

INFO-H-415 - Advanced Databases

Session 1 Active Databases

Université libre de Bruxelles
École polytechnique de Bruxelles

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Practicalities

12 exercise sessions

(on machines, at room [UB4.329a](#) “Descartes”)

1 project

(starting at week 8)

Practicalities

Course's Wiki

<http://cs.ulb.ac.be/public/teaching/infoh415>

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Active Databases

SQL Server Triggers

SQL Server triggers

In SQL Server, triggers are executed directly after an instruction (i.e. not after each row or each transaction)

Types

- **AFTER triggers** are executed after the instruction takes place
- **INSTEAD OF triggers** do not execute the triggering instruction, but executes custom code in place of it

SQL Server triggers

Syntax

```
create trigger <name>  
on <table>  
{after|instead of} <list of events>  
as  
<transact-SQL-statements>
```

Possible events : insert, delete, update

SQL Server triggers

Inside the `<transact-SQL-statements>`, special tables allow accessing the *newly created* and the *deleted* rows.

Special tables

- **Inserted** : new or updated rows of the triggering transaction
- **Deleted** : deleted rows (or old state for updates) of the triggering transaction

Note that, since the trigger is executed at instruction level, these tables can contain many rows.

Example of a trigger

Consider two relations :

- **Employee** (*Name*, Salary, Department)
with Department referencing **Department**.DeptNo
- **Department** (*DeptNo*, Manager)
with Manager referencing **Employee**.Name

We want to ensure that *the salary of an employee cannot be greater than that of his manager.*

What are the events that could bring this rule to be violated ?

Example of a trigger

We want to ensure that *the salary of an employee cannot be greater than that of his manager.*

Constraint violating events :

- When adding an employee
- When modifying an employee's salary
- When modifying an employee's department
- When modifying department's manager

Example of an *after insert* trigger

```
create trigger salaryEmployee
on Employee
after insert
as
if exists(
    select *
    from Inserted I,
         Department D,
         Employee Mgr
    where I.DeptNo = D.DeptNo
         and D.Manager = Mgr.Name
         and Mgr.Salary < I.Salary )
begin
    raiserror 13000 'The salary of an employee
                    cannot be greater than that of his manager'
    rollback
end
```

Active Databases

Exercises

Connecting to the database environment

- Log on to the computer with your *netid*
- Open *SQL Server Management Studio*
- Connect to the server “*CS-MSSQL*”
(using Windows authentication)

Loading the data set

Available on the labs web page :

<http://cs.ulb.ac.be/public/teaching/infoh415/tp>

Set-up

- Create a “*infoh415-**<your-netid>**-PhD*” database (drop it if it already exists)
- Open and run `phd_createtable.sql`
- Open and run `phd_dbload.sql`

Caution : Select the right database before running these scripts !

Practical steps for the exercises

We suppose that the database is initially *consistent*.

Steps

- ① Determine when a constraint can be violated.
- ② Then, decide on an action to be taken : *abort* or *repair*
- ③ Write the trigger
- ④ Test the trigger, by editing the data in a way that violates the constraint