

EE3009 Lab 1.1 (Router set : group) Sem A 2024/2025

Name : _____(CityU ID : _____)

Group no.: ____

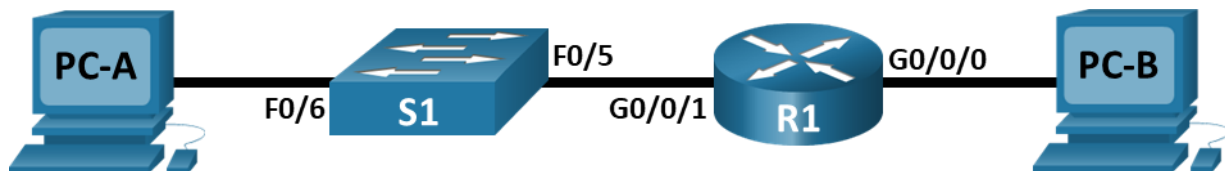
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1.6.2 - Configure Basic Router Settings

Topology



Addressing Table

Device	Interface	IP Address / Prefix	Default Gateway
R1	G0/0/0	192.168.0.1 /24	N/A
		2001:db8:acad::1 /64	
		fe80::1	
	G0/0/1	192.168.1.1 /24	
		2001:db8:acad:1::1 /64	
		fe80::1	
	Loopback0	10.0.0.1 /24	
		2001:db8:acad:2::1 /64	
PC-A	NIC	192.168.1.10 /24	192.168.1.1
		2001:db8:acad:1::10 /64	fe80::1
PC-B	NIC	192.168.0.10 /24	192.168.0.1
		2001:db8:acad::10 /64	fe80::1

Objectives

Part 1: Set Up the Topology and Initialize Devices

- Cable equipment to match the network topology.
- Initialize and restart the router and switch.

Part 2: Configure Devices and Verify Connectivity

- Assign static IPv4 and IPv6 information to the PC interfaces.
- Configure basic router settings.
- Configure the router for SSH.
- Verify network connectivity.

Part 3: Display Router Information

- Retrieve hardware and software information from the router.
- Interpret the output from the startup configuration.
- Interpret the output from the routing table.
- Verify the status of the interfaces.

Background / Scenario

This is a comprehensive lab to review previously covered IOS router commands. In Parts 1 and 2, you will cable the equipment and complete basic configurations and interface settings on the router.

In Part 3, you will use SSH to connect to the router remotely and utilize the IOS commands to retrieve information from the device to answer questions about the router.

For review purposes, this lab provides the commands necessary for specific router configurations.

Note: Make sure that the router and switch have been erased and have no startup configurations. Consult with your instructor for the procedure to initialize and reload a router and switch.

Required Resources

- 1 Router (Cisco 4321 with Cisco IOS XE Release 16.9.4 universal image or comparable)
- 1 Switch (Cisco 2960 with Cisco IOS Release 15.2(2) lanbasek9 image or comparable)
- 2 PCs (Windows with a terminal emulation program, such as Tera Term)
- Console cables to configure the Cisco IOS devices via the console ports
- Ethernet cables as shown in the topology

Note: The Gigabit Ethernet interfaces on Cisco 4221 routers are autosensing and an Ethernet straight-through cable may be used between the router and PC-B. If using another model Cisco router, it may be necessary to use an Ethernet crossover cable.

Instructions

Part 1: Set Up the Topology and Initialize Devices

Step 1: Cable the network as shown in the topology.

- a. Attach the devices as shown in the topology diagram, and cable as necessary.

Step 2 : Initialize and reload the router and switch. (Finished by Technician)

Part 2: Configure Devices and Verify Connectivity

Step 1: Configure the PC interfaces.

**** Configure the *Realtek RTL8139/810x Family NIC* and disable the *Intel Ethernet Card*.**

**** Turn off the firewalls of both PC-A and PC-B**

- a. Configure the IP address, subnet mask, and default gateway settings on PC-A.
- b. Configure the IP address, subnet mask, and default gateway settings on PC-B.

Step 2: Configure the router.

- a. Console into the router and enable privileged EXEC mode.
`router> enable`
- b. Enter configuration mode.
`router# config terminal`
- c. Assign a device name to the router.
`router(config)# hostname R1`
- d. Set the router's domain name as ccna-lab.com.
`R1(config)# ip domain name ccna-lab.com`
- e. Disable DNS lookup to prevent the router from attempting to translate incorrectly entered commands as though they were host names.
`R1(config)# no ip domain lookup`
- f. Encrypt the plaintext passwords.
`R1(config)# service password-encryption`
- g. Configure the username **SSHadmin** with an encrypted password of **SSHpass**.
`R1(config)# username SSHadmin secret SSHpass`
- h. Generate a set of crypto keys with a 1024 bit modulus
`R1(config)# crypto key generate rsa modulus 1024`
- i. Assign the privileged EXEC password to cisco
`R1(config)# enable secret cisco`
- j. Assign **conpass** as the console password, configure sessions to disconnect after four minutes of inactivity, and enable login.
`R1(config)# line console 0`
`R1(config-line)# password conpass`
`R1(config-line)# exec-timeout 4 0`
`R1(config-line)# login`
`R1(config-line)# exit`
- k. Assign **vtypass** as the vty password, configure the vty lines to accept SSH connections only, configure sessions to disconnect after four minutes of inactivity, and enable login using the local database.
`R1(config)# line vty 0 4`
`R1(config-line)# password vtypass`
`R1(config-line)# exec-timeout 4 0`
`R1(config-line)# transport input ssh`
`R1(config-line)# login local`
`R1(config-line)# exit`
- l. Enable IPv6 Routing
`R1(config)# ipv6 unicast-routing`
- m. Configure all three interfaces on the router with the IPv4 and IPv6 addressing information from the addressing table above. Configure all three interfaces with descriptions. Activate all three interfaces.
`R1(config)# interface g0/0/0`
`R1(config-if)# ip address 192.168.0.1 255.255.255.0`
`R1(config-if)# ipv6 address fe80::1 link-local`
`R1(config-if)# ipv6 address 2001:db8:acad::1/64`

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```
R1(config-if)# description Connection to PC-B
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config)# interface g0/0/1
R1(config-if)# ip address 192.168.1.1 255.255.255.0
R1(config-if)# ipv6 address fe80::1 link-local
R1(config-if)# ipv6 address 2001:db8:acad:1::1/64
R1(config-if)# description Connection to S1
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config)# interface loopback0
R1(config-if)# ip address 10.0.0.1 255.255.255.0
R1(config-if)# ipv6 address fe80::1 link-local
R1(config-if)# ipv6 address 2001:db8:acad:2::1/64
R1(config-if)# description loopback adapter
R1(config-if)# no shutdown
R1(config-if)# exit
```

- n. The router should not allow vty logins for two minutes if three failed login attempts occur within 60 seconds.

```
R1(config)# login block-for 120 attempts 3 within 60
R1(config)# exit
```

- o. Save the running configuration to the startup configuration file.

```
R1# copy running-config startup-config
```

What would be the result of reloading the router prior to completing the **copy running-config startup-config** command?

Step 3: Verify network connectivity.

- a. Using the command line at PC-A, ping the IPv4 and IPv6 addresses for PC-B.

Were the pings successful?

- b. Remotely access R1 from PC-A using the Tera Term SSH client.

Using Tera Term on PC-A, open an SSH session to the R1 Loopback interface IPv4 address. Ensure that the **SSH** radio button is selected and then click **OK** to connect to the router. Log in as **SSHadmin** with the password SSHpass.

Was remote access successful?

Using Tera Term on PC-A, open an SSH session to the R1 Loopback interface IPv6 address. Ensure that the **SSH** radio button is selected and then click **OK** to connect to the router. Log in as **SSHadmin** with the password SSHpass.

**** Note:** The IPv6 address should be surrounded with square brackets, i.e. [IPv6 address]

Was remote access successful?

Why is the Telnet protocol considered to be a security risk?



Demonstrate the above results to the instructor.

Part 3: Display Router Information

In Part 3, you will use **show** commands from an SSH session to retrieve information from the router.

Step 1: Establish an SSH session to R1.

Using Tera Term on PC-B, open an SSH session to the R1 Loopback interface IPv6 address and log in as **SSHadmin** with the password **SSHpass**.

Step 2: Retrieve important hardware and software information.

- a. Use the **show version** command to answer questions about the router.

```
R1# show version
Cisco IOS XE Software, Version 16.09.04
Cisco IOS Software [Fujii], ISR Software (X86_64_LINUX_IOSD-UNIVERSALK9_IAS-M),
Version 16.9.4, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2019 by Cisco Systems, Inc.
Compiled Wed 20-Mar-19 08:01 by mcpre
```

.....

```
ROM: IOS-XE ROMMON
```

```
R1 uptime is 32 minutes
Uptime for this control processor is 35 minutes
System returned to ROM by PowerOn
System restarted at 14:49:40 UTC Thu Sep 5 2019
System image file is "flash:isr4200-universalk9_ias.16.09.04.SPA.bin"
Last reload reason: PowerOn
```

.....

```
cisco ISR4221/K9 (1RU) processor with 1784656K/6147K bytes of memory.
Processor board ID FGL221693BV
2 Gigabit Ethernet interfaces
2 Serial interfaces
32768K bytes of non-volatile configuration memory.
4194304K bytes of physical memory.
6598655K bytes of flash memory at bootflash:.
0K bytes of WebUI ODM Files at webui:.
```

```
Configuration register is 0x2102
```

What is the name of the IOS image that the router is running?

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How much non-volatile random-access memory (NVRAM) does the router have?

How much Flash memory does the router have?

- b. The **show** commands often provide multiple screens of outputs. Filtering the output allows a user to display certain sections of the output. To enable the filtering command, enter a pipe (|) character after a **show** command, followed by a filtering parameter and a filtering expression. You can match the output to the filtering statement by using the **include** keyword to display all lines from the output that contain the filtering expression. Filter the **show version** command, using **show version | include register** to answer the following question.

```
R1# show version | include register
Configuration register is 0x2102
```

What is the boot process for the router on the next reload?

Step 3: Display the startup configuration.

Use the **show startup-config** command on the router to answer the following questions.

```
R1# show start
Using 1997 out of 33554432 bytes
!
version 16.9
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
platform qfp utilization monitor load 80
no platform punt-keepalive disable-kernel-core
!
hostname R1
!
boot-start-marker
boot-end-marker
!
security passwords min-length 12
enable secret 5 $1$b2iA$/7Hj3HRmBXTbOESxm1yiG0
!
no aaa new-model
!
no ip domain lookup
ip domain name ccna-lab.com
!
login block-for 120 attempts 3 within 60
login on-success log
!
subscriber templating
!
```

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```
ipv6 unicast-routing
multilink bundle-name authenticated
!
license udi pid ISR4221/K9 sn FGL221693BV
no license smart enable
diagnostic bootup level minimal
!
spanning-tree extend system-id
!
username SSHadmin secret 5 $1$6HtR$T0QPZWbzb6bz3g6iwmZrP1
!
redundancy
mode none
!
interface Loopback0
description loopback adapter
ip address 10.0.0.1 255.255.255.0
ipv6 address FE80::1 link-local
ipv6 address 2001:DB8:ACAD:2::1/64
!
interface GigabitEthernet0/0/0
description Connection to PC-B
ip address 192.168.0.1 255.255.255.0
negotiation auto
ipv6 address FE80::1 link-local
ipv6 address 2001:DB8:ACAD::1/64
!
interface GigabitEthernet0/0/1
description Connection to S1
ip address 192.168.1.1 255.255.255.0
negotiation auto
ipv6 address FE80::1 link-local
ipv6 address 2001:DB8:ACAD:1::1/64
!
interface Serial0/1/0
no ip address
!
interface Serial0/1/1
no ip address
!
ip forward-protocol nd
no ip http server
ip http secure-server
!
control-plane
!
line con 0
exec-timeout 4 0
password 7 145311021F07256A650B1C1B68
logging synchronous
login
transport input none
stopbits 1
```

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```
line aux 0
  stopbits 1
line vty 0 4
  exec-timeout 4 0
  password 7 15560805172924656905011B59
  login local
  transport input ssh
!
end
```

How are passwords presented in the output?

Use the **show startup-config | section vty** command.

```
R1# show startup-config | section vty
line vty 0 4
  exec-timeout 4 0
  password 7 15560805172924656905011B59
  login local
  transport input ssh
```

What is the result of using this command?

Step 4: Display the routing table on the router.

Use the **show ip route** command on the router to answer the following questions.

```
R1# show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR
```

Gateway of last resort is not set

```

    10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.0.0.0/24 is directly connected, Loopback0
L       10.0.0.1/32 is directly connected, Loopback0
    192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.0.0/24 is directly connected, GigabitEthernet0/0/0
L       192.168.0.1/32 is directly connected, GigabitEthernet0/0/0
    192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, GigabitEthernet0/0/1
L       192.168.1.1/32 is directly connected, GigabitEthernet0/0/1
```


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What code is used in the routing table to indicate a directly connected network?

How many route entries are coded with a C code in the routing table?

Step 5: Display a summary list of the interfaces on the router.

- a. Use the **show ip interface brief** command on the router to answer the following question.

```
R1# show ip interface brief
Interface                IP-Address      OK? Method Status        Protocol
GigabitEthernet0/0/0     192.168.0.1     YES manual up            up
GigabitEthernet0/0/1     192.168.1.1     YES manual up            up
Serial0/1/0              unassigned      YES unset  up            up
Serial0/1/1              unassigned      YES unset  up            up
Loopback0                10.0.0.1        YES manual up            up
```

What command changed the status of the Gigabit Ethernet ports from administratively down to up?

- b. Use the **show ipv6 int brief** command to verify IPv6 settings on R1.

```
R1# show ipv6 interface brief
GigabitEthernet0/0/0    [up/up]
    FE80::1
    2001:DB8:ACAD::1
GigabitEthernet0/0/1    [up/up]
    FE80::1
    2001:DB8:ACAD:1::1
Serial0/1/0             [up/up]
    unassigned
Serial0/1/1             [up/up]
    unassigned
Loopback0              [up/up]
    FE80::1
    2001:DB8:ACAD:2::1
```

What is the meaning of the [up/up] part of the output?

- c. On PC-B, change its configuration so that it no longer has a static IPv6 address. You may have to reboot the machine. Then, issue the **ipconfig** command on PC-B to examine the IPv6 configuration.

What is the IPv6 address assigned to PC-B?

What is the default gateway assigned to PC-B?

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Issue a ping from PC-B to the R1 default gateway link local address. Was it successful?

Issue a ping from PC-B to the R1 IPv6 unicast address 2001:db8:acad::1. Was it successful?



If the ping test is not successful, please troubleshoot. Demonstrate the results to the instructor.