APPENDIX B

Getting Started with MySQL

MySQL is probably the most popular open source database. It is available for Linux and you can download and install it on your Linux machine. The package is available in source code format as well as binary files. The easiest way to install it is to download the RPM file and install it on your Linux machine. I have used RedHat Linux 7.1 on my machine and installed the MySQL package that came with it.

MySQL has two basic parts, the server and the utilities used to administer the server and connect to it. If you install the RPM package, the startup script will be copied into the `/etc/init.d` directory which you use to start the database at boot time. Client utilities are available to manage the database.

MySQL is an easy database to use. This appendix contains some very basic commands that you can use to get started with the database. This is not a MySQL manual or tutorial by any means. Comprehensive information about MySQL can be obtained from http://www.mysql.com/doc/ web site.

For New Users of MySQL

The MySQL server daemon, mysqld, can be started using the startup script. It listens to incoming connection requests from clients. The package comes with mysql client program that you can use to connect to the database and carry out some system administration tasks as well as add/update/delete records in the database. You can have multiple databases and at the time of connection you can define to which database you want to connect.

Starting and Stopping MySQL Server

You can start and stop MySQL Server using startup script /etc/init.d/mysqld on Linux machines. This script is shown below:

```
#!/bin/bash
#
# mysqld This shell script takes care of starting
# and stopping
#       the MySQL subsystem (mysqld).
#
# chkconfig: - 78 12
# description: MySQL database server.
# processname: mysqld
# config: /etc/my.cnf
# pidfile: /var/run/mysqld/mysqld.pid

# Source function library.
. /etc/rc.d/init.d/functions

# Source networking configuration.
. /etc/sysconfig/network

# Source subsystem configuration.
[ -f /etc/sysconfig/subsys/mysqld ] && . /etc/sysconfig/subsys/mysqld


prog="MySQL"

start(){
    touch /var/log/mysqld.log
    chown mysql.mysql /var/log/mysqld.log
    chmod 0640 /var/log/mysqld.log
    if [ ! -d /var/lib/mysql/mysql ] ; then
        action $"Initializing MySQL database: " /usr/bin/
  mysql_install_db
        ret=$?
```

```
         chown -R mysql.mysql /var/lib/mysql
         if [ $ret -ne 0 ] ; then
          return $ret
         fi
     fi
     chown mysql.mysql /var/lib/mysql
     chmod 0755 /var/lib/mysql
     /usr/bin/safe_mysqld  --defaults-file=/etc/my.cnf >/dev/null 2>&1
   &
     ret=$?
     if [ $ret -eq 0 ]; then
         action $"Starting $prog: " /bin/true
     else
              action $"Starting $prog: " /bin/false
     fi
     [ $ret -eq 0 ] && touch /var/lock/subsys/mysqld
     return $ret
}

stop(){
        /bin/kill `cat /var/run/mysqld/mysqld.pid  2> /dev/null ` > /
   dev/null 2>&1
     ret=$?
     if [ $ret -eq 0 ]; then
         action $"Stopping $prog: " /bin/true
     else
              action $"Stopping $prog: " /bin/false
     fi
     [ $ret -eq 0 ] && rm -f /var/lock/subsys/mysqld
     [ $ret -eq 0 ] && rm -f /var/lib/mysql/mysql.sock
     return $ret
}
restart(){
    stop
    start
}

condrestart(){
    [ -e /var/lock/subsys/mysqld ] && restart || :
}

reload(){
    [ -e /var/lock/subsys/mysqld ] && mysqladmin reload
}

# See how we were called.
case "$1" in
```

```
  start)
    start
    ;;
  stop)
    stop
    ;;
  status)
    status mysqld
    ;;
  reload)
    reload
    ;;
  restart)
    restart
    ;;
  condrestart)
    condrestart
    ;;
  *)
    echo $"Usage: $0 {start|stop|status|reload|condrestart|restart}"
    exit 1
esac

exit $?
```

To start the server, use the following commands:

```
/etc/init.d/mysqld start
```

When you start MySQL for the first time, you will see the following messages on your screen:

```
[root@conformix /root]# /etc/init.d/mysqld start
Initializing MySQL database:                         [  OK  ]
Starting MySQL:                                      [  OK  ]
[root@conformix /root]#
```

The next time you start MySQL, it will not show the first line of output because it only needs to initialize its own database the first time you start it.

To stop the database, use the following command:

```
[root@conformix /root]# /etc/init.d/mysqld stop
Stopping MySQL:                                      [  OK  ]
[root@conformix /root]#
```

If the script is not available on your platform, you can create a similar script yourself for your particular UNIX platform.

MySQL Server Configuration File

At startup time, the server uses its configuration file /etc/my.cnf as mentioned in this startup script. The default configuration file that came with my distribution of Linux 7.1 is shown below:

```
[mysqld]
datadir=/var/lib/mysql
socket=/var/lib/mysql/mysql.sock

[mysql.server]
user=mysql
basedir=/var/lib

[safe_mysqld]
err-log=/var/log/mysqld.log
pid-file=/var/run/mysqld/mysqld.pid
```

Database Storage Files

Each database is stored in a directory under /var/lib/mysql top level directory (configurable through my.cnf file). For example, if you use “snort” as the database name, all files in this database will be located in the directory /var/lib/mysql/snort. You have used a script to create tables in this database in Chapter 5. The typical contents of this directory after creating all tables is as follows:

```
[root@laptop]# ls -l /var/lib/mysql/snort
total 4080
-rw-rw----    1 mysql    mysql        8614 Apr 30 14:30
data.frm
-rw-rw----    1 mysql    mysql           0 Apr 30 14:30
data.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:30
data.MYI
-rw-rw----    1 mysql    mysql        8606 Apr 30 14:30
detail.frm
-rw-rw----    1 mysql    mysql          40 Apr 30 14:30
detail.MYD
-rw-rw----    1 mysql    mysql        2048 Apr 30 14:30
detail.MYI
-rw-rw----    1 mysql    mysql        8614 Apr 30 14:30
encoding.frm
-rw-rw----    1 mysql    mysql          60 Apr 30 14:30
encoding.MYD
-rw-rw----    1 mysql    mysql        2048 Apr 30 14:30
encoding.MYI
```

```
-rw-rw----    1 mysql    mysql        8642 Apr 30 14:30
event.frm
-rw-rw----    1 mysql    mysql           0 Apr 30 14:30
event.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:30
event.MYI
-rw-rw----    1 mysql    mysql        8802 Apr 30 14:39
flags.frm
-rw-rw----    1 mysql    mysql       17476 Apr 30 14:39
flags.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:39
flags.MYI
-rw-rw----    1 mysql    mysql        8738 Apr 30 14:30
icmphdr.frm
-rw-rw----    1 mysql    mysql           0 Apr 30 14:30
icmphdr.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:30
icmphdr.MYI
-rw-rw----    1 mysql    mysql        8920 Apr 30 14:30
iphdr.frm
-rw-rw----    1 mysql    mysql           0 Apr 30 14:30
iphdr.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:30
iphdr.MYI
-rw-rw----    1 mysql    mysql        8728 Apr 30 14:30
opt.frm
-rw-rw----    1 mysql    mysql           0 Apr 30 14:30
opt.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:30
opt.MYI
-rw-rw----    1 mysql    mysql        8624 Apr 30 14:39
protocols.frm
-rw-rw----    1 mysql    mysql        6248 Apr 30 14:39
protocols.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:39
protocols.MYI
-rw-rw----    1 mysql    mysql        8630 Apr 30 14:30
reference.frm
-rw-rw----    1 mysql    mysql           0 Apr 30 14:30
reference.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:30
reference.MYI
-rw-rw----    1 mysql    mysql        8618 Apr 30 14:30
reference_system.frm
-rw-rw----    1 mysql    mysql           0 Apr 30 14:30
reference_system.MYD
```

```
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:30
reference_system.MYI
-rw-rw----    1 mysql    mysql        8580 Apr 30 14:30
schema.frm
-rw-rw----    1 mysql    mysql          13 Apr 30 14:30
schema.MYD
-rw-rw----    1 mysql    mysql        2048 Apr 30 14:30
schema.MYI
-rw-rw----    1 mysql    mysql        8706 Apr 30 14:30
sensor.frm
-rw-rw----    1 mysql    mysql           0 Apr 30 14:30
sensor.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:30
sensor.MYI
-rw-rw----    1 mysql    mysql        8648 Apr 30 14:39
services.frm
-rw-rw----    1 mysql    mysql     3686536 Apr 30 14:39
services.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:39
services.MYI
-rw-rw----    1 mysql    mysql        8614 Apr 30 14:30
sig_class.frm
-rw-rw----    1 mysql    mysql           0 Apr 30 14:30
sig_class.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:30
sig_class.MYI
-rw-rw----    1 mysql    mysql        8730 Apr 30 14:30
signature.frm
-rw-rw----    1 mysql    mysql           0 Apr 30 14:30
signature.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:30
signature.MYI
-rw-rw----    1 mysql    mysql        8616 Apr 30 14:30
sig_reference.frm
-rw-rw----    1 mysql    mysql           0 Apr 30 14:30
sig_reference.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:30
sig_reference.MYI
-rw-rw----    1 mysql    mysql        8888 Apr 30 14:30
tcphdr.frm
-rw-rw----    1 mysql    mysql           0 Apr 30 14:30
tcphdr.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:30
tcphdr.MYI
-rw-rw----    1 mysql    mysql        8704 Apr 30 14:30
udphdr.frm
```

```
-rw-rw----    1 mysql    mysql           0 Apr 30 14:30
udphdr.MYD
-rw-rw----    1 mysql    mysql        1024 Apr 30 14:30
udphdr.MYI
[root@laptop]#
```

As you may have figured out, there are three files related to each table in the database. To find out how many databases are present on your system, just list the directories under `/usr/lib/mysql`.

Basic MySQL Commands

This section presents some very basic MySQL commands. These commands are required to do basic operations with the database.

Creating a Database

First of all you have to login to create a database. You can login as user "root" to MySQL server as shown below. This root user is not the Linux root user. It is related to MySQL database only.

```
[root@conformix /root]# mysql -u root
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 1 to server version: 3.23.36

Type 'help;' or '\h' for help. Type '\c' to clear the buffer

mysql>
```

At the `mysql>` prompt, you can use MySQL commands. The following command creates `testdb`.

```
mysql> create database testdb;
Query OK, 1 row affected (0.01 sec)

mysql>
```

When you create a database, a directory is created under `/var/lib/mysql` to store database files. In this case the name of the directory is `/var/lib/mysql/testdb`.

Displaying a List of Databases

At the command prompt, you can use the `show databases` command to list available databases.

```
mysql> show databases;
+----------+
| Database |
+----------+
| mysql    |
| test     |
| testdb   |
+----------+
3 rows in set (0.00 sec)

mysql>
```

This command shows that three databases exist. The names of these databases are `mysql`, `test` and `testdb`.

Connecting to a Database

To connect to a database, you can use the `use` command by providing the name of the database as the argument to this command. The following command starts using `testdb` as the database.

```
mysql> use testdb;
Database changed
mysql>
```

In some cases you can also use the following command:

```
mysql> connect testdb
Reading table information for completion of table and column
names
You can turn off this feature to get a quicker startup with -A

Connection id:    3
Current database: testdb

mysql>
```

Creating Tables

The following command creates a table with the name `customer`. The table contains four columns.

```
mysql> create table customers (name varchar(20), address
varchar(40), phone varchar(10), dob date);
Query OK, 0 rows affected (0.00 sec)

mysql>
```

Column names and their data types are defined in the command. When you create a table, three files are created in the directory that corresponds to the database. In this case, files are created in /var/lib/mysql/testdb directory as shown in the following command.

```
[root@conformix]# ls /var/lib/mysql/testdb
customers.frm  customers.MYD  customers.MYI
[root@conformix]#
```

The names of these files start with the name used for the table.

Listing Tables

The show tables command lists currently defined tables in the database.

```
mysql> show tables;
+-------------------+
| Tables_in_testdb |
+-------------------+
| customers        |
+-------------------+
1 row in set (0.01 sec)

mysql>
```

Displaying Table Information

You can display information about each table column by using the describe command. The following command displays information about recently created table customers.

```
mysql> describe customers;
+---------+-------------+------+-----+---------+-------+
| Field   | Type        | Null | Key | Default | Extra |
+---------+-------------+------+-----+---------+-------+
| name    | varchar(20) | YES  |     | NULL    |       |
| address | varchar(40) | YES  |     | NULL    |       |
| phone   | varchar(10) | YES  |     | NULL    |       |
| dob     | date        | YES  |     | NULL    |       |
+---------+-------------+------+-----+---------+-------+
4 rows in set (0.01 sec)

mysql>
```

Adding Data to Tables

Data can be added to a table using the insert command. The following command adds one row to the customers table.

```
mysql> insert into customers values ('Boota', '135 SB,
Sargodha', '001-946-15', '1970-01-01');
Query OK, 1 row affected (0.06 sec)

mysql>
```

Displaying Data in Tables

The select command retrieves data from one or more tables. In its simplest form, the following command displays all records in the customers table.

```
mysql> select * from customers;
+-------+------------------+------------+------------+
| name  | address          | phone      | dob        |
+-------+------------------+------------+------------+
| Boota | 135 SB, Sargodha | 001-946-15 | 1970-01-01 |
+-------+------------------+------------+------------+
1 row in set (0.00 sec)

mysql>
```

For more information on the select command, use any SQL language reference.

Deleting Data from Tables

The delete command removes data from the table. The following command deletes records from the customer table where the name of the customer is Boota.

```
mysql> delete from customers where customers.name='Boota';
Query OK, 1 row affected (0.00 sec)

mysql>
```

Switching from One Database to Another

You can use the use commands to switch to another database. The following command starts using mysql-test database.

```
mysql> use mysql-test
Reading table information for completion of table and column
names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql>
```

Creating a User

The simplest way to create a user is to grant the user some access rights to a database. If the user does not already exist, it will be created. The following command creates a user rrehman and grants all access rights on the testdb database.

```
mysql> grant all on testdb.* to rrehman;
Query OK, 0 rows affected (0.00 sec)

mysql>
```

This command creates a row in the user table in mysql database for user rrehman and grants permission for everything to user rrehman on database testdb.

Setting Password for a User

You can assign a password to the user upon creation. The following command creates a user rrehman and assigns a password boota.

```
grant all on testdb.* to rrehman identified by ‘boota’;
```

To assign a password later on, use the following command:

```
mysql> set password for rrehman = password('kaka');
Query OK, 0 rows affected (0.00 sec)

mysql>
```

Granting Permissions

The grant command is used to grant different levels of permissions to users. Refer to the following command where different permissions are assigned to a user rr on localhost.

```
mysql> grant CREATE,INSERT,DELETE,UPDATE,SELECT on snort.* to
rr@localhost;
Query OK, 0 rows affected (0.00 sec)

mysql>
```

Using mysqladmin Utility

The mysqladmin utility is used for database administration. A complete discussion is beyond the scope of this book. The following output of the command shows some of the tasks that it is capable of doing.

```
[root@conformix /root]# mysqladmin
mysqladmin  Ver 8.18 Distrib 3.23.36, for redhat-linux-gnu on i386
Copyright (C) 2000 MySQL AB & MySQL Finland AB & TCX DataKonsult AB
This software comes with ABSOLUTELY NO WARRANTY. This is free software,
and you are welcome to modify and redistribute it under the GPL license

Administration program for the mysqld daemon.
Usage: mysqladmin [OPTIONS] command command....

  -#, --debug=...        Output debug log. Often this is
  'd:t:o,filename`
  -f, --force          Don't ask for confirmation on drop database;
  with
```

```
                      multiple commands, continue even if an error
  occurs
  -?, --help          Display this help and exit
  --character-sets-dir=...
                        Set the character set directory
  -C, --compress        Use compression in server/client protocol
  -h, --host=#        Connect to host
  -p, --password[=...] Password to use when connecting to server
                      If password is not given it's asked from the tty
  -P  --port=...  Port number to use for connection
  -i, --sleep=sec Execute commands again and again with a sleep between
  -r, --relative        Show difference between current and previous
  values
                        when used with -i. Currently works only with
                        extended-status
  -E, --vertical        Print output vertically. Is similar to --
  relative,
                        but prints output vertically.
  -s, --silent        Silently exit if one can't connect to server
  -S, --socket=...Socket file to use for connection
  -t, --timeout=...Timeout for connection to the mysqld server
  -u, --user=#        User for login if not current user
  -v, --verbose         Write more information
  -V, --version       Output version information and exit
  -w, --wait[=retries]  Wait and retry if connection is down

Default options are read from the following files in the given order:
/etc/my.cnf /var/lib/mysql/my.cnf ~/.my.cnf
The following groups are read: mysqladmin client
The following options may be given as the first argument:
--print-defaults  Print the program argument list and exit
--no-defaults         Don't read default options from any options file
--defaults-file=# Only read default options from the given file #
--defaults-extra-file=# Read this file after the global files are read

Possible variables for option --set-variable (-O) are:
connect_timeout       current value: 0
shutdown_timeout      current value: 3600

Where command is a one or more of: (Commands may be shortened)
  create databasenameCreate a new database
  drop databasenameDelete a database and all its tables
  extended-status       Gives an extended status message from the
  server
  flush-hosts           Flush all cached hosts
  flush-logs            Flush all logs
  flush-status        Clear status variables
  flush-tables          Flush all tables
  flush-threads         Flush the thread cache
  flush-privileges      Reload grant tables (same as reload)
  kill id,id,...  Kill mysql threads
  password new-password Change old password to new-password
  ping                Check if mysqld is alive
  processlist         Show list of active threads in server
  reload              Reload grant tables
  refresh             Flush all tables and close and open logfiles
  shutdown            Take server down
  status              Gives a short status message from the server
  start-slave         Start slave
  stop-slave          Stop slave
  variables             Prints variables available
  version             Get version info from server
[root@conformix]#
```

You can use different options on the command line. For example “`mysqladmin version`” will show the version number for the utility.