CSE-320

Network Models

OSI MODEL :

Application layer : (when data comm starts) identifies what type of data I am trying to send. e.g. Webpage, email, game ? initiates that

Different rules for different apps are called protocols.

$\boxed{\text{DNS}}$ $\boxed{\text{HTTP}}$ $\boxed{\text{SNTP}}$ $\boxed{\text{POP}}$ $\boxed{\text{DHCP}}$ $\boxed{\text{FTP}}$

→ provides users with access to services

Presentation layer :

→ translation : convert to a medium/language that can be read by sender and receiver devices. Interoperability between these different encoding methods

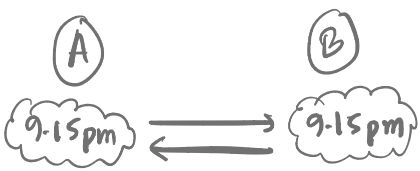
→ Compression : reduces file size

→ encryption : restrict unauthorised access

Session layer : Network dialogue controller, between comms devices. Establishes, maintains, and synchronizes the interaction.

→ Dialogue control : Mutual agreement about sending/receiving data between devices. Restart idle sessions. Half duplex or full-duplex.

→ Synchronization : setting the timing of sending/receiving between each other.



Transport layer :

Every type of data comm is a process.
The multiple processes are differentiated by this layer.
Every process is given an ID no. to identify them each.

Common protocol used in transport layer is TCP

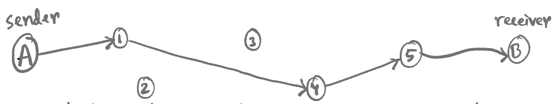
Adds port address and sequence number — each segment given a seq. no.
Divides the large chunk of data into separate segments, so that error can be handled easily
Follow common rules and regulations → flow and connection → Bandwidth division
Mutual agreement so that data flow is same for both.
How much access/priority to be given to each process → multiplex

→ Segmentation and reassembly : Message is divided into transmittable segments with each segment containing a sequence number. (transmittable segments: transport layer protocol data units)

→ Service point addressing : Process is differentiated in this layer and that very process (one to be sent) is identified and then transported. The transport layer header must therefore include a type of address [port address].

→ Connection control : Follow common rules and regulations
→ Flow and error control : Mutual agreement so that data flow is same for both
→ Multiplexing : Access/priority control given to each process.

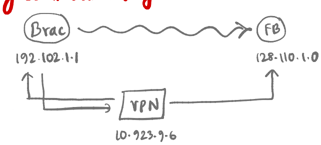
Network layer :-



→ least hop count
→ least time

→ Routing control, which path to follow, route discovering/routing

✓ Routing, i.e. which path it will follow.
✓ logical addressing [IP address]
✓ IP address explains under which network I am currently communicating.
✓ Different networks have different IP address.
→ Responsible for delivery of individual packets from source host to the destination host
packets: Protocol data units [PDU]

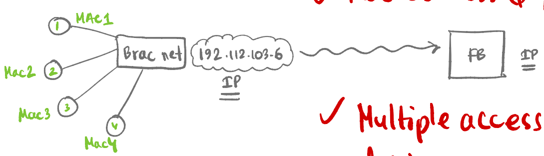


→ logical addressing : Responsible for distinguishing the source and destination. [IP addressing] → 32 bits
→ Routing : Deciding the best route for the packet to follow

Data link layer :-

✓ Responsible for moving frames from one hop to the next.

✓ Mac address (physical addressing) for device recognition under an IP hub.



✓ Multiple access control, controlling how much access to be given to each device.

→ Physical addressing : → Mac address is a unique address given by manufacturer
→ 48 bits of 12 hexadecimal characters

→ Framing :- Divides the stream of bits from network layer into manageable data units called frames.

→ Flow control and error control

→ Access control

Physical layer :-

✓ Responsible for movements of individual bits from one hop to next

→ Physical topology : Mesh / star / bus / ring

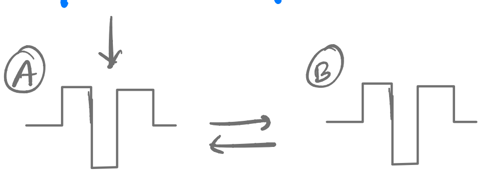
→ Type of physical connection : Simplex / half-duplex / full-duplex

→ Characteristics of the interface between devices

→ Transmission medium choosing

→ Data rate : Duration of a bit. The number of bits sent each second.

→ Synchronization of bits



TCP/IP PROTOCOL :

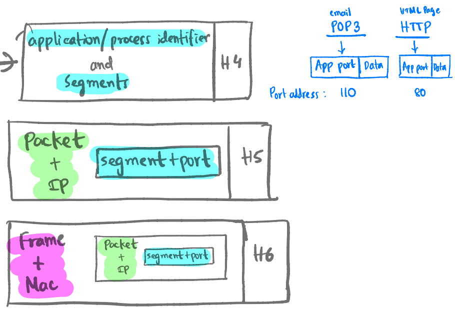
OSI	TCP
Application Presentation Session	Application
Transport	Transport
Network	Internet
Data link Physical	Network access

Addressing :-

Addresses

- Physical (Mac)
  - device identify
  - 6-byte (12 hexdec)
- Logical (IP)
  - network
  - 32-bit
- Port
  - ↓ process identify
  - 16 bits in length
  - one - single no.
- Specific
  - ↓ email / URL addresses

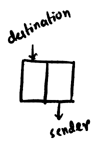
A		B	
① Application	← Data →	Application	
② Presentation	← Data →	Presentation	
③ Session	← Data →	Session	
④ Transport	← Segments → (Port address)	Transport	→
⑤ Network	← Packets → (IP address)	Network	→
⑥ Data link (Hop)	← Frames → (Mac address)	Data link (Hop)	→
⑦ Physical	← Bits →	Physical	

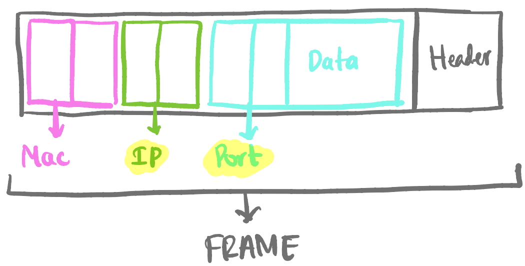


Mac IP PORT → FRAMES

↓

IP and Port never changes
Mac address always change.





Encapsulation

Application → Physical

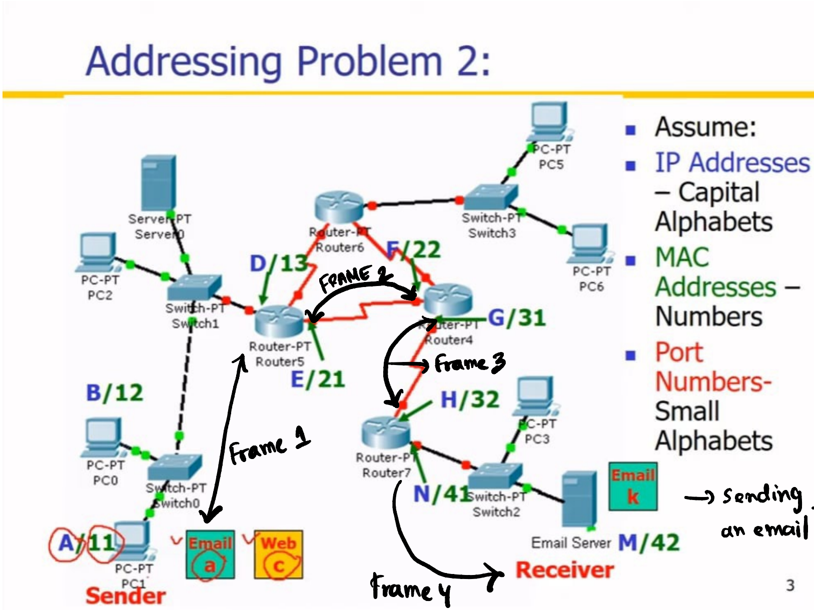
Data unit

Protocol data unit	Header

Protocol data unit: Data unit from the layer above

Header: info about current layer

Example :-



→ sending an email →∴ port will be for email

FRAME 1	13	11	M	A	k	a	Data	T2
FRAME 2	22	21	M	A	k	a	Data	T2
FRAME 3	32	31	M	A	k	a	Data	T2
Frame 4	42	41	M	A	k	a	Data	T2

A | B

1. Application ←Data→ Application
   - → provides users with access to services

2. Presentation ←Data→ Presentation
   - → translation : convert to a medium/language that can be read by sender and receiver devices. Interoperability between these different encoding methods
   - → Compression : reduces file size
   - → encryption : restrict unauthorised access

3. Session ←Data→ Session
   - → Dialogue control : Mutual agreement about sending/receiving data between devices. Restart idle sessions. Half duplex or full-duplex.
   - → Synchronization : setting the timing of sending/receiving between each other.

→ **Application**

4. Transport ←Segments (Port address)→ Transport → application/process identifier and Segments | H4
   - → Segmentation and reassembly : Message is divided into transmittable segments with each segment containing a sequence number. (transmittable → transport layer protocol data units)
   - → Service point addressing : Process is differentiated in this layer and that very process (one to be sent) is identified and then transported. The transport layer header must therefore include a type of address [port address].
   - → Connection control : Follow common rules and regulations
   - → Flow and error control : Mutual agreement so that data flow is same for both
   - → Multiplexing : Access/priority control given to each process.

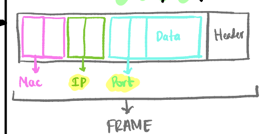
→ **Transport**

→ **Internet**

5. Network ←Packets (IP address)→ Network → Packet + IP | segment + port | H5
   - → logical addressing : Responsible for distinguishing the source and destination. [IP addressing] → 32 bits
   - → Routing : Deciding the best route for the packet to follow

6. Data link (Hop) ←Frames (Mac address)→ Data link (Hop) → Frame + Mac | Packet + IP | segment + port | H6
   - → Physical addressing : → Mac address is a unique address given by manufacturer
     → 48 bits of 12 hexadecimal characters
   - → Framing :- Divides the stream of bits from network layer into manageable data units called frames.
   - → Flow control and error control
   - → Access control

Mac IP PORT → FRAMES
↓
IP and Port never changes
Mac address always change.



7. Physical ←Bits→ Physical
   - → Physical topology : Mesh/star/bus/ring
   - → Type of physical connection : Simplex/half-duplex/full-duplex
   - → Characteristics of the interface between devices
   - → Transmission medium choosing
   - → Data rate : Duration of a bit. The number of bits sent each second
   - → Synchronization of bits

→ **Network access**