Triggers and Stored Procedures

(Chapter 7, 11: Kroenke)
Today

- Triggers
- Stored procedures
Triggers

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

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

- CREATE TRIGGER *trigger_name*
  ON *table_or_view_name*
  AFTER | BEFORE | INSTEAD OF
  INSERT | UPDATE | DELETE
  AS
  *trigger_code*
Trigger for Enforcing a Data Constraint – SQL Server

Arenas (ArenaID, ArenaName, City, ArenaCapacity), ArenaCapacity >= 5000

CREATE TRIGGER minseating ON Arenas /*trigger associated to Arenas*/
FOR INSERT /*executed after an insert*/
AS
DECLARE @capacity as int /*variable declarations*/

SELECT @capacity = ArenaCapacity /* get values inserted */
FROM inserted

if @capacity < 5000

BEGIN
   ROLLBACK /*undo the insert*/
   Print 'Arena too small' /*message for the user*/
END
CREATE TRIGGER EMPLOYEE_DeleteCheck
    INSTEAD OF DELETION ON DeleteEmployee

DECLARE
    rowcount     int;

BEGIN
    /* First determine if this is the last employee in the department */
    SELECT        Count(*) into rowcount
    FROM          EMPLOYEE
    WHERE         EMPLOYEE : EmployeeNumber = old : EmployeeNumber
    IF rowcount > 1 Then
        /* Not last employee, allow deletion */
        DELETE       EMPLOYEE
        WHERE        EMPLOYEE : EmployeeNumber = old : EmployeeNumber
    ELSE
        /* Send a message to the user saying cannot delete last employee in a department. */
        END IF;

END;
Class Exercise

- Concerts (PerformerID, ArenaID, ConcertDate, TicketPrice)

- Define a trigger: if inserted price is below 25, print a message and change the ticket price to 25.

- Insert rows to test the trigger
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
  AS proc_code

- exec proc_name [@param1 = ]value1, …
Stored Procedure Example

- Performers (PerformerID, PerformerName, Street, City, State, Zip)

- Procedure: Insert a performer only if same name and zip not already in the table
CREATE PROCEDURE performer_Insert
    @ID int,
    @NewName char(20),
    @street char(20),
    @city char(15),
    @state char(2),
    @NewZip int
AS

    DECLARE @Count as int
    SELECT @Count = Count(*) FROM Performers WHERE PerformerName =@NewName AND Zip = @NewZip

    IF @Count > 0
        BEGIN
            PRINT 'Performer is already in the Database'
            RETURN
        END

    BEGIN TRANSACTION
    INSERT INTO Performers(PerformerID, PerformerName, Street, City, State, Zip) VALUES (@ID, @NewName, @street, @city, @state, @NewZip)
    PRINT 'Performer added to database'
    COMMIT

To run: exec performer_Insert @ID = 10, @NewName = 'James Brown', @street = 'Main', @city = 'Aiken', @state = 'SC', @NewZip = 54322
Class Exercise

- Add code to the previous procedure to prevent anyone named ‘Spears’ to be inserted into the DB. Print an error explicative message when that happens.
- Test the procedure (exec ....)
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
Class Exercise

- Students(\textit{Alpha}, \textit{LName}, \textit{FName}, \textit{GPA})
- Enroll(\textit{Alpha}, \textit{CourseID}, \textit{Semester}, \textit{Grade})
- GradeValues(\textit{LetterGrade}, \textit{PointValue})

- Define a trigger to update the GPA every time the student gets a new grade, or a grade changes