

COP 4610L: Applications in the Enterprise Spring 2006

Introduction To MySQL – Part 2

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Manipulating Tables in MySQL (cont.)

- Recall that the `create table` command has the following general format:

```
create [temporary] table
[if not exists] tablename
[ (create_definition, ... ) ]
[ table_options ]
[ select_statement ] ;
```

- The table options allow you to specify the MySQL table type. The table type can be anyone of the six types listed in the table on the next slide.



Manipulating Tables in MySQL (cont.)

Table Type	Description
ISAM	MySQL's original table handler
HEAP	The data for this table is only stored in memory
MyISAM	A binary portable table handler that has replaced ISAM
MERGE	A collection of MyISAM tables used as one table
BDB	Transaction-safe tables with page locking
InnoDB	Transaction-safe tables with row locking

MySQL Table Types

ISAM, HEAP, and MyISAM are available for MySQL versions 3.23.6 or later.

MERGE, BDB, and InnoDB are available for MySQL versions 4.0 and later.

Default table type is ISAM.



Altering A Table

- After a table has been created, it is possible to change the specifications of its schema. This is done through the `alter table` command:

```
alter table table_name action_list
```

- Note: Changing the schema of a table in a database is not something that is done very often once the database has been created. The time for altering the schema is during the design phase. Altering the schema of an operational database is a very dangerous thing.
- Multiple changes to the table can be made at the same time by separating actions with commas in the `action_list`.
- The possible attribute (column) actions that can be used are shown in the table on the following slide.



Altering A Table (cont.)

Action Syntax	Action Performed
<code>add [column] <i>column_declaration</i> [first after <i>column_name</i>]</code>	Add a column to the table
<code>alter [column] <i>column_name</i> {set default <i>literal</i> drop default}</code>	Specify new default value for a column or remove old default
<code>change [column] <i>column_name</i> <i>column_declaration</i></code>	Modify column declaration with renaming of column
<code>modify [column] <i>column_declaration</i></code>	Modify column declaration without renaming column
<code>drop [column] <i>column_name</i></code>	Drop a column and all data contained within it.
<code>rename [as] <i>new_table_name</i></code>	Rename a table
<code><i>table_options</i></code>	Change the table options

Actions performed by `alter table` (column related) command

`column_name` represents the current name of the column, `column_declaration` represents the new declaration, in the same format as if it were in a `create` command.



Altering A Table (cont.)

- The screen shot below shows an example of altering a table.

```
mysql> describe bikes;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| bikename | varchar(30) | YES | PRI | NULL |  |
| size | int(2) | YES |  | NULL |  |
| color | varchar(15) | YES |  | NULL |  |
| cost | int(5) | YES |  | NULL |  |
| purchased | date | YES |  | NULL |  |
| mileage | int(6) | YES |  | NULL |  |
+-----+-----+-----+-----+-----+-----+
6 rows in set (0.05 sec)

mysql> alter table bikes
-> add column races_won int(3) default 0;
Query OK, 8 rows affected (0.08 sec)
Records: 8 Duplicates: 0 Warnings: 0

mysql> describe bikes;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| bikename | varchar(30) | YES | PRI | NULL |  |
| size | int(2) | YES |  | NULL |  |
| color | varchar(15) | YES |  | NULL |  |
| cost | int(5) | YES |  | NULL |  |
| purchased | date | YES |  | NULL |  |
| mileage | int(6) | YES |  | NULL |  |
| races_won | int(3) | YES |  | 0 |  |
+-----+-----+-----+-----+-----+-----+
7 rows in set (0.00 sec)

mysql>
```

Schema of bikes before alteration

There are eight rows affected because this table currently contains eight tuples (rows) and the new attribute has been added to both rows.

Bikes table after the addition of a new column named races_won



Altering A Table (cont.)

- The screen shot below shows the tuples currently in the bikes table after the addition of the new attribute illustrating that all of the tuples have assumed the default value on the new attribute.

```
Command Prompt (2) - mysql -u root -p
mysql> select bikename, color, cost, mileage, races_won from bikes;
+-----+-----+-----+-----+-----+
| bikename          | color      | cost  | mileage | races_won |
+-----+-----+-----+-----+-----+
| Colnago Dream Rabobank | blue/orange | 5500  | 4300    | 0         |
| Bianchi Evolution 3   | celeste    | 4800  | 2000    | 0         |
| Eddy Merckx Molteni  | orange     | 5100  | 0       | 0         |
| Eddy Merckx Domo     | blue/black | 5300  | 0       | 0         |
| Battaglin Carrera    | red/white  | 4000  | 11200   | 0         |
| Gianni Motta Personal | red/green  | 4400  | 8700    | 0         |
| Gios Torino Super    | blue       | 3800  | 9000    | 0         |
| Schwinn Paramount P14 | blue       | 1800  | 200     | 0         |
+-----+-----+-----+-----+-----+
8 rows in set (0.00 sec)
mysql>
```

Every tuple in the table has the default value for the new attribute.



Altering A Table (cont.)

- The screen shot below illustrates dropping a column from a table.
- Note that in general, this type of operation may not always be allowed due to constraint violations.

```
CA Command Prompt (2) - mysql -u root -p
mysql> alter table bikes
-> drop column races_won;
Query OK, 8 rows affected (0.06 sec)
Records: 8 Duplicates: 0 Warnings: 0

mysql> describe bikes;
+-----+-----+-----+-----+-----+-----+
| Field      | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| bikename   | varchar(30)   |      | PRI |          |       |
| size       | int(2)        | YES  |     | NULL    |       |
| color      | varchar(15)   | YES  |     | NULL    |       |
| cost       | int(5)        | YES  |     | NULL    |       |
| purchased  | date          | YES  |     | NULL    |       |
| mileage    | int(6)        | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
6 rows in set (0.00 sec)

mysql> _
```

The attribute races_won has been eliminated from the table.



Altering A Table (cont.)

- The screen shot below shows a more complicated example of altering a table.

```
C:\ Command Prompt (2) - mysql -u root -p

mysql> describe bikes;
+-----+-----+-----+-----+-----+-----+
| Field      | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| bikename   | varchar(30)   |      | PRI |          |       |
| size       | int(2)        | YES  |     | NULL    |       |
| color      | varchar(15)   | YES  |     | NULL    |       |
| cost       | int(5)        | YES  |     | NULL    |       |
| purchased  | date          | YES  |     | NULL    |       |
| mileage    | int(6)        | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
6 rows in set (0.00 sec)

mysql> alter table bikes
  -> add column lastoverhaul datetime after bikename,
  -> modify cost int(6),
  -> add column races_ridden int(3) after mileage;
Query OK, 8 rows affected (0.06 sec)
Records: 8  Duplicates: 0  Warnings: 0

mysql> describe bikes;
+-----+-----+-----+-----+-----+-----+
| Field      | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| bikename   | varchar(30)   |      | PRI |          |       |
| lastoverhaul | datetime      | YES  |     | NULL    |       |
| size       | int(2)        | YES  |     | NULL    |       |
| color      | varchar(15)   | YES  |     | NULL    |       |
| cost       | int(6)        | YES  |     | NULL    |       |
| purchased  | date          | YES  |     | NULL    |       |
| mileage    | int(6)        | YES  |     | NULL    |       |
| races_ridden | int(3)        | YES  |     | NULL    |       |
+-----+-----+-----+-----+-----+-----+
8 rows in set (0.00 sec)
```

Schema of bikes before alteration

More complicated alter table command.

Bikes table after the alteration



Inserting Data Into A Table

- Data can be entered into a MySQL table using either the `insert` or `replace` commands.
- The `insert` statement is the primary way of getting data into the database and has the following form:

Form 1 `insert [low priority | delayed] [ignore] [into]table_name`
`[set] column_name1 = expression1,`
`column_name2 = expression2, ...`

Form 2 `insert [low priority | delayed] [ignore] [into]table_name`
`[(column_name,...)]values (expression,...), (...)`...

Form 3 `insert [low priority | delayed] [ignore] [into]table_name`
`[(column_name,...)] select...`



Inserting Data Into A Table (cont.)

- Form 1 of the insert statement is the most verbose, but also the most common. The `set` clause explicitly names each column and states what value (evaluated from each `expression`) should be put into the table.
- Form 2 (insert values) requires just a comma separated list of the data. For each row inserted, each data value must correspond with a column. In other words, the number of values listed must match the number of columns and the order of the value list must be the same as the columns. (In form 1, the order is not critical since each column is named.)
- Form 3 is used to insert data into a table which is the result set of a `select` statement. This is similar to the temporary table example from the previous section of notes.
- The following couple of pages give some examples of the different forms of the `insert` command.



Examples: Inserting Data Into A Table

```
C:\> Command Prompt (2) - mysql -u root -p
mysql> select * from bikes;
+-----+-----+-----+-----+-----+-----+
| bikename      | size | color      | cost  | purchased | mileage |
+-----+-----+-----+-----+-----+-----+
| Colnago Dream Rabobank | 60   | blue/orange | 5500  | 2002-06-27 | 4300   |
| Bianchi Evolution 3   | 58   | celeste    | 4800  | 2003-11-16 | 2000   |
| Eddy Merckx Molteni  | 58   | orange     | 5100  | 2004-08-12 | 0      |
| Eddy Merckx Domo     | 58   | blue/black | 5300  | 2004-02-02 | 0      |
| Battaglin Carrera   | 60   | red/white  | 4000  | 2001-03-14 | 11200  |
| Gianni Motta Personal | 59   | red/green  | 4400  | 2000-05-01 | 8700   |
| Gios Torino Super    | 60   | blue       | 3800  | 1998-11-08 | 9000   |
| Schwinn Paramount P14 | 60   | blue       | 1800  | 1992-03-01 | 200    |
+-----+-----+-----+-----+-----+-----+
8 rows in set (0.00 sec)

mysql> insert into bikes
-> set bikename='Bianchi Corse',
-> cost=5700,
-> mileage=2300,
-> purchased='2004-12-22',
-> color='celeste',
-> size=58;
Query OK, 1 row affected (0.02 sec)

mysql> select * from bikes;
+-----+-----+-----+-----+-----+-----+
| bikename      | size | color      | cost  | purchased | mileage |
+-----+-----+-----+-----+-----+-----+
| Colnago Dream Rabobank | 60   | blue/orange | 5500  | 2002-06-27 | 4300   |
| Bianchi Evolution 3   | 58   | celeste    | 4800  | 2003-11-16 | 2000   |
| Eddy Merckx Molteni  | 58   | orange     | 5100  | 2004-08-12 | 0      |
| Eddy Merckx Domo     | 58   | blue/black | 5300  | 2004-02-02 | 0      |
| Battaglin Carrera   | 60   | red/white  | 4000  | 2001-03-14 | 11200  |
| Gianni Motta Personal | 59   | red/green  | 4400  | 2000-05-01 | 8700   |
| Gios Torino Super    | 60   | blue       | 3800  | 1998-11-08 | 9000   |
| Schwinn Paramount P14 | 60   | blue       | 1800  | 1992-03-01 | 200    |
| Bianchi Corse       | 58   | celeste    | 5700  | 2004-12-22 | 2300   |
+-----+-----+-----+-----+-----+-----+
9 rows in set (0.00 sec)

mysql>
```

Using Form 1 for insertion – attribute order is not important.



Examples: Inserting Data Into A Table

```
C:\> Command Prompt (2) - mysql -u root -p

mysql> select * from bikes;
+-----+-----+-----+-----+-----+-----+
| bikename      | size | color      | cost  | purchased | mileage |
+-----+-----+-----+-----+-----+-----+
| Colnago Dream Rabobank | 60  | blue/orange | 5500  | 2002-06-27 | 4300   |
| Bianchi Evolution 3   | 58  | celeste    | 4800  | 2003-11-16 | 2000   |
| Eddy Merckx Molteni  | 58  | orange     | 5100  | 2004-08-12 | 0       |
| Eddy Merckx Domo     | 58  | blue/black | 5300  | 2004-02-02 | 0       |
| Battaglin Carrera    | 60  | red/white  | 4000  | 2001-03-14 | 11200  |
| Gianni Motta Personal | 59  | red/green  | 4400  | 2000-05-01 | 8700   |
| Gios Torino Super    | 60  | blue      | 3800  | 1998-11-08 | 9000   |
| Schwinn Paramount P14 | 60  | blue      | 1800  | 1992-03-01 | 200    |
| Bianchi Corse        | 58  | celeste    | 5700  | 2004-12-22 | 2300   |
+-----+-----+-----+-----+-----+-----+
9 rows in set (0.00 sec)

mysql> insert into bikes
-> values('Colnago Superissimo',59,'red',3800,'1996-3-1',13000);
Query OK, 1 row affected (0.00 sec)

mysql> select * from bikes;
+-----+-----+-----+-----+-----+-----+
| bikename      | size | color      | cost  | purchased | mileage |
+-----+-----+-----+-----+-----+-----+
| Colnago Dream Rabobank | 60  | blue/orange | 5500  | 2002-06-27 | 4300   |
| Bianchi Evolution 3   | 58  | celeste    | 4800  | 2003-11-16 | 2000   |
| Eddy Merckx Molteni  | 58  | orange     | 5100  | 2004-08-12 | 0       |
| Eddy Merckx Domo     | 58  | blue/black | 5300  | 2004-02-02 | 0       |
| Battaglin Carrera    | 60  | red/white  | 4000  | 2001-03-14 | 11200  |
| Gianni Motta Personal | 59  | red/green  | 4400  | 2000-05-01 | 8700   |
| Gios Torino Super    | 60  | blue      | 3800  | 1998-11-08 | 9000   |
| Schwinn Paramount P14 | 60  | blue      | 1800  | 1992-03-01 | 200    |
| Bianchi Corse        | 58  | celeste    | 5700  | 2004-12-22 | 2300   |
| Colnago Superissimo  | 59  | red       | 3800  | 1996-03-01 | 13000  |
+-----+-----+-----+-----+-----+-----+
10 rows in set (0.00 sec)

mysql>
```

Using Form 2 for insertion – attribute order is important.



Examples: Inserting Data Into A Table

```
C:\> Command Prompt (2) - mysql -u root -p

mysql> create table bluebikes <
-> bikename varchar(30),
-> color varchar(15),
-> price int(6),
-> total_miles int(6),
-> primary key (bikename));
Query OK, 0 rows affected (0.03 sec)

mysql> show tables;
+-----+
| Tables_in_bikedb |
+-----+
| bikes             |
| bluebikes         |
+-----+
2 rows in set (0.00 sec)

mysql> insert into bluebikes
-> select bikename,color,cost,mileage
-> from bikes
-> where color='blue';
Query OK, 2 rows affected (0.00 sec)
Records: 2  Duplicates: 0  Warnings: 0

mysql> select * from bluebikes;
+-----+-----+-----+-----+
| bikename          | color | price | total_miles |
+-----+-----+-----+-----+
| Gios Torino Super | blue  | 3800  | 9000        |
| Schwinn Paramount P14 | blue  | 1800  | 200         |
+-----+-----+-----+-----+
2 rows in set (0.00 sec)

mysql>
```

Create an initially empty table

Using Form 3 for insertion

This table contains the name and cost of those bikes whose color was blue from the source table.



Using Scripts with MySQL

- Entering data to create sample databases using conventional SQL commands is tedious and prone to errors. A much simpler technique is to use scripts. The following illustrates two techniques for invoking scripts in MySQL.
- Create your script file using the text editor of your choice.
- Comments in the SQL script files begin with a # symbol.
- In the script file example shown on the next slide, I drop the database in the first SQL command. Without the if exists clause, this will generate an error if the database does not exist. The first time the script executes (or subsequent executions if the database is dropped independently) the error will be generated...simply ignore the error.



Using Scripts with MySQL (cont.)

```
script - Notepad
File Edit Format View Help
# SQL commands in a script file
drop database if exists testdb;
create database testdb;
use testdb;
create table states (
  name varchar(15) not null,
  abbrev char(2),
  capital varchar(25),
  population integer,
  square_miles integer,
  primary key (name)
);
insert into states values ('Florida','FL','Tallahassee', 17019068, 53997);
insert into states values ('Georgia','GA','Atlanta', 8684715, 57919);
insert into states values ('Indiana','IN','Indianapolis', 6195643, 35870);
insert into states values ('Maryland','MD','Annapolis', 5508909, 9775);
select * from states;
```

Drop the database if it already exists.

Create a new database.

Switch to the new database.

Define schema for the new table.

Insert some tuples

Run a simple selection query on the new table.



Using Scripts with MySQL (cont.)

```
C:\> Command Prompt (2) - mysql -u root -p

mysql> show databases;
+-----+
| Database |
+-----+
| bikedb  |
| mysql  |
| prog3   |
| test    |
+-----+
4 rows in set (0.00 sec)

mysql> source c:\script.sql
Query OK, 0 rows affected, 1 warning (0.00 sec)

Query OK, 1 row affected (0.01 sec)

Database changed
Query OK, 0 rows affected (0.05 sec)

Query OK, 1 row affected (0.02 sec)

Query OK, 1 row affected (0.00 sec)

Query OK, 1 row affected (0.00 sec)

Query OK, 1 row affected (0.00 sec)

+-----+-----+-----+-----+-----+
| name      | abbrev | capital      | population | square_miles |
+-----+-----+-----+-----+-----+
| Florida   | FL     | Tallahassee | 17019068   | 53997         |
| Georgia   | GA     | Atlanta      | 8684715    | 57919         |
| Indiana   | IN     | Indianapolis  | 6195643    | 35870         |
| Maryland  | MD     | Annapolis    | 5508909    | 9775          |
+-----+-----+-----+-----+-----+
4 rows in set (0.00 sec)

mysql>
```

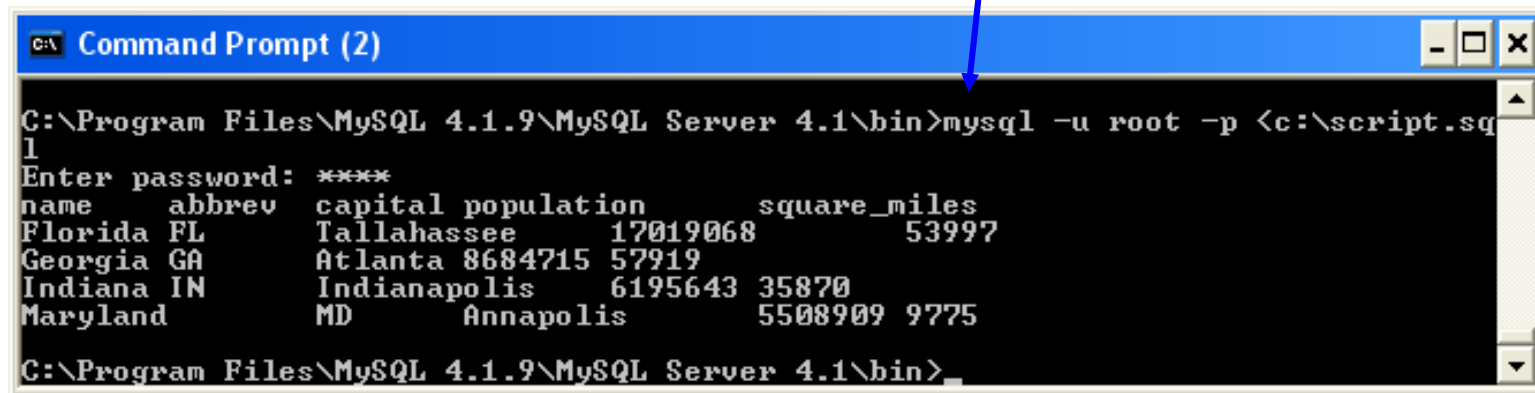
Specify which script to execute

Results of select query at end of script.



Using Scripts with MySQL (cont.)

Piping the script file into MySQL as input. MySQL executes the script. In this case displaying the results of the select query after creating the database and table as well as filling the table. Note that MySQL exits after running the script.



```
C:\Program Files\MySQL 4.1.9\MySQL Server 4.1\bin>mysql -u root -p <c:\script.sql
Enter password: ****
name abbrev capital population square_miles
Florida FL Tallahassee 17019068 53997
Georgia GA Atlanta 8684715 57919
Indiana IN Indianapolis 6195643 35870
Maryland MD Annapolis 5508909 9775
C:\Program Files\MySQL 4.1.9\MySQL Server 4.1\bin>
```



Importing Data Using the `mysqlimport` Utility

- As with many things in MySQL there are several ways to accomplish a specific task. For getting data into tables, the `mysqlimport` utility is also useful.
- The `mysqlimport` utility reads a range of data formats, including comma- and tab- delimited, and inserts the data into a specified database table. The syntax for `mysqlimport` is:

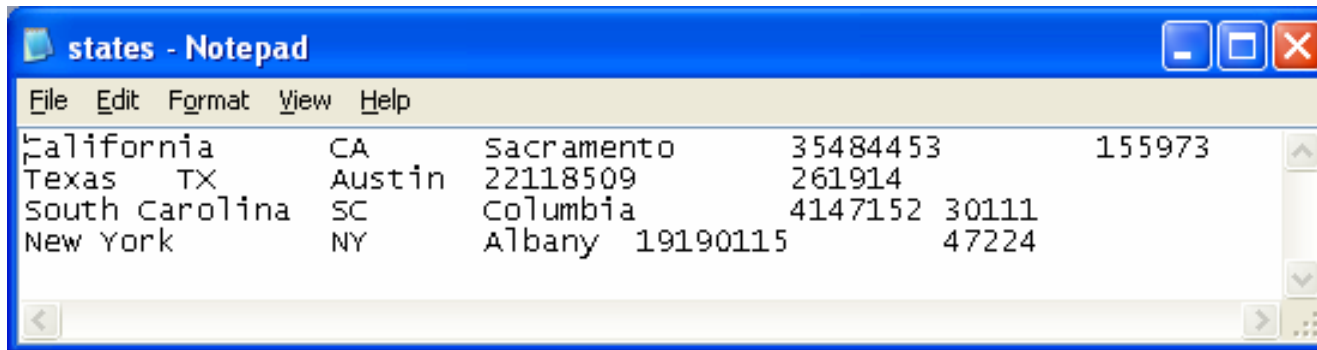
```
mysqlimport [options] database_name file1 file2 ...
```

- This utility is designed to be invoked from the command line.
- The name of the file (excluding the extension) must match the name of the database table into which the data import will occur. Failure to match names will result in an error.



Importing Data Using the `mysqlimport` Utility (cont.)

- The file shown below was created to import additional data into the `states` table within the `testdb` database used in the previous example.



```
File Edit Format View Help
California CA Sacramento 35484453 155973
Texas TX Austin 22118509 261914
South Carolina SC Columbia 4147152 30111
New York NY Albany 19190115 47224
```

- In this case, the default field delimiter (tab), default field enclosure (nothing), and the default line delimiter (`\n`) were used. Many options are available and are illustrated in the table on pages 23-24.



Importing Data Using the `mysqlimport` Utility

```
Command Prompt (2)
mysql> show databases;
+-----+
| Database |
+-----+
| bikedb   |
| mysql    |
| prog3    |
| test     |
| testdb   |
+-----+
5 rows in set (0.00 sec)

mysql> use testdb;
Database changed
mysql> show tables
-> ;
+-----+
| Tables_in_testdb |
+-----+
| states            |
+-----+
1 row in set (0.00 sec)

mysql> exit
Bye

C:\Program Files\MySQL 4.1.9\MySQL Server 4.1\bin>mysqlimport -u root -p -vr tes
tdb c:\states.sql
Enter password: ****
Connecting to localhost
Selecting database testdb
Loading data from SERVER file: c:/states.sql into states
testdb.states: Records: 4 Deleted: 0 Skipped: 0 Warnings: 0
Disconnecting from localhost

C:\Program Files\MySQL 4.1.9\MySQL Server 4.1\bin>
```

Importing a "data file" into a MySQL database table using the `mysqlimport` utility

See tables on pages 23-24 for listing of options.

Table updated



Importing Data Using the mysqlimport Utility

```
C:\ Command Prompt (2) - mysql -u root -p

mysql> select * from states;
+-----+-----+-----+-----+-----+
| name      | abbrev | capital      | population | square_miles |
+-----+-----+-----+-----+-----+
| Florida   | FL     | Tallahassee | 17019068  | 53997         |
| Georgia   | GA     | Atlanta      | 8684715   | 57919         |
| Indiana   | IN     | Indianapolis  | 6195643   | 35870         |
| Maryland  | MD     | Annapolis    | 5508909   | 9775          |
+-----+-----+-----+-----+-----+
4 rows in set (0.00 sec)

mysql> select * from states;
+-----+-----+-----+-----+-----+
| name      | abbrev | capital      | population | square_miles |
+-----+-----+-----+-----+-----+
| Florida   | FL     | Tallahassee | 17019068  | 53997         |
| Georgia   | GA     | Atlanta      | 8684715   | 57919         |
| Indiana   | IN     | Indianapolis  | 6195643   | 35870         |
| Maryland  | MD     | Annapolis    | 5508909   | 9775          |
| South Carolina | SC     | Columbia    | 4147152   | 30111         |
| Texas     | TX     | Austin       | 22118509  | 261914        |
| California | CA     | Sacramento   | 35484453  | 155973        |
| New York  | NY     | Albany       | 19190115  | 47224         |
+-----+-----+-----+-----+-----+
8 rows in set (0.00 sec)

mysql>
```

Table **before** another client updated the table using the mysqlimport utility.

Table **after** another client updated the table using the mysqlimport utility.



mysqlimportUtility Options

Option	Action
-r or --replace	Causes imported rows to overwrite existing rows if they have the same unique key value.
-i or --ignore	Ignores rows that have the same unique key value as existing rows.
-f or --force	Forces mysqlimport to continue inserting data even if errors are encountered.
-l or --lock	Lock each table before importing (a good idea in general and especially on a busy server).
-d or --delete	Empty the table before inserting data.
--fields-terminated-by='char'	Specify the separator used between values of the same row, default \t (tab).
--fields-enclosed-by='char'	Specify the delimiter that encloses each field, default is none.



mysqlimport Utility Options (cont.)

Option	Action
--fields-optionally-enclosed-by='char'	Same as --fields-enclosed-by, but delimiter is used only to enclosed string-type columns, default is none.
--fields-escaped-by='char'	Specify the escape character placed before special characters; default is \.
--lines-terminated-by='char'	Specify the separator used to terminate each row of data, default is \n (newline).
-u or --user	Specify your username
-p or --password	Specify your password
-h or --host	Import into MySQL on the named host; default is localhost.
-s or --silent	Silent mode, output appears only when errors occur.
-v or --verbose	Verbose mode, print more commentary on action.
-? or --help	Print help message and exit



Importing Data From A File With SQL

Statement `Load Data Infile`

- Using the utility `mysqlimport` to load data into a table from an external file works well if the user has access to a command window or command line.
- If you have access via a connection to only the MySQL database, or you are importing data from within an executing application, you will need to use the SQL statement `Load Data Infile`.
- The `Load Data Infile` statement also provides a bit more flexibility since the file name does not need to match the table name. Other than that the options are basically the same and the same results are accomplished.
- The example on page 27 illustrates this SQL command which is available in MySQL.



Importing Data From A File With SQL

Statement Load Data Infile (cont.)

- The basic form of the Load Data Infile statement is:

```
LOAD DATA [LOW_PRIORITY | CONCURRENT] [LOCAL] INFILE 'filename'
[REPLACE | IGNORE]
INTO TABLE tablename
[FIELDS
  [TERMINATED BY 'char' ]
  [ [OPTIONALLY] ENCLOSED BY 'char' ]
  [ESCAPED BY '\\char' ] ]
[LINES
  [STARTING BY 'char' ]
  [TERMINATED BY 'char' ] ]
[IGNORE number LINES]
[(column_name, ... )]
```

Either allow concurrent update or block until no other clients are reading from the specified table. See page 32.

Same as `-r` and `-i` options in `mysqlimport` utility – either replace or ignore rows with duplicate keys.

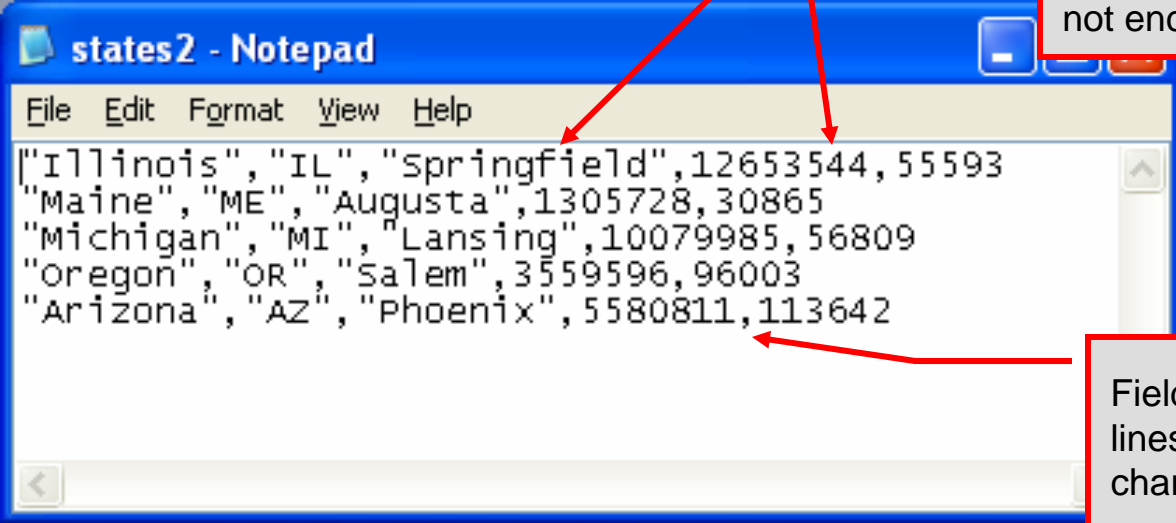
Sets the characters that delimit and enclose the fields and lines in the data file. Similar to `mysqlimport` syntax.

Ignores lines at the start of the file (miss header info)

Used to load only certain columns (not entire rows)



Load Data Infile Example



String fields are enclosed by double quotes in this file. Numeric values are not enclosed in quotes.

```
File Edit Format View Help
"illinois","IL","springfield",12653544,55593
"Maine","ME","Augusta",1305728,30865
"Michigan","MI","Lansing",10079985,56809
"Oregon","OR","Salem",3559596,96003
"Arizona","AZ","Phoenix",5580811,113642
```

Fields are delimited by commas and lines are terminated by newline characters (an invisible \n)

Text file containing the data to be loaded into the database table.



```
mysql> select * from states;
```

name	abbrev	capital	population	square_miles
Florida	FL	Tallahassee	17019068	53997
Georgia	GA	Atlanta	8684715	57919
Indiana	IN	Indianapolis	6195643	35870
Maryland	MD	Annapolis	5508909	9775
California	CA	Sacramento	35484453	155973
Texas	TX	Austin	22118509	261914
South Carolina	SC	Columbia	4147152	30111
New York	NY	Albany	19190115	47224

States table **before** addition of data

```
8 rows in set (0.00 sec)
```

```
mysql> load data infile 'states2.sql'  
-> into table states  
-> fields  
-> terminated by ','  
-> optionally enclosed by ''  
-> ;
```

Load data infile statement indicating all of the parameters which describe the configuration of the input file.

```
Query OK, 5 rows affected (0.02 sec)  
Records: 5 Deleted: 0 Skipped: 0 Warnings: 0
```

```
mysql> select * from states;
```

name	abbrev	capital	population	square_miles
Florida	FL	Tallahassee	17019068	53997
Georgia	GA	Atlanta	8684715	57919
Indiana	IN	Indianapolis	6195643	35870
Maryland	MD	Annapolis	5508909	9775
California	CA	Sacramento	35484453	155973
Texas	TX	Austin	22118509	261914
South Carolina	SC	Columbia	4147152	30111
New York	NY	Albany	19190115	47224
Illinois	IL	Springfield	12653544	55593
Maine	ME	Augusta	1305728	30865
Michigan	MI	Lansing	10079985	56809
Oregon	OR	Salem	3559596	96003
Arizona	AZ	Phoenix	5580811	113642

States table **after** addition of data

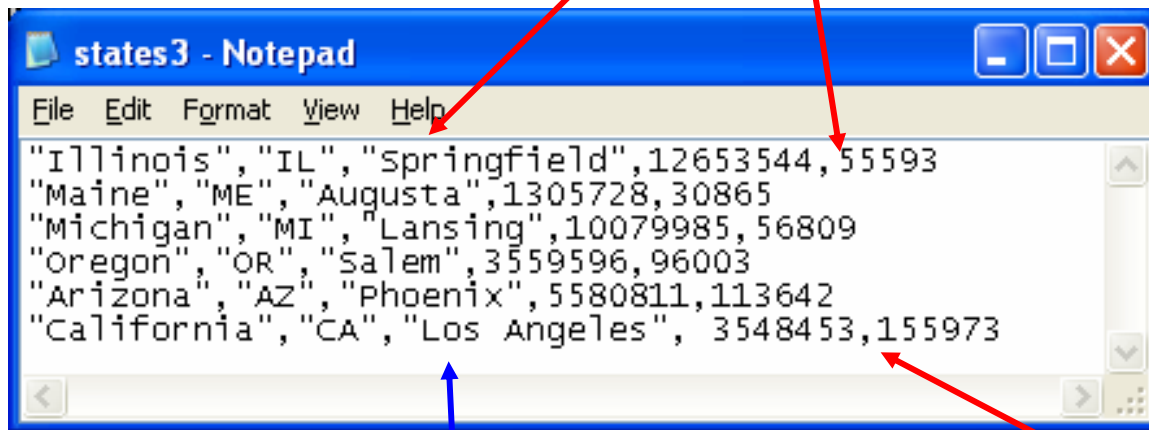
```
13 rows in set (0.00 sec)
```

```
mysql>
```



Load Data Infile Example 2

String fields are enclosed by double quotes in this file. Numeric values are not enclosed in quotes.



```
states3 - Notepad
File Edit Format View Help
"illinois","IL","springfield",12653544,55593
"Maine","ME","Augusta",1305728,30865
"Michigan","MI","Lansing",10079985,56809
"Oregon","OR","Salem",3559596,96003
"Arizona","AZ","Phoenix",5580811,113642
"California","CA","Los Angeles", 3548453,155973
```

Text file containing the data to be loaded into the database table.

Fields are delimited by commas and lines are terminated by newline characters (an invisible \n)

California already exists in the states table – this one will replace the value of the capital with a different value.



```
Database changed
mysql> select * from states;
```

name	abbrev	capital	population	square_miles
Florida	FL	Tallahassee	17019068	53997
Georgia	GA	Atlanta	8684715	57919
Indiana	IN	Indianapolis	6195643	35870
Maryland	MD	Annapolis	5508909	9775
California	CA	Sacramento	35484453	155973
Texas	TX	Austin	22118509	261914
South Carolina	SC	Columbia	4147152	30111
New York	NY	Albany	19190115	47224

States table **before** addition of data

8 rows in set (0.00 sec)

```
mysql> load data infile 'states3.sql'
-> replace into table states
-> fields
-> terminated by ','
-> optionally enclosed by '"'
-> ;
Query OK, 7 rows affected (0.02 sec)
Records: 6 Deleted: 1 Skipped: 0 Warnings: 0
```

Same basic configuration as in previous example except that we have instructed MySQL to replace duplicate key value rows with new values (in this case replacing California's capital).

```
mysql> select * from states;
```

name	abbrev	capital	population	square_miles
Florida	FL	Tallahassee	17019068	53997
Georgia	GA	Atlanta	8684715	57919
Indiana	IN	Indianapolis	6195643	35870
Maryland	MD	Annapolis	5508909	9775
California	CA	Los Angeles	3548453	155973
Texas	TX	Austin	22118509	261914
South Carolina	SC	Columbia	4147152	30111
New York	NY	Albany	19190115	47224
Illinois	IL	Springfield	12653544	55593
Maine	ME	Augusta	1305728	30865
Michigan	MI	Lansing	10079985	56809
Oregon	OR	Salem	3559596	96003
Arizona	AZ	Phoenix	5580811	113642

States table **after** addition of data. Note that California's capital has been changed!

13 rows in set (0.00 sec)

mysql>



States table **before** addition of data

```
CA Command Prompt (2) - mysql -u root -p

mysql> select * from states;
+-----+-----+-----+-----+-----+
| name      | abbrev | capital   | population | square_miles |
+-----+-----+-----+-----+-----+
| Florida   | FL     | Tallahassee | 17019068  | 53997         |
| Georgia   | GA     | Atlanta     | 8684715   | 57919         |
| Indiana   | IN     | Indianapolis | 6195643   | 35870         |
| Maryland  | MD     | Annapolis   | 5508909   | 9775          |
| California| CA     | Los Angeles  | 3548453   | 155973        |
| Texas     | TX     | Austin      | 22118509  | 261914        |
| South Carolina | SC     | Columbia    | 4147152   | 30111         |
| New York  | NY     | Albany      | 19190115  | 47224         |
| Illinois  | IL     | Springfield  | 12653544  | 55593         |
| Maine     | ME     | Augusta     | 1305728   | 30865         |
| Michigan  | MI     | Lansing     | 10079985  | 56809         |
| Oregon    | OR     | Salem      | 3559596   | 96003         |
| Arizona   | AZ     | Phoenix     | 5580811   | 113642        |
+-----+-----+-----+-----+-----+

13 rows in set (0.00 sec)

mysql> load data infile 'states3.sql'
-> replace into table states
-> fields
->   terminated by ','
->   optionally enclosed by '"'
-> ;
Query OK, 12 rows affected (0.00 sec)
Records: 6 Deleted: 6 Skipped: 0 Warnings: 0

mysql>
```

Notice that running the same command on the altered table produced a different set of statistics, since all six key values appear in the infile, their corresponding values in the table are deleted and re-entered using the "new" data.



The Ignore Clause of the Insert Command

- While the normal issues of data type compatibility are always of concern, there are other issues to deal with when inserting data into tables.
- There is the possibility that a duplicate of a key may be entered. If so, you will see an error like this:

```
ERROR 1062: Duplicate entry '2' for key 1
```

- It is possible to subdue errors by using the keyword `ignore` in the `insert` statement. By using `ignore` any duplicate rows will simply be ignored. They won't be imported, and the data at the related row of the target table will be left untouched.
 - In your application, you would be wise to check how many rows were affected (imported) whenever using `ignore` because ignoring a record may constitute a failure condition in your application that needs to be handled.



Low Priority and Delayed Inserts

- If you specify `insert low-priority`, the insert waits until all other clients have finished reading from the table before the insert is executed.
- If you specify `insert delayed`, the client performing the action gets an instant acknowledgement that the insert has been performed, although in fact the data will only be inserted when the table is not in use by another thread.
 - This may be useful if you have an application that needs to complete its process in minimum time, or simply where there is no need for it to wait for the effect of an insert to take place. For example, when you're adding data to a log or audit trail.
 - This feature applies only to ISAM or MyISAM type files.



Inserting/Replacing Data Using Replace

- Data can also be entered into a MySQL table using the `replace` command.
- The `replace` statement has forms similar to the `insert` statement:

Form 1 `replace [low priority | delayed] [ignore] [into]table_name
[set] column_name1 = expression1,
column_name2 = expression2, ...`

Form 2 `replace [low priority | delayed] [ignore] [into]table_name
[(column_name,...)]values (expression,...), (...)`

Form 3 `replace [low priority | delayed] [ignore] [into]table_name
[(column_name,...)] select...`



Using replace

- The `replace` statement works similar to `insert`. It always tries to insert the new data, but when it tries to insert a new row with the same primary or unique key as an existing row, it deletes the old row and replaces it with the new values.
- The following examples will illustrate how `replace` operates.

```
C:\> Command Prompt (2) - mysql -u root -p

mysql> select * from bluebikes;
+-----+-----+-----+-----+
| bikename      | color | price | total_miles |
+-----+-----+-----+-----+
| Gios Torino Super | blue  | 3800  | 9000        |
| Schwinn Paramount P14 | blue  | 1800  | 200         |
+-----+-----+-----+-----+
2 rows in set (0.00 sec)

mysql> replace into bluebikes
-> values ('Gios Torino Super', 'blue', 4200, 11000);
Query OK, 2 rows affected (0.00 sec)

mysql> select * from bluebikes;
+-----+-----+-----+-----+
| bikename      | color | price | total_miles |
+-----+-----+-----+-----+
| Gios Torino Super | blue  | 4200  | 11000       |
| Schwinn Paramount P14 | blue  | 1800  | 200         |
+-----+-----+-----+-----+
2 rows in set (0.00 sec)

mysql>
```

Changing non-key values. Simplest form of data replacement.



Using Replace (cont.)

```
C:\ Command Prompt (2) - mysql -u root -p
mysql> select * from bluebikes;
+-----+-----+-----+-----+
| bikename          | color | price | total_miles |
+-----+-----+-----+-----+
| Gios Torino Super | blue  | 4200  | 11000       |
| Schwinn Paramount P14 | blue  | 1800  | 200         |
+-----+-----+-----+-----+
2 rows in set (0.00 sec)

mysql> replace into bluebikes
-> values ('Fondriest U107', 'blue', 5300, 2200);
Query OK, 1 row affected (0.00 sec)

mysql> select * from bluebikes;
+-----+-----+-----+-----+
| bikename          | color | price | total_miles |
+-----+-----+-----+-----+
| Gios Torino Super | blue  | 4200  | 11000       |
| Schwinn Paramount P14 | blue  | 1800  | 200         |
| Fondriest U107     | blue  | 5300  | 2200        |
+-----+-----+-----+-----+
3 rows in set (0.00 sec)

mysql>
```

Specifying values for a non-existent key. Basically the same as an insert since the key value being replaced does not currently exist.



Performing Updates on Tables

- The `update` command allows you to modify the values of the existing data in a table. The basic format of the statement is:

```
update [low priority] [ignore] table_name
    set column_name1 = expression1,
        column_name2 = expression2, ...
    [where where_definition]
    [limit num];
```

- There are basically two parts to the statement: the `set` portion to declare which column to set to what value; and the `where` portion, which defines which rows are to be affected.
- `Limit` restricts the number of rows affected to `num`.



Using update (cont.)

```
CA Command Prompt (2) - mysql -u root -p
mysql> select * from bluebikes;
+-----+-----+-----+-----+
| bikename      | color | price | total_miles |
+-----+-----+-----+-----+
| Gios Torino Super | blue  | 4200  | 11000       |
| Schwinn Paramount P14 | blue  | 1800  | 200         |
| Fondriest U107    | blue  | 5300  | 2200        |
+-----+-----+-----+-----+
3 rows in set (0.01 sec)

mysql> update bluebikes
-> set price=price*1.05;
Query OK, 3 rows affected (0.02 sec)
Rows matched: 3  Changed: 3  Warnings: 0

mysql> select * from bluebikes;
+-----+-----+-----+-----+
| bikename      | color | price | total_miles |
+-----+-----+-----+-----+
| Gios Torino Super | blue  | 4410  | 11000       |
| Schwinn Paramount P14 | blue  | 1890  | 200         |
| Fondriest U107    | blue  | 5565  | 2200        |
+-----+-----+-----+-----+
3 rows in set (0.00 sec)

mysql>
```

Global update within the relation. All tuples have their price field increased by 5%



Using update (cont.)

```
C:\ Command Prompt (2) - mysql -u root -p
mysql> select * from bluebikes;
+-----+-----+-----+-----+
| bikename      | color | price | total_miles |
+-----+-----+-----+-----+
| Gios Torino Super | blue  | 4200  | 11000       |
| Schwinn Paramount P14 | blue  | 1800  | 200         |
| Fondriest U107    | blue  | 5300  | 2200        |
+-----+-----+-----+-----+
3 rows in set (0.00 sec)

mysql> update bluebikes
-> set price = price * 1.05
-> where price > 4500;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> select * from bluebikes;
+-----+-----+-----+-----+
| bikename      | color | price | total_miles |
+-----+-----+-----+-----+
| Gios Torino Super | blue  | 4200  | 11000       |
| Schwinn Paramount P14 | blue  | 1800  | 200         |
| Fondriest U107    | blue  | 5565  | 2200        |
+-----+-----+-----+-----+
3 rows in set (0.00 sec)

mysql>
```

Specific update, only tuples satisfying the select condition (those with price greater than 4500) will have their price field increased by 5%.



Select Queries in MySQL

- The `select` command in MySQL is basically the same as in the standard SQL, however, it does have some additional features. The basic format of the statement is (not all options are shown – for complete details see pg 711 of SQL Manual):

```
SELECT [ALL | DISTINCT | DISTINCTROW][HIGH_PRIORITY]
      [STRAIGHT JOIN] [SQL_SMALL_RESULT][SQL_BIG_RESULT]
      [SQL_BUFFER_RESULT][SQL_CACHE | SQL_NO_CACHE]
      select_expression, ...
[INTO {OUTFILE | DUMPFILE} 'path/to/filename' export_options]
[FROM table_references
  WHERE where_definition]
  [GROUP BY {col_name | col_alias | col_pos | formula}
    [asc | desc], ...]
  [HAVING where_definition]
  [ORDER BY {col_name | col_alias | col_pos | formula}
    [asc | desc], ...]
  [LIMIT [offset, ] num_rows]
  [PROCEDURE procedure_name];
```



MySQL RDBMS (cont.)

- MySQL features a user permissions system, which allows control over user's access to the databases under MySQL control.
- There are very few competitors of MySQL (Oracle, Sybase, DB2, and SQL Server) that can match the level of sophistication provided by MySQL's permissions system in terms of granularity and level of security provided.

Note that I did not include Microsoft Access in the list above. There are a couple of reasons for this; Access concentrates on the client front-end, although available in shareable versions, it lacks the management system that is a key part of any RDBMS. Access provides virtually no user authentication capabilities nor does it have multithreading processing capabilities, in its normal form.



Authorization in MySQL

- `mysql` and the various utility programs such as `mysqladmin`, `mysqlshow`, and `mysqlimport` can only be invoked by a valid MySQL user.
- Permissions for various users are recorded in **grant tables** maintained by MySQL.
- As the root user, you have access to all the databases and tables maintained by the MySQL Server.
- One of these databases is named `mysql` and contains the various information on the users who have access to this installation of MySQL. Some of the tables which comprise this database are shown on the next few pages.



Tables in the `mysql` Database

```
C:\> Command Prompt (2) - mysql -u root -p
Type 'help;' or '\h' for help. Type '\c' to clear the buffer.

mysql> show databases;
+-----+
| Database |
+-----+
| bikedb   |
| mysql    |
| prog3    |
| test     |
| testdb   |
+-----+
5 rows in set (0.01 sec)

mysql> use mysql;
Database changed
mysql> show tables;
+-----+
| Tables_in_mysql |
+-----+
| columns_priv    |
| db              |
| func            |
| help_category   |
| help_keyword    |
| help_relation   |
| help_topic      |
| host            |
| tables_priv     |
| time_zone       |
| time_zone_leap_second |
| time_zone_name  |
| time_zone_transition |
| time_zone_transition_type |
| user            |
| user_info       |
+-----+
16 rows in set (0.00 sec)

mysql>
```

The `mysql` database contains user information

Details on user privileges at the database level. See page 46.

Specific details on privileges at the table level. See page 45

Details on user privileges. See page 43.

Details about the various users. See page 44.



Contents of the user Table

```

outt; - Notepad
File Edit Format View Help
mysql> use mysql;
Database changed
mysql> describe user;
+-----+-----+-----+-----+-----+
| Field                | Type                | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| Host                 | varchar(60)         |      | PRI |          |       |
| User                 | varchar(16)         |      | PRI |          |       |
| Password             | varchar(41)         |      |     |          |       |
| Select_priv         | enum('N','Y')       |      |     | N        |       |
| Insert_priv         | enum('N','Y')       |      |     | N        |       |
| Update_priv         | enum('N','Y')       |      |     | N        |       |
| Delete_priv         | enum('N','Y')       |      |     | N        |       |
| Create_priv         | enum('N','Y')       |      |     | N        |       |
| Drop_priv           | enum('N','Y')       |      |     | N        |       |
| Reload_priv         | enum('N','Y')       |      |     | N        |       |
| Shutdown_priv       | enum('N','Y')       |      |     | N        |       |
| Process_priv        | enum('N','Y')       |      |     | N        |       |
| File_priv           | enum('N','Y')       |      |     | N        |       |
| Grant_priv          | enum('N','Y')       |      |     | N        |       |
| References_priv     | enum('N','Y')       |      |     | N        |       |
| Index_priv          | enum('N','Y')       |      |     | N        |       |
| Alter_priv          | enum('N','Y')       |      |     | N        |       |
| Show_db_priv        | enum('N','Y')       |      |     | N        |       |
| Super_priv          | enum('N','Y')       |      |     | N        |       |
| Create_tmp_table_priv | enum('N','Y')       |      |     | N        |       |
| Lock_tables_priv    | enum('N','Y')       |      |     | N        |       |
| Execute_priv        | enum('N','Y')       |      |     | N        |       |
| Repl_slave_priv     | enum('N','Y')       |      |     | N        |       |
| Repl_client_priv    | enum('N','Y')       |      |     | N        |       |
| ssl_type             | enum('', 'ANY', 'X509', 'SPECIFIED') |      |     |          |       |
| ssl_cipher           | blob                |      |     |          |       |
| x509_issuer          | blob                |      |     |          |       |
| x509_subject         | blob                |      |     |          |       |
| max_questions       | int(11) unsigned    |      |     | 0        |       |
| max_updates         | int(11) unsigned    |      |     | 0        |       |
| max_connections     | int(11) unsigned    |      |     | 0        |       |
+-----+-----+-----+-----+-----+
31 rows in set (0.00 sec)

```



Contents of the user_info Table

```
C:\ Command Prompt (2) - mysql -u root -p
16 rows in set (0.00 sec)
mysql> describe user_info;
+-----+-----+-----+-----+-----+-----+
| Field          | Type          | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| User           | varchar(16)   |      | PRI |          |       |
| Full_name      | varchar(60)   | YES  | MUL | NULL     |       |
| Description    | varchar(255)  | YES  |     | NULL     |       |
| Email         | varchar(80)   | YES  |     | NULL     |       |
| Contact_information | text         | YES  |     | NULL     |       |
| Icon          | blob         | YES  |     | NULL     |       |
+-----+-----+-----+-----+-----+-----+
6 rows in set (0.00 sec)
mysql>
```



Contents of the tables_priv Table

```
mysql> \t;
mysql> describe tables_priv;
+-----+-----+
| Field      | Type                                     |
+-----+-----+
| Host       | char(60)                                |
| Db         | char(64)                                |
| User       | char(16)                                 |
| Table_name | char(64)                                 |
| Grantor    | char(77)                                 |
| Timestamp  | timestamp                                |
| Table_priv | set('Select','Insert','Update','Delete','Create','Drop','Grant','References','Index','Alter') |
| Column_priv | set('Select','Insert','Update','References') |
+-----+-----+
8 rows in set (0.00 sec)
```

```
mysql>
mysql> describe tables_priv;
+-----+-----+-----+-----+-----+
| Field      | Type                                     | Null | Key | Default          | Extra |
+-----+-----+-----+-----+-----+-----+
| Host       | char(60)                                |      |     |                  |       |
| Db         | char(64)                                |      |     |                  |       |
| User       | char(16)                                 |      |     |                  |       |
| Table_name | char(64)                                 |      |     |                  |       |
| Grantor    | char(77)                                 |      |     |                  |       |
| Timestamp  | timestamp                                |      |     |                  |       |
| Table_priv | set('Select','Insert','Update','Delete','Create','Drop','Grant','References','Index','Alter') | YES  |     | CURRENT_TIMESTAMP |       |
| Column_priv | set('Select','Insert','Update','References') |      |     |                  |       |
+-----+-----+-----+-----+-----+-----+
```



Contents of the db Table

```
C:\ Command Prompt (2) - mysql -u root -p
6 rows in set (0.00 sec)
mysql> describe db;
+-----+-----+-----+-----+-----+-----+
| Field          | Type          | Null | Key  | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| Host           | char(60)      |      | PRI  |          |       |
| Db             | char(64)      |      | PRI  |          |       |
| User          | char(16)      |      | PRI  |          |       |
| Select_priv   | enum('N','Y') |      |      |          |       |
| Insert_priv   | enum('N','Y') |      |      |          |       |
| Update_priv   | enum('N','Y') |      |      |          |       |
| Delete_priv   | enum('N','Y') |      |      |          |       |
| Create_priv   | enum('N','Y') |      |      |          |       |
| Drop_priv     | enum('N','Y') |      |      |          |       |
| Grant_priv    | enum('N','Y') |      |      |          |       |
| References_priv | enum('N','Y') |      |      |          |       |
| Index_priv    | enum('N','Y') |      |      |          |       |
| Alter_priv    | enum('N','Y') |      |      |          |       |
| Create_tmp_table_priv | enum('N','Y') |      |      |          |       |
| Lock_tables_priv | enum('N','Y') |      |      |          |       |
+-----+-----+-----+-----+-----+-----+
15 rows in set (0.00 sec)
mysql>
```



How The Grant Tables Work

- The various grant tables work together to define access capabilities for the various users of the databases in MySQL. The tables represent a hierarchy which begins at the database level and moves downward to finer and finer granularity in access capabilities.
- To understand how the grant tables work, it is necessary to understand the process that MySQL goes through when considering a request from a client.

Step 1: A user attempts to connect to the MySQL server. The `user` table is consulted, and on the basis of the username, password, and host from which the connection is occurring, the connection is either refused or accepted. (MySQL actually sorts the user table and looks for the first match.)



How The Grant Tables Work (cont.)

Step 2: If the connection is accepted, any privilege fields in the `user` table that are set to 'Y' will allow the user to perform that action on any database under the server's control. For administrative actions such as shutdown and reload, the entry in the `user` table is deemed absolute, and no further grant tables are consulted.

Step 3: Where the user makes a database-related request and the `user` table does not allow the user to perform that operations (the privilege is set to 'N'), MySQL consults the `db` table (see page 46).

Step 4: The `db` table is consulted to see if there is an entry for the user, database, and host. If there is a match, the `db` privilege fields determine whether the user can perform the request.



How The Grant Tables Work (cont.)

Step 5: If there is a match on the db table's `Db` and `User` files but `Host` is blank, the `host` table is consulted to see whether there is a match on all three fields. If there is, the privilege fields in the `host` table will determine whether the user can perform the requested operation. Corresponding entries in the `db` and `host` tables must both be 'Y' for the request to be granted. Thus, an 'N' in either table will block the request.

Step 6: If the user's request is not granted, MySQL checks the `tables_priv` (see page 45) and `columns_priv` tables. It looks for a match on the user, host, database, and table to which the request is made (and the column, if there is an entry in the `columns_priv` table). It adds any privileges it finds in these tables to the privileges already granted. The sum of these privileges determines if the request can be granted.



Managing User Privileges with GRANT and REVOKE

- The basic granting and revocation of privileges in MySQL are accomplished through the `grant` and `revoke` commands.
- The format of the `grant` command is:

```
GRANT privileges [(column_list)]  
ON database_name.table_name  
TO username@hostname [IDENTIFIED BY 'password']  
[REQUIRE [SSL | X509]  
    [CIPHER cipher [AND] ]  
    [ISSUER issuer [AND] ]  
    [SUBJECT subject ] ]  
[WITH GRANT OPTION |  
    MAX_QUERIES_PER_HOUR num |  
    MAX_UPDATES_PER_HOUR num |  
    MAX_CONNECTIONS_PER_HOUR num ]
```



Some of the Privileges Assigned with GRANT

Privilege	Operations Permitted
ALL or ALL PRIVILEGES	All privileges except for GRANT
ALTER	Change a table definition using ALTER TABLE excluding the creation and dropping of indices.
CREATE	Create database or tables within a database.
CREATE TEMPORARY TABLES	Create temporary tables.
DELETE	Ability to perform deletions from tables. (Delete DML statements).
DROP	Ability to drop databases or tables.
INSERT	Ability to insert data into tables.
SHUTDOWN	Ability to shutdown the MySQL server.

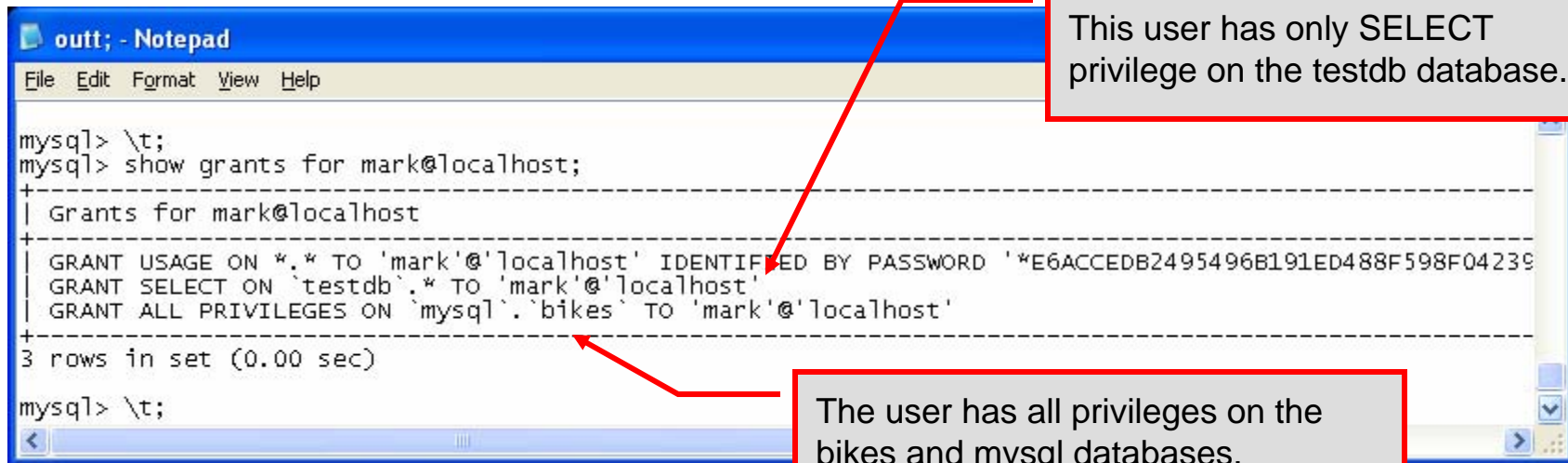


Displaying Privileges with SHOW

- The SQL command SHOW is used to display the grant privileges for a given user.
- The syntax for the SHOW command is:

SHOW GRANTS FOR *username@hostname*

- An example is shown below:



```
mysql> \t;
mysql> show grants for mark@localhost;
+-----+
| Grants for mark@localhost |
+-----+
| GRANT USAGE ON *.* TO 'mark'@'localhost' IDENTIFIED BY PASSWORD '*E6ACCEDB2495496B191ED488F598F04239 |
| GRANT SELECT ON `testdb`.* TO 'mark'@'localhost' |
| GRANT ALL PRIVILEGES ON `mysql`.`bikes` TO 'mark'@'localhost' |
+-----+
3 rows in set (0.00 sec)

mysql> \t;
```



Revoking User Privileges with REVOKE

- Revocation of privileges in MySQL is accomplished with the revoke command.
- The format of the revoke command is:

```
REVOKE privileges [(column_list)]  
ON database_name.table_name  
FROM username@hostname
```

- An example is shown on the next page.



Example - Revoking User Privileges with REVOKE

```
outt; - Notepad
File Edit Format View Help
mysql> show grants for mark@localhost;
+-----+
| Grants for mark@localhost |
+-----+
| GRANT USAGE ON *.* TO 'mark'@'localhost' IDENTIFIED BY PASSWORD '*E6ACCEDB2495496B191ED488F598F04239C85E73' |
| GRANT ALL PRIVILEGES ON `mysql`.`bikes` TO 'mark'@'localhost' |
| GRANT SELECT ON `testdb`.`states` TO 'mark'@'localhost' |
+-----+
3 rows in set (0.00 sec)

mysql> revoke select
-> on testdb.states
-> from mark@localhost;
Query OK, 0 rows affected (0.00 sec)

mysql> show grants for mark@localhost;
+-----+
| Grants for mark@localhost |
+-----+
| GRANT USAGE ON *.* TO 'mark'@'localhost' IDENTIFIED BY PASSWORD '*E6ACCEDB2495496B191ED488F598F04239C85E73' |
| GRANT ALL PRIVILEGES ON `mysql`.`bikes` TO 'mark'@'localhost' |
+-----+
2 rows in set (0.00 sec)

mysql> \t;
```

User has SELECT privilege on testdb.states table.

Revoking user's SELECT privilege on testdb.states.

User's grant listing shows that they no longer have SELECT privilege on testdb.states table.

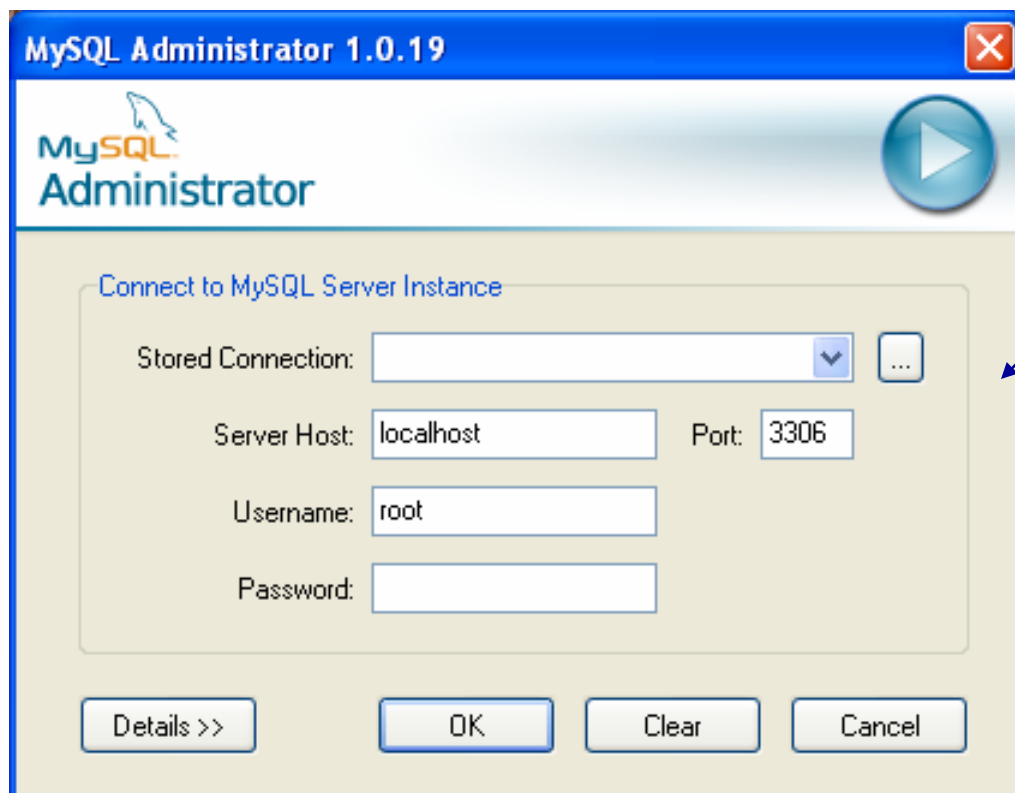


The MySQL Administrator Tool

- From MySQL you can download a GUI-based administrator tool to help you administer your MySQL databases.
- This tool implements all of the GRANT, REVOKE, and SHOW functionality available in SQL.
- This tool also contains some system administrator functionality for monitoring system resources and utilization.
- You can download this tool at:
<http://www.mysql.com/products/administrator/>
- A few screen shots of this tool and its capabilities are shown in the next few slides.



The MySQL Administrator Tool – Screen Shots



Initial login
screen




MySQL Administrator - root@localhost:3306

File Edit View Tools Help

- Server Information
- Service Control
- Startup Variables
- User Administration
- Server Connections
- Health
- Server Logs
- Replication Status
- Backup
- Restore
- Catalogs

Server status:
MySQL Server is running.



Connected to MySQL Server Instance

Username:	root
Hostname:	localhost
Port:	3306

Server Information

MySQL Version:	MySQL 4.1.9 via TCP/IP
Network Name:	localhost
IP:	127.0.0.1

Client Information

Version:	MySQL Client Version 5.0.0
Network Name:	MARK-PC
IP:	132.170.107.73
Operating System:	Windows XP
Hardware:	2x Intel(R) Pentium(R) 4 CPU 3.00GHz, 512 MB RAM

Initial screen after successful login.



MySQL Administrator - root@localhost:3306

File Edit View Tools Help

- Server Information
- Service Control
- Startup Variables
- User Administration
- Server Connections
- Health
- Server Logs
- Replication Status
- Backup
- Restore
- Catalogs

Users Accounts

- mark
- root

User Information Schema Privileges Resources

root@localhost
Login and additional information on the user

Login Information

MySQL User: The user has to enter this MySQL User name to connect to the MySQL Server

Password: Fill out this field if you want to set the user's password

Confirm Password: Again, enter the user's password to confirm


Additional Information

Full Name: The user's full name

Description: Additional description of the user

Email: The user's email address

Contact Information: Optional contact information

Icon:  Icon assigned to the user

View of user information screen.



MySQL Administrator - root@localhost:3306

File Edit View Tools Help

Server Information
Service Control
Startup Variables
User Administration
Server Connections
Health
Server Logs
Replication Status
Backup
Restore
Catalogs

Users Accounts

mark
root

User Information Schema Privileges Resources

mark@localhost
Schema Privileges assigned to the User

Schemata

- bikedb
- mysql
- prog3
- test
- testdb

Assigned Privileges

- SELECT
- INSERT
- CREATE_TM...

Available Privileges

- UPDATE Grants the UPDATE privilege to the user
- DELETE Grants the DELETE privilege to the user
- CREATE Grants the CREATE privilege to the user
- DROP Grants the DROP privilege to the user
- GRANT Grants the GRANT privilege to the user
- REFERENCES Grants the REFERENCES privilege to the u...
- INDEX Grants the INDEX privilege to the user
- ALTER Grants the ALTER privilege to the user
- LOCK_TABLES Grants the LOCK_TABLES privilege to the ...

New User Apply changes Discard changes

Select a user and a database to grant or revoke privileges.



MySQL Administrator - root@localhost:3306

File Edit View Tools Help

Server Information
Service Control
Startup Variables
User Administration
Server Connections
Health
Server Logs
Replication Status
Backup
Restore
Catalogs

Schemata

- bikedb
- coloursurvey
- guestbook
- imagedb
- MailingList
- mysql
- old prog3
- prog3
- program5
- test
- testdb

Schema Tables Schema Indices

bikedb
All tables of the bikedb schema

Table Name	Engine	Rows	Data length	Index length	Update time
bikes	MyISAM	11	572 B	2 kB	2005-10-03 10:33:39
bluebikes	MyISAM	3	96 B	2 kB	2005-10-03 10:36:42

View of system catalogs which describe the databases maintained by the server.

Num. of Tables: 2 Rows: 14 Data Len: 668 B Index Len: 4 kB

Details >> Create Table Edit Table Maintenance Refresh

The MySQL Query Browser Tool

- From MySQL you can also download a GUI-based query browser tool.
- This tool implements all of the basic DML side of SQL with some limitation. For example, editing result sets is possible only if the result set was generated from a single table. Join-based result sets are not editable. This tool also implements many DDL commands.
- This tool is helpful for developing and testing queries.
- You can download this tool at:
<http://dev.mysql.com/downloads/query-browser/1.1.html>
- A few screen shots of this tool and its capabilities are shown in the next few slides.



MySQL Query Browser - root@localhost:3306 / bikedb

Edit View Query Script Tools Help

```
SELECT * FROM `bikes` b
```

Execute Stop

Explain Compare

SELECT FROM WHERE GROUP HAVING ORDER SET CREATE

Resultset 1

bikename	size	color	cc
olnago Dream Rabobank	60	blue/orange	58
ianchi Evolution 3	58	celeste	48
ddy Merckx Molteni	58	orange	51
ddy Merckx Domo	58	blue/black	53
attaglin Carrera	60	red/white	40
ianni Motta Personal	59	red/green	44
ios Torino Super	60	blue	20
chwinn Paramount P14	60	blue	18
ianchi Corse Evo 4	58	celeste	57
olnago Superissimo	59	red	38
iquigas Bianchi FG Lite	59	celeste/blue/gr	58

Schemata Bookmarks History

- bikedb
 - bikes
 - bluebikes
 - coloursurvey
 - guestbook
 - guests
 - imagedb
 - MailingList
 - mysql
 - old prog3
 - prog3
 - program5
 - test
 - testdb

Syntax Functions Params Trx

- Data Manipulation
- Data Definition
- MySQL Utility
- Transactional and Locking

1 rows fetched in 0.0109s (0.0007s)

Edit Apply Changes Discard Changes First Last Search

Result set shown for this query. Note that this query is based on a single table, so the result set is editable.

MySQL Query Browser - root@localhost:3306 / imageodb

Edit View Query Script Tools Help

Next Refresh

```
SELECT * FROM `testdb`.`shipments` s
```

Execute Stop

Explain Compare

SELECT FROM WHERE GROUP HAVING ORDER SET CREATE

Resultset 1 Resultset 2 **Resultset 4**

idnum	pnum	jnum	qty
1	P3	J4	100
4	P2	J5	60
3	P5	J2	90
1	P4	J3	125
3	P2	J1	70

Schemata Bookmarks History

- help_topic
- host
- tables_priv
- time_zone
- time_zone_leap_second
- time_zone_name
- time_zone_transition
- time_zone_transition_type
- user
- user_info
- old prog3
- prog3
- program5
- test
- testdb
 - shipments
 - states

Syntax Functions Params Trx

- CREATE DATABASE
- CREATE INDEX
- CREATE TABLE
- DROP DATABASE
- DROP INDEX
- DROP TABLE
- RENAME TABLE
- MySQL Utility
- DESCRIBE
- USE
- Transactional and Locking

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