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IT3090E - Databases

Chapter 4: Structured Query Language
part 4

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Contents

- Chapter 1: Introduction
- Chapter 2: Relational databases
- Chapter 3: Relational algebra
- **Chapter 4: Structured Query Language (SQL)**
- Chapter 5: Database Design
- Chapter 6: Indexing
- Chapter 7: Query processing and optimization
- Chapter 8: Constraints, rules and triggers
- Chapter 9: Security
- *(Optional) Chapter 10: Transactions: concurrency and recovery*

Outline of Chapter 4

1. Data Definition and Data Manipulation SQL languages
2. Creating and managing views
3. Privileges and User Management in SQL

Global Outline of Chapter 4

- Chapter 4 - Part 1:
  - 1 - Introduction to SQL
  - 2 – Definition of a Relational Schema (DDL)
  - 3 – Data Manipulation: 3.1.-3.3. Insertion, deletion, updates
- Chapter 4 - Part 2:
  - 3.4. Data Manipulation Language for Querying (simple queries)
- Chapter 4 - Part 3:
  - 3.4. Data Manipulation Language for Querying (complex queries)
- Chapter 4 - Part 4:
  - 4. Privileges and User Management in SQL

Learning objective of Chapter 4 - part 4

- Have experience with a DBMS: **manage user account and database access permissions**

Keywords of Chapter 4

Keyword	Description
Query	A request (SQL statement) for information from a database
Subquery	A subquery (inner query, nested query) is a query within another (SQL) query.
Privileges	Database access permissions
View	A view is the result set of a stored query on the data, which the database users can query just as they would in a persistent database collection object.

Privileges and User Management in SQL

1. Privileges
2. Creating users
3. Granting privileges
4. Revoking privileges
5. Roles

3.1. Privileges

- There are two types of **privileges**:
  - System Privileges: This indicate user to CREATE, ALTER, or DROP database elements.
  - Object Privileges: This allows user to EXECUTE, SELECT, INSERT, or DELETE data from database objects to which the privileges apply.
- **Roles** are the collection of privileges or access rights.

3.1. Privileges – system privileges

- CREATE object: allows users to create the specified object in their own schema.
- CREATE ANY object: allows users to create the specified object in any schema.
- The same rules apply for the ALTER and DROP system privileges

3.1. Privileges – object privileges

- SELECT, INSERT, DELETE, UPDATE: privileges on table/view
- REFERENCES: privilege on a relation: right to refer to that relation in an integrity constraint
- USAGE: the right to use that element in one’s own declarations
  - Synonym for “no privileges”
- TRIGGER: privilege on a relation; the right to define triggers on that relation
- EXECUTE: the right to execute a piece of code, such as a procedure or function

3.2. Creating users

- Syntax: variations in different database platforms
  - Creating an user in Oracle, MySQL:

    ```
    CREATE USER username IDENTIFIED BY password;
    ```

  - Creating an user in PostgreSQL:

    ```
    CREATE USER username
    [[WITH] options] PASSWORD password;
    ```

  - Deleting:

    ```
    DROP USER username [CASCADE];
    ```

    CASCADE will remove all schema objects of the user before deleting the user

- Example:

  ```
  CREATE USER toto IDENTIFIED BY pwdtoto
  ```

3.3. Granting privileges

- Syntax:

  GRANT <privilege list> ON <database element> TO <user list>

  [WITH GRANT OPTION] ;

  - <privilege list> : INSERT, SELECT, …, ALL PRIVILEGES
  - <database element>: a table, a view
  - WITH GRANT OPTION:
    - the user is allowed to grant the privilege to other users

- Example:

  GRANT SELECT, INSERT ON student TO tom WITH GRANT OPTION;

3.3. Granting privileges

- A user is referred to by authorization ID, typically their login name
- There is an authorization ID called PUBLIC.
  - Granting a privilege to PUBLIC makes it available to any authorization ID.
- A user has all possible privileges on the objects (such as relations) that they create.
  - The object owner may grant privileges to other users (authorization ID’s), including PUBLIC.
  - The object owner may also grant privileges WITH GRANT OPTION

3.4. Revoking privileges

- Syntax (for revoking object privileges):

  REVOKE <privilege list> ON <database element> FROM <user list>

  [CASCADE| RESTRICT] ;

  - CASCADE : revokes the privileges in <privilege_list>, plus all privileges that depend on the privileges being revoked.
    - It removes the revoked rights from all users that have been granted the rights by the user revoked
    - If you want those other users to retain the rights granted by the user with the GRANT OPTION, you must then manually assign those rights explicitly to those other users.
  - RESTRICT: does not to revoke the specified privilege if there are any dependent privileges.

3.4. Revoking privileges

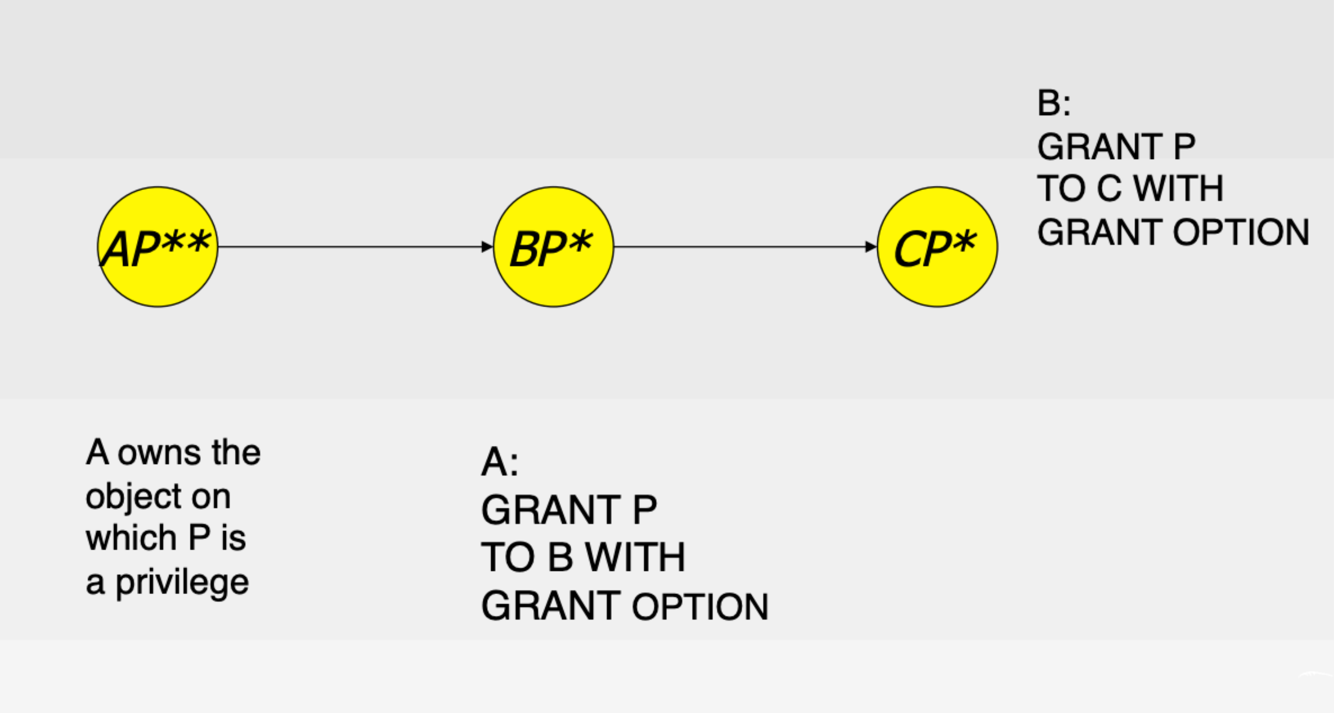
- Syntax (for revoking grant privileges):

REVOKE GRANT OPTION FOR ….. [CASCADE] ; : remove the grant option

- Examples:

```
REVOKE  INSERT ON student FROM tom CASCADE;
REVOKE  GRANT OPTION FOR student;
```

3.4. GRANT diagrams

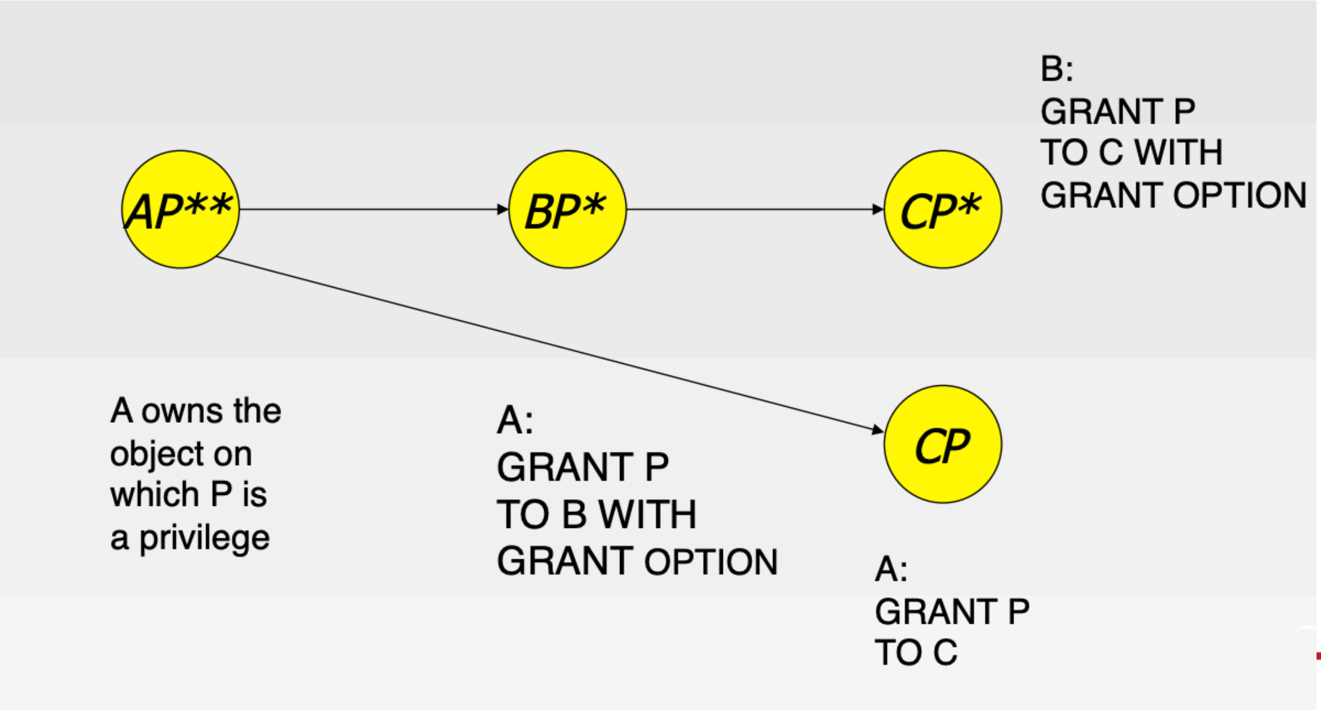


B:
GRANT P
TO C WITH
GRANT OPTION

A owns the object on which P is a privilege

A:
GRANT P
TO B WITH
GRANT OPTION

3.4. GRANT diagrams



B:
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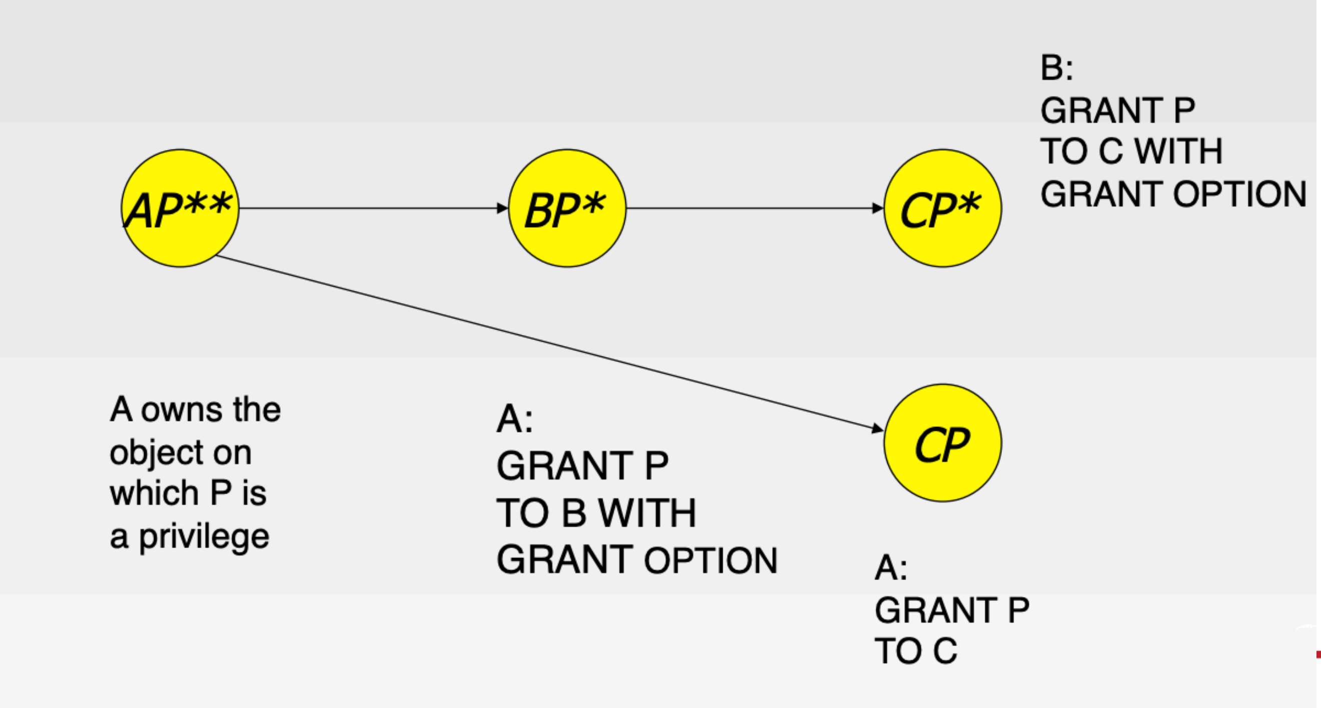
3.4. GRANT diagrams



B:
GRANT P
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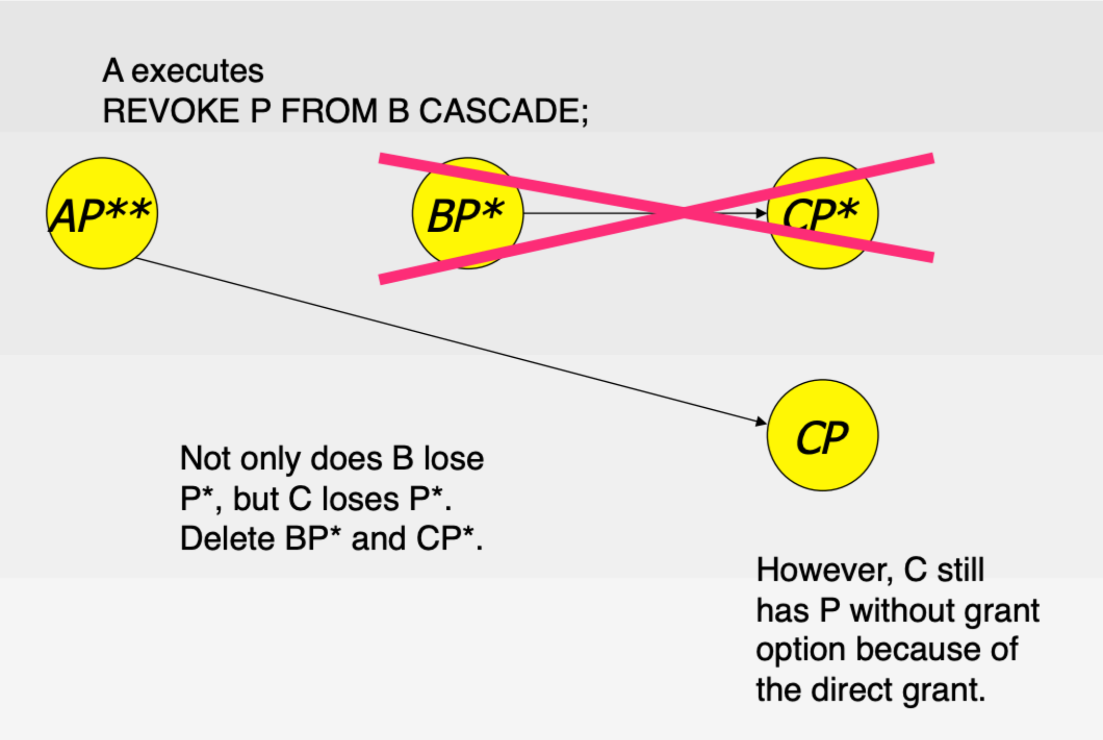
3.4. GRANT diagrams

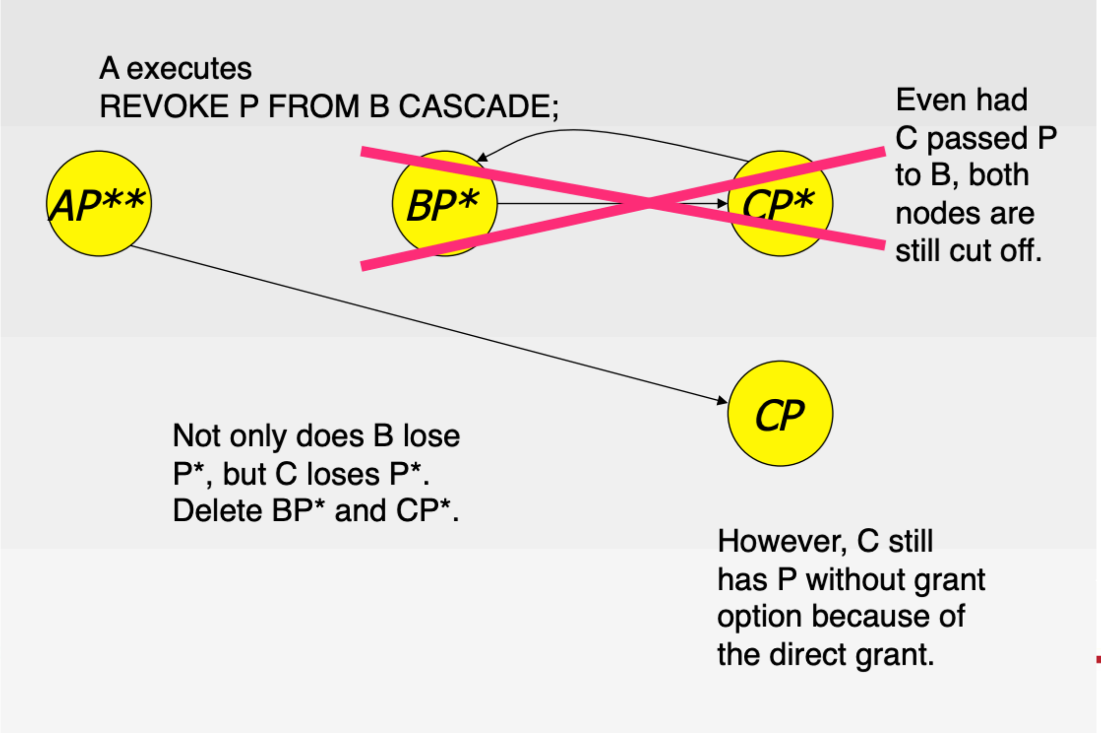


A executes
REVOKE P FROM B CASCADE;

Not only does B lose
P*, but C loses P*.
Delete BP* and CP*.

However, C still
has P without grant
option because of
the direct grant.

3.4. GRANT diagrams



A executes
REVOKE P FROM B CASCADE;

Even had C passed P to B, both nodes are still cut off.

Not only does B lose P*, but C loses P*. Delete BP* and CP*.

However, C still has P without grant option because of the direct grant.

3.5. Roles in SQL Server

- Roles are a part of the tiered security model:
  - Login security: Connecting to the server
  - Database security: Getting access to the database
  - Database objects: Getting access to individual database objects and data

- Server roles are maintained by the database administrator (DBA) and apply to the entire server, not an individual database file.

- Database roles are applied to an individual database.

3.5. Roles in SQL Server – server roles

- The PUBLIC role sets the basic default permissions for all users.
  - Every user that's added to SQL Server is automatically assigned to the public role—you don't need to do anything
  - The public server role is granted VIEW ANY DATABASE permission and the CONNECT permission on the default endpoints.
- The PUBLIC server role is not a fixed server role, because the permissions can be changed

3.5. Roles in SQL Server – server roles

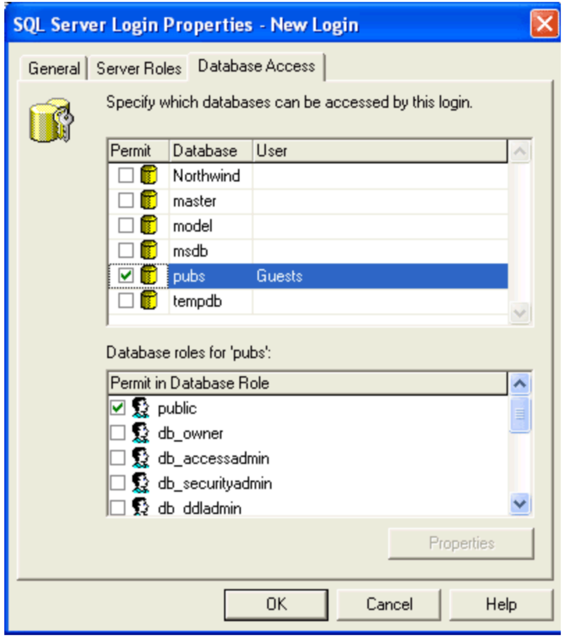
- The fixed server roles are applied serverwide, and there are several predefined server roles:
    - SysAdmin: Any member can perform any action on the server.
    - ServerAdmin: Any member can set configuration options on the server.
    - SetupAdmin: Any member can manage linked servers and SQL Server startup options and tasks.
    - Security Admin: Any member can manage server security.
    - ProcessAdmin: Any member can kill processes running on SQL Server.
    - DbCreator: Any member can create, alter, drop, and restore databases.
    - DiskAdmin: Any member can manage SQL Server disk files.
    - BulkAdmin: Any member can run the bulk insert command.
    - .

3.5. Roles in SQL Server – database roles

- You may need to create your own, but you have access to several predefined database roles:
  - db_owner: Members have full access.
  - db_accessadmin: Members can manage Windows groups and SQL Server logins
  - db_datareader: Members can read all data.
  - db_datawriter: Members can add, delete, or modify data in the tables.
  - db_ddladmin: Members can run dynamic-link library (DLL) statements.
  - db_securityadmin: Members can modify role membership and manage permissions.
  - db_bckupoperator: Members can back up the database.
  - db_denydatareader: Members can't view data within the database.
  - db_denydatawriter: Members can't change or delete data in tables or views.

3.5. Roles in SQL Server

- In SQL Server, you can change the role of a user (by default PUBLIC) through the SQL Server interface



Specify which databases can be accessed by this login.

Permit	Database	User
□	Northwind	
□	master	
□	model	
□	msdb	
☑	pubs	Guests
□	tempdb	

Database roles for 'pubs':

Permit in Database Role	
☑	public
□	db_owner
□	db_accessadmin
□	db_securityadmin
□	db_ddladmin

Summary

- Privileges and User Managements
  - Privileges
  - Creating user
  - Granting / Revoking privileges

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