



Computer Networks 1

Practice on Cisco devices, Basics of VLAN

Names:

Student No.:

Objectives

- Using Cisco IOS command-line interface (CLI) for configuring Switches 2960 Series and Routers 1800 Series.
- Understanding VLAN basics.

Content and Practice

I. Cisco IOS command-line interface (CLI)

1. Command Modes

The Cisco IOS user interface is divided into many different modes. The commands available to you depend on which mode you are currently in. Enter a question mark (?) at the system prompt to obtain a list of commands available for each command mode.

Mode	Access Method	Prompt	Exit Method	About This Mode
User EXEC	Begin a session with your device.	device>	Enter logout or quit .	Use this mode to <ul style="list-style-type: none">•Change terminal settings.•Perform basic tests.•Display system information.
Privileged EXEC	While in user EXEC mode, enter the enable command.	device#	Enter disable to exit.	Use this mode to verify commands that you have entered. Use a password to protect access to this mode.
Global configuration	While in privileged EXEC mode, enter the configure command.	device (config)#	To exit to privileged EXEC mode, enter exit or end , or press Ctrl-Z .	Use this mode to configure parameters that apply to the entire device.
VLAN configuration	While in global configuration mode, enter the vlan vlan-id command.	device (config-vlan)#	To exit to global configuration mode, enter the exit command. To return to privileged EXEC mode, press	Use this mode to configure VLAN parameters. When VTP mode is transparent, you can create extended-range VLANs (VLAN IDs greater than 1005) and save configurations in the device startup



			Ctrl-Z or enter end .	configuration file.
Interface configuration	While in global configuration mode, enter the interface command (with a specific interface).	device (config-if) #	To exit to global configuration mode, enter exit . To return to privileged EXEC mode, press Ctrl-Z or enter end .	Use this mode to configure parameters for the Ethernet ports.
Line configuration	While in global configuration mode, specify a line with the line vty or line console command.	device (config-line) #	To exit to global configuration mode, enter exit . To return to privileged EXEC mode, press Ctrl-Z or enter end .	Use this mode to configure parameters for the terminal line.

2. Help System

Command	Purpose
help	Obtain a brief description of the help system in any command mode.
<i>abbreviated-command-entry?</i>	Obtain a list of commands that begin with a particular character string. For example: device# di? dir disable disconnect
<i>abbreviated-command-entry<Tab></i>	Complete a partial command name. For example: device# sh conf <tab> device# show configuration
?	List all commands available for a particular command mode. For example: device> ?
<i>command?</i>	List the associated keywords for a command. For example: device> show ?
<i>command keyword?</i>	List the associated arguments for a keyword. For example: device(config)# cdp holdtime ? <10-255> Length of time (in sec) that receiver must keep this packet



3. Abbreviated Commands

You need to enter only enough characters for the device to recognize the command as unique.

This example shows how to enter the show configuration privileged EXEC command in an abbreviated form:

```
device# show conf
```

4. “no” and “default” Forms of Commands

Almost every configuration command also has a “no” form. In general, use the “no” form to disable a feature or function or reverse the action of a command.

Configuration commands can also have a “default” form. The “default” form of a command returns the command setting to its default. Most commands are disabled by default, so the “default” form is the same as the “no” form. However, some commands are enabled by default and have variables set to certain default values. In these cases, the “default” command enables the command and sets variables to their default values.

5. Searching and Filtering Output of “show” and “more” Commands

You can search and filter the output for *show* and *more* commands. This is useful when you need to sort through large amounts of output or if you want to exclude output that you do not need to see. Using these commands is optional.

```
command | {begin | include | exclude} regular-expression
```

Expressions are case sensitive.

```
device# show interfaces | include protocol
```

```
Vlan1 is up, line protocol is up
```

```
Vlan10 is up, line protocol is down
```

6. Accessing the CLI

You can access the CLI through a console connection, through Telnet, or by using the browser.

a. Accessing the CLI through a Console Connection or through Telnet

You can use one of these methods to establish a connection with the device:

- Connect the device console port to a management station or dial-up modem. For information about connecting to the console port, see the device getting started guide or hardware installation guide.
- Use any Telnet TCP/IP or encrypted Secure Shell (SSH) package from a remote management station. The device must have network connectivity with the Telnet or SSH client, and the device must have an enable secret password configured.

b. Using Putty on Windows System

- First, connect the terminal using the RJ-45 to DB9 rollover cable

- Then, open Putty and configure the terminal for 9600 baud, 8 data bits, no parity, 1 stop bit, and no flow control (see Category → Connection → Serial preference)
- Fire up putty, and select the serial radio button, the Serial Line, and Speed boxes will be populated for you. However, make sure that speed is 9600. And save the connection (give it a name) and save it
- View Console

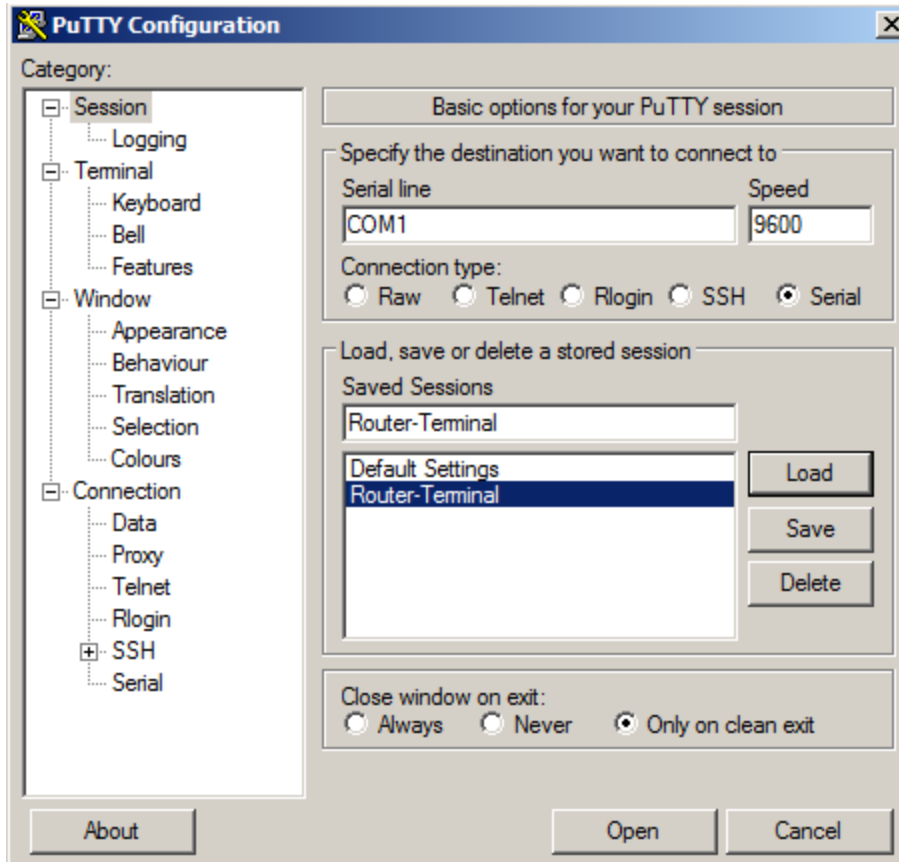


Figure 1: Using putty to control network devices

Practice on real Cisco devices:

- Configuring the Device Hostname and Prompt
- Configuring Time and Date Manually
- Configuring the Enable and Enable Secret Passwords
- [Router] Configuring Fast Ethernet and Gigabit Ethernet Interfaces
- [Switch] Manually Assigning IP Information (optional)
- Verifying Network Connectivity
- Saving Your Device Configuration



Configuring the device Hostname and Prompt

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **hostname** *name (SwLANx, CEx)*
4. Verify that the device prompt displays your new **hostname**.
5. **end**

Configuring Time and Date Manually

SUMMARY STEPS

1. **enable**
2. **clock set** *hh:mm:ss day month year* or **clock set** *hh:mm:ss month day year*

This example shows how to manually set the system clock to 1:32 p.m. on July 23, 2010:

```
device# clock set 13:32:00 27 Sep 2010
```

Configuring the Enable and Enable Secret Passwords

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **enable password** *password (NetLab@switchx, NetLab@routerx)*
4. **enable secret** *password (NetLab@switchx, NetLab@routerx)*
5. **exit**
6. **enable**
7. **exit**

[Router] Configuring Fast Ethernet and Gigabit Ethernet Interfaces

SUMMARY STEPS

1. **enable**
2. **show ip interface brief**
3. **configure terminal**
4. **interface** {*fastethernet* | *gigabitethernet*} *port (0)*
5. **description** *string (Port on RouterX connect to SwitchX, NetLab LAN)*
6. **ip address** *ip-address mask (172.28.13.2x 255.255.255.0 where x for group number)*
7. **no shutdown**
8. **end**
9. **show ip interface brief**



[Switch] Manually Assigning IP Information on SVIs

SUMMARY STEPS

1. **enable**
 2. **show ip interface brief**
 3. **configure terminal**
 4. **interface vlan** *vlan-id (1)*
 5. **ip address** *ip-address subnet-mask (172.28.13.3x 255.255.255.0)*
 6. **exit**
 7. **ip default-gateway** *ip-address (172.28.13.2x)*
 8. **end**
 9. **show interfaces vlan** *vlan-id (1)*
 10. **show ip redirects**
 11. **copy running-config startup-config**
- When you create an SVI, it does not become active until you associate it with a physical port
- Assigning Static-Access Ports to a VLAN
12. **interface** *interface-id (fastethernet0)*
 13. **switchport mode access**
 14. **switchport access vlan** *vlan-id (1)*
 15. **end**
 16. **copy running-config startup-config**

Verifying Network Connectivity

PRE-REQUISITES

- Complete all previous configuration tasks in this document.
- The router must be connected to a properly configured network host.

SUMMARY STEPS

1. **enable**
2. **ping** [*ip-address | hostname*]

Saving Your Router Configuration

SUMMARY STEPS

1. **enable**
2. **copy running-config startup-config**



II. Virtual Local Area Network

Figure 2 shows a switched local network connecting three departments, two servers and a router with four switches. If all switches support only a single LAN, several drawbacks arise:

Lack of traffic isolation. Broadcast traffic (e.g., frames carrying ARP and DHCP messages or frames whose destination has not yet been learned by a selflearning switch) traverse the entire LAN. Limiting

the scope of such broadcast traffic would improve LAN performance. Perhaps more importantly, it also may be desirable to limit LAN broadcast traffic for security/privacy reasons.

Inefficient use of switches. If instead of three groups, the institution had 10 groups, then 10 first-level switches would be required. If each group were small, say less than 10 people, then a single 96-port switch would likely be large enough to accommodate everyone, but this single switch would not provide traffic isolation.

- *Managing users.* If an employee moves between groups, the physical cabling must be changed to connect the employee to a different switch. Employees belonging to two groups make the problem even harder.

Fortunately, these difficulties can be handled by a switch that supports **virtual local area networks (VLANs)**. As the name suggests, a switch that supports VLANs allows multiple *virtual* local area networks to be defined over a single *physical* local area network infrastructure. Hosts within a VLAN communicate

with each other as if they (and no other hosts) were connected to the switch. In a port-based VLAN, the switch's ports (interfaces) are divided into groups by the network manager. Each group constitutes a VLAN, with the ports in each VLAN forming a broadcast domain (i.e., broadcast traffic from one port can only reach other ports in the group).

To interconnecting VLAN switches, we use VLAN trunking. A special port on each switch is configured as a trunk port to interconnect the two VLAN switches. The trunk port belongs to all VLANs, and frames sent to any VLAN are forwarded over the trunk link to the other switch. Traffic between VLANs must be routed. This relates to configuring the router which is beyond the scope of this lab.

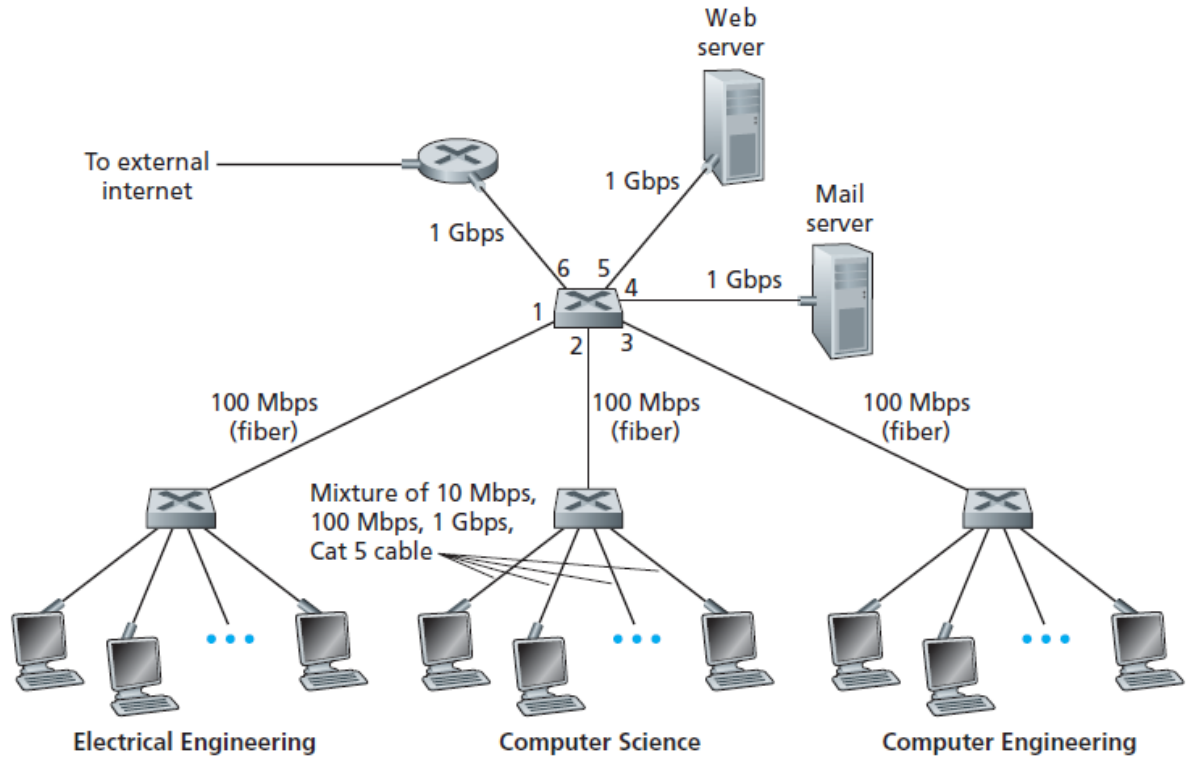


Figure 2: An institutional network connected together by four switches

Cisco IOS Release 12.2SX supports 4096 VLANs in accordance with the IEEE 802.1Q standard. These VLANs are organized into several ranges

VLANs	Range	Usage
0, 4095	Reserved	For system use only. You cannot see or use these VLANs.
1	Normal	Cisco default. You can use this VLAN but you cannot delete it.
2-1001	Normal	For Ethernet VLANs; you can create, use, and delete these VLANs.
1002-1005	Normal	Cisco defaults for FDDI and Token Ring. You cannot delete VLANs 1002-1005.
1006-4094	Extended	For Ethernet VLANs only.

Practice 2

1. Connect 2 PCs to 2960 series switch, using Fast Ethernet 1 and Fast Ethernet 2 port, configure static ip address for each PC, verify that 2 PCs can ping each other.
2. Add Fast Ethernet 1 port to VLAN 2, Fast Ethernet 2 port to VLAN 3, verify that 2 PCs cannot ping each other.

Solution:

1. enable
2. vlan database
3. vlan 2 name Engineer
4. vlan 3 name Manager
5. exit
6. conf t
7. int fa1
8. switchport access vlan 2
9. int fa2
10. switchport access vlan 3
11. end
12. show vlan

Practice 3

Create network topology in figure 3 in Cisco Packet Tracer.

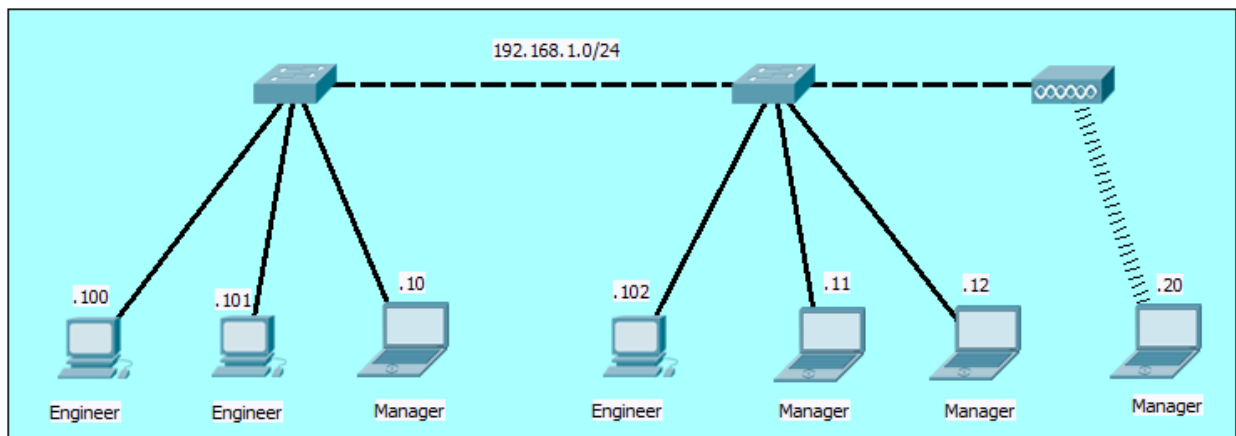


Figure 3: network layout for practice

Requirements:

Engineers' computers are assigned to vlan 2, Managers' laptops are assigned to vlan 3. Make sure that computers in the same vlan can ping each other.

Submission

Complete practice 3 and save as lab9.pkt, submit this file to your instructor.

References

http://www.cisco.com/en/US/docs/switches/lan/catalyst2960/software/release/12.2_55_se/configuration/guide/scg_2960.html

<http://www.cisco.com/en/US/docs/routers/access/1800/1841/software/configuration/guide/sw.html>

Kurose Ross, "Computer Networking, A Top-Down Approach", 6th edition

<http://www.cisco.com/c/en/us/td/docs/switches/lan/catalyst6500/ios/12-2SX/configuration/guide/book/vlans.html>