



Introduction to Networking

CTO43-3-1 Version VD1



A • P • U
ASIA PACIFIC UNIVERSITY
OF TECHNOLOGY & INNOVATION

Configure Network Operating System



Configure Network Operating System



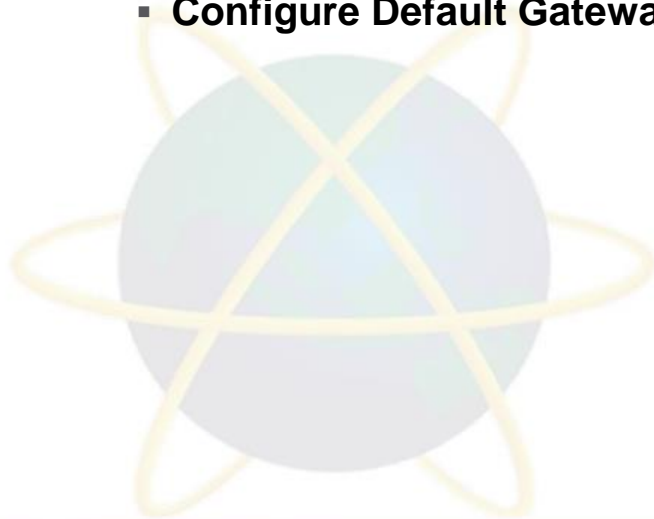
Topics and Structure of the lesson

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

Key Terms You Must Be Able To Use

If you have mastered this topic, **you should be able to use the following terms correctly in your exams:**

- Basic Router configuration steps
- Configure Interfaces
- Verify interface Configuration
- Configure Default Gateway



Configure Initial Router Settings

Configure Initial Router Settings

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
```

Configure Initial Router Settings

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
```

Configure Interfaces

Configure Router Interfaces

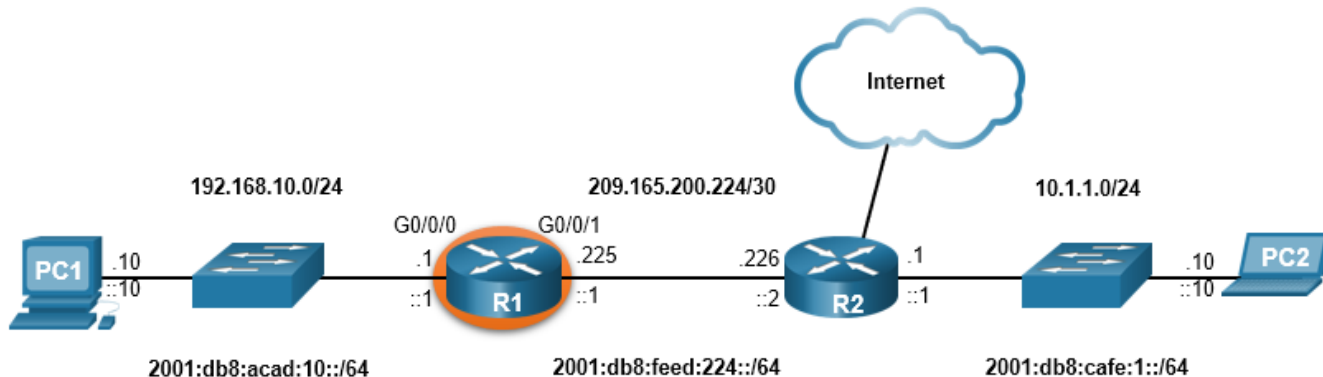
Configuring a router interface includes issuing the following commands:

```
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

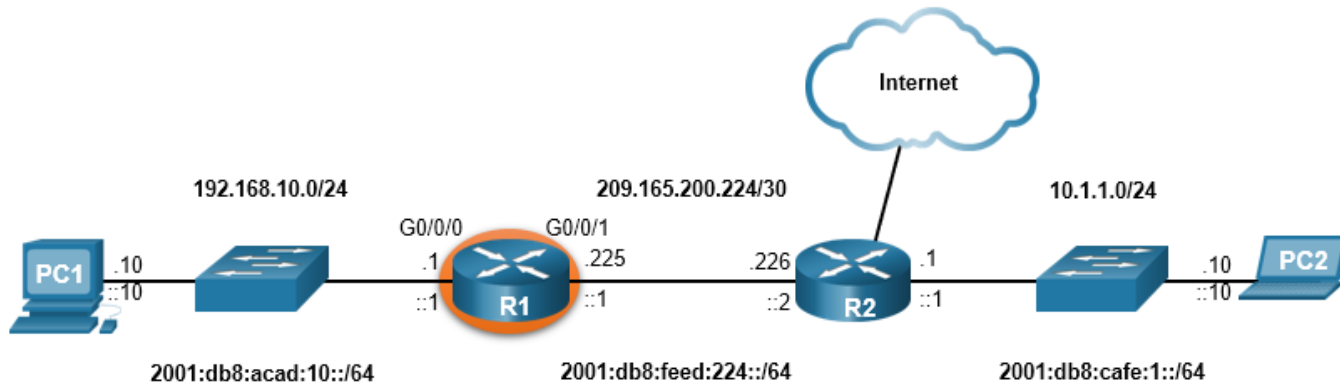
The commands to configure interface G0/0/0 on R1 are shown here:



```
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 (Cont.)

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
```

Configure Interfaces

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 Interfaces

Configure Verification Commands

The table summarizes show commands used to verify interface configuration.

Commands	Description
<code>show ip interface brief</code> <code>show ipv6 interface brief</code>	Displays all interfaces, their IP addresses, and their current status.
<code>show ip route</code> <code>show ipv6 route</code>	Displays the contents of the IP routing tables stored in RAM.
<code>show interfaces</code>	Displays statistics for all interfaces on the device. Only displays the IPv4 addressing information.
<code>show ip interface</code>	Displays the IPv4 statistics for all interfaces on a router.
<code>show ipv6 interface</code>	Displays the IPv6 statistics for all interfaces on a router.

Configure Verification Commands (Cont.)

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 (Cont.)

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 (Cont.)

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 (Cont.)

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 unreachable 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 (Cont.)

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

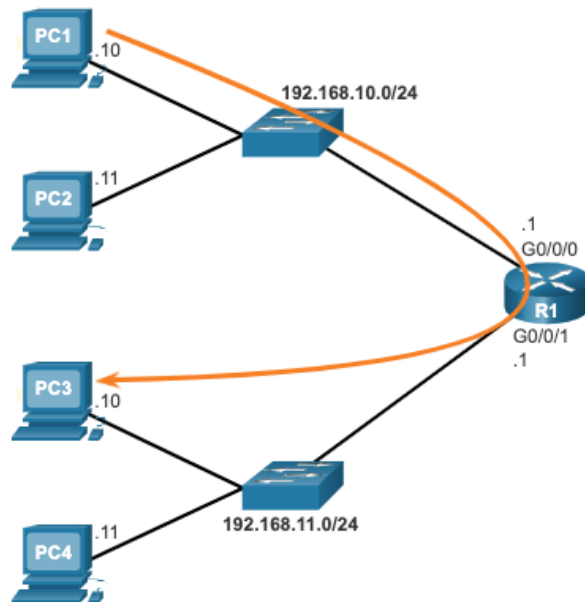
R1#
```

Configure the Default Gateway

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.
- 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.



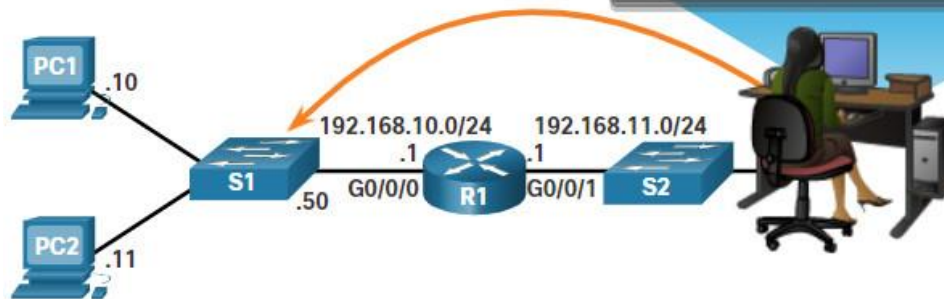
Note: The IP address of the host and the router interface must be in the same network.

Configure the Default Gateway

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.

```
S1# show running-configuration
Building configuration...
!
<Output Omitted>
service password-encryption
!
hostname S1
!
Interface Vlan1
  ip address 192.168.10.50.255.255.255.0
!
<Output Omitted>
!
ip default-gateway 192.168.10.1
<Output Omitted>
```



Summary

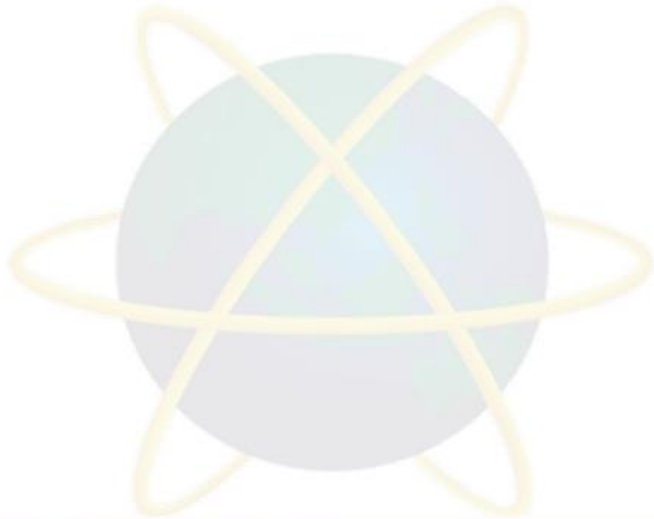
Summary of Main Teaching Points

- **Configure a Router with Basic Configurations.**
- **Configure Interface**
- **Verify Interface Configuration**
- **Configure verification commands**
- **Configure Default Gateways (Host & Switch)**



Question and Answer Session

Q & A



What We Will Cover Next:

Network

