

Aim:

Implementation & understanding the use of Subnetting & VLSM with Cisco Packet Tracer

Obj-1

An overview on classless IPv4 addressing, CIDR notation, subnetting and VLSM used in computer networking

Classless IPv4:- Classless addressing come to replace the classful addressing and to handle the issue of allocation of IP address. It supports the VLSM.

CIDR notation:- Classes Inter Domain Routing is a method for allocating and specifying IP address more flexible than classful addressing. CIDR notation uses a "/" followed by the prefix length (no. of bits) to represent the n/w portion of an IP address  
eg:- 192.168.10/24

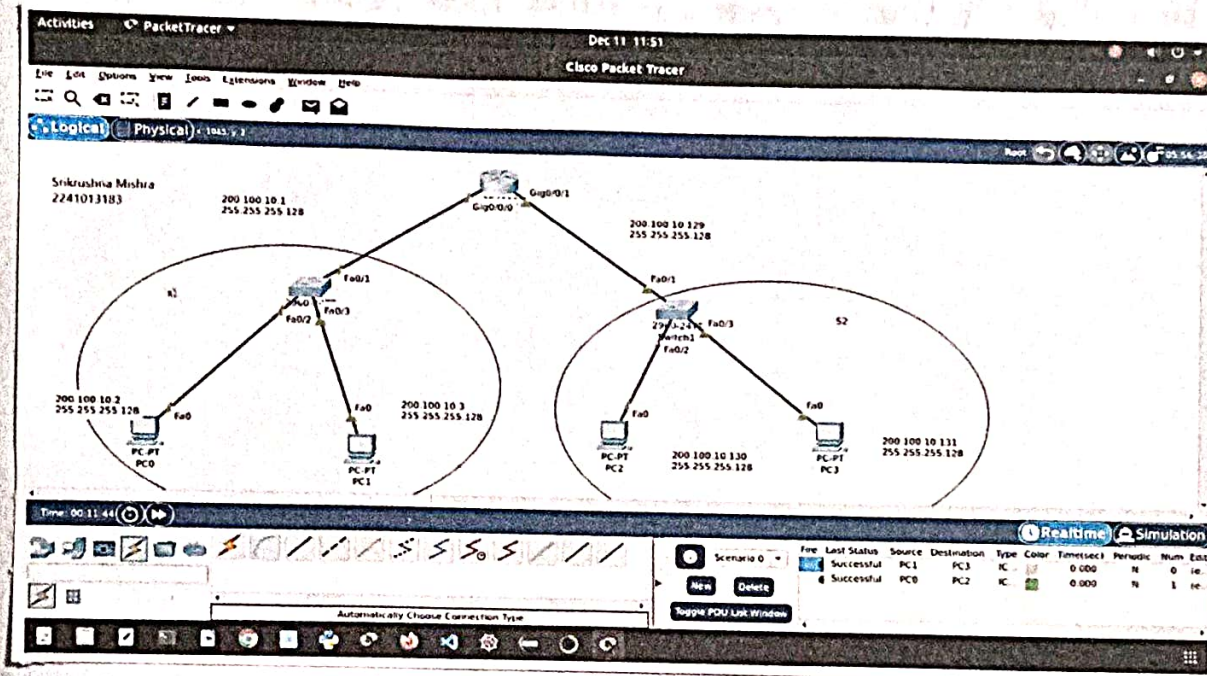
Subnetting:- Subnetting is the process of dividing a large n/w into smaller, more manageable sub n/w (subnets). This process is useful for optimizing address space and improving n/w performance

VLSM:- It is an extension of subnetting that allows for subnets of varying sizes within the same n/w. It allows the use of different subnet masks depending on the no. of hosts in each subnet.



Obj-2

Implementing the sub-netting technique to divide a n/w into smaller subnets (with predefined users) & analysing the communication b/w PCs in both intra & inter-subnets.



Router = 4331

Switch = 2960

Gig 0/0/0  $\Rightarrow$  200.100.10.1 (D.G.)  
Gig 0/0/1  $\Rightarrow$  200.100.10.129 (D.G.)

Subnet Mask

= 255.255.255.128

PC0  $\Rightarrow$  200.100.10.2

PC1  $\Rightarrow$  200.100.10.3

PC2  $\Rightarrow$  200.100.10.130

PC3  $\Rightarrow$  200.100.10.131

Subnet mask = 255.255.255.128

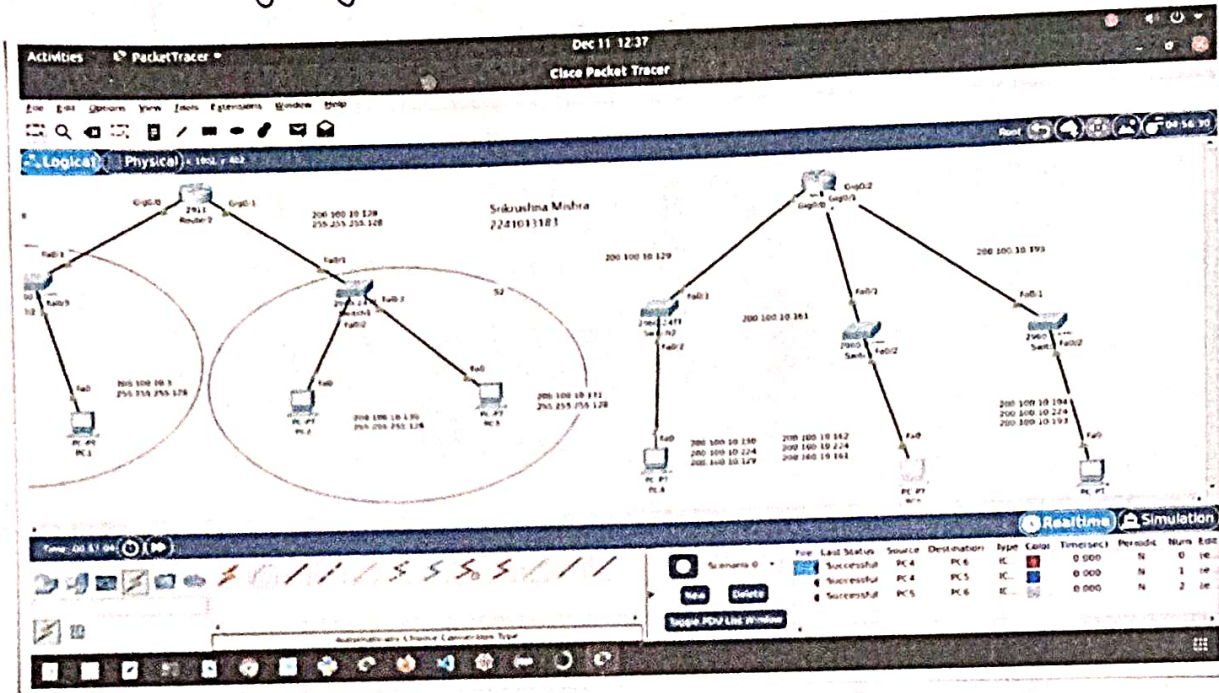
Name: \_\_\_\_\_

Regd. Number: \_\_\_\_\_



### Obj-3

Implementing the VLSM technique to optimize the IPv4 addresses allocations to PCs (belonging to subnets) & interfaces in a given n/w and analysing the communication b/w PCs in the n/w.



S1      S2  
200.100.10.0      200.100.10.128  
200.100.10.128      200.100.10.255

S2  
Sub - Subnets

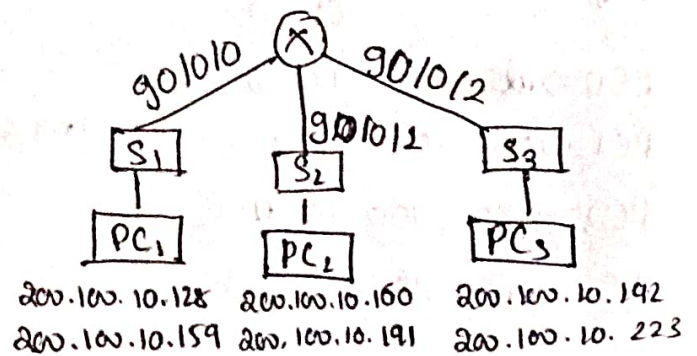
200.100.10.128/27

N/w address

Broadcast address = 200.100.10.159

We will divide the subnet-2 into 3-sub subnets; this is called VLSM.

we will perform VLSM on subnet-2



200.100.10.224  
200.100.10.255

future use



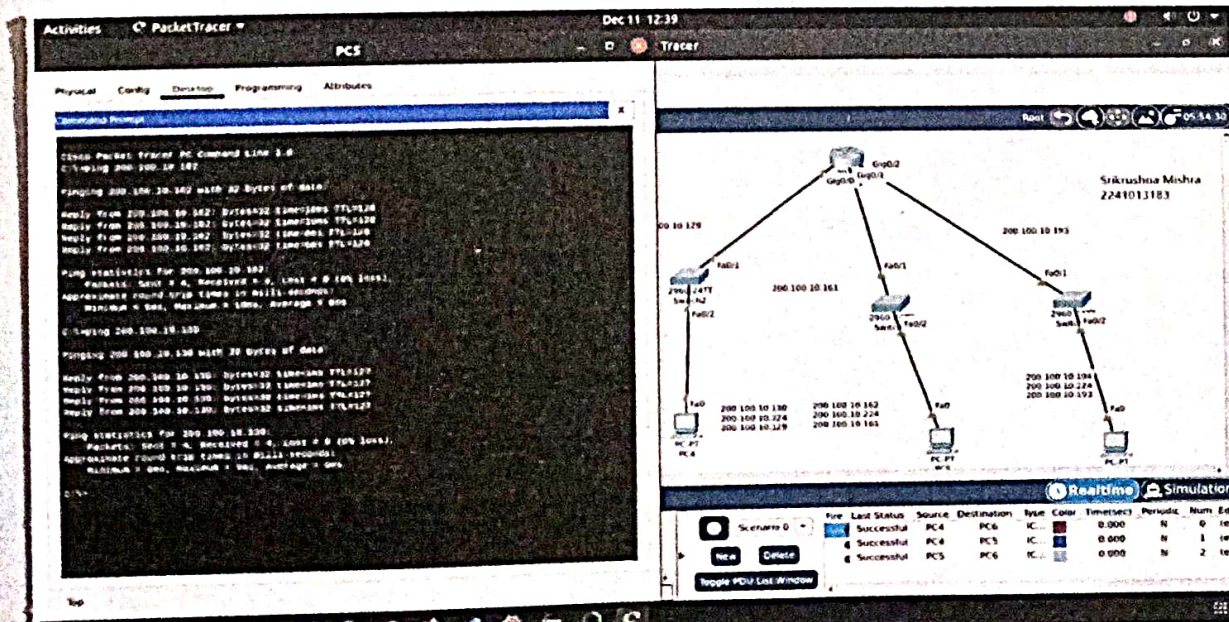
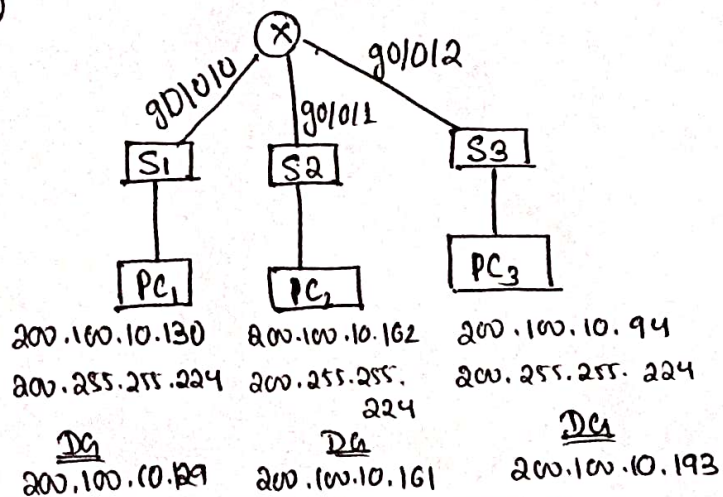
$2^1 = 2$   
 $2^2 = 4 \rightarrow 3 \text{ bit fixed}$   
divided by 4

VLSM:-

	<u>Subnet 1</u>	<u>Subnet 2</u>	<u>Subnet 3</u>	<u>Subnet 4</u>
N/w ID :-	200.100.10.128	200.100.10.160	200.100.10.192	200.100.10.224
1st usable:-	200.100.10.129	200.100.10.161	200.100.10.193	200.100.10.225
Last usable:-	200.100.10.158	200.100.10.190	200.100.10.222	200.100.10.254
Broadcast address:-	200.100.10.159	200.100.10.191	200.100.10.223	200.100.10.255

\* 255.255.255.1 | 00 | 0 0000  
1 | 11 | 0 0000

255.255.255.224 → Subnet mask



Name: \_\_\_\_\_

Regd. Number: \_\_\_\_\_



# \*Connect - 2 routers:-

## Router - 2

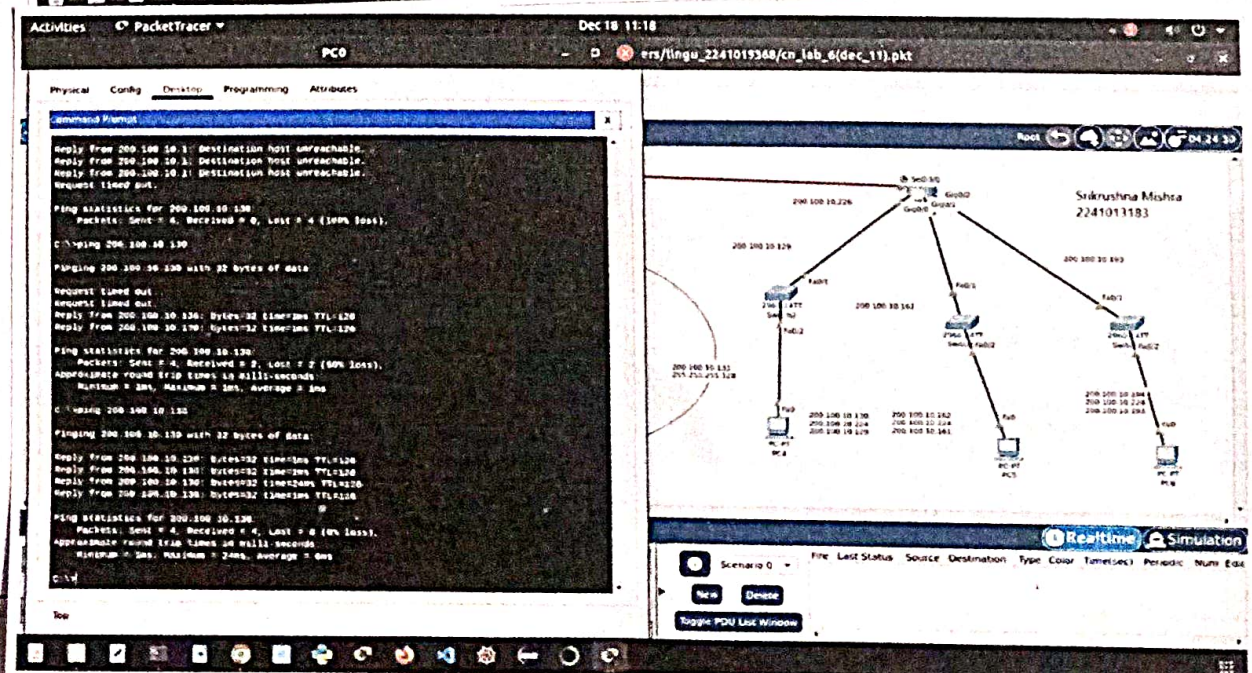
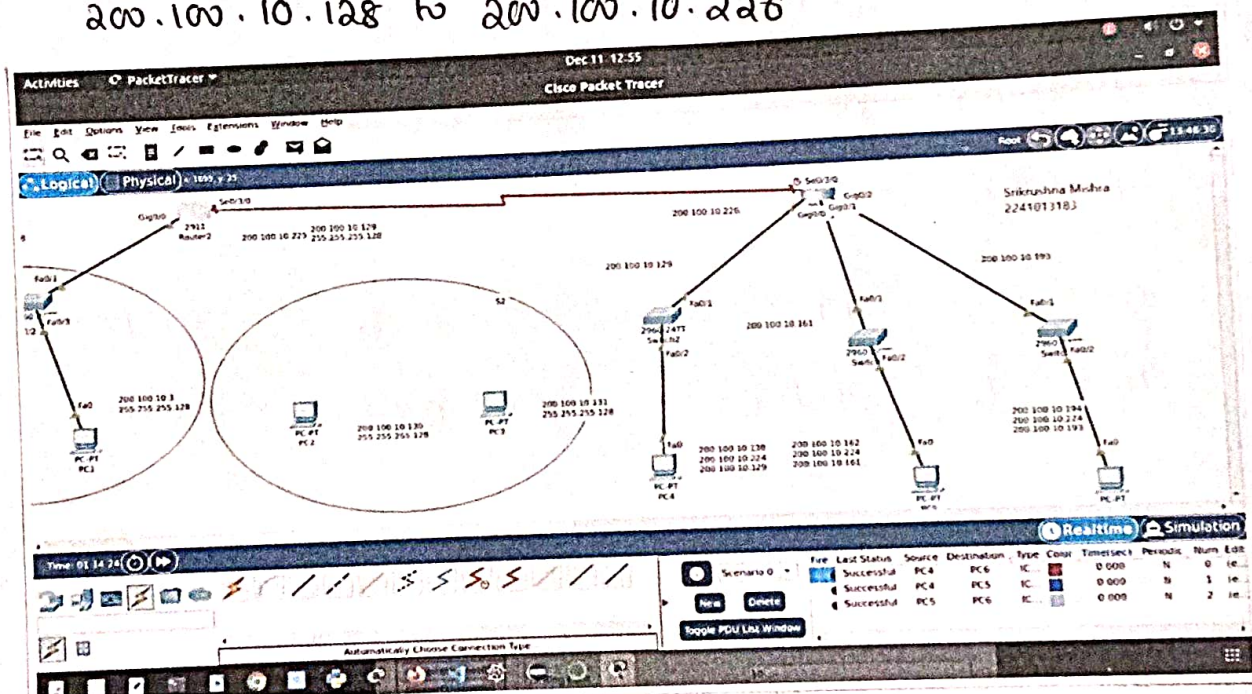
HWIC-2  $\Rightarrow$  OFF

Config  
IPv4

Wire  
Serial dF  
 $\downarrow$   
Serial 0/3/0

## Static Routing (Router-2):-

200.100.10.192 to 200.100.10.226  
200.100.10.160 to 200.100.10.226  
200.100.10.128 to 200.100.10.226





## Conclusion

Subnetting and VLSM effectively optimize IP address management and enhance network efficiency. Both techniques make them essential for scalable network design.

## Exercises :-

1) Express the following classful IP addresses in CIDR notation.

a) 192.34.1.9 — class C — 192.34.1.9/24

b) 10.10.10.1 — class A — 10.10.10.1/8

c) 129.10.14.5 — class B — 129.10.14.5/16

2) Given the IP address of a device as 192.168.10.126/25. Find the subnet mask & network ID in dotted decimal notation.

Given IP address is 192.168.10.126/25

So, net id + subnet id = 25-bits

Subnet mask = 255.255.255.128 (makes 25-bit is)

Network id = 192.168.10.0

3) A network with ID 200.1.2.0 is divided into 3 subnets, find no. of hosts per subnet. Also for all the subnets, find -

a. Subnet Address

b. 1st Host ID

c. Last Host ID

d. Broadcast Address

Given, net id is 200.1.2.0/24 (Class C network)

no. of hosts =  $2^8 - 2 = 256 - 2 = 254$

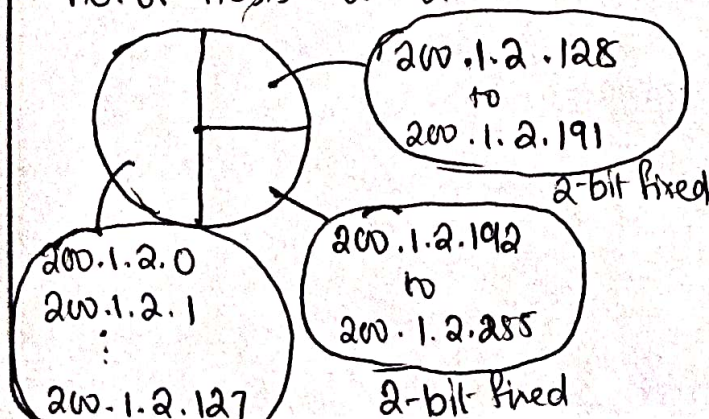
For 1st student :-

Subnet address = 200.1.2.0/25

1st Host id = 200.1.2.1

Last Host id = 200.1.2.126

Broadcast Address = 200.1.2.127



Name: \_\_\_\_\_  
1 bit fixed

Regd. Number: \_\_\_\_\_



For 2nd subnet:-

Subnet mask =  $200.1.2.128/26$

1st host id =  $200.1.2.129$

Last " " =  $200.1.2.190$

Broadcast address =  $200.1.2.191$

For 3rd subnet:-

Subnet mask =  $200.1.2.192/26$

1st Host id =  $200.1.2.193$

Last host id =  $200.1.2.254$

Broadcast address =  $200.1.2.255$

Q) Design a n/w using VLSM for the following requirements with the given n/w  $10.0.0.0/24$ . Assign IP addresses accordingly:

- a) Network A: 60 hosts (b) Network B: 30 hosts (c) Network C: 14 hosts  
d) Network D: 6 hosts.

	<u>n/w A</u>	<u>n/w B</u>	<u>n/w C</u>	<u>n/w D</u>
Subnet address	$10.0.0.0/26$	$10.0.0.64/27$	$10.0.0.96/28$	$10.0.0.112/29$
First host id	$10.0.0.1$	$10.0.0.65$	$10.0.0.97$	$10.0.0.113$
Last host id	$10.0.0.62$	$10.0.0.94$	$10.0.0.110$	$10.0.0.118$
Broadcast address:	$10.0.0.63$	$10.0.0.95$	$10.0.0.111$	$10.0.0.119$