Network+ | 05.Ethernet Fundamentals Cheat Sheet

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Fundamentals

Basic elements	Layer 1, contention-based (unorderly transmission)
CSMA/CD	Carrier Sense Multiple Access / Collision Detect
Carrier Sense	Listen to the wire, verify if busy
Multiple Access	all devices have access at any time
Collision Detect	if collision occurs, wait random time, try again
Collision Domain */CDO*	all devices on an internet segment (same cable or hub)
	half duplex, operates CSMA/CD
Switches	creates multiple CDOs, 1port=1CDO
	-> no chance of collision, full-duplex capability

Limitations

SPEED	
Ethernet	10Mbps
Fast Ethernet	100Mbps
Gigabit Ethernet	1000Mbps / 1Gbps
10-Gigabit Ethernet	10Gbps
100-Gigabit Ethernet	100Gbps
DISTANCE *(memo)*	
Copper	100m
CAT6	100m@1Gbps / 55m@10Gbps
CAT8	30m
MMF (T, TX,FX, SR, SX)	short range (200-500m)
SMF (LX, LR, ZX)	long range (in km)

Infrastructure devices

Collision domain */CD*	network segment where packets collide. Collision detection/avoidance can be set
Broadcase domain */BD*	domain where broadcast packets are diffused. The smaller the better
Hub	multiport repeater with or without amplification (passive/active/smart)

Infrastructure devices (cont)

Bridge	analyse source MAC adr & populates table. Separates collision domains
Switch	combination of hub and bridge
- layer 2	all ports belong to broadcast domain
- layer 3	creates one *BD* per port. Makes routing decisions, interconnect entire NW
Router	connects NW together, makes *fw* decisions. Separates *CD* and *BD*

Other Features

Link Aggregation	802.3ad	combines multiple connect° into a single logical connect°
		increased bandwith, congestion lowered
PoE, **PoE+**	802.3af/at	electrical power over Ethernet, Cat5 mini, 15.4W/25.5W
Port monitoring		network sniffer plugged on a hub - analyse purpose
Port mirroring		copy all traffic to another port
User Auth.	802.1x	once auth., a key is generated and shared
Management		**SSH** for remote access, **console port** for local admin.
Out-of-Band		NW conf. devices on a separate NW
First-Hop Redundancy		creates a stand-by router in case the active router fails
MAC Filtering		filters connect° based on MAC adr
Traffic Filtering		filters connect° based on IP adr
QoS		forwards traffic according to priority markings

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Spanning Tree Protocol STP 802.1D

Role	redundant links btw switches, prevent traffic loops. Without STP, MAC table can be corrupted
Broadcast Storms	
when a switches broadcasts btw each other in loop. Multiple copies are forwarded in loop. NW becomes saturated	
Root Bridge	reference bridge for spanning tree. defined with BID (lower BID) - made of *priority value* and MAC adr.
Non-Root Bridge	all other switches

Root Port	on N-RB, closest port to the RB
Designated Port	port with the lowest cost index to route to the RB. RB has only designated ports
Non-Des. Port	all other ports. Block traffic to avoid loops

Port states	
- *Blocking*	BPDU recieved but not forwarded
- *Listensing*	idem+ but populates MAC adr table
- *Learning*	process BPDU, switch tries to determine its role
- *Forwarding*	full ops

Link Costs	speed of a link. Lower the speed, higher the cost
ex:	Fast Ethernet :19, GB Ethernet : 4
	Long STP from 2.000.000 to 2.

Virtual LAN (VLAN)

Principle	allows different logical NWs with a single hardware.
How ?	use certain ports to separate broadcast domains
VLAN Trunking	multiple VLAN using same phy. cable
TPI	Tag Protocol Identifier
TCI	Tag Control Identifier
VLAN 0	Native VLAN left untagged

Specialized Equipment

VPN	virtual tunnel over untrusted NW/Internet
VPN concen-trator	tunnel traffic to a single location
VPN headend	
Firewalls	softw or hardw, allows some outcome traffic, blocks some inbound traffic
NGFW	packet inspection at layer 7 (App lvl). much more powerful
IDS/IPS	*Intrusion Detection/Prevention System*
	recognizes attacks and can respond
Proxy	content filter server
Content/C-aching Engine	caching service for a proxy
Load Balancer	distributes request across a server farm