Network+ Study Guide Taylan Unal 9/7/16-Present

**1.1 Networking Overview:**

PAN: Personal Area Network. Generally PAN are Bluetooth or NFC connections.

LAN: Local Area Network. Devices connected by a router. WLAN is wireless Local Area Network.

WAN: Connection of Local Area Networks that together form a Wide Area Network

MAN: Connection of many WAN in a metropolitan area.

Internetwork: Link between two or more organizations

Internet: Large public network of information accessible by all users.

Intranet: Information only accessible from within an organization. Private availability only.

Extranet: Authorized external users can access organization's information.

Networks are made up of computers (nodes/hosts), transmission media (cables, etc.), network interfaces, and protocols.

Networks are worth the cost because of ability to share resources within an organization.

**1.2 Networking Topologies:**

*Physical Topologies are the Roads that connect our homes, but the logical topologies dictate how traffic flows on those roads.*

Bus: Topology where all nodes are linked by a single cable. Series connection. Any breaks would cause a complete communication failure across the network.

Ring: Where all computers are linked by a ring shape where data is passed 'downstream' and any break would stop communications downstream. Series connection.

Star: Centrally connected network where data sent to router, then to nodes. Much greater redundancy and resistance to failure.

Mesh: Redundant network where each node needs its own network adapter and a connection to each of the other nodes. In wired networks, mesh topologies are incredibly costly, and may not be effective to a degree. However, while using wireless connections, mesh topologies are effective, and automatic, as each device may talk to others without wiring.

**1.3 OSI Model (Open Systems Interconnection-1983):**

Application-Presentation-Session-Transport-Network-DataLink-Physical

The OSI Model standardizes network communications implementations.

Works with non-proprietary links. Packages that are sent travel from top down and packages that are received travel from bottom up.

Acronym: All People Seem To Need Data Processing

Both the physical and data link layers work at the hardware level, but the top 5 layers work at the software level.

It can also be described that the top 3 layers (HTTP/DNS) act as application layers, the next two are transport layers, and the bottom two are architecture layers. Many times protocols move and use other tools top down.

MAC sub layer defines unique hardware addresses for each network interface, and controls access to the LAN.

Port #'s are assigned to services like mail and web servers so that transport layers knows where to redirect traffic up the OSI layers.

OSI Travel = Sender: APSTNDP -> Receiver: PDNTSPA

*7 Application= Ex. HTTP, FTP, TTP, and SMTP. Intersection of network functionality and Enables communications between network clients and services.*

*6 Presentation= Ex. Syntax, encryption, compression, SSL. Encryption and data format.*

*5 Session= Addressed the Session ID for the connection, to identify unique connections.*

*4 Transport= Segments files into packets. TCP(connection-based) and UDP(connectionless) run at this stage. Ports are assigned here.*

*3 Network= Ex. Routing IP Address assigned. Packets are created when source and target IP addresses are added to data. Controls how messages are propagated across a network.*

*2 Data Link= Ex. LLC/MAC Address CRC made up the frame. CRC= Cyclic redundancy check. MAC Address identifies network adapter.*

*1 Physical= CAT6/5e/5 network cables, RJ45, RJ11, Hubs.*

**1.4 Network Signaling:**

Network Signaling is a part of the Physical Layer 1 of the OSI Model. Both Digital and Analog signals are used frequently.

Digital signal either uses a 1 or a 0 identify signals represented by 2.5v and -2.5v. Analog signals use modulation through frequency (FM) and amplitude (AM) to transmit data. Modems modulate and demodulate signals.

Transmission Systems include Broadband (analog signals using only a portion of the bandwidth/unidirectional) so two cables needed for up and downstream connections, and Baseband (digital signals, uses entire bandwidth), bidirectional, so only 1 cable needed for up and downstream connection.

Line Codes:

1. ReturnToZero: Signal always hits zero after a max or a min
2. NonReturnToZero: Signal stays at max or min until a flip where it moves directly.
3. Manchester: Instead of measures max min counts, this counts the number of flips.

**1.5 Network Protocols:**

Key topics: Protocol suite v. protocol. TCP v. UDP, IMAP v POP3 v IMAP, SSH v. Telnet, HTTPS v HTTP.

Protocol suites are groups of protocols used together. Most common suite is TCP/IP. TCP is connection based and guarantees delivery. UDP is connectionless and does not guarantee delivery.

**VOCAB:**

HTTP(S): Protocol that handles web requests. FTP: transfers files across computers using TCP. TFTP uses UDP instead. SCP and SFTP both use SSH to securely transfer files across networks. SMTP sends emails to other clients using SMTP. POP3 downloads these emails to the client, and IMAP stores the emails on a remote server. DHCP automatically configures DNS and IP assignment on a network. DNS uses logical names to mask IP addresses. NTP synchronizes time across networks and computers. LDAP is a directory service on a network. SNMP network management protocols allows for alerts on status of network. Telnet: outdated and insecure remote management method. SSH modern secure access and management service. ICMP is used to ping and verify host activity. IGMP establishes multicast group membership on a network.

**1.5 Contd.**

**COMMON NETWORK SERVICES:**

Key Services: Web, FTP, DNS, DHCP, Directory Services, SSH, MTA, MBC/CIFS

Server: Computer that provides a service or services for a network

MTA and MDA are mail services that all mail transfer agents to send and receive messages over the network. SMB and CIFS provide shared resources to network devices remotely.

**1.6 Numbering Systems:**

Binary is base 2, Octal is base 8, Decimal is base 10, Hexadecimal is base 16. With decimal, number of possibilities is always the base to the n power with n being the number of bits. Converting between the systems requires using subtraction or modulus method.