

Hubs → Obsolete.

→ Dumb.

→ Always broadcast.

→ collision domain - I.

→ semi-duplex.

→ works on layer - I.

Unicast → (I to I).

multicast → (I to many.)

broadcast → (I to All).

Computer Network → Computer Network is a group of computer connecting together for the purpose of sharing some data.

Network devices :-

No Mode of communication [data flow]

(1) Hubs :-

Simplex [unidirectional]

$[S \rightarrow R]$

In simplex sender will always send the data & receiver will always receive.

Ex:- In UMS Announcement.

$(S \rightleftarrows R)$

Half / Semi-duplex

Here Sender and receiver both can communicate both one at a time.

Eg:- Walkie-talkie, one-lane Road.

(iii) Duplex :- $(S \leftrightarrow R)$

⇒ Here sender and Receiver both can communicate at the same time.
eg:- {Two Lane Road.}

Type of Address

① IP :- (Internet protocol) - These are logical address which changes everytime we connect to a different network.

command to check IP Address :-

{ ① windows → ip config (lower case) }
② Linux /ios → if config .

IP has 2 versions :-

① { IPV4 [32 bit] $[2^{32}]$ }

② { IPV6 [128 bit] $[2^{128}]$ }

IPV4 Rules :-

① Range betw. 0 to 255.

② It consists of 4 octets separated by dots (.) known as period.

1.1.1.1;

Date. |

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To check MAC TABLE

CMD:- MAC TABLE

{ 192.168.174.4 ✓ }
192.168.1.7.4 X }
198.268.7.1 X }

To check

↳ [arp-0].

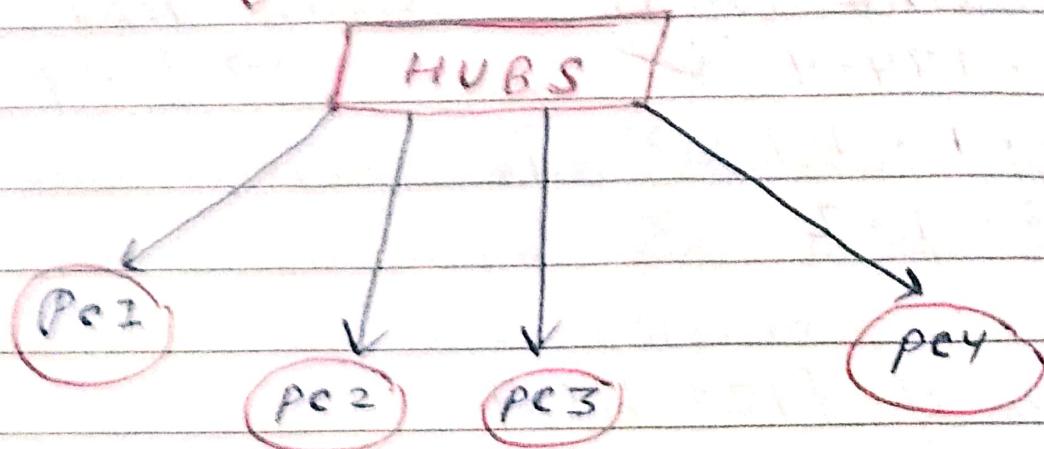
⑩ IPv6 is of [128 bits]

MAC [Media Access control] [48 bits]

These are physical Addresses and can't
be changed.

$$o = o$$

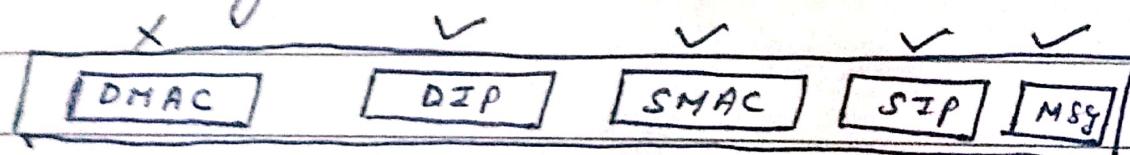
[Working of HUBS]



for the very first time, when a communication is initiated two packets are generated at :-

ARP (Address Resolution protocol) :-

It brings MAC to PC 1.



ICMP (Internet control message protocol)

It carries data.

To check mac table \rightarrow cmd \rightarrow arp -a

$P \rightarrow O_2$

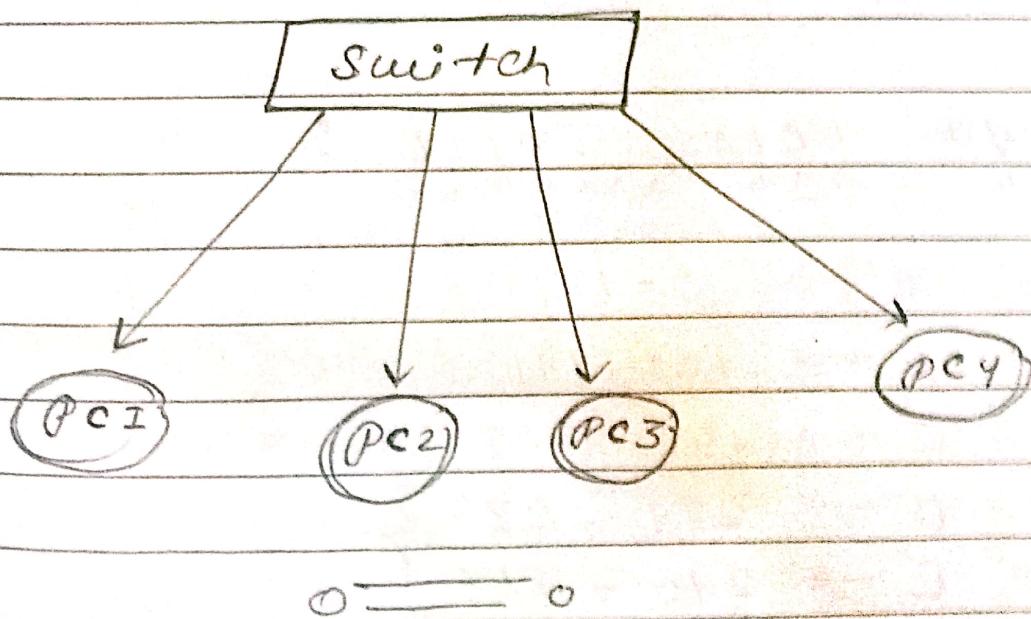
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Working of switches & topologies

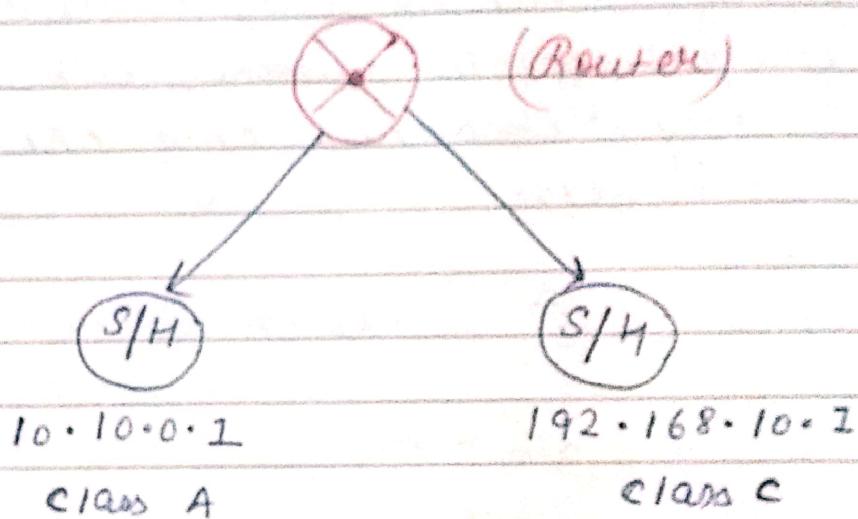
→ Switch :-

- ① widely in use. ② semi-intelligent.
- ③ for the first time switches will broadcast ARP to get DMAC. second time onwards unicasting of ICMP is done. There is no loss of privacy in switches like hubs because they broadcast only ARP and ARP carries no data.
- ④ full duplex. ⑤ works on layer -II
(2nd data link layer)
collision domain - n.



The Working of a single Router

⇒ Router is an intelligent networking device that is capable of connecting two different networks. switches and hubs can't do this.



①

IPV4 (CLASS TABLE) :-

class A → 0 - 127

B → 128 - 191

C → 192 - 223

D → 224 - 239 } only for Research
E → 240 - 255 } and scientist X

multicasting

②

Subnet mask:-

A → 255.0.0.0

B → 255.255.0.0

C → 255.255.255.0

D & E don't have subnet mask.

switch → 2960.

HUB → PT

Router → 1941/1841 (because they have ethernet cables).

To Rules to connect

① All PCs in one network must have same default Gateway.

② Default Gateway have same as URL.

If IP → 10.10.0.2

DG → 10.10.0.1 or like this only.

③ Note that DG and IP can't be same.

To commands in CLI Mode :-

Router > (disabled) > user execution mode.

① Router > en ↲ → (Router #) cmd is used to enable the Router.

② Router # (enabled) privileged mode (copy, erase)

③ Router # → config t ↲

Router (config) # (Global configuration mode)
→ All the changes are done in G.C mode.

Router (c) # To hostname Shubham ↲

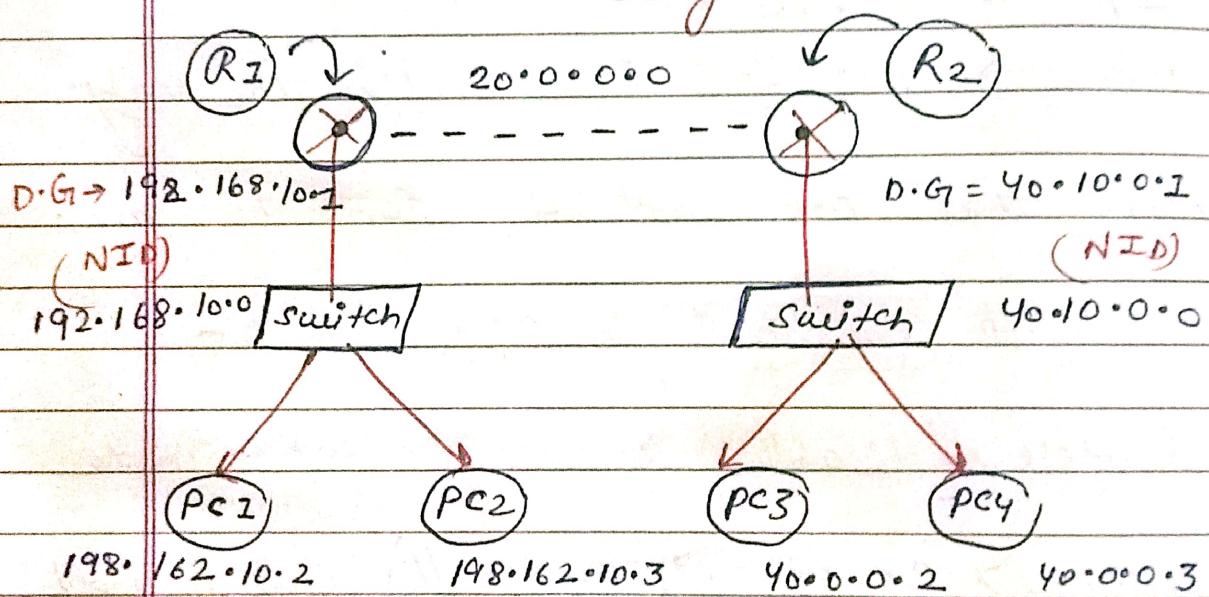
⑥ ~~QOS~~ shutdown (config) # int (interface) Gig 0/1

⑦ shutdown (i) # ip Address 192.168.10.2
→ no shut.

○ = ○

P → 04

No working of two Router using static
routing in network



① Here are 3-different networks.

② $10 \cdot 10 \cdot 10 \cdot 1$ } ✓ same network
③ $10 \cdot 10 \cdot 10 \cdot 2$ }

④ for different network, the three octets must be different.

$10 \cdot 10 \cdot 10 \cdot 1$ } X Not all 3 diff networks.
 $20 \cdot 10 \cdot 10 \cdot 2$

bit

IP:- 192.168.10.7

 $N \rightarrow I$ (Network)

IPV4:- 32 bits

 $H \rightarrow O$ (Host)

181 181 181 181

 $[N \rightarrow \text{Never change}]$

$$8 \times 4 = 32 \text{ bits}$$

 $[H \rightarrow \text{can change}]$

$$\left(IP = N \cdot ID + H \cdot ID \right)$$

↓

$\rightarrow (\text{Host ID})$

(Network ID)

A -	<u>N</u>	<u>H</u>	<u>H</u>	<u>H</u>	}
B -	<u>N</u>	<u>N</u>	<u>H</u>	<u>H</u>	
C -	<u>N</u>	<u>N</u>	<u>N</u>	<u>H</u>	

eg :- 192.168.10.7 (IP)

192.168.10.0 (N.ID)

(10.11.12.13) (IP)

class A

→ 10.0.0.0 (NID)

(34.35.18.1)

class A

34.0.0.0 (NID)

To verify the class we always see
the first node of IP.

Note subnet mask

A → 255.0.0.0

1.111111.0.0000000.0000000.00000000

$$1 \times 2^0 + 1 \times 2^1 + 1 \times 2^2 + \dots + 1 \times 2^8 = (255).$$

$B \rightarrow 255 \cdot 255 \cdot 0 \cdot 0$

$11111111 \cdot 1111111 \cdot 00000000 \cdot 00000000$

$\Rightarrow 255 \cdot 255 \cdot 0 \cdot 0$

No description of networks

N_1

✓ PC1 \rightarrow IP $\rightarrow 192 \cdot 168 \cdot 10 \cdot 2$

✓ PC2 \rightarrow IP $\rightarrow 192 \cdot 168 \cdot 10 \cdot 3$

\Rightarrow (D.G) default-Gate $\rightarrow 192 \cdot 168 \cdot 10 \cdot 1$
way

N_2

✓ PC3 \rightarrow IP $\rightarrow 40 \cdot 10 \cdot 0 \cdot 2$

✓ PC4 \rightarrow IP $\rightarrow 40 \cdot 10 \cdot 0 \cdot 3$

\Rightarrow D.G $\rightarrow 40 \cdot 10 \cdot 0 \cdot 1$

No CLI Mode to give commands

Router > en

Router # config t default gateway

R(c)# int Gig0/0 ↑ subnetmask

R(c-if)# IP Address 10.0.1.1, SM 255.255.255.0

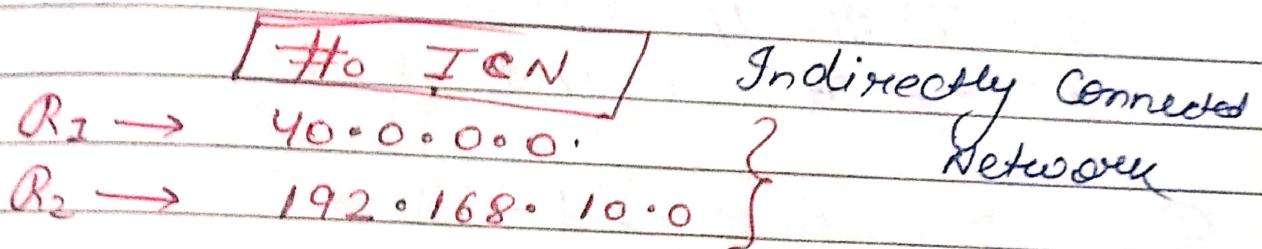
R(c-if)# No shut

\Rightarrow Never give default gateway when two Router.

To static Routing

It is the process of making a Router know about its indirectly connected networks (unknown networks).

Now we will perform static Routing on this scenario after which we will get successfully messages.



No command to check IEN and IEN on Router will be given

Router # Show IP Route. ↵

No performing static Routing

L.H.S → GUI Mode :-

Go to R₂ → config → static →

Net → 40.0.0.0	}
Mask → 255.0.0.0	
Next hop → 20.10.0.2	}

① Note to add all entries are of unknown network.

R.H.S using CLI :-

⇒ command to config static Routing → ↓ NID

① for Router 1 :- * if route N3, S4, N4
don't do no shut
do not config NID.

Router > en

Router # config it

R(c)# int Gig 0/0 0/1.

R(c-if)# ip address 20.10.0.1 255.0.0.0

R(c-if)# no shut.

② for Router 2 :-

Router > en

Router # config it

R(c)# int Gig 0/1

R(c-if)# ip address 20.10.0.2 255.0.0.0

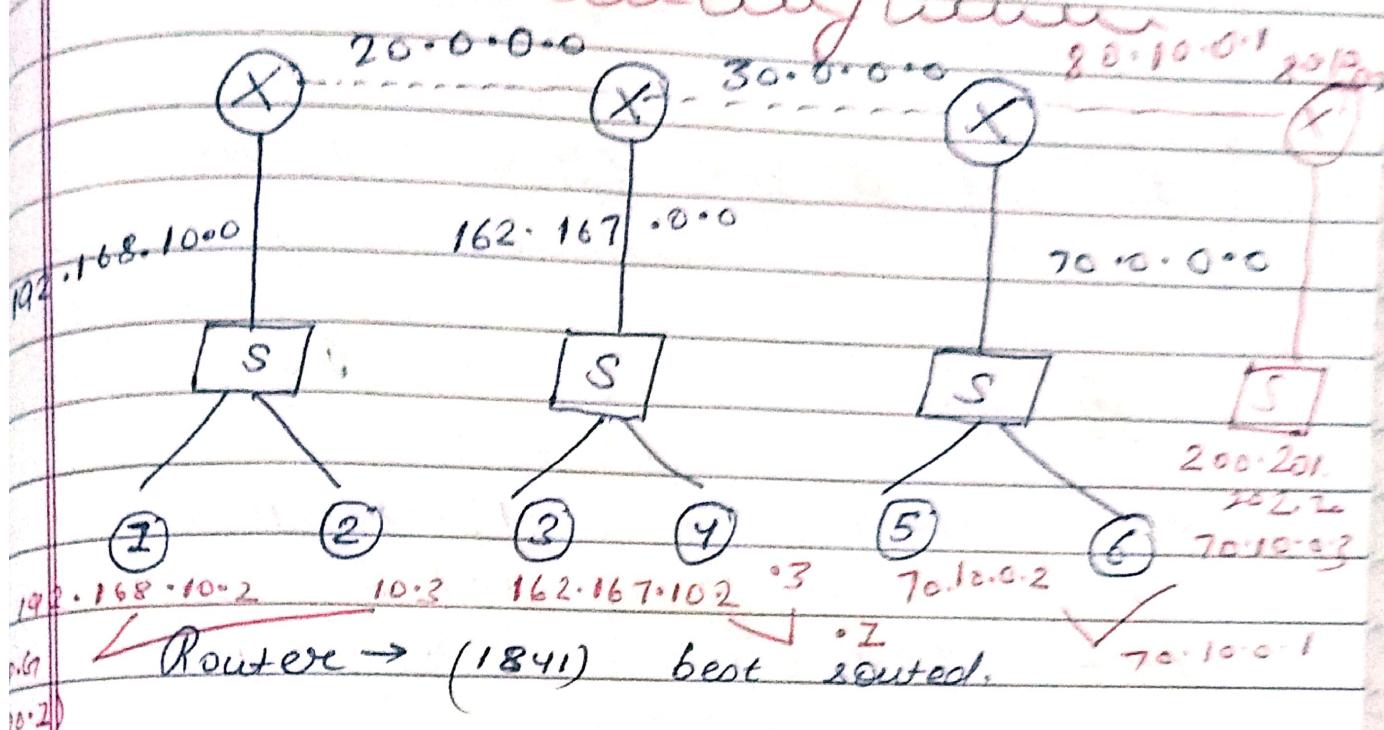
R(c-if)# no shut.

To command to exchange message

{ pc > cmd prompt > ping 40.10.0.3 } destination IP

③ for exiting to just previous step we have to write exit in CLI until you get back.

The Working of three Routers using static Routing



1841 has two interfaces to add a new interface to the Router →

Router → physical → zoom In → turn off green light switch → drag and drop (WIC - T1NET) in slot 2 at left side
→ Turn on switch.

Total 5 Networks we have.

0.CN / T1NET

R1 :- 2/5

R2 :- 3/5

R3 :- 2/5

* Static Routing is performed when all network path is green.

{ Network fail because
have ARP translated to IP

Date: / /
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do some procedure to give ip address.

lets perform static Routing.

R₁

NID:- 162.167.0.0
SM:- 255.255.0.0
NH:- 20.10.0.2

R₂

192.168.10.0
255.255.255.0
20.10.0.1

NID:- 70.0.0.0
SM:- 255.0.0.0
NH:- 20.10.0.2

70.0.0.0
255.0.0.0
20.10.0.2

NID:- 30.0.0.0
SM:- 255.0.0.0
NH:- 20.10.0.2

R₃

NID: 192.168.10.0
SM: 255.255.255.0
NH: 30.10.0.1

20.0.0.0
255.0.0.0
20.10.0.1

NID: 162.167.0.0
SM: 255.255.255.0
NH: 20.10.0.1



R4

NJD = 70.0.0.0

192.162.10.0

SM = 255.0.0.0

255.255.255.0

NH = 80.10.0.1

NJD = 162.167.0.0

20.0.0.0

SM = 255.255.0.0

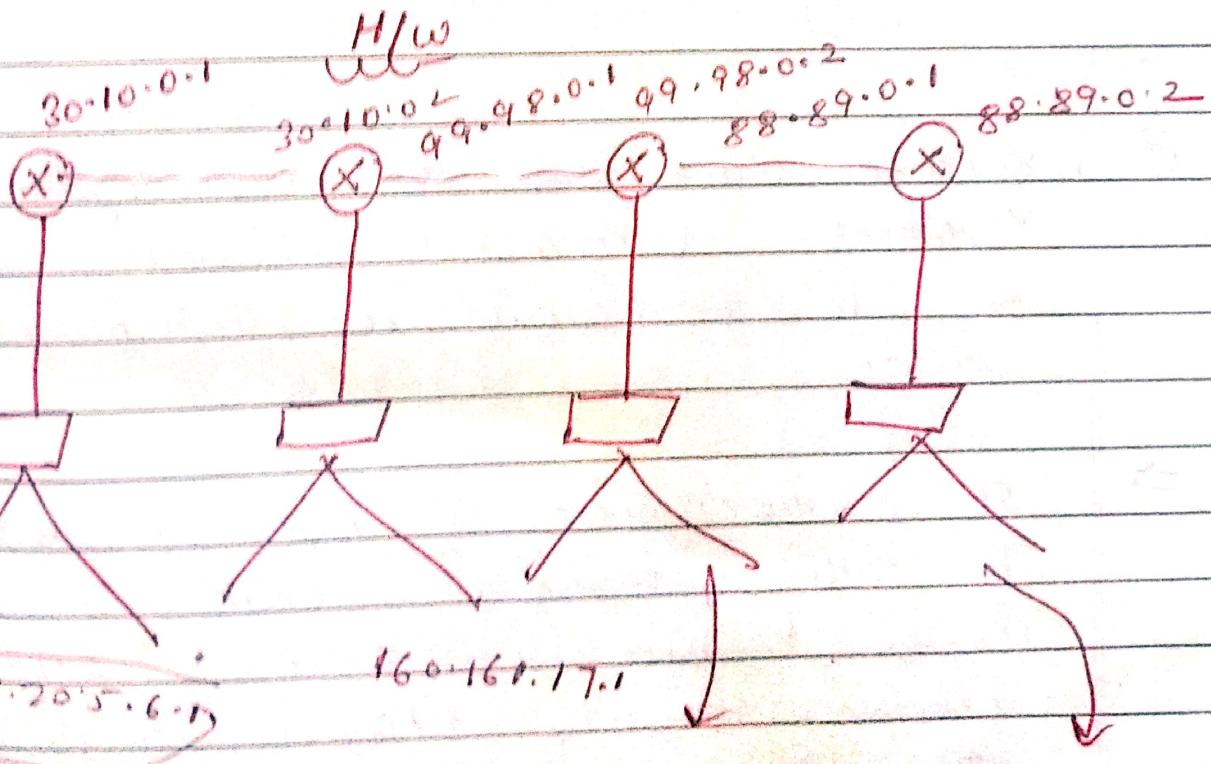
255.0.0.0

NH = -

NJD 20.0.0.0

SM = 255.0.0.0

NH



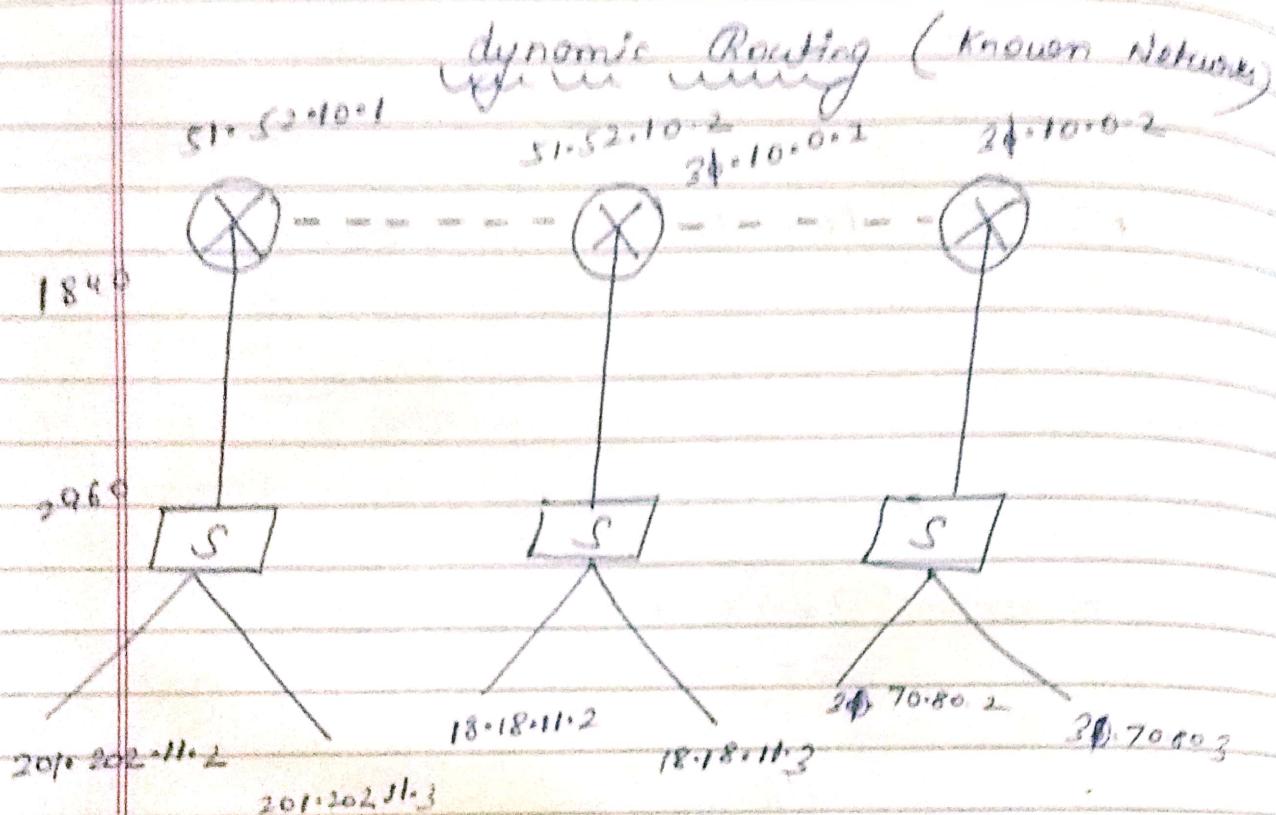
D4

14.17.11.1

27.28.

11.1

Three or four Router using dynamic
routing using RIP



- ① dynamic Routing is the way to give directly connected network information, and rest would be automatically taken.

⇒ It is the process of informing the Router about directly connected networks, Router will auto calculate SM, N.H.O, unknown networks etc on its own thus Reducing manual efforts?

Router → config → RIP

Routing information protocol

R₂ using GUI

NID: - 51.0.0.0

NID: - 201.202.11.0

R₂ and R₃ using CLI

> en

config t
R(c) # router : RIP<

(P2) network 51.0.0.0 <

" 31.0.0.0

router 18.0.0.0

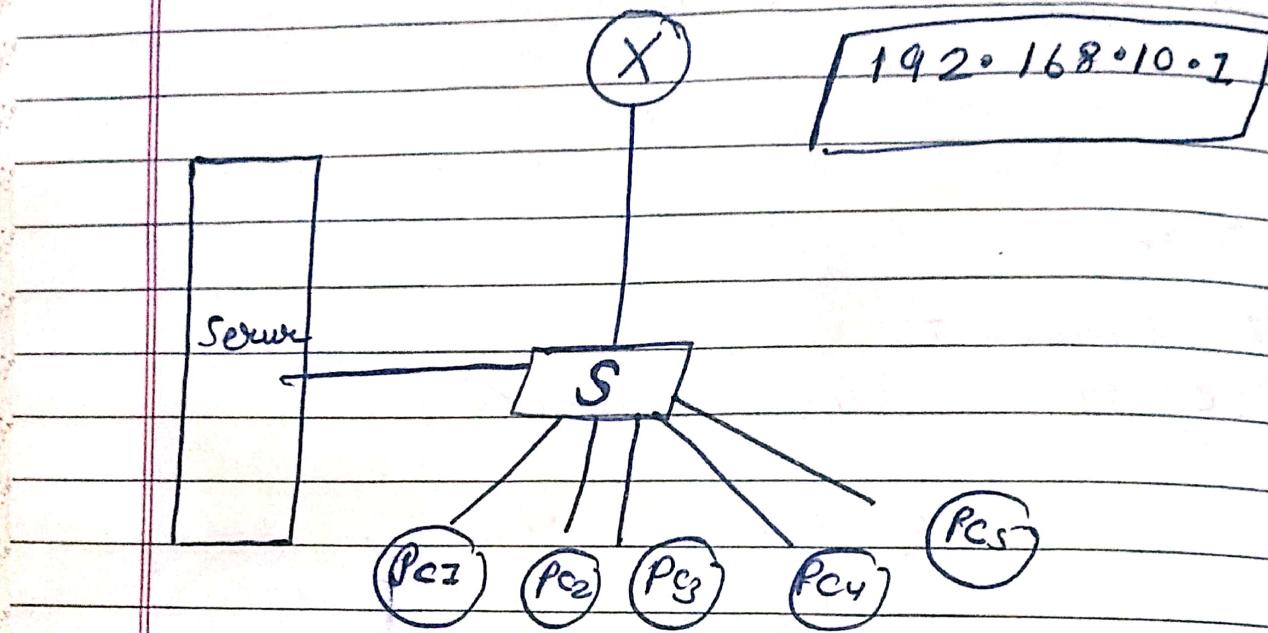
(Q3) Router QIP

network 31.0.0.0 <

network 30.0.0.0 . <

o — o

(A) DHCP :- Dynamic host configuration protocol.



Steps.

Rules

(1.) Enable Router by assigning IP 192.168.10.1 turn it green.

(2.) Click on Server → desktop → IP configuration
Assign IP - 192.168.10.2
D.G - 192.168.10.2

(3.) Server → services → DHCP → D.G.
192.168.10.2 → turn on radio button
→ save.

(4) Go to PC → desktop → IP config →
change Radio button from static
to DHCP.

DHCP is used to automatically assign the IP's to machines or pc during the run time; thus reducing the manual efforts.

DNS :- (Domain Name server/system/service)

DNS maps domain names with IP or it translates human readable domain names (Netflix.com or emonco) to machine readable IP Address (192.0.2.2) etc.

Rules

services > DNS >

Name:- amazon.com

Add:- 192.168.10.2

> Radio button - on

> save.

(edit)

Server > services > HTTP > Index.html

Change) > save

click on pc > Browser > give IP

192.168.10.2 > webpage will open.

(but will domain name it will not)

DNS - Resolution :-

Server > services > DHCP > DNS server
192.168.10.2 > save.

- ① Now go to all pc make switch from static to DHCP once again and
- ② go to browser > add domain name you will get webpage.

③ Email

services >
Server > E-mail > add domain name > set say g-mail.com > add username and password of

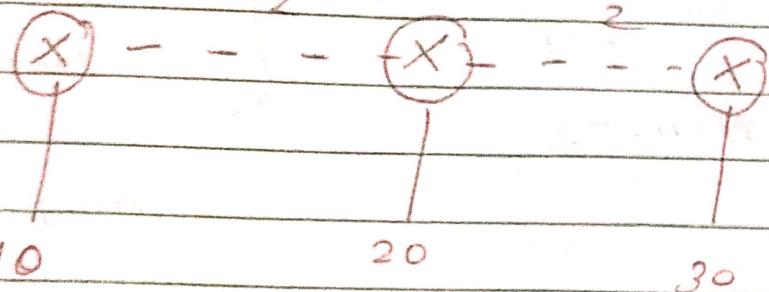
Go to desktop > two pc with different names.

go to pc > desktop > Email > add new name > address @ g-mail.com you choose > give name and pass > save

go to pc1 > Email > Compose >

PC1 email id > subject (any) > message > send.

FLSM with class - A B & C using static and dynamic Routing in your way



⇒ 198.11.11.0 / class C

① 198.11.11.0

② 198.11.11.00000000

$$2^n = 2^7 = 32$$

$$2^n \geq 32$$

$n=5$ (H.B) .

③

H.B

④ 198.11.11.00000000

198.11.11.11100000

198.11.11.224 / class E

198.11.11.224 / $24+3=27$

S.M default

(255.255.255.0) ✓

0000.0000.0000.224 ✓

To subnets

(if subnets
at least 1)

Date:
Page:

①

198.11.11.0

• 1

• 31

{ Make only
that subnet
which network
is Required

②

198.11.11.32

• 33

• 63

③

198.11.11.64

• 65

• 95

④

198.11.11.96

• 97

• 126

• 127

⑤

198.11.11.128

• 129

• 3.459

⑥

198.11.11.160

⑦

198.11.11.192

⑧

198.11.11.224

A/C Nid config IP address
and put access on all A/C

try to go in source

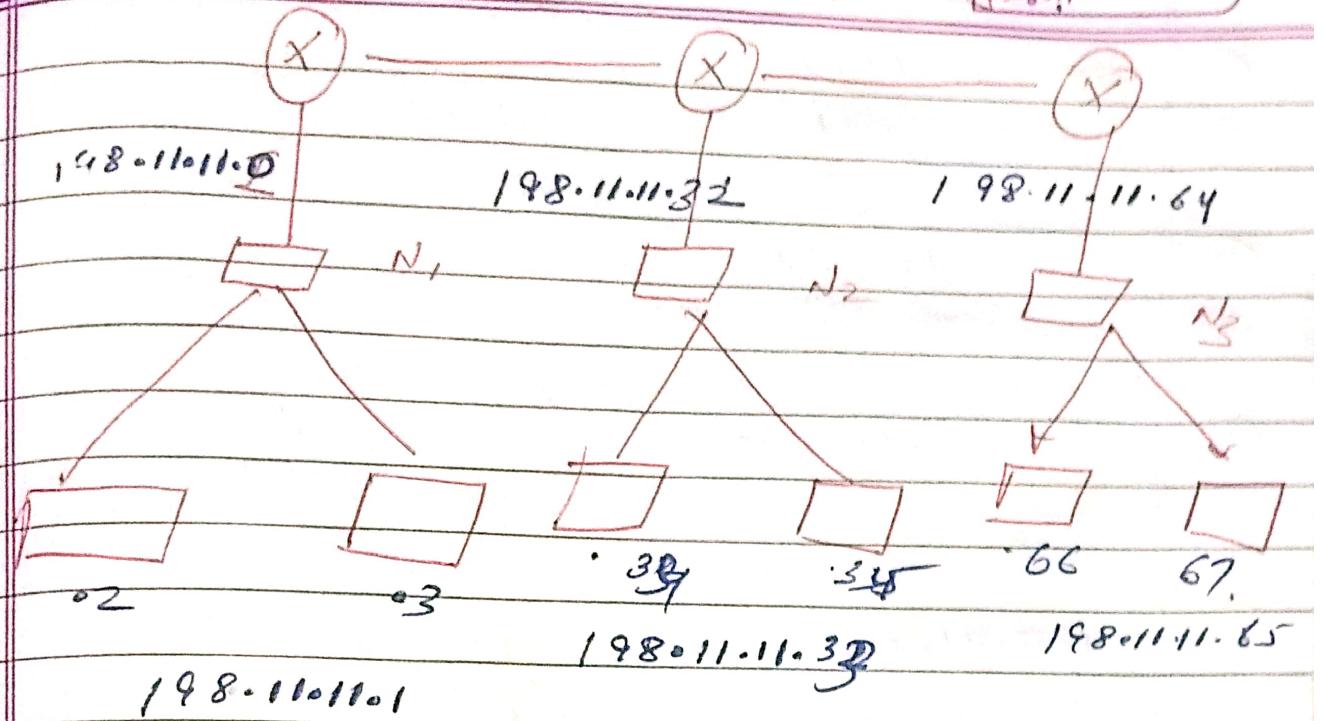
caused

BID and NID.



.97 N₁ .98 .129

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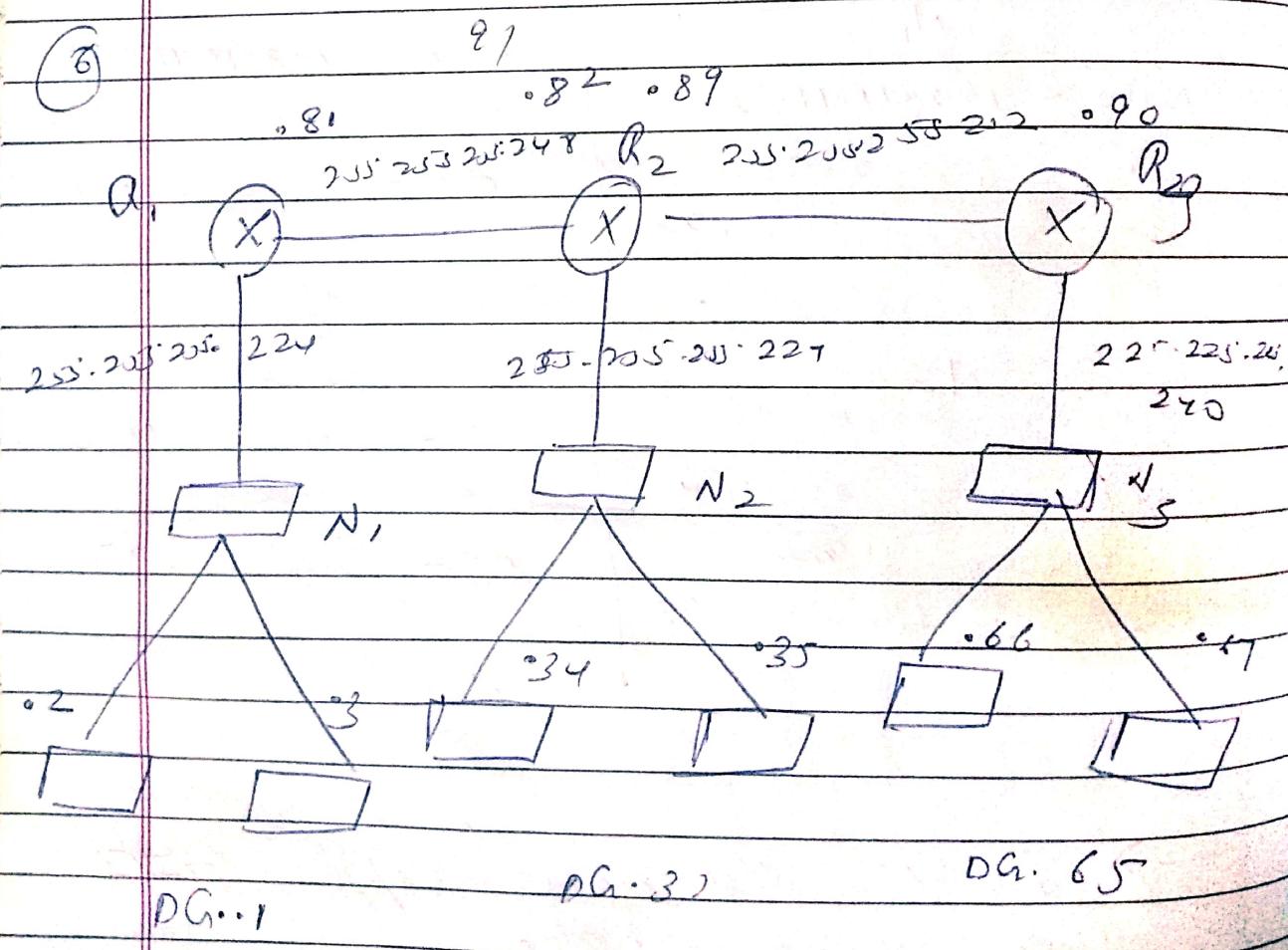
STATIC

R ₁	N ₁	N ₃
	315	
NID - 198-11-11-32		NID - 198-11-11-127
SM - 255-215-215-224		SM - some
N4 -	·98	N4 - ·98

N ₂	R ₂
NID - 198- - 11-0	
SM - some	
N4 -	·97
N10 - - - - -	
N11 - - - - -	
N12 - - - - -	
SM - some	
N2 - 1-20	

→ FLSM does not support GIIU mode dynamics/ RTI.

- (1) 197. 11. 11. 0 7.87 255. 255. 255. 294
 — 01 030. 31 BZA
- (2) 197. 11. 11. 32 220. 205. 205. 244
 — 33 6.2 — BZA
- (3) 197. 11. 11. 64 255. 215. 255. 290
 — 65 7.8
- (4) 197. 11. 11. 80 255. 1205. 2035. 248
 — 81 86
- (5) 197. 11. 11. 88 255. 215. 20. 202
 — 89



R₁R₂

NID: - 197.11.11.32

= 197.11.11.0

SM: - 224

224

NH: - 82

81

NIO: - 197.11.11.64

→ 197.11.11.64

SM: - 240

240

NH: - 82

90

NJO: 197.11.11.88

SM: - 252

NH: - 82

-(84)

R₃

RJP (GUZ) X

NJO: 197.11.11.0

SM: - 224

NH: - 87

NJO: 197.11.11.32

SM: - 224

-89

NJO: 197.11.11.80

SM: - 248

-89