CN-Lecture 1

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Chapter 1

L2

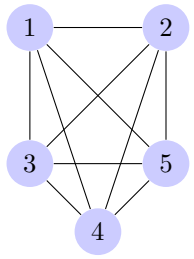
1.1 Routings

1.1.1 Client-Server Routing

- Connecting client to server using router.
- Every interface of router has a unique IP and Mac Address.
- The process:
  - Client sends a request to the server in the form of a payload.
  - the playload contains the IP and MAC address of the server.
  - Router receives the payload and matches the ¡IP, MAC¿ address of the server.
  - If it matches then the router forwards the payload to the server.
  - Else the router looks up the IP address of the server in the routing table.
  - Then the router will forward the payload to the next router.
  - Router forwards the response to the client.
- Each router has a routing table which contains the IP address of the server and the next router.
- Types of routing:
  - Hop-hop → Between two routers.
  - Src-dst → Between client and server.
  - Process-process → Port-port hop
- Each request has a header(metadata) and a payload(data)
- The layer of the request is generally:
  - Destination Mac Address
  - Destination IP Address
  - Port and extra important information

1.2 Network Topology

1.2.1 Point to Point Network

- A network in which there is a direct link between every pair of nodes.
- The link can be wired or wireless.
- Robust: If one link fails, the other links are not affected.
- Not Scalable (Not feasible for large networks) as it has $O(n^2)$ links.
- For each new node, we need to add $O(n)$ links.
- 

1.2.2 Multipoint Network (Broadcast Network)

- A network in which there is a single link (Bus) between all the nodes.
- The link can be wired or wireless.
- Not Robust: If the link fails, the whole network fails.
- Scalable (Feasible for large networks) as it has $O(n)$ links.
- For each new node, we need to add $O(1)$ links.
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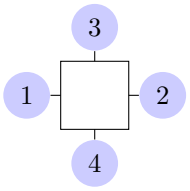
1.2.3 Switch Based Network

- A network in which there is a switch between all the nodes.
- Switch is a device that forwards data packets between nodes. It recieves data packets from a port and forwards it to the destination port.
- Once Receieved:
  - Switch has a CPU which reads the header of the packet and finds the destination port via routing table. This is called **Forwarding** or **Routing**.
  - Switch forwards the packet to the destination port by establishing a connection between the ports. This is called **Switching**.

  - There might be a buffer in the switch which stores the packet if the destination port is busy. If there is new info without the buffer, then the package is dropped in order to avoid collision.

- The link can be wired or wireless.
- Robust: If one link fails, the other links are not affected.
- Scalable (Feasible for large networks) as it has $O(n)$ links.
- For each new node, we need to add $O(1)$ links.
- 

1.2.4 Tree/Hybrid Network

- A network in which there is a combination of all the above networks.
- It is a tree like structure. One switch is connected to other switches and the other switches are connected to the nodes.
- The link can be wired or wireless.
- Robust: If one link fails, the other links are not affected.
- Scalable (Feasible for large networks) as it has $O(n)$ links.
- For each new node, we need to add $O(1)$ links.

1.3 Switching Techniques

1.3.1 Overview

- Switching is the process of transmitting data from one node to another node.
- There are three types of switching techniques:
  - Circuit Switching
  - Packet Switching
- The switching technique is selected based on the type of data to be transmitted.

1.3.2 Circuit Switching

- Each node is connected to the other node via a dedicated link.
- Will be used when the data is in the form of a stream or when it needs to switch in real time.
- Pros:
  - No delay in transmission.
  - No congestion.
  - No packet loss.
  - No overhead like headers are required.
- Cons:
  - If the link fails, the whole network fails.
  - If the link is idle, it is still reserved.
  - If the link is reserved, it cannot be used by other nodes. i.e, it is serially processed.
- eg: Telephone Network

1.3.3 Packet Switching

- Data is divided into packets and each packet is transmitted individually.
- Each packet is routed independently.
- Pros:
  - If the link fails, the other links are not affected.
  - Better utilization of the link and the network.
  - Can process packets in parallel.
- Cons:
  - Delay in transmission.
  - No isolation between packets.
  - Needs to have a buffer to store the packets.
  - Needs to have a header for each packet.
- eg: Internet