

# 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:

9 hours, 12 minutes

Progress:

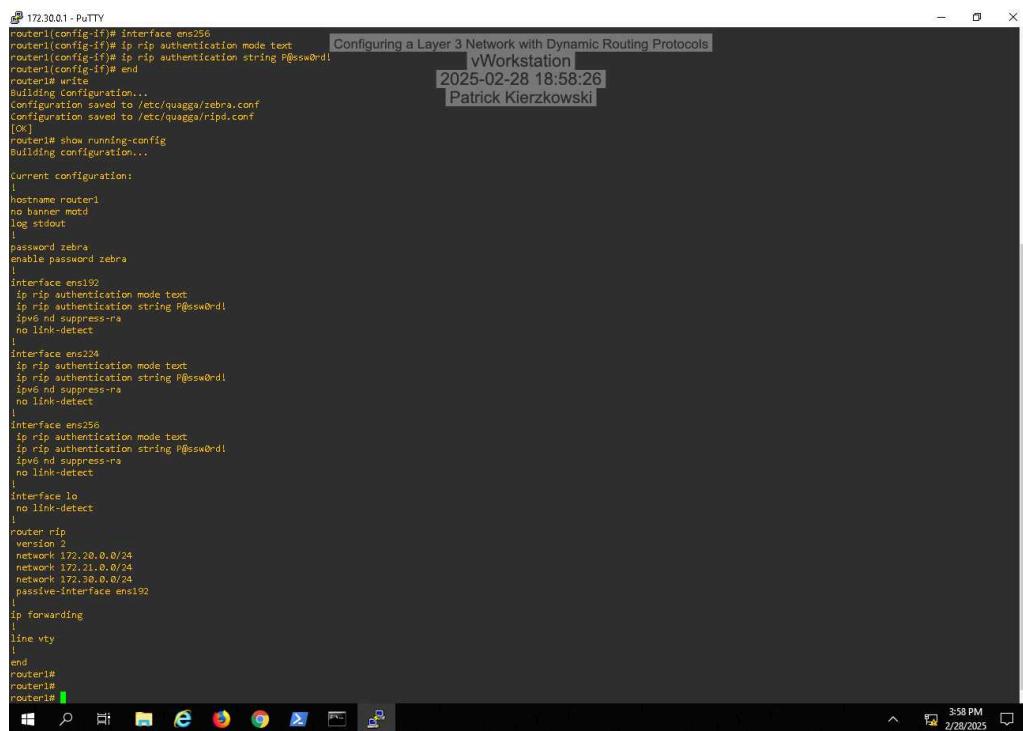
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Report Generated: Monday, July 7, 2025 at 9:46 PM

## 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.

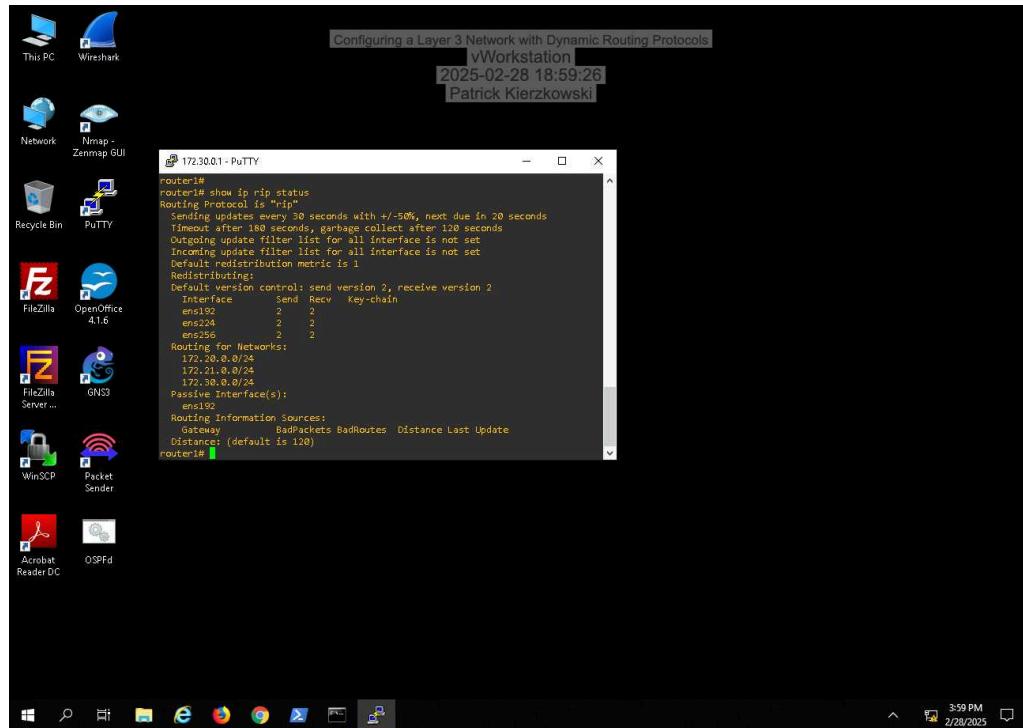


```
172.30.0.1 - PuTTY
router1(config-if)# ip rip authentication mode text
router1(config-if)# ip rip authentication string P@ssw0rd!
router1(config-if)# end
router1#
Building Configuration...
Configuration saved to /etc/quagga/zebra.conf
Configuration saved to /etc/quagga/ripd.conf
[OK]
router1# show running-config
Building configuration...
Current configuration:
!
hostname router1
no banner motd
log stdout
!
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 ens256
 ip rip authentication mode text
 ip rip authentication string P@ssw0rd!
 ipv6 nd suppress-ra
 no link-detect
!
interface lo
 no link-detect
!
router1# ip
version 2
network 172.20.0.0/24
network 172.21.0.0/24
network 172.30.0.0/24
passive-interface ens192
!
ip forwarding
!
line vty
!
end
router1#
router1#
router1#
```

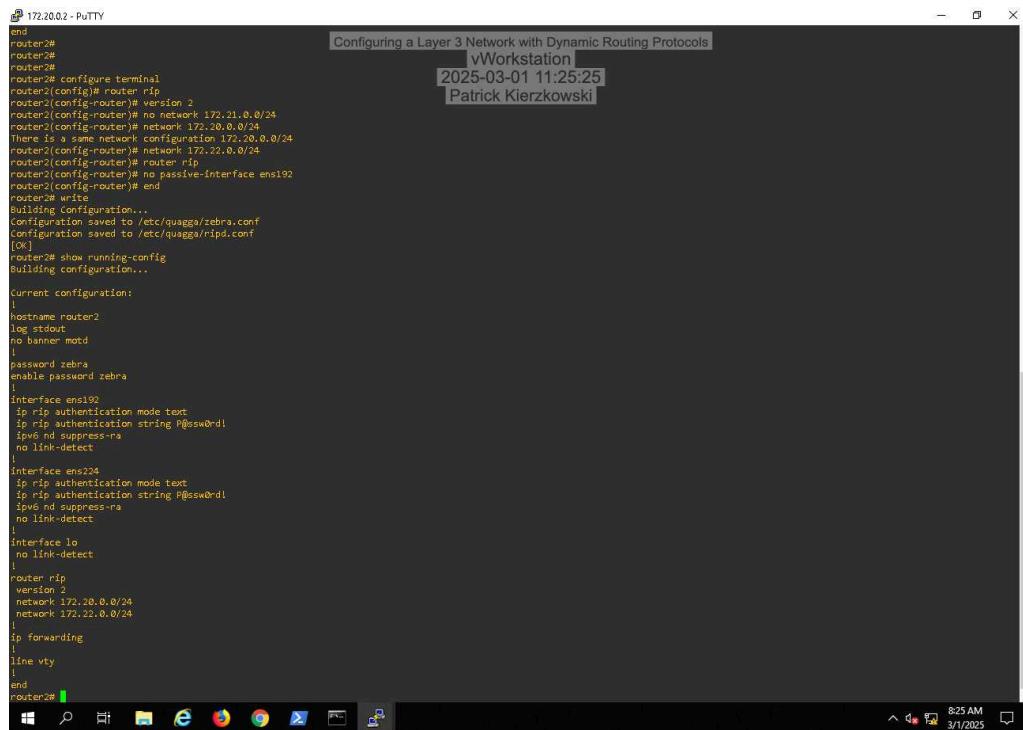
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24. Make a screen capture showing the output of the show ip rip status command.



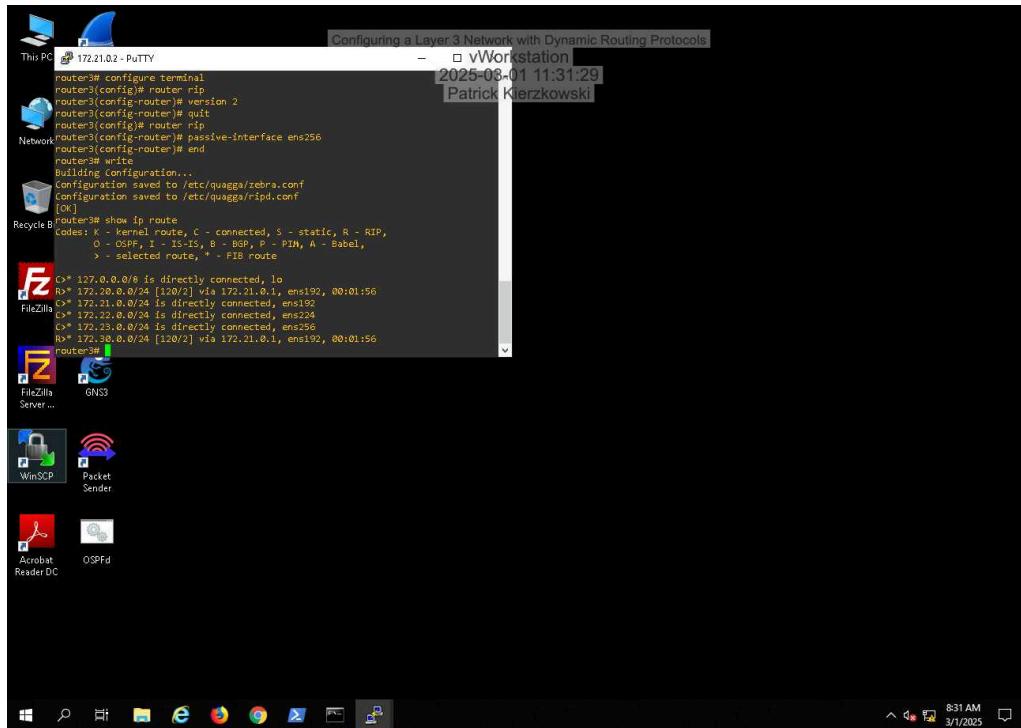
30. Make a screen capture showing the currently running RIP configuration on router2.



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

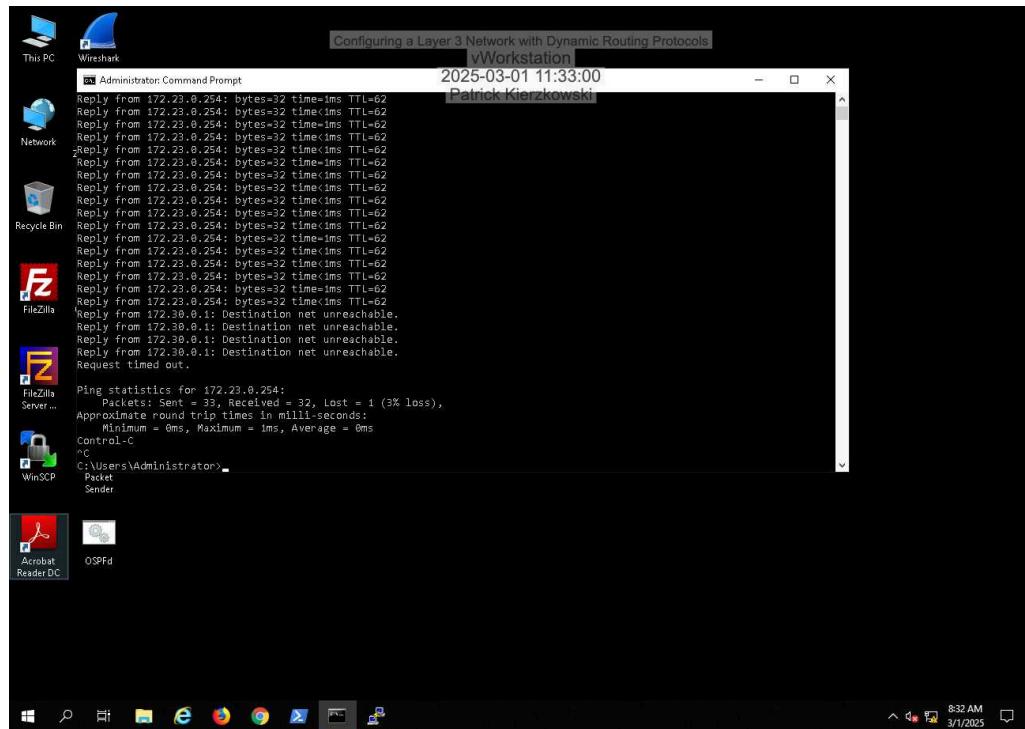


## Part 2: Test the RIPv2 Configuration

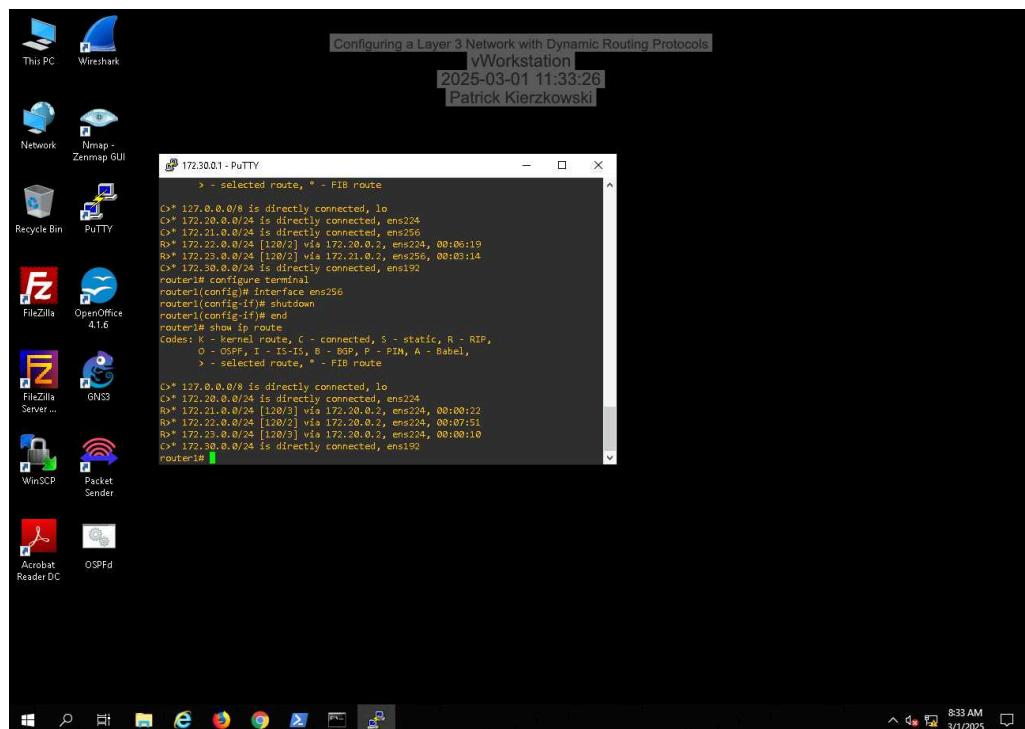
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15. Make a screen capture showing the “Destination net unreachable” messages, including the successful responses that preceded and succeeded them.



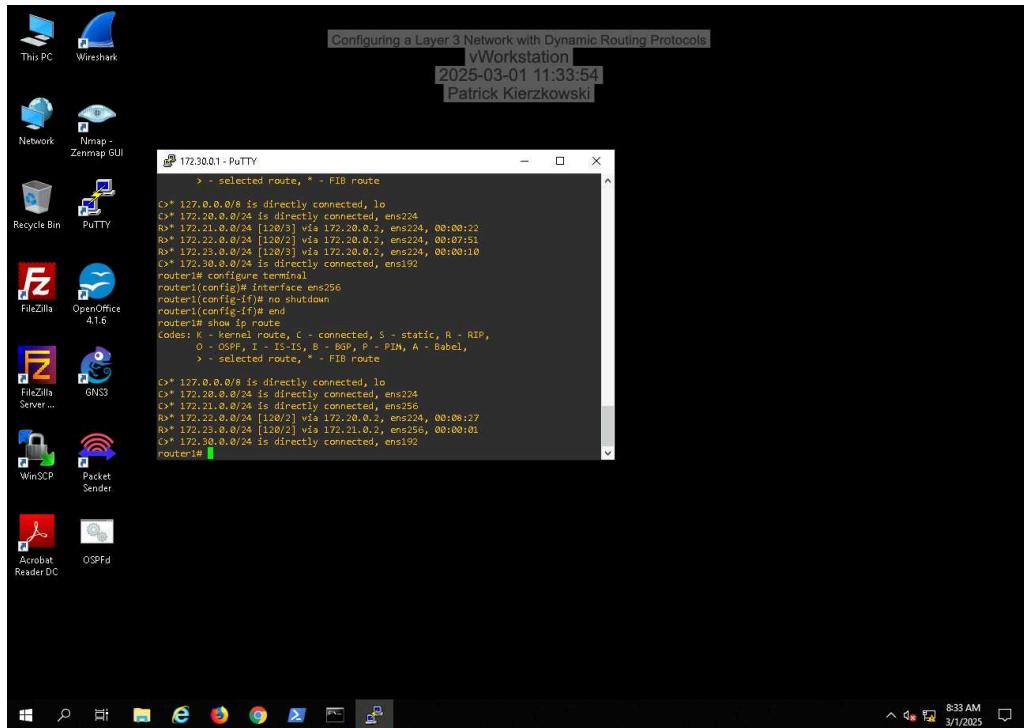
20. Make a screen capture showing the new routing table on router1 that resulted from the ens256 link removal.



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



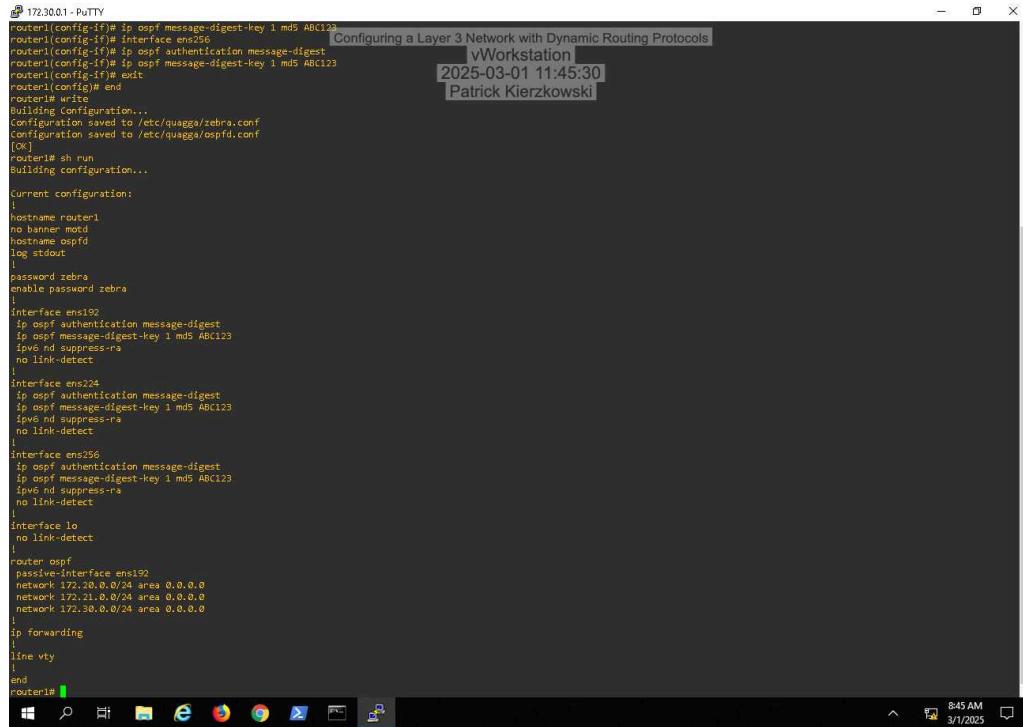
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## Section 2: Applied Learning

### Part 1: Configure OSPFv2 on the Routers

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

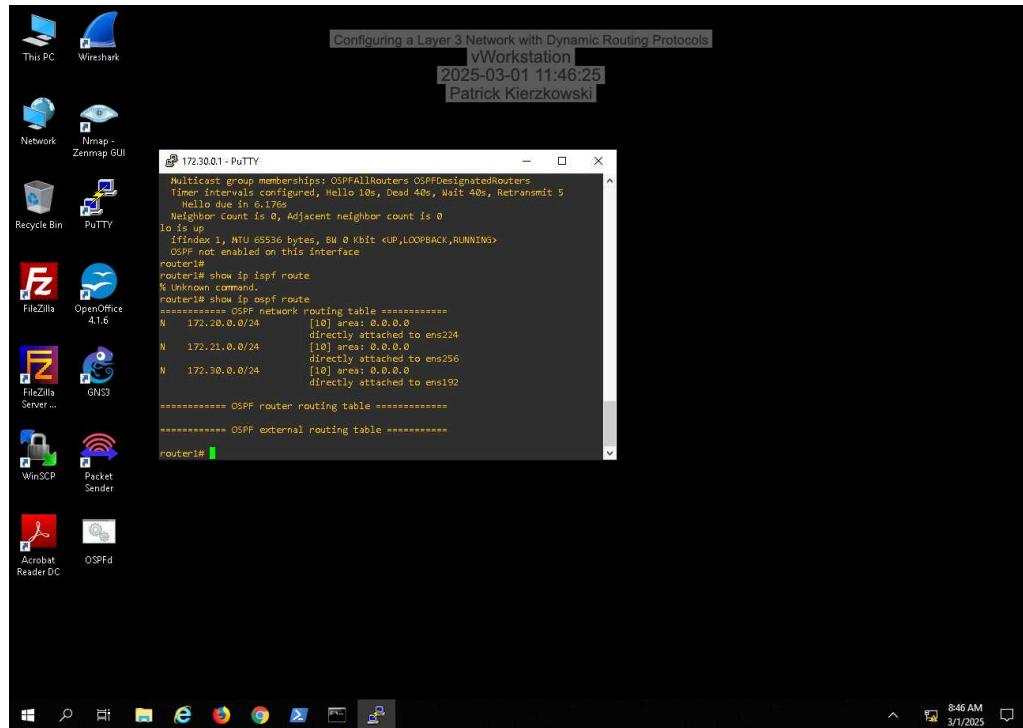


```
172.30.0.1 - PuTTY          Configuring a Layer 3 Network with Dynamic Routing Protocols
router1(config-if)# ip ospf message-digest-key 1 md5 ABC123
router1(config-if)# interface eno256
router1(config-if)# ip ospf authentication message-digest
router1(config-if)# ip ospf message-digest-key 1 md5 ABC123
router1(config-if)# exit
router1(config)# eno256
router1(config)# write
Building configuration...
Configuration saved to /etc/quagga/zebra.conf
Configuration saved to /etc/quagga/ospfd.conf
[OK]
router1# sh run
Building configuration...
Current configuration:
!
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 ens24
  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#
```

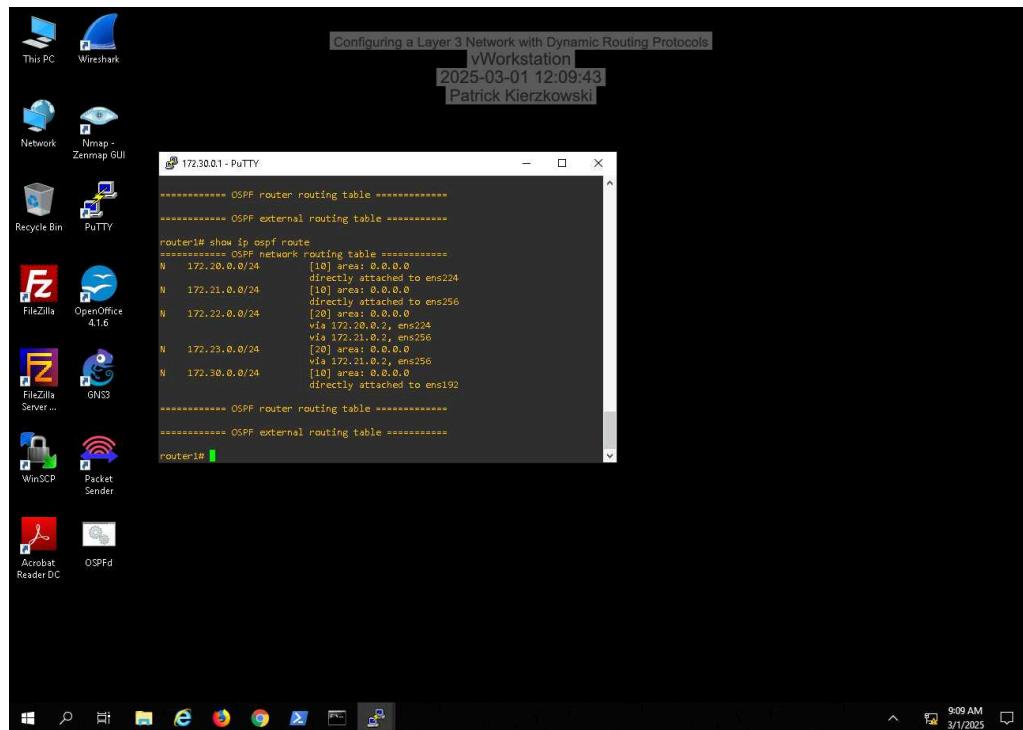
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20. Make a screen capture showing the current OSPF routing table on router1.



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

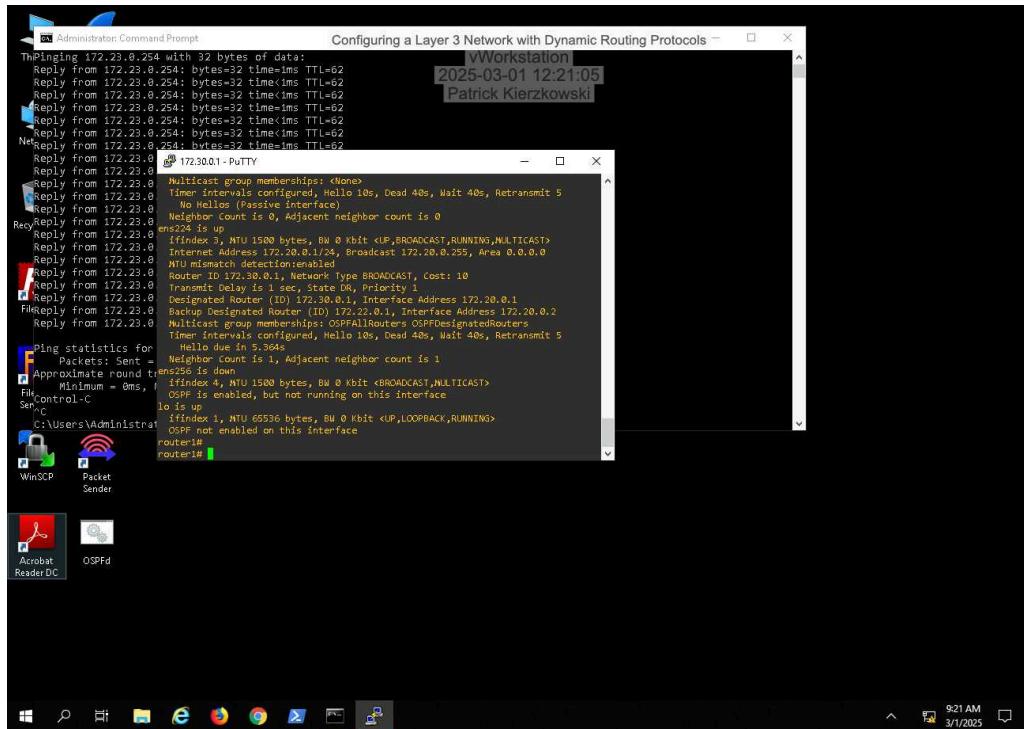


## Part 2: Test the OSPFv2 Configuration

# Configuring a Layer 3 Network with Dynamic Routing Protocols

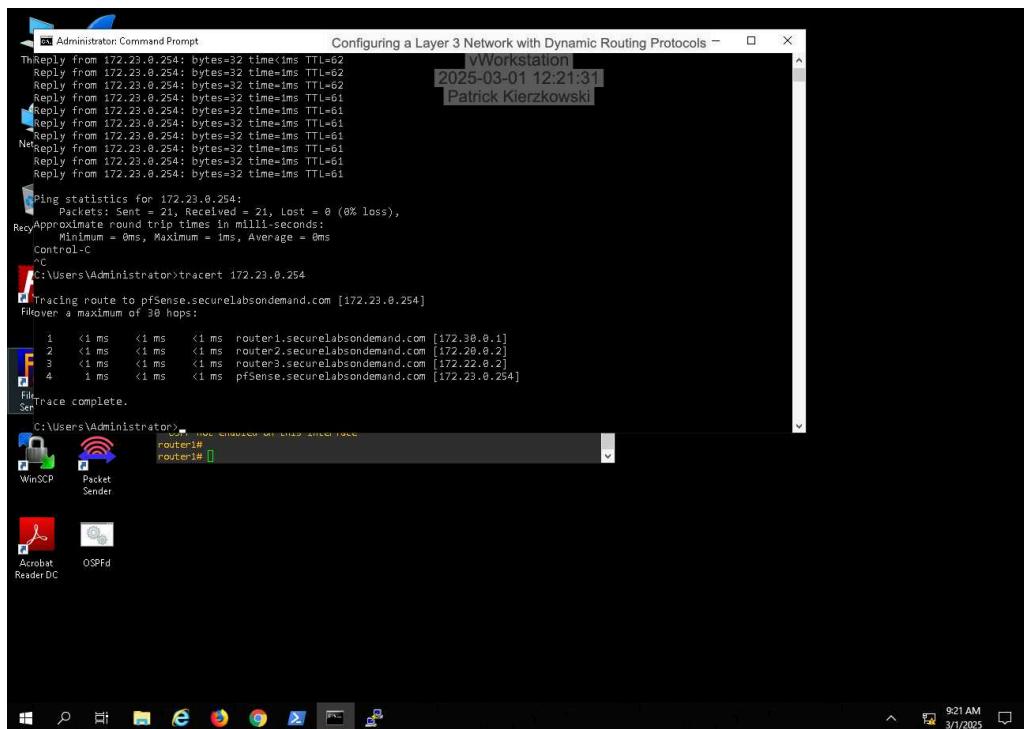
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## 13. Make a screen capture showing that **ens256** is down per the OSPF interface output.



The screenshot shows a Windows desktop with a Command Prompt window open. The window title is "Administrator: Command Prompt" and the content is "Configuring a Layer 3 Network with Dynamic Routing Protocols". The command entered was "ping 172.23.0.254". The output shows multiple replies from the target IP address. Below the ping command, the user runs "ifconfig" to check network interfaces. The "ens256" interface is listed with its status as "down". Other interfaces like "lo" and "eth0" are up. The "OSPF" section shows OSPF is enabled on "eth0" but not on "ens256". The desktop taskbar at the bottom shows icons for WinSCP, Packet Sender, Acrobat Reader DC, and OSPFd.

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

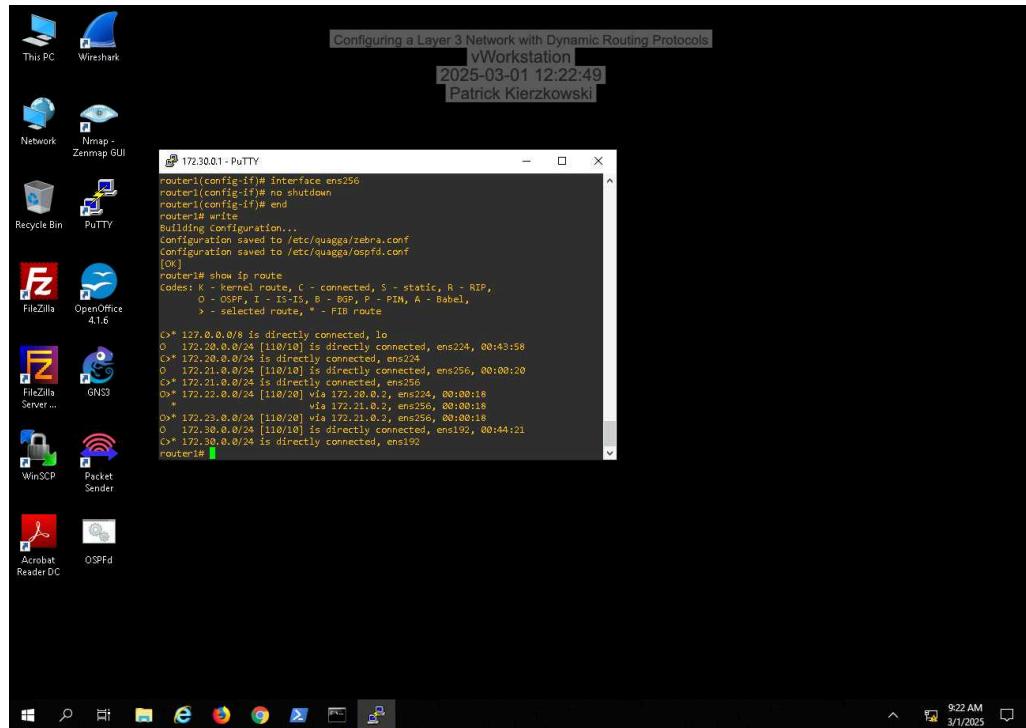


The screenshot shows a Windows desktop with a Command Prompt window open. The window title is "Administrator: Command Prompt" and the content is "Configuring a Layer 3 Network with Dynamic Routing Protocols". The user runs "traceroute 172.23.0.254" to trace the route to a destination. The output shows the path: 1 <1 ms <1 ms <1 ms router1.securelabsondemand.com [172.30.0.1], 2 <1 ms <1 ms <1 ms router2.securelabsondemand.com [172.20.0.2], 3 <1 ms <1 ms <1 ms router3.securelabsondemand.com [172.22.0.2], 4 <1 ms <1 ms <1 ms pfSense.securelabsondemand.com [172.23.0.254]. The desktop taskbar at the bottom shows icons for WinSCP, Packet Sender, Acrobat Reader DC, and OSPFd.

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



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## 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.

The minimum OSPF cost needed for the router 1 to router 3 link is 21. To make the path from router 1 to router 3 less efficient, its total cost must be higher than 30, which is the path from router 1 to router 2 to router 3. By making the router 1 to router 3 cost to 21, the total cost becomes 31, making it less efficient.

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

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

```
Router ID 172.30.0.1, Network Type BROADCAST, Cost: 10 Configuring a Layer 3 Network with Dynamic Routing Protocols
Transmit Delay is 1 sec, State DR, Priority 1 vWorkstation
Designated Router (ID) 172.30.0.1, Interface Address 172.20.0.1 2025-03-01 12:46:23
Backup Designated Router (ID) 172.21.0.1, Interface Address 172.20.0.2
Saved Netmasks LSA sequence number 0x00000002
Multicast group memberships: OSPFAllRouters OSPFDesignatedRouters
Timer intervals configured, Hello 10s, Dead 40s, Wait 40s, Retransmit 5
    Hello due in 5.116s
    Neighbor Count is 1, Adjacent neighbor count is 1
    ens35 is up
    ifindex 1, 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 detectiondisabled
    Router ID 172.30.0.1, Network Type BROADCAST, Cost: 10
    Transmit Delay is 1 sec, State Backup, Priority 1
    Designated Router (ID) 172.29.0.1, Interface Address 172.21.0.2
    Backup Designated Router (ID) 172.20.0.1, Interface Address 172.21.0.1
    Saved Netmasks LSA sequence number 0x00000002
    Multicast group memberships: OSPFAllRouters OSPFDesignatedRouters
    Timer intervals configured, Hello 10s, Dead 40s, Wait 40s, Retransmit 5
    Hello due in 3.808s
    Neighbor Count is 1, Adjacent neighbor count is 1
    ens35 is down
    ifindex 0, MTU 0 bytes, BW 0 Kbit <>
    OSPF not enabled on this interface
    lo is up
    ifindex 1, MTU 65536 bytes, BW 0 Kbit <UP,LOOPBACK,RUNNING>
    OSPF not enabled on this interface
router1#
configure conf t
router1(config)# interface ens192
router1(config-if)# ip ospf cost 21
router1(config-if)# end
router1# write
Building Configuration...
Configuration saved to '/etc/quagga/zebra.conf'
Configuration saved to '/etc/quagga/ospfd.conf'
[OK]
router1# show ip ospf route
***** OSPF network routing table *****
N  172.20.0.0/24      [10] area: 0.0.0.0
    directly attached to ens24
    via 172.20.0.1
N  172.21.0.0/24      [20] area: 0.0.0.0
    directly attached to ens256
N  172.22.0.0/24      [20] area: 0.0.0.0
    via 172.20.0.2, ens24
    via 172.21.0.2, ens256
N  172.23.0.0/24      [20] area: 0.0.0.0
    via 172.20.0.2, ens24
    via 172.21.0.2, ens256
N  172.30.0.0/24      [21] area: 0.0.0.0
    directly attached to ens192
*****
***** OSPF router routing table *****
*****
***** OSPF external routing table *****

router1#
```

### Part 3: Test Your Cost Changes

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

