National University of Computer and Emerging Sciences

Lab Manual

"Triggers"

Database Systems

Spring 2022

Department of Computer Science

FAST-NU, Lahore, Pakistan

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Objectives

The purpose this lab is to knowhow the triggers work, types of triggers, how to create a trigger and what are the uses of triggers.

Triggers

Triggers are special kind of stored procedures that automatically execute when a DML or DDL statement associated with the trigger is executed. Each trigger will be associated with one DML or DDL statement. Unlike stored procedure triggers cannot be executed directly by application/user, they will ONLY be executed by DBMS in reaction to DML or DDL statement with which the trigger was associated.

Triggers can be divided in two categories depending on the type of statement they are associated with as follow:

- DML triggers
- DDL triggers

We shall use the schema from the last lab's manual. Which is as follows.

Results | Messages

vehicle

	vehicle_id	engine_no	chassis_no	horsepower	company	model_no	make	price	typevehicle
1	12A3456877	0123770974	wa22315598	50	suzuki	15	car	650000	2
2	12A3456889	0123690974	wa22315593	50	suzuki	12	car	600000	2
3	12J3456889	0123690974	wa22313693	50	hyundai	17	small car	800000	2
4	12X3456789	1234567890	xx22335588	50	toyota	06	corolla	1600000	2
5	12Y3466789	1234876090	xx22315598	50	toyota	06	corolla	1600000	2
6	12Y3466889	0123658974	xx22315593	50	daihatsu	06	lala	600000	4

customer

	cname	c_id	c_address	c_cnic	contact
1	rehman	c123xyzjix	Karachi	35351-8906720-1	03111233767
2	farhan	c123xyzkal	Peshawar	35351-5906951-2	03131234567
3	kashif	c123xyzlal	Islamabad	35351-8906751-0	03111234567
4	habib	c123xyzlbl	Lahore	38351-9906751-0	03211236567

dealer

	dname	d_id	d_address	d_cnic	contact
1	khalid	d123xyzbab	Karachi	12345-1234568-1	03001294567
2	asif	d123xyzbbb	Islamabad	12345-1234567-1	03001234567
3	zahid	d224xyzbbb	Lahore	13345-1234367-1	03001254567
4	khur...	d789xyzbbb	Peshawar	54321-1234567-1	03009876543

deals

	v_id	c_id	d_id	payment_mode	payment_plan	paid	left_amount	date_deal
1	12A3456877	c123xyzjix	d123xyzbab	card	immediate	650000	0	2017-01-23
2	12J3456889	c123xyzlbl	d224xyzbbb	cash	install	500000	300000	2017-01-23
3	12Y3466789	c123xyz...	d789xyzbbb	cash	immediate	1600...	0	2015-05-03

	modelno	make	company	articles_available

	v_id	c_id	d_id	payment_mode	payment_plan	paid	left_amount	date_deal
1	12A3456877	c123xyzjix	d123xyzbab	card	immediate	650000	0	2017-01-23
2	12J3456889	c123xyzlbl	d224xyzbbb	cash	install	500000	300000	2017-01-23
3	12Y3466789	c123xyz...	d789xyzbbb	cash	immediate	1600...	0	2015-05-03

Deals

	modelno	make	company	articles_available
1	12	car	suzuki	35
2	15	car	suzuki	20
3	17	sm...	hyundai	3
4	6	lala	daihatsu	0

Inventory

	c_id	d_id	make	company	model	dateorder	status_order	date_completeion
1	c123xyzjix	d123xyzbab	car	suzuki	12	2017-10-02	1	2017-10-02
2	c123xyzlbl	d224xyzbbb	lala	daihatsu	6	2017-09-02	0	2017-09-02

Orders

DML Triggers:

DML is the data modification language that uses queries like INSERT, UPDATE, DELETE. The DML triggers are used to handle these kind of queries.

Syntax of (DML) Triggers:

```
CREATE [ OR ALTER ] TRIGGER [ schema_name . ]trigger_name
ON { table }
[ WITH <dml_trigger_option> [ ,...n ] ]
{ FOR | AFTER }
{ [ INSERT ] [ , ] [ UPDATE ] [ , ] [ DELETE ] }
AS { sql_statement  [ ; ] [ ,...n ] }

<dml_trigger_option> ::=
    [ NATIVE_COMPILATION ]
    [ SCHEMABINDING ]
    [ EXECUTE AS Clause ]
```

‘Instead of’ and ‘After’ Triggers:

You must have noticed the word after and instead of in the syntax of the trigger creation given above.

The instead of trigger is shot by stopping the action on which the trigger is created. However, the after trigger is shot after the action on which the trigger is created is complete.

DML trigger Option:

The DML trigger option given in the above syntax is used to specify the action on which the trigger is to be shot.

Now let us look at the triggers a little closely how they practically work.

```
go
create trigger the_trigger on customer
after insert
as begin
print 'your data has been inserted'
end
```

The trigger has been made as to be shot on the insert query on the customer table. Now if we insert anything in the customer table as soon as a new customer has been added in the table this trigger shall be shot.

```
select * from customer
insert into customer (cname, c_id, c_address, c_cnic, contact) values('talha', 'c168fghjas', 'Lalamusa', '35876-0987654-2','03213221234')
```

```
%
Messages
your data has been inserted

(1 row(s) affected)
```

In the above example you can clearly see that we have just inserted a new entry in the table customer but the trigger has been shot that too after the trigger has been shot.

```
go
create trigger the_del_trig
on customer
instead of delete
as begin
print'you can not delete this data'
end
go
```

```
100 %
Messages
Command(s) completed successfully.
```

Now we have created another trigger on the same table but on a different action. Note that this is an instead of trigger it will not execute the query.

The data currently in the table.

```
go

select * from customer
```

100 %

Results | Messages

	cname	c_id	c_address	c_cnic	contact
1	rehman	c123xyzjix	Karachi	35351-8906720-1	03111233767
2	farhan	c123xyzkal	Peshawar	35351-5906951-2	03131234567
3	kashif	c123xyzlal	Islamabad	35351-8906751-0	03111234567
4	habib	c123xyzlbl	Lahore	38351-9906751-0	03211236567
5	talha	c168fghjas	Lalamusa	35876-0987654-2	03213221234

```
delete from customer where cname='talha'
```

100 %

Messages

```
you can not delete this data
```

The data after this query

```
delete from customer where cname='talha'

select * from customer
```

100 %

Results | Messages

	cname	c_id	c_address	c_cnic	contact
1	rehman	c123xyzjix	Karachi	35351-8906720-1	03111233767
2	farhan	c123xyzkal	Peshawar	35351-5906951-2	03131234567
3	kashif	c123xyzlal	Islamabad	35351-8906751-0	03111234567
4	habib	c123xyzlbl	Lahore	38351-9906751-0	03211236567
5	talha	c168fghjas	Lalamusa	35876-0987654-2	03213221234

In the above example, it can be seen that the data has not been deleted form the table because the trigger was of the type instead of.

Getting the affected tables inside the triggers:

The triggers we have seen above are simple one, what if you want the value of effect rows from DML and use them in triggers.

Example: Whenever a customer is inserted in, it should automatically convert that name of that instructor in Upper Case.

For example: customer with Name "ali ahmed" should be inserted as "ALI AHMED"

For that we use special table "DELETED" and "INSERTED" designed for DML triggers.

DML triggers use the **deleted** and **inserted** logical (conceptual) tables. They are structurally similar to the table on which the trigger is defined, that is, the table on which the user action is tried. The **deleted** and **inserted** tables hold the old values or new values of the rows that may be changed by the DML action.

More details

http://technet.microsoft.com/en-us/library/ms191300.aspx

NOTE: These tables are only accessible in triggers

```
go
alter trigger the_trigger on customer
after insert
as begin
--print 'your data has been inserted'
select * from inserted
end
go
insert into customer (cname, c_id, c_address, c_cnic, contact) values('ihtesham', 'c18fghpas', 'Faisalabad', '35176-0987654-2','03213221234')
delete from customer where cname ='ihtesham'
```

0 %

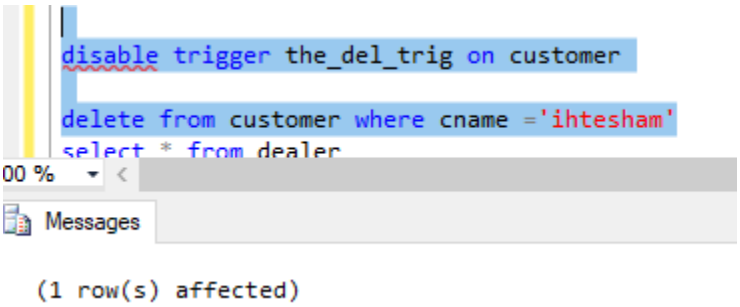
Results | Messages

	cname	c_id	c_address	c_cnic	contact
1	ihtesham	c18fghpas	Faisalabad	35176-0987654-2	03213221234

So far we have seen triggers on a single action a single trigger can be used to cater multiple actions.

Before moving forward you must know that only one trigger can be made on a particular action on a table so in order to make a new trigger on the same action we should either alter the previous trigger or drop the previous trigger or disable it. The syntax for these are as follows.

```
ALTER <TriggerName>

On <view/table>

After/Instead of  <insert/update/delete>

As

begin

      <Body>

end


Drop trigger <TriggerName>

Enable trigger <TriggerName> on <ObjectName>

Disable trigger <TriggerName> on <ObjectName>
```



See now after disabling the trigger the data can be easily deleted from the tables.

QLQuery1.sql - DE...33H5\M.Tahir (54))*

```
go
create trigger trig_trig on dealer
instead of insert, update, delete
as begin

declare @dname varchar(10)
select @dname = dname from inserted where dname like 'kh%'
if(@dname!=null)
begin
print 'the name of dealer started with kh this action can not be done'
end
else
print 'the code for else'
end
go
```

Messages

```
Command(s) completed successfully.
```

The above example shows how a trigger on a table for multiple actions can be made. Now let us see the effect of the given trigger.

```
declare @dname varchar(10)
select @dname = dname from inserted where dname like 'kh%'
if(@dname!=null)
begin
print 'the name of dealer started with kh this action can not be done'
end
else
print 'the code for else'
end
go
select * from dealer
delete from dealer where d_id='d123xyzbab'
```

Messages

```
the code for else

(1 row(s) affected)
```

The given id is for khalid but the else fragment was run because the column dname was not included in the temporary table insert.

DDL Triggers

DDL triggers, fire in response to a DDL statement to which they are associated. DDL event primarily correspond to SQL statements that start with the keywords CREATE, ALTER, and DROP. These triggers are current databases.

There triggers are also of two types, FOR and AFTER, first one executes instead of the DDL statement it is associated with and second one executes after the DDL statement, it is associate with is successfully executed.

(For in DML FOR is same as Instead of in DDL)

Use DDL triggers when you want to do the following:

- You want to prevent certain changes to your database schema.
- You want something to occur in the database in response to a change in your database schema.
- You want to record changes or events in the database schema.

Syntax Of DDL

```
CREATE TRIGGER trigger_name
ON DATABASE
{ FOR | AFTER } { event_type} [ ,...n ]
AS
Begin
      <Body>
End
```

Triggers:

```
go
create trigger ddl_trig
on database
for
drop_table
as begin
print'you are not allowed to drop the table in question'
end
```

```
%
Messages
Command(s) completed successfully.
```

```
drop table deals
```

```
100 %
Messages
you are not allowed to drop the table in question
```

References:

https://msdn.microsoft.com/en-us/library/bb522542.aspx