* APPLICATION LAYER PROTOCOLS

- Domain Name Service (DNS)
- Hyper Text Transfer Protocol (HTTP)
- Simple Mail Transfer Protocol (SMTP)
- File Transfer Protocol (FTP)

1. DNS (Domain Name Service / System)

↳ It is an application layer protocol.

↳ PURPOSE : It converts human readable domain names into machine readable IP addresses.

Basically, it converts the names we type in our web browser address bar to the IP Address of web servers hosting those sites.

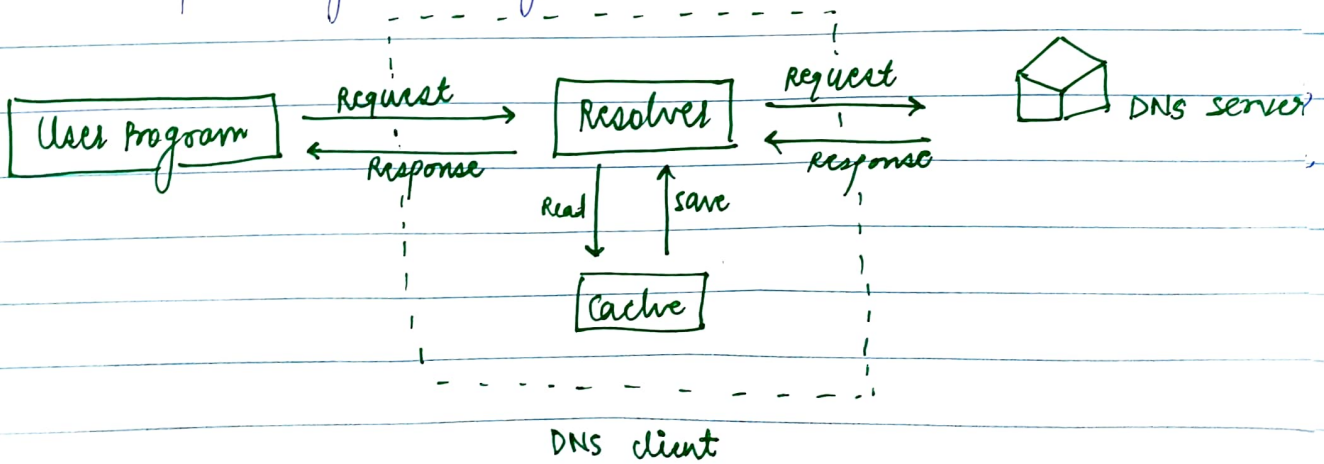
Host Name → Domain Name service (DNS) → IP Address

↳ NEED :

- IP addresses are not static & may change dynamically. So, a mapping is required which maps the domain names to the IP Addresses of their web ~~browsers~~ servers.
- IP addresses are a complex series of numbers. So, it is difficult to remember IP Addresses directly while it is easy to remember names.

↳ **DNS Resolution** :

It is a process of resolving a domain name onto an IP address.



- A user program sends a name query to resolver.
- Resolver looks up the local domain name cache for a match. If a match is found, it sends the corresponding IP address back.
  If no match is found, it sends a query to the local DNS server.
- DNS server then looks up for the same. If a match is found, it returns the corresponding IP address to the resolver.
  If a match is not found, the local DNS server sends a query to a higher level DNS server. This process is continued until a result is returned.
- After receiving the response, the DNS client returns the resolution result to the application.

↳ DNS uses UDP at the transport layer. bcoz -

1. UDP is much faster than TCP. TCP is slow as it uses Three-way handshaking to start the data transfer.
2. DNS requests are very small. So, they fits well within UDP segments.
3. Although UDP is not reliable but reliability can be added on application layer by using timeouts. Hence, in the end both speed & protection is achieved.

4.

↳ DNS uses UDP at the transport layer for replying to the DNS queries of clients. ∴ DNS is a connectionless protocol.

↳ DNS is non-persistent.

2. HTTP (HYPER TEXT TRANSFER PROTOCOL)

↳ It is an application layer Protocol.

PURPOSE:

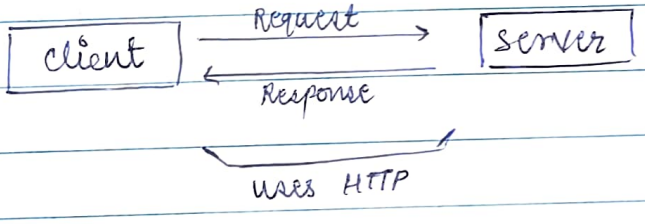
↳ It is used to access data from the websites throughout the internet. Basically, it is used to access data over the world wide web.

↳ It works on the top of TCP/IP protocol suite.

WORKING:

↳ HTTP uses client-server model where -

- web browser is the client & the client communicates with the web server hosting the website.



Whenever a client requests some information to the website server, the browser sends a request message to the HTTP server for the requested objects.

Then,

- HTTP opens a connection b/w the client & server through TCP.
- HTTP sends a request to the server which collects the requested data.
- HTTP sends the response with the requested data back to the client.
- HTTP closes the connection.

HTTP Connections: 2 types -

(1) Non-persistent HTTP connection

(2) Persistent HTTP connection

Non-Persistent HTTP connection	Persistent HTTP connection
• It is used for serving exactly one request and sending one response.	• It is used for serving multiple requests.
• It closes the TCP connection automatically after sending a HTTP response.	• It closes the TCP connection only when it is not used for a certain amount of time.
• A new separate TCP connection is used for each object.	• A single TCP connection is used for sending multiple objects one after the other.

↳ HTTP uses TCP at the transport layer because -
- unlike UDP, it guarantees the delivery of data via a three-way handshake.
- It ensures the retransmission of lost packets.

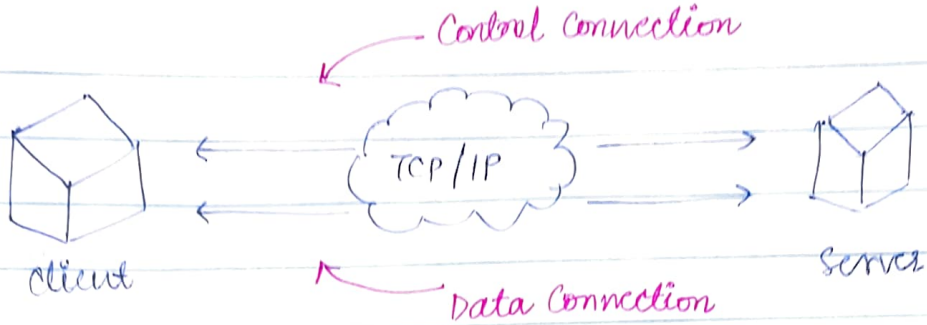
↳ HTTP uses port no. 80

3. FILE TRANSFER PROTOCOL (FTP)

↳ It is an application layer protocol.

PURPOSE : ↳ This protocol is used for transmitting the files from one device to another or it is used for exchanging the files over the internet.

WORKING : FTP establishes 2 TCP connections b/w the client & the server.
- One connection is used for transferring data.
- Other connection is used for transferring control information.



↳ Characteristics of FTP-

- FTP uses TCP at the transport layer.
- FTP is a connection-oriented protocol.
- Emails can't be sent using FTP bcoz FTP requires the connection establishment b/w the client & the server before transferring the files. so, both have to be online at the same time.
- FTP can transfer one file at a time.

4. SNMP (Simple Network Management Protocol)

↳ It is an application layer protocol.

PURPOSE: ↳ It is used for managing & monitoring the network devices.

SNMP enables network administrators to manage network performance, find and troubleshoot network issues, & collect information about network devices & their configurations.

WORKING: SNMP operates in a client-server model, where a network device, referred to as an SNMP agent, communicates with an SNMP manager, also called as an SNMP Network Management System (NMS).

SNMP components -

There are 3 components of SNMP.

1. SNMP agent : SNMP agent collects & stores data about the device's configeration, status & performance in a hierarchical structure known as the Management Information Base (MIB).

2. SNMP manager : It requests information from the SNMP agent, receives the data, & analyzes it to determine the network device's health & performance.

3. Management Information Base : MIB consists of information on resources that are to be managed.