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Database Programming with PL/SQL

9-5
Review of Object Privileges

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Objectives

This lesson covers the following objectives:

- List and explain several object privileges
- Explain the function of the EXECUTE object privilege
- Write SQL statements to grant and revoke object privileges

Purpose

- You already know that one of the benefits of PL/SQL subprograms is that they can be reused in many applications.
- Users can call and execute subprograms only if they have the privileges to do so.
- This lesson first reviews object privileges in general, then focuses in more detail on the privileges needed to execute a PL/SQL subprogram.

What Is an Object Privilege?

- An object privilege allows the use of a specific database object, such as a table, a view, or a PL/SQL procedure, by one or more database users.
- When a database object is first created, only its owner (creator) and the Database Administrator are privileged to use it.
- Privileges for all other users must be specifically granted (and maybe later revoked).
- This can be done by the object's owner or by the DBA.

What Object Privileges Are Available?

- Each object has a particular set of grantable privileges.
- The following table lists the privileges for various objects.

Object Privilege	Table	View	Sequence	Procedure
ALTER	X		X	
DELETE	X	X		
EXECUTE				X
INDEX	X			
INSERT	X	X		
REFERENCES	X	X		
SELECT	X	X	X	
UPDATE	X	X		

What Object Privileges Are Available?

- SELECT, INSERT, UPDATE, and DELETE privileges allow the holder (the grantee) of the privilege to use the corresponding SQL statement on the object.
- For example, INSERT privilege on the EMPLOYEES table allows the holder to INSERT rows into the table, but not to UPDATE or DELETE rows.

What Object Privileges Are Available?

- The ALTER privilege allows the grantee to ALTER the table, while INDEX privilege allows the grantee to create indexes on the table.
- Of course, you can automatically do this on your own tables.
- The REFERENCES privilege allows the grantee to check for the existence of rows in a table or view using foreign key constraints.

Granting Object Privileges

- Syntax:

```
GRANT object_priv [(columns)]
  ON object
  TO {user|role|PUBLIC}
  [WITH GRANT OPTION];
```

Examples:

```
GRANT INSERT, UPDATE
  ON employees TO TOM, SUSAN;

GRANT SELECT
  ON departments TO PUBLIC;
```

Syntax	Definition
`object_priv`	The privilege to be granted.
`columns`	Limits UPDATE privilege to a specific column (optional).
`object`	The object name on which the privilege(s) are granted.
`user|role`	Identifies the user/roles to whom the privilege is granted.
`PUBLIC`	Grants the named privilege(s) to all users.
`WITH GRANT OPTION`	Allows grantee to grant object privileges to others.

Revoking Object Privileges

- Syntax:

```
REVOKE object_priv [(columns)]
ON object
FROM {user|role|PUBLIC};
```

- Examples:

```
REVOKE INSERT, UPDATE ON employees FROM TOM, SUSAN;
```

```
REVOKE SELECT ON departments FROM PUBLIC;
```

Using the EXECUTE Privilege With Stored Subprograms

- To invoke and execute a PL/SQL subprogram, the user must be granted EXECUTE privilege on the subprogram.

```
CREATE OR REPLACE PROCEDURE add_dept ... ;
CREATE OR REPLACE FUNCTION  get_sal ... ;

GRANT EXECUTE ON add_dept TO TOM, SUSAN;
GRANT EXECUTE ON get_sal  TO PUBLIC;
...
REVOKE EXECUTE ON get_sal FROM PUBLIC;
```

Referencing Objects in Subprograms

- What about the objects referenced inside the subprogram?
- To invoke a subprogram, a user needs only EXECUTE privilege on the subprogram.

```
CREATE OR REPLACE PROCEDURE add_dept ...
IS BEGIN
...
  INSERT INTO DEPARTMENTS ... ;
...
END;

GRANT EXECUTE ON add_dept TO SUSAN;
```

Referencing Objects in Subprograms

- He/she does NOT need any privileges on the objects referenced by SQL statements within the subprogram.
- The user (SUSAN) does not need INSERT (or any other privilege) on the DEPARTMENTS table.

```
CREATE OR REPLACE PROCEDURE add_dept ...
IS BEGIN
...
  INSERT INTO DEPARTMENTS ... ;
...
END;

GRANT EXECUTE ON add_dept TO SUSAN;
```

Privileges on Referenced Objects

- Someone must have privileges on the referenced objects.
- Who is it?
- The subprogram owner (creator) must hold the appropriate privileges on the objects referenced by the subprogram – this is called Definer's Rights.

```
(Table owner or DBA): GRANT INSERT ON departments TO TOM;
(Tom) CREATE OR REPLACE PROCEDURE add_dept ...
        IS BEGIN
           ...
           INSERT INTO DEPARTMENTS ... ;
           ...
        END;
(Tom) GRANT EXECUTE ON add_dept TO SUSAN;
```

Privileges on Referenced Objects

- The owner's privileges are checked when the subprogram is created or replaced, and also every time the subprogram is invoked.
- In this example, TOM creates a procedure that SUSAN needs to invoke:

```
(Table owner or DBA): GRANT INSERT ON departments TO TOM;
(Tom) CREATE OR REPLACE PROCEDURE add_dept ...
        IS BEGIN
           ...
           INSERT INTO DEPARTMENTS ... ;
           ...
        END;
(Tom) GRANT EXECUTE ON add_dept TO SUSAN;
```

Privileges on Referenced Objects

- Below is another example.
- BILL owns the STUDENTS and GRADES tables.
- HANNAH needs to create a procedure that JIEP needs to invoke:

```
(Hannah)CREATE OR REPLACE PROCEDURE student_proc ...
   IS BEGIN
      SELECT ... FROM bill.students JOIN bill.grades ...;
      UPDATE bill.students ...;
            ...
   END;

(Jiep)  BEGIN    hannah.student_proc(…);  END;
```

- Who needs which privileges on which objects?

System Privileges

- On the previous slide, HANNAH created a procedure.
- What privilege(s) did HANNAH need in order to do this?
- Yes, HANNAH needs suitable object privileges on BILL's tables.
- She also needs the CREATE PROCEDURE system privilege:

```
(DBA) GRANT CREATE PROCEDURE TO hannah;
```

- Although the name of the privilege is CREATE PROCEDURE, it also allows HANNAH to create functions and packages.

Terminology

Key terms used in this lesson included:

- ALTER privilege
- EXECUTE privilege
- INDEX privilege
- Object privilege
- REFERENCES privilege

Summary

In this lesson, you should have learned how to:

- List and explain several object privileges
- Explain the function of the EXECUTE object privilege
- Write SQL statements to grant and revoke object privileges


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