DNS: Domain Name System - a global and highly distributed network service that resolves strings of letters into IP addresses

Network classes:

A: 0 - 127

B: 128 - 191

C: 192 - 223

D: 224 - 239

E: 239 - 255

**Physical Layer**

Consist of physical devices that transmitting bits across computer network. A standard network cable when connected to devices on both ends, it carries a constant electrical voltage charge. 1s and 0s are sent across network cable through a process called modulation.

The most common type of cable is twisted pair (8 copper wires -> 4 twisted pairs together help protect against electromagnetic interference and crosstalk from neighboring pairs).

Twisted pairs terminate with a plug that exposes the wires. Common plug is RJ45 can connect to RJ45 network port.

RJ45 port: 2 LED

Link: when cable properly connects to 2 powered-on devices

Activity: when data is transmitting ( 1 and 0)

Patch panel: like an cable extension to organize cable which then will be connected to a switch, each is separated

Switch: like a upgraded version of patch panel, every port can communicate with other plugged-in ports

Network port: are attached directly in the device

Duplex: allows communication to flow in both directions (ex:phone call - both can listen and speak)

Simplex: unidirectional

Full-duplex: simultaneous duplex (both can communicate at the same time)

Half-duplex: only 1 device can communicate at the time

Modulation: a way of varying the voltage of the charge moving across the cable, in computer network, it's called line coding. able to move 10 billions ones and zeroes/second

Bit: the smallest representation of data that a computer can understand, 1 or 0

**Data Link Layer**

Data Link layer abstract away the need of any other layers to care about the physical layer.

Ethernet: Ethernet for LAN, Internet for WAN.

Unicast: send data to only 1 receiving address (Least Significant Bit is 0 - last bit on the right)

Multicast: send data to multiple intended devices, will be accepted or discarded by each depending on criteria from their own hardware MAC address like switch (Least Significant Bit is 1 - last bit on the right)

Broadcast: send data to all devices on LAN like hub. (FF:FF:FF:FF:FF:FF)

**Transport Layer**

Multiplexing: nodes on network have ability to direct traffic toward many different receiving services, multi services sending data

Demultiplexing: Same concept but at the receiving end, taking traffic that is aimed at the same node and delivering it to the proper receiving service

Port: 16 bit number used to direct traffic to a specific services running on a networked computer

Difference btw port and socket: port 80, socket includes address and port 100.100.100.10:80

Ethernet encapslates IP datagram, IP datagram encapsulates TCP segment

TCP segment (made up of TCP header and data section/payload) includes:

Destination port: the port of service traffic needs to go to

Source port: high-numbered port chosen from a special section of ports known as ephemeral ports, keep outgoing connection separated

Sequence number: 32-bit number to keep track which segment out of many

Acknowledgement number: number of the next expected segment

Data offset field: 4-bit, how long the TCP header for this segment is

Control flag: 6-bit (6 flags, a value of one each)

URG: indicating if the segment is urgent (isn't normally seen)

ACK: acknowledge number should be exam

PSH: the transmitting device wants the receiving device to push currently buffered data to the app on the receiving end ASAP

RST: one of the sides in a TCP connection hasn't been able to properly recover from a series of missing or malformed segments

SYN: FIRST establishing a TCP connection and make sure the receiving end knows to examine the sequence number field

FIN: when this is set to one, the transmitting computer doesn't have any more data to send and the connection can be closed

TCP window: 16-bit number

TCP checksum: calculate across the entire segment and is compared with the original checksum in header to make sure no data loss

Urgent pointer field: used with TCP control flag to point out important segments among others (not regular and rare to see)

1. **way handshake**: SYN - SYN/ACK - ACK a way for 2 devices to ensure that they're speaking the same protocol and understand each other. When this is done, TCP connection is established
2. **way handshake**: when the connection is ready to close. The one wants to close send a FIN then alternately ACK - FIN - ACK

Socket: the instantiation of an end-point in a potential TCP connection

Instantiation: the actual implementation of something defined elsewhere

UDP