

# **UNIT 5- Database Security and Transaction Processing**

- Data is a valuable entity that must have to be firmly handled and managed as with any economic resource. So some part or all of the commercial data may have tactical importance to their respective organization and hence must have to be kept protected and confidential



- Database security is the technique that protects and secures the database against intentional or accidental threats. Security concerns will be relevant not only to the data resides in an organization's database: the breaking of security may harm other parts of the system, which may ultimately affect the database structure. Consequently, database security includes hardware parts, software parts, human resources, and data.
- Security is a broad subject and involves many issues like legal and ethical issues.
- Database security can be defined as “a system or process by which the confidentiality,integrity and availability of the database can be protected.
- Unauthorized access or entry to a database server signifies a loss of confidentiality, unauthorized alteration to the available data signifies loss of integrity, and lack of access to the database services signifies loss of availability.
- Loss of one or more of these basic facts will have a significant impact on the security of the database.

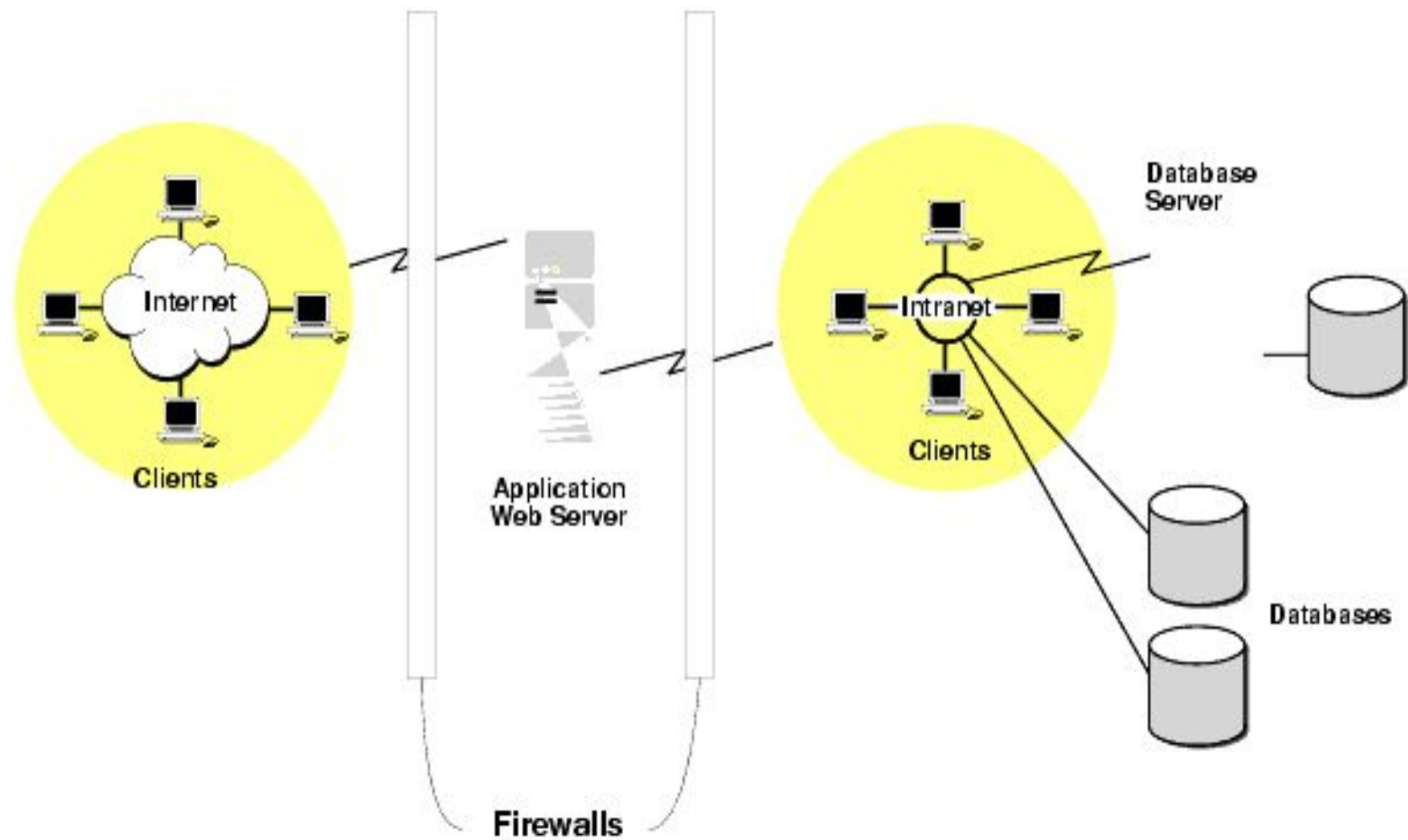
## Needs of data security

- ❑ Must protect database and the servers on which they reside.
- ❑ Must administer and protect the right of internal database users.
- ❑ Must guarantee the confidentiality of ecommerce customers as they access the database.
- ❑ With the internet continually growing, the threat to data traveling over the network increases exponentially.

## Database security measures at various levels

- ❑ **Physical:-** The sites containing the computer system must be secured against armed or surreptitious entry by intruders.
- ❑ **Human:-** User must be authorized carefully to reduce the chance of any such user giving access to an intruder in exchange for a bribe or other favours.
- ❑ **Operating system :-** No matter how secure the database system, Weakness in operating system security may serve as a means Of unauthorized access to the database.
- ❑ **Network:-** Since almost all database systems allow remote  
Access through terminals or network, software-level security within the network software is as important as physical security , both on the internet and in network private to an enterprise.
- ❑ **Database system:-** Some database systems users may be authorized to access only a limited portion of the database. Other users may be allowed to issue queries , but may be forbidden to modify the data. It is responsibility of the database system to ensure authorization restriction are not violated.





## **Database Security Requirements**

**1)Confidentiality:-** Confidentiality means that the prevention of unauthorised disclosure of information wrong people will not be able to get any sensitive information,and making sure the authorized or right people can easily get it. Confidentiality is roughly equivalent to privacy.

There are the following authorization rights.

- 1) Read authorization allow reading, but not modification.
- 2) Insert authorization allow insertion of new data,but not modification of existing data.
- 3) Update authorization allow modification, but not deletion of data.

**2)Integrity** involves maintaining the consistency, accuracy and trustworthiness of data over its entire lifecycle. Data must not be changed in transit, and steps must be taken to ensure data cannot be altered by unauthorized people (for example, in a breach of confidentiality).

**3)Availability** means information should be consistently and readily accessible for authorized parties. This involves properly maintaining hardware and technical infrastructure and systems that hold and display the information.

## **Function of DBA:**

- 1) Storage structure and access method definition:** The DBA creates appropriate storage structure and access methods by writing a set of definitions which is translated by data storage and data definition language compiler
- 2) Schema Definition:-** Database schemas are written by database administrator.
- 3) Backup and Recovery:-** DBA also take backup of the data on a backup storage device so that if data can be lost it can be recovered.
- 4) Granting of Authorization for Data Access:-** DBA is responsible for granting the access to the database.



## **Creating, Altering and Deleting Users.**

A database may have many users. Each user must have a user account. Database administrator are users with authority to specify new users, specify user roles and grant general privileges to users.

- 1) Create new user account and new roles.
- 2) Grant roles for users
- 3) revoke roles from users
- 4) delete users
- 5) change user attributes, especially password.

**A new user account is created with the statement ‘create user’**

Syntax:- create user username identified by password

Example:- create user shreyas identified by Shreyas@453

**A role is created with the statement ‘create role’**

Syntax:- create role rolename

Example:- create role users

**A role is created with the statement ‘create role’**

Syntax:- create role rolename

Example:- create role users

Roles are assigned to users with ‘grant’ statements

Syntax:- grant rolename {, rolename2 ...}

To username {,username2 ....}

[with admin option]

Example:- grant users to shreyas

A role is denied with revoke-statement. Only the database administrator that has granted the role may revoke it.

Syntax:- revoke rolename {,rolename2...}

From username {,username2..}

Role is deleted with the drop role statements

Syntax:- drop role rolename

Example:- drop role users

**A user account is deleted with a drop user-statement.Only Database administrators are entitled to use this statement.**

Syntax:- drop user username [cascade]

Example:- drop user shreyas cascade

The password and also other user account attributes may be changed with the ‘alter user’-statement.

The user himself may use this command to change his password.

Syntax:- Alter user username identified by password

Example:- alter user shreyas identified by shreya

## **Protecting the data within database**

### **1)Database Privileges**

When a database object is created such as a schema ,table,or view that object is assigned an owner , the person who executed the create statement. By Default , Database administrators (super users) or object owners are the only users who can do anything with the object.

In order to allow other users to use an object, or remove a user's right to use an object the authorized user must grant another user privileges on the object.

Privileges are granted (or revoked) through a collection of grant/revoke statement that assign the privilege, a type of permission that lets users perform an action on a database object such as:

- ☐ Create a schema
- ☐ Create a table
- ☐ Create a view
- ☐ View (select) data
- ☐ Insert, update or delete table data
- ☐ Drop Tables ,
- ☐ Run procedures

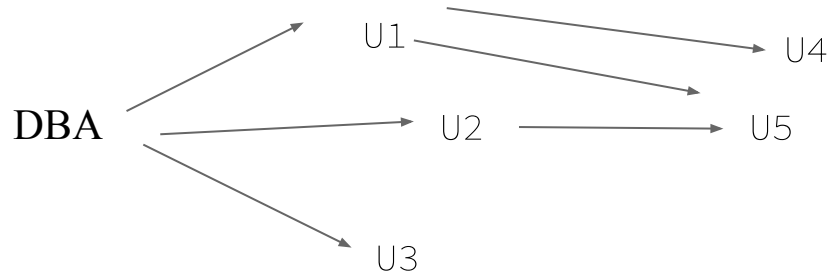
## Protecting the data within database

There are two types of privileges as given below:

- 1) System Privileges
- 2) Object privileges

**System Privileges:-** A system privileges is the right to perform a particular action or to perform an action on any object of a particular type. Object include tables,views,synonyms,index ,sequences,function ,procedure and package.

**Object Privileges:-** An object privilege is the right to perform a particular action on an object or to access another user's object.Object include tables,views,indexes . Privileges can be specified at the column level.



Data Control Language Statements are used to grant privileges on tables, views, sequences, synonyms, procedures to other users or roles.

The DCL statements are

**GRANT** :Use to grant privileges to other users or roles.

**REVOKE** :Use to take back privileges granted to other users and roles.

Grant is use to grant privileges on tables, view, procedure to other users or roles

Examples

Suppose you own emp table. Now you want to grant select,update,insert privilege on this table to other user “SAMI”.

grant select, update, insert on emp to sami;

Suppose you want to grant all privileges on emp table to sami. Then

grant all on emp to sami;

Suppose you want to grant select privilege on emp to all other users of the database. Then

```
grant select on emp to public;
```

Suppose you want to grant update and insert privilege on only certain columns not on all the columns then include the column names in grant statement. For example you want to grant update privilege on ename column only and insert privilege on empno and ename columns only. Then give the following statement

```
grant update (ename),insert (empno, ename) on emp to sami;
```

To grant select statement on emp table to sami and to make sami be able further pass on this privilege you have to give WITH GRANT OPTION clause in GRANT statement like this.

```
grant select on emp to sami with grant option;
```

Use to revoke privileges already granted to other users.

For example to revoke select, update, insert privilege you have granted to Sami then give the following statement.

```
revoke select, update, insert on emp from sami;
```

To revoke select statement on emp granted to public give the following command.

```
revoke select on emp from public;
```

To revoke update privilege on ename column and insert privilege on empno and ename columns give the following revoke statement.

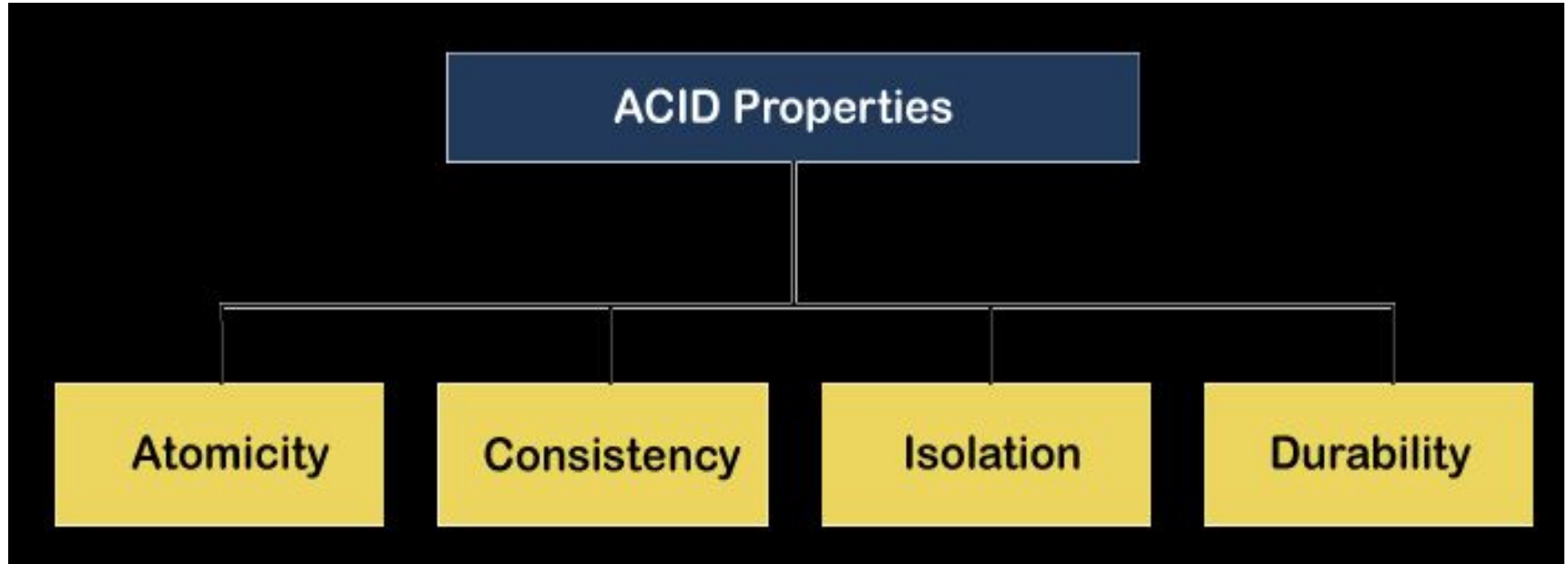
```
revoke update, insert on emp from sami;
```

Note :You cannot take back column level privileges. Suppose you just want to take back insert privilege on ename column then you have to first take back the whole insert privilege and then grant privilege on empno column.



## ACID Properties in DBMS

DBMS is the management of data that should remain integrated when any changes are done in it. It is because if the integrity of the data is affected, whole data will get disturbed and corrupted. Therefore, to maintain the integrity of the data, there are four properties described in the database management system, which are known as the **ACID** properties



**1) Atomicity:** The term atomicity defines that the data remains atomic. It means if any operation is performed on the data, either it should be performed or executed completely or should not be executed at all. It further means that the operation should not break in between or execute partially. In the case of executing operations on the transaction, the operation should be completely executed and not partially.

**2) Consistency:** The word **consistency** means that the value should remain preserved always. In DBMS the integrity of the data should be maintained, which means if a change in the database is made, it should remain preserved always. In the case of transactions, the integrity of the data is very essential so that the database remains consistent before and after the transaction. The data should always be correct.

**3) Isolation:** The term 'isolation' means separation. In DBMS, Isolation is the property of a database where no data should affect the other one and may occur concurrently. In short, the operation on one database should begin when the operation on the first database gets complete. It means if two operations are being performed on two different databases, they may not affect the value of one another. In the case of transactions, when two or more transactions occur simultaneously, the consistency should remain maintained. Any changes that occur in any particular transaction will not be seen by other transactions until the change is not committed in the memory.

**4) Durability:** Durability ensures the permanency of something. In DBMS, the term durability ensures that the data after the successful execution of the operation becomes permanent in the database. The durability of the data should be so perfect that even if the system fails or leads to a crash, the database still survives. However, if gets lost, it becomes the responsibility of the recovery manager for ensuring the durability of the database. For committing the values, the COMMIT command must be used every time we make changes.