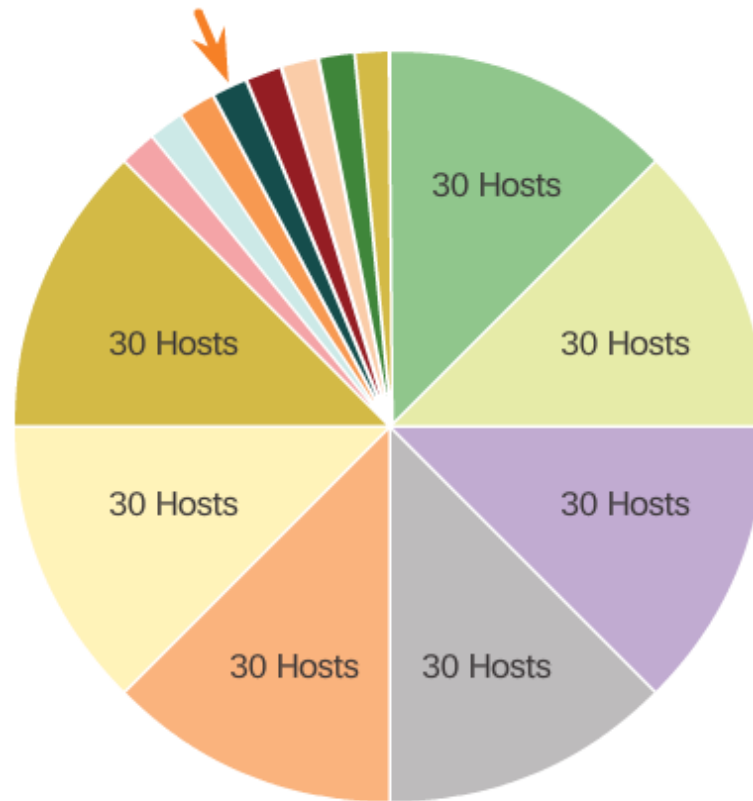


# Variable Length Subnet Masks

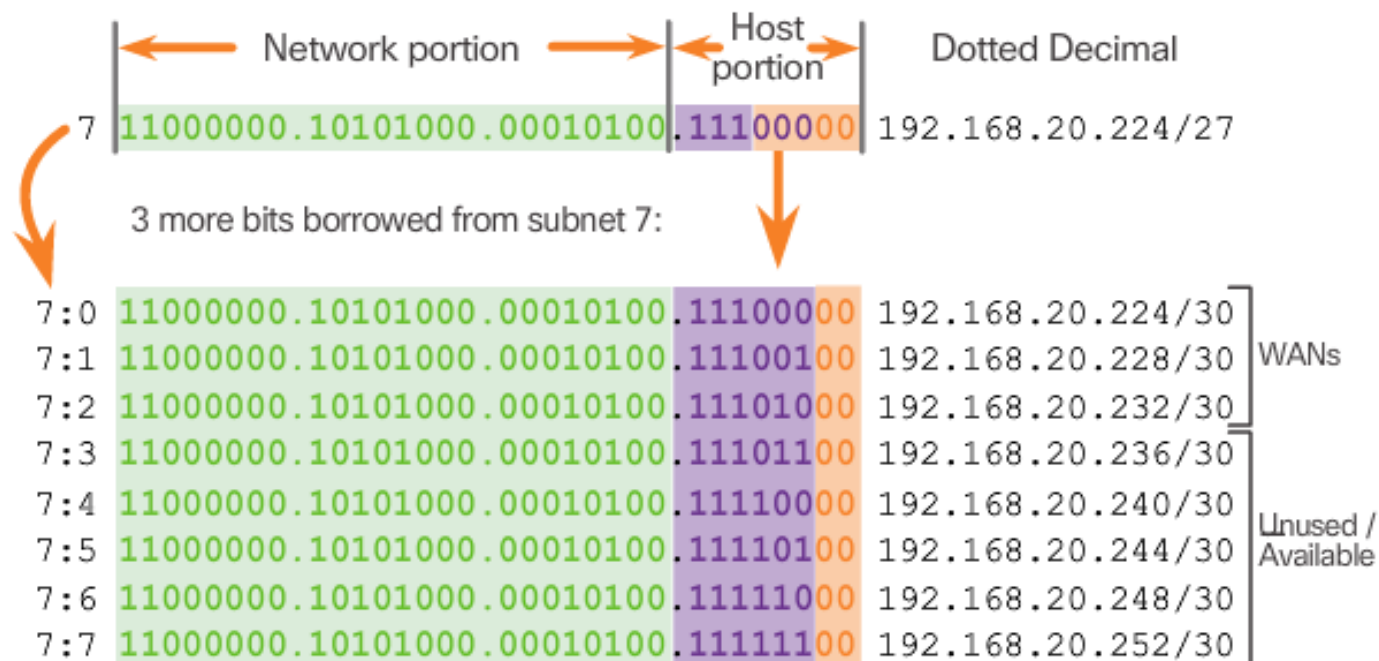
## Subnets of Varying Sizes

One subnet was further divided to create 8 smaller subnets of 4 hosts each



# Basic VLSM

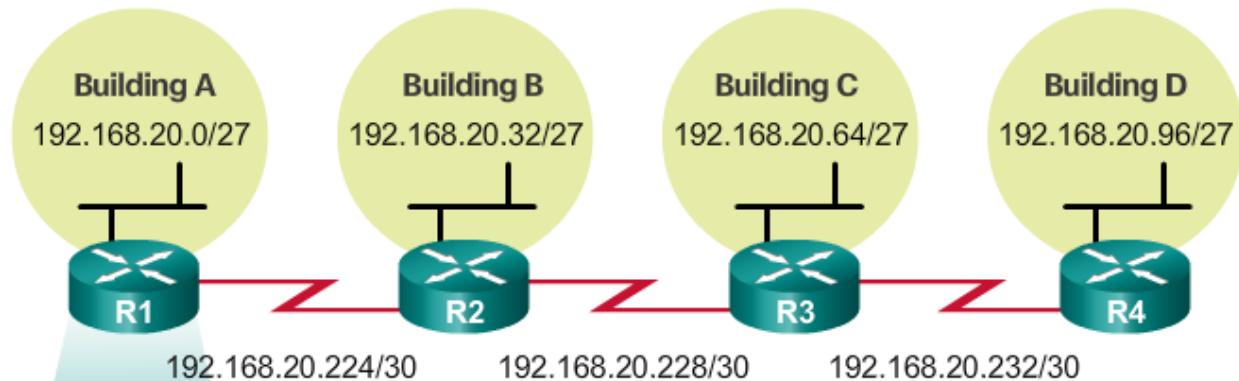
## VLSM Subnetting Scheme



Subnetting a subnet

# VLSM in Practice

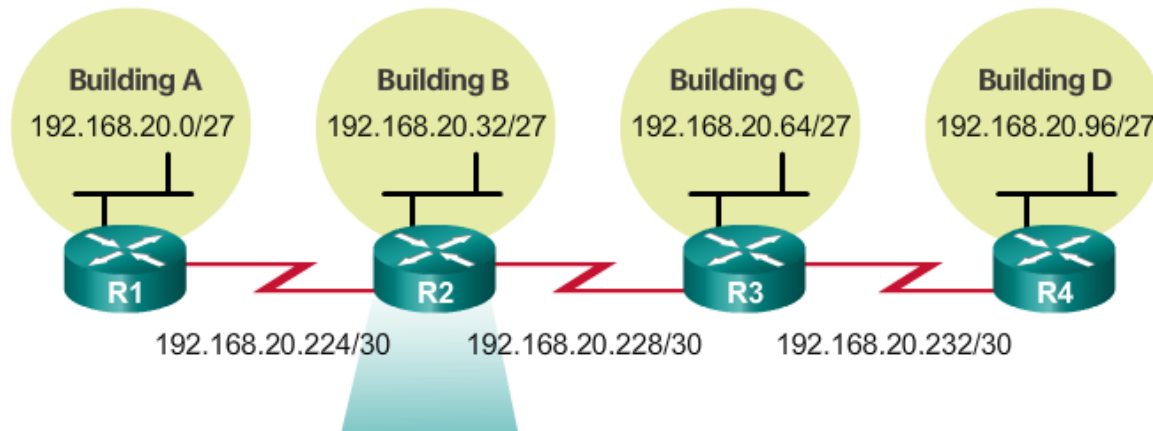
## Network Topology: VLSM Subnets



```
R1(config)# interface gigabitethernet 0/0
R1(config-if)# ip address 192.168.20.1 255.255.255.224
R1(config-if)# exit
R1(config)# interface serial 0/0/0
R1(config-if)# ip address 192.168.20.225 255.255.255.252
R1(config-if)# end
R1#
```

# VLSM in Practice (cont.)

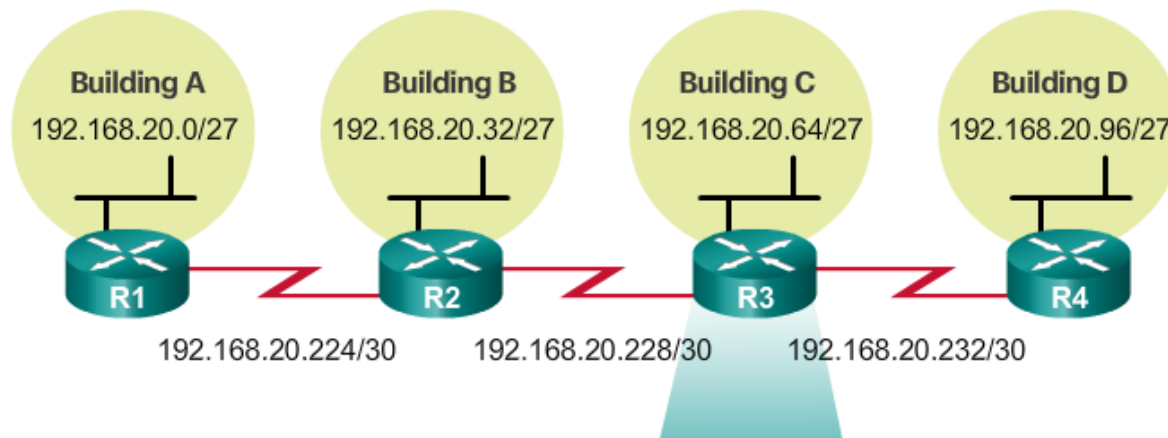
Network Topology: VLSM Subnets



```
R2(config)# interface gigabitethernet 0/0
R2(config-if)# ip address 192.168.20.33 255.255.255.224
R2(config-if)# exit
R2(config)# interface serial 0/0/0
R2(config-if)# ip address 192.168.20.226 255.255.255.252
R2(config-if)# exit
R2(config)# interface serial 0/0/1
R2(config)# ip address 192.168.20.229 255.255.255.252
R2(config-if)# end
R2#
```

# VLSM in Practice (cont.)

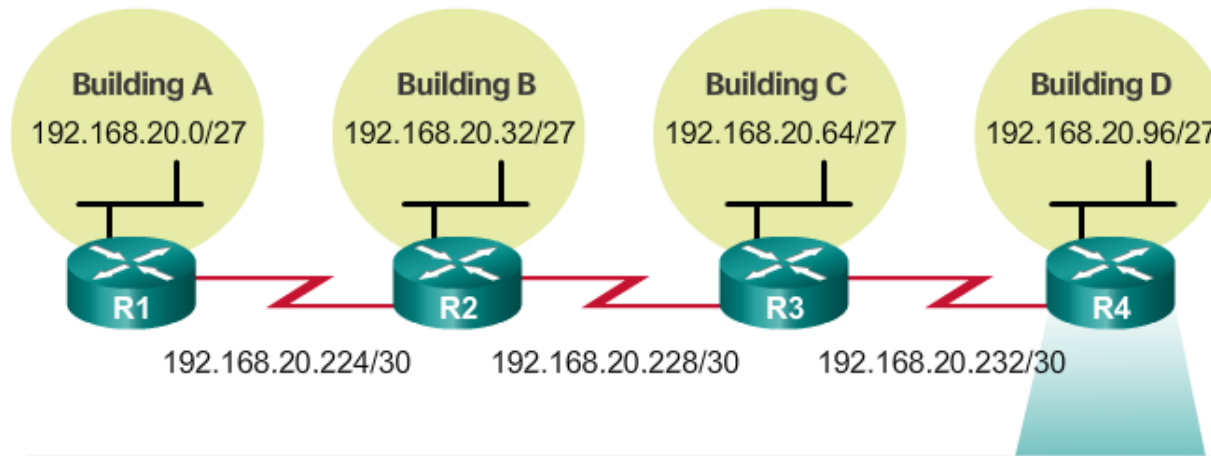
Network Topology: VLSM Subnets



```
R3(config)# interface gigabitethernet 0/0
R3(config-if)# ip address 192.168.20.65 255.255.255.224
R3(config-if)# exit
R3(config)# interface serial 0/0/0
R3(config-if)# ip address 192.168.20.230 255.255.255.252
R3(config-if)# exit
R3(config)# interface serial 0/0/1
R3(config)# ip address 192.168.20.233 255.255.255.252
R3(config-if)# end
R3#
```

# VLSM in Practice (Cont.)

## Network Topology: VLSM Subnets



```
R4(config)# interface gigabitethernet 0/0
R4(config-if)# ip address 192.168.20.97 255.255.255.224
R4(config-if)# exit
R4(config)# interface serial 0/0/0
R4(config-if)# ip address 192.168.20.234 255.255.255.252
R4(config-if)# end
R4#
```

# VLSM Chart

VLSM Subnetting of 192.168.20.0/24

	/27 Network	Hosts
Bldg A	.0	.1 - .30
Bldg B	.32	.33 - .62
Bldg C	.64	.65 - .94
Bldg D	.96	.97 - .126
Unused	.128	.129 - .158
Unused	.160	.161 - .190
Unused	.192	.193 - .222
	.224	.225 - .254

	/30 Network	Hosts
WAN R1-R2	.224	.225 - .226
WAN R2-R3	.228	.229 - .230
WAN R3-R4	.232	.233 - .234
Unused	.236	.237 - .238
Unused	.240	.241 - .242
Unused	.244	.245 - .246
Unused	.248	.249 - .250
Unused	.252	.253 - .254

# Section 8.2: Addressing Schemes

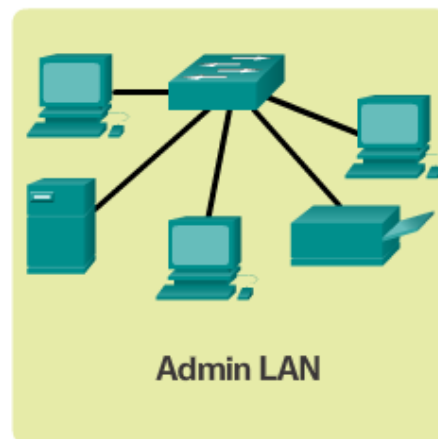
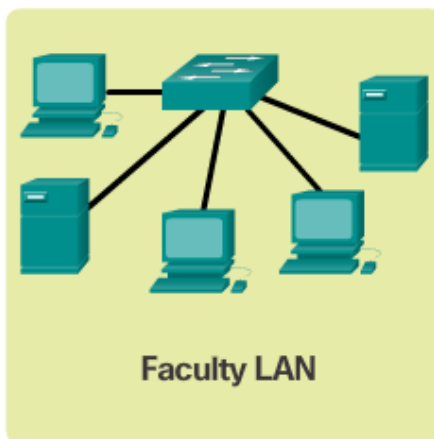
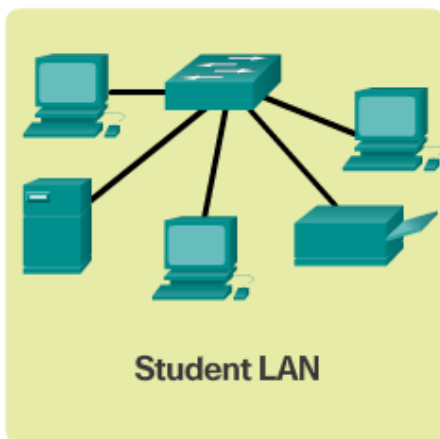
Upon completion of this section, you should be able to:

- Implement a VLSM addressing scheme.



# Network Address Planning

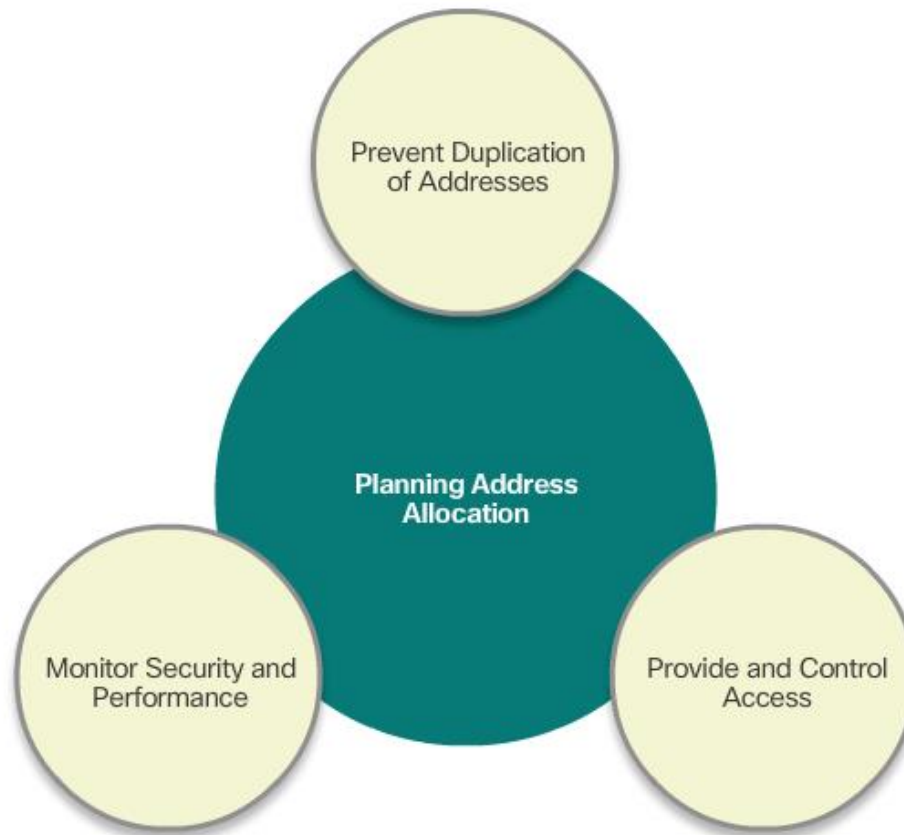
## Planning IP Address Assignment



Planning requires decisions on each subnet in terms of size, the number of hosts per subnet, and how host addresses will be assigned.

# Planning to Address the Network

## Primary Considerations when Planning Address Allocations



# Assigning Addresses to Devices

## IP Address Ranges

Network: 192.168.1.0/24		
Use	First	Last
Host Devices	.1	.229
Servers	.230	.239
Printers	.240	.249
Intermediary Devices	.250	.253
Gateway (router LAN interface)	.254	

# Section 8.3:

## Design Considerations for IPv6

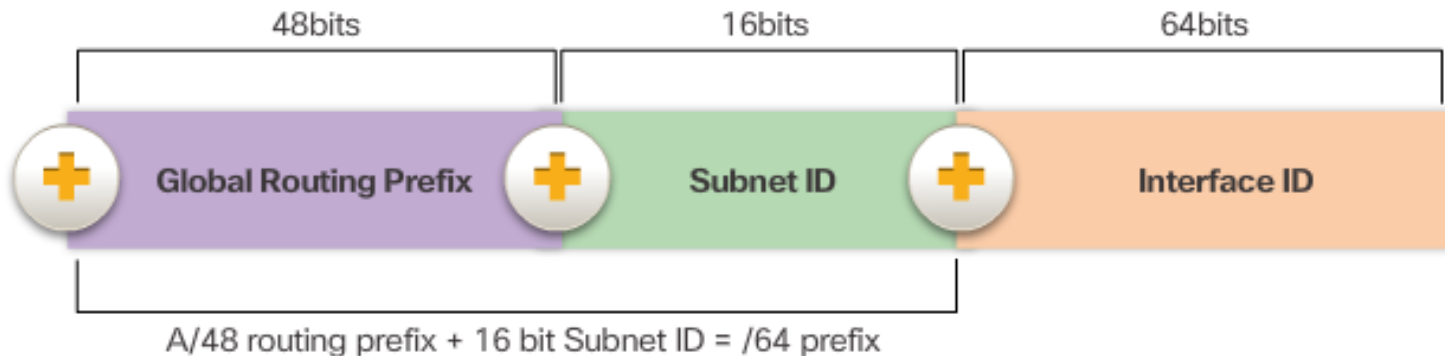
Upon completion of this section, you should be able to:

- Explain how to implement IPv6 address assignments in a business network.

# The IPv6 Global Unicast Address

The IPv6 global unicast address normally consists of a /48 global routing prefix, a 16 bit subnet ID, and a 64 bit interface ID.

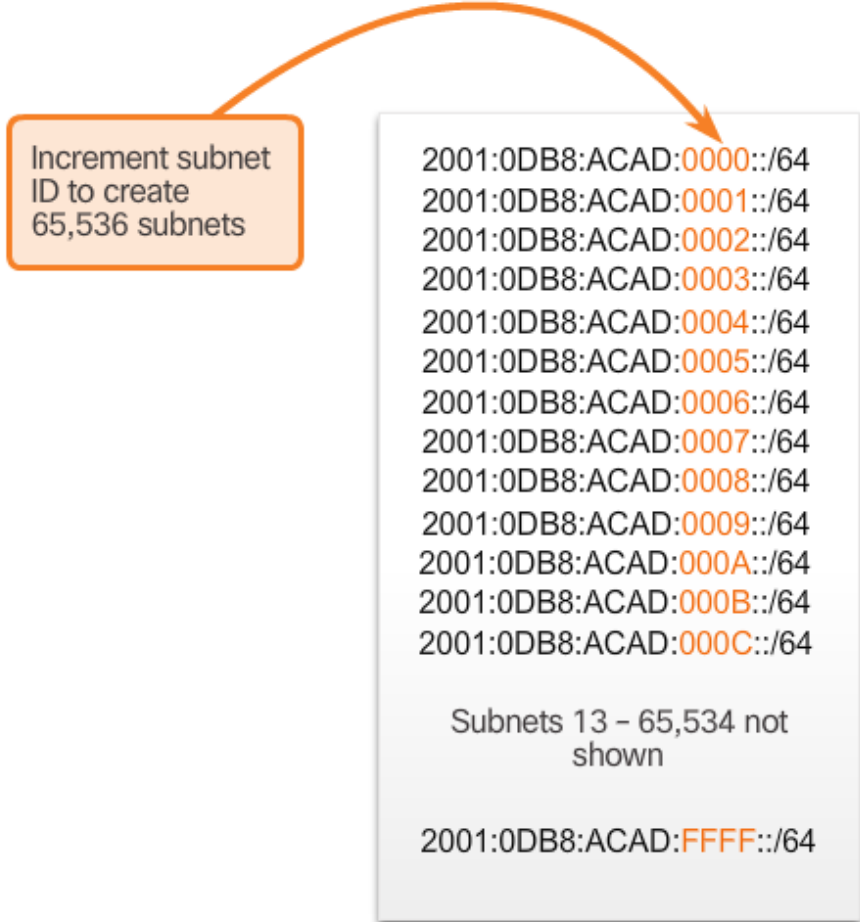
## IPv6 Global Unicast Address Structure



# Subnetting Using the Subnet ID

Address Block: 2001:0DB8:ACAD::/48

Increment subnet  
ID to create  
65,536 subnets

An orange curved arrow points from the text box on the left to the first address in the list on the right. The list of addresses is contained within a light gray box with a drop shadow. The addresses are listed vertically, with the last one being 2001:0DB8:ACAD:FFFF::/64. Below the list, it says 'Subnets 13 - 65,534 not shown'.

```
graph LR; A[Increment subnet ID to create 65,536 subnets] --> B[2001:0DB8:ACAD:0000::/64];
```

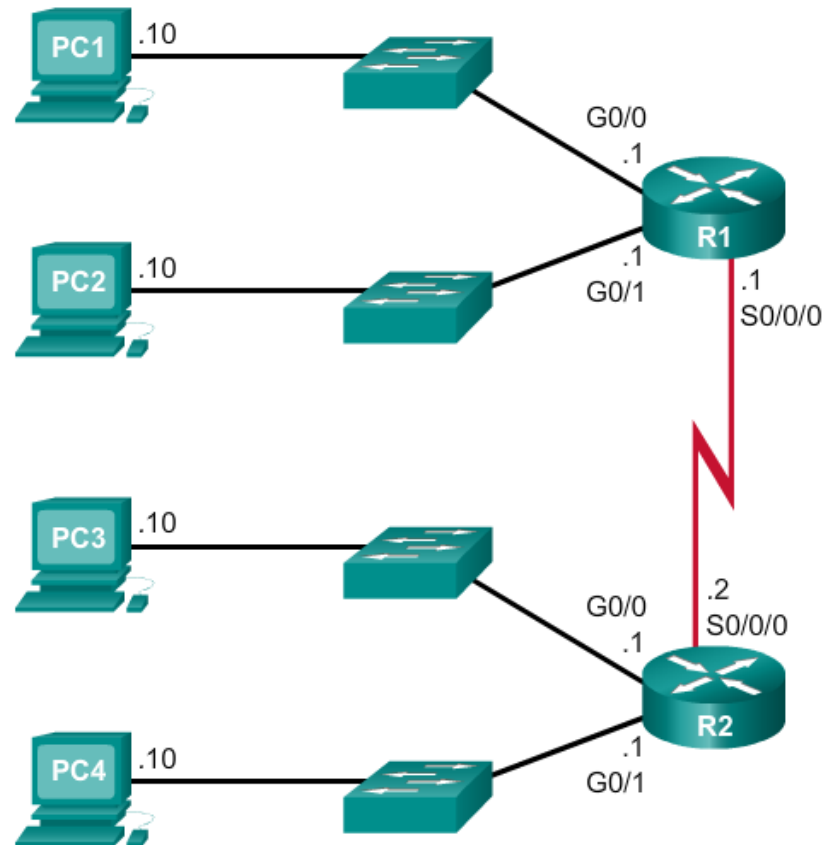
2001:0DB8:ACAD:0000::/64  
2001:0DB8:ACAD:0001::/64  
2001:0DB8:ACAD:0002::/64  
2001:0DB8:ACAD:0003::/64  
2001:0DB8:ACAD:0004::/64  
2001:0DB8:ACAD:0005::/64  
2001:0DB8:ACAD:0006::/64  
2001:0DB8:ACAD:0007::/64  
2001:0DB8:ACAD:0008::/64  
2001:0DB8:ACAD:0009::/64  
2001:0DB8:ACAD:000A::/64  
2001:0DB8:ACAD:000B::/64  
2001:0DB8:ACAD:000C::/64

Subnets 13 - 65,534 not  
shown

2001:0DB8:ACAD:FFFF::/64

# IPv6 Subnet Allocation

Example Topology



# IPv6 Subnet Allocation (cont.)

Address Block: 2001:0DB8:ACAD::/48

5 subnets allocated  
from 65,536  
available subnets

2001:0DB8:ACAD:0000::/64

2001:0DB8:ACAD:0001::/64

2001:0DB8:ACAD:0002::/64

2001:0DB8:ACAD:0003::/64

2001:0DB8:ACAD:0004::/64

2001:0DB8:ACAD:0005::/64

2001:0DB8:ACAD:0006::/64

2001:0DB8:ACAD:0007::/64

2001:0DB8:ACAD:0008::/64

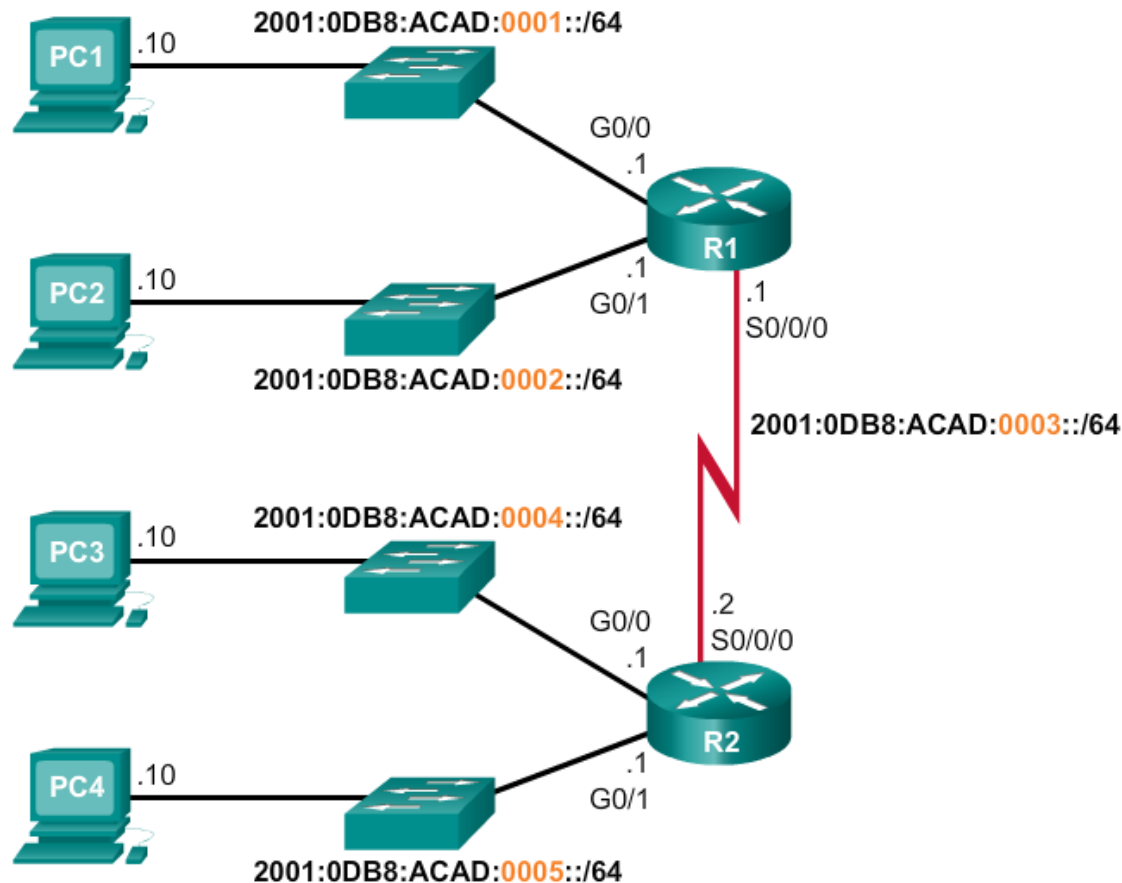
⋮

2001:0DB8:ACAD:FFFF::/64



# IPv6 Subnet Allocation (cont.)

IPv6 Subnet Allocation



# IPv6 Subnet Allocation (cont.)

## IPv6 Address Configuration



```
R1(config)# interface gigabitethernet 0/0
R1(config-if)# ipv6 address 2001:db8:acad:1::1/64
R1(config-if)# exit
R1(config)# interface gigabitethernet 0/1
R1(config-if)# ipv6 address 2001:db8:acad:2::1/64
R1(config-if)# exit
R1(config)# interface serial 0/0/0
R1(config-if)# ipv6 address 2001:db8:acad:3::1/64
R1(config-if)# end
R1#
```

# Section 8.4: Summary

## Chapter Objectives:

- Implement an IPv4 addressing scheme to enable end-to-end connectivity in a small to medium-sized business network.
- Given a set of requirements, implement a VLSM addressing scheme to provide connectivity to end users in a small to medium-sized network.
- Explain design considerations for implementing IPv6 in a business network.