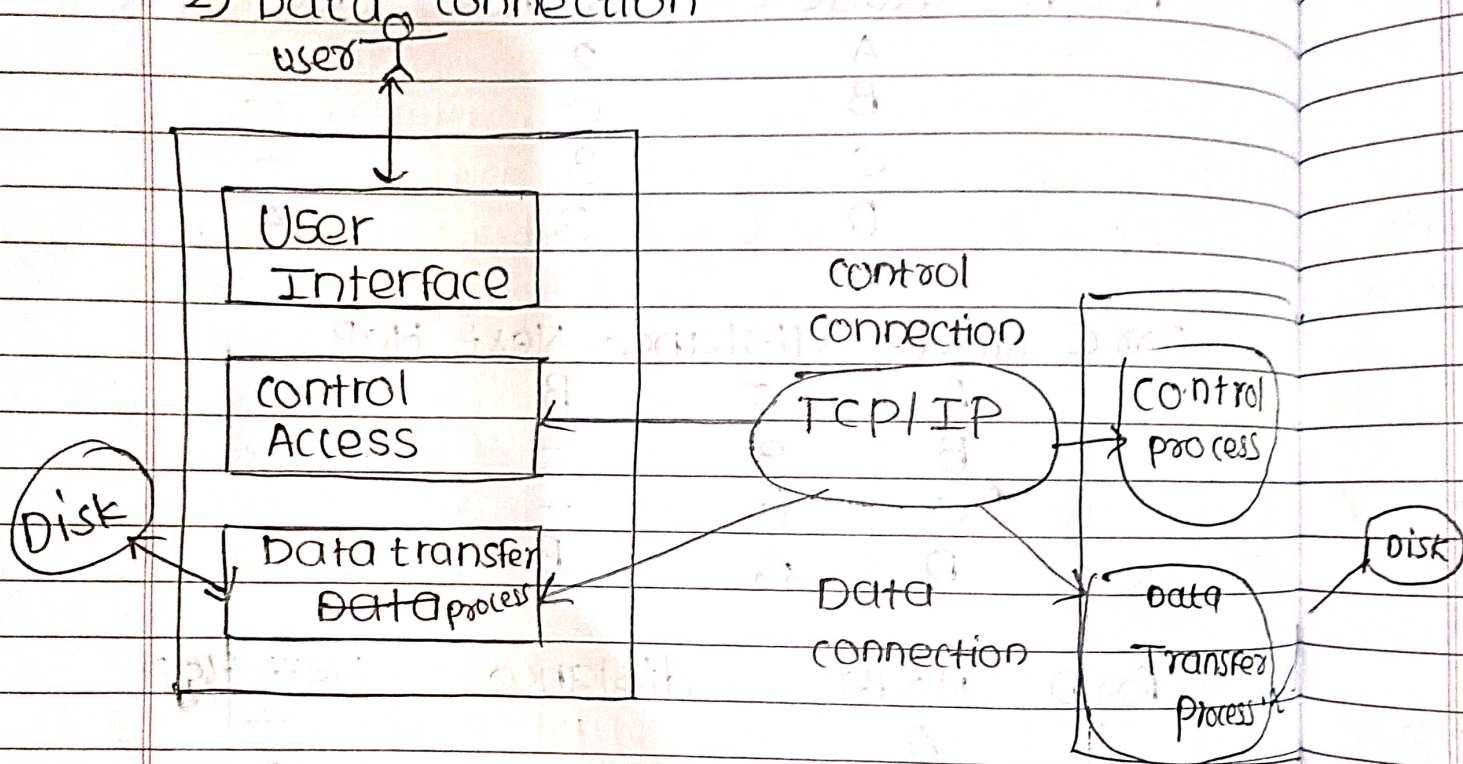# Application Layer

* **FTP: File Transfer Protocol**

1. File Transfer protocol (FTP) is an application layer protocol that moves files between local and remote file systems.

2. It runs on the top of TCP, like HTTP.

3. To transfer a file, 2 TCP connections are used by FTP in parallel:
   1) Control connection
   2) Data connection

File Transfer protocol

* Control connection

1) For sending control information like user identification, password, commands to change the remote directory, commands to retrieve and store files etc.
2) FTP makes use of a control connection.
3) The control connection is initiated on port number 21.

* Data connection

1. For sending the actual file, FTP makes use of a data connection.
2. A data connection is initiated on port number 20.
3.

* FTP Session :

1. When an FTP session is started between a client and a server, the client initiates a control TCP connection with the server side.

2. The client sends control information over this.

3. When the server receives this, it initiates a data connection to the client side.

4. Only one file can be sent over one data connection.

5. But the control connection remains active throughout the user session.

6. As we know HTTP is stateless i.e. it does not have to keep track of any user state.

7. But FTP needs to maintain a state about its user throughout the session.

* Data Structures:
FTP allows 3 types of DS

1. File structure
   In File structure, there is no internal structure and the file is considered to be a continouous sequence of data bytes.

2. Record structure :
   In record structure, the file is made up of sequential records.

3. Page structure
   In page structure, the file is made up of independent indexed pages.

* DHCP :

1. It stands for Dynamic Host configuration protocol (DHCP).

2. It is a client-server protocol that automatically assigns the an Internet protocol (IP) address to device as well as other related configuration.

9. It is an application layer protocol which is used to provide
   1. Subnet mask   (255. 255. 255. 0)
   2. Router address (192. 168.1.1.)
   3. DNS address   (8.8.8.8)
   4. Vendor class   Identifier

4. DHCP is based on a client server model and based on discovery, often, requests and Ack like operations

5. DHCP port number for server is 67 and for the client is 68

6. It is a client server protocol uses UDP service.

* Operations of DHCP :

1. DHCP Operations fall into Four phases

1. **DHCP discover Message**
   1. This is a first message generated in the communication process bet? server and client.

2. This message is generated by client host in order to discover if there is any DHCP server are present in a network or not.

3. This message is broadcasted to all devices present in a network to find the DHCP server

4. This message is 342 or 576 byte long.

* 2. DHCP Offer message

1. This message is broadcasted by server.

2. The server will respond to host in this message Specifying the unleasted IP address and other TCP configuration info.

3. Size of message is 342 byte

4. If there are more than one DHCP servers present in the network then client host will accept the first DHCP offer message if recieves.

*3. DHCP request message:

1. When client receives a offer message.

2. It responds by broadcasting a DHCP request message

3. The client will produce a gratatutions ARP in order to find if there is another host present in the network with the same IP address

4. If there is no host reply by other host then there is no host with same TCP configuration.

5. And the message is broadcasted to server showing the acceptance of IP address.

* 4. DHCP Acknowledgement Msg
1. If response to the request message received.

2. The server will make entry with specified client in and offered with lease time their IP address.

3. Now client will have IP address provided by server.