Network+ Study Guide

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1.1 Networking Overview

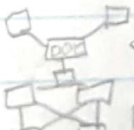
PAN: Connecting between personal devices. Usually Bluetooth.
LAN: Local Area Network. Devices connected by a router. WLAN (wireless LAN)
WAN: Connection of Local Area Networks make up a Wide Area Network.
MAN: Connection of many WAN in a metropolitan area.
Internetwork: Link between two or more organizations.
Internet: Large public network of information accessible by all users.
Intranet: Information accessible within organization even from outside network. Private Availability Only
Extranet: Authorized outside users can access organizations information

Networks are made up of computers (nodes/hosts), transmission medium (cables, etc), network interfaces, and protocols.
Networks are worth cost because of ability to share resources within an organization.

1.2 Networking Topologies


Bus: Topology where all nodes linked by a single cable. Series connection


Ring: Where all computers linked by a ring where all computers connected to one another in a ring.


Star: Centrally connected network where data sent to router, then to node
Mesh: Redundant network where 50 nodes need 50 net adapters. In wired network mesh is not practical, but wireless is very practical as each devices links to others seamlessly.

1.3 OSI (Open Systems Interconnection)

OSI Model (1983): Standardizes network communications implementations.

Application	A	7
Presentation	P	6
Session	S	5
Transport	T	4
Network	N	3
Data Link	D	2
Physical	P	1

Non-proprietary links. Packages sent and received travel from top to bottom, then bottom to top for senders and receivers respectively.
All People Seem To Need Data Processing
Bottom 2 layers (data link, Physical) are physical hardware, other 5 are software based. Or: Top 3 are application layers (HTTP/DNS), Next 2 are Transport layers and bottom 2 are architecture layers.

FLCP studying

OSI model.

1.3 OSI Cont'd. Many times protocols must and use other tools top down.

7. Application: Ex. HTTP, FTP, TFTP, and SMTP. Interaction of network functionality into OS Enables common software network clients & servers
6. Presentation: Ex. Syntax, encryption, compression, SSL } Encryption and data format
5. Session Ex. Session ID.
4. Transport Ex. Segments files into packets. (connection-based) TCP and (connectionless) UDP run here, Ports assigned here.
3. Network: Ex. Routing IP Address assigned, Packets are created when source and target IP are added to data
2. Data Link: Ex. LLC MAC address CRC. Frame CRC=Cyclic Redundancy check, MAC address identifies network adapter } Controls how messages Proposed on network
1. Physical: Ex. CAT6 (cable) RJ45 (adapter). Hubs.

Mac & layer defines unique HW address & lets device on network access CAN

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

Sender/Source → Reciever/Destination

↳ APSTNDP → PDNTSPA

Packets: MAC | MAC | IP | IP | DATA | CRC frame.

Bits: 0101010101

TCP/IP and OSI model

Data Link includes NICs, Bridges, switches,	Application	Application / Presentation / Session
Physical includes Hubs & repeaters,	Transport	Transport
Network includes Routers.	Internet	Network
	Network Interface (Hardware)	Data Link
		Physical

Port Example and OSI model

HTTP	Application
ASCII	Presentation
SessionID	Session
Port #'s	Transport
Router	Network (uniform addressing)
Switch	Data Link (NIC and Switch)
WAP	Physical

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1.4 Network Signaling [Part of Physical Layer 1 of OSI Model]

Baud rate is numbers of modulations per second; usually same as bitrate.

- Digital and Analog signals are types of signals.
- Digital signal has 1=on and 0 or negative = off.
- Analog signals use modulations through frequency (FM) and amplitude (AM) to transmit data.
- Modems modulate and demodulate signals
- Manchester encoding uses

LTE, wireless routers, DSL all use OFDM (orthogonal) Frequency division multiplexing.

Transmission systems:

- Broadband systems (use analog signals, only portion of bandwidth) unidirectional, so 2 cables needed for up/down
- Fiber optic cables also use multiplexing to split up frequency ranges.
- Baseband systems (use digital signals, use more bandwidth), bi-directional, so only 1 cable needed for up/down link.

Line Code:

Return to Zero: Signal always hits zero after max or min

Non Return to Zero: Signal stays at max or min until a flip where it moves directly

Manchester: Instead of measuring max/min counts, this counts the number of flips.

1.5 Network Protocols

Key topics:

- Protocol suite v. protocol
- TCP and UDP differences.
- IMAP4, POP3, SMTP
- How does SSH differ from Telnet? How does HTTPS differ from HTTP?

NTP: time sync across networks

LDAP: Directory service on network

- Group of protocols used together are called protocol suites. Most common is TCP/IP

TCP (transmission control protocol) is connection oriented. Needs ack packets

UDP (user datagram protocol) connectionless, quick b/c no ack required

S): SSL or TLS (code encryption)

HTTP (Hypertext Transfer Protocol): Protocol that handles web requests

TFTP uses UDP

FTP (File Transfer Protocol): Transfers files between computers (uses TCP)

SCP and SFTP both use ssh to securely transfer files across networks

SMTP sends emails to other addresses, POP3 downloads emails to client. IMAP stores mail on server.

DHCP (Dynamic host config Protocol): automates addressing

DNS: uses logical names to mask ip addresses.

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1.5 cont'd.

SNMP (simple network management protocol) allows for alerts on status of network
Telnet is outdated and insecure. Unused by modern admins
SSH: securely access & manage remote devices
ICMP: used to verify host activity.
IGMP: Establishes multicast group memberships on network.

Common Network Services.

Key services: Web, FTP, DNS, DHCP, Directory Services, SSH, MTA, SMB/CIFS
Server: Computer that provides service or a specific service for network on computer.
Apache web server used by 50-60% and IIS is used by 30-35%
FTP servers allow file transfers remotely. Less used due to security
DNS servers query domain name and returns IP address
DHCP automatically configures IP addresses on all network computers.
MS AD, Novell eDirectory, & OpenLDAP are all directory services that help manage networks.
SSH allows administrator to create remote computer as if sitting in front of it.
MTA/MDA are mail services that allow Mail Transfer Agents to send and receive emails.
SMB/CIFS provide shared resources to network devices remotely.

Exploring Network Services.

YAST allows easy setup for services on Unix servers.
On Windows use Cmd to use ftp. Simply type ftp then open, then log in. Linux commands apply.

1.6 Numbering Systems.

Octal uses base 8. • Decimal or base 10 is most familiar, Binary (base 2) is used by computers
For Hex chars, need 4 bits. • Max # of possibilities is 2^n with n being number of bits.
• Hexadecimal or base 16 includes 0-9 and A-F
• Converting Dec to Bin. Use conversion grid for 110101

32	16	8	4	2	1
1	1	0	1	0	1

512 0-9 is 10
256 A is 11
128
64
32
16
8
4
2
1