CCNA 200-301, Volume I

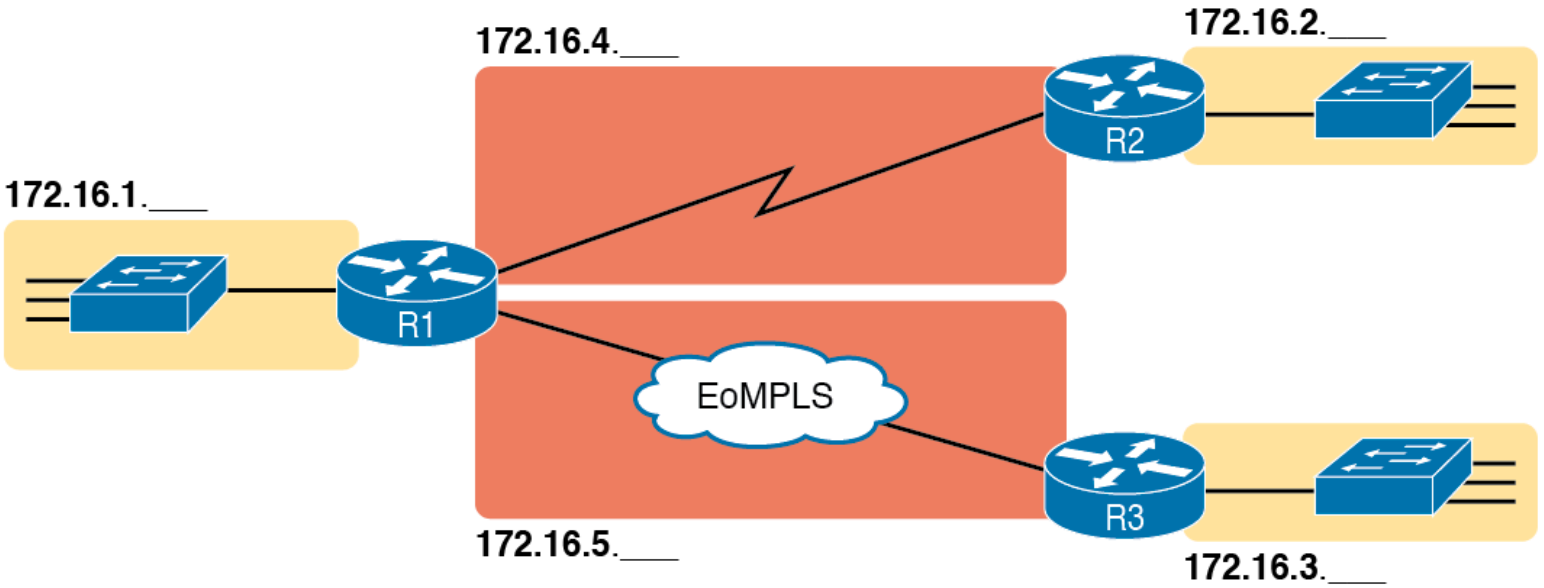
Chapter 11

Perspectives on IPv4 Subnetting

Objectives

- Analyze Requirements
- Make Design Choices

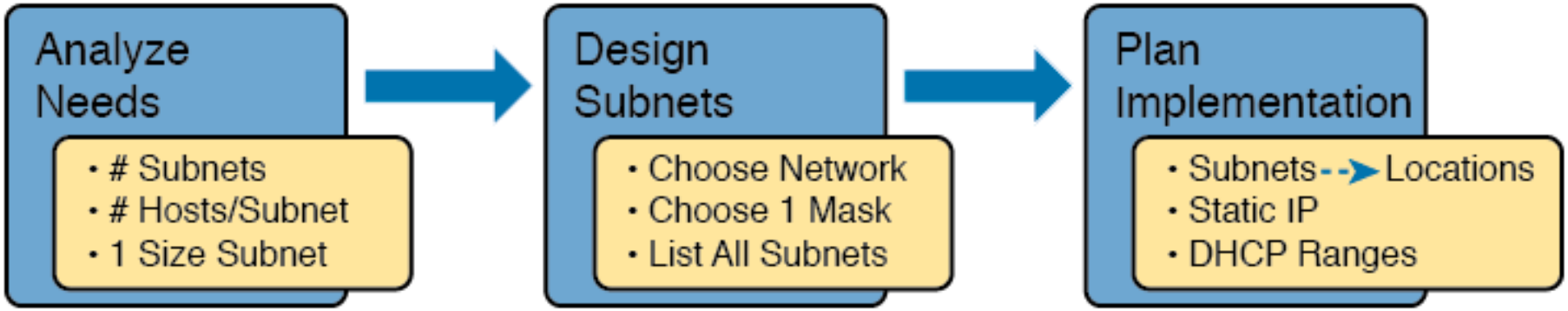
Example Subnet Plan Document



Subnet Design:

Class B 172.16.0.0
First 3 Octets are Equal

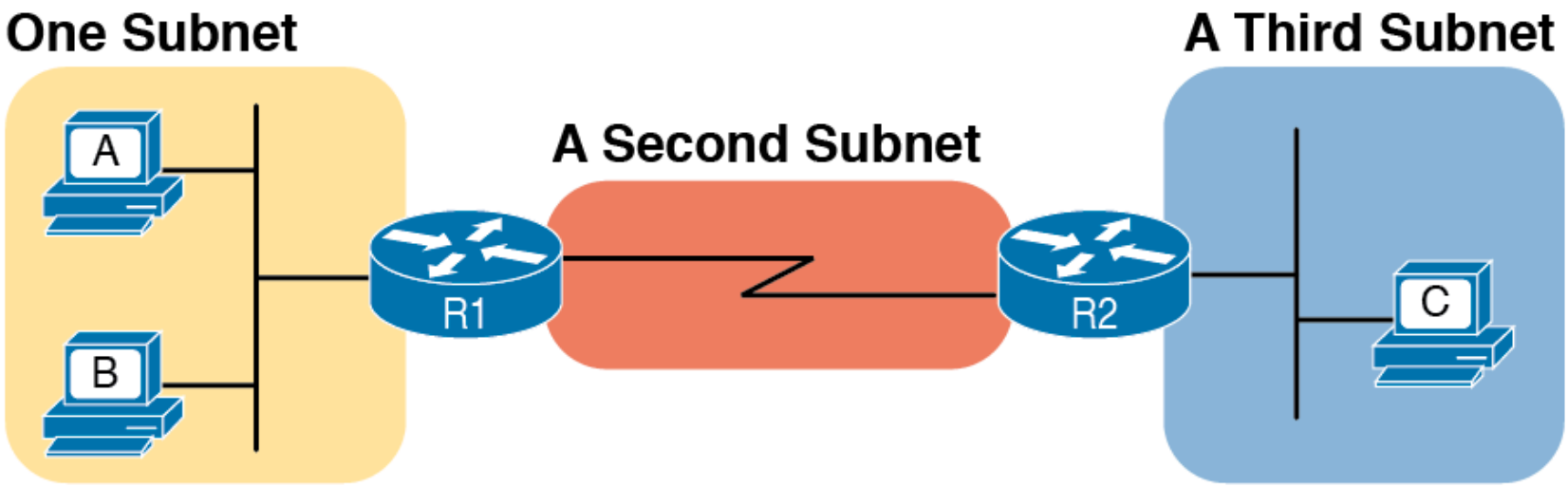
Subnet Planning, Design, and Implementation Tasks



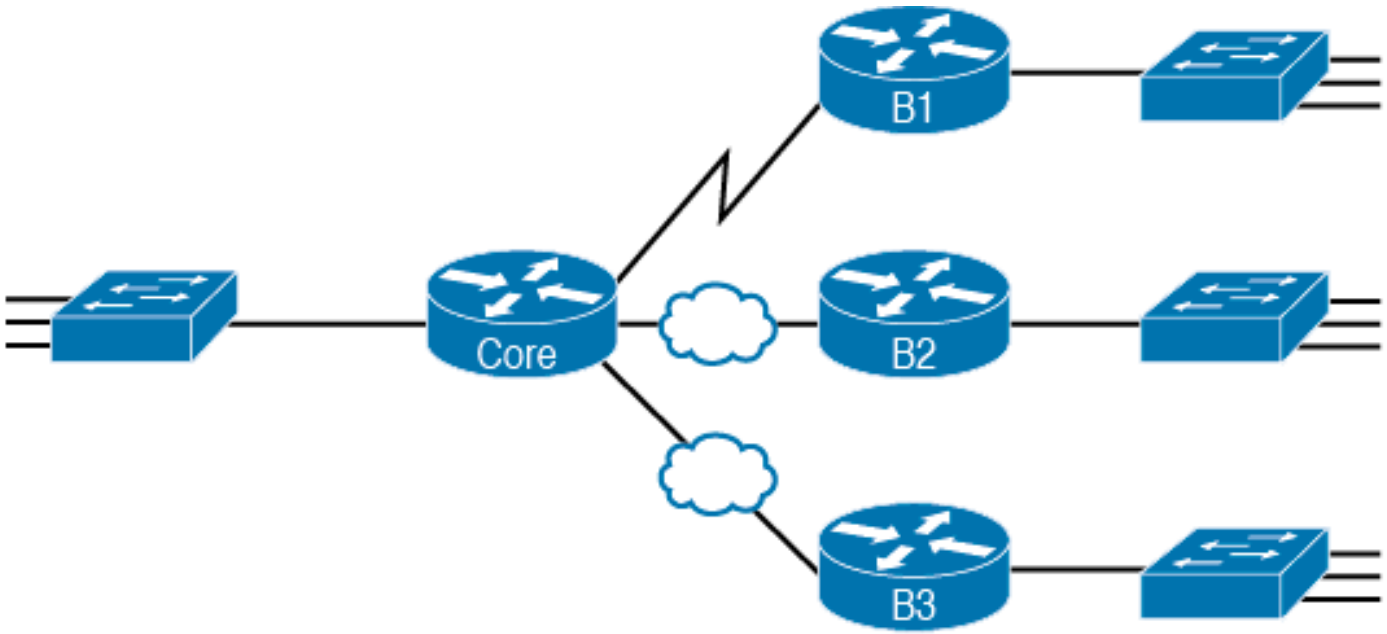
Analyze Subnetting and Addressing Needs

- Which hosts should be grouped together into a subnet?
- How many subnets does this network require?
- How many host IP addresses does each subnet require?
- Will we use a single subnet size for simplicity, or not?

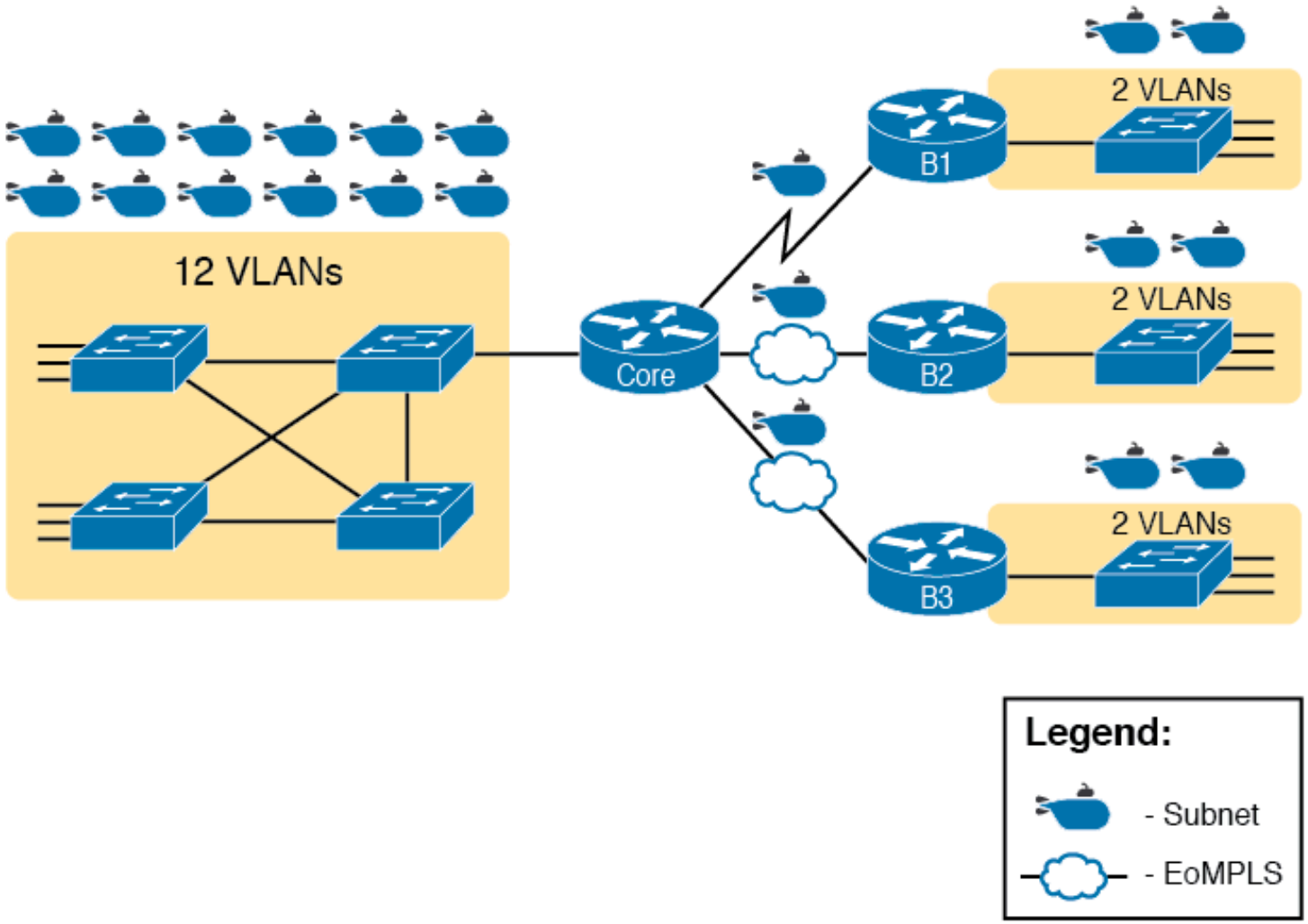
PC A and B in One Subnet, PC C in a Different Subnet



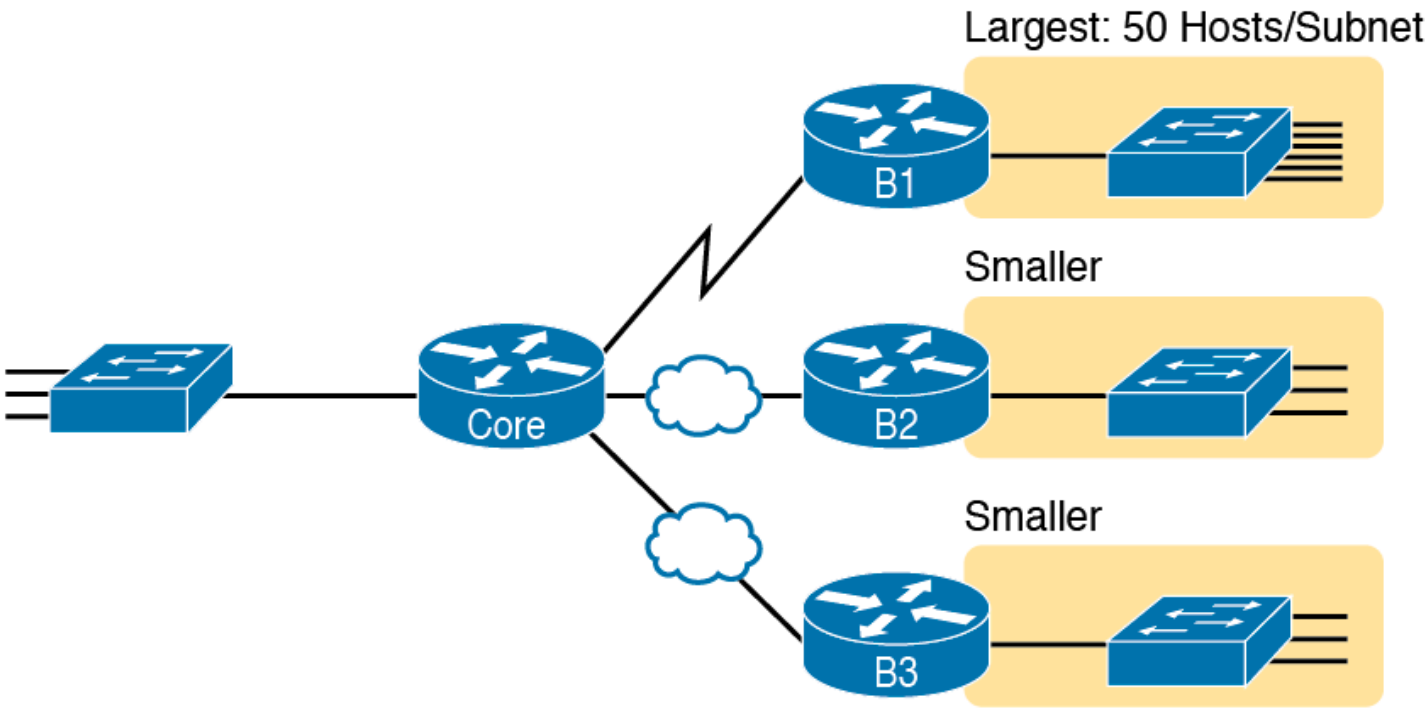
Four Site Internetwork with Small Central Site



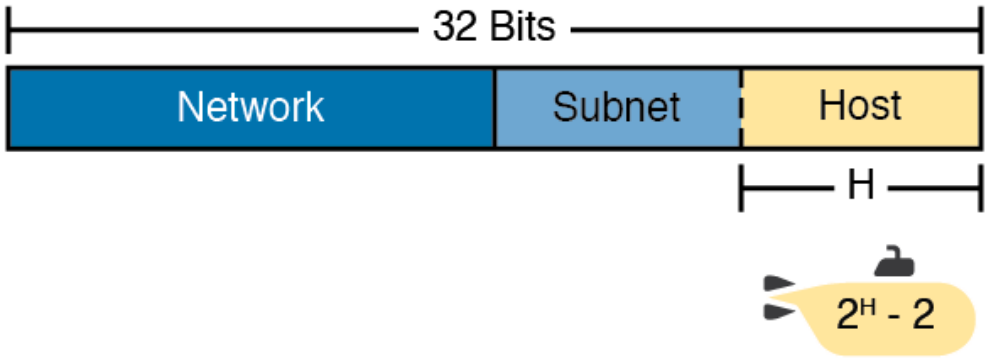
Four-Site Internetwork with Larger Central Site



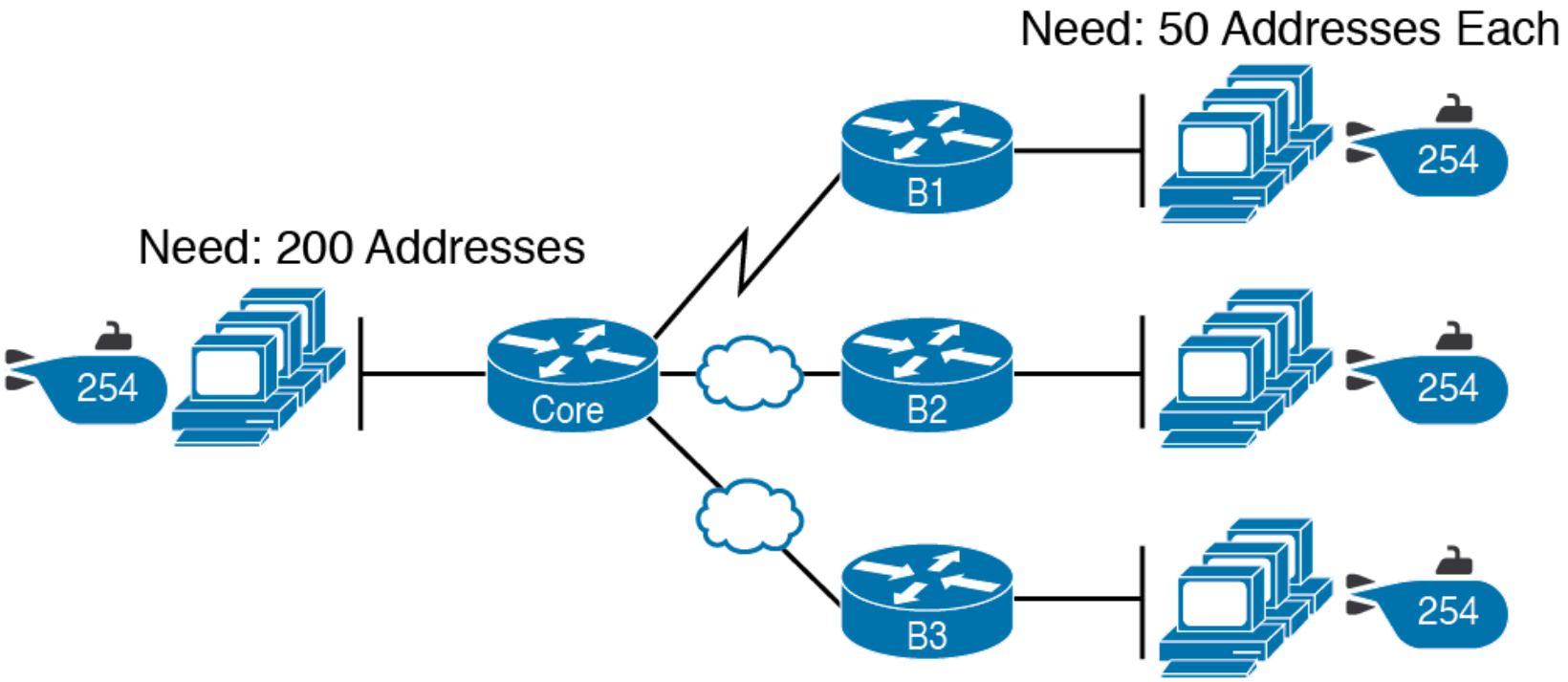
Large Branch B1 with 50 Hosts/Subnet



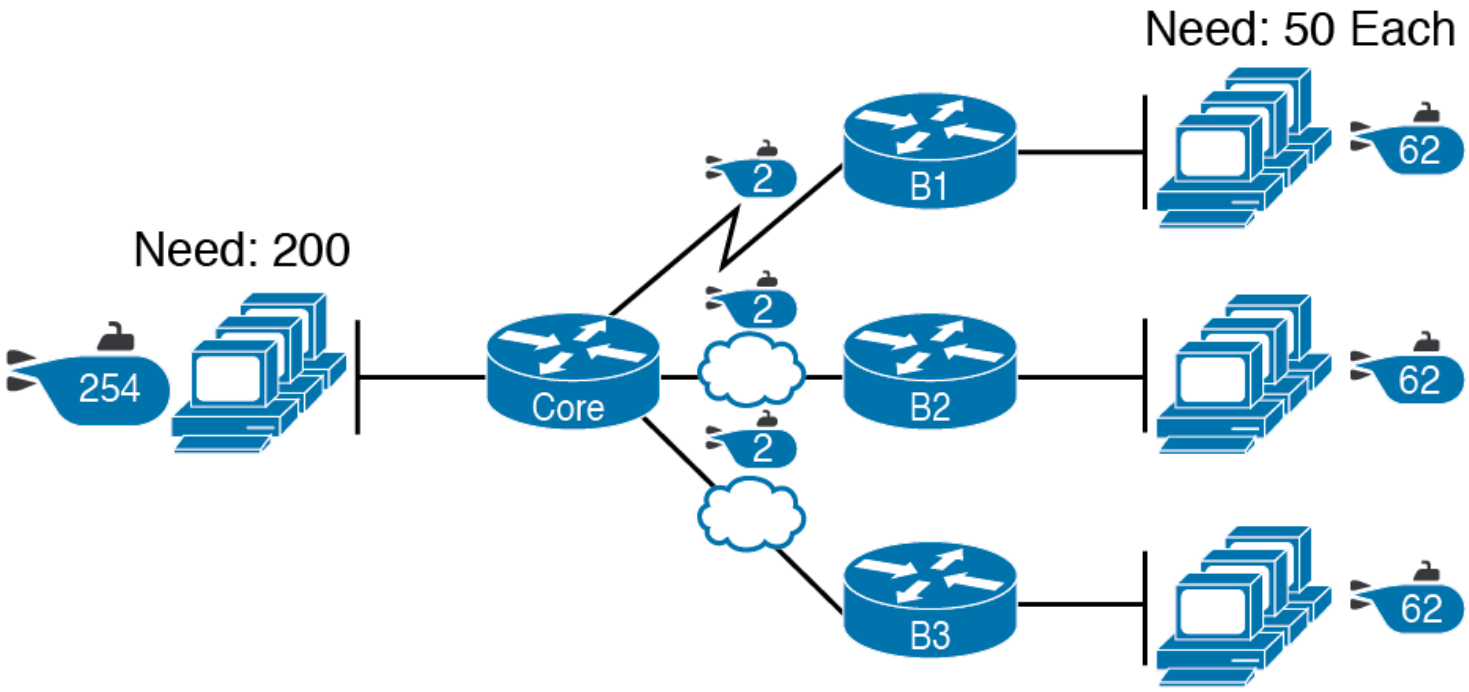
Subnet Size Concepts



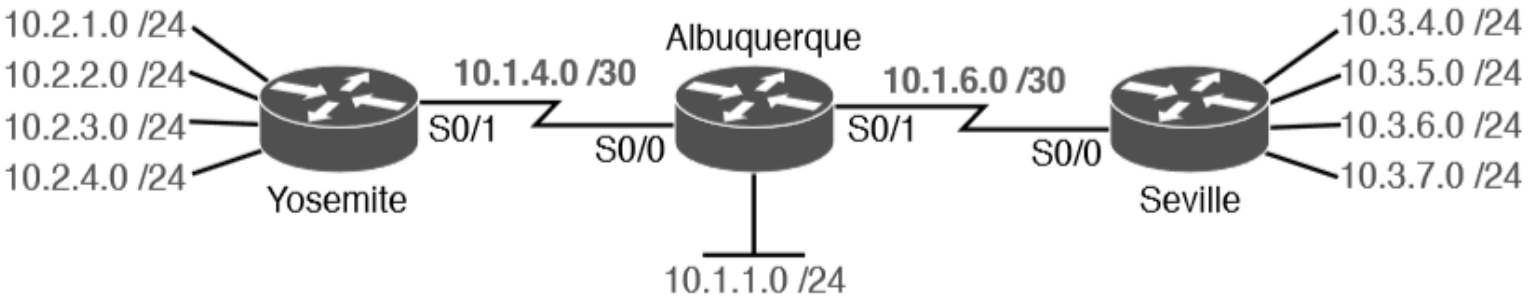
Network Using One Subnet Size



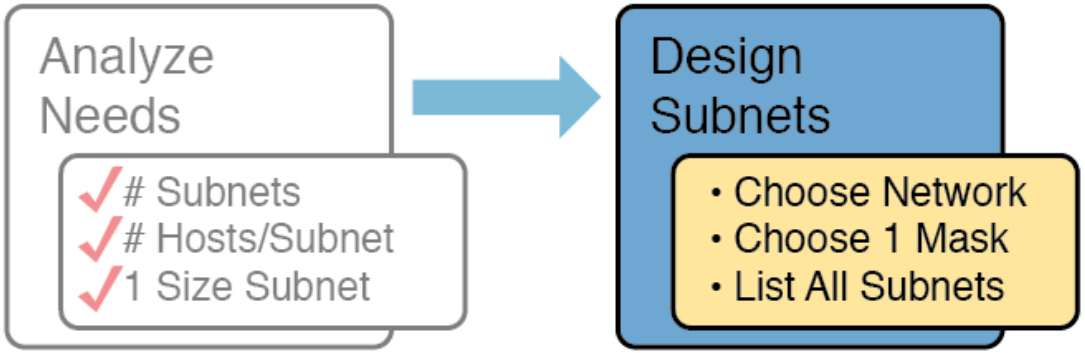
Three Masks, Three Subnet Sizes



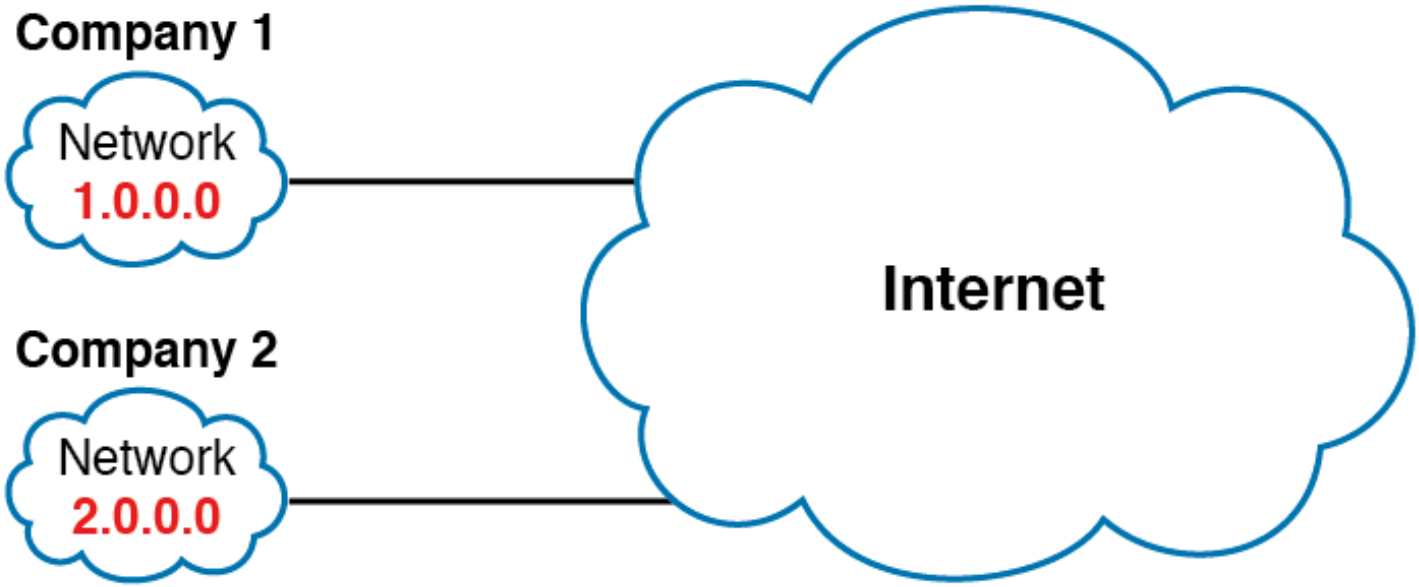
Internetwork with VLSM: Network 10.0.0.0, >1 Mask



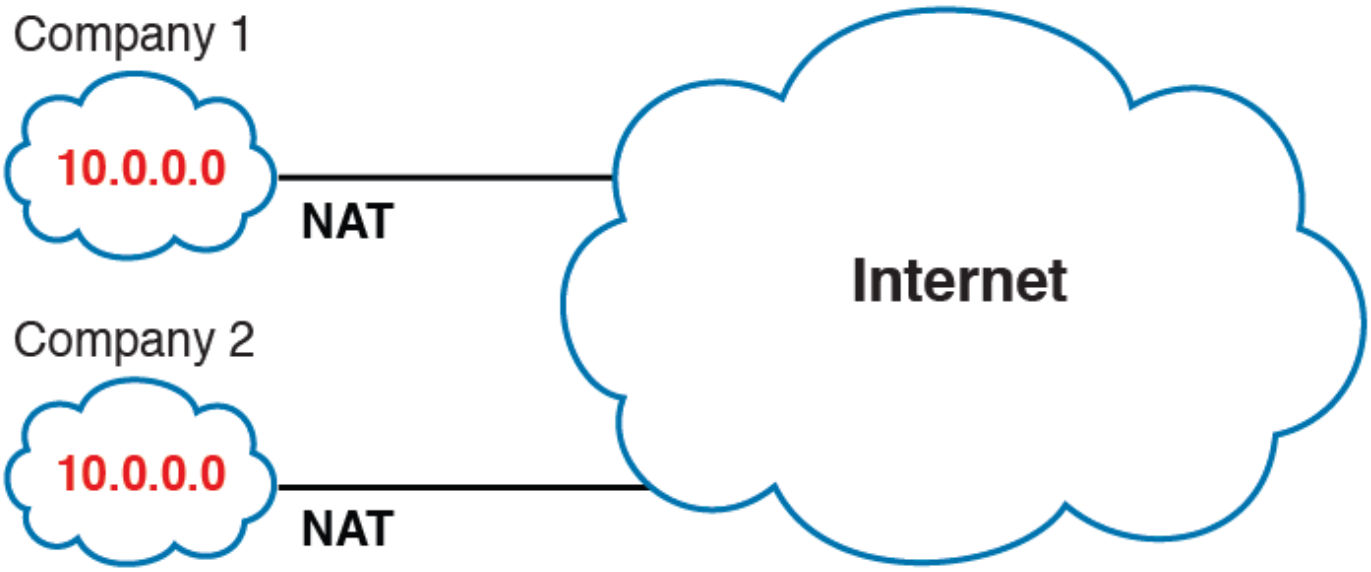
Input to the Design Phase, and Design Questions to Answer



Two Companies with Unique Public IP Networks



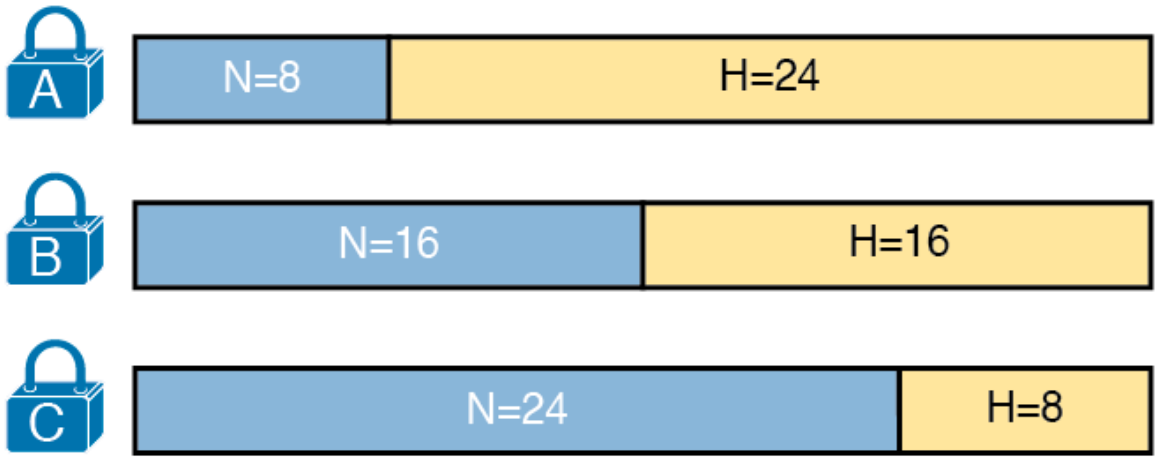
Reusing the Same Private Network 10.0.0.0 with NAT



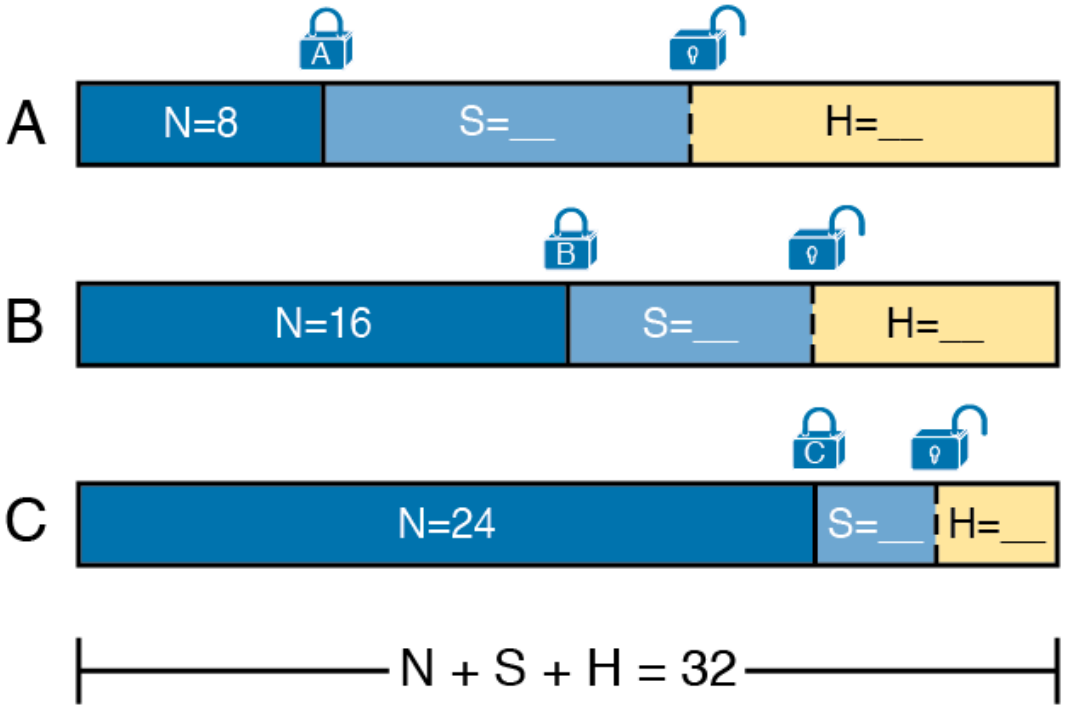
RFC 1918 Private Address Space

Private IP Networks	Class of Networks	Number of Networks
10.0.0.0	A	1
172.16.0.0 through 172.31.0.0	B	16
192.168.0.0 through 192.168.255.0	C	256

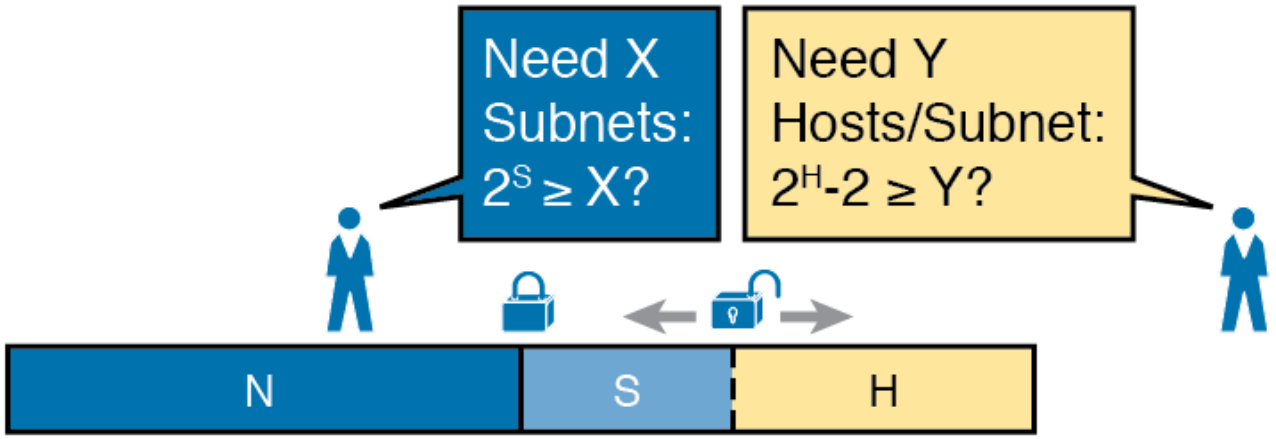
Format of Unsubnetted Class A, B, and C Networks



Concept of Borrowing Host Bits



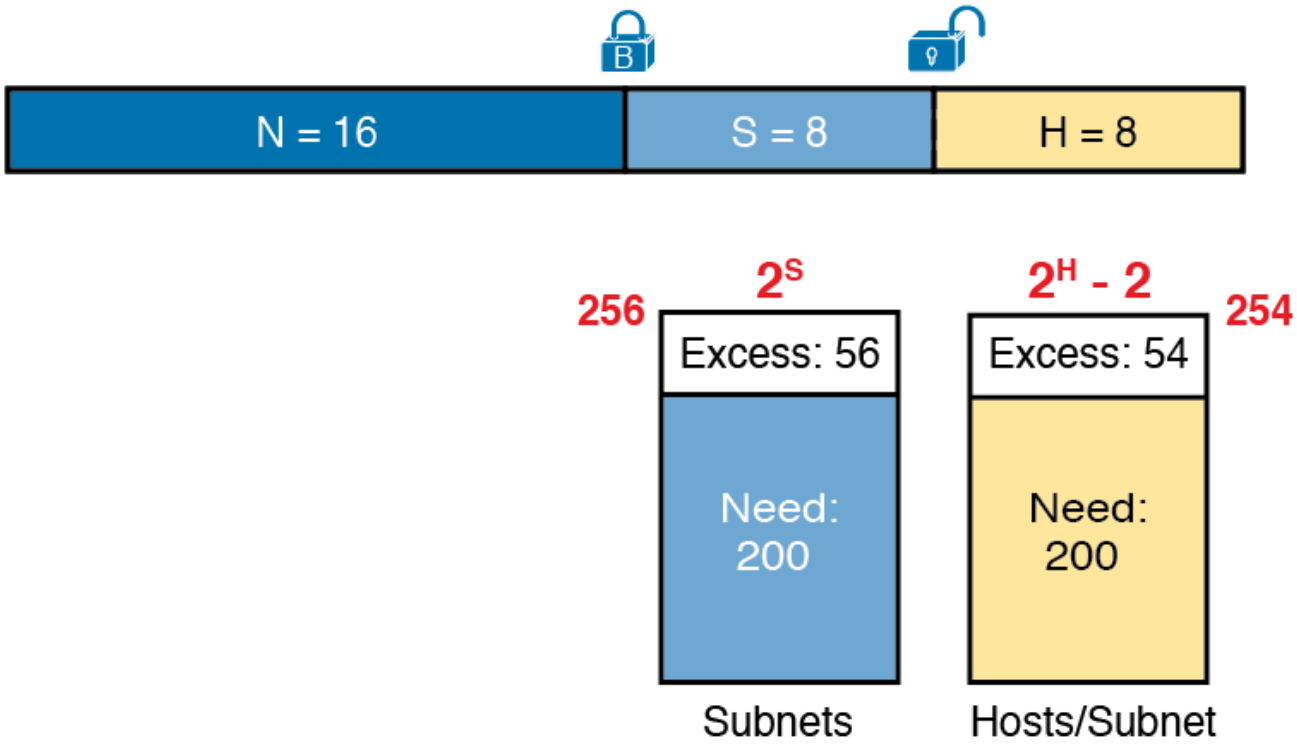
Borrowing Enough Subnet and Host Bits



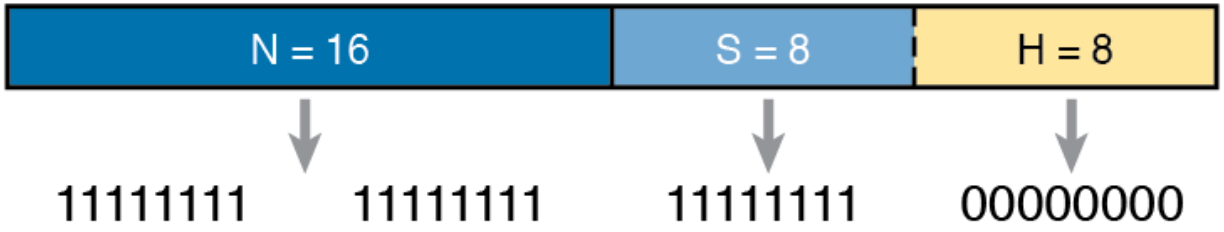
Powers of 2 Reference for Designing Masks

Number of Bits	2^X	$2^X - 2$
1	2	0
2	4	2
3	8	6
4	16	14
5	32	30
6	64	62
7	128	126
8	256	254
9	512	510
10	1024	1022
11	2048	2046
12	4096	4094

Example Mask Choice, N = 16, S = 8, H = 8



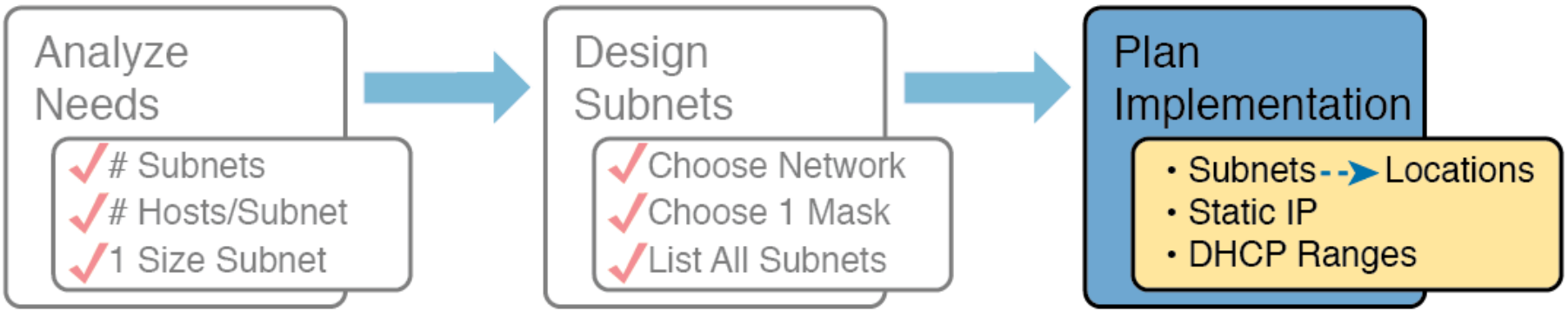
Creating the Subnet Mask—Binary—Class B Network



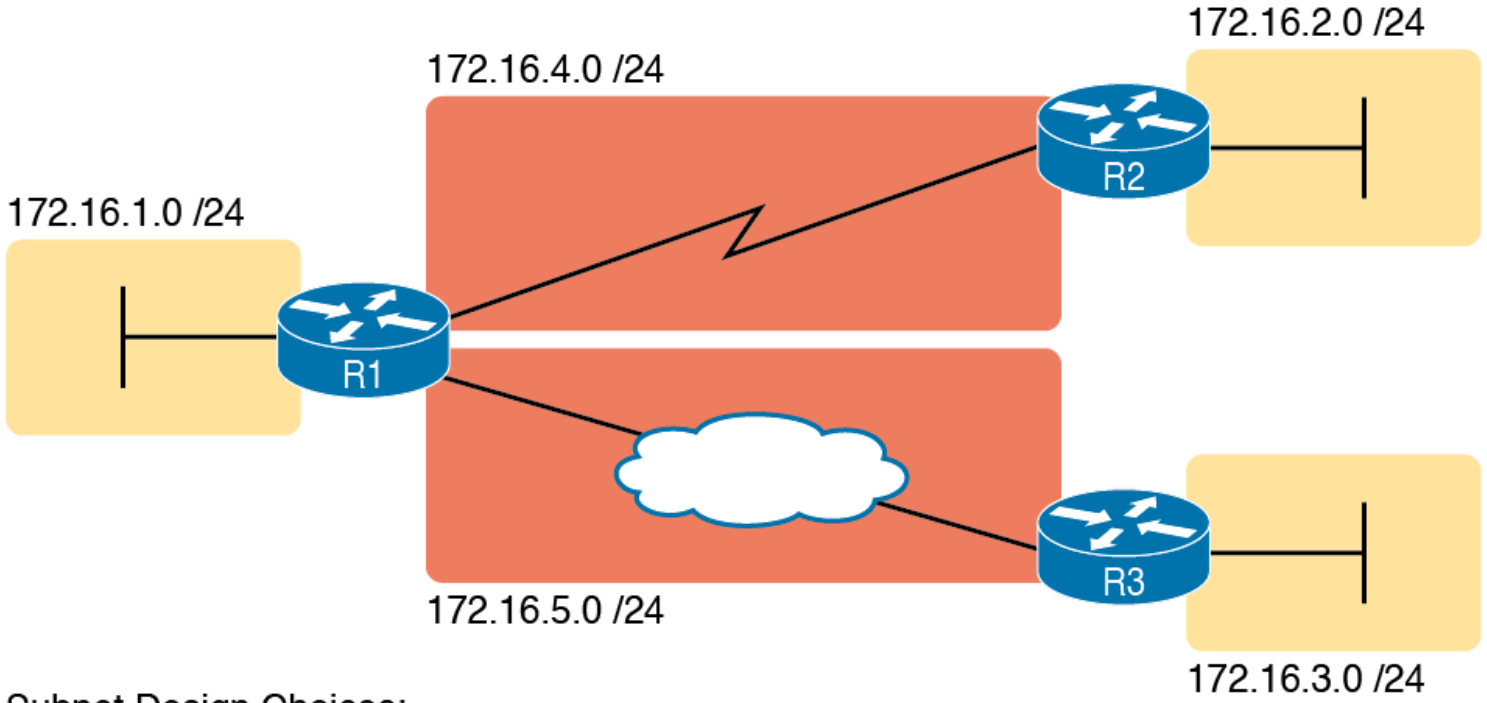
First Ten Subnets, Plus the Last Few, from 172.16.0.0, 255.255.255.0

Subnet Number	IP Addresses	Broadcast Address
172.16.0.0	172.16.0.1 – 172.16.0.254	172.16.0.255
172.16.1.0	172.16.1.1 – 172.16.1.254	172.16.1.255
172.16.2.0	172.16.2.1 – 172.16.2.254	172.16.2.255
172.16.3.0	172.16.3.1 – 172.16.3.254	172.16.3.255
172.16.4.0	172.16.4.1 – 172.16.4.254	172.16.4.255
172.16.5.0	172.16.5.1 – 172.16.5.254	172.16.5.255
172.16.6.0	172.16.6.1 – 172.16.6.254	172.16.6.255
172.16.7.0	172.16.7.1 – 172.16.7.254	172.16.7.255
172.16.8.0	172.16.8.1 – 172.16.8.254	172.16.8.255
172.16.9.0	172.16.9.1 – 172.16.9.254	172.16.9.255
----------Skipping many ----------		
172.16.254.0	172.16.254.1 – 172.16.254.254	172.16.254.255
172.16.255.0	172.16.255.1 – 172.16.255.254	172.16.255.255

Facts Supplied to the Plan Implementation Step



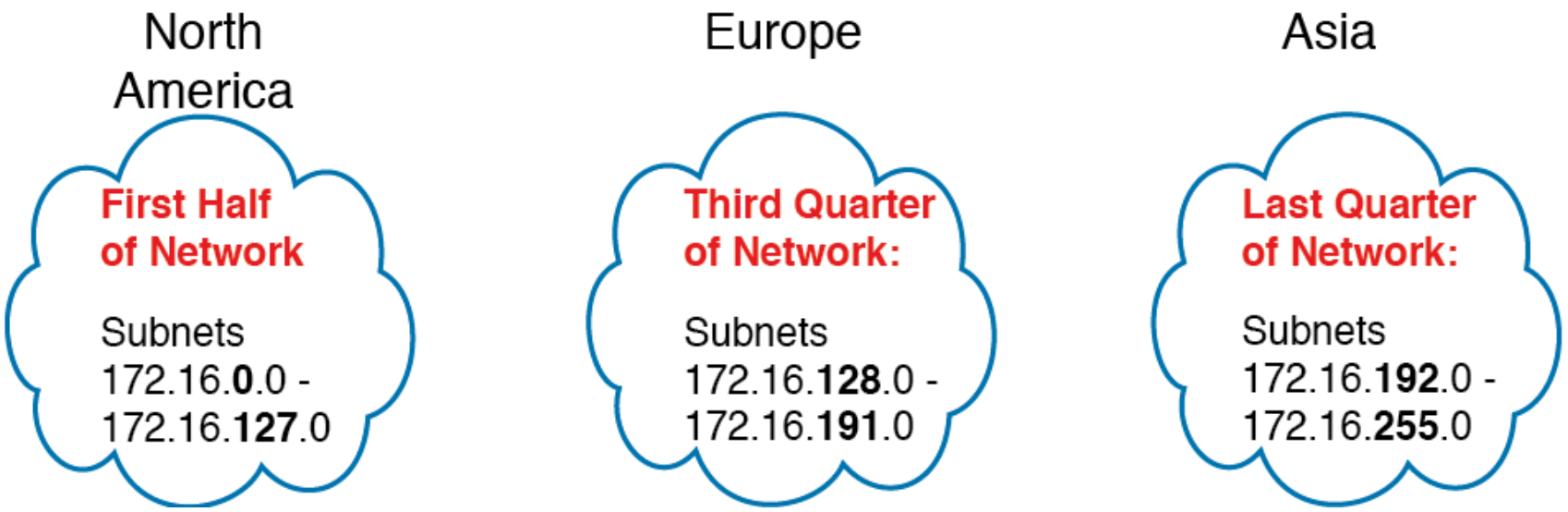
Example of Subnets Assigned to Different Locations



Subnet Design Choices:

Class B 172.16.0.0 /24 (255.255.255.0)

Reserving 50% of Subnets for North America and 25% Each for Europe and Asia



Static from the Low End and DHCP from the High End