MySQL and Linux/Unix

MySQL and Linux/Unix

Abstract

This is the MySQL Linux extract from the MySQL 5.0 Reference Manual.

Document generated on: 2014-08-17 (revision: 39677)

Table of Contents

Preface and Legal Notices

This is the MySQL Linux extract from the MySQL 5.0 Reference Manual.

Legal Notices

Chapter 1 Installing MySQL on Unix/Linux Using Generic Binaries

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

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

To obtain MySQL, see How to Get MySQL.

MySQL compressed `tar` file binary distributions have names of the form `mysql-`*`VERSION-OS`*`.tar.gz`, where *`VERSION`* is a number (for example, `5.0.96`), and *`OS`* indicates the type of operating system for which the distribution is intended (for example, `pc-linux-i686` or `winx64`).

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

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

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

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

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

```
shell> groupadd mysql
shell> useradd -r -g mysql mysql
shell> cd /usr/local
shell> tar zxvf /path/to/mysql-VERSION-OS.tar.gz
shell> ln -s full-path-to-mysql-VERSION-OS mysql
shell> cd mysql
shell> chown -R mysql .
shell> chgrp -R mysql .
shell> scripts/mysql_install_db --user=mysql
shell> chown -R root .
shell> chown -R mysql data
# Next command is optional
shell> cp support-files/my-medium.cnf /etc/my.cnf
shell> bin/mysqld_safe --user=mysql &
```

```
# Next command is optional
shell> cp support-files/mysql.server /etc/init.d/mysql.server
```

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

> **Note**
>
> This procedure assumes that you have root (administrator) access to your system. Alternatively, you can prefix each command using the sudo (Linux) or pfexec (OpenSolaris) command.
>
> The procedure does not set up any passwords for MySQL accounts. After following the procedure, proceed to Securing the Initial MySQL Accounts.

Create a mysql User and Group

If your system does not already have a user and group for mysqld to run as, you may need to create one. The following 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.

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

> **Note**
>
> Because the user is required only for ownership purposes, not login purposes, the useradd command uses the -r option to create a user that does not have login permissions to your server. Omit this option to permit logins for the user (or if your useradd does not support the option).

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

Obtain and Unpack the Distribution

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

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

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

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

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

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

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

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

Perform Postinstallation Setup

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

> **Note**
>
> The accounts that are listed in the MySQL grant tables initially have no passwords. After starting the server, you should set up passwords for them using the instructions in Securing the Initial MySQL Accounts.

Chapter 2 Installing MySQL on Linux Using RPM Packages

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 How to Get MySQL.

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

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 are also provided by other vendors. Be aware that they may differ from those built by us in features, capabilities, and conventions (including communication setup), and that the instructions in this manual do not necessarily apply to installing them. The vendor's instructions should be consulted instead. Because of these differences, RPM packages built by us check whether such RPMs built by other vendors are installed. If so, the RPM does not install and produces a message explaining this.

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 3.2, “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 the shared libraries for older releases for backward compatibility.

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 to compile other MySQL clients, such as the Perl modules. Install this RPM if you intend to compile C API applications.

- `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. Install this RPM if you intend to compile or run C API applications that depend on the shared client library. 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 older releases, 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-clusterstorage-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 Perl Installation Notes, and `ndb_size.pl` — NDBCLUSTER Size Requirement Estimator, 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.

***`PLATFORM`* Value**	**Intended Use**
`glibc23`	Platform independent, should run on any Linux distribution that supports `glibc` 2.3
`rhel4`, `rhel5`	Red Hat Enterprise Linux 4 or 5
`sles10`	SuSE Linux Enterprise Server 10

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

***`CPU`* Value**	**Intended Processor Type or Family**
`i386`, `i586`, `i686`	Pentium processor or better, 32 bit
`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. To learn more about this feature, see Verifying Package Integrity Using MD5 Checksums or `GnuPG`.

The server RPM places data under the `/var/lib/mysql` directory. The RPM also creates a login account for a user named `mysql` (if one does not exist) to use for running the MySQL server, and creates the appropriate entries in `/etc/init.d/` to start the server automatically at boot time. (This means that if you have performed a previous installation and have made changes to its startup script, you may want to make a copy of the script so that you do not lose it when you install a newer RPM.) See Section 8.2, "Starting and Stopping MySQL Automatically", for more information on how MySQL can be started automatically on system startup.

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 1, *Installing MySQL on Unix/Linux Using Generic Binaries*.

> **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 Securing the Initial MySQL Accounts.

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`.

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

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

Chapter 3 Linux Notes

Table of Contents

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 postinstallation 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.

3.1 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.

3.2 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% to 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 (nonfatal) 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 addresses 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.

3.3 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. Do 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 to 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`.

If you use these patches to build a special static version of `libpthread.a`, 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 `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 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
```

3.4 Linux Postinstallation 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 8.2, “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 enable a server 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 3.3, "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. Values between 128KB and 256KB are recommended.

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 is recommended for 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, it is definitely recommended to upgrade 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.

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` — MySQL Server Startup Script.

3.5 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. 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 do not 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
```

3.6 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.

3.7 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% to 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`.

3.8 Linux PowerPC Notes

MySQL should work on MkLinux with the newest `glibc` package (tested with `glibc` 2.0.7).

3.9 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).

3.10 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 Building C API Client Programs.

3.11 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 Oracle Corporation 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 Oracle Corporation. For further information, see https://bugzilla.redhat.com/bugzilla/show_bug.cgi?id=167551 and http://rhn.redhat.com/errata/RHBA-2006-0049.html.

Chapter 4 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 Chapter 5, *Solaris Notes*.

Chapter 5 Solaris Notes

Table of Contents

For information about installing MySQL on Solaris using PKG distributions, see Chapter 4, *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.

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 following 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 do not 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.)

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

5.1 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:

1. Configure with `CFLAGS=-DHAVE_CURSES_H CXXFLAGS=-DHAVE_CURSES_H ./configure`.
2. Edit `/usr/include/widec.h` as indicated in the preceding discussion and re-run `configure`.
3. 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.

5.2 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 Debugging and Porting MySQL.

Chapter 6 BSD Notes

Table of Contents

This section provides information about using MySQL on variants of BSD Unix.

6.1 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 `gethostbyname()` 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 &
```

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` — MySQL Server Startup Script.

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 Environment Variables.

6.2 NetBSD Notes

To compile on NetBSD, you need GNU `make`. Otherwise, the build process fails when `make` tries to run `lint` on C++ files.

6.3 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
```

6.4 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 Environment Variables.

6.5 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`.

6.6 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).

Chapter 7 Other Unix Notes

Table of Contents

7.1 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. Use `gcc` instead of the HP-UX native compiler, because `gcc` produces better code.

Use `gcc` 2.95 on HP-UX. Do not 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
```

7.2 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 do not 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.

7.3 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`.

Use 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 do not know if the `-fno-exceptions` is required with `gcc` 2.95, but because MySQL doesn't use exceptions and the option generates faster code, 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 do not 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 threads on AIX 5.3, you should upgrade AIX 5.3 to technology level 7 (5300-07).

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. `gcc` 3.3.2 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 *);
```

7.4 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.

7.5 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` — MySQL Server Startup Script.

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
```

7.6 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: http://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 linking `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 do not 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.

7.7 SGI Irix Notes

> **Note**
>
> As of MySQL 5.0, we do not 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: http://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
```

7.8 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 permits 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/.

Use 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 enable 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
```

Set 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
```

To tune the system, 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.
- The following formulas are recommended 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 do not 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.

7.9 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:`.

Use 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-5.0.96-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-5.0.96-sco-osr6-i686.VOLS.tar
```

Prior to installation, back up your data in accordance with the procedures outlined in 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 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 using 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 enables 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. To set the kernel values, execute 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
```

To tune the system, 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).
- The following formulas are recommended 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.

7.10 SCO UnixWare 7.1.x and OpenUNIX 8.0.0 Notes

Use 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 enables 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. To set the kernel values, execute 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
```

To tune the system, 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).
- The following formulas are recommended 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.

Chapter 8 Unix Postinstallation Procedures

Table of Contents

After installing MySQL on Unix, you must 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 an existing database cannot be found.

- 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 DMG distribution, the installer runs `mysql_install_db`.

For other platforms and installation types, including generic binary and source installs, 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 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 8.2, “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` and perhaps tighten access to test databases. For instructions, see 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 the installation directory for your MySQL instance. It is likely to be something like `/usr/local/mysql` or `/usr/local`. The following steps assume that you have changed location to this directory.

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

   - 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 Environment Variables.

     For some distribution types, `mysqld` is in the `libexec` directory.

   - 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.

For some distribution types, `mysql_install_db` is in the `bin` directory.

2. If necessary, 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.

3. If necessary, run the `mysql_install_db` program to set up the initial MySQL grant tables containing the privileges that determine how users are permitted to connect to the server. You will need to do this if you used a distribution type for which the installation procedure does not 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.

   The exact location of `mysql_install_db` will depends on the layout for your given installation. 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 identify 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 with `mysql` as the owner. Under the data directory, it creates directories for the `mysql` database that holds the grant tables and the `test` database that you can use to test MySQL. The script also creates privilege table entries for `root` and anonymous-user accounts. The accounts have no passwords initially. Securing the Initial MySQL Accounts, describes the initial privileges. Briefly, these privileges permit the MySQL `root` user to do anything, and permit 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 do not want to have the `test` database, you can remove it after starting the server, using the instructions in Securing the Initial MySQL Accounts.

If you have trouble with `mysql_install_db` at this point, see Section 8.1, “Problems Running `mysql_install_db`”.

4. Most of the MySQL installation can be owned by `root` if you like. The exception is that the data directory must be owned by `mysql`. To accomplish this, run the following commands as `root` in the installation directory. For some distribution types, the data directory might be named `var` rather than `data`; adjust the second command accordingly.

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

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

6. If you installed MySQL using a source distribution, you may want to optionally copy one of the provided configuration files from the `support-files` directory into your `/etc` directory. There are different sample configuration files for different use cases, server types, and CPU and RAM configurations. If you want to use one of these standard files, you should copy it to `/etc/my.cnf`, or `/etc/mysql/my.cnf` and edit and check the configuration before starting your MySQL server for the first time.

   If you do not copy one of the standard configuration files, the MySQL server will be started with the default settings.

   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 `mysql.server` script itself, and in Section 8.2, “Starting and Stopping MySQL Automatically”.

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

   If you neglected to create the grant tables by running `mysql_install_db` 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'
```

This error also occurs if you run `mysql_install_db` as `root` without the `--user` option. Remove the `data` directory and run `mysql_install_db` with the `--user` option as described previously.

If you have other problems starting the server, see Section 8.3, “Starting and Troubleshooting the MySQL Server”. For more information about `mysqld_safe`, see `mysqld_safe` — MySQL Server Startup Script.

8. 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 5.0.96, for pc-linux-gnu on i686
...
Server version          5.0.96
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.

9. Verify that you can shut down the server:

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

10. 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 8.3, “Starting and Troubleshooting the MySQL Server”.

11. 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      |
+--------------------+
| information_schema |
| 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_% |      |
+------+--------+------+
```

12. 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 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 do not 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 before 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.

13. At this point, you should have the server running. However, none of the initial MySQL accounts have a password, and the server permits permissive access to test databases. To tighten security, follow the instructions in Securing the Initial MySQL Accounts.

The MySQL 5.0 installation procedure creates time zone tables in the mysql database but does not populate them. To do so, use the instructions in MySQL Server Time Zone Support.

You can set up new accounts using the bin/mysql_setpermission script if you install the DBI and DBD::mysql Perl modules. See mysql_setpermission — Interactively Set Permissions in Grant Tables. For Perl module installation instructions, see Perl Installation Notes.

If you would like to use mysqlaccess and have the MySQL distribution in some nonstandard location, you must change the location where mysqlaccess expects to find the mysql client. Edit the bin/mysqlaccess script at approximately line 18. Search for a line that looks like this:

```
$MYSQL     = '/usr/local/bin/mysql';    # path to mysql executable
```

Change the path to reflect the location where mysql actually is stored on your system. If you do not do this, a Broken pipe error will occur when you run mysqlaccess.

8.1 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 did not start. If you do not understand what happened, include the log when you post a bug report. See How to Report Bugs or Problems.

- **There is a mysqld process running**

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

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

  If you do not have write access to create temporary files or a Unix socket file in the default location (the /tmp directory), 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 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 are 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.

8.2 Starting and Stopping MySQL Automatically

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

- Invoke `mysqld` directly. This works on any platform.
- Invoke `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` — MySQL Server Startup Script.
- Invoke `mysql.server`. This script is used primarily at system startup and shutdown on systems that use System V-style run directories (that is, `/etc/init.d` and run-level specific directories), where it usually is installed under the name `mysql`. The `mysql.server` script starts the server by invoking `mysqld_safe`. See `mysql.server` — MySQL Server Startup Script.
- On Mac OS X, 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 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 nonstandard location. Modify it to change location into the proper directory before it runs `mysqld_safe`. If you do this, your modified version of `mysql.server` may be overwritten if you upgrade MySQL in the future, 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 2, *Installing MySQL on Linux Using RPM Packages*, 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
```

> **Note**
>
> 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.

Table 8.1 MySQL Startup scripts and supported server option groups

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.

For more information on MySQL configuration files and their structure and contents, see Using Option Files.

8.3 Starting and Troubleshooting the MySQL Server

This section provides troubleshooting suggestions for problems starting the server on Unix. If you are using Windows, see 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:

- If you are using `InnoDB` tables, see Configuring InnoDB.
- 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 do not match the MySQL installation layout on your system, you can override them by specifying options to `mysqld` or `mysqld_safe` on the command line or in an option file.

To specify the location of the data directory explicitly, use the `--datadir` option. However, normally you can tell `mysqld` the location of the base directory under which MySQL is installed and it looks for the data directory there. You can do this with the `--basedir` option.

To check the effect of specifying path options, invoke `mysqld` with those options followed by the `--verbose` and `--help` options. For example, if you change location 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 permit server access. In this case, you change the permissions for the involved files and directories so that the server has the right to use them. You can also start the server as `root`, but this raises security issues and should be avoided.

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 it possible that even with correct ownership, MySQL may fail to start up if there is other security software running on your system that manages application access to various parts of the file system. In this case, you may need to reconfigure that software to enable `mysqld` to access the directories it uses during normal operation.

If the server fails to start up correctly, check the error log. Log files are located in the data directory (typically `C:\Program Files\MySQL\MySQL Server 5.0\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 could not 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 beginning 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 Instances on One Machine.)

If no other server is running, try to execute the command `telnet your_host_name tcp_ip_port_number`. (The default MySQL port number is 3306.) Then press Enter a couple of times. If you do not get an error message like `telnet: Unable to connect to remote host: Connection refused`, some other program is using the TCP/IP port that `mysqld` is trying to use. You will need to track down what program this is and disable it, or else tell `mysqld` to listen to a different port with the `--port` option. In this case, you will also need to specify the port number for client programs when connecting to the server using TCP/IP.

Another reason the port might be inaccessible is that you have a firewall running that blocks connections to it. If so, modify the firewall settings to permit access to the port.

If the server starts but you cannot connect to it, you should make sure that you have an entry in `/etc/hosts` that looks like this:

```
127.0.0.1       localhost
```

If you cannot get `mysqld` to start, you can try to make a trace file to find the problem by using the `--debug` option. See The DBUG Package.

Appendix A Licenses for Third-Party Components

Table of Contents

The following is a list of the libraries we have included with the MySQL Server source and components used to test MySQL. We are thankful to all individuals that have created these. Some of the components require that their licensing terms be included in the documentation of products that include them. Cross references to these licensing terms are given with the applicable items in the list.

- Bjorn Benson

  For his safe_malloc (memory checker) package which is used in when you build MySQL using one of the `BUILD/compile-*-debug` scripts or by manually setting the `-DSAFEMALLOC` flag.

MySQL 5.0

- Section A.1, “Editline Library (libedit) License”
- Section A.2, “Fred Fish's Dbug Library License”
- Section A.4, “GNU General Public License Version 2.0, June 1991”
- Section A.6, “GNU Libtool License”
- Section A.7, “GNU Readline License”
- Section A.8, “lib_sql.cc License”
- Section A.16, “RegEX-Spencer Library License”
- Section A.17, “RFC 3174 - US Secure Hash Algorithm 1 (SHA1) License”
- Section A.18, “Richard A. O'Keefe String Library License”

- Section A.19, “zlib License”

MySQL Proxy

- Section A.3, “GLib License (for MySQL Proxy)”
- Section A.5, “GNU Lesser General Public License Version 2.1, February 1999”
- Section A.9, “libevent License”
- Section A.10, “Libiconv License”
- Section A.11, “libintl License”
- Section A.12, “LPeg Library License”
- Section A.13, “Lua (liblua) License”
- Section A.14, “LuaFileSystem Library License”
- Section A.15, “PCRE License”

A.1 Editline Library (libedit) License

The following software may be included in this product:

Editline Library (libedit)

Some files are:

```
Copyright (c) 1992, 1993
The Regents of the University of California. All rights reserved.

This code is derived from software contributed to
Berkeley by Christos Zoulas of Cornell University.

Redistribution and use in source and binary forms,
with or without modification, are permitted provided
that the following conditions are met:

1. Redistributions of source code must retain the
  above copyright notice, this list of conditions
  and the following disclaimer.
2. Redistributions in binary form must reproduce the
  above copyright notice, this list of conditions and
  the following disclaimer in the documentation and/or
  other materials provided with the distribution.
3. Neither the name of the University nor the names of
  its contributors may be used to endorse or promote
  products derived from this software without specific
  prior written permission.

THIS SOFTWARE IS PROVIDED BY THE REGENTS AND CONTRIBUTORS
"AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING,
BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY
AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO
EVENT SHALL THE REGENTS OR CONTRIBUTORS BE LIABLE FOR ANY
DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR
CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE,
DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED
```

```
AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT
LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED
OF THE POSSIBILITY OF SUCH DAMAGE.
```

Some files are:

```
Copyright (c) 2001 The NetBSD Foundation, Inc.
All rights reserved.

This code is derived from software contributed to The NetBSD Foundation

by Anthony Mallet.

Redistribution and use in source and binary forms,
with or without modification, are permitted provided
that the following conditions are met:

1. Redistributions of source code must retain the
   above copyright notice, this list of conditions
   and the following disclaimer.
2. Redistributions in binary form must reproduce the
    above copyright notice, this list of conditions and the
    following disclaimer in the documentation and/or
    other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE NETBSD FOUNDATION, INC.
AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED
WARRANTIES, INCLUDING, BUT NOT LIMITED  TO, THE IMPLIED
WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A
PARTICULAR PURPOSE ARE DISCLAIMED.  IN NO EVENT SHALL
THE FOUNDATION OR CONTRIBUTORS BE LIABLE FOR ANY
DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR
CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF
USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER
CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE
OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS
SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH
DAMAGE.
```

Some files are:

```
Copyright (c) 1997 The NetBSD Foundation, Inc.
All rights reserved.

This code is derived from software contributed to The NetBSD Foundation

by Jaromir Dolecek.

Redistribution and use in source and binary forms,
with or without modification, are permitted provided
that the following conditions are met:

1. Redistributions of source code must retain the
   above copyright notice, this list of conditions
   and the following disclaimer.
2. Redistributions in binary form must reproduce
    the above copyright notice, this list of conditions
    and the following disclaimer in the documentation
    and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE NETBSD FOUNDATION, INC.
AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED
```

```
WARRANTIES, INCLUDING, BUT NOT LIMITED  TO, THE IMPLIED
WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A
PARTICULAR PURPOSE ARE DISCLAIMED.  IN NO EVENT SHALL
THE FOUNDATION OR CONTRIBUTORS BE LIABLE FOR ANY
DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR
CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF
USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER
CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE
OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS
SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH
DAMAGE.
```

Some files are:

```
Copyright (c) 1998 Todd C. Miller <Todd.Miller@courtesan.com>

Permission to use, copy, modify, and distribute this
software for any purpose with or without fee is hereby
granted, provided that the above copyright notice and
this permission notice appear in all copies.

THE SOFTWARE IS PROVIDED "AS IS" AND TODD C. MILLER
DISCLAIMS ALL WARRANTIES WITH REGARD TO THIS SOFTWARE
INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY
AND FITNESS. IN NO EVENT SHALL TODD C. MILLER BE LIABLE
FOR ANY SPECIAL, DIRECT, INDIRECT, OR CONSEQUENTIAL
DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM
LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION
OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION,
ARISING OUT OF OR IN CONNECTION WITH THE USE OR
PERFORMANCE OF THIS SOFTWARE.
```

A.2 Fred Fish's Dbug Library License

The following software may be included in this product:

Fred Fish's Dbug Library

```
                            N O T I C E


                 Copyright Abandoned, 1987, Fred Fish


    This previously copyrighted work has been placed into the  public
    domain  by  the  author  and  may be freely used for any purpose,
    private or commercial.


    Because of the number of inquiries I was receiving about the  use
    of this product in commercially developed works I have decided to
    simply make it public domain to further its unrestricted use.   I
    specifically  would  be  most happy to see this material become a
```

```
     part of the standard Unix distributions by AT&T and the  Berkeley

     Computer  Science  Research Group, and a standard part of the GNU

     system from the Free Software Foundation.



     I would appreciate it, as a courtesy, if this notice is  left  in

     all copies and derivative works.  Thank you.



     The author makes no warranty of any kind  with  respect  to  this

     product  and  explicitly disclaims any implied warranties of mer-

     chantability or fitness for any particular purpose.

The dbug_analyze.c file is subject to the following notice:

     Copyright June 1987, Binayak Banerjee
     All rights reserved.

     This program may be freely distributed under the same terms and
     conditions as Fred Fish's Dbug package.
```

A.3 GLib License (for MySQL Proxy)

The following software may be included in this product:

```
GLib

You are receiving a copy of the GLib library in both source
and object code in the following [proxy install dir]/lib/ and
[proxy install dir]/licenses/lgpl folders. The terms of the
Oracle license do NOT apply to the GLib library; it is licensed
under the following license, separately from the Oracle programs
you receive. If you do not wish to install this library, you may
create an "exclude" file and run tar with the X option, as in
the following example, but the Oracle program might not operate
properly or at all without the library:
  tar -xvfX <package-tar-file> <exclude-file>
where the exclude-file contains, e.g.:
  <package-name>/lib/libglib-2.0.so.0.1600.6
  <package-name>/lib/libglib-2.0.so.0
  ...

Example:
tar -xvfX mysql-proxy-0.8.1-solaris10-x86-64bit.tar.gz Exclude

Exclude File:
mysql-proxy-0.8.1-solaris10-x86-64bit/lib/libglib-2.0.so
mysql-proxy-0.8.1-solaris10-x86-64bit/lib/libglib-2.0.so.0
mysql-proxy-0.8.1-solaris10-x86-64bit/lib/libglib-2.0.so.0.1600.6
mysql-proxy-0.8.1-solaris10-x86-64bit/lib/libgmodule-2.0.so
mysql-proxy-0.8.1-solaris10-x86-64bit/lib/libgmodule-2.0.so.0
mysql-proxy-0.8.1-solaris10-x86-64bit/lib/libgmodule-2.0.so.0.1600.6
mysql-proxy-0.8.1-solaris10-x86-64bit/lib/libgthread-2.0.so
mysql-proxy-0.8.1-solaris10-x86-64bit/lib/libgthread-2.0.so.0
mysql-proxy-0.8.1-solaris10-x86-64bit/lib/libgthread-2.0.so.0.1600.6
mysql-proxy-0.8.1-solaris10-x86-64bit/licenses/lgpl/glib-2.16.6.tar.gz
```

This component is licensed under Section A.5, “GNU Lesser General Public License Version 2.1, February 1999”.

A.4 GNU General Public License Version 2.0, June 1991

```
The following applies to all products licensed under the GNU General
Public License, Version 2.0: You may not use the identified files
except in compliance with the GNU General Public License, Version
2.0 (the "License.") You may obtain a copy of the License at
http://www.gnu.org/licenses/gpl-2.0.txt. A copy of the license is
also reproduced below. Unless required by applicable law or agreed
to in writing, software distributed under the License is distributed
on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND,
either express or implied. See the License for the specific language
governing permissions and limitations under the License.

GNU GENERAL PUBLIC LICENSE
Version 2, June 1991

Copyright (C) 1989, 1991 Free Software Foundation, Inc.,
51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA
Everyone is permitted to copy and distribute verbatim
copies of this license document, but changing it is not
allowed.

                    Preamble

  The licenses for most software are designed to take away your
freedom to share and change it.  By contrast, the GNU General Public
License is intended to guarantee your freedom to share and change free
software--to make sure the software is free for all its users.  This
General Public License applies to most of the Free Software
Foundation's software and to any other program whose authors commit to
using it.  (Some other Free Software Foundation software is covered by
the GNU Lesser General Public License instead.)  You can apply it to
your programs, too.

  When we speak of free software, we are referring to freedom, not
price.  Our General Public Licenses are designed to make sure that you
have the freedom to distribute copies of free software (and charge for
this service if you wish), that you receive source code or can get it
if you want it, that you can change the software or use pieces of it
in new free programs; and that you know you can do these things.

  To protect your rights, we need to make restrictions that forbid
anyone to deny you these rights or to ask you to surrender the rights.
These restrictions translate to certain responsibilities for you if you
distribute copies of the software, or if you modify it.

  For example, if you distribute copies of such a program, whether
gratis or for a fee, you must give the recipients all the rights that
you have.  You must make sure that they, too, receive or can get the
source code.  And you must show them these terms so they know their
rights.

  We protect your rights with two steps: (1) copyright the software,
and (2) offer you this license which gives you legal permission to
copy, distribute and/or modify the software.

  Also, for each author's protection and ours, we want to make certain
that everyone understands that there is no warranty for this free
software.  If the software is modified by someone else and passed on,
we want its recipients to know that what they have is not the original,
so that any problems introduced by others will not reflect on the
original authors' reputations.
```

```
  Finally, any free program is threatened constantly by software
patents.  We wish to avoid the danger that redistributors of a free
program will individually obtain patent licenses, in effect making the
program proprietary.  To prevent this, we have made it clear that any
patent must be licensed for everyone's free use or not licensed at all.

  The precise terms and conditions for copying, distribution and
modification follow.

                    GNU GENERAL PUBLIC LICENSE
   TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

  0. This License applies to any program or other work which contains
a notice placed by the copyright holder saying it may be distributed
under the terms of this General Public License.  The "Program", below,
refers to any such program or work, and a "work based on the Program"
means either the Program or any derivative work under copyright law:
that is to say, a work containing the Program or a portion of it,
either verbatim or with modifications and/or translated into another
language.  (Hereinafter, translation is included without limitation in
the term "modification".)  Each licensee is addressed as "you".

Activities other than copying, distribution and modification are not
covered by this License; they are outside its scope.  The act of
running the Program is not restricted, and the output from the Program
is covered only if its contents constitute a work based on the
Program (independent of having been made by running the Program).
Whether that is true depends on what the Program does.

  1. You may copy and distribute verbatim copies of the Program's
source code as you receive it, in any medium, provided that you
conspicuously and appropriately publish on each copy an appropriate
copyright notice and disclaimer of warranty; keep intact all the
notices that refer to this License and to the absence of any warranty;
and give any other recipients of the Program a copy of this License
along with the Program.

You may charge a fee for the physical act of transferring a copy, and
you may at your option offer warranty protection in exchange for a fee.

  2. You may modify your copy or copies of the Program or any portion
of it, thus forming a work based on the Program, and copy and
distribute such modifications or work under the terms of Section 1
above, provided that you also meet all of these conditions:

    a) You must cause the modified files to carry prominent notices
    stating that you changed the files and the date of any change.

    b) You must cause any work that you distribute or publish, that in
    whole or in part contains or is derived from the Program or any
    part thereof, to be licensed as a whole at no charge to all third
    parties under the terms of this License.

    c) If the modified program normally reads commands interactively
    when run, you must cause it, when started running for such
    interactive use in the most ordinary way, to print or display an
    announcement including an appropriate copyright notice and a
    notice that there is no warranty (or else, saying that you provide
    a warranty) and that users may redistribute the program under
    these conditions, and telling the user how to view a copy of this
    License.  (Exception: if the Program itself is interactive but
    does not normally print such an announcement, your work based on
    the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole.  If
identifiable sections of that work are not derived from the Program,
```

```
and can be reasonably considered independent and separate works in
themselves, then this License, and its terms, do not apply to those
sections when you distribute them as separate works.  But when you
distribute the same sections as part of a whole which is a work based
on the Program, the distribution of the whole must be on the terms of
this License, whose permissions for other licensees extend to the
entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest
your rights to work written entirely by you; rather, the intent is to
exercise the right to control the distribution of derivative or
collective works based on the Program.

In addition, mere aggregation of another work not based on the Program
with the Program (or with a work based on the Program) on a volume of
a storage or distribution medium does not bring the other work under
the scope of this License.

  3. You may copy and distribute the Program (or a work based on it,
under Section 2) in object code or executable form under the terms of
Sections 1 and 2 above provided that you also do one of the following:

    a) Accompany it with the complete corresponding machine-readable
    source code, which must be distributed under the terms of Sections
    1 and 2 above on a medium customarily used for software
    interchange; or,

    b) Accompany it with a written offer, valid for at least three
    years, to give any third party, for a charge no more than your
    cost of physically performing source distribution, a complete
    machine-readable copy of the corresponding source code, to be
    distributed under the terms of Sections 1 and 2 above on a medium
    customarily used for software interchange; or,

    c) Accompany it with the information you received as to the offer
    to distribute corresponding source code.  (This alternative is
    allowed only for noncommercial distribution and only if you
    received the program in object code or executable form with such
    an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for
making modifications to it.  For an executable work, complete source
code means all the source code for all modules it contains, plus any
associated interface definition files, plus the scripts used to
control compilation and installation of the executable.  However, as
a special exception, the source code distributed need not include
anything that is normally distributed (in either source or binary
form) with the major components (compiler, kernel, and so on) of the
operating system on which the executable runs, unless that component
itself accompanies the executable.

If distribution of executable or object code is made by offering
access to copy from a designated place, then offering equivalent
access to copy the source code from the same place counts as
distribution of the source code, even though third parties are not
compelled to copy the source along with the object code.

  4. You may not copy, modify, sublicense, or distribute the Program
except as expressly provided under this License.  Any attempt
otherwise to copy, modify, sublicense or distribute the Program is
void, and will automatically terminate your rights under this License.
However, parties who have received copies, or rights, from you under
this License will not have their licenses terminated so long as such
parties remain in full compliance.

  5. You are not required to accept this License, since you have not
signed it.  However, nothing else grants you permission to modify or
```

```
distribute the Program or its derivative works.  These actions are
prohibited by law if you do not accept this License.  Therefore, by
modifying or distributing the Program (or any work based on the
Program), you indicate your acceptance of this License to do so, and
all its terms and conditions for copying, distributing or modifying
the Program or works based on it.

  6. Each time you redistribute the Program (or any work based on the
Program), the recipient automatically receives a license from the
original licensor to copy, distribute or modify the Program subject to
these terms and conditions.  You may not impose any further
restrictions on the recipients' exercise of the rights granted herein.
You are not responsible for enforcing compliance by third parties to
this License.

  7. If, as a consequence of a court judgment or allegation of patent
infringement or for any other reason (not limited to patent issues),
conditions are imposed on you (whether by court order, agreement or
otherwise) that contradict the conditions of this License, they do not
excuse you from the conditions of this License.  If you cannot
distribute so as to satisfy simultaneously your obligations under this
License and any other pertinent obligations, then as a consequence you
may not distribute the Program at all.  For example, if a patent
license would not permit royalty-free redistribution of the Program by
all those who receive copies directly or indirectly through you, then
the only way you could satisfy both it and this License would be to
refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under
any particular circumstance, the balance of the section is intended to
apply and the section as a whole is intended to apply in other
circumstances.

It is not the purpose of this section to induce you to infringe any
patents or other property right claims or to contest validity of any
such claims; this section has the sole purpose of protecting the
integrity of the free software distribution system, which is
implemented by public license practices.  Many people have made
generous contributions to the wide range of software distributed
through that system in reliance on consistent application of that
system; it is up to the author/donor to decide if he or she is willing
to distribute software through any other system and a licensee cannot
impose that choice.

This section is intended to make thoroughly clear what is believed to
be a consequence of the rest of this License.

  8. If the distribution and/or use of the Program is restricted in
certain countries either by patents or by copyrighted interfaces, the
original copyright holder who places the Program under this License
may add an explicit geographical distribution limitation excluding
those countries, so that distribution is permitted only in or among
countries not thus excluded.  In such case, this License incorporates
the limitation as if written in the body of this License.

  9. The Free Software Foundation may publish revised and/or new
versions of the General Public License from time to time.  Such new
versions will be similar in spirit to the present version, but may
differ in detail to address new problems or concerns.

Each version is given a distinguishing version number.  If the Program
specifies a version number of this License which applies to it and
"any later version", you have the option of following the terms and
conditions either of that version or of any later version published by
the Free Software Foundation.  If the Program does not specify a
version number of this License, you may choose any version ever
published by the Free Software Foundation.
```

```
  10. If you wish to incorporate parts of the Program into other free
programs whose distribution conditions are different, write to the
author to ask for permission.  For software which is copyrighted by the
Free Software Foundation, write to the Free Software Foundation; we
sometimes make exceptions for this.  Our decision will be guided by the
two goals of preserving the free status of all derivatives of our free
software and of promoting the sharing and reuse of software generally.

                            NO WARRANTY

  11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO
WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW.
EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR
OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND,
EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED
WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS
WITH YOU.  SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF
ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

  12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN
WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY
AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU
FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR
CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE
PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING
RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A
FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF
SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH
DAMAGES.

                     END OF TERMS AND CONDITIONS

            How to Apply These Terms to Your New Programs

  If you develop a new program, and you want it to be of the greatest
possible use to the public, the best way to achieve this is to make it
free software which everyone can redistribute and change under these terms.

  To do so, attach the following notices to the program.  It is safest
to attach them to the start of each source file to most effectively
convey the exclusion of warranty; and each file should have at least
the "copyright" line and a pointer to where the full notice is found.

    <one line to give the program's name and a brief idea of what it
    does.>
    Copyright (C) <year>  <name of author>

    This program is free software; you can redistribute it and/or
    modify it under the terms of the GNU General Public License as
    published by     the Free Software Foundation; either version
    2 of the License, or (at your option) any later version.

    This program is distributed in the hope that it will be useful,
    but WITHOUT ANY WARRANTY; without even the implied warranty of
    MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
    GNU General Public License for more details.

    You should have received a copy of the GNU General Public License
    along with this program; if not, write to the Free Software
    Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA
    02110-1301 USA.

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this
```

```
when it starts in an interactive mode:

    Gnomovision version 69, Copyright (C) year name of author
    Gnomovision comes with ABSOLUTELY NO WARRANTY; for details
    type 'show w'. This is free software, and you are welcome
    to redistribute it under certain conditions; type 'show c'
    for details.

The hypothetical commands 'show w' and 'show c' should show the
appropriate parts of the General Public License.  Of course, the
commands you use may be called something other than 'show w' and
'show c'; they could even be mouse-clicks or menu items--whatever
suits your program.

You should also get your employer (if you work as a programmer) or your
school, if any, to sign a "copyright disclaimer" for the program, if
necessary.  Here is a sample; alter the names:

  Yoyodyne, Inc., hereby disclaims all copyright interest in the
  program 'Gnomovision' (which makes passes at compilers) written
  by James Hacker.

  <signature of Ty Coon>, 1 April 1989
  Ty Coon, President of Vice

This General Public License does not permit incorporating your program
into proprietary programs.  If your program is a subroutine library,
you may consider it more useful to permit linking proprietary
applications with the library.  If this is what you want to do, use
the GNU Lesser General Public License instead of this License.
```

A.5 GNU Lesser General Public License Version 2.1, February 1999

```
The following applies to all products licensed under the
GNU Lesser General Public License, Version 2.1: You may
not use the identified files except in compliance with
the GNU Lesser General Public License, Version 2.1 (the
"License"). You may obtain a copy of the License at
http://www.gnu.org/licenses/lgpl-2.1.html. A copy of the
license is also reproduced below. Unless required by
applicable law or agreed to in writing, software distributed
under the License is distributed on an "AS IS" BASIS,
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express
or implied. See the License for the specific language governing
permissions and limitations under the License.

                  GNU LESSER GENERAL PUBLIC LICENSE
                       Version 2.1, February 1999

 Copyright (C) 1991, 1999 Free Software Foundation, Inc.
 51 Franklin Street, Fifth Floor, Boston, MA  02110-1301  USA
 Everyone is permitted to copy and distribute verbatim copies
 of this license document, but changing it is not allowed.

[This is the first released version of the Lesser GPL.  It also counts
 as the successor of the GNU Library Public License, version 2, hence
 the version number 2.1.]

                            Preamble

  The licenses for most software are designed to take away your
freedom to share and change it.  By contrast, the GNU General Public
Licenses are intended to guarantee your freedom to share and change
free software--to make sure the software is free for all its users.
```

```
  This license, the Lesser General Public License, applies to some
specially designated software packages--typically libraries--of the
Free Software Foundation and other authors who decide to use it.  You
can use it too, but we suggest you first think carefully about whether
this license or the ordinary General Public License is the better
strategy to use in any particular case, based on the explanations below.

  When we speak of free software, we are referring to freedom of use,
not price.  Our General Public Licenses are designed to make sure that
you have the freedom to distribute copies of free software (and charge
for this service if you wish); that you receive source code or can get
it if you want it; that you can change the software and use pieces of
it in new free programs; and that you are informed that you can do
these things.

  To protect your rights, we need to make restrictions that forbid
distributors to deny you these rights or to ask you to surrender these
rights.  These restrictions translate to certain responsibilities for
you if you distribute copies of the library or if you modify it.

  For example, if you distribute copies of the library, whether gratis
or for a fee, you must give the recipients all the rights that we gave
you.  You must make sure that they, too, receive or can get the source
code.  If you link other code with the library, you must provide
complete object files to the recipients, so that they can relink them
with the library after making changes to the library and recompiling
it.  And you must show them these terms so they know their rights.

  We protect your rights with a two-step method: (1) we copyright the
library, and (2) we offer you this license, which gives you legal
permission to copy, distribute and/or modify the library.

  To protect each distributor, we want to make it very clear that
there is no warranty for the free library.  Also, if the library is
modified by someone else and passed on, the recipients should know
that what they have is not the original version, so that the original
author's reputation will not be affected by problems that might be
introduced by others.

  Finally, software patents pose a constant threat to the existence of
any free program.  We wish to make sure that a company cannot
effectively restrict the users of a free program by obtaining a
restrictive license from a patent holder.  Therefore, we insist that
any patent license obtained for a version of the library must be
consistent with the full freedom of use specified in this license.

  Most GNU software, including some libraries, is covered by the
ordinary GNU General Public License.  This license, the GNU Lesser
General Public License, applies to certain designated libraries, and
is quite different from the ordinary General Public License.  We use
this license for certain libraries in order to permit linking those
libraries into non-free programs.

  When a program is linked with a library, whether statically or using
a shared library, the combination of the two is legally speaking a
combined work, a derivative of the original library.  The ordinary
General Public License therefore permits such linking only if the
entire combination fits its criteria of freedom.  The Lesser General
Public License permits more lax criteria for linking other code with
the library.

  We call this license the "Lesser" General Public License because it
does Less to protect the user's freedom than the ordinary General
Public License.  It also provides other free software developers Less
of an advantage over competing non-free programs.  These disadvantages
are the reason we use the ordinary General Public License for many
libraries.  However, the Lesser license provides advantages in certain
```

```
special circumstances.

  For example, on rare occasions, there may be a special need to
encourage the widest possible use of a certain library, so that it
becomes a de-facto standard.  To achieve this, non-free programs
must be allowed to use the library.  A more frequent case is that
a free library does the same job as widely used non-free libraries.
In this case, there is little to gain by limiting the free library
to free software only, so we use the Lesser General Public License.

  In other cases, permission to use a particular library in non-free
programs enables a greater number of people to use a large body of
free software.  For example, permission to use the GNU C Library in
non-free programs enables many more people to use the whole GNU
operating system, as well as its variant, the GNU/Linux operating
system.

  Although the Lesser General Public License is Less protective of the
users' freedom, it does ensure that the user of a program that is
linked with the Library has the freedom and the wherewithal to run
that program using a modified version of the Library.

  The precise terms and conditions for copying, distribution and
modification follow.  Pay close attention to the difference between a
"work based on the library" and a "work that uses the library".  The
former contains code derived from the library, whereas the latter must
be combined with the library in order to run.

                  GNU LESSER GENERAL PUBLIC LICENSE
   TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

  0. This License Agreement applies to any software library or other
program which contains a notice placed by the copyright holder or
other authorized party saying it may be distributed under the terms of
this Lesser General Public License (also called "this License").
Each licensee is addressed as "you".

  A "library" means a collection of software functions and/or data
prepared so as to be conveniently linked with application programs
(which use some of those functions and data) to form executables.

  The "Library", below, refers to any such software library or work
which has been distributed under these terms.  A "work based on the
Library" means either the Library or any derivative work under
copyright law: that is to say, a work containing the Library or a
portion of it, either verbatim or with modifications and/or translated
straightforwardly into another language.  (Hereinafter, translation is
included without limitation in the term "modification".)

  "Source code" for a work means the preferred form of the work for
making modifications to it.  For a library, complete source code means
all the source code for all modules it contains, plus any associated
interface definition files, plus the scripts used to control
compilation and installation of the library.

  Activities other than copying, distribution and modification are not
covered by this License; they are outside its scope.  The act of
running a program using the Library is not restricted, and output from
such a program is covered only if its contents constitute a work based
on the Library (independent of the use of the Library in a tool for
writing it).  Whether that is true depends on what the Library does
and what the program that uses the Library does.

  1. You may copy and distribute verbatim copies of the Library's
complete source code as you receive it, in any medium, provided that
you conspicuously and appropriately publish on each copy an
appropriate copyright notice and disclaimer of warranty; keep intact
```

```
all the notices that refer to this License and to the absence of any
warranty; and distribute a copy of this License along with the
Library.

  You may charge a fee for the physical act of transferring a copy,
and you may at your option offer warranty protection in exchange for a
fee.

  2. You may modify your copy or copies of the Library or any portion
of it, thus forming a work based on the Library, and copy and
distribute such modifications or work under the terms of Section 1
above, provided that you also meet all of these conditions:

    a) The modified work must itself be a software library.

    b) You must cause the files modified to carry prominent notices
    stating that you changed the files and the date of any change.

    c) You must cause the whole of the work to be licensed at no
    charge to all third parties under the terms of this License.

    d) If a facility in the modified Library refers to a function or a
    table of data to be supplied by an application program that uses
    the facility, other than as an argument passed when the facility
    is invoked, then you must make a good faith effort to ensure that,
    in the event an application does not supply such function or
    table, the facility still operates, and performs whatever part of
    its purpose remains meaningful.

    (For example, a function in a library to compute square roots has
    a purpose that is entirely well-defined independent of the
    application.  Therefore, Subsection 2d requires that any
    application-supplied function or table used by this function must
    be optional: if the application does not supply it, the square
    root function must still compute square roots.)

These requirements apply to the modified work as a whole.  If
identifiable sections of that work are not derived from the Library,
and can be reasonably considered independent and separate works in
themselves, then this License, and its terms, do not apply to those
sections when you distribute them as separate works.  But when you
distribute the same sections as part of a whole which is a work based
on the Library, the distribution of the whole must be on the terms of
this License, whose permissions for other licensees extend to the
entire whole, and thus to each and every part regardless of who wrote
it.

Thus, it is not the intent of this section to claim rights or contest
your rights to work written entirely by you; rather, the intent is to
exercise the right to control the distribution of derivative or
collective works based on the Library.

In addition, mere aggregation of another work not based on the Library
with the Library (or with a work based on the Library) on a volume of
a storage or distribution medium does not bring the other work under
the scope of this License.

  3. You may opt to apply the terms of the ordinary GNU General Public
License instead of this License to a given copy of the Library.  To do
this, you must alter all the notices that refer to this License, so
that they refer to the ordinary GNU General Public License, version 2,
instead of to this License.  (If a newer version than version 2 of the
ordinary GNU General Public License has appeared, then you can specify
that version instead if you wish.)  Do not make any other change in
these notices.

  Once this change is made in a given copy, it is irreversible for
```

```
that copy, so the ordinary GNU General Public License applies to all
subsequent copies and derivative works made from that copy.

  This option is useful when you wish to copy part of the code of
the Library into a program that is not a library.

  4. You may copy and distribute the Library (or a portion or
derivative of it, under Section 2) in object code or executable form
under the terms of Sections 1 and 2 above provided that you accompany
it with the complete corresponding machine-readable source code, which
must be distributed under the terms of Sections 1 and 2 above on a
medium customarily used for software interchange.

  If distribution of object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the
source code from the same place satisfies the requirement to
distribute the source code, even though third parties are not
compelled to copy the source along with the object code.

  5. A program that contains no derivative of any portion of the
Library, but is designed to work with the Library by being compiled or
linked with it, is called a "work that uses the Library".  Such a
work, in isolation, is not a derivative work of the Library, and
therefore falls outside the scope of this License.

  However, linking a "work that uses the Library" with the Library
creates an executable that is a derivative of the Library (because it
contains portions of the Library), rather than a "work that uses the
library".  The executable is therefore covered by this License.
Section 6 states terms for distribution of such executables.

  When a "work that uses the Library" uses material from a header file
that is part of the Library, the object code for the work may be a
derivative work of the Library even though the source code is not.
Whether this is true is especially significant if the work can be
linked without the Library, or if the work is itself a library.  The
threshold for this to be true is not precisely defined by law.

  If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a derivative
work.  (Executables containing this object code plus portions of the
Library will still fall under Section 6.)

  Otherwise, if the work is a derivative of the Library, you may
distribute the object code for the work under the terms of Section 6.
Any executables containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.

  6. As an exception to the Sections above, you may also combine or
link a "work that uses the Library" with the Library to produce a
work containing portions of the Library, and distribute that work
under terms of your choice, provided that the terms permit
modification of the work for the customer's own use and reverse
engineering for debugging such modifications.

  You must give prominent notice with each copy of the work that the
Library is used in it and that the Library and its use are covered by
this License.  You must supply a copy of this License.  If the work
during execution displays copyright notices, you must include the
copyright notice for the Library among them, as well as a reference
directing the user to the copy of this License.  Also, you must do one
of these things:

    a) Accompany the work with the complete corresponding
    machine-readable source code for the Library including whatever
```

```
    changes were used in the work (which must be distributed under
    Sections 1 and 2 above); and, if the work is an executable linked
    with the Library, with the complete machine-readable "work that
    uses the Library", as object code and/or source code, so that the
    user can modify the Library and then relink to produce a modified
    executable containing the modified Library.  (It is understood
    that the user who changes the contents of definitions files in the
    Library will not necessarily be able to recompile the application
    to use the modified definitions.)

    b) Use a suitable shared library mechanism for linking with the
    Library.  A suitable mechanism is one that (1) uses at run time a
    copy of the library already present on the user's computer system,
    rather than copying library functions into the executable, and (2)
    will operate properly with a modified version of the library, if
    the user installs one, as long as the modified version is
    interface-compatible with the version that the work was made with.

    c) Accompany the work with a written offer, valid for at
    least three years, to give the same user the materials
    specified in Subsection 6a, above, for a charge no more
    than the cost of performing this distribution.

    d) If distribution of the work is made by offering access to copy
    from a designated place, offer equivalent access to copy the above
    specified materials from the same place.

    e) Verify that the user has already received a copy of these
    materials or that you have already sent this user a copy.

  For an executable, the required form of the "work that uses the
Library" must include any data and utility programs needed for
reproducing the executable from it.  However, as a special exception,
the materials to be distributed need not include anything that is
normally distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on
which the executable runs, unless that component itself accompanies
the executable.

  It may happen that this requirement contradicts the license
restrictions of other proprietary libraries that do not normally
accompany the operating system.  Such a contradiction means you cannot
use both them and the Library together in an executable that you
distribute.

  7. You may place library facilities that are a work based on the
Library side-by-side in a single library together with other library
facilities not covered by this License, and distribute such a combined
library, provided that the separate distribution of the work based on
the Library and of the other library facilities is otherwise
permitted, and provided that you do these two things:

    a) Accompany the combined library with a copy of the same work
    based on the Library, uncombined with any other library
    facilities.  This must be distributed under the terms of the
    Sections above.

    b) Give prominent notice with the combined library of the fact
    that part of it is a work based on the Library, and explaining
    where to find the accompanying uncombined form of the same work.

  8. You may not copy, modify, sublicense, link with, or distribute
the Library except as expressly provided under this License.  Any
attempt otherwise to copy, modify, sublicense, link with, or
distribute the Library is void, and will automatically terminate your
rights under this License.  However, parties who have received copies,
or rights, from you under this License will not have their licenses
```

terminated so long as such parties remain in full compliance.

  9. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.

  10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties with this License.

  11. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent license would not permit royalty-free redistribution of the Library by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Library.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply, and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

  12. If the distribution and/or use of the Library is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Library under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

  13. The Free Software Foundation may publish revised and/or new versions of the Lesser General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Library specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and

conditions either of that version or of any later version published by
the Free Software Foundation. If the Library does not specify a
license version number, you may choose any version ever published by
the Free Software Foundation.

  14. If you wish to incorporate parts of the Library into other free
programs whose distribution conditions are incompatible with these,
write to the author to ask for permission. For software which is
copyrighted by the Free Software Foundation, write to the Free
Software Foundation; we sometimes make exceptions for this. Our
decision will be guided by the two goals of preserving the free status
of all derivatives of our free software and of promoting the sharing
and reuse of software generally.

                            NO WARRANTY

  15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO
WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW.
EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR
OTHER PARTIES PROVIDE THE LIBRARY "AS IS" WITHOUT WARRANTY OF ANY
KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE
IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR
PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE
LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME
THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

  16. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN
WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY
AND/OR REDISTRIBUTE THE LIBRARY AS PERMITTED ABOVE, BE LIABLE TO YOU
FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR
CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE
LIBRARY (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING
RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A
FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF
SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH
DAMAGES.

                     END OF TERMS AND CONDITIONS

           How to Apply These Terms to Your New Libraries

  If you develop a new library, and you want it to be of the greatest
possible use to the public, we recommend making it free software that
everyone can redistribute and change. You can do so by permitting
redistribution under these terms (or, alternatively, under the terms
of the ordinary General Public License).

  To apply these terms, attach the following notices to the library.
It is safest to attach them to the start of each source file to most
effectively convey the exclusion of warranty; and each file should
have at least the "copyright" line and a pointer to where the full
notice is found.

    <one line to give the library's name and a brief idea of what it does.>
    Copyright (C) <year> <name of author>

    This library is free software; you can redistribute it and/or
    modify it under the terms of the GNU Lesser General Public
    License as published by the Free Software Foundation; either
    version 2.1 of the License, or (at your option) any later version.

    This library is distributed in the hope that it will be useful,
    but WITHOUT ANY WARRANTY; without even the implied warranty of
    MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU
    Lesser General Public License for more details.

    You should have received a copy of the GNU Lesser General Public

```
    License along with this library; if not, write to the Free Software
    Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA
    02110-1301  USA

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your
school, if any, to sign a "copyright disclaimer" for the library, if
necessary.  Here is a sample; alter the names:

  Yoyodyne, Inc., hereby disclaims all copyright interest in the
  library `Frob' (a library for tweaking knobs) written by James
  Random Hacker.

  <signature of Ty Coon>, 1 April 1990
  Ty Coon, President of Vice

That's all there is to it!
```

A.6 GNU Libtool License

The following software may be included in this product:

GNU Libtool (The GNU Portable Library Tool)

```
If you are receiving a copy of the Oracle software in
source code, you are also receiving a copy of two files
(ltmain.sh and ltdl.h) generated by the GNU Libtool in
source code. If you received the Oracle software under
a license other than a commercial (non-GPL) license,
then the terms of the Oracle license do NOT apply to
these files from GNU Libtool; they are licensed under
the following licenses, separately from the Oracle
programs you receive.

Oracle elects to use GNU General Public License version
2 (GPL) for any software where a choice of GPL or GNU
Lesser/Library General Public License (LGPL) license
versions are made available with the language indicating
that GPL/LGPL or any later version may be used, or where
a choice of which version of the GPL/LGPL is applied is
unspecified.

From GNU Libtool:

ltmain.sh - Provide generalized library-building support
services.
NOTE: Changing this file will not affect anything until
you rerun configure.
Copyright (C) 1996, 1997, 1998, 1999, 2000, 2001, 2003, 2004,
2005, 2006, 2007 Free Software Foundation, Inc.
Originally by Gordon Matzigkeit, 1996

This program is free software; you can redistribute it
and/or modify it under the terms of the GNU General
Public License as published by the Free Software Foundation;
either version 2 of the License, or (at your option) any
later version.

This program is distributed in the hope that it will be
useful, but WITHOUT ANY WARRANTY; without even the implied
warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR
PURPOSE. See the GNU General Public License for more
details. You should have received a copy of the GNU General
Public License along with this program; if not, write to
```

```
the Free Software Foundation, Inc., 51 Franklin Street,
Fifth Floor, Boston, MA 02110-1301, USA.

As a special exception to the GNU General Public License,
if you distribute this file as part of a program that
contains a configuration script generated by Autoconf,
you may include it under the same distribution terms that
you use for the rest of that program.
```

This component is licensed under Section A.4, “GNU General Public License Version 2.0, June 1991”

A.7 GNU Readline License

The following software may be included in this product:

GNU Readline Library

```
GNU Readline Library
With respect to MySQL Server/Cluster software licensed
under GNU General Public License, you are receiving a
copy of the GNU Readline Library in source code. The
terms of any Oracle license that might accompany the
Oracle programs do NOT apply to the GNU Readline Library;
it is licensed under the following license, separately
from the Oracle programs you receive. Oracle elects to
use GNU General Public License version 2 (GPL) for any
software where a choice of GPL license versions are
made available with the language indicating that GPLv2
or any later version may be used, or where a choice of
which version of the GPL is applied is unspecified.
```

This component is licensed under Section A.4, “GNU General Public License Version 2.0, June 1991”

A.8 lib_sql.cc License

The following software may be included in this product:

`lib_sql.cc`

```
Copyright (c) 2000
SWsoft company

This material is provided "as is", with absolutely no warranty
expressed or implied. Any use is at your own risk.

Permission to use or copy this software for any purpose is hereby
granted without fee, provided the above notices are retained on
all copies. Permission to modify the code and to distribute modified
code is granted, provided the above notices are retained, and a
notice that the code was modified is included with the above copyright
notice.

This code was modified by the MySQL team.
```

A.9 libevent License

The following software may be included in this product:

```
libevent

Copyright (c) 2000-2007 Niels Provos <provos@citi.umich.edu>
```

```
All rights reserved.

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions
are met:
1. Redistributions of source code must retain the above copyright
   notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright
   notice, this list of conditions and the following disclaimer in the
   documentation and/or other materials provided with the distribution.
3. The name of the author may not be used to endorse or promote products
   derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR ``AS IS'' AND ANY EXPRESS OR
IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES
OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED.
IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT,
INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT
NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE,
DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY
THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT
(INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF
THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE

==
Parts developed by Adam Langley
==

==
log.c
Based on err.c, which was adapted from OpenBSD libc *err*warncode.

Copyright (c) 2005 Nick Mathewson
Copyright (c) 2000 Dug Song
Copyright (c) 1993 The Regents of the University of California.
All rights reserved.

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions
are met:
1. Redistributions of source code must retain the above copyright
   notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright
   notice, this list of conditions and the following disclaimer in
   the documentation and/or other materials provided with the
   distribution.
3. Neither the name of the University nor the names of its
   contributors may be used to endorse or promote products derived
   from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE REGENTS AND CONTRIBUTORS "AS IS"
AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED
TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A
PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS
OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT
LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF
USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED
AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT
LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING
IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF
THE POSSIBILITY OF SUCH DAMAGE.
==

==
min_heap.h
```

```
Copyright (c) 2006 Maxim Yegorushkin
All rights reserved.

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions
are met:
1. Redistributions of source code must retain the above copyright
   notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright
   notice, this list of conditions and the following disclaimer in
   the documentation and/or other materials provided with the
   distribution.
3. The name of the author may not be used to endorse or promote
   products derived from this software without specific prior
   written permission.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR "AS IS" AND ANY EXPRESS
OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED
WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE
ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY
DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL
DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE
GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS
INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER
IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR
OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN
IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
==

==
win32.c

Copyright 2000-2002 Niels Provos
Copyright 2003 Michael A. Davis
All rights reserved.

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions
are met:
1. Redistributions of source code must retain the above copyright
   notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright
   notice, this list of conditions and the following disclaimer in
   the documentation and/or other materials provided with the
   distribution.
3.  The name of the author may not be used to endorse or promote
    products derived from this software without specific prior
    written permission.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR "AS IS" AND ANY EXPRESS
OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED
WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE
ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY
DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL
DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE
GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS
INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER
IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR
OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN
IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
==
```

A.10 Libiconv License

The following software may be included in this product:

```
Libiconv

You are receiving a copy of the GNU LIBICONV Library. The terms of the Oracle
license do NOT apply to the GNU LIBICONV Library; it is licensed under the
following license, separately from the Oracle programs you receive. If you do
not wish to install this program, you may delete [agent install
dir]/lib/libiconv.* and [agent install dir]/licenses/lgpl/iconv files.
```

This component is licensed under Section A.5, “GNU Lesser General Public License Version 2.1, February 1999”.

A.11 libintl License

The following software may be included in this product:

libintl

```
Copyright (C) 1994 X Consortium

Permission is hereby granted, free of charge, to any person obtaining a copy of
this software and associated documentation files (the "Software"), to deal in
the Software without restriction, including without limitation the rights to
use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of
the Software, and to permit persons to whom the Software is furnished to do so,
subject to the following conditions:

The above copyright notice and this permission notice shall be included in all
copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR
IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS
FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE X CONSORTIUM
BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF
CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE
SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of the X Consortium shall not be
used in advertising or otherwise to promote the sale, use or other dealings in
this Software without prior written authorization from the X Consortium.

FSF changes to this file are in the public domain.
 .
Copyright 1996-2007 Free Software Foundation, Inc. Taken from GNU libtool, 2001

Originally by Gordon Matzigkeit <gord@gnu.ai.mit.edu>, 1996

This file is free software; the Free Software Foundation gives unlimited
permission to copy and/or distribute it, with or without modifications, as long
as this notice is preserved.
.
You are receiving a copy of the libintl library. The terms of the Oracle license
do NOT apply to the libintl library; it is licensed under the following license,
separately from the Oracle programs you receive. If you do not wish to install
this program, you may create an "exclude" file and run tar with the X option.

This component is licensed under Section A.5, “GNU Lesser General Public License Version 2.1, February 199
```

A.12 LPeg Library License

The following software may be included in this product:

```
LPeg

Use of any of this software is governed by the terms of the license below:

Copyright © 2008 Lua.org, PUC-Rio.

Permission is hereby granted, free of charge, to any person obtaining a copy of
this software and associated documentation files (the "Software"), to deal in
the Software without restriction, including without limitation the rights to
use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of
the Software, and to permit persons to whom the Software is furnished to do so,
subject to the following conditions:

The above copyright notice and this permission notice shall be included in all
copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR
IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS
FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR
COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER
IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN
CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
```

A.13 Lua (liblua) License

The following software may be included in this product:

```
Lua (liblua)

Copyright © 1994–2008 Lua.org, PUC-Rio.

Permission is hereby granted, free of charge, to any person obtaining
a copy of this software and associated documentation files (the
"Software"), to deal in the Software without restriction, including
without limitation the rights to use, copy, modify, merge, publish,
distribute, sublicense, and/or sell copies of the Software, and to
permit persons to whom the Software is furnished to do so, subject
to the following conditions:

The above copyright notice and this permission notice shall be
included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND,
EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES
OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND
NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT
HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY,
WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING
FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR
OTHER DEALINGS IN THE SOFTWARE.
```

A.14 LuaFileSystem Library License

The following software may be included in this product:

```
LuaFileSystem

Copyright © 2003 Kepler Project.

Permission is hereby granted, free of charge, to any person obtaining
a copy of this software and associated documentation files (the
"Software"), to deal in the Software without restriction, including
without limitation the rights to use, copy, modify, merge, publish,
```

```
distribute, sublicense, and/or sell copies of the Software, and to
permit persons to whom the Software is furnished to do so, subject
to the following conditions:

The above copyright notice and this permission notice shall be
included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND,
EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF
MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.
IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR
ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF
CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION
WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
```

A.15 PCRE License

The following software may be included in this product:

PCRE (Perl Compatible Regular Expressions) Library

```
PCRE LICENCE

PCRE is a library of functions to support regular expressions
whose syntax and semantics are as close as possible to those
of the Perl 5 language.

Release 7 of PCRE is distributed under the terms of the "BSD"
licence, as specified below. The documentation for PCRE,
supplied in the "doc" directory, is distributed under the same
terms as the software itself.

The basic library functions are written in C and are
freestanding. Also included in the distribution is a set
of C++ wrapper functions.

THE BASIC LIBRARY FUNCTIONS
---------------------------
Written by:       Philip Hazel
Email local part: ph10
Email domain:     cam.ac.uk

University of Cambridge Computing Service,
Cambridge, England. Phone: +44 1223 334714.

Copyright (c) 1997-2006 University of Cambridge
All rights reserved.

THE C++ WRAPPER FUNCTIONS
-------------------------
Contributed by:   Google Inc.

Copyright (c) 2006, Google Inc.
All rights reserved.

THE "BSD" LICENCE
-----------------

Redistribution and use in source and binary forms,
with or without modification, are permitted provided
that the following conditions are met:

* Redistributions of source code must retain the above
  copyright notice, this list of conditions and the
  following disclaimer.
```

```
* Redistributions in binary form must reproduce the
  above copyright notice, this list of conditions and
  the following disclaimer in the documentation and/or
  other materials provided with the distribution.
* Neither the name of the University of Cambridge nor
  the name of Google Inc. nor the names of their contributors
  may be used to endorse or promote products derived from
  this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND
CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES,
INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE
DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS
BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY,
OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT
OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS;
OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF
LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING
NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF
THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

End
```

A.16 RegEX-Spencer Library License

The following software may be included in this product: Henry Spencer's Regular-Expression Library (RegEX-Spencer)

```
Copyright 1992, 1993, 1994 Henry Spencer.  All rights reserved.
This software is not subject to any license of the American Telephone
and Telegraph Company or of the Regents of the University of California.

Permission is granted to anyone to use this software for any purpose on
any computer system, and to alter it and redistribute it, subject
to the following restrictions:

1. The author is not responsible for the consequences of use of this
   software, no matter how awful, even if they arise from flaws in it.

2. The origin of this software must not be misrepresented, either by
   explicit claim or by omission.  Since few users ever read sources,
   credits must appear in the documentation.

3. Altered versions must be plainly marked as such, and must not be
   misrepresented as being the original software.  Since few users
   ever read sources, credits must appear in the documentation.

4. This notice may not be removed or altered.
```

A.17 RFC 3174 - US Secure Hash Algorithm 1 (SHA1) License

The following software may be included in this product:

RFC 3174 - US Secure Hash Algorithm 1 (SHA1)

```
RFC 3174 - US Secure Hash Algorithm 1 (SHA1)

Copyright (C) The Internet Society (2001).  All Rights Reserved.

This document and translations of it may be copied and furnished to
others, and derivative works that comment on or otherwise explain it
```

```
or assist in its implementation may be prepared, copied, published
and distributed, in whole or in part, without restriction of any
kind, provided that the above copyright notice and this paragraph are
included on all such copies and derivative works.  However, this
document itself may not be modified in any way, such as by removing
the copyright notice or references to the Internet Society or other
Internet organizations, except as needed for the purpose of
developing Internet standards in which case the procedures for
copyrights defined in the Internet Standards process must be
followed, or as required to translate it into languages other than
English.

The limited permissions granted above are perpetual and will not be
revoked by the Internet Society or its successors or assigns.

This document and the information contained herein is provided on an
"AS IS" basis and THE INTERNET SOCIETY AND THE INTERNET ENGINEERING
TASK FORCE DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING
BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION
HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF
MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Acknowledgement
Funding for the RFC Editor function is currently provided by the
Internet Society.
```

A.18 Richard A. O'Keefe String Library License

The following software may be included in this product:

Richard A. O'Keefe String Library

```
The Richard O’Keefe String Library is subject to the following notice:

These files are in the public domain.  This includes getopt.c, which
is the work of Henry Spencer, University of Toronto Zoology, who
says of it "None of this software is derived from Bell software. I
had no access to the source for Bell's versions at the time I wrote
it.  This software is hereby explicitly placed in the public domain.
It may be used for any purpose on any machine by anyone." I would
greatly prefer it if *my* material received no military use.

The t_ctype.h file is subject to the following notice:

Copyright (C) 1998, 1999 by Pruet Boonma, all rights reserved.
Copyright (C) 1998 by Theppitak Karoonboonyanan, all rights reserved.

  Permission to use, copy, modify, distribute and sell this software and its
documentation for any purpose is hereby granted without fee, provided that the above
copyright notice appear in all copies.

  Smaphan Raruenrom and Pruet Boonma makes no representations about
the suitability of this software for any purpose. It is provided
"as is" without express or implied warranty.
```

A.19 zlib License

The following software may be included in this product:

zlib

Oracle gratefully acknowledges the contributions of Jean-loup Gailly and Mark Adler in creating the zlib general purpose compression library which is used in this product.

```
zlib.h -- interface of the 'zlib' general purpose compression library
Copyright (C) 1995-2004 Jean-loup Gailly and Mark Adler

zlib.h -- interface of the 'zlib' general purpose compression library
version 1.2.3, July 18th, 2005
Copyright (C) 1995-2005 Jean-loup Gailly and Mark Adler

zlib.h -- interface of the 'zlib' general purpose compression library
version 1.2.5, April 19th, 2010
Copyright (C) 1995-2010 Jean-loup Gailly and Mark Adler

This software is provided 'as-is', without any express or implied warranty.
In no event will the authors be held liable for any damages arising from the
use of this software. Permission is granted to anyone to use this software
for any purpose,including commercial applications, and to alter it and
redistribute it freely, subject to the following restrictions:

1. The origin of this software must not be misrepresented; you must not
   claim that you wrote the original software. If you use this software
   in a product, an acknowledgment in the product documentation would
   be appreciated but is not required.
2. Altered source versions must be plainly marked as such, and must not
   be misrepresented as being the original software.
3. This notice may not be removed or altered from any source distribution.

Jean-loup Gailly jloup@gzip.org
Mark Adler madler@alumni.caltech.edu
```