

AIM OF THE EXPERIMENT :-

Consider a class C network $200.1.2.0$. Create 3 subnets for 100, 30 and 4 hosts. Also specify the network address, subnet mask and directed broadcast address for each subnet.

DETERMINATION OF REQUIRED SUBNET SIZES :-

- We have to create 3 subnets from class C network $200.1.2.0$ that can accommodate, 100, 30 and 4 hosts.
- It can be done by performing Variable Length Subnet Masking (VLSM)

→ Subnet 1 :-

100 hosts

So, it needs at least $2^7 - 2 = 126$ hosts (So, we use $/21$)

→ Subnet 2 :-

30 hosts

So, it needs at least $2^5 - 2 = 30$ hosts (So, we use $/27$)

→ Subnet 3 :-

4 hosts

So, it needs at least $2^3 - 2 = 6$ hosts (So, we use $/29$).

Computation of Subnet address, Subnet mask and directed broadcast address :-

- For subnet 1 we need 126 hosts. So, the last octave will be divided into 2 parts 1 bit for networking and rest 7 for host as $2^7 = 128$. So, for the subnet 1

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TABLE 6.1

S. No.	Network Address	Subnet Mask	Usable IP Range.	Broadcast Address
1	200.1.2.0	255.255.255.128 (/25)	200.1.2.1 - 200.1.2.126	200.1.2.127
2	200.1.2.128	255.255.255.224 (/27)	200.1.2.129 - 200.1.2.158	200.1.2.159
3	200.1.2.160	255.255.255.248 (/29)	200.1.2.161 - 200.1.2.166	200.1.2.167

the Network Address will be $200.1.2.0$, subnet mask would be $255.255.255.128$ ($/25$) and the directed broadcast address would be $200.1.2.127$ (Last host address).

⇒ For subnet 2: We need 30 hosts. So, the last octave will be divided in 2 parts, 3 bits for networking and 5 bits ($2^5=32$) for host. So, the network address will be $255.255.255.128$.

$$\begin{array}{c} \underbrace{11100000}_{\text{Network}} = 224 \\ \underbrace{\quad\quad\quad}_{\text{Host}} \end{array}$$

So, subnet mask would be $255.255.255.224$ ($/27$)

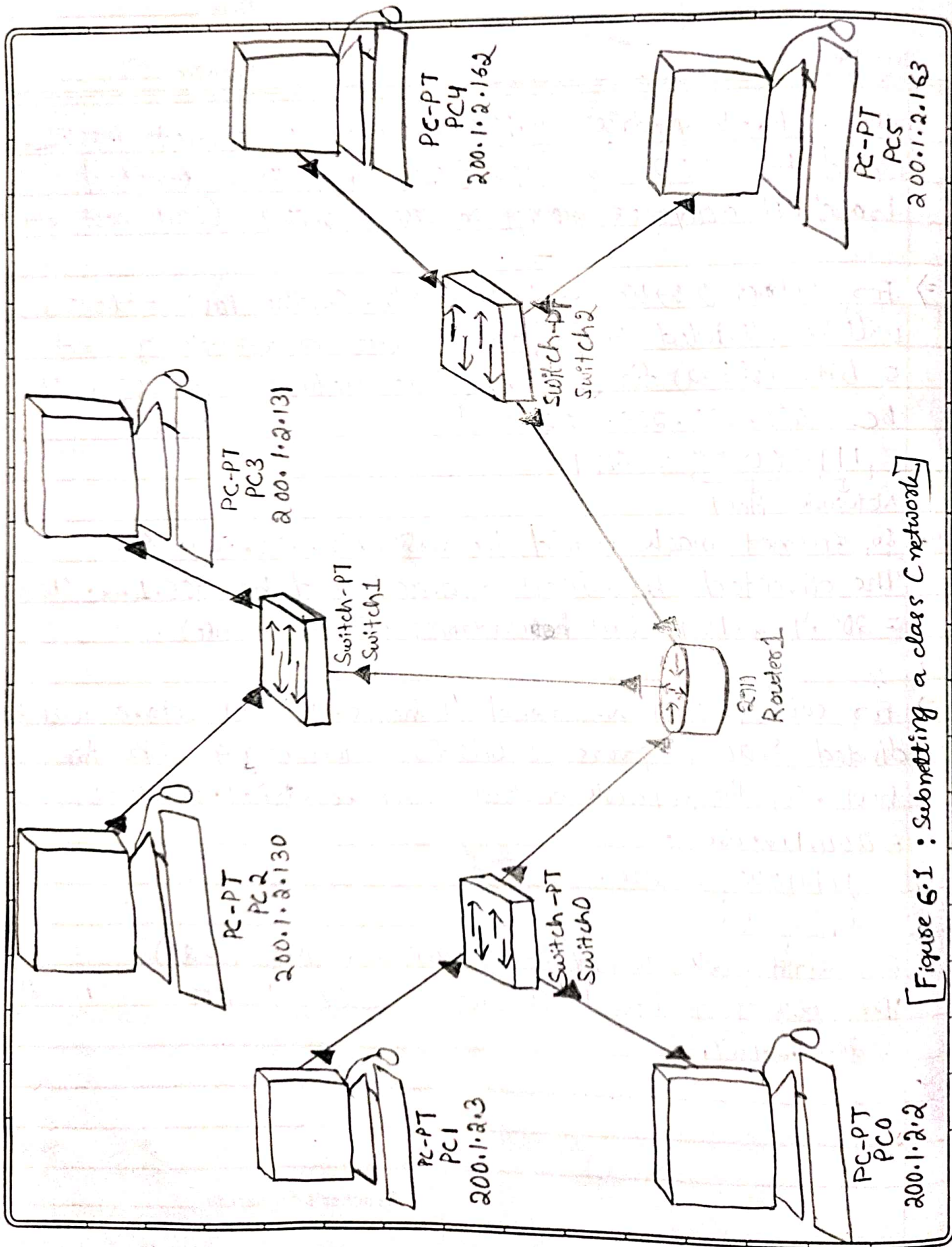
The directed broadcast address would be $200.1.2.(127+2)$
 $= 200.1.2.159$ (Last host address of this subnet).

⇒ For subnet 3: We need 4 hosts. So, last octave will be divided into 2 parts, 5 bits for networking & 3 bits for host. So, the network address will be $200.1.2.(159+1)$
 $= 200.1.2.160$.

$$\begin{array}{c} \underbrace{11111000}_{\text{Subnetting}} = 248 \\ \underbrace{\quad\quad\quad}_{\text{Host}} \end{array}$$

So, subnet mask would be $255.255.255.248$ ($/29$)

The directed broadcast address would be $200.1.2.(159+8)$
 $= 200.1.2.167$



[Figure 6.1 : Subnetting a class C network]

IMPLEMENTATION:DEVICES:

The following devices are used in the experiment for generating 3 subnets as per our require.

- PC0, PC1, PC2, PC3, PC4 and PC5 are personal computers which are connected in twos with 3 different switches.
- Switch0, Switch1 and Switch2 are 3 different PT-switches.
- One 2911 Router is used for network connection among the different subnets.

ARCHITECTURE:

- The network structure involves connecting 2 PCs with one switch through copper straight-through wire as shown in the figure 6.1.
- Like this - PC0, PC1 are connected with Switch0
 - PC2, PC3 are connected with Switch1
 - PC4, PC5 are connected with Switch2
- All the three switches are connected with the 2911 Router through the 3 Gigabit Ethernet ports.
- Switch0 is connected with Gigabit Ethernet 0/0 of Router1
- Switch1 is connected with Gigabit Ethernet 0/1 of Router1
- Switch2 is connected with Gigabit Ethernet 0/2 of Router1.
- All the 3 PT-switch are connected with the 2911 Router through Copper-straight-through wire as shown in the figure 6.1.

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CONFIGURATION OF NETWORK

- The IP address of PC0 is set to 200.1.2.2, Subnet Mask set to 255.255.255.128 and the default gateway is set to 200.1.2.1.
- The IP address of PC1 is set to 200.1.2.3, subnet mask set to 255.255.255.128 and the default gateway is set to 200.1.2.1.
- The IP address of PC2 is set to 200.1.2.130, subnet Mask is set to 255.255.255.224 and the default gateway is set to 200.1.2.129.
- The IP address of PC3 is set to 200.1.2.131, subnet Mask is set to 255.255.255.224 and the default gateway is set to 200.1.2.129.
- The IP address of PC4 is set to 200.1.2.162, subnet Mask is set to 255.255.255.248 and the default gateway is set to 200.1.2.161.
- The IP address of PC5 is set to 200.1.2.163, subnet mask is set to 255.255.255.248 and the default gateway is set to 200.1.2.161.
- The IP address of GigabitEthernet 0/0 port of Router1 is set to 200.1.2.1 and Subnet Mask is set to 255.255.255.128 and turned on.
- The IP address of GigabitEthernet 0/1 port of Router1 is set to 200.1.2.129 and subnet Mask is set to 255.255.255.224 and turned on.
- The IP address of GigabitEthernet 0/2 port of Router1 is set to 200.1.2.161 and subnet Mask is set to 255.255.255.248 and turned on.

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Output 6.1

>ping 200.1.2.163

pinging 200.1.2.163 with 32 bytes of data:

Reply from 200.1.2.163: bytes = 32 time < 1ms TTL = 127

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Reply from 200.1.2.163: bytes = 32 time = 1ms TTL = 127

Ping statistics for 200.1.2.163:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0 ms, Maximum = 1ms, Average = 0ms

Output 6.2

>ping 200.1.2.131

Pinging 200.1.2.131 with 32 bytes of data:

Reply from 200.1.2.131: bytes = 32 time = 3ms TTL = 128

Reply from 200.1.2.131: bytes = 32 time = 8ms TTL = 128

Reply from 200.1.2.131: bytes = 32 time = 1ms TTL = 128

Reply from 200.1.2.131: bytes = 32 time = 6ms TTL = 128

Ping statistics for 200.1.2.131:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 1ms, Maximum = 8ms, Average = 4ms

OBSERVATION →

- The systems were connected as per the architecture shown in the figure 6.1.
- The connection between different PCs was verified by using PDU packet transferred from one PC to another PC in the same subnet and in the different subnet.
- Then using the command prompt of the PCs connection status is checked whether it is connected or not.
- At PC0 command prompt it is checked the connection with PC5 by writing the command:
ping 200.1.2.163 then it is confirmed of the 0% loss of the 4 packet sent to PC3. (Output 6.1)
- Like this in PC2 command prompt it is checked the connection with PC3 by the command ping 200.1.2.131 and it is confirmed the 0% loss. (Output 6.2)
- Like this other connections are also confirmed.

CONCLUSION →

From the above experiment we are able to create 3 subnets effectively for accommodating 100, 30 and 4 hosts using switches and routers.