



MODULE 10: BASIC ROUTER CONFIGURATION



Introduction to Networks

Module Objectives

- Module Title: Basic Router Configuration
- Module Objective: Implement initial settings on a router and end devices

Topic Title	Topic Objective
10.1 Configure Initial Router Settings	Configure initial settings on an IOS Cisco router.
10.2 Configure Interfaces	Configure two active interfaces on a Cisco IOS router.
10.3 Configure the Default Gateway	Configure devices to use the default gateway.



10.1 CONFIGURE INITIAL ROUTER SETTINGS

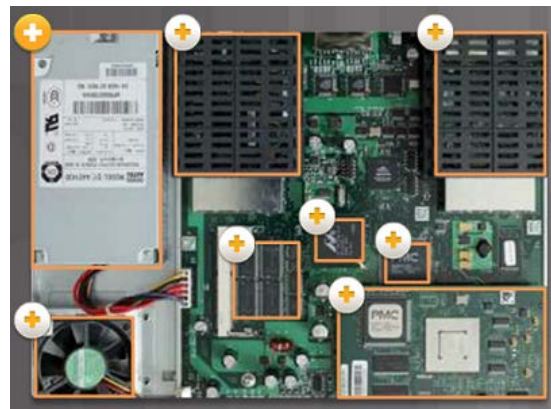


Purpose of a Router

- Routers are layer 3 devices because they deal with IP addressing.
- Routers are critical devices in our network infrastructure.
- The primary functions of a router are:
 - **Interconnect networks** – A packet is typically forwarded from one router to another router through the networks that constitute the Internet.
 - **Path selection/determination** – The router reads the network address information in the packet header to determine the ultimate destination.
 - **Packet forwarding** – Using information in its routing table, it directs the packet to the next network on its journey.

Anatomy of a Router

- A Router is a Computer
 - Routers have CPU, memory and I/O devices.
 - Cisco routers use IOS as their operating system.
- Inside a Router
 - Routers have the same general structure.
- Connect to a Router
 - Routers have many ports to support connections.
- Interfaces
 - Routers have LAN and WAN ports/interfaces.
 - Different models ship with different ports
 - Ethernet is very common LAN on different router models.
- Cisco routers are designed to meet the needs of wide variety of businesses and networks:
 - **Branch** – Teleworkers, small businesses, and medium-size branch sites
 - **WAN** – Large businesses, organizations and enterprises
 - **Service Provider** – Large service providers
- The focus of the CCNA certification is on the branch family of routers





Anatomy of a Router

- Router Memory
 - Just as a computer, routers have memory.
 - Routers contain RAM, ROM, NVRAM and Flash memory.

Memory	Volatile / Non-Volatile	Stores
RAM	Volatile	<ul style="list-style-type: none"> • Running IOS • Running configuration file • IP routing and ARP tables • Packet buffer
ROM	Non-Volatile	<ul style="list-style-type: none"> • Basic diagnostic software • Bootup instructions • Limited IOS
NVRAM	Non-Volatile	<ul style="list-style-type: none"> • Startup configuration file
Flash	Non-Volatile	<ul style="list-style-type: none"> • IOS • Other system files

- **Volatile** memory – requires continual power to store information.
- **Non-volatile** memory – does not require continual power.

Connect to a Router

- Cisco devices, routers, and switches typically interconnect many devices. The Cisco 4221 router backplane includes the following ports and connections:
 - **RJ-45 Console Port** – Used for initial configuration and Command Line Interface access
 - **2 x GigabitEthernet ports** – used to provide LAN access by connecting to switches, users, or to other routers (G0/0/0 – RJ-45 or SFP)
 - **Power Supply** – 12DC @ 7.5A
 - **USB port** – used to provide additional storage space
 - **2 x Network Interface Module (NIM) Slots** – support data and voice modules.



Cisco 4221/K9 Integrated Service Router

Routers

- Cisco 4221



- Have two types of local ports that can be used to access the console: Console and/or Auxiliary

- Cisco 1941

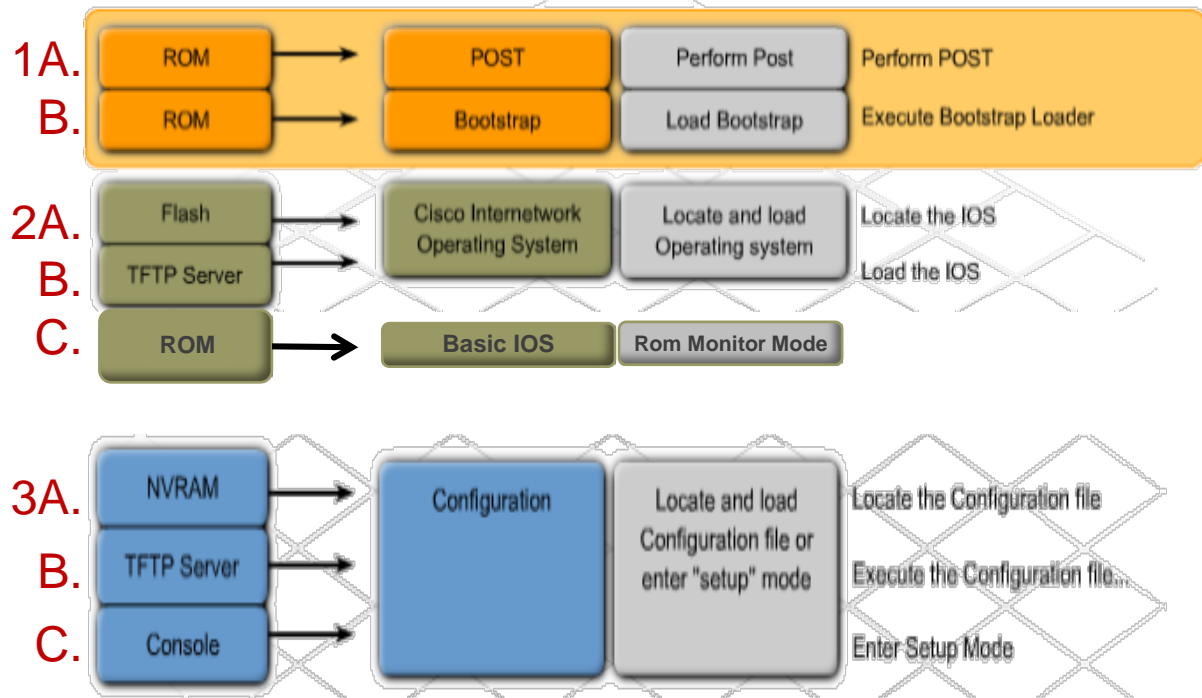


LAN and WAN Interfaces

- Cisco router connections can be classified in two categories:
 - **In-band** router interfaces – LAN and WAN interfaces
 - **Out-of-band** Management ports – Console and AUX ports
- The most common ways to access user EXEC mode in the CLI environment on a Cisco router:
 - **Console** – This is a physical management port that provides out-of-band access to the Cisco router. Out-of-band means that it is dedicated and does not require network services to be configured on the router.
 - **Secure Shell (SSH)** – This is a secure method of remotely establishing a CLI connection over a network. SSH does require active networking services configured.
 - **Telnet** – Telnet is an insecure method of remotely establishing a CLI session through a virtual interface over a network. The connection is not encrypted



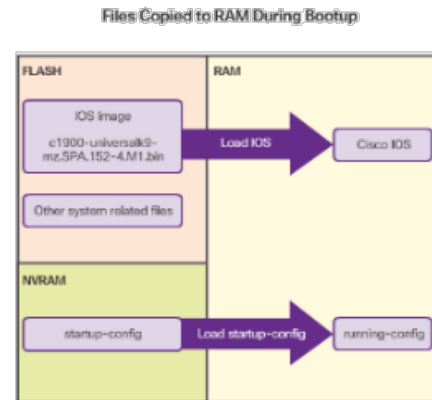
Router Bootup Process



- Three major phases to the bootup process of a router:
 - Phase 1: Perform the POST and load the bootstrap program** – During the Power-on Self-Test, the router executes diagnostics from ROM on various hardware components. After the POST, the bootstrap program is copied from ROM into RAM and its job is to locate the Cisco IOS and load it into RAM.
 - Phase 2: Locate and load the Cisco IOS software** – Typically, the IOS is stored in flash memory and is copied into RAM for execution by the CPU.
 - Phase 3: Locate and load the startup configuration file or enter setup mode** – The bootstrap program then copies the startup config file from NVRAM into RAM and becomes the running configuration.

Router Bootup Process

- Routing table and ARP cache will be lost when the router loses power, is turned off, or restarted.
- The IOS image file and startup configuration are copied into RAM as a router, with the default configuration register setting, boots up.
- If the full IOS cannot be found, the IOS image held in ROM would be used to boot the router.
- If no configuration file is found, the router will enter setup mode.
- The startup configuration contains the commands that are used to initially configure a router on startup.
- A packet to a destination host in the same LAN will be sent directly to the destination host.
- The running configuration is modified when the network administrator makes any changes.
- These changes should be saved to the startup configuration file in NVRAM in order for them to take effect on the next reboot of the router or during in the event of a power loss.



Show Version

- The **show version** command displays information about the version of the Cisco IOS software running on the router.

```

Router# show version
Cisco IOS Software, C1900 Software (C1900-UNIVERSALK9-M), Version 15.2(4)M1, RELEASE SOFTWARE (fcl)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2012 by Cisco Systems, Inc.
Compiled Thu 26-Jul-12 19:34 by prod_rel_team

ROM: System Bootstrap, Version 15.0(1r)M15, RELEASE SOFTWARE (fcl)

Router uptime is 10 hours, 9 minutes
System returned to ROM by power-on
System image file is "flash0:c1900-universalk9-mz.SPA.152-4.M1.bin"
Last reload type: Normal Reload
Last reload reason: power-on

<Output omitted>

Cisco CISC01941/K9 (revision 1.0) with 446464K/77824K bytes of memory.
Processor board ID FTX1636848Z
 2 Gigabit Ethernet interfaces
 2 Serial(sync/async) interfaces
 1 terminal line
DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
250880K bytes of ATA System CompactFlash 0 (Read/Write)

<Output omitted>

Technology Package License Information for Module:'c1900'

-----
Technology      Technology-package      Technology-package
                Current              Type                  Next reboot
-----
ipbase          ipbasek9              Permanent            ipbasek9
security        None                   None                  None
data            None                   None                  None

Configuration register is 0x21142 (will be 0x2102 at next reload)
    
```

IOS Information

ROM Information

IOS Image file

RAM

Interfaces

NVRAM for Configuration file

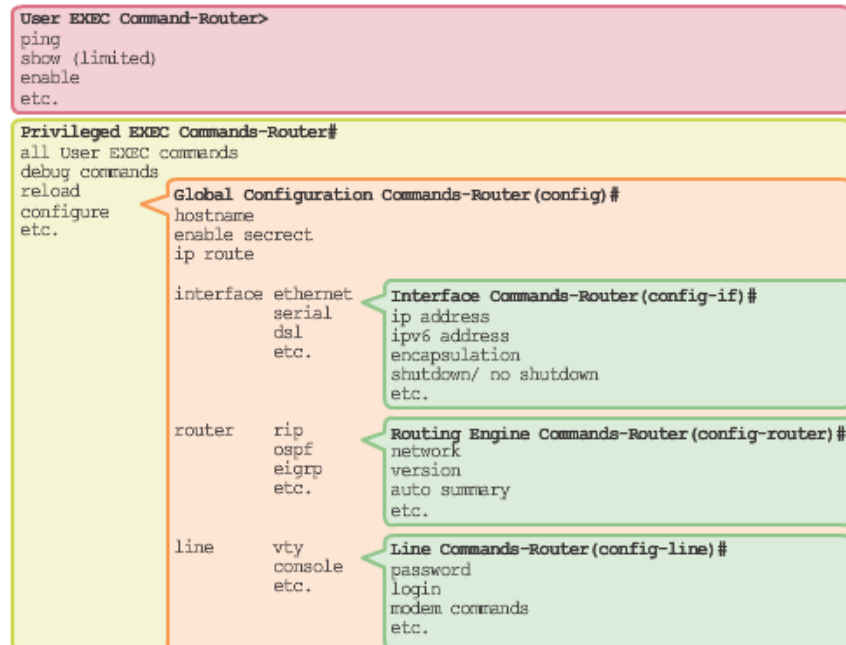
Flash for IOS files

Configuration Register setting

Cisco IOS Modes of Operation

- The Cisco IOS modes use a hierarchical command structure.
- Each mode has a distinctive prompt and is used to accomplish particular tasks with a specific set of commands that are available only to that mode.
- Initial configuration must be done via console connection, locally accessed through a serial or USB interface of a PC.
- Configuration is then done via various CLI command modes.

IOS Mode Hierarchical Structure





Configuration Modes

Mode (Prompt)	Definition
Router>	User EXEC mode – Allows only a limited number of basic monitoring commands. Often referred to as view-only mode.
Router#	Privileged EXEC mode – Allows execution of all monitoring, configuration, and management commands. Often referred to as “enable mode” because it requires the enable user EXEC command.
Router(config)#	Global Configuration mode – The primary configuration mode. The Configure Terminal command enters the Global Configuration Mode.
Router(config-line)#	Line Configuration mode – Used to configure one of the network interfaces.
Router(config-if)#	Interface Configuration mode – Used to configure the console, AUX, Telnet, or SSH access.
Router(config-router)#	Routing Protocol Configuration mode – Used to configure RIP, EIGRP, OSPF, IS-IS, BGP.
Router(dhcp-config)#	DHCP Configuration mode – Used to configure DHCP settings.

Router Configuration Steps

1. Naming

- Configure device name
- Disable DNS
- Provide legal notification

2. Passwords

- Secure User EXEC mode
- Secure Privilege EXEC mode
- Secure Console and Aux
- Secure VTY lines
- Secure all passwords

3. Interfaces

- Configure Serial
- Configure Ethernet
- Configure Loopback

4. Protocols

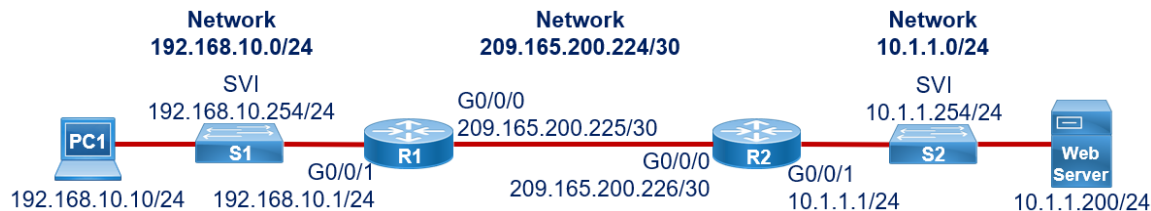
- Configure Routing Protocols

5. IP Hosts

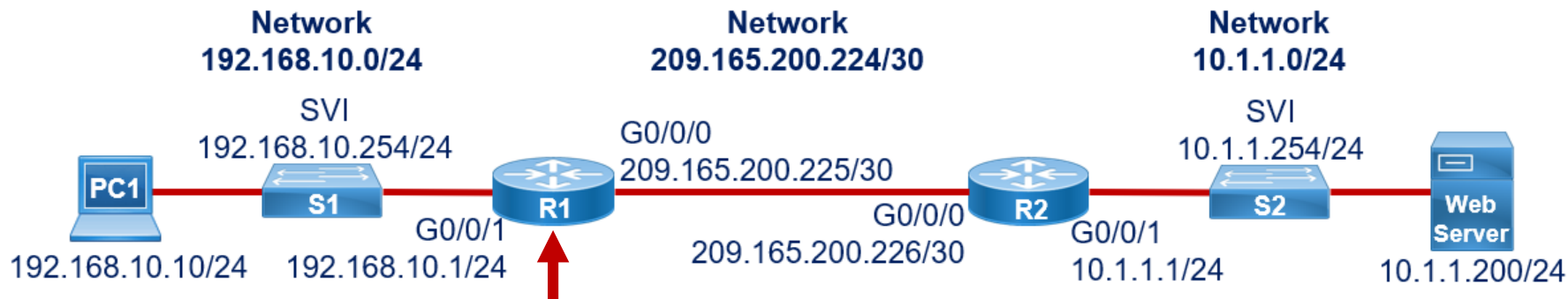
- Configure IP Hosts

6. Verify and Save

- Verify configuration
- Save Configuration to NVRAM
- Verify saved



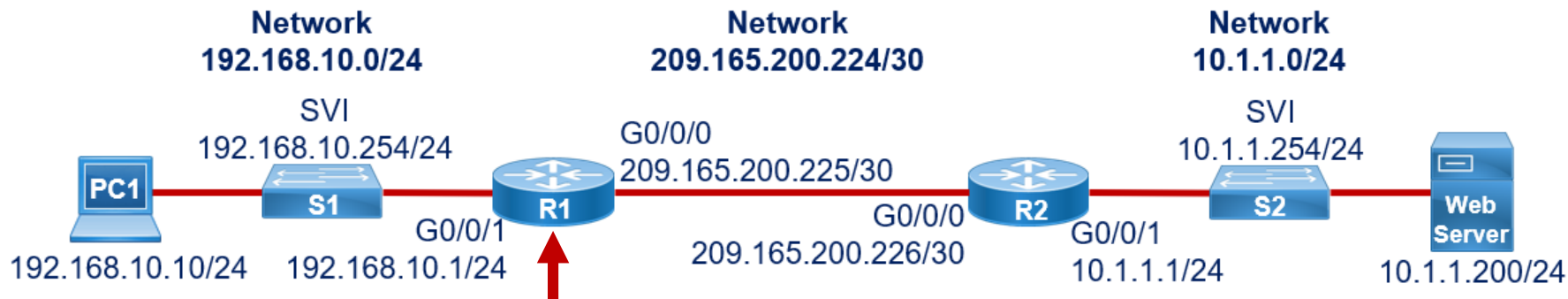
Router Configuration Step 1



```

Router> enable
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# hostname R1
R1(config)# no ip domain-lookup
R1(config)# banner motd #
Enter TEXT message. End with the character '#'.
*****
  WARNING: Unauthorized access is prohibited!
*****
#
R1(config)#
  
```

Router Configuration Step 2



```

R1(config)# enable secret class
R1(config)# line console 0
R1(config-line)# password cisco
R1(config-line)# login
R1(config-line)# logging synchronous
R1(config-line)# exec-timeout 0 0
R1(config)# line vty 0 4
R1(config-line)# password cisco
R1(config-line)# login
R1(config-line)# transport input ssh
R1(config-line)# logging synchronous
R1(config-line)# exec-timeout 0 0
R1(config-line)# exit
R1(config)# service password-encryption
  
```

This keeps unsolicited messages and debug output from being interspersed with solicited software output and prompts.

Disconnect and require re-login after a specific amount of inactivity. 0 disables it (not recommended in production environments).

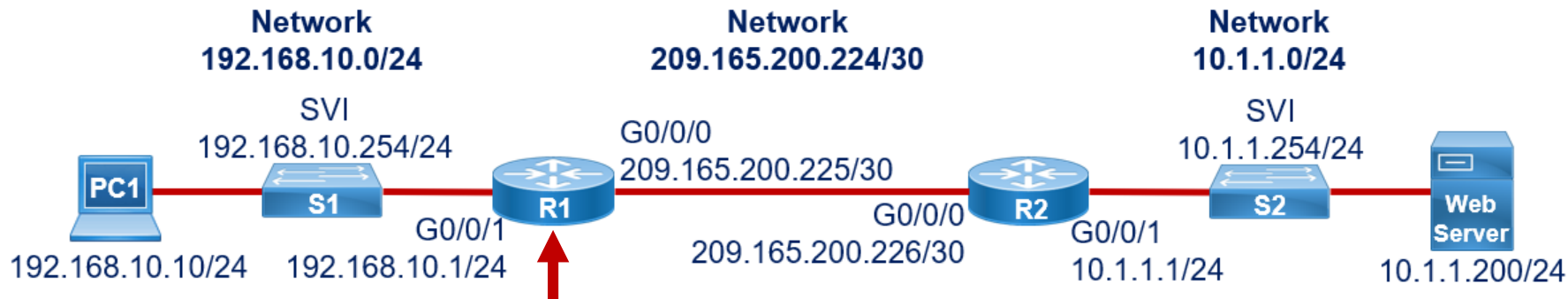
Encrypts communication between the router and remote users.



10.2 CONFIGURE INTERFACES



Router Configuration Step 3



```

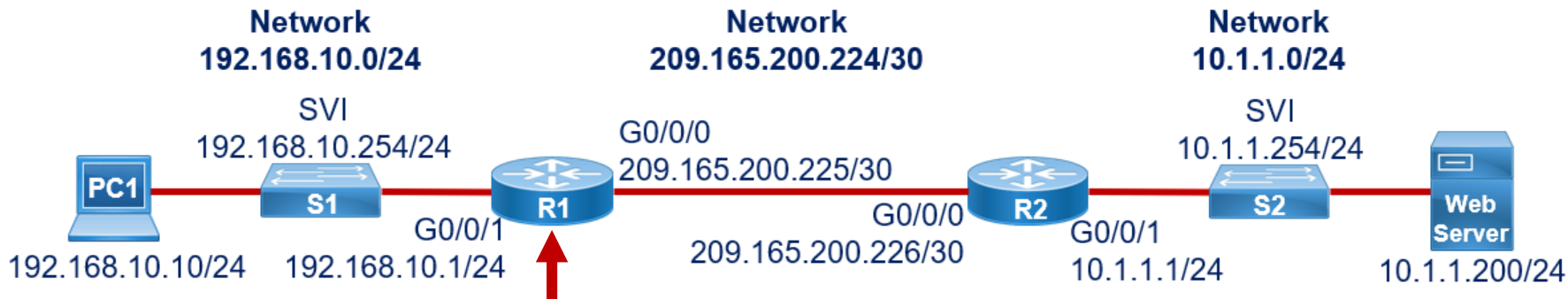
R1(config)# ipv6 unicast-routing
R1(config)# interface loopback 0
R1(config-if)# ip address 1.1.1.1 255.255.255.255
R1(config)# interface gigabitethernet 0/0/0
R1(config-if)# description Link to R2
R1(config-if)# ip address 209.165.200.225 255.255.255.252
R1(config-if)# ipv6 address 2001:DB8:ACAD:200::1/64
R1(config-if)# ipv6 address FE80::1 link-local
R1(config-if)# no shutdown
    
```

```
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
```

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
```

Interface/Device	IPv6 Address	Link-Local Address
R1 – G0/0/0	2001:DB8:ACAD:200::1/64	FE80::1
R1 – G0/0/1	2001:DB8:ACAD:10::1/64	FE80::1
S1 – SVI	2001:DB8:ACAD:10::254/64	FE80::2
PC1	2001:DB8:ACAD:10::10/64	---
R2 – G0/0/0	2001:DB8:ACAD:200::2/64	FE80::3
R2 – G0/0/1	2001:DB8:ACAD:1::1/64	FE80::3
S2 – SVI	2001:DB8:ACAD:1::254/64	FE80::4
Web Server	2001:DB8:ACAD:1::200/64	---

Router Configuration Step 3



```

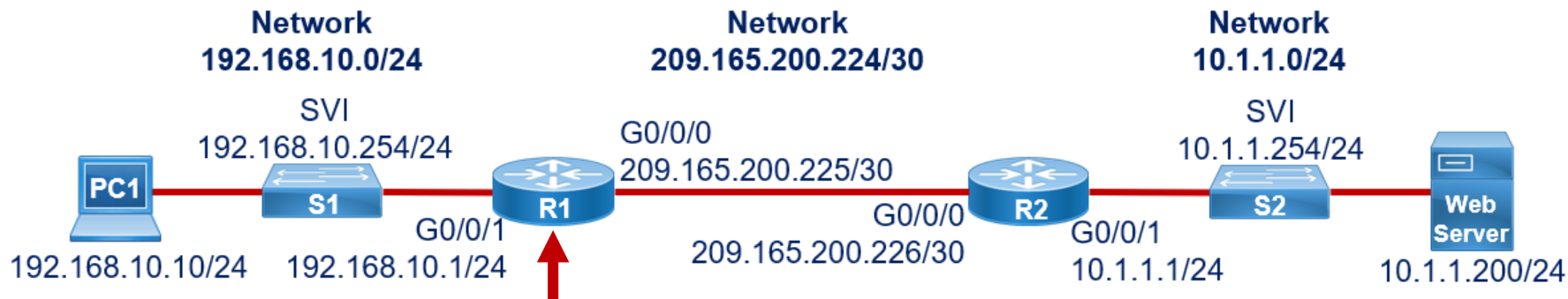
R1(config)# int gigabitethernet0/0/1
R1(config-if)# description Link to LAN
R1(config-if)# ip address 192.168.10.1 255.255.255.0
R1(config-if)# ipv6 address 2001:DB8:ACAD:10::1/64
R1(config-if)# ipv6 address FE80::1 link-local
R1(config-if)# no shutdown
    
```

```

%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
R1(config-if)# exit
    
```

Interface/Device	IPv6 Address	Link-Local Address
R1 – G0/0/0	2001:DB8:ACAD:200::1/64	FE80::1
R1 – G0/0/1	2001:DB8:ACAD:10::1/64	FE80::1
S1 – SVI	2001:DB8:ACAD:10::254/64	FE80::2
PC1	2001:DB8:ACAD:10::10/64	---
R2 – G0/0/0	2001:DB8:ACAD:200::2/64	FE80::3
R2 – G0/0/1	2001:DB8:ACAD:1::1/64	FE80::3
S2 – SVI	2001:DB8:ACAD:1::254/64	FE80::4
Web Server	2001:DB8:ACAD:1::200/64	---

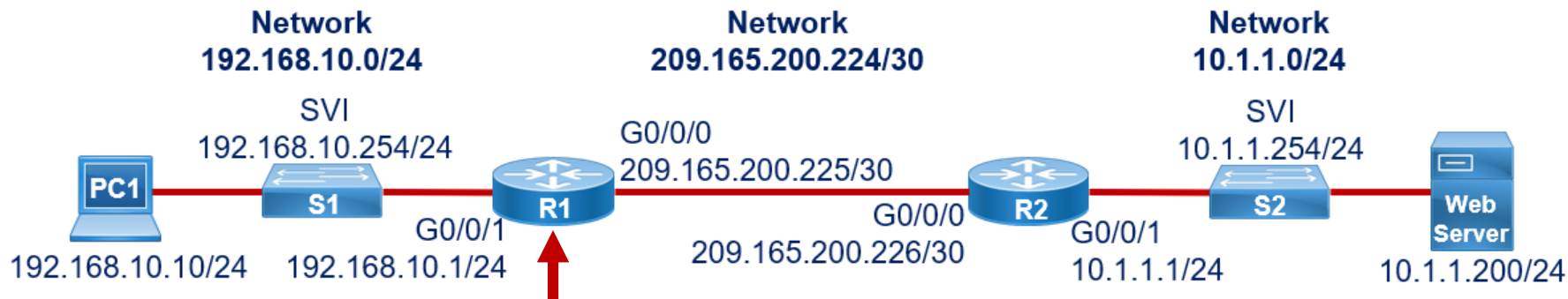
Router Configuration Step 4



```

R1(config)# router rip
R1(config-router)# network 1.1.1.1
R1(config-router)# network 192.168.10.0
R1(config-router)# network 209.165.200.224
R1(config-router)# exit
R1(config)# interface g0/0/0
R1(config-if)# ipv6 rip 1 enable
R1(config)# interface g0/0/1
R1(config-if)# ipv6 rip 1 enable
R1(config)# exit
R1(config)#
    
```

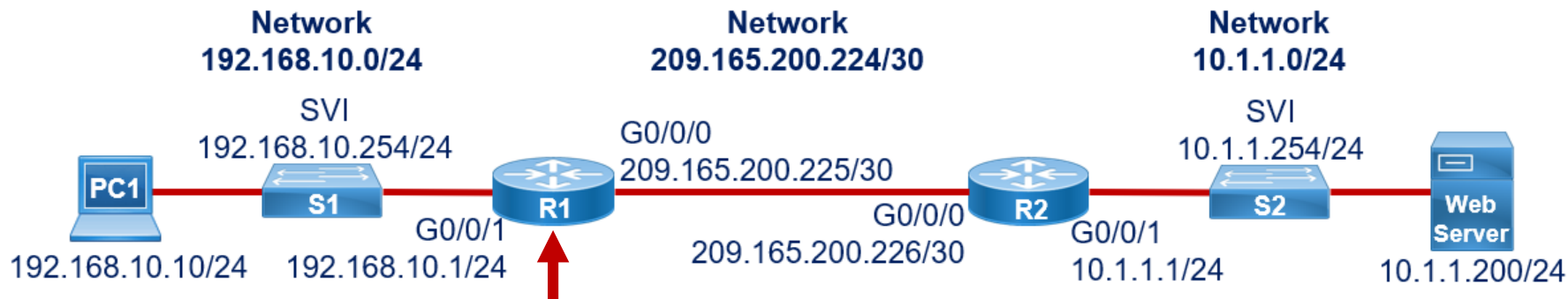
Router Configuration Step 5



```

R1(config)# ip host PC1 192.168.10.10
R1(config)# ip host WS 10.1.1.254
R1(config)# ip host R1 1.1.1.1 192.168.10.1 209.165.200.225
R1(config)# ip host R2 2.2.2.2 10.1.1.1 209.165.200.226
R1(config)# ipv6 host R16 2001:DB8:ACAD:200::225 2001:DB8:ACAD:10::1
R1(config)# ipv6 host R26 2001:DB8:ACAD:200::226 2001:DB8:ACAD:1::1
R1(config)# end
R1#
  
```


Router Configuration Step 6



R1# **show ip interface brief**

Interface	IP-Address	OK?	Method	Status	Protocol
Loopback0	1.1.1.1	YES	Manual	up	up
GigabitEthernet0/0/0	209.165.200.225	YES	manual	up	up
GigabitEthernet0/0/1	192.168.10.1	YES	manual	up	up
Vlan1	unassigned	YES	NVRAM	administratively down	down

R1#

R1# **ping R2** (or ping 2.2.2.2, ping 209.165.200.226, ping 10.1.1.1)

Type escape sequence to abort.

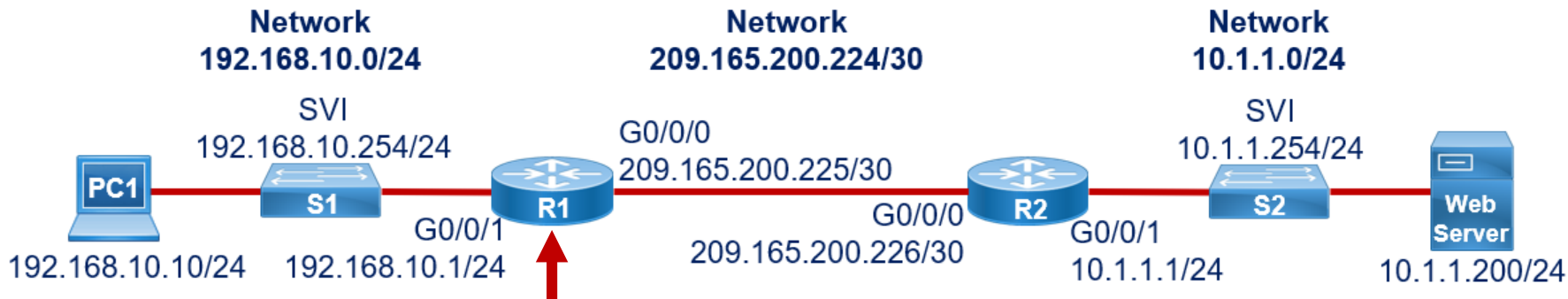
Sending 5, 100-byte ICMP Echos to 209.165.200.226, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/9 ms

R1#

Router Configuration Step 6



R1# **show ipv6 interface brief**

```
Interface
GigabitEthernet0/0/0    [up/up]
    FE80::1
    2001:DB8:ACAD:200::225
GigabitEthernet0/0/1    [up/up]
    FE80::1
    2001:DB8:ACAD:10::1
Vlan1                    [administratively/down]
    unassigned
```

R1# **ping R26**

Type escape sequence to abort.

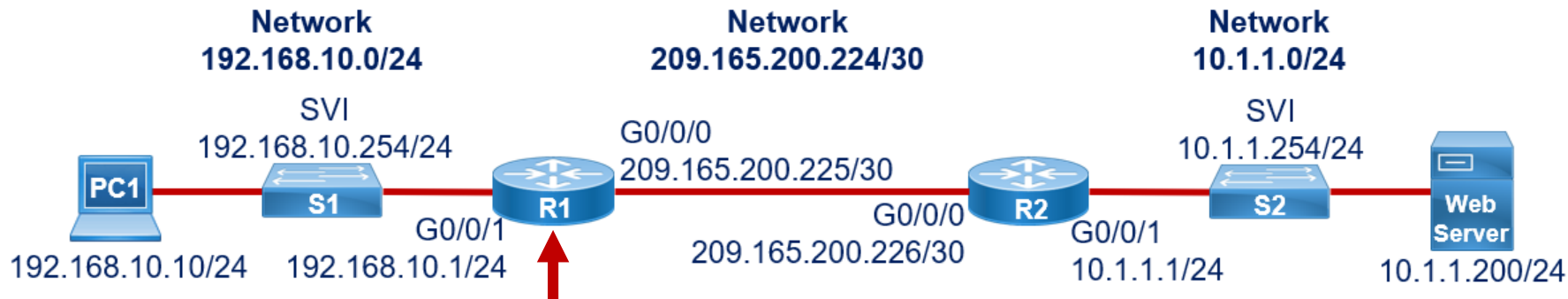
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD:200::226, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/9 ms

R1#

Router Configuration Step 6



- Other verification commands
 - **show ip route** – Displays the contents of the IPv4 routing table stored in RAM
 - **show ipv6 route** – Displays the contents of the IPv6 routing table stored in RAM
 - **show interfaces** – Displays statistics for all interfaces on the device
 - **show ip interfaces** – Displays the IPv4 statistics for all interfaces on a router
 - **show ipv6 interfaces** – Displays the IPv6 statistics for all interfaces on a router

```
R1# show running-config
```

```
---Output omitted---
```

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

```
Destination filename [startup-config]? (enter)
```

```
Building configuration...
```

```
[OK]
```

```
R1# show startup-config
```

```
---Output omitted---
```

Things to Remember

- General:
 - LAN and WAN interfaces will allow access via the VTY lines to configure the router.
 - A configured and activated router interface must be connected to another device in order to operate.
 - Activate the interface with a **no shutdown** command.

- IPv6:
 - Turn on IPv6 routing with the **ipv6 unicast-routing** command.
 - Turn on IPv6 RIP with the **ipv6 rip *name* enable** from the interface.



Configure Verification Commands

- The table summarizes show commands used to verify interface configuration:

Commands	Description
<pre>show ip interface brief show ipv6 interface brief</pre>	Displays all interfaces, their IP addresses, and their current status.
<pre>show ip route show ipv6 route</pre>	Displays the contents of the IP routing tables stored in RAM.
<pre>show interfaces</pre>	Displays statistics for all interfaces on the device. Only displays the IPv4 addressing information.
<pre>show ip interfaces</pre>	Displays the IPv4 statistics for all interfaces on a router.
<pre>show ipv6 interfaces</pre>	Displays the IPv6 statistics for all interfaces on a router.
<pre>tracert</pre>	Display the path taken to a destination with the tracert (PC) or tracert (router) commands:

Configure Verification Commands

- View status of all interfaces with the **show ip interface brief** and **show ipv6 interface brief** commands, shown here:

```
R1# show ip interface brief
Interface                IP-Address      OK? Method Status
Protocol
GigabitEthernet0/0/0    192.168.10.1    YES manual up
GigabitEthernet0/0/1    209.165.200.225 YES manual up
Vlan1                   unassigned      YES unset  administratively down down
R1#
R1#
R1# show ipv6 interface brief
GigabitEthernet0/0/0    [up/up]
FE80::201:C9FF:FE89:4501
2001:DB8:ACAD:10::1
GigabitEthernet0/0/1    [up/up]
FE80::201:C9FF:FE89:4502
2001:DB8:FEED:224::1
Vlan1                   [administratively down/down]
unassigned
R1#
```

Configure Verification Commands

- Display the contents of the IP routing tables with the **show ip route** and **show ipv6 route** commands as shown here:

```
R1# show ip route
< output omitted>
Gateway of last resort is not set
      192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.10.0/24 is directly connected,
GigabitEthernet0/0/0
L       192.168.10.1/32 is directly connected,
GigabitEthernet0/0/0
      209.165.200.0/24 is variably subnetted, 2 subnets, 2 masks
C       209.165.200.224/30 is directly connected,
GigabitEthernet0/0/1
L       209.165.200.225/32 is directly connected,
GigabitEthernet0/0/1
R1#
R1# show ipv6 route
<output omitted>
C   2001:DB8:ACAD:10::/64 [0/0]
    via GigabitEthernet0/0/0, directly connected
L   2001:DB8:ACAD:10::1/128 [0/0]
    via GigabitEthernet0/0/0, receive
C   2001:DB8:FEED:224::/64 [0/0]
    via GigabitEthernet0/0/1, directly connected
L   2001:DB8:FEED:224::1/128 [0/0]
    via GigabitEthernet0/0/1, receive
L   FF00::/8 [0/0]
    via Null0, receive
R1#
```


Configure Verification Commands

- Display statistics for all interfaces with the **show interfaces** command, as shown here:

```
R1# show interfaces gig0/0/0
GigabitEthernet0/0/0 is up, line protocol is up
  Hardware is ISR4321-2x1GE, address is a0e0.af0d.e140 (bia
a0e0.af0d.e140)
  Description: Link to LAN
  Internet address is 192.168.10.1/24
  MTU 1500 bytes, BW 100000 Kbit/sec, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not supported
  Full Duplex, 100Mbps, link type is auto, media type is RJ45
  output flow-control is off, input flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:01, output 00:00:35, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/375/0/0 (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
    1180 packets input, 109486 bytes, 0 no buffer
    Received 84 broadcasts (0 IP multicasts)
    0 runts, 0 giants, 0 throttles
<output omitted>
```

Configure Verification Commands

- Display IPv4 statistics for router interfaces with the **show ip interface** command, as shown here:

```
R1# show ip interface g0/0/0
GigabitEthernet0/0/0 is up, line protocol is up
  Internet address is 192.168.10.1/24
  Broadcast address is 255.255.255.255
  Address determined by setup command
  MTU is 1500 bytes
  Helper address is not set
  Directed broadcast forwarding is disabled
  Outgoing Common access list is not set
  Outgoing access list is not set
  Inbound Common access list is not set
  Inbound access list is not set
  Proxy ARP is enabled
  Local Proxy ARP is disabled
  Security level is default
  Split horizon is enabled
  ICMP redirects are always sent
  ICMP unreachables are always sent
  ICMP mask replies are never sent
  IP fast switching is enabled
  IP Flow switching is disabled
<output omitted>
```

Configure Verification Commands

- Display IPv6 statistics for router interfaces with the **show ipv6 interface** command shown here:

```
R1# show ipv6 interface g0/0/0
GigabitEthernet0/0/0 is up, line protocol is up
  IPv6 is enabled, link-local address is FE80::868A:8DFF:FE44:49B0
  No Virtual link-local address(es):
  Description: Link to LAN
  Global unicast address(es):
    2001:DB8:ACAD:10::1, subnet is 2001:DB8:ACAD:10::/64
  Joined group address(es):
    FF02::1
    FF02::1:FF00:1
    FF02::1:FF44:49B0
  MTU is 1500 bytes
  ICMP error messages limited to one every 100 milliseconds
  ICMP redirects are enabled
  ICMP unreachable are sent
  ND DAD is enabled, number of DAD attempts: 1
  ND reachable time is 30000 milliseconds (using 30000)
  ND NS retransmit interval is 1000 milliseconds
```

```
R1#
```

Configure Verification Commands

- Display the path taken to a destination with the **tracert** (PC) or **tracert** (router) commands:

```
PC> tracert 10.1.1.200
```

```
Tracing route to 10.1.1.200 over a maximum of 30 hops:
```

1	1 ms	0 ms	0 ms	192.168.10.1
2	2 ms	1 ms	1 ms	209.165.200.226
3	2 ms	3 ms	2 ms	10.1.1.1
4	3 ms	3 ms	3 ms	10.1.1.200

```
Trace complete.
```

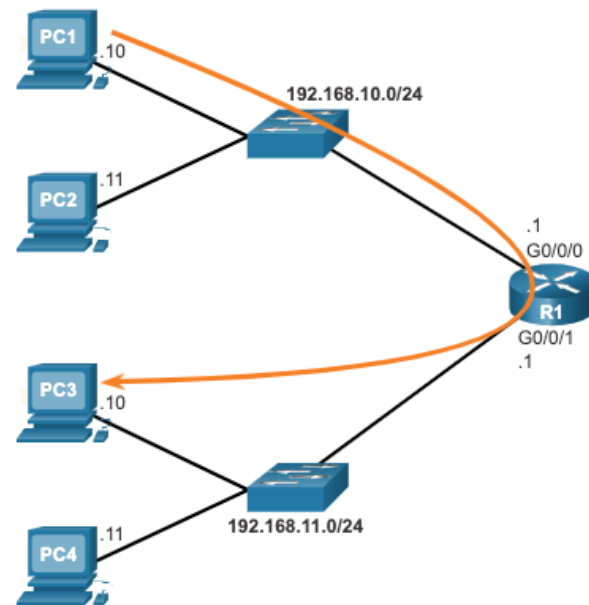


10.3 CONFIGURE THE DEFAULT GATEWAY



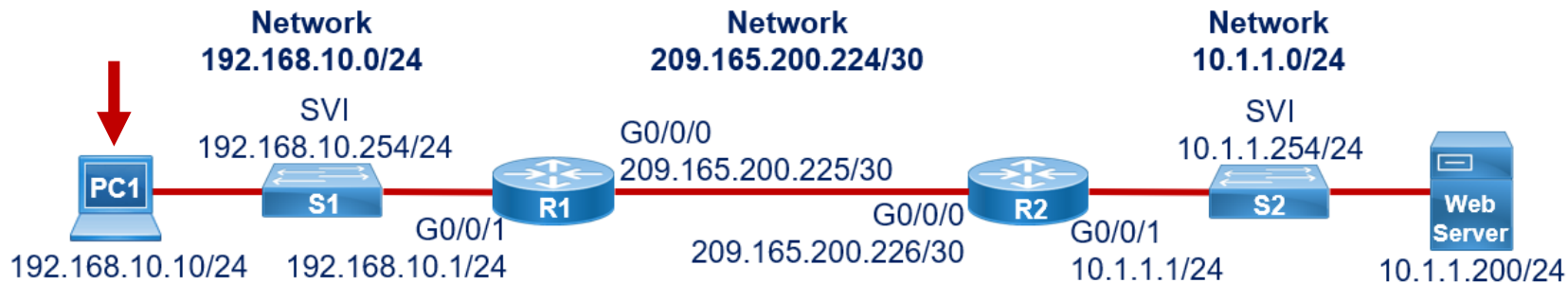
Default Gateway on a Host

- The default gateway is used when a host sends a packet to a device on another network.
- The default gateway address is generally the router interface address attached to the local network of the host.
- The IP address of the host and the router interface must be in the same network.
- The default gateway is the egress point out of your network and to the internet.

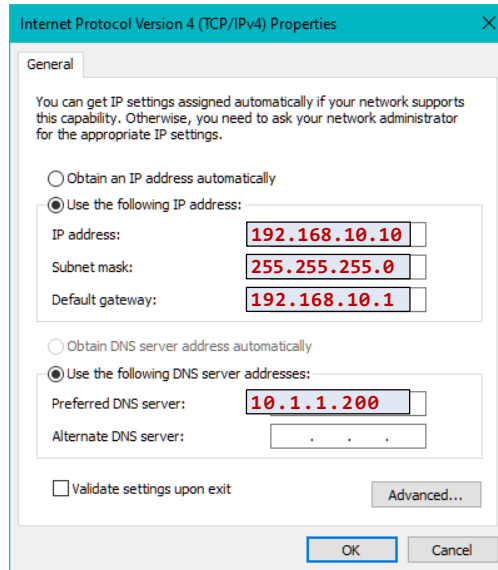


- To reach PC3, PC1 addresses a packet with the IPv4 address of PC3, but forwards the packet to its default gateway, the G0/0/0 interface of R1.

Configuring the Host



- A computer **MUST** have an **IP address**, a **subnet mask**, and a **default gateway** address to communicate on the network.
- A default gateway is required for remote network communication and management.
- DNS server (optional) is usually configured. For this example, use the IP address of the Web Server.



Default Gateway on a Switch

- A switch must have a default gateway address configured to remotely manage the switch from another network.
- To configure an IPv4 default gateway on a switch, use the **ip default-gateway *ip-address*** global configuration command.

Basic Switch Configuration Steps



```

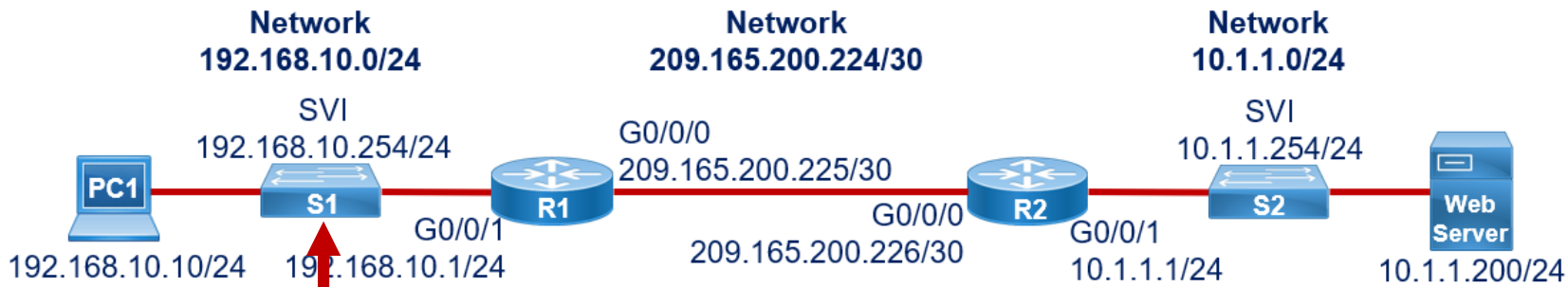
Router> enable
Router# configure terminal
Enter configuration commands, one per line. End with
CNTL/Z.
Router(config)# hostname S1
R1(config)# no ip domain-lookup
R1(config)# banner motd #WARNING: Unauthorized access
is prohibited!#
R1(config)# enable secret class
R1(config)# line console 0
R1(config-line)# password cisco
R1(config-line)# login
R1(config-line)# logging synchronous
R1(config-line)# exec-timeout 0 0
R1(config)# line vty 0 15
R1(config-line)# password cisco
    
```

- Cisco routers and switches have many similarities in regards to their configuration:
 - Support a similar operating system
 - Support similar command structure
 - Support many of the same commands
 - They also have identical initial configuration steps when implemented in a network
- The commands on the left display a sample configuration of a switch.

```

R1(config-line)# login
R1(config-line)# logging synchronous
R1(config-line)# exec-timeout 0 0
R1(config-line)# exit
R1(config)# service password-encryption
    
```

SVI and Default Gateway on a Switch



```

Router(config)# interface vlan 1
R1(config-if)# ip address 192.168.10.254 255.255.255.0
R1(config-if)# ipv6 address 2001:DB8:ACAD:10::254/64
R1(config-if)# ipv6 address FE80::2 link-local
R1(config-if)# exit
R1(config)# ip default-gateway 192.168.10.1
R1(config)# end
R1# copy run start
  
```

Interface/Device	IPv6 Address	Link-Local Address
R1 – G0/0/0	2001:DB8:ACAD:200::1/64	FE80::1
R1 – G0/0/1	2001:DB8:ACAD:10::1/64	FE80::1
S1 – SVI	2001:DB8:ACAD:10::254/64	FE80::2
PC1	2001:DB8:ACAD:10::10/64	---
R2 – G0/0/0	2001:DB8:ACAD:200::2/64	FE80::3
R2 – G0/0/1	2001:DB8:ACAD:1::1/64	FE80::3
S2 – SVI	2001:DB8:ACAD:1::254/64	FE80::4
Web Server	2001:DB8:ACAD:1::200/64	---

Verify Interface Configuration



S1# **show ip interface brief**

Interface	IP-Address	OK?	Method	Status	Protocol
Vlan1	192.168.10.254	YES	manual	up	up
FastEthernet0/1	unassigned	YES	unset	up	up
FastEthernet0/2	unassigned	YES	unset	down	down
(parts omitted)					
GigabitEthernet0/1	unassigned	YES	unset	up	up

S1#

S1# **ping 10.1.1.200**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 209.165.200.226, timeout is 2 seconds:

!!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/9 ms

S1#

- After configuring an interface, or for troubleshooting purposes, there are several commands that can be used:
 - **show ip interface brief** – Provides you a summarized view of all interfaces to verify if they are activated and operational. Look for Status of “up” and Protocol of “up”.
 - **show interfaces** – Displays the IPv4 statistics for all interfaces on a router.
- Remember to save your configuration changes with the **copy running-config startup-config** command.

Things to Remember

- General:
 - If a switch is to be managed via its VTY lines, it needs a SVI and default gateway.
- IPv6:
 - IPv6 does not need a default gateway because it automatically uses the link-local address.
 - Note: **sdm prefer dual-ipv4-and-ipv6 default** command must be enable before ipv6 commands are accepted.



10.4 MODULE PRACTICE AND QUIZ



What did I learn in this module?

- The tasks that should be completed when configuring initial settings on a router:
 - Configure the device name
 - Secure privileged EXEC mode
 - Secure user EXEC mode
 - Secure remote Telnet / SSH access
 - Secure all passwords in the config file
 - Provide legal notification
 - Save the configuration

What did I learn in this module?

- For routers to be reachable, the router interfaces must be configured.
 - Using the `no shutdown` command activates the interface.
 - The interface must also be connected to another device, such as a switch or a router, for the physical layer to be active.
 - There are several commands that can be used to verify interface configuration including:
 - `show ip interface brief`
 - `show ipv6 interface brief`
 - `show ip route`
 - `show ipv6 route`
 - `show interfaces`
 - `show ip interface`
 - `show ipv6 interface`

What did I learn in this module?

- For an end device to reach other networks, a default gateway must be configured.
 - The IP address of the host device and the router interface address must be in the same network.
- A switch must have a default gateway address configured to remotely manage the switch from another network.
 - To configure an IPv4 default gateway on a switch, use the **ip default-gateway *ip-address*** global configuration command.

New Terms and Commands

- `show ip interface brief`
- `show ipv6 interface brief`
- `show ip route`
- `show ipv6 route`
- `show interfaces`
- `show ip interface`
- `show ipv6 interface`
- `ip default-gateway`
- `sdm prefer dual-ipv4-and-ipv6 default`
- `ipv6 host name ip-address`
- `ipv6 address ip-address network-prefix`
- `ipv6 address ip-address link-local`

