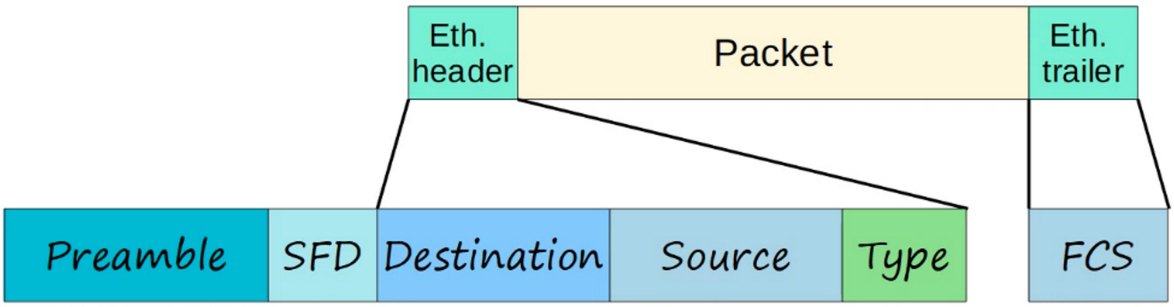
Thursday, July 31, 2025 4:05 PM

ETHERNET LAN SWITCHING : PART 2



An ETHERNET FRAME looks like:

Ethernet Header --- DATA (Packet) --- Ethernet Trailer

The Ethernet Header contains 5 Fields:

Preamble -- SFD -- Destination -- Source -- Type/Length

7 bytes -- 1 byte -- 6 bytes -- 6 bytes -- 2 bytes

Ethernet Trailer contains 1 Field:

FCS (Frame Check Sequence) = 4 bytes

- The PREAMBLE + SFD is not usually considered part of the ETHERNET HEADER.

THEREFORE the size of the ETHERNET HEADER + TRAILER is 18 bytes

(6 + 6 + 2 + 4 bytes for the FRAME CHECK SEQUENCE)

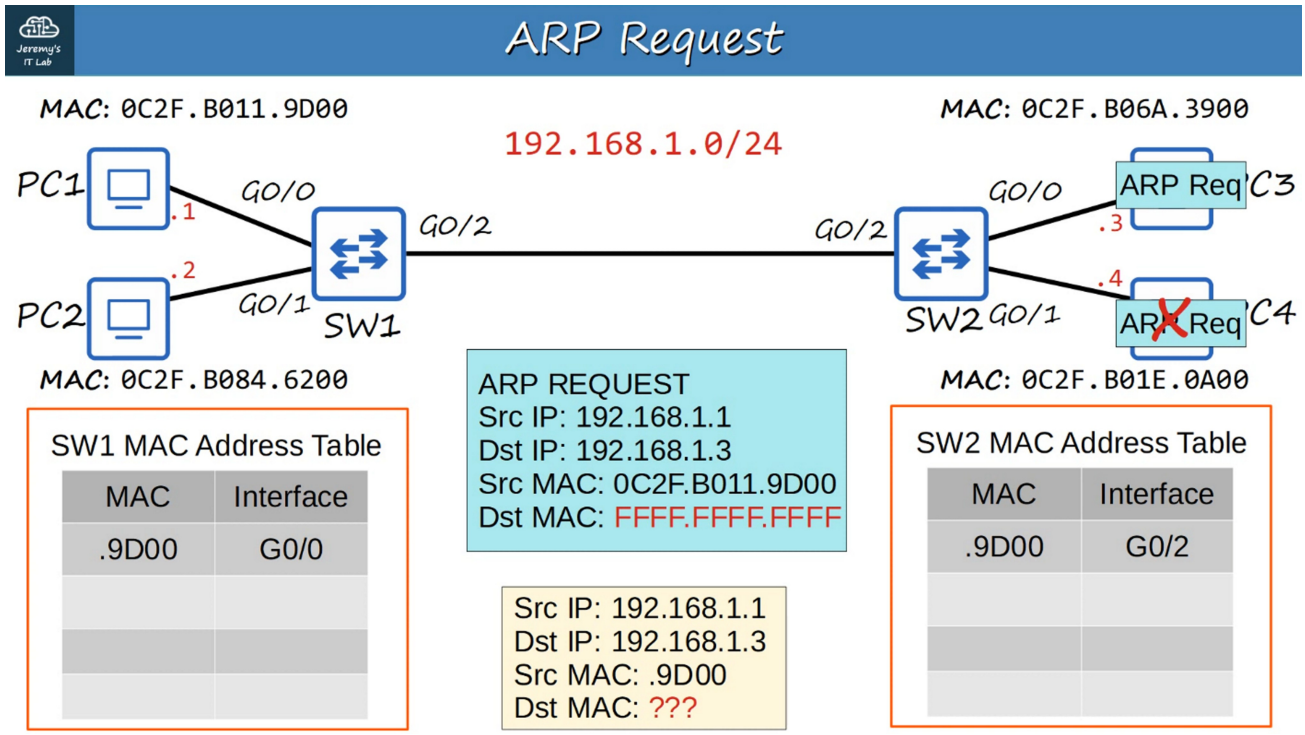
The MINIMUM size for an ETHERNET FRAME (Header + Payload [PACKET] + Trailer) is 64 BYTES.

64 BYTES - 18 BYTES (Header + Trailer size) = 46 BYTES

THEREFORE the MINIMUM DATA PAYLOAD (PACKET) size is 46 BYTES!

IF the PAYLOAD is LESS than 46 BYTES then PADDING BYTES are added (padding bytes are a series of 0's) until it equals to 46 BYTES.

When a PC sends a packet to a device with an unknown IP address, it uses an ARP Request.



- ARP stands for 'Address Resolution Protocol'.
- It is used to discover the Layer 2 address (MAC address) of a known Layer 3 address (IP address)
- Consists of two messages:
  - ARP REQUEST (Source message)
  - ARP REPLY (Destination message)
- ARP REQUEST is BROADCAST = sent to all hosts on network, except the one it received the request from.

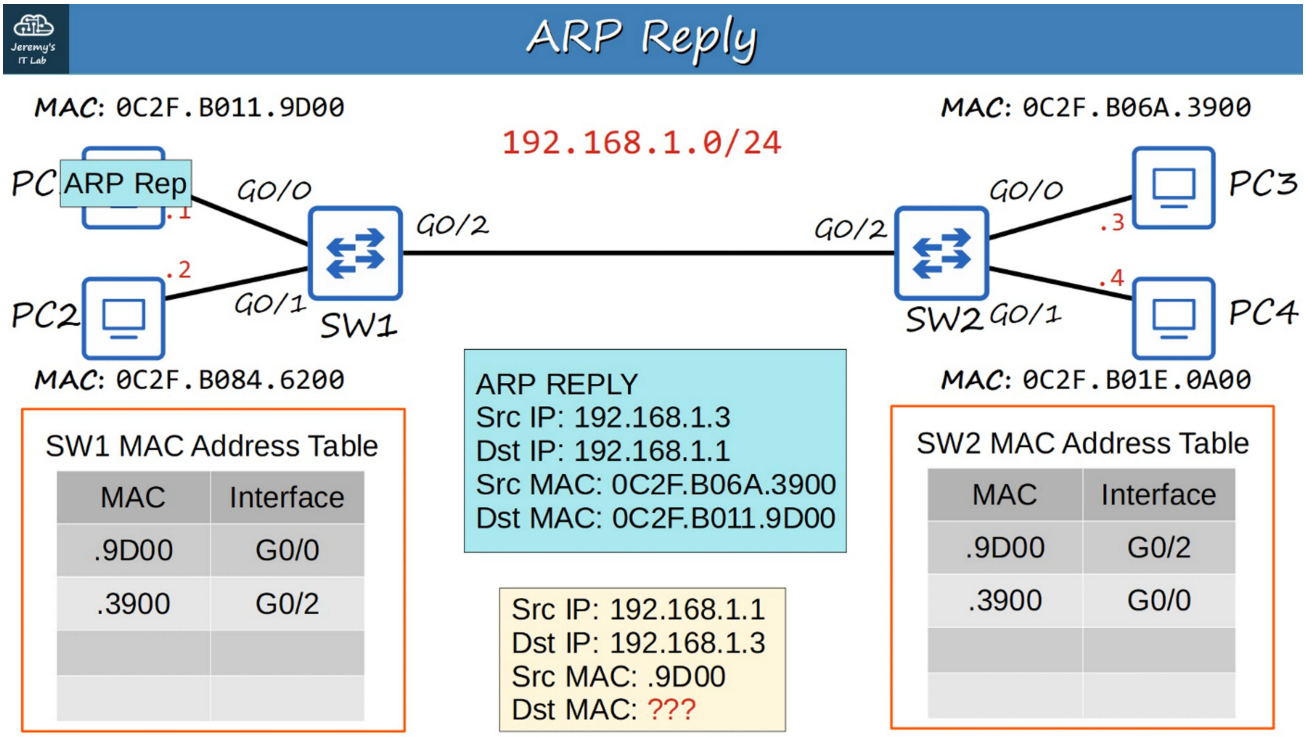
An ARP REQUEST frame has:

- Source IP Address
- Destination IP Address
- Source MAC address
- BROADCAST MAC Address - FFFF.FFFF.FFFF

An ARP REPLY frame has:

- Source IP Address
- Destination IP Address
- Source MAC address
- Destination MAC Address

ARP REPLY is a known UNICAST frame = Sent only to the host that sent the ARP REQUEST.



PING

- A network utility that is used to test reachability
- Measures round-trip time
- Uses two messages:
  - ICMP Echo REQUEST
  - ICMP Echo REPLY
- Is UNICAST
- Command to use ping:
  - ping

By Default, a CISCO IOS sends 5 ICMP requests/replies (Default size is 100-bytes)

- A period (.) is a failed ping
- An exclamation mark (!) is a successful ping

USEFUL CISCO IOS COMMANDS (from Privileged EXEC mode)

PC1# show arp // shows hosts ARP table

ARP Table

```
C:\Users\user>arp -a

Interface: 169.254.146.29 --- 0x9
  Internet Address      Physical Address      Type
  169.254.255.255       ff-ff-ff-ff-ff-ff     static
  224.0.0.2             01-00-5e-00-00-02     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

Interface: 192.168.0.167 --- 0xd
  Internet Address      Physical Address      Type
  192.168.0.1           98-da-c4-dd-a8-e4     dynamic
  192.168.0.255         ff-ff-ff-ff-ff-ff     static
  224.0.0.2             01-00-5e-00-00-02     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static
```

- Use `arp -a` to view the ARP table (Windows, macOS, Linux)
- `Internet Address` = IP address (Layer 3 address)
- `Physical Address` = MAC address (Layer 2 address)
- `Type static` = default entry
- `Type dynamic` = learned via ARP

SW1#show mac address-table // show the switches MAC table

MAC Address Table

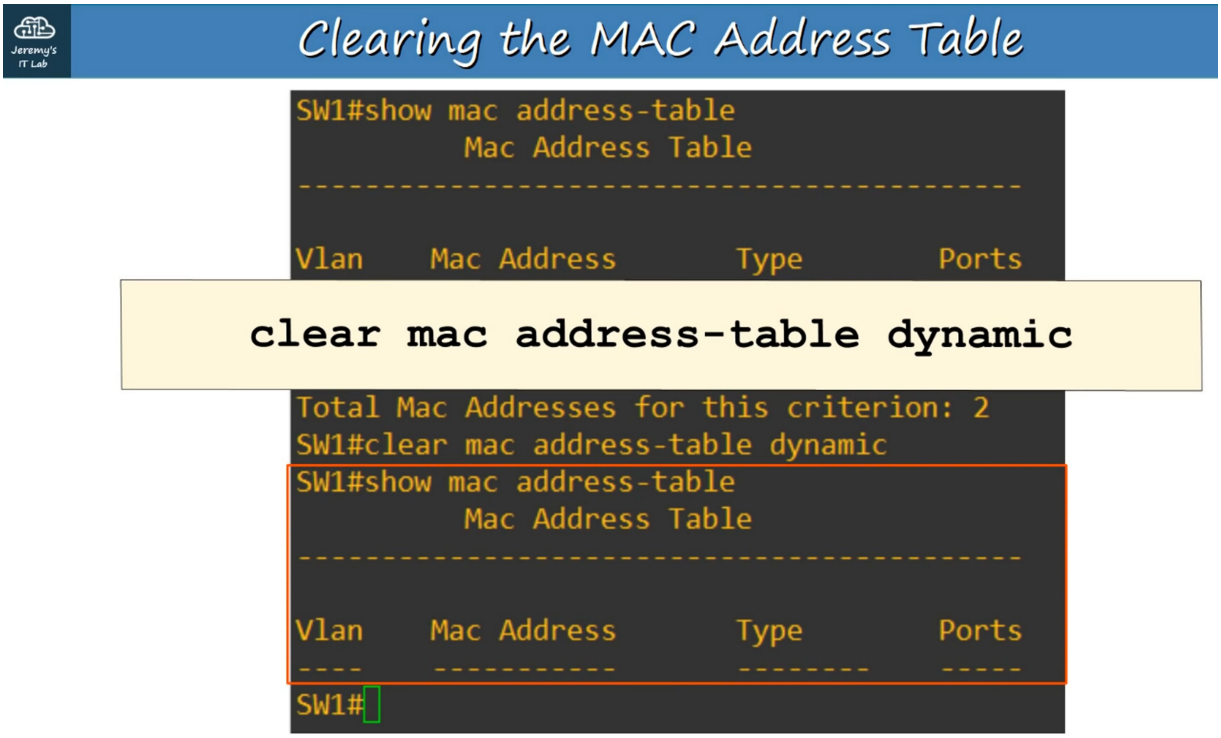
```
SW1#show mac address-table
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----
   1    0c2f.b011.9d00    DYNAMIC     Gi0/0
   1    0c2f.b06a.3900    DYNAMIC     Gi0/2
Total Mac Addresses for this criterion: 2
SW1#
```

Will show:

Vlan --- MAC Address --- Type --- Ports(interfaces)

(Vlan = Virtual Local Area Network)

SW1# clear mac address-table dynamic



// clears the entire switches MAC table. // IF the optional MAC address is used, it will clear the SPECFIC MAC address.

SW1 #clear mac address-table dynamic interface

// clears the MAC table entry of the Switch by it's INTERFACE name.