8차시 수업: “배운 내용 총정리”
10월 20일 (목) - 송준규

자리에 앉아서 D드라이브에
Packet Tracer 8.2.0설치
(노트북 사용 가능)

등교수업	10/20	목	15:30 ~ 18:30	오늘 (총 복습 + Inter-vlan)
등교수업				
등교수업				
등교수업	10/25	화	16:30 ~ 18:30	다음 시간 (Frame-Relay)
등교수업				
등교수업	10/27	목	15:30 ~ 18:30	다음 다음시간 (Server Service)
등교수업				
등교수업				
등교수업	10/28	금	15:30 ~ 18:30	다음 다음 다음 시간 (Config)
등교수업				
등교수업				
등교수업	11/1	화	16:30 ~ 18:30	온라인 강의 대체 예정

네트워크 이론 복습

Network ?
LAN v.s WAN
Internet ?
Protocol ?
통신 방식 3가지 ?
MAC v.s. IP address
ARP ?
ㄴ통신 방식: ?
OSI 7 Layer v.s. TCP / IP Layer
7th Layer
6th Layer
5th Layer 4th Layer
4th Layer 3rd Layer
3rd Layer 2nd Layer
2nd Layer 1st Layer
1st Layer

How can we count Network ?
How can we count Broadcast Domain?
If IP addresses are in same network,
ㄴ> _____ have to be Same but
ㄴ> _____ have to be Different !

PDU: Protocol Data Unit - Header
4th Layer ?
3rd Layer ?
2nd Layer ?
1st Layer ?
Ethernet: 동작 방식: CSMA/CD ?
계층별 장비:
3rd Layer ?
2nd Layer ?
1st Layer ?
When we use CrossOver cable
and DirectCable? (UTP)
CrossOver cable color?
IP: Internet Protocol ?
_____ is used to divide an IP address into two parts.
ㄴ> IP = _____ + _____
FLSM ?
VLSM ?
Class A ~ E
Prefix ?

Subnetting 문제 풀이

1. 11100101: 232 :

2. C class, 각 서브넷에 61개의 호스트가 연결되어야 한다면, 이때 서브넷 마스크와 서브넷 갯수를 구하여라.

3. B class 주소를 가지고 서브넷 마스크 255.255.255.248으로 서브넷을 만들었을 때,
추가된 서브넷의 수와 각 서브넷 당 사용 가능한 호스트의 수를 작성하시오.

Subnetting 문제 풀이

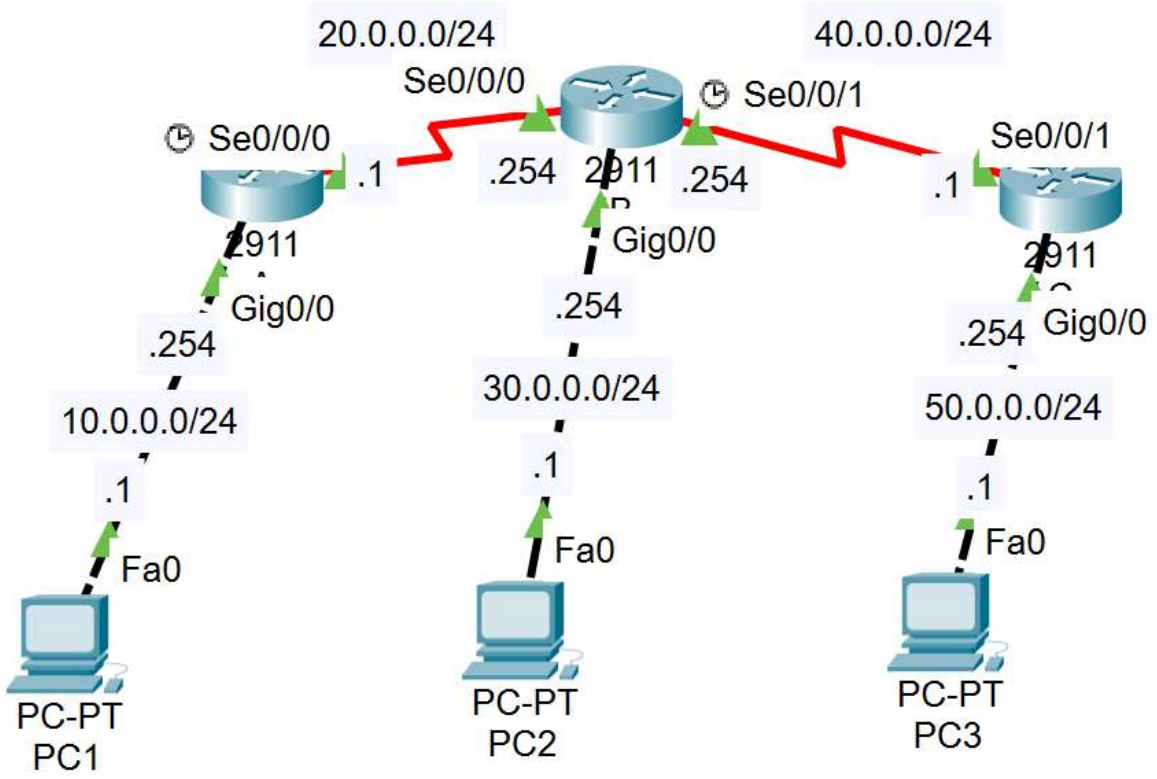
4. IP 주소가 111.222.33.199(255.255.255.192)이라면 해당 주소의 네트워크 id는 어떻게 될 것인가?

5. IP 주소는 111.222.33.42에, 서브넷 마스크는 255.255.255.248이다. 본 네트워크의 브로드 캐스트 주소는?

6. 주식회사 "Sunrin"회사와 사무실에 VLSM이 필요한 시점입니다. 192.168.120.0/24 네트워크를
정보팀 60대 / 숍팀 30대 / 잇경팀 4대 / 콘디팀 2 대의 PC가 사용 가능하도록 서브넷팅합니다.
총무팀 Network-ID: 사용 가능한 IP범위:
Broadcast IP:
영업팀 Network-ID: 사용 가능한 IP범위:
Broadcast IP:
마케팅팀 Network-ID: 사용 가능한 IP범위:
Broadcast IP:
인사팀 Network-ID: 사용 가능한 IP범위:
Broadcast IP:1

Routing

1.Static, 2.Dynamic (RIPv2, EIGRP, OSFP)

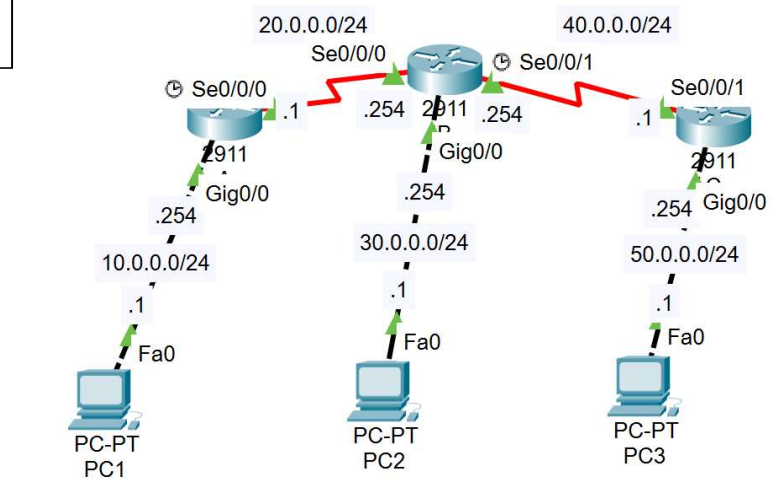


1. IP Settings

```
en // Router Left
conf t
int se0/0/0
ip add 20.0.0.1 255.255.255.0

int g0/0
ip add 10.0.0.254 255.255.255.0
```

```
en // Router Center
conf t
int se0/0/0
ip add 20.0.0.254 255.255.255.0

int se0/0/1
ip add 40.0.0.254 255.255.255.0

int g0/0
ip add 30.0.0.254 255.255.255.0
```

```
en // Router Right
conf t
int se0/0/1
ip add 40.0.0.1 255.255.255.0

int g0/0
ip add 50.0.0.254 255.255.255.0
```



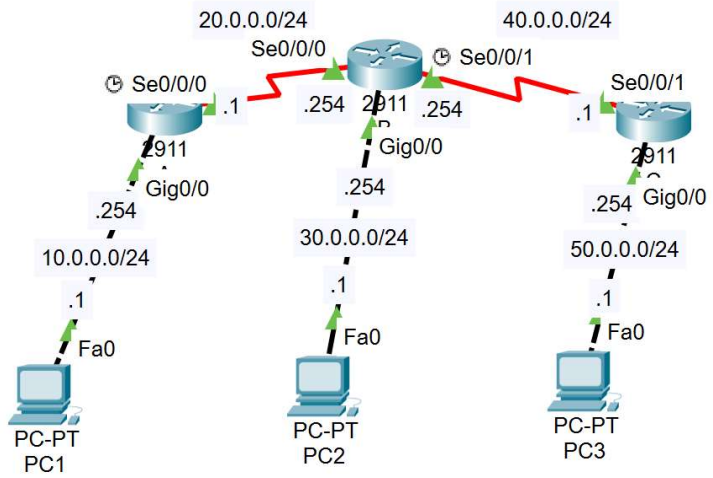
2-1. Static Routing

```
conf t // Static Routing
ip route [net-id] [sm] [상대편 Router ip]
```

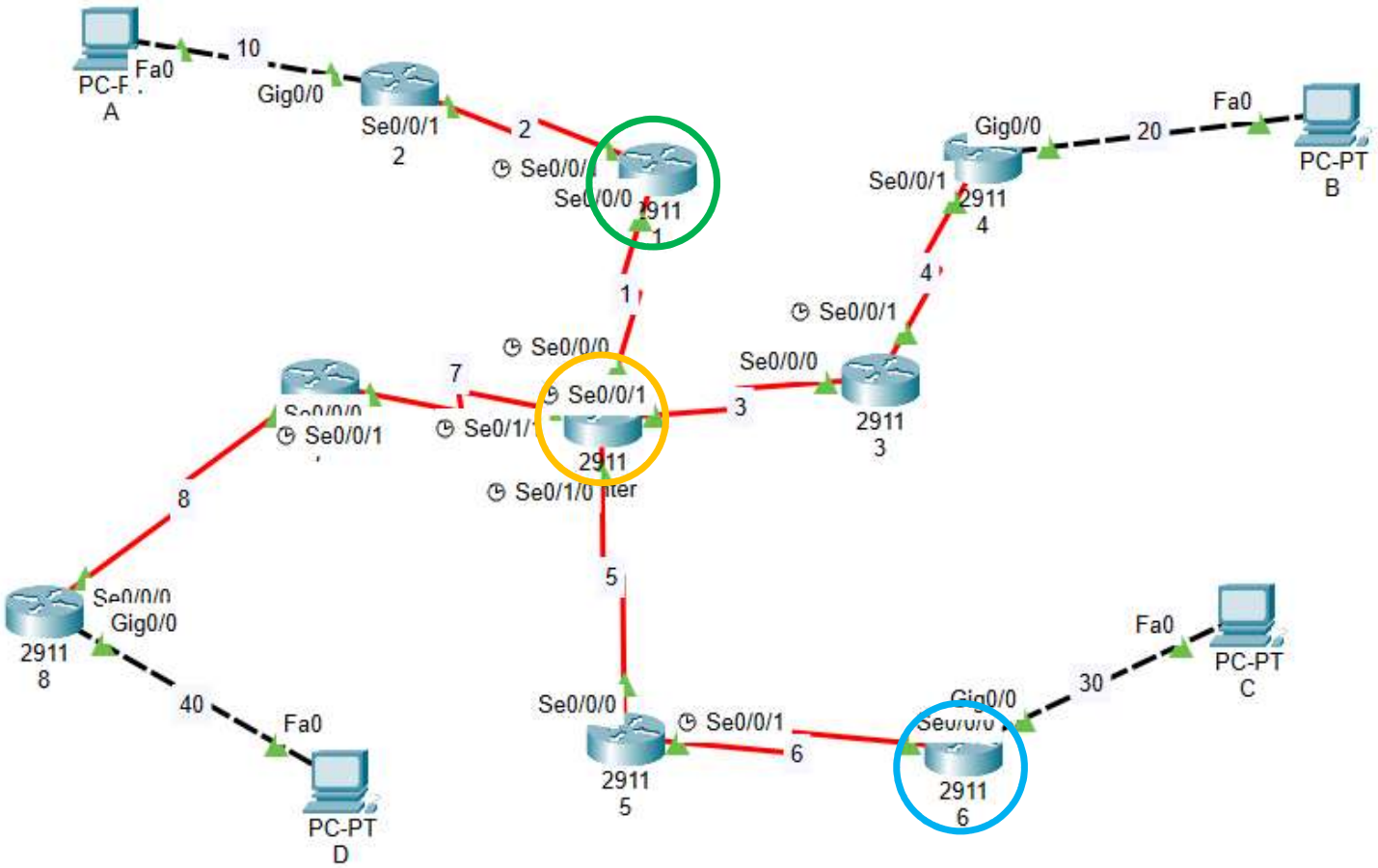
```
conf t // router Center
ip route 10.0.0.0 255.255.255.0 20.0.0.1
ip route 50.0.0.0 255.255.255.0 40.0.0.1
```

```
conf t // Router Left
ip route 30.0.0.0 255.255.255.0 20.0.0.254
ip route 40.0.0.0 255.255.255.0 20.0.0.254
ip route 50.0.0.0 255.255.255.0 20.0.0.254
```

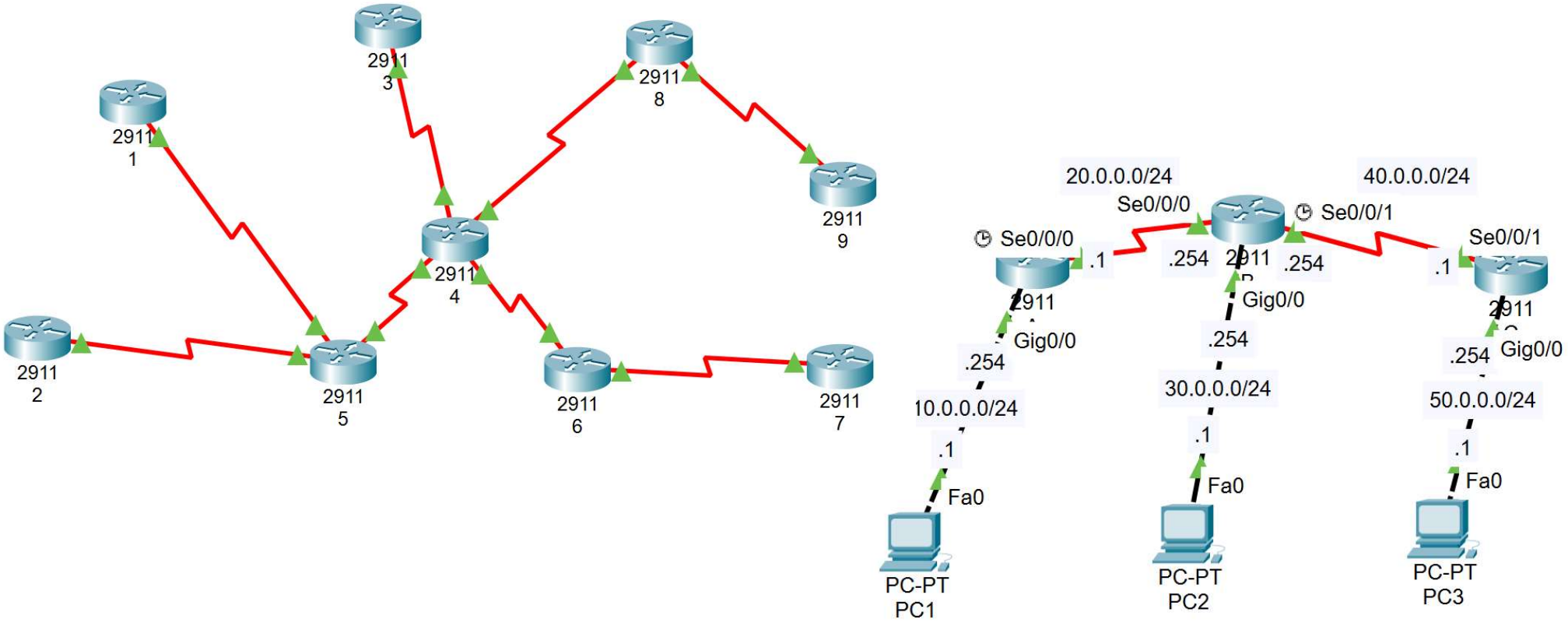
```
conf t// Router Right
ip route 10.0.0.0 255.255.255.0 40.0.0.254
ip route 20.0.0.0 255.255.255.0 40.0.0.254
ip route 30.0.0.0 255.255.255.0 40.0.0.254
```



2-2. Static Routing



2-2. Stub Network / 단말 라우터



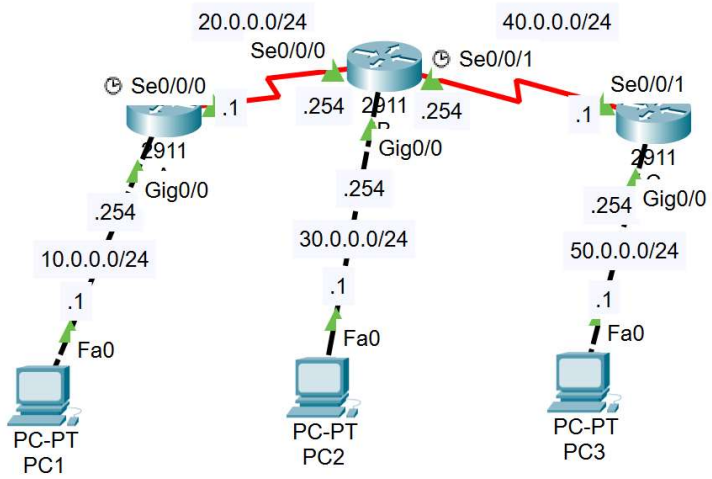
2-3. Default Routing

```
conf t // Static Default Routing
ip route 0.0.0.0 0.0.0.0 [상대편 Router ip]
```

```
conf t // router Center
ip route 10.0.0.0 255.255.255.0 20.0.0.1
ip route 50.0.0.0 255.255.255.0 40.0.0.1
```

```
conf t // Router Left
ip route 0.0.0.0 0.0.0.0 20.0.0.254
```

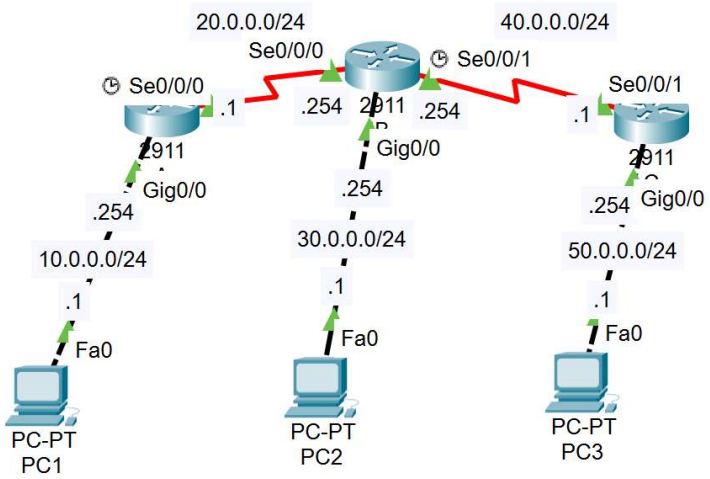
```
conf t// Router Right
ip route 0.0.0.0 0.0.0.0 40.0.0.254
```



3-1. Dynamic Routing (RIPv2)

```
router rip
version 2
network [인접한 네트워크 id]
no auto-summary
```

```
conf t // router Center
router rip
version 2
network 20.0.0.0
network 30.0.0.0
network 40.0.0.0
no auto-summary
```




```
conf t // Router Left
router rip
v 2
net 10.0.0.0
net 20.0.0.0
no au
```

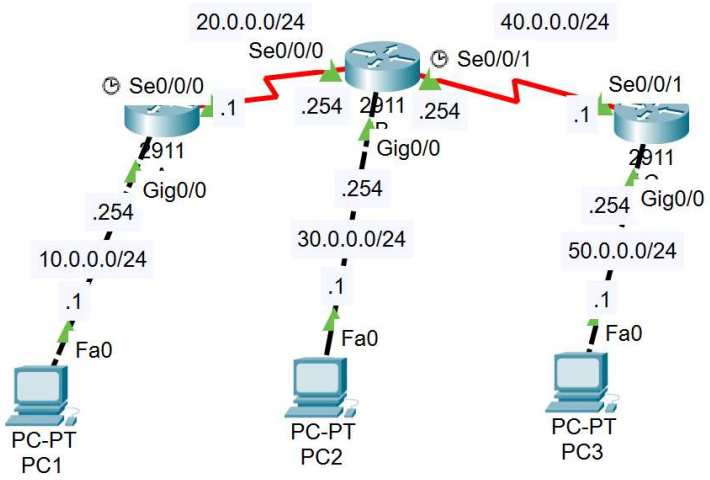
```
conf t// Router Right
router rip
v 2
net 40.0.0.0
net 50.0.0.0
no au
```

3-2. Dynamic Routing (EIGRP)

```
router eigrp [AS number]
network [인접한 네트워크 id] [Wildcard mask]
no auto-summary
```

```
conf t // router Center
router eigrp 2
network 20.0.0.0 0.0.0.255
network 30.0.0.0 0.0.0.255
network 40.0.0.0 0.0.0.255
no auto-summary
```

```
conf t // Router Left
router eigrp 2
net 10.0.0.0 0.0.0.255
net 20.0.0.0 0.0.0.255
no au
```




```
conf t// Router Right
router eigrp 2
net 40.0.0.0 0.0.0.255
net 50.0.0.0 0.0.0.255
no au
```

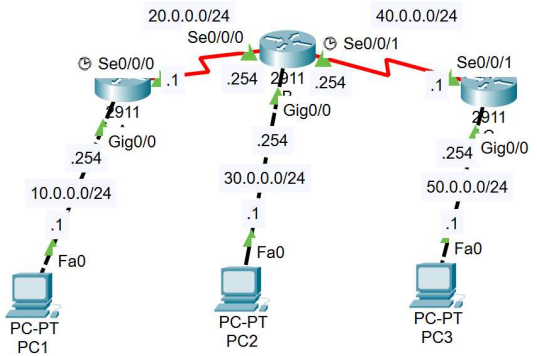
3-3. Dynamic Routing (OSPF)

```
사전 단계: Loopback 주소
router ospf [process-id]
router-id [ip address]
network [인접한 네트워크 id] [Wildcard mask] area [area]
```

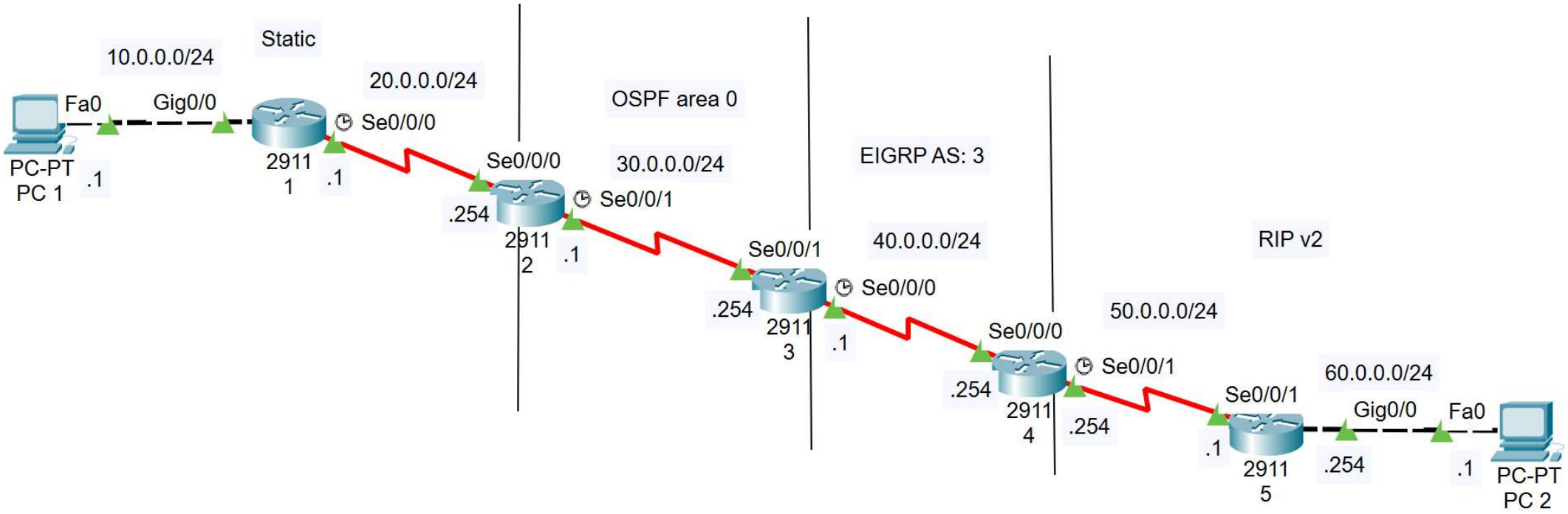
```
conf t // Router Left
int lo 0
ip add 1.1.1.1 255.255.255.0

router ospf 1
router-id 1.1.1.1
net 10.0.0.0 0.0.0.255 area 0
net 20.0.0.0 0.0.0.255 area 0
```

```
conf t // router Center
int lo 0
ip add 2.2.2.2 255.255.255.0

router ospf 1
router-id 2.2.2.2
network 20.0.0.0 0.0.0.255 area 0
network 30.0.0.0 0.0.0.255 area 0
network 40.0.0.0 0.0.0.255 area 0
```

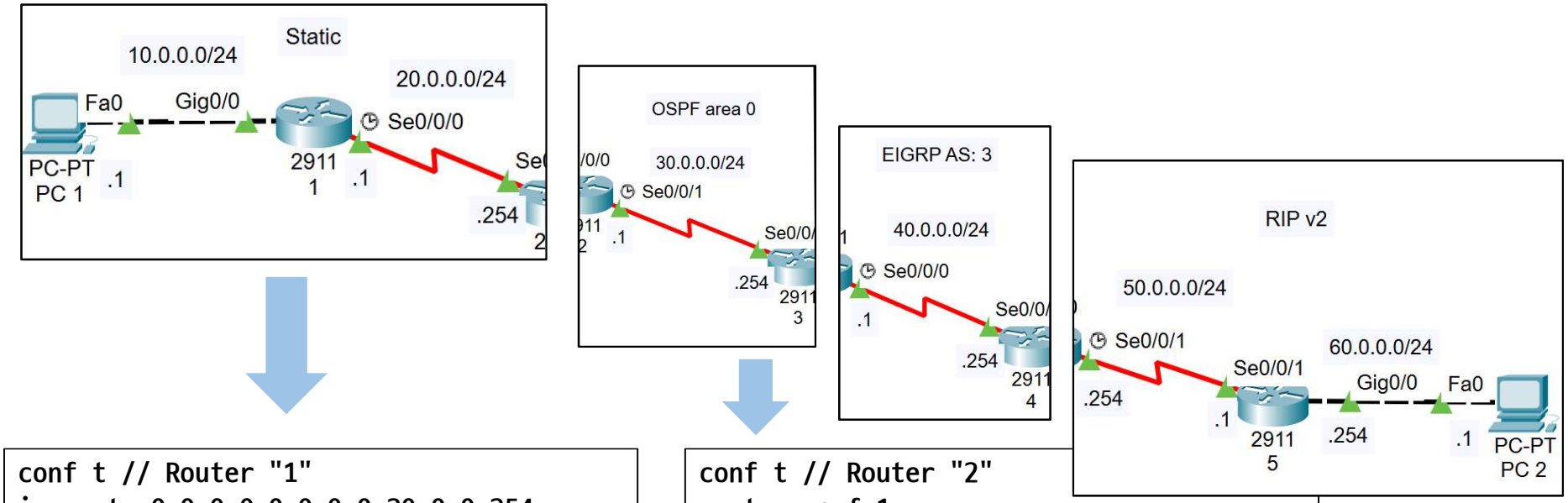
```
conf t// Router Right
int lo 0
ip add 3.3.3.3 255.255.255.0

router ospf 1
router-id 3.3.3.3
net 40.0.0.0 0.0.0.255 area 0
net 50.0.0.0 0.0.0.255 area 0
```



4-1. Redistribute (IP Settings)



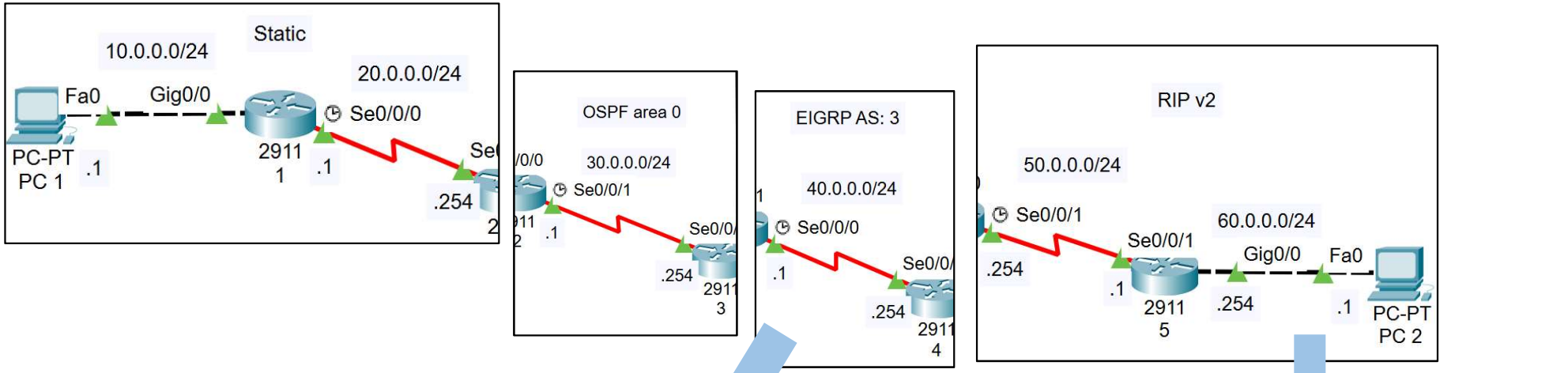
4-2-1. Redistribute (Routing)




```
conf t // Router "1"
ip route 0.0.0.0 0.0.0.0 20.0.0.254

conf t// Router "2"
ip route 10.0.0.0 255.255.255.0 20.0.0.1
```

```
conf t // Router "2"
router ospf 1
net 30.0.0.0 0.0.0.255 area 0

conf t// Router "3"
router ospf 1
net 30.0.0.0 0.0.0.255 area 0
```

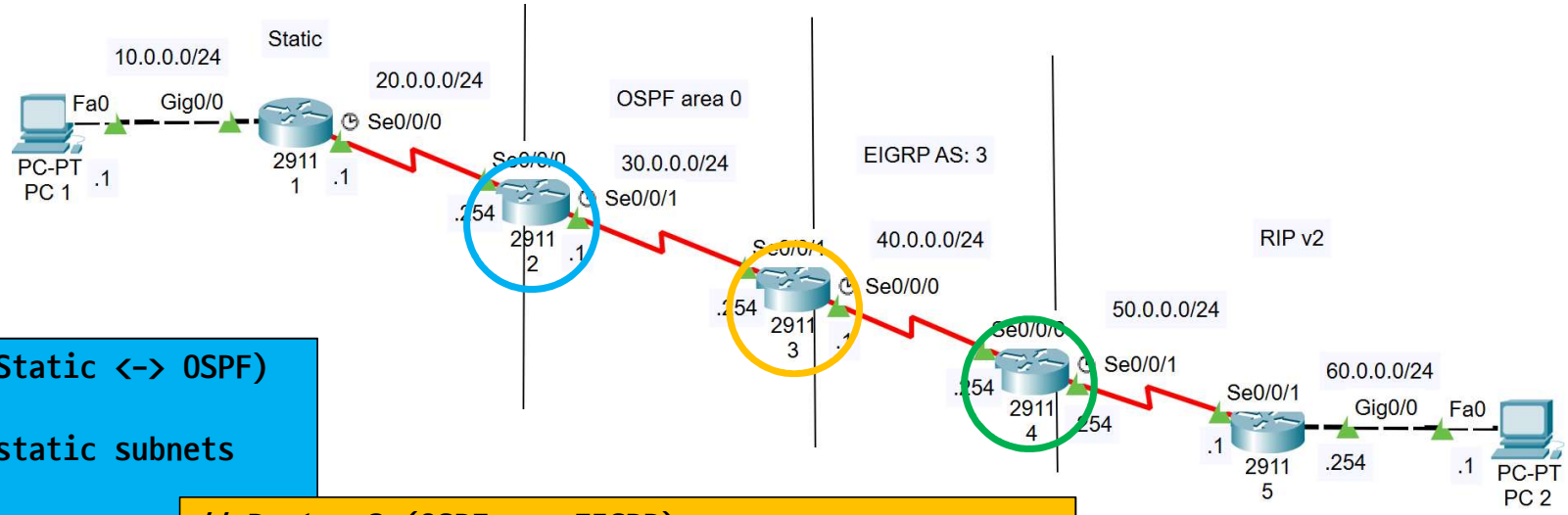
4-2-2. Redistribute (Routing)




```
conf t // Router "3"
router eigrp 3
net 40.0.0.0 0.0.0.255
no au

conf t// Router "4"
router eigrp 4
net 40.0.0.0 0.0.0.255
no au
```

```
conf t // Router "4"
router rip
version 2
net 50.0.0.0
no au

conf t// Router "5"
router rip
v 2
net 50.0.0.0
net 60.0.0.0
no au
```

4-3. Redistribute




```
// Router 2 (Static <-> OSPF)
router ospf 1
redistribute static subnets

// router static ???
```

```
// Router 3 (OSPF <-> EIGRP)
router ospf 1
redistribute eigrp 3 subnets

router eigrp 3
redistribute ospf 1 metric 3000 1000 255 1 1500
```

```
// Router 4 (EIGRP <-> RIP)
router egirp 3
redistribute rip metric 3000 1000 255 1 1500

router rip
redistribute eigrp 3 metric 1
```

4-4. Redistribution Example

```
OSPF: no auto-summary / subnets
EIGRP: Metric / Bandwith, Delay, Reliability, Load, MTU
RIP: Hop Counts(max: 15)
```

```
// Router A (Static <-> OSPF:1)
router ospf 1
redistribute static subnets
```

```
// Router A (Static <-> EGIRP:3)
router eigrp 3
redistribute static metric 3000 1000 255 1 1500
```

```
// Router A (Static <-> RIP)
router rip
redistribute static metric 1
```

```
// Router A (EIGRP:3 <-> OSPF:1)
router ospf 1
redistribute eigrp 3 subnets
```

```
// Router A (OSPF:1 <-> EIGRP:3)
router eigrp 3
redistribute ospf 1 metric 3000 1000 255 1 1500
```

```
// Router A (EIGRP:3 <-> RIP)
router rip
redistribute eigrp 3 metric 1
```

```
// Router A (RIP <-> OSPF:1)
router ospf 1
redistribute rip subnets
```

```
// Router A (RIP <-> EIGRP:3)
router eigrp 3
redistribute rip metric 3000 1000 255 1 1500
```

```
// Router A (OSPF:1 <-> RIP)
router rip
redistribute eigrp 3 metric 1
```

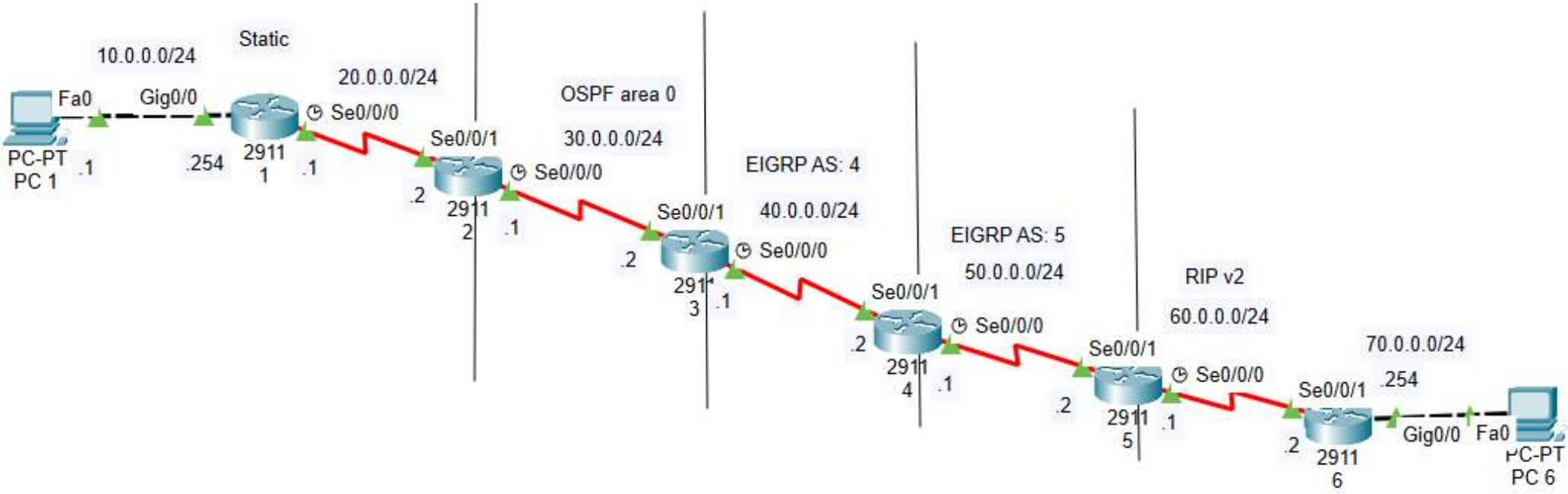
```
// Router A (OSPF:2 <-> OSPF:1)
router ospf 1
redistribute ospf 2 subnets
```

```
// Router A (EIGRP:2 <-> EIGRP:3)
router eigrp 3
redistribute eigrp 2 metric 3000 1000 255 1 1500
```

```
// Router A (RIP <-> RIP) ???
router rip
redistribute rip metric 1
```

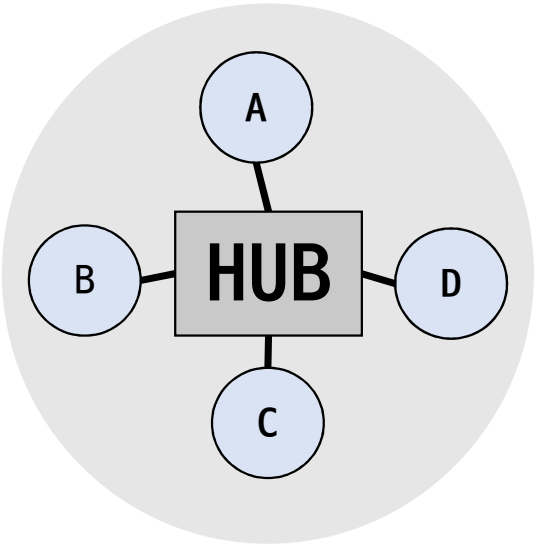
4-5. Redistribution Practice

```
tips for ip settings:
se0/0/0: N.0.0.1
se0/0/1: N.0.0.2
OSPF process-id: 1 / eigrp metric: 3000 1000 255 1 1500 / RIP metric: 2
```

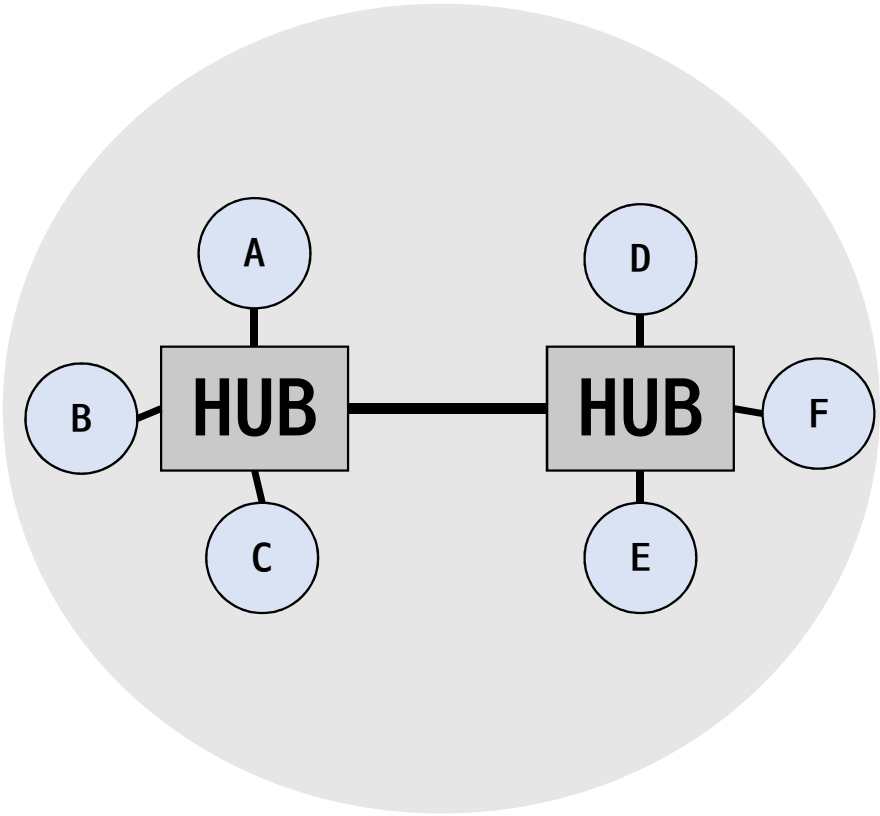


5-1. Ethernet Hub (Multiport Reapeater)

CSMA/CD

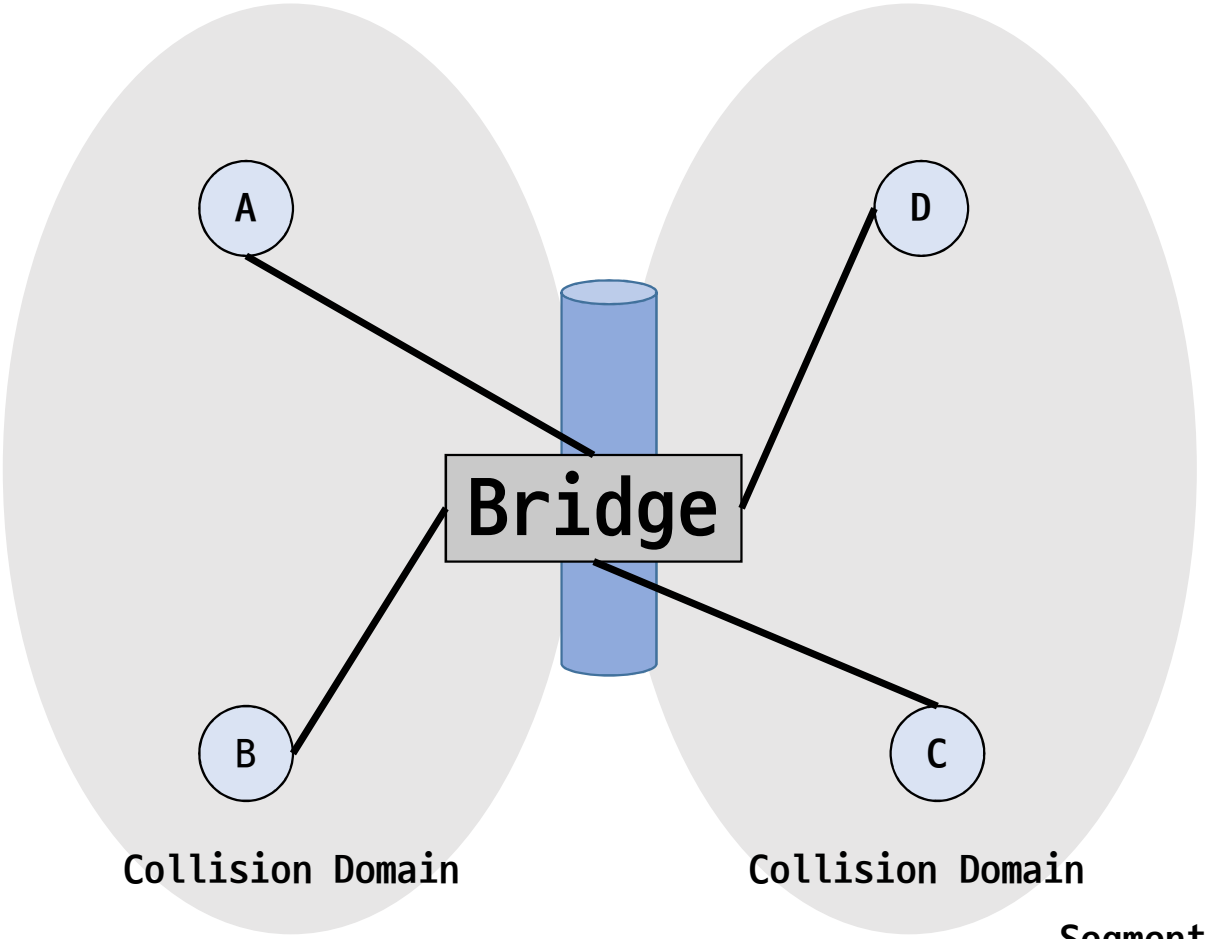


Collision Domain



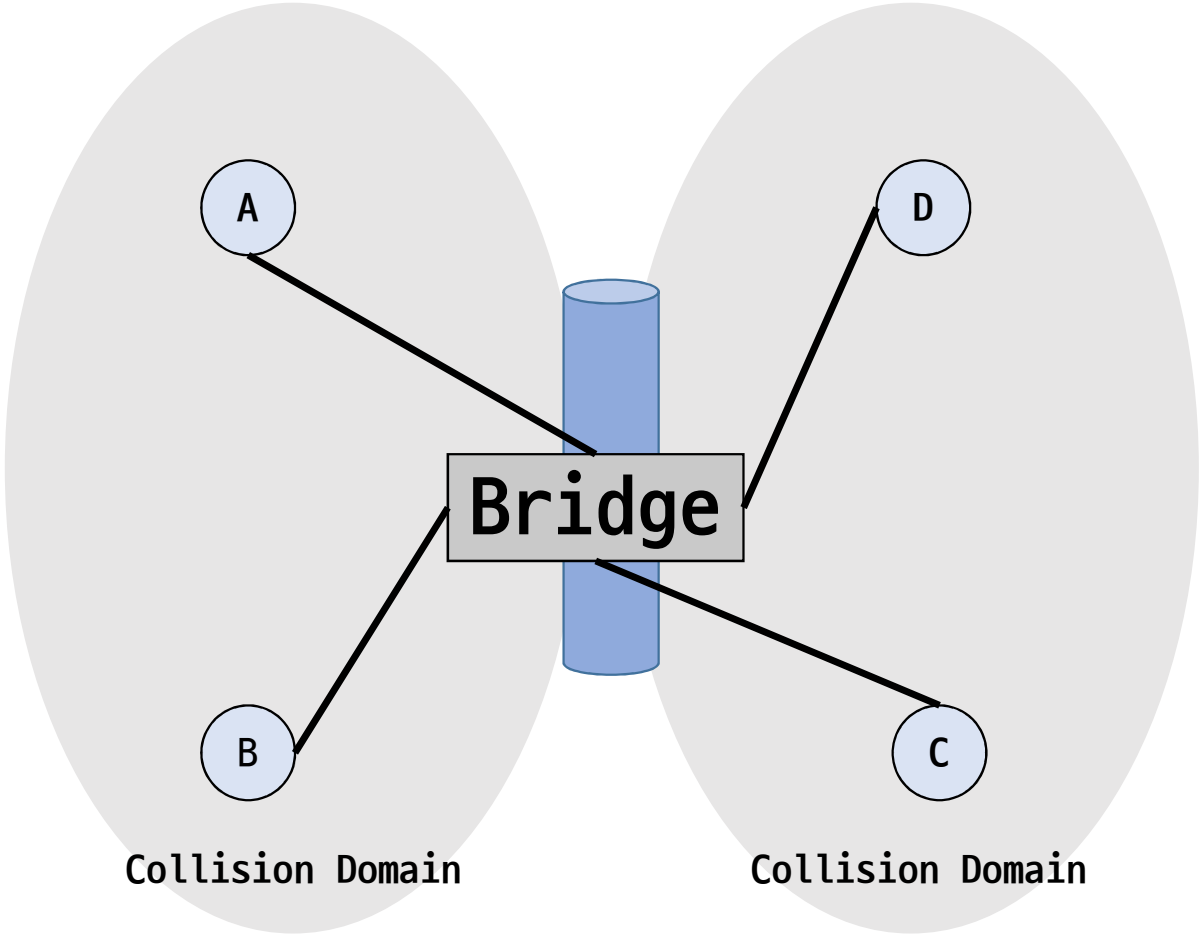
Collision Domain

5-2. Bridge



Segment: 수신자 상관없이 신호 전달
Hub: 연결만 가능
Bridge: Collision Domain을 나눈다.

5-2. Bridge Status



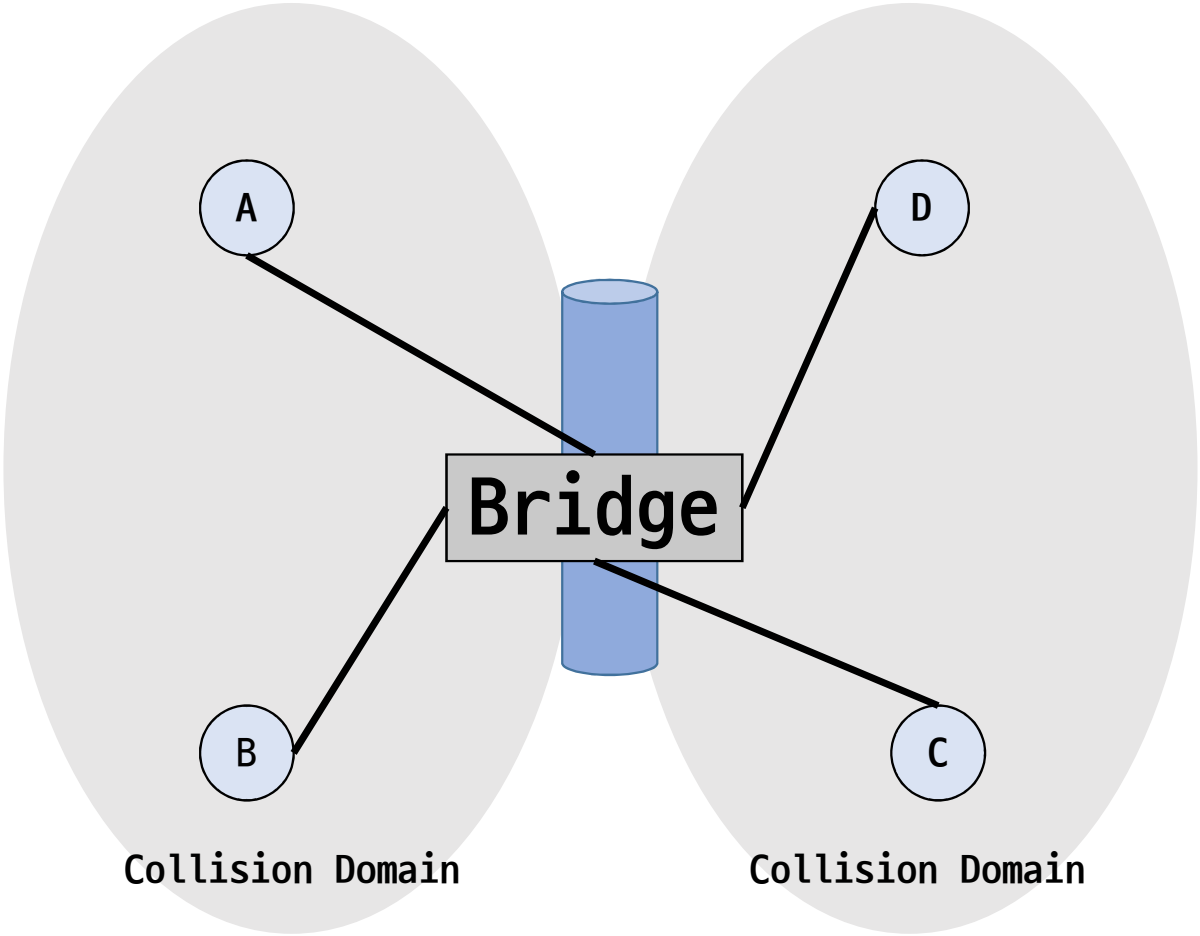
1. Learning / 모르면 배운다 (프레임 접수)
2. Flooding / 모르면 뿌린다.

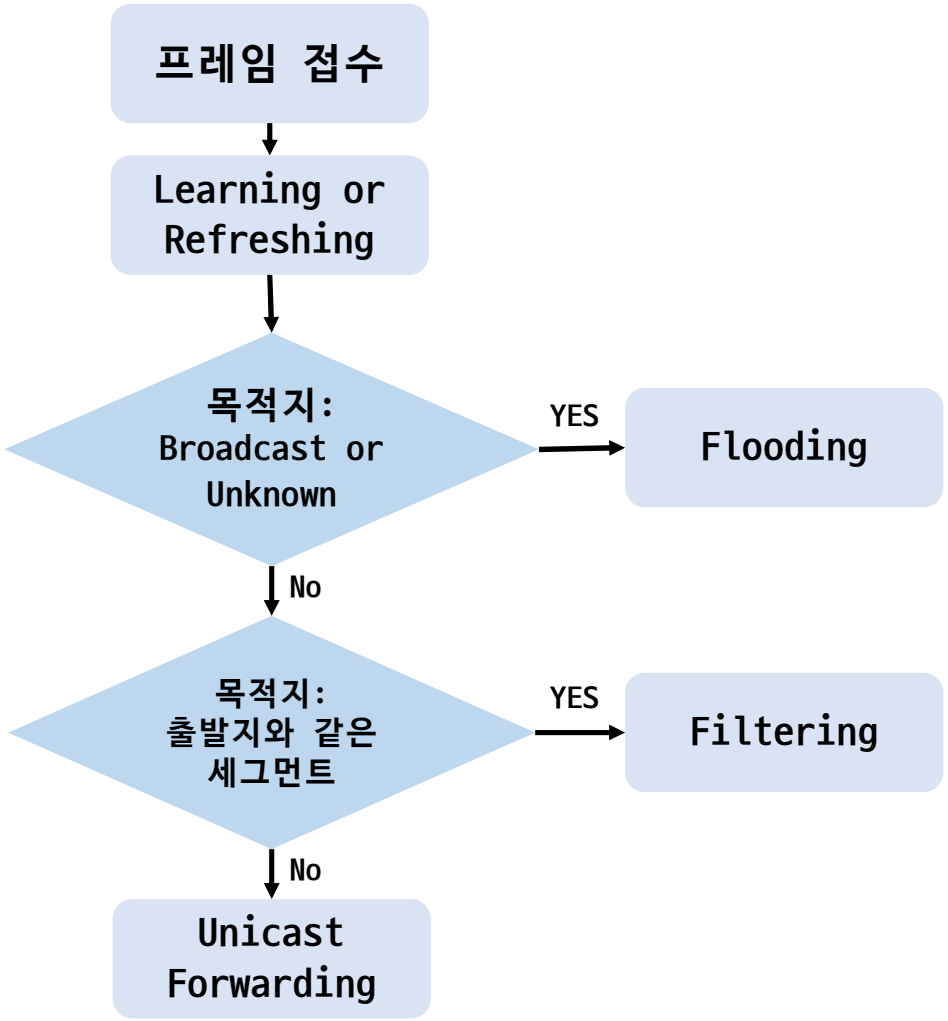
3. Forwarding / 해당 세그먼트로 건네준다.
4. Filtering /목적지 세그먼트가 같을 경우, 다른 포트로 못 건너게 막는다
(Collision Domain 분리)

5. Aging (메모리)

Hub: 연결만 가능
Bridge: Collision Domain을 나눈다.

5-3. Frame Flow on Bridge

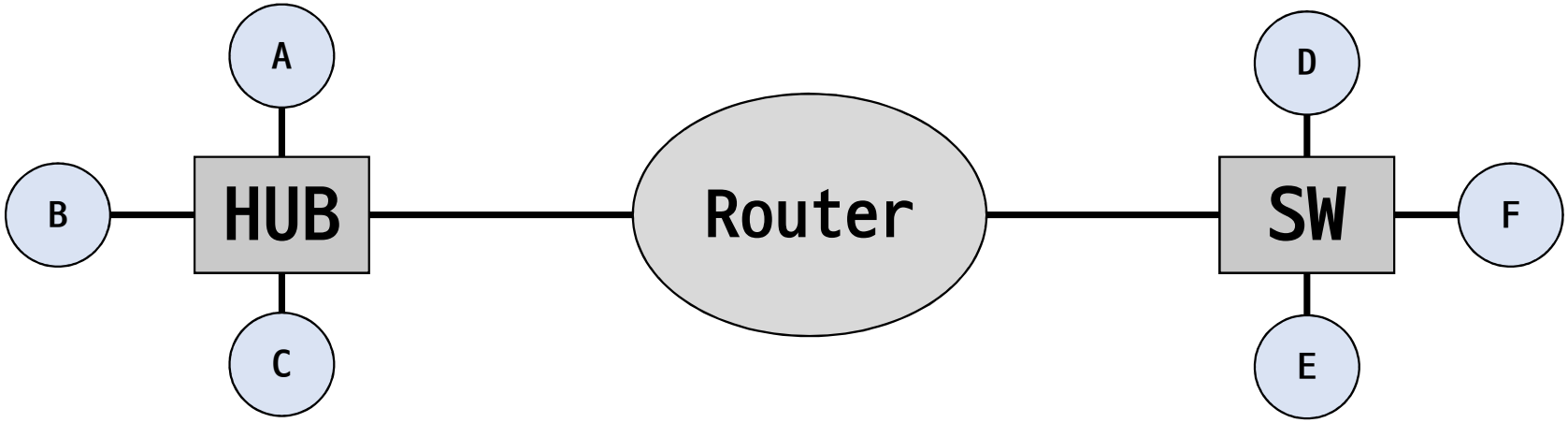




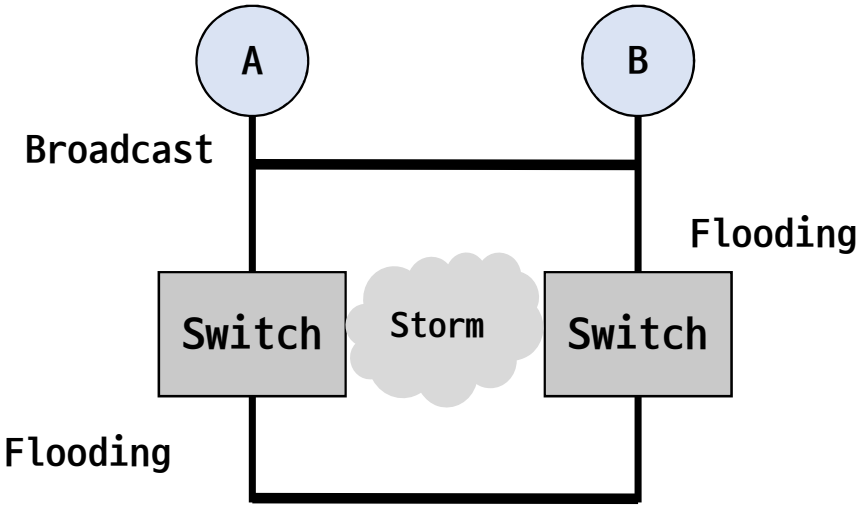
6. Summary + Quiz

Hub: Multiport Repeater
Bridge: Devide Collision Domain
Switch: Bridge + more Functions (포트별로)
Router: Devide Broadcast Domain

Quiz : How many Broadcast domain, Collision Domain in this topology?



7. Broadcast Storm



To Solve -> **STP**

Spanning Tree Protocol

8-1. STP (Prepare)

Broadcast Strom Solve -> **STP**

1. Bridge ID (BID)

- Priority (2Byte)
- Mac Address (6Byte)

2. Path Cost

- 1000Mbps / Bandwith
- 정수 / 소수점 Issue

Speed	Port Cost	Comment
10 Mbps	100	Ethernet
20 Mbps	56	EtherChannel
30 Mbps	47	EtherChannel
40 Mbps	41	EtherChannel
50 Mbps	35	EtherChannel
54 Mbps	33	802.11 wireless
60 Mbps	30	EtherChannel
70 Mbps	26	EtherChannel
80 Mbps	23	EtherChannel
100 Mbps	19	Fast Ethernet
200 Mbps	12	Fast EtherChannel
300 Mbps	9	Fast EtherChannel
400 Mbps	8	Fast EtherChannel
500 Mbps	7	Fast EtherChannel
600 Mbps	6	Fast EtherChannel
700 Mbps	5	Fast EtherChannel
800 Mbps	5	Fast EtherChannel
1 Gbps	4	Gigabit Ethernet
2 Gbps	3	Gigabit EtherChannel
10 Gbps	2	10G Ethernet
20 Gbps	1	20G EtherChannel
40 Gbps	1	40G EtherChannel

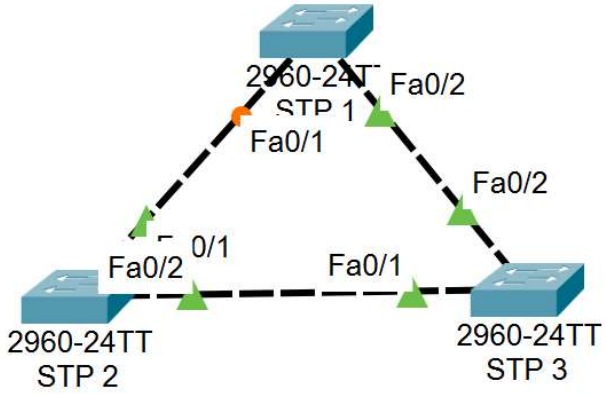
8-2. STP (Rules)

1번 규칙: 네트워크당 하나의 Root Bridge를 갖는다.

2번 규칙: Non Root Bridge는 하나의 Root Port를 갖는다.

3번 규칙: Segment당 하나씩의 Designated Port를 갖는다.

*. Root port, Designated Port 가 아닌 포트 차단



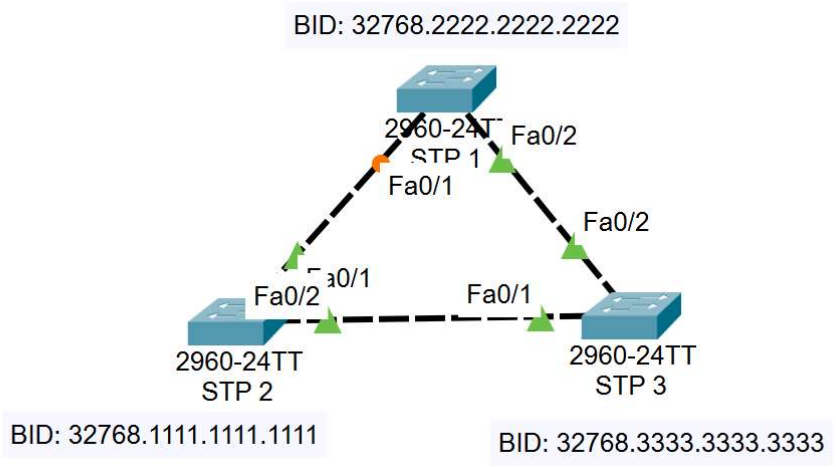
8-3. STP (Root Bridge)

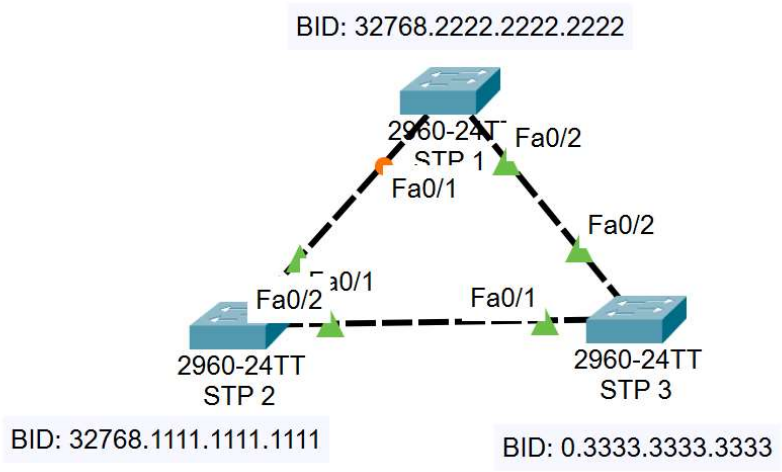
1번 규칙: 네트워크당 하나의 Root Bridge를 갖는다.

Root Bridge 선정 기준: 낮은 BID

BPDU (Bridge Protocol Data Unit)

Root BID	Sender BID	Port ID	Root Path Cost

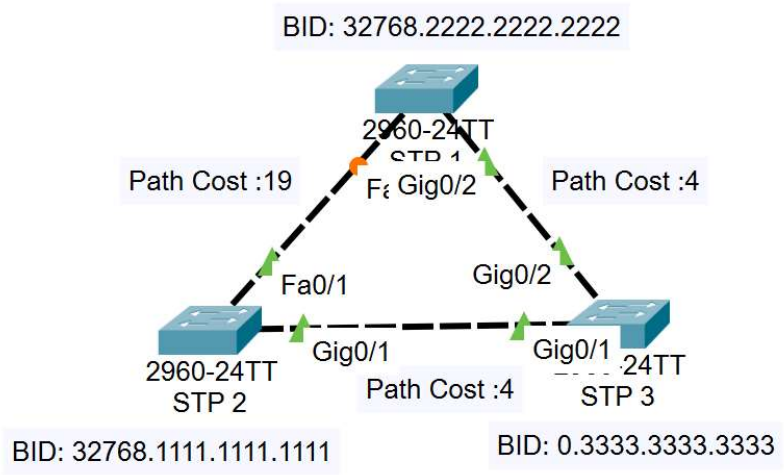


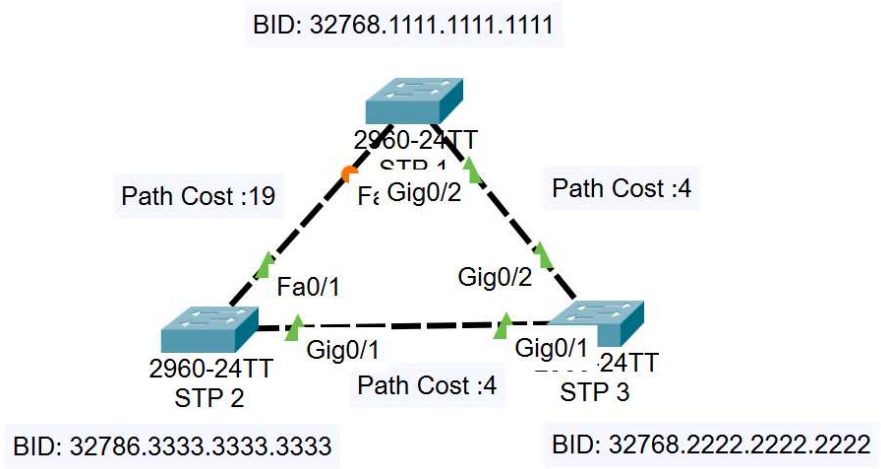


8-4. STP (Root port)

2번 규칙: Non Root Bridge는 하나의 Root Port를 갖는다.

Root Port 선정 기준: Root Path Cost가 낮은 포트

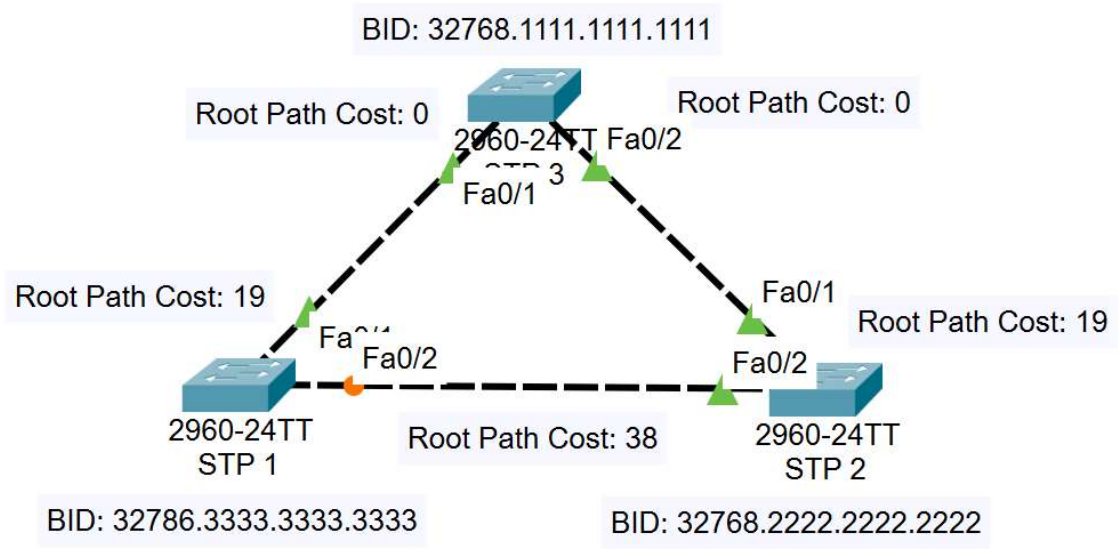




8-5. STP (Designated Port)

3번 규칙: Segment당 하나씩의 Designated Port를 갖는다.

Designated Port 선정 기준:
1. 누가 더 작은 Root BID를 가졌는가?
2. Root path Cost가 누가 더 작은가?
3. 누구의 BID가 더 낮은가?
4. 누구의 포트 ID가 더 낮은가?

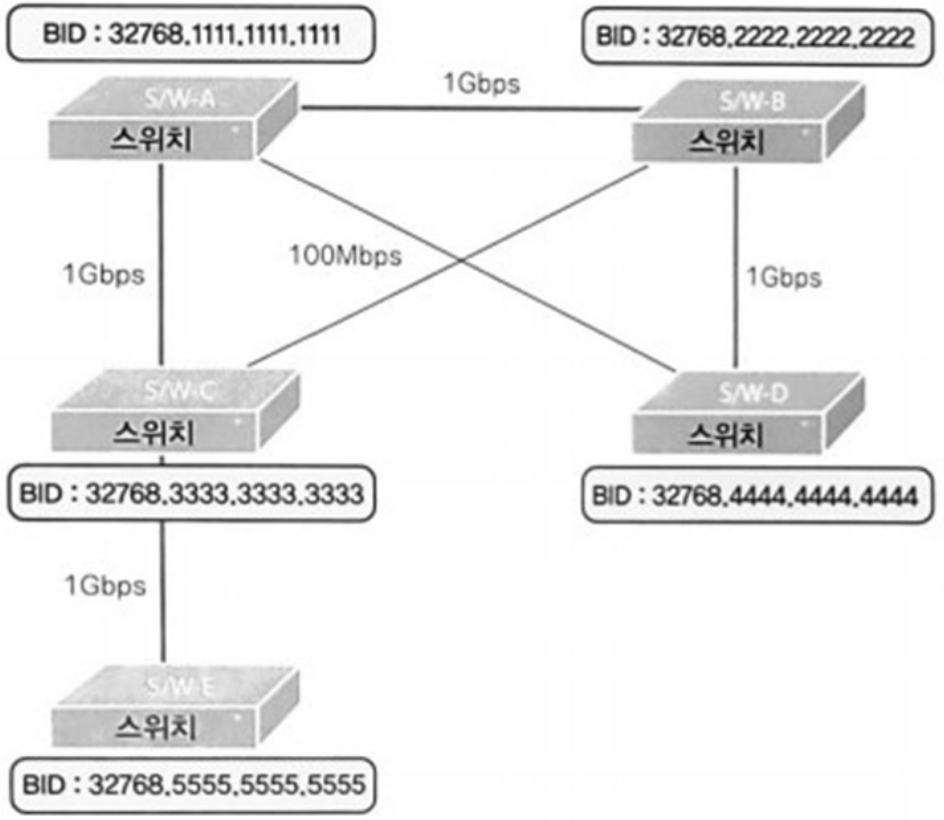


8-6. STP (Summary + Quiz)

1번 규칙: 네트워크당 하나의 Root Bridge를 갖는다.
2번 규칙: Non Root Bridge는 하나의 Root Port를 갖는다.
3번 규칙: Segment당 하나씩의 Designated Port를 갖는다.
*. Root port, Designated Port 가 아닌 포트 차단

1. Root Bridge 선정 기준: 낮은 BID
2. Root Port 선정 기준: Root Path Cost가 낮은 포트
3. Designated Port 선정 기준:
1. 누가 더 작은 Root BID를 가졌는가?
2. Root path Cost가 누가 더 작은가?
3. 누구의 BID가 더 낮은가?
4. 누구의 포트 ID가 더 낮은가?

Why STP? / BID / Path Cost / BPDU



8-7. STP (Status)

(데이터 전송, MAC Address 학습, BPDU 송수신)

1. Disabled (x/x/x): 고장 or 의도적 shutdown

(Non Designated: Disabled 상태)

2. Blocking (x/x/o): 전원 On or Disabled 해제

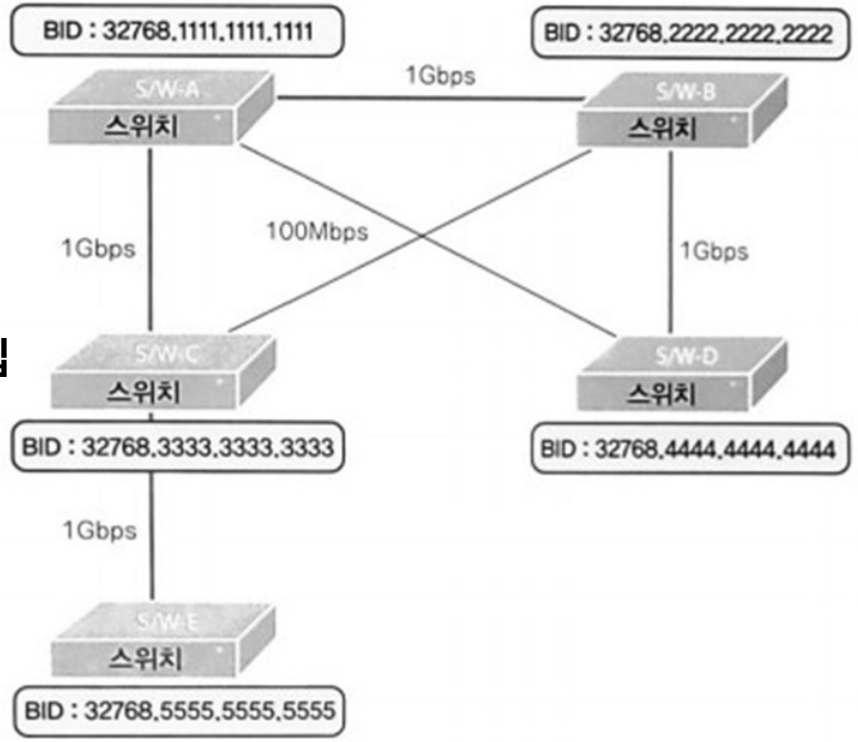
3. Listening (x/x/o): Root, Designated Port 설정 완료 후 진입

(아직 전쟁중)

4. Learning (x/o/o): Listening 상태 15초 이상 유지 후 진입

5. Forwarding (o/o/o): Learning 상태 15초 이상 유지 후 진입

시간 해결: RSTP... etc



9. VTP + Inter-vlan

Vlan: Switch에서만 지원 (Bridge, Hub 미지원)

Vlan: 논리적으로 Broadcast Domain을 나눈다.

VTP: Switch간 vlan 정보를 항상 일치 시켜 주는 프로토콜

VTP 정보: Trunk port 로만 전달 가능

VTP mode: Server / Transparent / Client
        Server: 생성, 변경, 전달 가능
        Transparent: 저장 X, 전달만 가능
        Client: 연결된 스위치에 전달, 수신 가능

-다른 네트워크는 라우터를 통해야만 연결이 가능하다 (라우팅 필요)

9. VTP + Inter-vlan (Practice)