Tutorial 3: MySQL (contd…)

- By default the **storage engine** is InnoDB (version 5 above), it's **transaction** safe and **ACID (**Atomicity, Consistency, Isolation, Durability) compliant. Lacks hash indexing capabilities.

Other examples of storage engine are memory, archive, blackhole, NDB, MariaDB etc.

1) Create new users:
   Commands to create new user and assign privileges-

   mysql> CREATE USER ‘newuser’@’localhost’ IDENTIFIED BY ‘password’;
   mysql> GRANT ALL PRIVILEGES ON * . * TO 'newuser'@'localhost';
   mysql> FLUSH PRIVILEGES;

   Creating New Users in MySQL

2) Show information_schema and metadata:
   Information_Schema database contains all the metadata about your tables and their values, including environment variables and mysql objects such as triggers, stored procedures and scheduled events.

   Recent status updates about the tables (including errors) can also be retrieved from the information_schema tables.

   MySQL Information Schema

3) Triggers:
   The MySQL trigger is a database object that is associated with a table. It will be activated when a defined action is executed for the table. The trigger can be executed when you run one of the following MySQL statements on the table: INSERT, UPDATE or DELETE and it can be invoked before or after the event.

   Consider the following:
   A table employees_audit used to track the changes of the employee table

```
CREATE TABLE employees_audit (
    id INT AUTO_INCREMENT PRIMARY KEY,
    employeeNumber INT NOT NULL,
    lastname VARCHAR(50) NOT NULL,
    changedat DATETIME DEFAULT NULL,
    action VARCHAR(50) DEFAULT NULL
);
```

We will create a before update trigger that is invoked before a change is made to the employees table.

```
DELIMITER //
CREATE TRIGGER before_employee_update
   BEFORE UPDATE ON employees
   FOR EACH ROW
BEGIN
   INSERT INTO employees_audit
   SET action = 'update',
    employeeNumber = OLD.employeeNumber,
      lastname = OLD.lastname,
      changedat = NOW();
END //
DELIMITER ;
```

OLD is used to refer to the original values of the tuple whereas NEW refers to the modified values.

Keep in mind that when using an INSERT Trigger you can only use NEW and when using a DELETE Trigger you can only use the OLD keyword.

MySQL Triggers Tutorial

4) Stored procedure:

A stored procedure is a set of declarative sql statements that can be invoked either directly or using triggers or events.

A stored procedure to display the names of all the students:-

```
DELIMITER //
CREATE PROCEDURE StudentNames()
        BEGIN
                SELECT distinct sname FROM Student;
        END //
DELIMITER ;
```

A stored procedure to return the number of students enrolled for a particular course:-

```
DELIMITER //
```

```
CREATE PROCEDURE StudentRegistrations(IN courseName varchar(50), OUT num
INTEGER)
        BEGIN
                SELECT COUNT(*) INTO num FROM Enrolled WHERE cname =
courseName;
        END //
DELIMITER ;
```

[Mysql Stored Procedure Tutorial]

Questions:

Given the following schema:

Student(snum: integer, sname: string, major: string, level: string, age: integer)
Class(name: string, meets at: string, room: string, fid: integer)
Enrolled(snum: integer, cname: string) - Enrolled has one record per student-class pair such that the student is enrolled in the class.
Faculty(fid: integer, fname: string, deptid: integer)

Note : The data has initial zeros in many IDs, that is the reason we use varchar instead of integer for snum,fid.

1. Find the names of faculty members who teach in every room in which some class is taught.
2. Find the names of students who enroll in all courses
3. Find the names of all classes that either meet in room R128 or have five or more students enrolled.
4. List all students in decreasing order of their ages
5. Display system information, metadata about your database
6. Try to delete records from Faculty where record exists in Class for the faculty.
7. Try to insert or update records which violate integrity/key constraints.
8. Run queries on metadata.

Commands:

1)

```
mysql> select fname from faculty
                where fid in(select fid from class group by fid having count(*) = (select
```

count(distinct room) from class));
+------------------+
| fname |
+------------------+
| 'Richard Jackson' |
+------------------+
1 row in set (0.00 sec)

---

2)
mysql> select sname from student
-> where snum in(select snum from student group by snum having count(*) = (select count(distinct cname) from class));
Empty set (0.00 sec)

---

3)
mysql> select cname from class where room = 'R128' or cname in(select cname from enrolled group by cname having count(*) >= 5);
+---------------------------+
| cname |
+---------------------------+
| 'Archaeology of the Incas' |
| 'Dairy Herd Management' |
| 'Data Structures' |
| 'Database Systems' |
| 'Intoduction to Math' |
| 'Operating System Design' |
| 'Patent Law' |
+---------------------------+
7 rows in set (0.00 sec)

---

4)
mysql> select * from student order by age desc;
+-----------+----------------------+--------------------------+-------+------+
| snum | sname | major | level | age |

```
+-----------+---------------------+-------------------------+-------+------+
|  60839453 | 'Charles Harris'    | 'Architecture'          | 'So'  |   22 |
|  51135593 | 'Maria White'       | 'English'               | 'SR'  |   21 |
| 550156548 | 'George Wright'     | 'Education'             | 'SR'  |   21 |
| 556784565 | 'Kenneth Hill'      | 'Civil Engineering'     | 'SR'  |   21 |
| 578875478 | 'Edward Baker'      | 'Veterinary Medicine'   | 'SR'  |   21 |
|  99354543 | 'Susan Martin'      | 'Law'                   | 'JR'  |   20 |
| 115987938 | 'Christopher Garcia' | 'Computer Science'      | 'JR'  |   20 |
| 132977562 | 'Angela Martinez'   | 'History'               | 'SR'  |   20 |
| 301221823 | 'Juan Rodriguez'    | 'Psychology'            | 'JR'  |   20 |
| 574489456 | 'Betty Adams'       | 'Economics'             | 'JR'  |   20 |
| 112348546 | 'Joseph Thompson'   | 'Computer Science'      | 'SO'  |   19 |
| 351565322 | 'Nancy Allen'       | 'Accounting'            | 'JR'  |   19 |
| 462156489 | 'Donald King'       | 'Mechanical Engineering' | 'SO'  |   19 |
| 552455318 | 'Ana Lopez'         | 'Computer Engineering'  | 'SR'  |   19 |
| 573284895 | 'Steven Green'      | 'Kinesiology'           | 'SO'  |   19 |
| 269734834 | 'Thomas Robinson'   | 'Psychology'            | 'SO'  |   18 |
| 280158572 | 'Margaret Clark'    | 'Animal Science'        | 'FR'  |   18 |
| 318548912 | 'Dorthy Lewis'      | 'Finance'               | 'FR'  |   18 |
| 348121549 | 'Paul Hall'         | 'Computer Science'      | 'JR'  |   18 |
| 451519864 | 'Mark Young'        | 'Finance'               | 'FR'  |   18 |
| 567354612 | 'Karen Scott'       | 'Computer Engineering'  | 'FR'  |   18 |
| 320874981 | 'Daniel Lee'        | 'Electrical Engineering' | 'FR'  |   17 |
| 322654189 | 'Lisa Walker'       | 'Computer Science'      | 'SO'  |   17 |
| 455798411 | 'Luis Hernandez'    | 'Electrical Engineering' | 'FR'  |   17 |
+-----------+---------------------+-------------------------+-------+------+
24 rows in set (0.01 sec)
```