



Worksheet 7

Student Name: Rachit Kumar

Branch: CSE

Semester: 5th

Subject Name: ADBMS

UID: 23BCS11597

Section/Group: KRG 2-A

Date of Performance: 09/10/2025

Subject Code: 23CSP-333

1. Aim:

1. Design a PostgreSQL trigger that performs the following task:
 - a. Whenever a new record is inserted into the student table, the inserted row should be displayed on the output console.
 - b. Similarly, when a record is deleted from the student table, the deleted row should also be displayed on the console.
2. Create PostgreSQL triggers to maintain an audit log for employee actions.
 - a. Whenever a new employee is inserted into tbl_employee, a record should be inserted into tbl_employee_audit with the message: "Employee name <emp_name> has been added at <current_time>"
 - b. Whenever an employee is deleted from tbl_employee, a record should be inserted into tbl_employee_audit with the message: "Employee name <emp_name> has been deleted at <current_time>"

2. Objective:

- Maintain a complete and reliable record of all employee insertions and deletions for accountability and auditing purposes.
- Automatically insert descriptive audit messages into tbl_employee_audit whenever changes occur in tbl_employee, without requiring manual input.
- Guarantee that every change in the employee table is consistently tracked in real-time, reducing the risk of unrecorded modifications.
- Store timestamps and employee names in the audit log to create a chronological history of employee activity for future reference and compliance checks.
- Increase visibility into employee-related database actions, supporting internal monitoring, troubleshooting, and security reviews.

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3. Code:

1.

```
-- Create the student table
CREATE TABLE student (
    id SERIAL PRIMARY KEY,
    name VARCHAR(100),
    age INT,
    class VARCHAR(50)
);

-- Create the trigger function
CREATE OR REPLACE FUNCTION fn_student_audit()
RETURNS TRIGGER
LANGUAGE plpgsql
AS
$$
BEGIN
    IF TG_OP = 'INSERT' THEN
        RAISE NOTICE 'Inserted Row -> ID: %, Name: %, Age: %, Class: %',
            NEW.id, NEW.name, NEW.age, NEW.class;
        RETURN NEW;

    ELSIF TG_OP = 'DELETE' THEN
        RAISE NOTICE 'Deleted Row -> ID: %, Name: %, Age: %, Class: %',
            OLD.id, OLD.name, OLD.age, OLD.class;
        RETURN OLD;
    END IF;

    RETURN NULL;
END;
$$;

-- Create the trigger
CREATE TRIGGER trg_student_audit
AFTER INSERT OR DELETE
ON student
FOR EACH ROW
EXECUTE FUNCTION fn_student_audit();

-- Test the trigger

-- Insert records
INSERT INTO student(name, age, class) VALUES ('Shivanshu', 20, 'B.Tech');
INSERT INTO student(name, age, class) VALUES ('Tanya', 21, 'B.Tech');
INSERT INTO student(name, age, class) VALUES ('Devanshu', 19, 'Non-CSE');

-- Delete a record
DELETE FROM student WHERE name = 'Devanshu';

SELECT * FROM student;
```

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2.

-- Create employee and audit tables

```
CREATE TABLE tbl_employee (  
    emp_id SERIAL PRIMARY KEY,  
    emp_name VARCHAR(100) NOT NULL,  
    emp_salary NUMERIC  
);
```

```
CREATE TABLE tbl_employee_audit (  
    sno SERIAL PRIMARY KEY,  
    message TEXT  
);
```

-- Create the trigger function

```
CREATE OR REPLACE FUNCTION audit_employee_changes()  
RETURNS TRIGGER  
LANGUAGE plpgsql  
AS  
$$  
BEGIN  
    IF TG_OP = 'INSERT' THEN  
        INSERT INTO tbl_employee_audit(message)  
        VALUES ('Employee name ' || NEW.emp_name || ' has been added at ' || NOW());  
        RETURN NEW;  
  
    ELSIF TG_OP = 'DELETE' THEN  
        INSERT INTO tbl_employee_audit(message)  
        VALUES ('Employee name ' || OLD.emp_name || ' has been deleted at ' || NOW());  
        RETURN OLD;  
    END IF;  
  
    RETURN NULL;  
END;  
$$;
```

-- Create the trigger

```
CREATE TRIGGER trg_employee_audit  
AFTER INSERT OR DELETE  
ON tbl_employee  
FOR EACH ROW  
EXECUTE FUNCTION audit_employee_changes();
```

-- Test the trigger

-- Insert employees

```
INSERT INTO tbl_employee(emp_name, emp_salary) VALUES ('Shivanshu', 90000);  
INSERT INTO tbl_employee(emp_name, emp_salary) VALUES ('Tanya', 95000);  
INSERT INTO tbl_employee(emp_name, emp_salary) VALUES ('Karan', 100000);
```

-- Delete one employee

```
DELETE FROM tbl_employee WHERE emp_name = 'Karan';
```

```
SELECT * FROM tbl_employee;  
SELECT * FROM tbl_employee_audit;
```

4. Output:

(1)

Output:

```
CREATE TABLE
CREATE FUNCTION
CREATE TRIGGER
INSERT 0 1
INSERT 0 1
INSERT 0 1
DELETE 1
```

id	name	age	class
1	Shivanshu	20	B.Tech
2	Tanya	21	B.Tech

(2 rows)

```
psql:commands.sql:41: NOTICE:  Inserted Row -> ID: 1, Name: Shivanshu, Age: 20, Class: B.Tech
psql:commands.sql:42: NOTICE:  Inserted Row -> ID: 2, Name: Tanya, Age: 21, Class: B.Tech
psql:commands.sql:43: NOTICE:  Inserted Row -> ID: 3, Name: Devanshu, Age: 19, Class: Non-CSE
psql:commands.sql:46: NOTICE:  Deleted Row -> ID: 3, Name: Devanshu, Age: 19, Class: Non-CSE
```

(2)

Output:

```
CREATE TABLE
CREATE TABLE
CREATE FUNCTION
CREATE TRIGGER
INSERT 0 1
INSERT 0 1
INSERT 0 1
DELETE 1
```

emp_id	emp_name	emp_salary
1	Shivanshu	90000
2	Tanya	95000

(2 rows)

sno	message
1	Employee name Shivanshu has been added at 2025-10-17 09:32:51.612426+00
2	Employee name Tanya has been added at 2025-10-17 09:32:51.61611+00
3	Employee name Karan has been added at 2025-10-17 09:32:51.618558+00
4	Employee name Karan has been deleted at 2025-10-17 09:32:51.620008+00

(4 rows)



5. Learning Outcomes:

- Understanding Trigger Mechanisms
- Practical Use of Trigger Functions
- Implementing Auditing and Logging
- Event-driven Automation in Databases