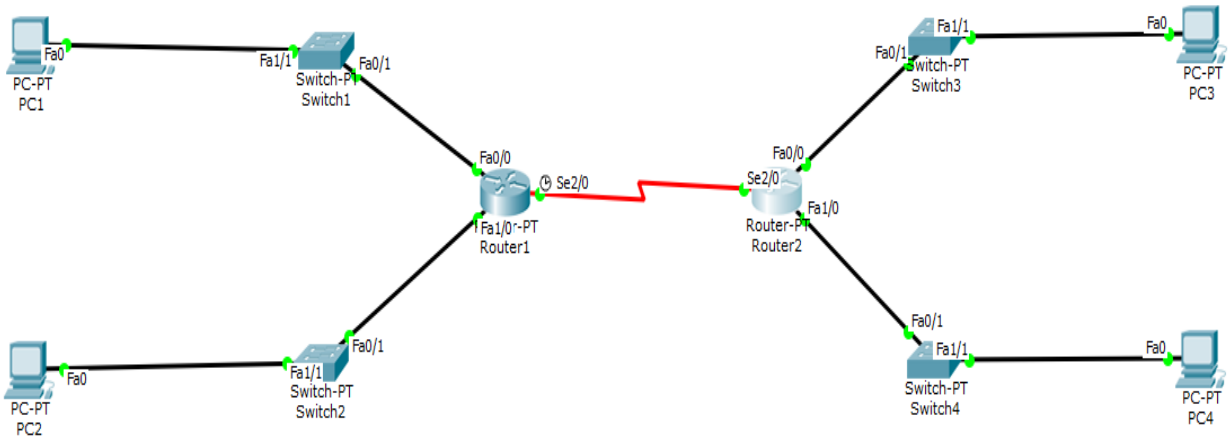
IP Addressing
&
Network Configuration
PRACTICAL
Exercises

Section A : Design an IP Addressing Scheme

You are given the network address of 192.168.150.10 and requested to subnet and provide the IP addressing for the network shown in the topology shown below. Each LAN in the network requires enough space for minimum 27 addresses for end devices.



1. What is the default subnet mask for the given the network address?
2. Based on the topology, how many subnets are needed?
3. How many bits must be borrowed to support the number of subnets in the topology?
4. What are the total subnets for borrowed bits?
5. How many usable hosts does this create per subnet?
6. What is the new subnet mask?
7. What is the network address for the IP address?

8. Fill in the Table below, 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 number	Network ID	Useable Hosts	Broadcasting Address
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			

Section B: Packet Tracer Configuration

Instruction:

a. Please use "Generic" type for router (Router-PT) and switch (Switch-PT).
b. Verify the connection:
   - PC1 must can ping PC3
   - PC2 must can ping PC4
   - PC3 must can ping PC2
   - PC4 must can ping PC1

……

1. Follow the figure from **Section A**, create the topology diagram and connect all devices by using Packet Tracer (choose correct devices and cabling) accordingly.

2. Configure the Routers' interfaces, Ethernet interfaces of all PCs with IP addresses, and the default gateway with IP addresses from the table from **Section A**. Use the table below to help you assigning IP addresses properly

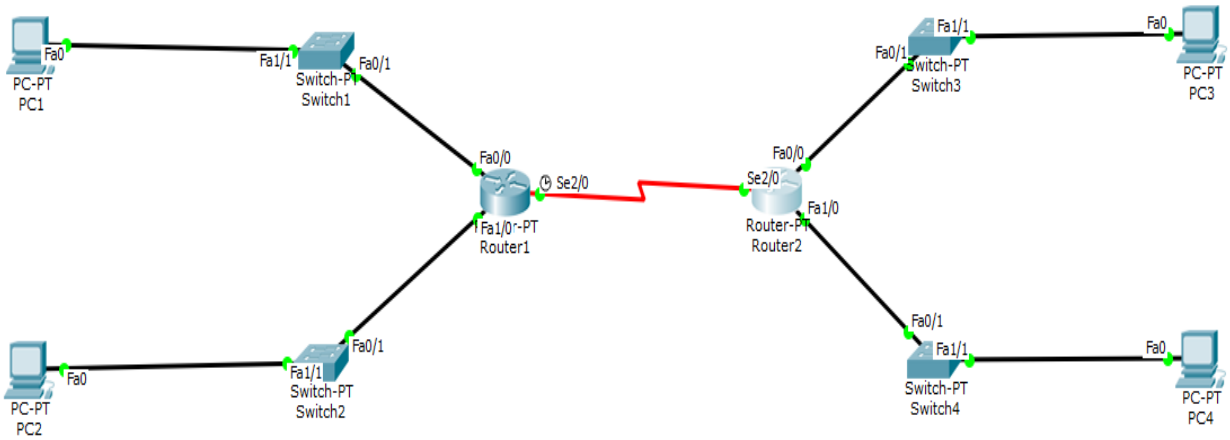
Device	Interface	Network Address	IP Address	Default Gateway
R1	Fa0/0			N/A
	Fa1/0			N/A
	Se2/0			N/A
R2	Fa0/0			N/A
	Fa1/0			N/A
	Se2/0			N/A
PC1	NIC			
PC2	NIC			
PC3	NIC			
PC4	NIC			

3. Verify the network by using PING command and try to ping between all PCs.

Solution

Section A : Design an IP Addressing Scheme

You are given the network address of 192.168.150.10 and requested to subnet and provide the IP addressing for the network shown in the topology shown below. Each LAN in the network requires enough space for minimum 27 addresses for end devices.



1. What is the default subnet mask for the given the network address?
   255.255.255.224
2. Based on the topology, how many subnets are needed?
   5
3. How many bits must be borrowed to support the number of subnets in the topology?
   3
4. What are the total subnets for borrowed bits?
   8
5. How many usable hosts does this create per subnet?
   30
6. What is the new subnet mask?
   255.255.255.224
7. What is the network address for the IP address?
   192.168.150.0

8. Fill in the Table below, 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 number	Network ID	Useable Hosts	Broadcasting Address
0	**192.168.150.0**	**192.168.150.1-192.168.150.30**	**192.168.150.31**
1	**192.168.150.32**	**192.168.150.33-192.168.150.62**	**192.168.150.63**
2	**192.168.150.64**	**192.168.150.65-192.168.150.94**	**192.168.150.95**
3	**192.168.150.96**	**192.168.150.97-192.168.150.126**	**192.168.150.127**
4	**192.168.150.128**	**192.168.150.129-192.168.150.158**	**192.168.150.159**
5	**192.168.150.160**	**192.168.150.161-192.168.150.190**	**192.168.150.191**
6	**192.168.150.192**	**192.168.150.193-192.168.150.222**	**192.168.150.223**
7	**192.168.150.224**	**192.168.150.225-192.168.150.254**	**192.168.150.255**
8			
9			

Section B: Packet Tracer Configuration

Instruction:

a. Please use "Generic" type for router (Router-PT) and switch (Switch-PT).
b. Verify the connection:
   - PC1 must can ping PC3
   - PC2 must can ping PC4
   - PC3 must can ping PC2
   - PC4 must can ping PC1

……

1. Follow the figure from **Section A**, create the topology diagram and connect all devices by using Packet Tracer (choose correct devices and cabling) accordingly.

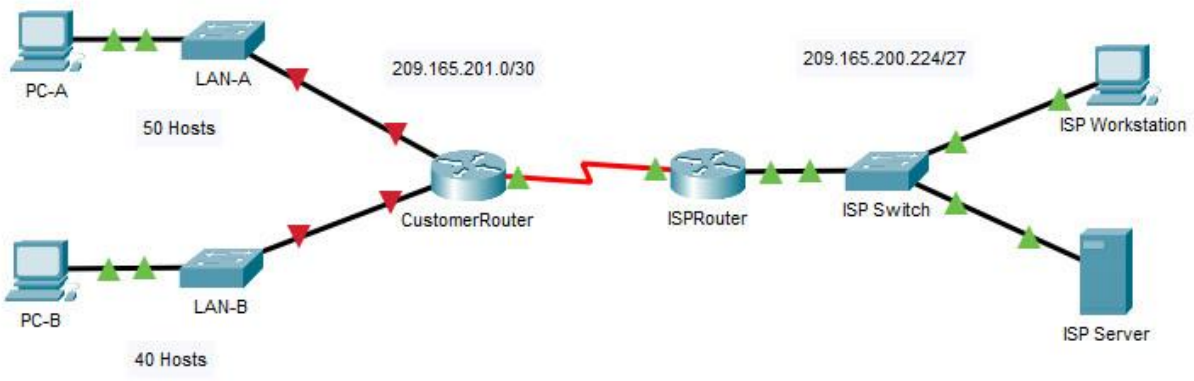
2. Configure the Routers' interfaces, Ethernet interfaces of all PCs with IP addresses, and the default gateway with IP addresses from the table from **Section A**. Use the table below to help you assigning IP addresses properly

Device	Interface	Network Address	IP Address	Default Gateway
R1	Fa0/0	192.168.150.0	192.168.150.1	N/A
	Fa1/0	192.168.150.32	192.168.150.33	N/A
	Se2/0	192.168.150.64	192.168.150.65	N/A
R2	Fa0/0	192.168.150.96	192.168.150.97	N/A
	Fa1/0	192.168.150.128	192.168.150.129	N/A
	Se2/0	192.168.150.64	192.168.150.66	N/A
PC1	NIC	192.168.150.0	192.168.150.2	192.168.150.1
PC2	NIC	192.168.150.32	192.168.150.34	192.168.150.33
PC3	NIC	192.168.150.96	192.168.150.98	192.168.150.97
PC4	NIC	192.168.150.128	192.168.150.130	192.168.150.129

3. Verify the network by using PING command and try to ping between all PCs.

Q1. Subnet an IPv4 Network

Topology

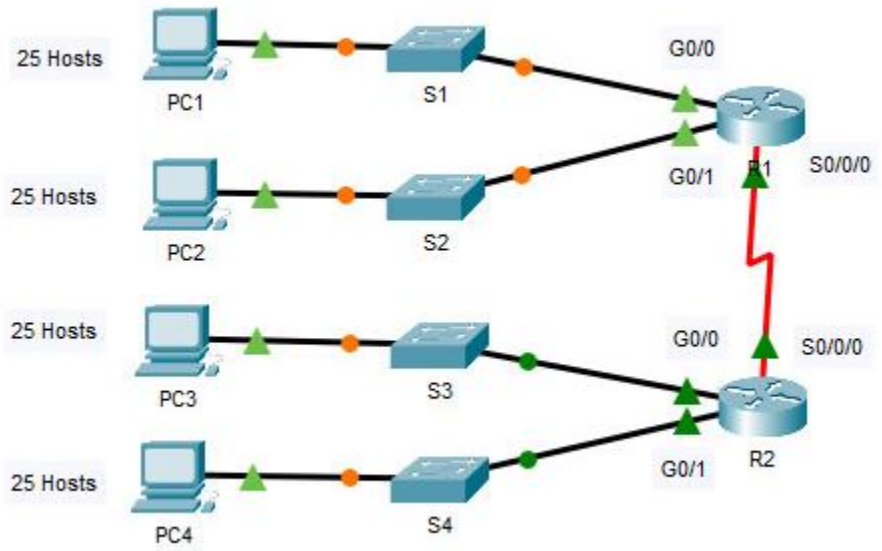


Device Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
CustomerRouter	G0/0			N/A
	G0/1			N/A
	S0/1/0	209.165.201.2	255.255.255.252	N/A
LAN-A Switch	VLAN1			
LAN-B Switch	VLAN1			
PC-A	NIC			
PC-B	NIC			
ISPRouter	G0/0	209.165.200.225	255.255.255.224	N/A
	S0/1/0	209.165.201.1	255.255.255.252	N/A
ISPSwitch	VLAN1	209.165.200.226	255.255.255.224	209.165.200.225
ISP Workstation	NIC	209.165.200.235	255.255.255.224	209.165.200.225
ISP Server	NIC	209.165.200.240	255.255.255.224	209.165.200.225

Q2. Subnet an IPv4 Network 192.168.100.0/24

Topology



Device Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/0			
	G0/1			
	S0/0/0			
R2	G0/0			
	G0/1			
	S0/0/0			
S1	VLAN 1			

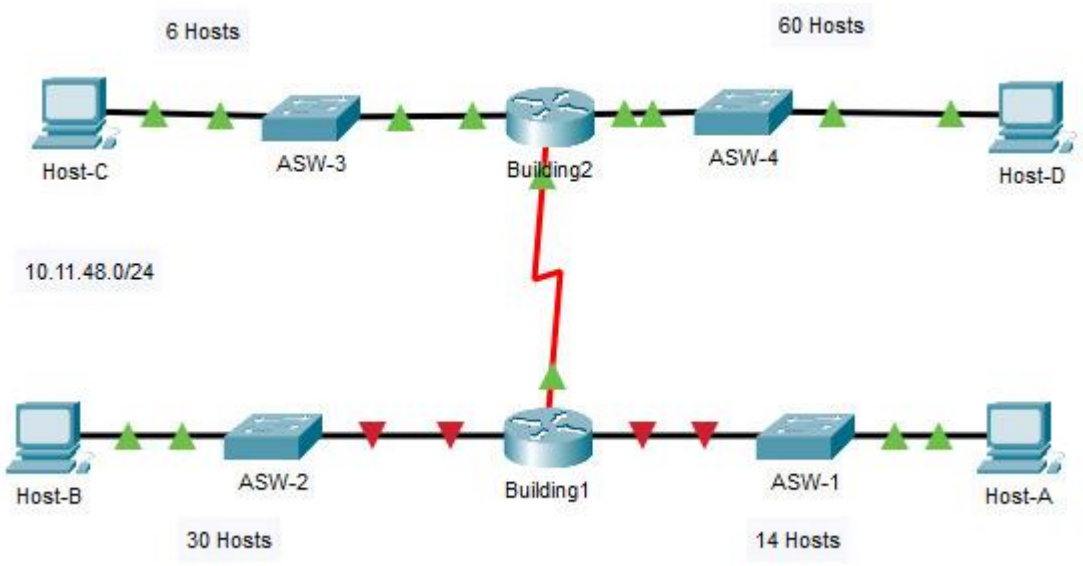
Device	Interface	IP Address	Subnet Mask	Default Gateway
S2	VLAN 1			
S3	VLAN 1			
S4	VLAN 1			
PC1	NIC			
PC2	NIC			
PC3	NIC			
PC4	NIC			

Subnet Table

Subnet Number	Subnet Address	First Usable Host Address	Last Usable Host Address	Broadcast Address
0				
1				
2				
3				
4				
5				
6				
7				

Q3. VLSM Design and Implementation - Network Address: 10.11.48.0/24

Topology



Device Addressing Table

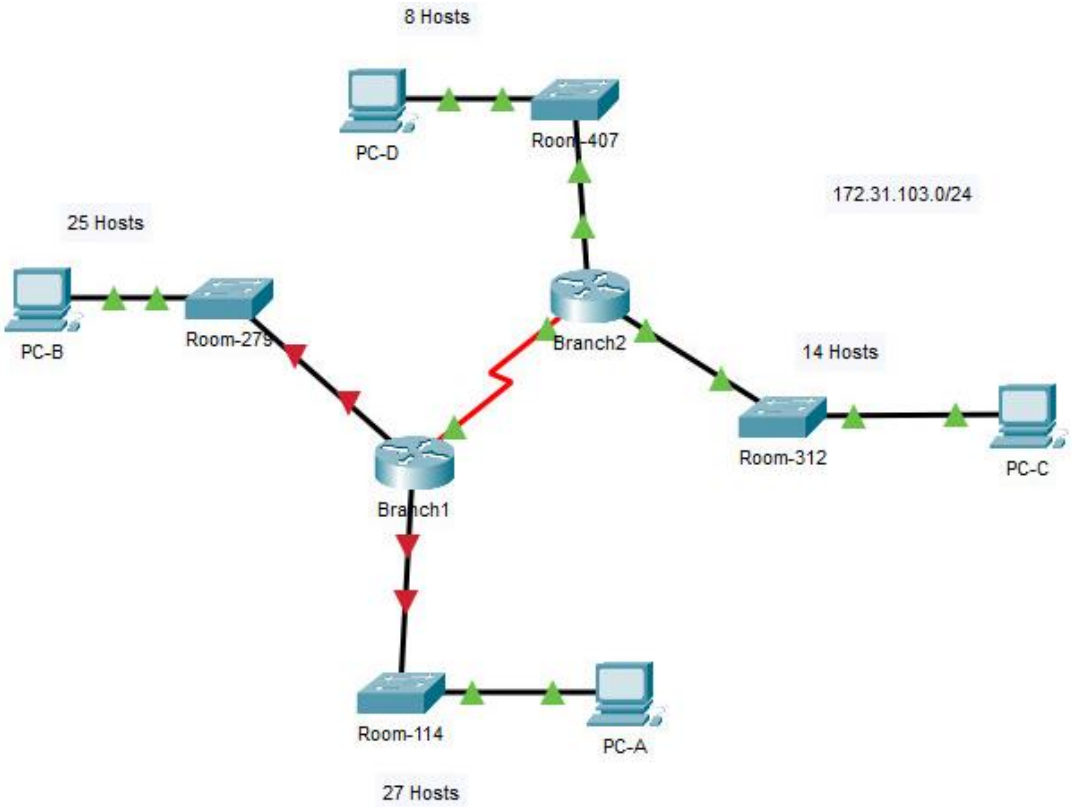
Device	Interface	Address	Subnet Mask	Default Gateway
Building1	G0/0			
	G0/1			
	S0/0/0			
Building2	G0/0			
	G0/1			
	S0/0/0			
ASW1	VLAN 1			
ASW2	VLAN 1			
ASW3	VLAN 1			
ASW4	VLAN 1			
Host-A	NIC			
Host-B	NIC			
Host-C	NIC			
Host-D	NIC			

Subnet Table

Subnet Description	Number of Hosts Needed	Network Address/CIDR	First Usable Host Address	Last Usable Host Address	Broadcast Address
Host-D LAN	60				
Host-B LAN	30				
Host-A LAN	14				
Host-C LAN	6				
WAN Link	2				

Q4. VLSM Design and Implementation - Network Address: 172.31.103.0/24

Topology



Subnet Table

Subnet Description	Number of Hosts Needed	Network Address/CIDR	First Usable Host Address	Last Usable Host Address	Broadcast Address
PC-A LAN	27				
PC-B LAN	25				
PC-C LAN	14				
PC-D LAN	8				
WAN Link	2				

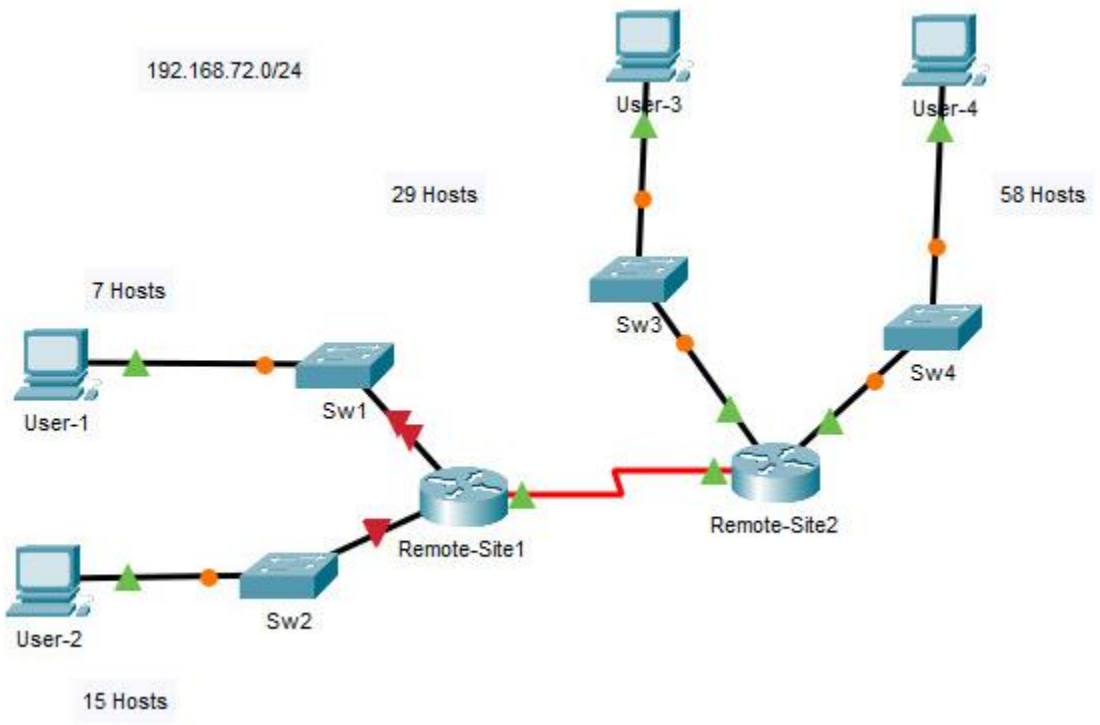
Device Addressing Table

Device	Interface	Address	Subnet Mask	Default Gateway
Branch1	G0/0			
	G0/1			
	S0/0/0			
Branch2	G0/0			
	G0/1			
	S0/0/0			
Room-114	VLAN 1			

Device	Interface	Address	Subnet Mask	Default Gateway
Room-279	VLAN 1			
Room-312	VLAN 1			
Room-407	VLAN 1			
PC-A	NIC			
PC-B	NIC			
PC-C	NIC			
PC-D	NIC			

Q5. VLSM Design and Implementation Scenario 3 - Network Address: 192.168.72.0/24

Topology



Subnet Table

Subnet Description	Number of Hosts Needed	Network Address/CIDR	First Usable Host Address	Last Usable Host Address	Broadcast Address
User-4 LAN	58				
User-3 LAN	29				
User-2 LAN	15				
User-1 LAN	7				
WAN Link	2				

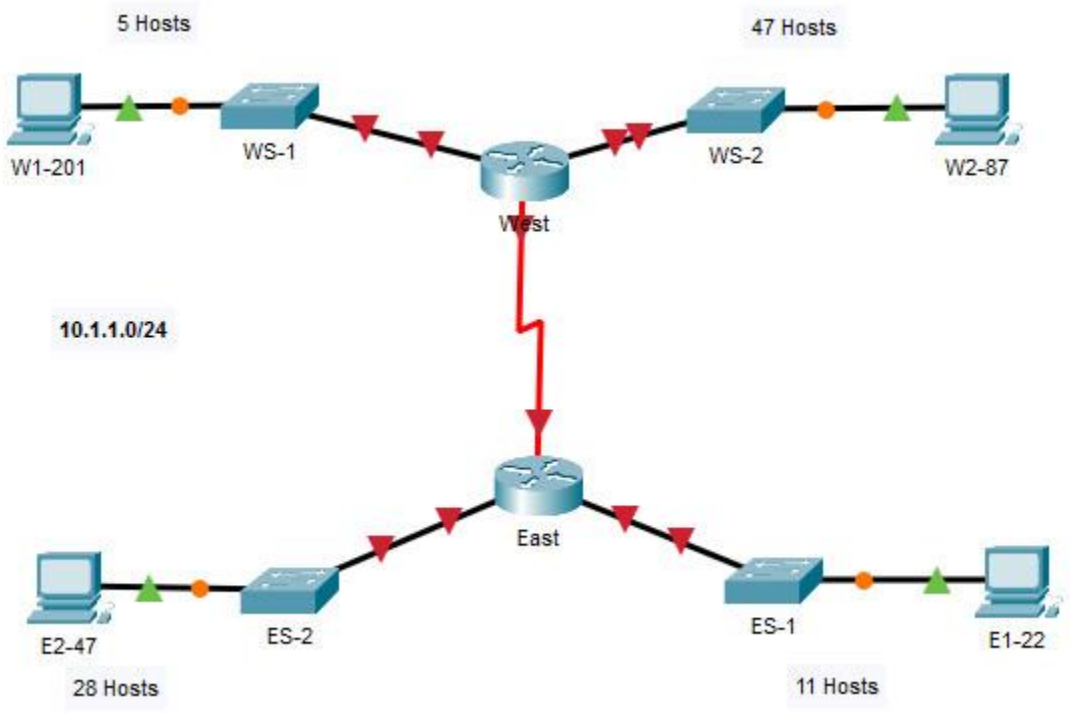
Device Addressing Table

Device	Interface	Address	Subnet Mask	Default Gateway
Remote-Site1	G0/0			
Remote-Site1	G0/1			
Remote-Site1	S0/0/0			
Remote-Site2	G0/0			
Remote-Site2	G0/1			

Device	Interface	Address	Subnet Mask	Default Gateway
Remote-Site2	S0/0/0			
Sw1	VLAN 1			
Sw2	VLAN 1			
Sw3	VLAN 1			
Sw4	VLAN 1			
User-1	NIC			
User-2	NIC			
User-3	NIC			
User-4	NIC			

Q6. Design and Implement a VLSM Addressing Scheme 10.1.1.0/24

Topology



Addressing Table

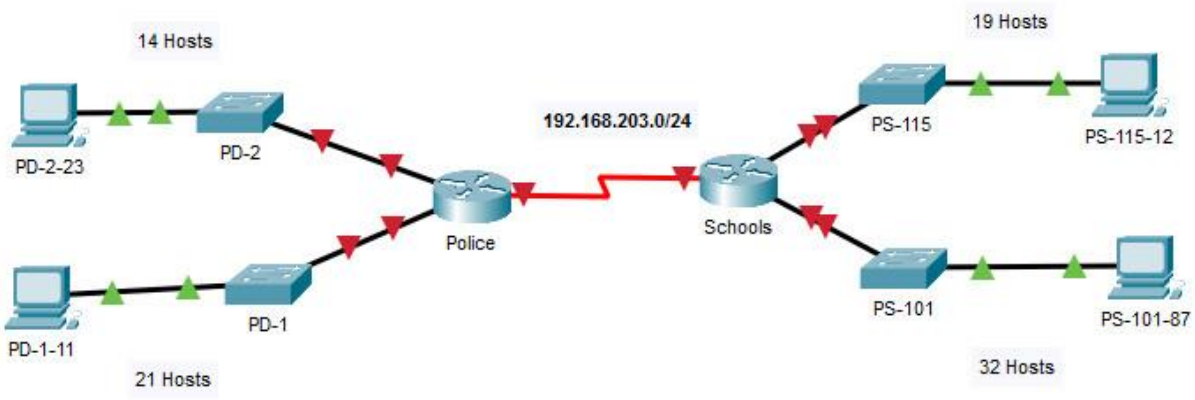
Device	Interface	Address	Subnet Mask	Default Gateway
East	G0/0			
	G0/1			
	S0/0/0			
West	G0/0			
	G0/1			
	S0/0/0			
ES-1	VLAN 1			

Device	Interface	Address	Subnet Mask	Default Gateway
ES-2	VLAN 1			
WS-1	VLAN 1			
WS-2	VLAN 1			
PC E1-22	NIC			
PC E2-47	NIC			
PC W1-201	NIC			
PC W2-87	NIC			

Device Addressing Table

Subnet Description	Number of Hosts Needed	Network Address/CIDR	First Usable Host Address	Last Usable Host Address	Broadcast Address
WS-2 LAN					
ES-2 LAN					
ES-1 LAN					
WS-1 LAN					
WAN Link					

Q7. Design and Implement a VLSM Addressing Scheme – Network Address: 192.168.203.0/24



Subnet Table

Subnet Description	Number of Hosts Needed	Network Address/CIDR	First Usable Host Address	Last Usable Host Address	Broadcast Address
PS-101 LAN	32				
PD-1 LAN	21				
PS-115 LAN	19				
PD-2 LAN	14				
WAN Link	2				

Device Addressing Table

Device	Interface	Address	Subnet Mask	Default Gateway
Police	G0/0			
Police	G0/1			
Police	S0/0/0			
Schools	G0/0			
Schools	G0/1			
Schools	S0/0/0			
PD-1	VLAN 1			
PD-2	VLAN 1			
PS-101	VLAN 1			
PS-115	VLAN 1			
PD-1-11	NIC			
PD-2-23	NIC			
PS-101-87	NIC			
PS-115-12	NIC			

Answers:

Q1.

Device Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
CustomerRouter	G0/0	192.168.0.1	255.255.255.192	N/A
	G0/1	192.168.0.65	255.255.255.192	N/A
	S0/1/0	209.165.201.2	255.255.255.252	N/A
LAN-A Switch	VLAN1	192.168.0.2	255.255.255.192	192.168.0.1
LAN-B Switch	VLAN1	192.168.0.66	255.255.255.192	192.168.0.65
PC-A	NIC	192.168.0.62	255.255.255.192	192.168.0.1
PC-B	NIC	192.168.0.126	255.255.255.192	192.168.0.65
ISPRouter	G0/0	209.165.200.225	255.255.255.224	N/A
	S0/1/0	209.165.201.1	255.255.255.252	N/A
ISPSwitch	VLAN1	209.165.200.226	255.255.255.224	209.165.200.225
ISP Workstation	NIC	209.165.200.235	255.255.255.224	209.165.200.225
ISP Server	NIC	209.165.200.240	255.255.255.224	209.165.200.225

Q2.

Device Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/0	192.168.100.1	255.255.255.224	N/A
	G0/1	192.168.100.33	255.255.255.224	N/A
	S0/0/0	192.168.100.129	255.255.255.224	N/A
R2	G0/0	192.168.100.65	255.255.255.224	N/A
	G0/1	192.168.100.97	255.255.255.224	N/A
	S0/0/0	192.168.100.158	255.255.255.224	N/A
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

Subnet Table

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

Q3.

Device Addressing Table

Device	Interface	Address	Subnet Mask	Default Gateway
Building1	G0/0	10.11.48.97	255.255.255.240	N/A
	G0/1	10.11.48.65	255.255.255.224	N/A
	S0/0/0	10.11.48.121	255.255.255.252	N/A
Building2	G0/0	10.11.48.113	255.255.255.248	N/A
	G0/1	10.11.48.1	255.255.255.192	N/A
	S0/0/0	10.11.48.122	255.255.255.252	N/A
ASW1	VLAN 1	10.11.48.98	255.255.255.240	10.11.48.97
ASW2	VLAN 1	10.11.48.66	255.255.255.224	10.11.48.65
ASW3	VLAN 1	10.11.48.114	255.255.255.248	10.11.48.113
ASW4	VLAN 1	10.11.48.2	255.255.255.192	10.11.48.1
Host-A	NIC	10.11.48.110	255.255.255.240	10.11.48.97
Host-B	NIC	10.11.48.94	255.255.255.224	10.11.48.65
Host-C	NIC	10.11.48.118	255.255.255.248	10.11.48.113
Host-D	NIC	10.11.48.62	255.255.255.192	10.11.48.1

Subnet Table

Subnet Description	Number of Hosts Needed	Network Address/CIDR	First Usable Host Address	Last Usable Host Address	Broadcast Address
Host-D LAN	60	10.11.48.0/26	10.11.48.1	10.11.48.62	10.11.48.63
Host-B LAN	30	10.11.48.64/27	10.11.48.65	10.11.48.94	10.11.48.95
Host-A LAN	14	10.11.48.96/28	10.11.48.97	10.11.48.110	10.11.48.111
Host-C LAN	6	10.11.48.112/29	10.11.48.113	10.11.48.118	10.11.48.119
WAN Link	2	10.11.48.120/30	10.11.48.121	10.11.48.122	10.11.48.123

Q4.

Subnet Table

Subnet Description	Number of Hosts Needed	Network Address/CIDR	First Usable Host Address	Last Usable Host Address	Broadcast Address
PC-A LAN	27	172.31.103.0/27	172.31.103.1	172.31.103.30	172.31.103.31
PC-B LAN	25	172.31.103.32/27	172.31.103.33	172.31.103.62	172.31.103.63
PC-C LAN	14	172.31.103.64/28	172.31.103.65	172.31.103.78	172.31.103.79
PC-D LAN	8	172.31.103.80/28	172.31.103.81	172.31.103.94	172.31.103.95
WAN Link	2	172.31.103.96/30	172.31.103.97	172.31.103.98	172.31.103.99

Device Addressing Table

Device	Interface	Address	Subnet Mask	Default Gateway
Branch1	G0/0	172.31.103.1	255.255.255.224	N/A
	G0/1	172.31.103.33	255.255.255.224	N/A
	S0/0/0	172.31.103.97	255.255.255.252	N/A
Branch2	G0/0	172.31.103.65	255.255.255.240	N/A
	G0/1	172.31.103.81	255.255.255.240	N/A
	S0/0/0	172.31.103.98	255.255.255.252	N/A
Room-114	VLAN 1	172.31.103.2	255.255.255.224	172.31.103.1
Room-279	VLAN 1	172.31.103.34	255.255.255.224	172.31.103.33
Room-312	VLAN 1	172.31.103.66	255.255.255.240	172.31.103.65
Room-407	VLAN 1	172.31.103.82	255.255.255.240	172.31.103.81
PC-A	NIC	172.31.103.30	255.255.255.224	172.31.103.1
PC-B	NIC	172.31.103.62	255.255.255.224	172.31.103.33

Device	Interface	Address	Subnet Mask	Default Gateway
PC-C	NIC	172.31.103.78	255.255.255.240	172.31.103.65
PC-D	NIC	172.31.103.94	255.255.255.240	172.31.103.81

Q5.

Subnet Table

Subnet Description	Number of Hosts Needed	Network Address/CIDR	First Usable Host Address	Last Usable Host Address	Broadcast Address
User-4 LAN	58	192.168.72.0/26	192.168.72.1	192.168.72.62	192.168.72.63
User-3 LAN	29	192.168.72.64/27	192.168.72.65	192.168.72.94	192.168.72.95
User-2 LAN	15	192.168.72.96/27	192.168.72.97	192.168.72.126	192.168.72.127
User-1 LAN	7	192.168.72.128/28	192.168.72.129	192.168.72.142	192.168.72.143
WAN Link	2	192.168.72.144/30	192.168.72.145	192.168.72.146	192.168.72.147

Device Addressing Table

Device	Interface	Address	Subnet Mask	Default Gateway
Remote-Site1	G0/0	192.168.72.129	255.255.255.240	N/A
Remote-Site1	G0/1	192.168.72.97	255.255.255.224	N/A
Remote-Site1	S0/0/0	192.168.72.145	255.255.255.252	N/A
Remote-Site2	G0/0	192.168.72.65	255.255.255.224	N/A
Remote-Site2	G0/1	192.168.72.1	255.255.255.192	N/A
Remote-Site2	S0/0/0	192.168.72.146	255.255.255.252	N/A
Sw1	VLAN 1	192.168.72.130	255.255.255.240	192.168.72.129
Sw2	VLAN 1	192.168.72.98	255.255.255.224	192.168.72.97
Sw3	VLAN 1	192.168.72.66	255.255.255.224	192.168.72.65
Sw4	VLAN 1	192.168.72.2	255.255.255.192	192.168.72.1
User-1	NIC	192.168.72.142	255.255.255.240	192.168.72.129
User-2	NIC	192.168.72.126	255.255.255.224	192.168.72.97
User-3	NIC	192.168.72.94	255.255.255.224	192.168.72.65
User-4	NIC	192.168.72.62	255.255.255.192	192.168.72.1

Q.6

Device Addressing Table

Device	Interface	Address	Subnet Mask	Default Gateway
East	G0/0	10.1.1.97	255.255.255.240	N/A
	G0/1	10.1.1.65	255.255.255.224	N/A
	S0/0/0	10.1.1.121	255.255.255.252	N/A
West	G0/0	10.1.1.113	255.255.255.248	N/A
	G0/1	10.1.1.1	255.255.255.192	N/A
	S0/0/0	10.1.1.122	255.255.255.252	N/A
ES-1	VLAN 1	10.1.1.98	255.255.255.240	10.1.1.97
ES-2	VLAN 1	10.1.1.66	255.255.255.224	10.1.1.65
WS-1	VLAN 1	10.1.1.114	255.255.255.248	10.1.1.113
WS-2	VLAN 1	10.1.1.2	255.255.255.192	10.1.1.1
PC E1-22	NIC	10.1.1.110	255.255.255.240	10.1.1.97
PC E2-47	NIC	10.1.1.94	255.255.255.224	10.1.1.65
PC W1-201	NIC	10.1.1.118	255.255.255.248	10.1.1.113
PC W2-87	NIC	10.1.1.62	255.255.255.192	10.1.1.1

Subnet Table

Subnet Description	Number of Hosts Needed	Network Address/CIDR	First Usable Host Address	Last Usable Host Address	Broadcast Address
WS-2 LAN	47	10.1.1.0/26	10.1.1.1	10.1.1.62	10.1.1.63
ES-2 LAN	28	10.1.1.64/27	10.1.1.65	10.1.1.94	10.1.1.95
ES-1 LAN	11	10.1.48.96/28	10.1.1.97	10.1.1.110	10.1.1.111
WS-1 LAN	5	10.1.48.112/29	10.1.1.113	10.1.1.118	10.1.1.119
WAN Link	2	10.1.48.120/30	10.1.1.121	10.1.1.122	10.1.1.123

Q7.

Subnet Table

Subnet Description	Number of Hosts Needed	Network Address/CIDR	First Usable Host Address	Last Usable Host Address	Broadcast Address
PS-101 LAN	32	192.168.203.0/26	192.168.203.1	192.168.203.62	192.168.203.63
PD-1 LAN	21	192.168.203.64/27	192.168.203.65	192.168.203.94	192.168.203.95
PS-115 LAN	19	192.168.203.96/27	192.168.203.97	192.168.203.126	192.168.203.127
PD-2 LAN	14	192.168.203.128/28	192.168.203.129	192.168.203.142	192.168.203.143
WAN Link	2	192.168.203.144/30	192.168.203.145	192.168.203.146	192.168.203.14

Device Addressing Table

Device	Interface	Address	Subnet Mask	Default Gateway
Police	G0/0	192.168.203.129	255.255.255.240	N/A
Police	G0/1	192.168.203.97	255.255.255.224	N/A
Police	S0/0/0	192.168.203.145	255.255.255.252	N/A
Schools	G0/0	192.168.203.65	255.255.255.224	N/A
Schools	G0/1	192.168.203.1	255.255.255.192	N/A
Schools	S0/0/0	192.168.203.146	255.255.255.252	N/A
PD-1	VLAN 1	192.168.203.130	255.255.255.240	192.168.203.129
PD-2	VLAN 1	192.168.203.98	255.255.255.224	192.168.203.97
PS-101	VLAN 1	192.168.203.66	255.255.255.224	192.168.203.65
PS-115	VLAN 1	192.168.203.2	255.255.255.192	192.168.203.1
PD-1-11	NIC	192.168.203.142	255.255.255.240	192.168.203.129
PD-2-23	NIC	192.168.203.126	255.255.255.224	192.168.203.97
PS-101-87	NIC	192.168.203.94	255.255.255.224	192.168.203.65
PS-115-12	NIC	192.168.203.62	255.255.255.192	192.168.203.1