

# Configuring a Layer 3 Network with Dynamic Routing Protocols

Fundamentals of Communications and Networking, Third Edition - Lab 05

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Time on Task:

1 hour, 45 minutes

Progress:

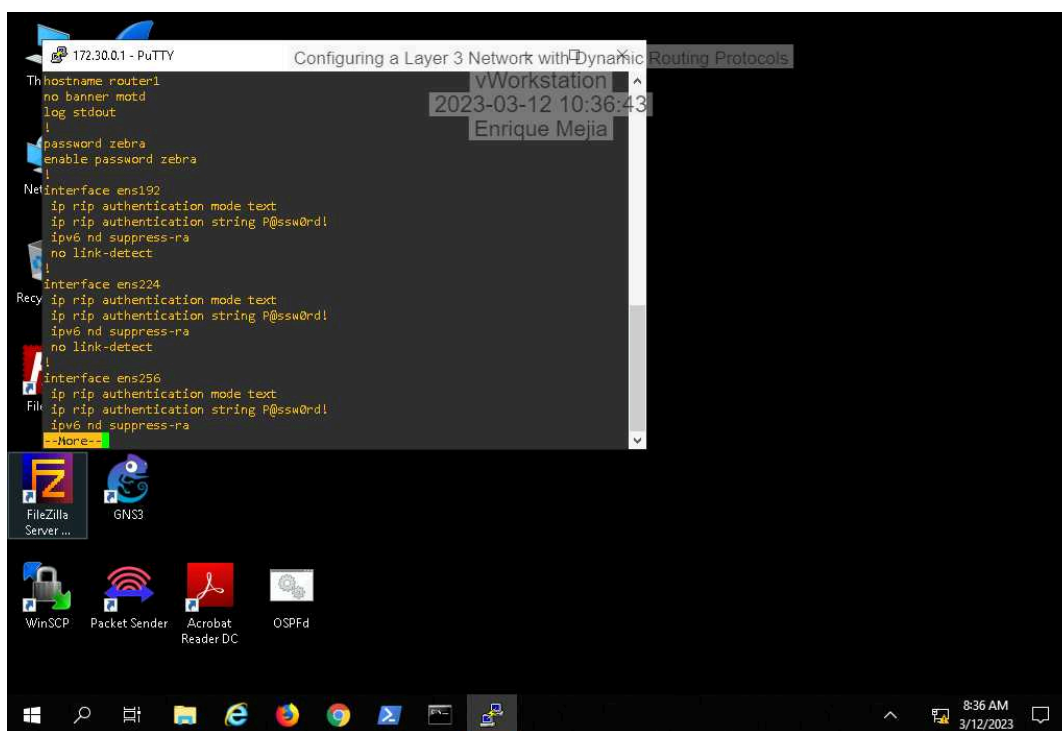
100%

Report Generated: Sunday, March 12, 2023 at 1:10 PM

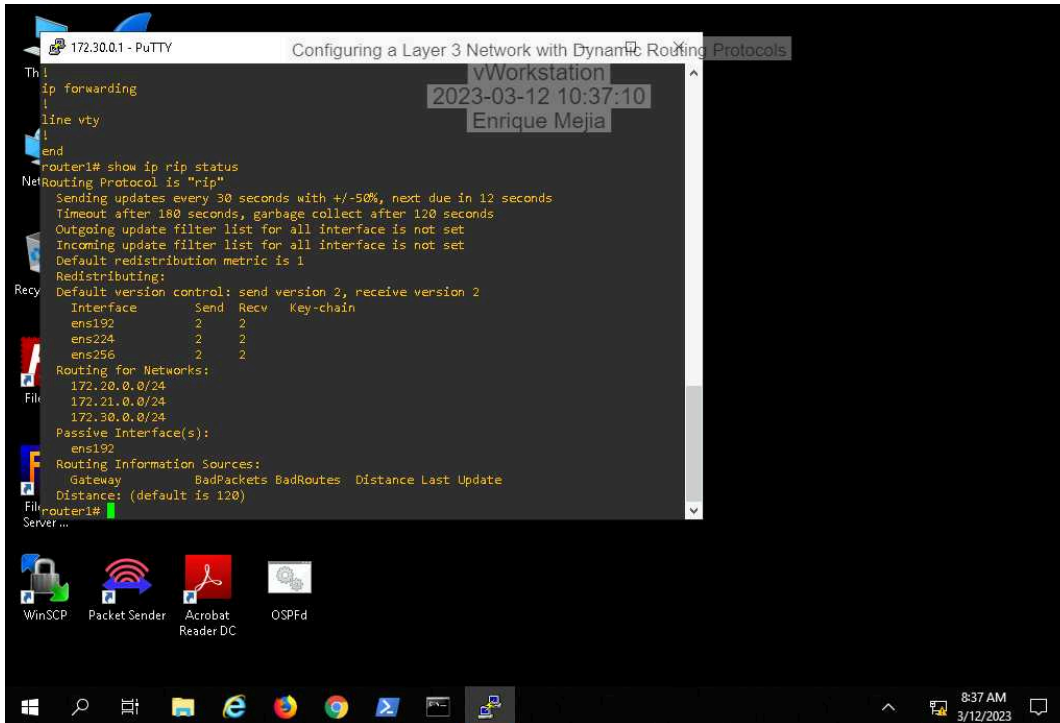
## Section 1: Hands-On Demonstration

### Part 1: Configure RIPv2 on the Routers

22. Make a screen capture showing the currently running RIP configuration on router1.



24. Make a screen capture showing the output of the show ip rip status command.

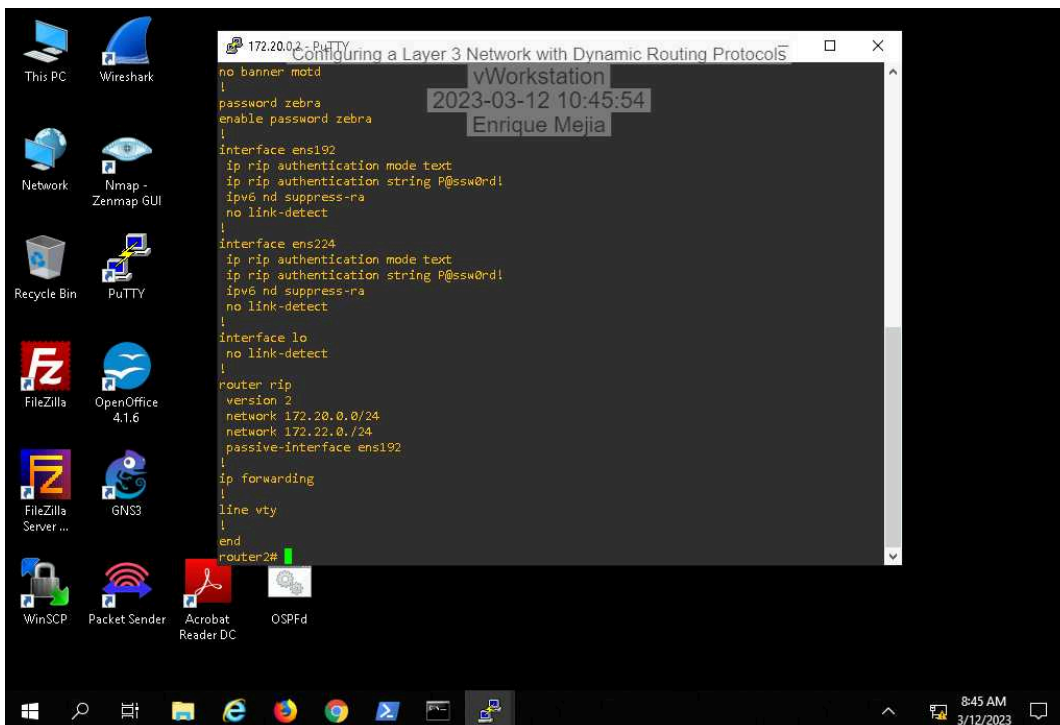


The screenshot shows a Windows desktop with a PuTTY terminal window titled "172.30.0.1 - PuTTY". The terminal displays the output of the "show ip rip status" command on router1. The output includes the following information:

```
router1# show ip rip status
NetRouting Protocol is "rip"
  Sending updates every 30 seconds with +/-50%, next due in 12 seconds
  Timeout after 180 seconds, garbage collect after 120 seconds
  Outgoing update filter list for all interface is not set
  Incoming update filter list for all interface is not set
  Default redistribution metric is 1
  Redistributing:
    Default version control: send version 2, receive version 2
  Interface          Send Recv  Key-chain
  ens192              2      2
  ens224              2      2
  ens256              2      2
  Routing for Networks:
    172.20.0.0/24
    172.21.0.0/24
    172.30.0.0/24
  Passive Interface(s):
    ens192
  Routing Information Sources:
    Gateway           BadPackets BadRoutes  Distance Last Update
  Distance: (default is 120)
router1#
```

The desktop background is dark, and the taskbar at the bottom shows various application icons including WinSCP, Packet Sender, Acrobat Reader DC, and OSPFd. The system clock in the bottom right corner indicates 8:37 AM on 3/12/2023.

30. Make a screen capture showing the currently running RIP configuration on router2.

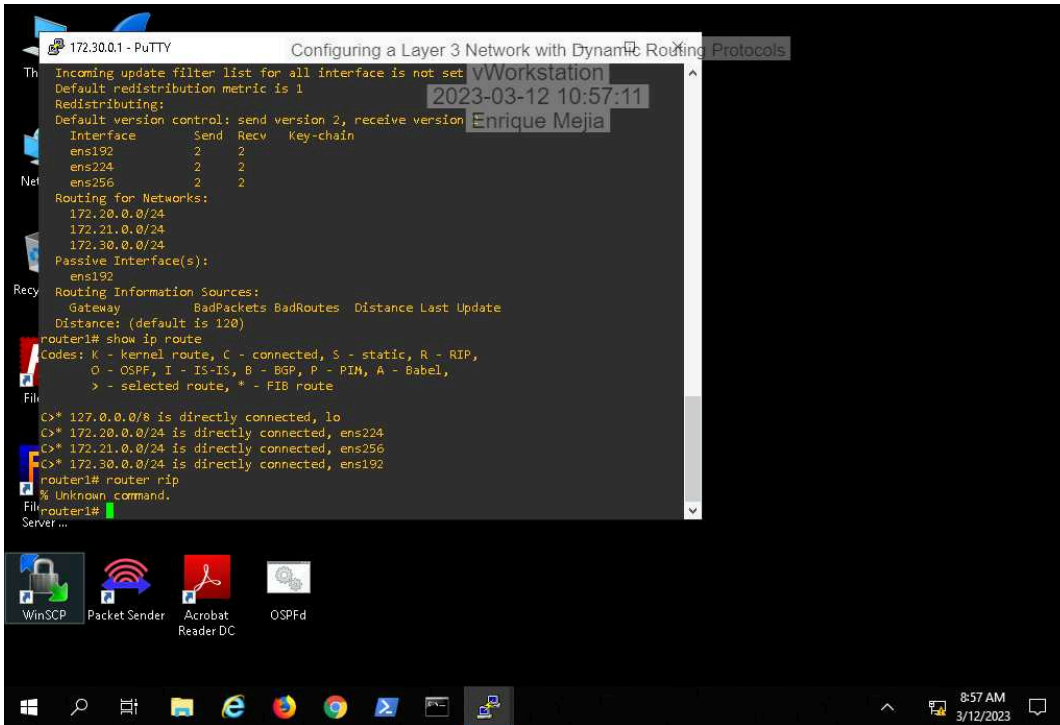


The screenshot shows a Windows desktop with a PuTTY terminal window titled "172.20.0.2 - PuTTY". The terminal displays the currently running RIP configuration on router2. The configuration includes the following commands:

```
no banner motd
!
password zebra
enable password zebra
!
interface ens192
 ip rip authentication mode text
 ip rip authentication string P@ssw0rd!
 ipv6 nd suppress-ra
 no link-detect
!
interface ens224
 ip rip authentication mode text
 ip rip authentication string P@ssw0rd!
 ipv6 nd suppress-ra
 no link-detect
!
interface lo
 no link-detect
!
router rip
 version 2
 network 172.20.0.0/24
 network 172.22.0.0/24
 passive-interface ens192
!
ip forwarding
!
line vty
!
end
router2#
```

The desktop background is dark, and the taskbar at the bottom shows various application icons including This PC, Wireshark, Network, Nmap, Zenmap GUI, Recycle Bin, PuTTY, FileZilla, OpenOffice 4.1.6, GNS3, FileZilla Server, WinSCP, Packet Sender, Acrobat Reader DC, and OSPFd. The system clock in the bottom right corner indicates 8:45 AM on 3/12/2023.

### 41. Make a screen capture showing the routes known by router3.



```
172.30.0.1 - PuTTY
Configuring a Layer 3 Network with Dynamic Routing Protocols
vWorkstation
2023-03-12 10:57:11
Enrique Mejia

Incoming update filter list for all interface is not set
Default redistribution metric is 1
Redistributing:
Default version control: send version 2, receive version
Interface      Send Recv  Key-chain
ens192         2      2
ens224         2      2
ens256         2      2

Routing for Networks:
172.20.0.0/24
172.21.0.0/24
172.30.0.0/24

Passive Interface(s):
ens192

Routing Information Sources:
Gateway        BadPackets BadRoutes  Distance Last Update
Distance: (default is 120)

router1# show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, P - PIN, A - Babel,
       > - selected route, * - FIB route

C>* 127.0.0.0/8 is directly connected, lo
C>* 172.20.0.0/24 is directly connected, ens224
C>* 172.21.0.0/24 is directly connected, ens256
C>* 172.30.0.0/24 is directly connected, ens192

router1# router rip
% Unknown command.
File router1#
Server ...
```

## Part 2: Test the RIPv2 Configuration

## Fundamentals of Communications and Networking, Third Edition - Lab 05

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- The screenshot shows a Windows desktop environment. A window titled "vWorkstation" is open, displaying a Windows Command Prompt window. The Command Prompt shows a series of ping commands to the IP address 172.30.0.1, all of which fail with the message "Destination net unreachable" and "Request timed out". The taskbar at the bottom of the screen shows several application icons, including WinSCP, Packet Sender, Acrobat Reader DC, and OSPFd. The system tray in the bottom right corner shows the date as 3/12/2023 and the time as 8:59 AM.

- 
- 172.30.0.1 - PuTTY Configuring a Layer 3 Network with Dynamic Routing Protocols
- ```

C>* 127.0.0.0/8 is directly connected, lo
C>* 172.20.0.0/24 is directly connected, ens224
C>* 172.21.0.0/24 is directly connected, ens256
C>* 172.30.0.0/24 is directly connected, ens192

router1# router rip
% Unknown command.

Netrouter1# show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, P - PIN, A - Babel,
       > - selected route, * - FIB route

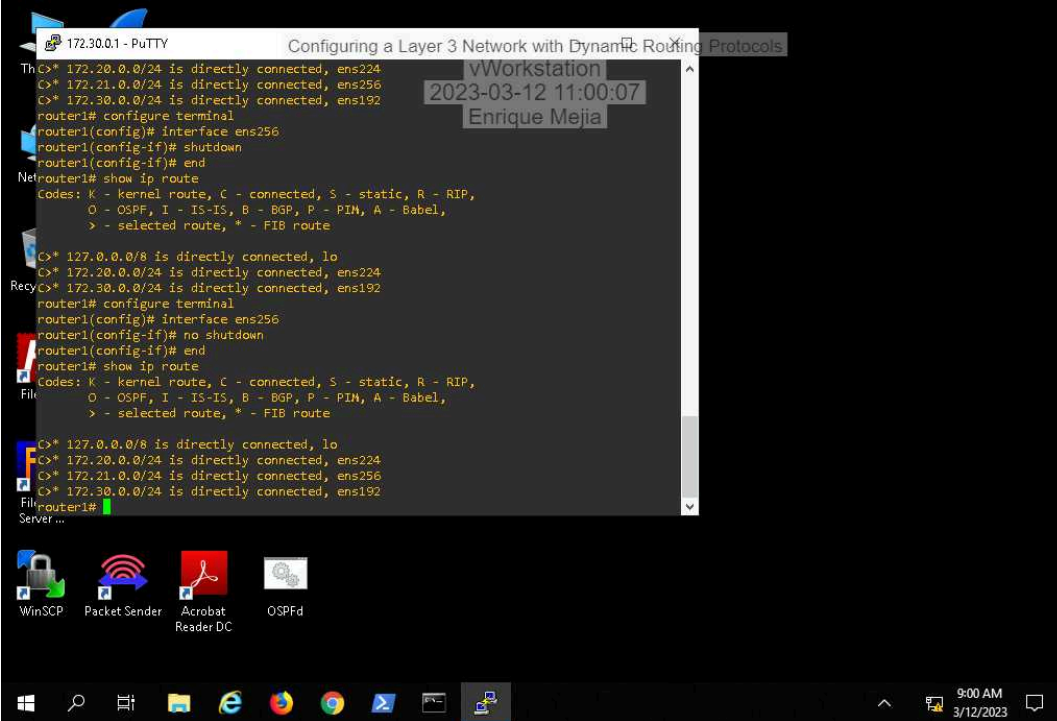
C>* 127.0.0.0/8 is directly connected, lo
C>* 172.20.0.0/24 is directly connected, ens224
RecyC>* 172.21.0.0/24 is directly connected, ens256
C>* 172.30.0.0/24 is directly connected, ens192

router1# configure terminal
router1(config)# interface ens256
router1(config-if)# shutdown
router1(config-if)# end
router1# show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, P - PIN, A - Babel,
       > - selected route, * - FIB route

F>* 127.0.0.0/8 is directly connected, lo
F>* 172.20.0.0/24 is directly connected, ens224
F>* 172.30.0.0/24 is directly connected, ens192

File>router1#
Server ...
  
```
- WinSCP Packet Sender Acrobat Reader DC OSPFd
- 8:59 AM 3/12/2023

### 26. Make a screen capture showing the updated routing table on router1.



The screenshot shows a PuTTY terminal window titled "172.30.0.1 - PuTTY" with a background image of a person. The terminal displays the following commands and output:

```
Th> C>* 172.20.0.0/24 is directly connected, ens224
C>* 172.21.0.0/24 is directly connected, ens256
C>* 172.30.0.0/24 is directly connected, ens192
router1# configure terminal
router1(config)# interface ens256
router1(config-if)# shutdown
router1(config-if)# end
Netrouter1# show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, P - PIN, A - Babel,
       > - selected route, * - FIB route

C>* 127.0.0.0/8 is directly connected, lo
C>* 172.20.0.0/24 is directly connected, ens224
Recy>* 172.30.0.0/24 is directly connected, ens192
router1# configure terminal
router1(config)# interface ens256
router1(config-if)# no shutdown
router1(config-if)# end
router1# show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP,
       O - OSPF, I - IS-IS, B - BGP, P - PIN, A - Babel,
       > - selected route, * - FIB route

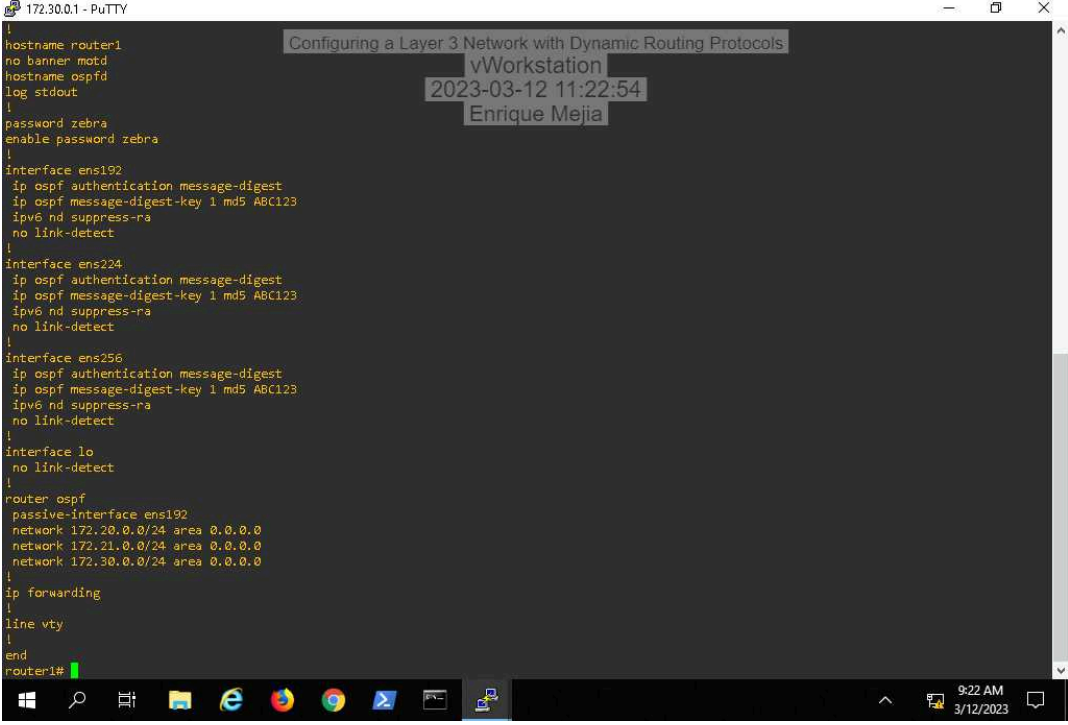
C>* 127.0.0.0/8 is directly connected, lo
C>* 172.20.0.0/24 is directly connected, ens224
C>* 172.21.0.0/24 is directly connected, ens256
C>* 172.30.0.0/24 is directly connected, ens192
File> router1#
```

The desktop background shows icons for WinSCP, Packet Sender, Acrobat Reader DC, and OSPFd. The taskbar at the bottom includes the Windows Start button, search, and task view icons, followed by application icons for File Explorer, Edge, Chrome, and others. The system clock in the bottom right corner shows 9:00 AM on 3/12/2023.

### Section 2: Applied Learning

#### Part 1: Configure OSPFv2 on the Routers

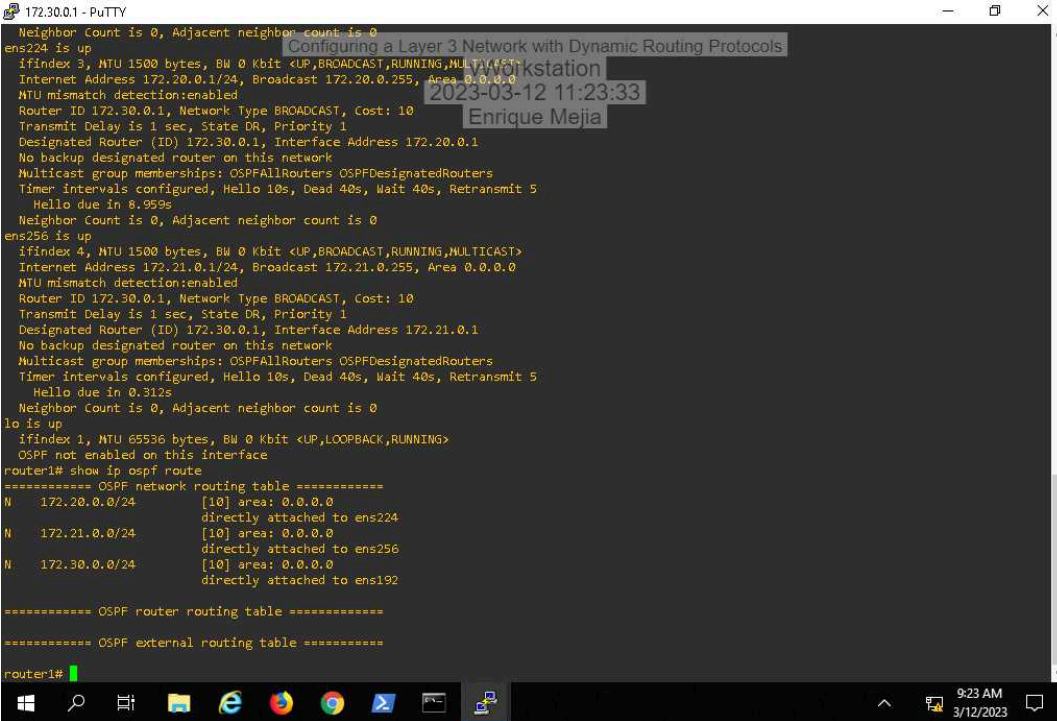
17. Make a screen capture showing the running OSPF configuration on router1.



```
172.30.0.1 - PuTTY
hostname router1
no banner motd
hostname ospfd
log stdout
!
password zebra
enable password zebra
!
interface ens192
 ip ospf authentication message-digest
 ip ospf message-digest-key 1 md5 ABC123
 ipv6 nd suppress-ra
 no link-detect
!
interface ens224
 ip ospf authentication message-digest
 ip ospf message-digest-key 1 md5 ABC123
 ipv6 nd suppress-ra
 no link-detect
!
interface ens256
 ip ospf authentication message-digest
 ip ospf message-digest-key 1 md5 ABC123
 ipv6 nd suppress-ra
 no link-detect
!
interface lo
 no link-detect
!
router ospf
 passive-interface ens192
 network 172.20.0.0/24 area 0.0.0.0
 network 172.21.0.0/24 area 0.0.0.0
 network 172.30.0.0/24 area 0.0.0.0
!
ip forwarding
!
line vty
!
end
router1#
```



### 20. Make a screen capture showing the current OSPF routing table on router1.



The screenshot shows a PuTTY terminal window titled "172.30.0.1 - PuTTY". The terminal displays the configuration of three interfaces (ens224, ens256, and lo) and the OSPF routing table. The OSPF network routing table shows three entries: 172.20.0.0/24, 172.21.0.0/24, and 172.30.0.0/24, all directly attached to their respective interfaces. The OSPF router routing table and OSPF external routing table are also shown, both being empty.

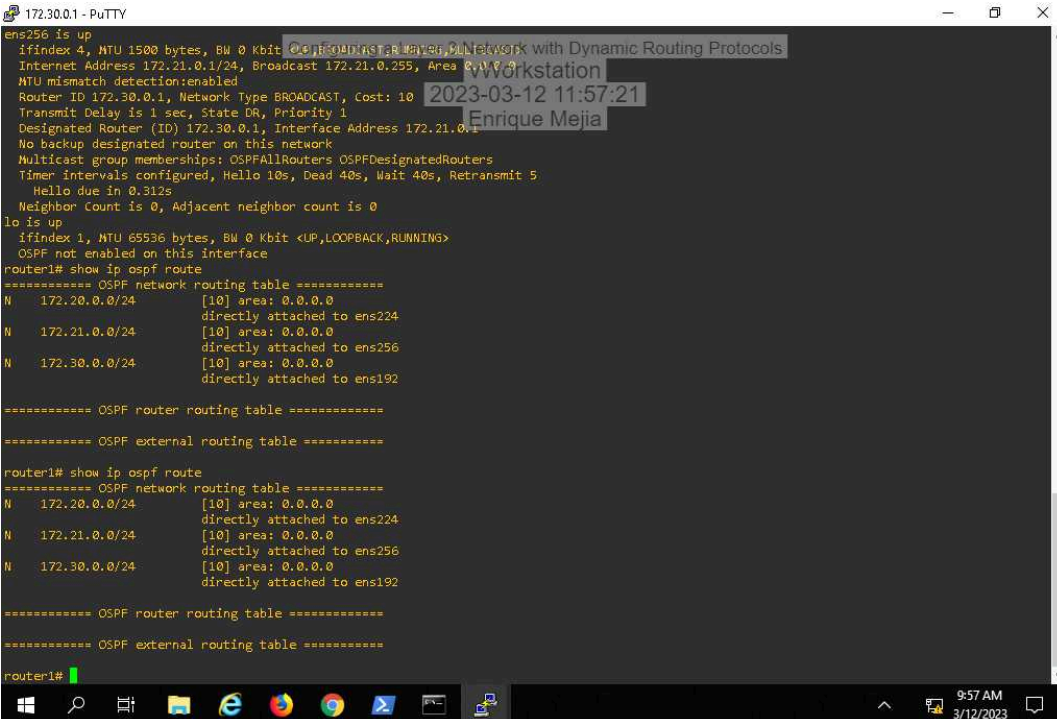
```
Neighbor Count is 0, Adjacent neighbor count is 0
ens224 is up
  ifindex 3, MTU 1500 bytes, BW 0 Kbit <UP,BROADCAST,RUNNING,MULTICAST>
  Internet Address 172.20.0.1/24, Broadcast 172.20.0.255, Area 0.0.0.0
  MTU mismatch detection:enabled
  Router ID 172.30.0.1, Network Type BROADCAST, Cost: 10
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 172.30.0.1, Interface Address 172.20.0.1
  No backup designated router on this network
  Multicast group memberships: OSPFAllRouters OSPFDesignatedRouters
  Timer intervals configured, Hello 10s, Dead 40s, Wait 40s, Retransmit 5
  Hello due in 8.959s
Neighbor Count is 0, Adjacent neighbor count is 0
ens256 is up
  ifindex 4, MTU 1500 bytes, BW 0 Kbit <UP,BROADCAST,RUNNING,MULTICAST>
  Internet Address 172.21.0.1/24, Broadcast 172.21.0.255, Area 0.0.0.0
  MTU mismatch detection:enabled
  Router ID 172.30.0.1, Network Type BROADCAST, Cost: 10
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 172.30.0.1, Interface Address 172.21.0.1
  No backup designated router on this network
  Multicast group memberships: OSPFAllRouters OSPFDesignatedRouters
  Timer intervals configured, Hello 10s, Dead 40s, Wait 40s, Retransmit 5
  Hello due in 0.312s
Neighbor Count is 0, Adjacent neighbor count is 0
lo is up
  ifindex 1, MTU 65536 bytes, BW 0 Kbit <UP,LOOPBACK,RUNNING>
  OSPF not enabled on this interface
router1# show ip ospf route
===== OSPF network routing table =====
N   172.20.0.0/24      [10] area: 0.0.0.0
    directly attached to ens224
N   172.21.0.0/24      [10] area: 0.0.0.0
    directly attached to ens256
N   172.30.0.0/24      [10] area: 0.0.0.0
    directly attached to ens192

===== OSPF router routing table =====

===== OSPF external routing table =====

router1#
```

### 26. Make a screen capture showing the updated OSPF routing table on router1.



The screenshot shows the same PuTTY terminal window as before, but with the OSPF routing table updated. The OSPF network routing table now shows three entries: 172.20.0.0/24, 172.21.0.0/24, and 172.30.0.0/24, all directly attached to their respective interfaces. The OSPF router routing table and OSPF external routing table are also shown, both being empty.

```
ens256 is up
  ifindex 4, MTU 1500 bytes, BW 0 Kbit <UP,BROADCAST,RUNNING,MULTICAST>
  Internet Address 172.21.0.1/24, Broadcast 172.21.0.255, Area 0.0.0.0
  MTU mismatch detection:enabled
  Router ID 172.30.0.1, Network Type BROADCAST, Cost: 10
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 172.30.0.1, Interface Address 172.21.0.1
  No backup designated router on this network
  Multicast group memberships: OSPFAllRouters OSPFDesignatedRouters
  Timer intervals configured, Hello 10s, Dead 40s, Wait 40s, Retransmit 5
  Hello due in 0.312s
Neighbor Count is 0, Adjacent neighbor count is 0
lo is up
  ifindex 1, MTU 65536 bytes, BW 0 Kbit <UP,LOOPBACK,RUNNING>
  OSPF not enabled on this interface
router1# show ip ospf route
===== OSPF network routing table =====
N   172.20.0.0/24      [10] area: 0.0.0.0
    directly attached to ens224
N   172.21.0.0/24      [10] area: 0.0.0.0
    directly attached to ens256
N   172.30.0.0/24      [10] area: 0.0.0.0
    directly attached to ens192

===== OSPF router routing table =====

===== OSPF external routing table =====

router1# show ip ospf route
===== OSPF network routing table =====
N   172.20.0.0/24      [10] area: 0.0.0.0
    directly attached to ens224
N   172.21.0.0/24      [10] area: 0.0.0.0
    directly attached to ens256
N   172.30.0.0/24      [10] area: 0.0.0.0
    directly attached to ens192

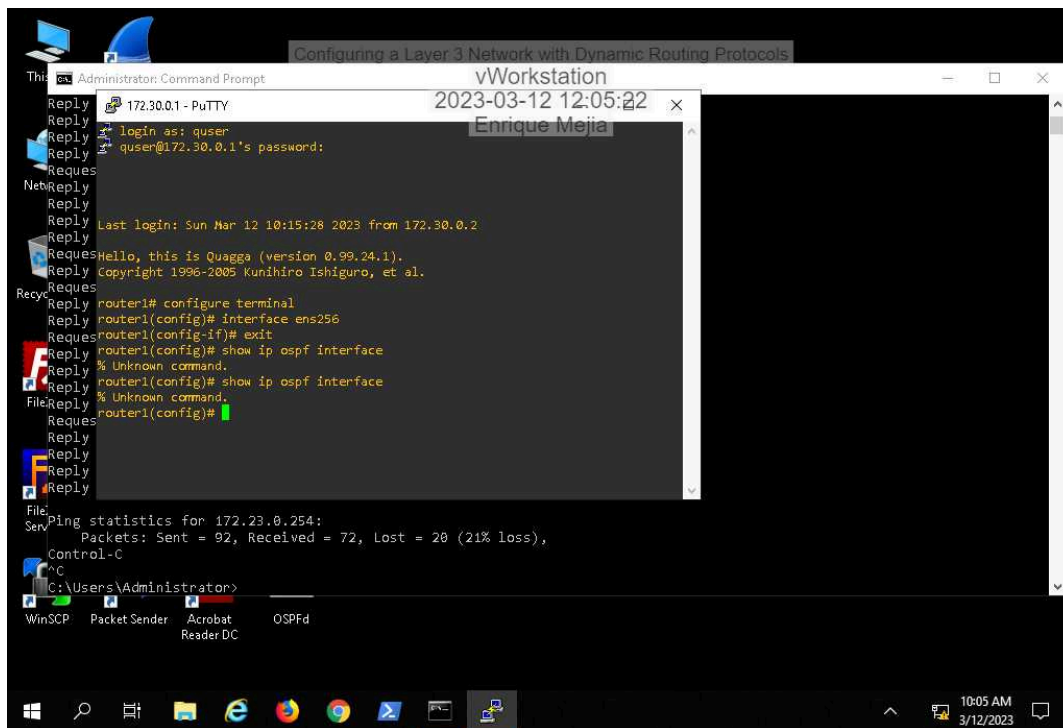
===== OSPF router routing table =====

===== OSPF external routing table =====

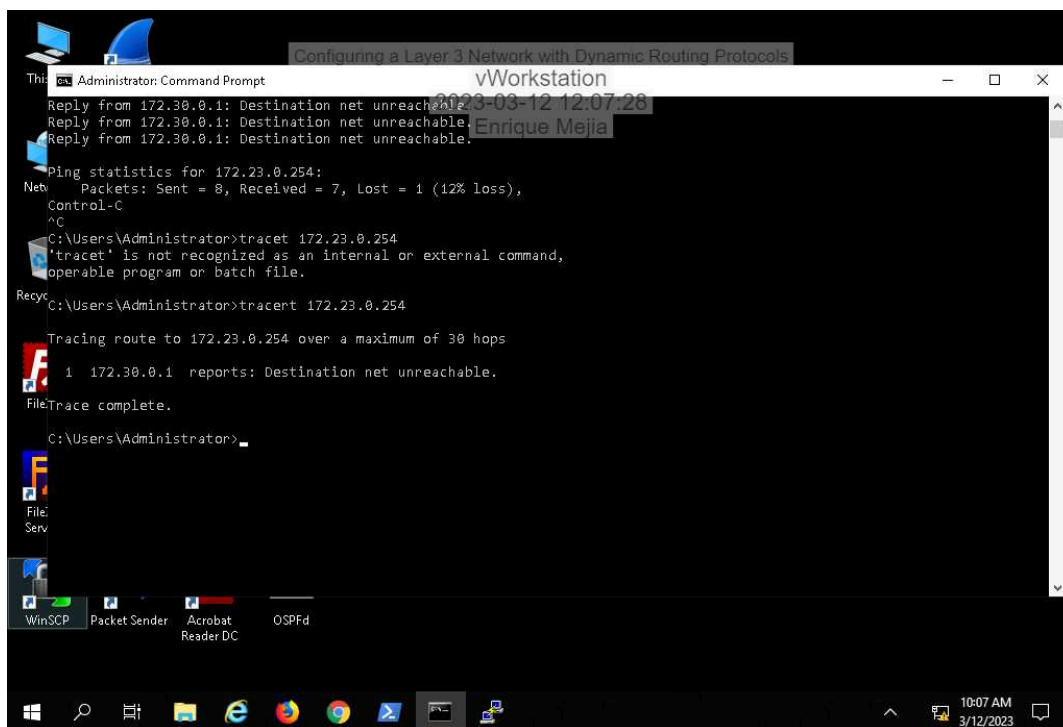
router1#
```

## Part 2: Test the OSPFv2 Configuration

13. Make a screen capture showing that ens256 is down per the OSPF interface output.

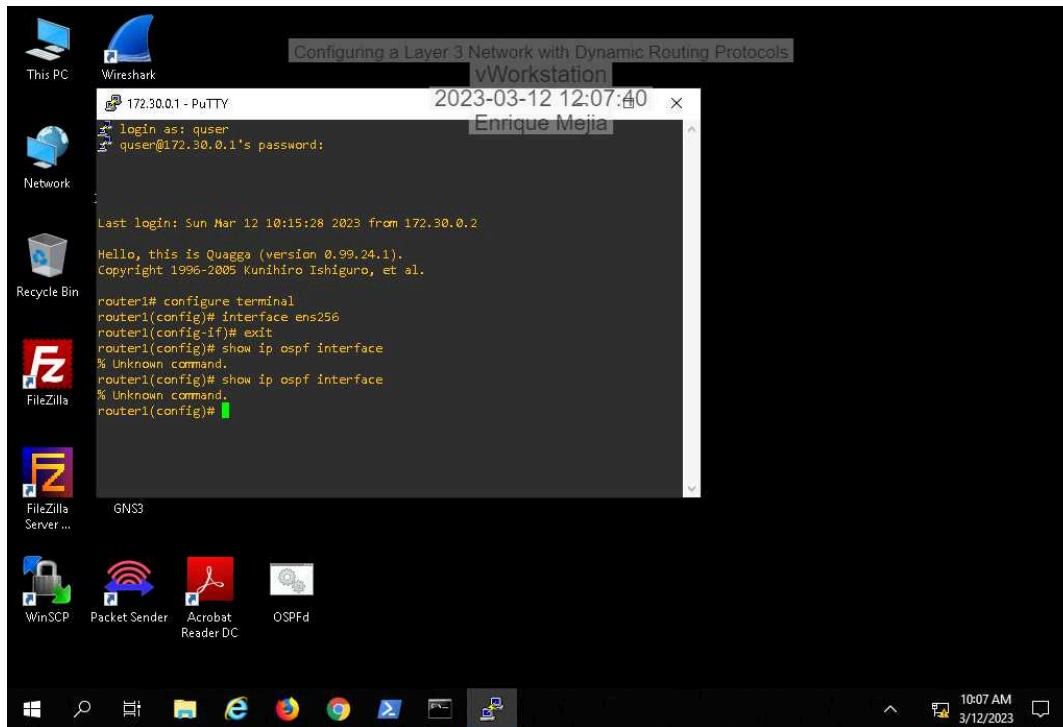


16. Make a screen capture showing the traceroute path through router2.





23. Make a screen capture showing the full routing table on router1.



### Section 3: Challenge and Analysis

#### Part 1: Calculate the OSPF Cost to Force a New Path Preference

**Record** the minimum OSPF cost needed for the router1 > router3 link to convince OSPF that this path is less efficient than the router1 > router2 > router3 path. **Explain** how you calculated this value.

To calculate the minimum OSPF cost needed for the Router1 > Router3 link to be less efficient than the Router1 > Router2 > Router3 path, we need to make the cost of the Router1 > Router3 path greater than the cost of the Router1 > Router2 > Router3 path. The current cost of the Router1 > Router2 > Router3 path is 30 (three links, each with a cost of 10). Therefore, we need to increase the cost of the Router1 > Router3 link to a value greater than  $30 - 20 = 10$ . Since we want to make the Router1 > Router3 path less efficient than the Router1 > Router2 > Router3 path, we can set the OSPF cost of the Router1 > Router3 link to 11 or higher. This will result in a total cost of 31 or higher for the Router1 > Router3 > pfSense path, making it less efficient than the Router1 > Router2 > Router3 > pfSense path.

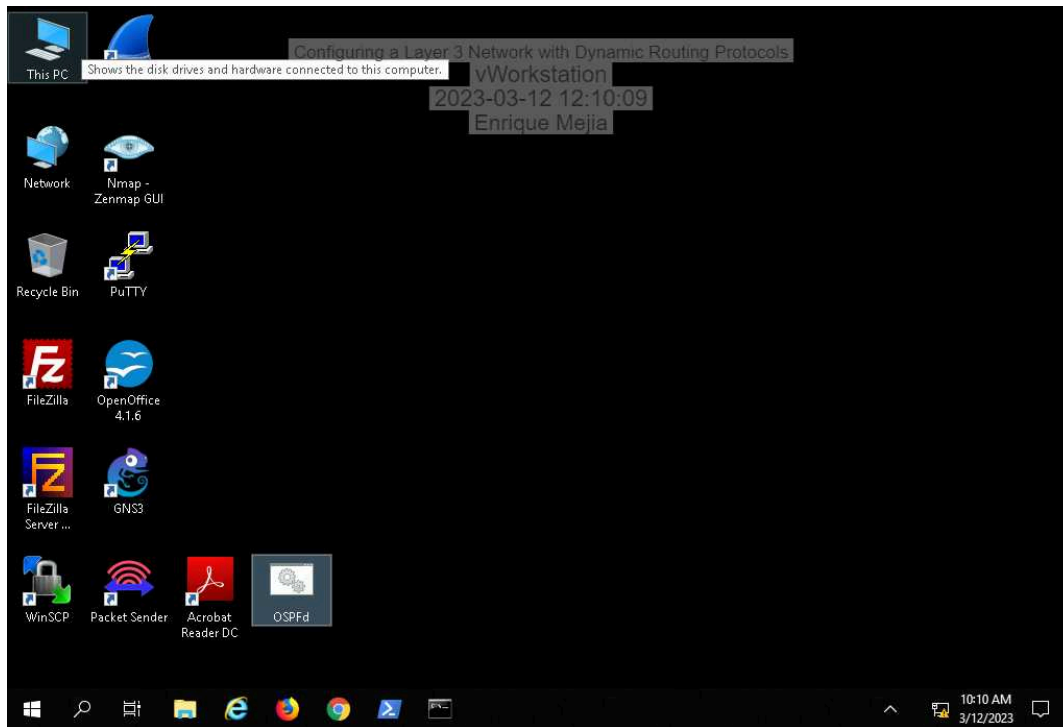
#### Part 2: Manually Set the OSPF Cost to Force a New Path Preference

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**Make a screen capture showing the new cost assignments on router1's OSPF routes.**



## Part 3: Test Your Cost Changes

# Configuring a Layer 3 Network with Dynamic Routing Protocols

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**Make a screen capture showing the new path taken to reach the pfSense appliance.**

