

MODULE : E-101



Lecture - I

Data
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Operating System :

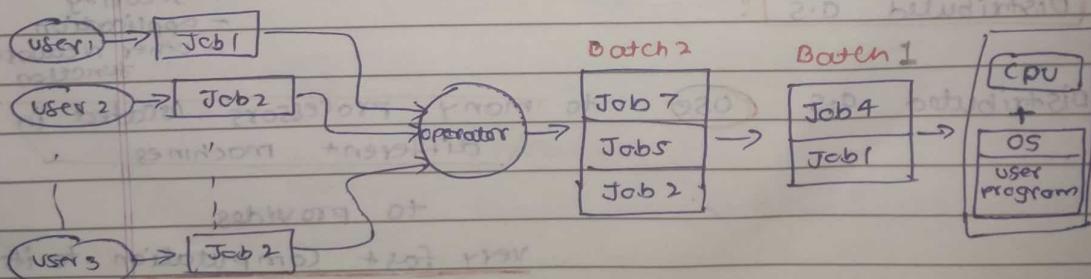
- An operating system (os) is a software that acts as an interface b/w computer hardware component and user.
- Every computer system must have at least one operating system to run other programs.
- Application like Browser, MS office, Notepad games, etc.
- The os helps you to communicate with the computer without knowing how to speak the computer language.
- It is not possible for the user to use any computer or mobile device without having an os.

Types of O.S. :-

(1) Batch O.S. :-

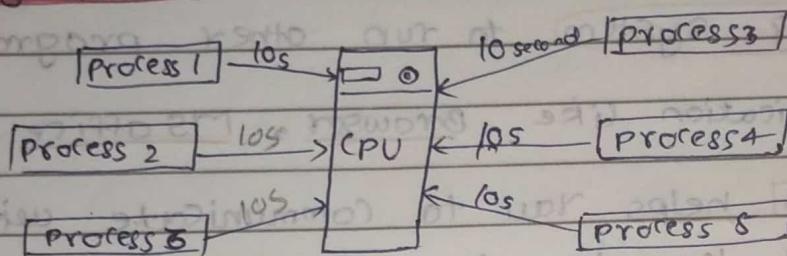
- Some computer process are very lengthy and time-consuming.

- To speed the same process, the similar jobs are grouped together into batches with the help of some operator and these batches are executed one-by-one.
- In this os, user does not interact directly with our computer system.



(2) Multi-Tasking / Time-Sharing: O.S

- The **CPU** will provide a **same time period** to **each** **on every process** to **complete its task** as soon as possible whether it is a **long process** or **short process**



(3) Real time O.S :

- The real time operating system **time interval** to **process** and **respond** to input is **very small**.

ex:- military software , space software system.

- In this O.S **CPU** provides **maximum efforts** to its **task** with **quick response**.

(4) Network O.S :

- Network operating System **run on a server**.

- It provides the capability to serve **to - mange data**
- user
- groups
- security
- application
- other network function

(5) Distributed O.S :

- Distributed O.S **use** **to many processors located in different machines** **to provides very fast computation to its users.**

(6) **Mobile O.S. :-**

- which are especially designed to power smartphones, tablets and wearables device.
- Some famous mobile O.S. are **Android** and **iOS**.

2. **Network :-** A collection of two or more computer connected by some communication medium to share resources and information.

3. **Network Topology :-**

There are many types of network topologies like bus, star, ring, mesh, tree etc.

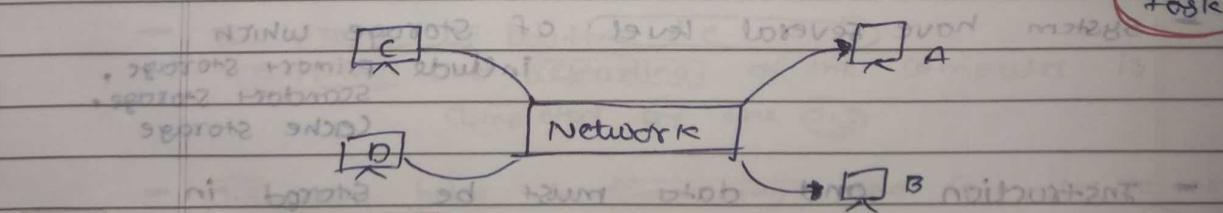
4. **Network Protocols :-**

Protocols define the rules and regulations for data exchange between two devices.

5. **Network Services :-**

Services provided by network include file sharing, printing, messaging, email, web browsing etc.

→ OR - When **many computers** are **interconnected** to each other through a **network** For the purpose of **sharing their task**



uses:
1. **Sharing of resources**:
2. **Communication**:
3. **Centralized management**:

Function of operating System :-

(1) Process management :

- Process management helps OS to create and delete processes
- Suspend or Resume any process
- It also provides mechanisms for Synchronization

Communication among processes.

(Synchronization communication) → exchange of information b/w 2 or more people like video call, phone call.

(2) Memory management :

- Memory management module performs the task of allocation and deallocation of memory space to program in need of these resources.

(3) File management :

- The manages all the file-related activities such organization storage, naming, sharing and protection of files

(4) Device management :

operating system performs the tasks of allocation and deallocation of the devices

(5) Secondary - Storage management:

- System have several levels of storage which include primary storage, secondary storage, cache storage
- Instruction and data must be stored in Primary storage and Cache so that running program can reference it.

- Human readable
 - Suitable for communicating with the computer user
 - printer, terminals, video displays
 - keyword : mouse
- (6) **Security management** :-
- Security management module
 - Protects data and information of computer system against malware threat and authorized access.

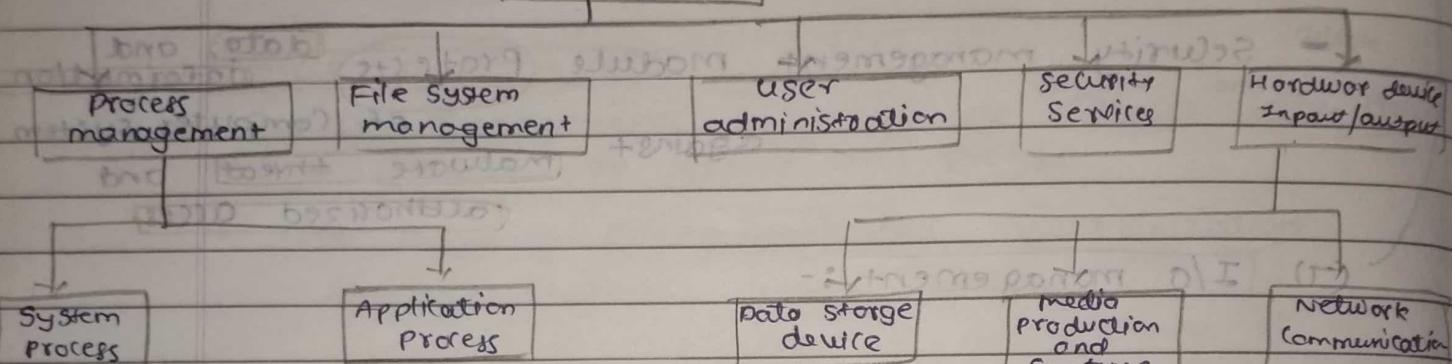
(7) **I/O management** :-

- To process the information, data and instruction are given by the O.S.
- In this way the O.S. does input - output management and sends the information to the users.

(8) **Additional functions of operating system** :-

- The O.S. is responsible for the execution of all types of program whether it be User programs and System programs
- O.S. takes care of the activities of the computer system during various processes
- operating system maintains the performance of the computer so that it can give best performance and good results to user
- The process of booting i.e starting and restarting of the computer is completed by the O.S.
- O.S. also helps in connecting the computer to the network
● It connects our computer to the network through TCP/IP.

Operating System



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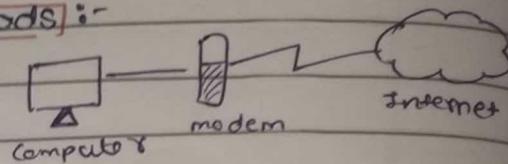
Lecture - 2



Internet connection methods :-

(1) Dial-up :

- A dial-up connection is established b/w your computer and internet service provider (ISP) using modem.



- It is temporary connection.

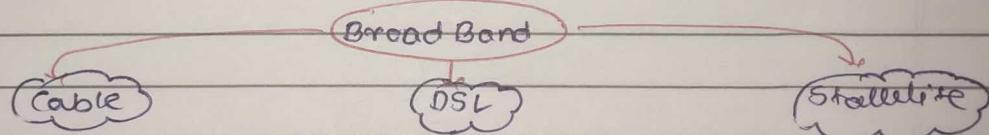
- Dial-up is the slowest connection method.

- Slow Speed 56 kbps.

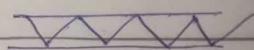
(2) BroadBand :

Broad :- large amount
Band :- Band width

- Broadband is a high-speed connection method.
- This method which can utilize Cable, DSL or Satellite or
- = Broad Band connection is provided through either Cable or telephone companies.
- Speed upto 256 Kbps or 8mbps.



(3) Fibre-optic :



- Fibre-optic communication transmit data by sending pulses of light through ultrathin optical fibers.
- Because light travel so quickly,
- This technology can transmit Internet data at super-fast speeds.

Super-fast speed

- Internet Service provider (ISP):

ISP are companies that connect you to the internet - For a fee, of course

(1) ISP are available on a local, state, and national level

(4) [Web Browser]:

- you'll need to have a web browser installed on your computer

- This software program that allows you to view web pages and navigate the internet

- Microsoft's Internet Explorer is probably the most commonly used web browser

- It often comes pre-installed when you purchase a computer that has a Microsoft Windows O.S.

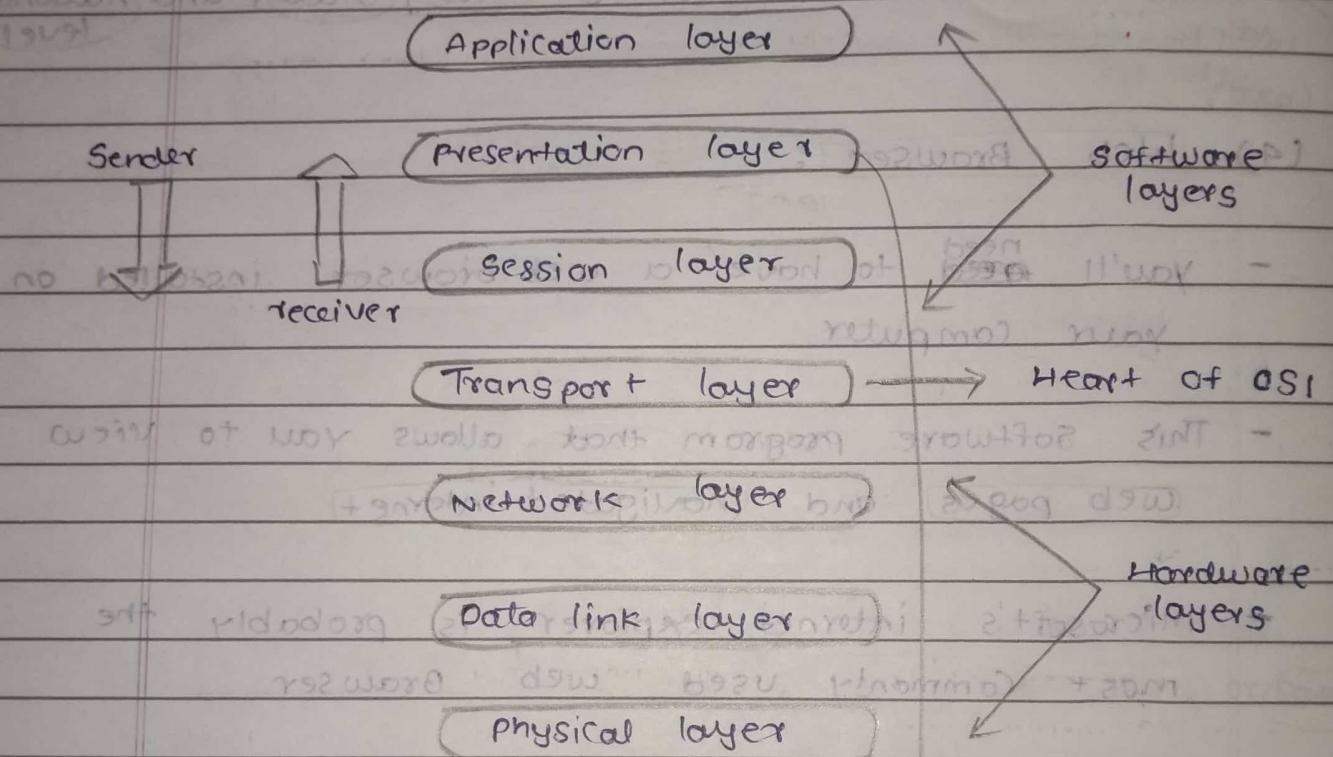
- And/other There are other free web-browsers such as Firefox, Apple's Safari

- You can have more than one browser installed on your computer.

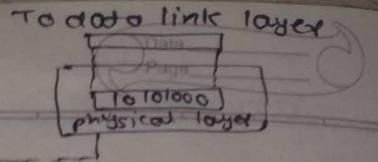
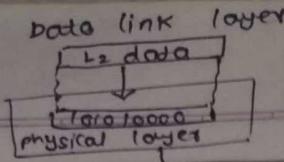
It has been developed by Standard organization (ISO) (international organization for standardization) → open system interconnection

The seven layers of the (OSI) model are described as follows:

→ OSI model consists of 7 layers and each layer performs a particular network function.



(1) **Application layer**: formats or translates data for the application layer.



(1) physical layer :

- The main functionality of the physical layer is to transmit the individual bits from one node to another node.
- It is the lowest layer of the OSI model.

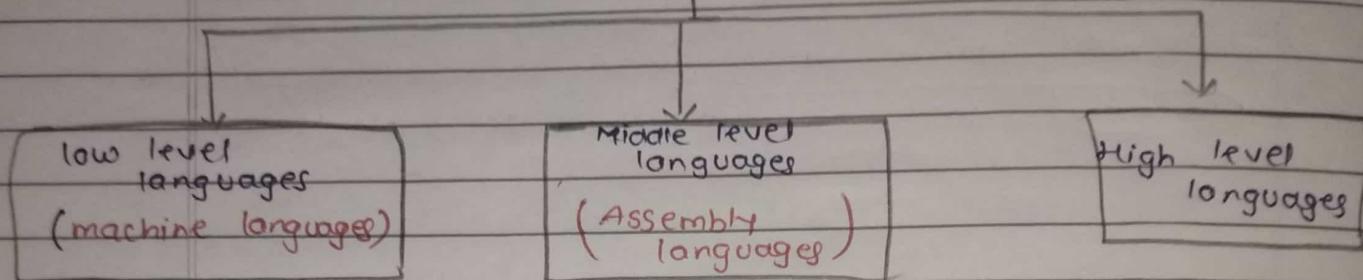
(2) Data-link layer :

- The data-link layer, directly connected nodes are used to perform node-to-node data transfer
- where the data transfer is packages ^{into} frames
- The data link layer also correct errors.
- It contain two sub layer
 - MAC (media access control layer)
 - LLC (logical link control)

(3) Network layer :

- The network layer is responsible for receiving frames from the data link.
- and
- delivering them to their intended destination based on the address contained inside the frame

Computer languages :



use 1's to 0's to
create instructions

ex:- Binary
languages

use mnemonics To
create instruction

ex:- Assembly
language

Similar to
human language

ex:- Basic C, C++,
Java, Python

(1) low - level languages : (Machine language)

- low-level languages is the only languages which can be understood by the computer.
- (Binary languages) is an example of a low-level language
- is also called as (Machine language).
- (1) The binary languages contain only two symbols 1 and 0
- (2) All the instructions of binary languages are written in the form of binary number 1's and 0's
- (3) A computer can directly understand the binary languages
- (4) (Machine language) is also known as Machine code.

- As the CPU directly understands the binary language instructions, it does not require any translator.
- CPU directly starts executing as it does not require any other binary language instruction and takes very less time to execute the instruction as it does not require any translator.
- low-level languages is considered as the **(First-generations languages) (1GL)**

Advantages :

- low-level languages instructions are very difficult to understand.
- A computer can be easily understand the low-level languages.
- A low-level languages instruction directly executes without any translation.
- low-level languages instruction takes very less time for their execution.

disadvantage :

- low-level languages instructions are very difficult to use and understand.
- In low-level languages, there is more chance for errors and it is very difficult to find error, debug and modify.

(2) Middle-level language : (Assembly language)

- Middle-level languages is a computer languages in which the instructions are created using **symbol** such as letters, digit and special character.
- **Assembly language** is an example of middle-level language
- In assembly languages, we use **predefined words** called **mneomics**.
- But the computer cannot understand **mneomics**, so we use a **translator** called **Assembler** to translate **mneomics** into **binary language**.
- **Assembler** is a translator, which **take** assembly code as **input** and produce machine code as **output**.
- That means, The computer **cannot understand** middle-level languages, so it needs to be translated into low-level languages.
- **Assembler** is used to translate **middle-level languages** into **low-level languages**.

advantages :

- writing instructions in a middle - level language is easier than writing instruction in a low - level language.
- middle - level language is more readable compared to low - level languages.
- easy to understand, find error and modify.

disadvantages :

- middle - level language need to translate into low - level language.

- middle - level language executes slower compared to low - level languages.

(3) High - Level language :-

- High - level languages is a computer language which can be understand by the user.
- High - level languages is very similar to Human language.
- every high-level language has a set of predefined words known as Keywords.
a set of rule known as Syntax, to create instruction.
- The High-level languages is easier to understand for the users, but the Computer cannot understand it.
- High - level languages need to be converted into the Low - level languages to make it understandable by the computer.
- we use Compiler or interpreter to convert High - level language to Low - level language.
- languages like COBOL, FORTAN, Basic, C, C++, Java, Python
- All these programming languages use human-understandable language.

- These instructions are converted into low-level language by the Compiler so that the computer can understand it.

Advantage:

- Writing instructions in a High-level language is easier.
- A High-level language is more readable and understandable.
- Easy to Understand, create, create programs, Find error and modify.

disadvantage:

- High-level languages need to be translated into low-level language.
- High-level languages executes slower compared to middle-level language.

Algorithm :-

- An algorithm is a process or step - by - step instruction for solving problem.
- They form the foundation of writing a program.

Advantage of using algorithm :

- (1) It is easy to write
- (2) Techniques to write an algorithm are easy to understand

- (1) You can easily understand the motive of the program.
- (2) Helps in searching / identifying the error.
- (3) Helps in correcting the error.
- (4) Helps to write a complex program in an easy way as because algorithm solves any problem step - by - step.

(5) To solve large problem, algorithm are helpful

Disadvantage of algorithm

- (1) It is not executable
- (2) Error cannot be detected
- (3) There is no syntax to write an algorithm
- (4) If algorithm is wrong then the program written based on that algorithm is also wrong.

Algorithm	Flowchart
(1) Algorithm is a step - by - step procedure to solve a problem.	(1) It is a pictorial representation of a process.
(2) In algorithm plain text are used.	(2) In flowchart symbols and shapes are used.
(3) Difficult to show branching and looping.	(3) Easy to show branching and looping.
(4) Solution shown in non - computer language like English.	(4) Solution shown in graphical format.
(5) Algorithm is easy to debug.	(5) Flowchart is not easy to debug.
(6) Algorithm does not follow rules.	(6) Flowchart follows rules to construct.

Flowchart:

- Graphical representation of algorithm

Advantage of Flowchart:

- (1) ~~common~~ They are a better way of communicating
- (2) Effective way of analysis of problem
- (3) Maintaining the program become easier
- (4) Serves as good documentation.

~~use~~

or

- (1) Easy to draw
- (2) Easy to understand problem solving
- (3) Easy to identify errors.

Disadvantages of flowchart:

- (1) more time is required to draw a flowchart.
- (2) modifying a flowchart is not very easy every time
- (3) It is not suitable for very large problem

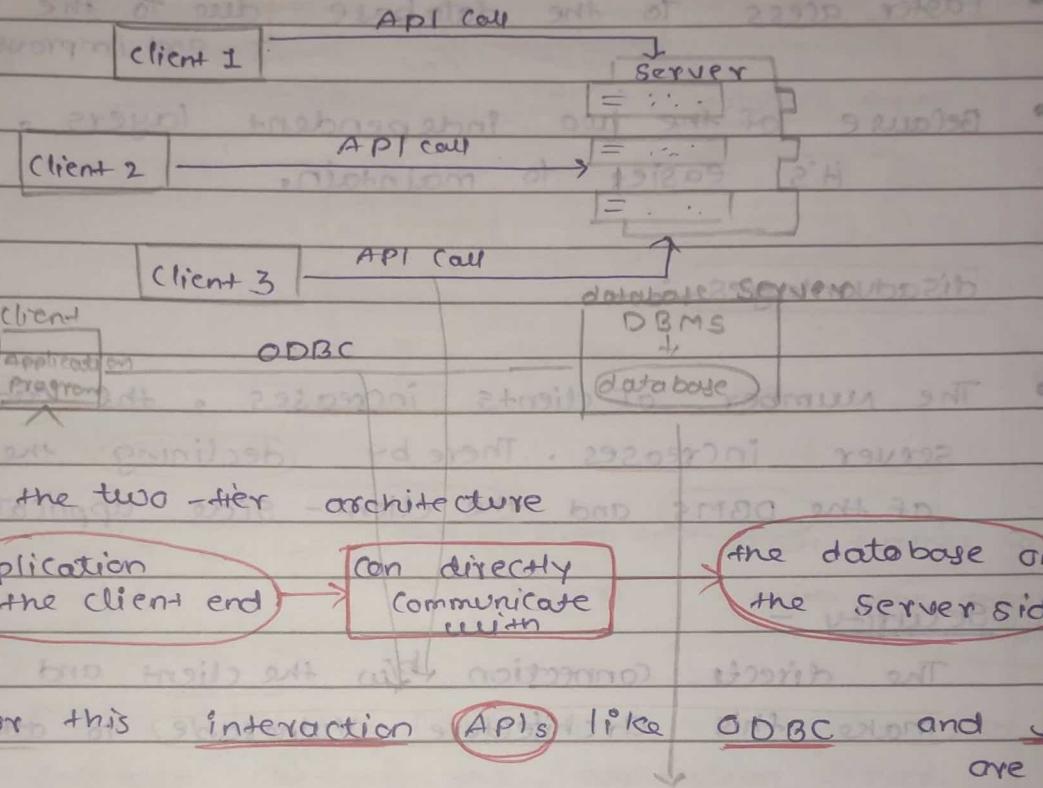
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Database architecture

:-

(2) Two Tier Architecture :-

- The 2-Tier architecture is the same as the basic client - server



- In the two-tier architecture
 - application on the client end can directly communicate with the database on the server side
- For this interaction APIs like ODBC and JDBC are used
- The user interfaces and application program are run on the client side
- The server side is responsible to provide the functionalities like query processing and transaction management
- To communicate with the DBMS, the client-side application established a connection with the server side

Advantages:

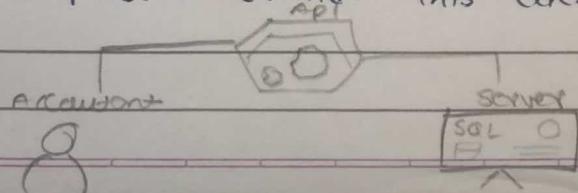
- multiple user can use it at the same time.
Hence it can be used in an organization
- Faster access to the database [due to the direct connection and improved performance]
- Because of the two independent layers, it's easier to maintain.

disadvantages:

- The number of clients increases, the load on the server increases. There by declining the performance of the DBMS and the client-side application.
- Security -
The direct connection b/w the client and server system makes this architecture vulnerable to attack

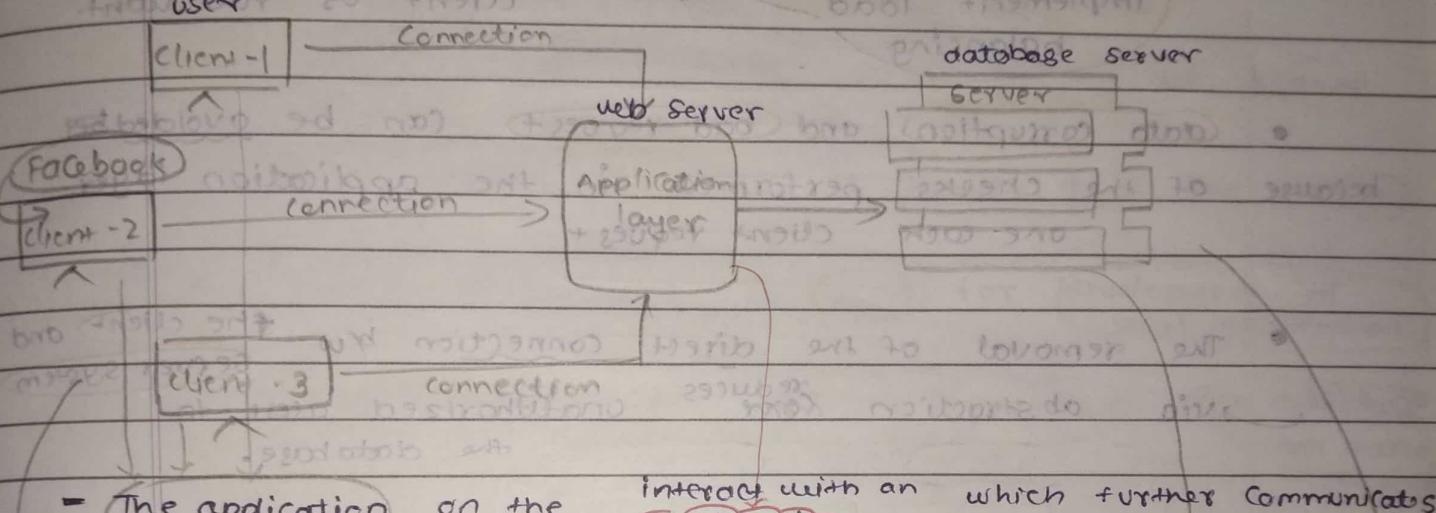
Example:

- Consider a situation where you went to a bank to withdraw some cash.
- After entering the withdrawal amount on the withdrawal slip
- The banker will go the server-side database via API call and will check whether there is enough balance present or not. This client-server model.



(3) Three - Tier architecture :

- The 3-Tier architecture contains another layer between the client and server.
- In this architecture, the client can't directly communicate with the server.



- The application on the client end interface with an application server which further communicates with the database system.
- The end-user has no idea about the existence of the database beyond the application server.

The database also has no idea about any other user beyond the application server.

The 3-tier architecture is used in the case of large web application.

Advantage :

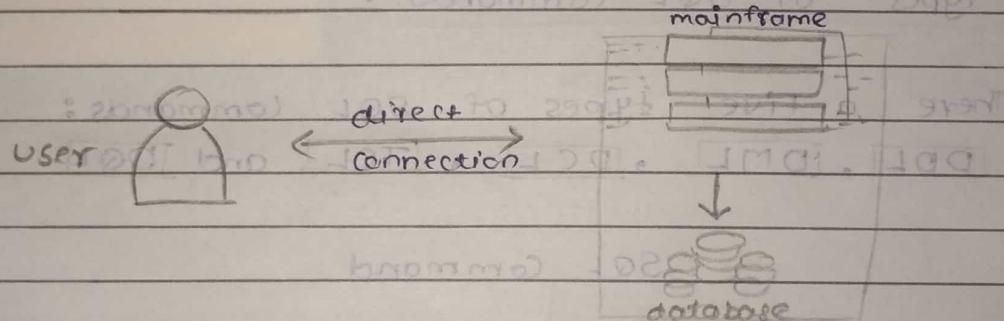
- The **database server** isn't aware of any user beyond the application layer and the application layer **implement load balancing**, **there can be as many client as you want.**
- **Data corruption** and **bad request** can be **avoided** because of the checks performed in the application layer one each client request.
- The removal of the direct connection b/w **the client and server system** via abstraction **reduces unauthorized access to the database.**

disadvantage :

- In 3-tier DBMS architecture, an additional layer (**Application layer**) is added b/w **the client and the server**.
This increases the no. of layers present between the **DBMS** and **end-users**, making the implementation of the **DBMS structure complex** and **difficult to maintain**.

(1) Single Tier Architecture :

- In this architecture the database is directly available to the user.
 - It means the user can directly sit on the DBMS and use it.
- Any changes done here will directly be done on the database itself.
It's doesn't provide a handy tool for end user.
- The 1-tier architecture is used for development of local application.
- Where programmers can directly communicate with the database for quick response.



Ex:- SQL (Structured Query language)

Single tier DBMS architecture is used whenever:

- The data isn't changed frequently.
- No multiple users are accessing the database system.
- we need a direct and simple way to modify or access the database for application development.

SQL Command :-

- SQL command are instructions. It is used to communicate with the database. It is also used to perform specific tasks, function and queries of data.

SQL can perform various task like
 create a table,
 add data to tables,
 drop the data,
 modify the table,
 Set permission for

Another command in DDL :

⑤ Rename :

[Syntax] : rename table-name to new-name

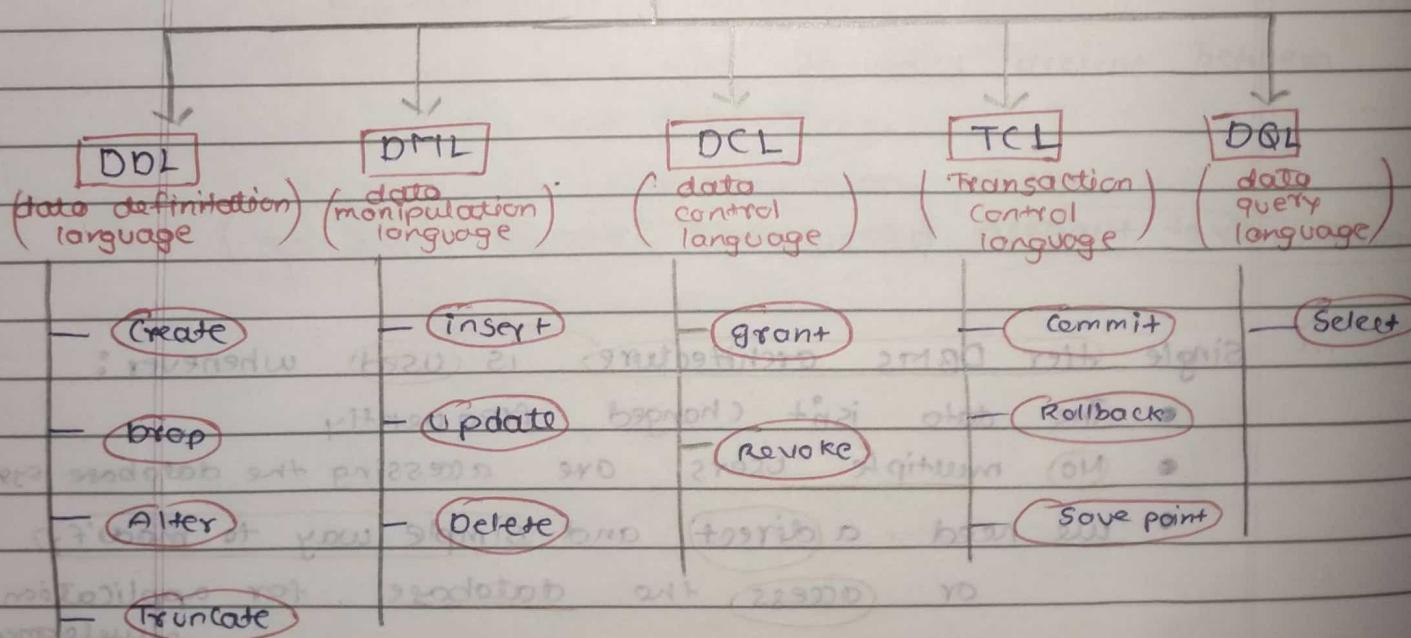
ex: rename EMPLOYEE to EMPLOYEE1

Types of SQL Commands :

There are five types of SQL commands:

DDL, DML, DCL, TCL and DQL.

SQL Command



- All the command of DDL are auto-committed, which mean it permanently save all changes in the database.

(1) Data definition language (DDL):

- DDL changes the structure of the table like creating a table, deleting a table, altering a table etc.

Here are some commands that come under DDL:

- Create, Alter, Drop, Truncate.

① **Create**: It is used to create a new table in database.

Syntax: CREATE TABLE TABLE-NAME (COLUMN_NAME DATATYPES [...]);

Example: CREATE TABLE EMPLOYEE (NAME VARCHAR(20), EMAIL VARCHAR(100)

insert into employee values ('10', 'Abhishek', 'abc@gmail.com', '1990-01-01');

② **Select**: It is used to select data from table;

③ **Drop**: It is used to delete the structure and record stored in table.

Syntax: DROP TABLE table-name;

Example: DROP TABLE EMPLOYEE;

④ **Truncate**: It is used to delete all the rows from the table and free space containing the table.

Syntax: TRUNCATE TABLE table-name;

Example: TRUNCATE TABLE EMPLOYEE;

⑤ **Alter**: It is used to modify the characteristics of an existing attribute and add a new attribute

Syntax: - To add a new column in the table

ALTER TABLE table-name ADD column-name COLUMN-definition;

- To modify existing column in the table

ALTER TABLE table-name MODIFY (column-definitions...);

Example:

ALTER TABLE STU-DETAILS ADD (ADDRESS VARCHAR(20));

ALTER TABLE STU-DETAILS MODIFY (ADDRESS VARCHAR(20));

(2) DATA Manipulation language :

- DML Command are used to modify the database, it is responsible for all forms of change in database.
- The command of DML is not auto-committed, which means it can't permanently save all the changes in the database.
 - They ~~are~~ can be rolled back.

Insert: It is used to insert data into the row of a table.

Syntax: `insert into Table-name`

`value (value1, value2, value3, ..., valueN);`

Example: `insert into EMPLOYEE value (10, 'abhishek', 25);`

Update: This command is used to update or modify the value of column in the table.

Syntax: `update Table-name Set [column_name1 = value1, ..., column_name2 = value2]`

Example: `update employee
set empname = "Abhishek"
set user_name = "Sonoo"
where employee_id = 3;`

Delete: It is used to remove one or more row from a table.

Syntax: `Delete from table-name [where Condition];`

Example: `Delete from employee where emp_id = 10;`

(3) Data Query language (DQL):

- DQL is used to fetch the data from the database.
- It uses only one command.

Select: It is used to Select the attributes based on the condition described by Where clause.

Syntax: `Select * From table-name;`
`Select * From table-name where condition;`

example: `Select * From employee;`
or
`Select * from employee where empid=20;`

`dept varchar(20),`

(4) Data control language (DCL):

DCL commands are used to grant and take back authority from any database user.

(5) Transaction control language (TCL):

- TCL Command can only be used with DML commands like Insert, Update and Delete only.
- they are three commands Commit, Rollback, Savepoint.

Syntax:

(i) Commit;

{ after commit not work}

(ii) Rollback: { before commit while rollback it's work }
→ Back one-step

(iii) Savepoint Save-point-name;

Save Point A;

Insert 1, 2, 3, 4

Rollback to B;

Save Point B;

Insert 1, 2, 3

→ See specific save point

Save Point C;

Insert 1, 2, 3

Save Point D;

(1) Application Layer

Date _____
Page _____

(1) Application layer:

- Application layer is **1st layer** of OSI model.

- Application layer is the only layer where

User can directly interact with the data

- This layer provides **Support services**

User interface such as mail access,

Protocol works under this layer file transfer, web browser
HTTP, FTP, DNS, SMTP
browsing internet, office 365

TELNET, DHCP

(2) presentation layer

- presentation layer is **2nd layer** of OSI model

- The presentation layer **Format** or **translate** the data from application layer based on the **Syntax**.

- it is sometime also called the **Syntax layer**.

- This layer can also handle the

Encryption decryption required by the application layer

(3) Session layer

- presentation layer is **3rd layer** of OSI model

- The session layer **Control** **Conversations**

b/w different computer

- The session

Services also

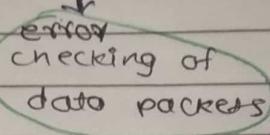
include **authentication** and **reconnections**

(4) Transport layer :

- This model is 4th layer / middle layer of OSI model
- It converts **packets** into **segment**.
- and forward it to the session layer.
- This transport layer → manage the delivery of data packet

ex: TCP

Transmission Control Protocol.



(5) Network layer :

- This layer is 5th layer of OSI model
- Network layer is responsible for receiving frames from the data link layer and delivering them to their intended destination based on the address contained inside the frame
- This layer connects frame into packets

(6) Data link layer :

- This model layer is 6th layer of OSI model
- It converts bit into frames and forward it to the network layer.
- It provides connection hosts on some directly connected nodes are used to perform node to node data transfer

(7) Physical layer :

- This layer is last layer of OSI model
- It converts data into bit and forward it to the data link layer
- In physical layer all the physical connectivity of a network through electrically or waves cables