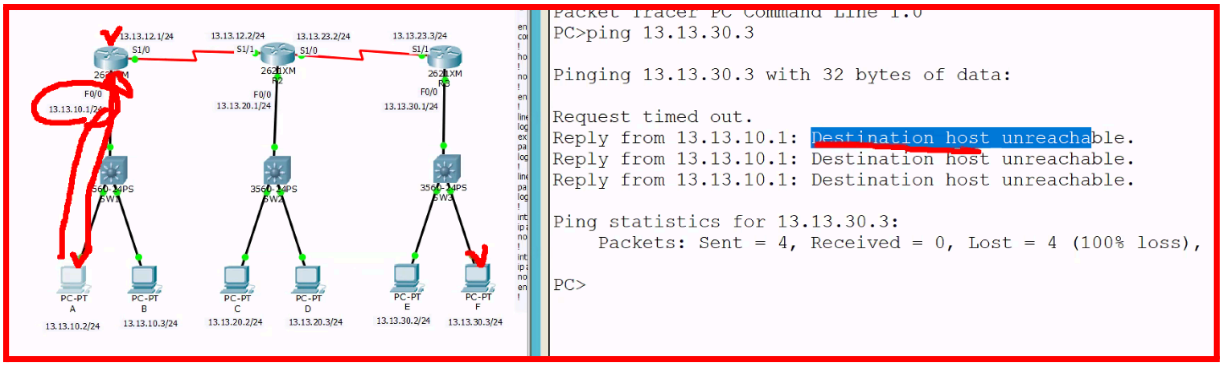
제2장 정적 경로 및 기본 경로 구성

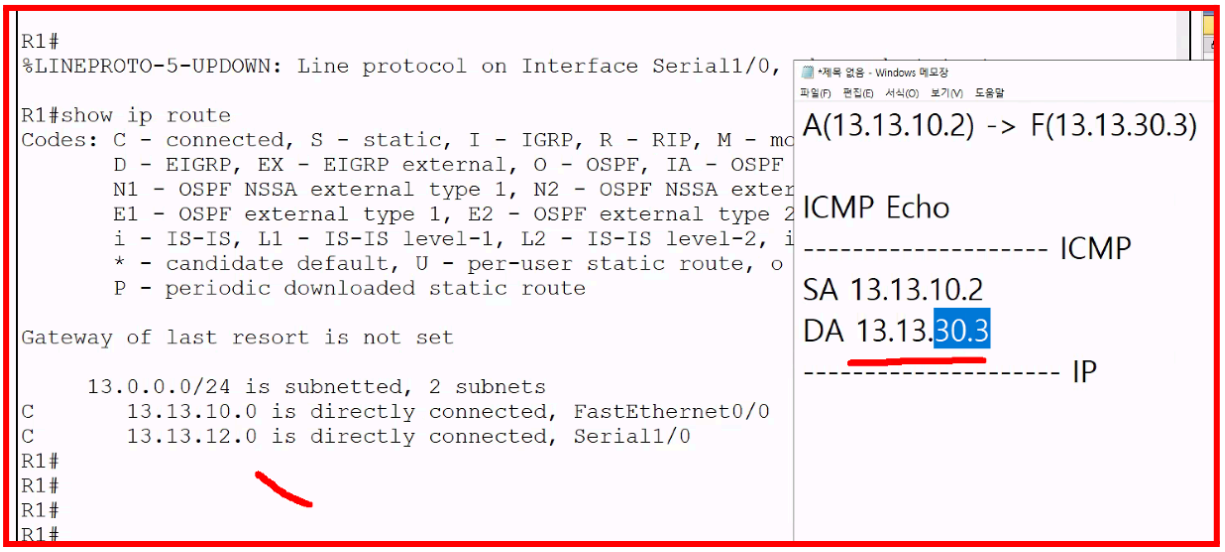
1. 정적 경로 구성

- '10-1.정적 경로 및 기본 경로 구성.pkt' 파일을 실행하여 기본 설정을 실시하고 정적 경로를 설정한다

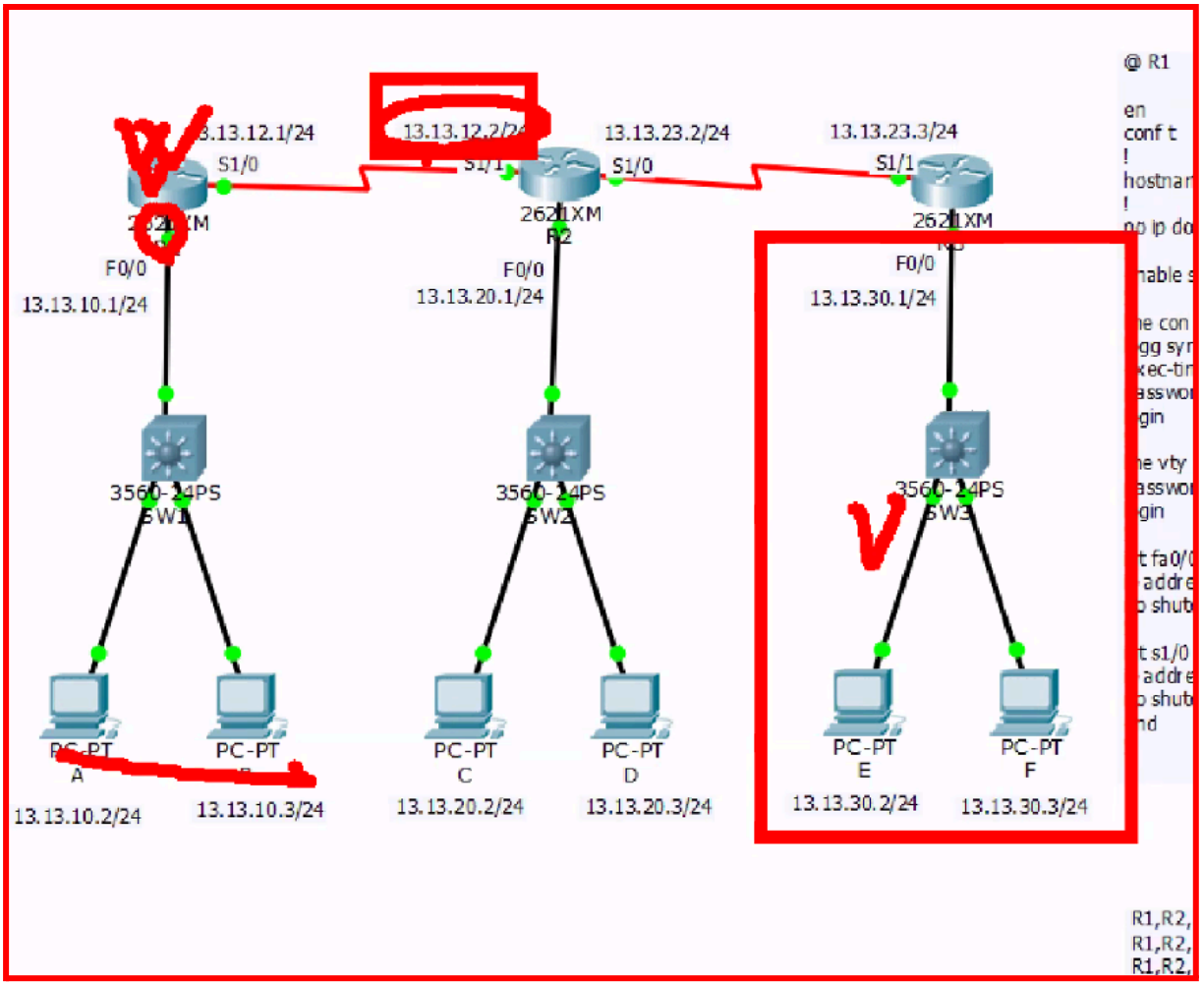
13.13.30.3으로 핑을 보낼경우:



- R1에서 받아서 다시 돌려준다.



- 라우터에대한 목적지 정보가 없기 때문에 드랍처리 해버린다.
- R1라우터에 목적지 30.3에대한 경로가 없기때문에 처리가 안된다.



R1 → NextOp → 13.13.30.2
루트를 정해줘야 한다.

```
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#
R1(config)#ip route ?
  A.B.C.D  Destination prefix
R1(config)#ip route 13.13.30.0 ?
  A.B.C.D  Destination prefix mask
R1(config)#ip route 13.13.30.0 255.255.255.0 ?
  A.B.C.D           Forwarding router's address
  Ethernet          IEEE 802.3
  FastEthernet      FastEthernet IEEE 802.3
  GigabitEthernet   GigabitEthernet IEEE 802.3z
  Loopback          Loopback interface
  Null              Null interface
  Serial            Serial
R1(config)#ip route 13.13.30.0 255.255.255.0 13.13.12.2
R1(config)#
```

Nextup : 13.13.12.2

R1 → 13.13.30.0(네트워크 이름) 으로 보내려 하는데 Nextup은 13.13.12.2이다.

show run 으로 설정확인:

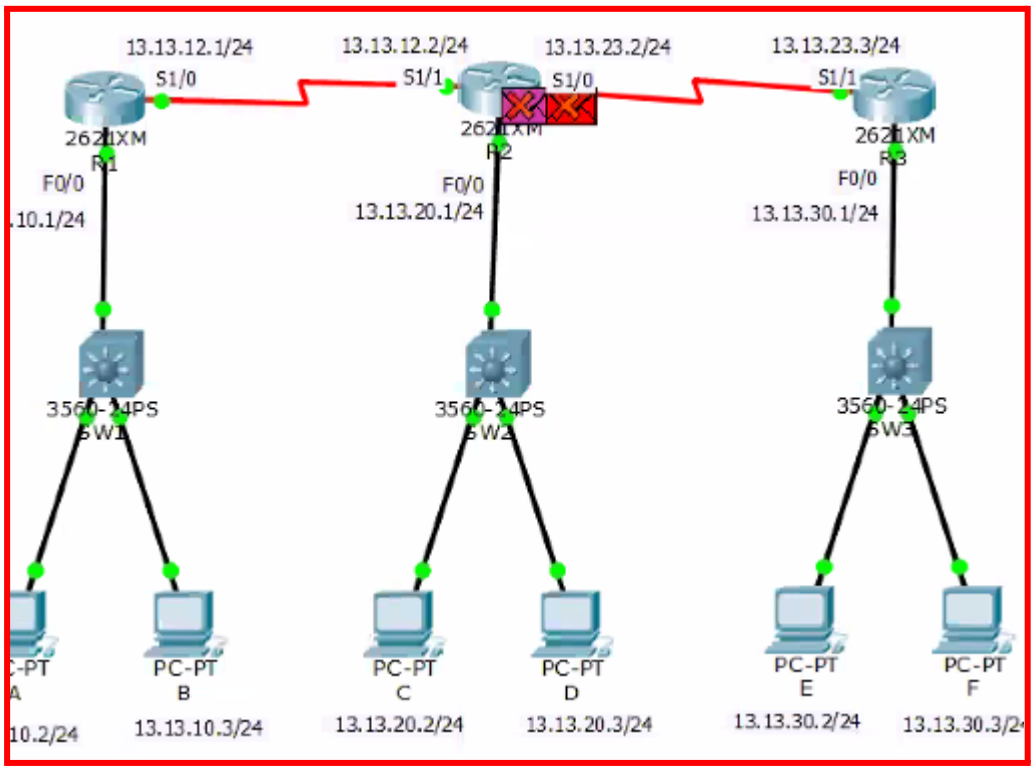
```
!
interface Serial1/2
 no ip address
 shutdown
!
interface Serial1/3
 no ip address
 shutdown
!
ip classless
ip route 13.13.30.0 255.255.255.0 13.13.12.2
!
ip flow-export version 9
!
!
```

show ip route 확인:

```
Gateway of last resort is not set

     13.0.0.0/24 is subnetted, 3 subnets
C       13.13.10.0 is directly connected, FastEthernet0/0
C       13.13.12.0 is directly connected, Serial1/0
S       13.13.30.0 [1/0] via 13.13.12.2
R1#
```

- 게이트웨이 추가 완료.
- 패킷을 출력하는 인터페이스 정보가 안나온다.
    - 13.13.30.0 (목적지) 13.13.12.0 (경유지)를 통해서 나간다.

그러나 A PC부터 13.13.30.2까지 핑이 안나간다:



R2도 똑같이 설정을 해줘야 한다.

```
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ip route 13.13.30.0 255.255.255.0 13.13.23.3
R2(config)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console

R2#
```

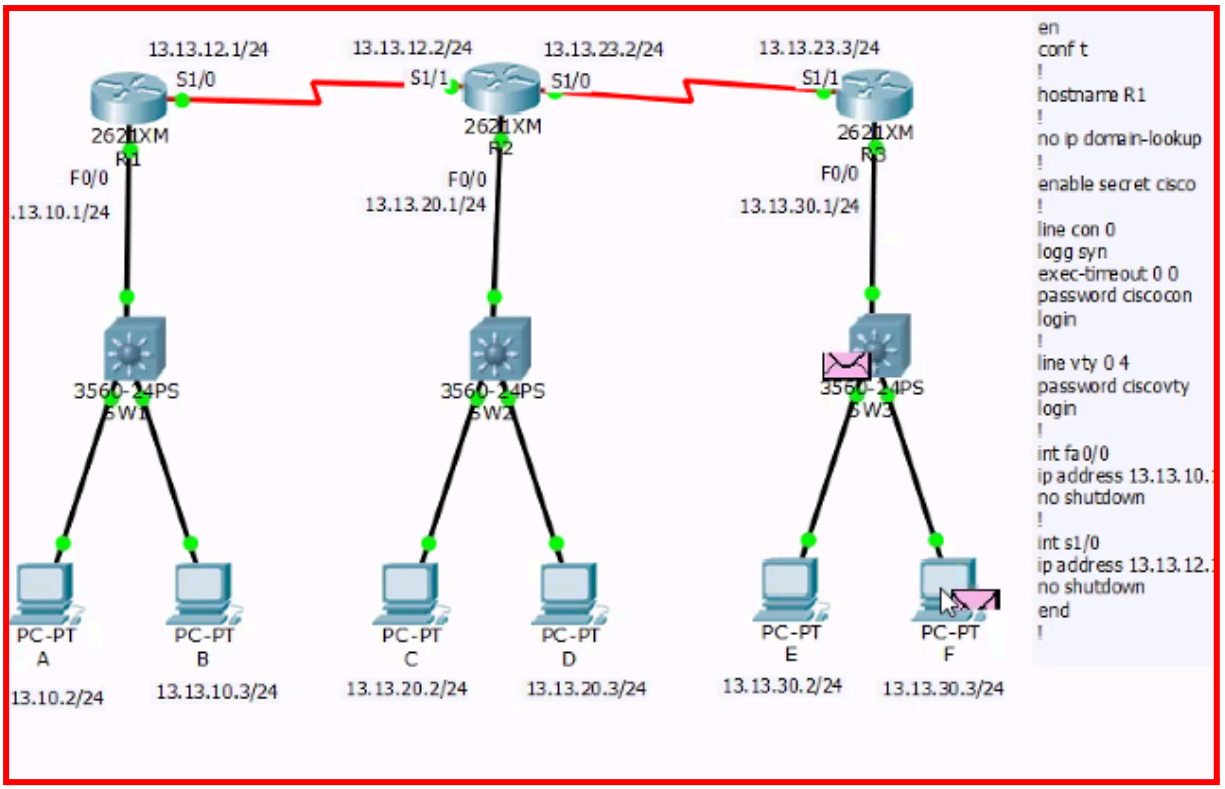
show run

```
!
ip classless
ip route 13.13.30.0 255.255.255.0 13.13.23.3
!
ip flow-export version 9
!
```

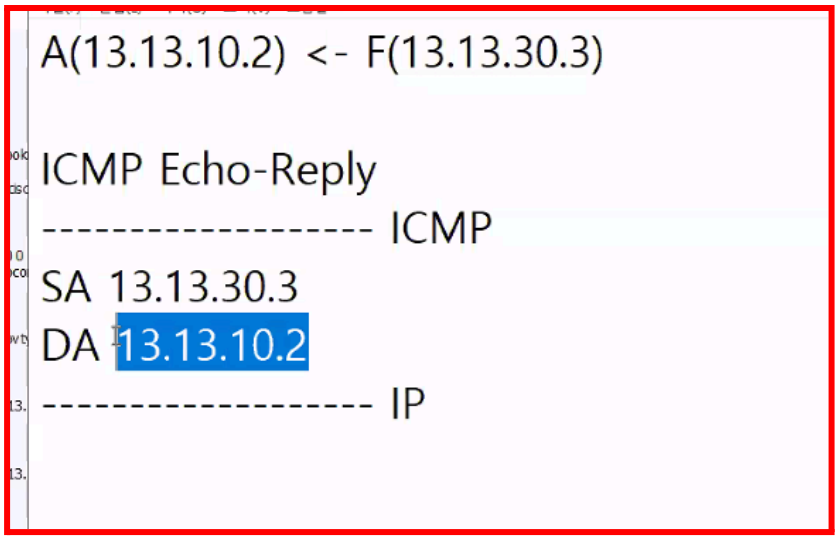
show ip route

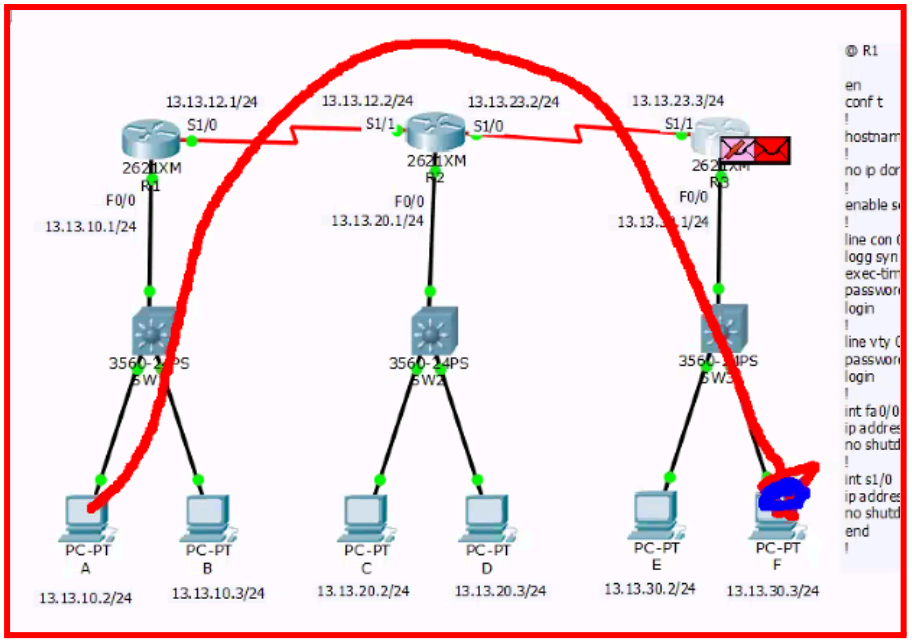
```
Gateway of last resort is not set

     13.0.0.0/24 is subnetted, 4 subnets
C       13.13.12.0 is directly connected, Serial1/1
C       13.13.20.0 is directly connected, FastEthernet0/0
C       13.13.23.0 is directly connected, Serial1/0
S       13.13.30.0 [1/0] via 13.13.23.3
R2#
```

그러나 아직도 안된다.



F PC까지는 나가지만 echo reply를 주지 않는다 (A까지 안준다)





여기까지는 이상이 없지만 돌아가는 경로가 없다.

- R3에서 경로를 추가해야한다.

R3 → R2

```
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#ip route 13.13.10.0 255.255.255.0 13.13.23.2
R3(config)#end
R3#
%SYS-5-CONFIG_I: Configured from console by console
```

show ip route

```
Gateway of last resort is not set

     13.0.0.0/24 is subnetted, 3 subnets
S       13.13.10.0 [1/0] via 13.13.23.2
C       13.13.23.0 is directly connected, Serial1/1
C       13.13.30.0 is directly connected, FastEthernet0/0
R3#
```

R2 → R1

```
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ip route 13.13.10.0 255.255.255.0 13.13.12.1
```

show run

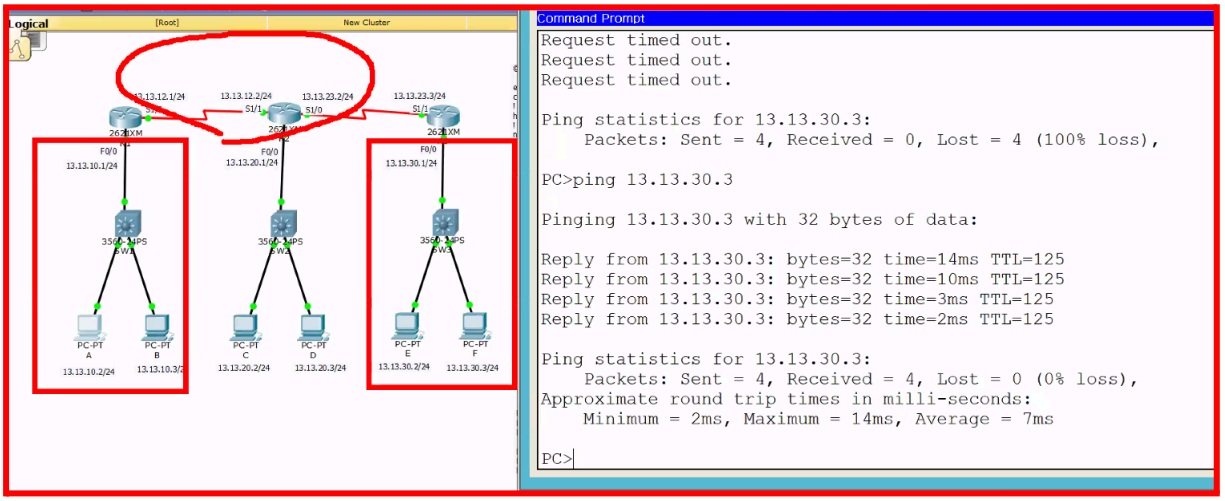
```
ip classless
ip route 13.13.30.0 255.255.255.0 13.13.23.3
ip route 13.13.10.0 255.255.255.0 13.13.12.1
!
```

show ip route

```
Gateway of last resort is not set

     13.0.0.0/24 is subnetted, 5 subnets
S       13.13.10.0 [1/0] via 13.13.12.1
C       13.13.12.0 is directly connected, Serial1/1
C       13.13.20.0 is directly connected, FastEthernet0/0
C       13.13.23.0 is directly connected, Serial1/0
S       13.13.30.0 [1/0] via 13.13.23.3
R2#
```

같은방식으로 추가해준다.

이제 외부망을 통해서 통신이 가능하다:



R1 → R2

R2 → R3

까지 해주면 모든 네트워크가 사용 가능하다.

A>ping 13.13.23.3

안되는 이유?

R1,R2,R3#show ip route

```
PC>ping 13.13.23.3

Pinging 13.13.23.3 with 32 bytes of data:

Reply from 13.13.10.1: Destination host unreachable.
Reply from 13.13.10.1: Destination host unreachable.
Reply from 13.13.10.1: Destination host unreachable.
Reply from 13.13.10.1: Destination host unreachable.

Ping statistics for 13.13.23.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

R1에서 경로가 없다.

```
Gateway of last resort is not set

     13.0.0.0/24 is subnetted, 4 subnets
C       13.13.10.0 is directly connected, FastEthernet0/0
C       13.13.12.0 is directly connected, Serial1/0
S       13.13.20.0 [1/0] via 13.13.12.2
S       13.13.30.0 [1/0] via 13.13.12.2
R1#
```

23.3에 대한 경로가 없다.

```
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#ip route 13.13.23.0 255.255.255.0 13.13.12.2
```

- 경로추가

```
!
ip classless
ip route 13.13.30.0 255.255.255.0 13.13.12.2
ip route 13.13.20.0 255.255.255.0 13.13.12.2
ip route 13.13.23.0 255.255.255.0 13.13.12.2
!
ip flow-export version 9
!
```

- 라우팅 테이블 확인

잘 나간다:

```
PC>ping 13.13.23.3

Pinging 13.13.23.3 with 32 bytes of data:

Reply from 13.13.23.3: bytes=32 time=2ms TTL=253
Reply from 13.13.23.3: bytes=32 time=4ms TTL=253
Reply from 13.13.23.3: bytes=32 time=6ms TTL=253
```

13.13.12.1

> 안되는 이유?
>
> R1,R2,R3#show ip route

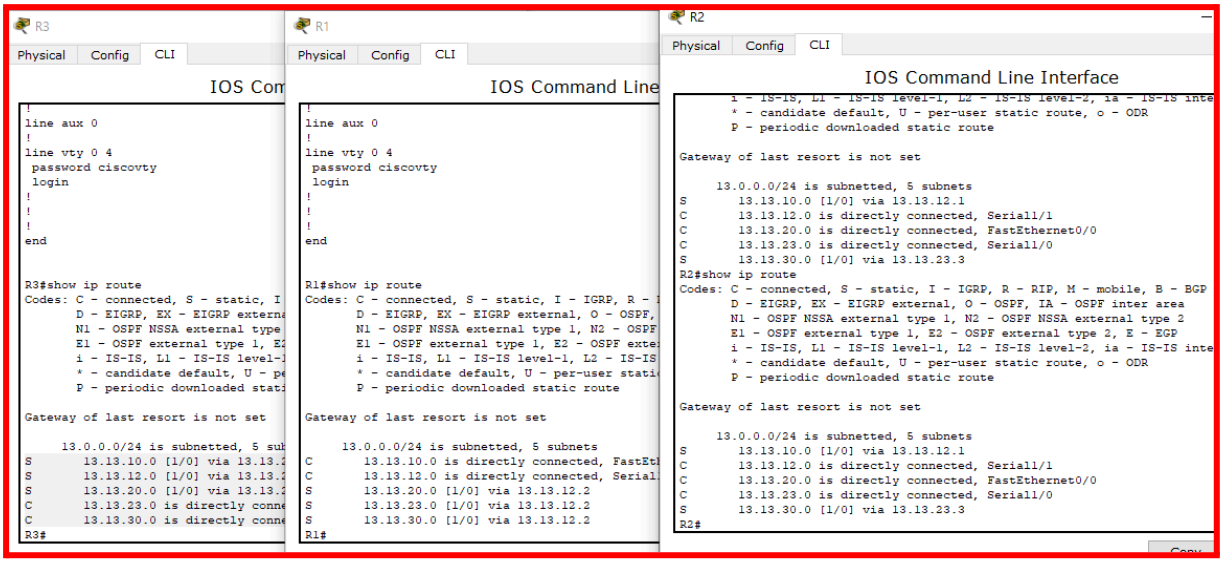
```
PC>ping 13.13.12.1

Pinging 13.13.12.1 with 32 bytes of data:

Reply from 13.13.30.1: Destination host unreachable.
Reply from 13.13.30.1: Destination host unreachable.
Reply from 13.13.30.1: Destination host unreachable.
Reply from 13.13.30.1: Destination host unreachable.

Ping statistics for 13.13.12.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

R3에 12.1로 보내는 패킷이 없다.

```
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#ip route 13.13.12.0 255.255.255.0 13.13.23.2
R3(config)#
```

```
ip classless
ip route 13.13.10.0 255.255.255.0 13.13.23.2
ip route 13.13.20.0 255.255.255.0 13.13.23.2
ip route 13.13.12.0 255.255.255.0 13.13.23.2
!
```

```
Gateway of last resort is not set

     13.0.0.0/24 is subnetted, 5 subnets
S       13.13.10.0 [1/0] via 13.13.23.2
S       13.13.12.0 [1/0] via 13.13.23.2
S       13.13.20.0 [1/0] via 13.13.23.2
C       13.13.23.0 is directly connected, Serial1/1
C       13.13.30.0 is directly connected, FastEthernet0/0
R3#
```



- 각 라우터마다 5개의 네트워크가 다 등록되어 있다.
- 모든 네트워크끼리 통신이 가능해졌다.

LoopBack

- 가상 인터페이스 (테스트용)

@ R3

```
conf t
!
int lo 1
 ip address 168.126.63.1 255.255.255.0
!
int lo 2
 ip address 8.8.8.8 255.255.255.0
!
int lo 3
 ip address 121.160.42.1 255.255.255.0
!
int lo 4
 ip address 61.42.100.1 255.255.255.0
 end
```

```
interface Loopback1
 ip address 168.126.63.1 255.255.255.0
!
interface Loopback2
 ip address 8.8.8.8 255.255.255.0
!
interface Loopback3
 ip address 121.160.42.1 255.255.255.0
!
interface Loopback4
 ip address 61.42.100.1 255.255.255.0
!
```

```
R3# show ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

     8.0.0.0/24 is subnetted, 1 subnets
C       8.8.8.0 is directly connected, Loopback2
     13.0.0.0/24 is subnetted, 5 subnets
S       13.13.10.0 [1/0] via 13.13.23.2
S       13.13.12.0 [1/0] via 13.13.23.2
S       13.13.20.0 [1/0] via 13.13.23.2
C       13.13.23.0 is directly connected, Serial1/1
C       13.13.30.0 is directly connected, FastEthernet0/0
     61.0.0.0/24 is subnetted, 1 subnets
C       61.42.100.0 is directly connected, Loopback4
     121.0.0.0/24 is subnetted, 1 subnets
C       121.160.42.0 is directly connected, Loopback3
 --More--
```

추가해준다

```
R2(config)#ip route 168.126.63.0 255.255.255.0 13.13.23.3
R2(config)#ip route 8.8.8.0 255.255.255.0 13.13.23.3
R2(config)#ip route 121.160.42.0 255.255.255.0 13.13.23.3
R2(config)#ip route 61.42.100.0 255.255.255.0 13.13.23.3
```

show run

```
ip classless
ip route 13.13.30.0 255.255.255.0 13.13.23.3
ip route 13.13.10.0 255.255.255.0 13.13.12.1
ip route 168.126.63.0 255.255.255.0 13.13.23.3
ip route 8.8.8.0 255.255.255.0 13.13.23.3
ip route 121.160.42.0 255.255.255.0 13.13.23.3
ip route 61.42.100.0 255.255.255.0 13.13.23.3
!
ip flow-export version 9
!
```

show ip route

```
R2#
R2#show ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

     8.0.0.0/24 is subnetted, 1 subnets
S       8.8.8.0 [1/0] via 13.13.23.3
     13.0.0.0/24 is subnetted, 5 subnets
S       13.13.10.0 [1/0] via 13.13.12.1
C       13.13.12.0 is directly connected, Serial1/1
C       13.13.20.0 is directly connected, FastEthernet0/0
C       13.13.23.0 is directly connected, Serial1/0
S       13.13.30.0 [1/0] via 13.13.23.3
     61.0.0.0/24 is subnetted, 1 subnets
S       61.42.100.0 [1/0] via 13.13.23.3
     121.0.0.0/24 is subnetted, 1 subnets
S       121.160.42.0 [1/0] via 13.13.23.3
 --More--
```

- 경로 등록완료

```
R2#ping 8.8.8.8'
Translating "8.8.8.8'"
% Unrecognized host or address or protocol not running.

R2#ping 8.8.8.8

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/11/18 ms

R2#ping 121.160.42.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 121.160.42.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/9/17 ms
```

핑테스트 성공

기본경로 설정

```
R1(config)#ip route 0.0.0.0 0.0.0.0 13.13.12.2
R1(config)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#
```

- 목적지가 뭐가되든간에 12.2한테 보내라
- 0.0.0.0은 모든 IP를 이야기한다.

```
R1#show ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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

Gateway of last resort is 13.13.12.2 to network 0.0.0.0

     13.0.0.0/24 is subnetted, 5 subnets
C       13.13.10.0 is directly connected, FastEthernet0/0
C       13.13.12.0 is directly connected, Serial1/0
S       13.13.20.0 [1/0] via 13.13.12.2
S       13.13.23.0 [1/0] via 13.13.12.2
S       13.13.30.0 [1/0] via 13.13.12.2
S*   0.0.0.0/0 [1/0] via 13.13.12.2
R1#
```

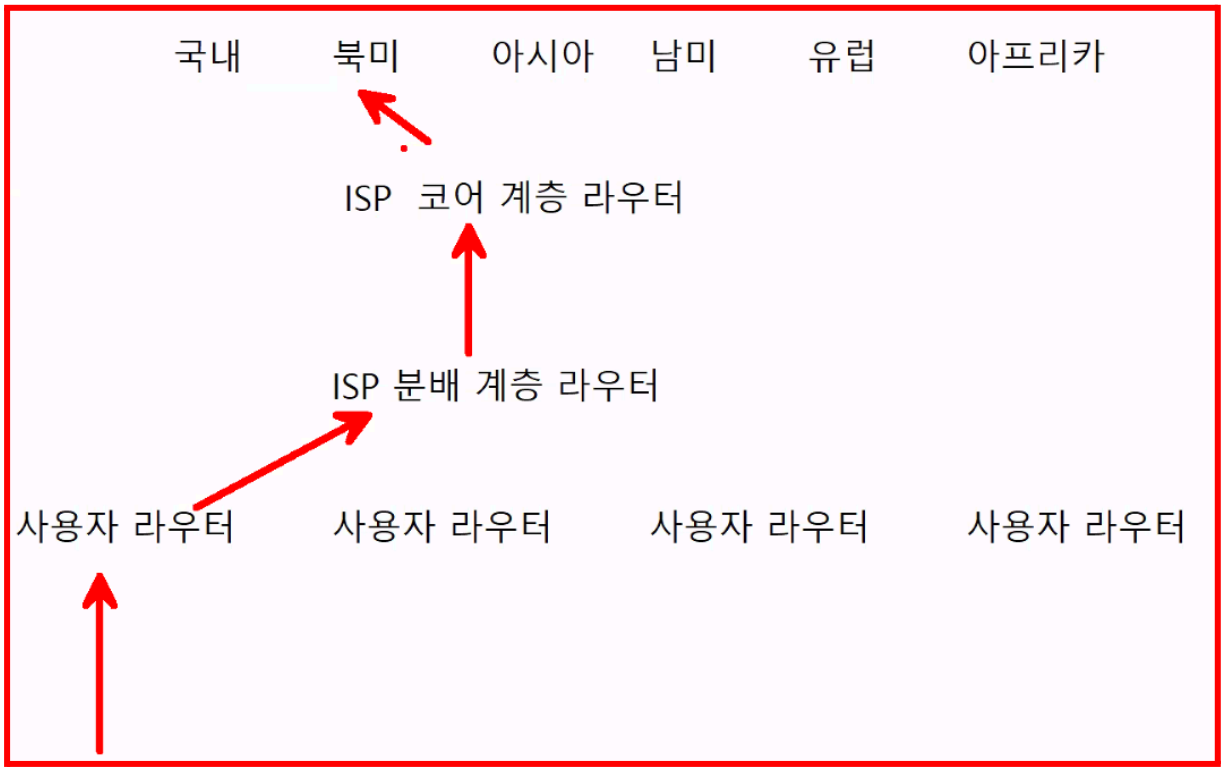
- * 이 붙어있다
- **기본경로로 설정됨.**

```
Gateway of last resort is 13.13.12.2 to network 0.0.0.0
```

- **만약 경로가 없을시, 최후의 수단으로 사용하도록 설정된다.**

```
PC>netstat -r

Route Table
===========================================================================
Interface List
0x1 ........................... PT TCP Loopback interface
0x2 ...00 16 6f 0d 88 ec ...... PT Ethernet interface
===========================================================================
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0      13.13.10.1      13.13.10.2       1
Default Gateway:      13.13.10.1
===========================================================================
Persistent Routes:
  None

PC>ipconfig

FastEthernet0 Connection:(default port)

   Link-local IPv6 Address.....: FE80::201:96FF:FEE4:7109
   IP Address......................: 13.13.10.2
   Subnet Mask.....................: 255.255.255.0
   Default Gateway.................: 13.13.10.1

PC>
```

- **PC에서도 기본경로가 똑같이 적용된다.**



인터넷

- **코어 계층**

사용자 라우터

- **기본경로**