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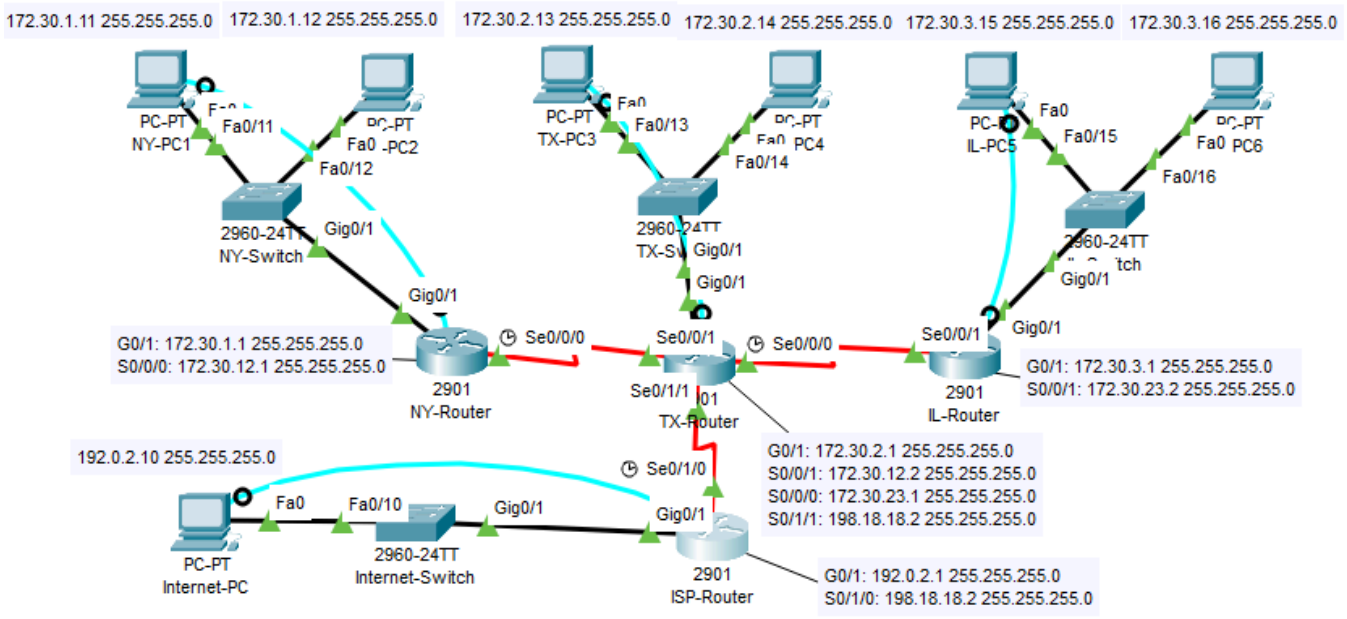
Internetworking

Lab 5

Description: In this lab we migrated from a static routing configuration to a dynamic routing configuration using OSPF.

Topology:



Syntax:

Command	Description	Mode of IOS
Router ospf 1	Enters OSPF configuration mode	Global configuration mode
Default-information originate	Injects a default route	OSPF configuration mode
Write memory	Saves the running configuration	Privileged exec mode

Verification:

B. G0/1 interface, WAN interfaces, show ip int brief, routing table on NY-router

```
NY-Router>show int G1/0
%Invalid interface type and number

NY-Router>show int G0/1
GigabitEthernet0/1 is up, line protocol is up (connected)
  Hardware is CN Gigabit Ethernet, address is 0001.c7b8.0102 (bia 0001.c7b8.0102)
  Internet address is 172.30.1.1/24
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s, media type is RJ45
  output flow-control is unsupported, input flow-control is unsupported
  ARP type: ARPA, ARP Timeout 04:00:00,
  Last input 00:00:08, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: fifo
  Output queue :0/40 (size/max)
  5 minute input rate 40 bits/sec, 0 packets/sec
  5 minute output rate 37 bits/sec, 0 packets/sec
     12 packets input, 1536 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 watchdog, 1017 multicast, 0 pause input
     0 input packets with dribble condition detected
     10 packets output, 1392 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets
     0 unknown protocol drops
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

```
Serial0/0/0 is up, line protocol is up (connected)
  Hardware is HD64570
  Internet address is 172.30.12.1/24
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
     Conversations  0/0/256 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
     Available Bandwidth 1158 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     6 packets input, 768 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
     8 packets output, 1024 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
     DCD=up  DSR=up  DTR=up  RTS=up  CTS=up
Serial0/0/1 is administratively down, line protocol is down (disabled)
  Hardware is HD64570
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
```

```
NY-Router> sho ip int brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     unassigned      YES unset  administratively down down
GigabitEthernet0/1     172.30.1.1      YES manual up                    up
Serial0/0/0            172.30.12.1     YES manual up                    up
Serial0/0/1            unassigned      YES unset  administratively down down
Serial0/1/0            unassigned      YES unset  administratively down down
Serial0/1/1            unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
NY-Router>
```

```
NY-Router>show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.30.0.0/16 is variably subnetted, 6 subnets, 2 masks
C       172.30.1.0/24 is directly connected, GigabitEthernet0/1
L       172.30.1.1/32 is directly connected, GigabitEthernet0/1
S       172.30.2.0/24 [1/0] via 172.30.12.2
S       172.30.3.0/24 [1/0] via 172.30.12.2
C       172.30.12.0/24 is directly connected, Serial0/0/0
L       172.30.12.1/32 is directly connected, Serial0/0/0
```

E. Verifying static routing connectivity

```
C:\>
C:\>ping 172.30.3.15

Pinging 172.30.3.15 with 32 bytes of data:

Reply from 172.30.3.15: bytes=32 time=17ms TTL=125
Reply from 172.30.3.15: bytes=32 time=13ms TTL=125
Reply from 172.30.3.15: bytes=32 time=16ms TTL=125
Reply from 172.30.3.15: bytes=32 time=17ms TTL=125

Ping statistics for 172.30.3.15:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 13ms, Maximum = 17ms, Average = 15ms

C:\>
```

```
C:\>
C:\>ping 192.0.2.10

Pinging 192.0.2.10 with 32 bytes of data:

Reply from 192.0.2.10: bytes=32 time=10ms TTL=126
Reply from 192.0.2.10: bytes=32 time=10ms TTL=126
Reply from 192.0.2.10: bytes=32 time=9ms TTL=126
Reply from 192.0.2.10: bytes=32 time=10ms TTL=126

Ping statistics for 192.0.2.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 9ms, Maximum = 10ms, Average = 9ms

C:\>
```

F. TX-Router's routing table

```
TX-Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 198.18.18.1 to network 0.0.0.0

     172.30.0.0/16 is variably subnetted, 8 subnets, 2 masks
S       172.30.1.0/24 [1/0] via 172.30.12.1
C       172.30.2.0/24 is directly connected, GigabitEthernet0/1
L       172.30.2.1/32 is directly connected, GigabitEthernet0/1
S       172.30.3.0/24 [1/0] via 172.30.23.2
C       172.30.12.0/24 is directly connected, Serial0/0/1
L       172.30.12.2/32 is directly connected, Serial0/0/1
C       172.30.23.0/24 is directly connected, Serial0/0/0
L       172.30.23.1/32 is directly connected, Serial0/0/0
     198.18.18.0/24 is variably subnetted, 2 subnets, 2 masks
C       198.18.18.0/24 is directly connected, Serial0/1/1
L       198.18.18.2/32 is directly connected, Serial0/1/1
S*   0.0.0.0/0 [1/0] via 198.18.18.1
```

H. The show ip protocol command on all three routers that needed it

```
NY-Router#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 17 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  GigabitEthernet0/1    22
  Serial0/0/0           22
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
          172.30.0.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.30.12.2          120      00:00:11
Distance: (default is 120)
NY-Router#
```

```
TX-Router#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 2 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  GigabitEthernet0/1    22
  Serial0/0/0           22
  Serial0/0/1           22
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
          172.30.0.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.30.12.1          120      00:00:21
          172.30.23.2          120      00:00:19
Distance: (default is 120)
TX-Router#
```

```
IL-Router#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 3 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  GigabitEthernet0/1    22
  Serial0/0/1           22
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
          172.30.0.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.30.23.1          120      00:00:05
Distance: (default is 120)
IL-Router#
```

J. Verifying static routing connectivity

```
C:\>ping 172.30.3.16

Pinging 172.30.3.16 with 32 bytes of data:

Reply from 172.30.3.16: bytes=32 time=19ms TTL=125
Reply from 172.30.3.16: bytes=32 time=12ms TTL=125
Reply from 172.30.3.16: bytes=32 time=12ms TTL=125
Reply from 172.30.3.16: bytes=32 time=4ms TTL=125

Ping statistics for 172.30.3.16:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 4ms, Maximum = 19ms, Average = 11ms

C:\>
```

```
C:\>ping 192.0.2.10

Pinging 192.0.2.10 with 32 bytes of data:

Reply from 192.0.2.10: bytes=32 time=8ms TTL=126
Reply from 192.0.2.10: bytes=32 time=6ms TTL=126
Reply from 192.0.2.10: bytes=32 time=8ms TTL=126
Reply from 192.0.2.10: bytes=32 time=9ms TTL=126

Ping statistics for 192.0.2.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 6ms, Maximum = 9ms, Average = 7ms

C:\>
```

K. The routing protocols configured on each router using show ip protocols

```
[OK]
NY-Router#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 2 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  GigabitEthernet0/1    22
  Serial0/0/0           22
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
          172.30.0.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.30.12.2          120      00:00:06
Distance: (default is 120)
NY-Router#
```

```
TX-Router#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 12 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chai
  GigabitEthernet0/1    22
  Serial0/0/0           22
  Serial0/0/1           22
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
          172.30.0.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.30.12.1          120      00:00:07
          172.30.23.2          120      00:00:14
Distance: (default is 120)
TX-Router#
```

```
Building configuration...
[OK]
IL-Router#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 6 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  GigabitEthernet0/1    22
  Serial0/0/1           22
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
          172.30.0.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.30.23.1          120      00:00:21
Distance: (default is 120)
IL-Router#
```

L. TX-Routers routing table

```
TX-Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 198.18.18.1 to network 0.0.0.0

     172.30.0.0/16 is variably subnetted, 8 subnets, 2 masks
R       172.30.1.0/24 [120/1] via 172.30.12.1, 00:00:20, Serial0/0/1
C       172.30.2.0/24 is directly connected, GigabitEthernet0/1
L       172.30.2.1/32 is directly connected, GigabitEthernet0/1
R       172.30.3.0/24 [120/1] via 172.30.23.2, 00:00:09, Serial0/0/0
C       172.30.12.0/24 is directly connected, Serial0/0/1
L       172.30.12.2/32 is directly connected, Serial0/0/1
C       172.30.23.0/24 is directly connected, Serial0/0/0
L       172.30.23.1/32 is directly connected, Serial0/0/0
     198.18.18.0/24 is variably subnetted, 2 subnets, 2 masks
C       198.18.18.0/24 is directly connected, Serial0/1/1
L       198.18.18.2/32 is directly connected, Serial0/1/1
S*   0.0.0.0/0 [1/0] via 198.18.18.1
```

N. Using the show ip protocol command after issuing OSPF commands

```
NY-Router#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 20 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  GigabitEthernet0/1    22
  Serial0/0/0           22
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
          172.30.0.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.30.12.2           120      00:00:11
Distance: (default is 120)

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 172.30.12.1
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.30.1.0 0.0.0.255 area 0
    172.30.12.0 0.0.0.255 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    172.30.12.1           110      00:01:43
    198.18.18.2           110      00:01:43
  Distance: (default is 110)
```

```
TX-Router#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 13 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  GigabitEthernet0/1    22
  Serial0/0/0           22
  Serial0/0/1           22
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
          172.30.0.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.30.12.1           120      00:00:08
          172.30.23.2           120      00:00:21
Distance: (default is 120)

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 198.18.18.2
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.30.2.0 0.0.0.255 area 0
    172.30.12.0 0.0.0.255 area 0
    198.18.18.0 0.0.0.255 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
```

```
[OK]
IL-Router#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 22 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  GigabitEthernet0/1    22
  Serial0/0/1           22
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
          172.30.0.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.30.23.1           120      00:00:23
Distance: (default is 120)

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 172.30.23.2
  Number of areas in this router is 1. 1 normal 0 stub 0 nss
  Maximum path: 4
  Routing for Networks:
    172.30.3.0 0.0.0.255 area 0
    172.30.23.0 0.0.0.255 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    172.30.23.2           110      00:00:41
  Distance: (default is 110)
```

O. Verifying connectivity after issuing OSPF commands

NY-PC1

Physical | Config | Desktop | Programming | Attributes

Command Prompt

```
C:\>
C:\>ping 172.30.3.16

Pinging 172.30.3.16 with 32 bytes of data:

Reply from 172.30.3.16: bytes=32 time=17ms TTL=125
Reply from 172.30.3.16: bytes=32 time=17ms TTL=125
Reply from 172.30.3.16: bytes=32 time=19ms TTL=125
Reply from 172.30.3.16: bytes=32 time=19ms TTL=125

Ping statistics for 172.30.3.16:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 17ms, Maximum = 19ms, Average = 18ms

C:\>
C:\>
```

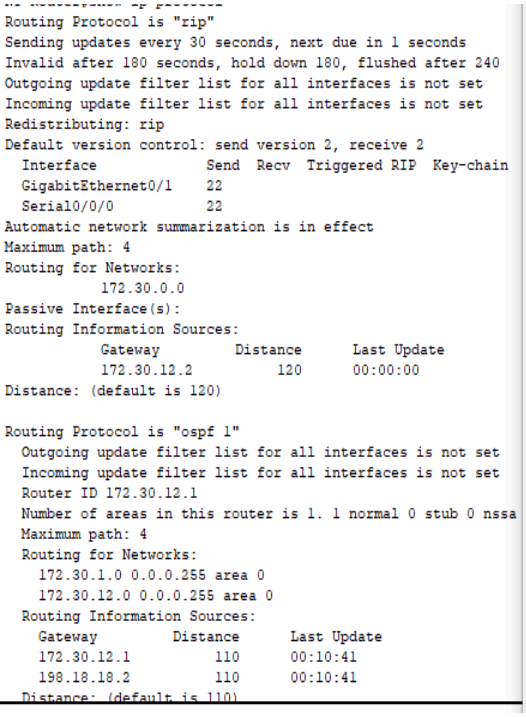
TX-PC4

Physical | Config | Desktop | Programming | Attributes

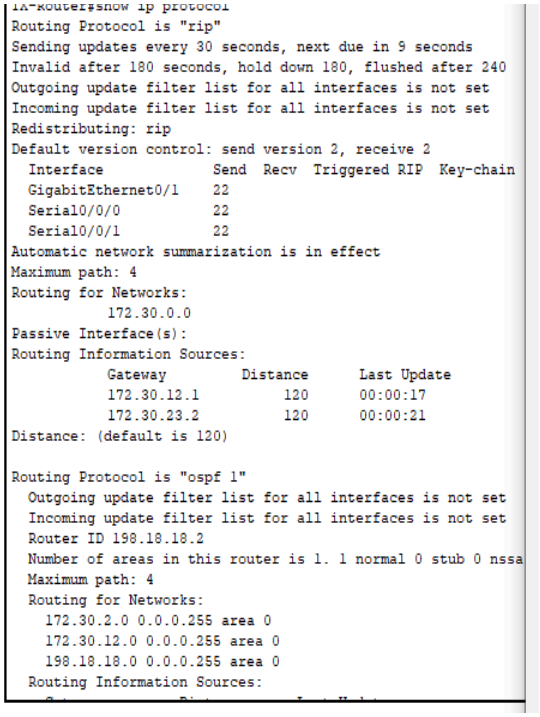
Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.0.2.10

Pinging 192.0.2.10 with 32 bytes of data:

Reply from 192.0.2.10: bytes=32 time=13ms TTL=126
Reply from 192.0.2.10: bytes=32 time=11ms TTL=126
Reply from 192.0.2.10: bytes=32 time=9ms TTL=126
Reply from 192.0.2.10: bytes=32 time=13ms TTL=126

Ping statistics for 192.0.2.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 9ms, Maximum = 13ms, Average = 11ms

C:\>
```

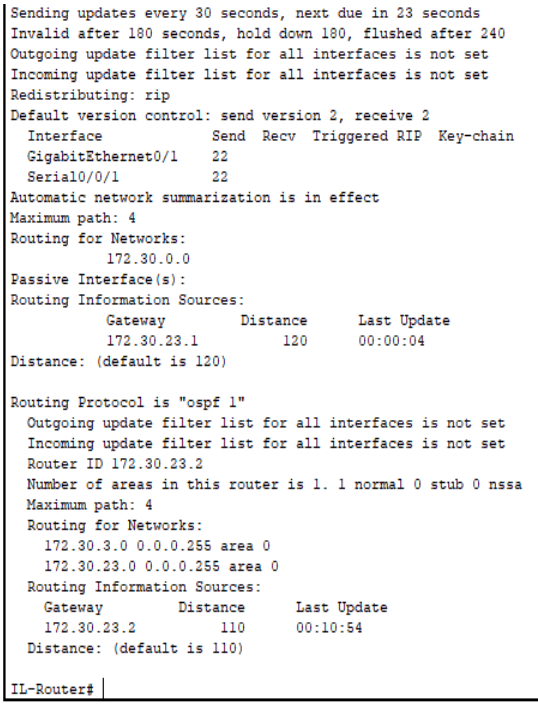
P. The routing protocols configured on each router using show ip protocols, after configuring OSPF. Yes, the routers are now actively sharing routing information. I think this is happening because OSPF is made to dynamically adapt to network changes and update the routing table accordingly.



```
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 1 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  GigabitEthernet0/1    22
  Serial0/0/0           22
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
          172.30.0.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.30.12.2          120      00:00:00
Distance: (default is 120)

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 172.30.12.1
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.30.1.0 0.0.0.255 area 0
    172.30.12.0 0.0.0.255 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    172.30.12.1          110      00:10:41
    198.18.18.2          110      00:10:41
Distance: (default is 110)
```



```
TX-Router#show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 9 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  GigabitEthernet0/1    22
  Serial0/0/0           22
  Serial0/0/1           22
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
          172.30.0.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.30.12.1          120      00:00:17
          172.30.23.2          120      00:00:21
Distance: (default is 120)

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 198.18.18.2
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.30.2.0 0.0.0.255 area 0
    172.30.12.0 0.0.0.255 area 0
    198.18.18.0 0.0.0.255 area 0
  Routing Information Sources:
```



```
Sending updates every 30 seconds, next due in 23 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 2, receive 2
  Interface             Send  Recv  Triggered RIP  Key-chain
  GigabitEthernet0/1    22
  Serial0/0/1           22
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
          172.30.0.0
Passive Interface(s):
Routing Information Sources:
          Gateway         Distance      Last Update
          172.30.23.1          120      00:00:04
Distance: (default is 120)

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 172.30.23.2
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.30.3.0 0.0.0.255 area 0
    172.30.23.0 0.0.0.255 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    172.30.23.2          110      00:10:54
  Distance: (default is 110)

IL-Router#
```

Q. TX-Router's routing table after configuring OSPF

```
TX-Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 198.18.18.1 to network 0.0.0.0

     172.30.0.0/16 is variably subnetted, 8 subnets, 2 masks
O       172.30.1.0/24 [110/65] via 172.30.12.1, 00:16:30, Serial0/0/1
C       172.30.2.0/24 is directly connected, GigabitEthernet0/1
L       172.30.2.1/32 is directly connected, GigabitEthernet0/1
R       172.30.3.0/24 [120/1] via 172.30.23.2, 00:00:24, Serial0/0/0
C       172.30.12.0/24 is directly connected, Serial0/0/1
L       172.30.12.2/32 is directly connected, Serial0/0/1
C       172.30.23.0/24 is directly connected, Serial0/0/0
L       172.30.23.1/32 is directly connected, Serial0/0/0
     198.18.18.0/24 is variably subnetted, 2 subnets, 2 masks
C       198.18.18.0/24 is directly connected, Serial0/1/1
L       198.18.18.2/32 is directly connected, Serial0/1/1
S*   0.0.0.0/0 [1/0] via 198.18.18.1
```

S. The routing tables on all of the routers after the default route injection configuration. The route “S* 0.0.0.0/0 [1/0] via 198.18.18.1” is new in my routing table. This new route allows the router to become capable of handling more traffic and maintains communication even when a specific route is not available.

```
    198.18.18.2           110      00:10:41
  Distance: (default is 110)

NY-Router# show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B -
BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS
inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 172.30.12.2 to network 0.0.0.0

     172.30.0.0/16 is variably subnetted, 7 subnets, 2 masks
C       172.30.1.0/24 is directly connected, GigabitEthernet0/1
L       172.30.1.1/32 is directly connected, GigabitEthernet0/1
O       172.30.2.0/24 [110/65] via 172.30.12.2, 00:20:25, Serial0/0/0
R       172.30.3.0/24 [120/2] via 172.30.12.2, 00:00:20, Serial0/0/0
C       172.30.12.0/24 is directly connected, Serial0/0/0
L       172.30.12.1/32 is directly connected, Serial0/0/0
R       172.30.23.0/24 [120/1] via 172.30.12.2, 00:00:20, Serial0/0/0
O    198.18.18.0/24 [110/128] via 172.30.12.2, 00:20:25, Serial0/0/0
O*E2 0.0.0.0/0 [110/1] via 172.30.12.2, 00:00:46, Serial0/0/0
```

```
TX-Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 198.18.18.1 to network 0.0.0.0

     172.30.0.0/16 is variably subnetted, 8 subnets, 2 masks
O       172.30.1.0/24 [110/65] via 172.30.12.1, 00:20:14, Serial0/0/1
C       172.30.2.0/24 is directly connected, GigabitEthernet0/1
L       172.30.2.1/32 is directly connected, GigabitEthernet0/1
R       172.30.3.0/24 [120/1] via 172.30.23.2, 00:00:26, Serial0/0/0
C       172.30.12.0/24 is directly connected, Serial0/0/1
L       172.30.12.2/32 is directly connected, Serial0/0/1
C       172.30.23.0/24 is directly connected, Serial0/0/0
L       172.30.23.1/32 is directly connected, Serial0/0/0
     198.18.18.0/24 is variably subnetted, 2 subnets, 2 masks
C       198.18.18.0/24 is directly connected, Serial0/1/1
L       198.18.18.2/32 is directly connected, Serial0/1/1
S*   0.0.0.0/0 [1/0] via 198.18.18.1

TX-Router#
```

```
IL-Router# show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     172.30.0.0/16 is variably subnetted, 7 subnets, 2 masks
S       172.30.1.0/24 [1/0] via 172.30.23.1
S       172.30.2.0/24 [1/0] via 172.30.23.1
C       172.30.3.0/24 is directly connected, GigabitEthernet0/1
L       172.30.3.1/32 is directly connected, GigabitEthernet0/1
R       172.30.12.0/24 [120/1] via 172.30.23.1, 00:00:03, Serial0/0/1
C       172.30.23.0/24 is directly connected, Serial0/0/1
L       172.30.23.2/32 is directly connected, Serial0/0/1
```

```
ISP-Router>show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 198.18.18.2 to network 0.0.0.0

     192.0.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.0.2.0/24 is directly connected, GigabitEthernet0/1
L       192.0.2.1/32 is directly connected, GigabitEthernet0/1
     198.18.18.0/24 is variably subnetted, 2 subnets, 2 masks
C       198.18.18.0/24 is directly connected, Serial0/1/0
L       198.18.18.1/32 is directly connected, Serial0/1/0
S*   0.0.0.0/0 [1/0] via 198.18.18.2

ISP-Router>
```

Conclusion: This lab was very interesting to me. I had to brush up on figuring out the static routes, but when I finally got them down I was good. Then we had to delete them. The only issue I had was figuring out the correct static routes, then the rest just took some time to get through.