



MySQL



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 User and Database

- `mysql> use mysql;`
 - Use database `mysql`, used by the system
- `mysql> insert into user (Host, User, Password) values ('localhost', 'test1', password('pass1'));`
 - Create a new database user `test1`
 - An alternative
 - `GRANT USAGE ON *.* TO 'test1'@'localhost' IDENTIFIED BY 'pass1';`

Create User and Database (cont.)

- `mysql>insert into db (Host, Db, User, Select_priv, Insert_priv, Update_priv, Delete_priv, Create_priv, Drop_priv) values ('localhost', 'testdb', 'test1', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y');`
 - Create a new database `testdb` for user `test1`
- `mysql>flush privileges`
 - Reloads the privileges from the grant tables in the database `mysql`
- An alternative
 - `GRANT SELECT, INSERT, UPDATE, DELETE, CREATE, DROP ON testdb.* TO 'test1'@'localhost' IDENTIFIED BY 'pass1';`



Create Database

What are the current databases at the server?

```
mysql> show databases;
```

```
+-----+
| Database |
+-----+
| mysql    |
| test     |
+-----+
```

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

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),
```

```
-> grade 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  |     | NULL     |       |
| grade         | varchar(5)         | YES  |     | NULL     |       |
+-----+-----+-----+-----+-----+-----+
```

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



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  
student WHERE name='Shannon';
```

```
+-----+-----+  
| major| grade|  
+-----+-----+  
| BCB | A    |  
+-----+-----+
```

```
1 row in set (0.00 sec)
```

```
mysql> SELECT * FROM student;
```

Student_ID	Name	Major	Grade
101	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

```
mysql> quit;
```



Buck Load

- Load batch data instead of inserting records one by one
- Example

```
mysql> LOAD DATA LOCAL INFILE "student.txt" INTO TABLE student;  
Query OK, 21 rows affected (0.01 sec)  
Records: 21 Deleted: 0 Skipped: 0 Warnings: 0
```

```
mysql> LOAD DATA LOCAL INFILE "project.txt" INTO TABLE project;  
Query OK, 7 rows affected (0.00 sec)  
Records: 7 Deleted: 0 Skipped: 0 Warnings: 0
```




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



MySQL Optimization

- Index

- Index columns that you search for

- Example

```
mysql> alter table student add index (name);
```

```
Query OK, 22 rows affected (0.00 sec)
```

```
Records: 22 Duplicates: 0 Warnings: 0
```

```
mysql> describe student;
```

Field	Type	Null	Key	Default	Extra
student_ID	int(10) unsigned		PRI	0	
name	varchar(20)		MUL		
major	varchar(10)	YES		NULL	
project_ID	int(10) unsigned	YES		NULL	

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



MySQL Optimization (cont.)

- EXPLAIN

- Find what is going on on a slow query

- Example

- `mysql> EXPLAIN select * from student s,
project p where s.project_ID = p.project_ID
order by p.level;`