

컴퓨터 네트워크 II

- 기말고사 토폴로지 발표자료

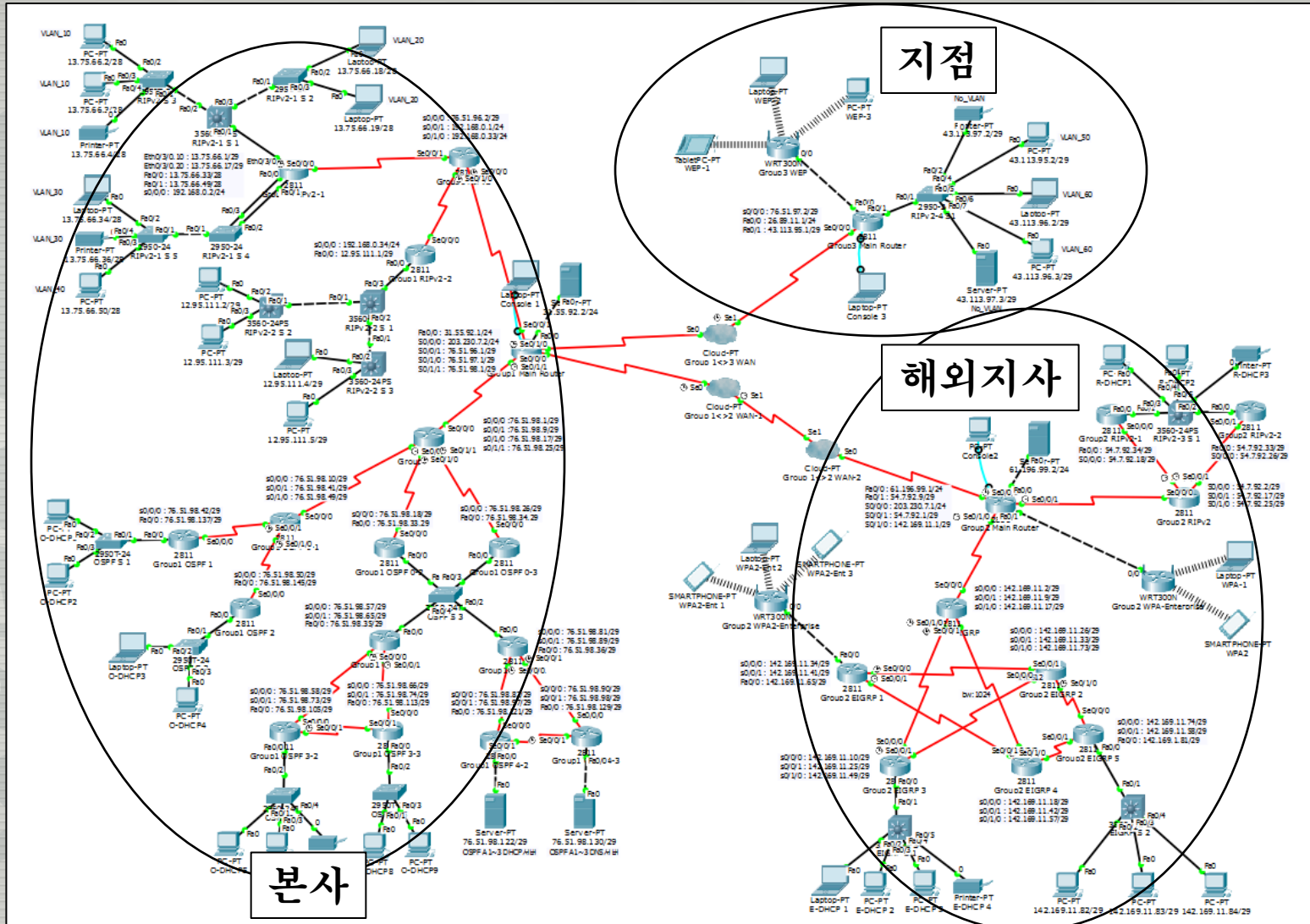
91117357 정성윤

91216098 남현정

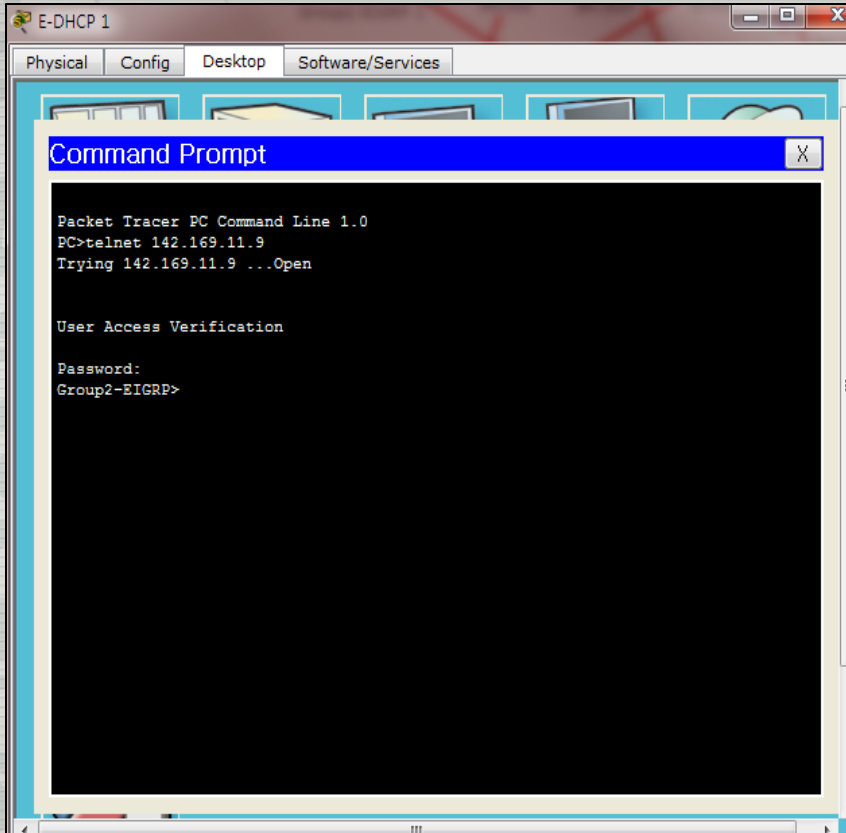
목 차

- 전체 토폴로지
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- Router 재분배
- Group 1 토폴로지 (RIPv2, OSPF)
- Group 2 토폴로지 (RIPv2, EIGRP, WPA2 & WPA)
- Group 3 토폴로지 (RIPv2, WEP)

전체 토폴로지



Telnet 설정



The screenshot shows a Packet Tracer PC Command Line window titled 'E-DHCP 1'. The window has tabs for 'Physical', 'Config', 'Desktop', and 'Software/Services'. The 'Desktop' tab is active, displaying a 'Command Prompt' window. The Command Prompt shows the following text:

```
Packet Tracer PC Command Line 1.0
PC>telnet 142.169.11.9
Trying 142.169.11.9 ...Open

User Access Verification

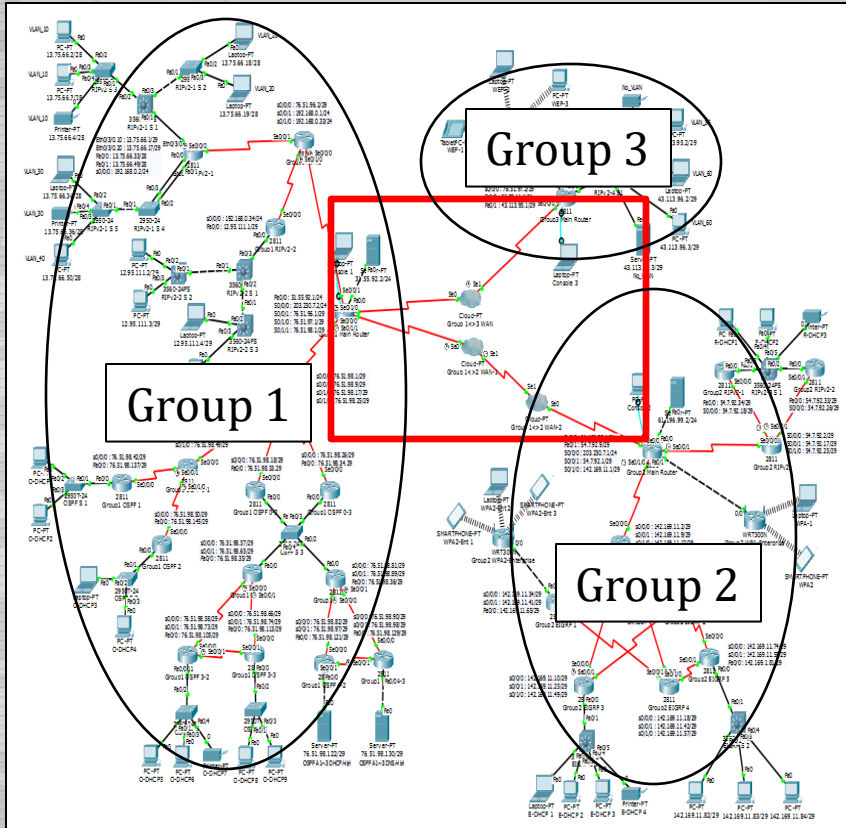
Password:
Group2-EIGRP>
```

원격지 PC에서 Telnet 접속 화면

- 전체 토폴로지 내 모든 Router에 Telnet 접속 설정 및 암호설정을 하여 네트워크 관리자가 원격지에서 라우터 설정을 할 수 있게 구성

-

WAN 설정



- Group 1 ↔ Group 2 연결 (해외라고 가정하고 Cloud 2개로 연결)
- Group 1 ↔ Group 3 연결
- Group 2 ↔ Group 3이 통신 할 경우에도 Group 1을 거치게 하여 회사 내부 보안 강화

Group간 WAN 설정

-

WAN 설정

Group2 Main Router

Physical Config CLI

IOS Command Line Interface

```
adjacency
Group2-Main-Router>en
Group2-Main-Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Group2-Main-Router(config)#do show int s0/0/0
Serial0/0/0 is up, line protocol is up (connected)
Hardware is HD64570
Internet address is 203.230.7.1/24
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation Frame Relay, loopback not set, keepalive set (10 sec)
LMI enq sent 116, LMI stat rcvd 117, LMI upd rcvd 0, DTE LMI up
LMI enq rcvd 0, LMI stat sent 0, LMI upd sent 0
LMI DLCI 1023 LMI type is CISCO frame relay DTE
Broadcast queue 0/64, broadcasts sent/dropped 0/0, interface broadcasts 0
Last input never, output never, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0 (size/max/drops); Total output drops: 0
Queueing strategy: weighted fair
Output queue: 0/1000/64/0 (size/max total/threshold/drops)
Conversations 0/0/256 (active/max active/max total)
Reserved Conversations 0/0 (allocated/max allocated)
Available Bandwidth 1158 kilobits/sec
5 minute input rate 54 bits/sec, 0 packets/sec
5 minute output rate 40 bits/sec, 0 packets/sec
54 packets input, 5284 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
--More--
```

Copy Paste

Group 1<->2 WAN-1

Physical Config

GLOBAL

Settings

TV Settings

CONNECTIONS

Frame Relay

DSL

Cable

INTERFACE

Serial0

Serial1

Serial2

Serial3

Modem4

Modem5

Ethernet6

Coaxial7

GigabitEthernet8

GigabitEthernet9

Frame Relay

Serial0 F-R <-> Serial0 F-R

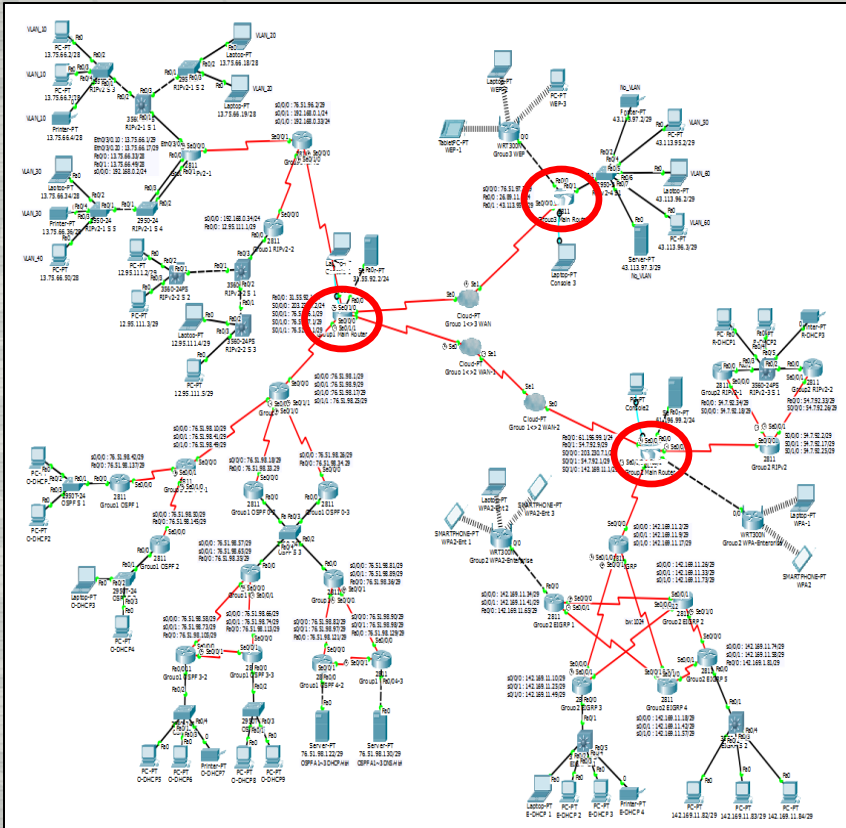
Port	Sublink	Port	Sublink
1	Serial0	Serial1	F-F
2	Serial0	Serial2	F-R

Add Remove

Frame-relay로 캡슐화 방식 변경

Frame-relay 지정

Router 재분배

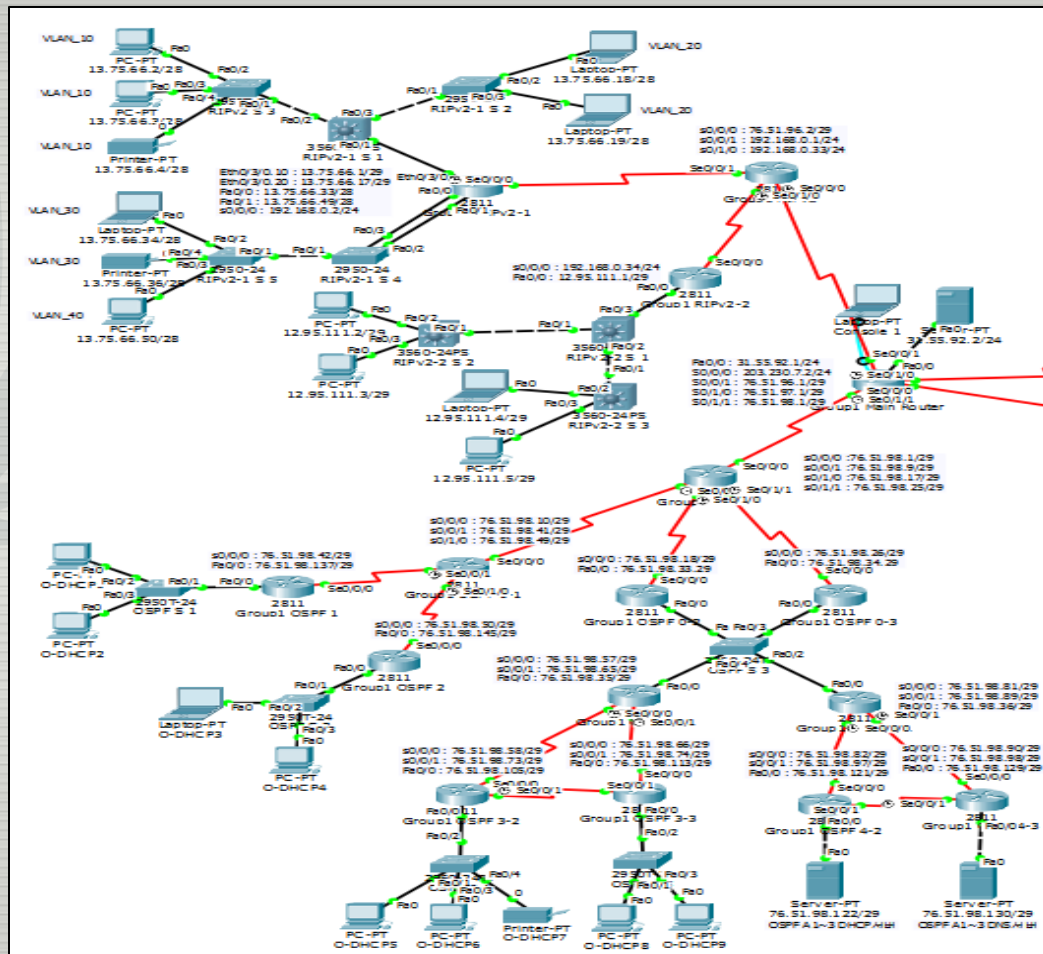


- **RIPv2-OSPF-EIGRP 재분배**
- **서로 다른 프로토콜 간의 통신을 가능하게 해줌**

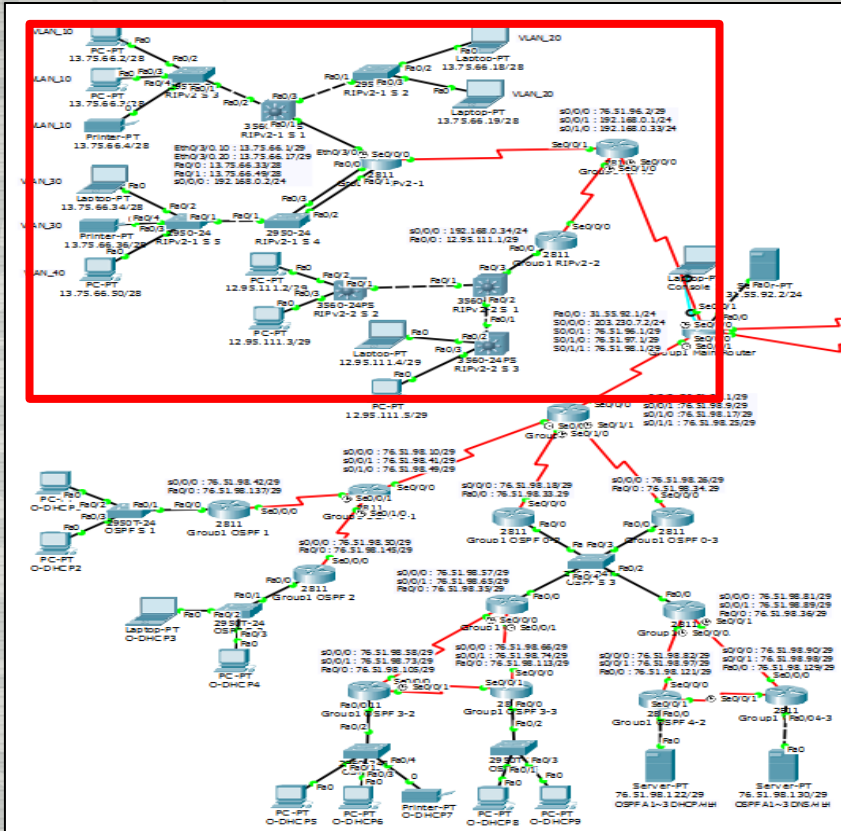
각 Group 내 재분배 라우터 위치

-

Group 1 토폴로지



Group 1 RIPv2



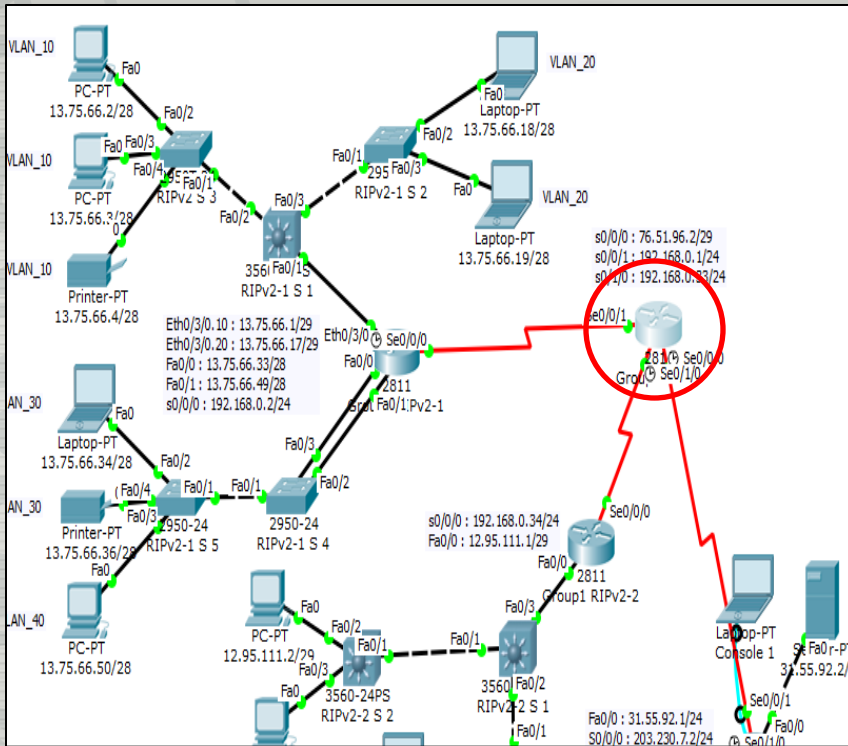
- RIPv2 :
- 규모가 작은 네트워크에 적합
- 사용이 비교적 간단함
- 타 네트워크 기본경로 설정으로 라우팅 테이블 간소화

- VLAN_10~40번 사용
- Inter-VLAN
- Router-on-a-stick

RIPv2 설정 영역

-

Group 1 RIPv2



Group1 RIPv2

Physical Config CLI

IOS Command Line Interface

Gateway of last resort is not set

```

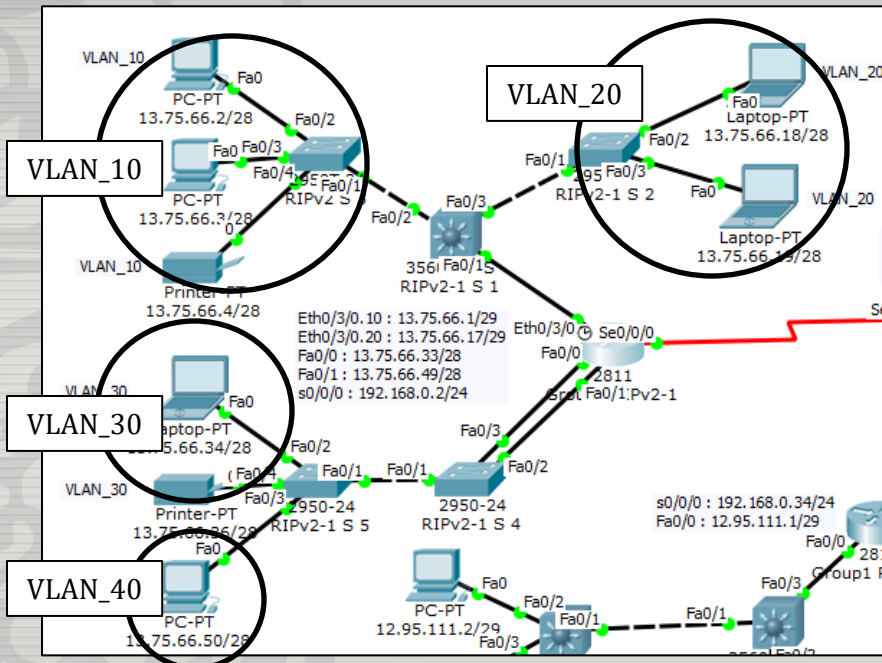
R 12.0.0.0/8 [120/1] via 192.168.0.34, 00:00:07, Serial0/1/0
R 13.0.0.0/8 [120/1] via 192.168.0.2, 00:00:05, Serial0/0/1
R 26.0.0.0/8 [120/2] via 76.51.96.1, 00:00:07, Serial0/0/0
R 31.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
R 31.0.0.0/8 [120/1] via 76.51.96.1, 00:01:22, Serial0/0/0
R 31.55.92.0/24 [120/1] via 76.51.96.1, 00:00:07, Serial0/0/0
R 43.0.0.0/8 [120/2] via 76.51.96.1, 00:00:07, Serial0/0/0
R 54.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
R 54.0.0.0/8 [120/2] via 76.51.96.1, 00:00:07, Serial0/0/0
R 54.7.92.16/29 [120/3] via 76.51.96.1, 00:00:07, Serial0/0/0
R 54.7.92.24/29 [120/3] via 76.51.96.1, 00:00:07, Serial0/0/0
R 54.7.92.32/29 [120/4] via 76.51.96.1, 00:00:07, Serial0/0/0
R 61.0.0.0/8 [120/2] via 76.51.96.1, 00:00:07, Serial0/0/0
R 76.0.0.0/29 is subnetted, 21 subnets
R 76.51.96.0 is directly connected, Serial0/0/0
R 76.51.97.0 [120/1] via 76.51.96.1, 00:00:07, Serial0/0/0
R 76.51.98.0 [120/1] via 76.51.96.1, 00:00:07, Serial0/0/0
R 76.51.98.8 [120/4] via 76.51.96.1, 00:00:07, Serial0/0/0
R 76.51.98.16 [120/4] via 76.51.96.1, 00:00:07, Serial0/0/0
R 76.51.98.24 [120/4] via 76.51.96.1, 00:00:07, Serial0/0/0
R 76.51.98.32 [120/4] via 76.51.96.1, 00:00:07, Serial0/0/0
R 76.51.98.40 [120/4] via 76.51.96.1, 00:00:07, Serial0/0/0
R 76.51.98.48 [120/4] via 76.51.96.1, 00:00:07, Serial0/0/0
R 76.51.98.56 [120/4] via 76.51.96.1, 00:00:07, Serial0/0/0
R 76.51.98.64 [120/4] via 76.51.96.1, 00:00:07, Serial0/0/0
R 76.51.98.72 [120/4] via 76.51.96.1, 00:00:07, Serial0/0/0
R 76.51.98.80 [120/4] via 76.51.96.1, 00:00:07, Serial0/0/0
  
```

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RIPv2 설정 라우터

RIPv2 라우팅 테이블

Group 1 RIPv2



```

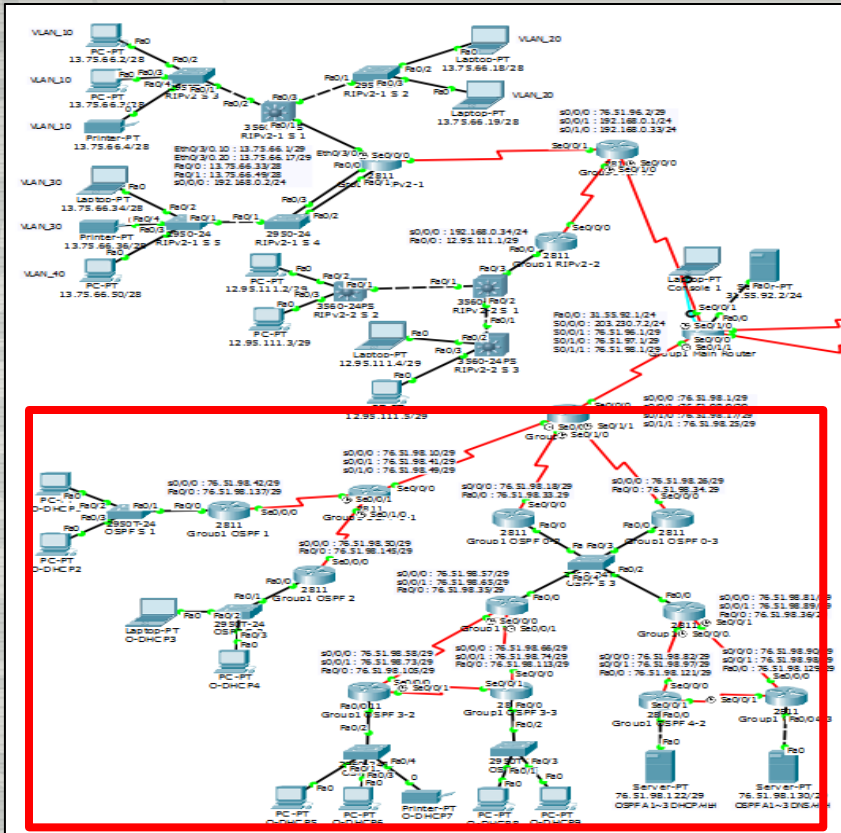
Gateway of last resort is not set

R   12.0.0.0/8 [120/2] via 192.168.0.1, 00:00:22, Serial0/0/0
   13.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C   13.75.66.0/29 is directly connected, Ethernet0/3/0.10
C   13.75.66.16/29 is directly connected, Ethernet0/3/0.20
C   13.75.66.32/28 is directly connected, FastEthernet0/0
C   13.75.66.48/28 is directly connected, FastEthernet0/1
R   26.0.0.0/8 [120/3] via 192.168.0.1, 00:00:22, Serial0/0/0
R   31.0.0.0/8 [120/2] via 192.168.0.1, 00:00:22, Serial0/0/0
R   43.0.0.0/8 [120/3] via 192.168.0.1, 00:00:22, Serial0/0/0
R   54.0.0.0/8 [120/3] via 192.168.0.1, 00:00:22, Serial0/0/0
R   61.0.0.0/8 [120/3] via 192.168.0.1, 00:00:22, Serial0/0/0
R   76.0.0.0/8 [120/1] via 192.168.0.1, 00:00:22, Serial0/0/0
R   142.169.0.0/16 [120/6] via 192.168.0.1, 00:00:22, Serial0/0/0
   192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks
C   192.168.0.0/24 is directly connected, Serial0/0/0
R   192.168.0.32/28 [120/1] via 192.168.0.1, 00:00:22, Serial0/0/0
R   203.230.7.0/24 [120/2] via 192.168.0.1, 00:00:22, Serial0/0/0
    
```

VLAN 구성

Router-on-a-stick & Inter-VLAN

Group 1 OSPF

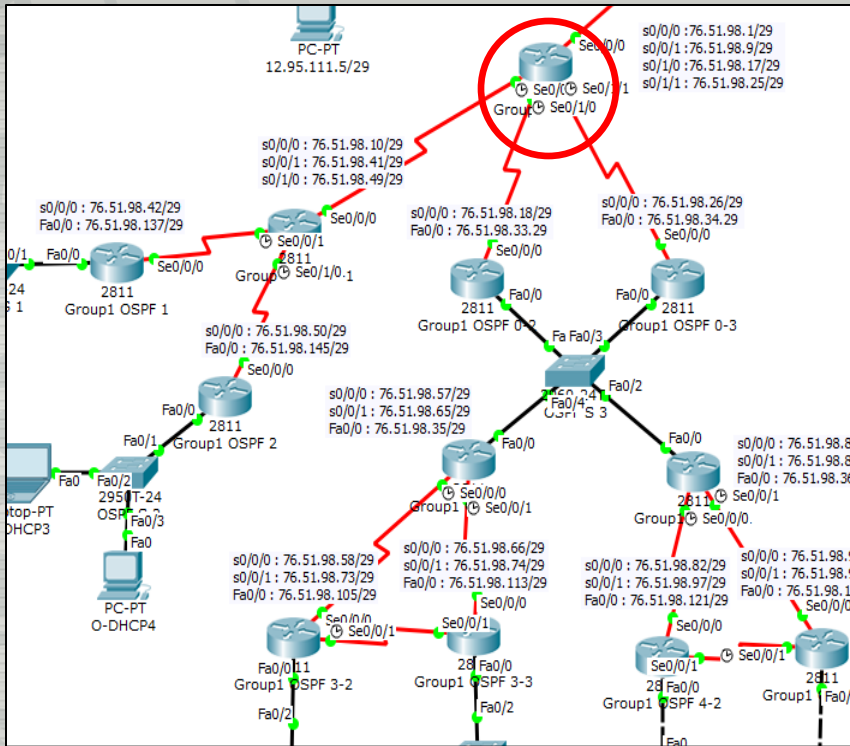


OSPF 설정 영역

- OSPF :
- 중, 대규모 네트워크에 적합
- 계층화 된 라우팅 동작
- 플러딩 기법 사용
(신속하게 갱신 기록 전달)

- Area 0~4 사용
- OSPF 브로드캐스트(DR-BDR)
- DHCP 서버 사용
- DNS 서버 사용

Group 1 OSPF



```

Group1 OSPF 0
Physical Config CLI
IOS Command Line Interface

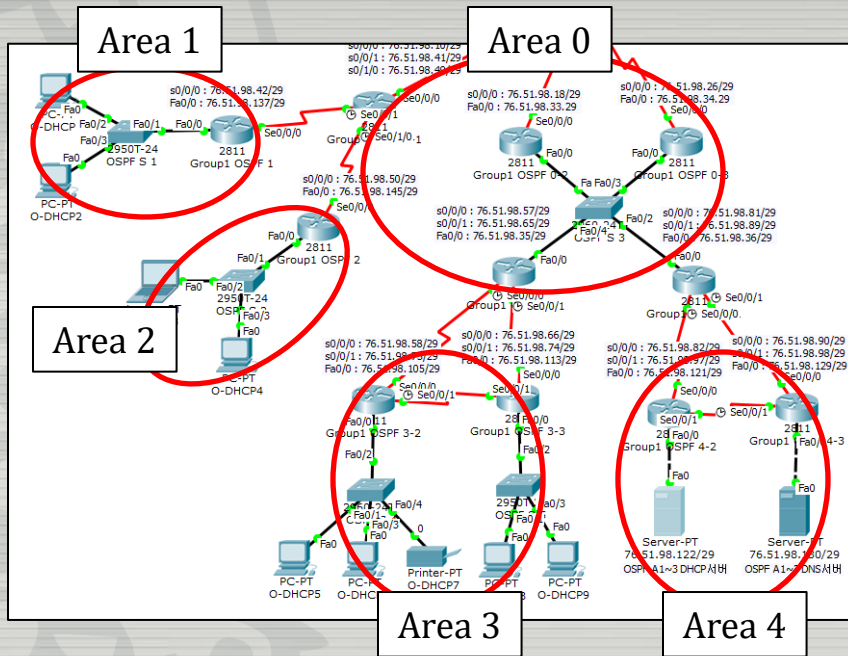
Gateway of last resort is not set

O E2 12.0.0.0/8 [110/20] via 76.51.98.1, 00:22:29, Serial0/0/0
O E2 13.0.0.0/8 [110/20] via 76.51.98.1, 00:22:29, Serial0/0/0
O E2 26.0.0.0/8 [110/20] via 76.51.98.1, 00:22:29, Serial0/0/0
   31.0.0.0/24 is subnetted, 1 subnets
O E2 31.55.92.0 [110/20] via 76.51.98.1, 00:22:29, Serial0/0/0
O E2 43.0.0.0/8 [110/20] via 76.51.98.1, 00:22:29, Serial0/0/0
O E2 54.0.0.0/8 [110/20] via 76.51.98.1, 00:22:29, Serial0/0/0
O E2 61.0.0.0/8 [110/20] via 76.51.98.1, 00:22:29, Serial0/0/0
   76.0.0.0/29 is subnetted, 21 subnets
O E2 76.51.96.0 [110/20] via 76.51.98.1, 00:22:29, Serial0/0/0
O E2 76.51.97.0 [110/20] via 76.51.98.1, 00:22:29, Serial0/0/0
C 76.51.98.0 is directly connected, Serial0/0/0
C 76.51.98.8 is directly connected, Serial0/0/1
C 76.51.98.16 is directly connected, Serial0/1/0
C 76.51.98.24 is directly connected, Serial0/1/1
O 76.51.98.32 [110/65] via 76.51.98.26, 00:21:59, Serial0/1/1
   [110/65] via 76.51.98.18, 00:21:59, Serial0/1/0
O IA 76.51.98.40 [110/128] via 76.51.98.10, 00:22:29, Serial0/0/1
O IA 76.51.98.48 [110/128] via 76.51.98.10, 00:22:29, Serial0/0/1
O IA 76.51.98.56 [110/129] via 76.51.98.26, 00:21:59, Serial0/1/1
   [110/129] via 76.51.98.18, 00:21:59, Serial0/1/0
O IA 76.51.98.64 [110/129] via 76.51.98.26, 00:21:59, Serial0/1/1
   [110/129] via 76.51.98.18, 00:21:59, Serial0/1/0
O IA 76.51.98.72 [110/193] via 76.51.98.26, 00:21:59, Serial0/1/1
   [110/193] via 76.51.98.18, 00:21:59, Serial0/1/0
O IA 76.51.98.80 [110/129] via 76.51.98.26, 00:21:59, Serial0/1/1
--More--
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```

OSPF 설정 라우터

OSPF 라우팅 테이블

Group 1 OSPF

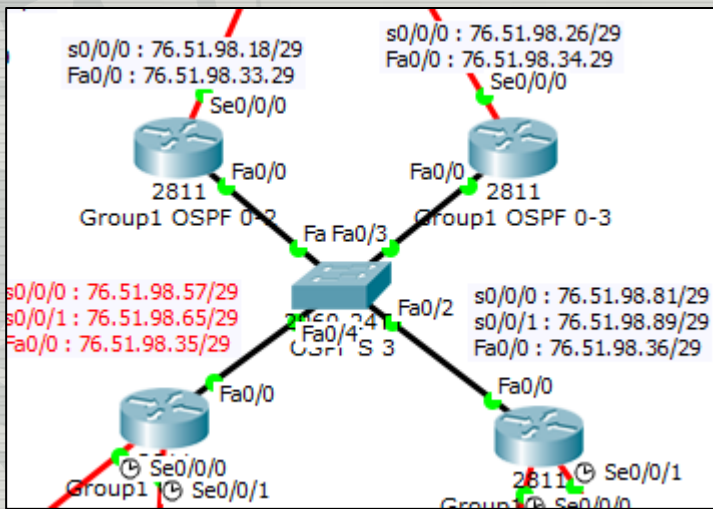


- OSPF로 계층적 네트워크를 설정 할 경우에는 Backbone 영역(Area 0)이 필수로 설정되어 있어야 하며, 다른 영역 네트워크는 Area0을 지나야만 통신이 가능하다.

OSPF 구역 설정

-

Group 1 OSPF



```

Group1 OSPF 0-3
Physical Config CLI
IOS Command Line Interface

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

00:00:10: %OSPF-5-ADJCHG: Process 1, Nbr 76.51.98.25 on Serial0/0/0 from LOADING to FULL, Loading Done
00:00:45: %OSPF-5-ADJCHG: Process 1, Nbr 76.51.98.65 on FastEthernet0/0 from LOADING to FULL, Loading Done
00:00:45: %OSPF-5-ADJCHG: Process 1, Nbr 76.51.98.33 on FastEthernet0/0 from LOADING to FULL, Loading Done
00:01:00: %OSPF-5-ADJCHG: Process 1, Nbr 76.51.98.89 on FastEthernet0/0 from LOADING to FULL, Loading Done

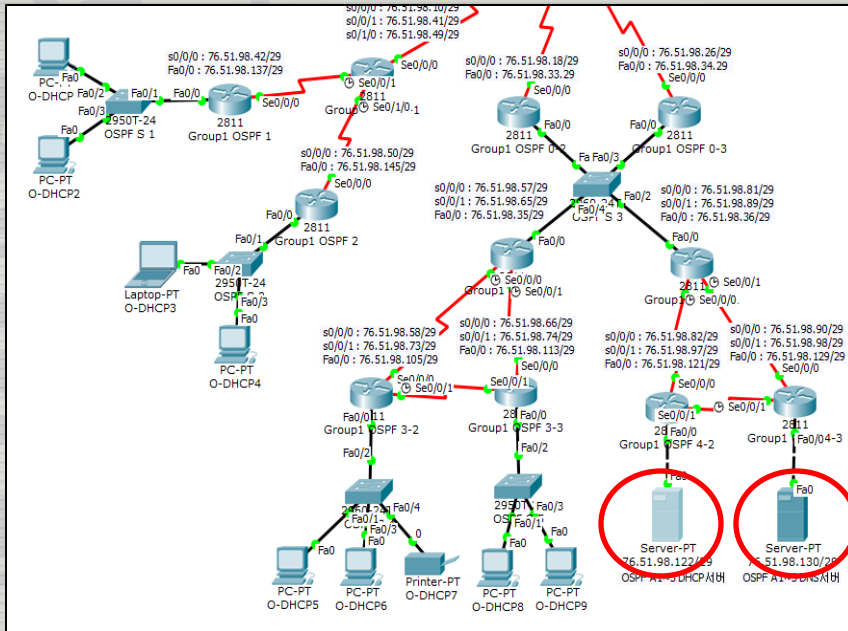
Group1-OSPF-0-3>en
Group1-OSPF-0-3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Group1-OSPF-0-3(config)#do show ip ospf neighbor

Neighbor ID      Pri   State           Dead Time   Address         Interface
76.51.98.33     1     2WAY/DROTHER    00:00:36   76.51.98.33    FastEthernet0/0
76.51.98.89     1     FULL/DR         00:00:36   76.51.98.36    FastEthernet0/0
76.51.98.65     1     FULL/BDR        00:00:36   76.51.98.35    FastEthernet0/0
76.51.98.25     0     FULL/-          00:00:36   76.51.98.25    Serial0/0/0
Group1-OSPF-0-3(config)#
    
```

OSPF 브로드캐스트

DR - BDR 관계

Group 1 OSPF



IP Configuration

IP Configuration

DHCP Static

IP Address:

Subnet Mask:

Default Gateway:

DNS Server:

IPv6 Configuration

DHCP Auto Config Static

IPv6 Address:

Link Local Address:

IPv6 Gateway:

IPv6 DNS Server:

DHCP & DNS 서버 사용

DHCP & DNS 서버 사용

Group 1 OSPF

The screenshot shows the DHCP configuration window for interface FastEthernet0. The service is set to 'On'. The pool name is 'serverPool'. The default gateway is 0.0.0.0. The DNS server is 0.0.0.0. The start IP address is 76.51.98.120 and the subnet mask is 255.255.255.248. The maximum number of users is 512. The TFTP server is 0.0.0.0. A table below shows the DHCP pool configuration:

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	T
Area1	76.51.98.137	76.51.9...	76.51.98.137	255.255...	7	0.0.0.0
Area2	76.51.98.145	76.51.9...	76.51.98.145	255.255...	7	0.0.0.0
Area3	76.51.98.105	76.51.9...	76.51.98.105	255.255...	7	0.0.0.0
Area3-1	76.51.98.113	76.51.9...	76.51.98.105	255.255...	7	0.0.0.0
server	0.0.0.0	0.0.0.0	76.51.98.120	255.255...	512	0.0.0.0

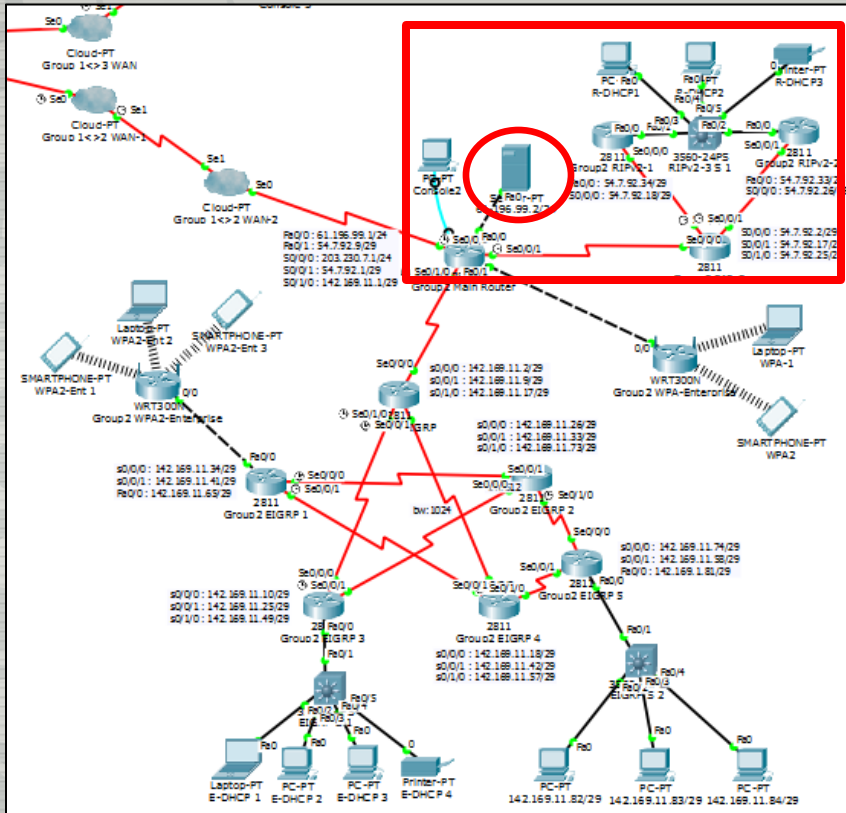
DHCP 서비스 설정

The screenshot shows the DNS configuration window. The DNS service is set to 'On'. The resource records table is as follows:

No.	Name	Type	Detail
0	area1	A Record	76.51.98.137
1	area2	A Record	76.51.98.145
2	area3	A Record	76.51.98.105
3	area3	A Record	76.51.98.113

DNS 서비스 설정

Group 2 RIPv2

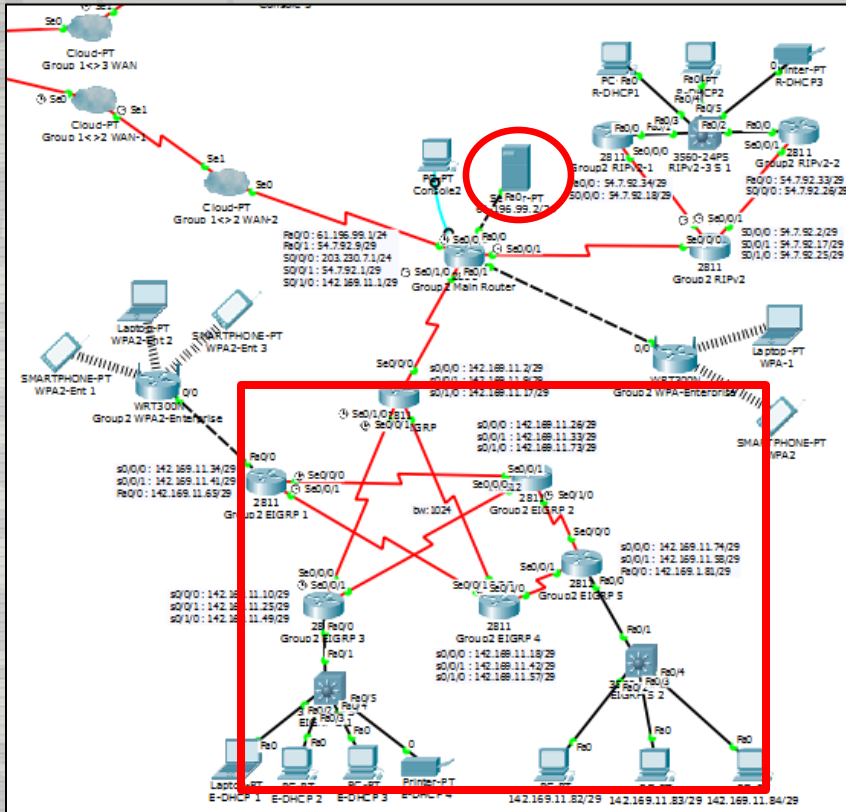


- 라우터 이중화
(스위치를 사용해 인터페이스 하나를 사용하지 못하더라도 다른 한쪽으로 통신이 가능하도록 구성)
- DHCP 서버 사용
- DNS 서버 사용

RIPv2 설정 영역

-

Group 2 EIGRP



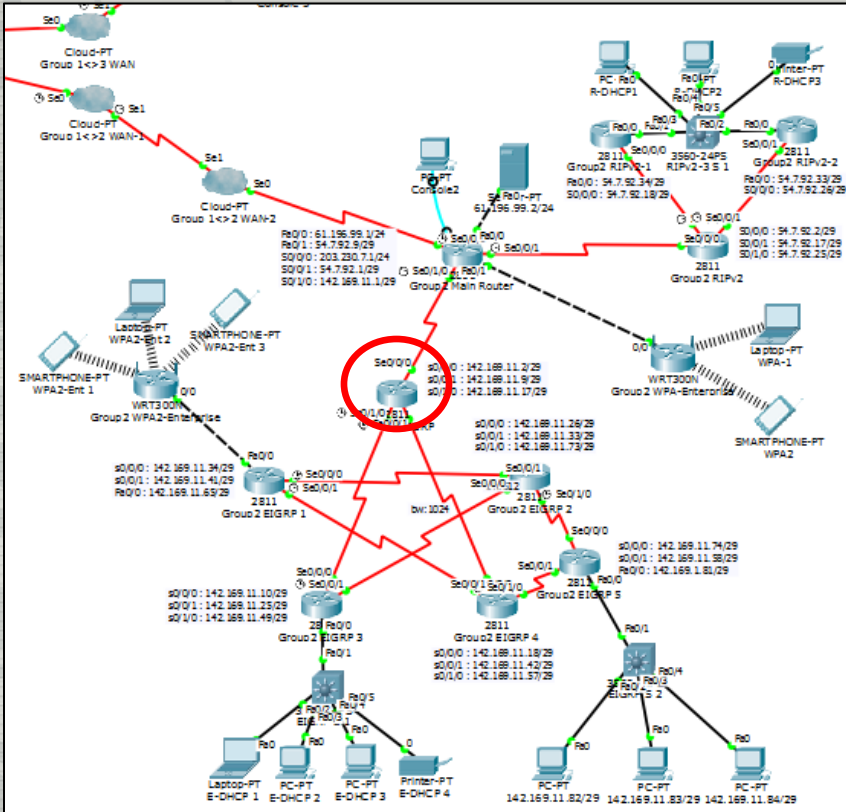
- EIGRP :
- DUAL 알고리즘을 수행하여 최적의 경로를 찾음
- 헬로 패킷으로 네이버를 확인하여 인접관계 구성

- DHCP 사용
- DNS 사용
- 라우터 이중화

EIGRP 설정 영역

-

Group 2 EIGRP



```

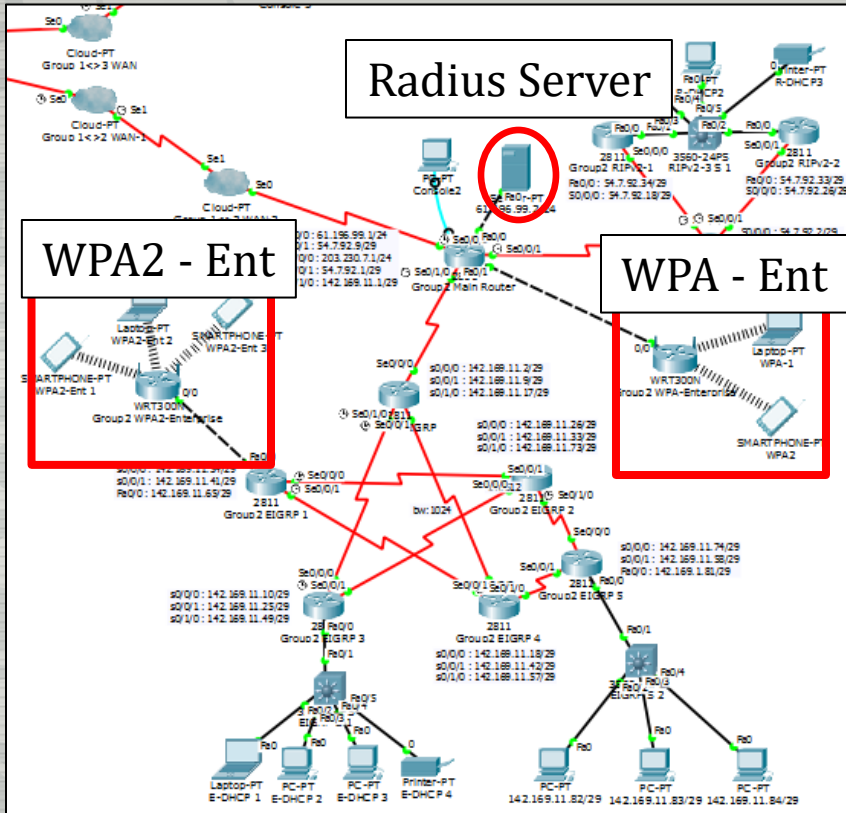
Group2 EIGRP
Physical Config CLI
IOS Command Line Interface
Gateway of last resort is not set

D EX 12.0.0.0/8 [170/2169856] via 142.169.11.1, 00:03:13, Serial0/0/0
D EX 13.0.0.0/8 [170/2169856] via 142.169.11.1, 00:03:13, Serial0/0/0
D EX 26.0.0.0/8 [170/2169856] via 142.169.11.1, 00:03:14, Serial0/0/0
  31.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
D EX 31.0.0.0/8 [170/2169856] via 142.169.11.1, 00:03:14, Serial0/0/0
D EX 31.55.92.0/24 [170/2169856] via 142.169.11.1, 00:02:52, Serial0/0/0
D EX 43.0.0.0/8 [170/2169856] via 142.169.11.1, 00:03:14, Serial0/0/0
  54.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
D 54.0.0.0/8 is a summary, 00:03:14, Null0
D EX 54.7.92.0/29 [170/2169856] via 142.169.11.1, 00:03:14, Serial0/0/0
D EX 54.7.92.8/29 [170/2169856] via 142.169.11.1, 00:03:14, Serial0/0/0
D EX 54.7.92.16/29 [170/2169856] via 142.169.11.1, 00:03:13, Serial0/0/0
D EX 54.7.92.24/29 [170/2169856] via 142.169.11.1, 00:03:13, Serial0/0/0
D EX 54.7.92.32/29 [170/2169856] via 142.169.11.1, 00:03:13, Serial0/0/0
  61.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
D 61.0.0.0/8 is a summary, 00:03:14, Null0
D EX 61.196.99.0/24 [170/2169856] via 142.169.11.1, 00:03:14, Serial0/0/0
  76.0.0.0/8 is variably subnetted, 22 subnets, 2 masks
D 76.0.0.0/8 is a summary, 00:03:14, Null0
D EX 76.51.96.0/29 [170/2169856] via 142.169.11.1, 00:02:52, Serial0/0/0
D EX 76.51.97.0/29 [170/2169856] via 142.169.11.1, 00:02:52, Serial0/0/0
D EX 76.51.98.0/29 [170/2169856] via 142.169.11.1, 00:02:52, Serial0/0/0
D EX 76.51.98.8/29 [170/2169856] via 142.169.11.1, 00:02:48, Serial0/0/0
D EX 76.51.98.16/29 [170/2169856] via 142.169.11.1, 00:02:48, Serial0/0/0
D EX 76.51.98.24/29 [170/2169856] via 142.169.11.1, 00:02:48, Serial0/0/0
D EX 76.51.98.32/29 [170/2169856] via 142.169.11.1, 00:02:19, Serial0/0/0
D EX 76.51.98.40/29 [170/2169856] via 142.169.11.1, 00:02:48, Serial0/0/0
--More--
    
```

EIGRP 설정 라우터

EIGRP 라우팅 테이블

Group 2 Wireless LAN (WPA2 & WPA-Enterprise)



- WPA2 & WPA :
- AES, TKIP 암호화 방식 사용
- Radius 서버 – AAA 서비스
- 사용자 계정 & 비밀번호 설정
- 서버에 등록된 사용자만 무선 랜 접속 가능

WPA2-Enterprise 설정 영역

-

Group 2 Wireless LAN (WPA2 & WPA-Enterprise)

Group2 WPA2-Enterprise

Physical Config GUI

Wireless-N Broadband Router

Firmware Version: v0.93.3

Wireless Setup Wireless Security Access Restrictions Applications & Gaming Administration Status

Basic Wireless Settings Wireless Security Wireless MAC Filter Advanced Wireless Settings

Wireless Security

Security Mode: **WPA2 Enterprise**

Encryption: AES

RADIUS Server: 61 . 196 . 99 . 2

RADIUS Port: 1645

Shared Secret: 1234567890

Key Renewal: 3600 seconds

61.196.99.2/24

Physical Config Services Desktop Software/Services

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

AAA

Service On Off Radius Port 1645

Network Configuration

WPA2 - Ent

Client Name	Client IP	Server Type	Key
1 Group2-EIGRP-WRT300N	142.169.11.66	Radius	1234567890
2 Group2-WRT300N	54.7.92.10	Radius	908070609

WPA - Ent

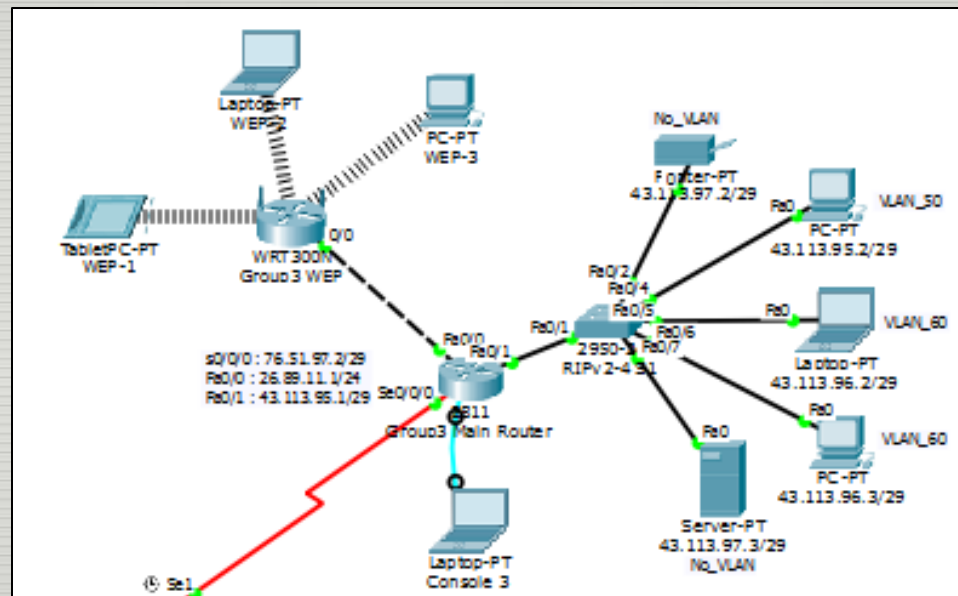
Username Password

Username	Password
1 Group2-User1	1
2 Group2-User2	2
3 Group2-User3	3

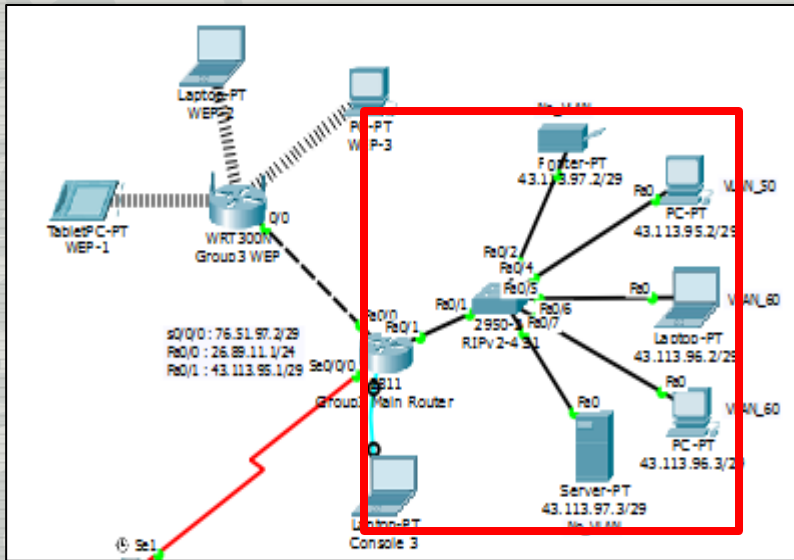
WPA2-Enterprise 설정

Radius 서버 설정

Group 3 토폴로지



Group 3 RIPv2

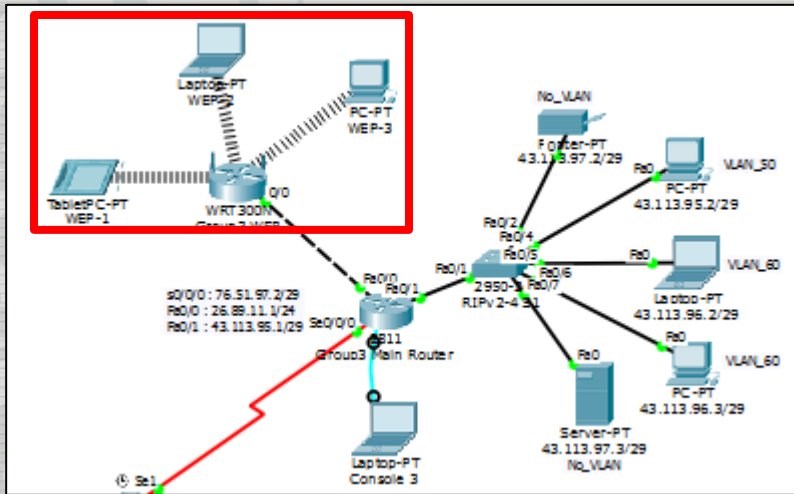


- VLAN 50-60, No_VLAN 사용
- Router-on-a-stick 사용

RIPv2 설정 영역

-

Group 3 Wireless LAN (WEP)

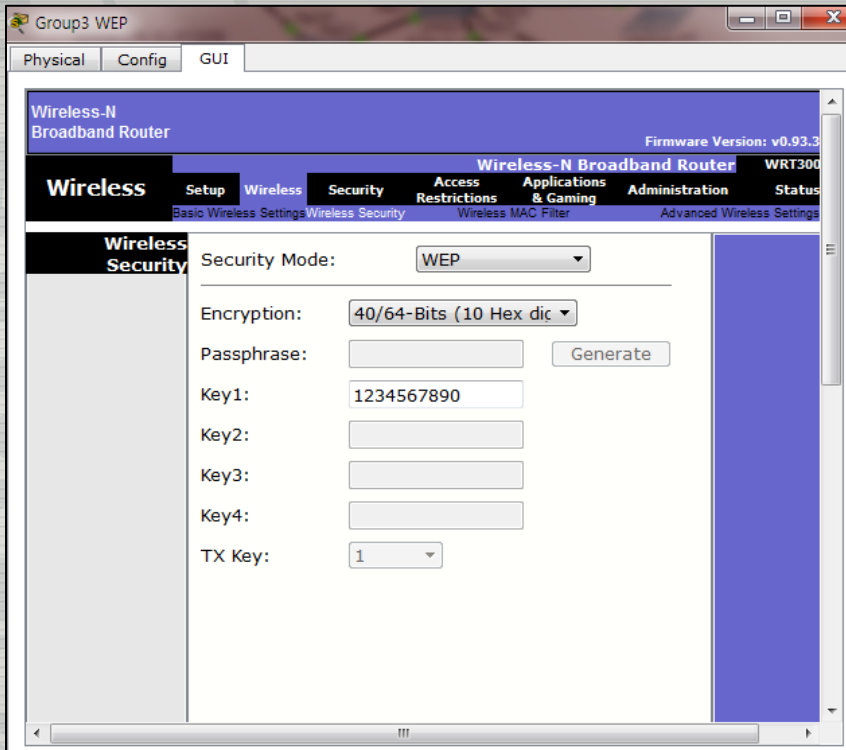


- WEP :
- 고정된 비밀번호 사용
- 통신 패킷을 모아서 분석하면 암호 키 획득 가능

WEP 설정 영역

-

Group 3 Wireless LAN (WEP)



```
[00:00:00] Tested 29381 keys (got 50641 IVs)
KB  depth  byte(vote)
0   0/ 1    31(71936) 6C(61696) ED(61440) F6(59392) 35(58880)
1   0/ 1    32(68352) ED(61440) 59(58624) 5B(58368) 6C(57856)
2   0/ 1    33(69120) A5(61696) 7D(59904) A3(59904) 6E(59136)
3   0/ 1    34(66304) 15(60160) 30(59648) 75(59392) 78(59392)
4   0/ 17   35(61952) 41(61440) 6D(60928) DD(60672) CB(59904)
5   0/ 1    36(72192) 33(59648) 97(59648) F2(59392) 81(59136)
6   0/ 6    37(64256) B2(61440) 9F(60416) 5D(59648) 3A(59392)
7   0/ 1    61(67328) ED(60416) B0(59392) 72(58880) BE(58624)
8   5/ 7    5F(58112) 2F(57344) 3E(57344) 1B(57088) 8B(56832)
9   0/ 4    63(64000) 94(61952) 4A(60928) A7(59392) 5A(58880)
10  0/ 1    64(71168) AB(60928) 42(60160) A7(59904) CE(59904)
11  1/ 4    65(60416) CB(60416) E4(60160) 3F(59648) 0D(58624)
12  0/ 3    66(64512) 1F(60416) 8A(59904) 65(59648) F6(58880)

KEY FOUND! [ 31:32:33:34:35:36:37:61:62:63:64:65:66 ] (ASCII: 1234567abcdef
The quieter you become, the more you are able to hear

Decrypted correctly: 100%
```

WEP 설정

실제 WEP 키 값 획득 결과

IPv6 제외 이유

- IPv4와 IPv6를 이용해 토폴로지를 구성하고 NAT-PT, NAT64, NAT46을 이용하여 통신이 되게 구성하려 하였으나, 패킷트레이서 프로그램이 위 3개 기술을 지원하지 않아 IPv6는 토폴로지 에서 제외하였습니다.

Q & A



감사합니다!