MySQL Basics I

Sang Shin
http://www.javapassion.com
"Learning is fun!"

Topics

- What is MySQL?
- Installation of MySQL server
- “mysql” command-line client
- SQL basics
  - Concept & terminology
  - Databases, tables, fields
  - Insert/Update/Delete
  - Retrieving records through SELECT
  - Arithmetic operations
- Read and execute SQL script file

What is MySQL?

What is MySQL?

- Most popular open source database
  - High performance
  - High reliability
  - Ease of use
- Runs many of the world's most demanding websites
  - Yahoo, Google, YouTube, ...
- “M” of LAMP (Linux, Apache, MySQL, PHP) stack
- Runs on all possible OS platforms

MySQL Products

- MySQL community server
  - Free
- MySQL Enterprise
  - Commercial
  - Enterprise features - monitoring
- MySQL Cluster
  - Provides fault tolerance
- MySQL embedded database
  - Embedded in small devices
- MySQL Workbench
  - GUI tool

Installation of MySQL Server

MySQL Server

- “mysqld” is a runnable program which represents MySQL database server

Installation Options

- Windows
  - MySQL database server can be installed either runnable program or Windows service
- Other platforms (Linux, MacOS, OpenSolaris)
  - As part of LAMP stack or
  - Independently as runnable program

“mysql” Command-line Client

What is “mysql” command-line client?

- Comes with MySQL package
- Connects to the running MySQL database server when run
- Can be run either in interactive mode or non-interactive mode
- When run in interactive mode, it provides a shell in which SQL commands can be executed
- Can be run with many options
  - mysql --help

SQL Basics:
Concept & Terminology

What is SQL?

- SQL is language for retrieving and manipulating data in a relational database
  - Data definition
  - Data manipulation
  - Data control
- Open standard - ANSI
  - Vendor implementations add vendor-specific features, however

SQL Terminology

- Table
  - A set of rows
  - Analogous to a “file”
- Row
  - Analogous to a record of a “file”
- Column
  - A column is analogous to a field of a record
  - Each column in a given row has a single value
- Primary Key
  - One of more columns whose contents are unique within a table and thus can be used to identify a row of that table

Types of SQL Statements

- DDL (Data Definition Language)
  - Used to build and modify the structure of your tables and other objects in the database
  - Examples: CREATE TABLE, ALTER TABLE, DROP TABLE, CREATE VIEW, ...
- DML (Data Manipulation Language)
  - Used to work with the data in tables
  - INSERT INTO, UPDATE, DELETE
- DCL (Data Control Language)
  - Used to control access rights
  - GRANT, REVOKE

SQL Basics:
Databases

Creating a database

```
mysql> CREATE DATABASE mydb;
Query OK, 1 row affected (0.01 sec)
```

Setting a default database

```
mysql> USE mydb;
Database changed
```

Dropping Databases

```
mysql> DROP DATABASE temp_db;
Query OK, 0 rows affected (0.01 sec)

mysql> DROP DATABASE IF EXISTS temp_db;
Query OK, 0 rows affected, 1 warning (0.00 sec)

mysql> SHOW DATABASES;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mydb               |
| mysql              |
| test               |
+--------------------+
4 rows in set (0.00 sec)
```

SQL Basics:
Tables

Creating a Table

```
mysql> CREATE TABLE person (
    -> person_id SMALLINT UNSIGNED NOT NULL,
    -> first_name VARCHAR(45) NOT NULL,
    -> last_name VARCHAR(45) NOT NULL,
    -> PRIMARY KEY  (person_id)
    -> ) ENGINE=InnoDB;
Query OK, 0 rows affected (0.14 sec)

mysql> SHOW TABLES;
+---------------+
| Tables_in_mydb |
+---------------+
| person         |
+---------------+
1 row in set (0.00 sec)
```

Altering table name (Two options)

```
mysql> ALTER TABLE person rename to person1;
Query OK, 0 rows affected (0.06 sec)

mysql> SHOW TABLES;
+--------------------+
| Tables_in_mydb |
+--------------------+
| person1              |
+--------------------+
1 row in set (0.00 sec)

mysql> RENAME TABLE person1 TO whatever;
Query OK, 0 rows affected (0.05 sec)

mysql> SHOW TABLES;
+--------------------+
| Tables_in_mydb |
+--------------------+
| whatever             |
+--------------------+
```

Altering field name and type

```
mysql> ALTER TABLE person CHANGE last_name surname varchar(30);
Query OK, 0 rows affected (0.62 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> DESCRIBE person;
+-----------+---------------------+------+-----+---------+---------------+
| Field     | Type                | Null | Key | Default | Extra         |
+-----------+---------------------+------+-----+---------+---------------+
| person_id | smallint(5) unsigned | NO   | PRI | NULL    |               |
| first_name | varchar(45)        | NO   |     | NULL    |               |
| surname   | varchar(30)         | YES  |     | NULL    |               |
+-----------+---------------------+------+-----+---------+---------------+
3 rows in set (0.01 sec)
```

Adding or removing fields

```
mysql> ALTER TABLE person ADD age smallint(3) unsigned not null;
Query OK, 0 rows affected (0.42 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> DESCRIBE person;
+-----------+---------------------+------+-----+---------+---------------+
| Field     | Type                | Null | Key | Default | Extra         |
+-----------+---------------------+------+-----+---------+---------------+
| person_id   | smallint(5) unsigned | NO   | PRI | NULL    |
| first_name | varchar(45)          | NO   |     | NULL    |               |
| surname   | varchar(30)          | YES  |     | NULL    |               |
| age       | smallint(3) unsigned | NO   |     | NULL    |               |
+-----------+---------------------+------+-----+---------+---------------+
4 rows in set (0.01 sec)

mysql> ALTER TABLE person DROP first_name;
Query OK, 0 rows affected (0.25 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

Dropping Tables

```
mysql> SHOW TABLES;
+------------------+
| Tables_in_temp_db |
+------------------+
| temp_table       |
+------------------+
1 row in set (0.00 sec)

mysql> DROP TABLE temp_table;
Query OK, 0 rows affected (0.06 sec)

mysql> DROP TABLE IF EXISTS temp_table;
Query OK, 0 rows affected, 1 warning (0.12 sec)

mysql> SHOW TABLES;
Empty set (0.00 sec)
```

Working with tables from Multiple Databases

```
mysql> SELECT * FROM temp_db.temp_table;
+---------+--------------------+
| temp_id | temp_whatever      |
+---------+--------------------+
|       1 | life is good       |
|       2 | life is even better |
+---------+--------------------+
2 rows in set (0.00 sec)

mysql> SELECT  * FROM mydb.student;
+------------+-----------+----------+-----+-------+
| student_id | first_name | last_name | age | grade |
+------------+-----------+----------+-----+-------+
|          1 | yuna       | kim       |  19 |     4 |
|          2 | kelly      | jones     |  22 |     5 |
+------------+-----------+----------+-----+-------+
2 rows in set (0.00 sec)
```

SQL Basics:
Fields

Field Definitions

- Each field has
  - Field name
  - Data type
  - Field modifier or constraint

Field Data types - Integers

- TINYINT
  - 1 byte, -128 to 127 (signed), 0 to 255 (unsigned)
- SMALLINT
  - 2 bytes, -32768 to 32767 (signed), 0 to 65535 (unsigned)
- MEDIUMINT
  - 3 bytes
- INT
  - 4 bytes
- BIGINT
  - 8 bytes

Field Data types

- FLOAT
  - single precision floating-point value
- DOUBLE
  - double precision floating-point value
- DECIMAL
  - decimal values
- BIT
  - bit value
  - b'0101'

Field Data Types

- CHAR
  - Fixed length strings up to 255 characters
- VARCHAR
  - Variable length strings up to 255 characters
- DATE, TIME, YEAR
- DATETIME, TIMESTAMP
- ENUM, SET
  - Predefined set of values

Field Modifiers

- NULL or NOT NULL
  - Indicates if the field can be null or not
- DEFAULT
  - Assigns default value if no value is specified when a new record is inserted
- AUTO_INCREMENT
  - MySQL automatically generates a number (by incrementing the previous value by 1)
  - Used for creating primary key
- CHARACTER SET
  - Specifies the character set for string values

SQL Basics:
INSERT/UPDATE/DELETE

INSERT'ing a single record

```
mysql> INSERT INTO person (person_id, first_name, last_name, age)
    -> VALUES (1, 'sang', 'shin', 88);
Query OK, 1 row affected (0.10 sec)

mysql> SELECT * FROM person;
+-----------+------------+-----------+-----+
| person_id | first_name | last_name | age |
+-----------+------------+-----------+-----+
|         1 | sang       | shin      |  88 |
+-----------+------------+-----------+-----+
1 row in set (0.00 sec)
```

INSERT'ing multiple records

```
mysql> INSERT INTO person (person_id, first_name, last_name, age)
    -> VALUES
    -> (2, 'kelly', 'jones', 22),
    -> (3, 'jack', 'kennedy', 56),
    -> (4, 'paul', 'kennedy', 34),
    -> (5, 'daniel', 'song', 24),
    -> (6, 'nichole', 'scott', 9);
Query OK, 3 rows affected (0.05 sec)
Records: 3  Duplicates: 0  Warnings: 0
```

Deleting recored(s)

```
mysql> DELETE FROM person WHERE age < 10;
Query OK, 1 row affected (0.07 sec)
```

Updating record(s)

```
mysql> UPDATE person SET age = 88
    -> WHERE age = 99 OR first_name = 'paul';
Query OK, 1 row affected, 2 warnings (0.04 sec)
Rows matched: 1  Changed: 1  Warnings: 2

mysql> SELECT * FROM person;
+----------+-----------+----------+-----+
| person_id | first_name | last_name | age |
+----------+-----------+----------+-----+
|         1 | sang       | shin      |  88 |
|         2 | kelly      | jones     |  22 |
|         3 | jack       | kennedy   |  56 |
|         4 | paul       | kennedy   |  88 |
+----------+-----------+----------+-----+
4 rows in set (0.00 sec)
```

SQL Basics:
SELECT

Retrieving some fields selectively

```
mysql> SELECT last_name, age FROM person;
+-----------+-----+
| last_name | age |
+-----------+-----+
| shin      |  88 |
| jones     |  22 |
| kennedy   |  56 |
| kennedy   |  34 |
| song      |  24 |
+-----------+-----+
5 rows in set (0.00 sec)
```

Retrieving with WHERE clause

```
mysql> SELECT first_name, age FROM person
    -> WHERE age > 50;
+------------+-----+
| first_name | age |
+------------+-----+
| sang       |  88 |
| jack       |  56 |
+------------+-----+
2 rows in set (0.00 sec)

mysql> SELECT first_name, last_name, age FROM person
    -> WHERE age < 50 AND first_name LIKE '%niel';
+------------+-----------+-----+
| first_name | last_name | age |
+------------+-----------+-----+
| daniel     | song      |  24 |
+------------+-----------+-----+
1 row in set (0.00 sec)
```

Retrieving records in order

```
mysql> SELECT last_name, age FROM person
    -> ORDER BY age ASC;
+-----------+-----+
| last_name | age |
+-----------+-----+
| jones     |  22 |
| song      |  24 |
| kennedy   |  34 |
| kennedy   |  56 |
| shin      |  88 |
+-----------+-----+
5 rows in set (0.00 sec)

mysql> SELECT * FROM person
        -> ORDER BY age DESC;
+-----------+------------+-----------+-----+
| person_id | first_name | last_name | age |
+-----------+------------+-----------+-----+
|         1 | sang       | shin      |  88 |
|         3 | jack       | kennedy   |  56 |
|         4 | paul       | kennedy   |  34 |
|         5 | daniel     | song      |  24 |
|         2 | kelly      | jones     |  22 |
```

Retrieving limited number of records

```
mysql> SELECT * from person
    -> ORDER BY age DESC
    -> LIMIT 3;
+-----------+------------+-----------+-----+
| person_id | first_name | last_name | age |
+-----------+------------+-----------+-----+
|         1 | sang       | shin      |  88 |
|         3 | jack       | kennedy   |  56 |
|         4 | paul       | kennedy   |  34 |
+-----------+------------+-----------+-----+
3 rows in set (0.00 sec)
```

Basic SQL Commands:
Arithmetic Functions

Arithmetic operations

```
mysql> SELECT 3 + 6;
+-------+
| 3 + 6 |
+-------+
|     9 |
+-------+
1 row in set (0.00 sec)

mysql> SELECT 45 * (1+2);
+------------+
| 45 * (1+2) |
+------------+
|        135 |
+------------+
1 row in set (0.00 sec)
```

COUNT, AVG, SUM

```
mysql> SELECT COUNT(age) FROM person;
+------------+
| COUNT(age) |
+------------+
|          5 |
+------------+
1 row in set (0.04 sec)

mysql> SELECT AVG(age) from person;
+----------+
| AVG(age) |
+----------+
|  44.8000 |
+----------+
1 row in set (0.00 sec)

mysql> SELECT SUM(age) FROM person;
+----------+
| SUM(age) |
+----------+
|      224 |
+----------+
1 row in set (0.00 sec)
```

MIN, MAX

```
mysql> SELECT MIN(age) FROM person;
+----------+
| MIN(age) |
+----------+
|       22 |
+----------+
1 row in set (0.00 sec)

mysql> SELECT MAX(age) FROM person;
+----------+
| MAX(age) |
+----------+
|       88 |
+----------+
1 row in set (0.00 sec)
```

Reading and Executing SQL Script File

Read and execute a SQL script file

```
mysql> SOURCE c:/tmp/student.sql
Query OK, 0 rows affected (0.10 sec)
```

Thank you!

Sang Shin
http://www.javapassion.com
“Learning is fun!”