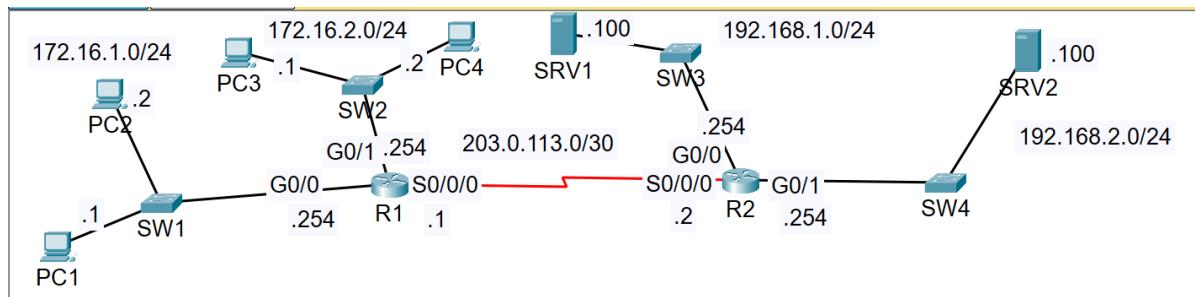


Network Topology:



Instructions and actions:

- Configure OSPF on R1 and R2 to allow full connectivity between the PCs and servers.

Configured

R1 CLI:

```
R1
Physical Config CLI Attributes
IOS Command Line Interface

R1(config-router)#exit
R1(config)#do sh ip protocols

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 203.0.113.1
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    203.0.113.0 0.0.0.3 area 0
    172.16.2.0 0.0.0.255 area 0
    172.16.1.0 0.0.0.255 area 0
  Passive Interface(s):
    GigabitEthernet0/0
    GigabitEthernet0/1
  Routing Information Sources:
    Gateway          Distance      Last Update
    203.0.113.1      110          00:09:28
    203.0.113.2      110          00:08:23
  Distance: (default is 110)

R1(config)#do sh ip route ospf
O  192.168.1.0 [110/65] via 203.0.113.2, 00:08:56, Serial0/0/0
O  192.168.2.0 [110/65] via 203.0.113.2, 00:08:30, Serial0/0/0

R1(config)#do sh ip ospf database
OSPF Router with ID (203.0.113.1) (Process ID 1)

  Router Link States (Area 0)

  Link ID      ADV Router      Age      Seq#      Checksum Link count
  203.0.113.1  203.0.113.1  587      0x80000004 0x00d21e 4
  203.0.113.2  203.0.113.2  522      0x80000004 0x00eda7 4
R1(config)#do sh ip ospf neighbor

  Neighbor ID      Pri      State      Dead Time      Address      Interface
  203.0.113.2      0      FULL/      -          00:00:31      203.0.113.2      Serial0/0/0
R1(config)#[/]
```

Top

R2 CLI:

```
R2
Physical Config CLI Attributes
IOS Command Line Interface

R2(config)#do sh ip protocols

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 203.0.113.2
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    203.0.113.0 0.0.0.3 area 0
    192.168.1.0 0.0.0.255 area 0
    192.168.2.0 0.0.0.255 area 0
  Passive Interface(s):
    GigabitEthernet0/0
    GigabitEthernet0/1
  Routing Information Sources:
    Gateway          Distance      Last Update
    203.0.113.1      110          00:11:15
    203.0.113.2      110          00:10:10
  Distance: (default is 110)

R2(config)#do sh ip route ospf
  172.16.0.0/24 is subnetted, 2 subnets
O  172.16.1.0 [110/65] via 203.0.113.1, 00:11:23, Serial0/0/0
O  172.16.2.0 [110/65] via 203.0.113.1, 00:11:46, Serial0/0/0

R2(config)#do sh ip ospf database
OSPF Router with ID (203.0.113.2) (Process ID 1)

  Router Link States (Area 0)

  Link ID      ADV Router      Age      Seq#      Checksum Link count
  203.0.113.1  203.0.113.1  690      0x80000004 0x00d21e 4
  203.0.113.2  203.0.113.2  625      0x80000004 0x00eda7 4
R2(config)#do sh ip ospf neighbor

  Neighbor ID      Pri      State      Dead Time      Address      Interface
  203.0.113.1      0      FULL/      -          00:00:31      203.0.113.1      Serial0/0/0
R2(config)#[/]
```

Top

All the end hosts are able to ping each other.

2. Configure standard numbered ACLs on R1 and standard named ACLs on R2 such that –
- (a) Only PC1 and PC3 can access 192.168.1.0/24
 - (b) Hosts in 172.16.2.0/24 can't access 192.168.2.0/24
 - (c) 172.16.1.0/24 can't access 172.16.2.0/24
 - (d) 172.16.2.0/24 can't access 172.16.1.0/24

Condition (a) on R2 CLI:

```
R2(config)#ip access-list standard R2_access
R2(config-std-nacl)#10 permit 172.16.1.1
R2(config-std-nacl)#20 permit 172.16.2.1
R2(config-std-nacl)#int g0/0
R2(config-if)#exit
R2(config)#ip access-list standard R2_access
R2(config-std-nacl)#no 10 permit 172.16.1.1
R2(config-std-nacl)#no 20 permit 172.16.2.1
R2(config-std-nacl)#10 permit ?
  A.B.C.D  Address to match
    any      Any source host
    host     A single host address
R2(config-std-nacl)#10 permit 172.16.1.1 ?
  A.B.C.D  Wildcard bits
<cr>
R2(config-std-nacl)#10 permit 172.16.1.1 0.0.0.0
R2(config-std-nacl)#20 permit 172.16.2.1 0.0.0.0
R2(config-std-nacl)#int g0/0
R2(config-if)#ip access-group R2_access out
R2(config-if)#do sh run | section access_list
R2(config-if)#exit
```

Only PC1 and PC3 can access the given network.

PC1:

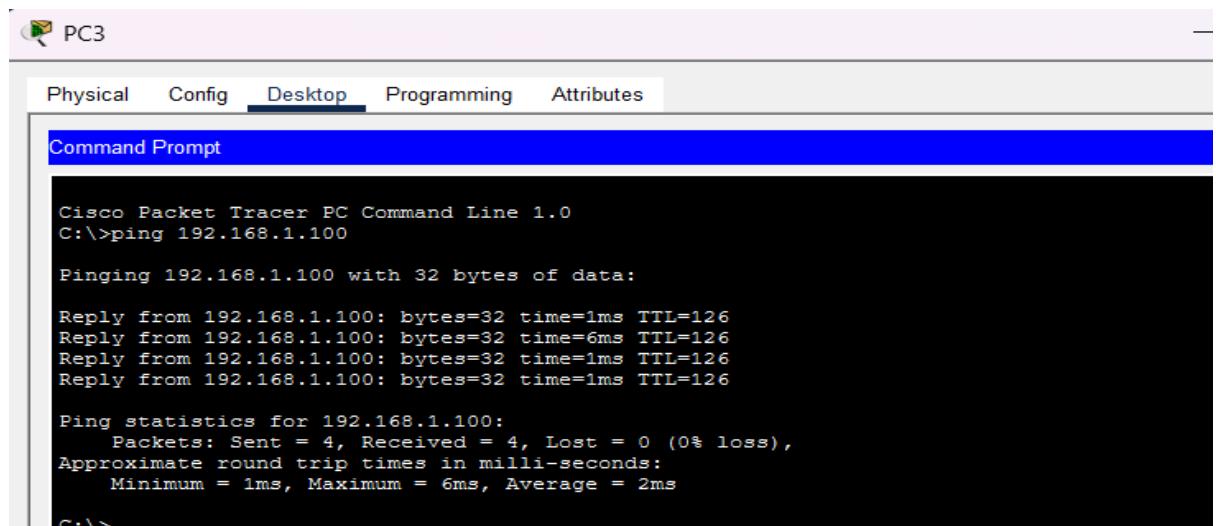
```
C:\>ping 192.168.1.100

Pinging 192.168.1.100 with 32 bytes of data:

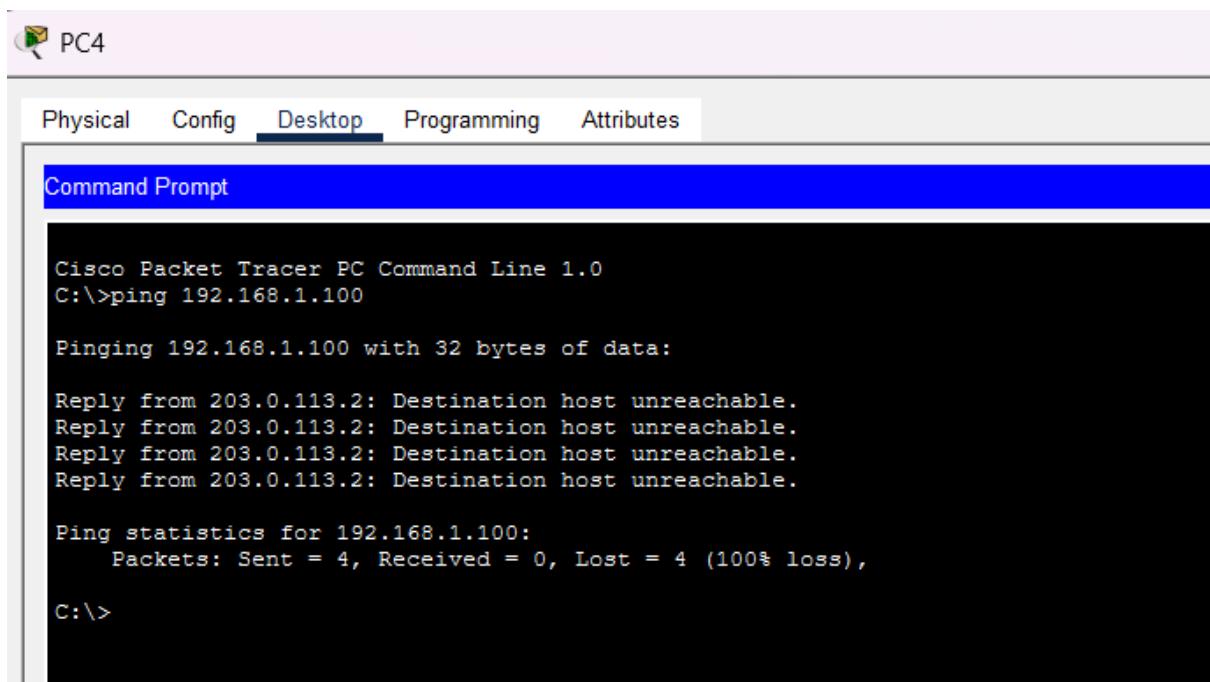
Request timed out.
Reply from 192.168.1.100: bytes=32 time=1ms TTL=126
Reply from 192.168.1.100: bytes=32 time=1ms TTL=126
Reply from 192.168.1.100: bytes=32 time=6ms TTL=126

Ping statistics for 192.168.1.100:
  Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
  Minimum = 1ms, Maximum = 6ms, Average = 2ms
```

PC3:



Others:



PC4

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.100

Pinging 192.168.1.100 with 32 bytes of data:

Reply from 203.0.113.2: Destination host unreachable.

Ping statistics for 192.168.1.100:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
```

Condition (b) on R2 CLI:

```
R2(config)#ip access-list standard R2_access_2
R2(config-std-nacl)#10 deny 172.16.2.0 0.0.0.255
R2(config-std-nacl)#20 permit any
R2(config-std-nacl)#int g0/1
R2(config-if)#ip access-group R2_access_2 out
R2(config-if)#do sh run
```

End hosts in 172.16.2.0/24 can't access 192.168.2.0 but others can.

PC3:

```
C:\>ping 192.168.2.100

Pinging 192.168.2.100 with 32 bytes of data:

Reply from 203.0.113.2: Destination host unreachable.

Ping statistics for 192.168.2.100:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

PC4:

```
C:\>ping 192.168.2.100

Pinging 192.168.2.100 with 32 bytes of data:

Reply from 203.0.113.2: Destination host unreachable.

Ping statistics for 192.168.2.100:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Others:

```
C:\>ping 192.168.2.100

Pinging 192.168.2.100 with 32 bytes of data:

Reply from 192.168.2.100: bytes=32 time=1ms TTL=126
Reply from 192.168.2.100: bytes=32 time=2ms TTL=126
Reply from 192.168.2.100: bytes=32 time=7ms TTL=126
Reply from 192.168.2.100: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.2.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 7ms, Average = 2ms
```

Condition (c) on R1 CLI:

```
R1>en
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#access-list ?
    <1-99>    IP standard access list
    <100-199>  IP extended access list
R1(config)#access-list 1 deny 172.16.1.0 0.0.0.255
R1(config)#access-list 1 permit any
R1(config)#int g0/1
R1(config-if)#ip access-group 1 out
```

PC1:

```
C:\>ping 172.16.2.1

Pinging 172.16.2.1 with 32 bytes of data:

Reply from 172.16.1.254: Destination host unreachable.

Ping statistics for 172.16.2.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

PC2:

```
C:\>ping 172.16.2.2

Pinging 172.16.2.2 with 32 bytes of data:

Reply from 172.16.1.254: Destination host unreachable.

Ping statistics for 172.16.2.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

SRV1:

```
C:\>ping 172.16.2.1

Pinging 172.16.2.1 with 32 bytes of data:

Reply from 172.16.2.1: bytes=32 time=1ms TTL=126
Reply from 172.16.2.1: bytes=32 time=7ms TTL=126
Reply from 172.16.2.1: bytes=32 time=6ms TTL=126
Reply from 172.16.2.1: bytes=32 time=1ms TTL=126

Ping statistics for 172.16.2.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 7ms, Average = 3ms
```

SRV2 (because of condition (b))^{*}:

```
C:\>ping 172.16.2.2

Pinging 172.16.2.2 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 172.16.2.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Condition (d) on R1 CLI:

```
R1(config)#access-list 2 deny 172.16.2.0 0.0.0.255
R1(config)#access-list 2 permit any
R1(config)#int g0/0
R1(config-if)#access-group 2 out
      ^
% Invalid input detected at '^' marker.

R1(config-if)#ip access-group 2 out
R1(config-if)#|
```

Now, PC3 and PC4:

```
C:\>ping 172.16.1.1

Pinging 172.16.1.1 with 32 bytes of data:

Reply from 172.16.2.254: Destination host unreachable.

Ping statistics for 172.16.1.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

SRV1:

```
C:\>ping 172.16.1.1

Pinging 172.16.1.1 with 32 bytes of data:

Reply from 172.16.1.1: bytes=32 time=1ms TTL=126

Ping statistics for 172.16.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 1ms, Average = 1ms
```

SRV2:

```
C:\>ping 172.16.1.2

Pinging 172.16.1.2 with 32 bytes of data:

Reply from 172.16.1.2: bytes=32 time=1ms TTL=126

Ping statistics for 172.16.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 1ms, Average = 1ms
```