L2 Protocols:
- Ethernet - uses MAC
- Frame Relay
- Serial - PPP
  - HLDC

Media Access Control:
- 48 bit address
- represented as hexadecimal

0001.234A.BCFE.3629

- Organisationally Unique Identifier (OUI)
- Unique to Interface
- Given to Company by IANA
- ALL Fs = Network broadcast

Collision Domains (CD):
- anywhere data can collide
- Hub = 1 large CD
- Switch - per port CD
- Half Duplex uses CSMA/CD → Carrier Sense Multiple Access / Collision Detection:
  - allows 1 device in CD to talk at a time - used for Half Duplex
  - if collision detected - all devices stop talking, each device starts random timer before it can talk again
  - devices listen on wire to make sure it is empty before speaking
- used by Ethernet

Hubs:
- single piece of wire
- traffic repeated out all ports
- 1 large CD
- unnecessary processing of frames on hosts that don't need said frames

L2 forwarding

Switch:
- uses virtual channels
- full duplex capable
- mac table - MAC to port mappings
- unknown unicast - flood - all ports in VLAN except Rx port
- Broadcast - destined for all ports in segment except Rx
- per port CD
- conversations go directly to right ports
- all devices in same segment = broadcast domain

VLAN:
- logical seperation
- creates multiple BD on single switch
- frames can't cross VLANs without L3 device
- doesn't cross L3 boundry

Default VLANs:

- 0 - reserved for 802.1P - X delete or modify
- 1 - Default VLAN - X delete or modify
- 2-1001 - normal range - stored in VLAN.dat
- 1002 - FDDI VLAN
- 1003 - TrCRF (Token Ring Concentrator Relay function)
- 1004 - FDDI Net VLAN
- 1005 - TrBRF (Token Ring Bridge Relay function)
- 1006-4094 - extended range - stored in running config

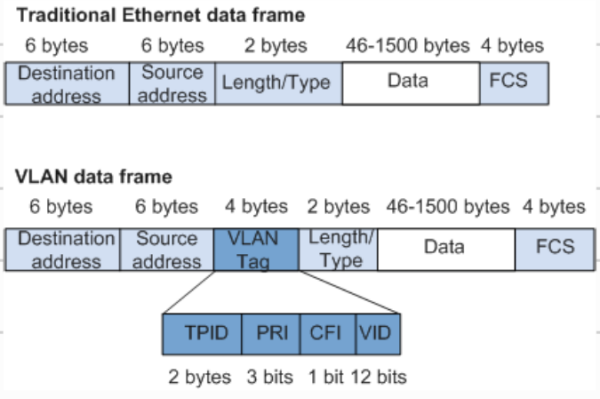
→ reserved - X delete or modify - 1002-1005

VLAN Config:

- name - max 32 characters
- 'show vlan' - VLAN-to-ports
  - System MTU
  - SPAN session
  - Private VLANs
  - 'br' - VLAN-to-port
  - 'sum' - no. VLANs
  - 'id'/'name' - filtered

Access Ports:

- assign to 1 data VLAN
- assign to 1 voice VLAN
- don't inc. 802.1Q header
- Catalyst switch - default - L2 ports, VLAN 1, access ports



802.1Q:

- Adds 32 bits to packet header
- Tag Protocol ID (TPID) - 16 bit - 0x8100 - 802.1Q
- Priority Code Point (PCP) - 3 bit - Class of Service (CoS) - L2 QoS between switches
- Drop Eligible Indicator (DEI) - 1 bit - can frame be dropped if BW contention
- VLAN ID (VID) - 12 bit - associated frame to VLAN

Trunk Ports:

- Carry multiple VLANs
- typically, Sw to Sw, Sw to router, Sw to firewall, sw to server
- 802.1Q header added to cross trunk
- 'show interfaces trunk'
  - port/etherchannels trunking, native/encapsulation
  - allowed VLANs

Native VLAN:

- untagged traffic associated to native VLAN
- default = 1
- match on both ends - VLAN mismatch if not - merge VLANs into single BD - all control plane traffic advertised in VLAN 1
- best practise - set as unused VLAN