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Set of rules and regulations are Protocols.

Internet → Represent WAN

internet → Reperesent LAN

Network core are mash of routers

Network edge are end users.

Routers are devices that connects networks.

Routers do packet switching i.e. providing as needed.

Relibility is when reciever recieve sender message.

Resource utilization are Through-put.

Dynamic Adaptive Streaming over http

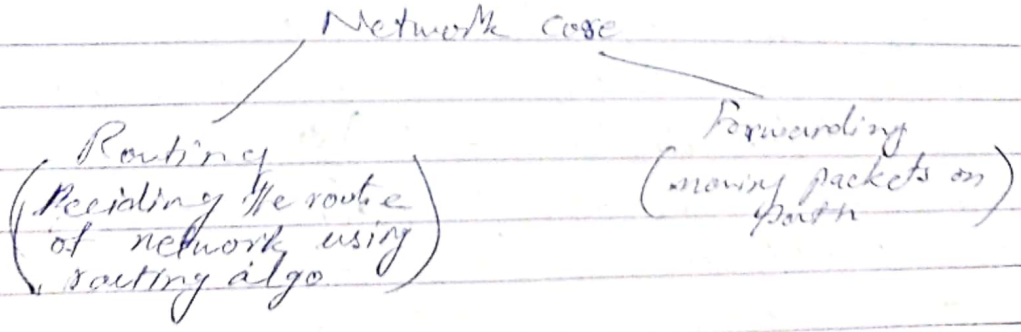
TCP are slower than UDP. UDP is used for streaming

- Packet size are represented as L. can be in bits.
- Bandwiths are R.
- Delay depends on size of packet and ~~packet~~ bandwith of link by L/R.

↑L R↓ ⟶ More delay

↓L R↑ ⟶ Less delay.

- Routers mashup are network core which have more reliability.
-



COPY

Routers run of IP addresses.
Unless the reciever acknowledge recieving packets, the sender donot delete copied packets in buffer.

| no. of hops × L/R |

- Packets stored in buffers known as queue.
- When R1 ~~and R~~ at first then R2 after router, then a queue will be generated.
- When buffer fills up then more packets arriving at the router will be lost.
- Frequency division → allocates same amount of resources to all.
- Time division → allocates higher resources for specific time for one user.
- Tier ISP are international service providers.
- All Tiers connect to IXP.
- IXP is now connected with Regional ISP.
- Then it is more distributed to access ISP which are internet providers locally.
- Delays
  - → Processing delay which occurs when request process through all layers.
  - → Queue delay (occurs when packet size and bandwidth diff.)
  - → Transmission delay (occurs when packets donot move forward)
  - → Propagation delay occurs when travelling from one part to another.

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Presentation layer decides the data representation.
Application (Session) layer contains process with a gateway. process traffic are assigned * with sockets which are combinations of IP and Ports (2^{16})
* process ID which are

- Transport layer contain TCP and UDP. Connection contain more input less output. Flow control decide the flow and throughput.
- TCP is not secured which is why we use SSL certificates. TCP are slower
- UDP is faster used for gaming.
- Network layer contain network design. It interacts with IP address. (source / destination).
- Data link layer contain switches contains MAC address.
- Physical layer decides & topology of the network.
- Ethical Hacking are used to check hacking attacks.
- Packet sniffing is when a third server gets sitting between a source and destination.
- IP Spoofing. when source is someone else and is shown someone else. Just like VPN
- Denial of service request when lots of request are generated that all request are blocked.
-

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CHAPTER # 02

- Application layer have nothing to do with network core devices.
- Softwares are for end devices.
- Server should always be available, static.
- Client requests and server responds.
- Client cannot communicate to each other directly.
- It always communicate through server.
- Cookies are current state stored by assigning a client ID.
- Cookies are mentained by servers.
- In Peer to Peer no need to be always on.
- Rare first approach is used in P to P.
- Client is also server (in P to P).
- In client Server a central server helps client communicate.
- Sockets are combination of IP and port.
- Process communicate through sockets.
- Message semantics have a checksum field to identify errors.
- Error corrections are only done by data link layer.
- Message syntex determine details of the message sent.
- Data integrity depends on reliability.
- TLS Uberaries secure TCP. converting data into ~~encription~~ cypher text.

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- Object load one by one on the web.
- Highest resolution load at the end.
- HTTP uses TCP for reliability.
- HTTP was stateless.

HTTP

Non persistent | Persistent.

- RTT → Round Trip Time → The time it takes for requ to be sent from client to server and its re from server to client.
- Persistent is faster than non persistent.
- For non persistent. (HTTP 1.0)
  2RTT + file download time.
- Per object need 2RTT in non persistent
- Persistent use HTTP 1.1
- [illegible]

- Specific URL embed → HEAD
- Sending input → POST
- Asking resources → GET
- Upload on web → PUT
- Copying data on sub server from main server is called proxy.
- States are maintained through cookies.
- Cookie ids are used to ease use.
- History is cookie.

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- Satisfy client request without involving main server.
- Web caches are local servers where cookies are maintained.
- Utilization = Bandwidth utilize / Total Bandwidth.
- Increase access link = Utilization lower
- Install web cache = utilization lower
- Access link increased means cost increase.
- Web cache is one time investment.
- Modify constraint is used to check any updates in main server by client server.
- In HTTP 2 priorities are set in sending objects. (slicing / round robin)
- In HTTP 3 UDP is used in transport layer and all the security is shifted on application layer.
- Now programmer secure it by using QUIC protocol.
- HTTP 1.0, 1.1 and 2 uses TCP.
- HTTP 3 is faster.
- Email use Simple Mail Transfer Protocol. (SMTP)
- ~~User agent~~ Mail reader.
- Mail → mail server (sender) → Checking → Mail server (reciever) → User agent. SMTP
- Greeting → Transfer → Closure (SMTP)
- User agent is the mail composer & viewer.
- HTTP is client pull → data is pulled
- SMTP is client push. → data is pushed.

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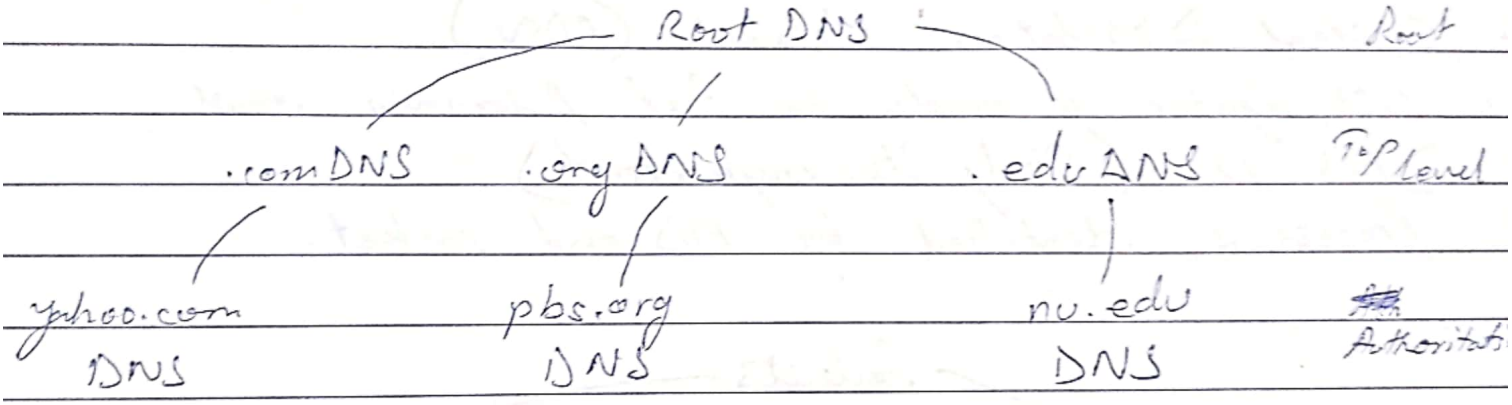
- Internet Mail Access Protocol (IMAP)
- Offers message store edit delete etc on server.
- We use IMAP.
- Post Office Protocol 3 (POP3)
- DNS → Domain Name System is a type of server.
- MAC is portable IP is not.
- DNS converts IP to name and name to IP
- Mail. Domain is stored in MX.
- DNS is distributed.
-



- Servers give addresses of each other in iteration
- Proxy servers maintains caching.
- U be server capacity. File distribution time.
  n be no. of files
  F be file size.

Time of send n copies = NF/Us ← uplaod Speed

File download time ≥ max (NF/Us, F/dmin)

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to peer to peer.

Time of distribution $\max(F/u_s, F/d_{min}, nF/(u_s + \sum u_i))$

(Download Time) — no. of clients.

- Client first register in trackers in P2P.
- After 30 sec peer changes.
- Every video has a manifest file containing URLs maintained by server. (frame rates).
- ECN detects conjection while streaming stored video to manage frame rates in manifest file.
- Content Distribution Network (CDN)
- URL register is made by first A domain and the DNS RP (Study its important)
- Process is identified by PID and socket.

Sockets

UDP
- no connection
- non reliable
- non recoverable

TCP
- connection build
- reliable
- recoverable