IT360: Applied Database Systems

Stored Procedures and Triggers
(Chapter 6 p.185 – Manga Guide to DB
Chapter 13 p 316 - PHP and MySQL
Web Development)

Today

- Stored procedures
- Triggers

Stored Procedures

- A **stored procedure** is a program that is stored within the database and is compiled when used
- Stored procedures can receive input parameters and they can return results
- Stored procedures can be called from:
  - Standard languages
  - Scripting languages
  - SQL command prompt
Stored Procedure Advantages

- Greater security as store procedures are always stored on the database server
- SQL can be optimized by the DBMS compiler
- Code sharing resulting in:
  - Less work
  - Standardized processing
  - Specialization among developers

Create And Execute Stored Procedures

- CREATE PROCEDURE proc_name (param_list)
  proc_code

  call proc_name(value1, …)

Stored Procedure Example

- Students (SNb, SName, Email, Gender, ClassYear, GPA)

  Procedure: Insert a student only if ClassYear < 2013
CREATE PROCEDURE insertStudents (SNbvar int, SNamevar varchar(50), Emailvar varchar(100), Gendervar char(1), ClassYearvar int, GPA double)
BEGIN
if ClassYearvar < 2013 then
    INSERT INTO Students(SNb, SName, Email, Gender, ClassYear, GPA) 
    VALUES (SNbvar, SNamevar, Emailvar, Gendervar, ClassYearvar, GPA);
end if;
END $$
DELIMITER ;

To run: call insertStudents(7, 'John', 'john@usna.edu', 'm', 2011, null)

Class Exercise

- Add code to the previous procedure to prevent anyone named 'Doe, John' to be inserted into the DB.
- Test the procedure (call ....)

Triggers

- **Trigger**: stored program that is executed by the DBMS whenever a specified event occurs
- Associated with a table [or view]
- Two [or three] trigger types: **BEFORE, AFTER, [and INSTEAD OF]**
- Each type can be declared for INSERT, UPDATE, or DELETE
Uses for Triggers

- Provide complex default values
- Enforce data constraints
- Update views – not in MySQL
- Perform referential integrity actions

Create Trigger – MySQL Syntax

CREATE TRIGGER trigger_name
  trigger_time trigger_event
ON table_name
  FOR EACH ROW
  trigger_code

trigger_time: BEFORE, AFTER
trigger_event: INSERT, DELETE, UPDATE

Trigger for Enforcing a Data Constraint – MySQL

delimiter $$ /* change default delimiter */
CREATE TRIGGER UpdateGPA /* provide trigger name */
  AFTER UPDATE ON Enrolled /* specify when trigger should be invoked */
  FOR EACH ROW
BEGIN
  if (new.Grade is not null) then /* create a variable @newGPA to compute and store the new gpa value */
    set @newGPA = (select avg(PointGrade)
      from Enrolled E, Grade G
      where E.Grade = G.LetterGrade and E.SNb = new.SNb);
  /* update the Students table with the new GPA value */
  update Students1 set GPA = @newGPA where SNb = new.SNb;
  end if;
END;
$$
delimiter ; /* restore the default delimiter */
Class Exercise

- Students (SNb, SName, Email, Gender, ClassYear, GPA)
- Define a trigger: if inserted email is null, change the Email to mxxx@usna.edu, where xxx is the SNb.
- Hint: in MySQL, CONCAT(a,b) will return the concatenate the two string a and b
- Insert rows to test the trigger

Triggers vs. Stored Procedures

- Trigger
  - Module of code that is called by the DBMS when INSERT, UPDATE, or DELETE commands are issued
  - Assigned to a table or view
  - Depending on the DBMS, may have more than one trigger per table or view
  - Triggers may issue INSERT, UPDATE, and DELETE commands and thereby may cause the invocation of other triggers
- Stored Procedure
  - Module of code that is called by a user or database administrator
  - Assigned to a database, but not to a table or a view
  - Can issue INSERT, UPDATE, and DELETE commands
  - Used for repetitive administration tasks or as part of an application