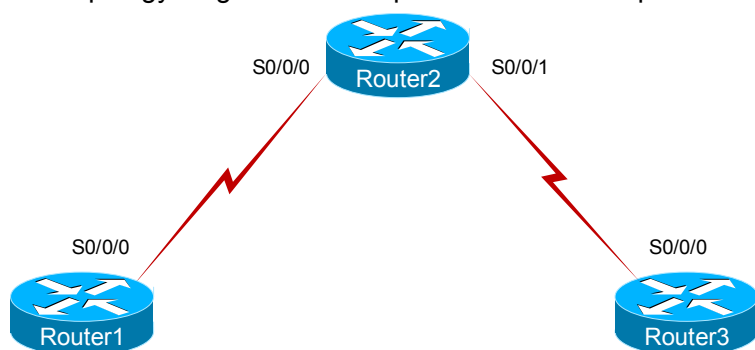# NetSim
NETWORK SIMULATOR®

Stand-Alone Lab: Configuring Router Interfaces

Objective

Configure the interfaces on a router, and learn what is required for the interface to be up. Configure all three routers with the appropriate settings.

Lab Topology

The topology diagram below represents the NetMap in the Simulator.

Command Summary

Command	Description
clock rate *clock-rate*	sets the clock rate for a Data Communications Equipment (DCE) interface
configure terminal	enters global configuration mode from privileged EXEC mode
description *description-text*	assigns a description to an interface, a class map, or a policy map
enable	enters privileged EXEC mode
end	ends and exits configuration mode
exit	exits one level in the menu structure
hostname *host-name*	sets the device name
interface *type number*	changes from global configuration mode to interface configuration mode
ip address *ip-address subnet-mask*	assigns an IP address to an interface
ip host *host-name ip-address*	configures a static host name-to-address mapping in the host cache of a device
no shutdown	enables an interface
ping *ip-address*	sends an Internet Control Message Protocol (ICMP) echo request to the specified address
show cdp neighbors	displays information about directly connected Cisco devices
show controllers [*type number*]	displays cable orientation for Serial interfaces
show interfaces [*type number*]	displays statistics for all interfaces configured on the router

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Command	Description
show ip interface	displays IP information for an interface
show ip interface brief	displays a brief summary of interface status and configuration
show running-config	displays the active configuration file

The IP addresses and subnet masks used in this lab are shown in the table below:

IP Addresses

Device	Interface	IP Address	Subnet Mask
Router1	Serial 0/0/0	10.1.1.1	255.255.255.0
Router2	Serial 0/0/0 Serial 0/0/1	10.1.1.2 172.16.10.2	255.255.255.0 255.255.255.0
Router3	Serial 0/0/0	172.16.10.1	255.255.255.0

Lab Tasks

Task 1: Enable Router Interfaces

1.   On Router1, enter global configuration mode and configure a host name of **Router1**.

2.   Enter interface configuration mode for the Serial 0/0/0 interface of Router1.

3.   Display all the commands available in interface configuration mode by typing ?.

4.   Issue the **no shutdown** command on Router1's Serial 0/0/0 interface to enable the interface. The **shutdown** command shuts down the selected interface. You can often achieve the opposite of a command by typing **no** in front of it. Why does the `Line protocol` state of the interface change to up and then down after you issue the **no shutdown** command? _____

5.   Add a description of **Serial 0/0/0 interface on Router1** for this interface.

6.   To view the interface description, return to privileged EXEC mode and issue the **show interfaces serial 0/0/0** command.

7.   Connect to Router2, and assign it a host name of **Router2**.

8.   On Router2, access the Serial 0/0/0 interface, enable the interface, and add the following description to the interface:

     Serial 0/0/0 interface on Router2

9. On Router2, why does the Serial 0/0/0 interface's `Line protocol` state change to `up` and then `down`, even though the connecting interface on Router1 is enabled? _____

    _____

10. On Router2, access the Serial 0/0/1 interface, enable the interface, and add the following description to the interface:

    Serial 0/0/1 interface on Router2

11. Verify that Router2's Serial 0/0/0 interface is the DCE end of the connection to Router1 and that Router2's Serial 0/0/1 interface is the DCE end for the connection to Router3.

12. Configure a clock rate of 1000 kilobits per second (Kbps) on Router2's Serial 0/0/0 interface and Serial 0/0/1 interface.

13. Connect to Router3, and assign it a host name of **Router3**.

14. On Router3, access the Serial 0/0/0 interface, enable the interface, and add the following description:

    Serial 0/0/0 interface on Router3

15. Now that the interfaces on both sides of the serial interfaces of Router2 are enabled, Router2 should be able to see Router1 and Router3 through CDP. On Router2, view all directly connected Cisco routers.

Task 2: Configure IP Addresses

Configure the routers with IP addresses, and ping between them to test connectivity.

1. On Router1, enter global configuration mode.

2. On Router1, enter interface configuration mode for the Serial 0/0/0 interface.

3. On Router1, configure the appropriate IP address on Router1's Serial 0/0/0 interface; refer to the IP Addresses table.

4. On Router2, enter global configuration mode.

5. On Router2, from the appropriate interface configuration mode, configure the appropriate IP addresses on the Serial interfaces; refer to the IP Addresses table.

6. On Router3, configure the appropriate IP address on the Serial 0/0/0 interface; refer to the IP Addresses table.

7. From Router2, try to ping Router1 and Router3. The pings should be successful.

8. On Router2, verify that the lines and protocols are up for all the interfaces.

9. On Router2, display the running configuration and verify the IP addresses you configured.

10. On Router2, display detailed IP information about each interface.

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Lab Solutions

Task 1: Enable Router Interfaces

1. On Router1, issue the following commands to enter global configuration mode and configure a host name of **Router1**:

    ```
    Router>enable
    Router#configure terminal
    Router(config)#hostname Router1
    ```

2. On Router1, issue the following command to enter interface configuration mode for the Serial 0/0/0 interface:

    ```
    Router1(config)#interface serial 0/0/0
    ```

3. Display all the commands available in interface configuration mode by typing **?**.

    ```
    Router1(config-if)#?
    auto                 Configure Automation
    backup               Modify backup parameters
    bandwidth            Set bandwidth informational parameter
    cdp                  CDP interface subcommands
    clock                Configure serial interface clock
    compress             Set serial interface for compression
    crypto               Encryption/Decryption commands
    custom-queue-list    Assign a custom queue list to an interface
    <output omitted>
    ```

4. On Router1, issue the following command to enable the Serial 0/0/0 interface:

    ```
    Router1(config-if)#no shutdown
    ```

    For the `Status` and `Protocol` state of an interface to remain up after you issue the no shutdown command, the interfaces on both ends of the link between two devices must be enabled and able to communicate. In this case, the Serial 0/0/0 interface of Router2 has not yet been enabled.

5. Issue the following command to configure the appropriate description for this interface:

    ```
    Router1(config-if)#description Serial 0/0/0 interface on Router1
    ```

6. To view the interface description, return to privileged EXEC mode and issue the **show interfaces serial 0/0/0** command. You should see the description under Serial 0/0/0:

```
Router1(config-if)#end
Router1#show interfaces serial 0/0/0
Serial0/0/0 is down, line protocol is down
  Hardware is HD64570
  Description: Serial 0/0/0 interface on Router1
  MTU 1500 bytes, BW 1544 Kbit, DLY 2000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input 00:00:00, output 00:00:00, output hang never
  Last clearing of show interface counters never
  Queuing strategy: weighted-fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
    Conversations 7/35/128 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
    Available Bandwidth 1158 kilobits/sec
  5 minute input rate 1000 bits/sec, 2 packets/sec
  5 minute output rate 1000 bits/sec, 2 packets/sec
     0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 input packets with dribble condition detected
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

7. On Router2, issue the following commands to assign it a host name of **Router2**:

```
Router>enable
Router#configure terminal
Router(config)#hostname Router2
```

8. On Router2, you should issue the following commands to enable the interface and to configure the appropriate description on the Serial 0/0/0 interface:

```
Router2(config)#interface serial 0/0/0
Router2(config-if)#no shutdown
Router2(config-if)#description Serial 0/0/0 interface on Router2
```

9. The `Line protocol` state of the Serial 0/0/0 interface on Router2 does not remain `up` after it is enabled because a clock rate has not been configured on the DCE end of the link between the Router1 and Router2.

10. On Router2, you should issue the following commands to configure the appropriate description on the Serial 0/0/1 interface:

```
Router2(config-if)#interface serial 0/0/1
Router2(config-if)#no shutdown
Router2(config-if)#description Serial 0/0/1 interface on Router2
```

11. You should issue the **show controllers** command on Router2 to verify that the Serial 0/0/0 interface is the DCE end of the connection to Router1 and that the Serial 0/0/1 interface is the DCE end of the connection to Router3. Sample output is shown below:

```
Router2(config-if)#end
Router2#show controllers
interface Serial0/0/0
HD unit 0, idb = 0x1AE828, driver structure at 0x1B4BA0
buffer size 1524  HD unit 0,V.35 DCE cable
cpb = 0x7, eda = 0x58DC, cda = 0x58F0
RX ring with 16 entries at 0x4075800
<output omitted>

interface Serial0/0/1
HD unit 0, idb = 0x1AE828, driver structure at 0x1B4BA0
buffer size 1524  HD unit 0,V.35 DCE cable
cpb = 0x7, eda = 0x58DC, cda = 0x58F0
RX ring with 16 entries at 0x4075800
<output omitted>
```

12. A clock rate must be configured on Router2 because it is the DCE end of the links to both Router1 and Router3. Issue the following commands to configure a clock rate of 1000 Kbps on both the Serial 0/0/0 and the Serial 0/0/1 interfaces of Router2:

```
Router2#configure terminal
Router2(config)#interface serial 0/0/0
Router2(config-if)#clock rate 1000000
Router2(config-if)#interface serial 0/0/1
Router2(config-if)#clock rate 1000000
```

13. On Router3, issue the following commands to assign it a host name of **Router3**:

```
Router>enable
Router#configure terminal
Router(config)#hostname Router3
```

14. On Router3, issue the following commands to access the Serial 0/0/0 interface, to enable the interface, and to add the appropriate description:

```
Router3(config)#interface serial 0/0/0
Router3(config-if)#no shutdown
Router3(config-if)#description Serial 0/0/0 interface on Router3
```

15. Now that the interfaces on both sides of the serial interfaces of Router2 are enabled, Router2 should be able to see Router1 and Router3 through CDP. Issue the **show cdp neighbors** command on Router2 to view all directly connected Cisco routers. Sample output is shown below:

```
Router2(config-if)#end
Router2#show cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
S -Switch, H - Host, i - IGMP, r - Repeater
Device ID     Local Intrfce     Holdtme     Capability   Platform   Port ID
Router1          Ser0/0/0         174            R          2811     Ser 0/0/0
Router3          Ser0/0/1         174            R          2811     Ser 0/0/0
```

Task 2: Configure IP Addresses

1. On Router1, issue the following command to enter global configuration mode:

```
Router1#configure terminal
```

2. On Router1, issue the following command to enter interface configuration mode for the Serial 0/0/0 interface:

```
Router1(config)#interface serial 0/0/0
```

3. On Router1, issue the following command to configure the appropriate IP address on Router1's Serial 0/0/0 interface:

```
Router1(config-if)#ip address 10.1.1.1 255.255.255.0
```

4. On Router2, issue the following command to enter global configuration mode:

```
Router2#configure terminal
```

5. On Router2, issue the following commands to configure the appropriate IP addresses on the Serial interfaces:

```
Router2(config)#interface serial 0/0/0
Router2(config-if)#ip address 10.1.1.2 255.255.255.0
Router2(config-if)#interface serial 0/0/1
Router2(config-if)#ip address 172.16.10.2 255.255.255.0
```

6. On Router3, configure the appropriate IP address on the Serial 0/0/0 interface; refer to the IP Addresses table.

```
Router3(config-if)#interface serial 0/0/0
Router3(config-if)#ip address 172.16.10.1 255.255.255.0
```

7. From Router2, try to ping Router1 and Router3. The pings should be successful.

```
Router2(config-if)#end
Router2#ping 10.1.1.1
Router2#ping 172.16.10.1
```

8. On Router2, issue the **show ip interface brief** command to verify that the lines and protocols are up for all the interfaces. Sample output is shown below:

```
Router2#show ip interface brief
Interface        IP-Address     OK? Method Status                  Protocol
Serial0/0/0      10.1.1.2       YES unset  up                      up
Serial0/0/1      172.16.10.2    YES unset  up                      up
FastEthernet0/0  unassigned     YES unset  administratively down   down
FastEthernet0/1  unassigned     YES unset  administratively down   down
```

9. On Router2, issue the **show running-config** command to display the running configuration and to verify that the IP addresses appear. Sample output is shown below:

```
Router2#show running-config
Building configuration...
Current configuration: 822 bytes
!
Version 12.3
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Router2
<output omitted
interface Serial0/0/0
 description Serial 0/0/0 interface on Router2
 ip address 10.1.1.2 255.255.255.0
 no ip directed-broadcast
 clock rate 1000000
!
interface Serial0/0/1
 description Serial 0/0/1 interface on Router2
 ip address 172.16.10.2 255.255.255.0
 no ip directed-broadcast
 clock rate 1000000
!
interface FastEthernet0/0
 no ip address
 no ip directed-broadcast
 shutdown
!
interface FastEthernet0/1
 no ip address
 no ip directed-broadcast
 shutdown
<output omitted>
```

10. On Router2, issue the **show ip interface** command to display detailed IP information about each interface. Sample output is shown below:

```
Router2#show ip interface
Serial0/0/0 is up, line protocol is up
  Internet address is 10.1.1.2/24
  Broadcast address is 255.255.255.255
  MTU 1500 bytes,
  Helper address is not set
  Directed broadcast forwarding is disabled
  Outgoing access list is not set
  Inbound  access list is not set
  Proxy ARP Is Enabled
  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 fast switching on the same interface is enabled
  IP Null turbo vector
  IP multicast fast switching is enabled
  IP multicast distributed fast switching is disabled
  router Discovery Is disabled
  IP output packet accounting is disabled
  IP access violation accounting is disabled
  TCP/IP header compression is disabled
<output omitted>
```

Sample Configuration Script

Router2

```
Router2#show running-config
Building configuration...
!
Version 12.3
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Router2
!
ip subnet-zero
!
ip cef
no ip domain-lookup
!
interface Serial0/0/0
 description Serial 0/0/0 interface on Router2
 ip address 10.1.1.2 255.255.255.0
 no ip directed-broadcast
 clock rate 1000000
!
interface Serial0/0/1
 description Serial 0/0/1 interface on Router2
 ip address 172.16.10.2 255.255.255.0
 no ip directed-broadcast
 clock rate 1000000
!
interface FastEthernet0/0
 no ip address
 no ip directed-broadcast
 shutdown
!
interface FastEthernet0/1
 no ip address
 no ip directed-broadcast
 shutdown
!
ip classless
no ip http server
!
line con 0
line aux 0
line vty 0 4
!
no scheduler allocate
end
```