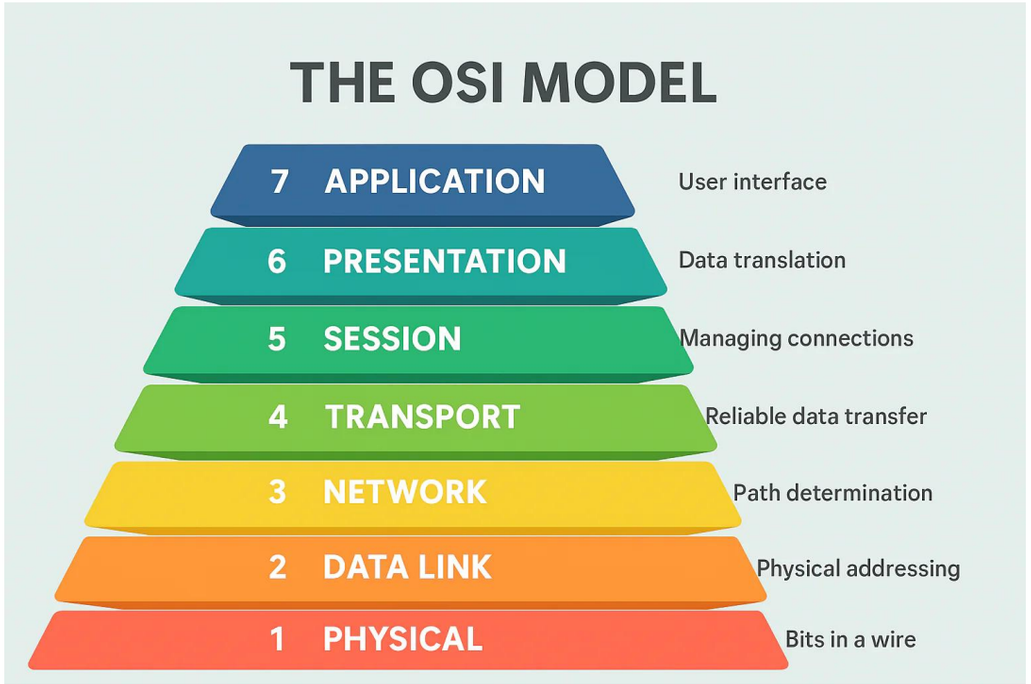
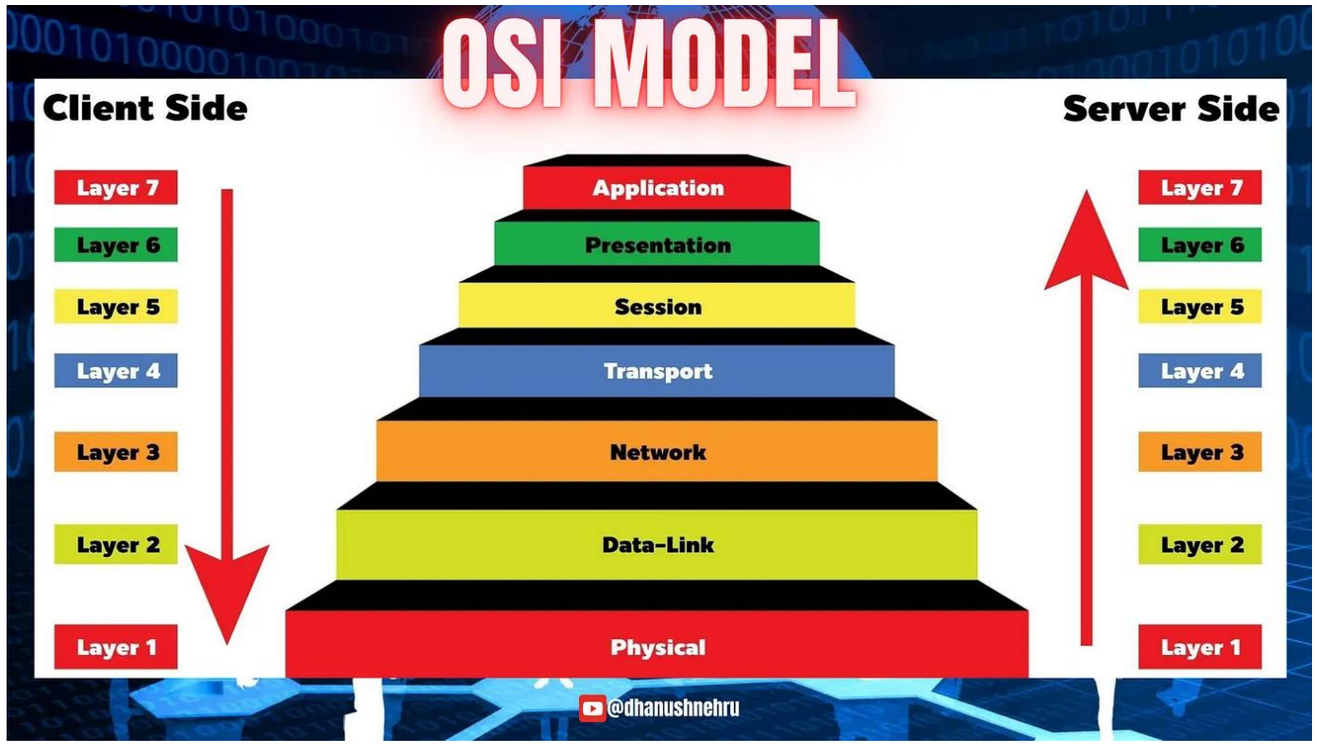
Feb 26 Notes

IP Address: made up of Network and Node

OSI Layers: site on the node [computer] you are working on]
7 layer model:





- Each layer is a component
- Change any part of the layer/component, does not matter; do not need to change any other components
- Most popular OSI model
- More granular

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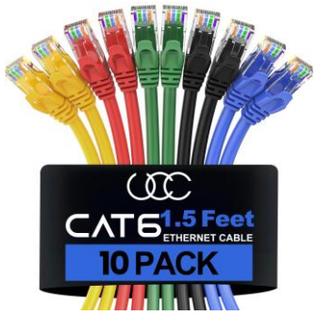
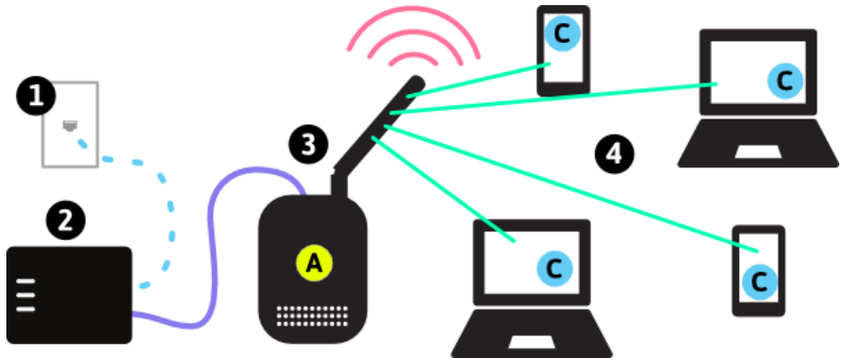
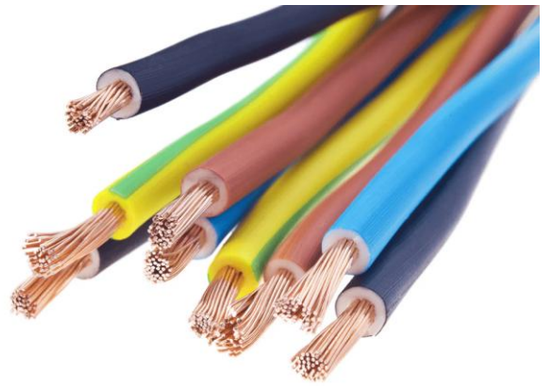
Physical Layer: cable, wires, wireless, fiber electrical



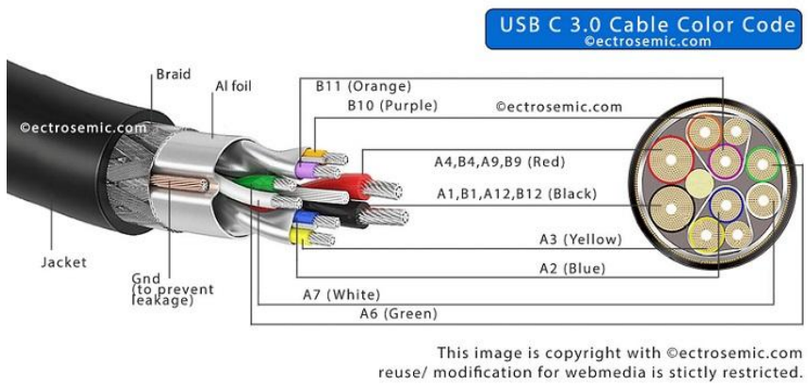




- Many options at each layer; depends upon your needs
- When changes are made at one layer, there is no need to touch other layers

Eg: - Network layer: change IP address
  - Data Link layer: change network card, MAC address changes
- Protocols/standards are set at each layer, Eg: voltage on cable
- Each layer connects to the layer above and below it
- Every layer has protocols and rules
- Hundreds of possible protocols
  - Eg: USB-C standards include voltage and data transfer rates

USB VERSION	DATA TRANSFER ONLY	AUDIO	VIDEO	POWER DELIVERY
USB 2.0 HighSpeed	✓			
USB 3.2 Gen 1 SuperSpeed 5 Gbps	✓	✓	✓	
USB 3.2 Gen 2 SupeSpeed 10Gbps	✓	✓	✓	
USB 3.2 Gen 2x2 SuperSpeed 20Gbps	✓	✓	✓	
USB 3.2 Gen 2 SuperSpeed 5Gbps Power Delivery	✓	✓	✓	✓
USB 3.2 Gen 2 SuperSpeed 10Gbps Power Delivery	✓	✓	✓	✓
USB4 20Gbps	✓	✓	✓	✓
USB4 40Gbps	✓	✓	✓	✓



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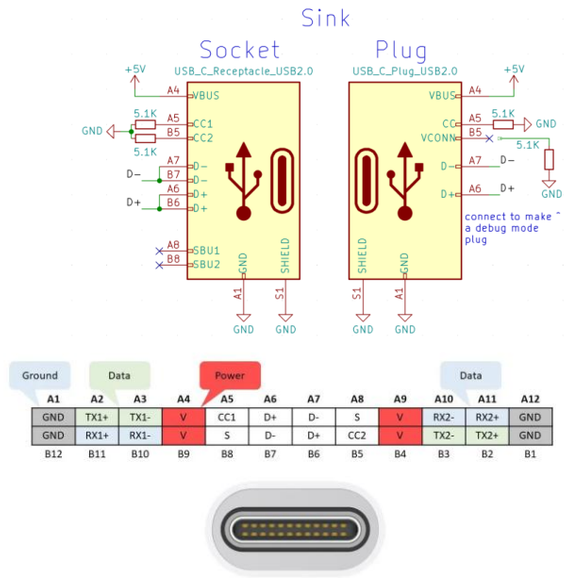
- IEEE, IETF: standard creating organizations
- Build to standards to sell the most equipment



Physical Layer: cable, wires, wireless, fiber electrical

Data Link Layer:
- 2 parts:
    - Convert IP address to MAC address
    - Getting 0s and 1s onto wire; media access control

Eg: - arp cache
    - Token ring
    - Ethernet
- Data Link layer deals with other computers on the same network
- MAC addresses are on the Data Link layer

Network Layer:
    - IP addresses

Transport Layer:
    - No guarantee of receipt
    - Mark packets with flags

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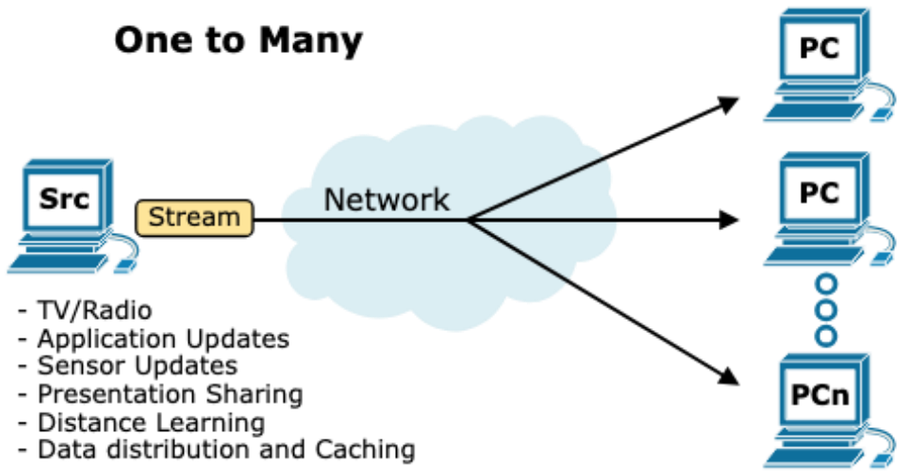
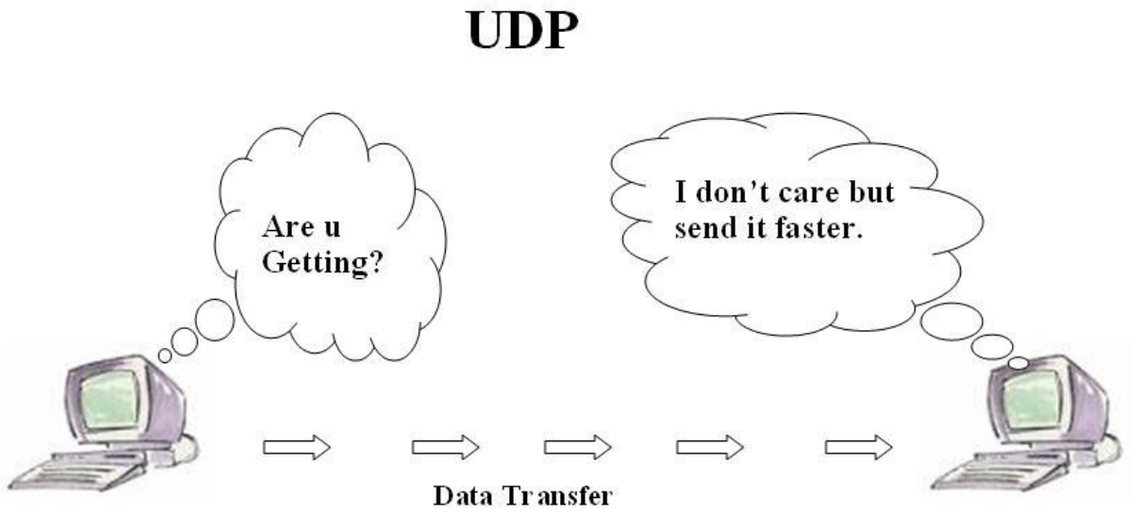
- Radio: transmits even if you do not listen
- This is known as multicasting; ok to drop packets
- Can create a buffer to store data; helps protect against dropped packets

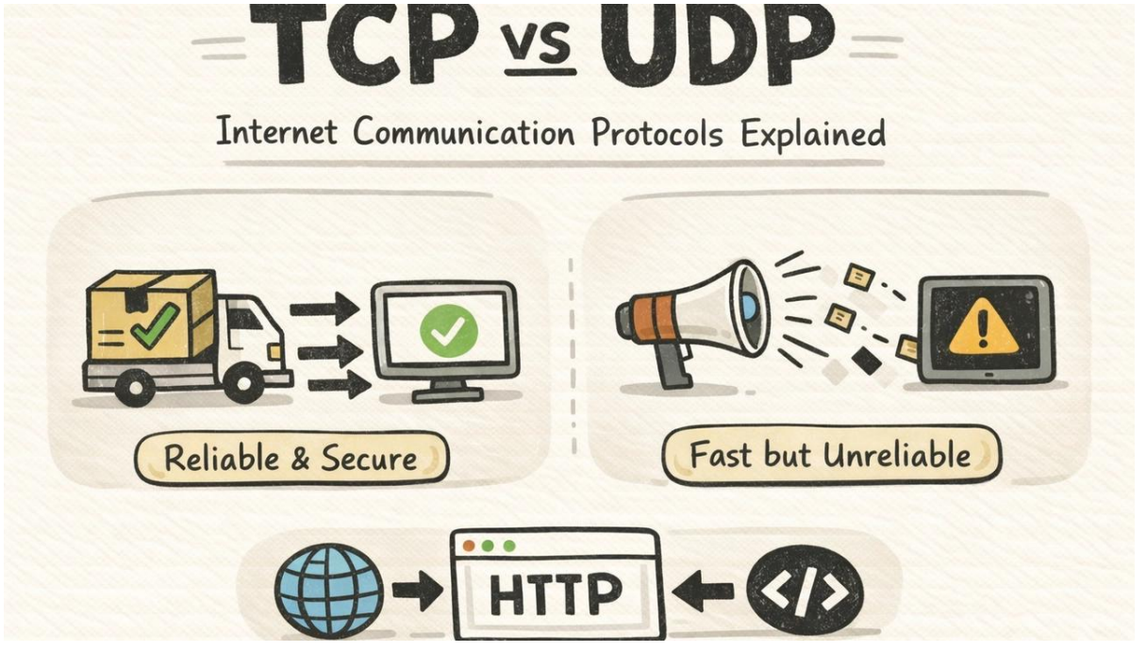
- TCP: makes sure you have a connection; error detection; handshake
- UDP: streaming audio/video; can drop packets; eg: radio

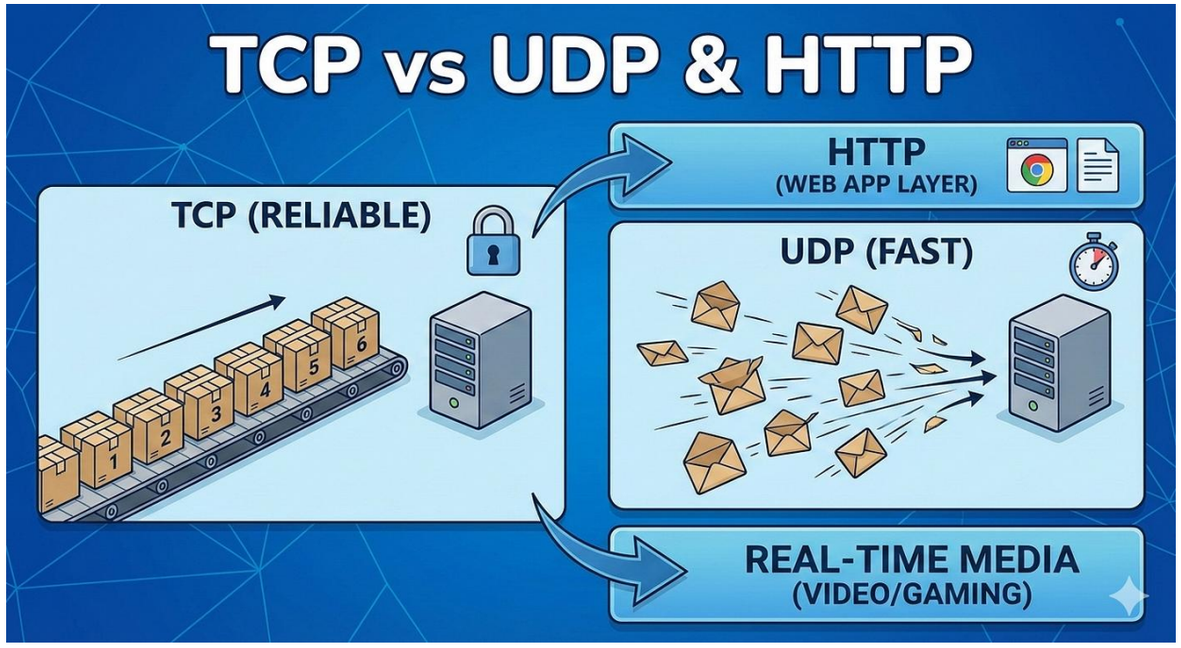
- TCP: reliable; connection oriented

- UDP: unreliable; connectionless









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1. TCP/IP: suite of protocols; UDP, TCP, IP, FTP, DHCP, ARP; tool box
2. TCP: tools; individual protocol
   IP: tools
3. TCP/IP: model

Feb 26 Class Notes continued

192.168.1 > network portion; determines which network you are on

Checks for computer on the same network; if so, converts IP address to MAC address
Command: arp -a > 192.168.1.1 > MAC address
If NOT on the network > goes to default gateway > router

Wired network > *CAN enter **static** IP address by hand; type in address

Better to obtain address automatically via DHCP server
Dynamic Host Configuration Server
* Dynamic Addressing
* Cannot keep IP address forever; on 24 hour lease
At 50% time of lease > if in use, will renew automaticlly

DHCP Server, Mail Server, Gateway > do NOT want dynamic IP

Client computers > DHCP is best but can lock in IP addresses from pool

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Feb 26 Class Notes continued

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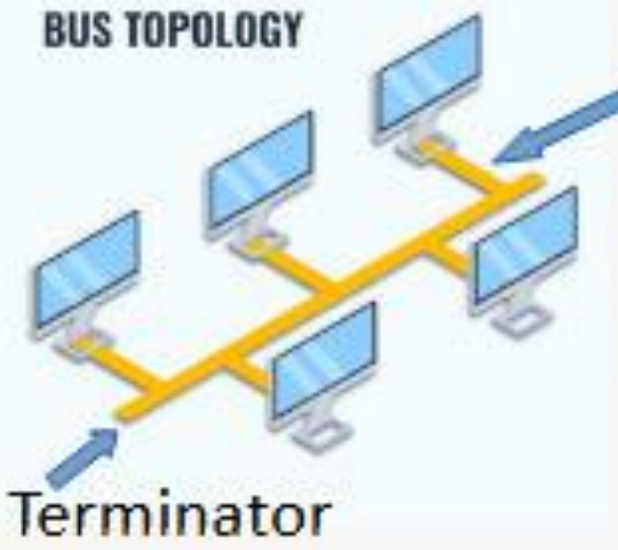
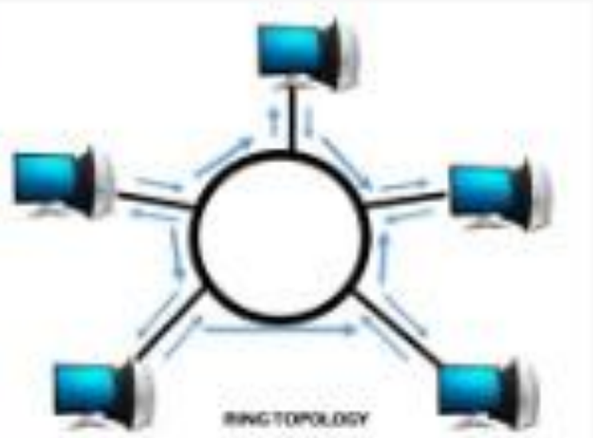
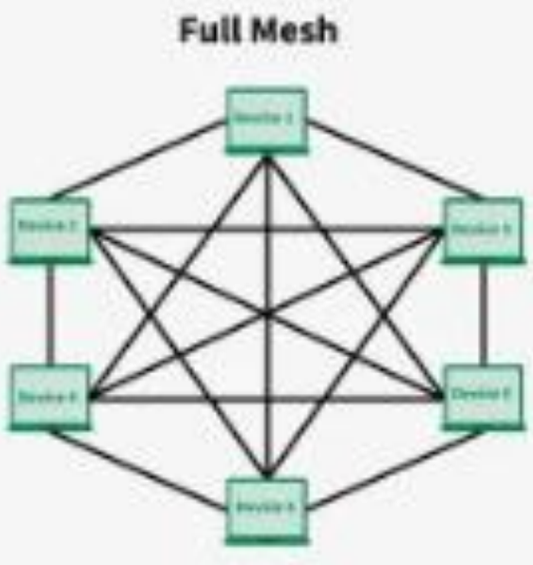
Physical Topologies Networks

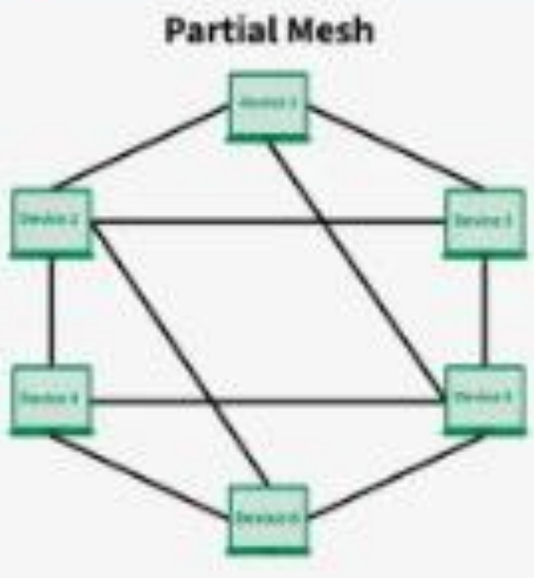


Star Topology [Ethernet]



Ring Topology
[Token passed around network]





Full and Partial Mesh
Allows for redundancy

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Physical Star topology, logical bus > Hub
Physical Star, logical ring > Multistation Access Unit

Ring topology > token > on data link layer

tracert command > find hops:
Computer host > Router >>>> Verizon >>>> alter.net >>>> Google

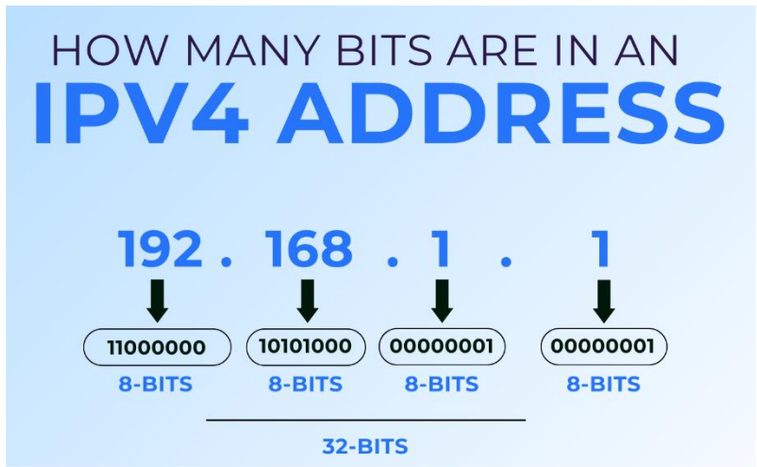
Hop 1

Hop 2

Hop 3

Each hop is a physical data link [not data link layer]

IPv4 is 32 bits



Router: connect to computer and connect to 2nd router/network
- At least 2 network connection but can have more
- Router has to be on the same network as router/PC

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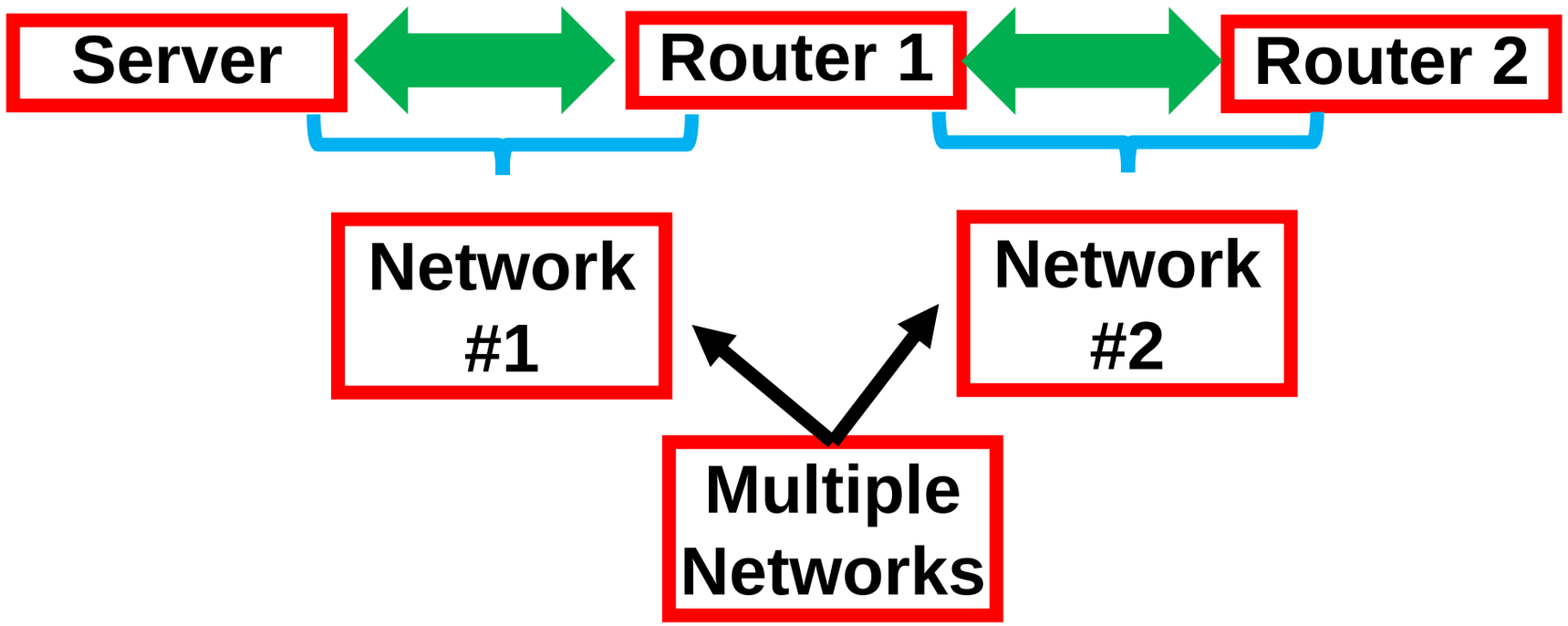

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OSI Layers Mnemoinc

Mnemonic	Layers	Num	
All	Application	7	← Web browser; email client
People	Presentation	6	
Seem	Session	5	
To	Transport	4	
Need	Network	3	
Data	Data link	2	
Processing	Physcial	1	← Physical cable; CAT 6

Away
Pizza
Sausage
Throw
Not
Do
Please

Use mneumonic to write out the **F**irst **L**etters of the OSI Layers, then use the letters to fill in the correct layer name. Write out 50 times.

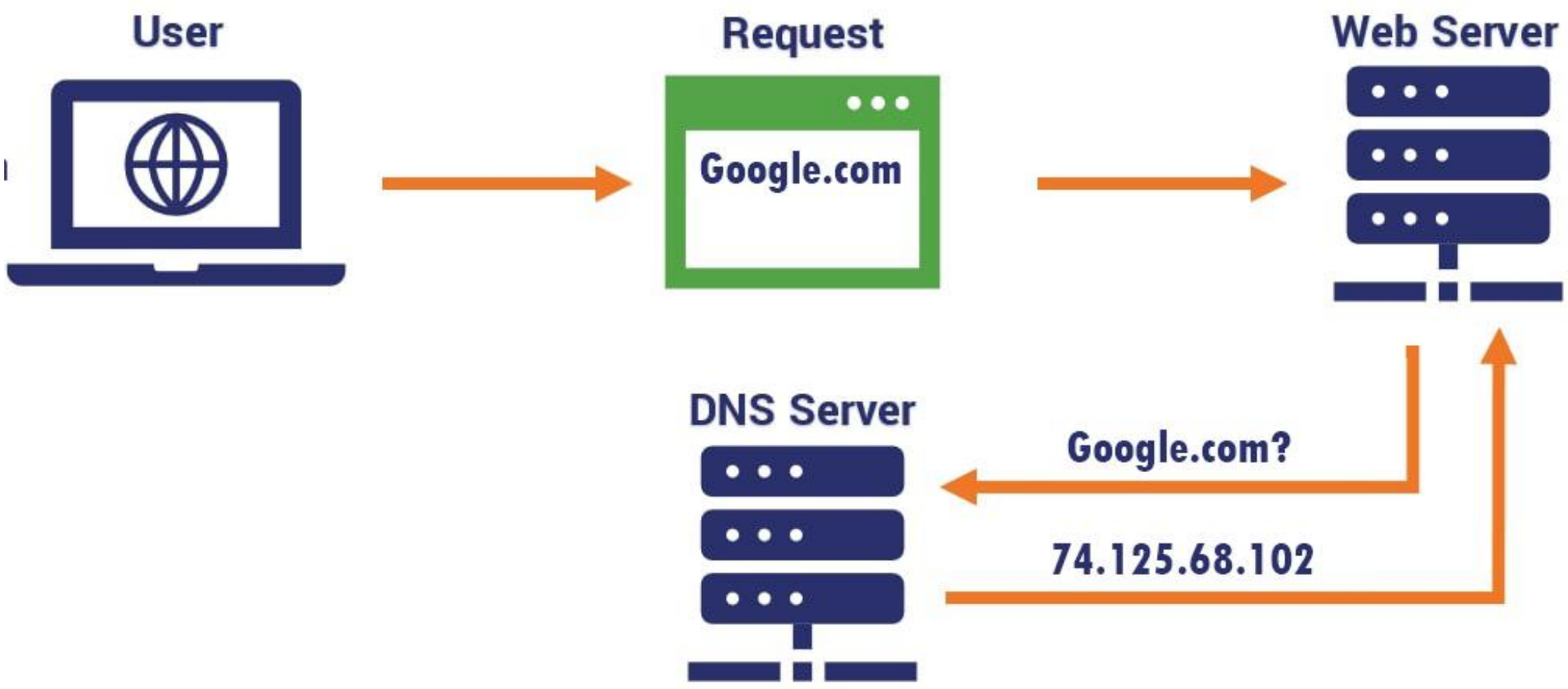
Made by Matt, Per Scholas, Network+ class, 2/2014

DNS: Domain Name Server
- **Can be the DHCP Server**
- **Converts Fully Qualified Domain Name [FQDN] to IP Address**
- **'Phone Book'**

DNS server entries are copied all over the world

Recursive: goes out to find IP address and returns

Iterative: if cannot find IP address, refers user to another DNS server



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Nslookup command:
Saved DNS list

```
root@SUP-GrantAD:~# nslookup www.synology.com 8.8.8.8
Server:         8.8.8.8
Address:        8.8.8.8#53

Non-authoritative answer:
Name:   www.synology.com
Address: 13.35.24.60
Name:   www.synology.com
Address: 13.35.24.58
Name:   www.synology.com
Address: 13.35.24.105
Name:   www.synology.com
Address: 13.35.24.80
```

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Internet Protocol Version 6
IPv6

IPv4
- Only 4 billion IP addresses
- Large number cannot be used [reserved]
- 192.168.1.1 > not routable
- - 2^32 = 4 billion

IPv6
- 128 bits
- 2^128
- 340 undecilion

IPv6
- Possible number of addresses: 340,282,366,920,938,463,463,374,607,431,768,211,456
- There are enough addresses to give an IP address to every grain of sand in the Sahara Desert

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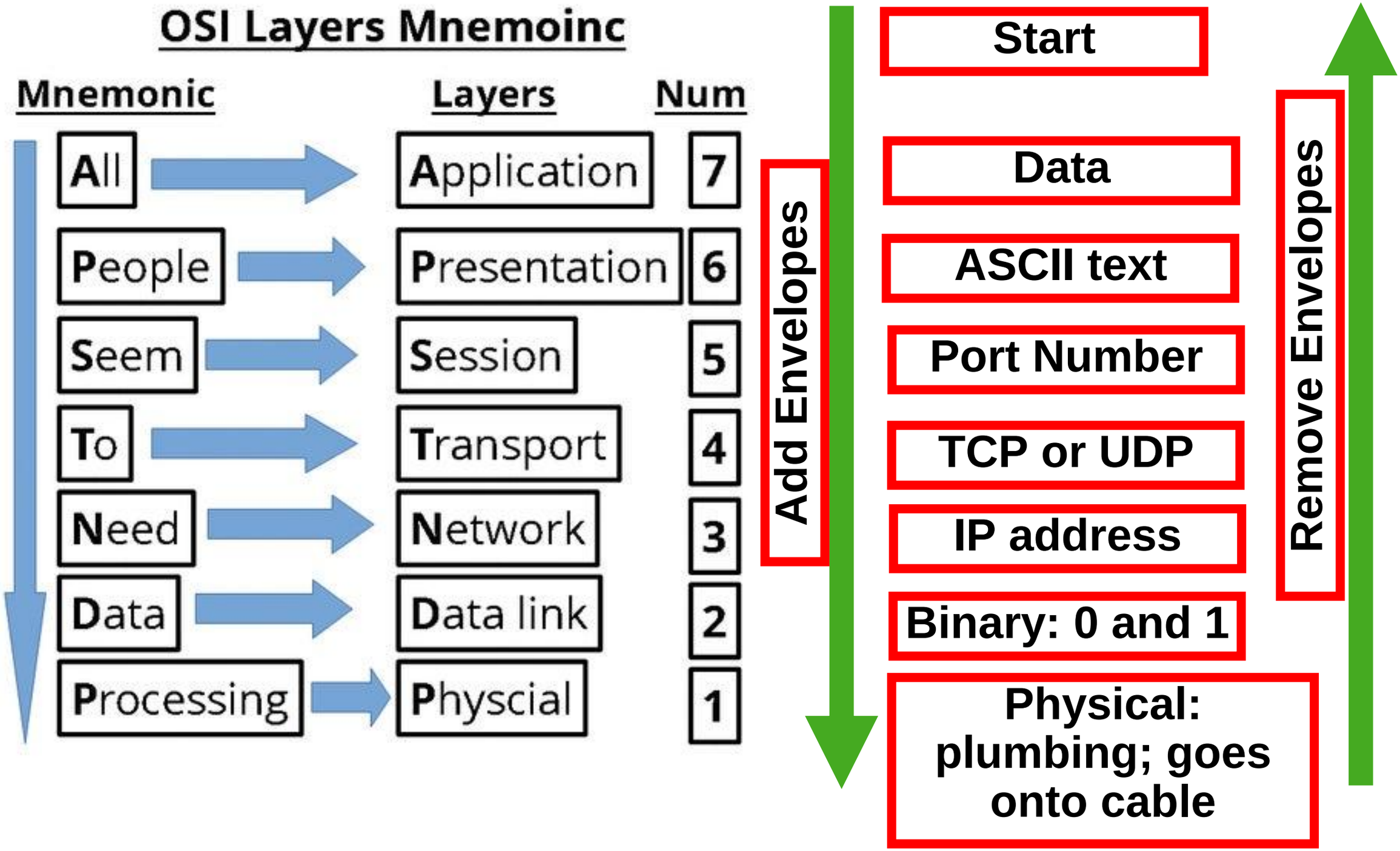
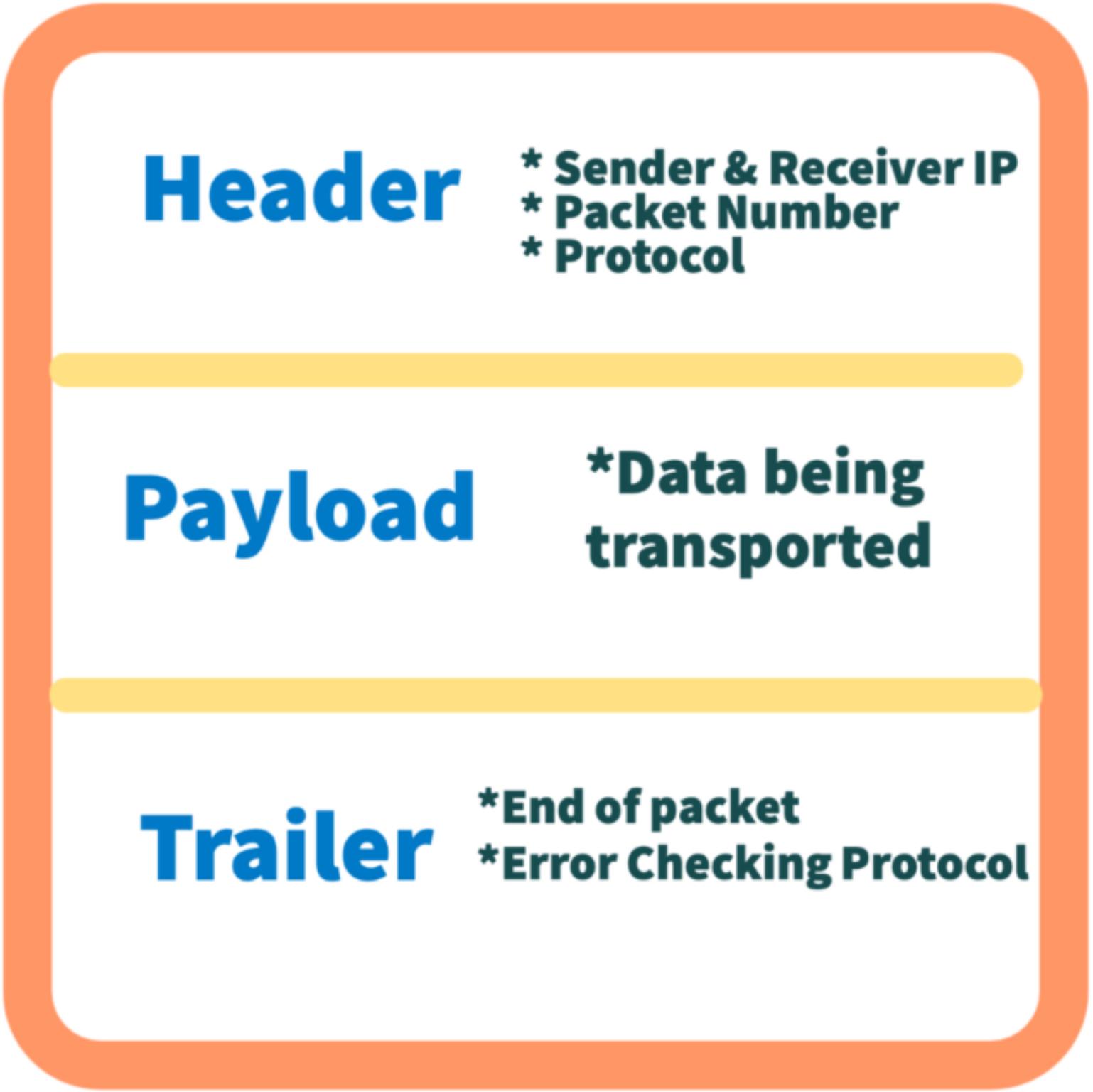
Encapsulation > user [email/https] > Tack information on as go through layers



Packets:
- Header [From/To]
- Footer [Error Correction/Detection]
- - Payload [Picture/Email]



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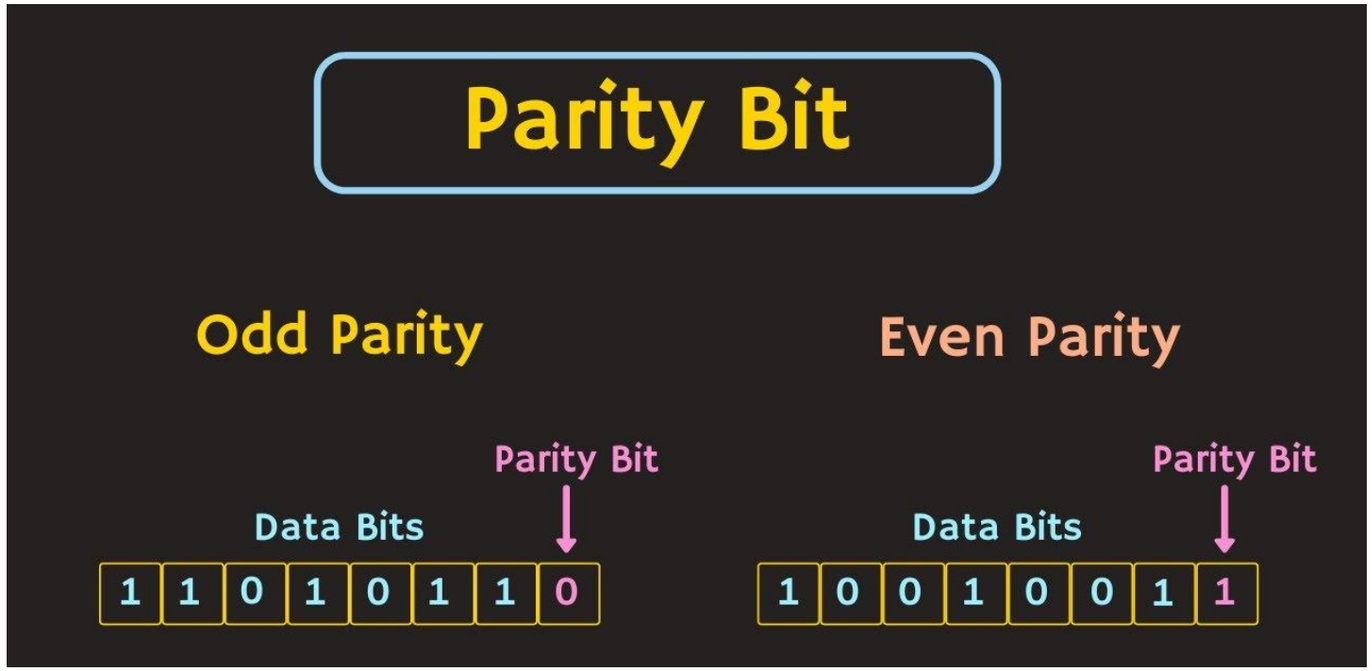
Parity:
- Error detection
- NOT correction



Cyclic Redundancy Check (CRC)

Cyclic Redundancy Check [CRC]
- Math formula
- Divide by a prime # > remainder gets sent with packet