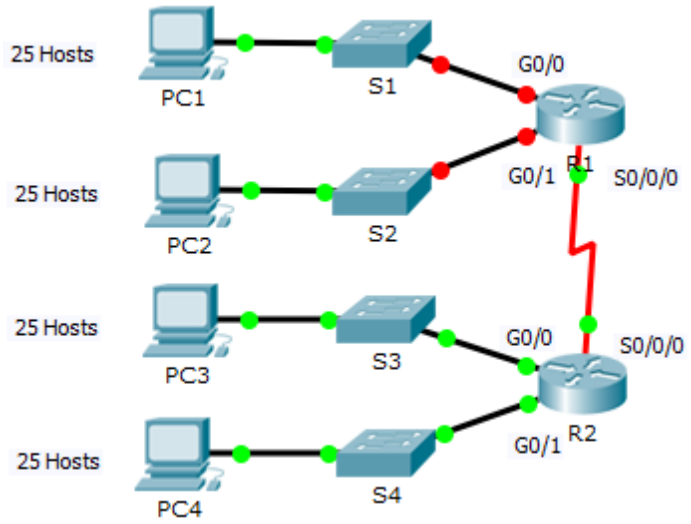
Packet Tracer - Subnetting Scenario

Topology



Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/0	192.168.100.1	255.255.255.224	
	G0/1	192.168.100.33	255.255.255.224	
	S0/0/0	192.168.100.129	255.255.255.224	
R2	G0/0	192.168.100.65	255.255.255.224	
	G0/1	192.168.100.97	255.255.255.224	
	S0/0/0	192.168.100.158	255.255.255.224	
S1	VLAN 1	192.168.100.2	255.255.255.224	192.168.100.1
S2	VLAN 1	192.168.100.34	255.255.255.224	192.168.100.33
S3	VLAN 1	192.168.100.66	255.255.255.224	192.168.100.65
S4	VLAN 1	192.168.100.98	255.255.255.224	192.168.100.97
PC1	NIC	192.168.100.30	255.255.255.224	192.168.100.1
PC2	NIC	192.168.100.62	255.255.255.224	192.168.100.33
PC3	NIC	192.168.100.94	255.255.255.224	192.168.100.65
PC4	NIC	192.168.100.126	255.255.255.224	192.168.100.97

Objectives

Part 1: Design an IP Addressing Scheme

Part 2: Assign IP Addresses to Network Devices and Verify Connectivity

Scenario

In this activity, you are given the network address of 192.168.100.0/24 to subnet and provide the IP addressing for the network shown in the topology. Each LAN in the network requires enough space for, at least, 25 addresses for end devices, the switch and the router. The connection between R1 to R2 will require an IP address for each end of the link.

1. Design an IP Addressing Scheme

1. Subnet the 192.168.100.0/24 network into the appropriate number of subnets.

a. Based on the topology, how many subnets are needed? 1 - G0/0; 1 - G0/1; 1 - S0/0/0; 1 - VLAN 1; 1 - NIC; ~ 5

b. How many bits must be borrowed to support the number of subnets in the topology table? Subnet mask 255.255.255.224 = 3 bits borrowed;

c. How many subnets does this create? Bits available in octet, 2^3 = 8;

d. How many usable hosts does this create per subnet? 5 subnets needed; Value of 224 for Subnet Mask, 2^5 = 32; 2^Number of Host Bits - 2(network and broadcast address) = How many usable hosts addresses per subnet; 2^5 - 2 = 30;

Note: If your answer is less than the 25 hosts required, then you borrowed too many bits.

e. Calculate the binary value for the first five subnets. The first subnet is already shown.

```
Net 0: 192 . 168 . 100 .  0   0   0   0   0   0   0   0

Net 1: 192 . 168 . 100 . _0__ _0__ _1__ _0__ _0__ _0__ _0__ _0__

Net 2: 192 . 168 . 100 . _0__ _1__ _0__ _0__ _0__ _0__ _0__ _0__

Net 3: 192 . 168 . 100 . _0__ _1__ _1__ _0__ _0__ _0__ _0__ __0_

Net 4: 192 . 168 . 100 . _1__ _0__ _0__ _0__ _0__ _0__ _0__ _0__
```

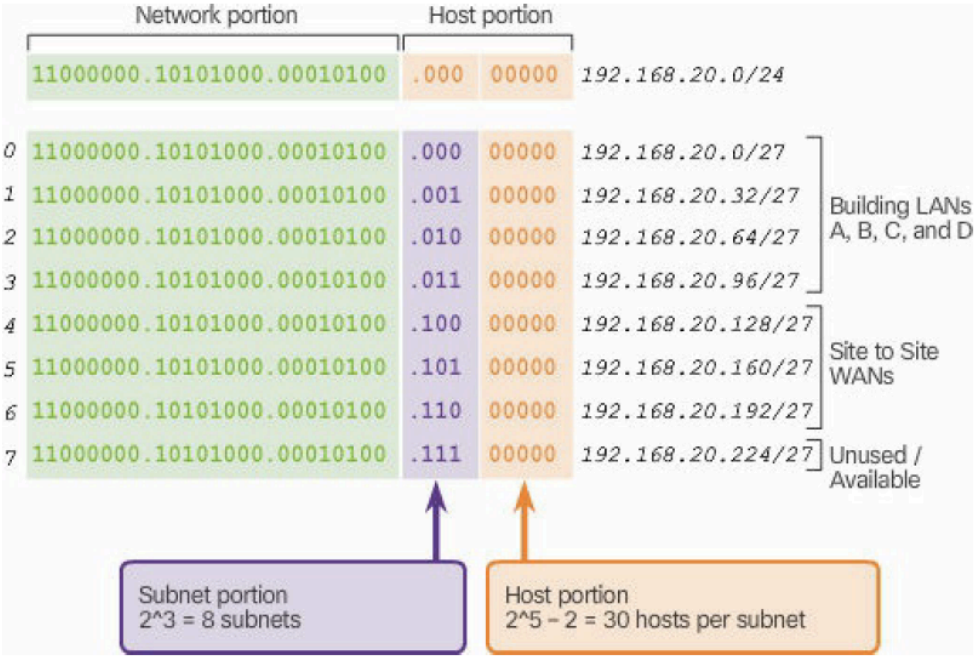


Figure 8-36 Basic Subnet Scheme

f. Calculate the binary and decimal value of the new subnet mask.

```
11111111.11111111.11111111. _1__ _1__ _1__ _0__ _0__ _0__ _0__ _0__
Subnet Mask:
   255  .   255  .   255  . __224____

Value of 224 for Subnet Mask:
1 1 1 0 0 0 0 0
    ^
    Bits available in octet:
    2^5 = 32
```

g. Fill in the **Subnet Table**, listing the decimal value of all available subnets, the first and last usable host address, and the broadcast address. Repeat until all addresses are listed.

Note: You may not need to use all rows.

Subnet Table

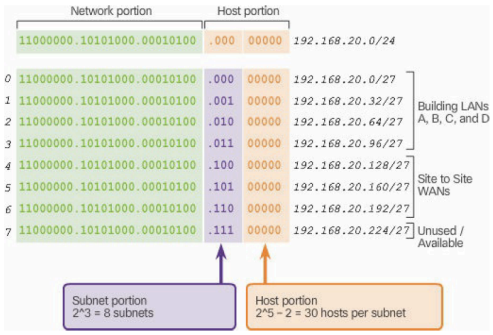
```
Net 0: 192 . 168 . 100 .  0   0   0   0   0   0   0   0

Net 1: 192 . 168 . 100 . _0__ _0__ _1__ _0__ _0__ _0__ _0__ _0__

Net 2: 192 . 168 . 100 . _0__ _1__ _0__ _0__ _0__ _0__ _0__ _0__

Net 3: 192 . 168 . 100 . _0__ _1__ _1__ _0__ _0__ _0__ _0__ __0_

Net 4: 192 . 168 . 100 . _1__ _0__ _0__ _0__ _0__ _0__ _0__ _0__
```



	/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

Net 0	Network	192.	168.	1.	00	00	0000	192.168.1.0
	First	192.	168.	1.	00	00	0001	192.168.1.1
	Last	192.	168.	1.	00	11	1110	192.168.1.62
	Broadcast	192.	168.	1.	00	11	1111	192.168.1.63
Net 1	Network	192.	168.	1.	01	00	0000	192.168.1.64
	First	192.	168.	1.	01	00	0001	192.168.1.65
	Last	192.	168.	1.	01	11	1110	192.168.1.126
	Broadcast	192.	168.	1.	01	11	1111	192.168.1.127
Net 2	Network	192.	168.	1.	10	00	0000	192.168.1.128
	First	192.	168.	1.	10	00	0001	192.168.1.129
	Last	192.	168.	1.	10	11	1110	192.168.1.190
	Broadcast	192.	168.	1.	10	11	1111	192.168.1.191

Subnet Number	Subnet Address	First Usable Host Address	Last Usable Host Address	Broadcast Address
0	192.168.100.0	192.168.100.1	192.168.100.30	192.168.100.31
1	192.168.100.32	192.168.100.33	192.168.100.62	192.168.100.63
2	192.168.100.64	192.168.100.65	192.168.100.94	192.168.100.95
3	192.168.100.96	192.168.100.97	192.168.100.126	192.168.100.127

4	192.168.100.128	192.168.100.129	192.168.100.158	192.168.100.159
5	192.168.100.160	192.168.100.161	192.168.100.190	192.168.100.191
6	192.168.100.192	192.168.100.193	192.168.100.222	192.168.100.223
7	192.168.100.224	192.168.100.225	192.168.100.254	192.168.100.255
8				
9				
10				

- First Usable Host Address - 192.168.100.1;

- Enter: enable
- Enter: configure terminal
- Enter: ipv unicast-routing
- Enter: interface gigabitethernet 0/0
- Enter: ip address 192.168.100.1 255.255.255.224
- Enter: exit

- First Usable Host Address - 192.168.100.33;

- Enter: interface gigabitethernet 0/1
- Enter: ip address 192.168.100.33 255.255.255.224
- Enter: exit

- First Usable Host Address - 192.168.100.65;

- Enter: interface serial 0/0/0
- Enter: ip address 192.168.100.65 255.255.255.224
- Enter: exit

- First Usable Host Address - 192.168.100.97;

- Enter: enable
- Enter: configure terminal
- Enter: hostname R2
- Enter: ipv unicast-routing
- Enter: interface gigabitethernet 0/0
- Enter: ip address 192.168.100.97 255.255.255.224
- Enter: exit

- First Usable Host Address - 192.168.100.129;

- Enter: interface gigabitethernet 0/1
- Enter: ip address 192.168.100.129 255.255.255.224
- Enter: exit

- First Usable Host Address - 192.168.100.161;

- Enter: interface serial 0/0/0
- Enter: ip address 192.168.100.161 255.255.255.224
- Enter: exit

- First Usable Host Address - 192.168.100.193;

- Enter: enable
- Enter: configure terminal
- Enter: hostname S1
- Enter: ipv unicast-routing
- Enter: interface vlan1
- Enter: ip address 192.168.100.193 255.255.255.224
- Enter: exit
- Enter: hostname S2
- Enter: ipv unicast-routing
- Enter: interface vlan1
- Enter: ip address 192.168.100.193 255.255.255.224

- Enter: exit
- Enter: hostname S3
- Enter: ipv unicast-routing
- Enter: interface vlan1
- Enter: ip address 192.168.100.193 255.255.255.224
- Enter: exit
- Enter: hostname S4
- Enter: ipv unicast-routing
- Enter: interface vlan1
- Enter: ip address 192.168.100.193 255.255.255.224
- Enter: exit
    - First Usable Host Address - 192.168.100.225;
- Enter: enable
- Enter: configure terminal
- Enter: hostname PC1
- Enter: ipv unicast-routing
- Enter: interface fastethernet0/1
- Enter: ip address 192.168.100.225 255.255.255.224
- Enter: exit
- Enter: hostname PC2
- Enter: ipv unicast-routing
- Enter: interface fastethernet0/2
- Enter: ip address 192.168.100.225 255.255.255.224
- Enter: exit
- Enter: hostname PC3
- Enter: ipv unicast-routing
- Enter: interface fastethernet0/3
- Enter: ip address 192.168.100.225 255.255.255.224
- Enter: exit
- Enter: hostname PC4
- Enter: ipv unicast-routing
- Enter: interface fastethernet0/4
- Enter: ip address 192.168.100.225 255.255.255.224
- Enter: exit

2. Assign the subnets to the network shown in the topology.

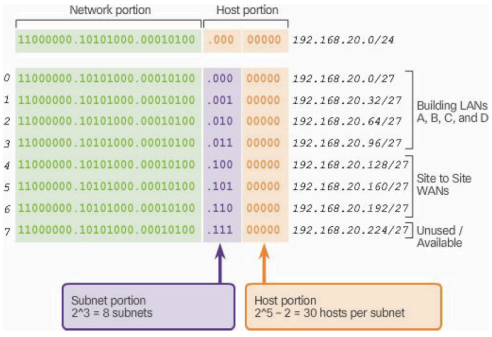
a. Assign Subnet 0 to the LAN connected to the GigabitEthernet 0/0 interface of R1: 192.168.100.0/27 _____

b. Assign Subnet 1 to the LAN connected to the GigabitEthernet 0/1 interface of R1: 192.168.100.32/27_____

c. Assign Subnet 2 to the LAN connected to the GigabitEthernet 0/0 interface of R2: 192.168.100.64/27_____

d. Assign Subnet 3 to the LAN connected to the GigabitEthernet 0/1 interface of R2: 192.168.100.96/27_____

e. Assign Subnet 4 to the WAN link between R1 to R2: 192.168.100.128/27 _____



3. Document the addressing scheme.

Fill in the **Addressing Table** using the following guidelines:

a. Assign the first usable IP addresses to R1 for the two LAN links and the WAN link.

b. Assign the first usable IP addresses to R2 for the LANs links. Assign the last usable IP address for the WAN link.

c. Assign the second usable IP addresses to the switches.

d. Assign the last usable IP addresses to the hosts.

2. Assign IP Addresses to Network Devices and Verify Connectivity

Most of the IP addressing is already configured on this network. Implement the following steps to complete the addressing configuration.

1. Configure IP addressing on R1 LAN interfaces.

```
R1>
R1>enable
R1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface gigabitethernet 0/0
R1(config-if)#ip address 192.168.100.1 255.255.255.224
R1(config-if)#no shut

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

R1(config-if)#ip address 192.168.100.33 255.255.255.224
R1(config-if)#no shut

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
```

2. Configure IP addressing on S3, including the default gateway.

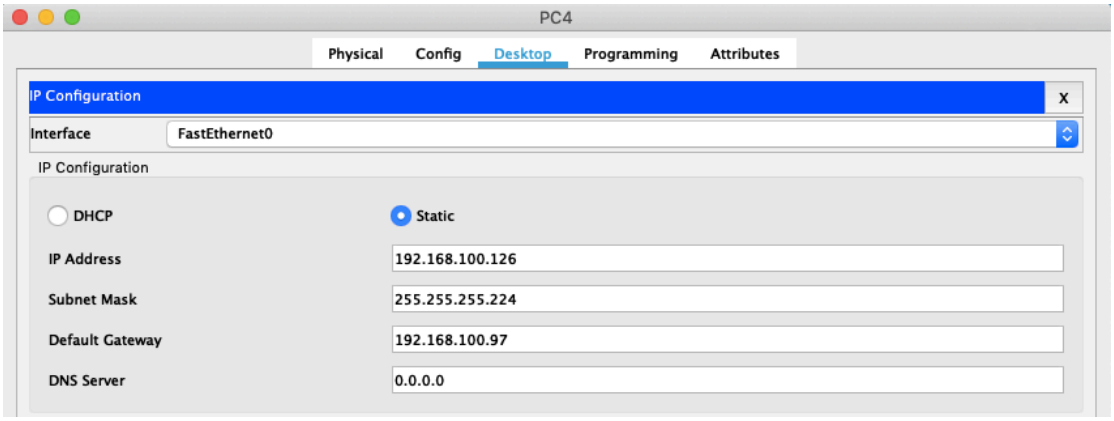
```
S3>enable
S3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)#interface vlan 1
S3(config-if)#ip address 192.168.100.66 255.255.255.224
S3(config-if)#no shut

S3(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up
```

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

S3(config-if)#exit
S3(config)#ip default-gateway 192.168.100.65
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console

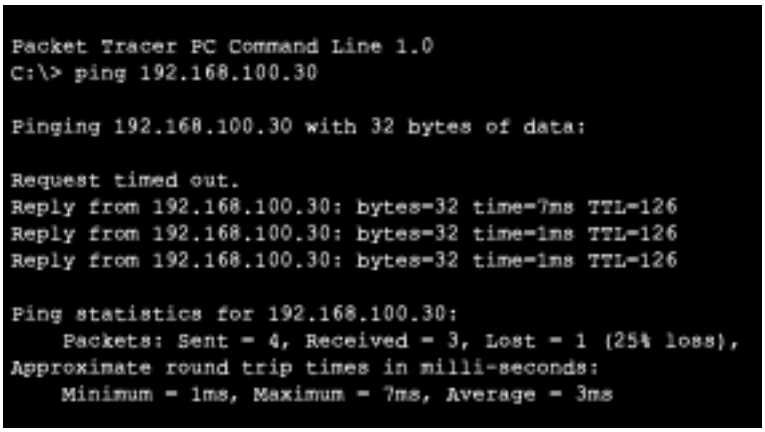
3. Configure IP addressing on PC4, including the default gateway.



4.Verify connectivity.

You can only verify connectivity from R1, S3, and PC4. However, you should be able to ping every IP address listed in the **Addressing Table**.

-Ping to PC1 from PC4 command prompt



-Ping to R1 G0/0 from PC4 command prompt

```
C:\> ping 192.168.100.1

Pinging 192.168.100.1 with 32 bytes of data:

Reply from 192.168.100.1: bytes=32 time=2ms TTL=254
Reply from 192.168.100.1: bytes=32 time=1ms TTL=254
Reply from 192.168.100.1: bytes=32 time=1ms TTL=254
Reply from 192.168.100.1: bytes=32 time=1ms TTL=254

Ping statistics for 192.168.100.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

Suggested Scoring Rubric

Activity Section	Question Location	Possible Points	Earned Points
Part 1: Design an IP Addressing Scheme	Step 1a	1	
	Step 1b	1	
	Step 1c	1	
	Step 1d	1	
	Step 1e	4	
	Step 1f	2	
Complete Subnet Table	Step 1g	10	
Assign Subnets	Step 2	10	
Document Addressing	Step 3	40	
	Part 1 Total	**70**	
	Packet Tracer Score	**30**	
	Total Score	**100**	