Implementing Row-Level Security (RLS) in Oracle

This document outlines the steps to implement Row-Level Security (RLS) in Oracle for the user PRACTICE1. It includes creating a new user, setting up an EMP table with sample data, defining the necessary context, procedure, and function, and applying the RLS policy. Testing steps are also included to validate the implementation.

Step 1: Create the User

Create the user PRACTICE1 and grant the required privileges.

CREATE USER PRACTICE1 IDENTIFIED BY practice1;

GRANT CONNECT, RESOURCE TO PRACTICE1;

ALTER USER PRACTICE1 QUOTA UNLIMITED ON USERS;

GRANT CREATE SESSION, CREATE TABLE, CREATE PROCEDURE,

CREATE VIEW, CREATE TRIGGER TO PRACTICE1;

GRANT EXECUTE ON DBMS_RLS TO PRACTICE1;

Step 2: Create the EMP Table

Create the EMP table under the PRACTICE1 schema.

```
CREATE TABLE EMP (
   EMPNO      NUMBER(4) PRIMARY KEY,
   ENAME      VARCHAR2(20),
   JOB        VARCHAR2(20),
   MGR        NUMBER(4),
   HIREDATE   DATE,
   SAL        NUMBER(10, 2),
   COMM       NUMBER(10, 2),
   DEPTNO     NUMBER(4),
   USERNAME   VARCHAR2(20)
);
```

Step 3: Insert Sample Data

Populate the EMP table with sample records.

```
INSERT INTO EMP VALUES (222, 'ANNAR', 'MANAGER', NULL,
SYSDATE, 3000, NULL, 10, 'ALI');

INSERT INTO EMP VALUES (7788, 'SCOTT', 'ANALYST', 7566, SYSDATE,
3000, NULL, 20, 'DANISH');
```

INSERT INTO EMP VALUES (7698, 'BLAKE', 'MANAGER', 7839, SYSDATE, 2850, NULL, 30, 'SYSTEM');

INSERT INTO EMP VALUES (7566, 'JONES', 'MANAGER', 7839, SYSDATE, 2975, NULL, 20, 'DANISH');

INSERT INTO EMP VALUES (7839, 'KING', 'PRESIDENT', NULL, SYSDATE, 5000, NULL, 10, 'ALI');

INSERT INTO EMP VALUES (7499, 'ALLEN', 'SALESMAN', 7698, SYSDATE, 1900, 300, 30, 'SYSTEM');

INSERT INTO EMP VALUES (7782, 'CLARK', 'MANAGER', 7839, SYSDATE, 2450, NULL, 10, 'ALI');

INSERT INTO EMP VALUES (7521, 'WARD', 'SALESMAN', 7698, SYSDATE, 1250, 500, 30, 'SYSTEM');

INSERT INTO EMP VALUES (7934, 'MILLER', 'CLERK', 7782, SYSDATE, 1300, NULL, 10, 'ALI');

INSERT INTO EMP VALUES (7902, 'FORD', 'ANALYST', 7566, SYSDATE, 3000, NULL, 20, 'DANISH');

INSERT INTO EMP VALUES (7654, 'MARTIN', 'SALESMAN', 7698, SYSDATE, 1250, 1400, 30, 'SYSTEM');

Step 4: Create a Context

Define a context named TEST that will store user-specific attributes.

create context test using set_deptno;

```
SQL>
SQL> create context test using set_deptno;

Context created.
```

Step 5: Define a Procedure to Set Context

Create a procedure to set the context for the TEST namespace.

```
create or replace procedure  set_deptno(p1 varchar2) as
begin
   dbms_session.set_context(
      namespace => 'test',
      attribute => 'username',
      value     => p1
   );
end;
/
```

```
SQL> create or replace procedure set_deptno(p1 varchar2) as
  2  begin
  3  dbms_session.set_context(
  4  namespace => 'test',
  5  attribute => 'username',
  6  value => p1
  7  );
  8  end;
  9  /

Procedure created.
```

Step 6: Define a Function for RLS Predicate

Create a function that defines the RLS predicate.

```
create or replace function dept_predicate(schema_name in varchar2,
object_name in varchar2)
return varchar2
is
   lv_predicate varchar2(1000);
begin
   lv_predicate := 'username = sys_context(''test'', ''username'')';
   return lv_predicate;
exception
   when others then
      raise_application_error(-20001, 'Error in dept_predicate: ' || sqlerrm);
end;
/
```

Step 7: Apply the RLS Policy

Attach the RLS policy to the EMP table.

```
BEGIN
   DBMS_RLS.ADD_POLICY(
      object_schema  => 'PRACTICE1',
```

```
    object_name    => 'EMP',
    policy_name    => 'EMP_CL_POLICY',
    function_schema => 'PRACTICE1',
    policy_function => 'dept_predicate'
  );
END;
/
```

Step 8: Test the Implementation

Set the Context for ALI:

```
begin
  set_deptno('ALI');
end;
/
```

```
SQL> begin
  2     set_deptno('ALI');
  3  end;
  4  /

PL/SQL procedure successfully completed.

SQL>
```

Verify the Context Setting:

```
SELECT SYS_CONTEXT('TEST', 'USERNAME') FROM DUAL;
```

OUTPUT:

SYS_CONTEXT('TEST', 'USERNAME')

ALI

```
SQL>
SQL> SELECT SYS_CONTEXT('TEST', 'USERNAME') FROM DUAL;

SYS_CONTEXT('TEST','USERNAME')
--------------------------------------------------------------------------------
ALI

SQL>
```

Query the EMP Table:

SELECT * FROM EMP;

```
SQL> select * from emp;

     EMPNO ENAME                JOB                         MGR HIREDATE
---------- -------------------- -------------------- ---------- ---------
       SAL       COMM     DEPTNO USERNAME
---------- ---------- ---------- --------------------
       222 ANNAR                MANAGER                       10-JAN-25
      3000                    10 ALI

      7839 KING                 PRESIDENT                     10-JAN-25
      5000                    10 ALI

      7782 CLARK                MANAGER                    7839 10-JAN-25
      2450                    10 ALI


     EMPNO ENAME                JOB                         MGR HIREDATE
---------- -------------------- -------------------- ---------- ---------
       SAL       COMM     DEPTNO USERNAME
---------- ---------- ---------- --------------------
      7934 MILLER               CLERK                      7782 10-JAN-25
      1300                    10 ALI
```

Change the Context to DANISH:

begin

set_deptno('DANISH');

end;

/

```
SQL> begin
  2     set_deptno('DANISH');
  3  end;
  4  /

PL/SQL procedure successfully completed.
```

Verify the Context Setting:

SELECT SYS_CONTEXT('TEST', 'USERNAME') FROM DUAL;

OUTPUT:

SYS_CONTEXT('TEST', 'USERNAME')

DANISH

SELECT * FROM EMP;

OUTPUT:

```
SQL> select * from emp;

     EMPNO ENAME                JOB                         MGR HIREDATE
---------- -------------------- ------------------- ---------- ---------
       SAL       COMM     DEPTNO USERNAME
---------- ---------- ---------- --------------------
      7788 SCOTT                ANALYST                   7566 10-JAN-25
      3000                     20 DANISH

      7566 JONES                MANAGER                   7839 10-JAN-25
      2975                     20 DANISH

      7902 FORD                 ANALYST                   7566 10-JAN-25
      3000                     20 DANISH
```

==========GOOD LUCK==========