Layers and Wording

7	**Application**	Data
6	**Presentation**	Data
5	**Session**	Data
4	**Transport**	Segments/Datagram
3	**Network**	Packets
2	**Data-Link**	Frames
1	**Phyiscal**	Bits

1. Physical

Function	transmission of bits across network
Representation	Electrical voltage on wires -> 1 or 0
- NRZ	0 volt = **0**, +/-5 volts = **1**
- Transition Modulation	during a clock cycle, no change = 0, change = 1
Topology	see cheatsheet 1/20
Async comm.	use of *start bits* and *stop bits* to indicate when transm. occurs
Sync comm.	use of a reference clock to coordinate transm.
Broadband bandwith	divides bw into separate channels (ex Cable TV)
Baseband bandwith	uses different freqs on a cable & a ref clock to coordinate transm.
Baseband Multixplexing	TDM, StatTDM, FDM are ways to allocate time slots and freqs over channels
ex	cables, radio freqs, devices (hubs, WAP, converters, ...)

2. Data-Link

MAC	48-bit -> Network Interface Card (NIC) / 1st 24bits : manufacturer, 2nd 24bits : unique device value
LLC	*Logical Link Control*
	Reliable transmission of data
	Segmentation & addressing
	Flow and Error control (checksum)
Syncro	Isochronous, Syncronous or Asyncronous
Devices	NIC, bridges, switches

3. Network

Function	forwards traffic with logical adress
Logical adress	IPv4, IPv6, IPX, AppleTalk
Packet switching	divides data into packets and forward
Circuit switching	dedicated comm link
Message switching	divides data into storable messages which can be stored and forwarded later
Routers	routing table based on IP adress, static or dynamic route
	protocol RIP, OSPF, EIGRP
Flow control	regulates data flow/speed
Packet reordering	thanks to numbering and sequencing, packets can be sent across multiple routes
ICMP	Internet Control Message Protocol
	send error msg & ops info about an IP, uses **ping** and **traceroute**
ex:	routers, multilayer switches, IPv4, IPv6, ICMP

4. Transport

TCP	Transmission Control Protocol
connection oriented	reliable, resend lost segments, acknowlege (3-way handshake)
UDP	User Datagram Protocol
connectio-nless	ureliable, no retransmission, faster due to low overhead
Windowing	adjust amount of data, based on retransmission reception quantity
Buffering	router allocates memory to store segments
	buffer overflow = segments dropped
ex:	TCP, UDP, WAN accelerators, load balancers, firewalls

5. Session

Function	setup a conversation
Setting up	check credentials, session id, services needed and who starts
Maintaining	transfer data, reestablish connection, acknowledge data recept°
Tearing Down	on mutual agreement or other party disconnecting
ex:	**H.323/264** (voice/video streaming), **NetBIOS** (file exchange)

6. Presentation

Function	format data for readability, encrypt and secure data
Data Formating	for compatibility purposes, readability (ASCII, JPG, etc)
	compression, conversion
Encryption	scrambles data, provide confidentiality (TLS)

6. Presentation (cont)

ex:	programmation languages, text formats, pict extentions, protocols like TLS, SSL

7. Application

Function	interface user <-> computer
App. Services	File transfer, sharing, email, remote access, NW mgmt, cl/srv processes
Advert-isement	service initiating a service offer to a NW
ex :	POP3, IMAP, SMTP / HTTP-S / DNS / FTP-S / Telnet, SSH / SNMP

Encapsulation & Decapsulation

Function	"envelopping" data with **headers**
PDU	Protocol Data Unit. ex: L3PDU->Packet
Flags	
SYN	initiates synchronization of connection
ACK	acknowledges during 3-WSH and packet reception
FIN	initates termination of connection
RST	when client or server receives a non expected packet
PSH	gives priority to data (for sender)
URG	gives priority to data (for recipient)
MAC	phyiscal adress of a NIC
EtherType	identify the protocol used (IPv4/v6)
from L7 to L1	
at L4	+TCP/UDP header (source & dest ports)
at L3	+IP header (source & dest adresses)
at L2	+MAC+LLC ---- +FCS
at L1	transmit L2 in bits (0 and 1)

By **Aelphi** (Aelphi)
cheatography.com/aelphi/

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