

جامعة حماة

الكلية التطبيقية – تقنيات حاسوب

عملي مادة تصميم شبكات الحاسب

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الجلسة الثالثة

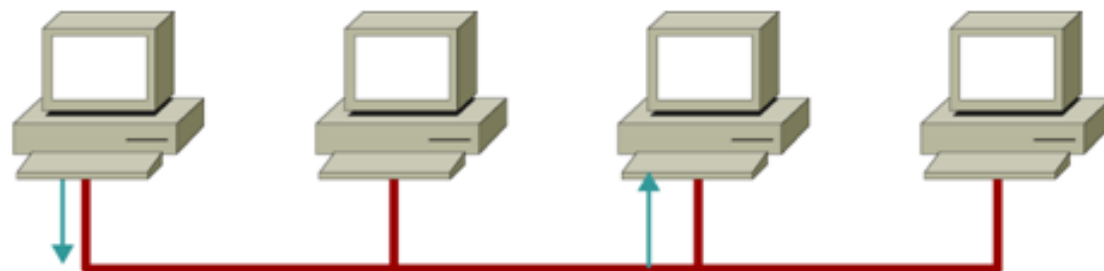


# **CISCO (Switch Architecture)**

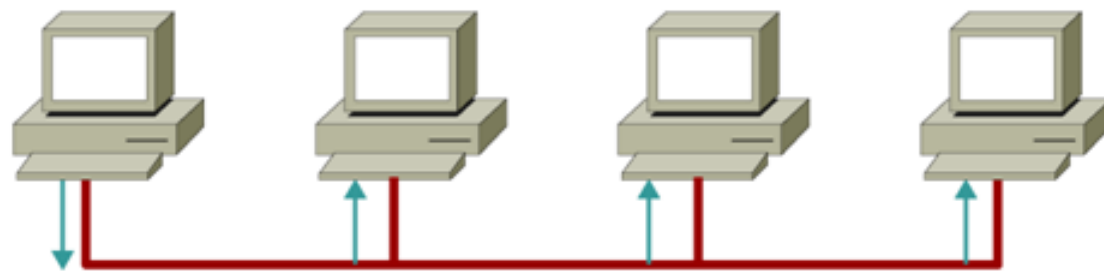
# Communicating Within the LAN

Cisco.com

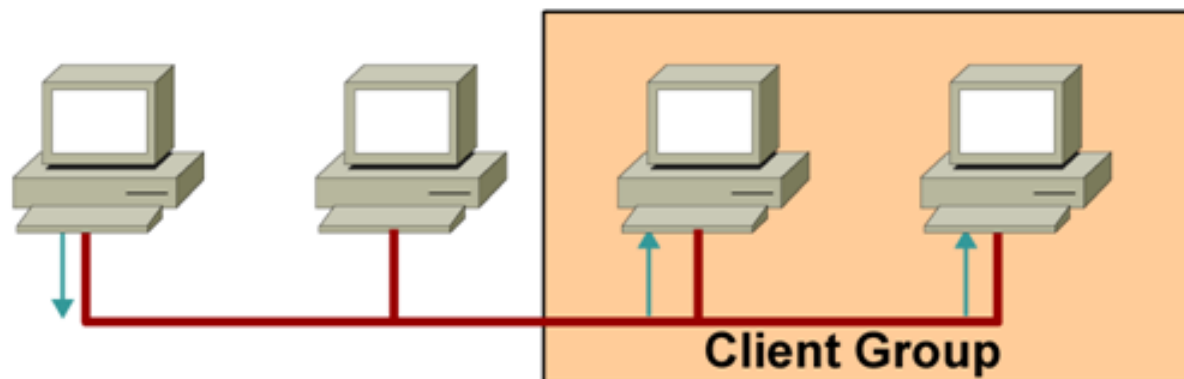
**Unicast**



**Broadcast**



**Multicast**



# LAN Switching

## Overview of Switch

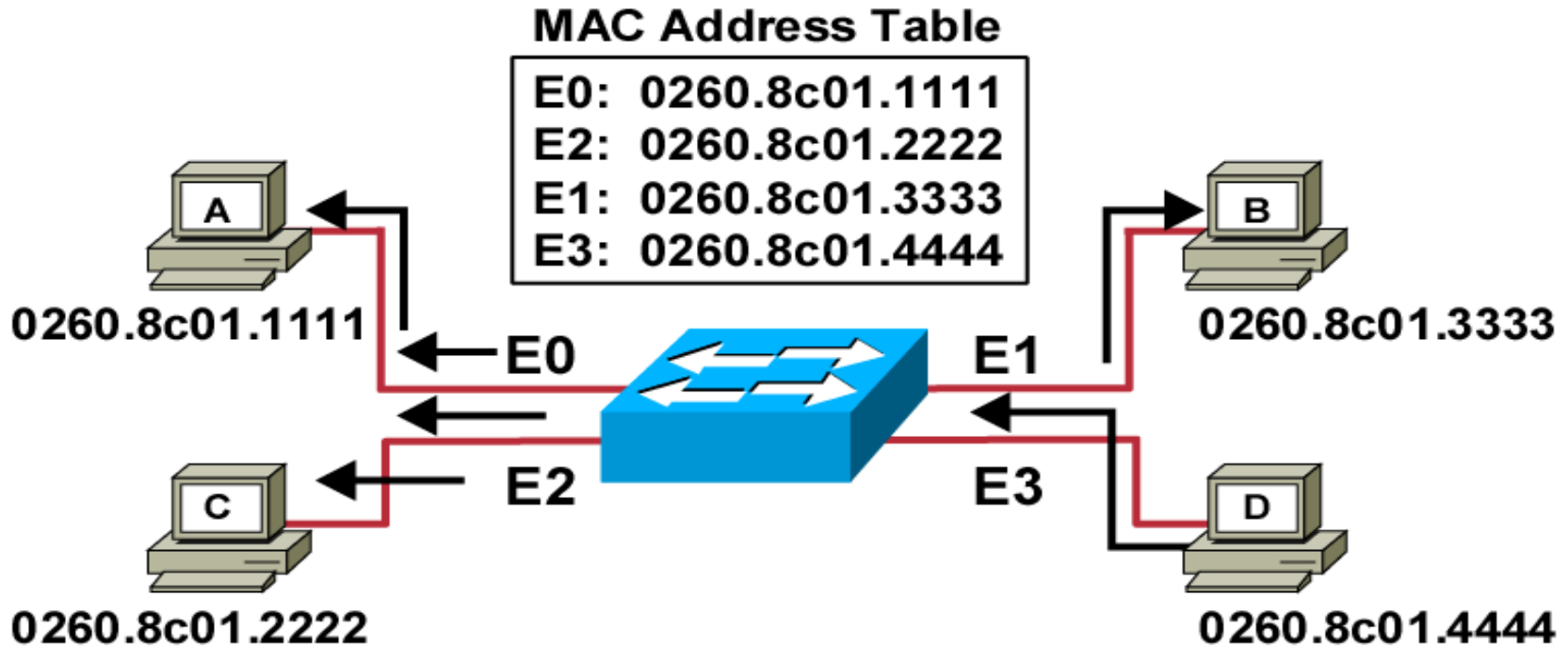
- Switches operate at layer 2 (Data Link layer) of OSI model.
- Process Frame.
- Learned MAC addresses Table
- Switches perform three major functions: Forwarding, Filtering, and Flooding

# Switches forward frames based on the destination address

## Case1:

- If the destination address is a broadcast, multicast or unknown destination unicast
  - The switch floods the frame
- (switch forwards the frame out all interfaces except the incoming interfaces)

# Flooding Frames



- Station D sends a broadcast or multicast frame.
- Broadcast and multicast frames are flooded to all ports other than the originating port.

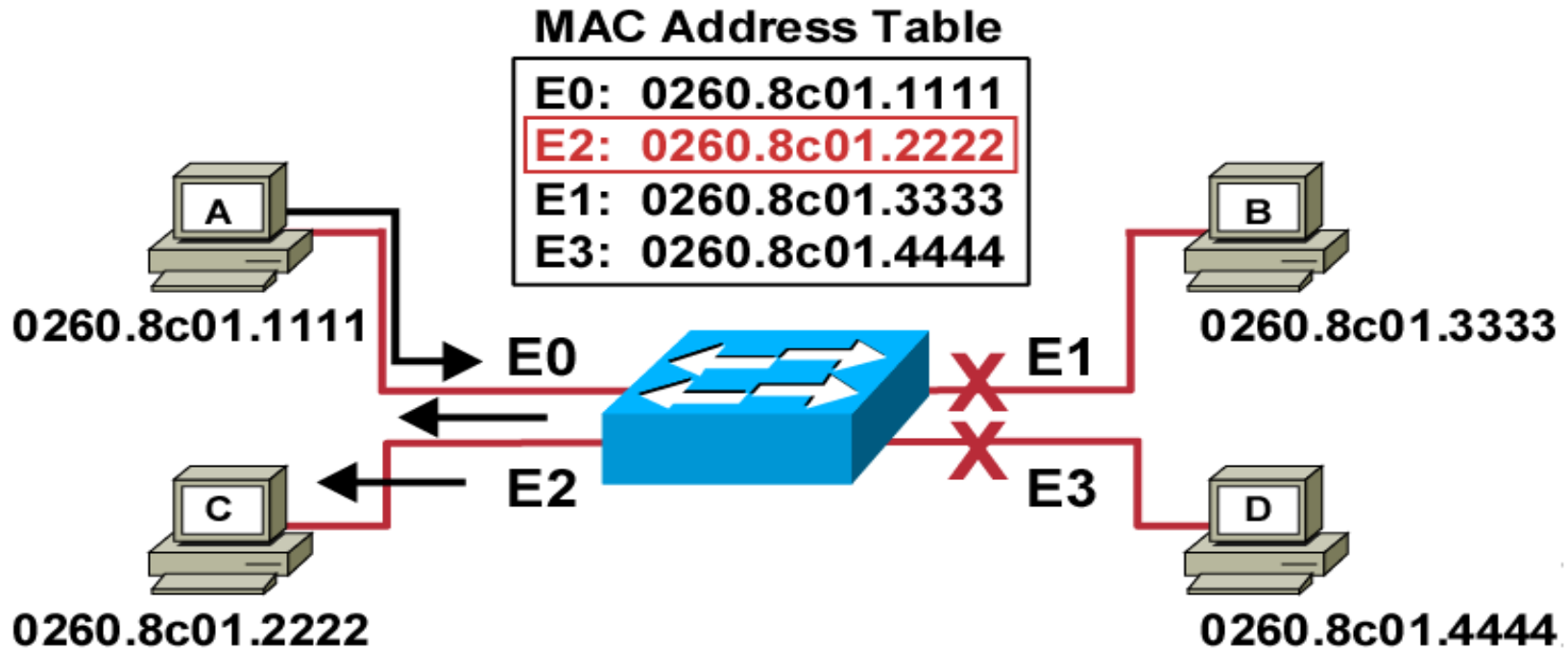
# Switches forward frames based on the destination address

## Case2:

If the destination address is a known unicast address

- ❑ 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 (**forwarding**).
- ❑ 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 (**filtering**).

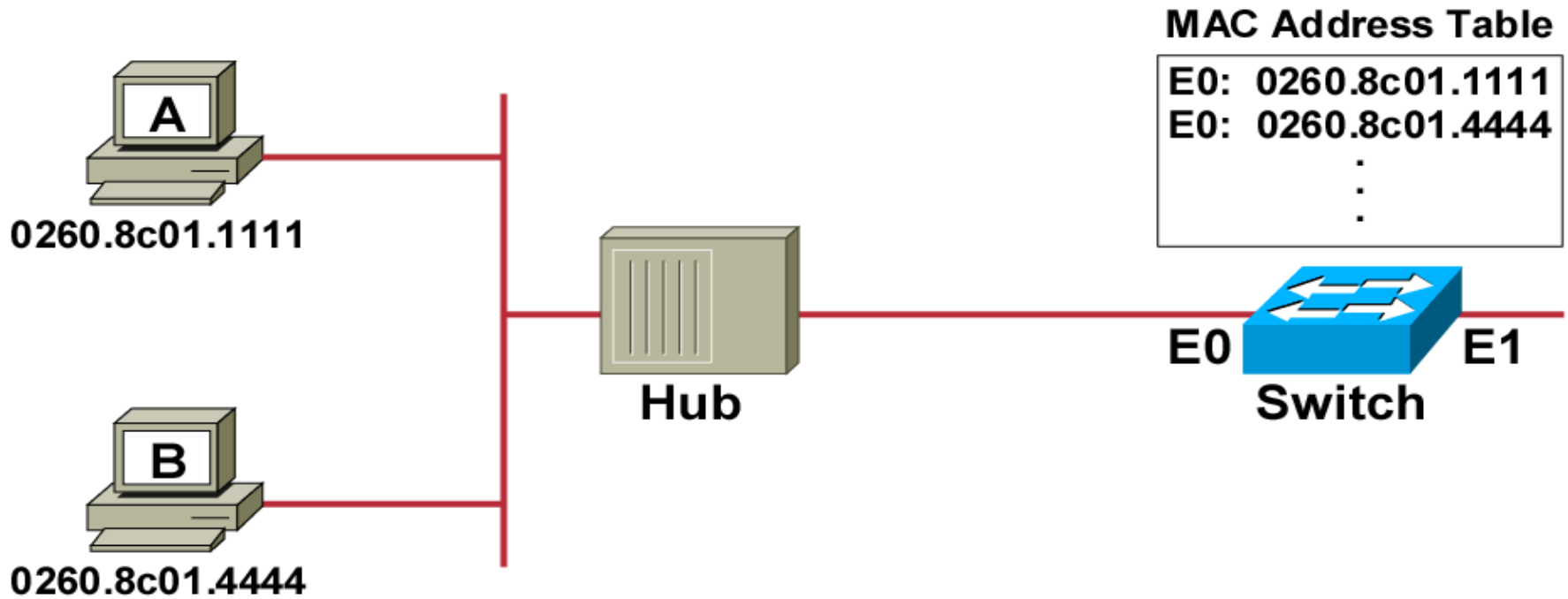
# Forwarding Frames



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

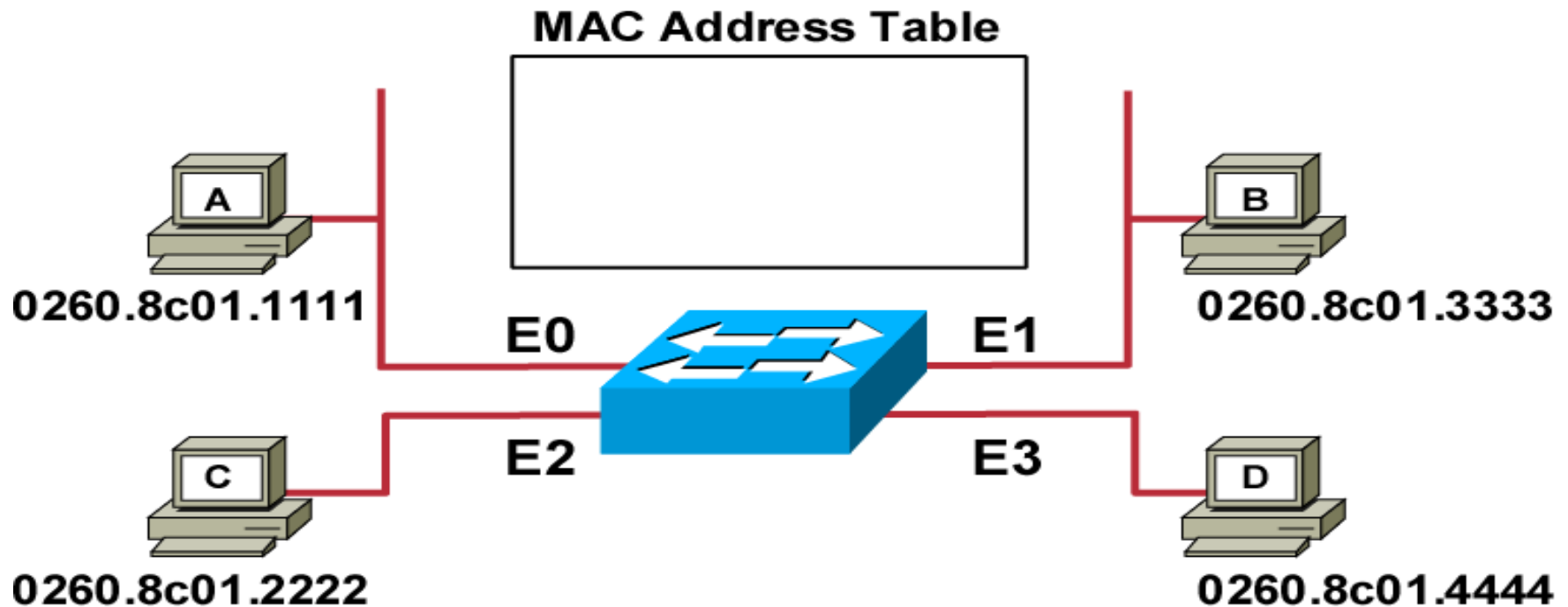


# Filtering Frames



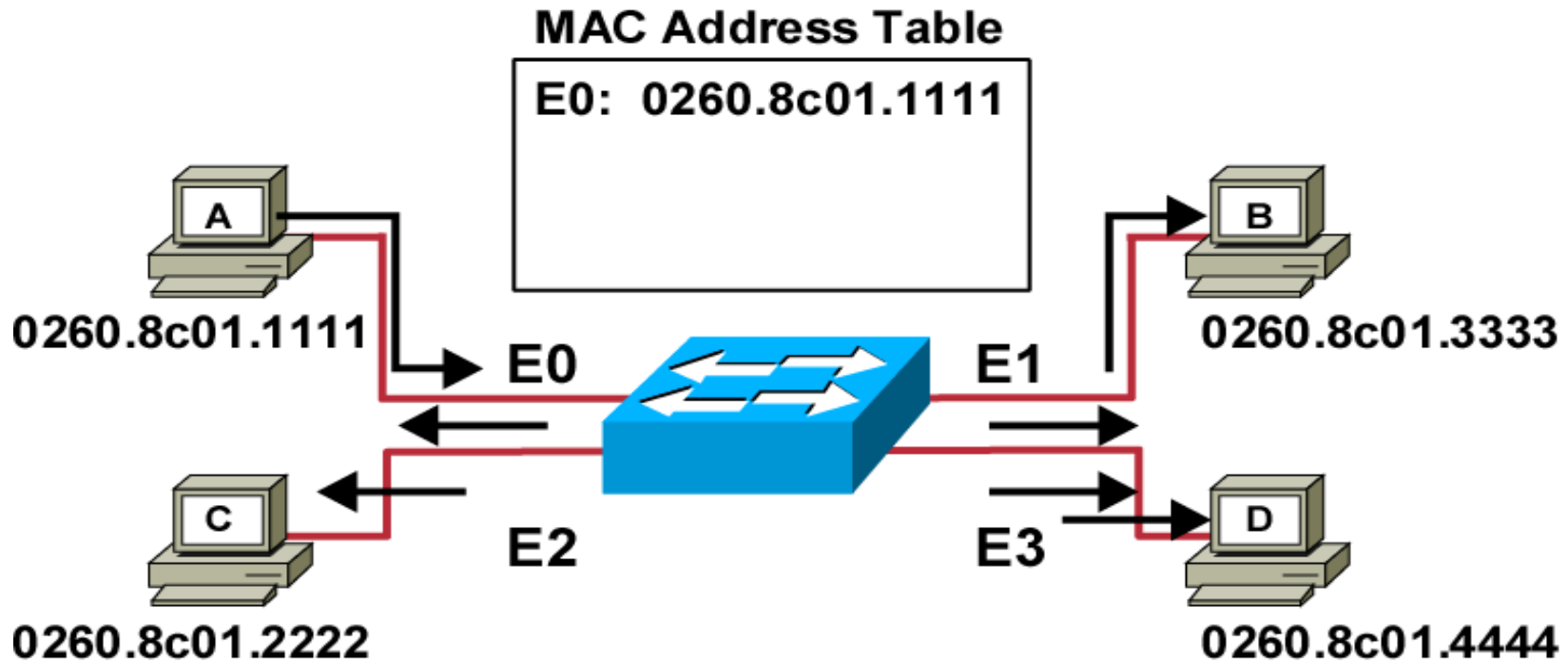
- Station A sends a frame to station B.
- The switch has the address for station B in the MAC address table.

# How switches learned MAC addresses table



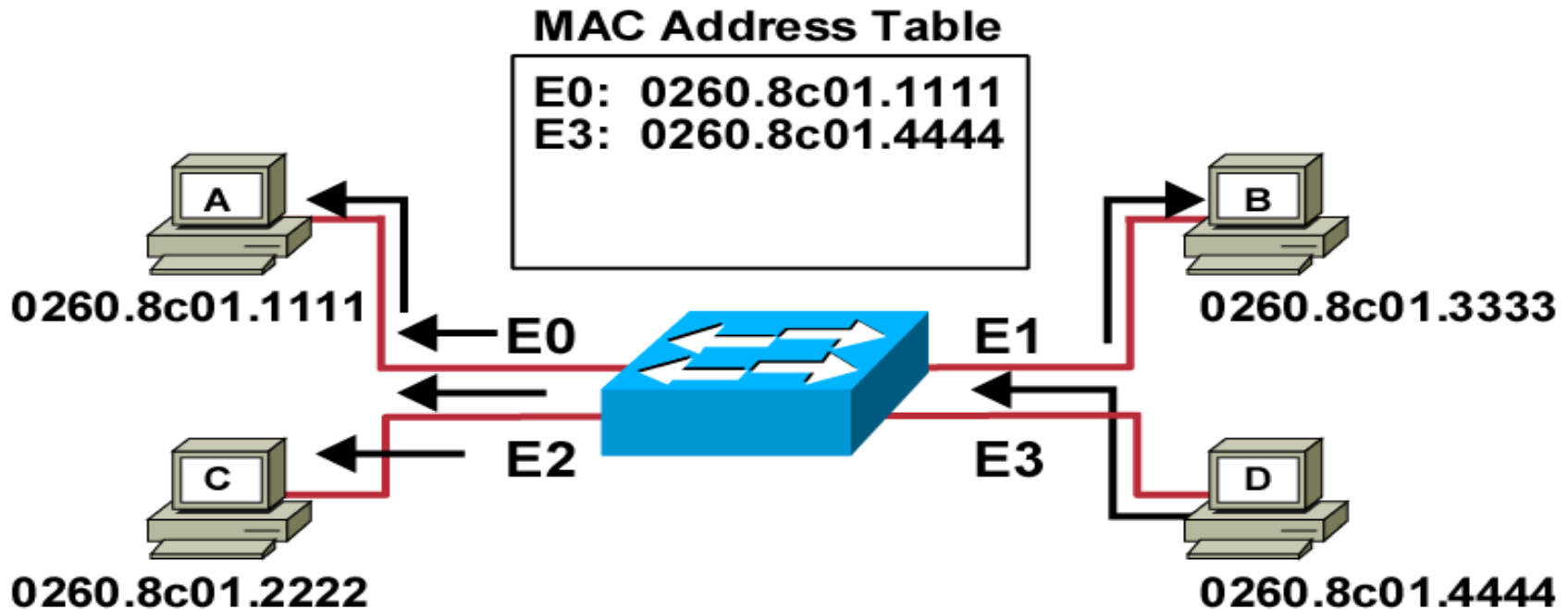
Initial MAC address table is empty

# Learning Addresses



- ✓ Station A sends a frame to station C
- ✓ Switch caches the MAC address of station A to port E0 by learning the source address of data frames
- ✓ The frame from station A to station C is flooded out to all ports except port E0 (unknown unicasts are flooded)

# Learning Addresses (cont.)

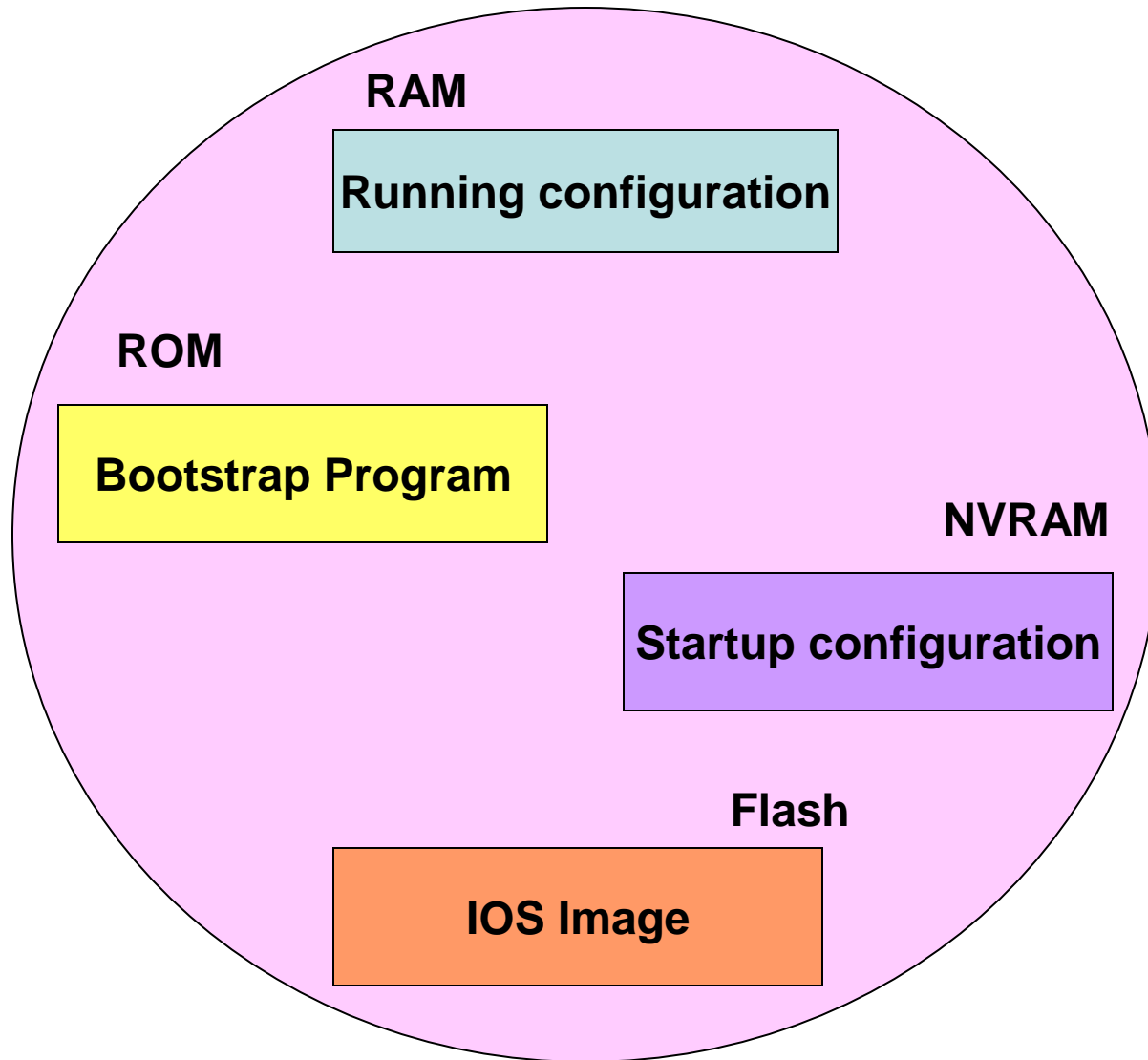


- Station D sends a frame to station C.
- Switch caches the MAC address of station D to port E3 by learning the source address of data frames.
- The frame from station D to station C is flooded out to all ports except port E3 (unknown unicasts are flooded).

# Cisco Switch Memory Types

- 1- **RAM**: it is used by the switch just as it is used just for working storage.  
The running (active) configuration file is stored here.
- 2- **ROM**: it stores a bootstrap program that is loaded when the switch first powers on.
- 3- **Flash memory**: it stores fully functional IOS images and also can be used to store any other files, including backup copies of configuration files.
- 4- **NVRAM**: Nonvolatile RAM (NVRAM) stores the initial or startup configuration file that is used when the switch is first powered on and when the switch is reloaded.

# Cisco Switch Memory Types



## Note

There are two Configuration Files:

- **Startup-config:** Stores the initial configuration used any time the switch reloads Cisco IOS (NVRAM).
- **Running-config:** Stores the currently used configuration commands, This file changes dynamically when someone enters commands in configuration mode (RAM).

# Accessing the Switch CLI (Command Line Interface)

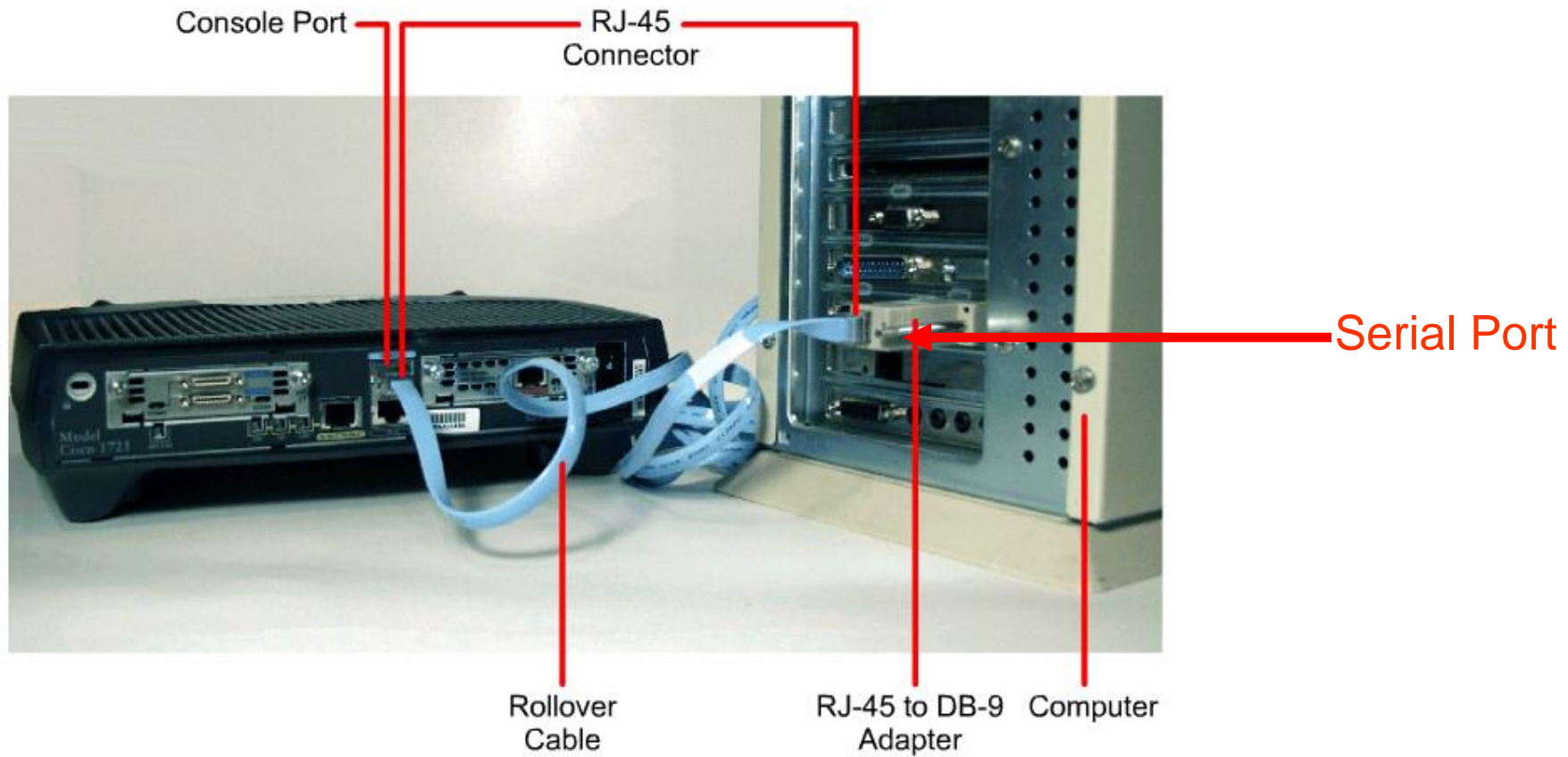
The switch CLI can be accessed through:

- ❖ Console

- ❖ Telnet

- ❖ Secure Shell (SSH)



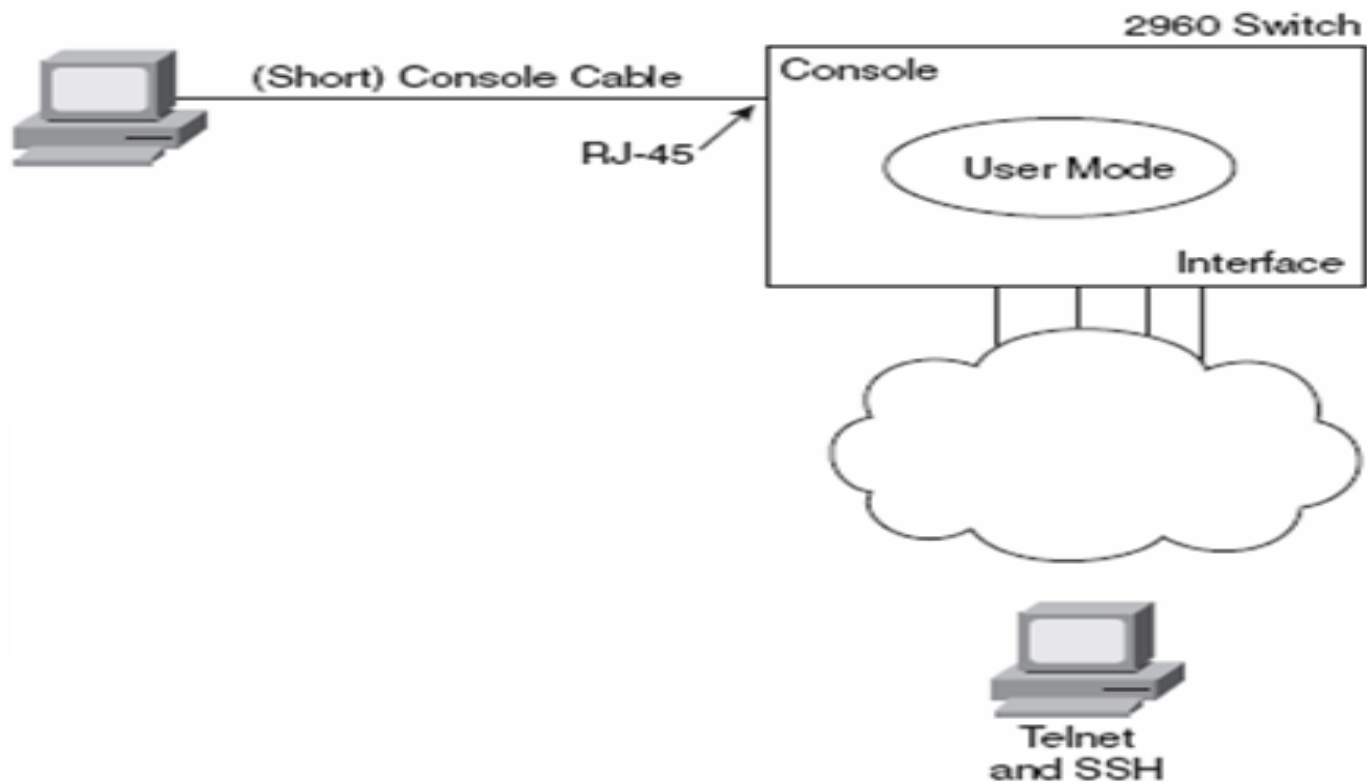


# Telnet and SSH

- ✓ Use the IP network to access the switch CLI via the network (Remotely)
- ✓ Telnet sends all data as clear-text data
- ✓ Secure Shell (SSH) sends all data in a more secure manner by using encryption

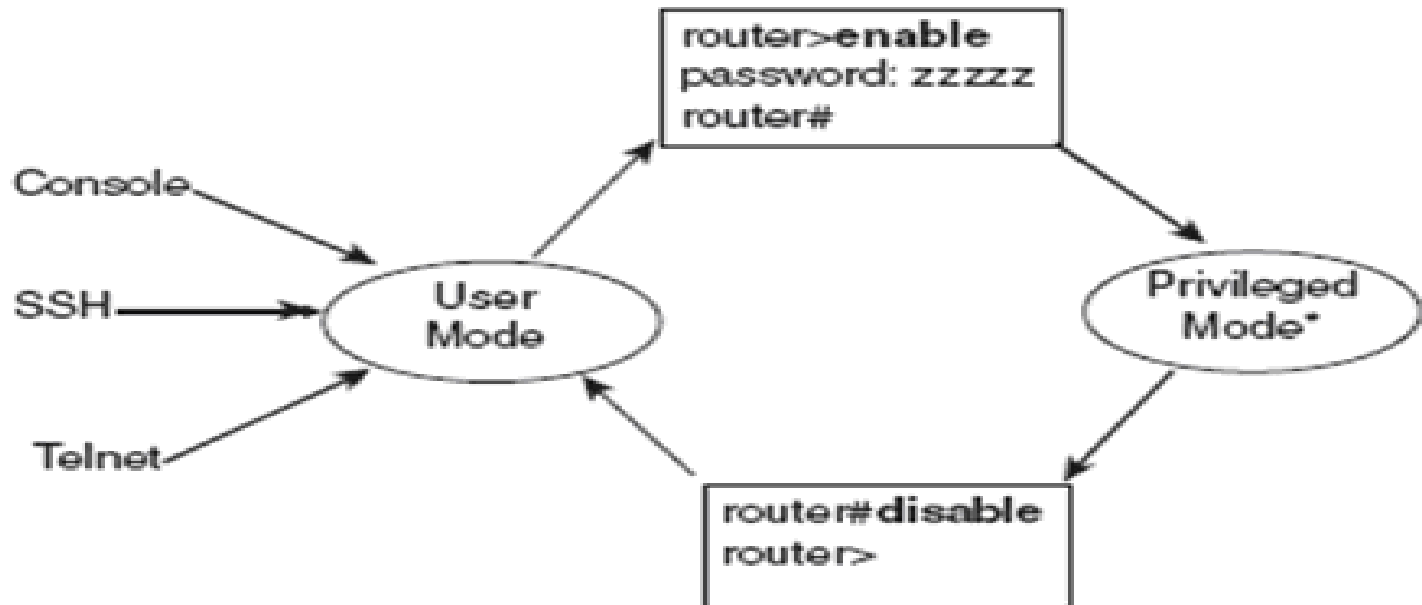
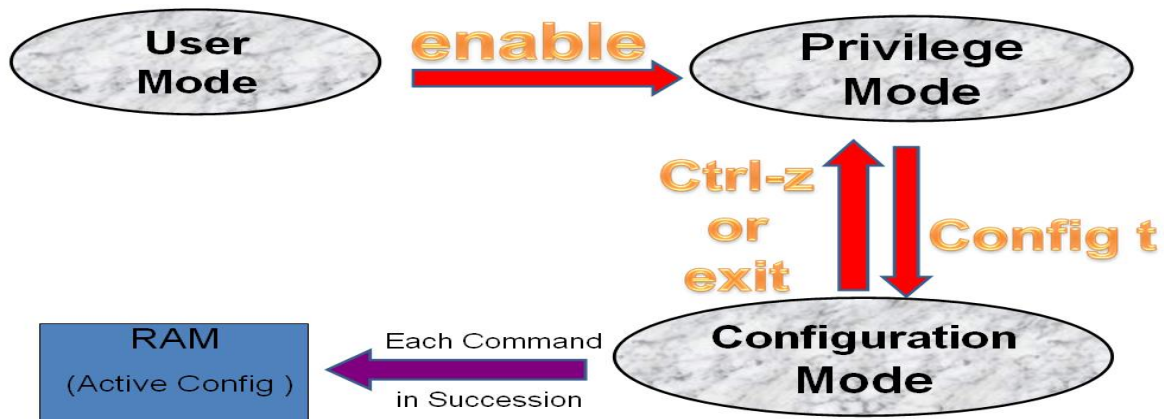
# Accessing CLI

## *CLI Access*



# CLI and Switch Mode

- All three CLI access methods place the user in user EXEC mode (User mode)
- User mode not break anything
- There is another more powerful EXEC mode called enable mode (privileged mode or privileged EXEC mode)
- The command prompt is > in user mode
- The command prompt is # in privileged mode



# CLI commands

- Setting the passwords.
- Setting the hostname.
- Configuring the IP address and subnet mask.
- Access configuration to switch through console and telnet
- Setting a description on the interfaces.

# PC Setting to connect to Router or Switch

## Via Hyper Terminal

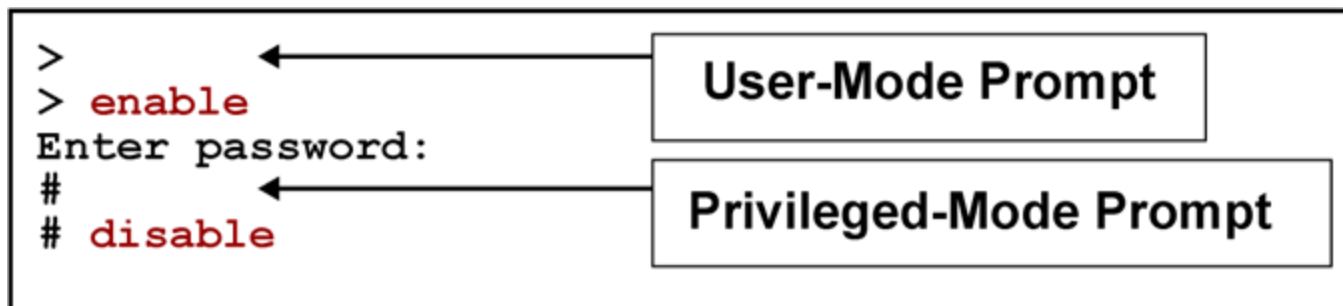


# How to Set Privilege level password

Switch# configure terminal

- switch(config)# enable password *cisco* (clear text password in running configuration file )
- switch(config)# enable secret *Netlab* (encrypt text password in running configuration file )

## Entering the Privileged mode of the Switch



Note

When execute two commands of privilege password, the strongest command is encrypted password



# How to Set Hostname and Configure Console Password

```
Switch(config)# hostname CISCO
```

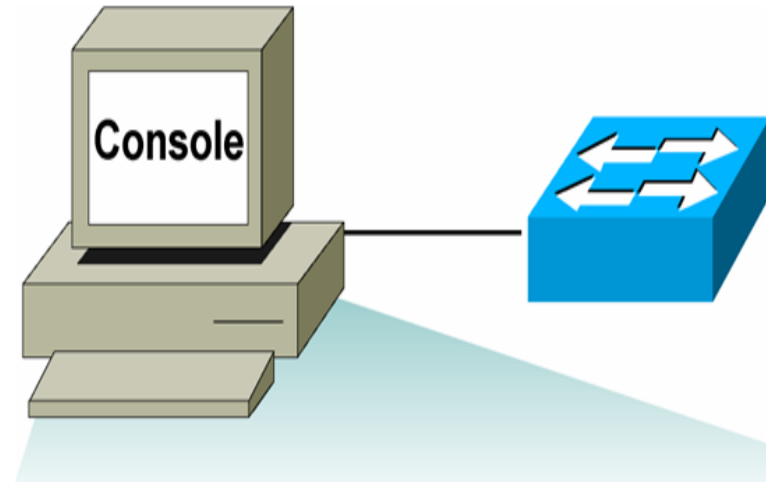
```
CISCO(config)# line console 0
```

```
CISCO(config-line)# password cisco123
```

```
CISCO(config-line)# login
```

```
CISCO(config-line)# end
```

```
CISCO#
```



# Switch Static IP address Configuration

```
CISCO(config)# interface vlan1
```

```
CISCO(config-if)# ip address {ip address} {mask}
```

```
CISCO(config-if)# ip address 10.0.0.10 255.0.0.0
```

```
CISCO(config-if)# no shutdown
```

```
CISCO(config-if)# exit
```

```
CISCO(config)#
```

## Note

It is necessary to use the no shutdown command to make the interface operational

# How to Set Telnet password

```
CISCO(config)# line vty 0 15
```

```
CISCO(config-line)# password cisco
```

```
CISCO(config-line)# login
```

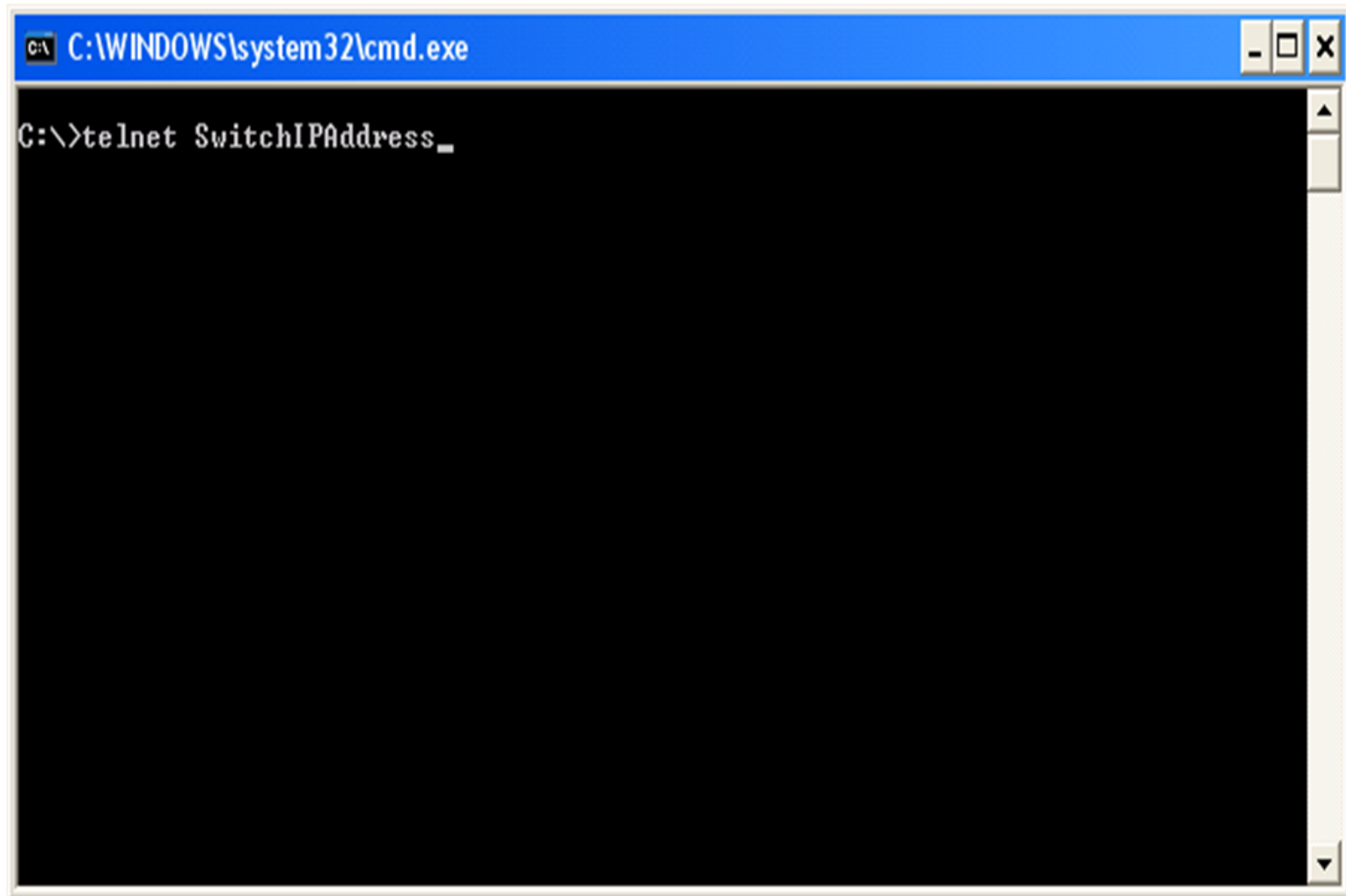
```
CISCO(config-line)# exit
```

```
CISCO(config)#
```

# How to connect to switch via telnet

- Set Privilege mode password
- Set switch static IP address
- Set Telnet password

# Telnet Connecting to your Switch



```
C:\WINDOWS\system32\cmd.exe
G:\>telnet SwitchIPAddress_
```

# How to Encrypt passwords

CISCO(config)# service password-encryption

CISCO(config)# no service password-encryption

# How to Copy

CISCO# copy running-config startup-config

OR

CISCO# wr

CISCO# copy startup-config running-config

# How to reboot the switch

CISCO# reload



# **How to increase the size of the history buffer**

CISCO# *terminal history size 25*

# Show command

switch# show running-config

switch # show startup-config

switch # show mac-address-table

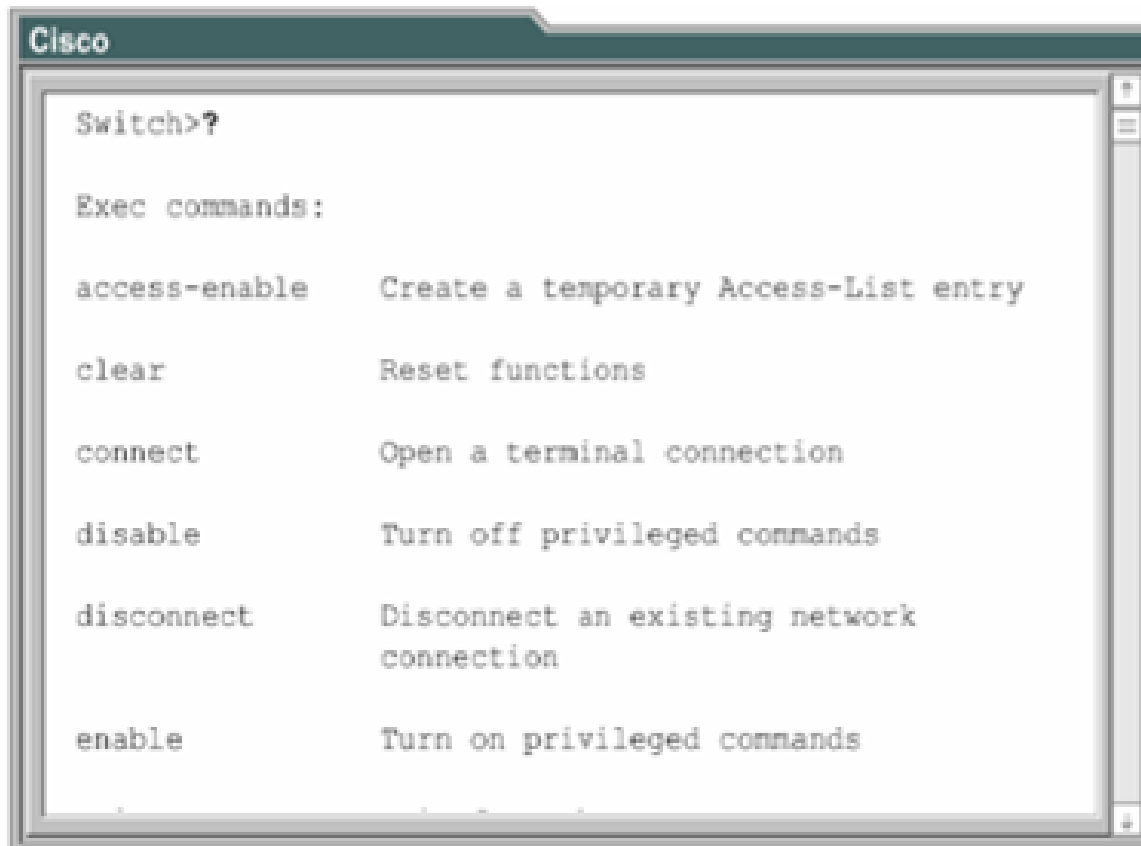
switch # show history

# The Command-Line Interface

## EXEC mode

### The Command-Line Interface

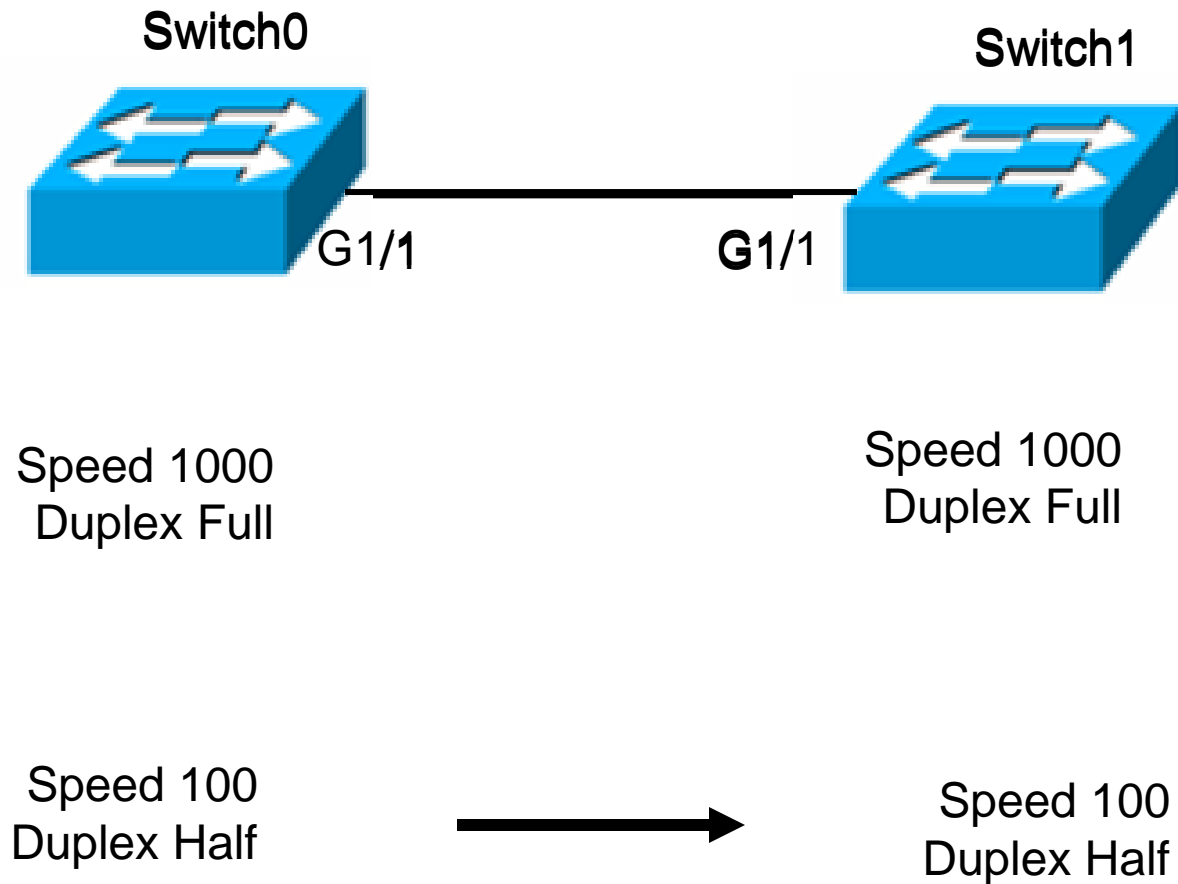
#### EXEC mode



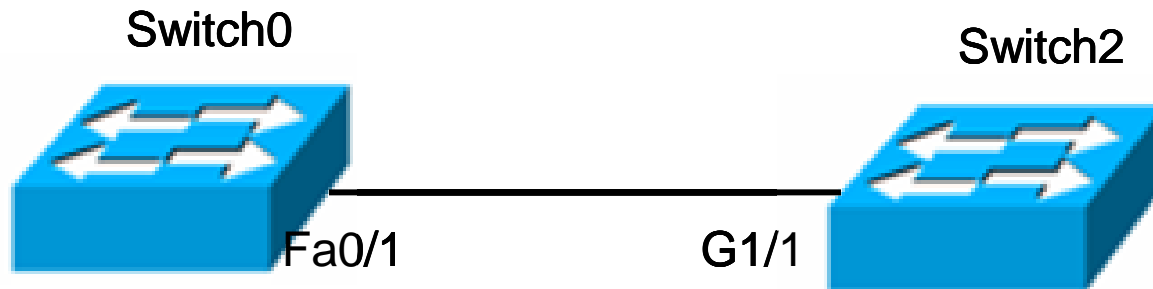
# Set Port Speed and Duplex Settings

```
Switch(config)#interface FastEthernet0/2  
Switch(config-if)#duplex full  
Switch(config-if)#speed 100
```

# Set Port Speed and Duplex Settings



# Set Port Speed and Duplex Settings



Speed 100  
Duplex Full



Speed 100  
Duplex Full

Speed 10  
Duplex Half



Speed 10  
Duplex Half

# Show interfaces

```
Switch#show interfaces gigabitEthernet 1/1
GigabitEthernet1/1 is up, line protocol is up (connected)
  Hardware is Lance, address is 00d0.ba9e.c701 (bia 00d0.ba9e.c701)
  BW 1000000 Kbit, DLY 1000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 1000Mb/s
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:08, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue :0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    956 packets input, 193351 bytes, 0 no buffer
    Received 956 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 watchdog, 0 multicast, 0 pause input
    0 input packets with dribble condition detected
  2357 packets output, 263570 bytes, 0 underruns
    0 output errors, 0 collisions, 10 interface resets
    0 babbles, 0 late collision, 0 deferred
    0 lost carrier, 0 no carrier
    0 output buffer failures, 0 output buffers swapped out
```

# LAB

- Create a simple network with two pcs (pc1 and pc2) and switch
- Apply IP addresses to workstations  
**using Net ID 192.168.1.0/24**
- Test connectivity between pc1 and pc2
- Add a new pc (pc-con) and connect to switch by console
- By using the console do the following:
  - 1- Set console password (cisco)
  - 2- Set encryption privilege password (cisco)
  - 3- show running configuration
  - 4- Save & reload
  - 5- Set telnet
- Change switch's hostname (Aleppo) by using telnet from pc1