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DBMSL

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Date / /

# Assignment No.: 8

## Aim

Database Trigger (All types: Row level and Statement level triggers, Before and After triggers).
Write a database trigger on library table. The system should keep track of the records that are being updated or deleted. The old value of updated or deleted records should be added in Library_Audit table.

## Objective

Learning the concept of use of trigger.

## Theory

### Database Triggers

A database trigger is a PL/SQL program unit, which gets fired automatically whenever the data event such as DML or DDL system event. Trigger are associated with a specific table and are fired automatically whenever the table gets manipulated in a predefined way. The act of executing a trigger is called as firing a trigger.

Triggers are similar to procedures in that they are named PL/SQL blocks with declarative, executable and exception handling sections. But the difference is a procedure is ~~exited~~ executed explicitly from another block via a procedure call but a trigger is executed implicitly whenever the triggering event happens. A procedure can pass arguments but trigger doesn't accept arguments.

A database trigger has following components:
i) A triggering Event
ii) A triggering Constraint
iii) A triggering Action.

## Trigger categories

i) Trigger type
ii) Triggering time
iii) Triggering event

### i) Trigger types

a) Statement trigger: A statement trigger is a trigger in which the trigger action is executed once for the manipulation operation that fires trigger

b) Row trigger: A row trigger is a trigger in which the trigger action is performed. repeatedly for each row of the table that is affected by the manipulation operation that fires the trigger.

### ii) Trigger time

Trigger can specify the time of trigger action.

a) Before the triggering event

The trigger action is performed before the operation that fires the trigger is executed. This trigger is used when execution of operation depends on trigger action.

b) After the triggering event

The trigger action is performed after the operation that fires the trigger is executed. This trigger is used when triggering action depends on the execution of operation.

### iii) Triggering Events

Triggering events are the DML operations. These operations are insert, update and delete. When these operations are performed on a table, the trigger which is associated with the operation is fired.

Syntax:

```
CREATE TRIGGER trigger_name
 <BEFORE|AFTER>
 DELETE |[OR] INSERT |[OR] UPDATE column1,...
 ON table_name
 [for each row [when < condition> ]]
  Begin
   ....
  END;
```

### Dropping Trigger

Syntax:

```
 DROP trigger trigger_name
```

### Conclusion

Thus, we learned concept of use of trigger.

```
 > create table borrower (rollin int, name varchar(30), dateofissue date, nameofbook varchar(30), status char(10));
Query OK, 0 rows affected (0.05 sec)

 > insert borrower values (101, 'abc', '2017-07-16', 'dbms', 'r'), (102, 'abc1', '2017-07-16', 'cn', 'i'),
(103,'abc3', '2017-07-18', 'toc', 'i'), (104, 'abc4', '2017-07-20', 'ds', 'i'), (105, 'abc5', '2017-07-23', 'daa',
'r'), (106, 'nisha', '2017-08-10', 'splm', 'r' );
Query OK, 6 rows affected (0.01 sec)
Records: 6  Duplicates: 0  Warnings: 0

 > create table library_audit(rollin int, name char(10), dateofissue date,
    -> nameofbook char(10), status char, ts timestamp);
Query OK, 0 rows affected (0.04 sec)

 > -- After INSERT Trigger
 > delimter //

 > create table borrower (rollin int, name varchar(30), dateofissue date, nameofbook varchar(30), status char(10));
Query OK, 0 rows affected (0.05 sec)

 > insert borrower values (101, 'abc', '2017-07-16', 'dbms', 'r'), (102, 'abc1', '2017-07-16', 'cn', 'i'),
(103,'abc3', '2017-07-18', 'toc', 'i'), (104, 'abc4', '2017-07-20', 'ds', 'i'), (105, 'abc5', '2017-07-23', 'daa',
'r'), (106, 'nisha', '2017-08-10', 'splm', 'r' );
Query OK, 6 rows affected (0.01 sec)
Records: 6  Duplicates: 0  Warnings: 0

 > create table library_audit(rollin int, name char(10), dateofissue date,
    -> nameofbook char(10), status char, ts timestamp);
Query OK, 0 rows affected (0.04 sec)

 > -- After INSERT Trigger
 > delimter //

 > create trigger after_insert after insert on borrower for each row
    -> begin
    -> insert into library_audit values(new.rollin, new.name, new.dateofissue,
    -> new.nameofbook, new.status, current_timestamp);
    -> end;
    -> //
Query OK, 0 rows affected (0.08 sec)

 > select * from borrower //
+--------+-------+-------------+------------+--------+
| rollin | name  | dateofissue | nameofbook | status |
+--------+-------+-------------+------------+--------+
|    101 | abc   | 2017-07-16  | dbms       | r      |
|    102 | abc1  | 2017-07-16  | cn         | i      |
|    103 | abc3  | 2017-07-18  | toc        | i      |
|    104 | abc4  | 2017-07-20  | ds         | i      |
|    105 | abc5  | 2017-07-23  | daa        | r      |
|    106 | nisha | 2017-08-10  | splm       | r      |
+--------+-------+-------------+------------+--------+
6 rows in set (0.00 sec)

 > select * from library_audit //
Empty set (0.00 sec)

 > insert into borrower values(107,'ada','2017-08-10','dbms','i') //
Query OK, 1 row affected (0.02 sec)


 > select * from borrower //
+--------+-------+-------------+------------+--------+
| rollin | name  | dateofissue | nameofbook | status |
+--------+-------+-------------+------------+--------+
|    101 | abc   | 2017-07-16  | dbms       | r      |
|    102 | abc1  | 2017-07-16  | cn         | i      |
|    103 | abc3  | 2017-07-18  | toc        | i      |
|    104 | abc4  | 2017-07-20  | ds         | i      |
|    105 | abc5  | 2017-07-23  | daa        | r      |
|    106 | nisha | 2017-08-10  | splm       | r      |
|    107 | ada   | 2017-08-10  | dbms       | i      |
+--------+-------+-------------+------------+--------+
7 rows in set (0.00 sec)

 > select * from library_audit //
+--------+------+-------------+------------+--------+---------------------+
| rollin | name | dateofissue | nameofbook | status | ts                  |
+--------+------+-------------+------------+--------+---------------------+
|    107 | ada  | 2017-08-10  | dbms       | i      | 2017-09-19 05:24:57 |
+--------+------+-------------+------------+--------+---------------------+
1 row in set (0.00 sec)

 >
 >
 > -- After DELETE Trigger
 > create trigger after_delete after delete on borrower for each row
    -> begin
    -> insert into library_audit values(old.rollin, old.name, old.dateofissue,
    -> old.nameofbook, old.status, current_timestamp());
    -> end ;
    -> //
Query OK, 0 rows affected (0.08 sec)

 > select * from borrower //
+--------+-------+-------------+------------+--------+
| rollin | name  | dateofissue | nameofbook | status |
+--------+-------+-------------+------------+--------+
|    101 | abc   | 2017-07-16  | dbms       | r      |
|    102 | abc1  | 2017-07-16  | cn         | i      |
|    103 | abc3  | 2017-07-18  | toc        | i      |
|    104 | abc4  | 2017-07-20  | ds         | i      |
|    105 | abc5  | 2017-07-23  | daa        | r      |
|    106 | nisha | 2017-08-10  | splm       | r      |
|    107 | ada   | 2017-08-10  | dbms       | i      |
+--------+-------+-------------+------------+--------+
7 rows in set (0.00 sec)


 > select * from library_audit //
+--------+------+-------------+------------+--------+---------------------+
| rollin | name | dateofissue | nameofbook | status | ts                  |
+--------+------+-------------+------------+--------+---------------------+
|    107 | ada  | 2017-08-10  | dbms       | i      | 2017-09-19 05:24:57 |
+--------+------+-------------+------------+--------+---------------------+
1 row in set (0.00 sec)


 > delete from borrower where rollin = 105 //
Query OK, 1 row affected (0.02 sec)

 > select * from borrower //
+--------+-------+-------------+------------+--------+
| rollin | name  | dateofissue | nameofbook | status |
+--------+-------+-------------+------------+--------+
|    101 | abc   | 2017-07-16  | dbms       | r      |
|    102 | abc1  | 2017-07-16  | cn         | i      |
|    103 | abc3  | 2017-07-18  | toc        | i      |
|    104 | abc4  | 2017-07-20  | ds         | i      |
|    106 | nisha | 2017-08-10  | splm       | r      |
|    107 | ada   | 2017-08-10  | dbms       | i      |
+--------+-------+-------------+------------+--------+
6 rows in set (0.00 sec)

 > select * from library_audit //
+--------+------+-------------+------------+--------+---------------------+
| rollin | name | dateofissue | nameofbook | status | ts                  |
+--------+------+-------------+------------+--------+---------------------+
|    107 | ada  | 2017-08-10  | dbms       | i      | 2017-09-19 05:24:57 |
|    105 | abc5 | 2017-07-23  | daa        | r      | 2017-09-19 05:26:51 |
+--------+------+-------------+------------+--------+---------------------+
2 rows in set (0.00 sec)


 > -- After UPDATE Trigger
 > create trigger after_update after update on borrower for each row
    -> begin
    -> insert into library_audit values(new.rollin, new.name, new.dateofissue,
    -> new.nameofbook, new.status, current_timestamp());
    -> end ;
    -> //
Query OK, 0 rows affected (0.08 sec)

 > select * from borrower //
+--------+-------+-------------+------------+--------+
| rollin | name  | dateofissue | nameofbook | status |
+--------+-------+-------------+------------+--------+
|    101 | abc   | 2017-07-16  | dbms       | r      |
|    102 | abc1  | 2017-07-16  | cn         | i      |
|    103 | abc3  | 2017-07-18  | toc        | i      |
|    104 | abc4  | 2017-07-20  | ds         | i      |
|    106 | nisha | 2017-08-10  | splm       | r      |
|    107 | ada   | 2017-08-10  | dbms       | i      |
+--------+-------+-------------+------------+--------+
6 rows in set (0.00 sec)


 > select * from library_audit //
+--------+------+-------------+------------+--------+---------------------+
| rollin | name | dateofissue | nameofbook | status | ts                  |
+--------+------+-------------+------------+--------+---------------------+
|    107 | ada  | 2017-08-10  | dbms       | i      | 2017-09-19 05:24:57 |
|    105 | abc5 | 2017-07-23  | daa        | r      | 2017-09-19 05:26:51 |
+--------+------+-------------+------------+--------+---------------------+
2 rows in set (0.00 sec)
```

```
 > update borrower set status='r' where borrower.rollin=104
    -> //
Query OK, 1 row affected (0.04 sec)
Rows matched: 1  Changed: 1  Warnings: 0

 > select * from borrower //
+--------+-------+-------------+------------+--------+
| rollin | name  | dateofissue | nameofbook | status |
+--------+-------+-------------+------------+--------+
|    101 | abc   | 2017-07-16  | dbms       | r      |
|    102 | abc1  | 2017-07-16  | cn         | i      |
|    103 | abc3  | 2017-07-18  | toc        | i      |
|    104 | abc4  | 2017-07-20  | ds         | r      |
|    106 | nisha | 2017-08-10  | splm       | r      |
|    107 | ada   | 2017-08-10  | dbms       | i      |
+--------+-------+-------------+------------+--------+
6 rows in set (0.00 sec)


 > select * from library_audit //
+--------+------+-------------+------------+--------+---------------------+
| rollin | name | dateofissue | nameofbook | status | ts                  |
+--------+------+-------------+------------+--------+---------------------+
|    107 | ada  | 2017-08-10  | dbms       | i      | 2017-09-19 05:24:57 |
|    105 | abc5 | 2017-07-23  | daa        | r      | 2017-09-19 05:26:51 |
|    104 | abc4 | 2017-07-20  | ds         | r      | 2017-09-19 05:28:10 |
+--------+------+-------------+------------+--------+---------------------+
3 rows in set (0.00 sec)
```