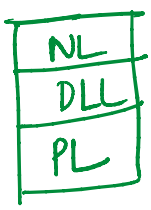
Module-4: Network Layer-1

Friday, February 25, 2022 10:53 AM

Transport Layer → process-to-process communication.
→ end-to-end data delivery &
(So the process that generates the message is delivered to the process that has requested for the msg)

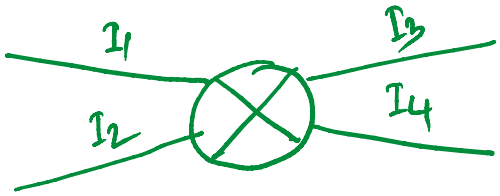
Network Layer → host-to-host communication.
(the host that wants to communicate gets the packet).
→ routing the packets across networks

Routers — truncated TCP/IP protocol stack.



→ Routers do not have access to the transport layer headers and the application layer data

Network layer facilitates moving of packets from one router to the other (host-to-host communication)



A router has multiple interfaces.

Two important functions of NL are:-

1. Forwarding: a packet arriving from host H_1 to router R_1 must be forwarded to the next router on a path to H_2

... of transferring packets

' path to H_2

→ it is a router-local action of transferring packets from an input link interface to the appropriate output link interface.

(2) Routing: a routing algorithm determines the path along which the packets flow from H_1 to H_2.

→ it is a network-wide process that determines the least cost path from source to destination.

→ routing algorithm is responsible for updating the forwarding table. by generating routing messages.

Routing algorithms → Centralized.
Routing algorithms → decentralized.

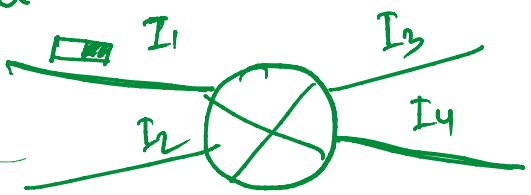
Centralized: algorithms executing on a central site and shares. routing information to each of the routers.

Decentralized: distributed routing algorithm running in each router.

→ cooperation and message passing among routers are done to get the network status information.

Packet switch: general packet-switching device that transfers a packet from input link interface to output link interface, ... in a field in the header of

packet from input link interface to output ...
according to the values in a field in the header of the packet.



Network layer

Data Link Layer.

- Link-layer switches: make forwarding decision on values in the fields of the link layer frames. They are also termed as layer-2 device.

- Routers: make forwarding decision on the values in the fields of the network layer packets. They are also termed as layer-3 device.

* L3 devices must also implement L2 protocols as well as implement their functionality.

Network Service Model:

- Guaranteed delivery - ensures that the packet will eventually arrive at its destination.
- Guaranteed delivery with bounded delay - not only guarantees delivery of the packets, but with a specified delay bound.
- In-order packet delivery - the service guarantees that packets arrive at the destination in the order they were sent.

packets arrive at the destination in the order they were sent.

- Guaranteed minimum bandwidth - as long as the sending host transmits bits at a rate below the specified bit rate, then no packet is lost and each packet arrives within a prespecified host-to-host delay.
- Guaranteed Constant jitter - guarantees that the amount of time between the transmission of two successive packets at the sender is equal to the amount of time b/w their receipts at the destination.
- Security service - use of secret session key by a pair of source and destination hosts for encryption and decryption of payloads — Confidentiality is provided to TL segments, data integrity and source authentication services.

ATM → Asynchronous Transfer Mode.
→ Circuit-switched network.

CBR-ATM:

- Similar to a dedicated fixed bandwidth transmission between sending and receiving hosts.
- Flow of packets (known as cells in ATM terminology) guarantees that the delay, jitter, loss are all less than the specified values.
- These values are agreed upon by the sending host and the ATM network when the CBR connection is first established.

SLA
Service Level Agreement

ABR-ATM:

Best-effort service.

ABR-ATM:

- Slightly better than best-effort service.
- Loss of cells is a possibility under ABR service.
- Unlike in the Internet, cells cannot be reordered, (although they may be lost) and a minimum cell transmission rate (MCR) is guaranteed to a connection using ABR service.
- On availability of free resources, a sender may also be able to send cells at a higher rate.
- Can provide feedback to the sender regarding congestion — Sender can adjust its rate between the MCR and allowable peak cell rate.

Transport Layer
- a connection-less service (UDP)
- a connection-oriented service (TCP) followed in ATM

Network Layer
- a connection service (Virtual Circuit N/Ws)
- a connectionless service (Datagram N/Ws)
  - ↳ followed in the Internet.

Virtual Circuit

(i) Path: a series of links and routers between the source and destination hosts.

(ii) VC Number (VCI): a number for each link along a path.

(iii) Forwarding table — contains the mapping b/w router

(iii) Forwarding table — contains the mapping b/w router interfaces (ports) and the VCIs.

↳ physical port