



# Routing and Routing Protocols

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Connected routes & Routing table

Trần Tuấn Toàn

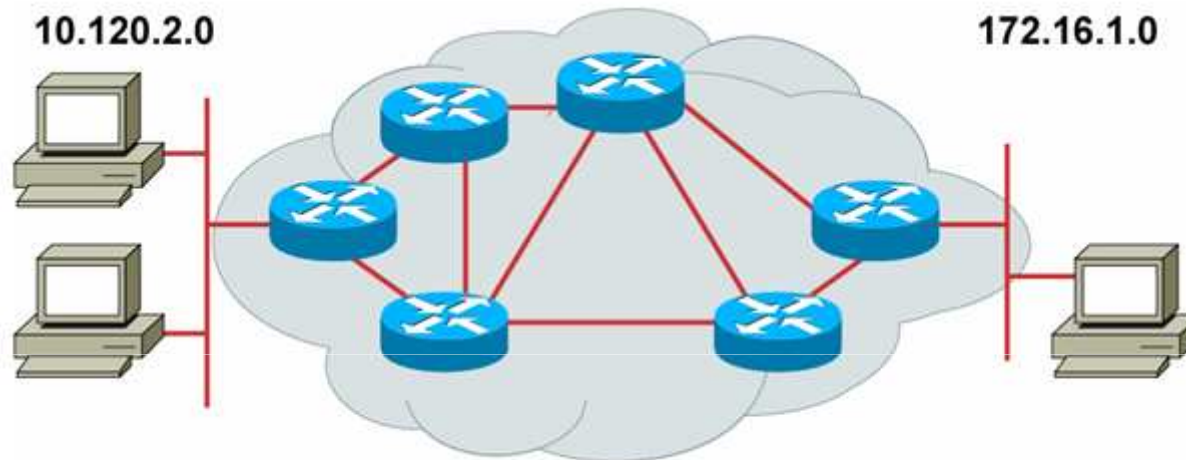


# Objective

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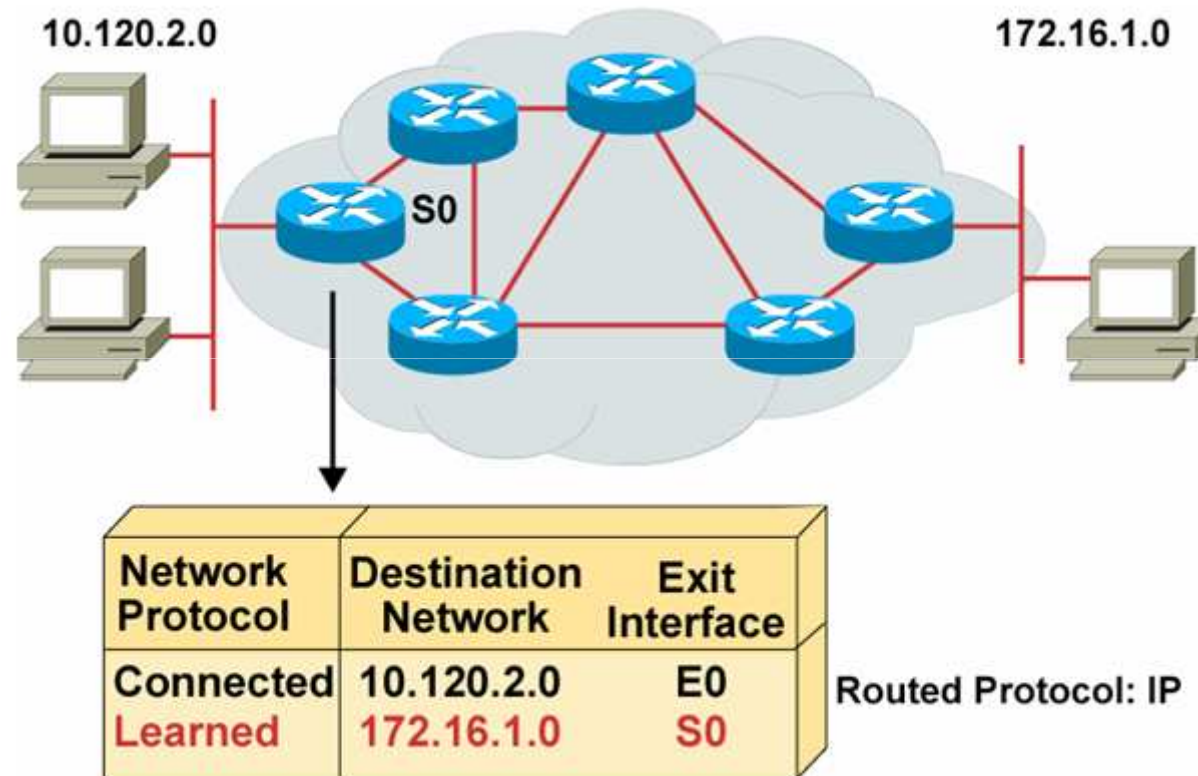
- Routing
- Routing table
- Static Routing
- Dynamic Routing
  - Routing Protocols

# What is routing



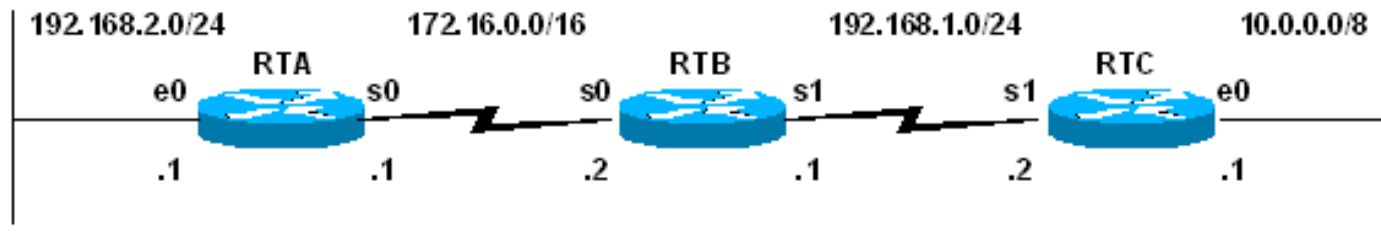
- Để dẫn đường, Router cần phải:
  - Biết được địa chỉ đích
  - Xác định được những nguồn mà có thể học được mạng từ đó
  - Xác định các đường đi có thể
  - Lựa chọn đường đi tốt nhất
  - Duy trì và kiểm tra thông tin các đường đi

# What is routing



**Router cần phải học những đích mà không kết nối trực tiếp với nó**

# Directly Connected Network & Routing table



```
RTA#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, * - candidate default  
       U - per-user static route, o - ODR
```

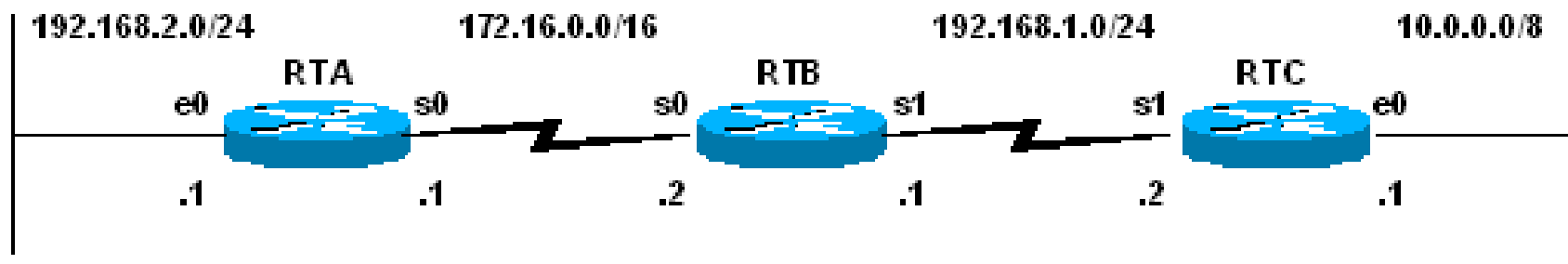
```
Gateway of last resort is not set
```

```
RTA#
```

**show ip route** command

Routing table trước khi cấu hình bất kỳ Interface nào

# Directly Connected Network & Routing table



```
RTA(config)#inter e 0
```

```
RTA(config-if)#ip add 192.168.2.1 255.255.255.0
```

```
RTA(config-if)#no shutdown
```

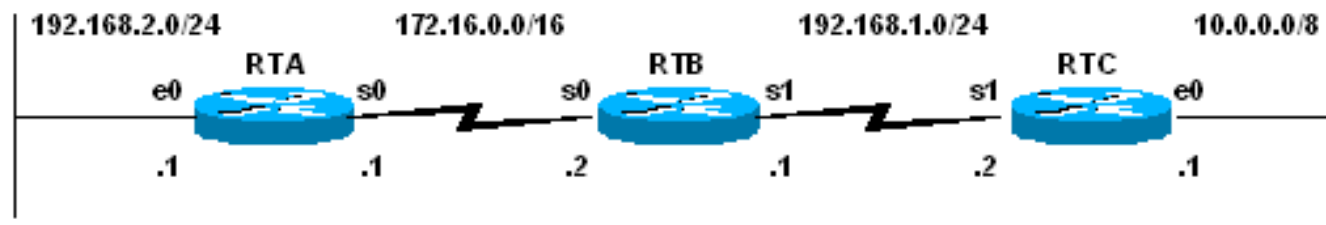
```
RTA#show ip route
```

```
Codes: C - connected, ... <Other codes and gateway information omitted>
```

```
C    192.168.2.0/24 is directly connected, Ethernet0
```

```
RTA#
```

# Directly Connected Network & Routing table



```
RTA#show ip route
```

```
Codes: C - connected, .. <Other codes and gateway information omitted>
```

```
C    172.16.0.0/16 is directly connected, Serial0
```

```
C    192.168.2.0/24 is directly connected, Ethernet0
```

```
RTB#show ip route
```

```
Codes: C - connected, .. <Other codes and gateway information omitted>
```

```
C    172.16.0.0/16 is directly connected, Serial0
```

```
C    192.168.1.0/24 is directly connected, Serial1
```

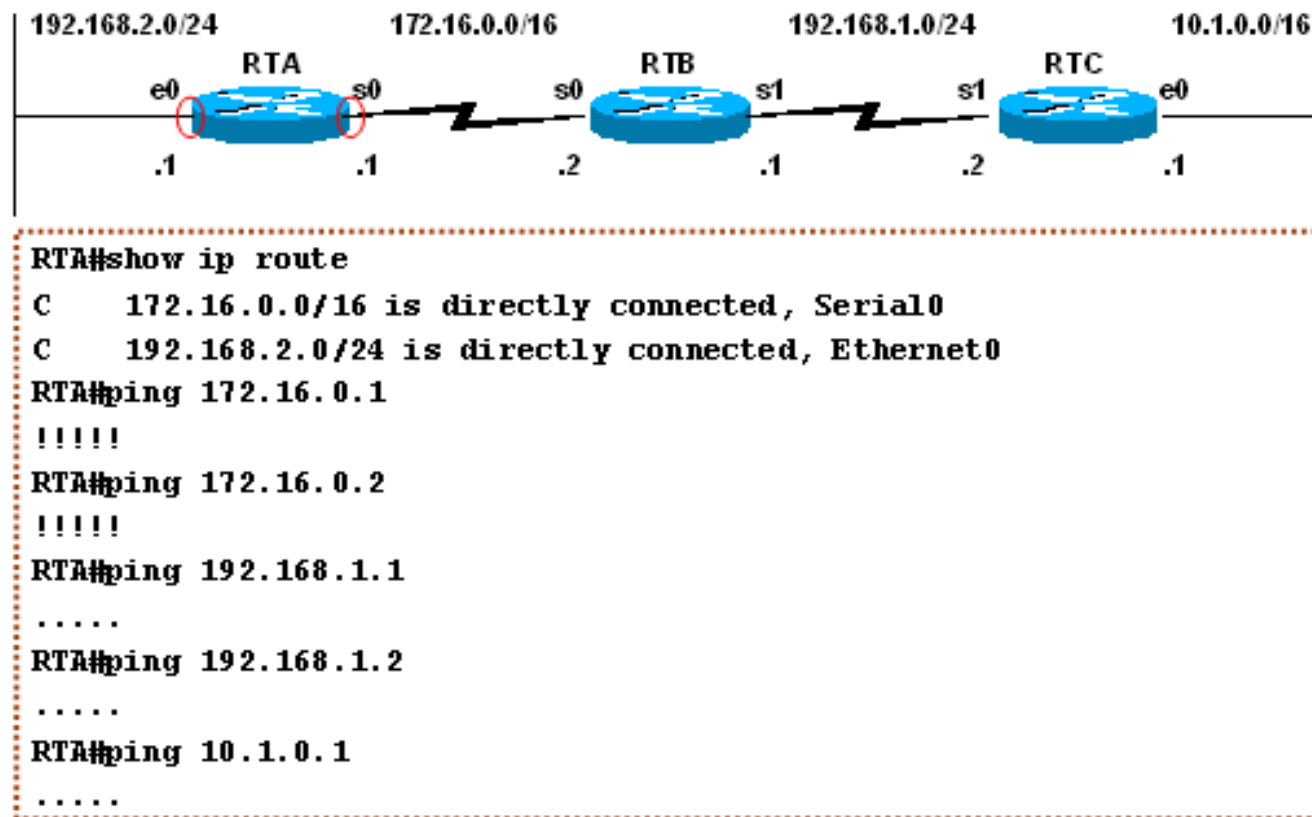
```
RTC#show ip route
```

```
Codes: C - connected, .. <Other codes and gateway information omitted>
```

```
C    10.0.0.0/8 is directly connected, Ethernet0
```

```
C    192.168.1.0/24 is directly connected, Serial1
```

# Directly Connected Network & Routing table



- **Q:** RTA có thể ping được đến **172.16.0.2** của RTB, tại sao không ping được đến **192.168.1.1** của RTB





# Routing and Routing Protocols

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Static Route



# Routing Type

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## Static

**Sử dụng một đường đi được lập sẵn do người quản trị nhập vào Router**

## Dynamic

**Sử dụng một đường đi do một giao thức dẫn đường tự động điều chỉnh theo topology hay sự thay đổi bảng thông mạng**



# Static Route Operation

```
Hoboken(config)#ip route 172.16.1.0 255.255.255.0 s0
                        command destination net  subnet mask    outgoing
                                                interface
```

```
Hoboken#show ip route
Codes: C - connected, S - static,
S    172.16.1.0/24 [1/0] is directly connected, Serial0
C    192.168.2.0/24 is directly connected, Ethernet0
```

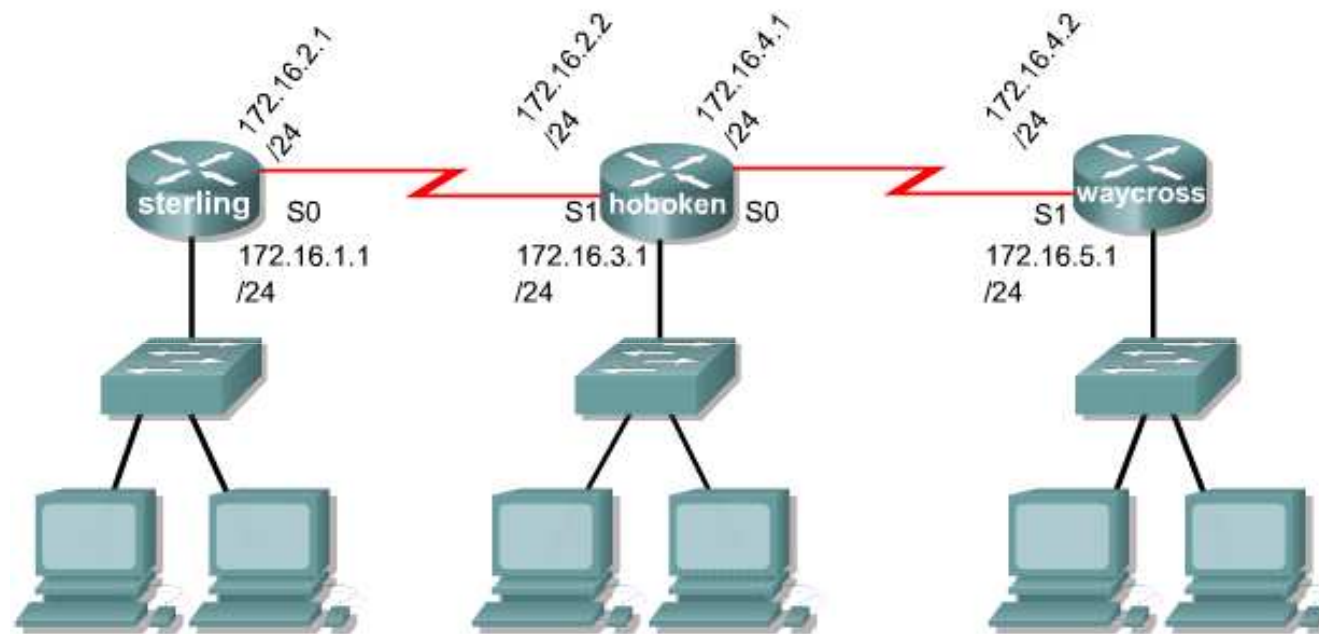


# ip route command

- Router(config)#  
    **ip route** *prefix mask* {address | interface} [distance]
  - *prefix/mask*: destination network & subnet mask
  - address: “*next hop*” IP address
  - interface: outgoing interface
  - distance: administrative distance

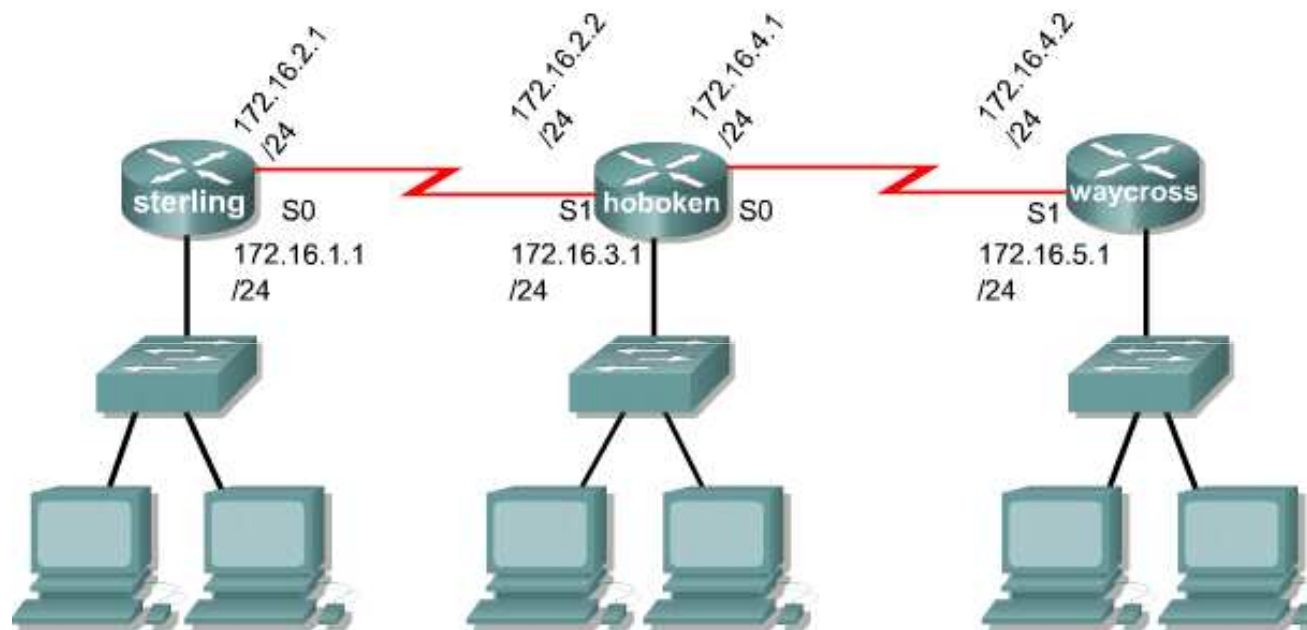
Administrative Distance Route Source	Default Distance
Connected interface	0
Static route	1
EIGRP summary route	5
External BGP	20
EIGRP internal route	90
IGRP	100
OSPF	110
IS-IS	115
RIP	120
EIGRP external route	170
Internal BGP	200
Unknown	255

# Static Route Operation



```
Hoboken(config)#ip route 172.16.1.0 255.255.255.0 s1
                    command destination network sub mask gateway
Hoboken(config)#ip route 172.16.5.0 255.255.255.0 s0
                    command destination network sub mask gateway
```

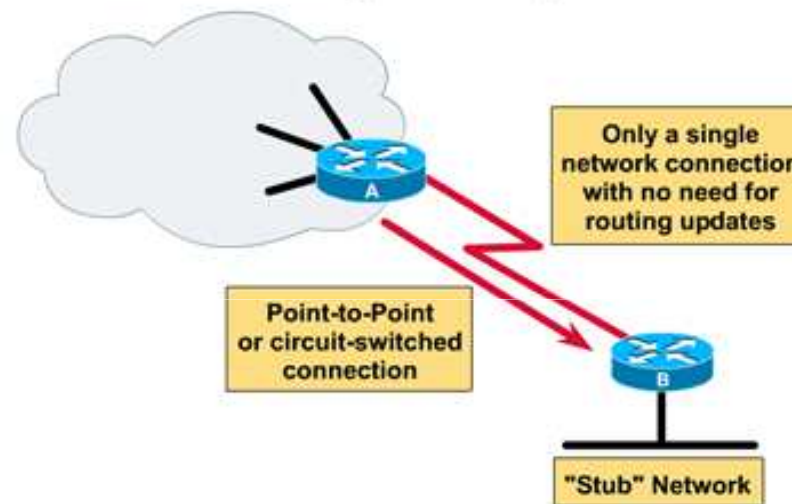
# Static Route Operation



```
Hoboken(config)#ip route 172.16.1.0 255.255.255.0 172.16.2.1
                    command destination sub mask gateway
                    network
Hoboken(config)#ip route 172.16.5.0 255.255.255.0 172.16.4.2
                    command destination sub mask gateway
                    network
```

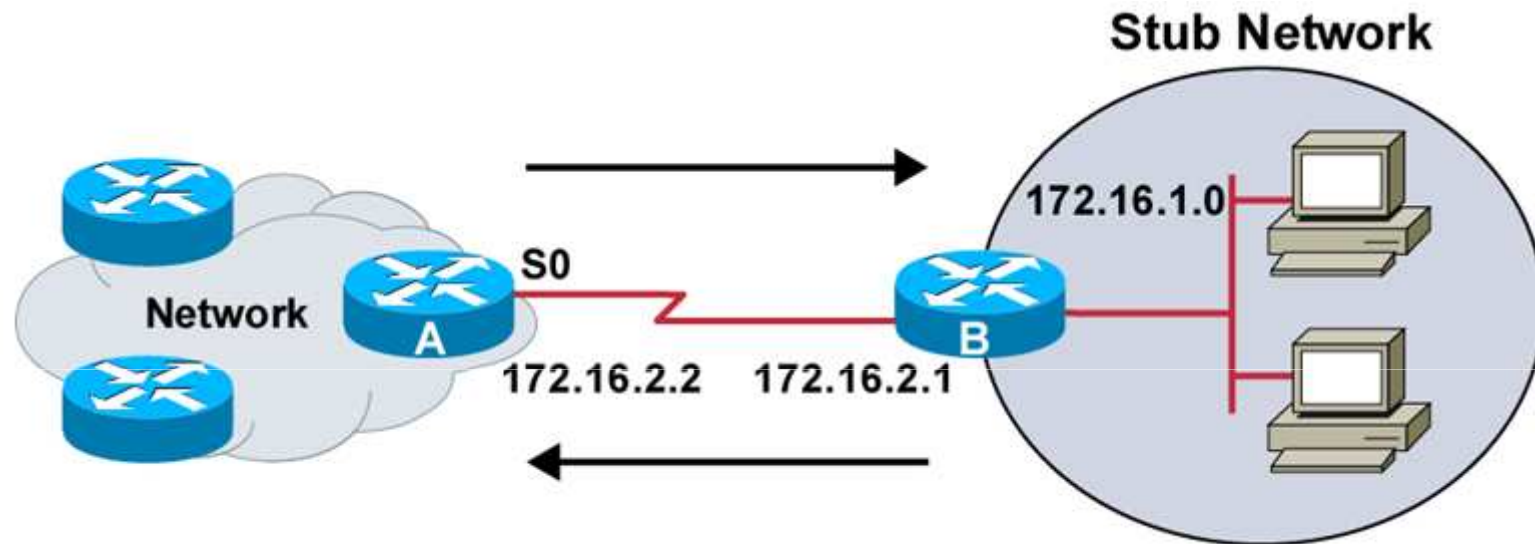
# Common uses for Static Routes

## Static Routing Example



- Static Routes thường được dùng kết hợp với Dynamic Routing Protocols.
- Static Routes thường được dùng khi Dynamic Routing Protocols có những bất lợi hay không cần thiết

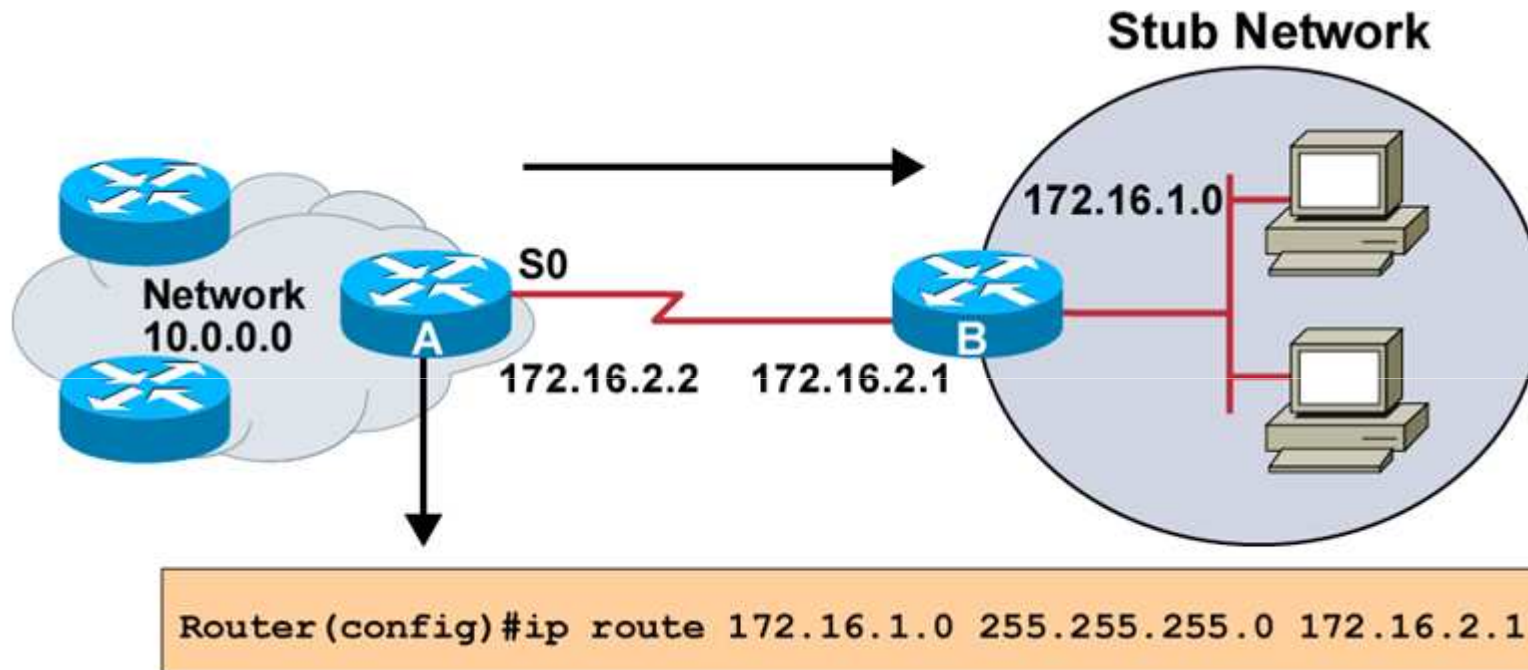
# Static Route Example



- Một đường đi tĩnh thường được cấu hình nhằm mục đích cho phép giao tiếp từ / đến một mạng (*stub network*)



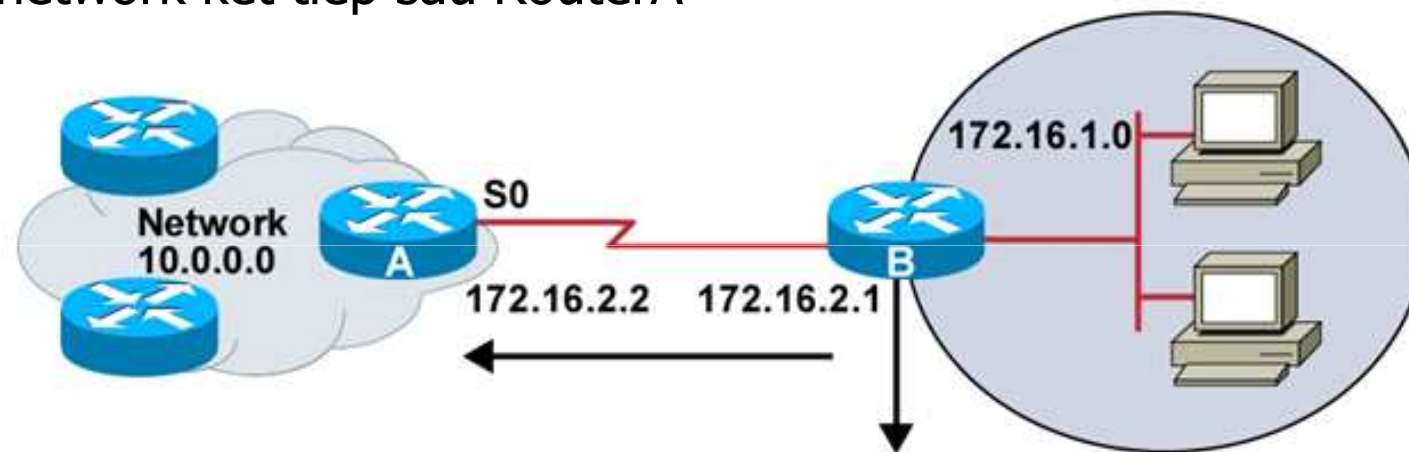
# Static Route Example



- Với kiểu kết nối point-to-point bằng liên kết serial:
  - ⇒ hoàn toàn có thể dùng outgoing interface thay vì dùng next-hop ip address

# Default Route

- Default Route: cho phép stub network có thể đi đến được mọi network kết tiếp sau RouterA



```
Router(config)#ip route 0.0.0.0 0.0.0.0 172.16.2.2
```

```
RTB#show ip route
```

```
Gateway of last resort is 172.16.2.2 to network 0.0.0.0
```

```
172.16.0.0/16 is subnetted, 1 subnets
```

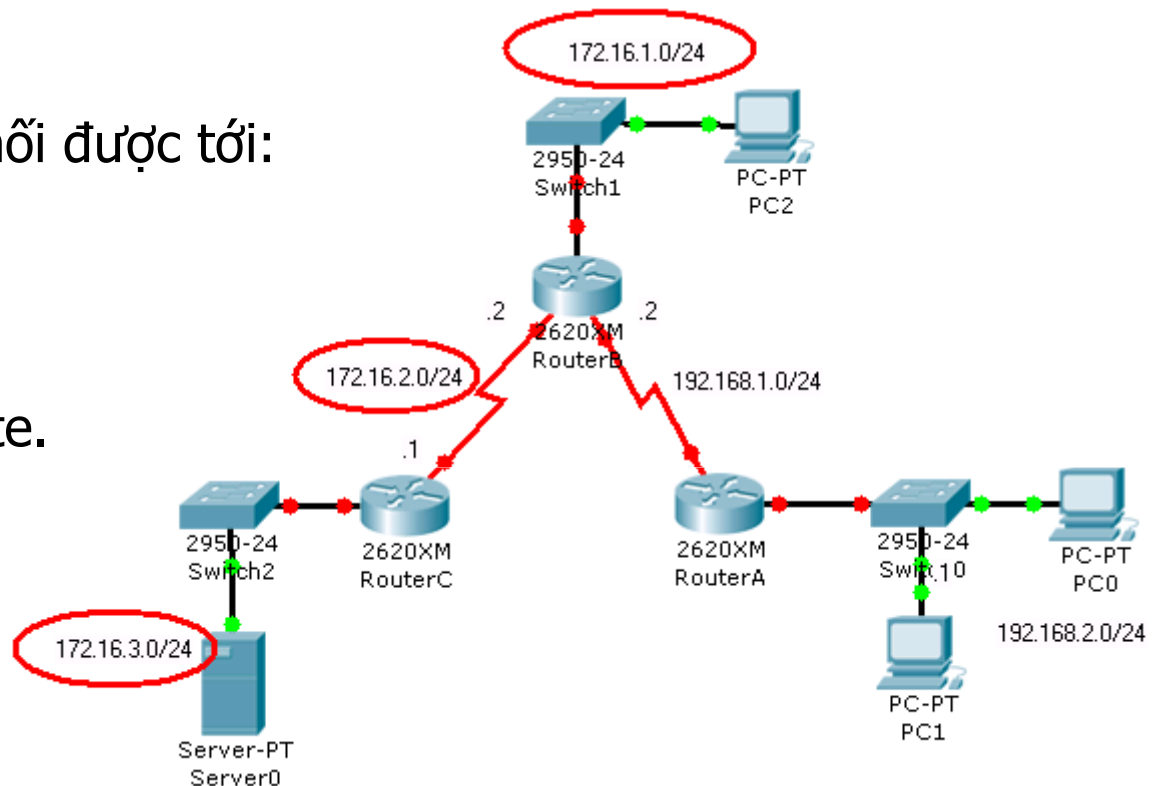
```
C    172.16.1.0/24 is directly connected, Ethernet0
```

```
C    172.16.2.0/24 is directly connected, Serial1
```

```
S*   0.0.0.0/0 [1/0] via 172.16.2.2
```

# Static Route Example

- PC0,PC1 muốn kết nối được tới:
  - 172.16.1.0/24
  - 172.16.2.0/24
  - 172.16.3.0/24
- Cấu hình Static Route.



# Verify Static Route

```
Router#show running-config
Current configuration : 953 bytes
!
version 12.1
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Router
!
memory-size iomem 15
ip subnet-zero
no ip finger
!
```

```
Hoboken#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 type2
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, 5 subnets
C       172.16.4.0 is directly connected, Serial0
S       172.16.5.0 is directly connected, Serial0
S       172.16.1.0 is directly connected, Serial1
C       172.16.2.0 is directly connected, Serial1
```



# Ping & Traceroute

```
Sterling#ping 172.16.5.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.5.1, timeout is 2
seconds:
.....
Success rate is 0 percent (0/5)

Sterling#traceroute 172.16.5.1
Type escape sequence to abort.
Tracing the route to 172.16.5.1
 0 172.16.2.2 16 msec 16 msec 16
 1 172.16.4.2 32 msec 28 msec *
 2 * * *
 3 * * *
 4 * * *
 5 * * *
 6 * * *
```

```
Hoboken#ping 172.16.5.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.5.1, timeout is
2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max
= 32/32/32 ms

Hoboken#ping 172.16.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.1.1, timeout is
2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max
= 32/32/32 ms
Hoboken#
```