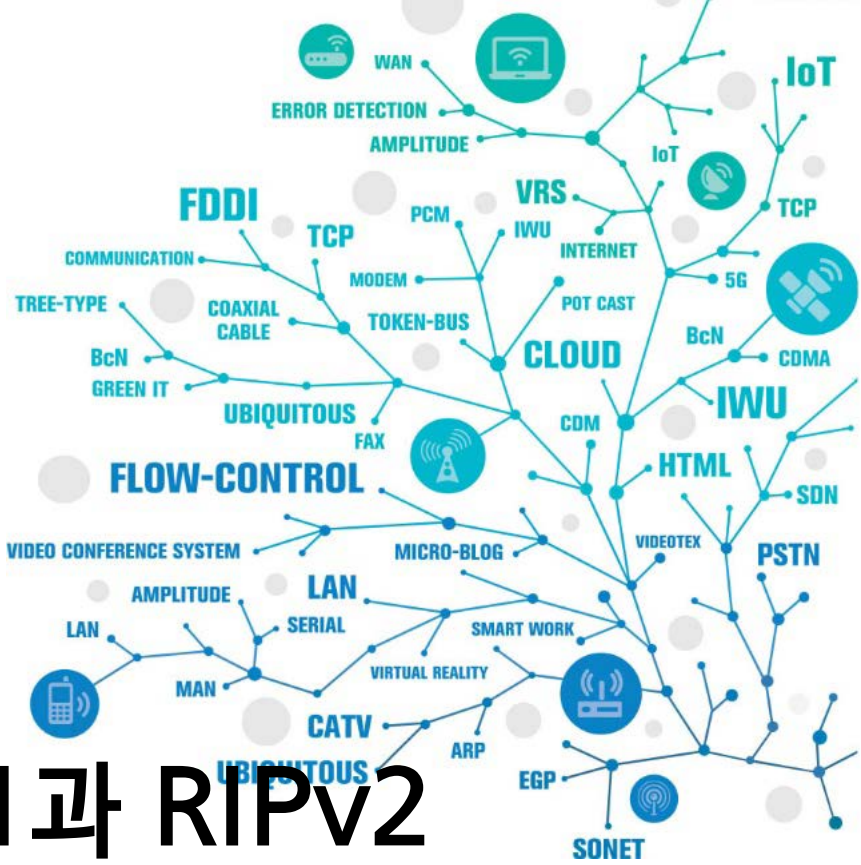


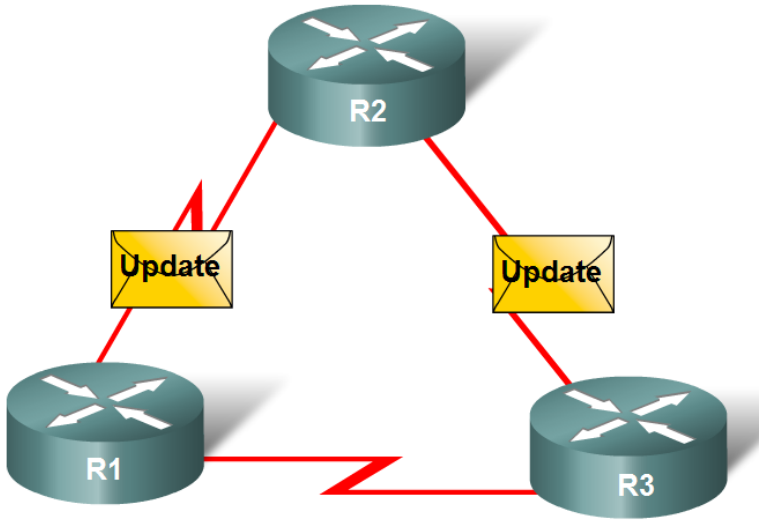
라우팅 프로토콜: RIPv1과 RIPv2

Dynamic Routing Protocols

Function(s) of Dynamic Routing Protocols:

- Dynamically share information between routers.
  (라우터 간에 정보를 동적으로 공유합니다.)
- Automatically update routing table when topology changes.
  (토폴로지가 변경되면 라우팅 테이블을 자동으로 업데이트합니다.)
- Determine best path to a destination.
  (대상에 가장 적합한 경로를 결정합니다.)

Routers Dynamically Pass Updates



Dynamic Routing Protocols

- **The purpose of a dynamic routing protocol is to:**
  - Discover remote networks (원격 네트워크 발견)
  - Maintaining up-to-date routing information (최신 라우팅 정보 유지)
  - Choosing the best path to destination networks (대상 네트워크에 가장 적합한 경로 선택)
  - Ability to find a new best path if the current path is no longer available (현재 경로를 더 이상 사용할 수 없는 경우 새로운 최상의 경로를 찾는 기능)

Routing Protocol Operation

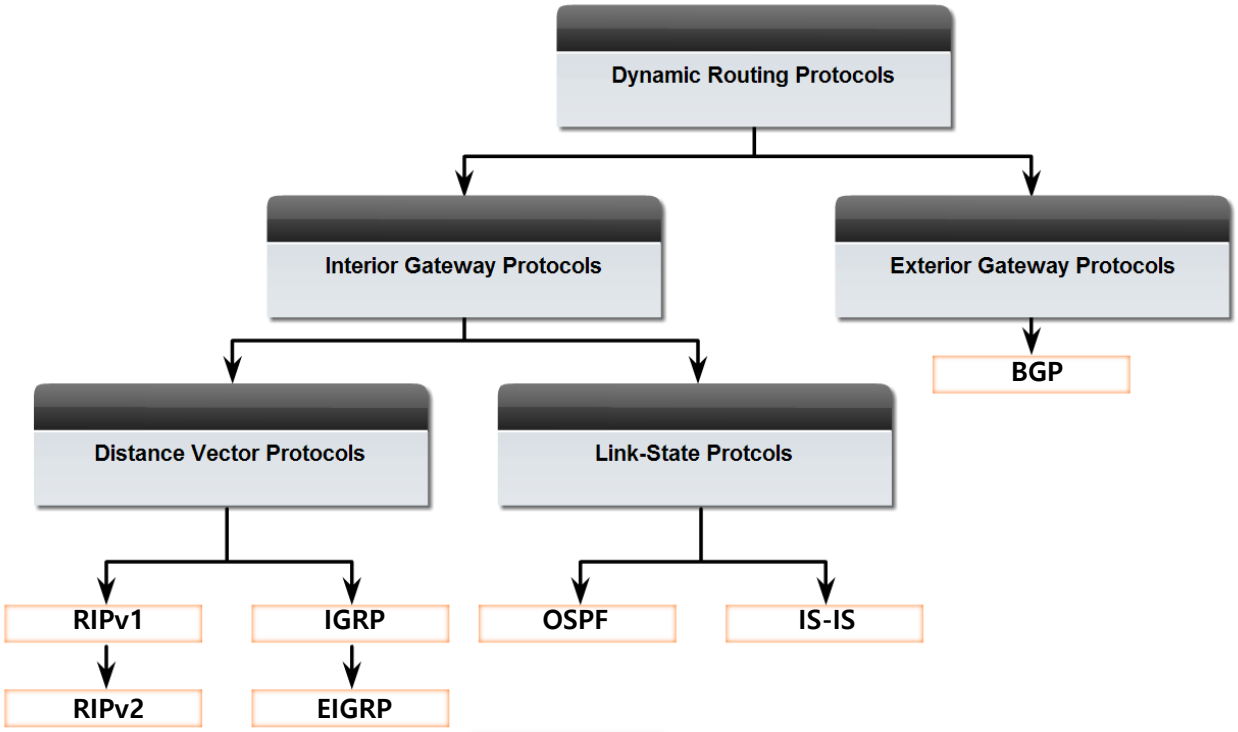
Routing protocols are used to exchange routing information between the routers.

Classifying Routing Protocols

- **Dynamic routing protocols are grouped according to characteristics.**

  Examples include:

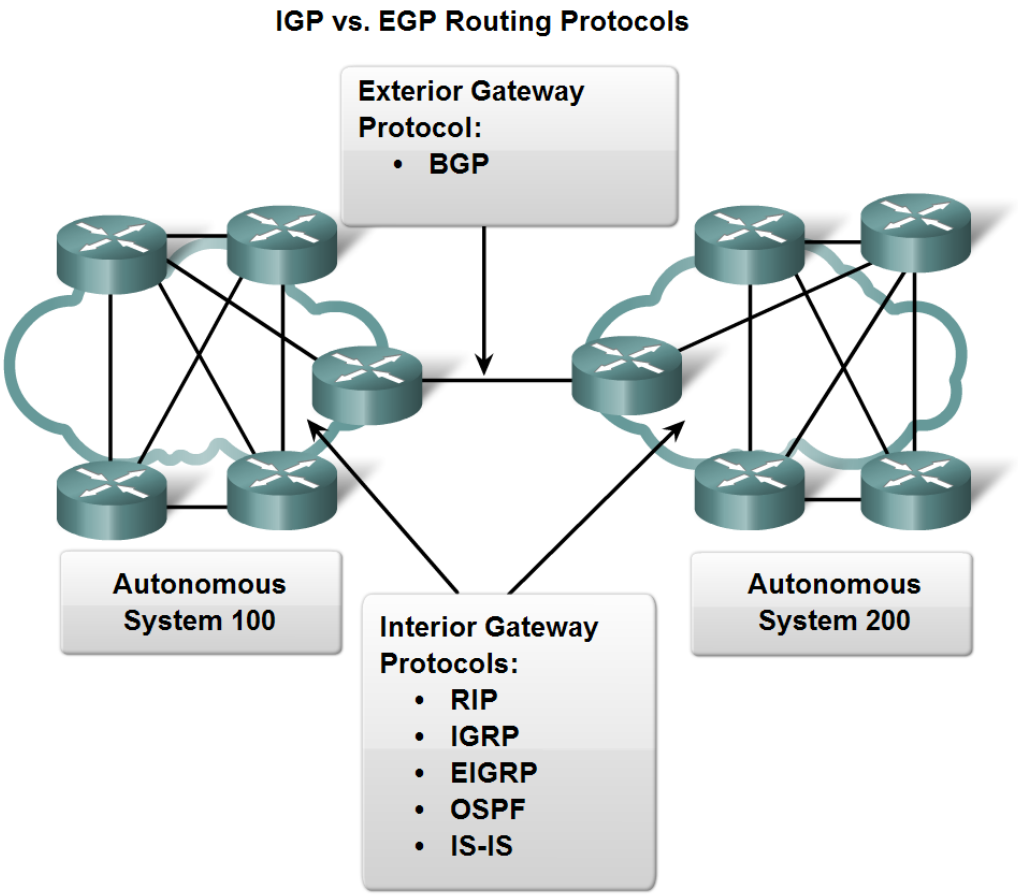
  - RIP
  - IGRP
  - EIGRP
  - OSPF
  - IS-IS
  - BGP



- **Autonomous System is a group of routers under the control of a single authority. (Autonomous System은 단일 기관의 통제하에 있는 라우터 그룹)**

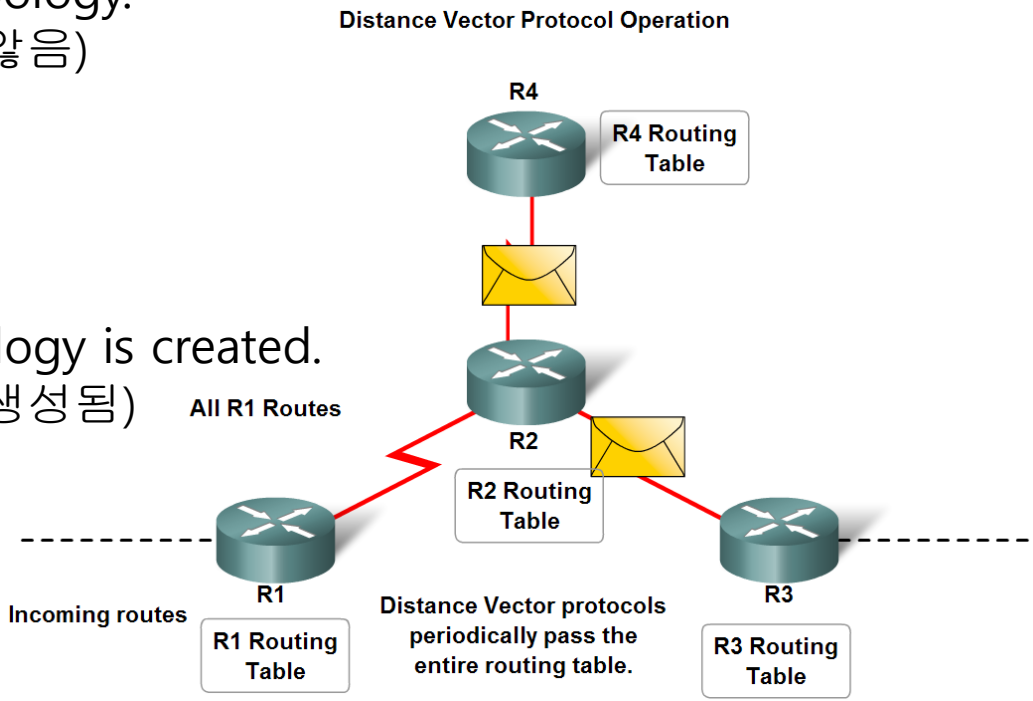
Classifying Routing Protocols

- **Types of routing protocols:**
  - **Interior Gateway Protocols** (IGP)
  - **Exterior Gateway Protocols** (EGP)

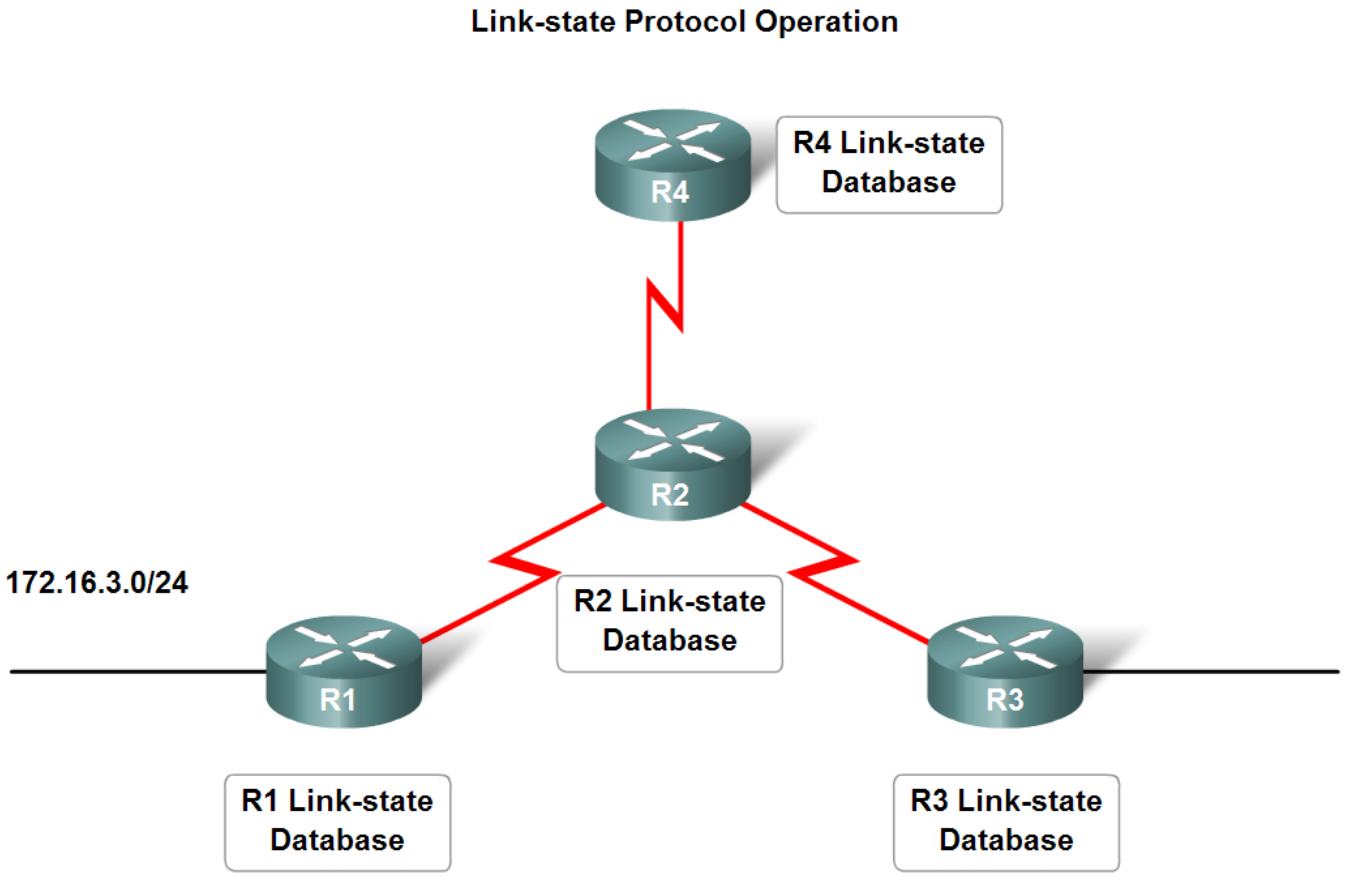


Classifying Routing Protocols

- **IGP: Comparison of Distance Vector & Link State Routing Protocols**
  - **Distance vector**
  - routes are advertised as vectors of distance & direction.
    (경로는 거리와 방향 벡터로 광고됨)
  - incomplete view of network topology.
    (네트워크 토폴로지가 완전하지 않음)
  - Generally, periodic updates.
    (일반적으로 주기적인 업데이트)
  - **Link state**
  - complete view of network topology is created.
    (네트워크 토폴로지가 완전하게 생성됨)
  - updates are not periodic.
    (업데이트는 주기적이지 않음)



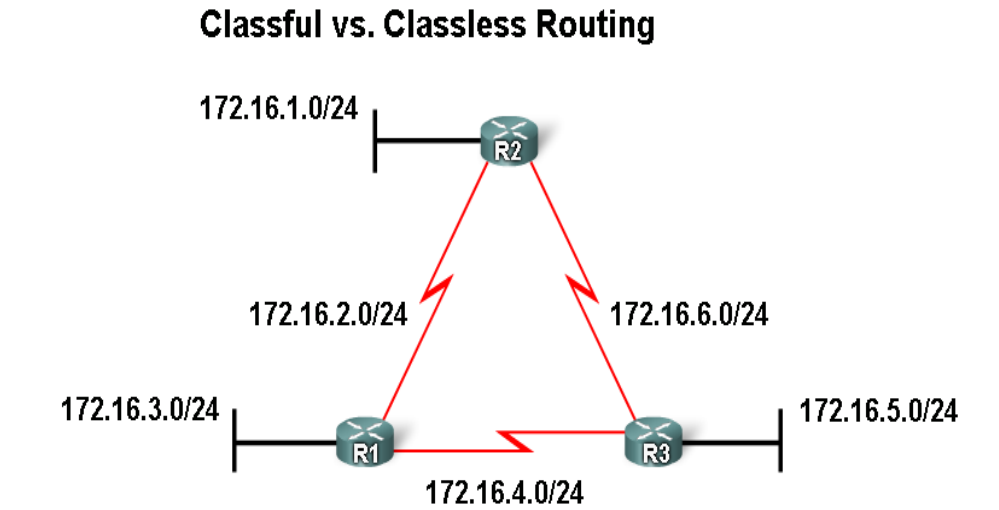
Classifying Routing Protocols



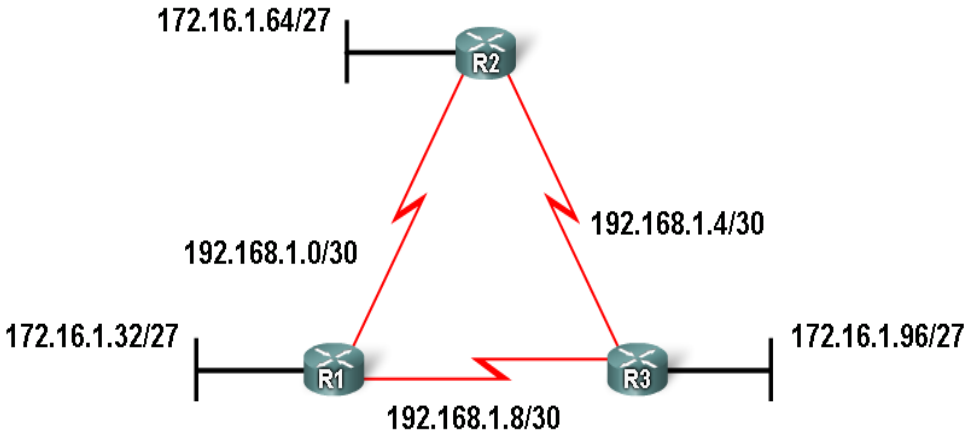
Link-state protocols pass updates when a link's state changes.

Classifying Routing Protocols

- **Classful routing protocols**
  - Do NOT send subnet mask in routing updates
    (라우팅 업데이트에
    서브넷마스크를 포함하지 않음)
- **Classless routing protocols**
  - Do send subnet mask in routing updates.
    (라우팅 업데이트에
    서브넷마스크를 포함)



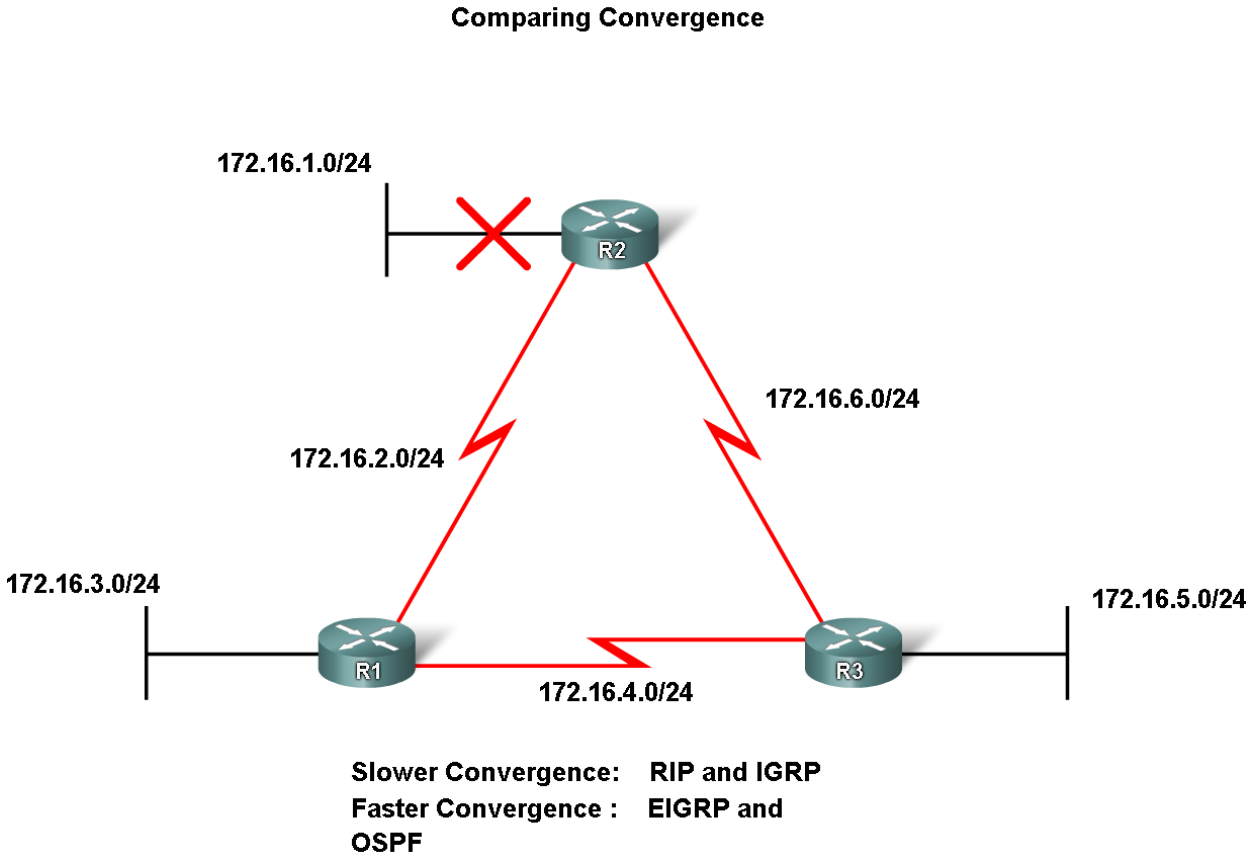
Classful: Subnet mask is the same throughout the topology



Classless: Subnet mask can vary in the topology

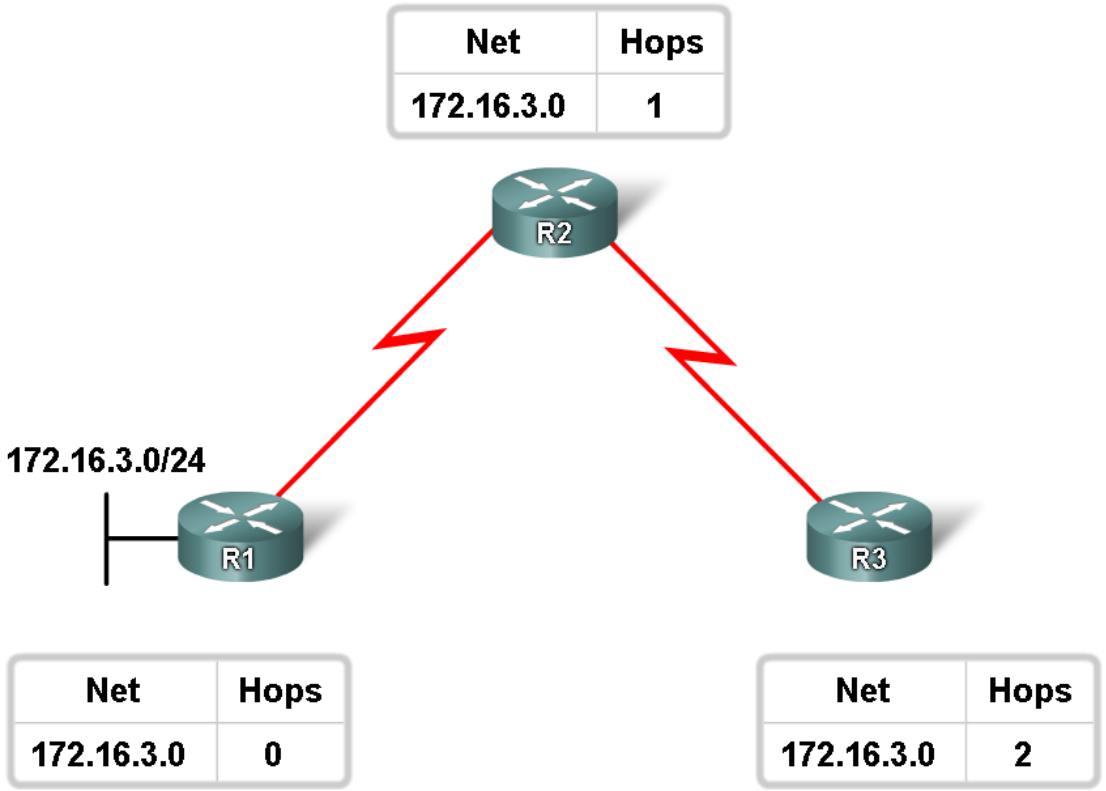
Classifying Routing Protocols

- **Convergence is defined as when all routers' routing tables are at a state of consistency** (컨버전스는 모든 라우터의 라우팅 테이블이 일관성 상태에 있을 때)



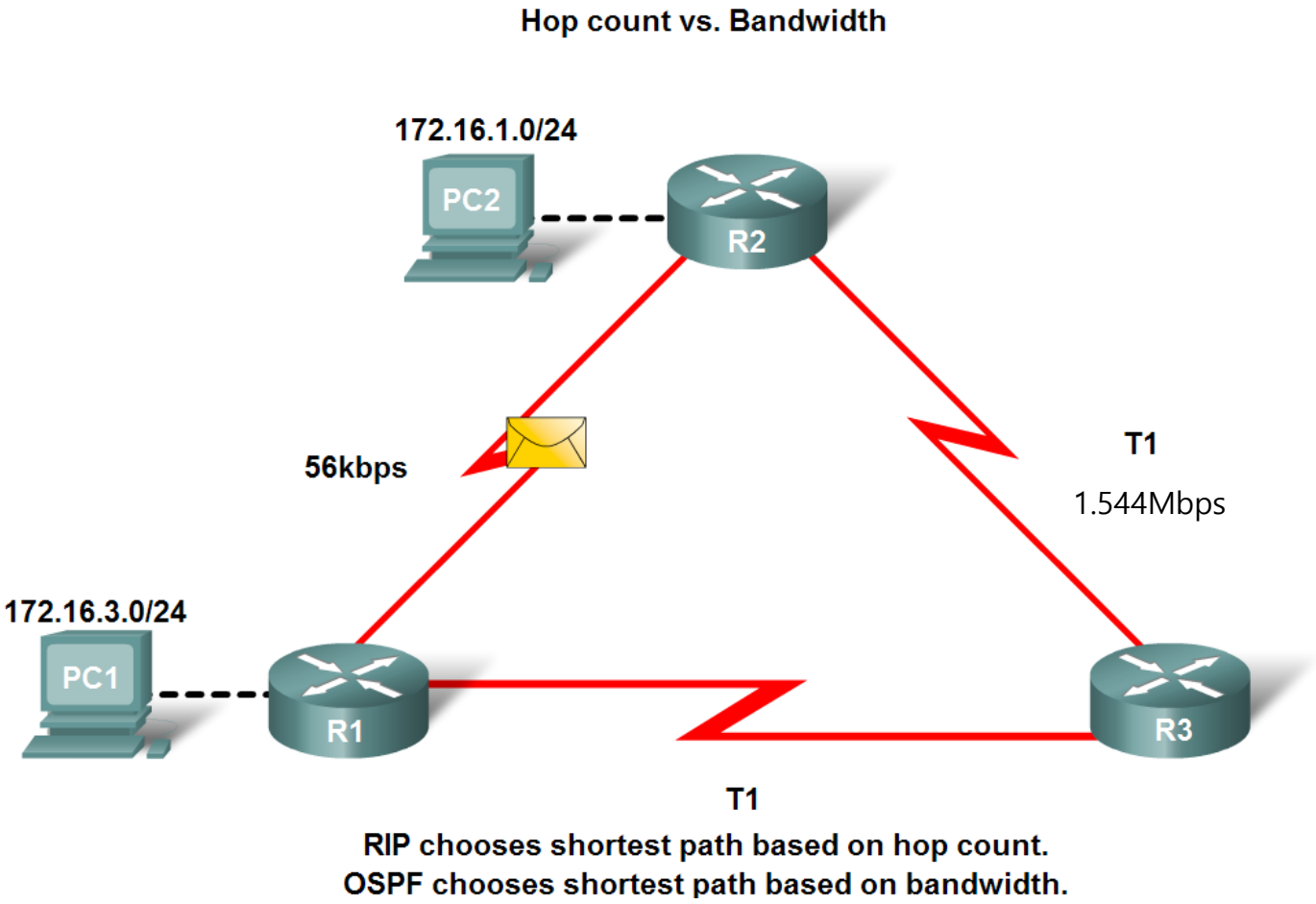
Routing Protocols Metrics

- **Metric**
  - A value used by a routing protocol to determine which routes are better than others.
    (라우팅 프로토콜이 다른 경로보다 더 나은 경로를 결정하는 데 사용하는 값)



Routing Protocols Metrics

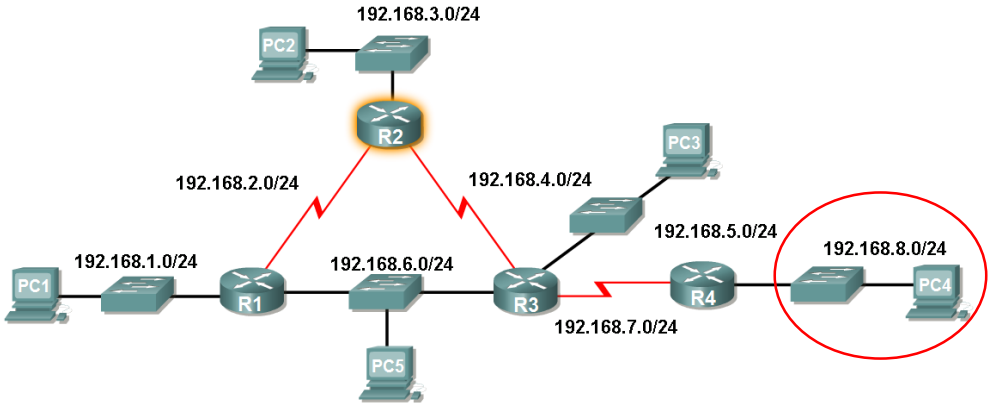
- **Metrics used in IP routing protocols**
  - Bandwidth
  - Cost
  - Delay
  - Hop count
  - Load
  - Reliability



Routing Protocols Metrics

- **The Metric Field in the Routing Table**
- **Metric used for each routing protocol**
  - RIP - hop count
  - IGRP & EIGRP - Bandwidth (used by default), Delay (used by default), Load, Reliability
  - IS-IS & OSPF – Cost, Bandwidth (Cisco's implementation)

Metric in the Routing Table



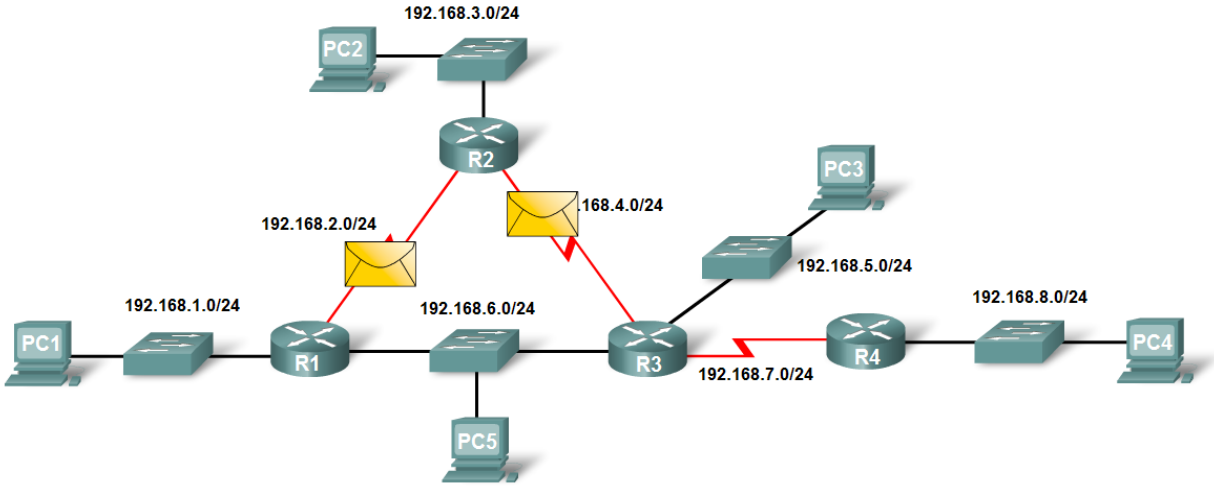

```
R2#show ip route
<output omitted>

Gateway of last resort is not set

R    192.168.1.0/24 [120/1] via 192.168.2.1, 00:00:24, Serial0/0
C    192.168.2.0/24 is directly connected, Serial0/0
C    192.168.3.0/24 is directly connected, FastEthernet0/0
C    192.168.4.0/24 is directly connected, Serial0/1
R    192.168.5.0/24 [120/1] via 192.168.4.1, 00:00:26, Serial0/1
R    192.168.6.0/24 [120/1] via 192.168.2.1, 00:00:24, Serial0/0
                            [120/1] via 192.168.4.1, 00:00:26, Serial0/1
R    192.168.7.0/24 [120/1] via 192.168.4.1, 00:00:26, Serial0/1
R    192.168.8.0/24 [120/2] via 192.168.4.1, 00:00:26, Serial0/1
```

It is 2 hops from R2 to 192.168.8.0/24

Routing Protocols Metrics

- **Load balancing**
  - This is the ability of a router to distribute packets among multiple same cost paths (여러 동일한 비용인 경로 사이에서 패킷을 분배하는 라우터의 기능)

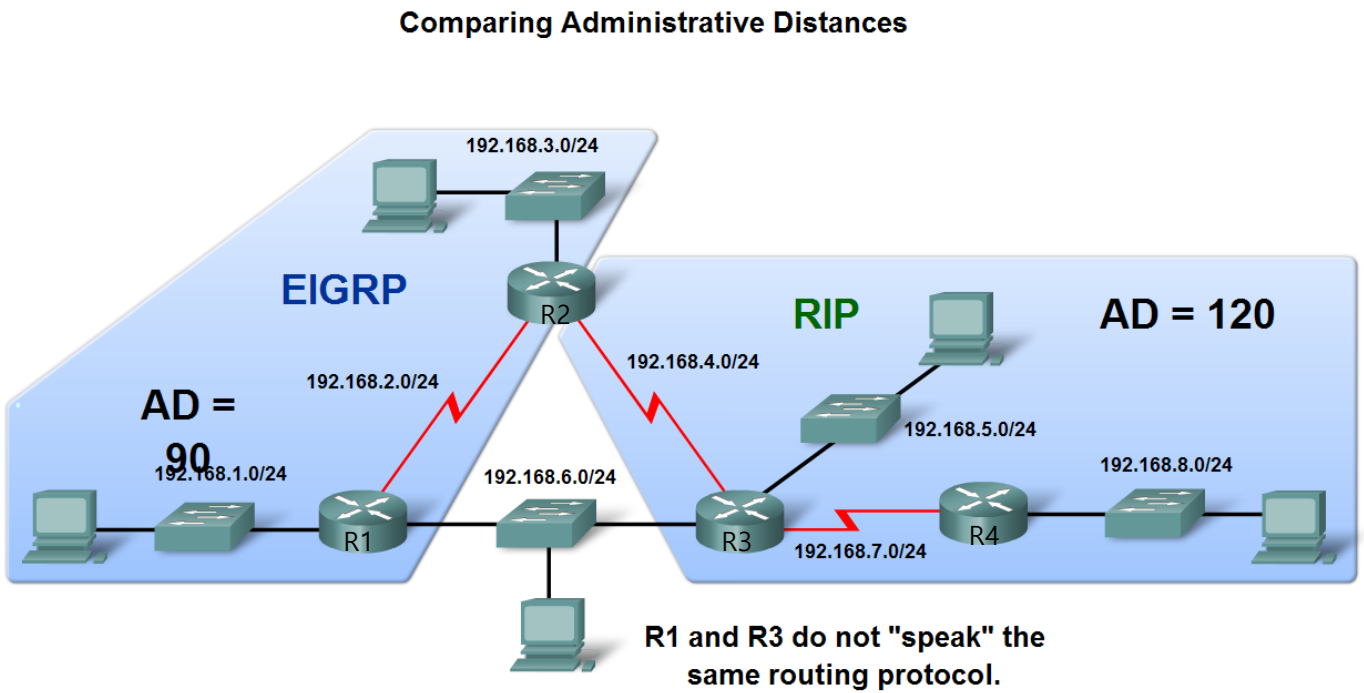
Load Balancing Across Equal Cost Paths




```
R2#show ip route
<output omitted>

R    192.168.6.0/24 [120/1] via 192.168.2.1, 00:00:24, Serial0/0/0
                    [120/1] via 192.168.4.1, 00:00:26, Serial0/0/1
```

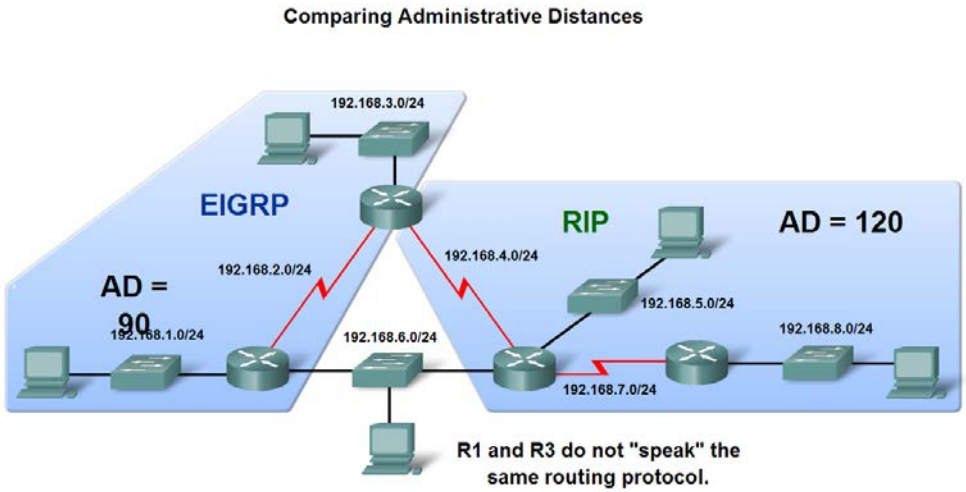
Administrative Distance of a Route

- **Purpose of a metric**
  - It's a calculated value used to determine the best path to a destination (목적지까지의 최적 경로를 결정하는데 사용되는 계산된 값)
- **Purpose of Administrative Distance**
  - It's a numeric value that specifies the preference of a particular route (특정 경로의 기본 설정을 지정하는 숫자 값)



Administrative Distance of a Route

- **Identifying the Administrative Distance (AD) in a routing table**
  - It is the first number in the brackets in the routing table
    (라우팅 테이블의 괄호안의 첫번째 숫자)




```
R2#show ip route
<output omitted>


Gateway of last resort is not set

D    192.168.1.0/24 [90/2172416] via 192.168.2.1, 00:00:24, Serial0/0/0
C    192.168.2.0/24 is directly connected, Serial0/0/0
C    192.168.3.0/24 is directly connected, FastEthernet0/0
C    192.168.4.0/24 is directly connected, Serial0/0/1
R    192.168.5.0/24 [120/1] via 192.168.4.1, 00:00:08, Serial0/0/1
D    192.168.6.0/24 [90/2172416] via 192.168.2.1, 00:00:24, Serial0/0/0
R    192.168.7.0/24 [120/1] via 192.168.4.1, 00:00:08, Serial0/0/1
R    192.168.8.0/24 [120/2] via 192.168.4.1, 00:00:08, Serial0/0/1
```

```
R2#show ip rip database
192.168.3.0/24    directly connected, FastEthernet0/0
192.168.4.0/24    directly connected, Serial0/0/1
192.168.5.0/24
    [1] via 192.168.4.1, Serial0/0/1
192.168.6.0/24
    [1] via 192.168.4.1, Serial0/0/1
192.168.7.0/24
    [1] via 192.168.4.1, Serial0/0/1
192.168.8.0/24
    [2] via 192.168.4.1, Serial0/0/1
```

Administrative Distance of a Route

- Dynamic Routing Protocols

Default Administrative Distances

Route source	Default AD
Connected interface	0
Static	1
EIGRP summary route	5
eBGP	20
EIGRP (Internal)	90
IGRP	100
OSPF	110
IS - IS	115
RIP	120
EIGRP (External)	170
iBGP	200
Unknown	255

Administrative Distance of a Route

- **Directly connected routes**
  - Have a default **AD of 0**
- **Static Routes**
  - Administrative distance of a static route has a **default value of 1**

```
R2#show ip route 172.16.3.0
Routing entry for 172.16.3.0/24
Known via "static", distance 1, metric 0 (connected)
  Routing Descriptor Blocks:
  * directly connected, via Serial0/0/0
      Route metric is 0, traffic share count is 1
```

Administrative Distance of a Route

- **Directly connected routes**
  - Immediately appear in the routing table as soon as the interface is configured

```
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

     172.16.0.0/24 is subnetted, 3 subnets
C       172.16.1.0 is directly connected, FastEthernet0/0
C       172.16.2.0 is directly connected, Serial0/0/0
S       172.16.3.0 is directly connected, Serial0/0/0
C    192.168.1.0/24 is directly connected, Serial0/0/1
S    192.168.2.0/24 [1/0] via 192.168.1.1
```

Distance Vector Routing Protocols

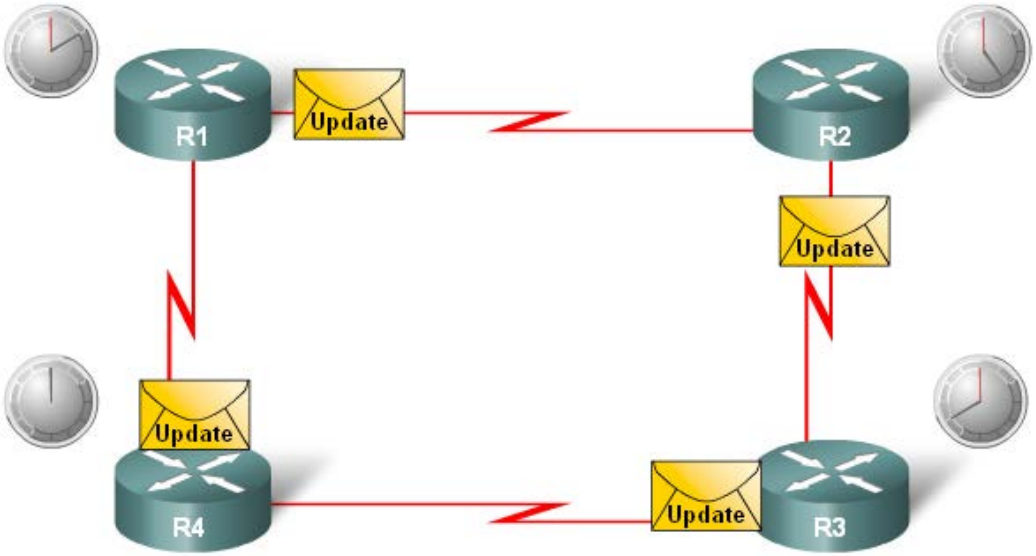
- **Examples of Distance Vector routing protocols:**
  - Routing Information Protocol (RIP)
  - Interior Gateway Routing Protocol (IGRP)
  - Enhanced Interior Gateway Routing Protocol (EIGRP)

Distance Vector Routing Protocols

- **Distance Vector Technology**
  - **The Meaning of Distance Vector**:
    - A router using distance vector routing protocols knows 2 things:
      (거리 벡터 라우팅 프로토콜을 사용하는 라우터는 다음 두 가지를 알고 있습니다.)
      - Distance to final destination (최종 목적지까지의 거리)
      - Vector, or direction, traffic should be directed
        (트래픽이 유도되는 벡터(또는 방향))

Distance Vector Routing Protocols

- **Characteristics of Distance Vector routing protocols:**
  - Periodic updates (주기적인 업데이트)
  - Neighbors (이웃하는 라우터들)
  - Broadcast updates (브로드캐스트 업데이트)
  - Entire routing table is included with routing update (라우팅 업데이트에 전체 라우팅 테이블 포함)



Distance Vector Routing Protocols

Routing Protocol Characteristics

- Criteria used to compare routing protocols includes (라우팅 프로토콜을 비교하는 기준)
  - Time to convergence (컨버전스되는 시간)
  - Scalability (확장성)
  - Resource usage (자원 사용)
  - Implementation & maintenance (구현 & 유지보수)

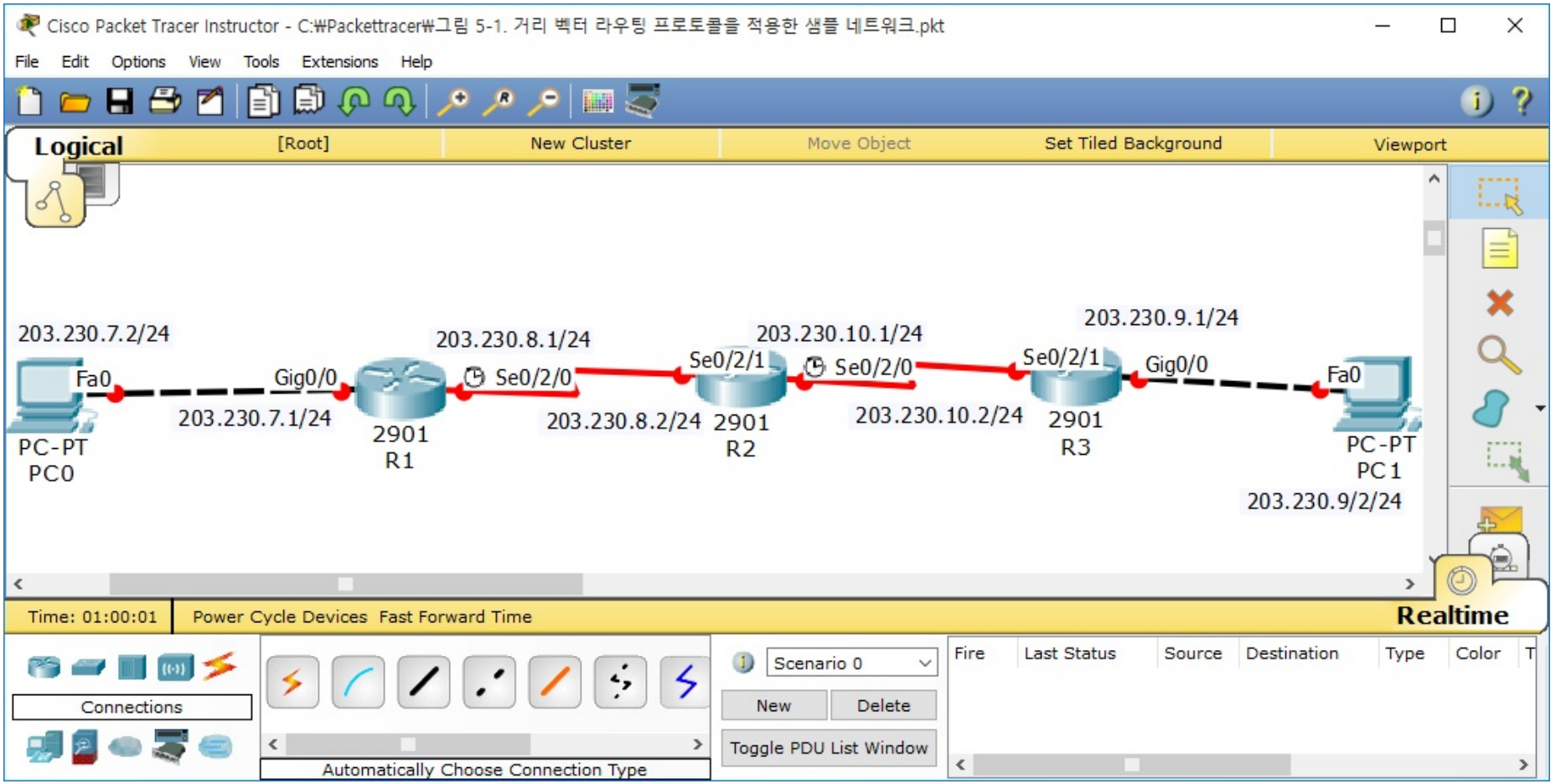
Routing Protocols Today

- Factors used to determine whether to use RIP or EIGRP include
  - Network size
  - Compatibility between models of routers
  - Administrative knowledge

Distance Vector Routing Protocols Compared

	Ripv1	Ripv2	IGRP	EIGRP
Speed of Convergance	Slow	Slow	Slow	Fast
Scalability – size of network	Small	Small	Small	Large
Use of VLSM	No	Yes	No	Yes
Resource usage	Low	Low	Low	Medium
Implementation and maintenance	Simple	Simple	Simple	Complex

거리 벡터 라우팅 프로토콜 샘플 네트워크



거리-벡터 라우팅 프로토콜의 라우팅 테이블 업데이트 과정

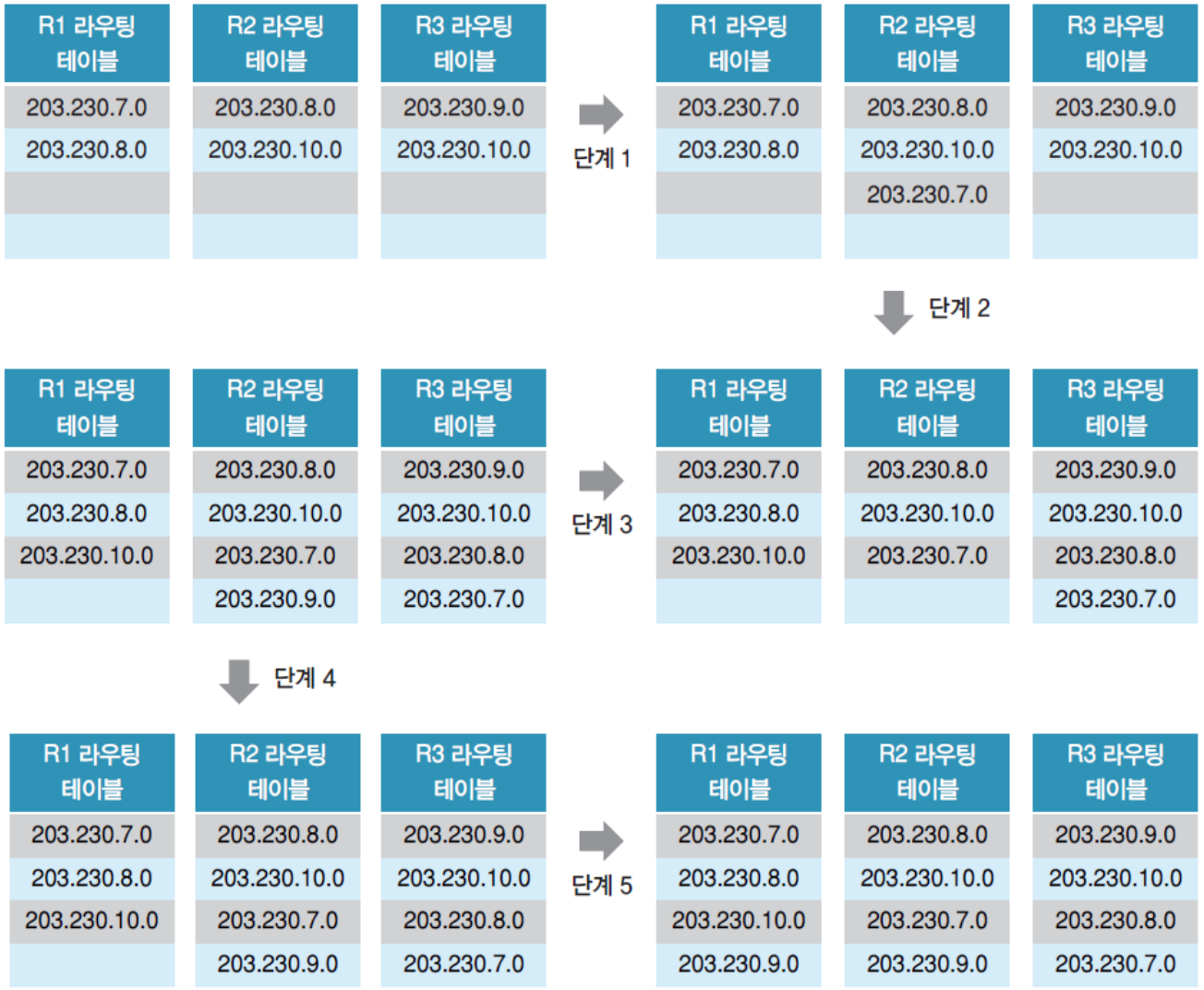
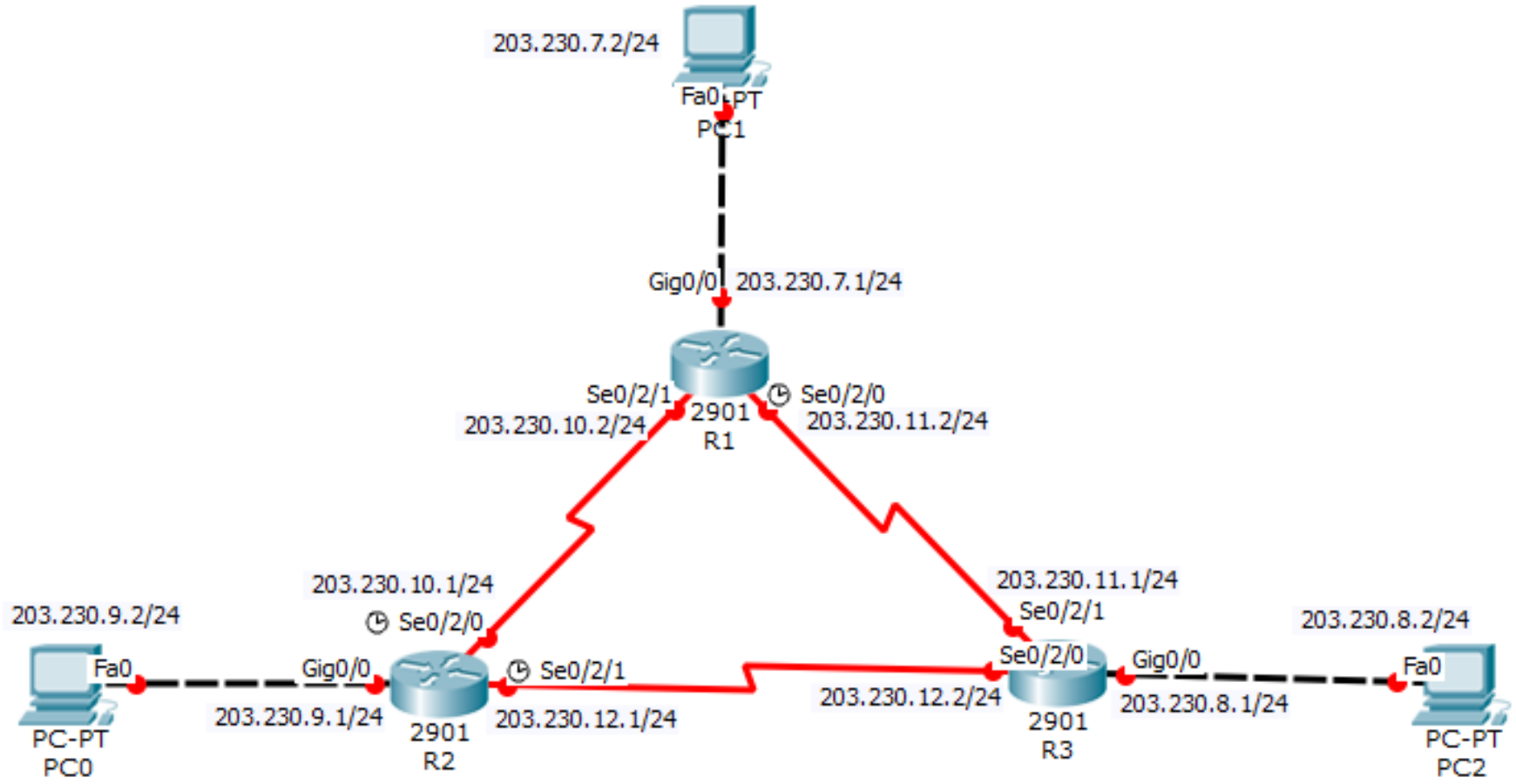


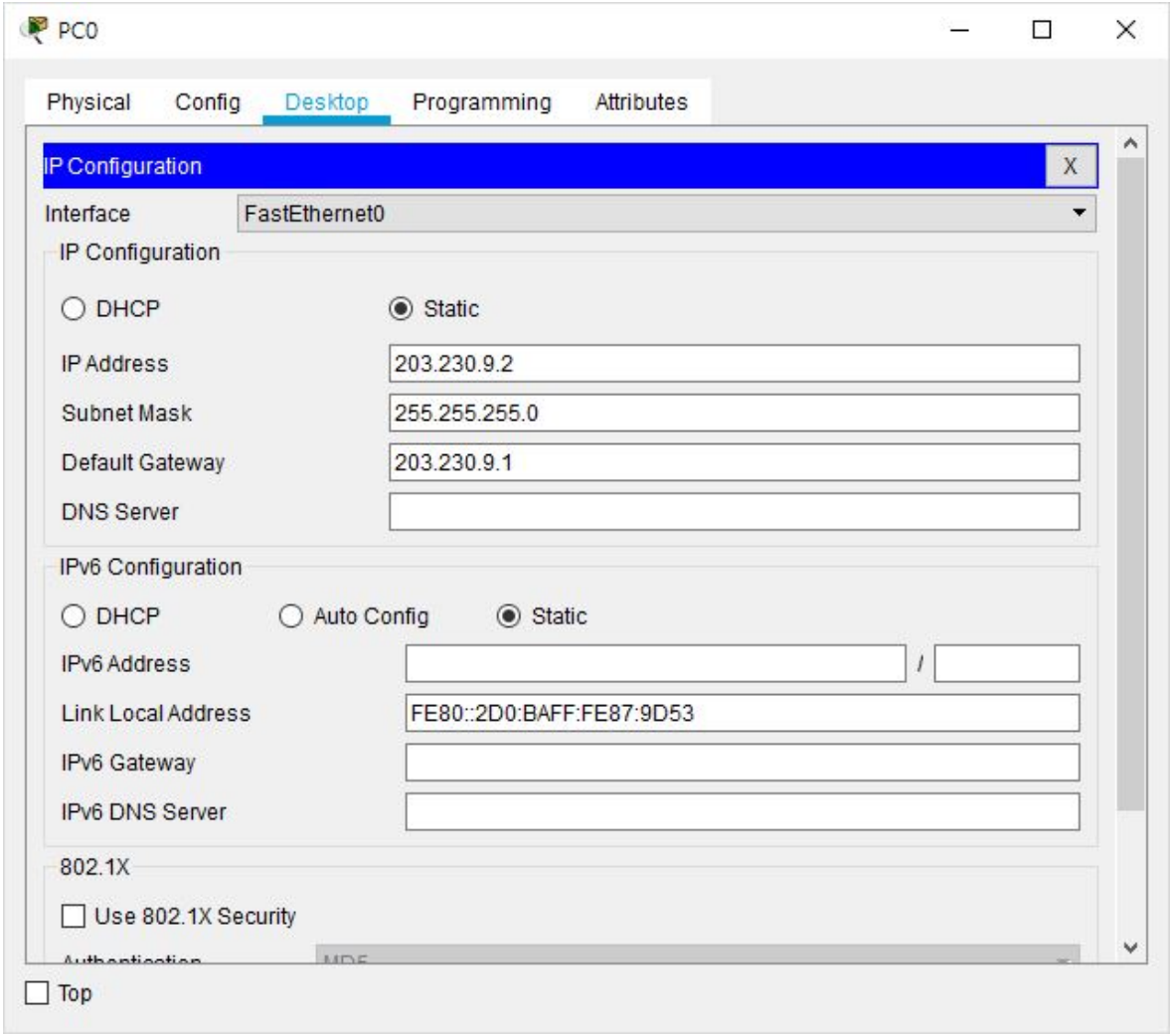
그림 5-2 라우팅 테이블 업데이트 과정

RIPv1 - 기본 네트워크 토폴로지



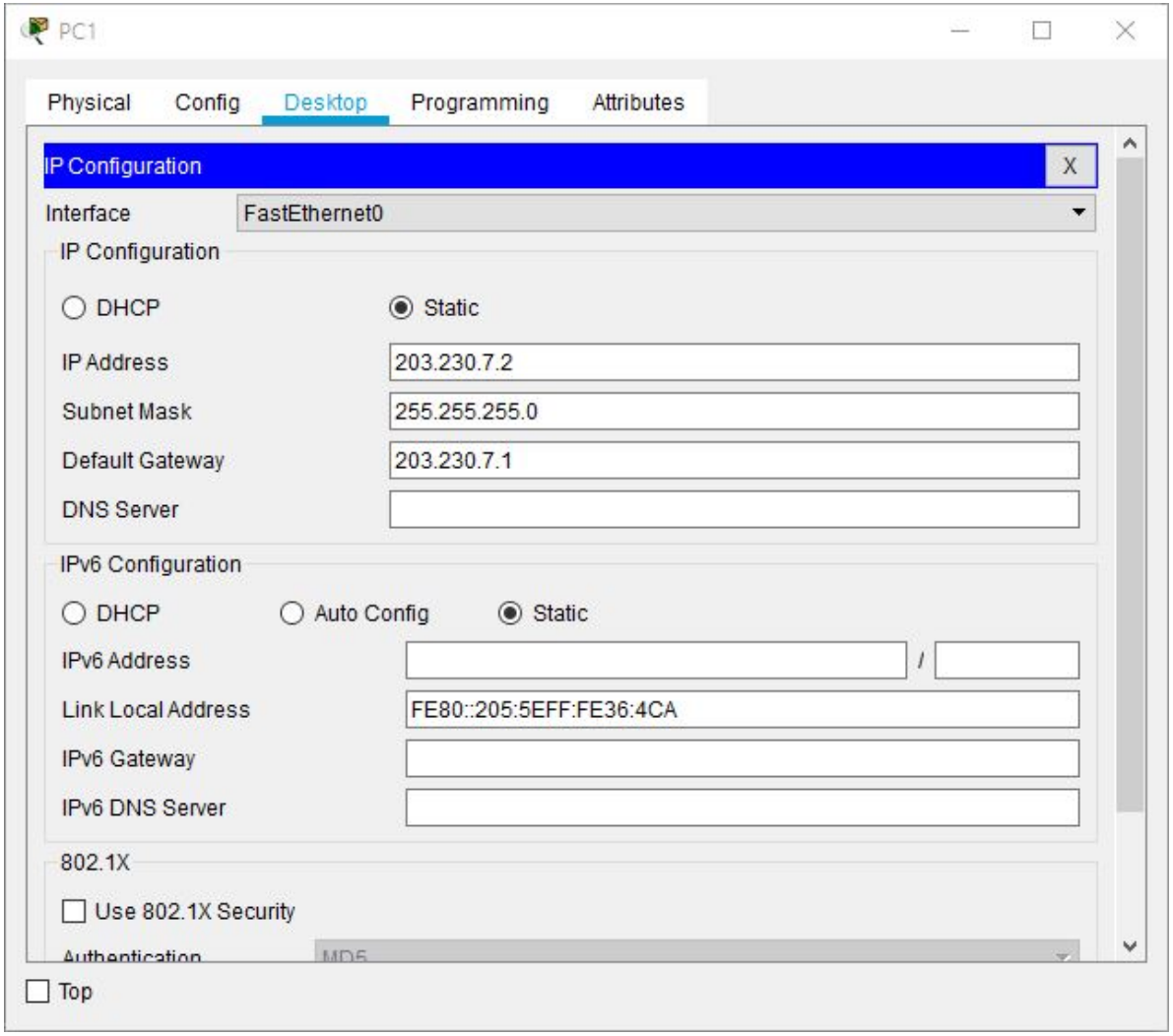
Configuring RIP

- **PC0 IP 주소 할당**



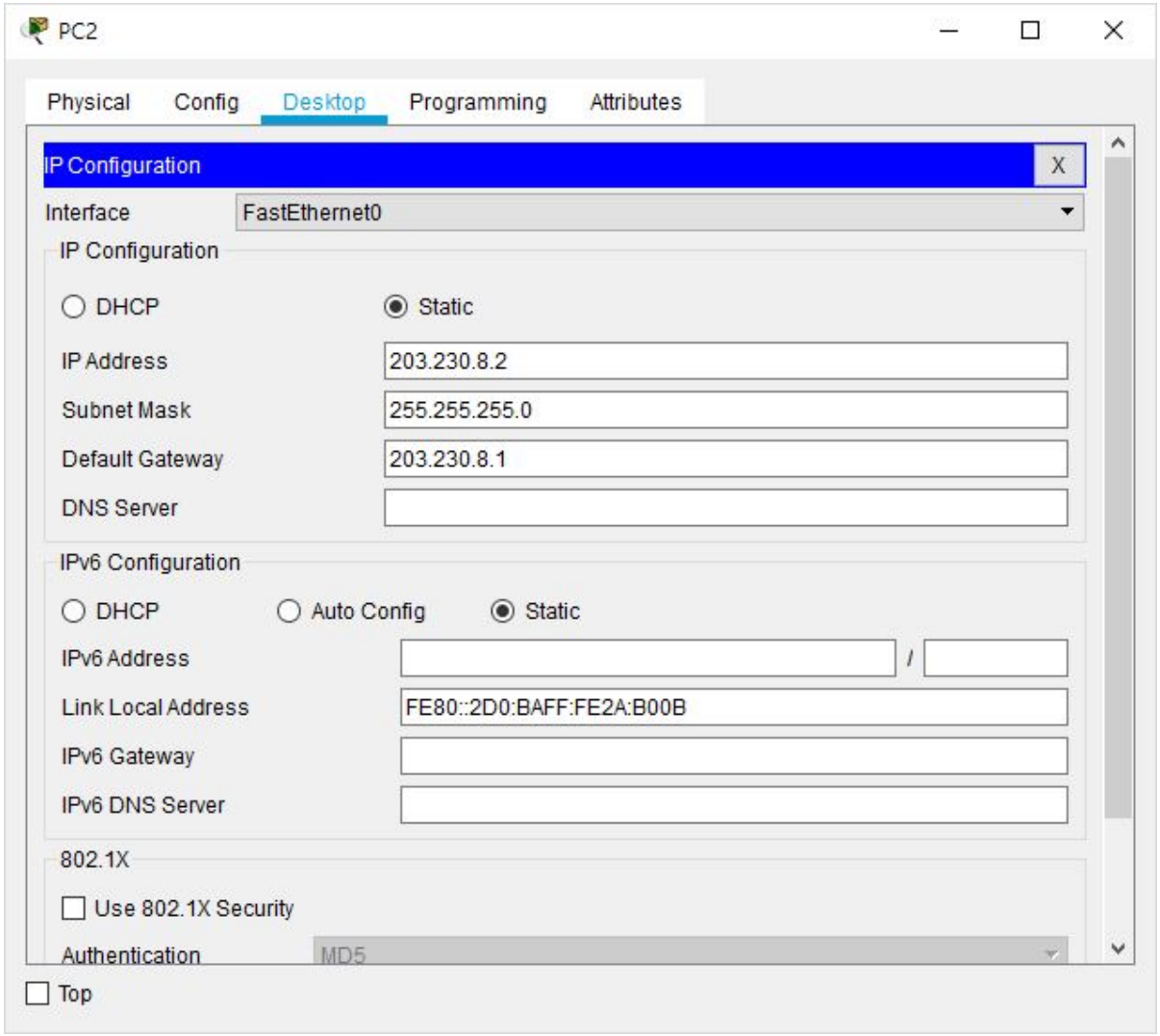
Configuring RIP

- PC1 IP 주소 할당



Configuring RIP

- PC2 IP 주소 할당



Configuring RIP

라우터 R1 인터페이스 설정

```
Router> enable
Router# config terminal
Enter configuration commands, one per Line. End with CNTL/z.
Router(config)# hostname R1
R1(config)# interface gi0/0
R1(config-if)# ip address 203.230.7.1 255.255.255.0
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config)# interface se0/2/0
R1(config-if)# ip address 203.230.11.2 255.255.255.0
R1(config-if)# clock rate 64000
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config)# interface se0/2/1
R1(config-if)# ip address 203.230.10.2 255.255.255.0
R1(config-if)# no shutdown
```

Configuring RIP

라우터 R2 인터페이스 설정

```
Router> enable
Router# config terminal
Enter configuration commands, one per Line. End with CNTL/z.
Router(config)# hostname R2
R2(config)# interface gi0/0
R2(config-if)# ip address 203.230.9.1 255.255.255.0
R2(config-if)# no shutdown
R2(config-if)# exit
R2(config)# interface se0/2/0
R2(config-if)# ip address 203.230.10.1 255.255.255.0
R2(config-if)# clock rate 64000
R2(config-if)# no shutdown
R2(config-if)# exit
R2(config)# interface se0/2/1
R2(config-if)# ip address 203.230.12.1 255.255.255.0
R2(config-if)# clock rate 64000
R2(config-if)# no shutdown
```

Configuring RIP

라우터 R3 인터페이스 설정

```
Router> enable
Router# config terminal
Enter configuration commands, one per Line. End with CNTL/z.
Router(config)# hostname R3
R3(config)# interface gi0/0
R3(config-if)# ip address 203.230.8.1 255.255.255.0
R3(config-if)# no shutdown
R3(config-if)# exit
R3(config)# interface se0/2/0
R3(config-if)# ip address 203.230.12.2 255.255.255.0
R3(config-if)# no shutdown
R3(config-if)# exit
R3(config)# interface se0/2/1
R3(config-if)# ip address 203.230.11.1 255.255.255.0
R3(config-if)# no shutdown
```

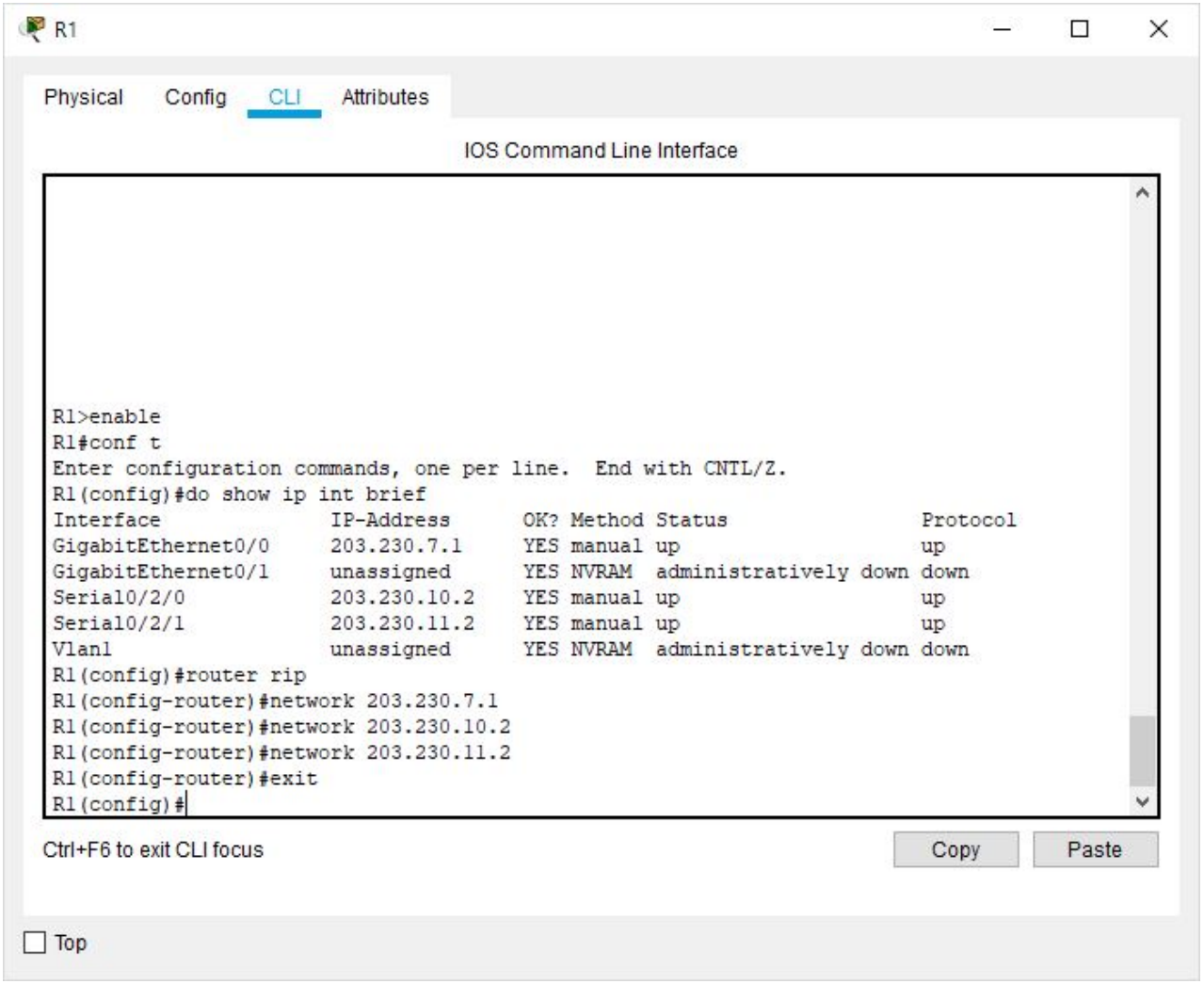
Configuring RIP

- 라우터에서 RIPv1 기본적인 설정 방법

```
Router>enable
Router#conf t
Router(config)#router rip
 → 라우팅 프로토콜로 RIP을 사용할 것을 선언.
Router(config-network)#network 네트워크 주소
 → network 명령어로 라우터에 직접 연결되어 있는 네트워크 주소를 입력.
```

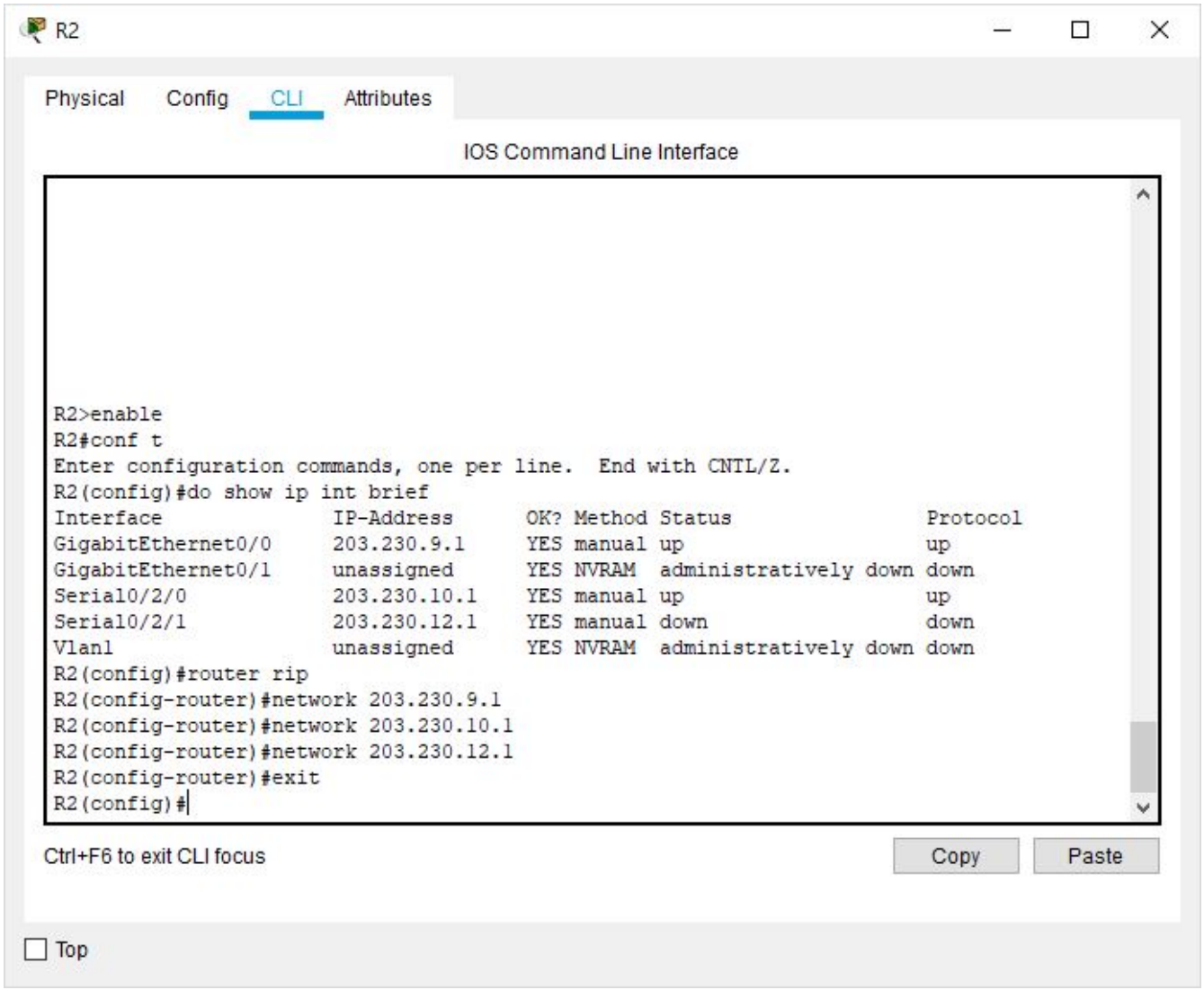
Configuring RIP

- **R1에서 RIPv1 설정**



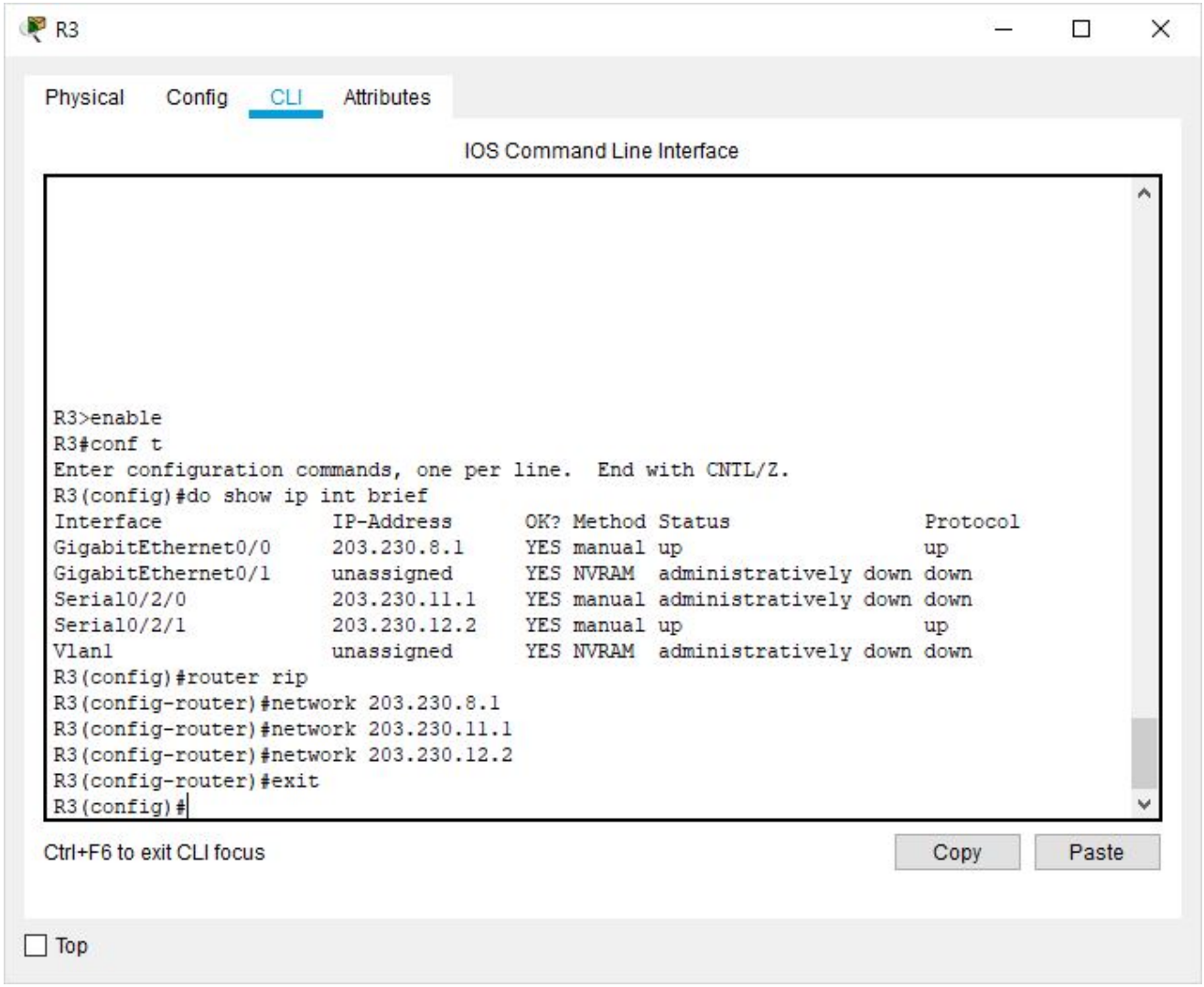
Configuring RIP

- R2에서 RIPv1 설정



Configuring RIP

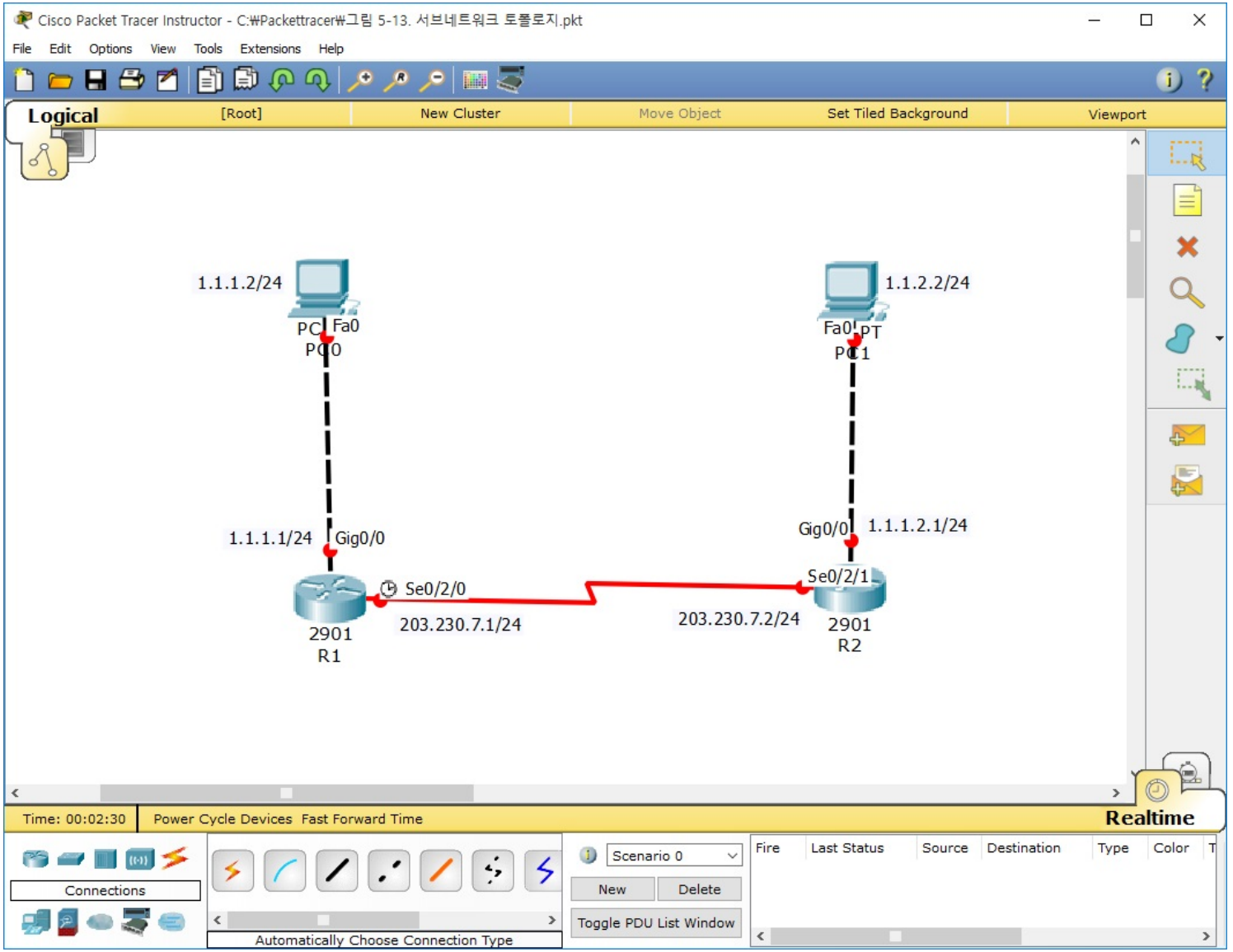
- R3에서 RIPv1 설정



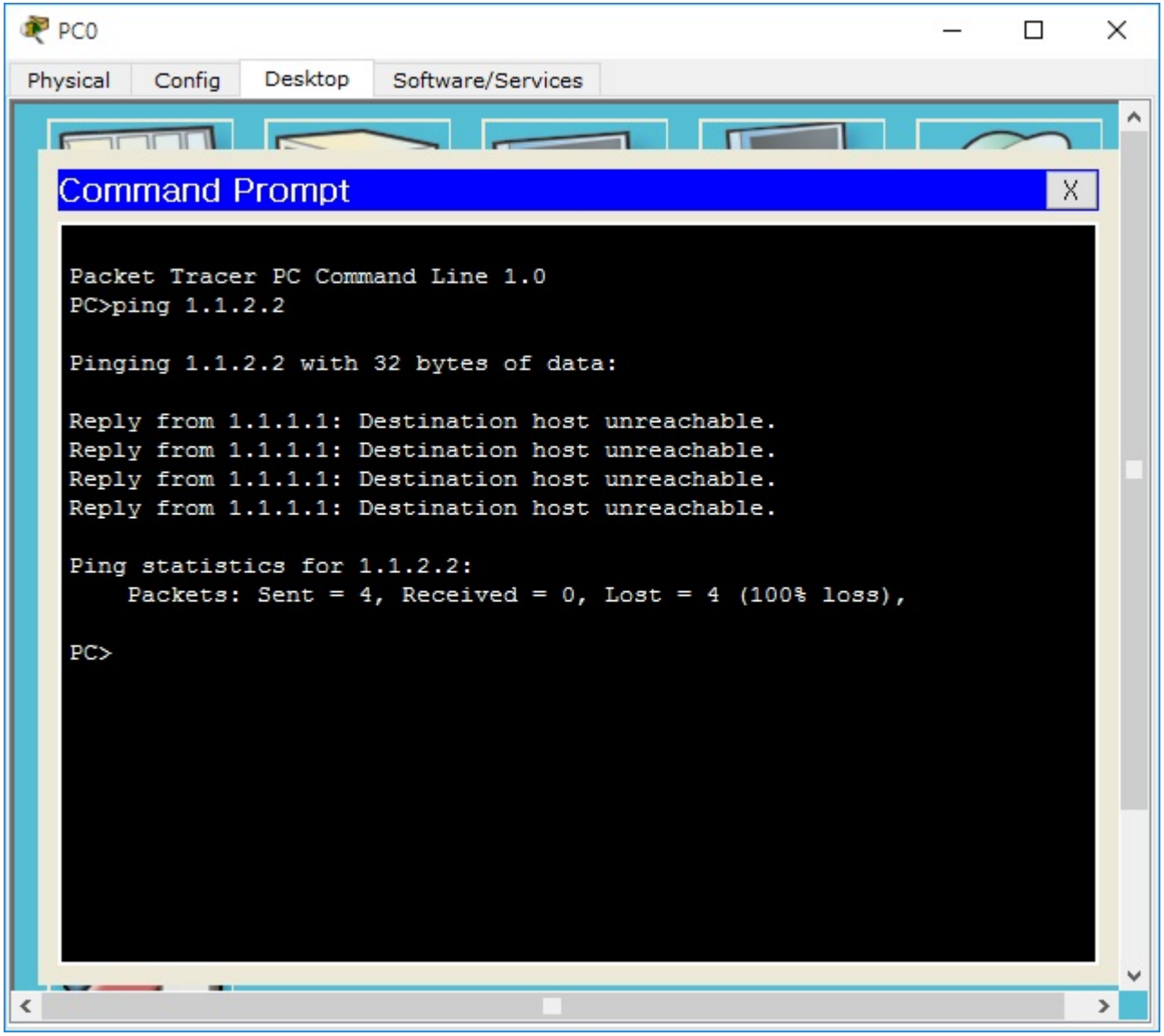
Verifying routing tables on R1, R2, and R3

- **show ip route**
- **show ip protocols**
- **debug ip rip**
- **passive-interface GigabitEthernet0/0**
  - 특정 인터페이스에 라우팅 업데이트 정보를 보내지 않도록 설정

서브네트워크 토폴로지


Cisco Packet Tracer Instructor - C:₩Packettracer₩그림 5-13. 서브네트워크 토폴로지.pkt
File Edit Options View Tools Extensions Help
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
1.1.1.2/24
PC
Fa0
PC0
1.1.2.2/24
Fa0
PT
PC1
1.1.1.1/24
Gig0/0
Gig0/0
1.1.1.2.1/24
Se0/2/0
203.230.7.1/24
203.230.7.2/24
Se0/2/1
2901
R1
2901
R2
Time: 00:02:30
Power Cycle Devices Fast Forward Time
Realtime
Connections
Automatically Choose Connection Type
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color

ping test between PC0 and PC1



ping test between PC0 and PC1

```
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, 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

     1.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       1.1.1.0/24 is directly connected, GigabitEthernet0/0
L       1.1.1.1/32 is directly connected, GigabitEthernet0/0
     203.230.7.0/24 is variably subnetted, 2 subnets, 2 masks
C       203.230.7.0/24 is directly connected, Serial0/2/0
L       203.230.7.1/32 is directly connected, Serial0/2/0
R1#
```

Considerations regarding RIPv1

```
R1#debug ip rip
RIP protocol debugging is on
R1#RIP: sending  v1 update to 255.255.255.255 via GigabitEthernet0/0 (1.1.1.1)
RIP: build update entries
      network 203.230.7.0 metric 1
RIP: sending  v1 update to 255.255.255.255 via Serial0/2/0 (203.230.7.1)
RIP: build update entries
      network 1.0.0.0 metric 1
RIP: received v1 update from 203.230.7.2 on Serial0/2/0
      1.0.0.0 in 1 hops
RIP: sending  v1 update to 255.255.255.255 via GigabitEthernet0/0 (1.1.1.1)
RIP: build update entries
      network 203.230.7.0 metric 1
RIP: sending  v1 update to 255.255.255.255 via Serial0/2/0 (203.230.7.1)
RIP: build update entries
      network 1.0.0.0 metric 1
RIP: received v1 update from 203.230.7.2 on Serial0/2/0
      1.0.0.0 in 1 hops

R2#debug ip rip
RIP protocol debugging is on
R2#RIP: received v1 update from 203.230.7.1 on Serial0/2/1
      1.0.0.0 in 1 hops
RIP: sending  v1 update to 255.255.255.255 via Serial0/2/1 (203.230.7.2)
RIP: build update entries
      network 1.0.0.0 metric 1
RIP: sending  v1 update to 255.255.255.255 via GigabitEthernet0/0 (1.1.2.1)
RIP: build update entries
      network 203.230.7.0 metric 1
```

Considerations regarding RIPv1 (cont.)

- **R1과 R2 간의 v1 업데이트 엔트리에 *network 1.0.0.0* 이 포함**
- **R1과 R2가 모두 상대방에게 받은 네트워크 1.0.0.0을 라우팅 테이블에 반영하지 않는 이유는 무엇인가?**
  - 1.0.0.0 네트워크가 자신에 직접 연결된 (directly connected) 인터페이스에서도 사용하는 네트워크 주소
  - 더 나아가 수신한 네트워크 정보 1.0.0.0의 AD 값은 120이지만 직접 연결된 네트워크 1.0.0.0의 AD 값은 0
  - 따라서 상대 라우터로부터 수신한 1.0.0.0 네트워크 정보는 반영될 수가 없음
  - RIPv1은 클래스풀 라우팅 프로토콜!

RIPv2

- RIPv2는 클래스리스 라우팅 프로토콜
- 라우팅 업데이트 시 네트워크 정보와 함께 서브넷 마스크 정보도 전달
- 자동 요약 기능은 설정할 수도 해제할 수도 있음
- RIPv2는 RIPv1에 비해 보안성 강화
- 라우팅 정보 전달 방식: RIPv1의 경우는 라우팅 정보 전달 시 브로드캐스트 주소 (255.255.255.255)를 사용하지만, RIPv2는 멀티캐스트 주소 (224.0.0.9)를 사용

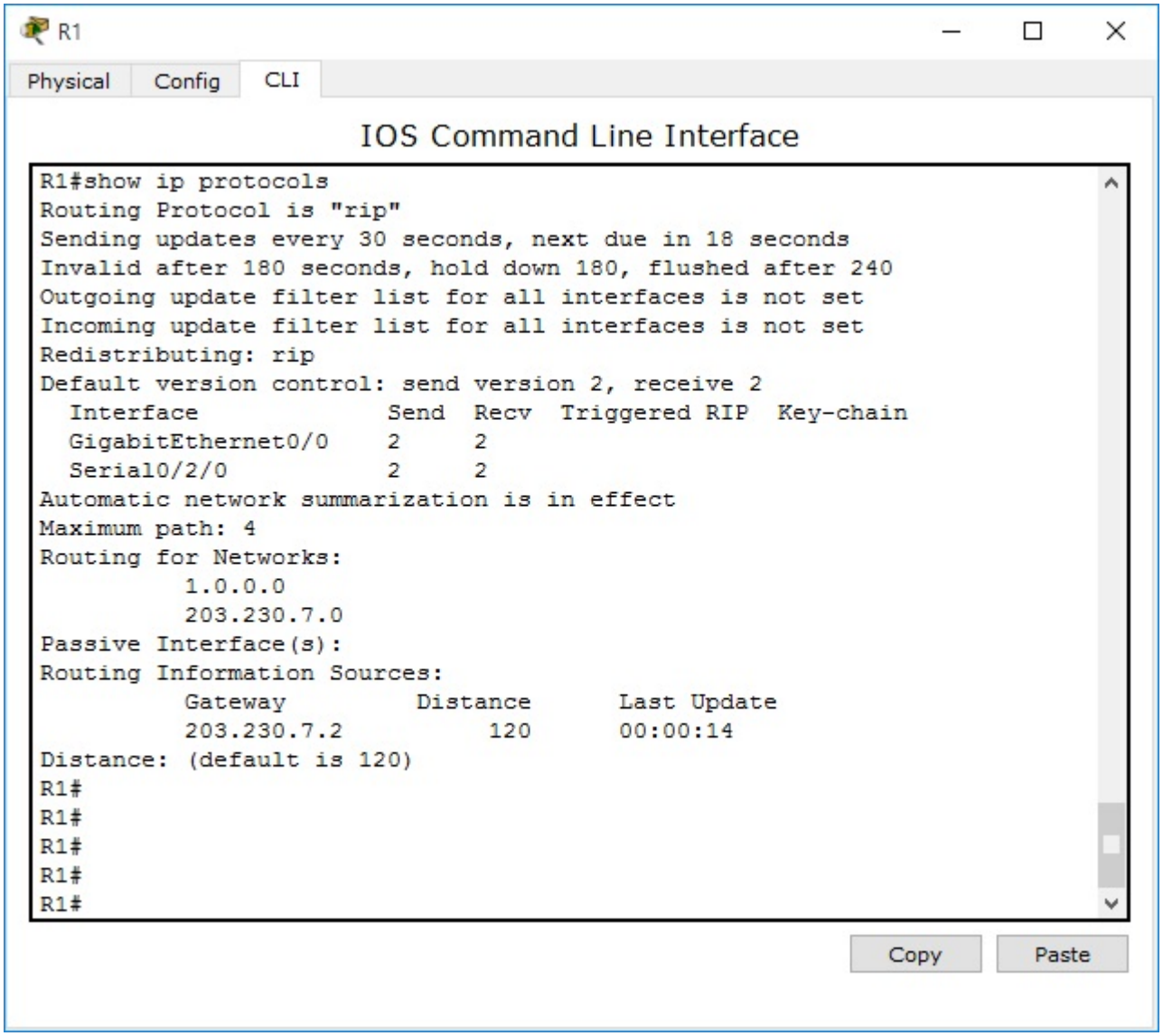
Configuring RIPv2

```
R1>en
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router rip
R1(config-router)#version 2
R1(config-router)#no auto-summary
R1(config-router)#

R2>en
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router rip
R2(config-router)#version 2
R2(config-router)#no auto-summary
R2(config-router)#
```

Routing table

```
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, 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

     1.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
C       1.1.1.0/24 is directly connected, GigabitEthernet0/0
L       1.1.1.1/32 is directly connected, GigabitEthernet0/0
R       1.1.2.0/24 [120/1] via 203.230.7.2, 00:00:12, Serial0/2/0
     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.10.10.0/24 is directly connected, Loopback0
L       10.10.10.1/32 is directly connected, Loopback0
     203.230.7.0/24 is variably subnetted, 2 subnets, 2 masks
C       203.230.7.0/24 is directly connected, Serial0/2/0
L       203.230.7.1/32 is directly connected, Serial0/2/0
R1#
```

Routing protocols in detail



debug ip rip

```
R1#debug ip rip
RIP protocol debugging is on
R1#RIP: sending  v2 update to 224.0.0.9 via GigabitEthernet0/0 (1.1.1.1)
RIP: build update entries
      1.0.0.0/8 via 0.0.0.0, metric 2, tag 0
      203.230.7.0/24 via 0.0.0.0, metric 1, tag 0
RIP: sending  v2 update to 224.0.0.9 via Serial0/2/0 (203.230.7.1)
RIP: build update entries
      1.0.0.0/8 via 0.0.0.0, metric 1, tag 0
RIP: received v2 update from 203.230.7.2 on Serial0/2/0
      1.0.0.0/8 via 0.0.0.0 in 1 hops
RIP: sending  v2 update to 224.0.0.9 via GigabitEthernet0/0 (1.1.1.1)
RIP: build update entries
      1.0.0.0/8 via 0.0.0.0, metric 2, tag 0
      203.230.7.0/24 via 0.0.0.0, metric 1, tag 0
RIP: sending  v2 update to 224.0.0.9 via Serial0/2/0 (203.230.7.1)
RIP: build update entries
      1.0.0.0/8 via 0.0.0.0, metric 1, tag 0
RIP: received v2 update from 203.230.7.2 on Serial0/2/0
      1.0.0.0/8 via 0.0.0.0 in 1 hops
RIP: received v2 update from 203.230.7.2 on Serial0/2/0
      1.0.0.0/8 via 0.0.0.0 in 1 hops
RIP: sending  v2 update to 224.0.0.9 via GigabitEthernet0/0 (1.1.1.1)
```

Default Route

- **그림 5-13 서브네트워크 토폴로지에서 라우터 R1을 이 토폴로지에 있는 모든 로컬 LAN 들이 외부 인터넷과 연결하기 위한 라우터라고 가정 (즉, R2는 인터넷에 연결된 다른 라우터와 패킷을 주고받기 위해서는 반드시 R1을 거쳐야만 됨)**
- **이 경우 라우터 R1이나 R2는 외부 인터넷에 있는 무수히 많은 네트워크에 대한 정보를 라우팅 테이블에 가지고 있어야 할까?**
  - 라우팅 테이블에 어떤 네트워크에 대한 정보가 없다면 해당 네트워크와는 통신을 할 수 없으나,
  - 이때 발생하는 아주 심각한 문제는 라우터의 라우팅 테이블이 매우 커지고 복잡해진다는 것이다.
- **디폴트 경로의 개념을 복잡하게 커지는 라우팅 테이블을 간소화하기 위해 적용**

Adding a loopback interface

```
R1(config)#interface loopback 0

%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

R1(config-if)#ip address 10.10.10.1 255.255.255.0
R1(config-if)#exit
R1(config)#do 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, 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

      1.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
C        1.1.1.0/24 is directly connected, GigabitEthernet0/0
L        1.1.1.1/32 is directly connected, GigabitEthernet0/0
R        1.1.2.0/24 [120/1] via 203.230.7.2, 00:00:25, Serial0/2/0
      10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        10.10.10.0/24 is directly connected, Loopback0
L        10.10.10.1/32 is directly connected, Loopback0
      203.230.7.0/24 is variably subnetted, 2 subnets, 2 masks
C        203.230.7.0/24 is directly connected, Serial0/2/0
L        203.230.7.1/32 is directly connected, Serial0/2/0
```

Configuring default route

- R1(config)# ip route 0.0.0.0 0.0.0.0 loopback 0

  %Default route without gateway, if not a point-to-point interface, may impact performance
- R1(config)# router rip
- R1(config-router)# default-information originate

- Verify routing tables on R1 and R2

Thank You