SLIIT

Discover Your Future

IT2050 – Computer Networks

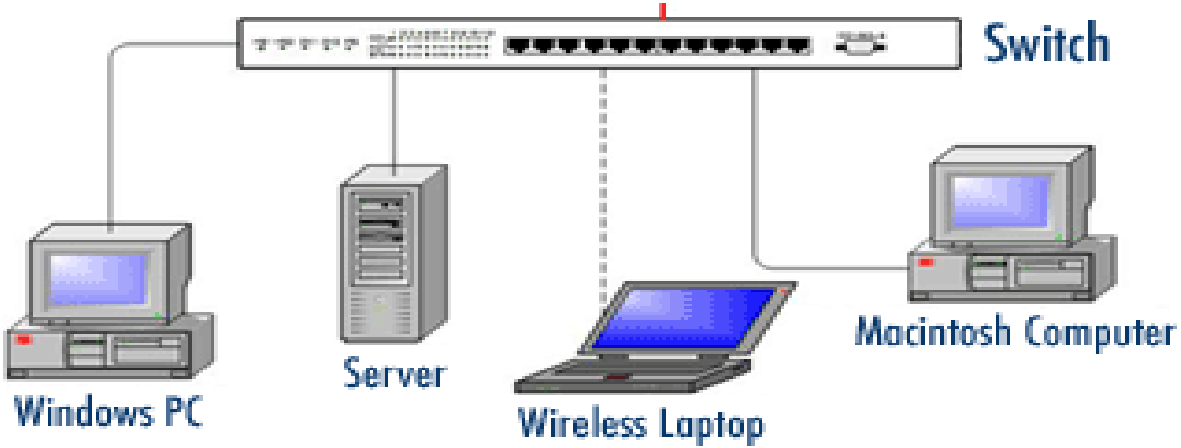
Lecture 04

Switched Networks

SLIIT
FACULTY OF COMPUTING

Switch

Catalyst Switch



- An intelligent device
  - Operates in layer 2 – layer2 switch
  - Operates in layer 3 – layer3 switch

Form Factors

Fixed Configuration

Modular Configuration

Stackable Configuration

Business Considerations On Selecting switches

- Cost
  - Speed and #of Interfaces , Supported Features
  - Expansion Capability
- Port Density
  - #of devices on the Network
- Power
  - Power access points , PoE , Redundant Power Supply
- Reliability
  - 24/7 Continues access
- Port Speed
  - Ethernet , FastEthernet , GigabitEthernet
- Scalability
  - Network growth

Switch Functions

- Address learning
- Forward/filter decisions
- Loop avoidance

Mac Address Table

- The switch learns the relationship of ports to devices, it builds a table called a MAC address.

- LAN switches determine how to handle incoming frames by maintaining the MAC address table. Switch builds its MAC address table by recording the MAC address of each device connected to each of its ports.

- The switch uses the information in the MAC address table to send frames destined for a specific device out the port which has been assigned to that device.

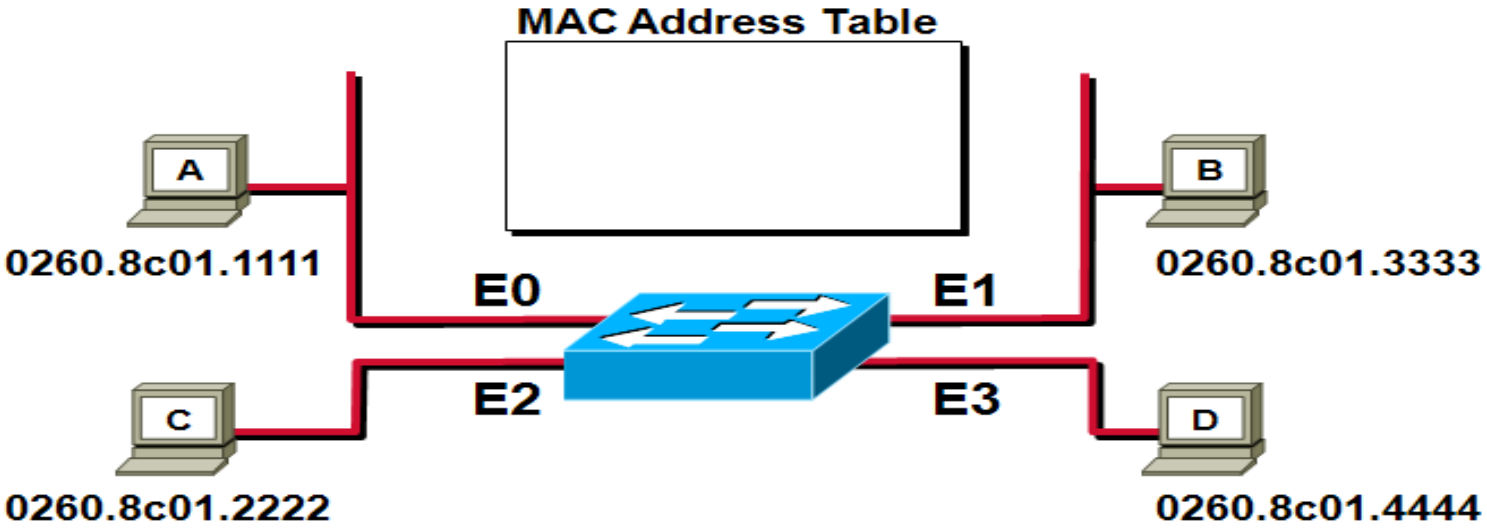
Address learning

- Layer 2 switches and bridges remember the source MAC address of each frame received on an interface, and they enter this information into a MAC database called a MAC address table

Switches use the following logic to learn MAC address table entries:

a. For each received frame, examine the source MAC address and note the interface from which the frame was received.
b. If they are not already in the table, add the address and interface, setting the inactivity timer to 0.
c. If it is already in the table, reset the inactivity timer for the entry to 0.

Address learning cont.



- **Initial MAC address table is empty.**

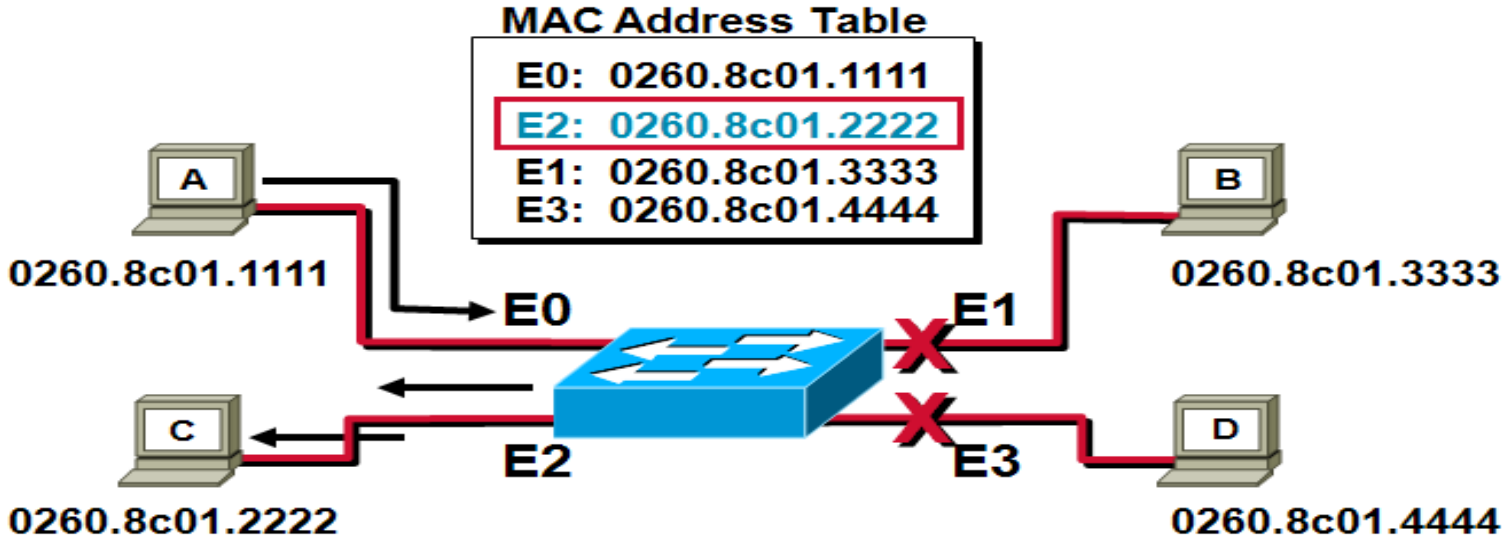
Forward/filter decisions

- When a frame is received on an interface, the switch looks at the destination MAC address and finds the exit interface in the MAC address table Frame is only forwarded out the specified destination port

Switches forward frames based on the destination address:

a. If the destination address is a broadcast, multicast, or unknown destination unicast (a unicast not listed in the MAC table), the switch floods the frame.
b. If the destination address is a known unicast address (a unicast address found in the MAC table):
    i. If the outgoing interface listed in the MAC address table is different from the interface in which the frame was received, the switch forwards the frame out the outgoing interface.
    ii. If the outgoing interface is the same as the interface in which the frame was received, the switch filters the frame, meaning that the switch simply ignores the frame and does not forward it.

Forward/filter decisions cont



- Station A sends a frame to station C.
- Destination is known; frame is not flooded.

Loop Avoidance

- If multiple connections between switches are created for redundancy purposes, network loops can occur

- Spanning Tree Protocol (STP) is used to stop network loops while still permitting redundancy

Switch Internal Processing

Switching Method	Description
Store-and-forward	The switch fully receives all bits in the frame (store) before forwarding the frame (forward). This allows the switch to check the FCS before forwarding the frame.
Cut-through	The switch forwards the frame as soon as it can. This reduces latency but does not allow the switch to discard frames that fail the FCS check.
Fragment-free	The switch forwards the frame after receiving the first 64 bytes of the frame, thereby avoiding forwarding frames that were errored due to a collision.

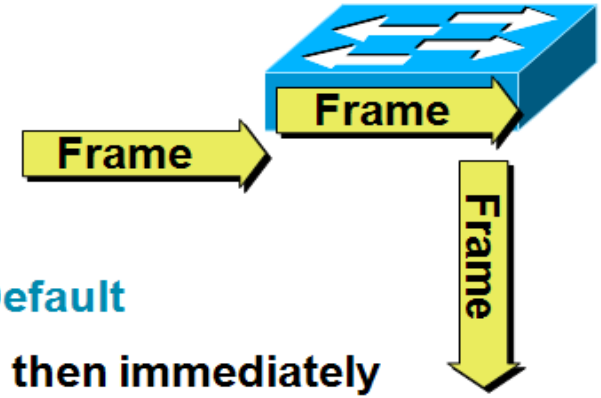
Switch Internal Processing cont.

Cut-Through

- Switch checks destination address and immediately begins forwarding frame.

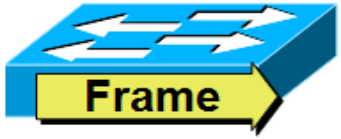
Store and Forward

- Complete frame is received and checked before forwarding.



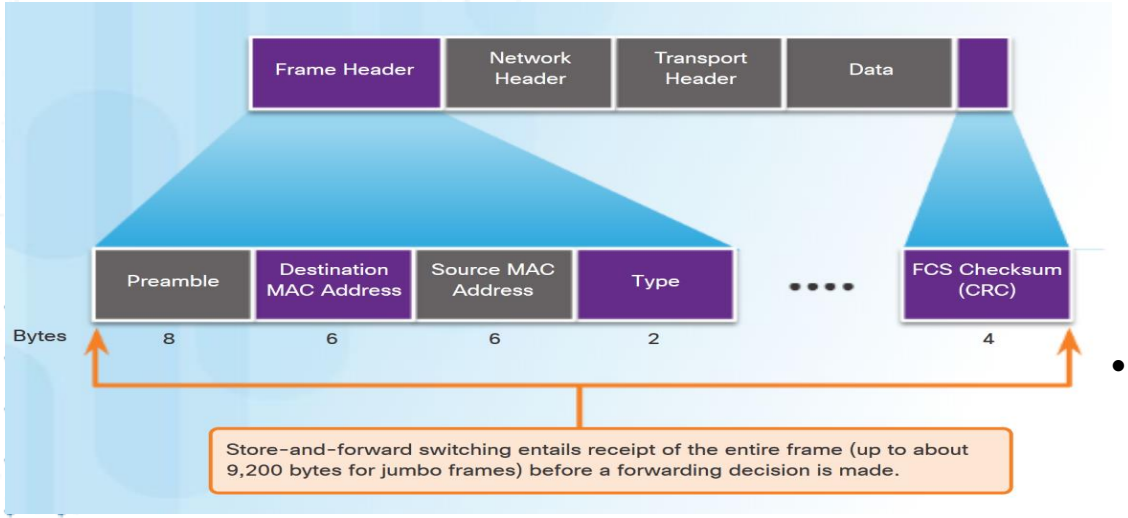
Fragment-Free (Modified Cut-Through)—Cat1900 Default

- Switch checks the first 64 bytes, then immediately begins forwarding frame.



Frame Forwarding

Store-and-Forward Switching



- **Error Checking–** After receiving the entire frame, the switch compares the frame-check-sequence (FCS) value in the last field against its own FCS calculations. Only error-free frames are forwarded

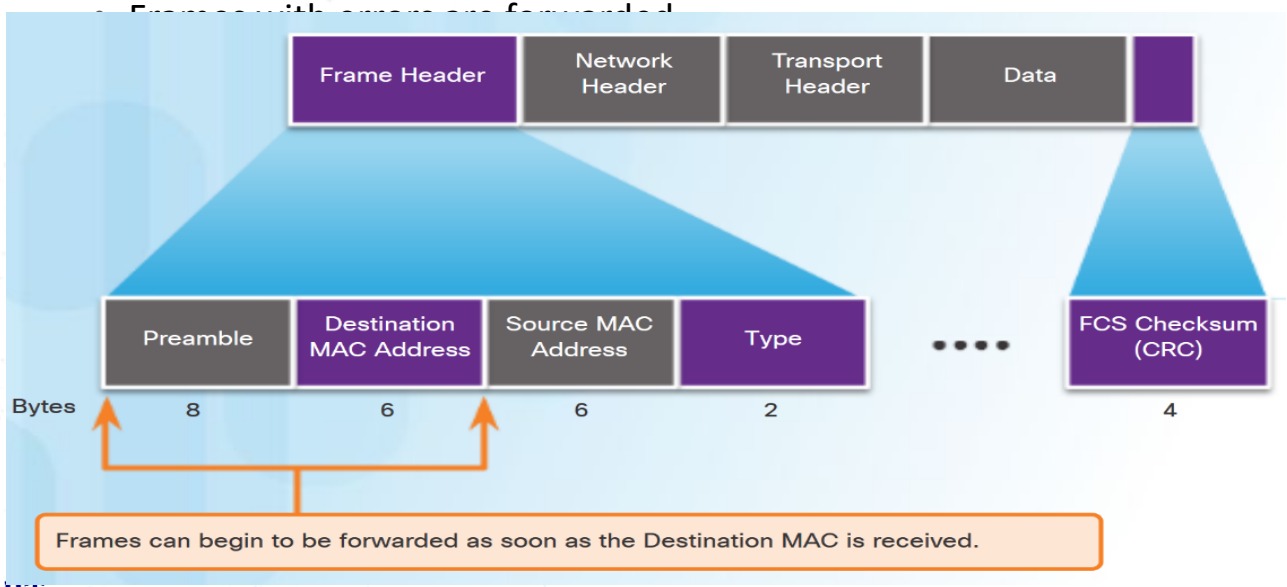
- Store-and-Forward is Cisco's primary LAN switching method.

Frame Forwarding

Cut-Through Switching

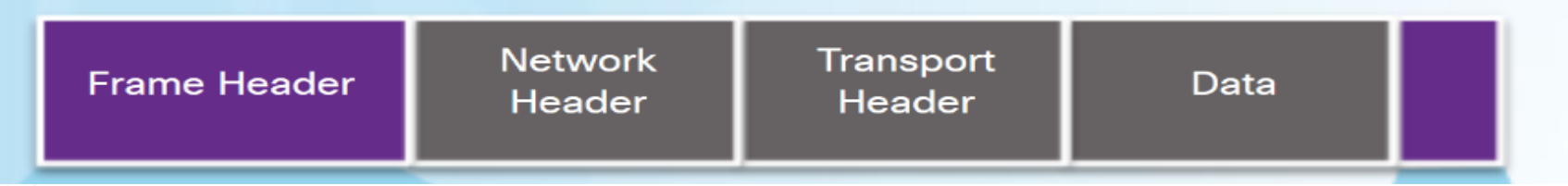
- Cut – Through Switching (Rapid Frame Forwarding) –

The switch makes a forwarding decision as soon as it has looked up the destination MAC address.



Fragment Free Switching

- **Fragment Free - modified form of cut-through switching. The switch waits for the collision window (64 bytes) to pass before forwarding the frame.**
  - **Provides better error checking than cut-through, with practically no increase in latency.**



Basic Switch Configurations

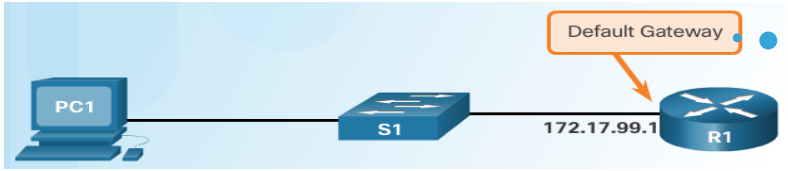
- Each port/interface does not need an IP address because the switch is not performing Layer 3 routing
- Can assign IP address to manage the switch or else IP would not be needed on the switch at all

Configuring Basic Switch Management Access with IPv4

Cisco Switch IOS Commands

Enter global configuration mode.	`S1# configure terminal`
Enter interface configuration mode for the SVI.	`S1(config)# interface vlan 99`
Configure the management interface IP address.	`S1(config-if)# ip address 172.17.99.11 255.255.255.0`
Enable the management interface.	`S1(config-if)# no shutdown`
Return to the privileged EXEC mode.	`S1(config-if)# exit`
Configure the default gateway for the switch.	`S1(config)# ip default-gateway 172.17.99.1`
Return to the privileged EXEC mode.	`S1(config)# end`
Save the running config to the startup config.	`S1# copy running-config startup-config`

Important Concept

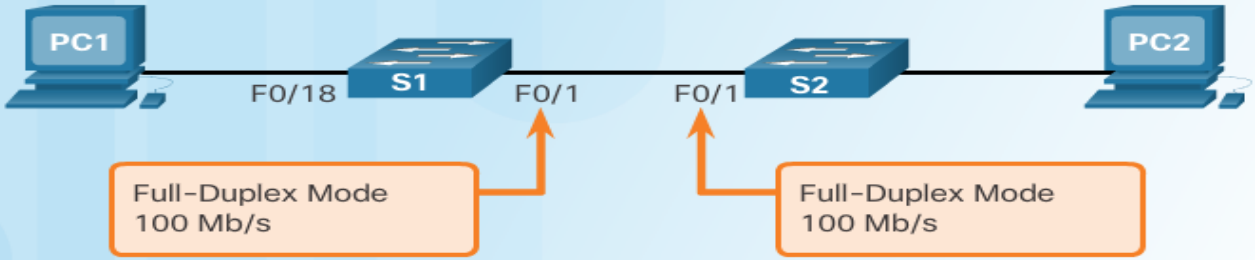


The default gateway is the router address and is used by the switch to communicate with other networks.

Configure Switch Ports

Verifying Switch Port Configuration

Cisco Switch IOS Commands	
Display interface status and configuration.	S1# **show interfaces** [*interface-id*]
Display current startup configuration.	S1# **show startup-config**
Display current operating config.	S1# **show running-config**
Display information about flash file system.	S1# **show flash**
Display system hardware and software status.	S1# **show version**
Display history of commands entered.	S1# **show history**
Display IP information about an interface.	S1# **show ip** [*interface-id*]
Display the MAC address table.	S1# **show mac-address-table** OR S1# **show mac address-table**



Cisco Switch IOS Commands

Enter global configuration mode.	`S1# configure terminal`
Enter interface configuration mode.	`S1(config)# interface FastEthernet 0/1`
Configure the interface duplex.	`S1(config-if)# duplex full`
Configure the interface speed.	`S1(config-if)# speed 100`
Return to the privileged EXEC mode.	`S1(config-if)# end`
Save the running config to the startup config.	`S1# copy running-config startup-config`