

The background of the slide is a photograph taken from space at night. It shows the curvature of the Earth against a dark sky. City lights are visible as numerous small yellow and white dots, primarily concentrated in coastal and urban areas. In the upper portion of the image, there are several bright, horizontal greenish-blue bands, which are the Aurora Borealis (Northern Lights) captured from a unique perspective.

UNIT 4

OSI AND TCP/IP COMMUNICATION MODELS

PROF. THUSHARA WEERAWARDANE

Information transmission scheme

Information Transmission Schemes

■ **Unicast**

- A piece of information is sent from one point to another point (one sender, and one receiver)

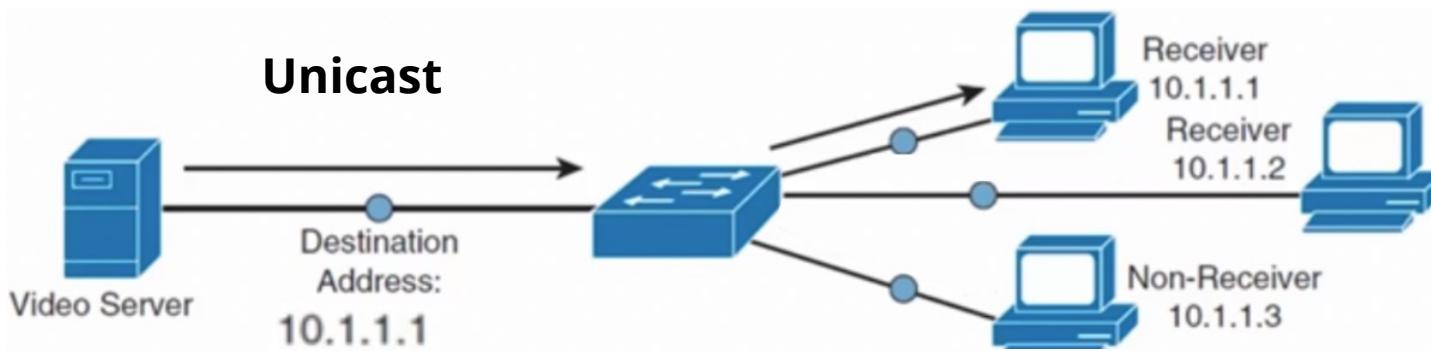
■ **Broadcast**

- A piece of information is sent from one point to all other points (one sender, but the information is sent to all connected receivers)

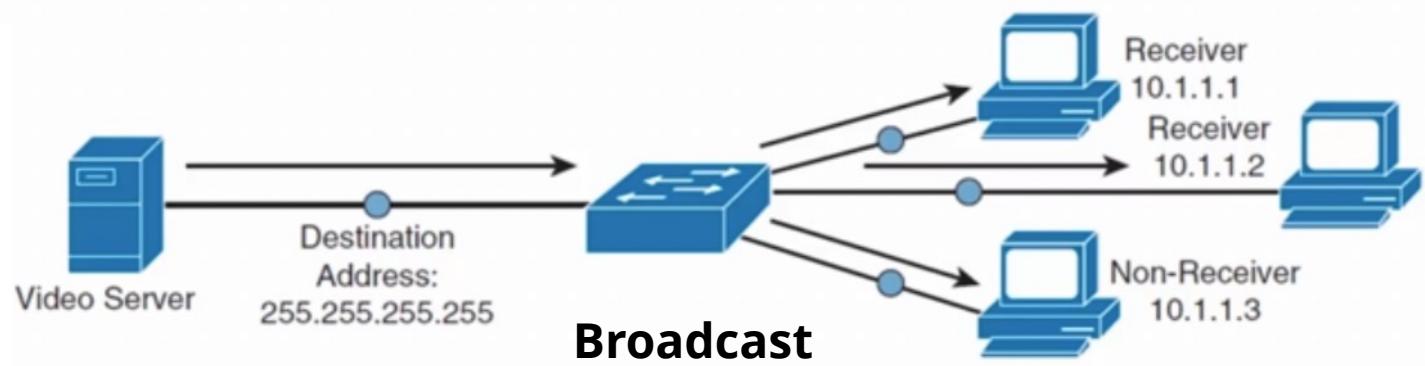
■ **Multicast**

- A piece of information is sent from one or more points to a set of other points or group of receivers (one or more senders, and the information is distributed to a set of receivers)
- Multicasting is the networking technique of delivering the same packet simultaneously to a group of clients.

Unicast

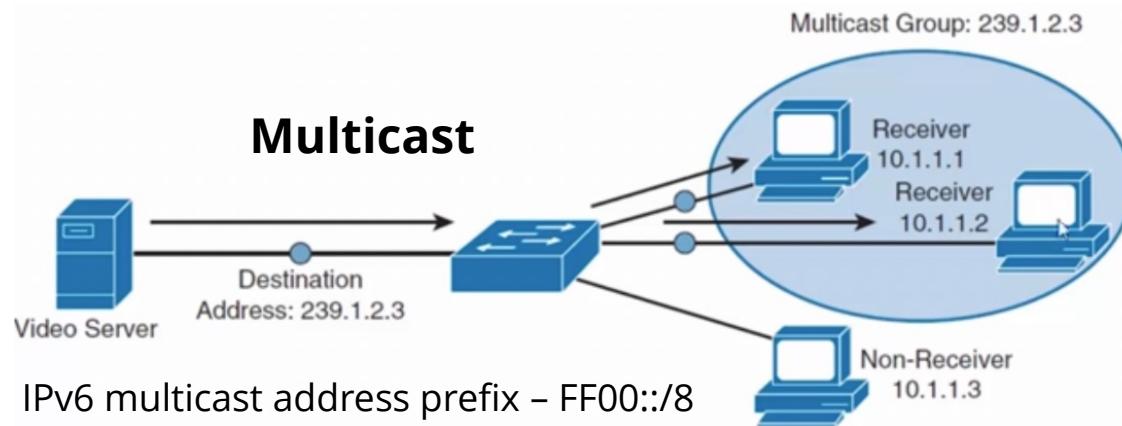


Broadcast



Broadcast addresses: 255.255.255.255, 192.168.1.255/24

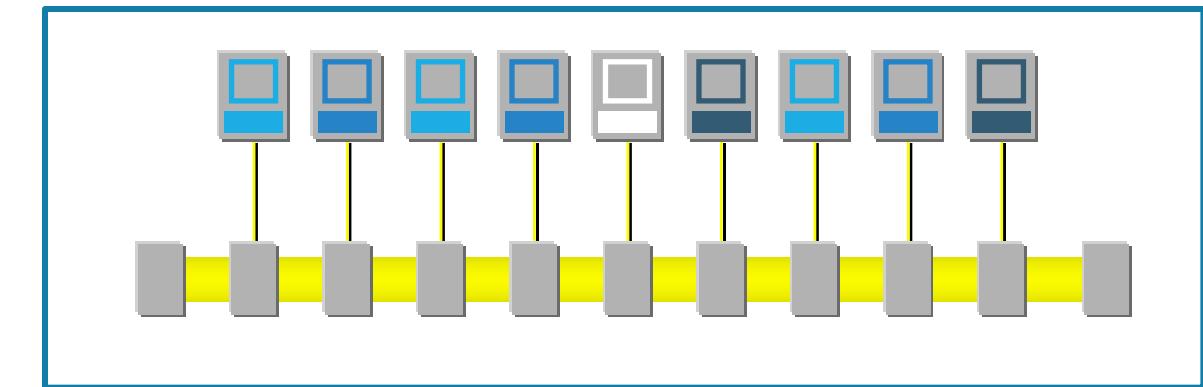
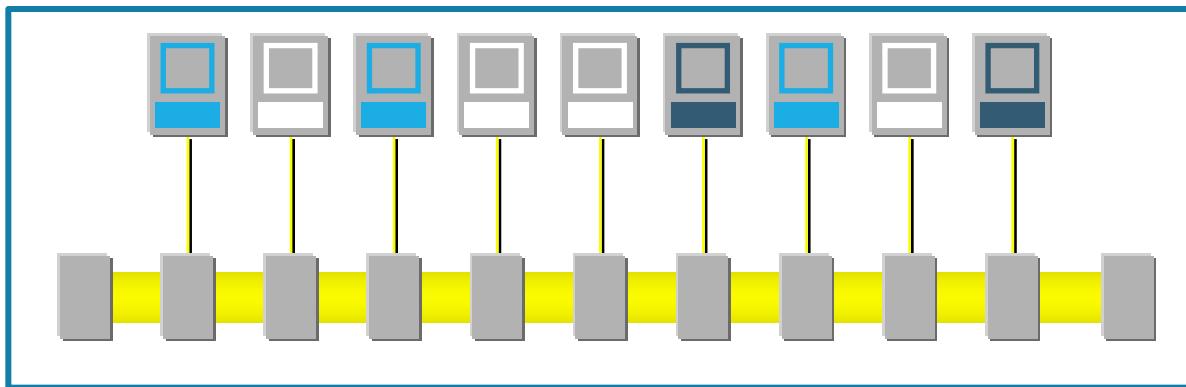
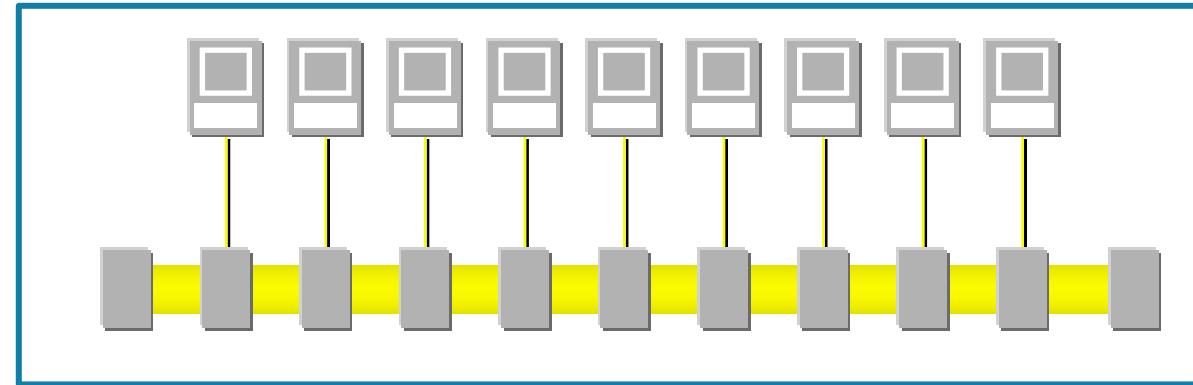
Multicast



IPv6 multicast address prefix – FF00::/8

Another category: Anycast

Multicast groups



Multicasting is the networking technique of delivering the same packet simultaneously to a group of clients.

OSI and TCP/IP Reference Models

Common language

How are
you?



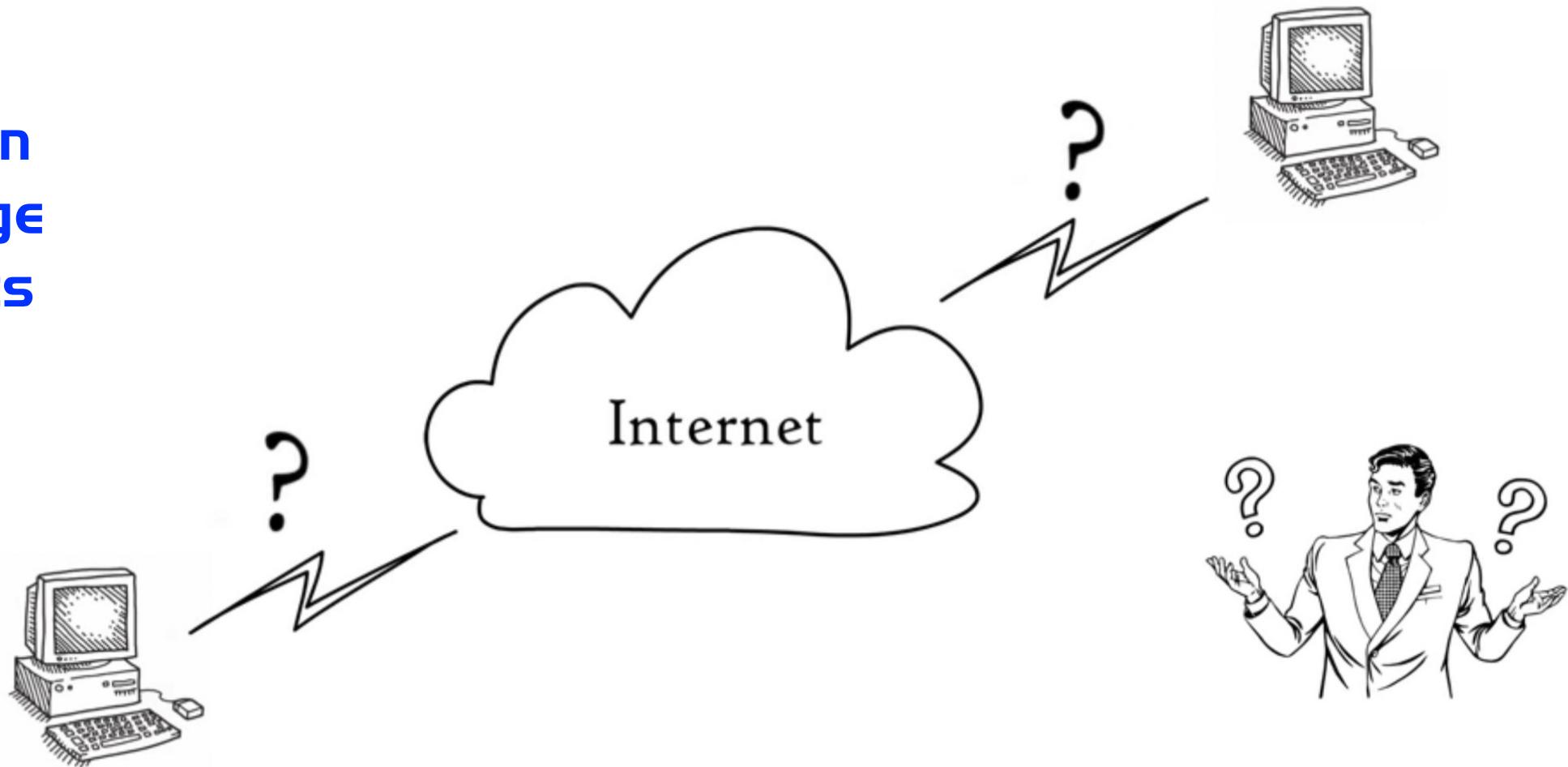
I am
fine.



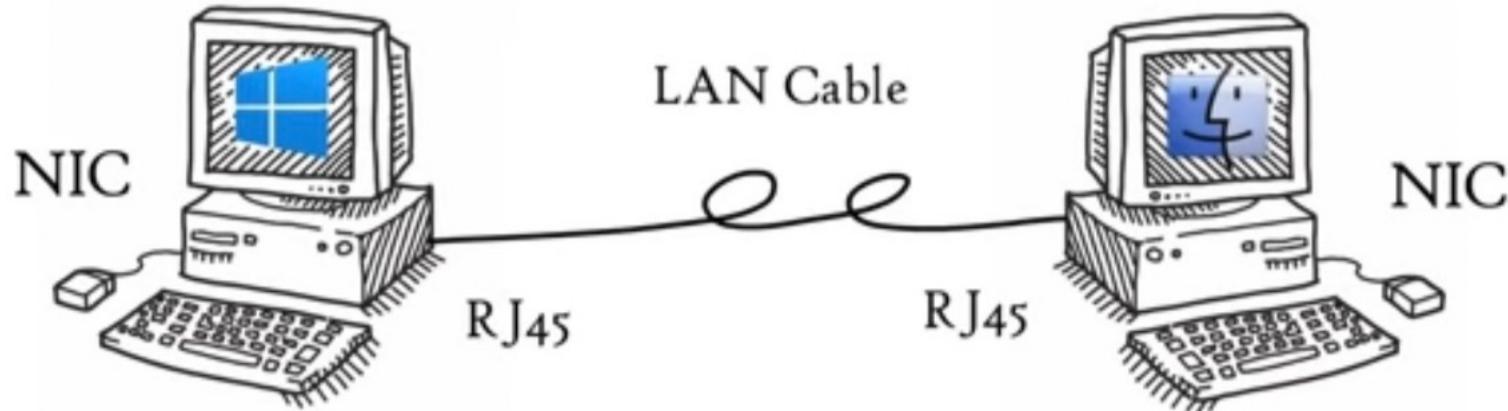
Communication?

How computer can communicate?

Common Message Formats



Two computers with two different OSs



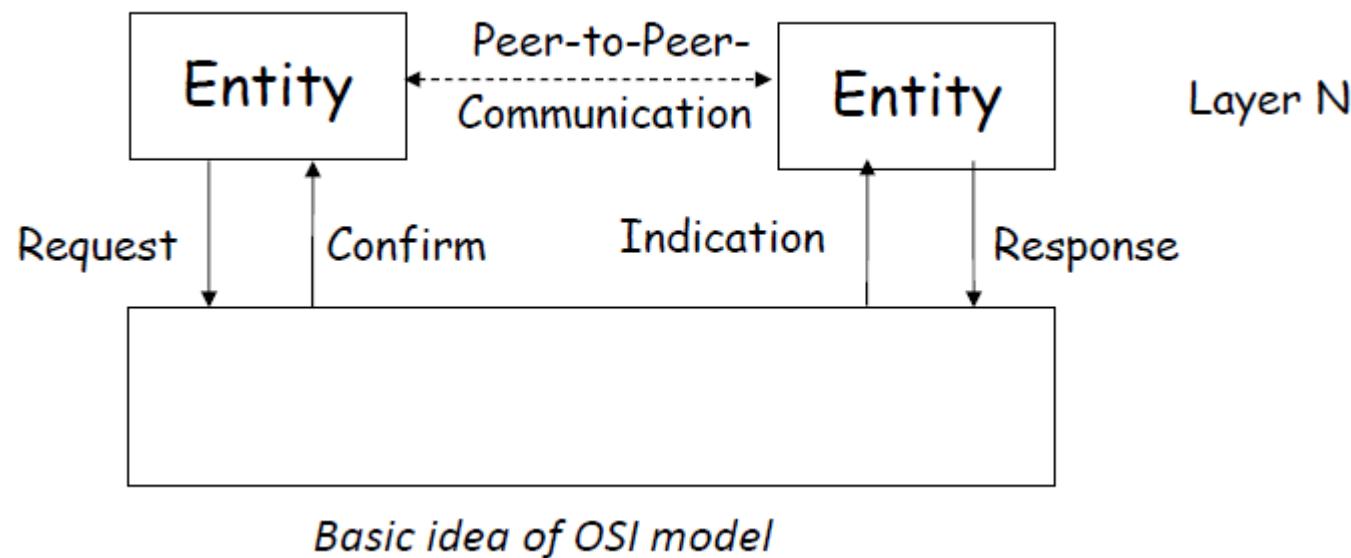
Protocol

The Agreed upon set of ground rules
That make communication Possible



Open System Interconnection (OSI)

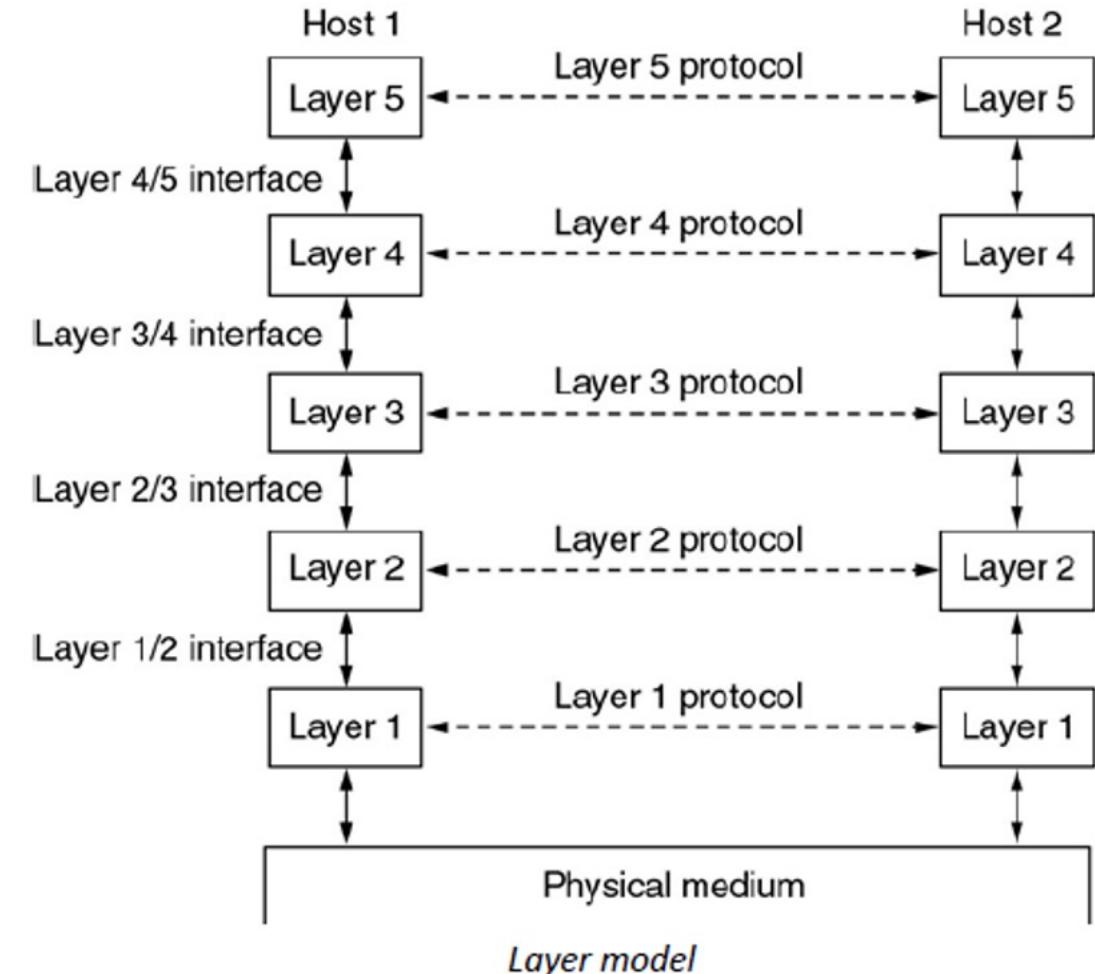
OSI is a layer model developed by International Standardization Organization (ISO). It is a prescription of standardizing the functions of a communication system in terms of layers.



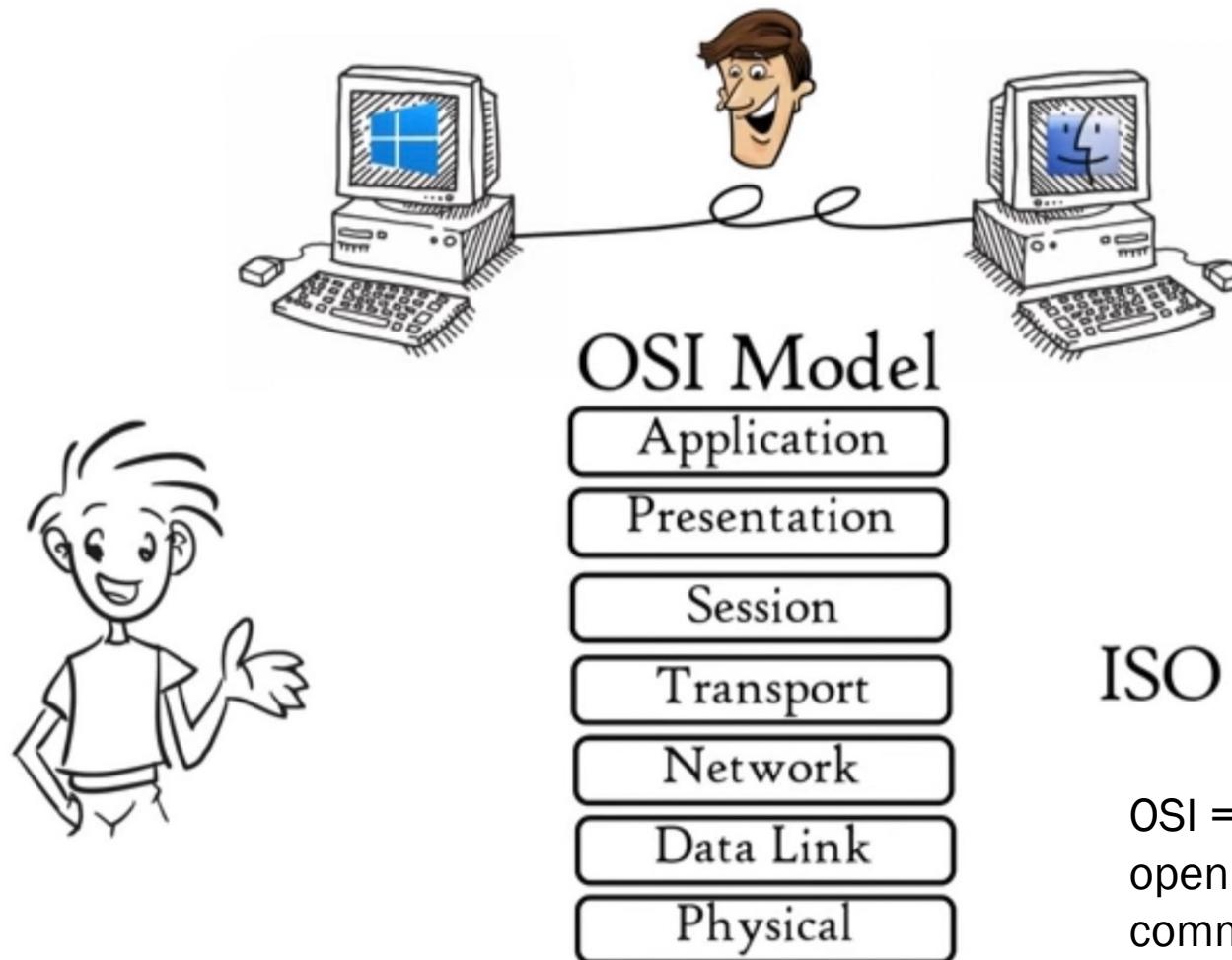
OSI has two major components: an abstract model of networking and a set of specific protocols.

Open System Interconnection (OSI) cont.

- In OSI model, a networking is divided into seven layers
- In each layer one or more entities implemented its functionality
- Entities in a layer provide service to entities of upper layer while receiving services from entities of the lower layer
- Protocol enable an entity in one host to interact with other entity at the same layer in other host.



Reference Model - Guidance



OSI serves as a "reference model" for how information is transmitted between any two points in a network.

OSI = “Open Systems Interconnection” deals with open systems, i.e. systems open for communications with other systems.

OSI Reference Model

Away

Pizza

Sausages

Throw

Not

Do

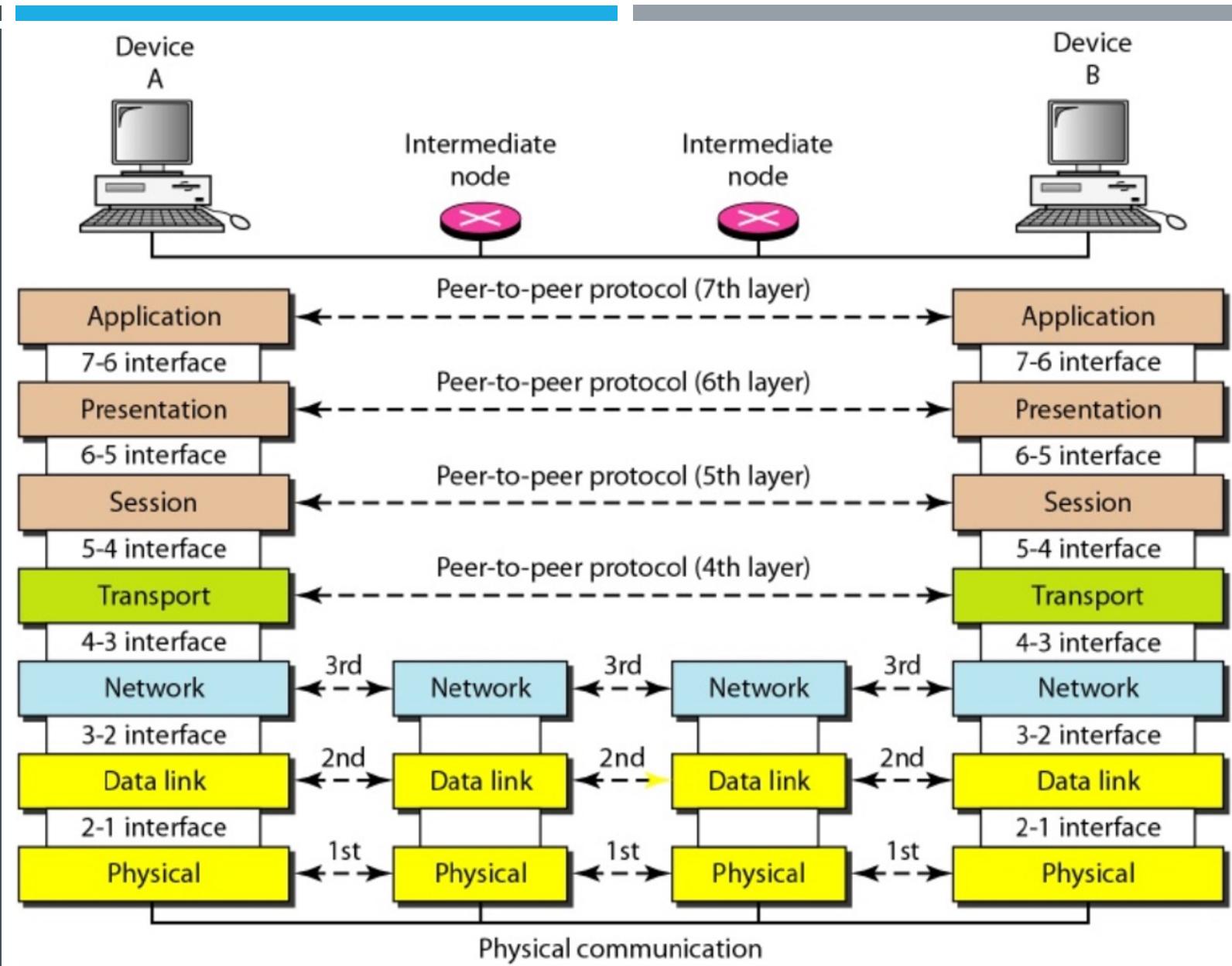
Please

OSI	
7	Application
6	Presentation
5	Session
4	Transport
3	Network
2	Data Link
1	Physical

- It guides manufacturers (vendors) so they can make products that will work with other products.
- The OSI model is comprised of seven layers that are involved in communicating between two nodes of a network.
 - Layers 1-4 relate to communications technology.
 - Layers 5-7 relate to user applications.

Please Do Not Throw Sausages Pizza Away

PEER-TO-PEER COMMUNICATION



OSI vs TCP/IP Model

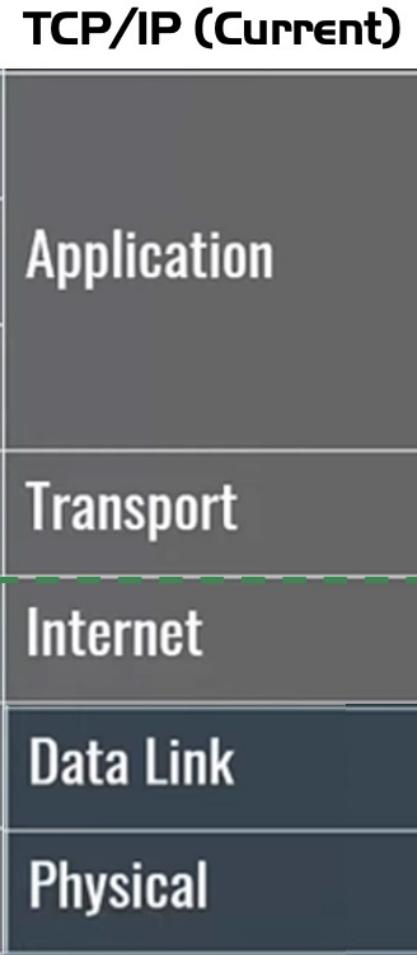
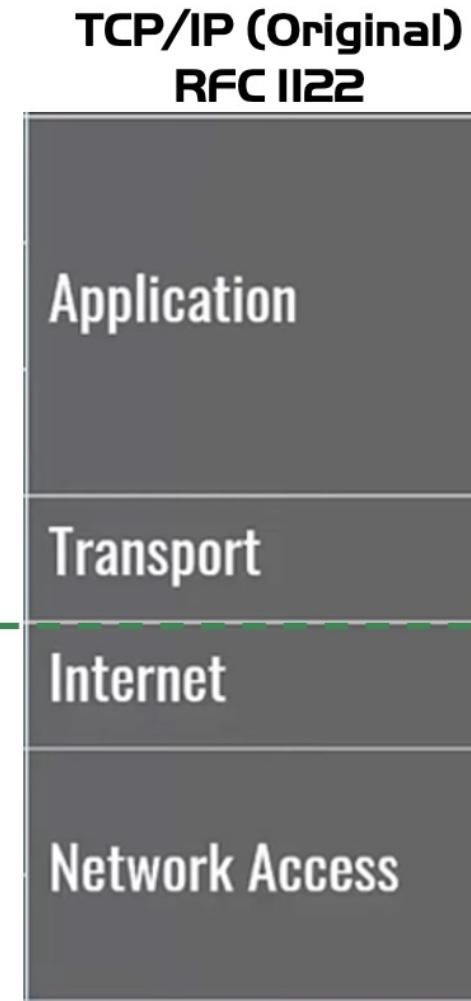
	OSI	TCP/IP
7	Application	
6	Presentation	Application
5	Session	
4	Transport	Transport
3	Network	Internet
2	Data Link	
1	Physical	Network Access

- The **Internet Protocol Suite** (commonly known as TCP/IP) is the set of communications protocols used for the Internet and other similar networks.
- It is named from two of the most important protocols in it
 - the **Transmission Control Protocol (TCP)** and the **Internet Protocol (IP)**, which were the first two networking protocols defined in this standard.

OSI and TCP/IP Models



Application and
Processes



Data
Transfer

OSI and TCP/IP Models – PDUs and Devices

	OSI	TCP/IP	Protocol Data Unit	Devices
7	Application	Application	Data	Layer 7 Firewall
6	Presentation			
5	Session			
4	Transport	Transport	Segments	Layer 4 Firewall
3	Network	Internet	Packets	Router, Multilayer Switch, Wireless Router
2	Data Link	Network Access	Frames	Switch, Bridge, NIC, Wireless Access Point
1	Physical		Bits	Hub, NIC, Wireless Access Point

OSI and TCP/IP Models – Protocols and Functions

	OSI	TCP/IP	Internet Protocol Suite
7	Application	Application	HTTP, DNS, DHCP, FTP, Telnet, SSH, SMTP, POP, IMAP, NTP, SNMP, TLS/SSL, BGP, RIP, SIP
6	Presentation		
5	Session		
4	Transport	Transport	TCP, UDP
3	Network	Internet	IPv4, IPv6, ICMP, ICMPv6, IPSec, OSPF, EIGRP
2	Data Link	Network Access	MAC, ARP, Ethernet 802.3, CDP, LLDP, HDLC, PPP, DSL, L2TP, 802.11, SONET/SDH
1	Physical		

Application Layer: Network Applications



File Transfer



Web Surfing



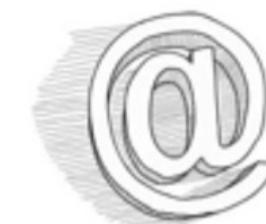
Virtual
Terminals



FTP



HTTP/S



SMTP

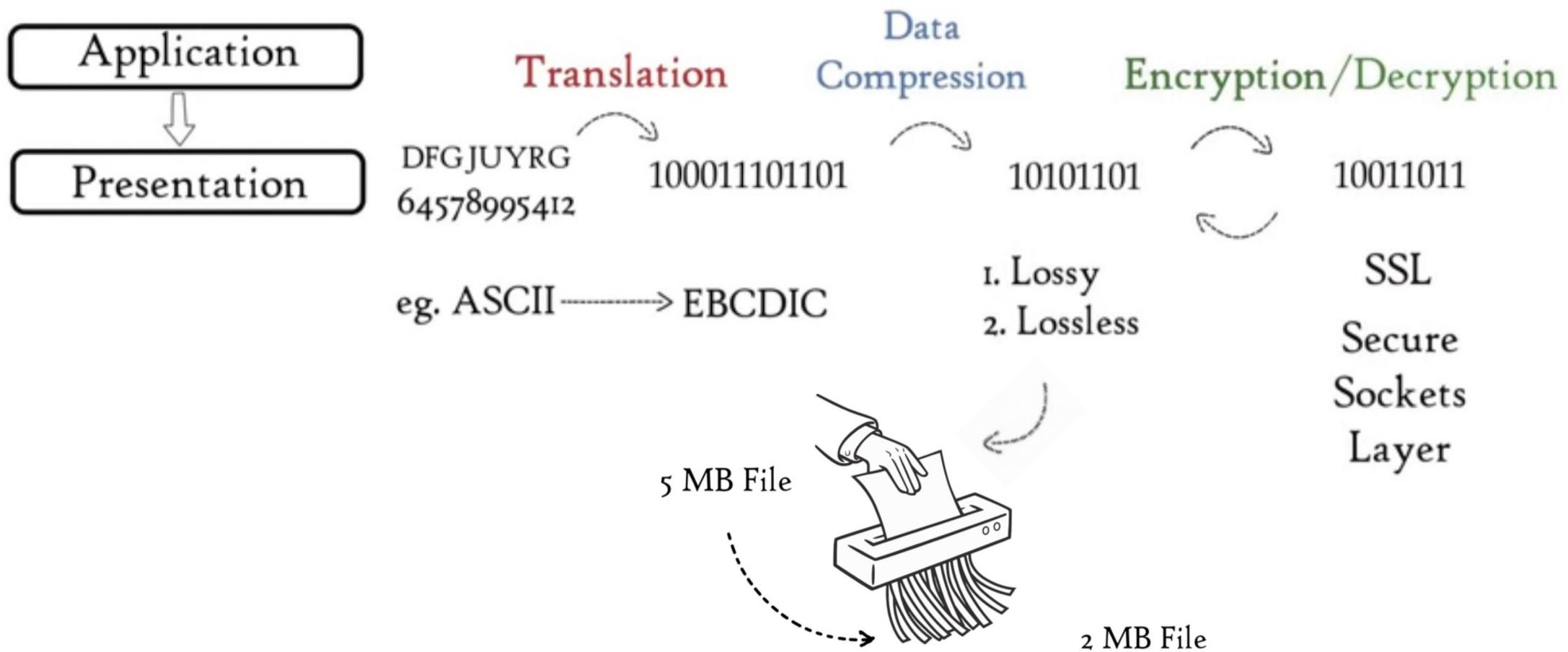


Telnet

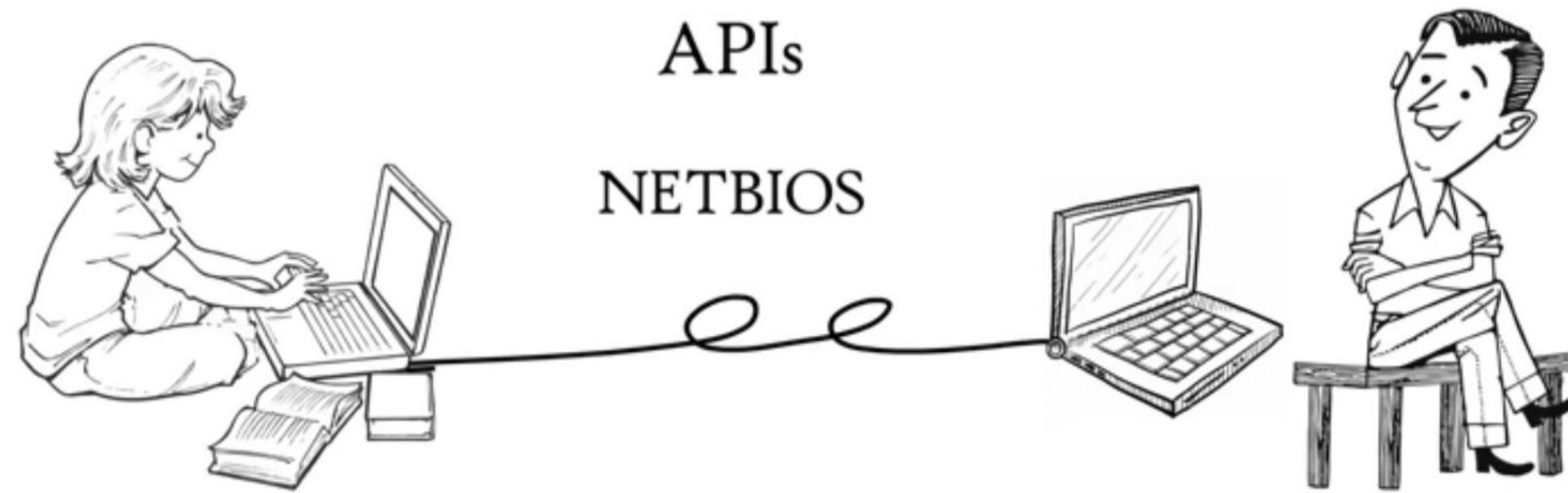
Application Layer

	OSI	TCP/IP	Function
7	Application		<ul style="list-style-type: none">- Applications, protocols and services that interface with the end user
6	Presentation	Application	<ul style="list-style-type: none">- Data is formatted, converted, encrypted decrypted compressed and decompressed and sent or presented to the user (MIME types),
5	Session		<ul style="list-style-type: none">- Open, close and manage a session between end-user application processes (RPC)
4	Transport	Transport	
3	Network	Internet	
2	Data Link		
1	Physical	Network Access	

Presentation Layer

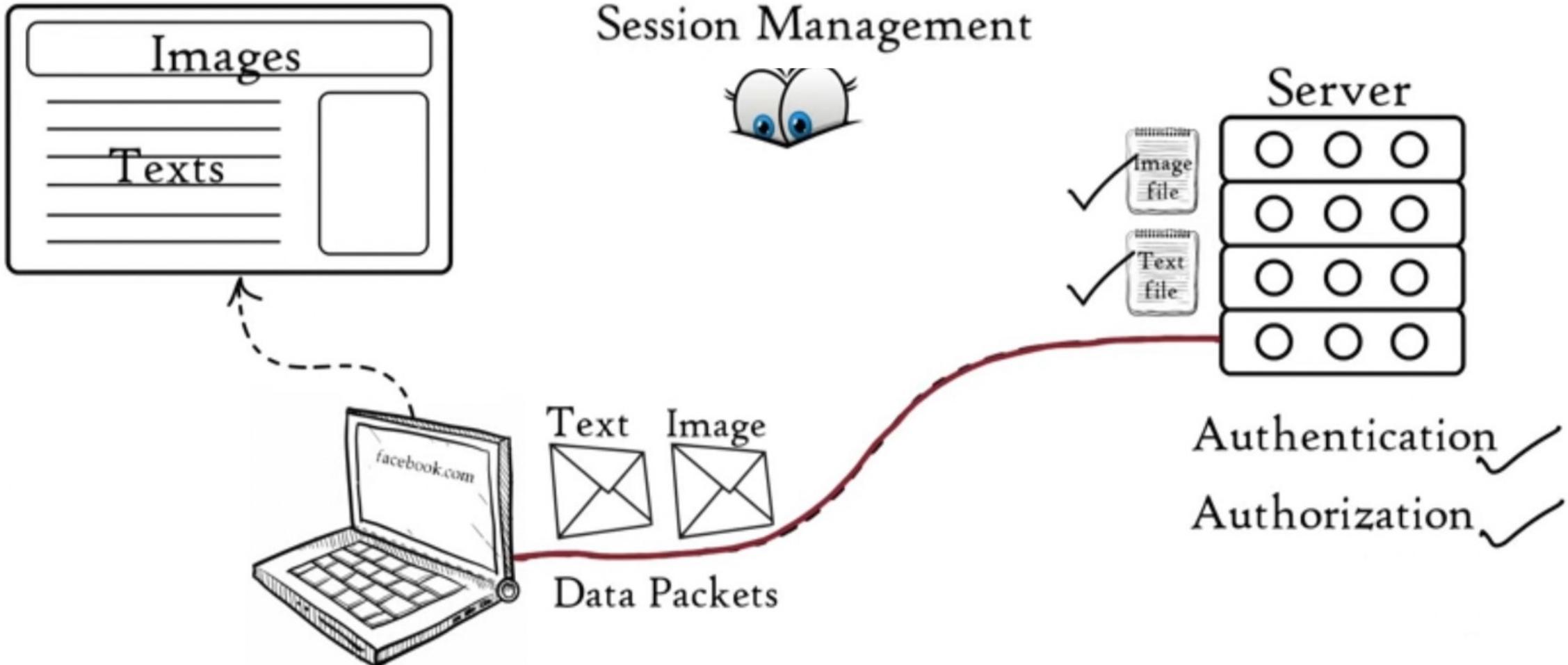


Session Layer



Session management
Authentication
Authorization

Session Layer



Transport Layer

	OSI	TCP/IP	Function
7	Application	Application	<ul style="list-style-type: none">- Facilitates end-to-end communications between multiple applications simultaneously (ports)
6	Presentation		<ul style="list-style-type: none">- Reliable and unreliable end-to-end data transport and data stream services (TCP, UDP, SCTP)
5	Session		<ul style="list-style-type: none">- Connection oriented, connectionless communications, and data stream services(session establishment and termination)
4	Transport		
3	Network	Internet	
2	Data Link	Network Access	
1	Physical		

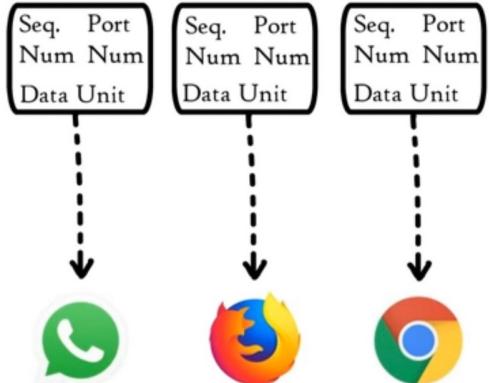
Transport Layer

Segmentation

Flow Control

Error Control

Segments



UDP



No feedback

Services:

- Connection-oriented Transmission
- Connectionless Transmission

TCP



Protocols:

- Transmission Control Protocol (TCP)
- User Datagram Protocol (UDP)

Feedback

Transport Layer



VIDEO
GAMES



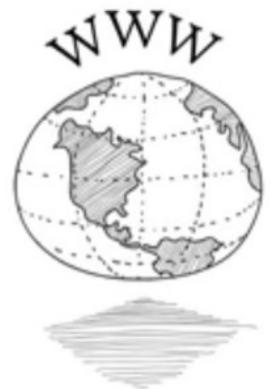
No feedback

Example:



TFTP DNS

TCP

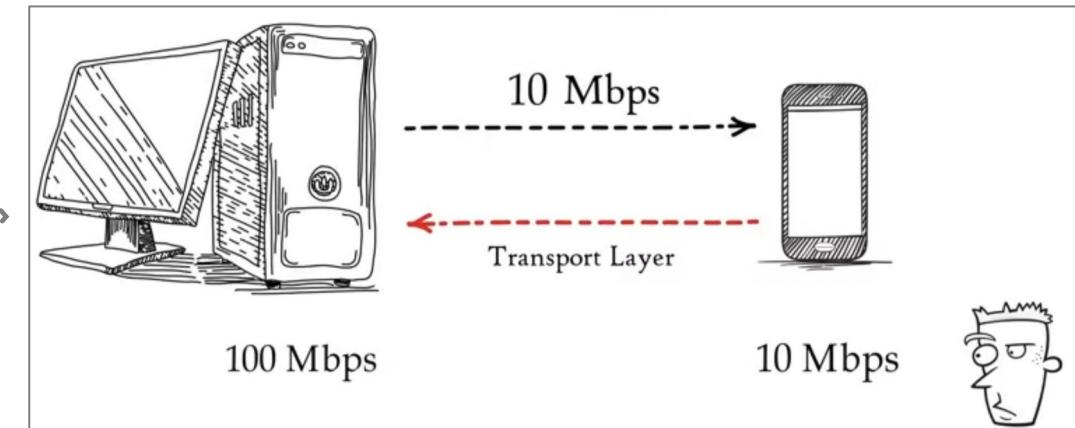
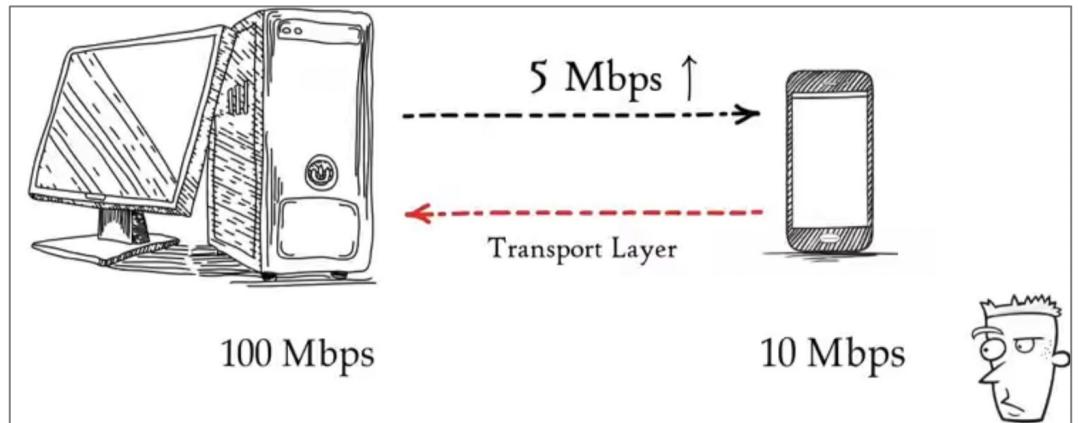
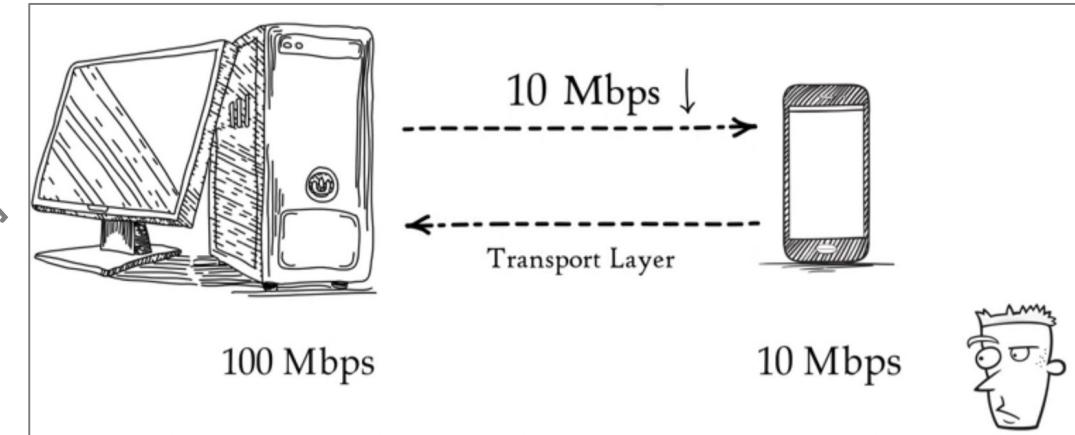
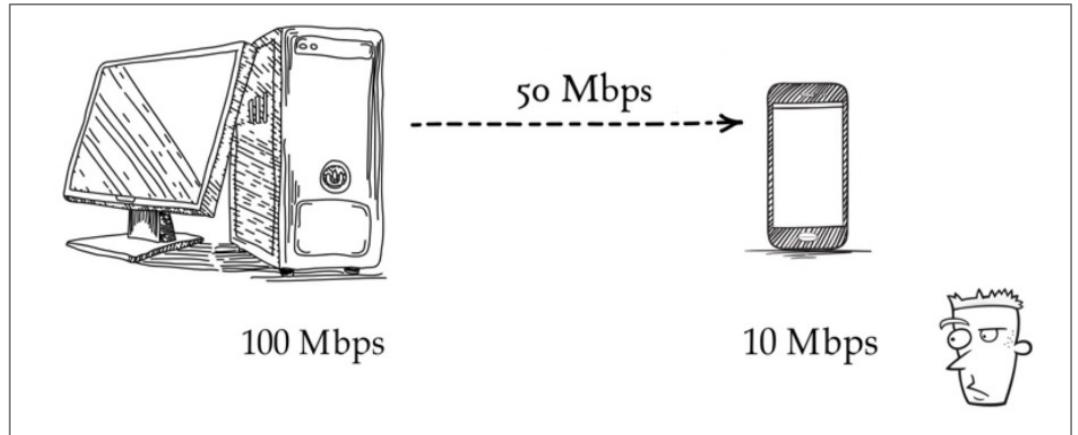


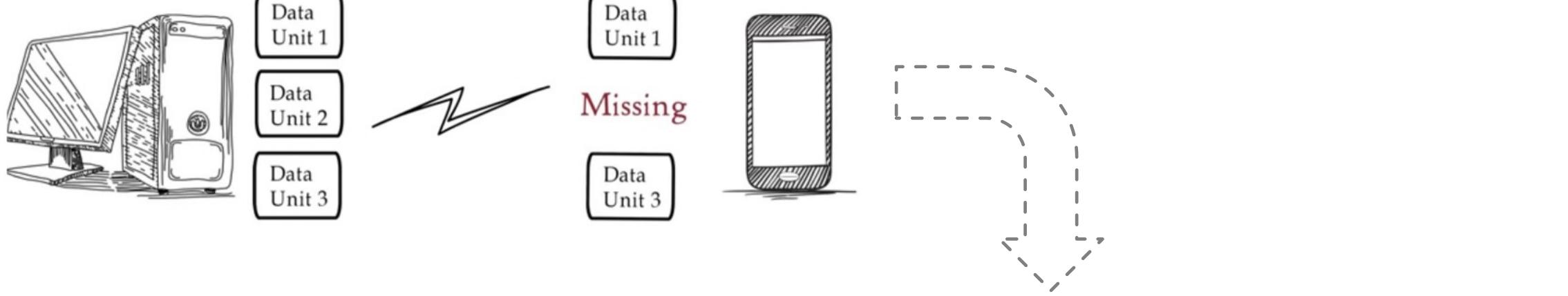
Feedback



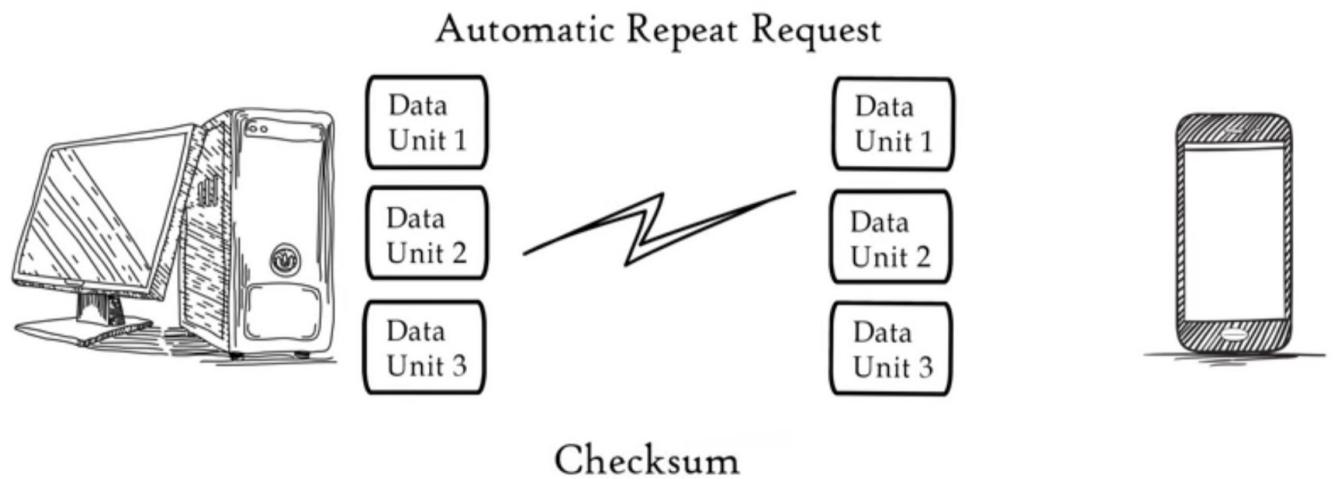
FTP

Flow Control:





Error Control:



Network Layer

	OSI	TCP/IP	Function	
7	Application	Application	<ul style="list-style-type: none">- Provide host addressing (IP)- Choose the best path to the destination network (Routing)- Switch packets out of the correct interface (Forwarding)- Maintain quality of service (QoS)- Connectionless end-to-end networking	
6	Presentation			
5	Session			
4	Transport	Transport		
3	Network	Internet		
2	Data Link	Network Access		
1	Physical			

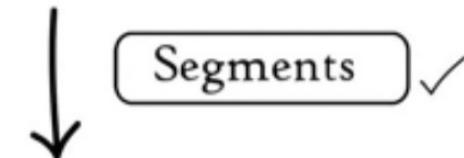
Network layer

Logical Addressing

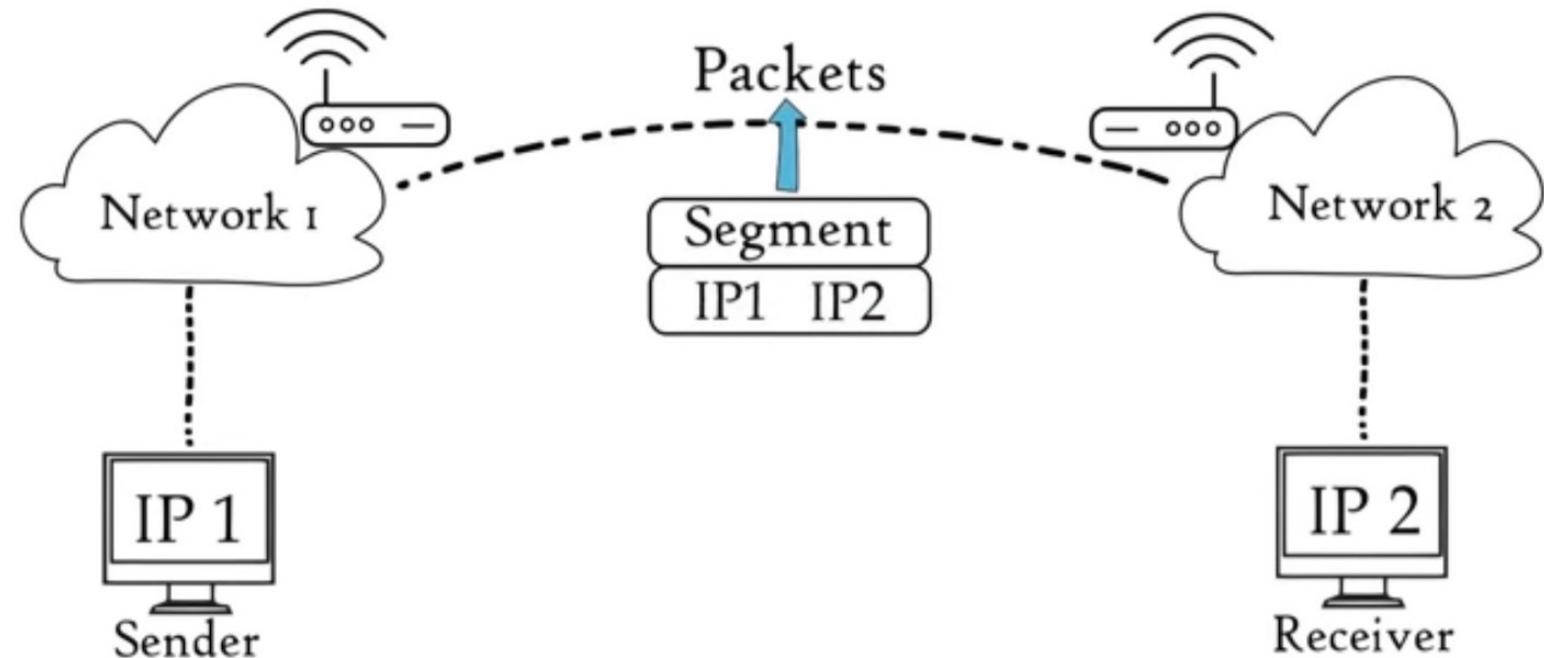
Routing

Path determination

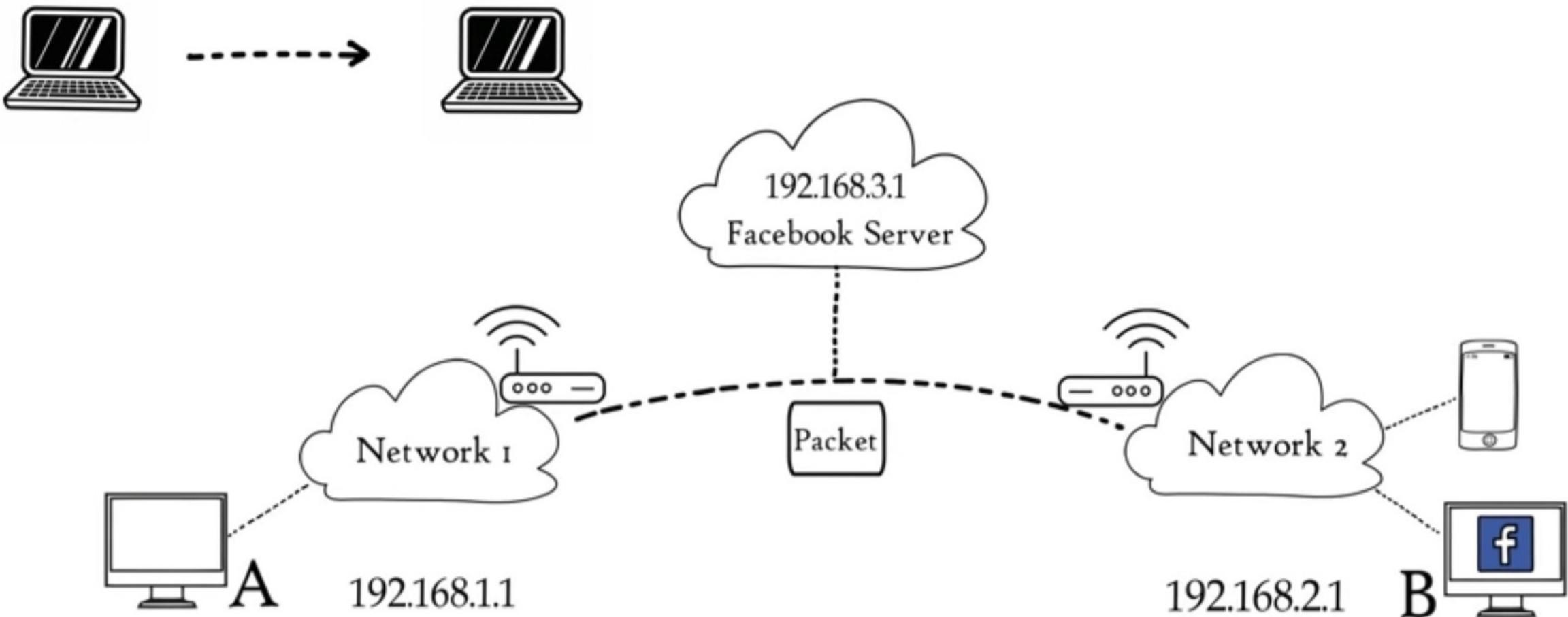
Transport Layer



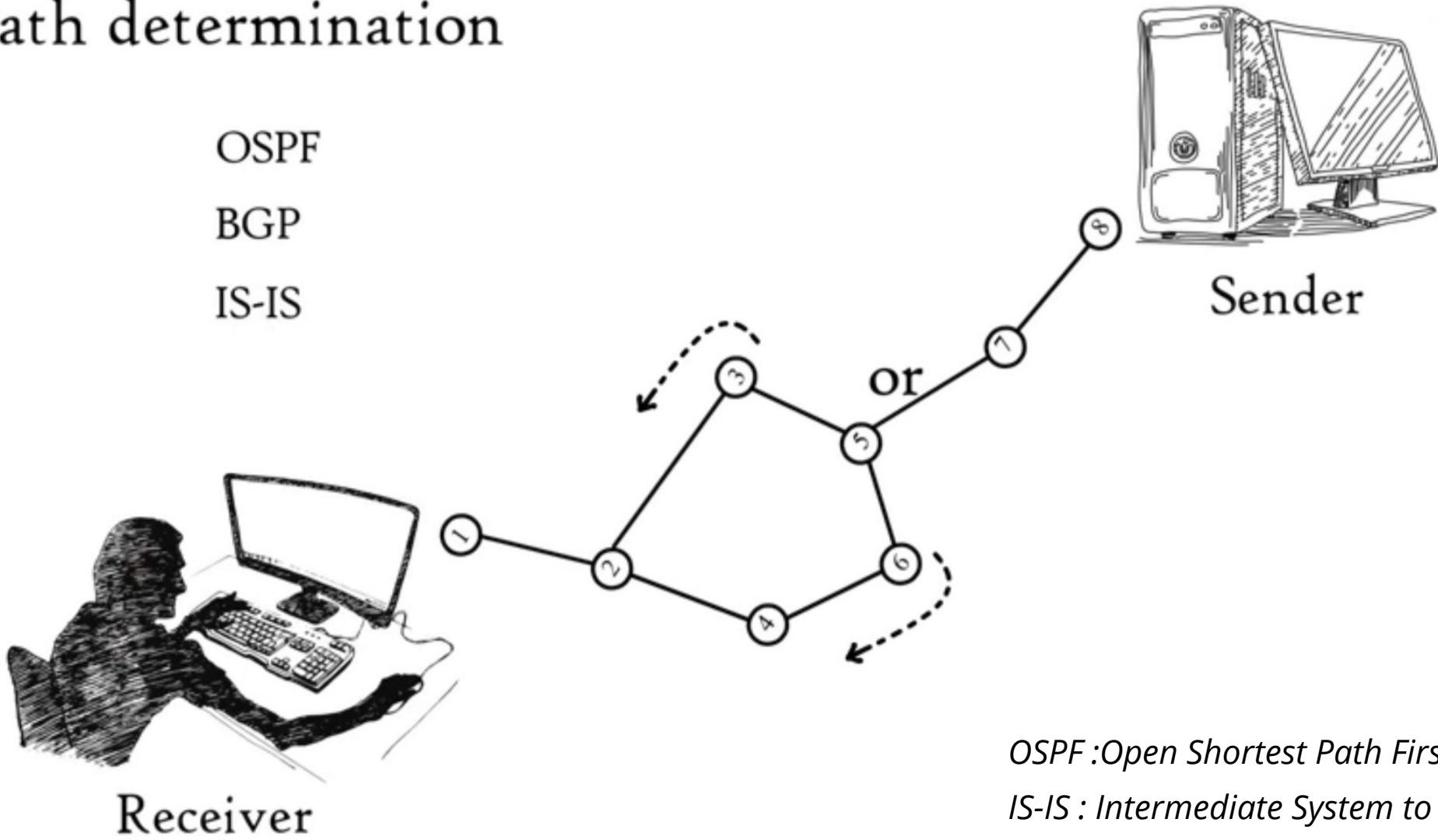
Network Layer



Routing



Path determination

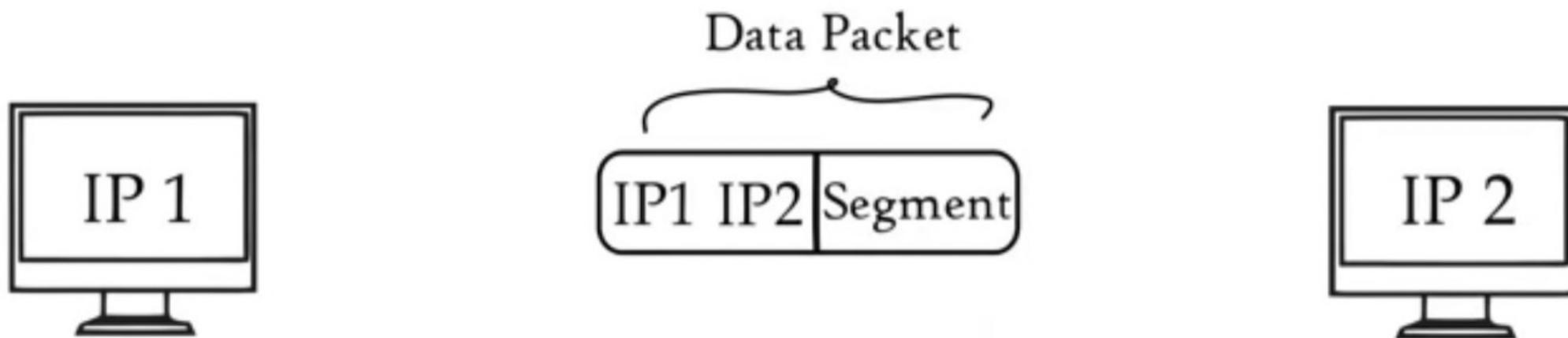


Data Link Layer

	OSI	TCP/IP	Function
7	Application	Application	<ul style="list-style-type: none">- 2 sublayers:<ul style="list-style-type: none">- Logical Link Control (LLC, 802.2) provides services to the upper layers- Media Access Control (MAC) defines how devices access the medium CSMA/CD, CSMA/CA, Token Passing Host addressing (MAC addressing)
6	Presentation		
5	Session		
4	Transport	Transport	
3	Network	Internet	
2	Data Link	Network Access	<ul style="list-style-type: none">- Layer 2 Framing- Error Checking (CRC)
1	Physical		

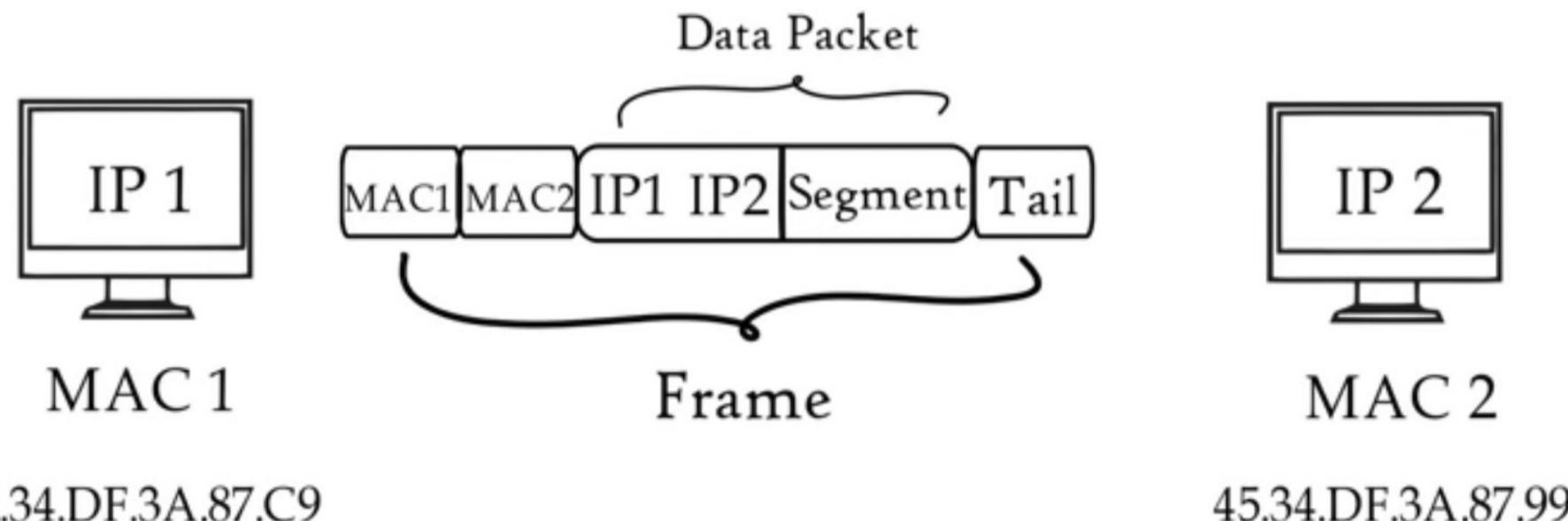
Data Link Layer

- Logical addressing : Network layer
- Physical addressing : Data Link layer

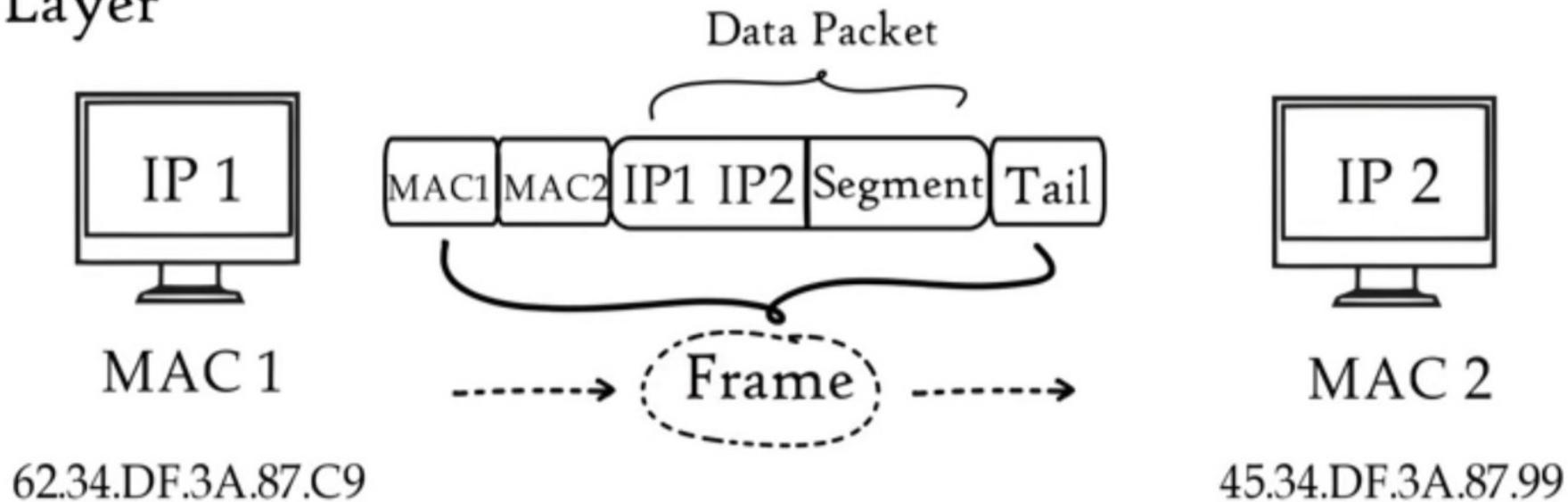


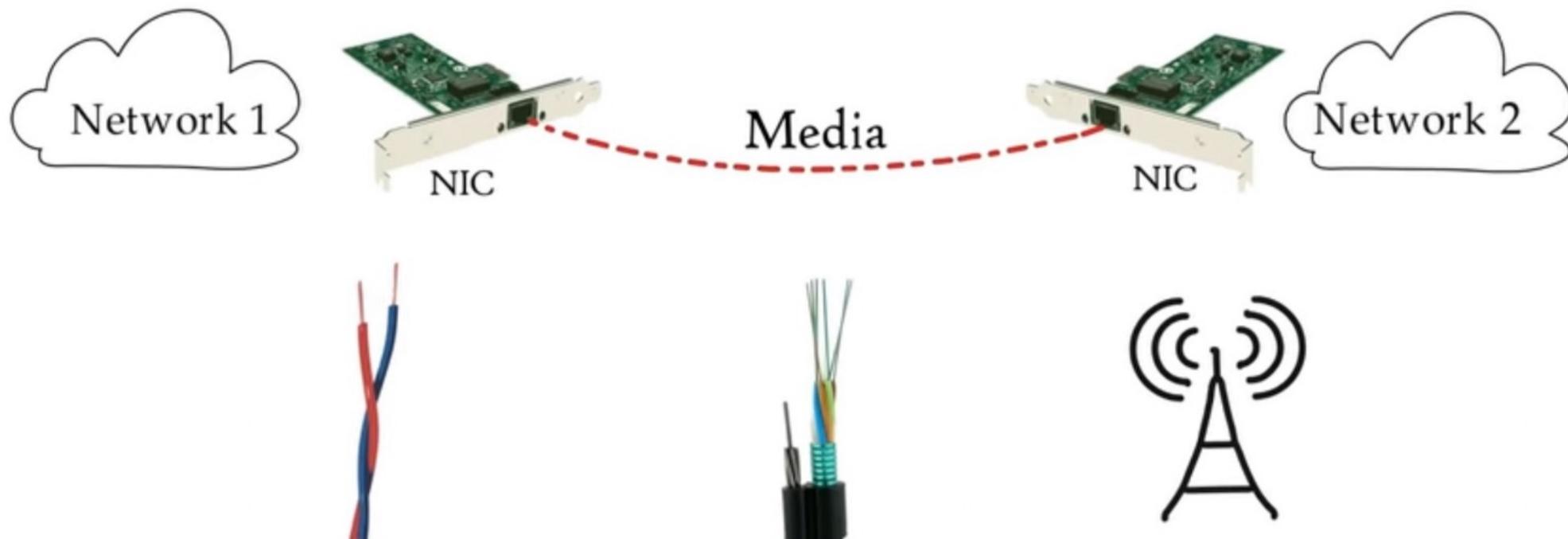
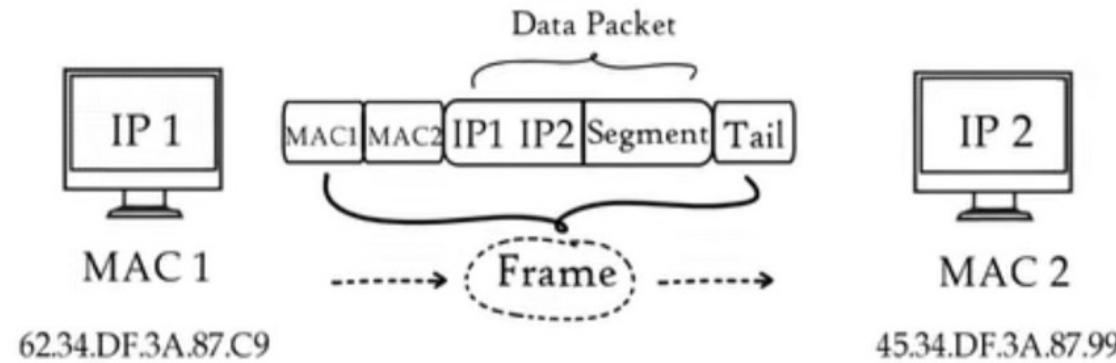
Data Link Layer

- Logical addressing : Network layer
- Physical addressing : Data Link layer

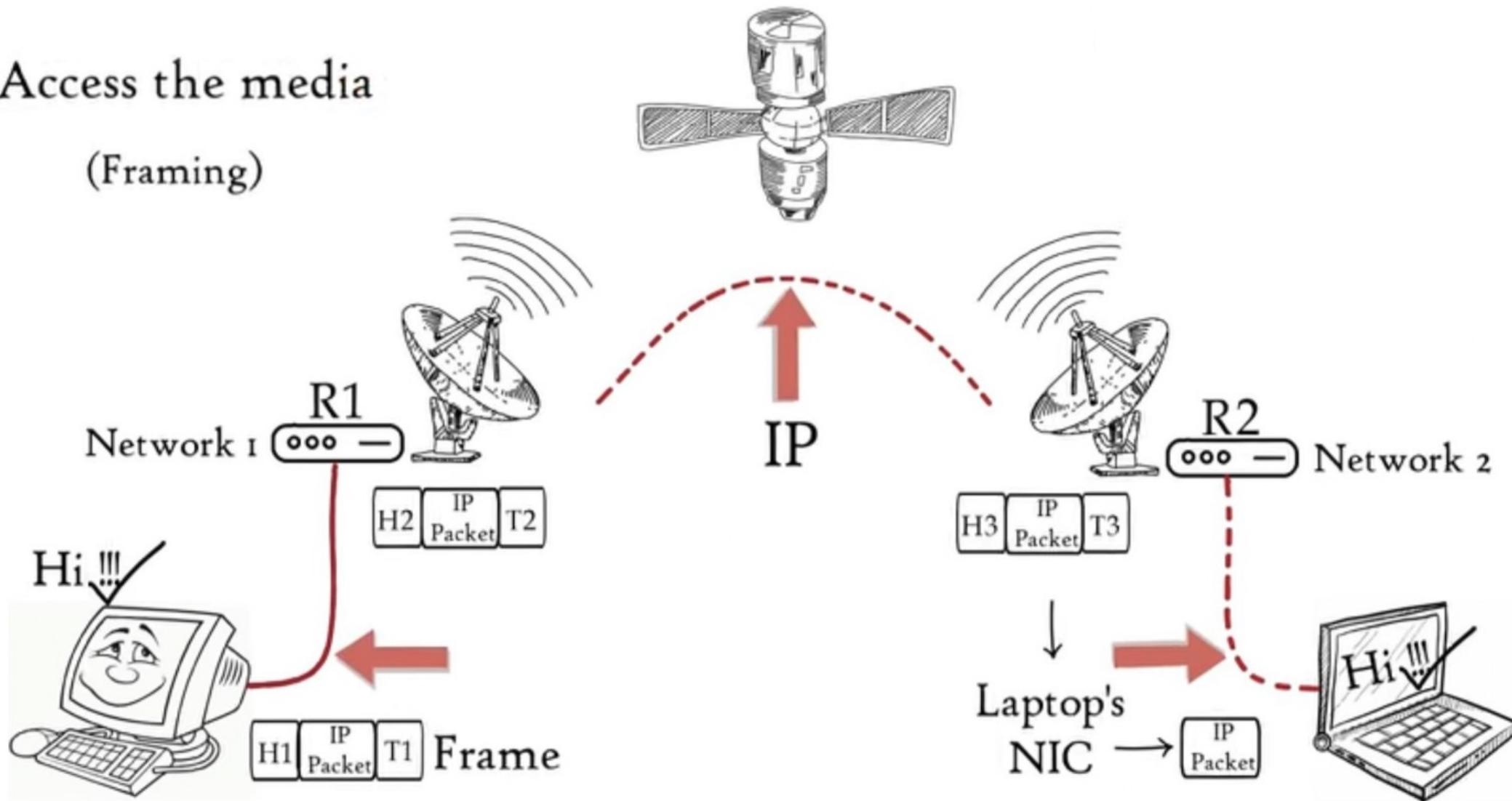


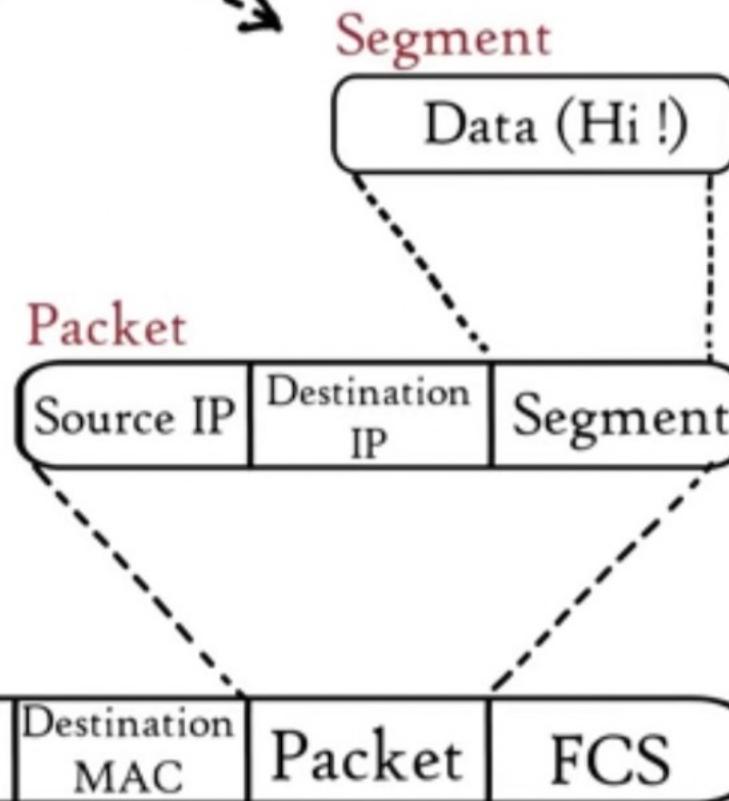
Data Link Layer





Access the media (Framing)





TRANSPORT LAYER

NETWORK LAYER

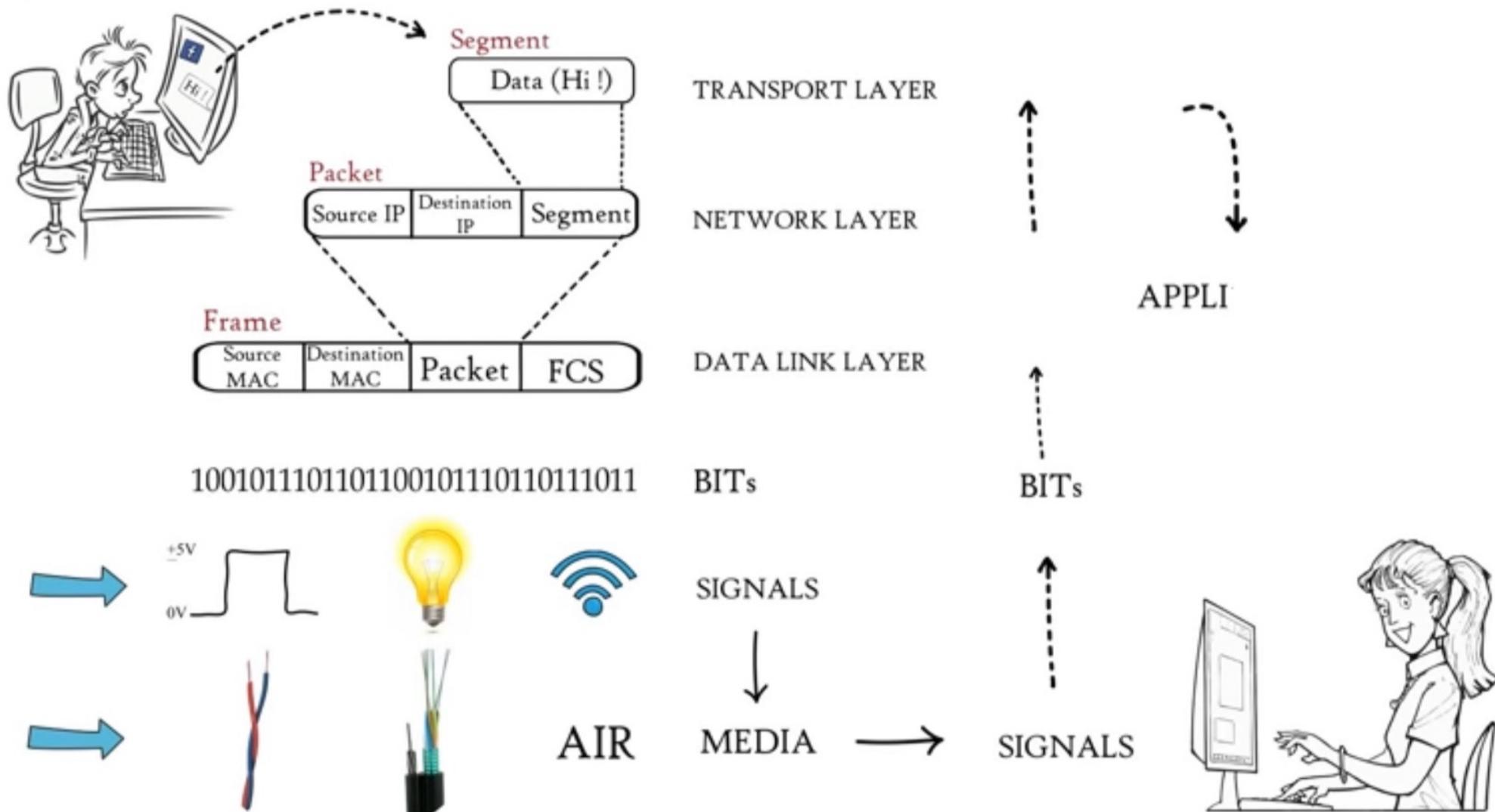
DATA LINK LAYER

Physical Layer

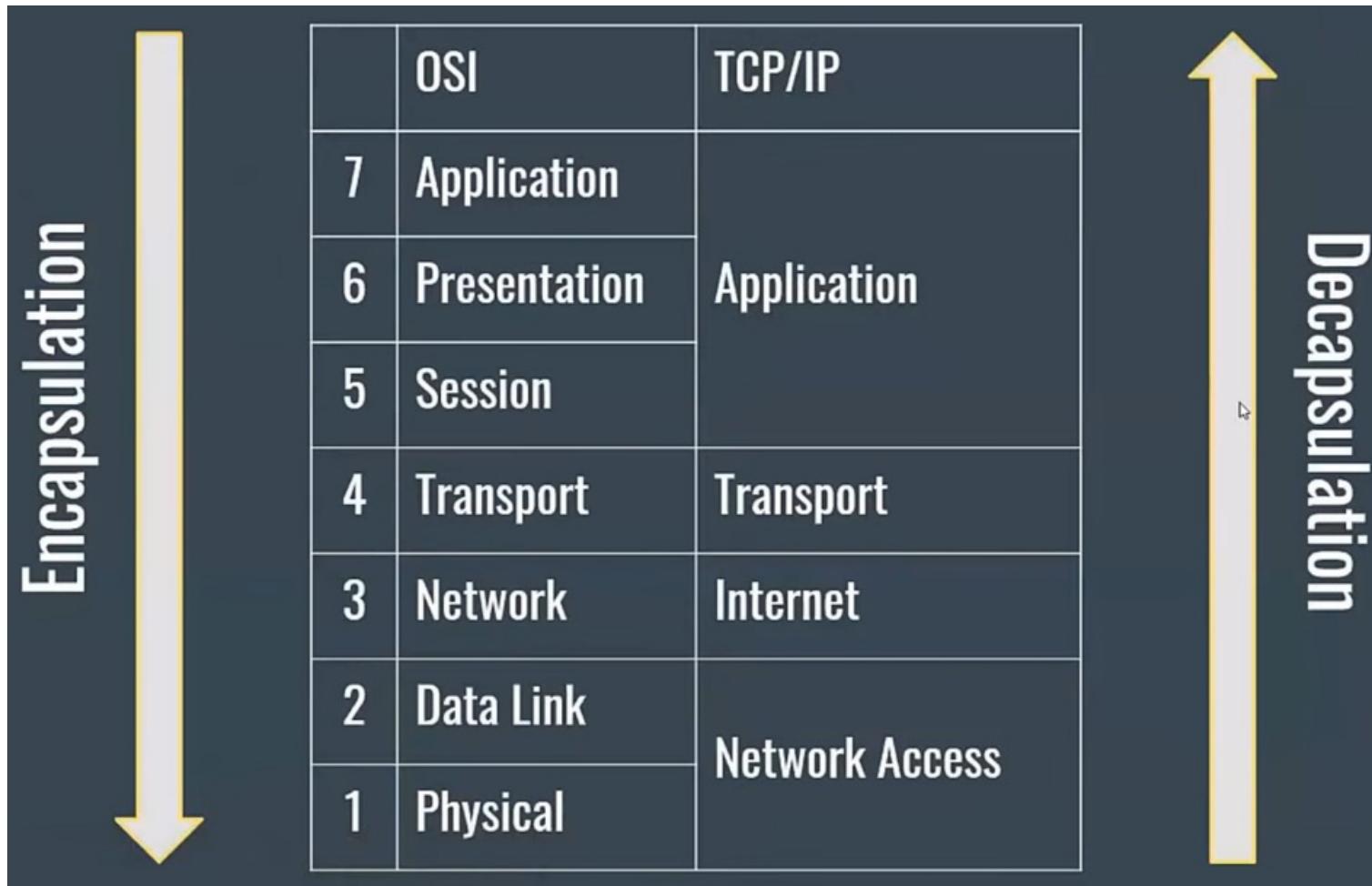
1001011101101100101110110111011

BITs

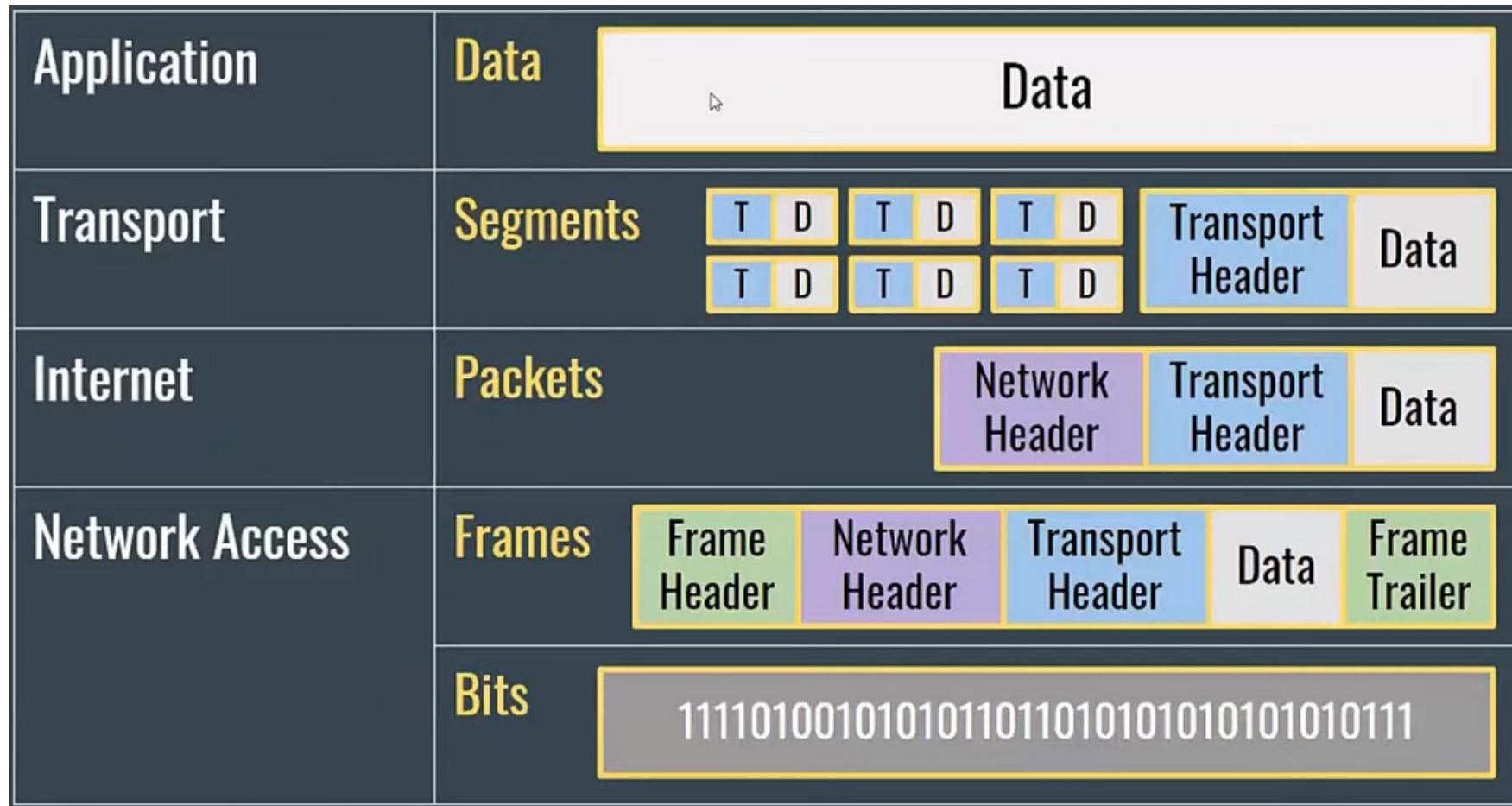
Physical Layer



Encapsulation and Decapsulation



Data Encapsulation Process



ANY QUESTION??

THANK YOU!!