MySQL

MySQL Introduction

- MySQL is a database management system
- SQL stands for the Structured Query Language. It defines how to insert, retrieve, modify and delete data

  Free from www.mysql.com Reference sites
- – NASA, Yahoo!, Compaq, Motorola
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Basic MySQL Operations

- Create table Insert records Load data Retrieve records Update records Delete records
- Modify table Join table
- Drop table Optimize table
- Count, Like, Order by, Group by
- More advanced ones (sub-queries, stored procedures, triggers, views
- …)

How MySQL stores data (by default)

- A MySQL server can store several databases
- Databases are stored as directories
  - Default is at /usr/local/mysql/var/
- Tables are stored as files inside each database (directory)
- For each table, it has three files:
  - table.FRM file containing information about the table structure
  - table.MYD file containing the row data
  - table.MYI containing any indexes belonging with this table, as well as some statistics about the table.

Login

- mysql –h hostname –u username –p [password] Example
-
  % mysql -u usrname -p Enter password: passowrd

  Welcome to the MySQL monitor. Commands end with ; or \g. Your MySQL connection id is 23 to server version: 3.23.41.

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

mysql>

Create Database

What are the current databases at the server?

mysql> show databases;

```
+-          +
| Database  |
+-          +
```

| mysql | mysql is a database (stores users' password …) used by system.
| test |

```
+-          +
```

Create a database (make a directory) whose name is MyDB mysql> create database MyDB;

Select database to use mysql> use MyDB; Database changed

What tables are currently stored in the MyDB database?

mysql> show tables; Empty set (0.00 sec)

Create Table

- CREATE TABLE Table_Name (column_specifications)
- Example

```
mysql> CREATE TABLE student
-> (
->   student_ID INT UNSIGNED   NOT NULL,
->   name       VARCHAR(20)    NOT NULL,
->
->   major      VARCHAR(50),
-> );                VARCHAR(5)
Query OK, 0 rows affected (0.00 sec)
```

Student_ID	Name	Major	Grade

Display Table Structure

```
mysql> show tables;
+------------------+
| Tables_in_MyDB |
+------------------+
| student          |
+------------------+
1 row in set (0.00 sec)  mysql> describe student;
+--------------+---------------------+------+-----+----------+-------+
| Field        | Type                | Null | Key | Default | Extra |
+--------------+---------------------+------+-----+----------+-------+

| student_ID | int(10) unsigned |      |       | 0              |
| name       | varchar(20)      |      |       |                |
| major      | varchar(50)      | YES |       |                |
| grade      | varchar(5)       | YES |       |                |
+--------------+---------------------+------+-----+-NULL--+------+
4 rows in set (0.00 sec)                                | NULL    |
```

Modify Table Structure

- ALTER TABLE table_name Operations

```
mysql> alter table student add primary key (student_ID);
Query OK, 0 rows affected (0.00 sec)
Records: 0 Duplicates: 0 Warnings: 0

mysql> describe student;
+------------+------------------+------+-----+---------+-------+
| Field      | Type             | Null | Key | Default | Extra |
+------------+------------------+------+-----+---------+-------+
| student_ID | int(10) unsigned |      | PRI | 0       |       |
| name       | varchar(20)      |      |     |         |       |
| major      | varchar(10)      | YES  |     | NULL    |       |
| grade      | varchar(5)       | YES  |     | NULL    |       |
+------------+------------------+------+-----+---------+-------+
 4 rows in set (0.00 sec)
```

Insert Record

- INSERT INTO table_name SET col_name1=value1, col_name2=value2, col_name3=value3, …
- Example

```
mysql> INSERT INTO student SET student_ID=101, name='Shannon', major='BCB',
    grade='A';
Query OK, 1 row affected (0.00 sec)
```

Student_ID	Name	Major	Grade
101	Shannon	BCB	A

Retrieve Record

- SELECT what_columns FROM table or tables WHERE condition
  Example
-

```
mysql> SELECT major, grade FROM stud
    WHERE name='Shannon';
+-------+-------+
| major| grade|
+-------+-------+
| BCB  | A     |
+-------+-------+
1 row in set (0.00 sec)

mysql> SELECT * FROM student;
```

Student_ID	Name	Major	Grade
101 ent	Shannon	BCB	A
102	Mike	BBMB	A
103	Wang	MCDB	A
	…	…	…

Update Record

- UPDATE table_name

  SET which columns to change WHERE condition

  Example
- mysql> UPDATE student SET grade='B' WHERE name='Shannon';

  Query OK, 1 row affected (0.00 sec)

  Rows matched: 1 Changed: 1 Warnings: 0

  mysql> SELECT * FROM student WHERE name='Shannon';

  +- +- +- +- +

  | name | student_ID | major | grade |

  +- +- +- +- +

  | Shannon | 101 | BCB | **B**
  |

  +- +- +- +- +

  1 row in set (0.00 sec)

Delete Record

- DELETE FROM table_name WHERE condition
- Example

mysql> DELETE FROM student WHERE name='Shannon';
Query OK, 1 row affected (0.00 sec)

Mysql> DELETE FROM student;

Will delete ALL student records!

Drop Table

- DROP TABLE table_name
- Example

```
mysql> drop table student;
Query OK, 0 rows affected (0.00 sec)
```

- Logout MySQL

```
mysq> quit;
```

More Table Retrieval

- OR

  mysql> select name from student where major = 'BCB' OR major = 'CS';
- COUNT (Count query results)

  mysql> select count(name) from student where major = 'BCB' OR major = 'CS';
- ORDER BY (Sort query results)

  mysql> select name from student where major = 'BCB' OR major = 'CS‘ ORDER BY name;

  mysql> select name from student where major = 'BCB' OR major = 'CS‘ ORDER BY name DESC;

  mysql> select * from student where major = 'BCB' OR major = 'CS‘ ORDER BY student_id ASC, name DESC
- LIKE (Pattern matching)

  mysql> select name from student where name LIKE "J%";
- DISTINCT (Remove duplicates)

  mysql> select major from student;

  mysql> select DISTINCT major from student;

Group By

- Cluster query results based on different groups
- Example

```
mysql> select major, count(*) from student GROUP BY major;
+---------+----------+
| major   | count(*) |
+---------+----------+
| BBMB    |        3 |
| BCB     |        3 |
| Chem    |        1 |
| CS      |        5 |
| IG      |        2 |
| Math    |        2 |
| MCDB    |        3 |
| Stat    |        2 |
+---------+----------+
8 rows in set (0.00 sec)
```

NULL

- **No Value**
- Can not use the usual comparison operators (>, =, != …)
- Use **IS** or **IS NOT** operators to compare with
- Example

```
mysql> select name from student where project_ID = NULL;
Empty set (0.00 sec)

mysql> select name from student where project_ID IS NULL;
+-------+
| name|
+-------+
| Jerry |
+-------+
1 row in set (0.00 sec)
```

Table Join

- Retrieve information from multiple tables
- Example
  - Which BCB students chose level-4 project?

```
mysql> select s.name from student s, project p
          where s.project_ID = p.project_ID
             and s.major='BCB' and p.level=4;
+-          +
| name      |
+-          +
| Stephen |
+-          +
1 row in set (0.00 sec)
```

Backup Database

- mysqldump
  - Writes the contents of database tables into text files
  - Example

    >mysqldump –p bcb –T ./
- Select … INTO OUTFILE ‘/path/outputfilename’;
  - Example
    - >SELECT * FROM student INTO OUTFILE ‘/dump/student.txt’;
- mysql –u username –p password –h host database > /path/to/file
- mysql –u bcb –p tuckseed0 bcb > test

InnoDB vs MyISAM

InnoDB	MyISAM
Default storage engine as of MySQL 5.5	Default storage engine before MySQL 5.5
ACID* compliant	Not ACID compliant
Transactional (Rollback, Commit)	Non-transactional
Row Level Locking	Table Level Locking
Row data stored in pages as per Primary Key order	No Particular order for data stored
Supports Foreign Keys	Does not support relationship constraint
No Full Text Search	Full Text Search