

INFO-H-415 - Advanced Databases

Sessions 2 & 3
Active Databases

Université libre de Bruxelles
École polytechnique de Bruxelles

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.

Active Databases

SQL Server Constraints

Types of constraints

CHECK

FOREIGN KEY

UNIQUE

CHECK constraints

CHECK is used to set a constraint on a single row.

Example

“The salary of an employee must be greater than 1000€.”

Employee (Name, Salary, Dept)

```
alter table Employee  
add constraint CK_EmployeeSalary1000  
check( Salary >= 1000 )
```


FOREIGN KEY constraints

Adds a foreign key.

Example

```
Employee ( Name, Salary, Dept )
```

Dept references Department.DeptNo

```
Department ( DeptNo, Manager )
```

```
alter table Employee  
add constraint FK_Employee_Dep  
foreign key( Dept )  
references Department ( DeptNo )
```

UNIQUE constraints

Used to set a uniqueness constraint on a (set of) attributes, for instance to be allowed to define a foreign key on non-primary keys.

Syntax

```
alter table <t_name>  
add constraint <c_name>  
unique( <field_list> )
```

Date-related functions

getdate ()

– Returns the current date.

dateadd (interval, n, date)

– interval : year, month, day, ...

– Returns the date (date + (n*interval))

datediff (interval, start, end)

– Returns the number of intervals between start and end

Active Databases

Exercises

Connecting to the database environment

- Start Microsoft Windows
- Open a session with your *netid*
- Launch *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>-Active`” database (drop it if it already exists)
- Open and run `activeSqlServer_createtable.sql`
- Open and run `activeSqlServer_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 Decide on an action to be taken : *abort* or *repair*
- 3 Decide which approach to use (trigger, CHECK, FOREIGN KEY, UNIQUE)
- 4 Write the trigger or constraint
- 5 Test the trigger/constraint, by editing the data in a way that violates the constraint