Badji Mokhtar University Annaba
Electronics Department

Chapter 1: Switching in LANs

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Lecture Purposes

Upon completion of this lecture, you should be able to:

- Explain basic switching concepts
- Compare fixed configuration and modular switch
- Explain the process of frame forwarding in a switched network
- Configure a Layer 3 switch

Layer 2 LAN Switch

- Connects end devices to a central intermediate devices on most Ethernet networks.
- Performs switching and filtering based only on the MAC address
- Builds a MAC address table which is used to make forwarding decisions
- Depends on routers to pass data between IP subnetworks

- Switching technologies are crucial to network design
- Switching allow traffic to be sent only where it is needed in most cases, using fast methods.

- A switched LAN:
  - Allows more flexibility
  - Allows more traffic management
  - Supports quality of service, additional security, wireless, IP telephony and mobility services,

Fixed platform

Features and options are limited to those that originally come with the switch.

Modular platform

The chassis accepts line cards that contain ports.

Stackable platform

Stackable switches are connected by specific cables to operate as one large switch.

Features of switches in networks

- There are various types of enterprise switches and the following are the criteria to consider when selecting them.

Consideration	Details
Cost	• Cost of a switch depends on the number and speed of the interfaces, supported features, and expansion capability.
Port Density	• Network switches must support the appropriate number of devices on the network.
Power	• Some switches support Power over Ethernet (PoE). • Some chassis-based switches support redundant power supplies.
Reliability	• Switch should provide continuous access to the network.
Port Speed	• Speed the network connection.
Frame Buffers	• Switch should be able to store frames for congested ports
Scalability	• Switch should provide the opportunity for growth

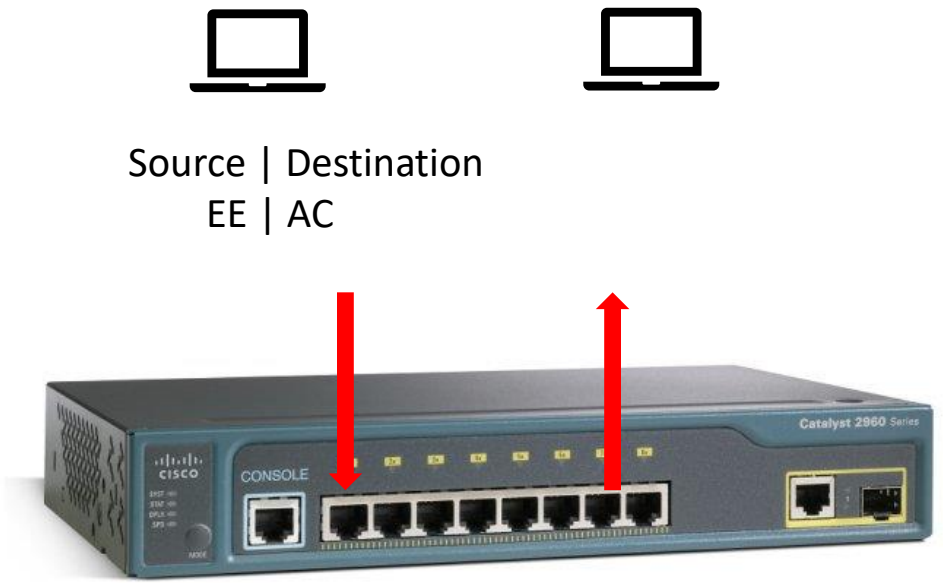
Switching as a general concept

The fundamental concepts of switching refers to a device making a decision based on two criteria:

- ✓ Ingres port
- ✓ Destination address

The term ingress is used to describe where a frame enters the device on a port.

The term egress is used to describe frames leaving the device from a particular port



Port Table

Destination adresses	Port
EE	1
AA	2
BA	3
EA	4
AC	5
AB	6

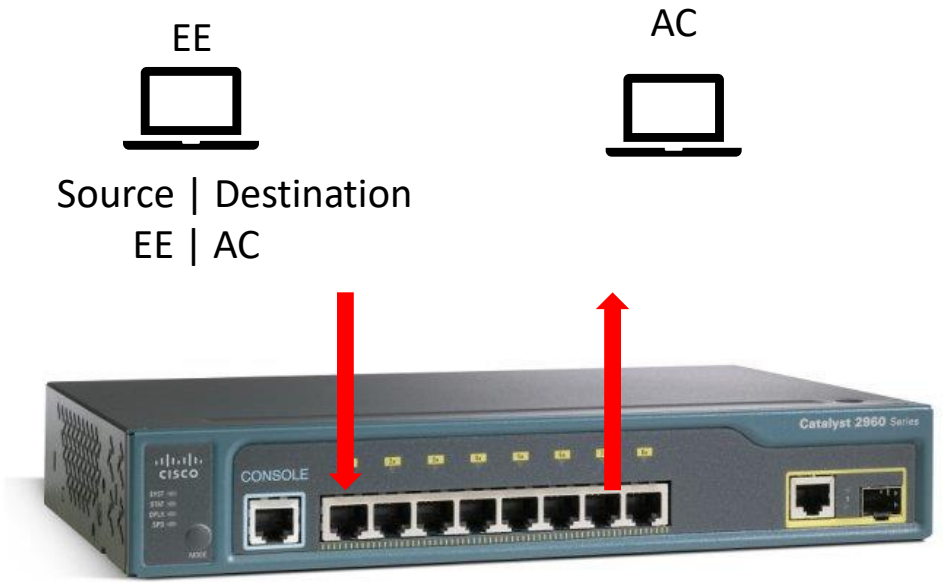
Dynamically Populating a Switch MAC address Table

Switches use MAC addresses to direct network communication through the switch to the appropriate port toward the destination.

Switch must first learn which device is connected to each port.

As the switch learns the relationship between ports and devices, it builds a table called a MAC address table, or Content Addressable Memory (CAM) table.

CAM is a special type of memory used in high-speed searching application



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Frame Forwarding

Switch Forwarding Methods

Store-and-Forward

A store-and-forward switch receives the entire frame, and computes the CRC. If the CRC is valid, the switch looks up to the destination address, wich determines the outgoing interface. The frame is then forwarded out of the correct port.

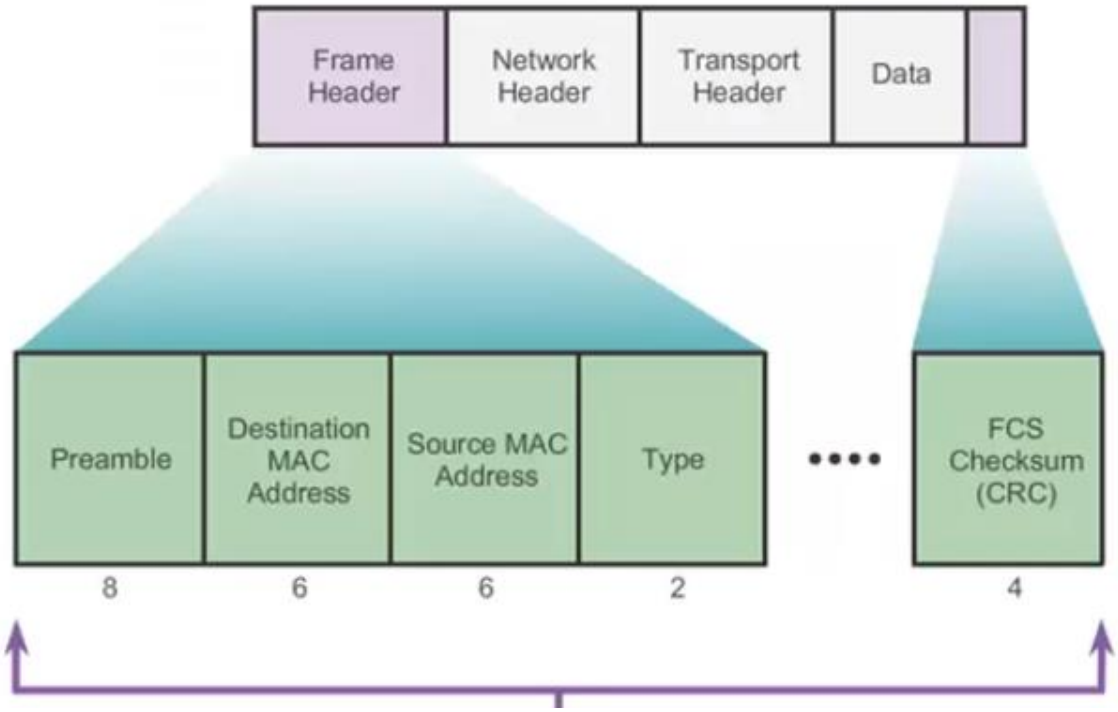
Cut-Trough

A Cut-Trough switch forwards the frame beofre it is entirely received.
At a minimum, the destination address of the frame be read before the frame can forwarded.

Frame Forwarding

Store-and-Forward Switching

- Allows switch to:
  - Check for errors (via FCS check)
  - Perform automatic buffering
- Slower forwarding process

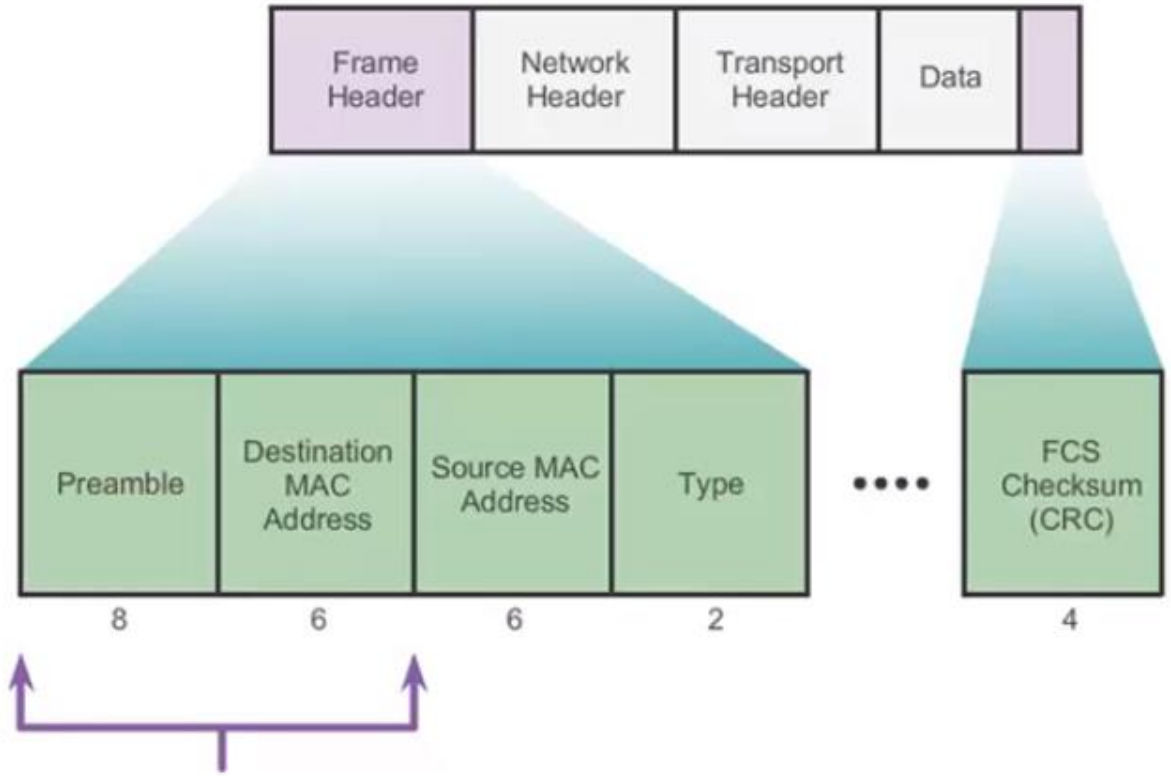


Store-and-forward switchiing entails receipt of the entire frame (about 9200 bytes for jumbo frames) before fowarding dcision is made

Frame Forwarding

Cut-Through Switching

- Allows the switch to start forwarding in a about 10 microseconds
- No FCS check
- No automatic buffering



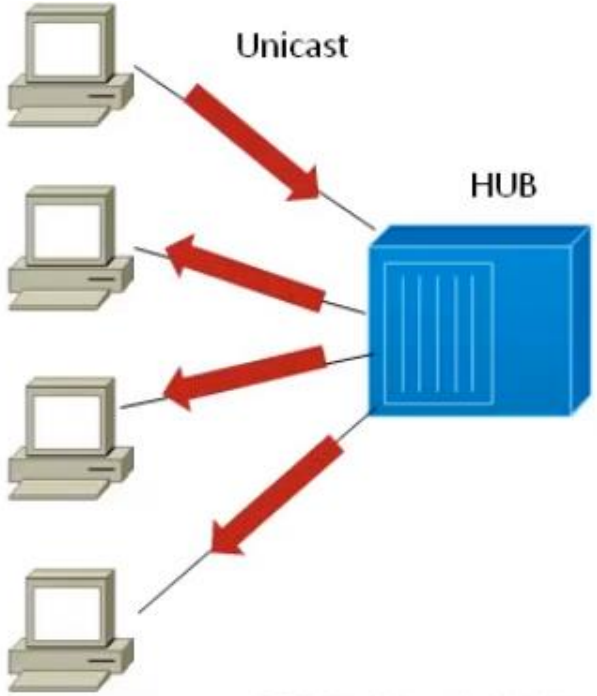
Frames are forwarded as soon as the destination MAC is received

Switching Domains

Collision Domains

A collision domain is the segment where devices must compete to communication.

- All ports of a hub belong to the same collision domain.
- Every switch port is a collision domain on its own.
- A switch breaks the segment into smaller collision domains, easing the device competition



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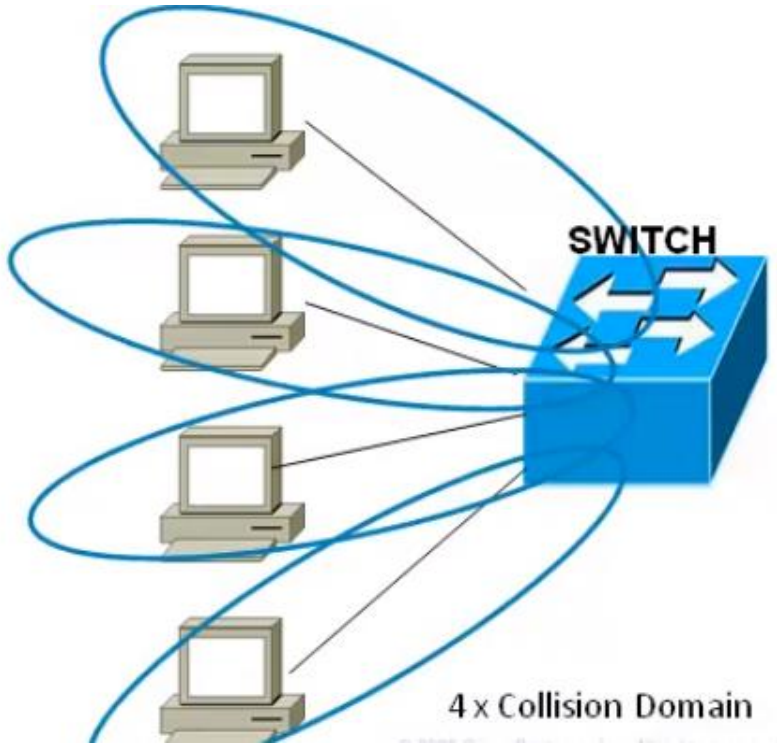


Switching Domains

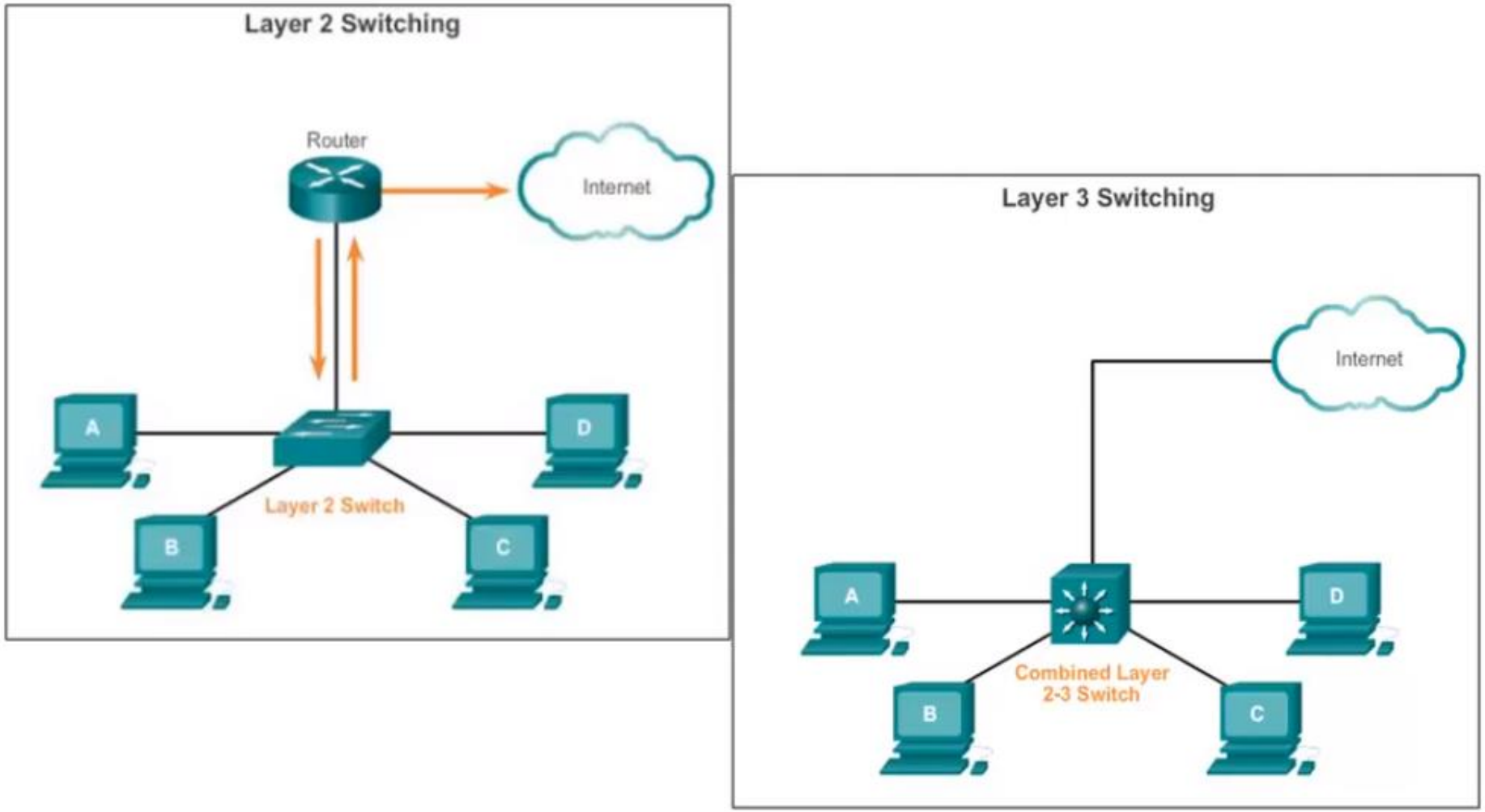
Broadcast Domains

A broadcast domain is the extend of the network where a broadcast frame can be heard.

- Switches forward broadcast frames to all ports; therefore, switches do not break broadcast domains.
- All ports of a switch, with its default configuration, belong to the same broadcast domain.
- If two or more switches are connected, broadcasts are forwarded to all ports of all switches, except for the port that originally received the broadcast

Layer 3 switching

Layer 2 versus Layer 3 Switching



Layer 3 switching

Types of Layer 3 Switching

The major types of Layer 3 interfaces are:

- **Switches Virtual Interface (SVI)** – Logical interface on a switch associated with a virtual local-area network (VLAN)

- **Routed port** - Physical port on a Layer 3 switch configured to act as a router port. Configure routed ports by putting the interface into Layer 3 mode with **no switchport** interface configuration command.

- **Layer 3 Etherchannel** – Logical interface on a Cisco device associated with bundle of routed ports.

Layer 3 switching

Configuring a Routed Port on a Layer 3 Switch

Routed Port Configuration

```
S1(config)#interface f0/6
S1(config-if)#no switchport
S1(config-if)#ip address 192.168.200.1 255.255.255.0
S1(config-if)#no shutdown
S1(config-if)#end
S1#
*Mar  1 00:15:40.115: %SYS-5-CONFIG_I: Configured from console by console
S1#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
Vlan1                  unassigned      YES unset  administratively down down
FastEthernet0/1        unassigned      YES unset  down                  down
FastEthernet0/2        unassigned      YES unset  down                  down
FastEthernet0/3        unassigned      YES unset  down                  down
FastEthernet0/4        unassigned      YES unset  down                  down
FastEthernet0/5        unassigned      YES unset  down                  down
FastEthernet0/6        192.168.200.1   YES manual up                    up
FastEthernet0/7        unassigned      YES unset  up                    up
FastEthernet0/8        unassigned      YES unset  up                    up
<output omitted>
```

Thank you for your attention