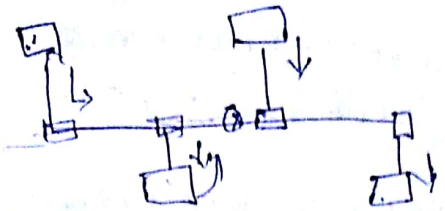
2:30 PM → 4:00 PM
↓
4:15 PM

CCNA
(Cisco certification Network Admin)

www.ExamCollation.com



N/w

H/w S/w

MAC (M/c Address)
IP (Virtual Addrs)
AKP

Hub
Switch
Bridge
Router
Gateway.

Topology
→ Protocol
→ Reference model

Packet

(MAC, IP)

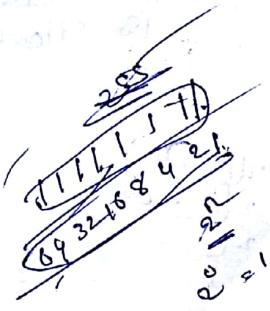
Repeater
Subnet (collection of Routers)

Wi-Fi 802.11
WiMax 802.16 (16 km upto wireless)

DNS

IP Address :-

→ IP Address Also called as logical Address (or) S/w Address.
→ IP Addrs is a identification of device over a network.
→ They are two Versions of IP Address
  → IPV4
  → IPV6



IPV4 :-

→ IPV4 is a 32-bit binary Number
→ This 32-bit Again devided into 4 - Bytes.

Binary → 0, 1
Decimal → 0-9
Hexa Decimal → 0-9, A-F
Octal → 0-7
Bit → 0, 1

ex:-

0 = OFF
1 = ON

00111001010111100111100111
8 bit 8 bit 8 bit 8 bit
11001100 . 00000000 . 11111111 . 01010101

10000000 = 128 (128.)
10000011 = 131 = (128 + 2 + 1) = 131
1001 1001 = 153 = (128 + 16 + 8 + 1) = 153

Calculations

1010 1010 = (128+32+8+2) = 170

0101 0101 = (64+16+4+1) = 85

0000 0000 = 0

1111 1111 = (128+64+32+16+8+4+2+1) = 255

0 1111 1111 = (+64+32+16+8+4+2+1) = 127

192.168.285.10 (using: Range out of Binary Number 255)

128 / 32 / 8 / 2 / 160

64 / 16 / 4 / 1 / 85

Starting Range 0.0.0.0

Find Range 255.255.255.255

2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0

128 64 32 16 8 4 2 1

⇒ How to Convert Decimal to Binary

192 :

1100 0000

128 = 0000 0000 } = 1000 0000

200 = 0000 1110 } = 1100 1000

100 = 1000 1100 } =

12 = 1100 0000 } = 0000 1100

2 | 192 - 0
2 | 96 - 0
2 | 48 - 0
2 | 24 - 0
2 | 12 - 0
2 | 6 - 0
2 | 3 - 1
1

96 / 16 / 112 / 8 / 120 / 127

Bottom to Top

2 | 192 - 0
2 | 6 - 0
2 | 3 - 1
1

2 | 128 - 0
2 | 64 - 0
2 | 32 - 0
2 | 16 - 0
2 | 8 - 0
2 | 4 - 0
2 | 2 - 0
0

2 | 200 - 0
2 | 100 - 0
2 | 50 - 0
2 | 25 - 1
2 | 12 - 1
2 | 6 - 0
2 | 4 - 0
2 | 2 - 0
0

2 | 100 - 0
2 | 50 - 0
2 | 25 - 1
2 | 12 - 1
2 | 6 - 0
2 | 4 - 0
2 | 2 - 0
1

Note :-

IP4 is devided into "5" class Use

class	Range	
A	1-126	LAN & WAN
B	128-191	
C	192-223	
D	224-239	Multicasting
E	240-255	→ Researching & Developemant.

0 = IS Reserved for static default Routing
127 = loop Back Addressing.

Ping 127.0.0.1

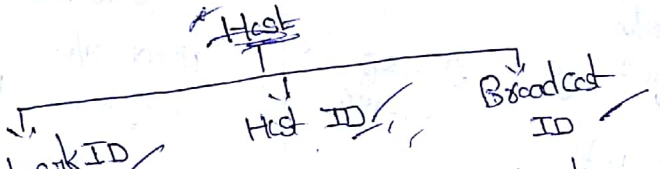
0 = 0000 0000
127 = 0111 1111
128 = 1000 0000
191 = 1011 1111
192 = 1100 0000
223 = 1101 1111
224 = 1110 0000
239 = 1110 1111
240 = 1111 0000
255 = 1111 1111

Network in IPv4.

A N H H H
B. N N H H
C. N N N H

ip Addrey is devided into two TYPE
ex:- 1. N/w portion
2. Host portion

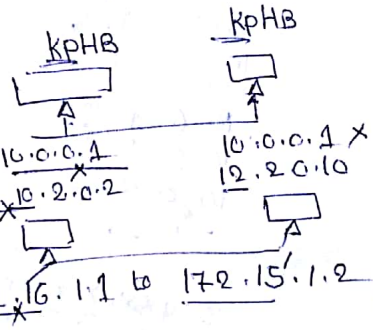
Note:-
→ Network portion Sud be Same & Host portion Compulsory different
→ Host Portion Again devided into



→ Network ID:-
→ Network ID is the first IP in a network
→ Network ID will be used As a network Identification
→ Network ID Alway in zero(0's) & Host Portions
→ Network ID is used by Routers
N/w ID is used to logical N/w

Host ID:-
→ Host ID Also called as Valied ip Address
→ it is used for Pc's, Routers, Switch, Firewalls, Servers, -- ext.

0 → 1st one Bit
Priority Bit 127
10 128-191 → 1st two Bit
110
110
1110
1110
1111
111



Broadcast ID:

→ it is last Address in a network it is used to Send a Broadcast Msg

→ Broadcast ID will be Always in the last position.

class A:-

N H H H

10.0.0.0

10.0.0.1

10.0.0.2

:

10.0.0.255

10.0.1.255

10.0.1.1

10.0.1.2

10.0.1.255

10.0.2.0

10.0.2.1

:

10.255.255.255

1 - 126.

10

classB

172.16.0.0 → Ip Address.

172.16.255.255

191
128
63

classA : N H H H

No of N/w

$2^{n-1} = 2^{8-1} = 2^7 = 128$

= 1-126

No of Host

$2^H - 2 = 2^{24} - 2$

= 16777216

-2

16777214

classB

N N H H

No of N/w

$2^{N-1} = 2^{16-2} = 2^{14} = 16384$

No of Host

$2^H - 2 = 2^{16} - 2$

= 65536

-2

65534

class C:- N N N H

No of N/w = $2^{n-3} = 2^{24-3}$

$= 2^{21}$

= 2097152

No of host

$2^H - 2 = 2^8 - 2$

= 256 - 2

= 254

128
128
256

	N/w's	Host
A	126	16777214
B	16384	65534
C	2097152	254

Public & Private IP's :-

Public IPs -

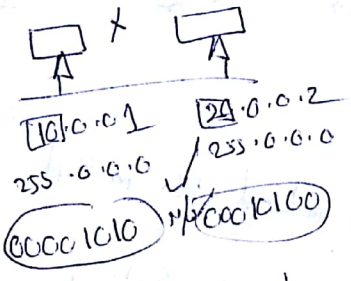
- used in internet
- Public IP are not free need to purchase it.

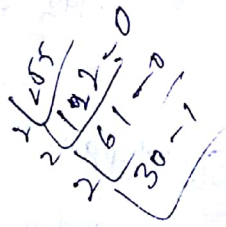
Private IPs :-

→ ICANN
→ BSNL, TATA, Reliance
→ Airtel, ...

This are the ips which r used in Privat Network

(1) A → 10.0.0.0
(16) B → 172.16.0.0 → 172.31.0.0
(255) C → 192.168.0.0 → 192.168.255.0





Subnet Mask :-

→ Differentiate N/w & host position of a IP
→ Network position always in one (1) 255.0.0.0 (11111111)
→ host position always in zero (0) e.g. 00000000.

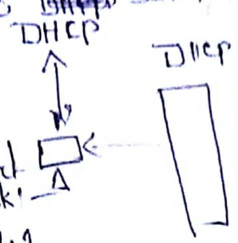
A 255.0.0.0 /8
B 255.255.0.0 /16
C 255.255.255.0 /24

Slash (/) Notation (or) cisco Notation
Number network position bits.

APIPA (Automatic private IP Address) :-

- This Adding is used with a n/w it does not assign a static id, & no DHCP Server Available.

Troubleshoot :-
> IpConfig



Calculation of ip for subnet mask :-

192 . 168 . 1 . 1
255 . 255 . 255 . 0

192 . 168 . 2 . 1
255 . 255 . 255 . 0

AND
00 = 0
01 = 0
10 = 0
11 = 1

AND
1100 0000 . 1010 1000 . 0000 0001 . 00000001
1111 1111 . 1111 1111 . 1111 1111 . 11111111

1100 0000 . 1010 1000 . 00000001 . 00000001

192 . 168 . 1 . 0

AND
1100 0000 . 1010 1000 . 0000 0010 . 00000001
1111 1111 . 1111 1111 . 1111 1111 . 11111111

1100 0000 . 1010 1000 . 0000 0010 . 0000 0001

192 . 168 . 2 . 1

Subnetting :-

- Dividing a bigger network into multiple subnetwork is called Subnetting.
- Subnetwork is done is reducing westage of ip Addressing.
- To need to borrow bit from host postion convert into network postion

→ Subnetting can be done in Two ways
1. Requirement of N/w
2. Requirement of Host

→ To do subnetworking basis of N/w we need to borrow bits from left side, → To do subnet host need to borrow to Right side

Sub-Network:-

Ex1:- 192.168.1.0/24

1111 1111 . 1111 1111 . 1111 1111 . 00 00 0000

11

$2^n \geq x$

$2^2 \geq 4$

$2^1 = 2$

$2^3 = 4$

00
01
10
11

(1) → 192.168.1.0 ← 192.168.1.63

(2) → 192.168.1.64 ← 192.168.1.127

(3) → 192.168.1.128 ← 192.168.1.191

(4) → 192.168.1.192 ← 192.168.1.255

128
64
192

192

Default = 255.255.255.0

C.M = 255.255.255.192

Ex2:-

192.168.1.0/24

128 64 32 16 8 4 2 1

1111 1111 . 1111 1111 . 1111 1111 . 0000 0000

16 8 4 2

$2^n \geq x = 2^4 = 16$

192.168.1.0 → 192.168.1.15

192.168.1.16 → 192.168.1.31

192.168.1.32 → 192.168.1.47

192.168.1.48 → 192.168.1.63

192.168.1.64 →

⋮

192.168.1.240 → 192.168.1.255

2^5

Ex3:-

192.168.1.0/24

128 64 32 16 8 4 2 1

1111 1111 . 1111 1111 . 1111 1111 . 0000 0000

$2^n \geq x$

$2^{12} \geq x$

~~$2^{12} = 256$~~

$2^8 \geq 25$

192.168.1.0 → 192.168.1.7

192.168.1.8 → 192.168.1.15

192.168.1.16 →

192 . 168 . 1 . 255

Ex:-

192 . 168 . 1 . 0 /24

1111 1111 . 1111 1111 . 1111 1111 . 0000 0000

$2^n \geq n$, $2^1 \geq 2$

128 64 32 16 8 4 2 1

→ 192 . 168 . 1 . 0 192 . 168 . 1 . 127 /25

192 . 168 . 1 . 128 192 . 168 . 1 . 255 /25

192 . 168 . 1 . 0 /25 192 . 168 . 1 . 200/25

255 . 255 . 255 . 128 255 . 255 . 255 . 128

AND

1100 0000 . 1010 1000 . 0000 0001 . 0000 1010

1111 1111 . 1111 1111 . 1111 1111 . 1000 0000

1100 0000 . 1010 1000 . 0000 0001 . 0000 0000

192 . 168 . 1 . 0

192 . 168 . 1 . 10

255 . 255 . 255 . 128

128
64
192

AND

1100 0000 . 1010 1000 . 0000 0001 . 1000 1010

1111 1111 . 1111 1111 . 1111 1111 . 1000 0000

1100 0000 . 1010 1000 . 0000 0001 . 1000 0000

192 . 168 . 1 . 128

Ex:-

192 . 168 . 1 . 0/24

00 = 0
01 = 0
10 = 0
11 = 1.

(1) → N/w & Host

(2) → Use Formula

(3) → write Subnet

(4) → Calculate Subnet mask.

(50) Networks

128
64
32
16
8
4
2
1

$2^n \geq X$

$X = 50$

$2^6 \geq 50$ $\quad n = 6$

128 64 32 16 8 4 2 1

192.168.1.0 $\quad$ 1111 1111 . 1111 1111 . 1111 1111 . 0000 0000

255.255.255.0 $\quad$ 1111 1111 . 1111 1111 . 1111 1111 . 1100 0000

128 + 64 = 192

1100 0000 . 1010 1000 . 0000 0001 . 0000 1910

1111 1111 . 1111 1111 . 1111 1111 . 0000 0000

1100 0000 . 1010 1000 . 0000 0001 . 0000 0000

192 . 168 . 1 . 0

N/w

192.168.1.0

192.168.1.4

192.168.1.8

192.168.1.12

⋮

192.168.1.252

B/c

192.168.1.3

192.168.1.7

192.168.1.11

192.168.1.255

1st

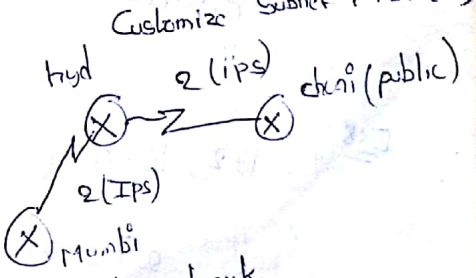
192.168.1.0 → N/w

192.168.1.2 } 2

⋮

3 → B/c

C. S.M :- 255.255.255.252 (30)/30



- Most popular Network

EX 6 :-

192.168.1.0/24

4 hosts

$2^n \geq X$

$2^2 \geq 4$

128
64
192

11
10
01
00

1111 1111 . 1111 1111 . 1111 1111 . 1100 0000

H/w

192.168.1.64 | 192.168.1.128 B/c.

192.168.1.192 192.168.1.63

192 . 168 . 1 . 0 /24

1111 1111 . 1111 1111 . 1111 1111 . 0000 0000

1111 1111

Ex7:-

172 . 16 . 0 . 0 /16

75

$2^n \geq X$

$2^7 \geq 75$

n=7

128 64 32 16 8 4 2 1

0111 0001 . 0000 1000 . 0000 0000

172 . 16 . 0 . 0

2	172 - 0
2	86 - 0
2	43 - 1
2	22 - 1
2	10 - 0
2	5 - 1
2	4 - 0
2	2 - 0
	1

64
32

2	16 - 0
2	8 - 0
2	4 - 0
2	2 - 0
	1

N/w

→ 172 . 16 . 0 . 0

→ 172 . 16 . 2 . 0

→ 172 . 16 . 4 . 0

. 6 . 0

. 8

B/c

→ 172 . 16 . 0 . 1 . 255

→ 172 . 16 . 3 . 255

→ 172 . 16 . 5 . 255

→ 172.16.252.0

→ 172.16.254.0

172.16.258.255

172.16.255.255.

C.S.M → 255.255.254.0 (or) /23

→ Two are in Network (ε)
Two are in Host portion

Ex8:

172 . 16 . 0 . 0

500

$2^9 \geq 500$

64
64
128
128
256
256
512

0111 1001 . 0000 1000 . 0000 0000 . 0000 0000

172 . 16 . 0 . 0

1111 1111 1

N/w Major Network (M.N/ip)

N/w	B/c
172.16.0.0	→ 172.16.1.127
172.16.0.128	→ 172.16.2.127
172.16.1.0	→ 172.16.1.255
172.16.1.128	→ 172.16.2.127
172.16.2.0	→ 172.16.2.255
172.16.2.128	→ 172.16.3.127
172.16.3.0	→ 172.16.3.255
172.16.3.128	→ 172.16.4.127
172.16.4.0	→ 172.16.4.255
172.16.4.128	

172.16.128.128 → 172.16.128.255

172.16.255.128 → 172.16.255.255

C.S.M → 255.255.255.128 (or) /16.

Home work (S+S) = 16

(1) 172.16.0.0/16

Subnets :- 1000, 20000, 16, 40

128
64
192

(2) 10.0.0.0/8

1000, 200000, 10, 40

(1) 172.16.0.0/16

(a)

128 64 32 16 8 4 2 1

1000

128	64
1	1
1	0
0	1
0	0

$2^n \geq N$ $2^{10} \geq 1000$

0110 1001 . 0000 1000 . 0000 0000 . 0000 0000

172 . 16 . 0 . 0

N/w B/c

N/w	B/c
172.16.0.0	172.16.0.63
172.16.0.64	172.16.0.127
172.16.0.128	172.16.0.191
172.16.0.192	172.16.0.255

172.16.2.0 → 172.16.2.63
172.16.2.64 → 172.16.2.127
172.16.2.128 → 172.16.2.191
172.16.2.192 → 171.16.2.255

⋮ ⋮

172.16.255.0 → 172.16.255.63
172.16.255.64 → 172.16.255.127
172.16.255.128 → 172.16.255.191
172.16.255.192 → 172.16.255.255

Certified Subnet Mask

255.255.255.192

(b) 172.16.0.0/16

2000

$2^n \geq X$

$2^n \geq 2000$ n = 11

0110 1001 . 0000 1000 . 0000 0000 . 0000 0000
111

N/w B/c

172.16.0.0 → 172.16.0.31
172.16.0.32 → 172.16.0.63
172.16.0.64 → 172.16.0.95
172.16.0.96 → 172.16.0.127
172.16.0.128 → 172.16.0.159
172.16.0.160 → 172.16.0.191
172.16.0.192 → 172.16.0.223
172.16.0.224 → 172.16.0.255
172.16.1.0 → 172.16.1.31
172.16.1.32 → 172.16.1.63
172.16.1.64 → 172.16.1.95

⋮

172.16.255.224 → 172.16.255.255

Certified Subnet Mask

255.255.255.224

(c) 172.16.0.0/16

40

$2^n \geq X$

$2^6 \geq 40 \quad n = 6$

128 64 32 16 8 4 2 1

0110 1001 . 0000 1000 . 0000 0000 . 0000 0000

1111 11

40 - 0
20 - 0
10 - 0
5 - 1
2 - 0
1

N/w

172.16.0.0 ⟶ 172.16.0.3
172.16.0.4 ⟶ 172.16.0.7
172.16.0.8 ⟶ 172.16.0.11
172.16.0.12

B/c

172.16.1.251 ⟶ 172.16.1.255
172.16.2.251 ⟶ 172.16.1.255

172.16.255.251 ⟶ 172.16.255.255

Combined Subnet Mask :-

255.255.255.252 NHHH

NNNH

(d) 172.16.0.0/16

10

$2^n \geq X$

$2^4 \geq 10$

0110 1001 . 0000 1000 . 0000 0000 . 0000 0000

1111

N/w

172.16.0.0.0
172.16.0.16.0
172.16.0.32.0
172.16.0.48.0
172.16.0.64.0

B/c

172.16.0.15.255
172.16.0.31.255
172.16.0.47.255
172.16.0.63.255

172.16.239.0 ⟶ 172.16.239.255

ESM :- 255.255.240.0

172.16.0.0 ⟶ 172.16.0.15
172.16.1.16 ⟶ 172.16.1.31

172.16.2.239 ⟶ 172.16.2.255
172.16.3.239 ⟶ 172.16.3.239

172.16.255.239 ⟶ 172.16.255.239

(2.) 10.0.0.0/8

1000, 2000, 10, 40

(a) 10.0.0.0/8

$2^n \geq X$ $\quad X = 1000$

$2^{10} \geq 1000$

128 64 32 16 8 4 2 1

0000 1010 . 0000 0000 . 0000 0000 . 0000 0000

N/w B/c

10.0.0.0 ⟶ 10.0.63.255
10.0.64.0 ⟶ 10.0.127.255
10.0.128.0 ⟶ 10.0.191.255
10.0.192.0 ⟶ 10.0.255.255
10.1.0.0 ⟶ 10.1.63.255
10.1.64.0 ⟶ 10.1.127.255
10.1.128.0 ⟶ 10.1.191.255
10.1.192.0 ⟶ 10.1.255.255

128
64
192

10.2.192.0 ⟶ 10.2.255.255
10.3.192.0 ⟶ 10.3.255.255

10.255.192.0 ⟶ 10.255.255.255

Certified Subnet Mask :—

255.255.192.0

(b) 10.0.0.0/8

$2^n \geq X$ $\quad X = 2000$

$2^{11} \geq 2000$

0000 1010 . 0000 0000 . 0000 0000 . 0000 0000

11

N/w B/c

10.0.0.0 ⟶ 10.0.31.255
10.0.32.0 ⟶ 10.0.63.255
10.0.64.0 ⟶ 10.0.95.255
10.0.96.0 ⟶ 10.0.127.255
10.0.128.0 ⟶ 10.0.159.255
10.0.160.0 ⟶ 10.0.191.255
10.0.192.0 ⟶ 10.0.223.255
10.0.224.0 ⟶ 10.0.255.255
10.1.224.0 ⟶ 10.1.255.255
10.2.224.0 ⟶ 10.2.255.255

10.255.224.0 ⟶ 10.255.255.255

Combined Subnet Mask:-

255.255.224.0

192
128
64
32
224

(c) 10.0.0.0/8

40

$2^n \geq x$

$2^6 \geq 40$

0000 1010 . 0000 0000 . 0000 0000 . 0000 0000

(42 1)

1111 11

N/w B/c

10.0.0.0 → 10.3.255.255

10.4.0.0 → 10.7.255.255

10.8.0.0 → 10.11.255.255

10.12.0.0

10.251.0.0 → 10.255.255.255

CSM 255.252.0.0.

(d) 10.0.0.0/8

$2^n \geq x$

$2^4 \geq 10$

0000 1010 . 0000 0000 . 0000 0000 . 0000 0000

(16 8 ...)

N/w B/c

10.0.0.0 → 10.0.0.15

~~10.16.0.0~~ 10.0.0.16 → 10.0.0.31

~~10.32.0.0~~ 10.0.0.32

10.0.1.96 → 10.0.1.31

10.0.2.132 → ~~10.0.2.0~~

~~10.1.255.255~~

10.1.255.239 → 10.255.255.255

10.255.255.239

128
64
32
8
2

C.S.M 255.232.0.0 //.

192.168.1.96/27 → ?

H/w ID
IP Add
P/c ID

Subnet Mask

(1) Decimal (2) Prefix

1111 1111 . 1111 1111 . 1111 1111 . 1110 0000 /27
255 . 255 . 255 . 224

1111 1111 . 1111 1111 . 1100 0000 . 0000 0000/18
255 . 255 . 192 . 0

1111 1111 . 1111 1111 . 1111 1111 . 1000 0000 / 25
255 . 255 . 255 . 128

Notice :-

Subnet Mask

(1) Decimal (2) Prefix

1111 1111 . 1110 0000 . 0000 0000 . 0000 0000/11
255 . 224 . 0 . 0

1111 1111 . 1111 1000 . 0000 0000 . 0000 0000 /13
255 . 248 . 0 . 0

1111 1111 . 1111 1111 . 1000 0000 . 0000 0000 /17
255 . 255 . 128 . 0

1111 1111 . 1111 1111 . 1111 1110 . 0000 0000 /23
255 . 255 . 254 . 0

1111 1111 . 1111 1111 . 1111 1111 . 1111 1100 /30
255 . 255 . 255 . 252

1111 1111 . 1111 1111 . 1111 1111 . 1111 1110 /31
255 . 255 . 255 . 254

→ Convert Decimal Mask to Prefix

(1) Decimal (2) Prefix

255.255.255.224 → 27

255.224.0.0 → 11

255.255.192.0 → 18

192.168.1.96/27 → ?

1111 1111.1111 1111.1111 1111.1110 0000

N/w ID

N/w ID = 27

IP add

B/c ID

32) 96 (3

96

0

∴ it exactly divisible that is N/w ID

192.168.1.64/29 → ?

— — — .1111 1000

8

last bit.

8) 64 (8

64

0

N/w ID = 29

192.168.1.32/30 → ?

Sol:-

N/w ID

4) 32 (8

32

0

Ans = 30.

✗ 192.168.280.64/26 ✓

Nw ⇒ 26

Sol:-

64) 64 (0 = Net nd id

= nd net id

Valid IP

172.168.100.0/31 ✗

16

1111 1000

172.168.100.100/29

1111 1000

✗ 192.168.1.100/31.

Sol:

8) 100 (12

8

20

16

4

Sol:

8) 100 (12

8

20

16

4

Net n/w id

N/w id = 31

onthe no" is in add

Sol:

2) 100 (50

100

0

N/w id = 31

Broadcast id:

192.168.1.63/26

24

11 1111

Valid ip

192.168.1.60/26

24

11 1100

Nctq

64/63 (1 ; Not a N/w id

64) 60 (0 Not a N/w id.

Differing is one in b/w of prifix. Range devid into.

4 octats differing is. One bit is a Broadcast id

255.255.255.232 Convert into Prefix

24

4

1110 1000

255
232
23

128 64 32 16 8 4 2 1

1 1 1 0 1 0 0 0

16 8 4 2 1

1 1 1 0 1

2^3

28//

⇒ In decimal Subnet Mask we can get only following Numbers

255, 254, 252, 248, 240, 224, 192, 128, 0

⇒ every time in first octat it will be 255

⇒ In 2nd, 3rd octats it can be Any Number in this Range.

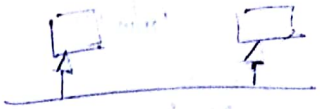
⇒ in 4th Octats Beside in 255 (252 it can get any

Other Mask

⇒ In Prefix Number we get /8 /16 /30

Tell Some Device :-

Switch, NIC
Cable
Hub
Router
Computer
Server
F/w.



N/w

physical — LAN, WAN, MAN

logical — IP

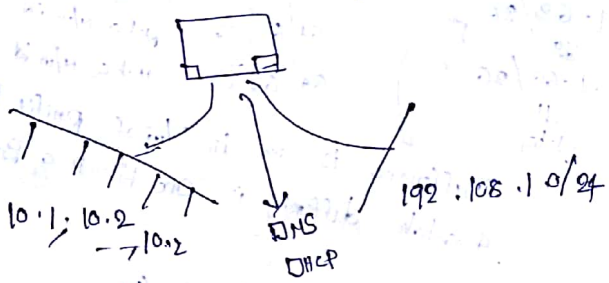
Router :-

Two Type of Router

1. S/w Router
2. H/w Router

S/w Router :-

A Comp in which we as Server for 2000 - 2012 instal Throw Nc card we install Service called Remote Acc Frabj Routing then in it is called S/w Router.



H/w Router :-

It is seperate decedicated h/w device it's in own h/w which can be Enable Two logical Network (LAN, WAN)

International Ex :-

- Cisco (60-70%)
- Juniper
- Huawei
- D-link
- Net-gear
- Samsung
- Ibll
- HP

ISP's → ISP

Internet

Juniper pepsy

Router Again Classified into 2 types

1. Manageable Router
2. Un Manageable Router

Series 750
|
1200

3 Layers
(1) Access layer Router
(2) Distribution Layer Router
(3) Core layer Router

(1) Access layer Router:—

- This Router can be used in "Small Company"
- The Series is from 700, 800, 1200, ... , 1700, 2500
outdated,

→ Series 2500
Model — 2501
2502
2503

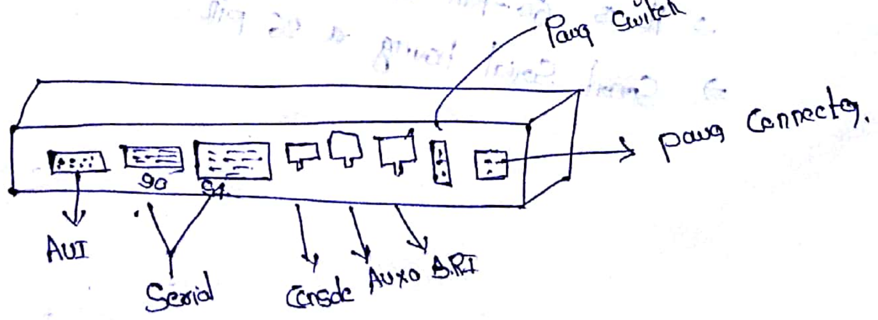
(2) Distribution layer Router:—

This Router are used in Medium level Company
→ The Series is from 2600, 2800, ... 4000

(3) Core Layer Router:—

This Router are used in MNC, & ISPs.
The Series is from 4500, 6000, 7000, -- 10,000, 12,000

External Component of Router:—



AUI (Atachiment Unit Interface):—

— it is also called a LAN port
— it is used to Connect LAN throw the Router
→ we need to accessing one ip Addrs that addrs is same logical N/w which we use in this LAN.
→ LAN port also called as Eithy Net, Fast Ethernet ... thy are The Gigabit ethernet.

→ AUI — 10 Mbs
— Ethernet — 10 Mbs
→ Fast Ethernet → 100 Mbs
→ Gigabit Ethernet → 1000 Mbs
} RJ-45

IP: 192.168.1.1
SM: 255.255.255.0
D/G.w: 192.168.1.100

IP: 192.168.1.2
S/w 255.255.255.0
D/G 192.168.1.100

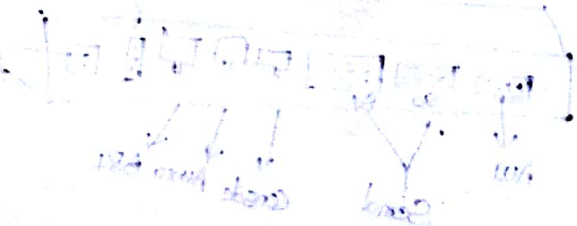
-700 -2500 (Fast ethernet are not available)

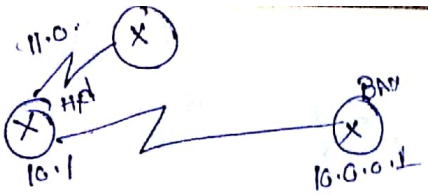
Default Gateway :—

1. it is "exit & entry" point of N/w
2. if M/c Communicating N/w default gate way not use
3. if Communicating other Lan default gate is used
4. Default Gateway always Router a Lan interface ip address

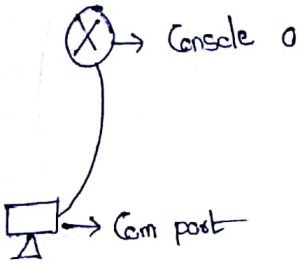
Serial port :—

⇒ It is also called a wan port
⇒ it is 60-PIN Connector
⇒ Smart Serial having a 26 pin





Console 0 :—



- Without Basic Configuration we cannot Connect Router to Lan
- To do Basic Configuration we need to use Console 0 port
- Console 0 port used locally.

(1) IP Addressing

- class & Range
- N/w & Host position
- Number of N/w & Host
- N/w, Host & Broadcast IDs
- Public & Private
- Subnet Mask
- Subnetting
  - Based on Network
  - Based on Host
- short cut
- VLSM

3 days

(2) Router

- what is a Router
- Type of Router
- Series of Models
- Mode in a Router
- Basic Command of Router
- Physical Connectivity
- Default Gateway
- Cisco IOS

3 class

(3) WAN Technology.

- physical connection
- WAN Protocols
- WAN Trouble shooting

1 day

(4) Routing Protocols

- Static Routing
- RIP Protocol
- ~~EIGRP~~ - EIGRP "
- ospf "

4 day

5) Access Control list — Security
- Rule of Acl
- Standard Acl
- Extended Acl

1 day (Boys class)

6) Switch
→ HuB
- CSMB/CD
- collistion & Broadcast Domain
- Type of Switch
- MAC Table
- Basic command & config
→ VLan
- Trunking
→ DTP
- VTP
- STP
- ~~Rou~~
- CDP
- Route on stick

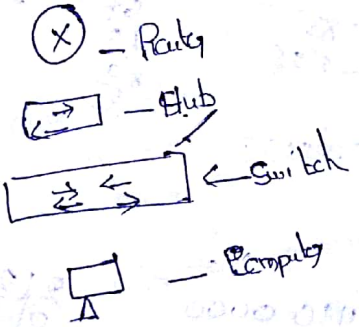
4 days

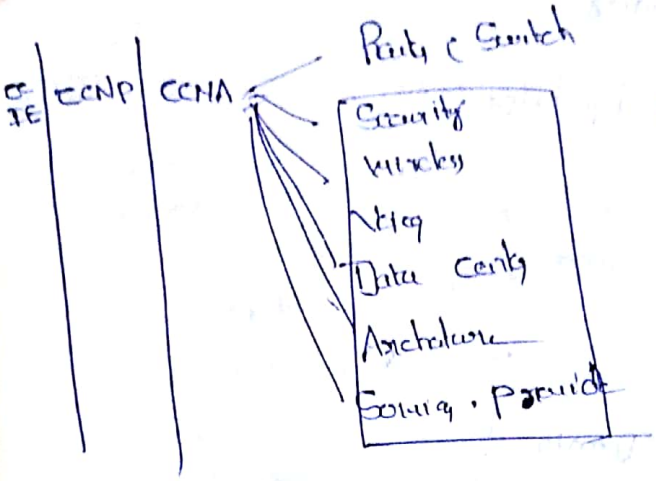
24/Aug/2013

(7) NAT & PAT
(8) Backupg
(9) Password Recovery
(10) IPV6

2 days

Topology :-





IP Address

it is also called as logical Address (or) S/w Address. They are

Two Types of ip Addressing one is

1. IPv4
2. IPv6

IP:-

It is unic number which will be identify over a Computer Network.

1. IPv4:-

it is a 32-bit logical Address which is devided into 4 octets

Note:- IPv4 is inform of binary Numbers

Convertion Binary to Decimal :—

0000 0000 — 0

1010 1010 — 170

0101 0101 — 85

1111 1111 — 255

0 . 150 . 85 . 255

128 + 32 + 16 + 2 = 178

64 + 32 + 4 + 1 = 101

Decimal - Binary

224 — 1110 0000

100 — 0110 0100

200 — 1100 1000

20 — 0001 0100

0 - 0000 0000
127 - 0111 1111
128 - 1000 0000
191 - 1011 1111
192 - 1100 0000
223 - 1101 1111
224 - 1110 0000
239 - 1110 1111
240 - 1111 0000
255 - 1111 1111

128 64 32 16 8 4 2 1

2|127-1
2|63-1
2|31-1
2|15-1
2|7-1
2|3-1
1

2|191-1
2|95-1
2|47-1
2|23-1
2|11-1
2|5-1
2|2-0
1

2|192-0
2|96-0
2|48-0
2|24-0
2|12-0
2|6-0
2|3-1
1

2|223-1
2|111-1
2|55-1
2|27-1
2|13-1
2|6-0
2|3-1
1

class	Range	Use
A	1-126	LAN & WAN
B	128-191	

4/08/13

Priory bit:-

Common Bit Pattern off each class is called Priory bit. Priory bit is only a first Octeat. By using This Priory bit we are geting Range in each class

IPV4 is devided into 2 Parstions one is network parstion & Anthy one is Host Parstion

Network Parstion:-

N/w Parstion Sude be same in Sude be same in all the pcs in a LAN

Host:- Host Parstion is complesary diff from LAN

ip Adding is devided into two parstion
1. N/w parstion
2. host "

why :-

- N/w id, used by Routers
- N/w id will allway will be host position

Broadcast id :-

- Broadcast id is a last ip Addrs in a network
- Broad cast id can not be assigned to any device
- Broadcast id will be allway One '1' in the host position

Valid Host ips :-

- This are the ip Addrs which given assicen to any host
- Addrs b/w N/w id & broadcast id & valid host Address

class A :-

Numbs of N/w

$2^{8-1} = 2^7 = 128$

$= 128$

$= 1 - 126$

Number of Hosts

$2^{24} = 16777216$

-2

16777214

N/w ID

B/c ID

class B (Parity)

$2^{16-2} = 2^{14}$

$= 16384$

$2^{16-2} = 2^{16}$

65536

-2

65532

N/w ID

B/c ID

128

128

256

class C

$2^{24-2} = 2^{22}$

$= 4194304$

$= 2097152$

$2^8 = 256$

-2

254

N/w ID

B/c ID

Ip are of Two TYPE

1. Public
2. Privcat

1. Public :-

are used in internet & wide Area Network. Public ip we need to purchase & registers

2. Private :-

Private ips can be used in a network is not connected through internet. Privat ips are free of cost

Private

		Network
A:	10.0.0.0 – 10.255.255.255	1
B:	172.16.0.0 – 172.31.255.255	16
C:	192.168.0.0 – 192.168.255.255	256

NAT

Subnet Mask: —

		Prefix Notation
Decimal Subnet mask	A: 255.0.0.0	/8
	B: 255.255.0.0	/16
	C: 255.255.255.0	/24

– subnet Mask will diff N/w portion & Host portion in a IP Address

Router: —

Router is a internetworking device which Route the Packet (DATA) one logical n/w to other logical N/w

There are Two Type of Network

1. Software Router
2. Hardware Router

S/w Router

1. S/w Router is a Comp. server os is installed, Two NIC cards Present, Routing & remote acc is Enabled this is a S/w Router
2. It is mainly used in local Area Networks

H/w Router

1. H/w Router is a dedicated Physical device it is its own Memory & Processor, Interface & OS (IOS) (Internetwork Operating System)
2. it is used with in a LAN as well for WAN

There are Two Type of Router

(1) FIXED ROUTER'S
(2) MODULAR Router's

There is hisrarical structure from cisco

(1) Access layer Router :-

This are the router which are used in small Company all end Branch

Series : 700, 800, --- 1700 --- 2500

(2) Distribution layer Router :-

This router are used in Medium level Organization

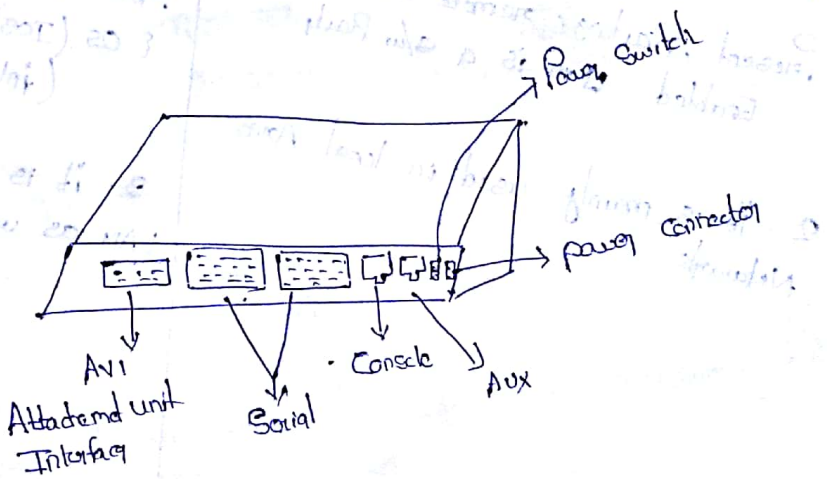
Range
M/c 700

Series : 2600, 2800, 3600, 3700 --- 4500

(3) Core layer Router :-

This router are used in Big Compal comping ex. MNC, National & internal ISP

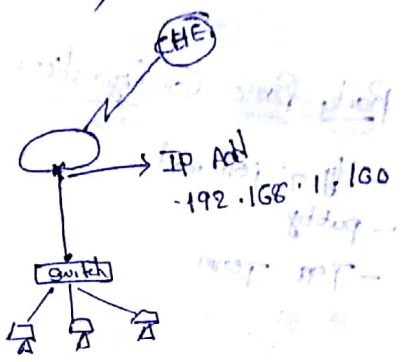
Series :
6500, 7200, --- 10,000, 11,000, 12,000



AUI (Attachment Unit Interface) :-

— it is a 15-pin Connector which we need to connect local Area network (LAN)

— it is also called as LAN port, Ethernet Port, Fast Ethernet Port gigabit ethernet & default gateway



Now	~~pins~~ speed
AUI	10 - 15
Ethernet	10 RJ-45
Fast Eth	100 →
Gigabit	1000

Name Default Gateway

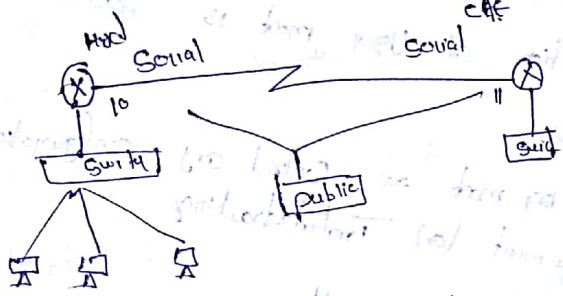
Default Gateway :-

It is exact entry point of a Network default Gateway is all ways Router LAN interface Address.

Serial Ports :- (oo) Serial Interface

— it is 16 pin Connector which is used to connect two routers

— This also called as WAN Port



Over a WAN Link we need Two Public ips

Console & Aux :-

Console	Aux
(1) it is used ~~to~~ for Basic Configuration	(1) used for Basic Configuration
(2) Used for locally	(2) used for remotely
(3) RJ45	(3) RJ45

$>en
#conf t

Router Basic Configuration:-
- Hyper Terminal
- putty
- Tera Term

after doing so we will enter into "User mode"

User Mode:-
(1) This is a first mode in a Router
(2) identification of User mode is Hostname ε > Symbol expt Router>
from user mode we cannot control any configuration it is used for basic Management (or) Troubleshooting
(i) Ping ipaddr.
(ii) Telnet ip Addr
(iii) Trace Router

Ping:- it is used to check connectivety b/w two devices

Telnet:- it is used to access a device which present in remote location

Trace Route / Tracert:- it is used to change a root of b/w source & destination, but destination is not directly connected.

enable : it will take into Privilege mode

Privilege mode:-

" This is the 2nd mode in a Router identification of Privilege mode.

it is a "host name" & # (symbol)

Note:- in Privilege mode also we cannot do any configuration.

from Privileged mode we can access router completely.

Router > show ip interface Brief

it will display interface type & number

Ip address for the interface it will

also display status of interface (IP/device)

> show Running - Config

display Configuration Protocol NVRPM / HDD

> show Version

it will display IOS Version

↓ 12.4 version

> copy running - config startup - config

it will copy information from RAM to NVRAM (Protocol)

> Erase ios

it will erase the Configuration file

Configure Terminal: it will taken into global Configuration mode

Router (config) #

(3) Global Configuration mode:-

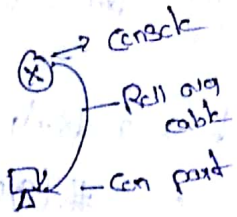
(i) identification of global Configuration mode is

Host name + (config) # (# Symbol)

Router (config) #

(ii) all the Configuration is a router we can start global Configuration mode

Packet Tracer : —



Win

- Hyper Terminal
- putty
- Tera Term

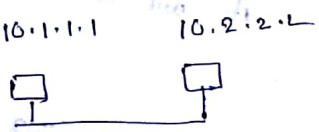
would you like to enter Basic config [yes/no]: no

Router> —

User mode

T. shooting

Ping
Telnet
Trace Route



→ Ping 10.2.2.2
× Telnet 10.2.2.2
T.R. 10.2.2.2

Router> enable
Router#

	RAM	NVRAM
File	Running-config	Startup-config
Storage	Temp	Perm

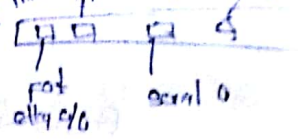
Console:- Router # Show Running-Config Router#. Show Startup-Config

(3) Router # Config Terminal

Router(Config)# — Global Config Mode

Router(config) # Hostname --- cisco ---

--- cisco-(config) # Ip add 1.1.1.1 255.0.0.0 *



- cisco - (config) # Interface fastethernet 0/0

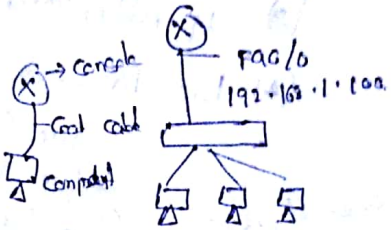
(5) - cisco - (config-if) # Ip address 192.168.1.100 255.255.255.0

" # No Shutdown

. exit

How To See interface conf t

Show Ip Interface brief



Security :—

- cisco - (config) # line console 0

-line) # Password CCNA

Telnet
192.168.1.100
Pwd be same for all

- CCNA CCNA-
CCNa cc-NA

login :—

(config-line) # login

exit

- Cisco - (config) # line vty 0 4.

- cisco - (Config-line) # Password CCNA

login

exit

enable # erase st

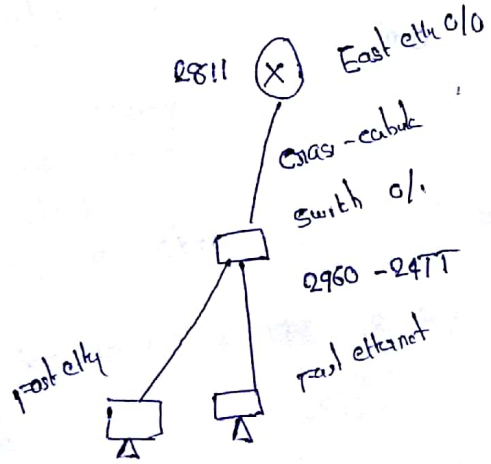
conf t

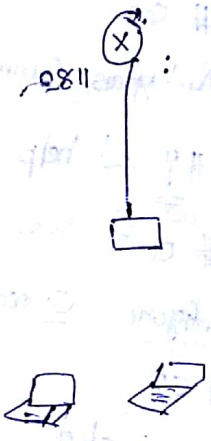
enable secret ccnp

#

--> enable

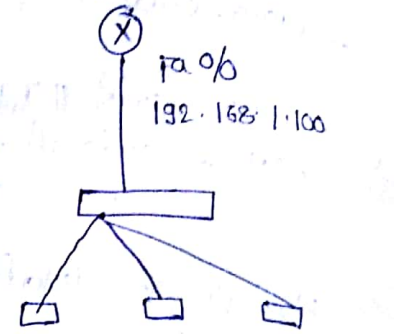
Password:





Basic Config

(1) Make physical Connection
(2) Hostname
(3) IP Address (or) Router
(4) Line Passwords
   - Line Console 0
   - Line VTY 0 4
(5) enable Secret Password
(6) Copy



IP	192.168.1.1	1.2	1.3
Mask	255.255.255.0	255.255.255.0	255.255.
DG	192.168.1.100	192.168.1.100	

== WIZDOM == # COPY RUNNING-Config Startup-Config

Enter ↵ Line
Space - Page

write (Parmet Save)
No Login (NC attentication)

encription for all Password encryption :—

(config) # Service Password-encryption

encripta is remove
no Service Password-encryption

error :-

== # con
% Ambiguous Command: "con"

== #? ↵ help

con?
Configure Connect
c?
clear clock --

conf (Pre Tab)

in cisco ISO we can see three o/p

1. incomplet cmd

incompld cmd Means this cmd is availbl in ISO but we need to add Sum More Syntex.

2. Invalid Cmd :-

if we see this Output that Means this cmd not Present in Cisco ISO IOS

3. Ambigues Command :-

it Means Cmd is Valid but we need to add Sum More Charaters in Syntex

Note :-

if we Use a ? Mark if directy in Any Mode (or) after typeing Sum chars in cmd then we can see remaing part of the Command.

-After Typing instial chars of cmd Press "Tab" To complet the Command

"Do" Command :-

if we want use Any Privelged mode Cmd Anthy mode before Command Just add "Do" & give the Command

Show history :-

== # Show History

⇒ Disply date & time

Show clock

⇒ Modification in clock

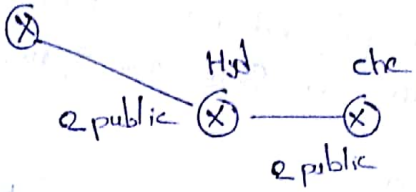
use ? Mark to set a cmd

clock set 09:55:55 12 Aug 2015

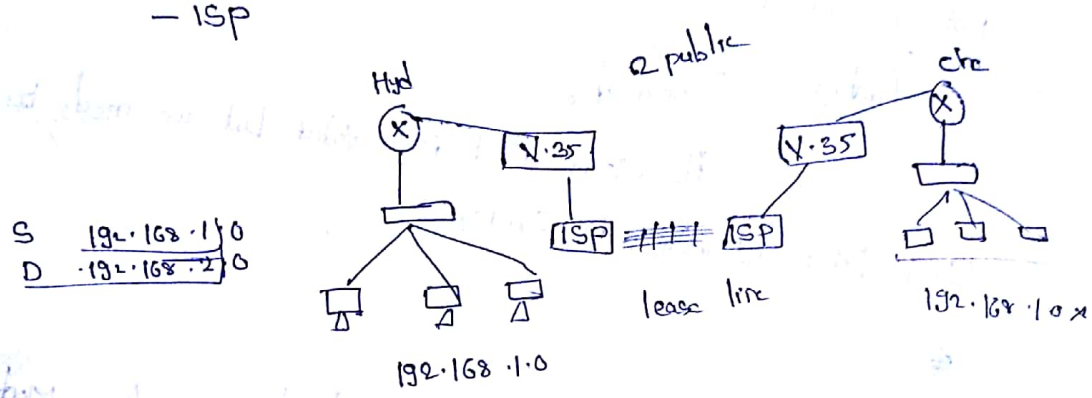
clock

show clock

WAN :—



— Router
— 2 IP addr = public ip add
— ISP

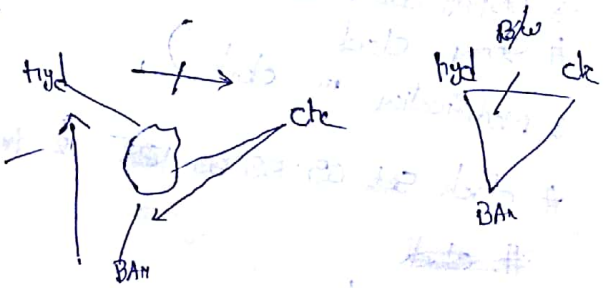


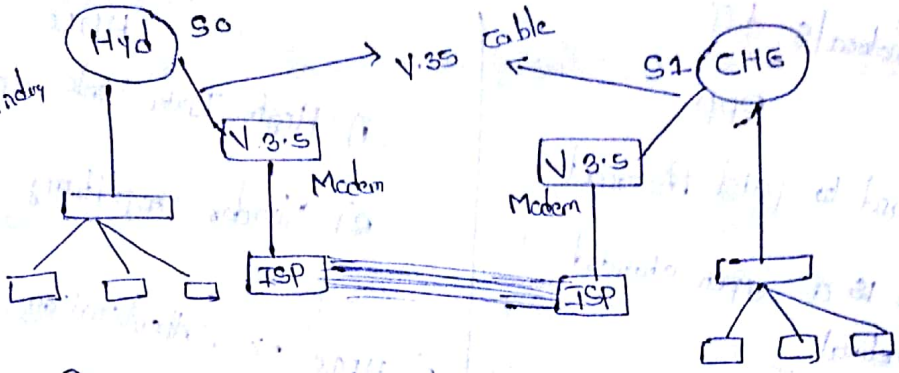
Rules of N/w :—

1. All the local Area N/w's (LAN) side be form different logical N/w.
2. Router Address side from same logical N/w which is used in a Lan.
3. Two directly connected Router, should be in same logical N/w.
4. all the interface of a Router side be in a d/w Network.

WAN (wide Area Network) :—

— lease line ✓
outdated — ISDN ✗ outdate — phone call is not push in data transfer.
— Frame-Relay ✓

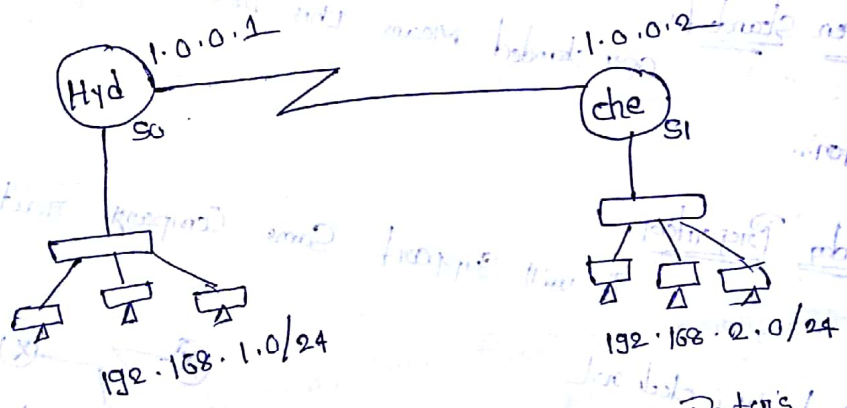




Last Lan connection in India - Mubai, chani.

Req :-

(1) Isp
(2) Public Ip address
(3) Protocol PPP / HDLC



Sol:- First do Basic Configuration on Both Routers

Hyd(conf) # Interface S0
-if) # IP add 1.0.0.1 255.0.0.0
NO shut down
encapsulation PPP
clock rate 64000

CHE(conf) # Fa0
Interface S1
IP add 1.0.0.2 255.0.0.0
NO shutdown
encapsulation PPP

Protocals diff

PPP

1) Point to point Protocal
2) it is a open standed Protocal
3) ppp will Support Athentication

HDLC

1) High Data Link control Protocal
2) Vendor Prepritary
3) HDLC Nr Authentication

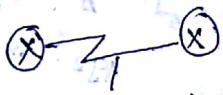
Open Standed :-

Open standed Means this Protocal Support Any Company Router.

Vendor Prepritary :-

It will Support Same Company routers

Bandwidth, clock rate



V.35 back to back

DCE

1) Data Communication Equipment
2) DCE devices generate "clock rate"
3) Modems

DTE

1) Data Termination Equipment
2) DTE device will accept clock rate
3) Routers

WAN Trouble Shooting

	Status (Physical)	Protocol (logical)	output
(1)	up	up	- Every thing is fine & working
(2)	up	Down	→ Mis-Match of Protocol
(3)	Administrative down	down	→ "No Shutdown" Not given on bal Router
(4)	Down	Down	→ "No Shutdown" not given on Remote Router → Link down

```
# SH ip INT BRIEF
# PING 1.0.6.2
# conf T
# Int Se/3/0
# Encapsulation HDLC
# Do Sh ip INT Bri
# end
# PING 1.0.6.2
# conf
```

Routing Table:-

1) The list of N/w : The Router know present in a Routing table
2) By default Router will be add all directly connected N/w in the routing table.
3) if directly Connected N/w is down this entry are not add in Routing Table
4) if Destination N/w are not available, Router will brock the Packet (data)
5) Destination N/w can be added in "two way"
   (1) Statically
   (2) Dynamically

6) Routing Table includes directly connected N/w (destination N/w if add), exit interface, Metric, Administrative Distance ..... ext

Static Routing :—

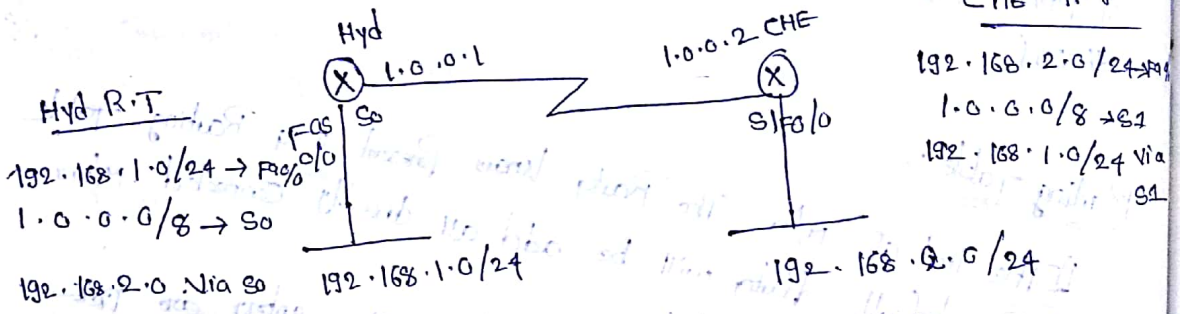
1. Static Routing is done by administrator manually stored
2. To Group Static Routing admin is know destination ip add (destination, Subnet Mask.
3. Static Routing is very secure but it can be use in very small N/w that is esly configure state Routing. OR Around "50" Router.

Syntex :—

(1) Router (config) # IP Router <Destination N/w ID>
<Destination Subnet Mask> <Exit interface>

(or)

(2) Router (config) # IP Router <Destination N/w ID>
<Destination Subnet Mask> <Next Hop Ip>



Hyd (Conf) # IP Route 192.168.2.0 255.255.255.0 S0

CHG (conf) # IP Route 192.168.1.0 255.255.255.0 S1

--Hyd -- # Show IP Route

Conf T

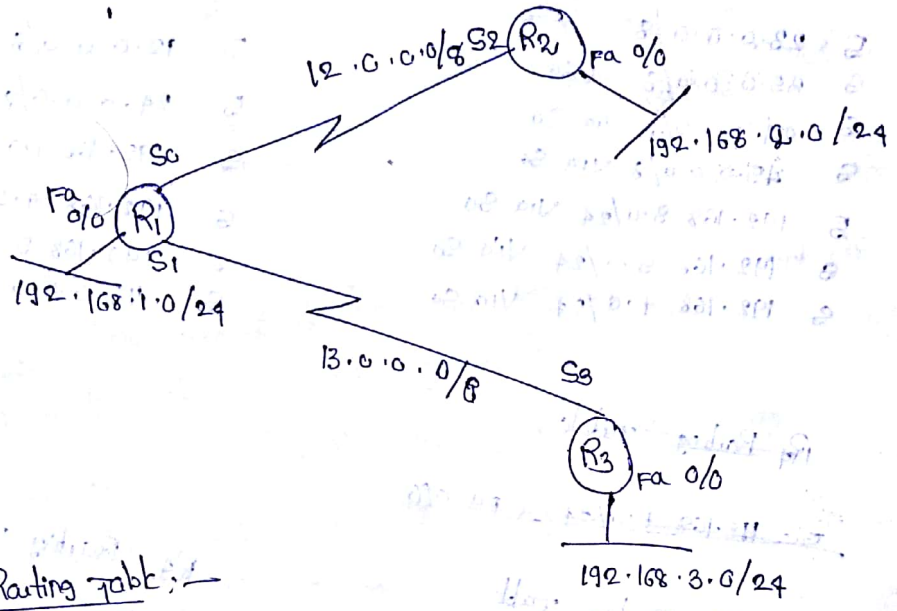
--(config)#

cmd:

Trace 192.168.23.1 ↵

Routing:—

The Process of Transferring data one logical N/w to other logical N/w is called "Routing"



R2 Routing Table:—

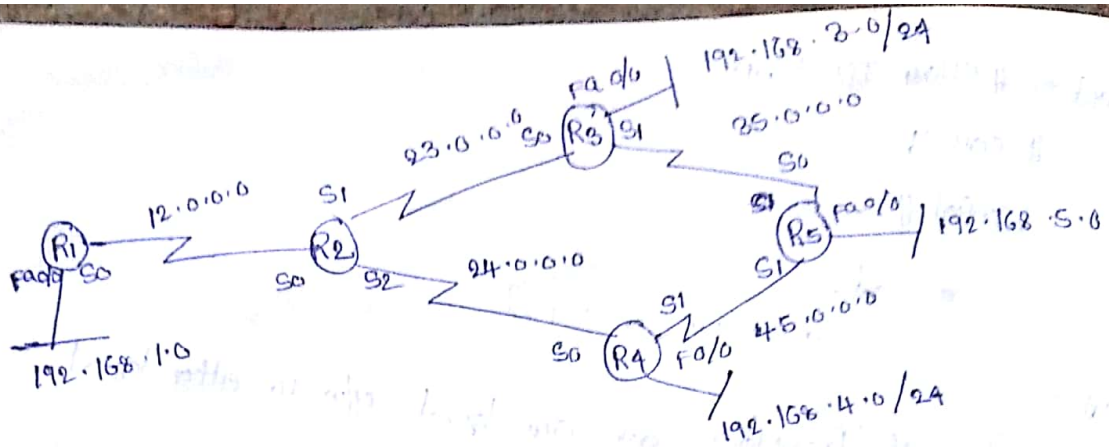
C 192.168.20/24 → Fa 0/0
C 12.0.0.0/8 → S2
S 192.168.1.0/24 → S2
S 192.168.3.0/24 ~~Via~~ S2
S 13.0.0.0/8 Via S2

R3 Routing Table

C 192.168.3.0/24 → Fa 0/0
C 13.0.0.0/8 → S3
S 192.168.1.0/24 Via S3
S 192.168.2.0/24 Via S3
S 12.0.0.0/8 Via S3

R1 Routing Table

C 192.168.1.0/24 → Fa 0/0
C 12.0.0.0/8 → S0
C 13.0.0.0/8 → S1
S 192.168.2.0/24 Via S0
S 192.168.3.0/24 Via S1



R1 Routing Table

C 192.168.1.0/24 Via Fa 0/0
C 12.0.0.0/8 → S0
S 23.0.0.0/8 → S0
S 25.0.0.0/8 → S0
S 24.0.0.0/8 Via S0
S 45.0.0.0/8 Via S0
S 192.168.3.0/24 Via S0
S 192.168.5.0/24 Via S0
S 192.168.4.0/24 Via S0

R3 Routing Table

C 192.168.3.0/24 Fa 0/0
C 23.0.0.0/8 → S0
C 25.0.0.0/8 → S1
S 12.0.0.0/8 Via - S0
S 24.0.0.0/8 Via S0
S 192.168.1.0 Via S0
S 192.168.4.0 Via S0
S 192.168.5.0 Via S1
S 45.0.0.0 Via S1

~~R4 Routing table.~~

~~C 192.168.4.0/24 → Fa 0/0~~

R2 Routing Table

C 12 → S0
C 24 → S2
C 23 → S1
S 192.168.1.0 Via S0
S 192.168.3.0 Via S1
S 192.168.4.0 Via S2
S 192.168.5.0 Via S1
S 35 Via S1
S 45 Via S2

R4 Routing Table

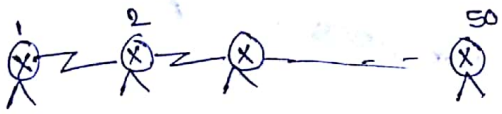
C 4.0
C 24
C 45
5.0 Via S1
3.0 Via S1
23.0 Via S0
35.0 Via S1
1.0 Via S0

R5 Routing Table.

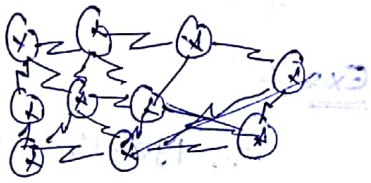
C 5.0
C 45
C 35

Range: 12-15
- show static Routing.

50 Routers



=149 R1 R2
3 4
add 146



Mask → Sub-N/w
IP add

Subnetting :-

The Procq of dividing a large N/w into multiple smaller Network (Subnets) is called the Subnetting.

Subnet is done to reduce the wastage of ip addressing

Subneting can be done in two way

(1) Req of Sub-net
(2) Req of Host

FLSM Subnet also called as FLSM (Fixed length Subnet Mask)
↓
Subnet is done by borrowing bits from host position convertin into N/w Position (i.e 0's to 1's)

B Req of Subneting

Note: To do Subneting on basq of Requirend of Subnet need to borrow bits from left side.

Ex 1:-

May take = 6 bits
Min " = 2 bits

128 64 32 16 8 4 2 1

192.168.1.0 /24

1111 1111 . 1111 1111 . 1111 1111 . 0000 0000

$2^n \geq X(2)$

N/w ID	B/c ID	C.S.M (Customize Subnet Mask)
192.168.1.0	192.168.1.127	255.255.255.128 (or) /25
192.168.1.128	192.168.1.255	

Ex 2:-

192.168.1.0 /24

1111 1111 . 1111 1111 . 1111 1111 . 0000 0000

24 + 2 = 26

$2^n \geq X(4)$

n = number of borrowing bit

N/w ID	B/c	C.S.M
192.168.1.0	192.168.1.63	255.255.255.192
192.168.1.64	192.168.1.127	(or)
192.168.1.128	192.168.1.191	/26
192.168.1.192	192.168.1.255	

192.168.1.2
255.255.255.192

192.168.1.67
255.255.255.0

Ex 3:-

192.168.1.0 /24

1111 1111 . 1111 1111 . 1111 1111 . 0000 0000

1111 1

$2^n \geq X(30)$

$2^5 \geq 30$ Req = 30 Subnets

N/w ID	B/c ID	C.S.M
192.168.1.0	192.168.1.7	255.255.255.248
192.168.1.8	192.168.1.15	(or)
192.168.1.24		/29

192.168.1.248 192.168.1.255

AND

192.168.1.5 192.168.1.10

255.255.255.248 255.255.255.248

Two comput are communicating (or) Not

Ex 4:-

192.168.1.0 /24

15-Subnet

→ write N/w & Host bits

→ use formate

→ write Subnet (N/w & B/c ID)

– Calculate C.S.M

1111 1111 . 1111 1111 . 1111 1111 . 0000 | 0000

1111

$2^n \geq X$

$2^4 \geq X(15)$

n = number of borrow bits

C.S.M (Customize Subnet Mask)

N/w ID	B/c ID
192.168.1.0	192.168.1.15
192.168.1.16	192.168.1.31
192.168.1.32	192.168.1.47
192.168.1.48	1.63
1.64	

192.168.1.239 /28

192.168.1.239

192.168.1.255

239 − 16 = 223

255 − 16 = 239

→ 7, 40, 80 (home work)

Ex5:-

7

192.168.1.0/24

1111 1111. 1111 1111. 1111 1111. 0000 0000

$2^n \geq x(7)$

$2^3 \geq x(7)$

1 2 4 8 16 32 64

C.S.M

255.255.255.224

(or)

27

N/w id

192.168.1.0

192.168.1.32

192.168.1.64

192.168.1.96

B/c id

192.168.1.31

192.168.1.63

192.168.1.95

192.168.1.255

255 / 32 = 7

255 / 2 = 3

255 / 4 = 0

(8)

Ex6:- 40

192.168.1.0/24

1111 1111. 1111 1111. 1111 1111. 0000 0000

$2^n \geq x(40)$

$2^6 \geq x(64)$

255 / 4 = 251

N/w id

192.168.1.0

192.168.1.4

192.168.1.8

192.168.1.12

192.168.1.16

192.168.1.252

B/c id

192.168.1.3

192.168.1.7

192.168.1.11

192.168.1.15

192.168.1.19

192.168.1.255

C.S.M

255.255.255.255

(or)

/30

Ex:- 80

192.168.1.0 /24

1111 1111 . 1111 1111 . 1111 1111 . 0000 0000

$2^n \geq x$ (80)

$2^7 \geq x$ (80)

80
80
160

N/w id	B/c id	C.S.M
192.168.1.0	192.168.1.1	255.255.255.253
192.168.1.2	192.168.1.3	(or)
192.168.1.4	192.168.1.5	/32
192.168.1.6	192.168.1.7	
1.8	1.9	
1.10	1.11	
:		

192.168.1.254 192.168.1.255

→ IP Subnet Calculations :-

How to identify N/w id

192.168.1.128 /25 → N/w ID

1111 1111 . 1111 1111 . 1111 1111 . 1000 0000

last bit

64) 128 (2
128
0

→ return "zero" is a Network id

192.168.1.64 /28

1111 1111 . 1111 1111 . 1111 1111 . 1111 0000

↳ end of bit pos. 4.

→ 64

16) 64 (4
64
0 — return zero is a Network id.

Ex → 192.168.1.96/28
→ 192.168.1.31/30
→ 192.168.270.128/27

Ex1:-
→ 192.168.1.96/28
1111 1111.1111 1111.1111 1111.1111 0000

16) 96 (6
96
0

is a Network id

Ex2:-
→ 192.168.1.31/30
1111 1111.1111 1111.1111 1111.1111 1100

4) 31 (7
28
3

"diff is 1"

is a Broadcast id

0, 4, 8, 12, 16, 20, 24, 28
1, 5, 9, 13, 17, 21, 25, 29
2, 6, 10, 14, 18, 22, 26, 30
3, 7, 11, 15, 19, 23, 27, 31

Ex3:- 1111 1111.1111 1111.1111 1111.1110 0000
→ 192.168.270.128/27
↳ invalid ip addr
More than "255"

Ex4:- 1111 1111.1111 1111.1111 1111.1111 1100
192.168.1.22/30 →

4) 22 (5
20
2

Valid ip Address

Ex5-
10.1.1.1/13
1111 1111.1111 1000.0000 0000.0000 0000
255.248.0.0

10.1.1.1/13
255.248.0.0

Ex6- 192.2.4.5/27
1111 1111.1111 1111.1111 1110.0000
255.255.255.224

Ex7:- 172.16.1.1/17
1111 1111.1111 1111.1000 0000.0000 0000
255.255.128.0

Ex8:- 172.16.1.1 /23

1111 1111 . 1111 1111 . 1111 1110 . 0000 0000

255 . 255 . 254 . 0

Ex9:- 10.1.1.100 /29

1111 1111 . 1111 1111 . 1111 1111 . 1111 1000

255 . 255 . 255 . 248

Ex10:-

172.16.0.0 /16

Subnet's = 500

2^{12} 2^{11} 2^{10} 2^9 2^8 2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0

4096 2048 1024 512 256 128 64 32 16 8 4 2 1

$2^n \geq x$

$2^9 \geq (512)$

1111 1111 . 1111 1111 . 1111 1111 . 1000 0000

N/w ID
172.16.0.0
172.16.0.128
172.16.1.0

B/c ID
172.16.0.127
172.16.0.255
172.16.1.127

C.S.M
255.255.255.128
(or)
25

172.16.255.128 172.16.255.255

Ex11:-

172.16.0.0 /16

Subnet = 1000

1111 1111 . 1111 1111 . 0000 0000 . 0000 0000

$2^n \geq x$

$2^{10} \geq (1024)$

1111 1111 . 1111 1111 . 1100 0000

N/w
172.16.0.0
172.16.0.64
172.16.0.128
172.16.0.192

B/c ID
172.16.0.63
0.127
0.191
0.255

C.S.M
255.255.255.192
(or)
26

255.192

192.

172.16.255.192 .

172.16.255.255

Ex 12:-

10.0.0.0 /8

Subnet = 4000

$2^n \geq x$

$2^{12} \geq x (4096)$

$2^{12} = 4096$

1111 1111 . 0000 0000 . 0000 0000 . 0000 0000

1111 1111 1111

N/w id

Sub N/w

C.S.M

128
64
32
16
240

10.0.0.0.0
10.0.0.16.0
10.0.0.32.0
10.0.0.48.0

10.0.0.15.0
10.0.0.31.0
10.0.0.47.0

255.255.240.0

/20

10.255.255.2400 10.255.255.255

Routing & Routing Table:-

(1) Static Routing
(2) Dynamic Routing

IGP - Interior Gateway Protocol

EGP - Exterior gateway Protocol

Ex: BGP

Distance Vector

Ex: RIPV1 X
RIPV2
IGRP X

Advance Distance Vector

Ex: Elgrip

link state Protocol

Ex: OSPF
IS-IS

X - outdated

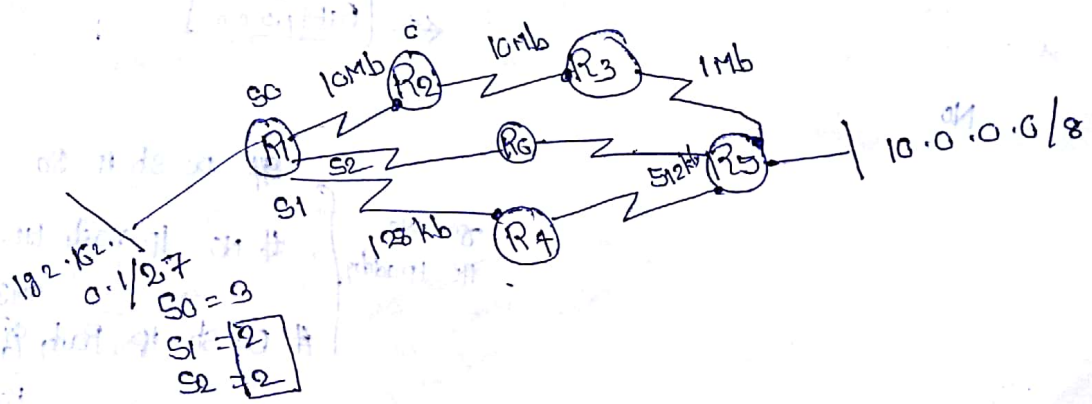
Functions of Dynamic Routing Protocall :—

1. They will exchage Routing info from Nabering Routy
2. They will may all N/w info of Nabering Routy
3. They will Caliale Shaulest & Best path Automatically
4. if N/w changes They will exchange . That change informate Automaticallay

RIP → Routing information Protocal :—

- Open Standard Protocal :—
  Mean we can config this Routing Protocy on Any Company Routey

→ Metric = Hop Counte :—
  it is way of calculating shaulest & best path

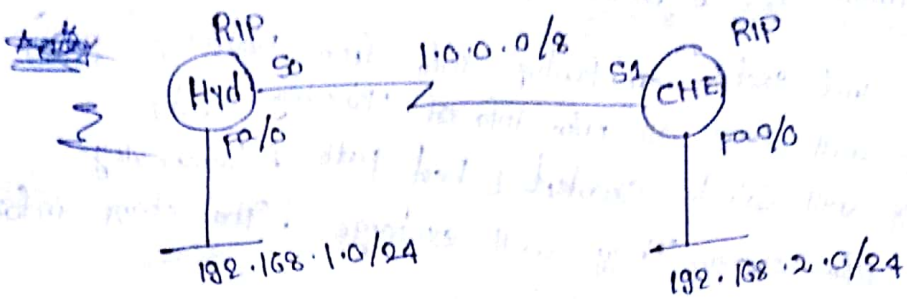


→ load balancing = 4 equal parts
→ Support only 16 Routers
→ RIP is a classfull Protocall :—
  it will support only default Subnet Mask.

class less :—
  it will be understand default & Customize Subnet Mask.

(30 sec)

→ Periodic Update :—
→ Full Routing tables are exchanged.



R.T

C 192.168.1.0/29 → Fas/0
C 1.0.0.0/8 → S0
R 192.168.2.0 via S0

R.T

C 192.168.2.0/24 → Fa/0
C 1.0.0.0/8 → S1
R 192.168.1.0 via S1

Hello RIP 1.0.0.0 →

Hyd(Config)# Routes RIP
Hyd(Config-Route)# Network 192.168.1.0
" # Network 1.0.0.0

CHE(conf)# Routes RIP
Net 192.168.2.0
Net 1.0.0.0

Hello
← RIP | 192.168.2.0 | 1.0.0.0

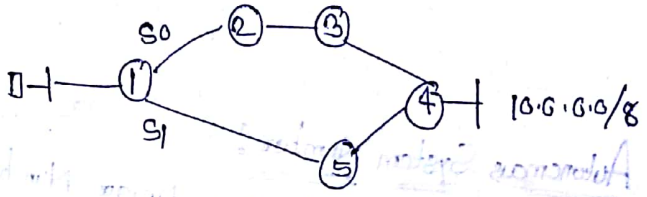
No

remove the ipaddr
Dc Sh ip Ro
No ip route 192.— Ser3/0/0
Dc Sh ip Route (Gay Route)

Update → 30 Sec
Invalid → 180 Sec
Flush Time → 240

	RIP	OSPF Open shortest path First	Eigrp Enhance Interior Gateway Routing Protocol.
Standard	Open	Open	Cisco
Max Router	16	No limit	254
Metric	Hop Count	Cost (B/w)	~~Load~~ + Bandwidth Delay.

RIP	OSPF
$S_0 = 3$ $S_1 = 2$	$S_0 = 1500$ kb $S_1 = 1300$ kb



$S_0 = 1500$ kb
$S_1 = 1300$ kb

Load Balancing	4-equal	6-equal	6-equal / Unequal
Updates	periodic	Trigger	Trigger.
loop :-	yes	~~Yes~~ No	No
Convergence	slow	Fast	Very Fast

Convergence :-
It is Time Taken by Routing Protocol to know the change that occur in a Topology.

Note :-
While selecting a Routing Protocol take which we need to see here Metric,
Convergence,
Standard,
load-balancing,
Updates,
classless / classful,
loop!

classless / classful classfull classless classless

Eigrp

Hyd(conf) # Router eigrp 10
-Router) # Network 192.168.1.0
Network 1.0.0.0

no router RIP
exit
do sh ip route

CHE(conf) # Router eigrp 10
-Router) # Network 192.168.2.0
Network 1.0.0.0

eigrp 10
do sh ip route
P - EIGRP

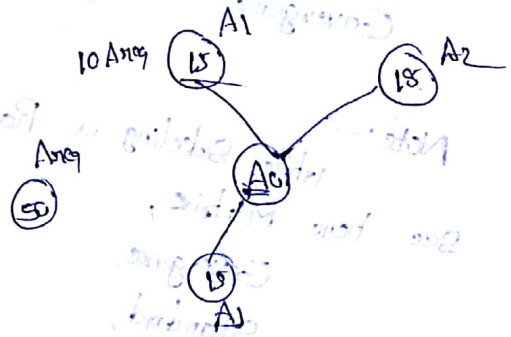
Autonomous System Number :-
it is a Unique Number it will identify - Routing Domain Range (1 - 65535)

OSPF :-

sh ip protocols

Hyd(conf) # Router ospf 1
-Router) # Network 192.168.1.0 0.0.0.255 Area 0
Network 1.0.0.0 0.255.255.255 Area 0

CHE(conf) # Router ospf 10
-Router) # Network 192.168.2.0 0.0.0.255 Area 0
Network 1.0.0.0 0.255.255.255 Area 0



Administrative Distance :-

it is Number it defines it Trust Worthy of the root

lesser the Number "Higher the Preference".

ospf - 110
eigrp - 90
RIP - 120
static ⇒ 1
D.C → 0

11:00 AM
- Hub
- Switch
- CSMA/CD
- collision / B
- MAC TAB
- Vlan
- Trunk

cmd :-

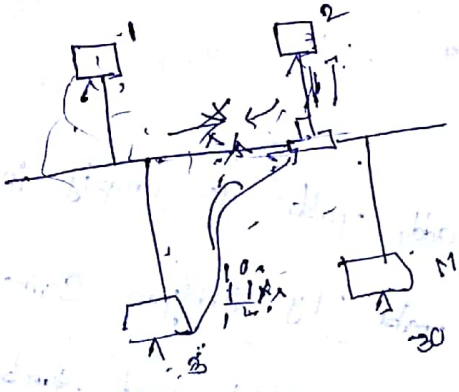
debug ip ospf events
debug ip packet (Dangerst cmd)
→ it disply all comming & outgoing packets

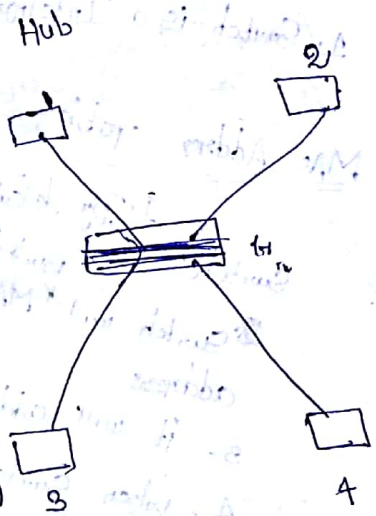
stop use "u all"

cmd -- # sh ip Protocols

TCP Ack | udp

Hub :-



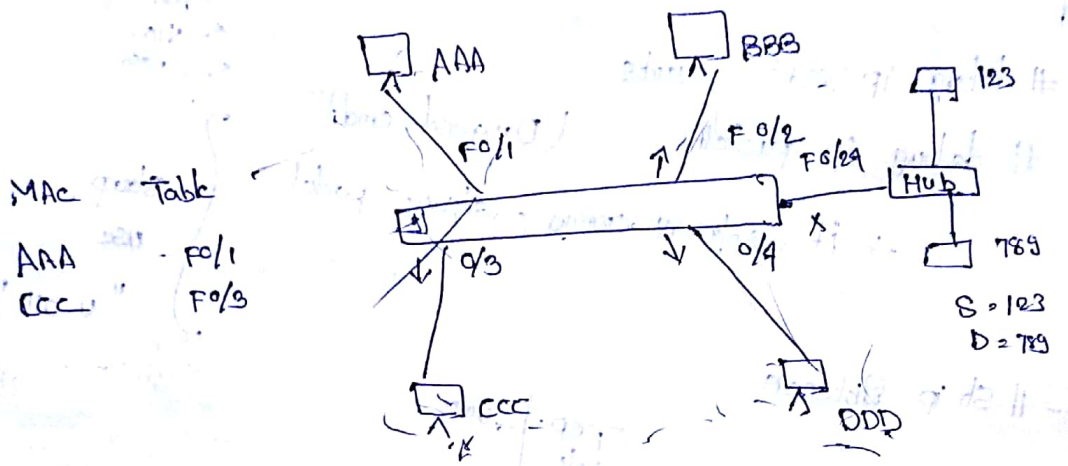


- Shared Media
- Collission
- CSMA/CD (Carried Sense Multiple Access / collision Detection)
- JAM Signal

SYS1 → SYS2
IP IP
MAC MAC

1. Hub is a Unintelligent Device
2. it is unintelligent device because can not read ip addr (or) MAC Addr
3. it can not give the information Connected devices
4. Hub is a Dumy device They use no Memory
5. Hub also called a Multiport Repiter
6. Hub are Having less Number of Ports & Very less in Cost

Switch:-



Note:-
1. Switch is a "Intelligent" Device

MAC Address Table:-

1. By default MAC addr Table is empty in ~~Table~~ Switch
2. Switch will Build MAC addr Table by Verifying Source M/c address
3. it will add Source MAC add with port Number
4. when Switch Recive a frame it will erth Flading (or) Forwading (or) filtering

Flood
Note:- if Destination MAC add is available it will be flooding

Forwarding:-

if Destination is available send info directly to That M/c.

3. Filtering :- if Source & Destination are on same interface it will do filtering it Drop the frame.

→ Manageble Switch — 1000
— Un-Manageble Switch — 8, 16, 32

internal Switch
M.B
Proc
RAM - Running-Conf
NRAM - Config.

Modes in Switch

~~MAC~~

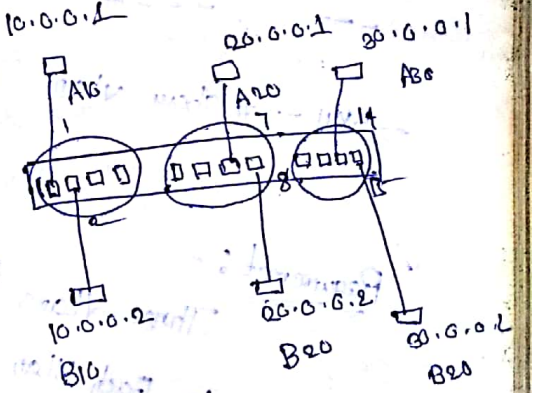
Switch>
↓
Switch #
Switch (config) # → Switch (conf-vlan) #
↓
Switch (conf-if) #
↓
Switch (conf-line) #

- Flading
- Security.

VLan :-

MAC Table

A10	Fe/1	Vlan 2
B10	Fe/2	Vlan 2



Vlan 1 = 22 - 24
Vlan 2 = 1 - 7
Vlan 3 = 8 - 14
Vlan 4 = 15 - 21

S: A10
D: B10

Vlan :-
logical grouping of N-devices which Common set of Requirement independent of physical location is called V-Lan. with Proper requirement.

- Vlans can devided a biger broadcast domain into Multiple Smaller Broadcast domain

- Vlan can improve N/w performance by stoping unnessary Stoping.
- Vlan improves N/w Security. It will
- each port of a switch is part of single vlan at a time.
- Vlan1 is default vlan & we can create vlan from vlan2 to vlan1002.
- In MAC table we can add Vlan information also

```
>en
# conf t
conf)# hostname - SW1 --
--sw1-# show mac-address-table
        Mac Addd Tabl
- - - - - - -
Vlan    Mac Addds    Type    Ports
---     -----        ---     ---
--SW1 -- # Show vlan (show vlan info)
```

Requirement :-
Three Vlans (sales, Account, HR)
In Each Vlan - 7 ports

Note :- Each Vlan Shud be Diff logical N/w

Creation of Vlans :-

```
-- SW1 - (config) # vlan ?
        # vlan 10
        # name sales
        # vlan 20
        # name accounts
        # vlan 30
        # name hr
        # end
```

--# show vlan

Assing port to vlan :—

conf)# int fa 0/1 - 7
if-range)# switchport access vlan 10
(conf)# switchport mode access

#int fa0/8 -14
switchport access vlan 20
switchport mode access

#int fa0/15 - 21
switchport acc vlan 30
switchport mod access

--# sh. vlan
Sh mac Table

#GetMAC
Macsel
Type my.
48 Number

Requirement :—

Navy In Sales = 7 User
Account = 9 Mor Us
HR = 2 Mor Users

Sw1
- Create Vlan
- Port to Vlan

Sw2
- Create Vlan (Same Number)
- Ports to Vlan

Vlan b

Automatically connect to auto Port.
DTP (Dynamic Trunk protocol).

Trunk port :—

Trunk port is logical N/w of all Vlan

-if) #INT G1/1
-if)# switchport Mode TRUNK

VTP

VTP ~~is~~ BPP is used to Mainteen Vlan consitentingy in a Switching devices. VPP is Making Switch as Serve Switch & client Switch

Serve Switch :—

- In a Serve Switch we can Creat Vlan & deleate a Vlan
- By default all Switchs are Server Switchs

client Switch :—

In client Switch we can not Creat (or) deleate Vlan

client Switch :take the information from Server Switch

Revison Number :—

By default all the Switch Revison Number as "zero (0)"

- when ever do Sum Configuring like Creating & deleting Revison Number change (Switchs will Trigar update They will Maintoy latest Vlan information)

Server :—

```
Config) # hist  Server --
        # VTP Mode Server
        # VTP DOMAIN INDIA
        # VTP PASSWORD CISCO
        # end
-- # show VTP Status
```

- No Need of . com any other things
- Provide a pwd .

Creat Vlan's :—

```
# conf T
```

#VLan 111
#Name ssss
vLan 222
#Name

Creat Trunk port

#

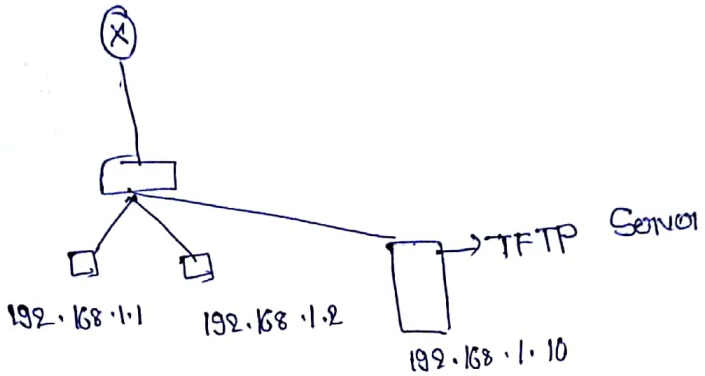
Client

config # HostNAME CLIENT-1-
VTP MODE CLIENT
VTP DOMAIN INDIA
VTP password CISCO
end
- # Show VLan

Router on stick :—

Backups

→ Startup-Config
→ IOS



Syntax:-

copy <Source> <Destination>

Go to Router

TFTP files

- # Copy startup-config TFTP
  ? 192.168.1.10 ↵
  ? ABCDE ↵
  --!!
  606 byte copied in (0 byte/sec)

Sp for Restoring the Backups:-

HHHHH# copy TFTP Running-config
? 192.168.1.10 ← TFTP Server ip addr
? ABCDE ← Backup file Name
? ↵

→

--Hyd--

CDP (Cisco Discovery Protocol)

: This is cisco Proprietary Protocol which is used to see information of other device like ip address, ios version, the flat form, which interface it is connected -- ext.

Disable CDP Protocol

conf) # No CDP Run ↵ } Enter to disable to all device

Show CDP ?

DTP (~~Dynamic Trunking Protocol~~)

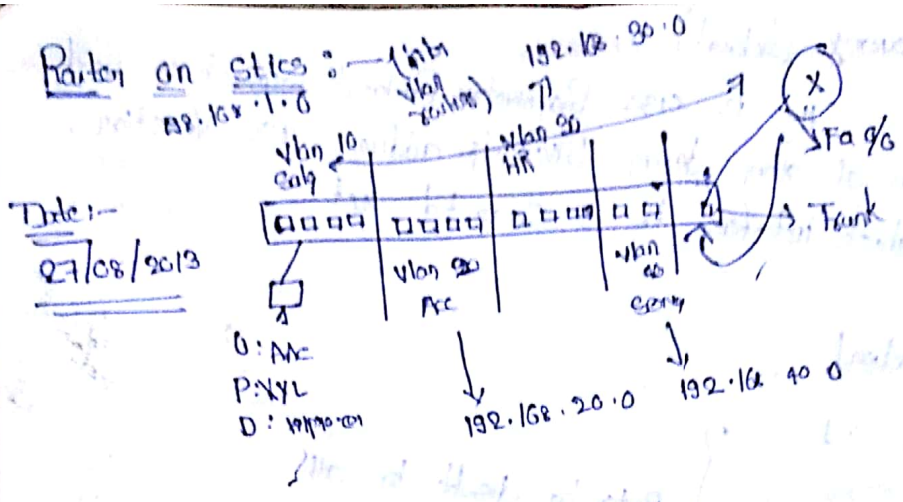
DTP Protocol :-

Protocol will Make Trunking Port by default on other Switch. by using 'No Switchport No' or negotiate it will disable DTP

No Switchport Nonegotiate

- Router Switch
- pool back
- IPV6
- NAT - A day

Router on Stick :-



Date :-
27/08/2013

Switch :-
- Do Basic Config
- Create Vlans (10, 20, 30, 40)
- Ports to Vlan
- Trunk

Router
- Do Basic Config
Note: just give "No shutdown" OR Router LAN interface, dont give IP add
- Create Sub-interfaces

#Interface Fo/0.1
Encapsulation Dot1Q 10
IP Address 192.168.10.100
255.255.255.0

INTERFACE Fo/0.2
Encapsulation Dot1Q 20
IP Address 192.168.20.100
255.255.255.0

Interface Fo/0.3
Encapsulation Dot1Q 30
IP Address 192.168.30.100
255.255.255.0

Interface Fo/0.4
Encapsulation Dot1Q 40
IP Address 192.168.40.100
255.255.255.0

Sh Run

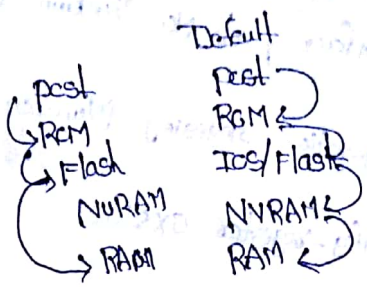
Port | Sub
Acc | Access
VLAN | - Vlan
R.P | - Trunk
- VTP

- Access Control List

DONE

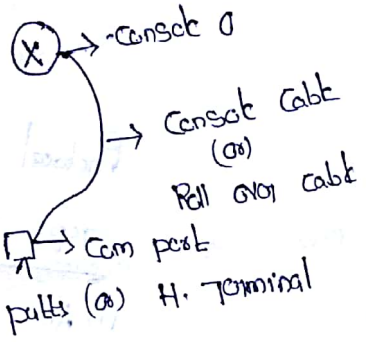
Password Breaking :-

Boot Process



Configuration Registry. 0x2142 0x2102

Power on self Switch



Step I :- put (or) Open H. Terminal [Switch on the Router

Traces Press "ctrl + Break" with 10sec # show version

> o/r 0x2142

> i

ROMMON > Confreg 0x2142

ROMMON > sreset

conf regis No 0x2102

Step II

Would you like to do banrc conf [yes/no] : No

yes : erasing all data in NVRAM

Step III :-

Router > enable

Router # copy start - RUN.

Hyd -- # conf T

Hyd - (conf) #

Line VTY 04

Note :- Now change all passwords

Note :-
with chg pwd go to all interface & do No shutdown Command

- Now change the configuration registry Number

```
Config)# Config-register 0x2102
#exit
#wr  (done)
#reload
```

28/8/2013

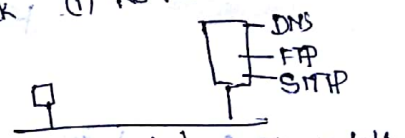
- Acc control list :-

Server	Port No
DNS	53
DHCP	67/68
FTP	21
HTTP	80
SMTP	25
Telnet	23
TFTP	69

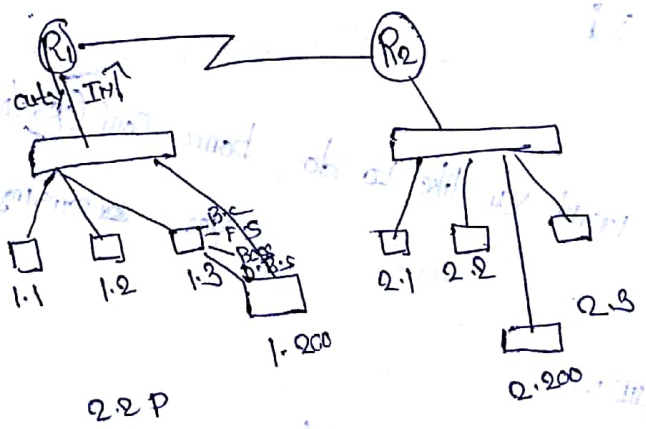
Total → 0 - 65535
Reserved → 0 - 1023
Open → 1024 - 65535

Protocol

TCP | UDP
(1) Ack (1) No Ack



- One - to - One
- One - to - Many
- Many to Many



2.2 P
2.3 P

Deny Permit

D 1.1
D 1.2
;

200
10X
190

Cisco firewall
P.D PIX | C.P X
New ASA

1.0 ↓ D 1.10
Deny all } Not visable.

Permit all
Deny all X

D 2.1 to 1.3 port 80

Creation Implimetation :-

5 ↓
1.2 D
1.3 P.

Interface
IN OUT

1. It is a list of statemant which will be useing we can Permit (or) Diney a "Packet"
2. ACL also called as "Packet filtering firewall"
3. It is a Security Tool Using which we can Contral folow of Trafic One Router to Anther Router.

They are Two Type of Acq list
1. Standed
2. Extended

1. Standed Access List :-
- AL Number is "1-99"
- we can black, host ona Subnet
- It Can black Open Communication
- It Can black the all the Services

2. Extended Acl :-
- The Number is "100-199"
- it can be black the n/w Host & Subnet & Service

- Extended Subnet we can block "one-way" "Two way" Communication
- we can have a sniffer (or) all the Services

- Rules of Acc Control List :-

1. All diney statements have to diney "first"
2. They Suck be at list one "Permit Statement"
3. Because an implicit all blocks all Traffic they when they is No block.
4. We can have Two Access List on every interface but one "inside" Anther is "Outside"
5. Acc Control list it work in Sequential Order

Syntax for standard Acl:

CReation

Router(config)# ACCESS-LIST <AC Number> <PERMIT/DENY>
<SOURCE ADD> <Source WILD card Mask>

Implementation

Router(config)# Interface <TYPE Number>
IP Access-GROup <Number> <IN/OUT>

Ex 1:-

1.1. Shubhbh Comm with R.G Network

WILD Card Mask :-

→ WILD Card Mask is opsit of Subnet Mask
- WILD card Mask Tell Ray which Bit Must Mach & which bit Must Not Mach.
- a bit Value of zero(0) - Match
1 - Dot Match (Ignore)
- WILD card Mask ip addr allway Zero's

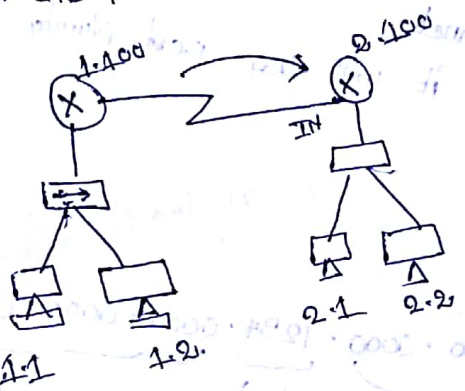
A : 255.0.0.0
WILD card Number 0.255.255.255

B 255.255.0.0
0.0.255.255

C 255.255.255.0
0.0.0.255

config)# Access-list 10 DENY 192.168.1.1 0.0.0.0
config)# ACCESS-LIST 10 PERMIT ANY

fig)# INT S0/3/0
-if)# IP ACCESS-GROUP 10 IN



NAT :- (N/w Address Translation)

1) it is used to Translate Privaal ip to public ip & public ip to Private ip.

2) by using Private ip address we can not Access internet

3) NAT is allow Communication from Private ip to Public Addres.

They are 3 Type of addr Translation

1. Static - NAT

in static NAT one-to-one Translation from a Private Address to a public Address.

we need Many Connection in a Static "NAT"

- Static - NAT is Mainly used in web-site Hosting.

(2) Dynamic-NAT :-

- Will Map local Address to pool of public ip address.

-In a Acc control list we need to define which Private ip to Communicat to Internet. which Private ip add to not communicate to Internet

- Dynamic-NAT Not in Use because How Many public ip addy. That Many Connections we can Establish. we need Many Internet Connecty

(3) PAT (port Address Translation) :-

- A Singk public ip Addrby can be used by Many Hosts in a Internet

-In PAT it will use port Numby for Translation (0-65535)

IPV6 :-

2001 : 0000 : 0000 : 1234 : 0000 : 0000 : 0000 : 0001 /64

N/w portion | subnet | Host

→ 2001:0:0:1234::01

→ 2001:!1234:0:0:0:01

1x 65535
65536

4294967296 → 65535

::1 → loop back addr

X: . — / —

Y . — — —

18446744073709551616 :

→ Hexa - decimal form
→ 128 bit Numby
→ parth 8 groip, seperated by :
→ Default N/w bith are /64
→ 2001, 2002, 2003, 2004 (Reserved)

Ex2:-

Sh Access-list } show acl list

Remove ACL

No IP Access-list standard 10

Line VT 0 4

Pass ccNA

=login

⇒

Ex2:- 1.1 student Telnet to chennai Router

conf t)# Access-list 111 Deny TCP 192.168.1.1. 00.0.0

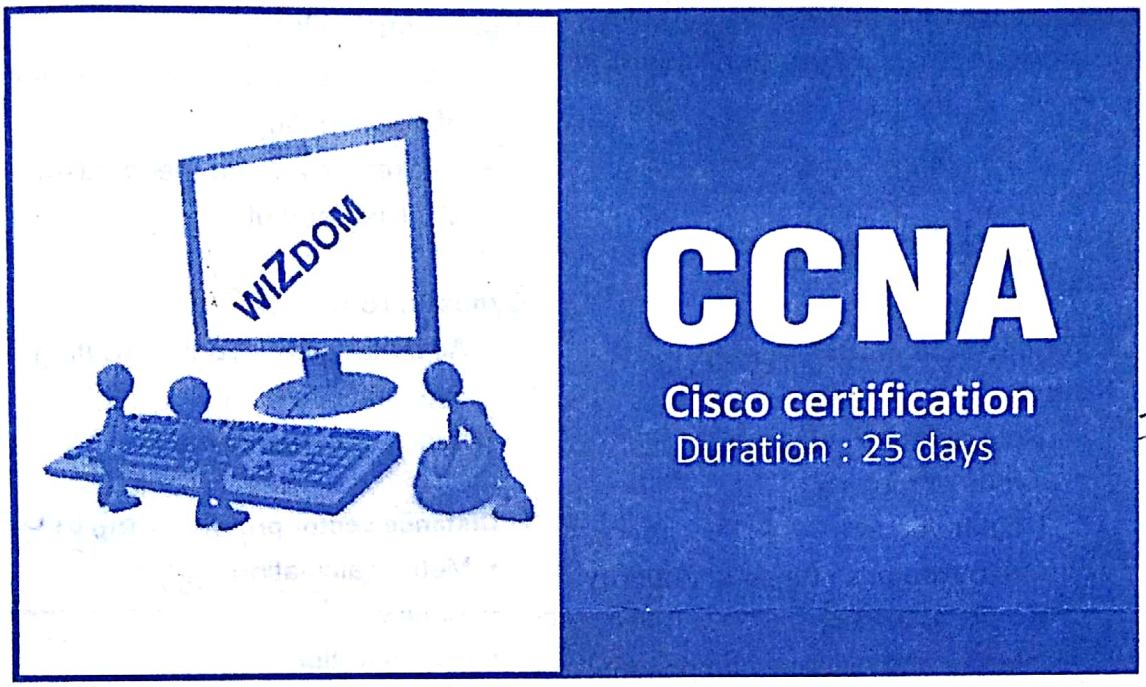
192.168.2.100 0.0.0.0 EQ 23

NEQ

GT

Access-list 111 Permit ip Any

WIZDOM
Technologies



CCNA

Cisco certification

Duration : 25 days

- Virtual Lab
- 24 Hours Classes Facility with Faculty

507, New HUDA Mythrivihar, Beside Aditya Trade Centre,
Ameerpet, Hyderabad. **Cell : 9550226526**

CCNA

WIZDOM Technologies

CCNA COURSE DETAILS

Basic of lan and wan
IP Addressing

- Fundamental's of Ip addressing
- Types of Ip address
- Classes of ip address
- Subnet mask
- Subnetting
- Vlsm
- Cidr

Osi reference model, Tcp/ip

Router

- Role of router
- Types of router's
- Router vendors
- Cisco Router's (Types & Model's)
- Router interfaces
- Internal and external components
- Boot process
- Initial configuration of router
- Default gateway
- IOS Modes, files
- Basic commands

Wan – wide area network

- Types of wan technologies
- Leased line
- Frame relay

Routing

- Rules of routing
- Routing table

Types of routing

- Static routing
- Dynamic routing

Static routing

- Advantages and dis-advantages of static routing
- Packet forwarding mechanism
- Verifying output

Dynamic routing

- Advantages of dynamic routing over static routing
- Types of dynamic routing

1. **Distance vector protocol – Rip v1**
   - Metric calculation
   - Timers
   - Configuration
   - Routing loops
   - Troubleshooting
2. **Advance distance vector protocol – RIPV2, EIGRP**
   - Difference between **RIPV1 & RIPV2**
   - **EIGRP**
   - Basic Eigrp features
   - Basic Eigrp configuration
   - Eigrp Metric
   - Eigrp tables
   - Successor / Feasible successor
   - Autonomous system number

3. **Link state routing protocol–OSPF**
   - Features of ospf
   - Ospf metric calculation
   - Hello messages

Types of routing
   - Router id
   - Ospf Tables
   - Areas
   - Disadvantages of single area

Access control list
   - Standard
   - Extended

Network address translation
   - What is NAT
   - Private and public ip add
   - Default routing
   - Types of NAT
     - Static
     - Dynamic
     - PAT

SWITCH
   - Difference between Repeaters & hubs
   - CSMA/CD
   - Types of switches
   - Basic behavior of switch
   - Broadcast domain
   - Collision domain
   - Initial configuration of switch
   - Vlan
   - Trunking
   - Inter vlan routing
   - Virtual trunking protocol
   - Ether channel
   - Spanning tree protocol

Backup & restore

Password recovery

Cisco discovery protocol

Frame relay
   - Advantages of frame relay
   - Virtual circuit
   - LMI & DLCI

THE OTHER COURSES OFFERED

- LINUX ADMIN
- SOLARIS ADMIN
- AIX (LPAR/DLPAR) ADMIN
- MCITP + LINUX + CCNA
- WINDOWS ADMIN
- POWER SHELL Scripting

VIRTUALIZATION TECH

- VMWARE
- VSPHERE
- WINDOWS HYPER V

- ORACLE DBA
- ORACLE APPS
- SQL, PL/SQL

- CCNA
- CCNP
- CCIE

- MQ, TESTING TOOLS
- SELENIUM

SECURITIES

- CISA
- CISSP
- CEH
- COMP TIA

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