/include/curses.h > include/curses.h
make
```

There have also been reports of scheduling problems. If only one thread is running, performance is slow. Avoid this by starting another client. This may lead to a two-to-tenfold increase in execution speed thereafter for the other thread. This is a poorly understood problem with Irix threads; you may have to improvise to find solutions until this can be fixed.

If you are compiling with `gcc`, you can use the following `configure` command:

```
CC=gcc CXX=gcc CXXFLAGS=-O3 \
./configure --prefix=/usr/local/mysql --enable-thread-safe-client \
    --with-named-thread-libs=-lpthread
```

On Irix 6.5.11 with native Irix C and C++ compilers ver. 7.3.1.2, the following is reported to work

```
CC=cc CXX=CC CFLAGS='-O3 -n32 -TARG:platform=IP22 -I/usr/local/include \
-L/usr/local/lib' CXXFLAGS='-O3 -n32 -TARG:platform=IP22 \
-I/usr/local/include -L/usr/local/lib' \
./configure --prefix=/usr/local/mysql --with-innodb --with-berkeley-db \
    --with-libwrap=/usr/local \
    --with-named-curses-libs=/usr/local/lib/libncurses.a
```

19.5.8. SCO UNIX and OpenServer 5.0.x Notes

The current port is tested only on `sco3.2v5.0.5`, `sco3.2v5.0.6`, and `sco3.2v5.0.7` systems. There has also been progress on a port to `sco3.2v4.2`. Open Server 5.0.8 (Legend) has native threads and allows files greater than 2GB. The current

maximum file size is 2GB.

We have been able to compile MySQL with the following `configure` command on OpenServer with `gcc` 2.95.3.

```
CC=gcc CFLAGS="-D_FILE_OFFSET_BITS=64 -O3" \
CXX=gcc CXXFLAGS="-D_FILE_OFFSET_BITS=64 -O3" \
./configure --prefix=/usr/local/mysql \
    --enable-thread-safe-client --with-innodb \
    --with-openssl --with-vio --with-extra-charsets=complex
```

`gcc` is available at ftp://ftp.sco.com/pub/openserver5/opensrc/gnutools-5.0.7Kj.

This development system requires the OpenServer Execution Environment Supplement oss646B on OpenServer 5.0.6 and oss656B and The OpenSource libraries found in gwxlibs. All OpenSource tools are in the `opensrc` directory. They are available at ftp://ftp.sco.com/pub/openserver5/opensrc/.

We recommend using the latest production release of MySQL.

SCO provides operating system patches at ftp://ftp.sco.com/pub/openserver5 for OpenServer 5.0.[0-6] and ftp://ftp.sco.com/pub/openserverv5/507 for OpenServer 5.0.7.

SCO provides information about security fixes at ftp://ftp.sco.com/pub/security/OpenServer for OpenServer 5.0.x.

The maximum file size on an OpenServer 5.0.x system is 2GB.

The total memory which can be allocated for streams buffers, clists, and lock records cannot exceed 60MB on OpenServer 5.0.x.

Streams buffers are allocated in units of 4096 byte pages, clists are 70 bytes each, and lock records are 64 bytes each, so:

```
(NSTRPAGES × 4096) + (NCLIST × 70) + (MAX_FLCKREC × 64) <= 62914560
```

Follow this procedure to configure the Database Services option. If you are unsure whether an application requires this, see the documentation provided with the application.

1. Log in as `root`.

2. Enable the SUDS driver by editing the `/etc/conf/sdevice.d/suds` file. Change the `N` in the second field to a `Y`.

3. Use `mkdev aio` or the Hardware/Kernel Manager to enable support for asynchronous I/O and relink the kernel. To allow users to lock down memory for use with this type of I/O, update the aiomemlock(F) file. This file should be updated to include the names of users that can use AIO and the maximum amounts of memory they can lock down.

4. Many applications use setuid binaries so that you need to specify only a single user. See the documentation provided with the application to determine whether this is the case for your application.

After you complete this process, reboot the system to create a new kernel incorporating these changes.

By default, the entries in `/etc/conf/cf.d/mtune` are set as follows:

```
Value          Default        Min          Max
-----          -------        ---          ---
NBUF           0              24           450000
NHBUF          0              32           524288
NMPBUF         0              12           512
MAX_INODE      0              100          64000
MAX_FILE       0              100          64000
CTBUFSIZE      128            0            256
MAX_PROC       0              50           16000
MAX_REGION     0              500          160000
NCLIST         170            120          16640
MAXUP          100            15           16000
NOFILES        110            60           11000
NHINODE        128            64           8192
NAUTOUP        10             0            60
NGROUPS        8              0            128
BDFLUSHR       30             1            300
MAX_FLCKREC    0              50           16000
PUTBUFSZ       8000           2000         20000
MAXSLICE       100            25           100
ULIMIT         4194303        2048         4194303
* Streams Parameters
NSTREAM        64             1            32768
NSTRPUSH       9              9            9
NMUXLINK       192            1            4096
STRMSGSZ       16384          4096         524288
STRCTLSZ       1024           1024         1024
STRMAXBLK      524288         4096         524288
NSTRPAGES      500            0            8000
STRSPLITFRAC   80             50           100
```

```
NLOG             3              3              3
NUMSP            64             1              256
NUMTIM           16             1              8192
NUMTRW           16             1              8192
* Semaphore Parameters
SEMMAP           10             10             8192
SEMMNI           10             10             8192
SEMMNS           60             60             8192
SEMMNU           30             10             8192
SEMMSL           25             25             150
SEMOPM           10             10             1024
SEMUME           10             10             25
SEMVMX           32767          32767          32767
SEMAEM           16384          16384          16384
* Shared Memory Parameters
SHMMAX           524288         131072         2147483647
SHMMIN           1              1              1
SHMMNI           100            100            2000
FILE             0              100            64000
NMOUNT           0              4              256
NPROC            0              50             16000
NREGION          0              500            160000
```

We recommend setting these values as follows:

- NOFILES should be 4096 or 2048.

- MAXUP should be 2048.

To make changes to the kernel, use the `idtune` *name parameter* command. `idtune` modifies the `/etc/conf/cf.d/stune` file for you. For example, to change SEMMS to 200, execute this command as root:

```
# /etc/conf/bin/idtune SEMMNS 200
```

Then rebuild and reboot the kernel by issuing this command:

```
# /etc/conf/bin/idbuild -B && init 6
```

We recommend tuning the system, but the proper parameter values to use depend on the number of users accessing the application or database and size the of the database (that is, the used buffer pool). The following kernel parameters can be set with `idtune`:

- SHMMAX (recommended setting: 128MB) and SHMSEG (recommended setting: 15). These parameters have an influence on the MySQL database engine to create user buffer pools.

- NOFILES and MAXUP should be set to at least 2048.

- MAXPROC should be set to at least 3000/4000 (depends on number of users) or more.

- We also recommend using the following formulas to calculate values for SEMMSL, SEMMNS, and SEMMNU:

  ```
  SEMMSL = 13
  ```

  13 is what has been found to be the best for both Progress and MySQL.

  ```
  SEMMNS = SEMMSL × number of db servers to be run on the system
  ```

  Set SEMMNS to the value of SEMMSL multiplied by the number of database servers (maximum) that you are running on the system at one time.

  ```
  SEMMNU = SEMMNS
  ```

  Set the value of SEMMNU to equal the value of SEMMNS. You could probably set this to 75% of SEMMNS, but this is a conservative estimate.

You need to at least install the SCO OpenServer Linker and Application Development Libraries or the OpenServer Development System to use gcc. You cannot use the GCC Dev system without installing one of these.

You should get the FSU Pthreads package and install it first. This can be found at http://moss.csc.ncsu.edu/~mueller/ftp/pub/PART/pthreads.tar.gz. You can also get a precompiled package from ftp://ftp.zenez.com/pub/zenez/prgms/FSU-threads-3.14.tar.gz.

FSU Pthreads can be compiled with SCO Unix 4.2 with tcpip, or using OpenServer 3.0 or Open Desktop 3.0 (OS 3.0 ODT 3.0) with the SCO Development System installed using a good port of GCC 2.5.x. For ODT or OS 3.0, you need a good port of GCC 2.5.x. There are a lot of problems without a good port. The port for this product requires the SCO Unix Development system. Without it, you are missing the libraries and the linker that is needed. You also need `SCO-3.2v4.2-includes.tar.gz`. This file contains the changes to the SCO Development include files that are needed to get MySQL to build. You need to replace the existing system include files with these modified header files. They can be obtained from ftp://ftp.zenez.com/pub/zenez/prgms/SCO-3.2v4.2-includes.tar.gz.

To build FSU Pthreads on your system, all you should need to do is run GNU `make`. The `Makefile` in FSU-threads-3.14.tar.gz is set up to make FSU-threads.

You can run `./configure` in the `threads/src` directory and select the SCO OpenServer option. This command copies `Makefile.SCO5` to `Makefile`. Then run `make`.

To install in the default `/usr/include` directory, log in as `root`, and then `cd` to the `thread/src` directory and run `make install`.

Remember that you must use GNU `make` to build MySQL.

> **Note**
>
> If you don't start `mysqld_safe` as `root`, you should get only the default 110 open files per process. `mysqld` writes a note about this in the log file.

With SCO 3.2V4.2, you should use FSU Pthreads version 3.14 or newer. The following `configure` command should work:

```
CFLAGS="-D_XOPEN_XPG4" CXX=gcc CXXFLAGS="-D_XOPEN_XPG4" \
./configure \
    --prefix=/usr/local/mysql \
    --with-named-thread-libs="-lgthreads -lsocket -lgen -lgthreads" \
    --with-named-curses-libs="-lcurses"
```

You may have problems with some include files. In this case, you can find new SCO-specific include files at ftp://ftp.zenez.com/pub/zenez/prgms/SCO-3.2v4.2-includes.tar.gz.

You should unpack this file in the `include` directory of your MySQL source tree.

SCO development notes:

- MySQL should automatically detect FSU Pthreads and link `mysqld` with `-lgthreads -lsocket -lgthreads`.

- The SCO development libraries are re-entrant in FSU Pthreads. SCO claims that its library functions are re-entrant, so they must be re-entrant with FSU Pthreads. FSU Pthreads on OpenServer tries to use the SCO scheme to make re-entrant libraries.

- FSU Pthreads (at least the version at ftp://ftp.zenez.com) comes linked with GNU `malloc`. If you encounter problems with memory usage, make sure that `gmalloc.o` is included in `libgthreads.a` and `libgthreads.so`.

- In FSU Pthreads, the following system calls are pthreads-aware: `read()`, `write()`, `getmsg()`, `connect()`, `accept()`, `select()`, and `wait()`.

- The CSSA-2001-SCO.35.2 (the patch is listed in custom as erg711905-dscr_remap security patch (version 2.0.0)) breaks FSU threads and makes `mysqld` unstable. You have to remove this one if you want to run `mysqld` on an OpenServer 5.0.6 machine.

- If you use SCO OpenServer 5, you may need to recompile FSU pthreads with `-DDRAFT7` in `CFLAGS`. Otherwise, `InnoDB` may hang at a `mysqld` startup.

- SCO provides operating system patches at ftp://ftp.sco.com/pub/openserver5 for OpenServer 5.0.x.

- SCO provides security fixes and `libsocket.so.2` at ftp://ftp.sco.com/pub/security/OpenServer and ftp://ftp.sco.com/pub/security/sse for OpenServer 5.0.x.

- Pre-OSR506 security fixes. Also, the `telnetd` fix at ftp://stage.caldera.com/pub/security/openserver/ or ftp://stage.caldera.com/pub/security/openserver/CSSA-2001-SCO.10/ as both `libsocket.so.2` and `libresolv.so.1` with instructions for installing on pre-OSR506 systems.

  It is probably a good idea to install these patches before trying to compile/use MySQL.

Beginning with Legend/OpenServer 6.0.0, there are native threads and no 2GB file size limit.

19.5.9. SCO OpenServer 6.0.x Notes

OpenServer 6 includes these key improvements:

- Larger file support up to 1 TB

- Multiprocessor support increased from 4 to 32 processors

- Increased memory support up to 64GB

- Extending the power of UnixWare into OpenServer 6

- Dramatic performance improvement

OpenServer 6.0.0 commands are organized as follows:

- `/bin` is for commands that behave exactly the same as on OpenServer 5.0.x.

- `/u95/bin` is for commands that have better standards conformance, for example Large File System (LFS) support.

- `/udk/bin` is for commands that behave the same as on UnixWare 7.1.4. The default is for the LFS support.

The following is a guide to setting `PATH` on OpenServer 6. If the user wants the traditional OpenServer 5.0.x then `PATH` should be `/bin` first. If the user wants LFS support, the path should be `/u95/bin:/bin`. If the user wants UnixWare 7 support first, the path would be `/udk/bin:/u95/bin:/bin:`.

We recommend using the latest production release of MySQL. Should you choose to use an older release of MySQL on OpenServer 6.0.x, you must use a version of MySQL at least as recent as 3.22.13 to get fixes for some portability and OS problems.

MySQL distribution files with names of the following form are `tar` archives of media are tar archives of media images suitable for installation with the SCO Software Manager (`/etc/custom`) on SCO OpenServer 6:

```
mysql-PRODUCT-5.0.84-sco-osr6-i686.VOLS.tar
```

A distribution where `PRODUCT` is `pro-cert` is the Commercially licensed MySQL Pro Certified server. A distribution where `PRODUCT` is `pro-gpl-cert` is the MySQL Pro Certified server licensed under the terms of the General Public License (GPL).

Select whichever distribution you wish to install and, after download, extract the `tar` archive into an empty directory. For example:

```
shell> mkdir /tmp/mysql-pro
shell> cd /tmp/mysql-pro
shell> tar xf /tmp/mysql-pro-cert-5.0.84-sco-osr6-i686.VOLS.tar
```

Prior to installation, back up your data in accordance with the procedures outlined in Section 18.1, "Upgrading MySQL".

Remove any previously installed `pkgadd` version of MySQL:

```
shell> pkginfo mysql 2>&1 > /dev/null && pkgrm mysql
```

Install MySQL Pro from media images using the SCO Software Manager:

```
shell> /etc/custom -p SCO:MySQL -i -z /tmp/mysql-pro
```

Alternatively, the SCO Software Manager can be displayed graphically by clicking on the `Software Manager` icon on the desktop, selecting `Software -> Install New`, selecting the host, selecting `Media Images` for the Media Device, and entering `/tmp/mysql-pro` as the Image Directory.

After installation, run `mkdev mysql` as the `root` user to configure your newly installed MySQL Pro Certified server.

> **Note**
>
> The installation procedure for VOLS packages does not create the `mysql` user and group that the package uses by default. You should either create the `mysql` user and group, or else select a different user and group using an option in `mkdev mysql`.

If you wish to configure your MySQL Pro server to interface with the Apache Web server via PHP, download and install the PHP

update from SCO at ftp://ftp.sco.com/pub/updates/OpenServer/SCOSA-2006.17/.

We have been able to compile MySQL with the following `configure` command on OpenServer 6.0.x:

```
CC=cc CFLAGS="-D_FILE_OFFSET_BITS=64 -O3" \
CXX=CC CXXFLAGS="-D_FILE_OFFSET_BITS=64 -O3" \
./configure --prefix=/usr/local/mysql \
    --enable-thread-safe-client --with-berkeley-db \
    --with-extra-charsets=complex \
    --build=i686-unknown-sysv5SCO_SV6.0.0
```

If you use `gcc`, you must use `gcc` 2.95.3 or newer.

```
CC=gcc CXX=g++ ... ./configure ...
```

The version of Berkeley DB that comes with either UnixWare 7.1.4 or OpenServer 6.0.0 is not used when building MySQL. MySQL instead uses its own version of Berkeley DB. The `configure` command needs to build both a static and a dynamic library in `src_directory`/bdb/build_unix/, but it does not with MySQL's own `BDB` version. The workaround is as follows.

1. Configure as normal for MySQL.

2. `cd bdb/build_unix/`

3. `cp -p Makefile Makefile.sav`

4. Use same options and run `../dist/configure`.

5. Run `gmake`.

6. `cp -p Makefile.sav Makefile`

7. Change location to the top source directory and run `gmake`.

This allows both the shared and dynamic libraries to be made and work.

SCO provides OpenServer 6 operating system patches at ftp://ftp.sco.com/pub/openserver6.

SCO provides information about security fixes at ftp://ftp.sco.com/pub/security/OpenServer.

By default, the maximum file size on a OpenServer 6.0.0 system is 1TB. Some operating system utilities have a limitation of 2GB. The maximum possible file size on UnixWare 7 is 1TB with VXFS or HTFS.

OpenServer 6 can be configured for large file support (file sizes greater than 2GB) by tuning the UNIX kernel.

By default, the entries in `/etc/conf/cf.d/mtune` are set as follows:

```
Value           Default         Min             Max
-----           -------         ---             ---
SVMMLIM         0x9000000       0x1000000       0x7FFFFFFF
HVMMLIM         0x9000000       0x1000000       0x7FFFFFFF
```

To make changes to the kernel, use the `idtune name parameter` command. `idtune` modifies the `/etc/conf/cf.d/stune` file for you. We recommend setting the kernel values by executing the following commands as `root`:

```
# /etc/conf/bin/idtune SDATLIM 0x7FFFFFFF
# /etc/conf/bin/idtune HDATLIM 0x7FFFFFFF
# /etc/conf/bin/idtune SVMMLIM 0x7FFFFFFF
# /etc/conf/bin/idtune HVMMLIM 0x7FFFFFFF
# /etc/conf/bin/idtune SFNOLIM 2048
# /etc/conf/bin/idtune HFNOLIM 2048
```

Then rebuild and reboot the kernel by issuing this command:

```
# /etc/conf/bin/idbuild -B && init 6
```

We recommend tuning the system, but the proper parameter values to use depend on the number of users accessing the application or database and size the of the database (that is, the used buffer pool). The following kernel parameters can be set with `idtune`:

*   `SHMMAX` (recommended setting: 128MB) and `SHMSEG` (recommended setting: 15). These parameters have an influence on the MySQL database engine to create user buffer pools.

- SFNOLIM and HFNOLIM should be at maximum 2048.

- NPROC should be set to at least 3000/4000 (depends on number of users).

- We also recommend using the following formulas to calculate values for SEMMSL, SEMMNS, and SEMMNU:

```
SEMMSL = 13
```

13 is what has been found to be the best for both Progress and MySQL.

```
SEMMNS = SEMMSL × number of db servers to be run on the system
```

Set SEMMNS to the value of SEMMSL multiplied by the number of database servers (maximum) that you are running on the system at one time.

```
SEMMNU = SEMMNS
```

Set the value of SEMMNU to equal the value of SEMMNS. You could probably set this to 75% of SEMMNS, but this is a conservative estimate.

19.5.10. SCO UnixWare 7.1.x and OpenUNIX 8.0.0 Notes

We recommend using the latest production release of MySQL. Should you choose to use an older release of MySQL on UnixWare 7.1.x, you must use a version of MySQL at least as recent as 3.22.13 to get fixes for some portability and OS problems.

We have been able to compile MySQL with the following configure command on UnixWare 7.1.x:

```
CC="cc" CFLAGS="-I/usr/local/include" \
CXX="CC" CXXFLAGS="-I/usr/local/include" \
./configure --prefix=/usr/local/mysql \
    --enable-thread-safe-client --with-berkeley-db=./bdb \
    --with-innodb --with-openssl --with-extra-charsets=complex
```

If you want to use gcc, you must use gcc 2.95.3 or newer.

```
CC=gcc CXX=g++ ... ./configure ...
```

The version of Berkeley DB that comes with either UnixWare 7.1.4 or OpenServer 6.0.0 is not used when building MySQL. MySQL instead uses its own version of Berkeley DB. The configure command needs to build both a static and a dynamic library in src_directory/bdb/build_unix/, but it does not with MySQL's own BDB version. The workaround is as follows.

1. Configure as normal for MySQL.

2. cd bdb/build_unix/

3. cp -p Makefile Makefile.sav

4. Use same options and run ../dist/configure.

5. Run gmake.

6. cp -p Makefile.sav Makefile

7. Change to top source directory and run gmake.

This allows both the shared and dynamic libraries to be made and work.

SCO provides operating system patches at ftp://ftp.sco.com/pub/unixware7 for UnixWare 7.1.1, ftp://ftp.sco.com/pub/unixware7/713/ for UnixWare 7.1.3, ftp://ftp.sco.com/pub/unixware7/714/ for UnixWare 7.1.4, and ftp://ftp.sco.com/pub/openunix8 for OpenUNIX 8.0.0.

SCO provides information about security fixes at ftp://ftp.sco.com/pub/security/OpenUNIX for OpenUNIX and ftp://ftp.sco.com/pub/security/UnixWare for UnixWare.

The UnixWare 7 file size limit is 1 TB with VXFS. Some OS utilities have a limitation of 2GB.

On UnixWare 7.1.4 you do not need to do anything to get large file support, but to enable large file support on prior versions of

UnixWare 7.1.x, run `fsadm`.

```
# fsadm -Fvxfs -o largefiles /
# fsadm /            * Note
# ulimit unlimited
# /etc/conf/bin/idtune SFSZLIM 0x7FFFFFFF      ** Note
# /etc/conf/bin/idtune HFSZLIM 0x7FFFFFFF      ** Note
# /etc/conf/bin/idbuild -B
* This should report "largefiles".
** 0x7FFFFFFF represents infinity for these values.
```

Reboot the system using `shutdown`.

By default, the entries in `/etc/conf/cf.d/mtune` are set as follows:

```
Value           Default         Min             Max
-----           -------         ---             ---
SVMMLIM         0x9000000       0x1000000       0x7FFFFFFF
HVMMLIM         0x9000000       0x1000000       0x7FFFFFFF
```

To make changes to the kernel, use the `idtune name parameter` command. `idtune` modifies the `/etc/conf/cf.d/stune` file for you. We recommend setting the kernel values by executing the following commands as `root`:

```
# /etc/conf/bin/idtune SDATLIM 0x7FFFFFFF
# /etc/conf/bin/idtune HDATLIM 0x7FFFFFFF
# /etc/conf/bin/idtune SVMMLIM 0x7FFFFFFF
# /etc/conf/bin/idtune HVMMLIM 0x7FFFFFFF
# /etc/conf/bin/idtune SFNOLIM 2048
# /etc/conf/bin/idtune HFNOLIM 2048
```

Then rebuild and reboot the kernel by issuing this command:

```
# /etc/conf/bin/idbuild -B && init 6
```

We recommend tuning the system, but the proper parameter values to use depend on the number of users accessing the application or database and size the of the database (that is, the used buffer pool). The following kernel parameters can be set with `idtune`:

- `SHMMAX` (recommended setting: 128MB) and `SHMSEG` (recommended setting: 15). These parameters have an influence on the MySQL database engine to create user buffer pools.

- `SFNOLIM` and `HFNOLIM` should be at maximum 2048.

- `NPROC` should be set to at least 3000/4000 (depends on number of users).

- We also recommend using the following formulas to calculate values for `SEMMSL`, `SEMMNS`, and `SEMMNU`:

  ```
  SEMMSL = 13
  ```

  13 is what has been found to be the best for both Progress and MySQL.

  ```
  SEMMNS = SEMMSL × number of db servers to be run on the system
  ```

  Set `SEMMNS` to the value of `SEMMSL` multiplied by the number of database servers (maximum) that you are running on the system at one time.

  ```
  SEMMNU = SEMMNS
  ```

  Set the value of `SEMMNU` to equal the value of `SEMMNS`. You could probably set this to 75% of `SEMMNS`, but this is a conservative estimate.

19.6. OS/2 Notes

> **Note**
>
> We no longer test builds on OS/2. The notes in this section are provided for your information but may not work on your system.

MySQL uses quite a few open files. Because of this, you should add something like the following to your `CONFIG.SYS` file:

```
SET EMXOPT=-c -n -h1024
```

If you do not do this, you may encounter the following error:

```
File 'xxxx' not found (Errcode: 24)
```

When using MySQL with OS/2 Warp 3, FixPack 29 or above is required. With OS/2 Warp 4, FixPack 4 or above is required. This is a requirement of the Pthreads library. MySQL must be installed on a partition with a type that supports long file names, such as HPFS, FAT32, and so on.

The INSTALL.CMD script must be run from OS/2's own CMD.EXE and may not work with replacement shells such as 4OS2.EXE.

The scripts/mysql-install-db script has been renamed. It is called install.cmd and is a REXX script, which sets up the default MySQL security settings and creates the WorkPlace Shell icons for MySQL.

Dynamic module support is compiled in but not fully tested. Dynamic modules should be compiled using the Pthreads runtime library.

```
gcc -Zdll -Zmt -Zcrtdll=pthrdrtl -I../include -I../regex -I.. \
    -o example udf_example.c -L../lib -lmysqlclient udf_example.def
mv example.dll example.udf
```

> **Note**
>
> Due to limitations in OS/2, UDF module name stems must not exceed eight characters. Modules are stored in the /mysql2/udf directory; the safe-mysqld.cmd script puts this directory in the BEGINLIBPATH environment variable. When using UDF modules, specified extensions are ignored---it is assumed to be .udf. For example, in Unix, the shared module might be named example.so and you would load a function from it like this:

```
mysql> CREATE FUNCTION metaphon RETURNS STRING SONAME 'example.so';
```

In OS/2, the module would be named example.udf, but you would not specify the module extension:

```
mysql> CREATE FUNCTION metaphon RETURNS STRING SONAME 'example';
```

Chapter 20. Environment Variables

This section lists all the environment variables that are used directly or indirectly by MySQL. Most of these can also be found in other places in this manual.

Note that any 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.

Variable	Description
CXX	The name of your C++ compiler (for running `configure`).
CC	The name of your C compiler (for running `configure`).
CFLAGS	Flags for your C compiler (for running `configure`).
CXXFLAGS	Flags for your C++ compiler (for running `configure`).
DBI_USER	The default user name for Perl DBI.
DBI_TRACE	Trace options for Perl DBI.
HOME	The default path for the `mysql` history file is `$HOME/.mysql_history`.
LD_RUN_PATH	Used to specify the location of `libmysqlclient.so`.
MYSQL_DEBUG	Debug trace options when debugging.
MYSQL_GROUP_SUFFIX	Option group suffix value (like specifying `--defaults-group-suffix`).
MYSQL_HISTFILE	The path to the `mysql` history file. If this variable is set, its value overrides the default for `$HOME/.mysql_history`.
MYSQL_HOME	The path to the directory in which the server-specific `my.cnf` file resides (as of MySQL 5.0.3).
MYSQL_HOST	The default host name used by the `mysql` command-line client.
MYSQL_PS1	The command prompt to use in the `mysql` command-line client.
MYSQL_PWD	The default password when connecting to `mysqld`. Note that using this is insecure. See End-User Guidelines for Password Security.
MYSQL_TCP_PORT	The default TCP/IP port number.
MYSQL_UNIX_PORT	The default Unix socket file name; used for connections to `localhost`.
PATH	Used by the shell to find MySQL programs.
TMPDIR	The directory where temporary files are created.
TZ	This should be set to your local time zone. See Time Zone Problems.
UMASK	The user-file creation mode when creating files. See note following table.
UMASK_DIR	The user-directory creation mode when creating directories. See note following table.
USER	The default user name on Windows and NetWare used when connecting to `mysqld`.

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.

MySQL assumes that the value for UMASK or UMASK_DIR is in octal if it starts with a zero.

Chapter 21. Perl Installation Notes

Perl support for MySQL is provided by means of the DBI/DBD client interface. The 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.

If you want to use transactions with Perl DBI, you need to have DBD::mysql 2.0900. If you are using the MySQL 4.1 or newer client library, you must use DBD::mysql 2.9003 or newer. Support for server-side prepared statements requires DBD::mysql 3.0009 or newer.

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.

Perl support for MySQL must be installed if you want to run the MySQL benchmark scripts; see The MySQL Benchmark Suite. It is also required for the MySQL Cluster ndb_size.pl utility; see ndb_size.pl.

21.1. 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. However, if you installed MySQL from RPM files on Linux, be sure that you've installed the developer RPM. The client programs are in the client RPM, but client programming support is in the developer RPM.

If you want to install Perl support, the files you need 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 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:

    ```
    shell> gunzip < DBI-VERSION.tar.gz | tar xvf -
    ```

    This command creates a directory named DBI-VERSION.

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

    ```
    shell> cd DBI-VERSION
    ```

3. Build the distribution and compile everything:

    ```
    shell> perl Makefile.PL
    shell> make
    shell> make test
    shell> make install
    ```

The make test command is important because it verifies that the module is working. Note that when you run that command during the 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 DBD::mysql distribution whenever you install a new release of MySQL, particularly if you notice symptoms such as that all your DBI scripts fail after you upgrade MySQL.

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: http://servers.digitaldaze.com/extensions/perl/modules.html#modules

Look under the heading "Installing New Modules that Require Locally Installed Modules."

21.2. Installing ActiveState Perl on Windows

On Windows, you should do the following to install the MySQL `DBD` module with ActiveState Perl:

1. Get ActiveState Perl from http://www.activestate.com/Products/ActivePerl/ and install it.

2. Open a console window (a "DOS window").

3. If necessary, set the `HTTP_proxy` variable. For example, you might try a setting like this:

    ```
    set HTTP_proxy=my.proxy.com:3128
    ```

4. Start the PPM program:

    ```
    shell> C:\perl\bin\ppm.pl
    ```

5. If you have not previously done so, install `DBI`:

    ```
    ppm> install DBI
    ```

6. If this succeeds, run the following command:

    ```
    ppm> install DBD-mysql
    ```

This procedure should work with ActiveState Perl 5.6 or newer.

If you cannot get the procedure to work, you should install the MyODBC driver instead and connect to the MySQL server through ODBC:

```
use DBI;
$dbh= DBI->connect("DBI:ODBC:$dsn",$user,$password) ||
  die "Got error $DBI::errstr when connecting to $dsn\n";
```

21.3. 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:

*   Compile the `DBD::mysql` distribution with `perl Makefile.PL -static -config` rather than `perl Makefile.PL`.

*   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 mis-

match by compiling both with `gcc`.

You may see the following error from `DBD::mysql` when you run the tests:

```
t/00base............install_driver(mysql) failed:
Can't load '../blib/arch/auto/DBD/mysql/mysql.so' for module DBD::mysql:
../blib/arch/auto/DBD/mysql/mysql.so: undefined symbol:
uncompress at /usr/lib/perl5/5.00503/i586-linux/DynaLoader.pm line 169.
```

This means that you need to include the `-lz` compression library on the link line. That can be done by changing the following line in the file `lib/DBD/mysql/Install.pm`:

```
$sysliblist .= " -lm";
```

Change that line to:

```
$sysliblist .= " -lm -lz";
```

After this, you *must* run `make realclean` and then proceed with the installation from the beginning.

If you want to install DBI on SCO, you have to edit the `Makefile` in DBI-*xxx* and each subdirectory. Note that the following assumes `gcc` 2.95.2 or newer:

```
OLD:                                 NEW:
CC = cc                              CC = gcc
CCCDLFLAGS = -KPIC -W1,-Bexport      CCCDLFLAGS = -fpic
CCDLFLAGS = -wl,-Bexport             CCDLFLAGS =
LD = ld                              LD = gcc -G -fpic
LDDLFLAGS = -G -L/usr/local/lib      LDDLFLAGS = -L/usr/local/lib
LDFLAGS = -belf -L/usr/local/lib     LDFLAGS = -L/usr/local/lib
LD = ld                              LD = gcc -G -fpic
OPTIMISE = -Od                       OPTIMISE = -O1
OLD:
CCCFLAGS = -belf -dy -w0 -U M_XENIX -DPERL_SCO5 -I/usr/local/include
NEW:
CCFLAGS = -U M_XENIX -DPERL_SCO5 -I/usr/local/include
```

These changes are necessary because the Perl dynaloader does not load the `DBI` modules if they were compiled with `icc` or `cc`.

If you want to use the Perl module on a system that does not support dynamic linking (such as SCO), you can generate a static version of Perl that includes `DBI` and `DBD::mysql`. The way this works is that you generate a version of Perl with the `DBI` code linked in and install it on top of your current Perl. Then you use that to build a version of Perl that additionally has the `DBD` code linked in, and install that.

On SCO, you must have the following environment variables set:

```
LD_LIBRARY_PATH=/lib:/usr/lib:/usr/local/lib:/usr/progressive/lib
```

Or:

```
LD_LIBRARY_PATH=/usr/lib:/lib:/usr/local/lib:/usr/ccs/lib:\
    /usr/progressive/lib:/usr/skunk/lib
LIBPATH=/usr/lib:/lib:/usr/local/lib:/usr/ccs/lib:\
    /usr/progressive/lib:/usr/skunk/lib
MANPATH=scohelp:/usr/man:/usr/local1/man:/usr/local/man:\
    /usr/skunk/man:
```

First, create a Perl that includes a statically linked `DBI` module by running these commands in the directory where your `DBI` distribution is located:

```
shell> perl Makefile.PL -static -config
shell> make
shell> make install
shell> make perl
```

Then you must install the new Perl. The output of `make perl` indicates the exact `make` command you need to execute to perform the installation. On SCO, this is `make -f Makefile.aperl inst_perl MAP_TARGET=perl`.

Next, use the just-created Perl to create another Perl that also includes a statically linked `DBD::mysql` by running these commands in the directory where your `DBD::mysql` distribution is located:

```
shell> perl Makefile.PL -static -config
shell> make
shell> make install
shell> make perl
```

Finally, you should install this new Perl. Again, the output of `make perl` indicates the command to use.