**Exercise 3**

**(OSPF Protocol)**

 (**OSPF**) is a link-state routing protocol for Internet Protocol (IP) networks. It uses a link state routing algorithm and falls into the group of interior routing protocols, operating within a single autonomous system (AS).

OSPF is perhaps the most widely used interior gateway protocol (IGP) in large enterprise networks. IS-IS, another link-state dynamic routing protocol, is more common in large service provider networks. The most widely used exterior gateway protocol is the Border Gateway Protocol (BGP), the principal routing protocol between autonomous systems on the Internet.

Configuring OSPF is slightly different from configuring RIP. When configuring OSPF, use the following syntax:

Router(config)# router ospf process\_ID

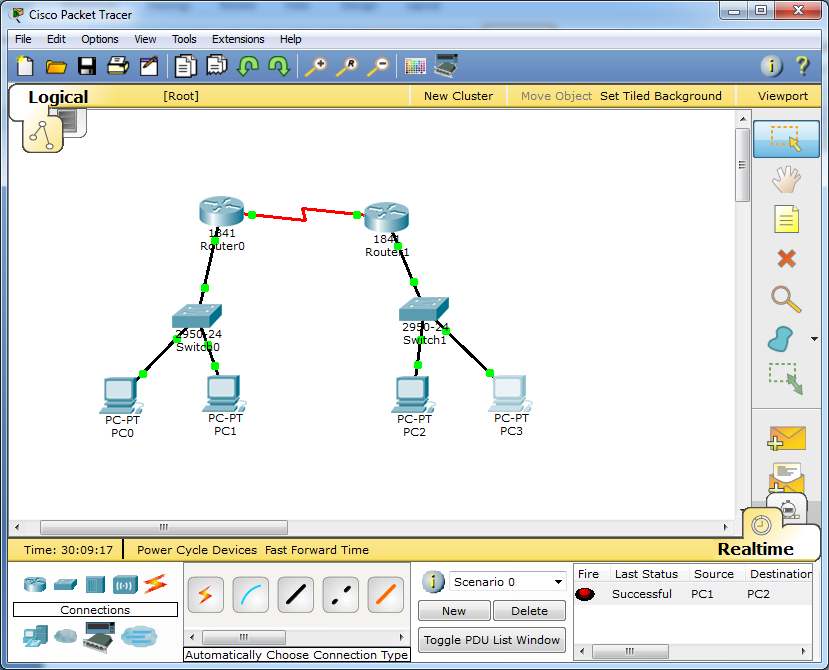
Router(config-router)# network IP\_address wildcard\_mask area area\_#

**wildcard\_mask:**

* is the opposite/inverse of the subnet mask
* It is obtained by replacing every 1 in the subnet mask with 0 and every 0 with 1.

**Examples:**

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| **Subnet mask** | **Wildcard mask** |
| **/8 = 255.0.0.0 = 11111111.00000000.00000000.00000000** | **0.255.255.255 = 00000000.11111111.11111111.11111111** |
| **/17=255.255.128.0=11111111.11111111.10000000.00000000** | **0.0.127.255 =00000000.00000000.01111111.1111111** |

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| **Device** | **Interface** | **IP Address** | **Subnet Mask** | **Default Gateway** |
| **R0** | **Fa0/0** | 10.0.0.1 | /8 | N/A |
| **S0/0/0** | 20.0.0.1 | /8 | N/A |
| **R1** | **Fa0/0** | 30.0.0.1 | /8 | N/A |
| **S0/0/0** | 20.0.0.2 | /8 | N/A |
| **PC0** | **NIC** | 10.0.0.2 | /8 | 10.0.0.1 |
| **PC1** | **NIC** | 10.0.0.3 | /8 | 10.0.0.1 |
| **PC2** | **NIC** | 30.0.0.2 | /8 | 30.0.0.1 |
| **PC3** | **NIC** | 30.0.0.3 | /8 | 30.0.0.1 |

**OSPF Protocol**

1. Draw the network and configure the nodes with the addresses.

**NOTE: Don't forget to set the clock rate at both routers!**

1. Fire a ping command from PC1 to PC3(Connected/Disconnected)
2. Fire a tracert command from PC1 to PC3

PC> tracert xxx.xxx.xxx.xxx

1. Apply the OSPF protocol on the routers as follows for router 0 then apply the same commands to router1 but replace the network address part:

Router(config)#router ospf 1

Router(config-router)#network 10.0.0.0 0.255.255.255 area 0

Router(config-router)#network 20.0.0.0 0.255.255.255 area 0

1. Fire again a ping command from PC1 to PC3(Connected/Disconnected)
2. Fire again tracert command from PC1 to PC.
3. To test the OSPF routing apply the following commands to both routers:
   1. Router#show ip route
   2. Router#show ip protocol

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| **Commands** | **Descriptions** |
| show ip route | Displays the full IP routing table |
| Router(config)#router ospf 1 | Starts OSPF process 1. The process ID is any positive integer value between 1 and 65,535. |
| Router(config-router)#network 172.16.0.0 0.0.255.255 area 0 | OSPF advertises interfaces, not networks. Uses the wildcard mask to determine which interfaces to advertise. |
| Router(config-if)#ip ospf hellointerval timer 20 | Changes the Hello Interval timer to 20 seconds. |
| Router(config-if)#ip ospf deadinterval 80 | Changes the Dead Interval timer to 80 seconds. |
| NOTE: Hello and Dead Interval timers must match for routers to become neighbors | |
| Router#show ip protocol | Displays parameters for all protocols running on the router |
| Router#show ip route | Displays a complete IP routing table |
| Router#show ip ospf | Displays basic information about OSPF routing processes |
| Router#show ip ospf interface | Displays OSPF info as it relates to all interfaces |
| Router#show ip ospf interface fastethernet 0/0 | Displays OSPF information for interface fastethernet 0/0 |