Routing Protocol (RIP)

RIP

- **RIP**은 **Distance Vector Routing Protocol**.
- **RIP**은 **v1**과 **v2**가 있다.
- **Routing** 정보 전송을 위해 **UDP** 포트 **520**번 사용
- **AD**값은 **120**

<장점>

- 설정이 간단하다.
- 작은 규모의 네트워크나 대형 네트워크의 말단 지점에서 사용하기 좋다.
- 표준 **Routing Protocol**이기 때문에 모든 회사의 **Router**에서 사용 가능
  (EIGRP 경우에는 **Cisco** 전용, 때문에 다른 회사의 **Router**에서는 사용 불가**)**

Routing Protocol (RIP)

RIP

<단점>

- **Metric**을 **Hop-count**로 사용한다.
  (가장 적은 **Hop-count**를 가진 경로가 최적 경로**)**

  → 때문에 경로 결정시 **Link**의 속도를 반영하지 못한다**.**

  → 복잡한 네트워크에서는 비효율적인 **Routing** 경로가 만들어질 수 있다**.**

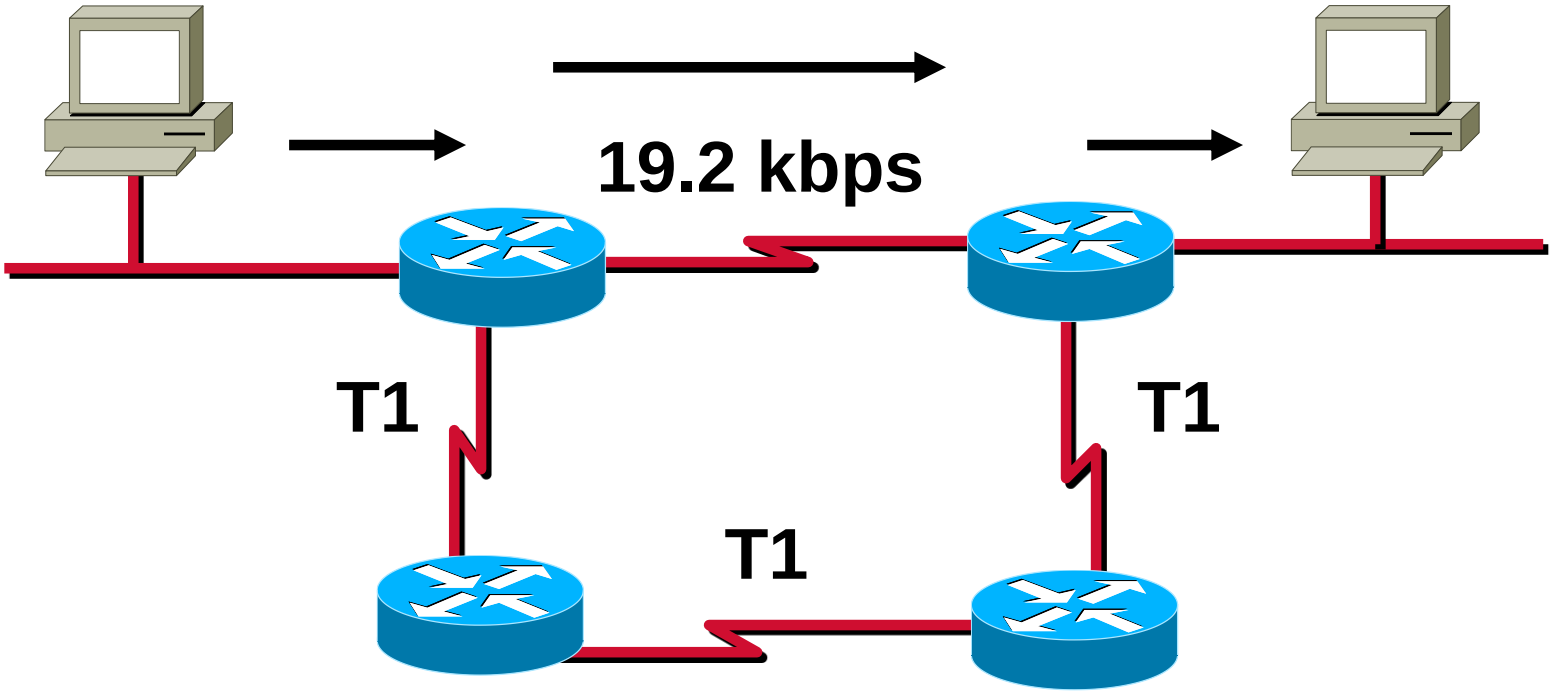
- **RIP**의 최대 **Hop-count**가 **15, **때문에 대형 네트워크에서는 사용이 불가능**.**
  (Hop-count가 **16**이면 도달 불가능한 네트워크로 간주**)**

- **Routing** 정보 전송 방식이 비효율적이다**.**

  → **Topology**에 변화와 상관없이 무조건 **30**초마다 인접 **Router**에게 **Routing table** 내용 전체를 전송한다**.**

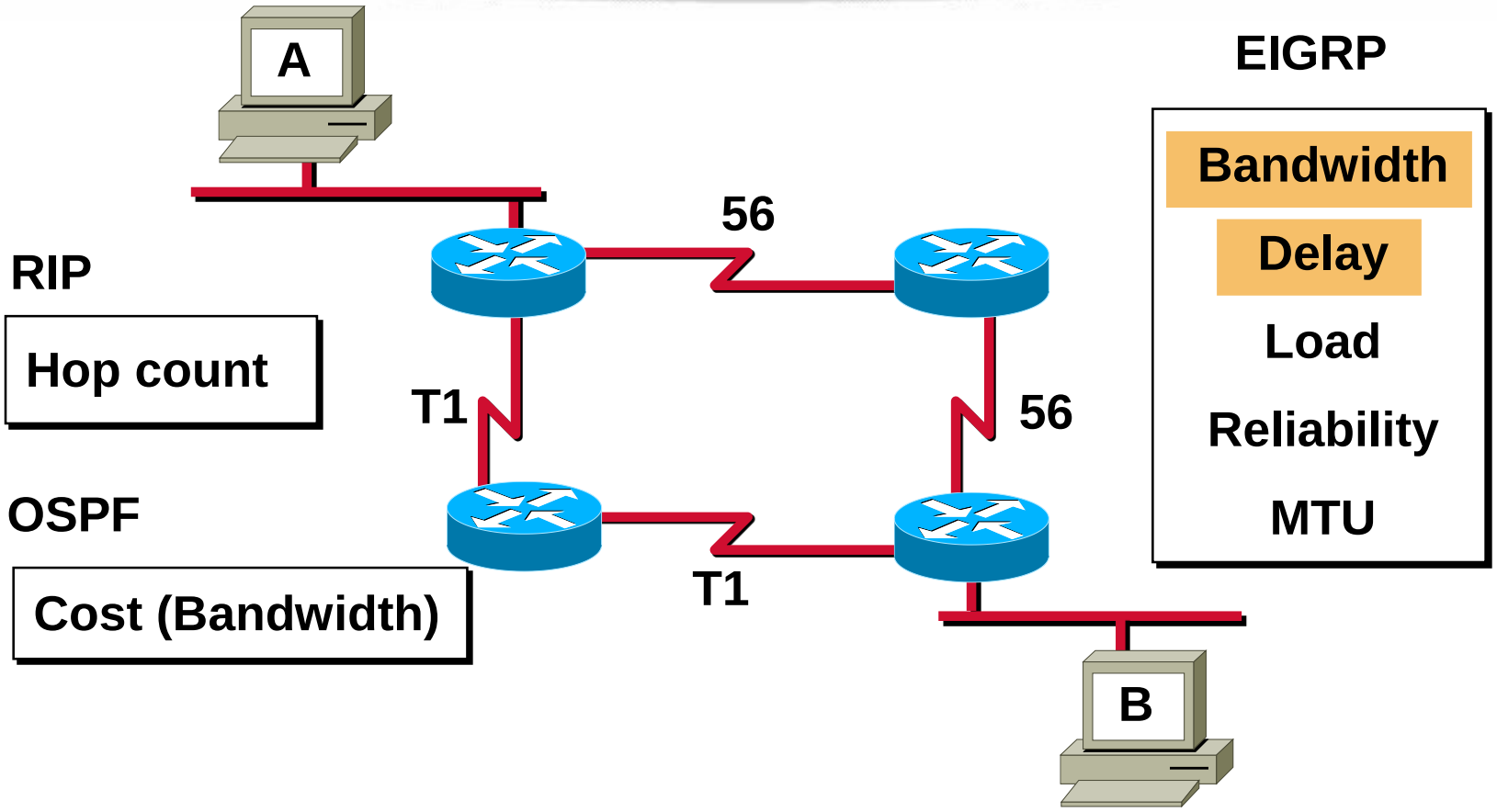
  (OSPF, EIGRP, BGP 등의 다른 **Dynamic Routing Protocol**은 **Topology** 변화가 생길 경우 바뀐 네트워크의 정보만 전송**)**

Routing Protocol (RIP)



- Hop count metric selects the path
- Routes update every 30 seconds

Distance Vector—Selecting Best Route with Metrics



Information used to select the best path for routing

Routing Protocol (RIP)

RIP version

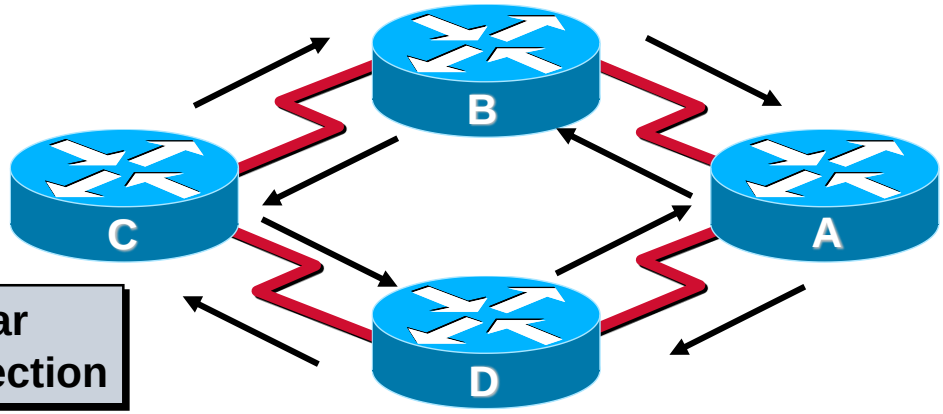
(1) RIP Version 1

- **Subnet mask** 정보가 없는 **Classful** 라우팅 프로토콜. **(VLSM** 미지원**)**
- 정보 전송 시 **Broadcast** 주소**(255.255.255.255)**를 사용.
  때문에 **RIP**이 설정 안된 다른 장비에게도 불필요한 부하가 걸리게 된다.

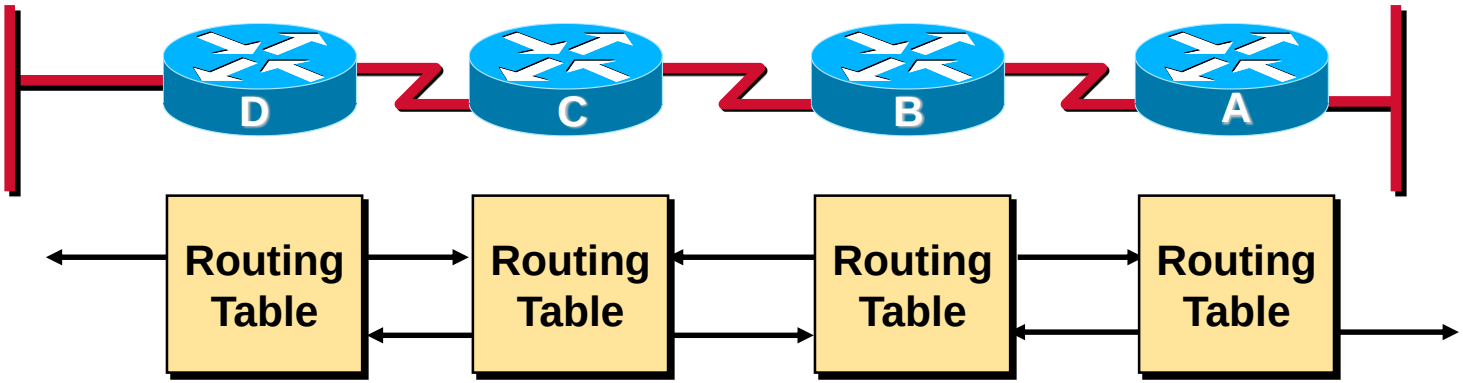
(2) RIP Version 2

- **Subnet mask** 정보가 있는 **Classless** 라우팅 프로토콜 **(VLSM** 지원**)**
- 정보 전송 시 **Multicast(224.0.0.9)**를 사용한다.
- 각 라우터에서 네트워크 경로 정보에 대한 인증을 할 수 있다. → 보완성 강화
- **tag(**꼬리표 **)** 사용이 가능
- **Auto Summary (**자동 축약**)**를 한다.
- **Manual Summary (**수동 축약**)**가 가능하다.

Distance Vector Routing Protocols

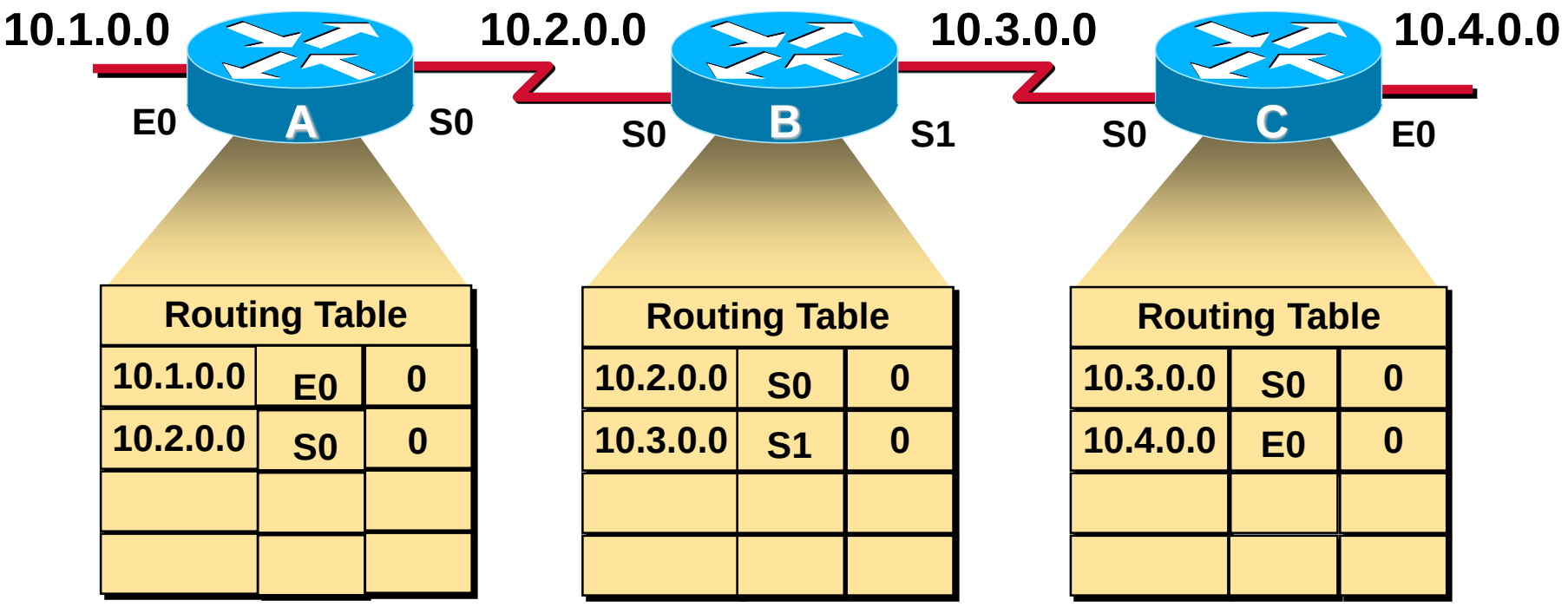


Distance—How far
Vector—In which direction



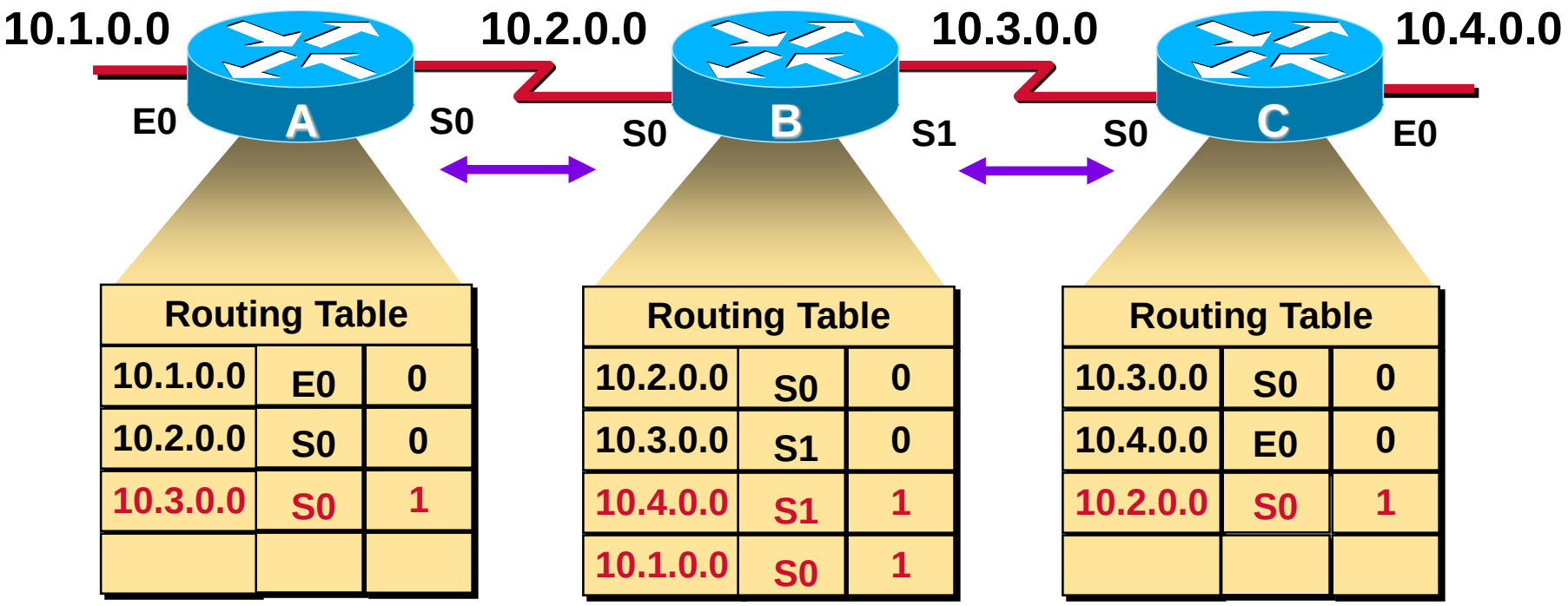
- **Distance Vector Routing Protocol은 Neighbor Router 에게 주기적으로 Routing Table을 Update. (RIP ➔ 30초, IGRP ➔ 90초)**

Distance Vector—Sources of Information and Discovering Routes



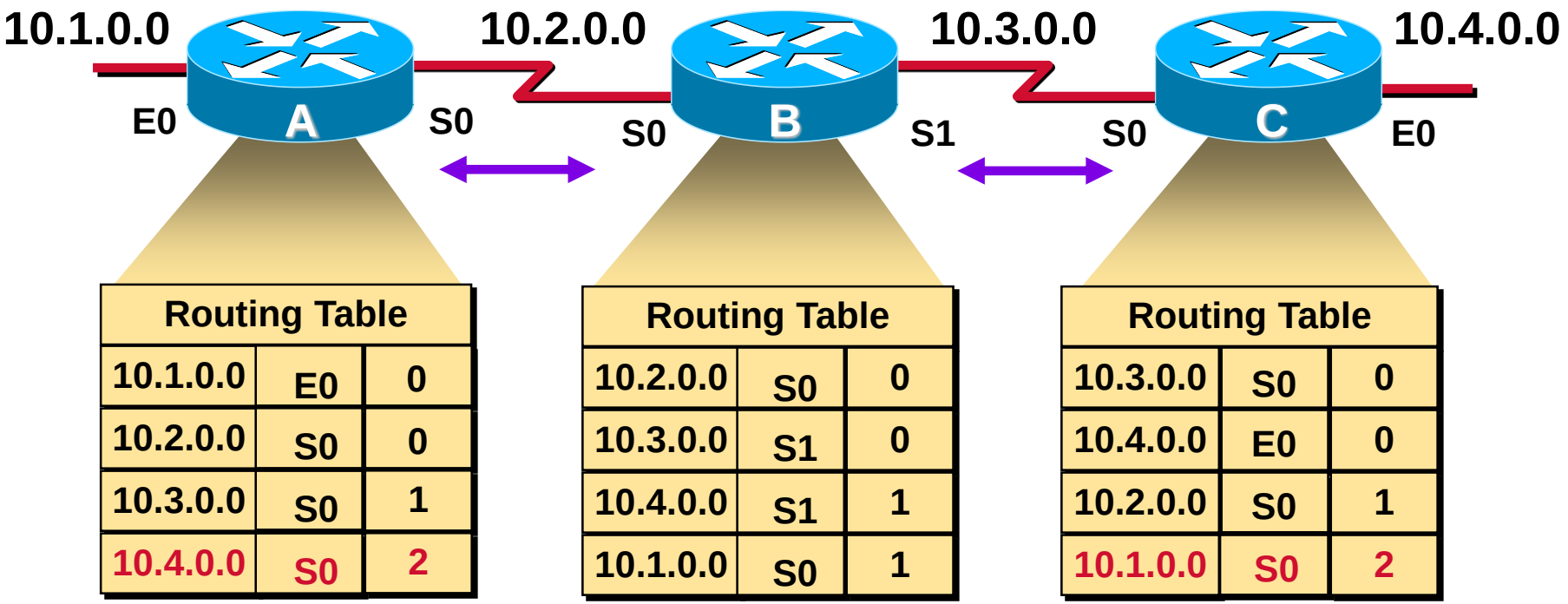
Routers discover the best path to destinations from each neighbor

Distance Vector—Sources of Information and Discovering Routes



Routers discover the best path to destinations from each neighbor

Distance Vector—Sources of Information and Discovering Routes



Routers discover the best path to destinations from each neighbor

Maintaining Routing Information Problem—Routing Loops

Convergence (수렴) Time

- **Convergence** → 네트워크에 변화가 생길 경우 모든 **Router**가 네트워크 변화 상태에 대한 정확하고 일관된 정보를 유지하는 것.

- **Convergence Time** → 네트워크에 변화가 생겼을 경우 그 변화된 정보를 서로 인식하고 수정하는 시간

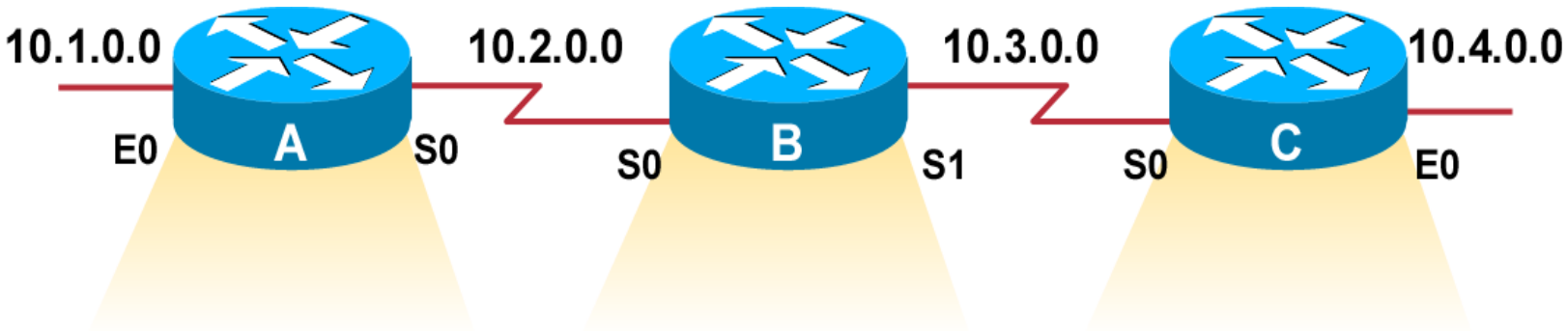
  → **Convergence Time**은 각 **Routing Protocol**별로 다르다.

  → **Convergence Time**은 짧을 수록 좋다.

- **RIP** 같은 경우는 **Convergence Time**이 **30초**.

  * **RIP** 같은 경우는 **Convergence Time**이 **30초**로 느리다. 때문에 **Routing Loop** 문제가 발생한다.

Maintaining Routing Information Problem—Routing Loops



Routing Table		
10.1.0.0	E0	0
10.2.0.0	S0	0
10.3.0.0	S0	1
10.4.0.0	S0	2

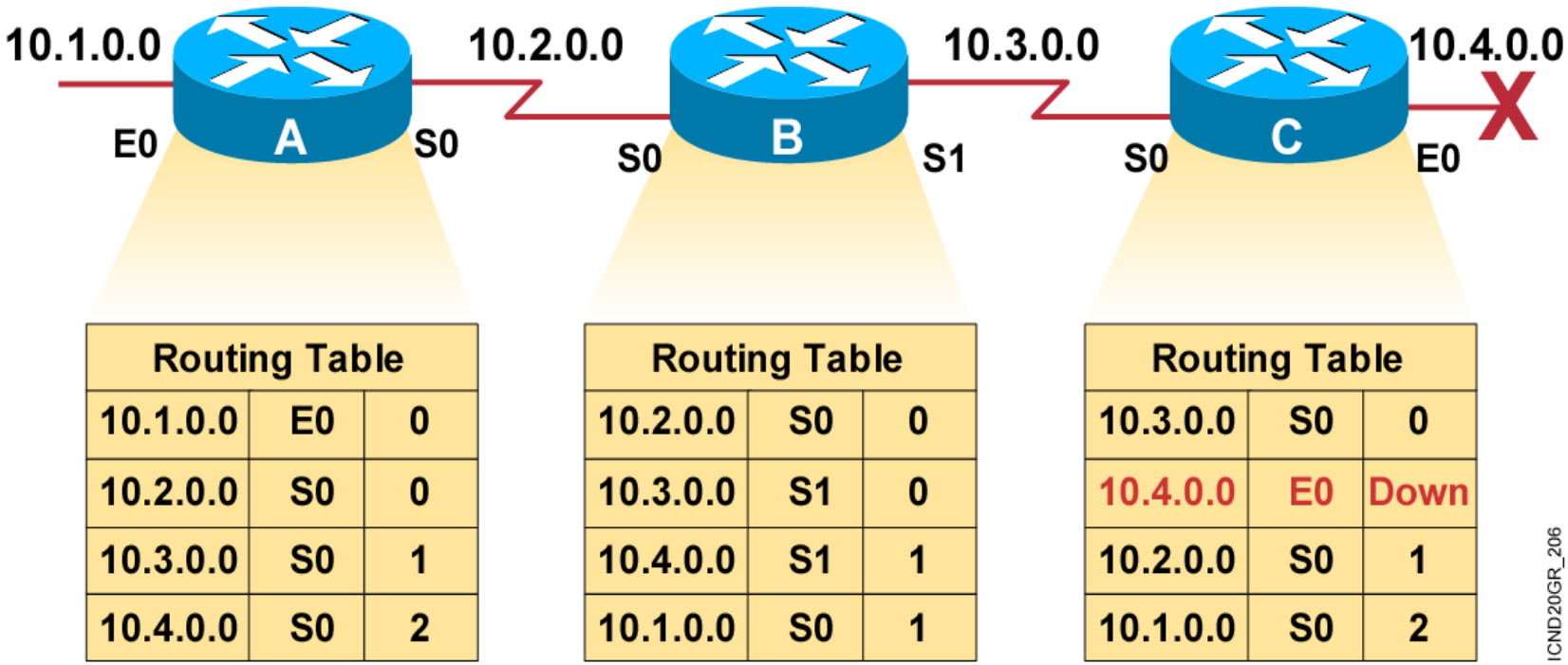
Routing Table		
10.2.0.0	S0	0
10.3.0.0	S1	0
10.4.0.0	S1	1
10.1.0.0	S0	1

Routing Table		
10.3.0.0	S0	0
10.4.0.0	E0	0
10.2.0.0	S0	1
10.1.0.0	S0	2

ICND20GR_205

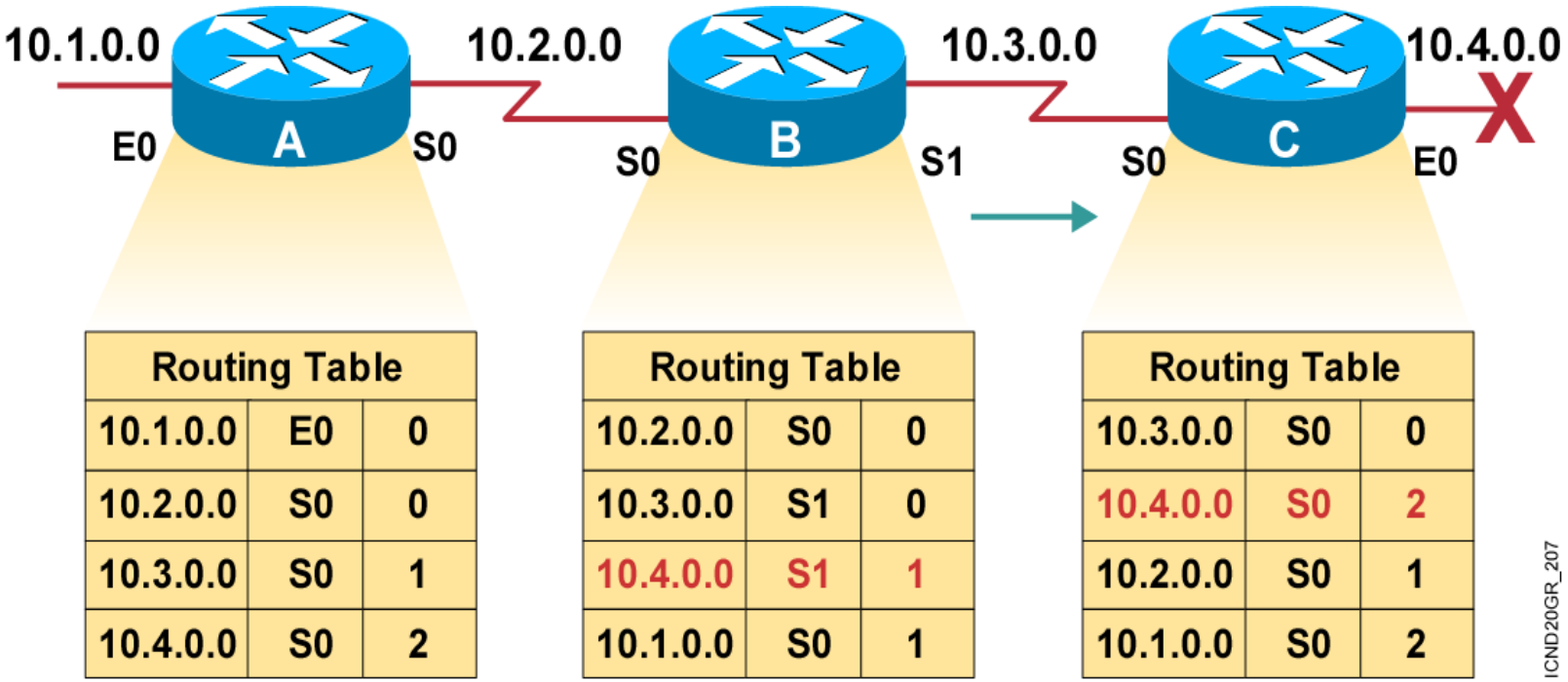
Routing Table

Maintaining Routing Information Problem—Routing Loops



Router C 의 10.4.0.0 Network 장애발생

Maintaining Routing Information Problem—Routing Loops



Routing Table		
10.1.0.0	E0	0
10.2.0.0	S0	0
10.3.0.0	S0	1
10.4.0.0	S0	2

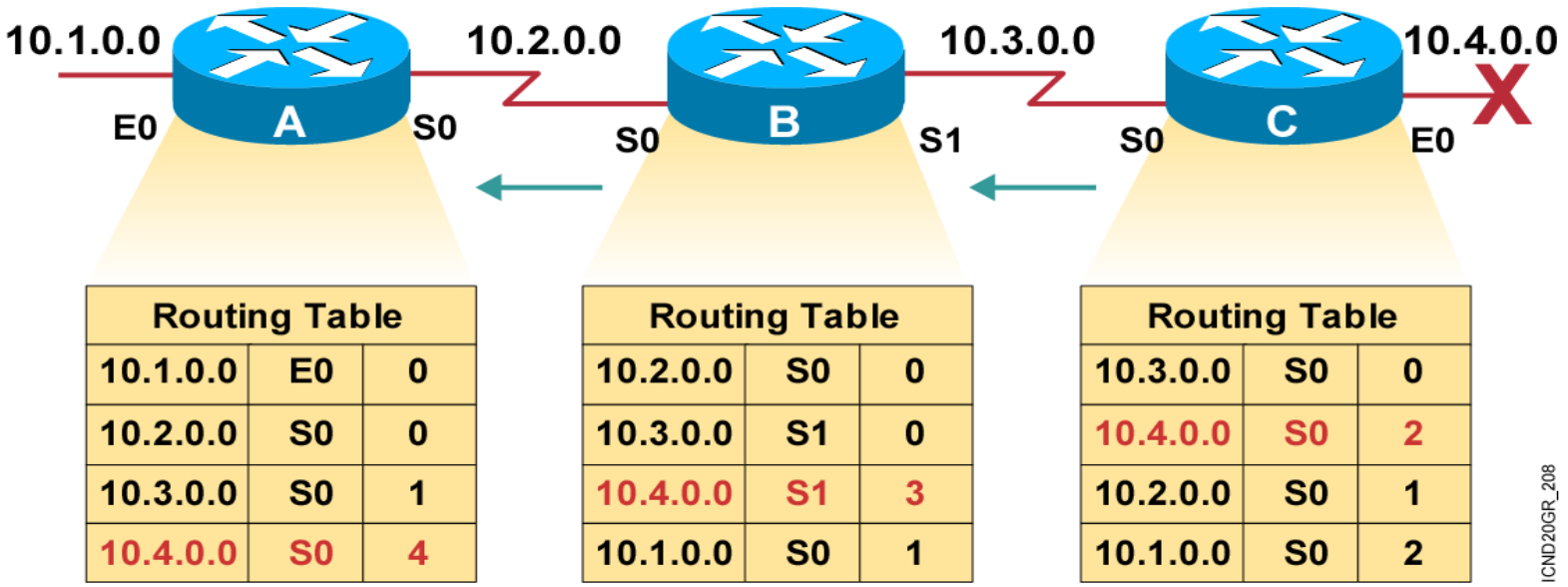
Routing Table		
10.2.0.0	S0	0
10.3.0.0	S1	0
10.4.0.0	S1	1
10.1.0.0	S0	1

Routing Table		
10.3.0.0	S0	0
10.4.0.0	S0	2
10.2.0.0	S0	1
10.1.0.0	S0	2

ICND20GR_207

- **Router C 는 10.4.0.0 Network의 best path 를 router B 에서 찾음**

Maintaining Routing Information Problem—Routing Loops



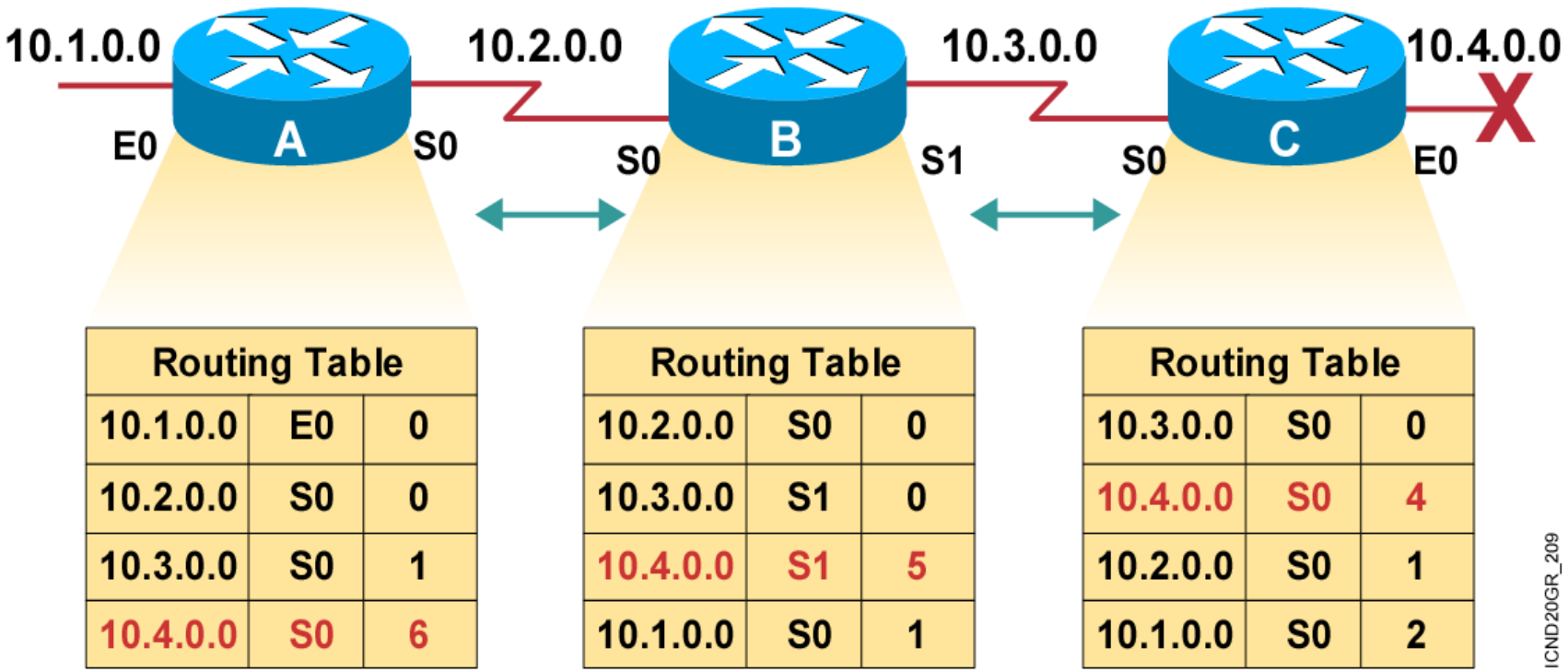
Routing Table		
10.1.0.0	E0	0
10.2.0.0	S0	0
10.3.0.0	S0	1
10.4.0.0	S0	4

Routing Table		
10.2.0.0	S0	0
10.3.0.0	S1	0
10.4.0.0	S1	3
10.1.0.0	S0	1

Routing Table		
10.3.0.0	S0	0
10.4.0.0	S0	2
10.2.0.0	S0	1
10.1.0.0	S0	2

- **Router A 는 Router B 로 부터 잘못된 Update를 받음.**

Maintaining Routing Information Problem—Routing Loops



Routing Table		
10.1.0.0	E0	0
10.2.0.0	S0	0
10.3.0.0	S0	1
10.4.0.0	S0	6

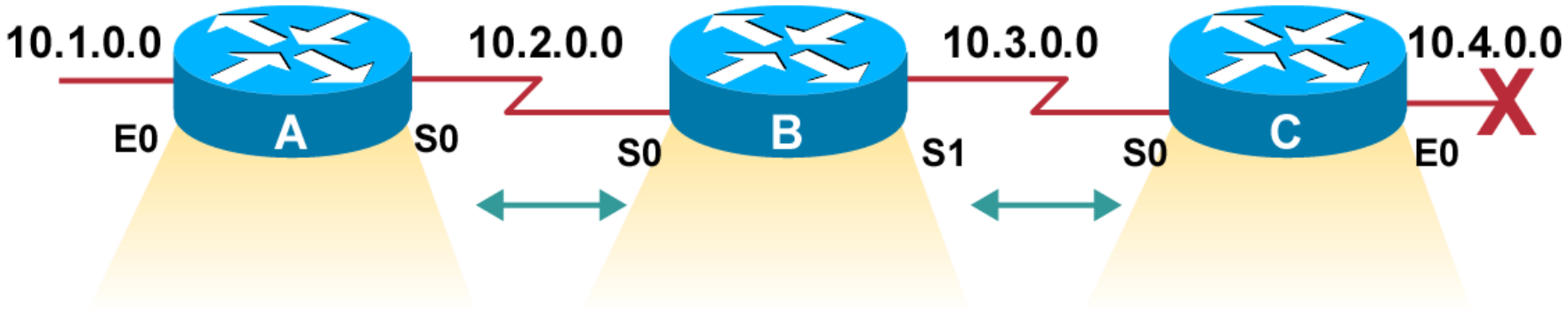
Routing Table		
10.2.0.0	S0	0
10.3.0.0	S1	0
10.4.0.0	S1	5
10.1.0.0	S0	1

Routing Table		
10.3.0.0	S0	0
10.4.0.0	S0	4
10.2.0.0	S0	1
10.1.0.0	S0	2

ICND20GR_209

Network 10.4.0.0 의 잘못된 정보가 계속 Update 됨.

Maintaining Routing Information Problem—Routing Loops



Routing Table		
10.1.0.0	E0	0
10.2.0.0	S0	0
10.3.0.0	S0	1
10.4.0.0	S0	16

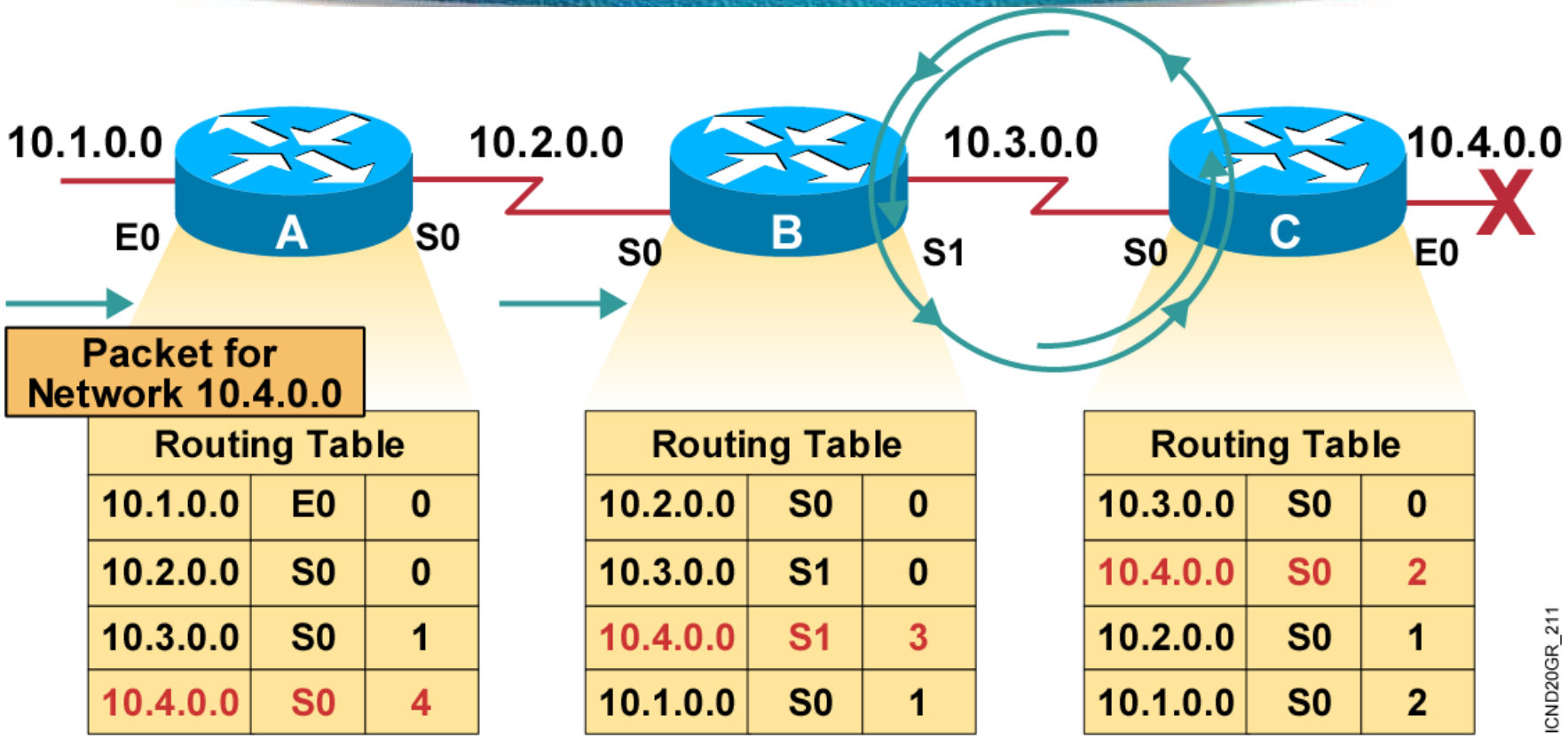
Routing Table		
10.2.0.0	S0	0
10.3.0.0	S1	0
10.4.0.0	S1	16
10.1.0.0	S0	1

Routing Table		
10.3.0.0	S0	0
10.4.0.0	S0	16
10.2.0.0	S0	1
10.1.0.0	S0	2

ICND20GR_210

16 Hop (Hop-Count-Limit)

Maintaining Routing Information Problem—Routing Loops



- **Packet** 은 **10.4.0.0**으로 가기 위해서 **Router B** 와 **Router C** 사이에서 계속 **Loop** 됨

Maintaining Routing Information Problem—Routing Loops

- 해결책 -

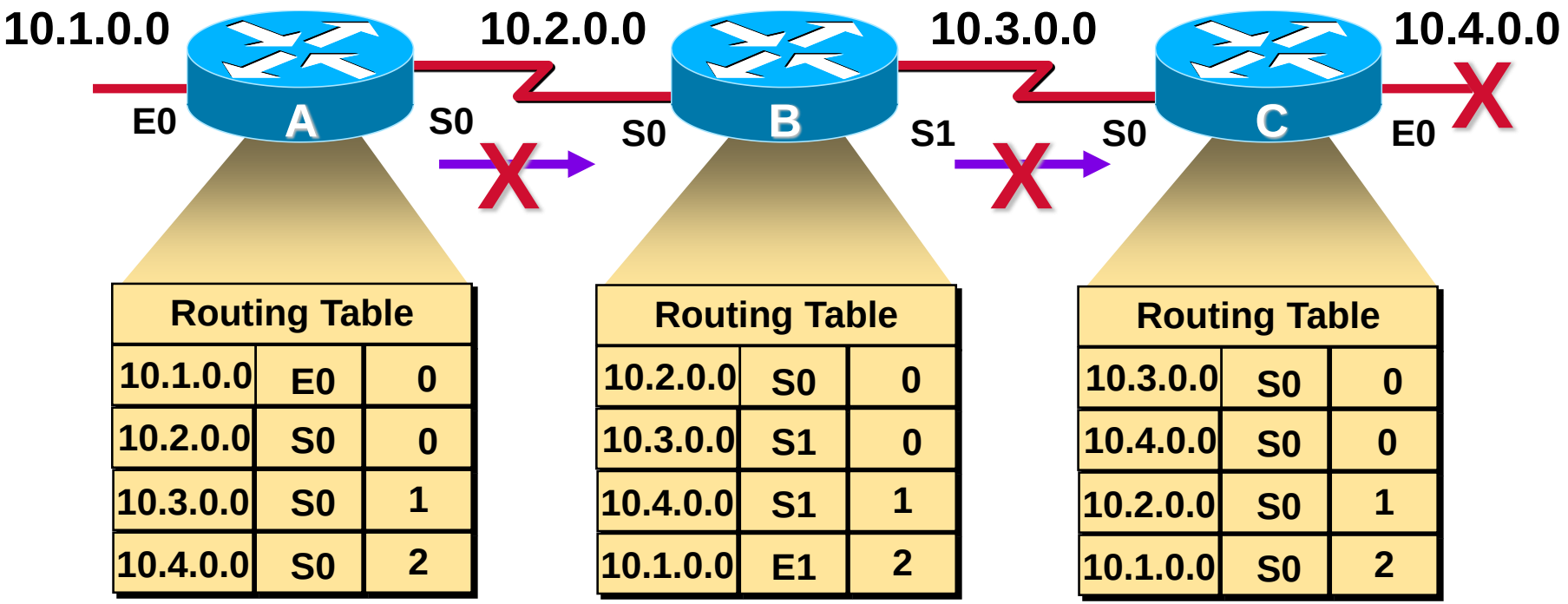
1)Split Horizon

2) Route Poisoning, Poison reverse

3) Hold Down Timer

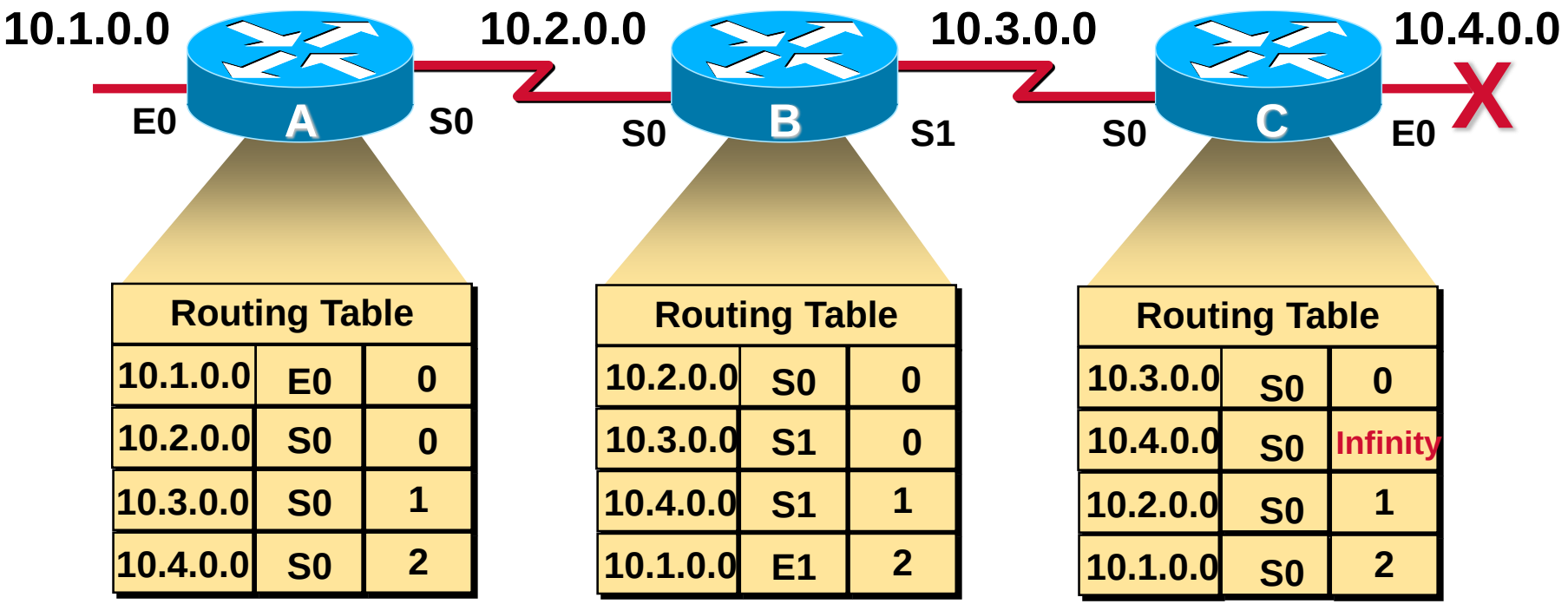
4) Triggered Update

Solution: Split Horizon



It is never useful to send information about a route back in the direction from which the original packet came

Solution: Route Poisoning



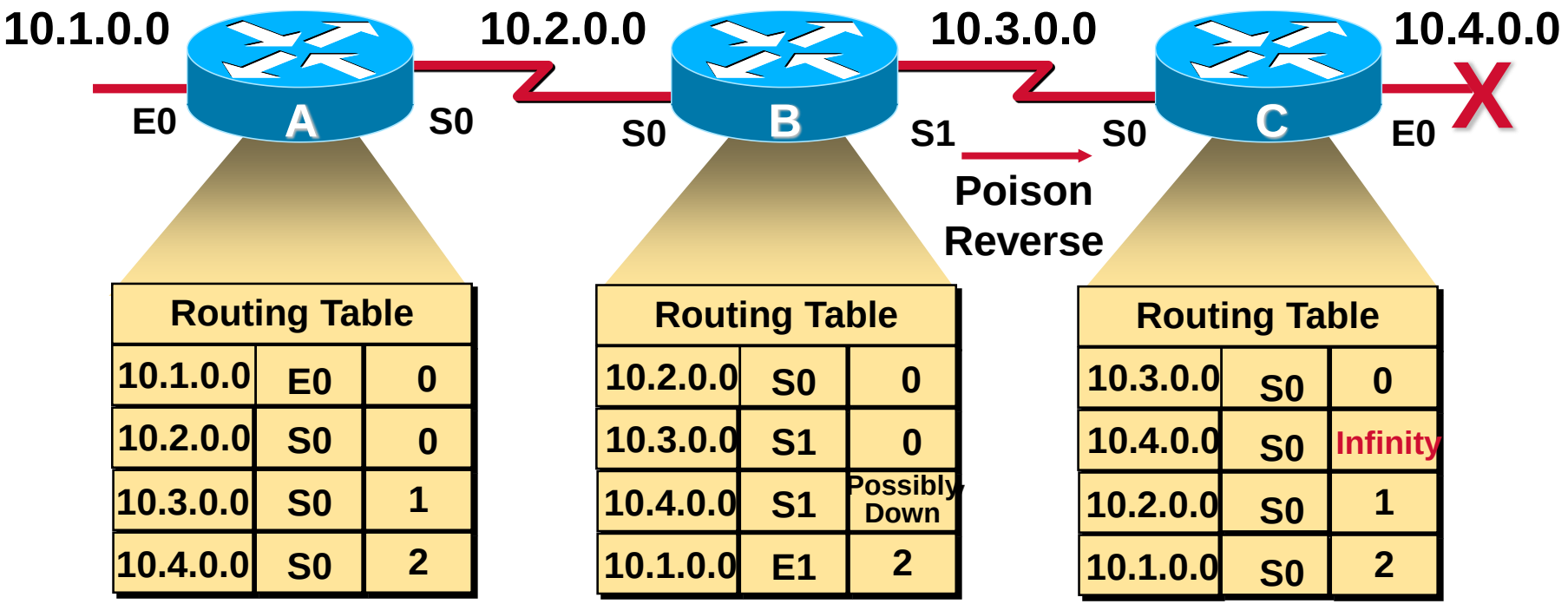
Routing Table		
10.1.0.0	E0	0
10.2.0.0	S0	0
10.3.0.0	S0	1
10.4.0.0	S0	2

Routing Table		
10.2.0.0	S0	0
10.3.0.0	S1	0
10.4.0.0	S1	1
10.1.0.0	E1	2

Routing Table		
10.3.0.0	S0	0
10.4.0.0	S0	Infinity
10.2.0.0	S0	1
10.1.0.0	S0	2

Routers set the distance of routes that have gone down to infinity

Solution: Poison Reverse



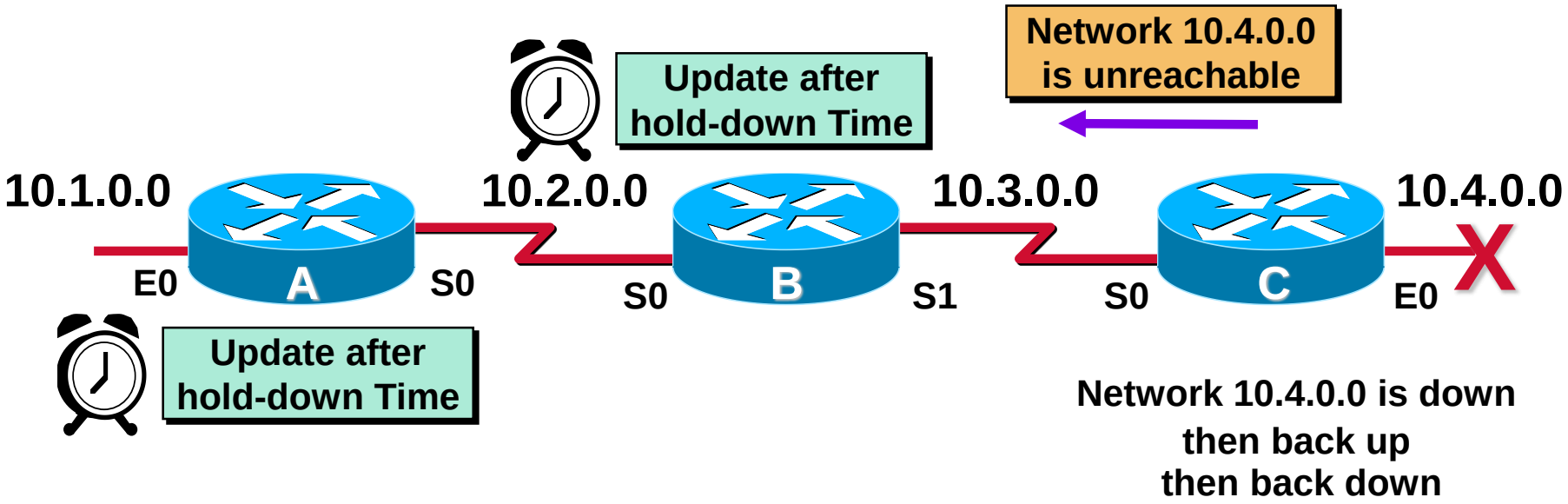
Routing Table		
10.1.0.0	E0	0
10.2.0.0	S0	0
10.3.0.0	S0	1
10.4.0.0	S0	2

Routing Table		
10.2.0.0	S0	0
10.3.0.0	S1	0
10.4.0.0	S1	Possibly Down
10.1.0.0	E1	2

Routing Table		
10.3.0.0	S0	0
10.4.0.0	S0	Infinity
10.2.0.0	S0	1
10.1.0.0	S0	2

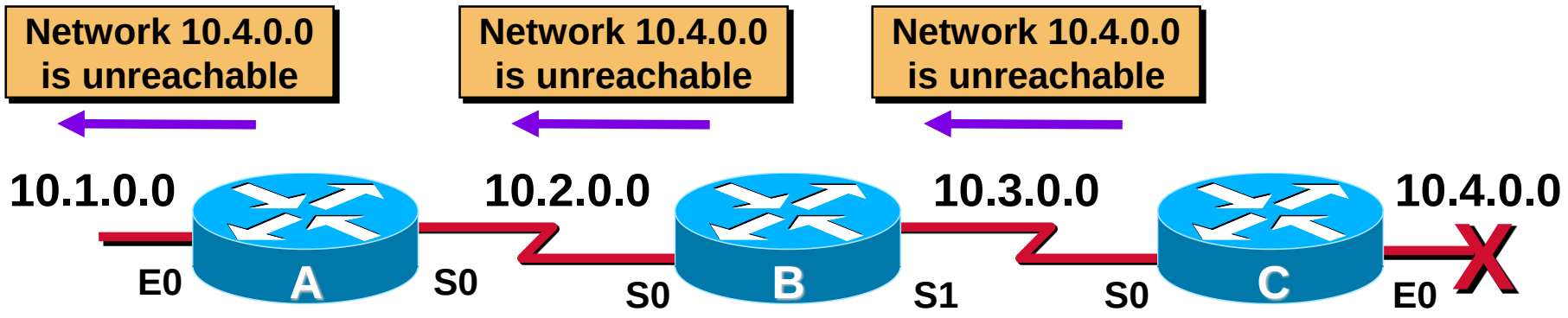
Poison Reverse overrides split horizon

Solution: Hold-Down Timers



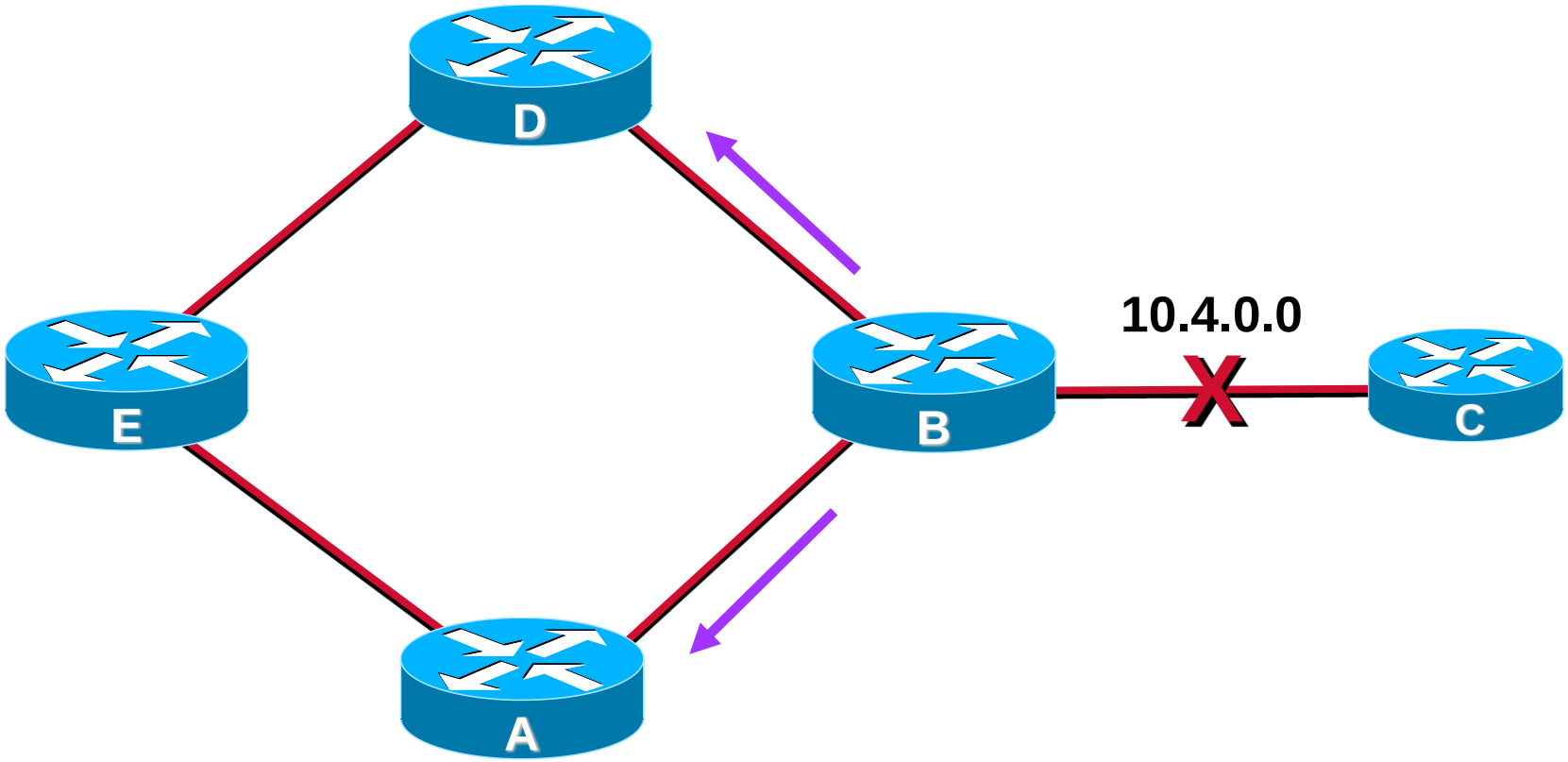
Router keeps an entry for the network possibly down state, allowing time for other routers to recompute for this topology change

Solution: Triggered Updates

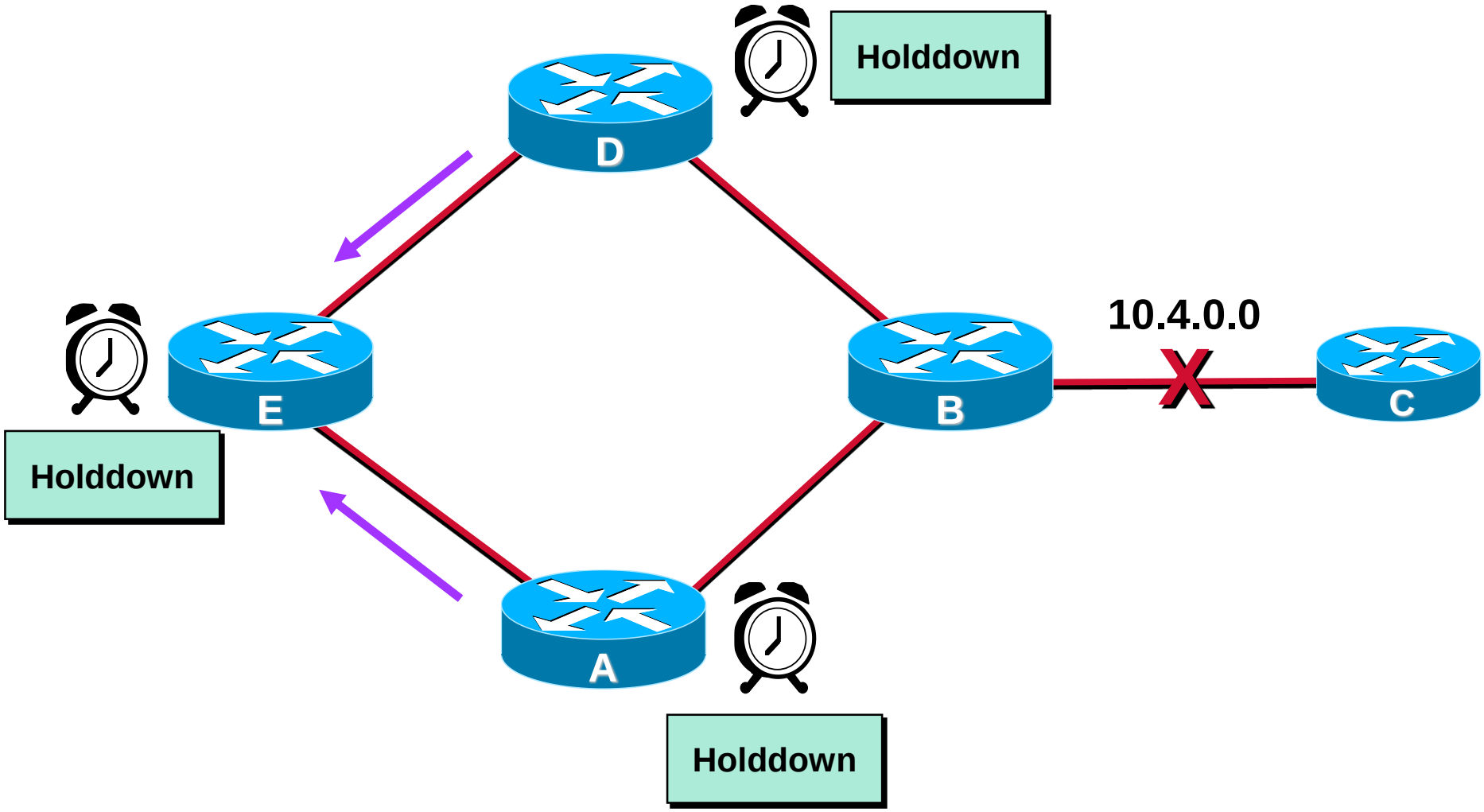


Router sends updates when a change in its routing table occurs

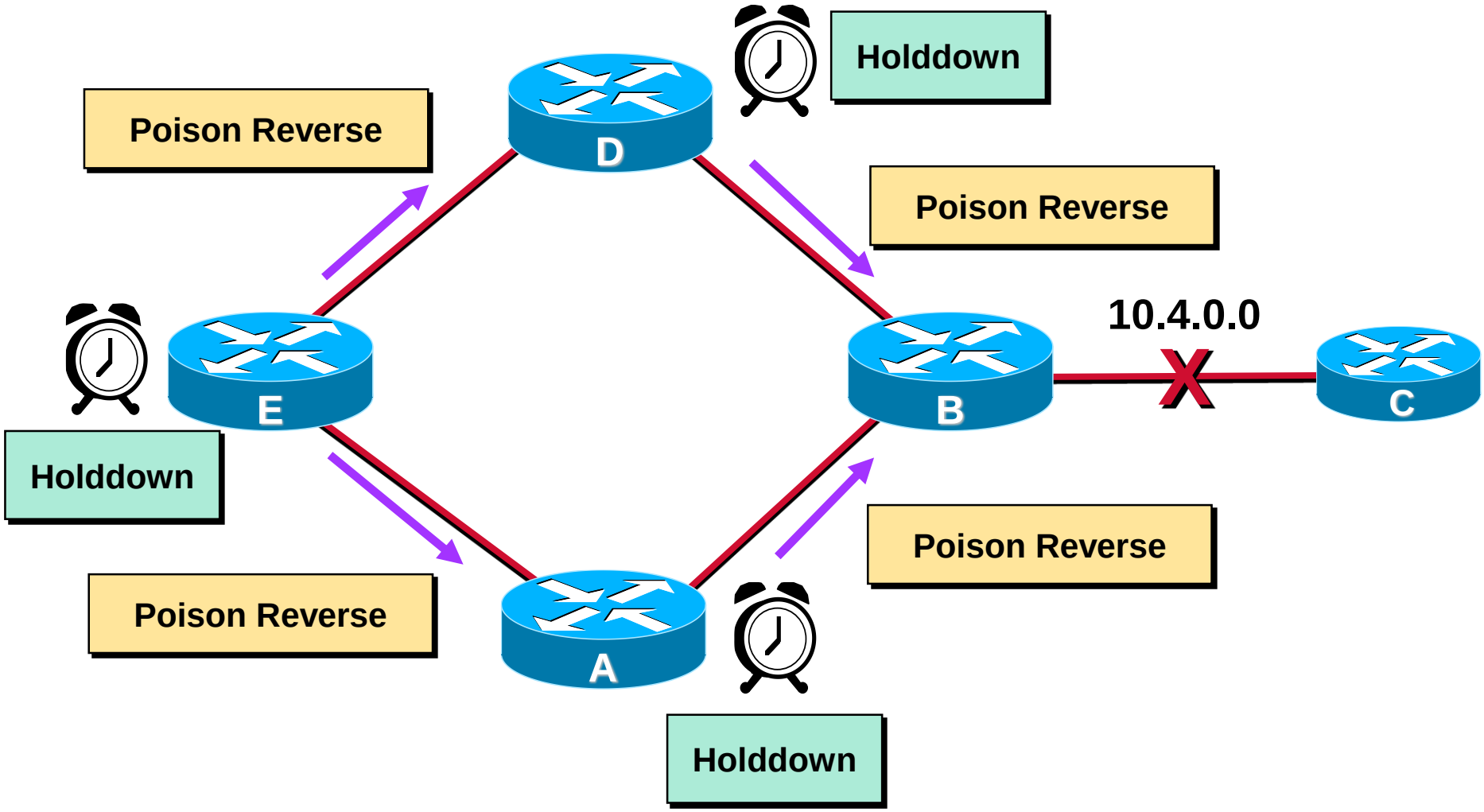
Implementing Solutions in Multiple Routes



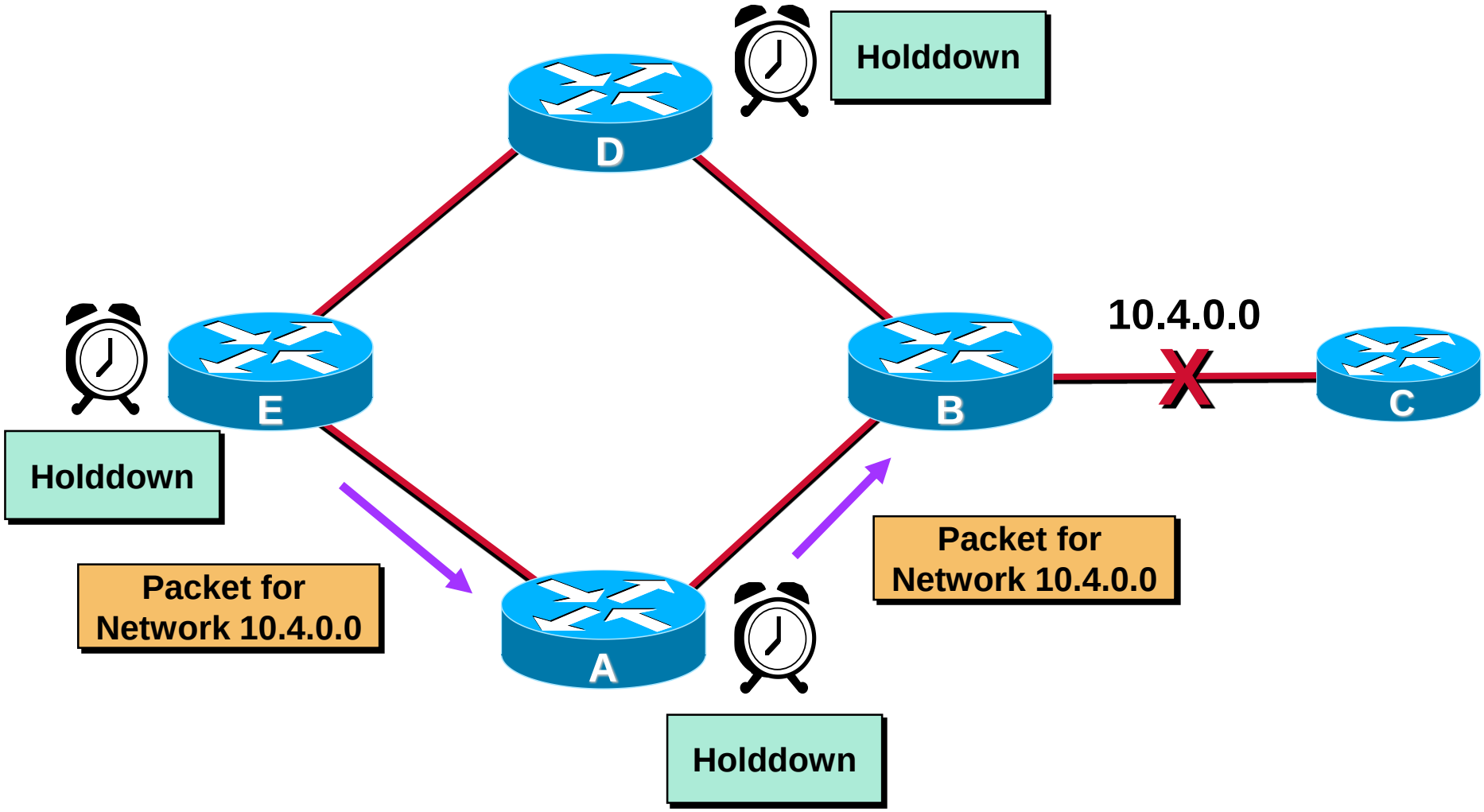
Implementing Solutions in Multiple Routes (cont.)



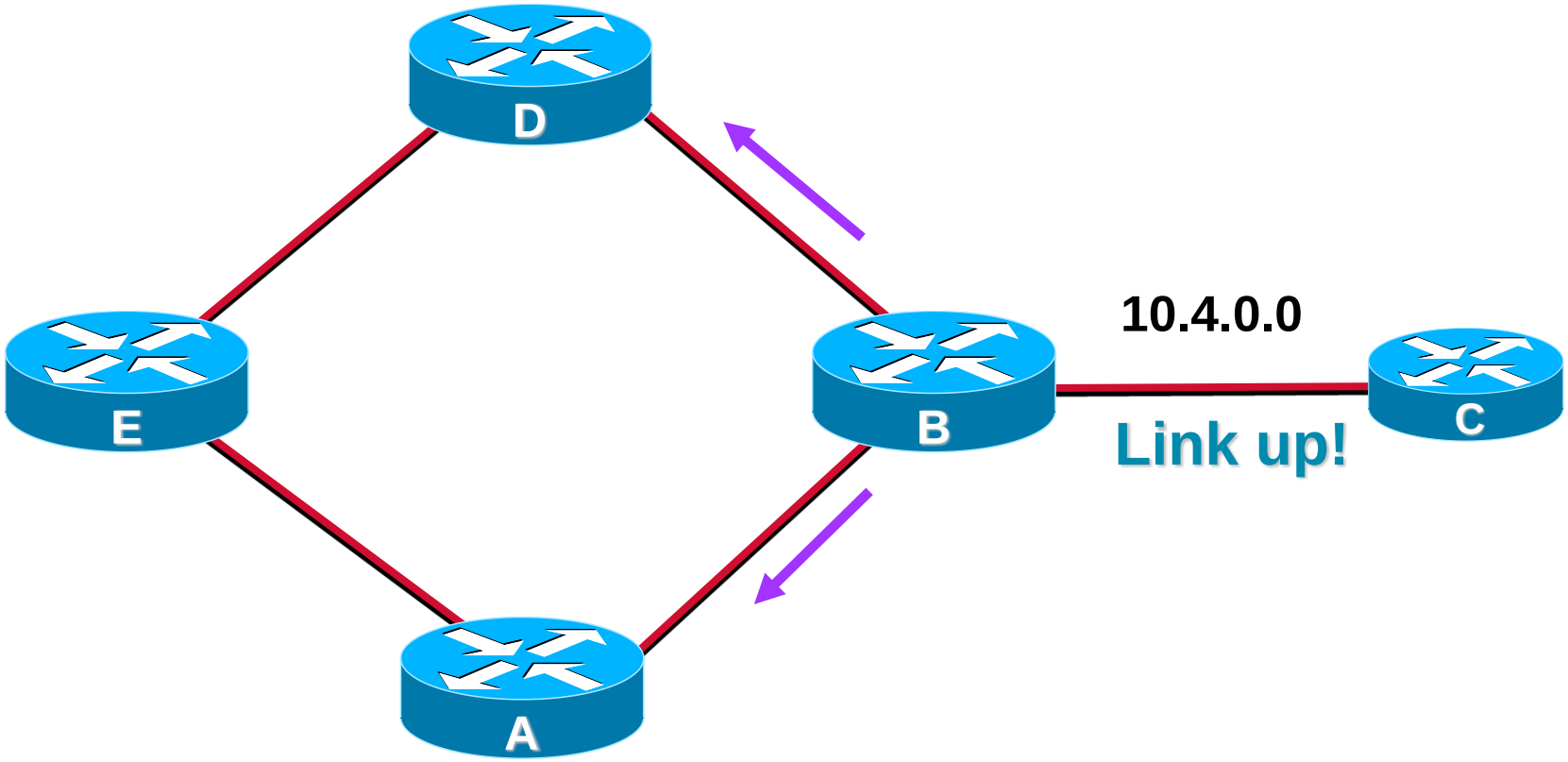
Implementing Solutions in Multiple Routes (cont.)



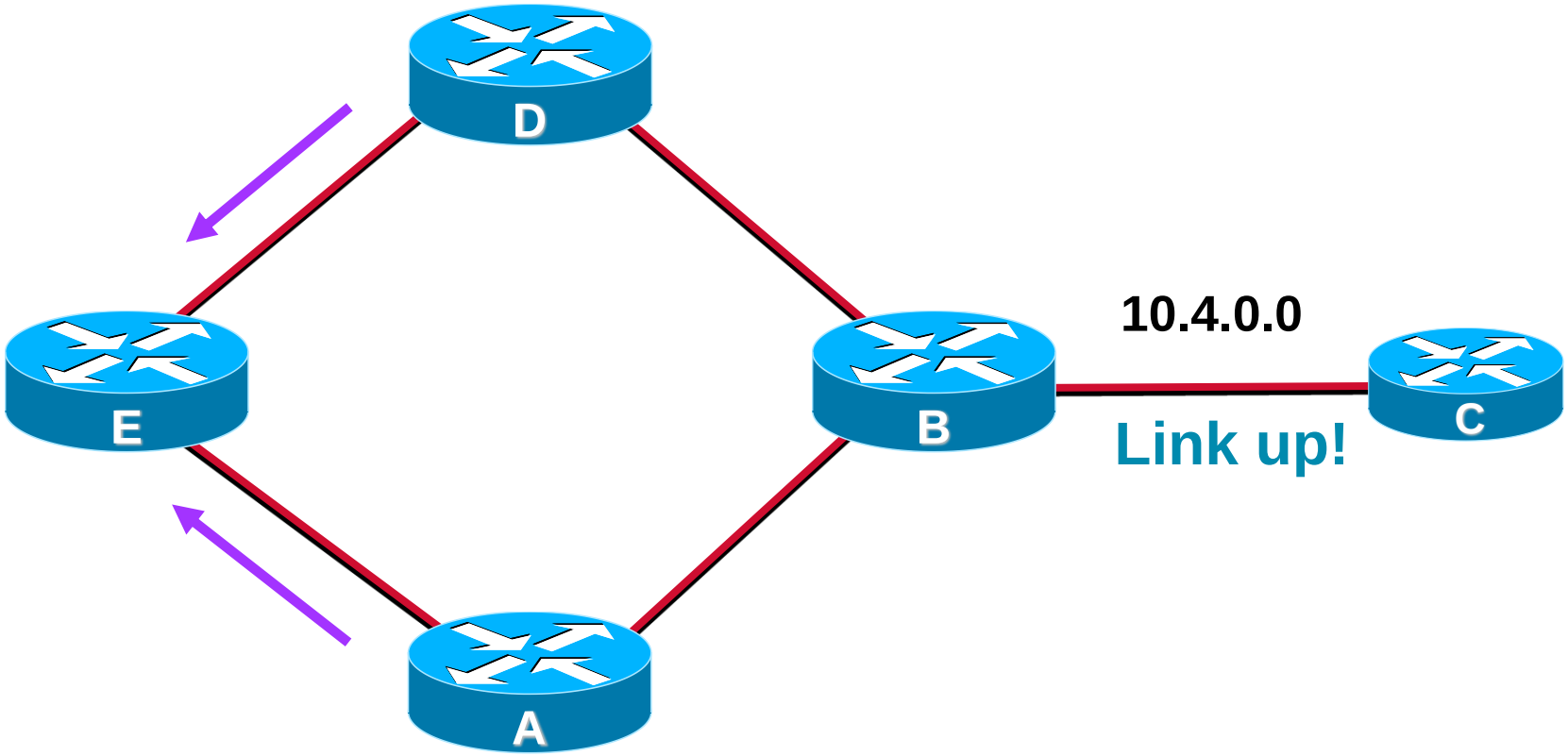
Implementing Solutions in Multiple Routes (cont.)



Implementing Solutions in Multiple Routes (cont.)



Implementing Solutions in Multiple Routes (cont.)



RIP Configuration

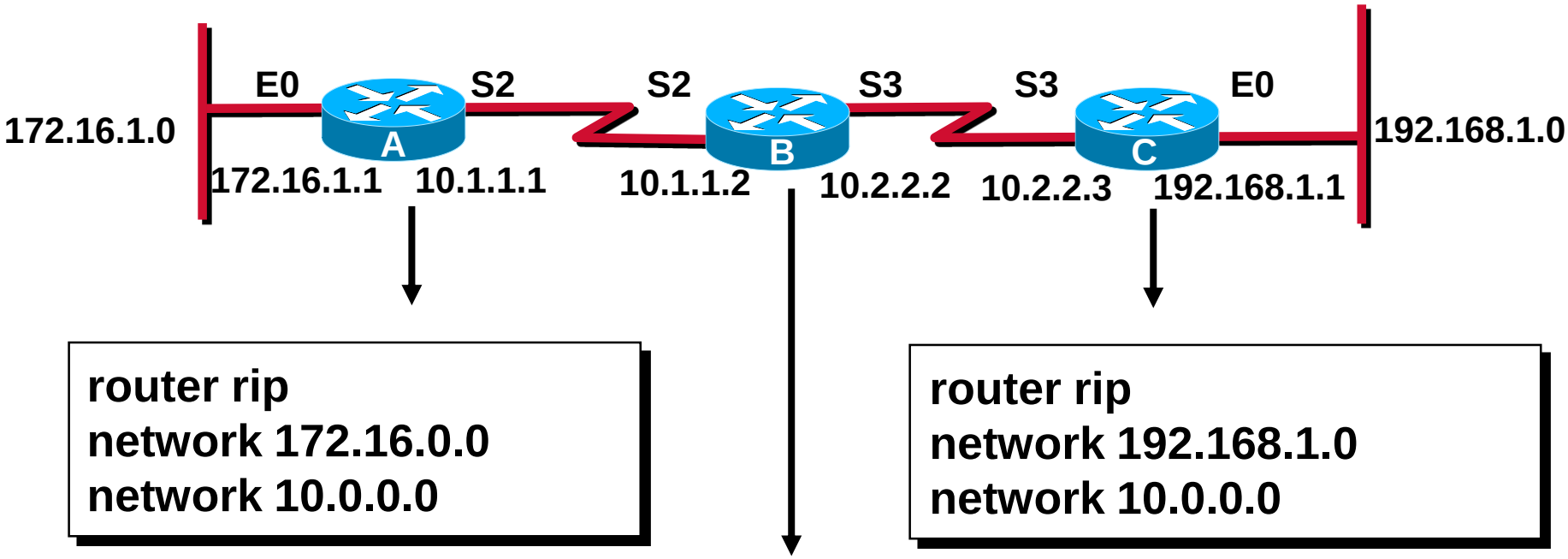
```
Router(config)#router rip
```

- Starts the RIP routing process

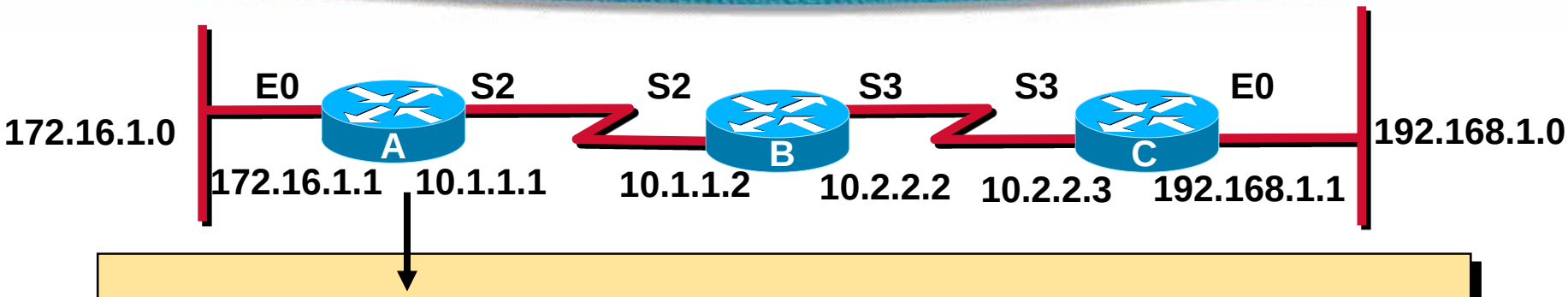
```
Router(config-router)#network network-number
```

- Selects participating attached networks
- The network number must be a major classful network number

RIP Configuration Example

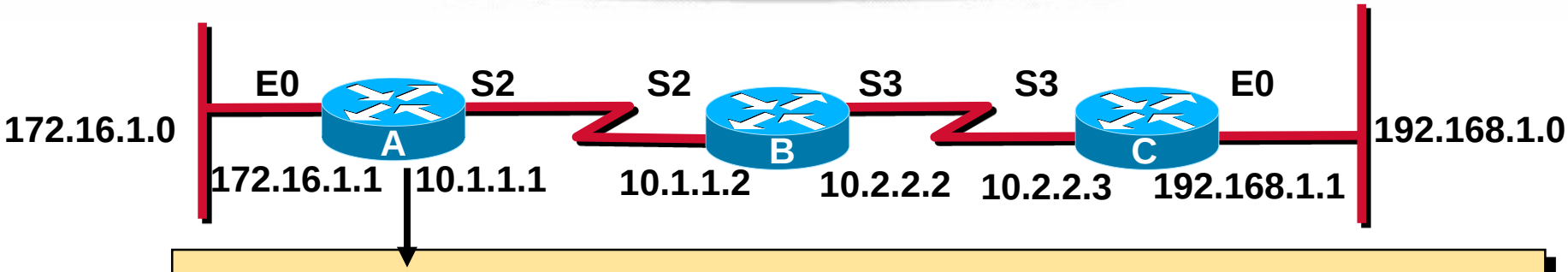


Verifying the Routing Protocol—RIP




```
RouterA#sh ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 0 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Outgoing update filter list for all interfaces is
  Incoming update filter list for all interfaces is
  Redistributing: rip
  Default version control: send version 1, receive any version
    Interface         Send  Recv   Key-chain
    Ethernet0         1     1 2
    Serial2           1     1 2
  Routing for Networks:
    10.0.0.0
    172.16.0.0
  Routing Information Sources:
    Gateway         Distance      Last Update
    10.1.1.2            120       00:00:10
  Distance: (default is 120)
```

Displaying the IP Routing Table

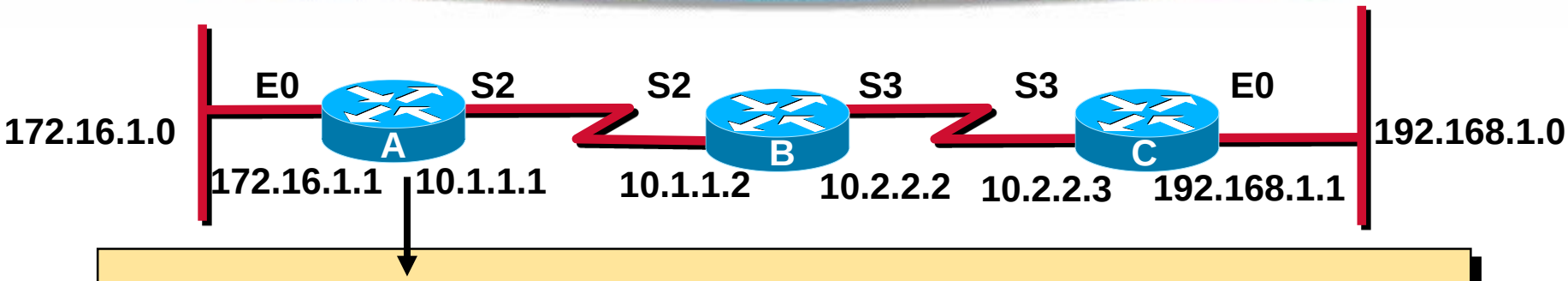



```
RouterA#sh ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, * - candidate default
       U - per-user static route, o - ODR
       T - traffic engineered route

Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 1 subnets
C       172.16.1.0 is directly connected, Ethernet0
     10.0.0.0/24 is subnetted, 2 subnets
R       10.2.2.0 [120/1] via 10.1.1.2, 00:00:07, Serial2
C       10.1.1.0 is directly connected, Serial2
R    192.168.1.0/24 [120/2] via 10.1.1.2, 00:00:07, Serial2
```

debug ip rip Command




```
RouterA#debug ip rip
RIP protocol debugging is on
RouterA#
00:06:24: RIP: received v1 update from 10.1.1.2 on Serial2
00:06:24:      10.2.2.0 in 1 hops
00:06:24:      192.168.1.0 in 2 hops
00:06:33: RIP: sending v1 update to 255.255.255.255 via Ethernet0 (172.16.1.1)
00:06:34:      network 10.0.0.0, metric 1
00:06:34:      network 192.168.1.0, metric 3
00:06:34: RIP: sending v1 update to 255.255.255.255 via Serial2 (10.1.1.1)
00:06:34:      network 172.16.0.0, metric 1
```