Application Layer

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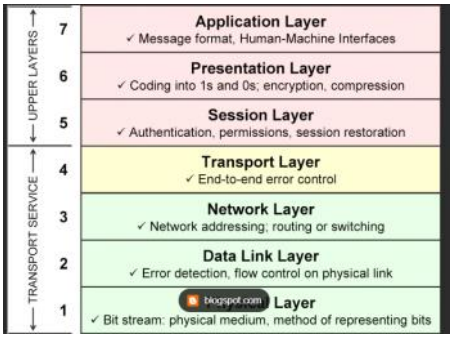
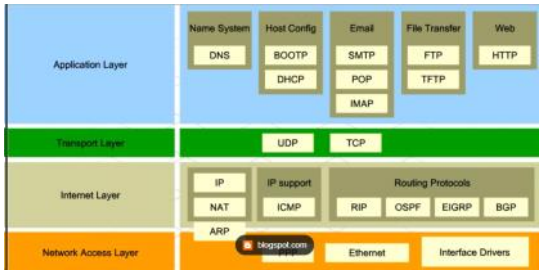


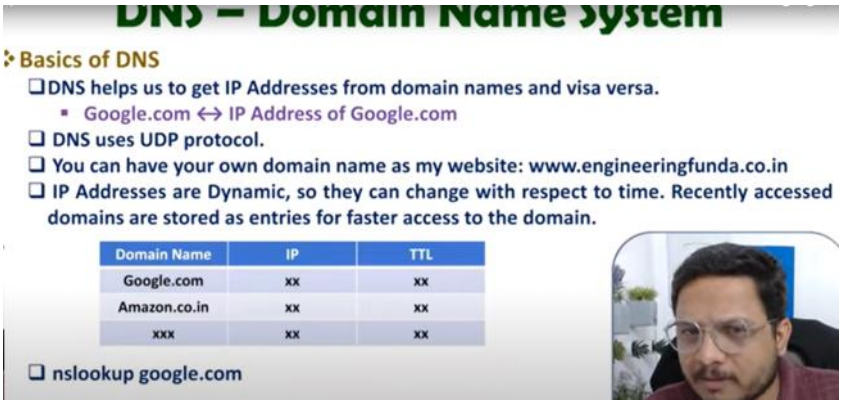


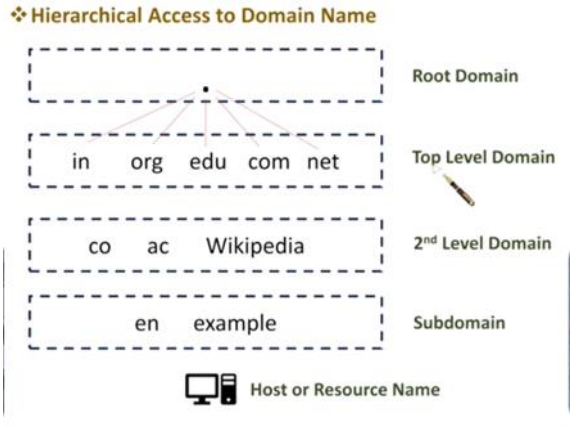
- Modularity: By organizing protocols into layers, the TCP/IP model achieves modularity. Each layer has a specific function, and changes in one layer do not necessarily affect the others. This modularity allows for easier development, maintenance, and upgrades of network protocols.
- Interoperability: Different layers provide standardized interfaces, ensuring that protocols at one layer can communicate with those at adjacent layers. This promotes interoperability between different hardware and software implementations.
- Abstraction: The layering allows for abstraction, where higher layers don't need to know the details of how lower layers operate. This simplifies the design and promotes flexibility in the development and evolution of protocols.

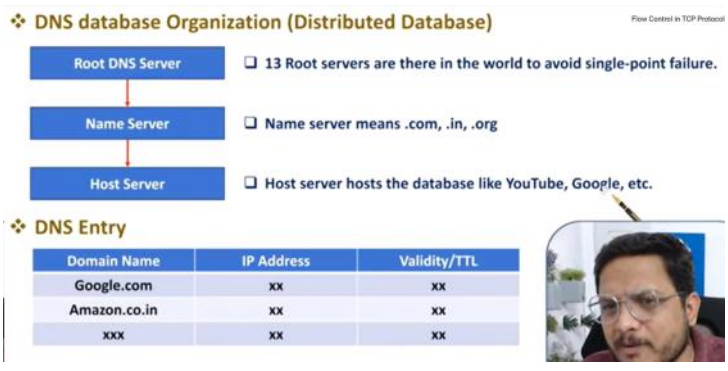
In summary, the layering of different protocols in the TCP/IP model provides a structured and organized approach to designing, implementing, and maintaining the diverse set of functionalities required for effective communication in a networked environment.

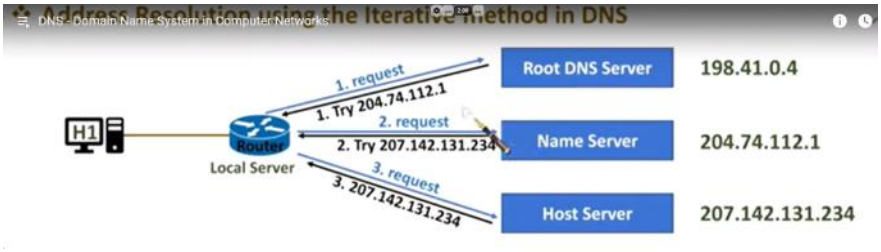
IP is an address which we use to communicate to another system
Domain name are google.com , yahoo.com

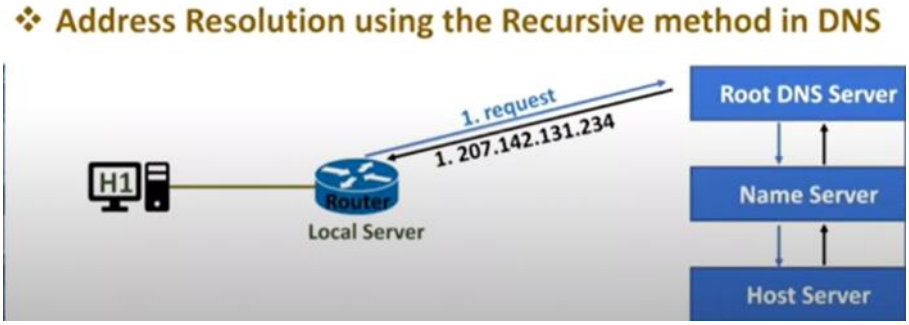
SMTP and POP are protocol regarding Email Services
For forwarding email we use SMTP











once (any) name server learns mapping, it caches mapping

cache entries timeout (disappear) after some time

DNS Records gives the information about the domain name

DNS: distributed db storing resource records (RR)

RR format: (name, value, type, ttl)

- Type=A
  - **name** is hostname
  - **value** is IP address
- Type=NS
  - **name** is domain (e.g. foo.com)
  - **value** is hostname of authoritative name server for this domain
- Type=CNAME
  - **name** is alias name for some "canonical" (the real) name `www.ibm.com` is really `servereast.backup2.ibm.com`
  - **value** is canonical name
- Type=MX
  - **value** is name of mailserver associated with **name**

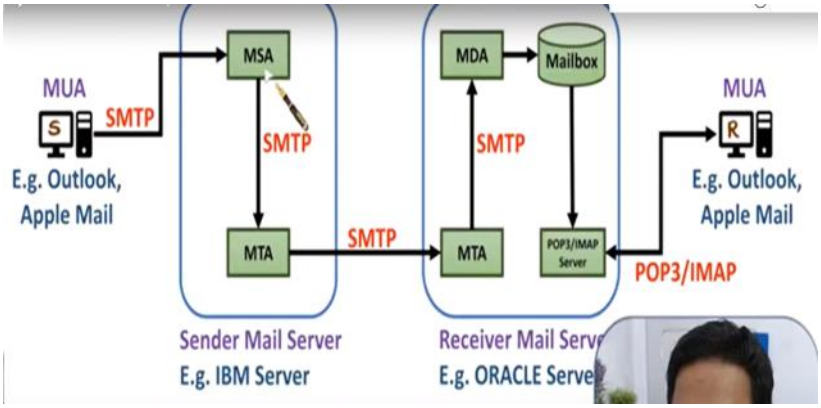
TTL is the cache time

TLD means top level Domain Server

DNS Record Dekhna hai ek baar

Electronic Mail

SMTP, POP3, IMAP



SMTP & POP

- FTP is synchronous but SMTP & POP is both synchronous & asynchronous
- SMTP Port no 25 for pushing the mail
- By default, the **POP3 protocol** works on **two** ports: Port **110** - this is the default **POP3** non-encrypted port. Port **995** - this is the port you need to use if you want to connect using **POP3** securely.
- MIME(**Multipurpose Internet Mail Extensions**)

MSA means message submission agent
MTA means message transfer agent

MDA means message Delivery agent

POP3 will be used to retriving email from the reciever server to reciever computer so we can say that SMTP is used to PUSH EMAIL

Parameters	SMTP	POP	IMAP
Full Form	Simple Mail Transfer Protocol	Post Office Protocol	Internet Message Access Protocol
Transfer Type	Send Mail (Push Mail)	Retrieve Mail (Pop Mail)	Retrieve Mail (Pop Mail)
Port Number	25	110 (Default) & 995 (SSL)	143 (Default) & 993 (SSL)
Transport Layer	TCP	TCP	TCP

In short and simple terms:

POP3 (Post Office Protocol 3):
- Downloads emails to your device.
- Typically removes them from the server.
- Doesn't sync changes across devices.
- Best for single-device use or when you want to save space on the server.

IMAP (Internet Message Access Protocol):
- Keeps emails on the server.
- Syncs changes across multiple devices.
- Allows you to access the same mailbox from different devices.
- Good for those who use multiple devices or want to keep emails on the server.

HTTP Protocol

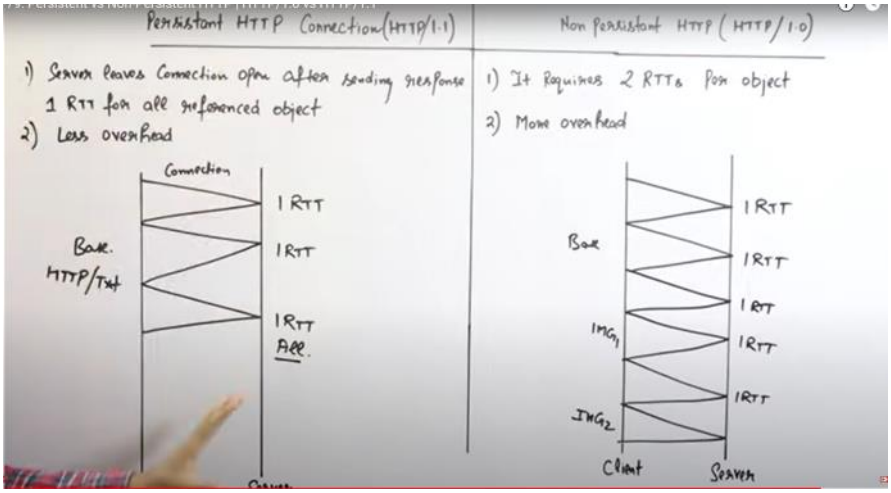
❖ Basics of HTTP/HTTPs
- ❑ HTTP is Hypertext Transfer Protocol.
- ❑ Port Number for HTTP is 80.
- ❑ At the transport Layer, HTTP usually uses TCP for reliable services.

- ❑ Server stays stateless. Many clients are connected to the server, so the server can not maintain the state of each client.
- ❑ Client state is maintained using cookies.
- ❑ HTTP is in Band protocol. {Command and Data are on the same connection}

❖ Types of HTTP
- ❑ HTTP 1.0 {Non Persistent Connection}
  - TCP connection is established for each HTTP request-response transaction.
  - After the server sends the response back to the client, the connection is closed.
  - If the client needs to make another request, it has to establish a new TCP connection.
    - Simple Implementation
    - Predictable resource usage
    - Increase in overhead
    - Higher latency
- ❑ HTTP 1.1 {Persistent Connection}
  - The client and server maintain the connection open after the initial request-response exchange.
  - So for a new request by the client, no need to establish a new TCP connection.
    - Reduced Overhead
    - Faster Response Time

HTTP
- Port no 80
- Itself not reliable but use TCP to achieve reliability
- Inband Protocol
- Stateless
- HTTP 1.0 Non-Persistent
- HTTP 1.1 Persistent
- Commands(Head, Get, Post, Put, Delete, Connect)

❖ HTTP Methods
- ❑ GET: The GET method is used to retrieve data from the server.
- ❑ HEAD: It is similar to the GET method, but it requests only the headers of the resource and not the actual content.
- ❑ POST: Post is used in filling forms on the server. In the POST method, the client fills forms back to the server.
- ❑ PUT: PUT method is used for uploading the object on the server. {Upload file on server}
- ❑ DELETE: The DELETE method is used to request the removal of an object on the server.
- ❑ CONNECT: The CONNECT method is used by HTTPS to enable secure connections.



FTP

❖ Basics of FTP, SFTP & TFTP

- ❑ FTP, SFTP & TFTP are used to transfer files over the computer network.
- ❑ FTP – File Transfer Protocol (Port Number = 21)
  - It has two channels, one is for data and the second is for command. (Out-of-band protocol)
  - It has no encryption, so data tempering is possible.
  - It uses TCP for data communication.

FTP

- Port no 20(DATA) & 21(Control)
- Data connection is non-persistent
- Control connection is persistent
- Not Inband
- Reliable
- Stateful