

Components

L2 - Switches

802.3 - Ethernet Frame

Pull Socks Down So Learn Dance Freely

Preamble	SFD (Start Frame Delimiter)	Dest. address	Src. address	Length	Data	FCS (CRC)
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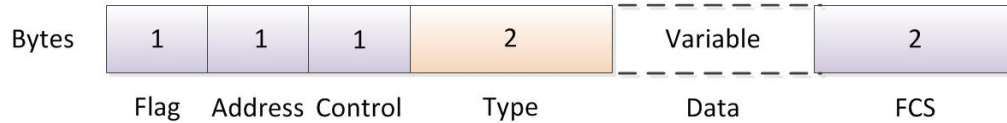
801.11 - MAC Frame

FC (2)	DUR (2)	Addr1 (6)	Addr2 (6)	Addr3 (6)	SEQ (2)	Addr4 (6)	Data	FCS (4)
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- FC (Frame Control)
- DUR (Duration)
- Addr 1, Addr 2, Addr 3
 - Src and dest MAC address, BSSID
- SEQ (Sequence)
- Addr 4
 - when frame is passing b/w DS(Distribution System)
 - Like - AP to AP
- Data
- FCS (Frame Check Sequence)
 - CRC (Cyclic Redundancy Check)
 - Used by receiving station to check whether received frame is corrupted or not

HDLC (High-level Data Link Control)

Cisco HDLC Frame with Proprietary Type Field



CAM (Content Addressable Memory)

- MAC address ⇔ port no.

Interface Counters :

Example 7-9 Interface Counters for Layer 1 Problems

```
SW1# show interfaces fa0/13
! lines omitted for brevity
Received 284 broadcasts (0 multicast)
0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
0 watchdog, 281 multicast, 0 pause input
0 input packets with dribble condition detected
95226 packets output, 10849674 bytes, 0 underruns
0 output errors, 0 collisions, 1 interface resets
0 unknown protocol drops
0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier, 0 PAUSE output
0 output buffer failures, 0 output buffers swapped out
```

- **Runts :**
 - Don't meet min frame size - 64 bytes
 - Reason : collision
- **Giants :**
 - Exceeds max frame size - 1518 bytes
 - **Baby giant** - upto 1600 bytes
- **Input errors :**
 - Runts, Giants, CRC, Frame, Overrun, Ignored
- **Frame :**

- Illegal format or corrupt
- **Late collision :**
 - Collision happen after 64th byte of frame is transmitted
 - Reason : duplex mismatch
- **Jumbo :**
 - 9216 bytes

L3 - Routers

Modes

- User mode
 - >enable
 - Enable mode (privilege) - EXEC
 - #conf t
 - Global config mode
 - #int f0/1
 - Interface mode
 - #line con 0
 - Console line mode
 - #line vty 0 4
 - VTY line mode
 - #vlan 1
 - VLAN mode

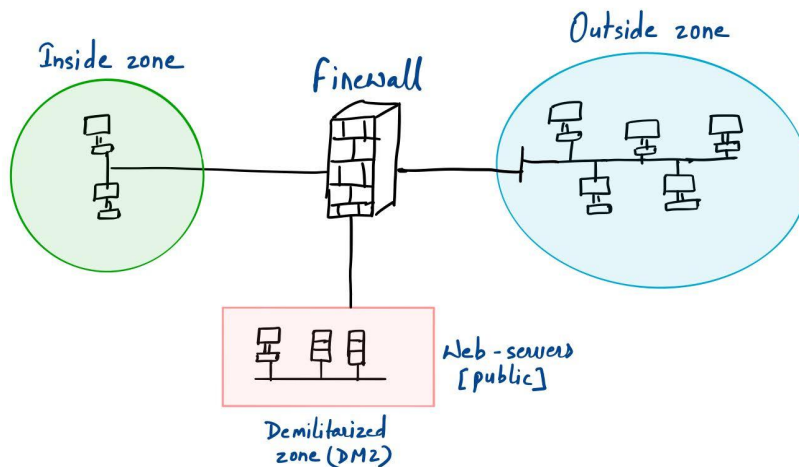
Components

- Bootstrap
 - Initialize the router
- POST (Power on self test)
 - check basic config and interfaces
- ROM
 - Store Bootstrap and POST
- NVRAM
 - startup-config

- Non-volatile RAM - Don't change when router is reloaded
- To erase
 - write erase
 - erase startup-config
 - erase nvram
- RAM
 - running-config
- Flash memory
 - Cisco IOS is stored
 - EEPROM (Electrically Erasable Programmable Read Only Memory)

Next-gen Firewall and IPS

- **Packet filtering** - Check src and dest IP address and port no
- **Stateful filtering** - Keeps record of previously checked packet



ng-Firewall

- **Deep packet inspection**
 - filter application source based on data, not port no.
- **URL filtering**
 - Reputation score of domains
- **Adv. Malware protection**
 - Block transmission and analyze infected packet
- **Ex -**
 - PaloAlto, Juniper, Fortinet, CheckPoint, StoneGate

ng-IPS

- **Host based info.**
 - current running app - ver, source
 - open ports
- Analyze log events if some kind of attack
- Similar to Antivirus
- URI filtering
- Ex -
 - McAfee, IBM, HP, SourceFire

Access Points (AP)

- Connect wireless devices to wired n/w

802.11 Wireless Standards

Standard	2.4 GHz	5 GHz	Speed	Year
802.11	✓	✗	2 mbps	1997
802.11b	✓	✗	11 mbps	1999
802.11g	✓	✗	54 mbps	2003
802.11a	✗	✓	54 mbps	1999
802.11n	✓	✓	600 mbps	2009
802.11ac	✗	✓	6.9 gbps	2013
802.11ax	✓	✓	4*ac	2019 (WiFi 6)

802.11 frame types

- Management
 - ATIM (Announcement Traffic Indication Message)
- Control
 - RTS (Ready-to-Send)
 - CTS (Clear-to-Send)
 - ACK (Acknowledgement)
 - PS (Power Save)
- Data

Controllers (DNA center and WLC)

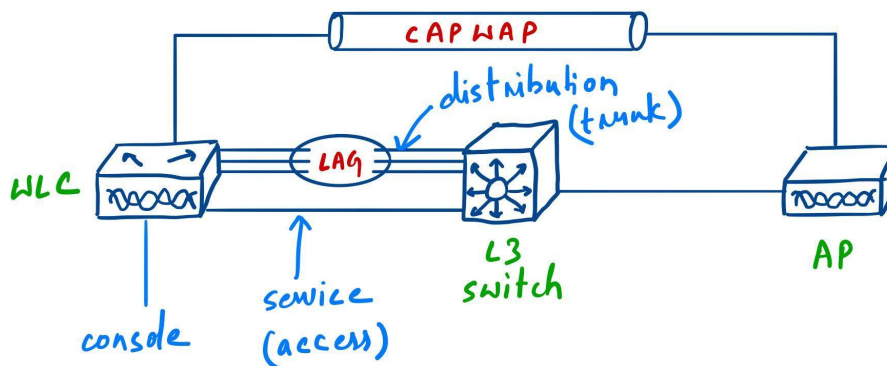
DNA Center

- Configure, monitor, troubleshoot and optimise the n/w
- Features
 - Intent-based networking
 - Using AI and ML to automate administrative task
 - Easy QoS
 - Encrypted traffic analysis
 - Network time travel - past performance
- SDA n/w
 - Controller
 - SBI - NETCONF, RESTCONF
- Non SDA n/w
 - n/w mgmt platform - Telnet, SSH, SNMP

WLC (Wireless LAN Controller)

- Lightweight AP gets its configuration by centralized controller WLC
- Support from 6 upto 300 APs
- Access WLC
 - SSH - by CLI [Terminal]
 - HTTP/HTTPS - by GUI [Browser]

Port types:



Interface types:

