VIT Vidyalankar Institute of Technology Accredited A+ by NAAC	Department of Computer Engineering A.Y-2025-26

Semester	T.E. Semester VI Div C Batch – CMPN
Subject	ADBMS Lab
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Assisting Teachers	Prof. Divya Nimbalkar

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Roll Number	24102C2001	
Grade and Subject Teacher's Signature		

Experiment Number	03
Experiment Title	Implementation of Role-Based Access Control (RBAC) with Row Level Security
Objectives (Skill Set / Knowledge Tested / Imparted)	• To secure the database of the Crowdsourced Traffic Incident Reporting System by implementing Role-Based • Access Control (RBAC) and Row-Level Security (RLS) so that different users access data according to their roles.

Aim: To create database roles, assign appropriate privileges, test role-based access by logging in as different users, and implement row-level security for sensitive data in the Crowdsourced Traffic Incident Reporting System.

Theory:

Role-Based Access Control (RBAC): -

Role-Based Access Control is a database security mechanism where permissions are assigned to roles instead of individual users. Users inherit privileges by being assigned a role. This simplifies security management and ensures controlled access to data.

Row-Level Security (RLS): -

Row-Level Security restricts access to specific rows in a table based on user identity or role. It ensures that users can view or modify only the data that belongs to them.

Roles in Crowdsourced Traffic Incident Reporting System: - • Admin: Manages users, incidents, and system data.

- Authority: Verifies incidents and updates incident status.
- User: Reports incidents and views only their own data.

Sensitive tables such as Incident and Feedback require restricted access to maintain data privacy and integrity.

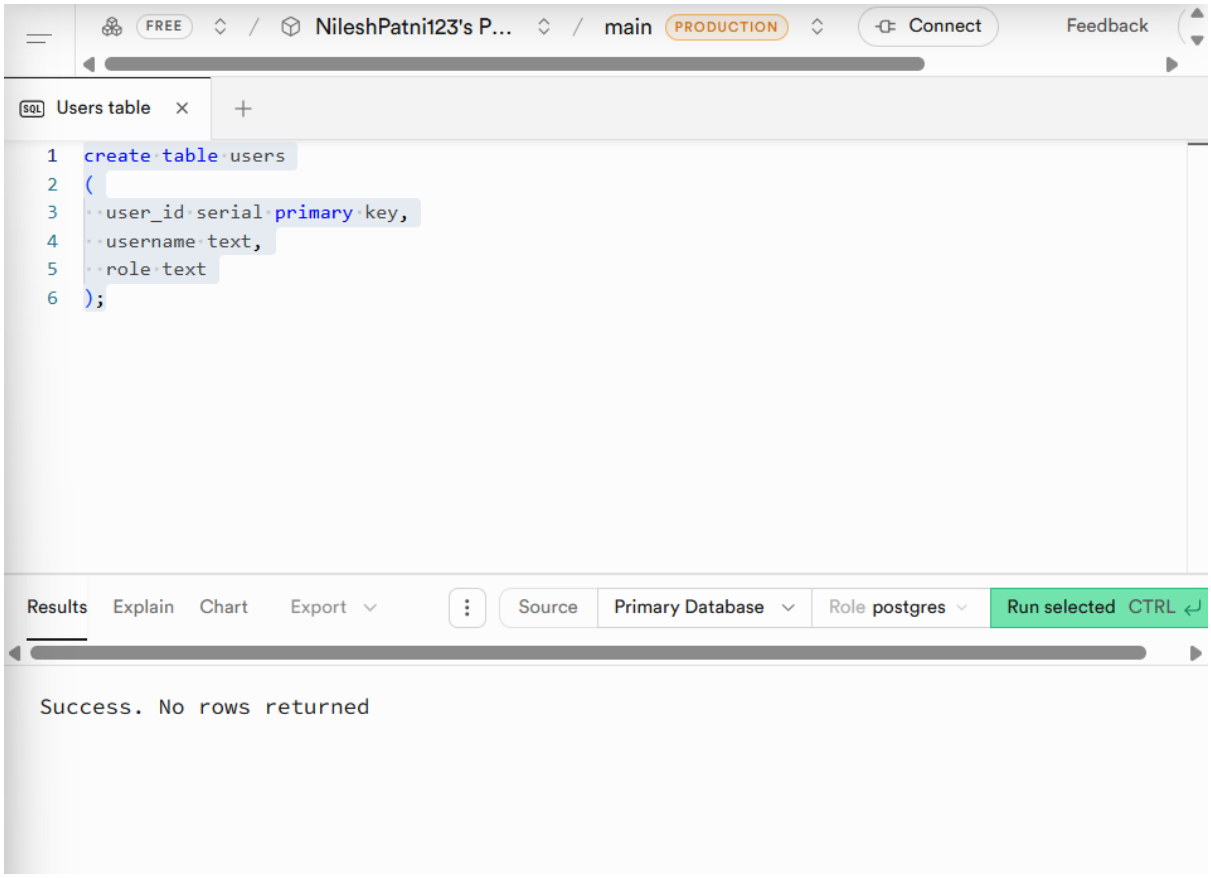
Lab Outcome Mapped: CO

CO Statement: Students will be able to design and implement database security using roles, privileges, and row-level security

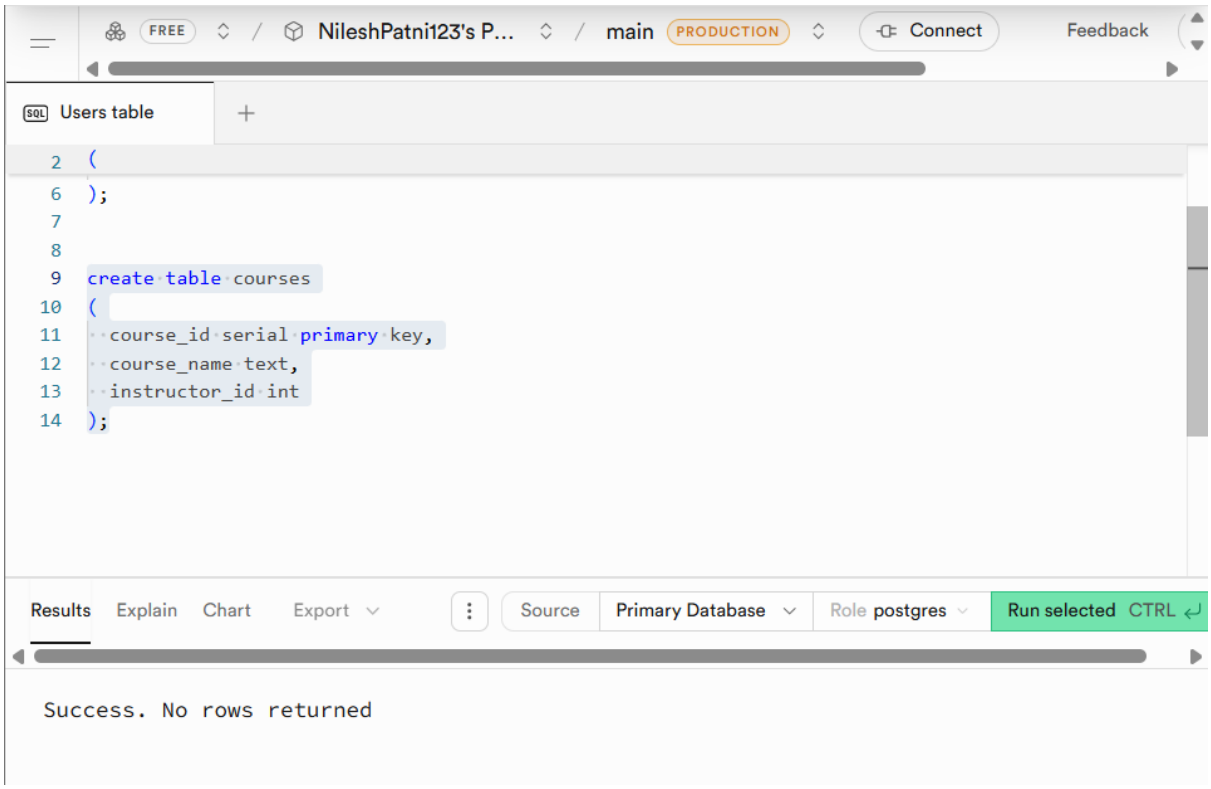
IMPLEMENTATION :

Create Tables (Database Schema)

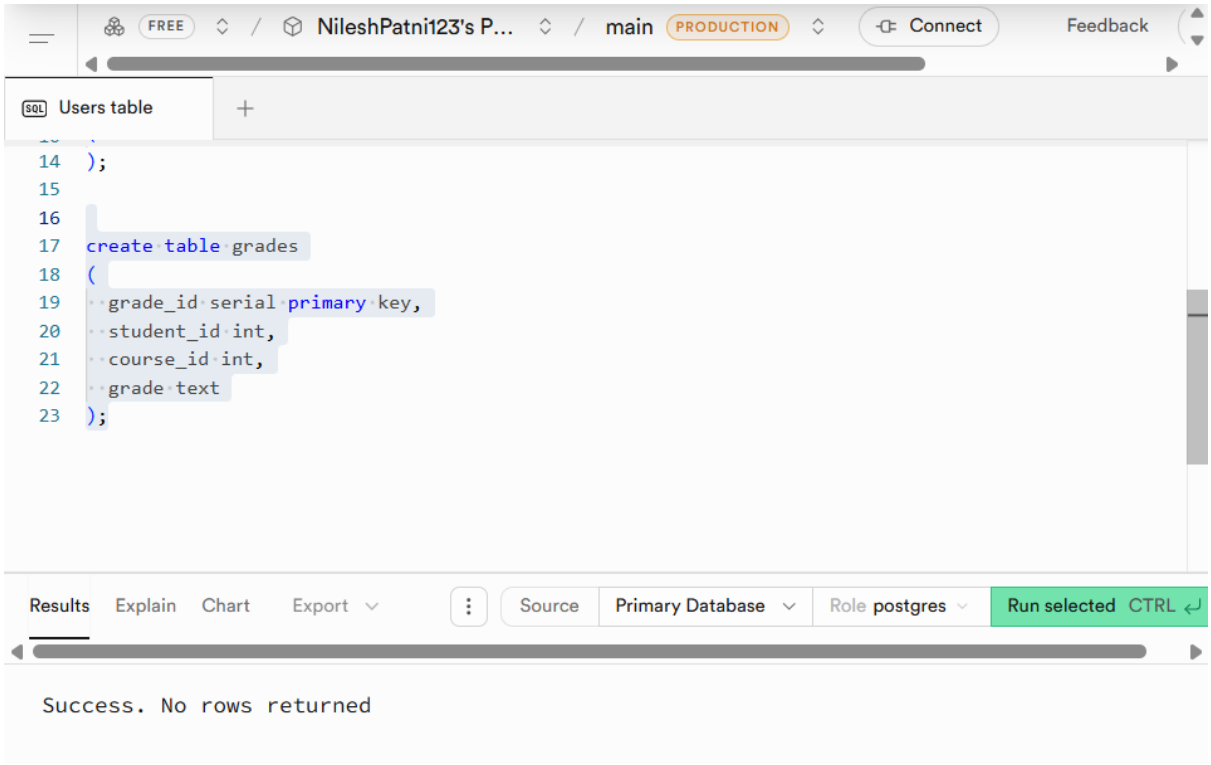
-- Users table :



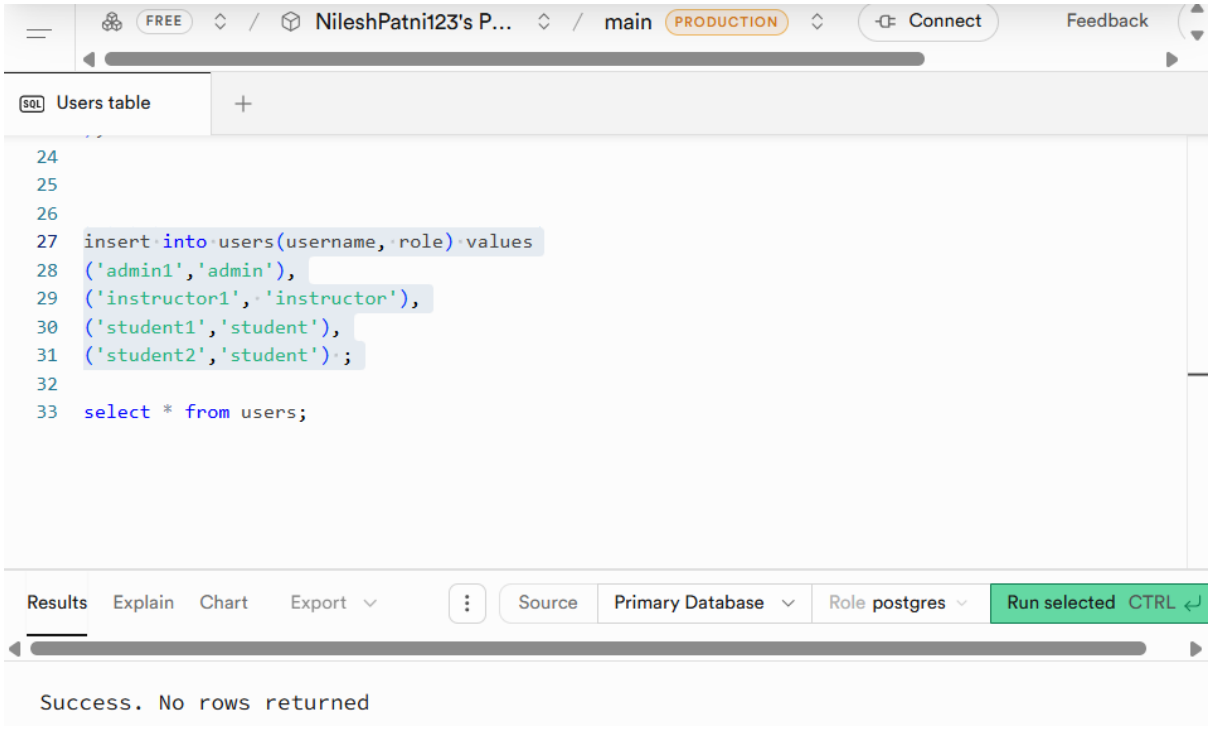
-- Courses table :

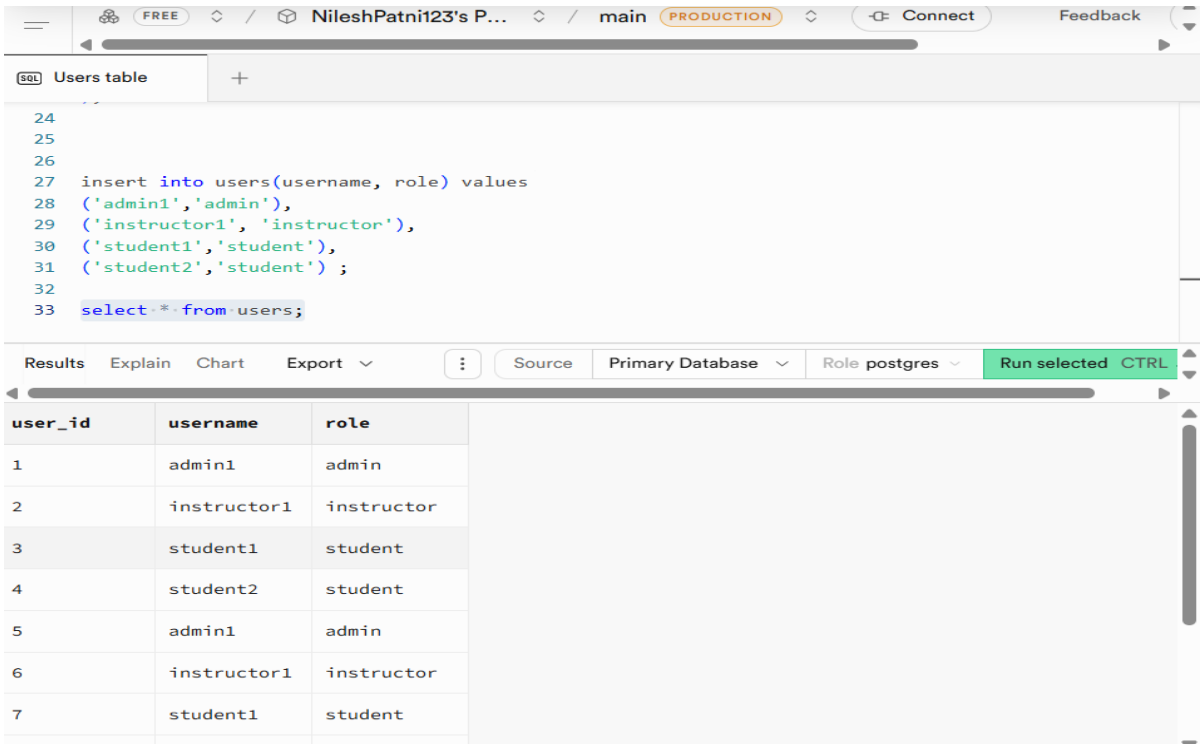


-- Grades table (Sensitive) :



Insert Sample Data :



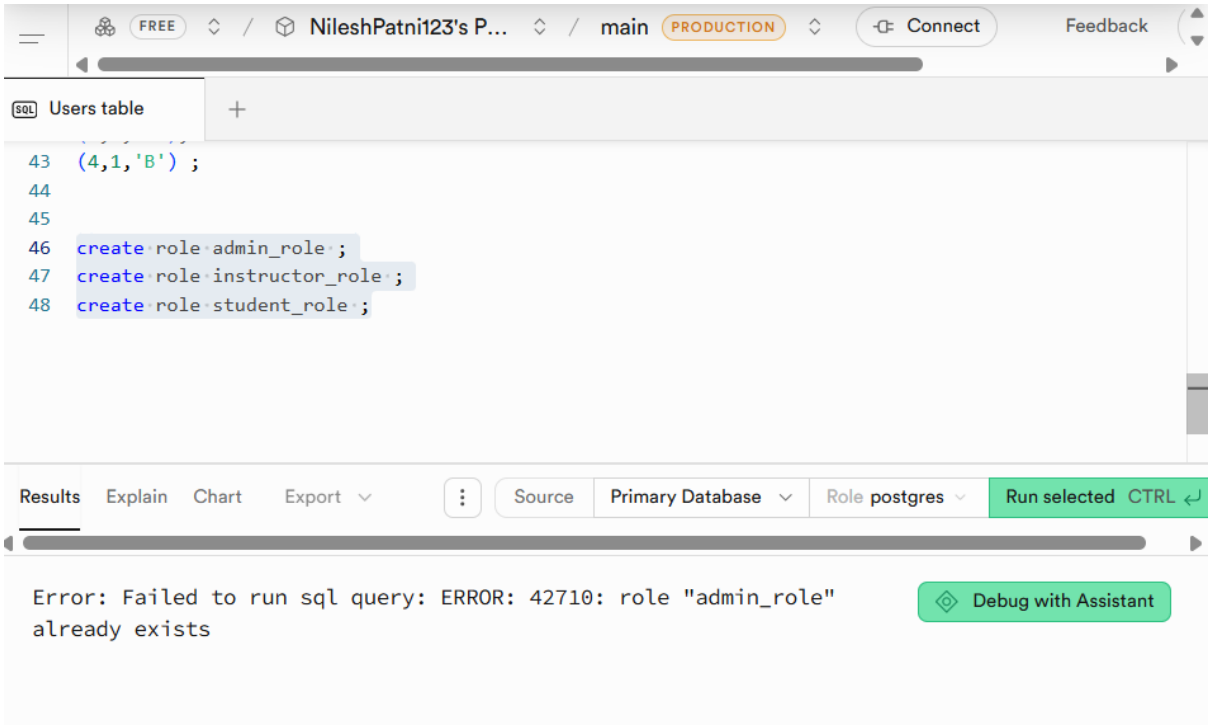


user_id	username	role
1	admin1	admin
2	instructor1	instructor
3	student1	student
4	student2	student
5	admin1	admin
6	instructor1	instructor
7	student1	student


FREE
NileshPatni123's P...
main
PRODUCTION
Connect
Feedback
Users table
33 select * from users;
34
35
36
37 insert into courses(course_name, instructor_id)
38 values ('Machine Learning',2) ;
Results
Explain
Chart
Export
Source
Primary Database
Role postgres
Run selected CTRL
Success. No rows returned


FREE
NileshPatni123's P...
main
PRODUCTION
Connect
Feedback
Users table
38 values ('Machine Learning',2) ;
39
40
41 insert into grades(student_id, course_id, grade) values
42 (3,1,'A'),
43 (4,1,'B') ;
Results
Explain
Chart
Export
Source
Primary Database
Role postgres
Run selected CTRL
Success. No rows returned

Create Roles (RBAC) :



Grant Privileges to Roles :

Admin – Full access

Instructor – View courses, update grades

```
grant select on courses to instructor_role;
grant select , update on grades to instructor_role;
```

Results Explain Chart Export Source Primary Database Role postgres Run selected CTRL

```
Success. No rows returned
```

Student – Read-only access

```
grant select on courses to student_role;
grant select on grades to student_role;
```

Results Explain Chart Export Source Primary Database Role postgres Run selected CTRL

```
Success. No rows returned
```

Test Role-Based Access Control :

Instructor Test :

```
SET ROLE instructor_role;
SELECT * FROM grades;
UPDATE grades SET grade = 'A+' WHERE student_id = 3;
```

Results Explain Chart Export Source Primary Database Role postgres Run selected CTRL

```
Error: Failed to run sql query: ERROR: 42501: permission denied to
set role "instructor_role"
```

Debug with Assistant

```
64
65  SET ROLE instructor_role;
66  SELECT * FROM grades;
67  UPDATE grades SET grade = 'A+' WHERE student_id = 3;
68
```

Results | Explain | Chart | Export | Source | Primary Database | Role postgres | Run selected CTRL

grade_id	student_id	course_id	grade
1	3	1	A
2	4	1	B

```
64
65  SET ROLE instructor_role;
66  SELECT * FROM grades;
67  UPDATE grades SET grade = 'A+' WHERE student_id = 3;
68
```

Results | Explain | Chart | Export | Source | Primary Database | Role postgres | Run selected CTRL

Success. No rows returned

Student Test :

```
72
73  set role student_role;
74  select * from courses;
```

Results | Explain | Chart | Export | Source | Primary Database | Role postgres | Run selected CTRL

Error: Failed to fetch (api.supabase.com)

Debug with Assistant

```
70  delete from grades ;
71
72
73  set role student_role;
74  select * from courses;
```

Results Explain Chart Export Source Primary Database Role postgres Run selected CTRL

course_id	course_name	instructor_id
1	Machine Learning	2

```
76
77  UPDATE grades SET grade='A' WHERE student_id=3;
78  select * from grades;
79
```

Results Explain Chart Export Source Primary Database Role postgres Run selected CTRL

Success. No rows returned

Enable Row-Level Security (RLS) :

```
80
81
82  ALTER TABLE grades ENABLE ROW LEVEL SECURITY;
83
```

Results Explain Chart Export Source Primary Database Role postgres Run selected CTRL

Success. No rows returned

Student-Specific Grade Access (RLS Policy) :

Students can see only their own grades

```
CREATE POLICY student_grade_policy
ON grades
FOR SELECT
TO student_role
USING (student_id = current_setting('app.current_student')::INT);
```

Results Explain Chart Export | Source: Primary Database | Role: postgres | Run selected CTRL

```
Success. No rows returned
```

Set current student context:

```
SET app.current_student = '3';
```

Results Explain Chart Export | Source: Primary Database | Role: postgres | Run selected CTRL

```
Success. No rows returned
```

Student sees only his/her row :

```
SET ROLE student_role;
SELECT * FROM grades;
```

Results Explain Chart Export | Source: Primary Database | Role: postgres | Run selected CTRL

```
Success. No rows returned
```

Instructor RLS Policy (Full Access) :

```
100
101 CREATE POLICY instructor_grade_policy
102 ON grades
103 FOR ALL
104 TO instructor_role
105 USING (true);
106
```

Results Explain Chart Export | Source | Primary Database | Role postgres | Run selected CTRL

Success. No rows returned

```
108 insert into grades(student_id, course_id, grade) values
109 (3,1,'A'),
110 (4,1,'B') ;
111 select * from grades;
112
113 UPDATE grades SET grade='A' WHERE student_id=3;
114 select * from grades;
```

Results Explain Chart Export | Source | Primary Database | Role postgres | Run selected CTRL

grade_id	student_id	course_id	grade
4	4	1	B
6	4	1	B
3	3	1	A
5	3	1	A

Conclusion : -

In this experiment, Role-Based Access Control (RBAC) and Row-Level Security (RLS) were successfully implemented for the Crowdsourced Traffic Incident Reporting System. Different roles were created and assigned appropriate privileges to control access to sensitive data. Row-level security ensured that users could access only their own incident and feedback records. This experiment demonstrates effective database security implementation and highlights the importance of access control in real-world database applications.

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