Database

Thursday, January 2, 2025 10:12 AM

What is Data?
Data nothing but raw fact and figure.

What is information?
Processed data is called information.

What is a Database?
A collection of interrelated data is called a database.

Type of Database: 1] Structured 2] Un-structure 3] Semi-structured

1. Structured Database : A **structured database** is a type of database that organizes and stores data in a predefined format using tables with rows and columns.
2. **Unstructured Database :** An **unstructured database** is a type of database that stores data in its native format without enforcing a rigid schema or structure.
3. **Semi-structured Database :** A **semi-structured database** is a type of database that allows data to be stored in a format that is neither entirely structured nor entirely unstructured.

Example of DB : College DB

What is DBMS?
The acronym DBMS stands for "Database Management System. "
"A Database Management System (DBMS) is software that provides functionalities to efficiently access, manage, and manipulate data stored in a database."

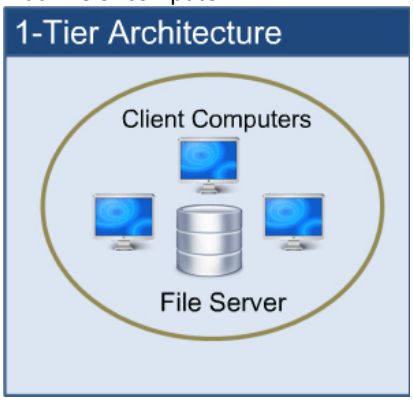
Example of DBMS :- Oracle ,Postgres,..etc

What is file system?
An operating system ' s approach for organising and storing data on storage units like hard drives is called a file system.

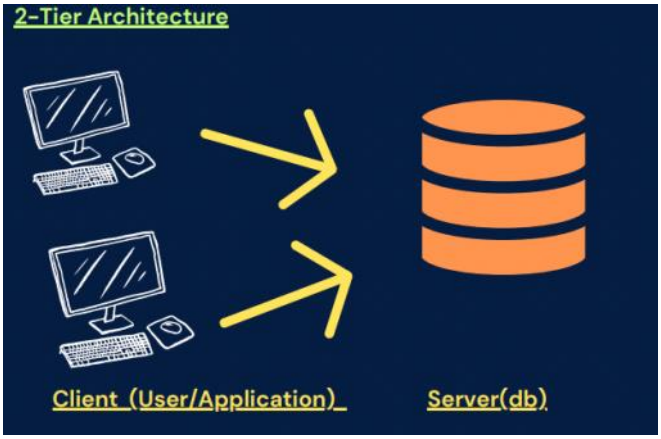
The major disadvantage of file system is
- Data redundancy
- Poor Memory utilization
- Data inconsistency
- Data security

DBMS Architecture:

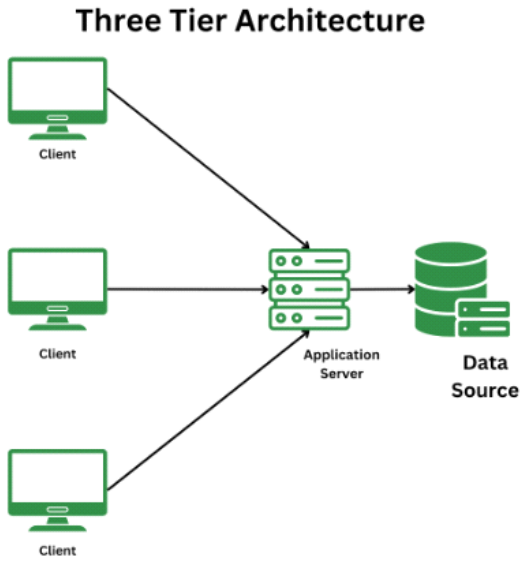
1-Tier Architecture
2-Tier Architecture
3-Tier Architecture
1-tier : In 1 tier architecture the entire database application, including the user interface, application logic, and data storage, resides on a single machine or computer.



2-tier : In 2 Tier Architecture the presentation layer runs on a client (PC, Mobile, Tablet, etc.), and data is stored on a server.



3-Tier Architecture - It separates the application into three logically distinct layers presentation, application, and data layer
Presentation layer- It handles the user interface.
Application layer - It manages business logic
Data layer- It manages data storage and processing. ex- your PC, Tablet, Mobile, etc ex- server ex- Database Server



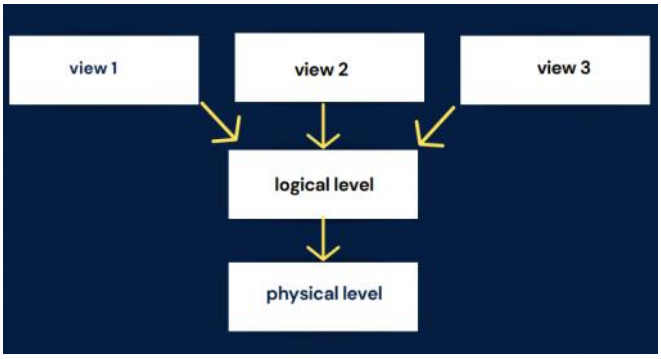
What is schema?
Schema nothing but template of database
Or
Table

Types of schema?
Physical Schema- A physical schema defines how data is stored on the underlying hardware, including details such as storage format, file organization, indexing methods, and data placement. Types of Schema :

. Logical Schema- A logical schema defines the database ' s structure from a logical or conceptual perspective, without considering how the data is physically stored.

What is Table?
Table is a collection of column and rows

Three level of abstraction?



Physical level- This is the lowest level of data abstraction. It describes how data is actually stored in database. You can get the complex data structure details at this level.
Logical level- This is the middle level of 3-level data abstraction architecture. It describes what data is stored in database.
View level- Highest level of data abstraction. This level describes the user interaction with database system.

Data Independence:
DATA INDEPENDENCE Data independence is a fundamental concept within database design and management, emphasizing the distinction between the logical and physical dimensions of data storage and administration in a database management system (DBMS). This principle yields various benefits, such as enhanced flexibility, heightened security, and simplified maintenance.

What is Constraints ?
Constraints define rules or conditions that must be satisfied by the data in the table.
e.g: check, unique

What is key?
Keys - A primary key is a unique identifier for each record in the table. It ensures that each row can be uniquely identified and accessed within the table

Types of key:
1] Primary key
2] Candidate key
3] Super key
4] Foreign key

A primary key is a key which uniquely identifies each record in a table. It ensures that each tuple or record can be uniquely identified within the table. It is always Unique+ Not null.
Candidate Key : A candidate key refers to a group of attributes capable of uniquely identifying a record within a table. Among these, one is selected to serve as the primary key.
A foreign key is a field in a table that refers to the primary key in another table. It establishes a relationship between two tables
Super key is a combination of all possible attribute which can uniquely identify two tuple in a table.
Super set of any candidate key is super key.

Create Table Query :

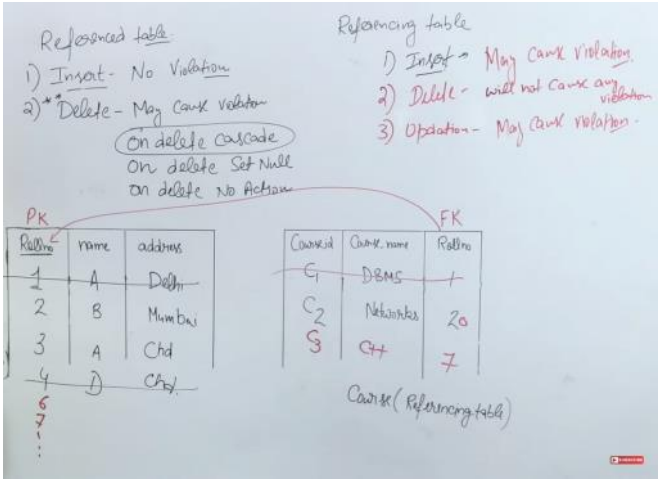
```
CREATE TABLE Students (
   StudentID INT PRIMARY KEY,             -- Primary Key Constraint
   Name VARCHAR(50) NOT NULL,             -- Not Null Constraint
   Email VARCHAR(100) UNIQUE,             -- Unique Constraint
   Phone VARCHAR(15) CHECK (LENGTH(Phone) >= 10), -- Check Constraint
   EnrollmentDate DATE DEFAULT CURRENT_DATE -- Default Constraint
);
```

Foreign key :

```
CREATE TABLE Customers (
  CustomerID INT PRIMARY KEY,
  Name VARCHAR(50) NOT NULL,
  Email VARCHAR(100) UNIQUE
);
```

```
CREATE TABLE Orders (
   OrderID INT PRIMARY KEY,
   CustomerID INT,
   OrderDate DATE NOT NULL,
   Amount DECIMAL(10, 2),
   FOREIGN KEY (CustomerID) REFERENCES Customers(CustomerID)
);
```

```
ALTER TABLE table_name
ADD CONSTRAINT constraint_name
FOREIGN KEY (column_name)
REFERENCES referenced_table_name(referenced_column_name);
```



DATA MODEL
Hierarchical Data Model
Network Data Model
Relational Data Model
Entity-Relationship Model (ER Model)
Object-Oriented Data Model
NoSQL Data Models

Types of Relations in Database Design:

- **One-to-One (1:1) Relation:**
  - One record in a table is related to one record in another table. For example, each employee has one employee ID.
- **One-to-Many (1:N) Relation:**
  - One record in a table is related to multiple records in another table. For example, one customer can place many orders.
- **Many-to-Many (N:M) Relation:**
  - Multiple records in one table are related to multiple records in another table. For example, students can enroll in multiple courses, and each course can have multiple students. This is often modeled with an **intermediate table** (junction table) containing foreign keys to both tables.

A **Many-to-One (M:N)** relationship in a database refers to a scenario where many records in one table are associated with a single record in another table. This relationship is typically represented by a **foreign key** in the "many" side of the relationship that points to the "one" side.