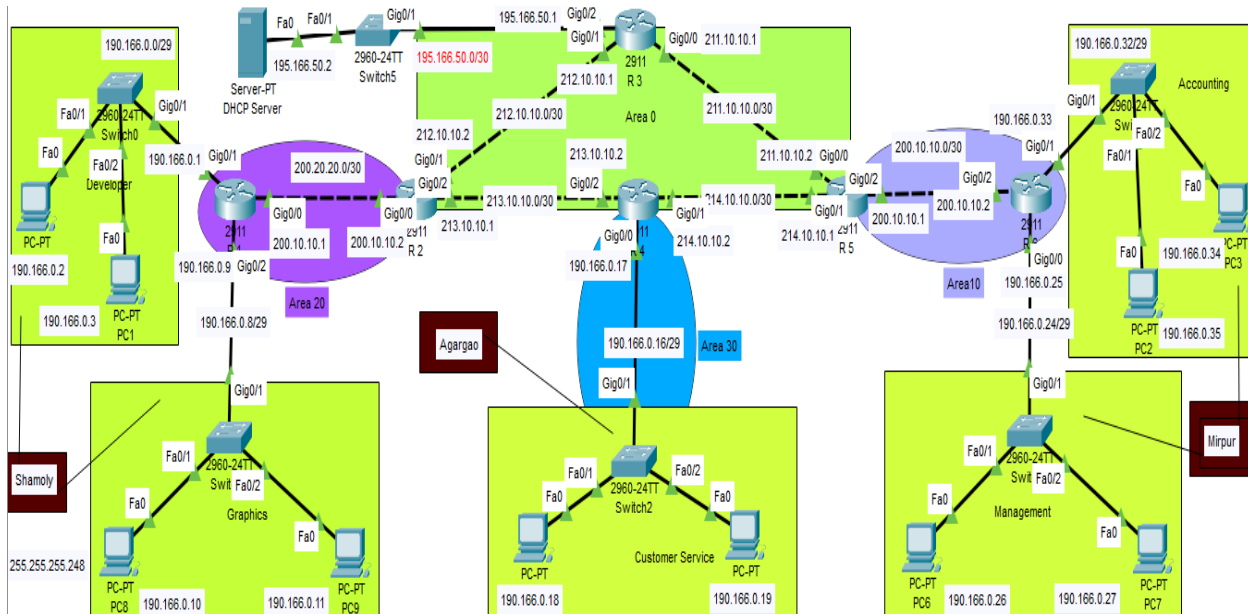


Multi-Area OSPF Network Design and Implementation with DHCP Services

Configuration Summary



For 190.166.0.0/29:

- The /29 means the subnet mask is 255.255.255.248.
- In the last part of the IP address, the 248 mask means addresses go in blocks of $256 - 248 = 8$.
- **Total IP addresses in this network: 8**
- **Usable IP addresses for devices: 6** (subtracting the network address and broadcast address)

Since the subnet mask 255.255.255.248 results in blocks of 8 addresses, your network addresses will increment by 8 in the last part of the IP address.

Starting from 190.166.0.0:

- **Network 1:**
 - Network Address: 190.166.0.0
 - Usable Range: 190.166.0.1 - 190.166.0.6
 - Broadcast Address: 190.166.0.7
- **Network 2:**
 - Network Address: 190.166.0.8
 - Usable Range: 190.166.0.9 - 190.166.0.14
 - Broadcast Address: 190.166.0.15
- **Network 3:**
 - Network Address: 190.166.0.16
 - Usable Range: 190.166.0.17 - 190.166.0.22

- Broadcast Address: 190.166.0.23
- **Network 4:**
 - Network Address: 190.166.0.24
 - Usable Range: 190.166.0.25 - 190.166.0.30
 - Broadcast Address: 190.166.0.31
- **Network 5:**
 - Network Address: 190.166.0.32
 - Usable Range: 190.166.0.33 - 190.166.0.38
 - Broadcast Address: 190.166.0.39

...and so on.

The pattern continues by adding 8 to the last number of the previous network address.

The network addresses will always be multiples of 8 in the last octet (e.g., 0, 8, 16, 24, 32, 40, ..., 248). The broadcast address for each network will always be one less than the next network address.

```
=====
Router1 Configuration
=====
```

```
Router>enable
Router#configure terminal
Router(config)#hostname R1
R1(config)#no ip domain-lookup
R1(config)#line console 0
R1(config-line)#exec-timeout 0
R1(config-line)#exit

R1(config)#interface gigabitEthernet 0/1
R1(config-if)#ip address 190.166.0.1 255.255.255.248
R1(config-if)#ip helper-address 195.166.50.2
R1(config-if)#no shutdown
R1(config-if)#exit

R1(config)#interface gigabitEthernet 0/0
R1(config-if)#ip address 200.10.10.1 255.255.255.252
R1(config-if)#no shutdown
R1(config-if)#exit

R1(config)#interface gigabitEthernet 0/2
R1(config-if)#ip address 190.166.0.8 255.255.255.248
R1(config-if)#ip helper-address 195.166.50.2
R1(config-if)#no shutdown
R1(config-if)#end
R1#write
```

```
R1#configure terminal
R1(config)#router ospf 1
R1(config-router)#router-id 1.1.1.1
R1(config-router)#network 190.166.0.0 0.0.0.7 area 20
R1(config-router)#network 190.166.0.8 0.0.0.7 area 20
R1(config-router)#network 200.10.10.0 0.0.0.3 area 20
R1(config-router)#end
R1#write
```

Router2 Configuration

```
Router>enable
Router#configure terminal
Router(config)#hostname R2
R2(config)#no ip domain-lookup
R2(config)#line console 0
R2(config-line)#exec-timeout 0
R2(config-line)#exit

R2(config)#interface gigabitEthernet 0/1
R2(config-if)#ip address 212.10.10.2 255.255.255.252
R2(config-if)#no shutdown
R2(config-if)#exit

R2(config)#interface gigabitEthernet 0/0
R2(config-if)#ip address 200.10.10.2 255.255.255.252
R2(config-if)#no shutdown
R2(config-if)#exit

R2(config)#interface gigabitEthernet 0/2
R2(config-if)#ip address 213.10.10.1 255.255.255.252
R2(config-if)#no shutdown
R2(config-if)#end
R2#write

R2#configure terminal
R2(config)#router ospf 2
R2(config-router)#router-id 2.2.2.2
R2(config-router)#network 212.10.10.0 0.0.0.3 area 0
R2(config-router)#network 213.10.10.0 0.0.0.3 area 0
R2(config-router)#network 200.10.10.0 0.0.0.3 area 20
R2(config-router)#end
R2#write
```

```
=====
Router3 Configuration
=====
```

```
Router>enable
Router#configure terminal
Router(config)#hostname R3
R3(config)#no ip domain-lookup
R3(config)#line console 0
R3(config-line)#exec-timeout 0
R3(config-line)#exit

R3(config)#interface gigabitEthernet 0/1
R3(config-if)#ip address 212.10.10.1 255.255.255.252
R3(config-if)#no shutdown
R3(config-if)#exit

R3(config)#interface gigabitEthernet 0/0
R3(config-if)#ip address 211.10.10.1 255.255.255.252
R3(config-if)#no shutdown
R3(config-if)#exit

R3(config)#interface gigabitEthernet 0/2
R3(config-if)#ip address 195.166.50.1 255.255.255.252
R3(config-if)#no shutdown
R3(config-if)#end
R3#write

R3#configure terminal
R3(config)#router ospf 3
R3(config-router)#router-id 3.3.3.3
R3(config-router)#network 212.10.10.0 0.0.0.3 area 0
R3(config-router)#network 195.166.50.0 0.0.0.3 area 0
R3(config-router)#network 211.10.10.0 0.0.0.3 area 0
R3(config-router)#end
R3#write
```

```
=====
Router4 Configuration
=====
```

```
Router>enable
Router#configure terminal
Router(config)#hostname R4
R4(config)#no ip domain-lookup
R4(config)#line console 0
R4(config-line)#exec-timeout 0
R4(config-line)#exit
```

```
R4(config)#interface gigabitEthernet 0/1
R4(config-if)#ip address 214.10.10.2 255.255.255.252
R4(config-if)#no shutdown
R4(config-if)#exit
```

```
R4(config)#interface gigabitEthernet 0/2
R4(config-if)#ip address 213.10.10.2 255.255.255.252
R4(config-if)#no shutdown
R4(config-if)#exit
```

```
R4(config)#interface gigabitEthernet 0/0
R4(config-if)#ip address 190.166.0.17 255.255.255.248
R4(config-if)#ip helper-address 195.166.50.2
R4(config-if)#no shutdown
R4(config-if)#end
R4#write
```

```
R4#configure terminal
R4(config)#router ospf 4
R4(config-router)#router-id 4.4.4.4
R4(config-router)#network 190.166.0.16 0.0.0.7 area 30
R4(config-router)#network 213.10.10.0 0.0.0.3 area 0
R4(config-router)#network 214.10.10.0 0.0.0.3 area 0
R4(config-router)#end
R4#write
```

=====

Router5 Configuration

=====

```
Router>enable
Router#configure terminal
Router(config)#hostname R5
R5(config)#no ip domain-lookup
R5(config)#line console 0
R5(config-line)#exec-timeout 0
R5(config-line)#exit
```

```
R5(config)#interface gigabitEthernet 0/1
R5(config-if)#ip address 214.10.10.1 255.255.255.252
R5(config-if)#no shutdown
R5(config-if)#exit
```

```
R5(config)#interface gigabitEthernet 0/0
R5(config-if)#ip address 211.10.10.2 255.255.255.252
R5(config-if)#no shutdown
```

```
R5(config-if)#exit
```

```
R5(config)#interface gigabitEthernet 0/2
R5(config-if)#ip address 200.10.10.1 255.255.255.252
R5(config-if)#no shutdown
R5(config-if)#end
R5#write
```

```
R5#configure terminal
R5(config)#router ospf 5
R5(config-router)#router-id 5.5.5.5
R5(config-router)#network 211.10.10.0 0.0.0.3 area 0
R5(config-router)#network 200.10.10.0 0.0.0.3 area 10
R5(config-router)#network 214.10.10.0 0.0.0.3 area 0
R5(config-router)#end
R5#write
```

```
=====
Router6 Configuration
=====
```

```
Router>enable
Router#configure terminal
Router(config)#hostname R6
R6(config)#no ip domain-lookup
R6(config)#line console 0
R6(config-line)#exec-timeout 0
R6(config-line)#exit
```

```
R6(config)#interface gigabitEthernet 0/1
R6(config-if)#ip address 190.166.0.33 255.255.255.248
R6(config-if)#ip helper-address 195.166.50.2
R6(config-if)#no shutdown
R6(config-if)#exit
```

```
R6(config)#interface gigabitEthernet 0/0
R6(config-if)#ip address 190.166.0.25 255.255.255.248
R6(config-if)#ip helper-address 195.166.50.2
R6(config-if)#no shutdown
R6(config-if)#exit
```

```
R6(config)#interface gigabitEthernet 0/2
R6(config-if)#ip address 200.10.10.2 255.255.255.252
R6(config-if)#no shutdown
R6(config-if)#end
R6#write
```

```
R6#configure terminal
R6(config)#router ospf 6
R6(config-router)#router-id 6.6.6.6
R6(config-router)#network 190.166.0.32 0.0.0.7 area 10
R6(config-router)#network 200.10.10.0 0.0.0.3 area 10
R6(config-router)#network 190.166.0.24 0.0.0.7 area 10
R6(config-router)#end
R6#write
```

DHCP Services Configuration

A DHCP server pool is like a pre-configured package of network information that a DHCP server hands out to devices needing an IP address.

It defines:

- **The network range** (e.g., 192.168.1.0 with a specific size) from which IP addresses will be assigned.
- **The default gateway** (your router's IP address) that clients should use to reach other networks.
- **DNS server addresses** that clients will use to resolve domain names (like website addresses) into IP addresses.
- Optionally, a **domain name** for the clients.
- Optionally, a **lease duration**, which determines how long a client can keep its assigned IP address before needing to renew it.

Before creating the pool, you typically tell the server which specific IP addresses within that range *not* to hand out dynamically.

DHCP Server

Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP**
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management
- Radius EAP

DHCP

Interface: FastEthernet0 Service: ☒ On ☐ Off

Pool Name: serverPool

Default Gateway: 0.0.0.0

DNS Server: 0.0.0.0

Start IP Address: 195 166 50 0

Subnet Mask: 255 255 255 252

Maximum Number of Users: 3

TFTP Server: 0.0.0.0

WLC Address: 0.0.0.0

Add Save Remove

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
Graphics	190.166.0.9	8.8.8.8	190.166.0.8	255.255.255.248	7	0.0.0.0	0.0.0.0
Customer Service	190.166.0.17	8.8.8.8	190.166.0.16	255.255.255.248	7	0.0.0.0	0.0.0.0
Management	190.166.0.25	8.8.8.8	190.166.0.24	255.255.255.248	7	0.0.0.0	0.0.0.0
Accounting	190.166.0.33	8.8.8.8	190.166.0.32	255.255.255.248	7	0.0.0.0	0.0.0.0
Developer	190.166.0.1	8.8.8.8	190.166.0.0	255.255.255.248	7	0.0.0.0	0.0.0.0
serverPool	0.0.0.0	0.0.0.0	195.166.50.0	255.255.255.252	3	0.0.0.0	0.0.0.0

Configuration Summary

This document provides a concise summary of the configuration commands applied to each router (R1 through R6) in your network topology. The configurations primarily cover basic router setup, interface IP addressing, OSPF routing protocol implementation (multi-area), and DHCP Relay Agent setup.

Router1 (R1) Configuration Summary

- **Hostname:** R1
- **Basic Setup:** Disabled ip domain-lookup, configured console line timeout to 0.
- **Interface Configuration:**
 - GigabitEthernet 0/1: IP 190.166.0.1 255.255.255.248 (Connected to Developers segment)
 - GigabitEthernet 0/0: IP 200.10.10.1 255.255.255.252 (Link to R2)
 - GigabitEthernet 0/2: IP 190.166.0.8 255.255.255.248 (Connected to Agaras segment)
- **OSPF Configuration (Process 1):**
 - router-id 1.1.1.1
 - Advertised networks 190.166.0.0/29, 190.166.0.8/29, and 200.10.10.0/30 into **Area 20**.
- **DHCP Relay Agent:**
 - ip helper-address 195.166.50.2 (This command needs to be applied *per interface* where clients reside and need DHCP services. The summary assumes it's intended

for the client-facing interfaces like Gig0/1 and Gig0/2, but the provided snippet shows it globally. In practice, it should be on interface gigabitEthernet 0/1 and interface gigabitEthernet 0/2.)

Router2 (R2) Configuration Summary

- **Hostname:** R2
- **Basic Setup:** Disabled ip domain-lookup, configured console line timeout to 0.
- **Interface Configuration:**
 - GigabitEthernet 0/1: IP 212.10.10.2 255.255.255.252 (Link to R3)
 - GigabitEthernet 0/0: IP 200.10.10.2 255.255.255.252 (Link to R1)
 - GigabitEthernet 0/2: IP 213.10.10.1 255.255.255.252 (Link to R4)
- **OSPF Configuration (Process 2):**
 - router-id 2.2.2.2
 - Advertised networks 212.10.10.0/30 and 213.10.10.0/30 into **Area 0** (Backbone).
 - Advertised network 200.10.10.0/30 into **Area 20**.
 - **Role:** Acts as an **Area Border Router (ABR)** connecting Area 20 to Area 0.

Router3 (R3) Configuration Summary

- **Hostname:** R3
- **Basic Setup:** Disabled ip domain-lookup, configured console line timeout to 0.
- **Interface Configuration:**
 - GigabitEthernet 0/1: IP 212.10.10.1 255.255.255.252 (Link to R2)
 - GigabitEthernet 0/0: IP 211.10.10.1 255.255.255.252 (Link to R5)
 - GigabitEthernet 0/2: IP 195.166.50.1 255.255.255.252 (Connected to DHCP Server segment)
- **OSPF Configuration (Process 3):**
 - router-id 3.3.3.3
 - Advertised networks 212.10.10.0/30, 195.166.50.0/30, and 211.10.10.0/30 into **Area 0**.

Router4 (R4) Configuration Summary

- **Hostname:** R4
- **Basic Setup:** Disabled ip domain-lookup, configured console line timeout to 0.
- **Interface Configuration:**
 - GigabitEthernet 0/1: IP 214.10.10.2 255.255.255.252 (Link to R5)
 - GigabitEthernet 0/0: IP 213.10.10.2 255.255.255.252 (Link to R2)
 - GigabitEthernet 0/2: IP 190.166.0.17 255.255.255.248 (Connected to Customer Service segment)
- **OSPF Configuration (Process 4):**
 - router-id 4.4.4.4
 - Advertised network 190.166.0.16/29 into **Area 30**.

- Advertised networks 213.10.10.0/30 and 214.10.10.0/30 into **Area 0**.
- **Role:** Acts as an **Area Border Router (ABR)** connecting Area 30 to Area 0.
- **DHCP Relay Agent:**
- ip helper-address 195.166.50.2 (Similar to R1, this needs to be applied per client-facing interface, e.g., interface gigabitEthernet 0/2.)

Router5 (R5) Configuration Summary

- **Hostname:** R5
- **Basic Setup:** Disabled ip domain-lookup, configured console line timeout to 0.
- **Interface Configuration:**
- GigabitEthernet 0/1: IP 214.10.10.1 255.255.255.252 (Link to R4)
- GigabitEthernet 0/0: IP 211.10.10.2 255.255.255.252 (Link to R3)
- GigabitEthernet 0/2: IP 200.10.10.1 255.255.255.252 (Link to R6)
- **OSPF Configuration (Process 5):**
- router-id 5.5.5.5
- Advertised networks 211.10.10.0/30 and 214.10.10.0/30 into **Area 0**.
- Advertised network 200.10.10.0/30 into **Area 10**.
- **Role:** Acts as an **Area Border Router (ABR)** connecting Area 10 to Area 0.

Router6 (R6) Configuration Summary

- **Hostname:** R6
- **Basic Setup:** Disabled ip domain-lookup, configured console line timeout to 0.
- **Interface Configuration:**
- GigabitEthernet 0/1: IP 190.166.0.33 255.255.255.248 (Connected to Accounting segment)
- GigabitEthernet 0/0: IP 190.166.0.25 255.255.255.248 (Connected to Mirpur segment)
- GigabitEthernet 0/2: IP 200.10.10.2 255.255.255.252 (Link to R5)
- **OSPF Configuration (Process 6):**
- router-id 6.6.6.6
- Advertised networks 190.166.0.32/29, 200.10.10.0/30, and 190.166.0.24/29 into **Area 10**.
- **DHCP Relay Agent:**
- ip helper-address 195.166.50.2 (Similar to R1 and R4, this needs to be applied per client-facing interface, e.g., interface gigabitEthernet 0/1 and interface gigabitEthernet 0/0.)

Overall Network Configuration:

This setup establishes a robust multi-area OSPF network with Area 0 as the backbone, connecting Area 10, Area 20, and Area 30 via ABRs (R2, R4, R5). A centralized DHCP server at 195.166.50.2 is accessible to client segments in Area 20 (via R1), Area 30 (via R4), and

Area 10 (via R6) through the ip helper-address command configured on their respective client-facing interfaces.