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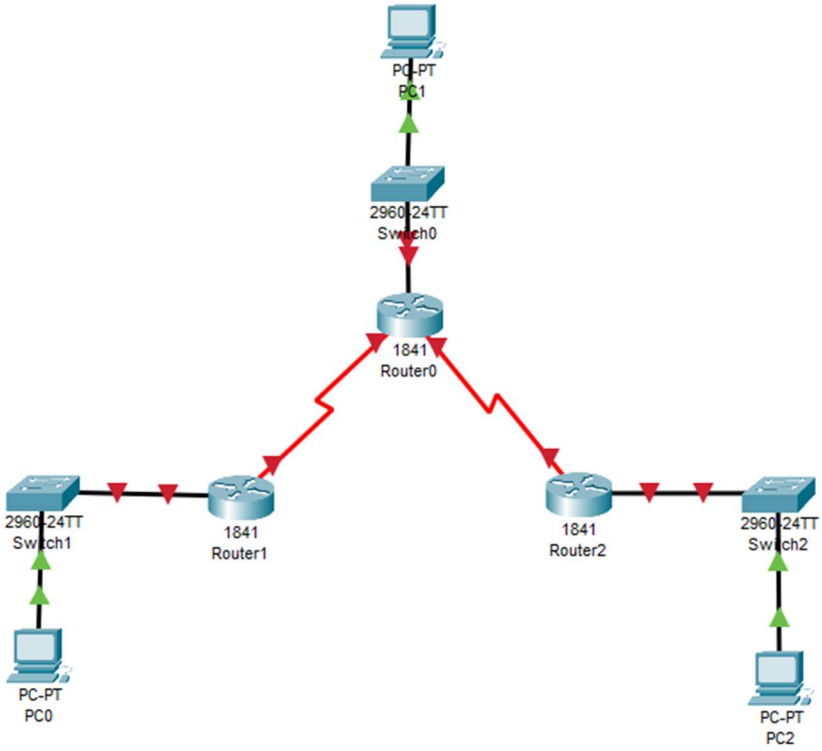
Lab 8 Networking



Basic configurations:

I did the same for rest of the routers

```
Router>enable
Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname R1
R1(config)#no ip domain-lookup
R1(config)#enable secret password
R1(config)#banner motd # Unauthorized access is prohibited! #
R1(config)#line console 0
R1(config-line)#password cisco
R1(config-line)#login
R1(config-line)#exit
R1(config)#line vty 0 4
R1(config-line)#password cisco
R1(config-line)#login
R1(config-line)#exit
R1(config)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#write memory
Building configuration...
[OK]
R1#
```

Configure serial and fast ethernet:

Same for rest of the routers and pcs

```
 Unauthorized access is prohibited!

User Access Verification

Password:

R1>enable
Password:
Password:
R1#shov ip interface brief
Interface              IP-Address      OK? Method Status                Protocol

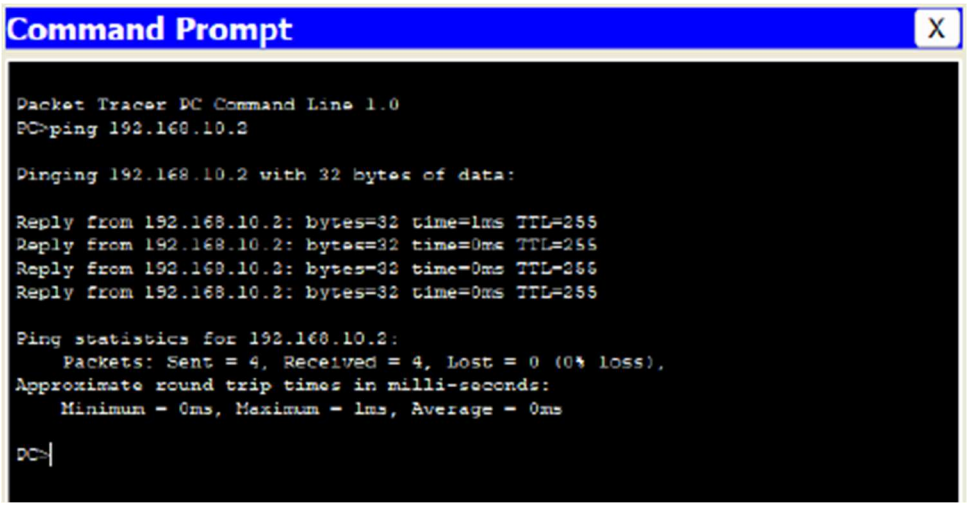
FastEthernet0/0        172.16.1.17     YES manual up                    up

FastEthernet0/1        unassigned      YES unset  administratively down down

Serial0/0/0            192.168.10.1    YES manual up                    up

Serial0/0/1            192.168.10.5    YES manual up                    up

Vlan1                  unassigned      YES unset  administratively down down
R1#
```



Configure OSPF on the routers:

```
 Unauthorized access is prohibited!

User Access Verification

Password:

R1>enable
Password:
R1#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#network 172.16.1.16 0.0.0.15 area 0
R1(config-router)#network 192.168.10.0 0.0.0.3 area 0
R1(config-router)#network 192.168.10.4 0.0.0.3 area 0
R1(config-router)#end
R1#
```

```
R2>enable
Password:
R2#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#network 10.10.10.0 0.0.0.255 area 0
R2(config-router)#network 192.168.10.0 0.0.0.3 area 0
R2(config-router)#
01:07:13: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.5 on Serial0/0/0 from LOADING
to FULL, Loading Done

R2(config-router)#network 192.168.10.8 0.0.0.3 area 0
R2(config-router)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console

R2#write memory
Building configuration...
[OK]
R2#
```

```
R3>enable
Password:
R3#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router ospf 1
R3(config-router)#network 172.16.1.32 0.0.0.7 area 0
R3(config-router)#network 192.168.10.4 0.0.0.3 area 0
R3(config-router)#
01:11:56: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.5 on Serial0/0/0 from LOADING
to FULL, Loading Done

R3(config-router)#network 192.168.10.8 0.0.0.3 area 0
R3(config-router)#
01:13:13: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.9 on Serial0/0/1 from LOADING
to FULL, Loading Done

R3(config-router)#end
R3#
%SYS-5-CONFIG_I: Configured from console by console

R3#write memory
Building configuration...
[OK]
R3#show ip ospf neighbor
```

Configure OSPF Router IDs:

```
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 192.168.10.6
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.16.1.16 0.0.0.15 area 0
    192.168.10.0 0.0.0.3 area 0
    192.168.10.4 0.0.0.3 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.10.5         110      00:07:10
    192.168.10.9         110      00:05:54
    192.168.10.10        110      00:05:54
  Distance: (default is 110)

R1#interface loopback 0
          ^
% Invalid input detected at '^' marker.

R1#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface loopback 0

R1(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

R1(config-if)#ip address 10.1.1.1 255.255.255.255
R1(config-if)#
```

```
Password:

R2>enable
Password:
R2#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#interface loopback 0

R2(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

R2(config-if)#ip address 10.2.2.2 255.255.255.255
R2(config-if)#
```

```
R3>enable
Password:
R3#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#interface loopback 0

R3(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

R3(config-if)#ip address 10.3.3.3 255.255.255.255
R3(config-if)#
R3(config-if)#exit
R3(config)#interface FastEthernet0/0
```

After this I reloaded the routers to force the new Router IDs to be used.

```
R1#show ip ospf neighbor


Neighbor ID     Pri   State           Dead Time   Address         Interface
10.3.3.3          0   FULL/  -        00:00:32    192.168.10.6    Serial0/0/1
10.2.2.2          0   FULL/  -        00:00:32    192.168.10.2    Serial0/0/0
R1#
```

```
R2>enable
Password:
R2#show ip ospf neighbor


Neighbor ID     Pri   State           Dead Time   Address         Interface
10.3.3.3          0   FULL/  -        00:00:37    192.168.10.10   Serial0/0/1
10.1.1.1          0   FULL/  -        00:00:30    192.168.10.1    Serial0/0/0
R2#
```

```
R3>enable
Password:
R3#show ip ospf neighbor


Neighbor ID     Pri   State           Dead Time   Address         Interface
10.2.2.2          0   FULL/  -        00:00:37    192.168.10.9    Serial0/0/1
10.1.1.1          0   FULL/  -        00:00:31    192.168.10.5    Serial0/0/0
R3#
```

router-id command to change the router ID on the R1 router:

```
R1#clear ip ospf process
Reset ALL OSPF processes? [no]: yes

R1#
00:09:02: %OSPF-5-ADJCHG: Process 1, Nbr 10.3.3.3 on Serial0/0/1 from FULL to
DOWN, Neighbor Down: Adjacency forced to reset

00:09:02: %OSPF-5-ADJCHG: Process 1, Nbr 10.3.3.3 on Serial0/0/1 from FULL to
DOWN, Neighbor Down: Interface down or detached

00:09:02: %OSPF-5-ADJCHG: Process 1, Nbr 10.2.2.2 on Serial0/0/0 from FULL to
DOWN, Neighbor Down: Adjacency forced to reset

00:09:02: %OSPF-5-ADJCHG: Process 1, Nbr 10.2.2.2 on Serial0/0/0 from FULL to
DOWN, Neighbor Down: Interface down or detached

R1#
00:09:10: %OSPF-5-ADJCHG: Process 1, Nbr 10.3.3.3 on Serial0/0/1 from LOADING to
FULL, Loading Done
```

After this I removed the configured router ID with the no form of the router-id command and Restart the OSPF process using the clear ip ospf process command.

```
R1#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#no router-id 10.4.4.4
R1(config-router)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#clear ip ospf process
Reset ALL OSPF processes? [no]: yes

R1#
00:14:28: %OSPF-5-ADJCHG: Process 1, Nbr 10.3.3.3 on Serial0/0/1 from FULL to
DOWN, Neighbor Down: Adjacency forced to reset

00:14:28: %OSPF-5-ADJCHG: Process 1, Nbr 10.3.3.3 on Serial0/0/1 from FULL to
DOWN, Neighbor Down: Interface down or detached

00:14:28: %OSPF-5-ADJCHG: Process 1, Nbr 10.2.2.2 on Serial0/0/0 from FULL to
DOWN, Neighbor Down: Adjacency forced to reset

00:14:28: %OSPF-5-ADJCHG: Process 1, Nbr 10.2.2.2 on Serial0/0/0 from FULL to
DOWN, Neighbor Down: Interface down or detached

00:14:29: %OSPF-5-ADJCHG: Process 1, Nbr 10.3.3.3 on Serial0/0/1 from LOADING to
FULL, Loading Done

00:14:36: %OSPF-5-ADJCHG: Process 1, Nbr 10.2.2.2 on Serial0/0/0 from LOADING to
FULL, Loading Done
```

Examine OSPF Routes in the Routing Tables:

```
R1# show ip route
Codes: C - connected, S - static, I - IGRP, 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

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.1.1.1/32 is directly connected, Loopback0
O       10.10.10.0/24 [110/65] via 192.168.10.2, 00:07:17, Serial0/0/0
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.1.16/28 is directly connected, FastEthernet0/0
O       172.16.1.32/29 [110/65] via 192.168.10.6, 00:21:38, Serial0/0/1
     192.168.10.0/30 is subnetted, 3 subnets
C       192.168.10.0 is directly connected, Serial0/0/0
C       192.168.10.4 is directly connected, Serial0/0/1
O       192.168.10.8 [110/128] via 192.168.10.2, 00:07:17, Serial0/0/0
                     [110/128] via 192.168.10.6, 00:07:17, Serial0/0/1
R1#
```

Changing bandwidth:

```
     DCD=up  DSR=up  DTR=up  RTS=up  CTS=up
R1#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface serial0/0/0
R1(config-if)#bandwidth 64
R1(config-if)#interface serial0/0/1
R1(config-if)#bandwidth 64
R1(config-if)#
```

```
R2>enable
Password:
Password:
R2#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#interface serial0/0/0
R2(config-if)#bandwidth 64
R2(config-if)#interface serial0/0/1
R2(config-if)#bandwidth 64
R2(config-if)#
R2(config-if)#
```

Verifying:

```
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
  Internet address is 192.168.10.1/30, Area 0
  Process ID 1, Router ID 10.4.4.4, Network Type POINT-TO-POINT, Cost: 1562
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:06
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 10.2.2.2
  Suppress hello for 0 neighbor(s)
Serial0/0/1 is up, line protocol is up
  Internet address is 192.168.10.5/30, Area 0
  Process ID 1, Router ID 10.4.4.4, Network Type POINT-TO-POINT, Cost: 1562
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:07
  Index 3/3, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
```

```
  Designated Router (ID) 10.3.3.3, Interface address 172.16.1.33
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:01
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Serial0/0/1 is up, line protocol is up
  Internet address is 192.168.10.10/30, Area 0
  Process ID 1, Router ID 10.3.3.3, Network Type POINT-TO-POINT, Cost: 1562
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:00
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1 , Adjacent neighbor count is 1
    Adjacent with neighbor 10.2.2.2
  Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
  Internet address is 192.168.10.6/30, Area 0
  Process ID 1, Router ID 10.3.3.3, Network Type POINT-TO-POINT, Cost: 1562
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
```

```
R3#
R3#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#interface serial0/0/0
R3(config-if)#ip ospf cost 1562
R3(config-if)#interface serial0/0/1
R3(config-if)#ip ospf cost 1562
R3(config-if)#end
R3#
%SYS-5-CONFIG_I: Configured from console by console
```

Redistribute an OSPF Default Route:

```
R1(config)#interface loopback1

R1(config-if)#
%LINK-5-CHANGED: Interface Loopback1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback1, changed state to up

R1(config-if)#ip route 0.0.0.0.0.0.0.0 loopback1
                 ^
% Invalid input detected at '^' marker.

R1(config-if)#ip address 172.30.1.1.255.255.255.252
                         ^
% Invalid input detected at '^' marker.

R1(config-if)#ip address 172.30.1.1 255.255.255.252
R1(config-if)#ip route 0.0.0.0 0.0.0.0 loopback1
R1(config)#
R1(config)#router ospf 1
R1(config-router)#default-information originate
R1(config-router)#
```

```
R2#show ip route
Codes: C - connected, S - static, I - IGRP, 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 192.168.10.1 to network 0.0.0.0

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.2.2.2/32 is directly connected, Loopback0
C       10.10.10.0/24 is directly connected, FastEthernet0/0
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
O       172.16.1.16/28 [110/1563] via 192.168.10.1, 00:19:16, Serial0/0/0
O       172.16.1.32/29 [110/1563] via 192.168.10.10, 00:19:16, Serial0/0/1
     192.168.10.0/30 is subnetted, 3 subnets
C       192.168.10.0 is directly connected, Serial0/0/0
O       192.168.10.4 [110/3124] via 192.168.10.10, 00:10:40, Serial0/0/1
                     [110/3124] via 192.168.10.1, 00:10:40, Serial0/0/0
C       192.168.10.8 is directly connected, Serial0/0/1
O*E2 0.0.0.0/0 [110/1] via 192.168.10.1, 00:02:43, Serial0/0/0
R2#
```

Additional OSPF Features:

```
R1(config-router)#default-information originate
R1(config-router)#auto-cost reference-bandwidth 10000
% OSPF: Reference bandwidth is changed.
        Please ensure reference bandwidth is consistent across all routers.
R1(config-router)#S
```

```
R2#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#auto-cost reference-bandwidth 10000
% OSPF: Reference bandwidth is changed.
        Please ensure reference bandwidth is consistent across all routers.
R2(config-router)#
```

```
R3#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router ospf 1
R3(config-router)#auto-cost reference-bandwidth 10000
% OSPF: Reference bandwidth is changed.
        Please ensure reference bandwidth is consistent across all routers.
R3(config-router)#
```

```
S*   0.0.0.0/0 is directly connected, Loopback1
R1#show ip ospf neighbor


Neighbor ID     Pri   State           Dead Time   Address         Interface
10.3.3.3          0   FULL/  -        00:00:33    192.168.10.6    Serial0/0/1
10.2.2.2          0   FULL/  -        00:00:33    192.168.10.2    Serial0/0/0
R1#
```

```
10.2.2.2          0   FULL/  -        00:00:33    192.168.10.2    Serial0/0/0
R1#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface serial0/0/0
R1(config-if)#ip ospf hello-interval 5
R1(config-if)#ip ospf dead-interval 20
R1(config-if)#
01:06:43: %OSPF-5-ADJCHG: Process 1, Nbr 10.2.2.2 on Serial0/0/0 from FULL to
DOWN, Neighbor Down: Dead timer expired

01:06:43: %OSPF-5-ADJCHG: Process 1, Nbr 10.2.2.2 on Serial0/0/0 from FULL to
DOWN, Neighbor Down: Interface down or detached
```

```
R2#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#interface serial0/0/0
R2(config-if)#ip ospf hello-internal 5
                                 ^
% Invalid input detected at '^' marker.

R2(config-if)#ip ospf hello-interval 5
R2(config-if)#ip ospf dead-interval 20
R2(config-if)#
01:45:20: %OSPF-5-ADJCHG: Process 1, Nbr 10.4.4.4 on Serial0/0/0 from LOADING to
FULL, Loading Done
```

Cleaning:

```
R1#write erase
Erasing the nvram filesystem will remove all configuration files! Continue?
[confirm]y[OK]
Erase of nvram: complete
%SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
R1#reload
Proceed with reload? [confirm]ySystem Bootstrap, Version 12.3(8r)T8, RELEASE
SOFTWARE (fc1)
Initializing memory for ECC
..
c2811 processor with 524288 Kbytes of main memory
Main memory is configured to 64 bit mode with ECC enabled

Readonly ROMMON initialized

Self decompressing the image :
################################################################################ [OK]
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