

CSF421 - Computer Networks - SEQ

Lecture 01 - Protocols

* Communication is done in layers. Why?

* Fosters competition

* Technology in one layer does not affect the other layer.

* Each layer have defined functions that they act upon.

* Standards - Benefits: (i) create + maintain an open + competitive market
(ii) Ensured greater compatibility + interoperability

Categories: (i) De facto - TCP/IP Model

(ii) De jure - OSI Model

* Protocols are Technology independent. They describe what must be done to communicate but not how it should be carried out.

* OSI Model - [ISO organization] * TCP/IP Model -

7. Application

6. Presentation

5. Session

4. Transport

3. Network

2. Data Link

1. Physical

Communications
between app.

Application (Specific Address)

Transport (Port Address)

Internet (logical)

Network Access (Physical)

Moving raw data
across the network.

Headers - added to data for Encapsulation.

- removed from data for Decapsulation.

Trailer - added to data for Error Identification / Detection

(*) Application Layer - Interface betw human + data networks; provides services to the user. Address - Specific Address/URL

(*) Presentation Layer - 3 primary function: translation + compression + encryption. Does not use protocols.

(*) Session Layer - Dialog control + synchronization. It handles exchange of information to initiate dialogs + keep them active + restart disrupted / idle sessions.

④ Transport Layer — Delivery of message from process to process/appⁿ to appⁿ. (Sender to Receiver)

Ex. DM from one discord to another.

PDU — Segments H₁+D₁

Protocol — TCP+UDP

Address — Port+Number

↳ identifies process/appⁿ

Functions — (I) Segmentation + Reassembly

(II) Port Address + Sequence Number

TCP
↑

(III) Connection Control [3 way handshake + secure connection]

(IV) Flow + Error Control

↳ Buffer

(V) Multiplexing

Receiver uses the segment's sequence number to order them sequentially. + merges them + sends to the upper layer.

④ Network Layer — Host to Host connection.

PDU — Packets

Protocol — IP

Address — IP Address / Logical Address (32 bits)

Functions — (I) Adds an address (IP) to identify S+R Hosts

(II) Decides which path to take (Routing)

④ Data Link Layer — Hop to Hop Delivery

PDU — Frames H₂+Data+T₂

Protocol — Ethernet (MAC varies)

Address — MAC Address / Physical Address (48 bits Hex)

Functions — (I) Framing

(II) Physical Addressing

(III) Flow control

(IV) Error control

MAC (Media Access Control)
— unique for each device

* Physical layer - Bit Stream \rightarrow movement of individual bits from one node to another. \rightarrow transmit bits over a medium.

Functions - (I) Physical features of interfaces + medium

(II) Representation of bits

(III) Data Rate

(IV) Synchronization of bits

Topology - Bus, ring, star.

Transmission - (I) Simplex
Modes

(II) Half Duplex

(III) Duplex (Full)

* TCP Encapsulation + PDU -

Application \rightarrow Data PDU - Data

Transport \rightarrow TH + Data PDU - Segment

Network / Internet \rightarrow NH + TH + Data PDU - Packet

Network Access { Datalink \rightarrow FH + NH + TH + Data + F_T PDU - Frame

Physical \rightarrow Bit stream PDU - Bits

* Addressing -

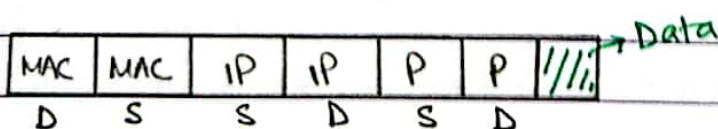
Physical - timing + sync. bits

Datalink - D + S physical addresses

Network - D + S logical "

Transport - D + S port "

Upper layers - Encoded appⁿ data



Port Address } Fixed
IP Address }
MAC Address } Δ s

* Same network - No hop

* Router - No. of Hands = No. of Networks

* Number of routers = Number of hops.