BASIC ROUTER CONFIGURATION

WHAT IS IT ABOUT?

This topic covers the essential steps to prepare and configure a router for use in a network. You'll learn how to assign names, secure access, configure IP addresses on interfaces, and test connections.

BASIC ROUTER CONFIGURATION STEPS

- Configure the device name.

- Secure privileged EXEC mode.

- Secure user EXEC mode.

- Secure remote Telnet / SSH access.

- Encrypt all plaintext passwords.

- Provide legal notification and save the configuration

```
Router(config)# hostname hostname
```

```
Router(config)# enable secret password
```

```
Router(config)# line console 0
Router(config-line)# password password
Router(config-line)# login
```

```
Router(config)# line vty 0 4
Router(config-line)# password password
Router(config-line)# login
Router(config-line)# transport input {ssh | telnet}
```

```
Router(config)# service password encryption
```

```
Router(config)# banner motd # message #
Router(config)# end
Router# copy running-config startup-config
```

BASIC ROUTER CONFIGURATION EXAMPLE

• Commands for basic router configuration on R1.

• Configuration is saved to NVRAM.

```
R1(config)# hostname R1
R1(config)# enable secret class
R1(config)# line console 0
R1(config-line)# password cisco
R1(config-line)# login
R1(config-line)# line vty 0 4
R1(config-line)# password cisco
R1(config-line)# login
R1(config-line)# transport input ssh telnet
R1(config-line)# exit
R1(config)# service password encryption
R1(config)# banner motd #
Enter TEXT message. End with a new line and the #
*******************************************
WARNING: Unauthorized access is prohibited!
*******************************************
R1(config)# exit
R1# copy running-config startup-config
```

STEP BY STEP EXPLANATION

Step 1: Change the Router Name

```
R1(config)# hostname R1
```

This sets the hostname of the router to "R1". It helps identify the router in the CLI (Command-Line Interface) prompt and network.

Step 2: Set Privileged EXEC Password

```
R1(config)# enable secret class
```

This creates a secure password (class) for entering privileged EXEC mode (also called "enable" mode). The password is encrypted by default.

STEP BY STEP EXPLANATION

Step 3: Set Console Password

```
R1(config)# line console 0
R1(config-line)# password cisco
R1(config-line)# login
```

This configures the console port (physical access):

- Password set to **cisco**

- **login** enables password checking

Anyone using the console will need this password.

STEP BY STEP EXPLANATION

Step 4: Set VTY (Remote Access) Password

```
R1(config-line)# line vty 0 4
R1(config-line)# password cisco
R1(config-line)# login
R1(config-line)# transport input ssh telnet
R1(config-line)# exit
```

This secures remote access via Telnet or SSH:

- Password is **cisco**
- **login** enables password check
- **transport input ssh telnet** allows both SSH and Telnet connections

STEP BY STEP EXPLANATION

Step 5: Encrypt All Passwords

```
R1(config)# service password encryption
```

This encrypts all plaintext passwords (like the console and VTY
passwords) so they don't appear in clear text in the config file.

Step 6: Add a Message of the Day (MOTD)

```
R1(config)# service password encryption
R1(config)# banner motd #
Enter TEXT message. End with a new line and the #
********************************************************
WARNING: Unauthorized access is prohibited!
********************************************************

R1(config)# exit
```

This displays a warning message every time someone connects to the router. Used for legal or
security notices.

STEP BY STEP EXPLANATION

Step 7: Exit Configuration Mode

```
R1(config)# exit
```

Leaves global configuration mode and returns to privileged EXEC mode.

Step 8: Save the Configuration

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

Saves the current configuration (in RAM) to startup config (in NVRAM), so it's not lost after a reboot.

CONFIGURE ROUTER INTERFACES

Configuring a router interface includes issuing the following commands:

```
Router(config)# interface type-and-number
Router(config-if)# description description-text
Router(config-if)# ip address ipv4-address subnet-mask
Router(config-if)# ipv6 address ipv6-address/prefix-length
Router(config-if)# no shutdown
```

• It is a good practice to use the **description** command to add information about the network connected to the interface.

• The **no shutdown** command activates the interface.

CONFIGURE ROUTER INTERFACES EXAMPLE

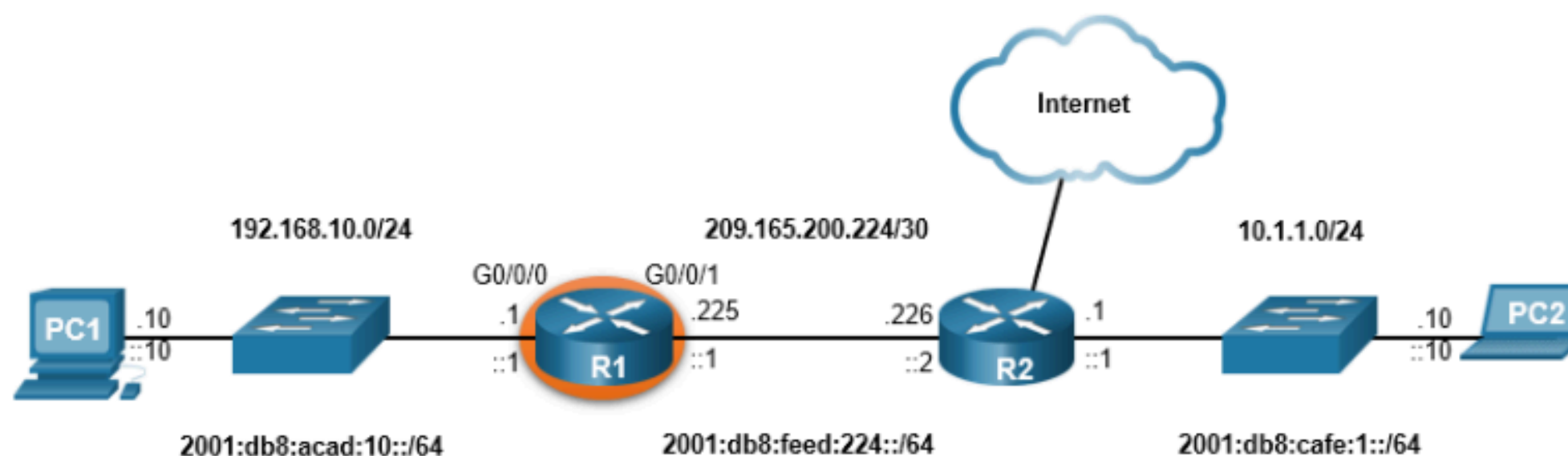The commands to configure interface G0/0/0 on R1 are shown here:
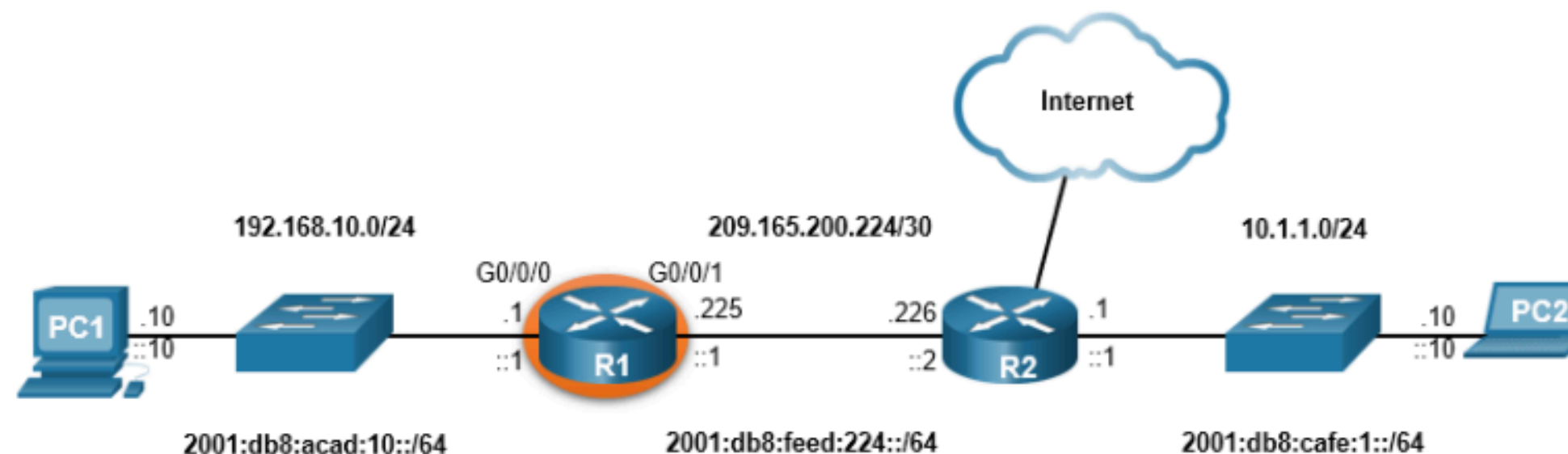

```
R1(config)# interface gigabitEthernet 0/0/0
R1(config-if)# description Link to LAN
R1(config-if)# ip address 192.168.10.1 255.255.255.0
R1(config-if)# ipv6 address 2001:db8:acad:10::1/64
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config)#
*Aug  1 01:43:53.435: %LINK-3-UPDOWN: Interface GigabitEthernet0/0/0, changed state to down
*Aug  1 01:43:56.447: %LINK-3-UPDOWN: Interface GigabitEthernet0/0/0, changed state to up
*Aug  1 01:43:57.447: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0,
changed state to up
```

CONFIGURE ROUTER INTERFACES EXAMPLE

The commands to configure interface G0/0/1 on R1 are shown here:


```
R1(config)# interface gigabitEthernet 0/0/1
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:feed:224::1/64
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config)#
*Aug  1 01:46:29.170: %LINK-3-UPDOWN: Interface GigabitEthernet0/0/1, changed state to down
*Aug  1 01:46:32.171: %LINK-3-UPDOWN: Interface GigabitEthernet0/0/1, changed state to up
*Aug  1 01:46:33.171: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1,
changed state to up
```

VERIFY INTERFACE CONFIGURATION

To verify interface configuration use 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                     up
GigabitEthernet0/0/1   209.165.200.225 YES manual up                     up
Vlan1                  unassigned      YES unset  administratively down down
```

```
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

The table summarizes show commands used to verify interface configuration.

Commands	Description
`show ip interface brief` `show ipv6 interface brief`	Displays all interfaces, their IP addresses, and their current status.
`show ip route` `show ipv6 route`	Displays the contents of the IP routing tables stored in RAM.
`show interfaces`	Displays statistics for all interfaces on the device. Only displays the IPv4 addressing information.
`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.

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                     up
GigabitEthernet0/0/1   209.165.200.225   YES manual up                     up
Vlan1                  unassigned        YES unset  administratively down   down
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>

R1#
```

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>

R1#
```

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 unreachables 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#
```

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.

- 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.
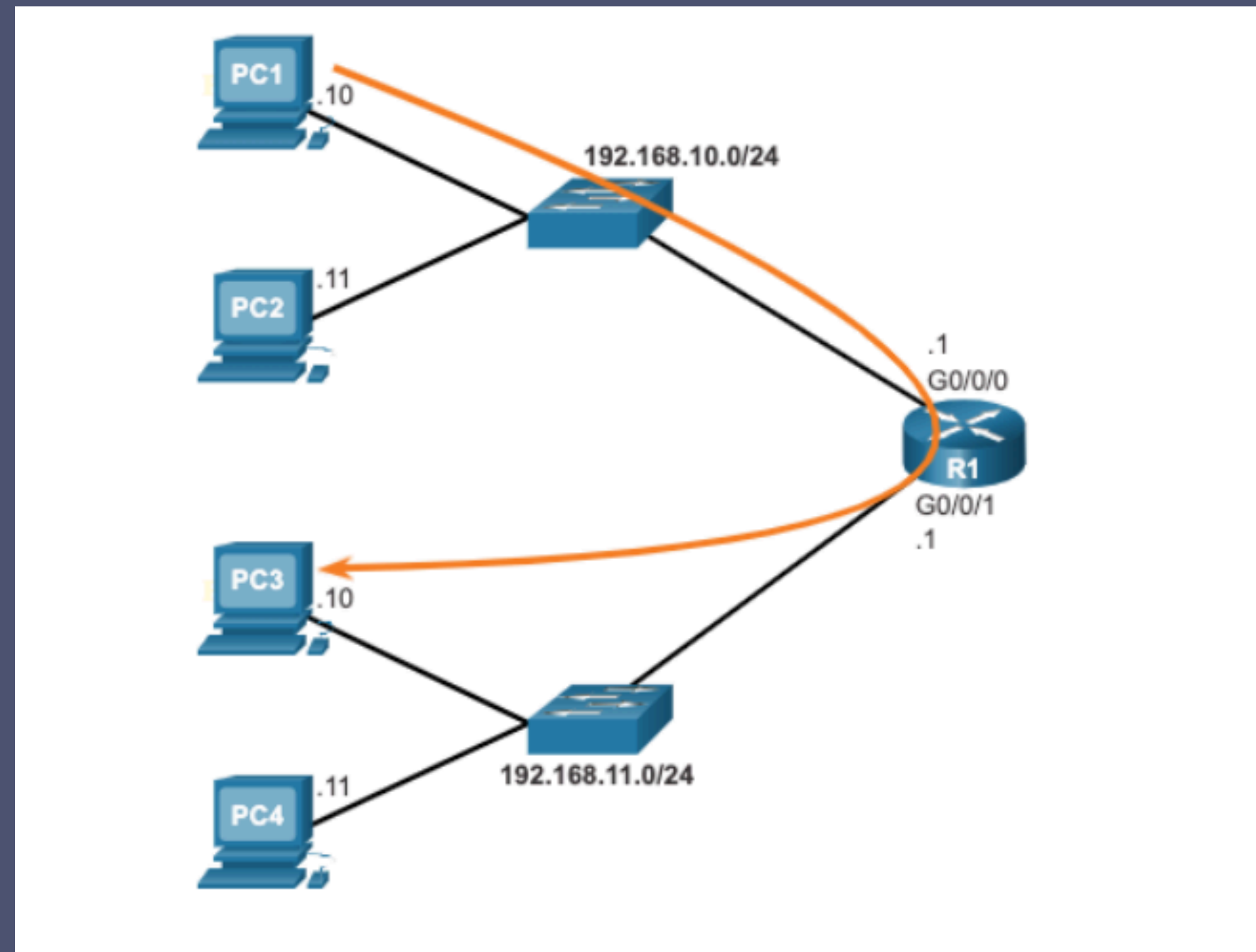
Note: The IP address of the host and the router interface must be in the same network.
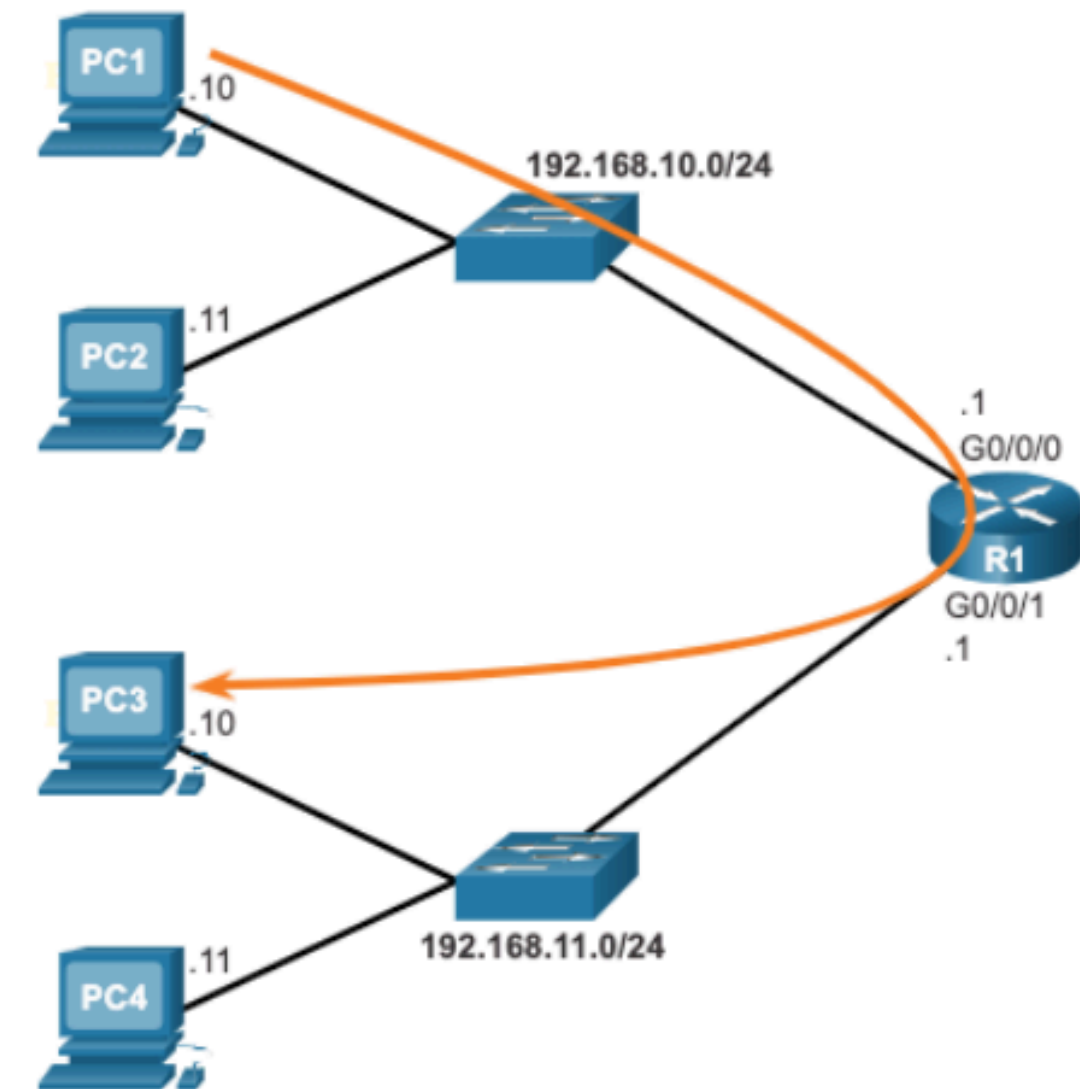
EXAMPLE SCENARIO

Setup:

- PC1 (192.168.10.10): A student computer in the Computer Lab
- PC3 (192.168.11.10): A file server located in the Principal's Office
- Router (R1): The school's main router connecting different departments
- Switches: Connect computers in each room

Scenario:

A student in the Computer Lab (using PC1) is working on a school project. They want to access a PDF file stored on the file server (PC3) in the Principal's Office.

Behind the Scenes:

1. The student clicks to open the PDF from the school's internal portal.
2. PC1 sees that the file is located on 192.168.11.10, which is outside its own network.
3. PC1 sends the request to its default gateway — the router's G0/0/0 interface (192.168.10.1).
4. The router (R1) checks the destination IP and sees that it's part of the 192.168.11.0/24 network, which is connected to G0/0/1.
5. R1 forwards the request through G0/0/1 to the file server (PC3).
6. PC3 responds by sending the file back the same way — through the router to PC1.
7. The student successfully accessed the file from a different network, thanks to the router forwarding packets between them.

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.