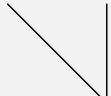


# Network Project

TEAM APEX

이정일  
김민호  
서재권  
임재근



# 목차

01

## 논리적 구성도

- IGP 구성도
- IP 구성도

02

## 물리적 구성도

- 물리적 구성도
- 전제

03

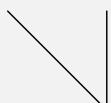
## 설정

- IGP 구성
- OSPF 구성
- 재분배
- OSPF - EIGRP 100
- DHCP
- OSPF AUTHENTICATION

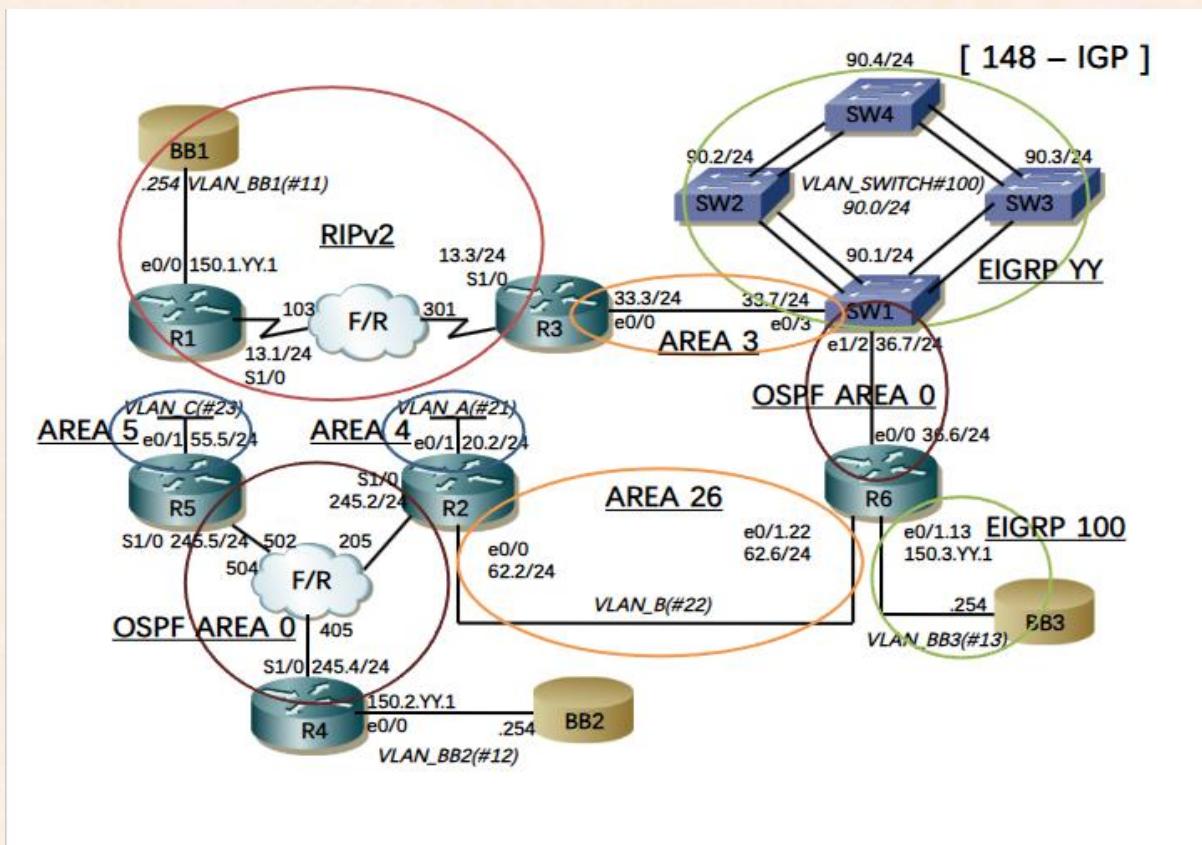
04

## 결과

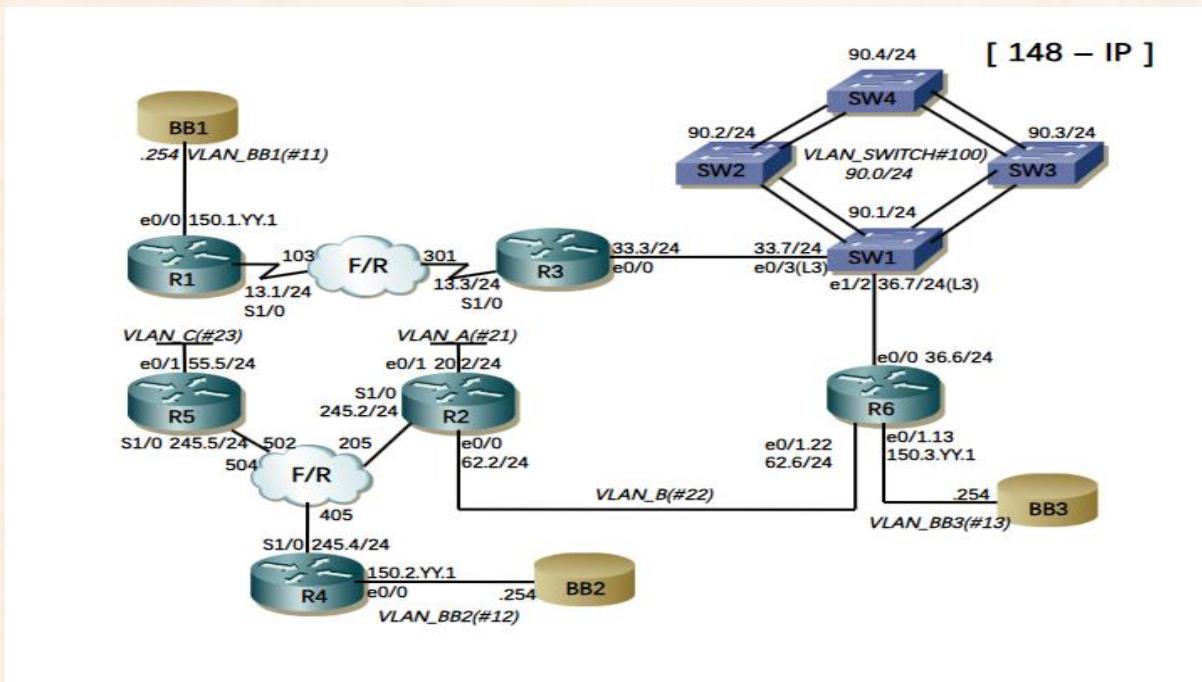
- 프로토콜
- VLAN
- 재분배
- TRUNK
- STP
- DHCP
- ETHERCHANNEL
- OSPF AUTHENTICATION



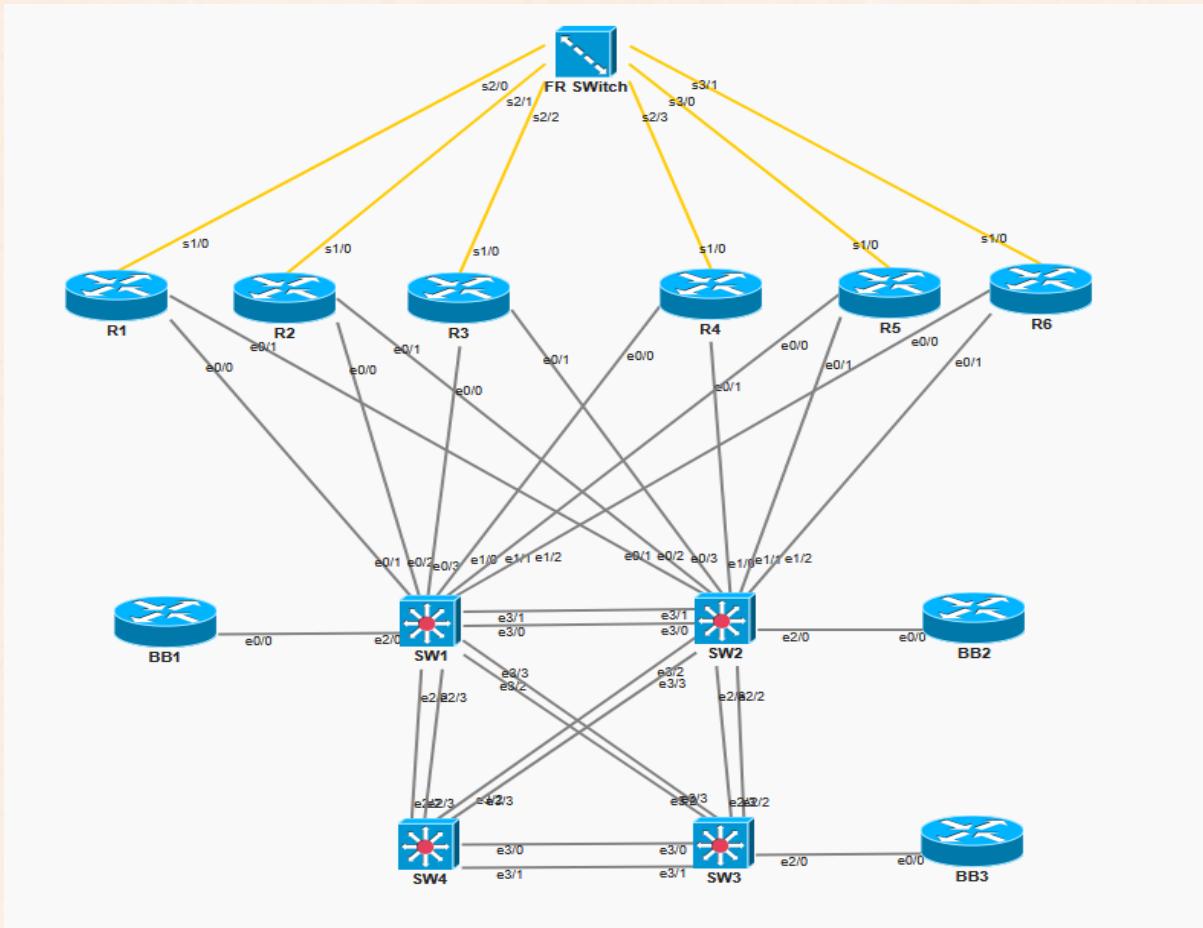
## 148 논리적 구성도 IGP



## 148 논리적 구성도 IP



## 148 물리적 구성도



### 전제

$Y = 14$

VLAN\_CUSTOMER1(CUSTOMER\_A) 50

VLAN\_CUSTOMER2(CUSTOMER\_B) 79

VLAN A 21= 14.14.20.0/24

VLAN B 22= 14.14.62.0/24

VLAN C 23= 14.14.55.0/24

VLAN Switches 100= 14.14.90.0/24

VLAN BB1 11

VLAN BB1 12

VLAN BB3 13

### FR

-R1-R3 = 14.14.13.0/24

-R2-R4-R5 = 14.14.245.0/24

BB1 = 150.1.14.254/24

BB2 = 150.2.14.254/24

BB3 = 150.3.14.254/24

loopback = 14.14.X.X/24 (X=router number)

## 인터페이스 설정 및 세부 설정

- frame relay 구성 후 자기 자신의 ip address로 ping이 되게 설정

```
APEX-R1(config-if)#interface s1/0
APEX-R1(config-if)#encapsulation frame-relay
APEX-R1(config-if)#no frame-relay inverse-arp
APEX-R1(config-if)#no shutdown
APEX-R1(config-if)#interface s1/0.103 point-to-point
APEX-R1(config-subif)#ip address 14.14.13.1 255.255.255.0
APEX-R1(config-subif)#frame-relay interface-dlci 103

APEX-R2(config-if)#interface s1/0
APEX-R2(config-if)#encapsulation frame-relay
APEX-R2(config-if)#no frame-relay inverse-arp
APEX-R2(config-if)#no shutdown
APEX-R2(config-if)#interface s1/0.245 multipoint
APEX-R2(config-subif)#ip address 14.14.245.2 255.255.255.0
APEX-R2(config-subif)#frame-relay map ip 14.14.245.5 205 broadcast
APEX-R2(config-subif)#frame-relay map ip 14.14.245.4 205 broadcast

APEX-R3(config-if)#interface s1/0
APEX-R3(config-if)#encapsulation frame-relay
APEX-R3(config-if)#no frame-relay inverse-arp
APEX-R3(config-if)#no shutdown
APEX-R3(config-if)#interface s1/0.301 point-to-point
APEX-R3(config-subif)#ip address 14.14.13.3 255.255.255.0
APEX-R3(config-subif)#frame-relay interface-dlci 301
APEX-R3(config-fr-dlci)#no shutdown

APEX-R4(config-if)#interface s1/0
APEX-R4(config-if)#encapsulation frame-relay
APEX-R4(config-if)#no frame-relay inverse-arp
APEX-R4(config-if)#ip address 14.14.245.4 255.255.255.0
APEX-R4(config-if)#frame map ip 14.14.245.5 405 broad
APEX-R4(config-if)#frame map ip 14.14.245.2 405 broad
APEX-R4(config-if)#frame map ip 14.14.245.4 405
```

1. vtp version 2 만 사용, password 는 cisco

```
APEX-SW1(config-if-range)#vtp mode transparent
```

```
APEX-SW1(config)#vtp domain apex.com
```

```
APEX-SW1(config)#vtp password cisco
```

```
APEX-SW1(config)#vtp version 2
```

2. R6 – SW2 사이를 Trunk port 로 만들고, 필요한 VLAN 정보만 흘러다니도록 설정

```
APEX-R6(config-if)#interface e0/1
```

```
APEX-R6(config-if)#no shutdown
```

```
APEX-R6(config-if)#interface e0/1.22
```

```
APEX-R6(config-subif)#encapsulation dot1q 22
```

```
APEX-R6(config-subif)#ip address 14.14.62.6 255.255.255.0
```

```
APEX-R6(config-subif)#ip ospf message-digest-key 1 md5 apex
```

```
APEX-R6(config-subif)#interface e0/1.13
```

```
APEX-R6(config-subif)#encapsulation dot1q 13
```

```
APEX-R6(config-subif)#ip address 150.3.14.1 255.255.255.0
```

```
APEX-SW2(config-if)#int e1/2
```

```
APEX-SW2(config-if)#switchport trunk encapsulation dot1q
```

```
APEX-SW2(config-if)#switchport mode trunk
```

```
APEX-SW2(config-if)#switchport trunk allowed vlan 13,22
```

3. vlan 11,21 은 SW1 01 root-swi 가 되어야 하고, vlan 100 은 번호가 높은 스위치 SW4 가 root 가 된다.

```
APEX-SW1(config)# spanning-tree mode mst  
APEX-SW1(config)# spanning-tree mst configuration  
APEX-SW1(config-mst)# revision 1  
APEX-SW1(config-mst)# instance 1 vlan 11,21  
APEX-SW1(config-mst)# instance 2 vlan 100  
  
APEX-SW1(config)# spanning-tree mst 1 root primary  
  
APEX-SW4(config)# spanning-tree mst 2 root primary
```

4. VLAN BB2 를 instance 3 으로 설정하여 SW2 가 root 가 되도록 하라.

```
APEX-SW4(config)# spanning-tree mode mst  
APEX-SW4(config)# spanning-tree mst configuration  
APEX-SW4(config-mst)# instance 3 vlan 12  
  
APEX-SW2(config)# spanning-tree mst 3 root primary
```

5. SW3 에서 BB3 의 MAC 주소 정보를 500 초 동안 보여지게 하라.

```
APEX-SW3(config)#mac address-table aging-time 500 vlan 13
```

6. vlan 100: sw1=14.14.90.1 / sw2=14.14.90.2 / sw3=14.14.90.3 / sw4=14.14.90.4

```
APEX-SW1(config-if)#int vlan 100
```

```
APEX-SW1(config-if)#no shutdown
```

```
APEX-SW1(config-if)#ip address 14.14.90.1 255.255.255.0
```

```
APEX-SW2(config-if)#int vlan 100
```

```
APEX-SW2(config-if)#no shutdown
```

```
APEX-SW2(config-if)#ip address 14.14.90.2 255.255.255.0
```

```
APEX-SW3(config-if)#int vlan 100
```

```
APEX-SW3(config-if)#no shutdown
```

```
APEX-SW3(config-if)#ip address 14.14.90.3 255.255.255.0
```

```
APEX-SW4(config-vlan)#int vlan 100
```

```
APEX-SW4(config-if)#no shutdown
```

```
APEX-SW4(config-if)#ip address 14.14.90.4 255.255.255.0
```

## 7. EtherChannel

PAGP 냐 LACP 와 같은 이더채널 네고 프로토콜 사용하지 말고 이더채널 설정하시오.(SW1~SW4 구간)

```
APEX-SW1(config)# port-channel load-balance src-dst-ip
```

```
APEX-SW1(config)# int ran e3/0-1
```

```
APEX-SW1(config-if)#channel-group 12 mode on
```

```
APEX-SW1(config)# int ran e3/2-3
```

```
APEX-SW1(config-if)#channel-group 13 mode on
```

```
APEX-SW2(config)# port-channel load-balance src-dst-ip
```

```
APEX-SW2(config)# int ran e3/0-1
```

```
APEX-SW2(config-if)#channel-group 21 mode on
```

```
APEX-SW2(config)# int ran e3/2-3
```

```
APEX-SW2(config-if)#channel-group 24 mode on
```

```
APEX-SW3(config)# port-channel load-balance src-dst-ip
```

```
APEX-SW3(config)# int ran e3/0-1
```

```
APEX-SW3(config-if)#channel-group 34 mode on
```

```
APEX-SW3(config)# int ran e3/2-3
```

```
APEX-SW3(config-if)#channel-group 31 mode on
```

```
APEX-SW4(config)# port-channel load-balance src-dst-ip
```

```
APEX-SW4(config)# int ran e3/0-1
```

```
APEX-SW4(config-if)#channel-group 43 mode on
```

```
APEX-SW4(config)# int ran e3/2-3
```

```
APEX-SW4(config-if)#channel-group 42 mode on
```

## IGP

8. IGP 구성시 router-id 를 사용하지 말것, ospf process number 는 rack number 로 설정
9. rip 설정 (+rip update 주소로 멀티캐스트, 브로드캐스트 사용하지 말 것  
+diagram 에 rip 과 관련이 없는 인터페이스로는 update 를 보내지 말 것

```
APEX-R1(config-subif)#router rip
APEX-R1(config-router)#ver 2
APEX-R1(config-router)#no auto
APEX-R1(config-router)#network 14.0.0.0
APEX-R1(config-router)#network 150.1.0.0
APEX-R1(config-router)#passive-interface default
APEX-R1(config-router)#neighbor 150.1.14.254
APEX-R1(config-router)#neighbor 14.14.13.1
```

```
APEX-R3(config-router)#router rip
APEX-R3(config-router)#ver 2
APEX-R3(config-router)#no auto
APEX-R3(config-router)#net 14.0.0.0
```

10. sw1~sw4 에 eigrp14 를 설정하고 loopback0(sw1 제외)과 SVI 인터페이스를 포함할 것, summary 를 허용 안 할 것

```
APEX-SW1(config-if)#router eigrp 14  
APEX-SW1(config-router)#net 14.14.90.1 0.0.0.0  
APEX-SW1(config-router)#no auto-summary
```

```
APEX-SW2(config-if)#router eigrp 14  
APEX-SW2(config-router)#net 14.14.8.8 0.0.0.0  
APEX-SW2(config-router)#net 14.14.90.2 0.0.0.0  
APEX-SW2(config-router)#no auto-summary
```

```
APEX-SW3(config-if)#router eigrp 14  
APEX-SW3(config-router)#net 14.14.9.9 0.0.0.0  
APEX-SW3(config-router)#net 14.14.90.3 0.0.0.0  
APEX-SW3(config-router)#no auto-summary
```

```
APEX-SW4(config-if)#router eigrp 14  
APEX-SW4(config-router)#net 14.14.10.10 0.0.0.0  
APEX-SW4(config-router)#net 14.14.90.4 0.0.0.0  
APEX-SW4(config-router)#no auto-summary
```

11. R6 와 BB3 에 eigrp 100 을 설정, BB3 은 R6 로 queries 를 보내지 말 것, summary 허용 안한다

```
APEX-R6(config-router)#router eigrp 100
APEX-R6(config-router)#no auto-summary
APEX-R6(config-router)#network 150.3.14.1 0.0.0.0
APEX-R6(config-router)#redistribute ospf 1 metric 1544 2000 255 1 1500
```

## OSPF

12. area 0 는 R2,R4,R5,SW1 이 포함되고 R5 가 DR 이 되어야 한다. 'ip ospf network'를 사용하지 말 것, ospf 인터페이스는 다른 모든 라우터에 보일것

```
APEX-SW1(config-router)#router ospf 1
APEX-SW1(config-router)#net 14.14.36.7 0.0.0.0 a 0

APEX-R2(config-subif)#router ospf 1
APEX-R2(config-router)#router-id 14.14.2.2
APEX-R2(config-router)#network 14.14.2.2 0.0.0.0 area 0
APEX-R2(config-router)#network 14.14.245.2 0.0.0.0 area 0
APEX-R2(config-router)#network 14.14.62.2 0.0.0.0 area 0

APEX-R4(config)#router ospf 1
APEX-R4(config-router)#router-id 14.14.4.4
APEX-R4(config-router)#network 14.14.4.4 0.0.0.0 area 0
APEX-R4(config-router)#network 14.14.245.4 0.0.0.0 area 0

APEX-R5(config-if)#router ospf 1
APEX-R5(config-router)#network 14.14.245.5 0.0.0.0 area 0

APEX-R6(config-subif)#router ospf 1
APEX-R6(config-router)#network 14.14.36.6 0.0.0.0 area 0
APEX-R6(config-router)#network 14.14.6.6 0.0.0.0 area 0
```

13. area 3 은 R3, SW1 0I 포함

```
APEX-R3(config-subif)#router ospf 1  
APEX-R3(config-router)#network 14.14.3.3 0.0.0.0 area 3  
APEX-R3(config-router)#network 14.14.33.3 0.0.0.0 area 3  
  
APEX-SW1(config-router)#router ospf 1  
APEX-SW1(config-router)#net 14.14.33.7 0.0.0.0 area 3
```

14. area 4 는 R2 가 포함, R2 에서 VLAN A 로 default 경로만 전달, area 4 에서는 VLAN A 로 intra 정보와 default 경로를 가지며 다른 external 경로를 전파하지 말 것

```
APEX-R2(config-subif)#router ospf 1  
APEX-R2(config-router)#network 14.14.20.2 0.0.0.0 area 4
```

15. area 5 는 R5 가 포함. R5 에 VLAN C 로 intra 정보 O 와 intra 정보 O IA 가 보이고 extra O E1 E2 는 전파 안 될 것

```
APEX-R5(config-if)#router ospf 1  
APEX-R5(config-router)#network 14.14.55.5 0.0.0.0 area 5  
APEX-R5(config-router)#network 14.14.5.5 0.0.0.0 area 5  
APEX-R5(config-router)#area 5 stub
```

**재분배** (재분배는 모두 mutual 하게 할 것)

16. RIP 을 ospf 로 재분배

```
APEX-R3(config-router)#router rip  
APEX-R3(config-router)#redistribute ospf 1 metric 3
```

17. SW1에서 OSPF를 EIGRP 14에 재분배

```
APEX-SW1(config-if)#router eigrp 14  
APEX-SW1(config-router)#redistribute ospf 1 metric 1 1 1 1 1
```

18. SW1에서 EIGRP14를 OSPF에 재분배, VLAN Switches에서 BB1이 보여야 한다.

```
APEX-SW1(config-router)#router ospf 1  
APEX-SW1(config-router)#redistribute eigrp 14 subnets
```

#### OSPF – EIGRP 100

- On R6, redistribute EIGRP 100 on OSPF, however announced only the prefix 198.2.0.0(not/16) routes and 150.3.YY.0/24
- *EIGRP 100 => OSPF로 재분배 하라. EIGRP 100은 150.3.YY.0/24 정보만 보냄.*

```
APEX-R6(config-subif)#router ospf 1  
APEX-R6(config-router)#redistribute eigrp 100 subnets  
APEX-R6(config-router)#router eigrp 100  
APEX-R6(config-router)#network 150.3.14.1 0.0.0.0
```

19. Loopback 어드레스는 라우팅 테이블에 /32로 보여지면 안된다.( ip ospf network point-to-point)

```
APEX-SW1(config)#interface loopback 0  
APEX-SW1(config-if)# ip ospf network point-to-point  
APEX-SW2(config)#interface loopback 0  
APEX-SW2(config-if)# ip ospf network point-to-point  
APEX-SW3(config)#interface loopback 0  
APEX-SW3(config-if)# ip ospf network point-to-point
```

```
APEX-SW4(config)#interface loopback 0  
APEX-SW4(config-if)# ip ospf network point-to-point
```

```
APEX-R1(config)#interface loopback 0  
APEX-R1(config-if)# ip ospf network point-to-point  
APEX-R2(config)#interface loopback 0  
APEX-R2(config-if)# ip ospf network point-to-point
```

```
APEX-R3(config)#interface loopback 0  
APEX-R3(config-if)# ip ospf network point-to-point
```

```
APEX-R4(config)# interface loopback 0  
APEX-R4(config-if)# ip ospf network point-to-point
```

```
APEX-R5(config)#interface loopback 0  
APEX-R5(config-if)#ip ospf network point-to-point
```

```
APEX-R6(dhcp-config)#interface loopback 0  
APEX-R6(config-if)#ip ospf network point-to-point
```

## DHCP

- Configure R6 to provide the following parameters for DHCP clients on VLAN\_B:
- Make sure all IP addresses that are not used yet in the subnet are available.
- Allow the subnet as 24bit mask / · DNS servers are 150.100.1.50 and 150.100.1.51
- Domain name is [cisco.com](#) / 할당된 정보는 영구히 사용할 수 있게 하라.
- For the Default gateway, ensure that if R6 is down, R2 will be the Default Gateway for hosts.

```
APEX-R6(config)#ip dhcp excluded-address 14.14.62.6
```

```
APEX-R6(config)#ip dhcp excluded-address 14.14.62.2
```

```
APEX-R6(config)#ip dhcp pool DHCP
```

```
APEX-R6(config)#network 14.14.62.0 255.255.255.0
```

```
APEX-R6(dhcp-config)#dns-server 150.100.1.50 150.100.1.51
```

```
APEX-R6(dhcp-config)#domain-name apex.com
```

```
APEX-R6(dhcp-config)#lease infinit
```

```
APEX-R6(dhcp-config)#default-router 14.14.62.6 14.14.62.2
```

## OSPF Authentication

- Area 0 에 가장 강력한 인증을 적용하여라.(text 말고 md5 / area 0 인증)

```
APEX-SW1(config-subif)#router ospf 1
APEX-SW1(config-router)#area 0 authentication message-digest
APEX-SW1(config)# int e1/2
APEX-SW1(config-if)# ip ospf message-digest-key 1 md5 apex

APEX-R2(config-subif)#router ospf 1
APEX-R2(config-router)#area 0 authentication message-digest
APEX-R2(config-router)# area 26 virtual-link 14.14.6.6 message-digest-key 1
md5 cisco
APEX-R2(config)#interface s1/0
APEX-R2(config-router)# ip ospf message-digest-key 1 md5 apex

APEX-R4(config-subif)#router ospf 1
APEX-R4(config-router)#area 0 authentication message-digest
APEX-R4(config)#interface s1/0
APEX-R4(config-router)# ip ospf message-digest-key 1 md5 apex

APEX-R5(config-subif)#router ospf 1
APEX-R5(config-router)#area 0 authentication message-digest
APEX-R5(config-if)#interface s1/0
APEX-R5(config-router)# ip ospf message-digest-key 1 md5 apex

APEX-R6(config-subif)#router ospf 1
APEX-R6(config-router)#area 0 authentication message-digest
APEX-R6(config-router)# area 26 virtual-link 14.14.2.2 message-digest-key 1 md5
cisco
APEX-R6(config)#interface e0/0
APEX-R6(config-if)#ip ospf message-digest-key 1 md5 apex
```

## 결과

### 1. Protocols

```
SW1#show ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is "eigrp 14"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  Redistributing: ospf 1
    EIGRP-IPv4 Protocol for AS(14)
      Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
      NSF-aware route hold timer is 240
      Router-ID: 14.14.7.7
      Topology : 0 (base)
        Active Timer: 3 min
        Distance: internal 90 external 170
        Maximum path: 4
        Maximum hopcount 100
        Maximum metric variance 1

      Automatic Summarization: disabled
      Maximum path: 4
      Routing for Networks:
        14.14.90.1/32
      Routing Information Sources:
        Gateway          Distance      Last Update
        14.14.90.2        90           00:28:30
        14.14.90.3        90           00:28:30
        14.14.90.4        90           00:28:30
      Distance: internal 90 external 170
```

```
R2#show ip protocols
*** IP Routing is NSF aware ***

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 14.14.2.2
  It is an area border router
  Number of areas in this router is 3. 2 normal 1 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    14.14.2.2 0.0.0.0 area 0
    14.14.20.2 0.0.0.0 area 4
    14.14.62.2 0.0.0.0 area 26
    14.14.245.2 0.0.0.0 area 0
  Routing Information Sources:
    Gateway          Distance      Last Update
    14.14.4.4        110          00:06:51
    14.14.5.5        110          00:06:51
    14.14.3.3        110          00:31:37
    14.14.7.7        110          00:31:27
    14.14.6.6        110          00:31:27
  Distance: (default is 110)
```

```
R3#show ip protocols
*** IP Routing is NSF aware ***

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 14.14.3.3
  It is an autonomous system boundary router
  Redistributing External Routes from,
    rip, includes subnets in redistribution
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    14.14.3.3 0.0.0.0 area 3
    14.14.33.3 0.0.0.0 area 3
  Routing Information Sources:
    Gateway          Distance      Last Update
    14.14.6.6        110          00:31:24
    14.14.7.7        110          00:29:08
  Distance: (default is 110)

Routing Protocol is "rip"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Sending updates every 30 seconds, next due in 25 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Redistributing: ospf 1, rip
  Default version control: send version 2, receive version 2
    Interface          Send  Recv Triggered RIP  Key-chain
    Ethernet0/0         2      2
    Serial1/0.301       2      2
    Loopback0           2      2
  Automatic network summarization is not in effect
  Maximum path: 4
  Routing for Networks:
    14.0.0.0
  Routing Information Sources:
    Gateway          Distance      Last Update
  Distance: (default is 120)
```

```

R6#show ip protocols
*** IP Routing is NSF aware ***

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 14.14.6.6
  It is an area border and autonomous system boundary router
  Redistributing External Routes from,
    eigrp 100, includes subnets in redistribution
  Number of areas in this router is 2. 2 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    14.14.6.6 0.0.0.0 area 0
    14.14.36.6 0.0.0.0 area 0
    14.14.62.6 0.0.0.0 area 26
  Routing Information Sources:
    Gateway          Distance      Last Update
    14.14.5.5        110          00:29:34
    14.14.4.4        110          00:29:34
    14.14.2.2        110          00:31:44
    14.14.3.3        110          00:06:59
    14.14.7.7        110          00:06:59
  Distance: (default is 110)

```

## 2. VLAN

```

SW2#show vlan brief

VLAN Name                               Status     Ports
-----+-----+-----+
 1   default                             active    Et0/0, Et0/1, Et0/3, Et1/0
                                         Et1/3, Et2/1, Et2/2, Et2/3
                                         Et3/0, Et3/1
 10  VLAN0010                            active
 11  VLAN_BB1                            active
 12  VLAN_BB2                            active    Et2/0
 13  VLAN_BB3                            active
 20  VLAN0020                            active
 21  VLAN_A                             active    Et0/2
 22  VLAN_B                             active
 23  VLAN_C                             active    Et1/1
 30  VLAN0030                            active
 40  VLAN0040                            active
 50  VLAN_CUSTOMER1                     active
 60  VLAN0060                            active
 79  VLAN_CUSTOMER2                     active
 100 VLAN_SWITCH                         active
 1002 fddi-default                      act/unsup
 1003 trcrf-default                     act/unsup
 1004 fddinet-default                   act/unsup

VLAN Name                               Status     Ports
-----+-----+-----+
 1005 trbrf-default                     act/unsup

```

VLAN	Name	Status	Ports
1	default	active	Et0/0, Et0/1, Et1/1, Et1/3 Et2/0, Et2/1, Et2/2, Et2/3 Et3/2, Et3/3
10	VLAN0010	active	
11	VLAN_BB1	active	
12	VLAN_BB2	active	Et1/0
13	VLAN_BB3	active	
20	VLAN0020	active	
21	VLAN_A	active	
22	VLAN_B	active	Et0/2
23	VLAN_C	active	
30	VLAN0030	active	
40	VLAN0040	active	
50	VLAN_CUSTOMER1	active	
60	VLAN0060	active	
79	VLAN_CUSTOMER2	active	
90	VLAN0090	active	
100	VLAN_SWITCH	active	
1002	fdci-default	act/unsup	
1003	trcrf-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trbrf-default	act/unsup	

### 3. 재분배

```
SW1#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
      i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
      + - replicated route, % - next hop override

Gateway of last resort is not set

  14.0.0.0/8 is variably subnetted, 21 subnets, 2 masks
0        14.14.2.0/24 [110/21] via 14.14.36.6, 00:09:22, Ethernet1/2
0        14.14.3.0/24 [110/11] via 14.14.33.3, 00:10:15, Ethernet0/3
0        14.14.4.0/24 [110/85] via 14.14.36.6, 00:07:17, Ethernet1/2
0  IA    14.14.5.0/24 [110/85] via 14.14.36.6, 00:07:17, Ethernet1/2
0        14.14.6.0/24 [110/11] via 14.14.36.6, 00:09:37, Ethernet1/2
C        14.14.7.0/24 is directly connected, Loopback0
L        14.14.7.7/32 is directly connected, Loopback0
D        14.14.8.0/24 [90/130816] via 14.14.90.2, 00:10:55, Vlan100
D        14.14.9.0/24 [90/130816] via 14.14.90.3, 00:09:29, Vlan100
D        14.14.10.0/24 [90/130816] via 14.14.90.4, 00:10:28, Vlan100
0  E2   14.14.13.0/24 [110/20] via 14.14.33.3, 00:10:15, Ethernet0/3
0  IA   14.14.20.0/24 [110/30] via 14.14.36.6, 00:09:22, Ethernet1/2
C        14.14.33.0/24 is directly connected, Ethernet0/3
L        14.14.33.7/32 is directly connected, Ethernet0/3
C        14.14.36.0/24 is directly connected, Ethernet1/2
L        14.14.36.7/32 is directly connected, Ethernet1/2
0  IA   14.14.55.0/24 [110/94] via 14.14.36.6, 00:07:17, Ethernet1/2
0  IA   14.14.62.0/24 [110/20] via 14.14.36.6, 00:09:36, Ethernet1/2
C        14.14.90.0/24 is directly connected, Vlan100
L        14.14.90.1/32 is directly connected, Vlan100
0        14.14.245.0/24 [110/84] via 14.14.36.6, 00:07:17, Ethernet1/2
      150.3.0.0/24 is subnetted, 1 subnets
0  E2   150.3.14.0 [110/20] via 14.14.36.6, 00:09:37, Ethernet1/2
```

```

Sw2#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
      i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
      + - replicated route, % - next hop override

Gateway of last resort is not set

        14.0.0.0/8 is variably subnetted, 21 subnets, 2 masks
D EX    14.14.2.0/24 [170/2170112] via 14.14.90.1, 00:11:18, Vlan100
D EX    14.14.3.0/24 [170/2170112] via 14.14.90.1, 00:12:11, Vlan100
D EX    14.14.4.0/24 [170/2170112] via 14.14.90.1, 00:09:13, Vlan100
D EX    14.14.5.0/24 [170/2170112] via 14.14.90.1, 00:09:13, Vlan100
D EX    14.14.6.0/24 [170/2170112] via 14.14.90.1, 00:11:33, Vlan100
D EX    14.14.7.0/24 [170/2170112] via 14.14.90.1, 00:12:50, Vlan100
C     14.14.8.0/24 is directly connected, Loopback0
L     14.14.8.8/32 is directly connected, Loopback0
D     14.14.9.0/24 [90/130816] via 14.14.90.3, 00:11:23, Vlan100
D     14.14.10.0/24 [90/130816] via 14.14.90.4, 00:12:24, Vlan100
D EX   14.14.13.0/24 [170/2170112] via 14.14.90.1, 00:12:11, Vlan100
C     14.14.20.0/24 is directly connected, Vlan21
L     14.14.20.8/32 is directly connected, Vlan21
D EX   14.14.33.0/24 [170/2170112] via 14.14.90.1, 00:12:50, Vlan100
D EX   14.14.36.0/24 [170/2170112] via 14.14.90.1, 00:12:50, Vlan100
C     14.14.55.0/24 is directly connected, Vlan23
L     14.14.55.8/32 is directly connected, Vlan23
D EX   14.14.62.0/24 [170/2170112] via 14.14.90.1, 00:11:32, Vlan100
C     14.14.90.0/24 is directly connected, Vlan100
L     14.14.90.2/32 is directly connected, Vlan100
D EX   14.14.245.0/24 [170/2170112] via 14.14.90.1, 00:11:18, Vlan100
      150.3.0.0/24 is subnetted, 1 subnets
D EX   150.3.14.0 [170/2170112] via 14.14.90.1, 00:11:33, Vlan100

R1#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
      i - IS-IS, su - IS-IS summary, 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, + - replicated route

Gateway of last resort is not set

        14.0.0.0/8 is variably subnetted, 20 subnets, 2 masks
C     14.14.1.0/24 is directly connected, Loopback0
L     14.14.1.1/32 is directly connected, Loopback0
R     14.14.2.0/24 [120/3] via 14.14.13.3, 00:00:05, Serial1/0.103
R     14.14.3.0/24 [120/1] via 14.14.13.3, 00:00:05, Serial1/0.103
R     14.14.4.0/24 [120/3] via 14.14.13.3, 00:00:05, Serial1/0.103
R     14.14.5.0/24 [120/3] via 14.14.13.3, 00:00:05, Serial1/0.103
R     14.14.6.0/24 [120/3] via 14.14.13.3, 00:00:05, Serial1/0.103
R     14.14.7.0/24 [120/3] via 14.14.13.3, 00:00:05, Serial1/0.103
R     14.14.8.0/24 [120/3] via 14.14.13.3, 00:00:05, Serial1/0.103
R     14.14.9.0/24 [120/3] via 14.14.13.3, 00:00:05, Serial1/0.103
R     14.14.10.0/24 [120/3] via 14.14.13.3, 00:00:05, Serial1/0.103
C     14.14.13.0/24 is directly connected, Serial1/0.103
L     14.14.13.1/32 is directly connected, Serial1/0.103
R     14.14.20.0/24 [120/3] via 14.14.13.3, 00:00:06, Serial1/0.103
R     14.14.33.0/24 [120/1] via 14.14.13.3, 00:00:06, Serial1/0.103
R     14.14.36.0/24 [120/3] via 14.14.13.3, 00:00:06, Serial1/0.103
R     14.14.55.0/24 [120/3] via 14.14.13.3, 00:00:06, Serial1/0.103
R     14.14.62.0/24 [120/3] via 14.14.13.3, 00:00:06, Serial1/0.103
R     14.14.90.0/24 [120/3] via 14.14.13.3, 00:00:06, Serial1/0.103
R     14.14.245.0/24 [120/3] via 14.14.13.3, 00:00:06, Serial1/0.103
      150.1.0.0/16 is variably subnetted, 2 subnets, 2 masks
C     150.1.14.0/24 is directly connected, Ethernet0/0
L     150.1.14.1/32 is directly connected, Ethernet0/0
      150.3.0.0/24 is subnetted, 1 subnets
R     150.3.14.0 [120/3] via 14.14.13.3, 00:00:06, Serial1/0.103

```

```

R6#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
      i - IS-IS, su - IS-IS summary, 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, + - replicated route

Gateway of last resort is not set

        14.0.0.0/8 is variably subnetted, 20 subnets, 2 masks
0         14.14.2.0/24 [110/11] via 14.14.62.2, 00:13:42, Ethernet0/1.22
0  IA    14.14.3.0/24 [110/21] via 14.14.36.7, 00:13:52, Ethernet0/0
0         14.14.4.0/24 [110/75] via 14.14.62.2, 00:11:33, Ethernet0/1.22
0  IA    14.14.5.0/24 [110/75] via 14.14.62.2, 00:11:33, Ethernet0/1.22
C         14.14.6.0/24 is directly connected, Loopback0
L         14.14.6.6/32 is directly connected, Loopback0
0  IA    14.14.7.0/24 [110/11] via 14.14.36.7, 00:13:52, Ethernet0/0
0  E2    14.14.8.0/24 [110/20] via 14.14.36.7, 00:13:52, Ethernet0/0
0  E2    14.14.9.0/24 [110/20] via 14.14.36.7, 00:13:42, Ethernet0/0
0  E2    14.14.10.0/24 [110/20] via 14.14.36.7, 00:13:52, Ethernet0/0
0  E2    14.14.13.0/24 [110/20] via 14.14.36.7, 00:13:52, Ethernet0/0
0  IA    14.14.20.0/24 [110/20] via 14.14.62.2, 00:13:42, Ethernet0/1.22
0  IA    14.14.33.0/24 [110/20] via 14.14.36.7, 00:13:54, Ethernet0/0
C         14.14.36.0/24 is directly connected, Ethernet0/0
L         14.14.36.6/32 is directly connected, Ethernet0/0
0  IA    14.14.55.0/24 [110/84] via 14.14.62.2, 00:11:35, Ethernet0/1.22
C         14.14.62.0/24 is directly connected, Ethernet0/1.22
L         14.14.62.6/32 is directly connected, Ethernet0/1.22
0  E2    14.14.90.0/24 [110/20] via 14.14.36.7, 00:13:54, Ethernet0/0
0         14.14.245.0/24 [110/74] via 14.14.62.2, 00:11:35, Ethernet0/1.22
      150.3.0.0/16 is variably subnetted, 2 subnets, 2 masks
C         150.3.14.0/24 is directly connected, Ethernet0/1.13
L         150.3.14.1/32 is directly connected, Ethernet0/1.13

```

#### 4. Trunk 설정 STP 설정

```

SW3#show interfaces trunk

Port      Mode          Encapsulation  Status      Native vlan
Et3/2     on           802.1q        trunking   1
Et3/3     on           802.1q        trunking   1
Po34      on           802.1q        trunking   1

Port      Vlans allowed on trunk
Et3/2     1-4094
Et3/3     1-4094
Po34      1-4094

Port      Vlans allowed and active in management domain
Et3/2     1,10-13,20-23,30,40,50,60,79,100
Et3/3     1,10-13,20-23,30,40,50,60,79,100
Po34      1,10-13,20-23,30,40,50,60,79,100

Port      Vlans in spanning tree forwarding state and not pruned
Et3/2     1,10-13,20-23,30,40,50,60,79,100
Et3/3     1,10-13,20-23,30,40,50,60,79,100
Po34      1,10-13,20-23,30,40,50,60,79,100

```

## 5. STP 설정

```
SW4#show spanning-tree

MST0
  Spanning tree enabled protocol mstp
  Root ID    Priority    32768
              Address     aabb.cc00.0800
              Cost        1000000
              Port        515 (Port-channel42)
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32768 (priority 32768 sys-id-ext 0)
              Address     aabb.cc00.0a00
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Interface      Role Sts Cost      Prio.Nbr Type
  -----  -----
  Et0/0          Desg FWD 2000000  128.1   Shr
  Et0/1          Desg FWD 2000000  128.2   Shr
  Et0/2          Desg FWD 2000000  128.3   Shr
  Et0/3          Desg FWD 2000000  128.4   Shr
  Et1/0          Desg FWD 2000000  128.33  Shr
  Et1/1          Desg FWD 2000000  128.34  Shr
  Et1/2          Desg FWD 2000000  128.35  Shr
  Et1/3          Desg FWD 2000000  128.36  Shr
  Et2/0          Desg FWD 2000000  128.65  Shr
  Et2/1          Desg FWD 2000000  128.66  Shr
  Po43           Desg FWD 1000000  128.514 Shr
  Po42           Root FWD 1000000  128.515 Shr Bound(RSTP)
```

```
MST1
  Spanning tree enabled protocol mstp
  Root ID    Priority    32769
              Address     aabb.cc00.0a00
              This bridge is the root
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
              Address     aabb.cc00.0a00
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Interface      Role Sts Cost      Prio.Nbr Type
  -----  -----
  Po43           Desg FWD 1000000  128.514 Shr
  Po42           Mstr FWD 1000000  128.515 Shr Bound(RSTP)
```

```

MST2
  Spanning tree enabled protocol mstp
  Root ID    Priority    24578
              Address     aabb.cc00.0a00
              This bridge is the root
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    24578 (priority 24576 sys-id-ext 2)
              Address     aabb.cc00.0a00
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Interface      Role Sts Cost      Prio.Nbr Type
  ----- -----
  Po43          Desg FWD 1000000  128.514  Shr
  Po42          Mstr FWD 1000000  128.515  Shr Bound(RSTP)

MST3
  Spanning tree enabled protocol mstp
  Root ID    Priority    32771
              Address     aabb.cc00.0a00
              This bridge is the root
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32771 (priority 32768 sys-id-ext 3)
              Address     aabb.cc00.0a00
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Interface      Role Sts Cost      Prio.Nbr Type
  ----- -----
  Po43          Desg FWD 1000000  128.514  Shr
  Po42          Mstr FWD 1000000  128.515  Shr Bound(RSTP)

```

## 6. DHCP 설정

```

R6#show running-config | section dhcp
ip dhcp excluded-address 14.14.62.6
ip dhcp excluded-address 14.14.62.2
ip dhcp pool DHCP
  network 14.14.62.0 255.255.255.0
  dns-server 150.100.1.50 150.100.1.51
  domain-name apex.com
  default-router 14.14.62.6 14.14.62.2
  lease infinite

```

## 7. EtherChannel 설정

```
SW1#show etherchannel summary
*Jul  3 05:07:02.631: %SYS-5-CONFIG_I: Configured from console by console
SW1#show etherchannel summary
Flags:  D - down          P - bundled in port-channel
        I - stand-alone  S - suspended
        H - Hot-standby (LACP only)
        R - Layer3         S - Layer2
        U - in use         f - failed to allocate aggregator

        M - not in use, minimum links not met
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

Number of channel-groups in use: 2
Number of aggregators:          2

Group  Port-channel  Protocol    Ports
-----+-----+-----+
12     Po12(SU)      -          Et3/0(P)   Et3/1(P)
13     Po13(SD)      -          Et3/2(D)   Et3/3(D)
```

```
SW4#show etherchannel summary
Flags:  D - down          P - bundled in port-channel
        I - stand-alone  S - suspended
        H - Hot-standby (LACP only)
        R - Layer3         S - Layer2
        U - in use         f - failed to allocate aggregator

        M - not in use, minimum links not met
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

Number of channel-groups in use: 2
Number of aggregators:          2

Group  Port-channel  Protocol    Ports
-----+-----+-----+
42     Po42(SU)      -          Et3/2(P)   Et3/3(P)
43     Po43(SU)      -          Et3/0(P)   Et3/1(P)
```

## 8. OSPF 인증 설정

```
R2#show running-config | section router ospf
router ospf 1
  router-id 14.14.2.2
  log-adjacency-changes
  area 0 authentication message-digest
  area 4 stub no-summary
  area 26 virtual-link 14.14.6.6 message-digest-key 1 md5 cisco
  network 14.14.2.2 0.0.0.0 area 0
  network 14.14.20.2 0.0.0.0 area 4
  network 14.14.62.2 0.0.0.0 area 26
  network 14.14.245.2 0.0.0.0 area 0
```

```
SW1#show running-config | section router ospf
router ospf 1
  area 0 authentication message-digest
  redistribute eigrp 14 subnets
  network 14.14.7.7 0.0.0.0 area 3
  network 14.14.33.7 0.0.0.0 area 3
  network 14.14.36.7 0.0.0.0 area 0
```

감사합니다.