Route Summarization

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What Is Route Summarization?

172.16.25.0/24

172.16.26.0/24

172.16.27.0/24

A

Routing table
172.16.25.0/24
172.16.26.0/24
172.16.27.0/24

What Is Route Summarization? (cont.)

172.16.25.0/24

172.16.26.0/24

172.16.27.0/24

I can route to the 172.16.0.0/16 network.

A

B

Routing Table
172.16.25.0/24
172.16.26.0/24
172.16.27.0/24

Routing Table
172.16.0.0/16
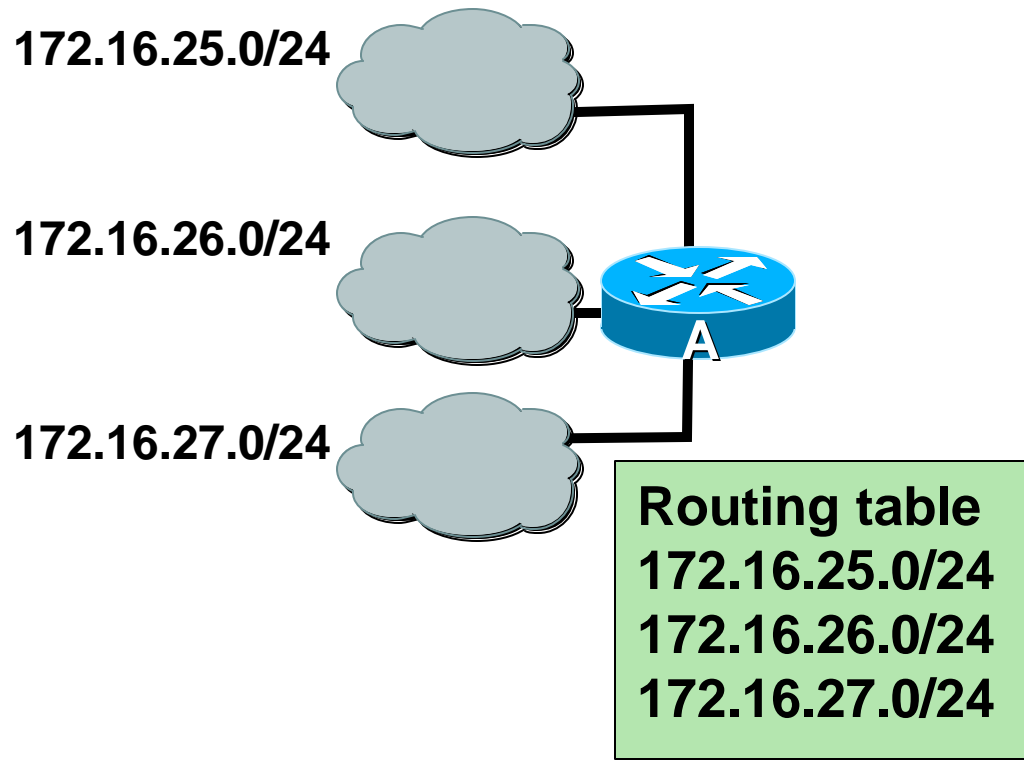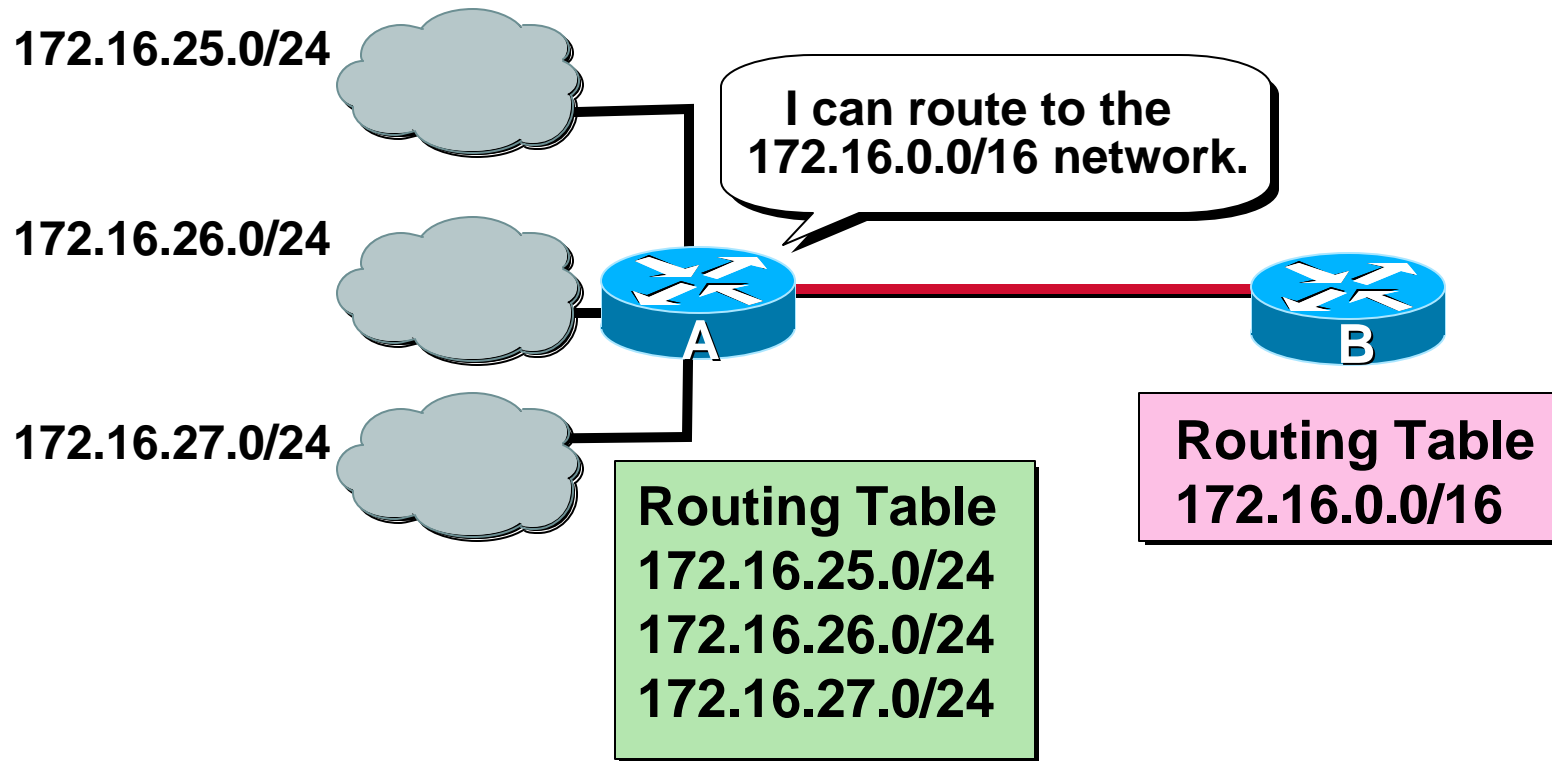
- **Routing protocols can summarize addresses of several networks into one address**

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Summarizing Within an Octet

172.16.168.0/24 =	10101100 .	00010000 .	10101	000 .	00000000
172.16.169.0/24 =	172 .	16 .	10101	001 .	0
172.16.170.0/24 =	172 .	16 .	10101	010 .	0
172.16.171.0/24 =	172 .	16 .	10101	011 .	0
172.16.172.0/24 =	172 .	16 .	10101	100 .	0
172.16.173.0/24 =	172 .	16 .	10101	101 .	0
172.16.174.0/24 =	172 .	16 .	10101	110 .	0
172.16.175.0/24 =	172 .	16 .	10101	111 .	0

Number of Common Bits = 21
Summary: 172.16.168.0/21

Noncommon Bits = 11

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Summarizing Addresses in a VLSM-Designed Network

172.16.128.0/20

B

172.16.128.0/20

172.16.32.64/26

172.16.32.0/24

C

A

Corporate Network

172.16.32.128/26

172.16.0.0/16

172.16.64.0/20

D

172.16.64.0/20

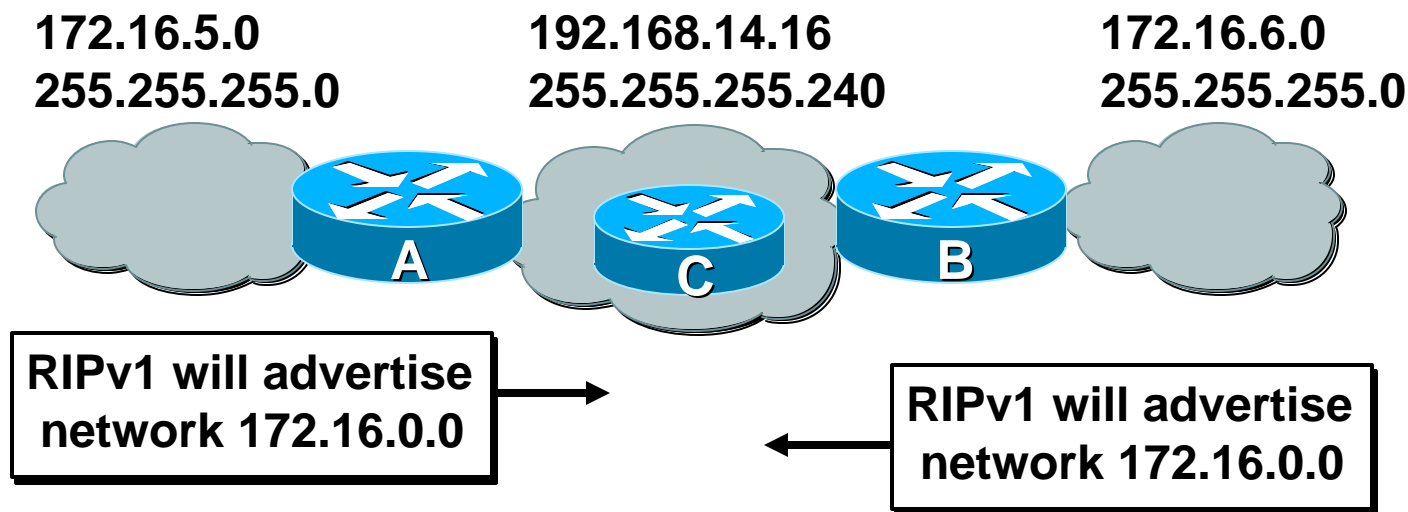Cisco.com
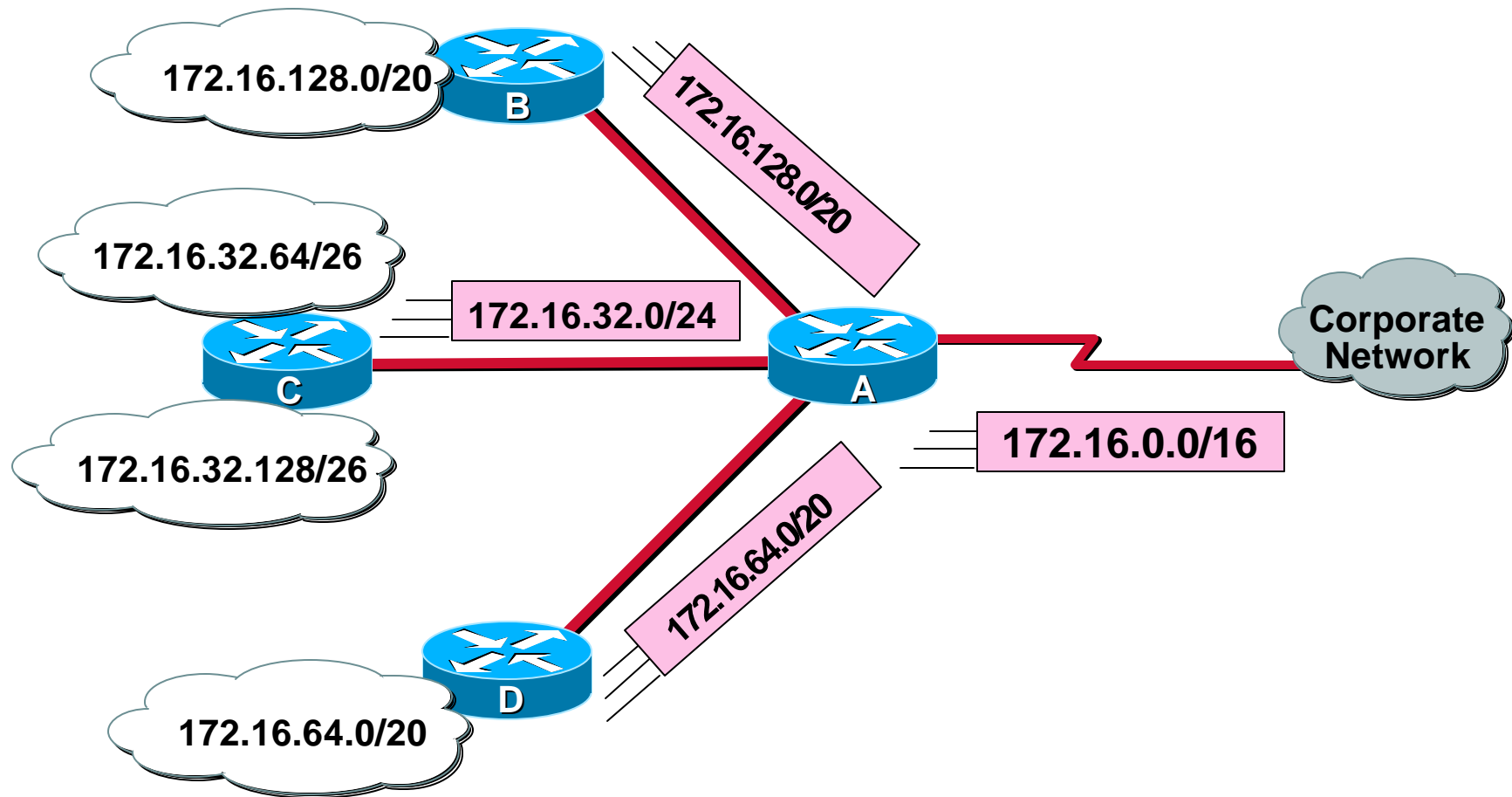
Implementation Considerations

- **Multiple IP addresses must have the same highest-order bits**

- **Routing decisions are made based on the entire address**

- **Routing protocols must carry the prefix (subnet mask) length**

Route Summarization Operation in Cisco Routers

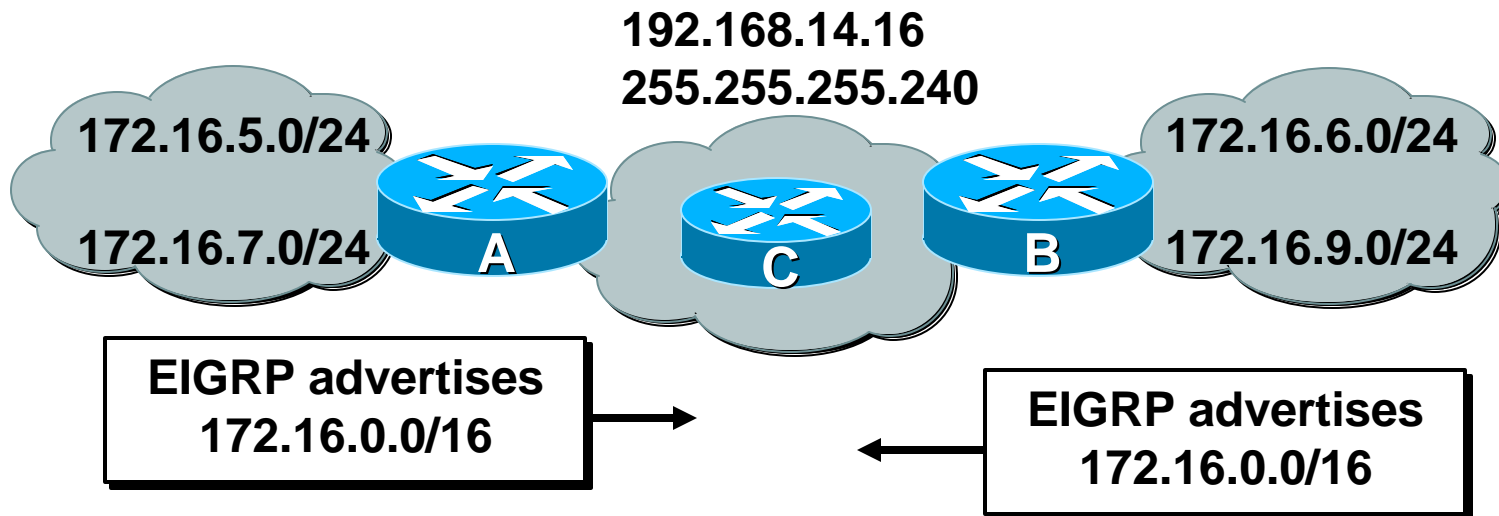|		
172.16.5.33	/32	Host
172.16.5.32	/27	Subnet
172.16.5.0	/24	Network
172.16.0.0	/16	Block of Networks
0.0.0.0	/0	Default

- **Supports host-specific routes, blocks of networks, default routes**

- **Routers use the longest match**

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Summarizing Routes in a Discontiguous Network

172.16.5.0	192.168.14.16	172.16.6.0
255.255.255.0	255.255.255.240	255.255.255.0

A **C** **B**

RIPv1 will advertise network 172.16.0.0

RIPv1 will advertise network 172.16.0.0

- **RIPv1 and IGRP do not advertise subnets, and therefore cannot support discontiguous subnets**

- **OSPF, EIGRP, and RIPv2 can advertise subnets, and therefore can support discontiguous subnets**

Be Careful When Summarizing Routes

192.168.14.16
255.255.255.240

172.16.5.0/24   172.16.6.0/24

172.16.7.0/24 A   C   B 172.16.9.0/24

EIGRP advertises
172.16.0.0/16

EIGRP advertises
172.16.0.0/16

- **EIGRP on both Router A and Router B advertise a summarized route to 172.16.0.0/16**

- **Router C receives two routes to 172.16.0.0/16**

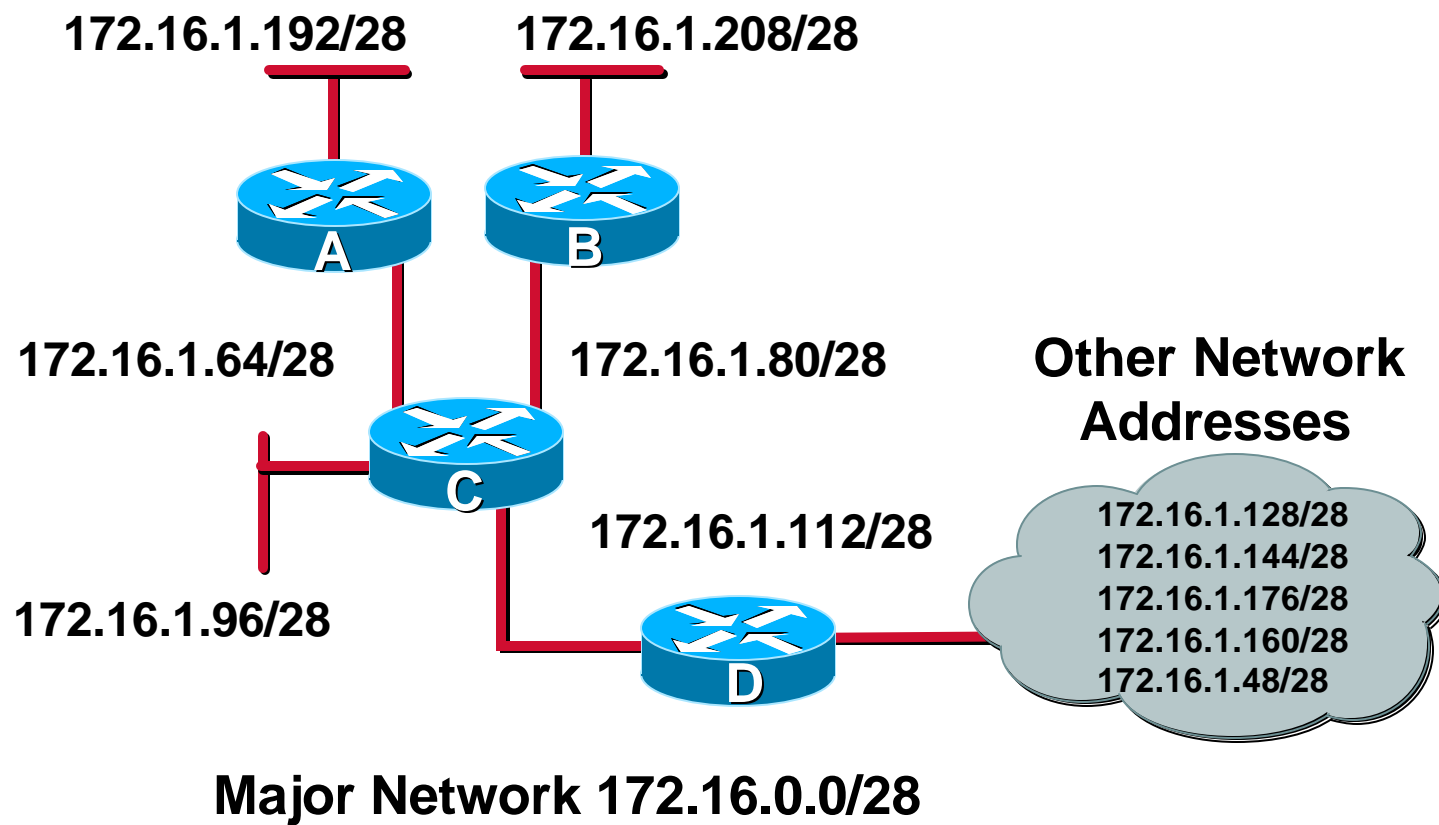- **Router A (or B or both) should be configured to not summarize**
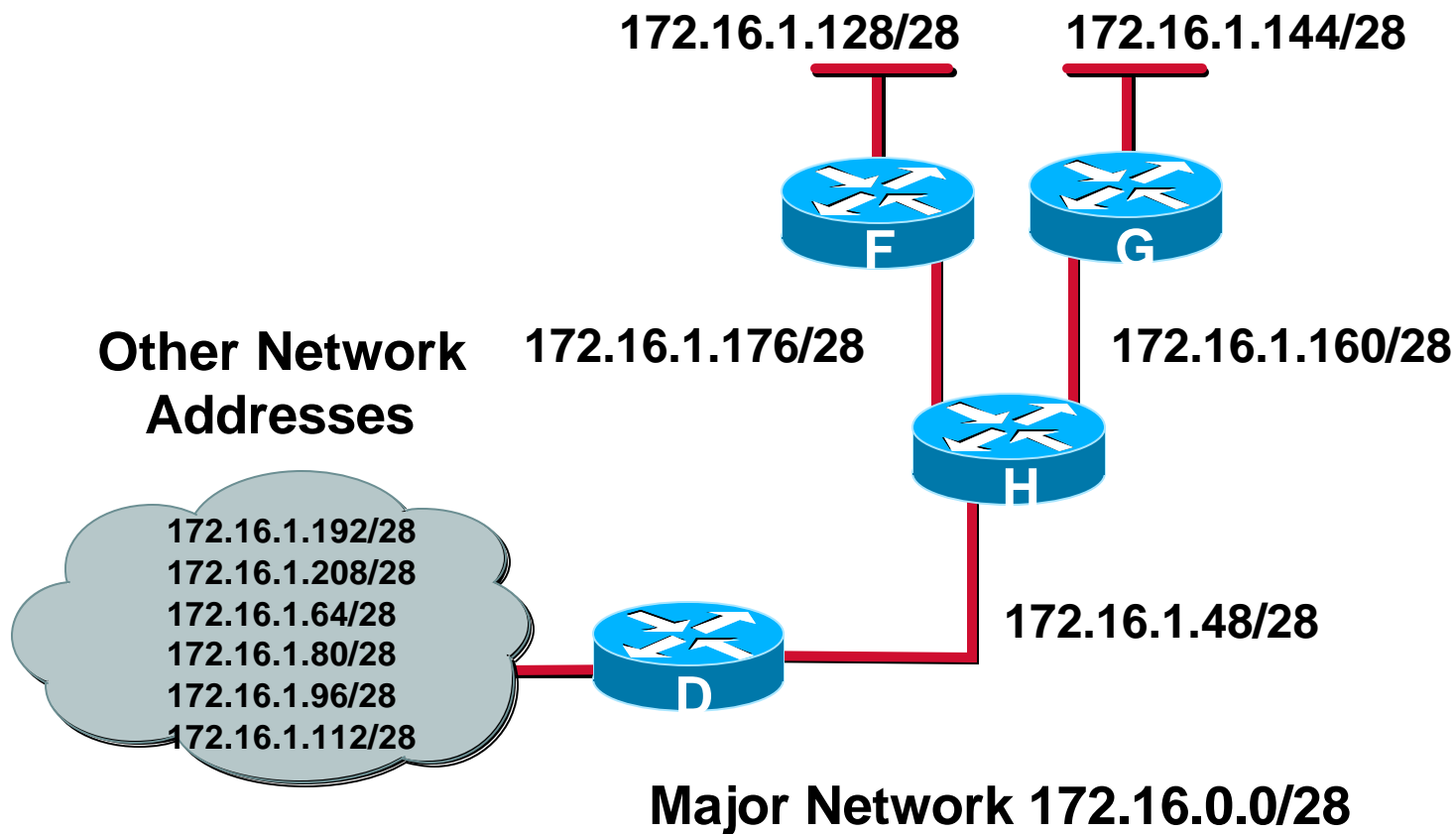
Written Exercise

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Written Exercise: Using Route Summarization

Exercise 1

172.16.1.192/28   172.16.1.208/28

172.16.1.64/28   172.16.1.80/28   **Other Network Addresses**

172.16.1.112/28

172.16.1.96/28

172.16.1.128/28
172.16.1.144/28
172.16.1.176/28
172.16.1.160/28
172.16.1.48/28

Major Network 172.16.0.0/28

Written Exercise: Using Route Summarization (cont.)

Exercise 2

172.16.1.128/28   172.16.1.144/28

F   G

Other Network Addresses   172.16.1.176/28   172.16.1.160/28

H

172.16.1.192/28
172.16.1.208/28
172.16.1.64/28   172.16.1.48/28
172.16.1.80/28
172.16.1.96/28
172.16.1.112/28
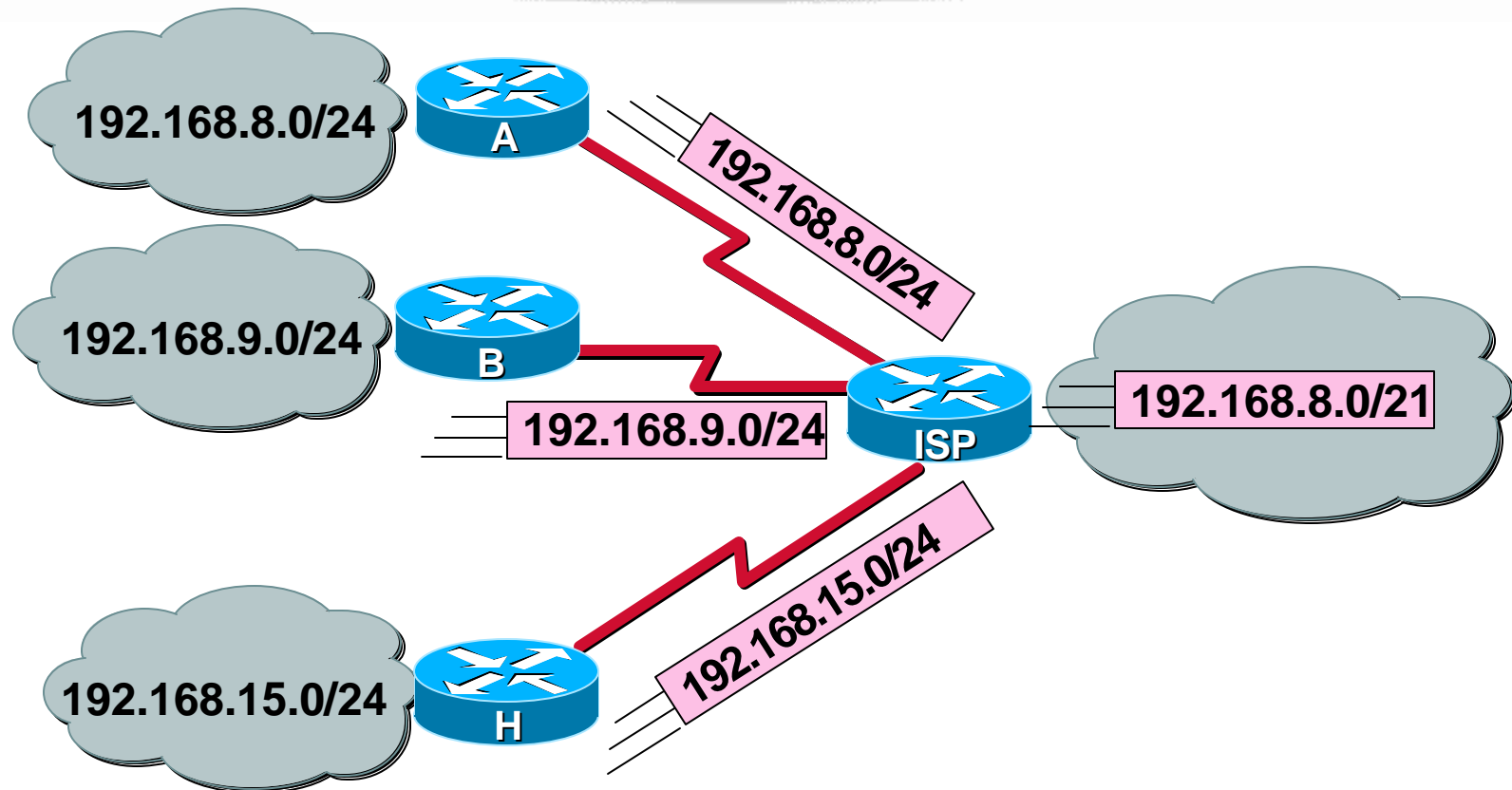
D

Major Network 172.16.0.0/28

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Classless Interdomain Routing

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Classless Interdomain Routing

- **Mechanism developed to alleviate exhaustion of addresses and reduce routing table size**

- **Blocks of Class C addresses assigned to ISPs—ISPs assign subsets of address space to organizations**

- **Blocks are summarized in routing tables**

CIDR Example

192.168.8.0/24 — A — 192.168.8.0/24

192.168.9.0/24 — B — 192.168.9.0/24 — ISP — 192.168.8.0/21

192.168.15.0/24 — H — 192.168.15.0/24

- **Networks 192.168.8.0/24 through 192.168.15.0/24 are summarized by the ISP in one advertisement 192.168.8.0/21**

Summary

After completing this lesson, you should be able to:

- **Use VLSMs to extend the use of the IP addresses, given an IP address range**

- **Explain if route summarization is possible, given a network plan that includes IP addressing**

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Review Questions

1. What are some of the advantages of using a hierarchical IP addressing model?

2. Given an address with a prefix of /20, how many additional subnets are gained when subnetting with a prefix of /28?

3. When selecting a route, the _____ prefix match is used.

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