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Computer Network
By-Ram sir

- Theory
- Explanation
- Derivation
- Example
- Shortcuts
- Previous Years Question With Solution

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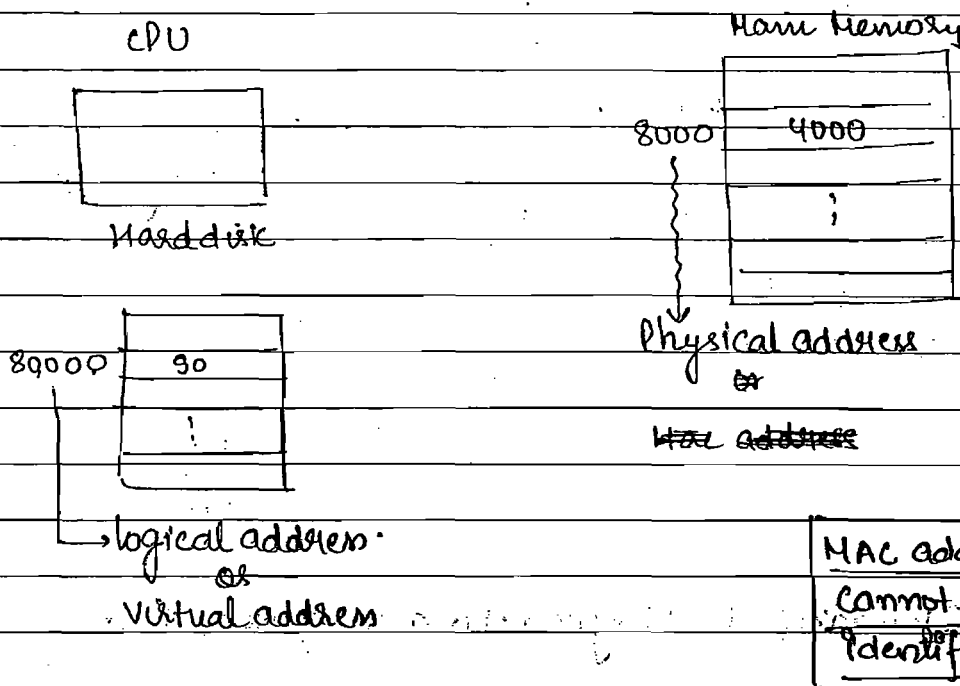|			
F230, Lado Sarai **New Delhi-110030** **Phone: 9311 989 030**	**Shop No: 46** **100 Futa M.G. Rd** **Near Made Easy** **Ghitorni, New Delhi-30** **Phone:9711475393**	**F518** **Near Kali Maa Mandir** **Lado Sarai** **New Delhi-110030** **Phone: 9560 163 471**	**Shop No.7/8** **Saidulajab Market** **Neb Sarai More,** **Saket, New Delhi-30**

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Computer Network and Security

CPU   Main Memory

8000 → | 4000 |
| : |

Harddisk

Physical address
or

~~MAC address~~

89000	90
:

→ logical address·
or
Virtual address

┌─────────────────────────────┐
│ MAC address is local, so   │
│ cannot be used as unique   │
│ identification Number   │
└─────────────────────────────┘
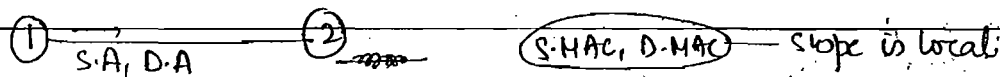
Physical address
(or)

Mac address
(or)   → Implicit address

~~the~~ Ethernet address ⇒ 48 bit address
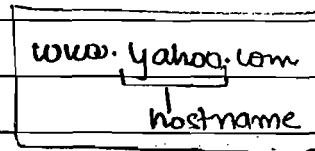(or)

LAN card address
(or)

NIC card address

① S·A, D·A   ② →   (S·MAC, D·MAC) — scope is local

┌──┐
│ logical address (classful addressing)   │
│   32 bit address (IPv4)   │
└──┘ IANA → Internet Assigned
                                             Number Authority

Note> Using MAC address alone cannot be used as an identification unit in transmitting the data, because scope is local

(IP) logical address ——→ 32 bit address
address
        ↳ classes ——→ A, B, C, D, Ⓔ — Research
                                 ↳ multicasting
                   unicasting
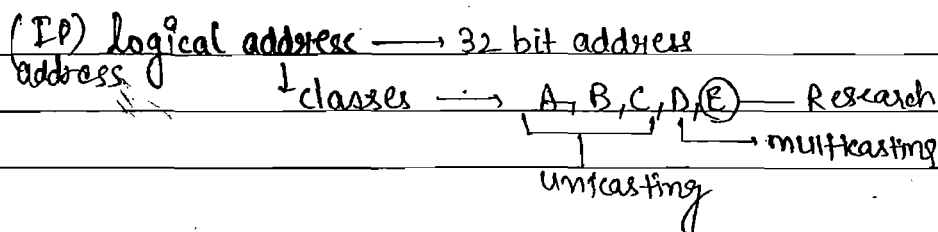
⊙ classful supports two level hierarchy.
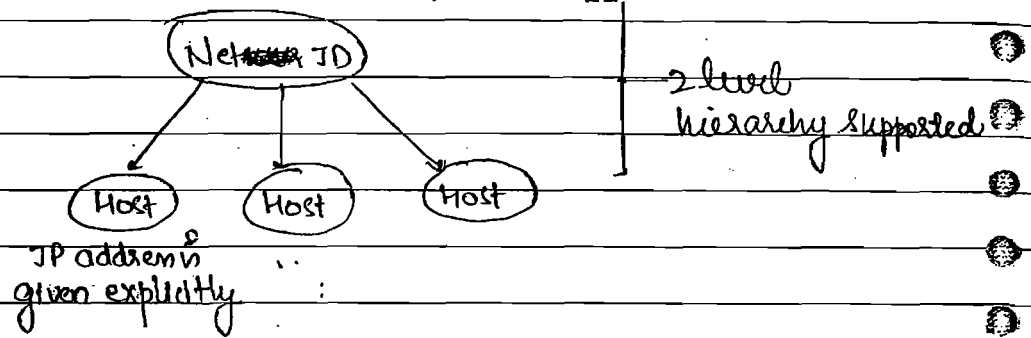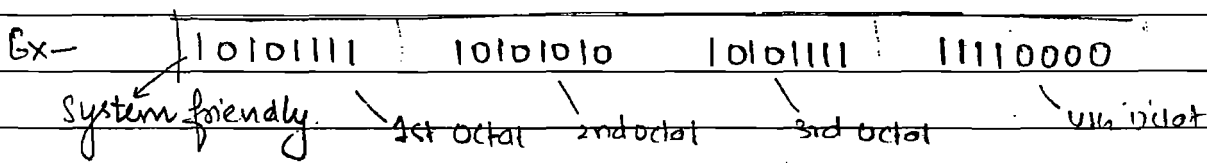

→ whenever an IP address is assigned to a computer, it is known as <u>host</u>.
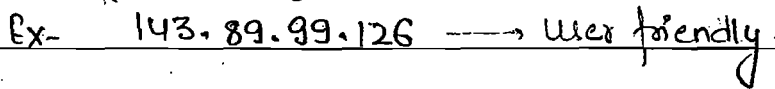
→ Entire Network will be represented by a number known as the <u>Net ID</u>.

<u>Notation</u>

i) Binary notation [2]

Ex— | 10101111   10101010   10101111   11110000

System friendly.   1st octat   2nd octat   3rd octat   4th octat

Decimal
ii) Dotted Notation [10]

Ex— 143.89.99.126 ——→ user friendly.

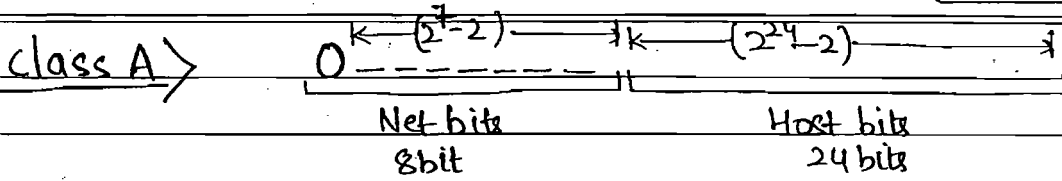——→ In Binary notation starting zero bits will decided the type of class

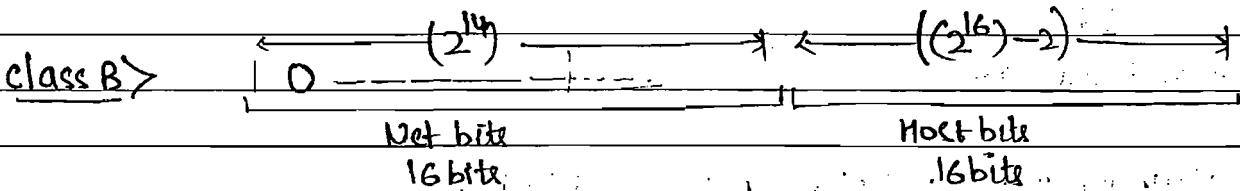→ In dotted decimal notation, first octate will decided the type of class.

class A ⟩   0 $\overset{\longleftarrow (2^7-2) \longrightarrow}{------}$ $\overset{\longleftarrow (2^{24}-2) \longrightarrow}{}$

Net bits   Host bits
8 bit   24 bits

0 0000000 → 0

$\underset{111111}{|}$ → 127

(0—127) but 0 and 127 not used

∴ (1—126) → class A

0.0.0.0 → DHCP client

127.x.y.z → loop back address

class B ⟩   1 0 $\overset{\longleftarrow (2^{14}) \longrightarrow}{------}$ $\overset{\longleftarrow (2^{16})-2 \longrightarrow}{}$

Net bits   Host bits
16 bits   16 bits

1 0 000000 → 128
$\underset{111111}{|}$ → 191

Class B Range → (128—191)

class C $\overset{\longleftarrow (2^{21}) \longrightarrow}{|\,|\,0}$ $\overset{\longleftarrow 2^8-2 \longrightarrow}{}$

Net bits   Host bits
24 bits   8 bits
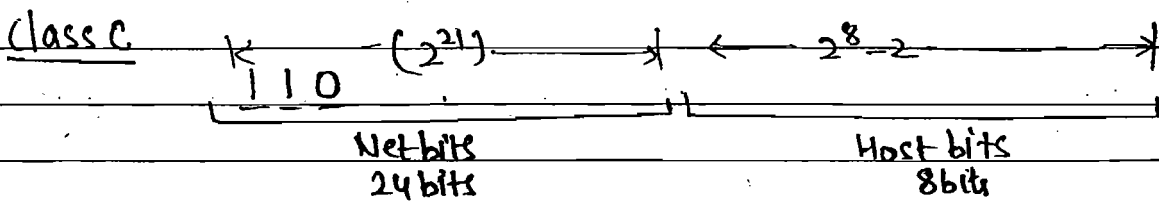
110 00000 → 192
11 0 11111 → 223

Class C Range → (192—223)

2

Class D	,IIIO	IIIO OOOO → 224

no division

multicasting

IIIO-IIII → 239

| Class D Range → (224—239) |

Class E	,IIII	IIII OOOO → 2⁄40

↓ Research

IIII IIII → 255

| Class E Range → (240—255) |

Q7 IP: 201.44.89.99

Net Jd =

Duet Broad cast address of network =

Network mask
or
[Default mask)

Class A : IIIIIIII·00000000·00000000·00000000

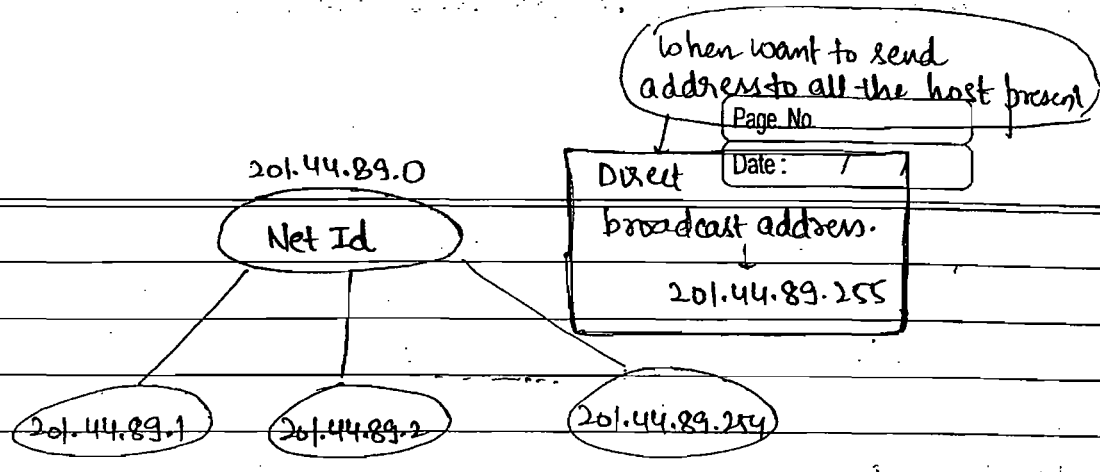| mask A → 255.0.0.0 |
|--------------------|
| class B : 255·255·0·0 |
| class C: 255·255·255·0 |

Mask → allowing
and
stopping

→ Network mask is a mathematical tool which is used for solving
networking problems

Janc

IP₁ :	201·44·89·99	99: 01100011
mask:	255·255·255·0	01 00000000
	201·44·89·0 (And)	01 00000000

n	y	output And
0	0	0
0	1	0
1	0	0
1	1	1

89: 01011001
255: 11111111
89: 01011001

201.44.89.0

Net Id

When want to send address to all the host present

Direct broadcast addres.

201.44.89.255

(201.44.89.1)   (201.44.89.2)   (201.44.89.254)

(i) we are subtracting 2 addresses in the no. of host, because one is used for net Id and other one is used for DBA of network

Pseudo approach of network

10.   172.16

(X) ———— (X)

10.0.0.1   172.16.0.5

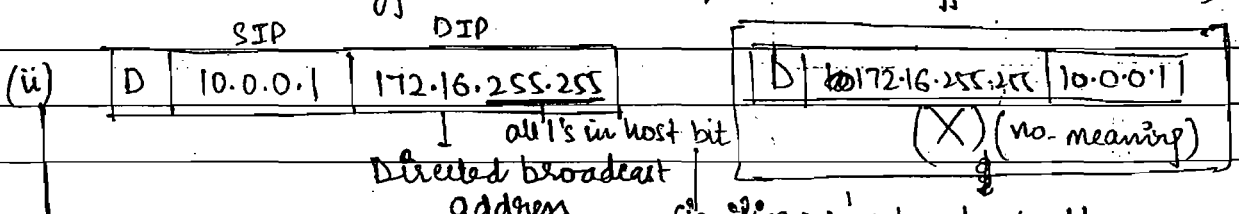|	S.IP	D.IP
(i)	D	10.0.0.1	172.16.0.5

Clan B
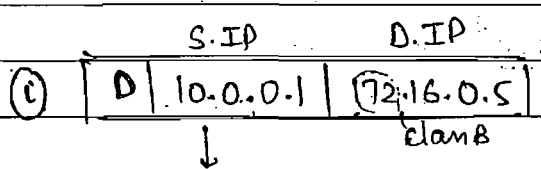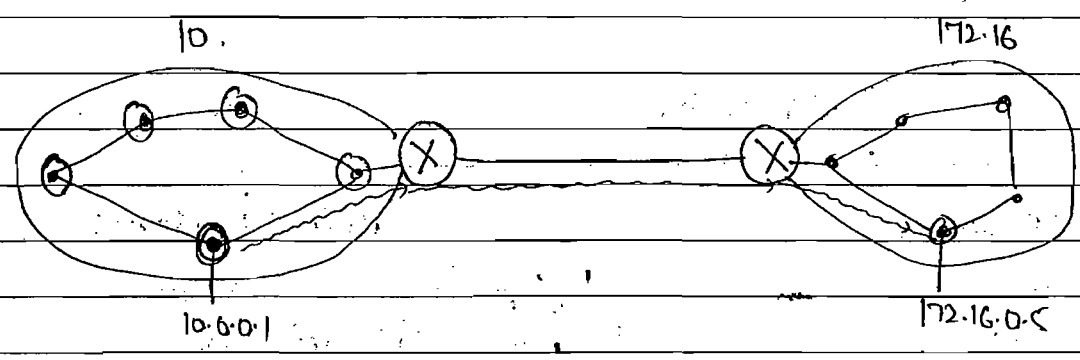
It is a unicasting packet between the networks (different networks)

	SIP	DIP
(ii)	D	10.0.0.1	172.16.255.255

| D | 172.16.255.255 | 10.0.0.1 |

all 1's in host bit
Directed broadcast addres

(X) (no. meaning)

signifies Direct broadcast address

→ It is a broadcasting packet of on the other network

→ Direct Broadcast addres will always be used as Destination IP.

(iii)

	S·IP	DIP
D	10.0.0.1	10.0.0.9

It is a unicasting packet within the network. (Same network)

(IV) Special case →

D	10.0.0.1	255.255.255.255

(Broadcast within the ↗
network)
limited broadcast address
→ scope is local (LAN)

→ limited Broadcast address will always be used as destination
IP.

(Used in LAN)

IP address

Private IP address	Public IP address
① Scope is local	① Scope is globally unique
② work only in LAN	② used To get Internet service
③ By loading networking Operating System	③ Not free of cost
④ Ranges of private IP.	④ have Control of ISP (Internet
	Service provider)

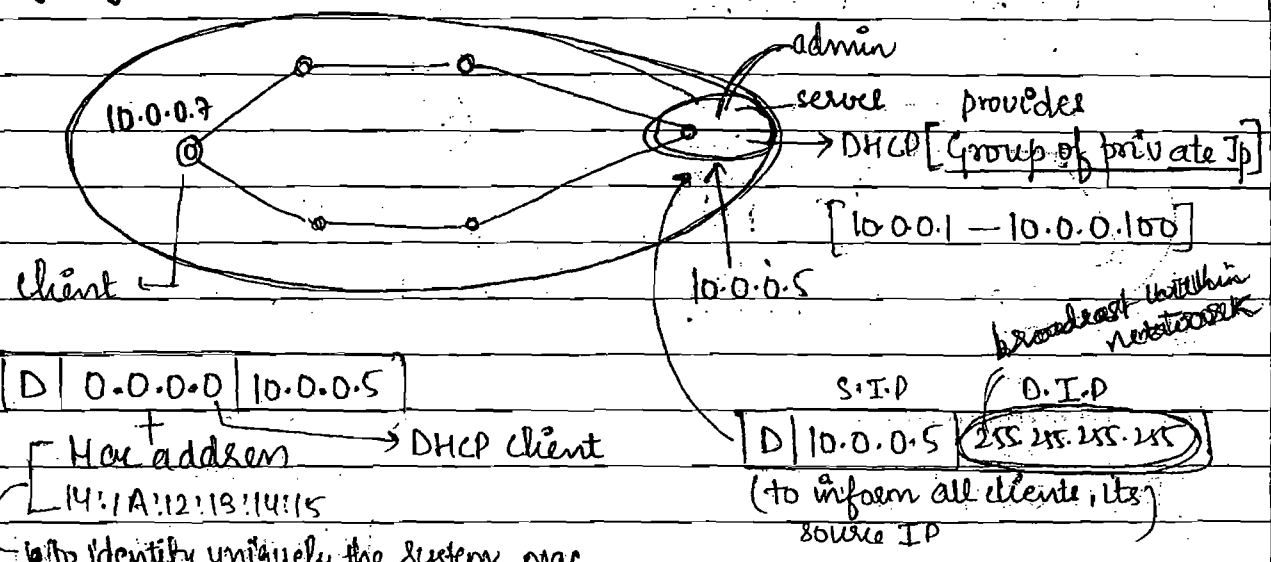| Ranges	No of Network
10.0.0.0 — 10.255.255.255	1
172.16.0.0 — 172.31.255.255	16
192.168.0.0 — 192.168.255.255	256

⑤ free of cost
⑥ will not get internet service

client => DOS, XP [DOS commands]

Server => windows NT, 2003

[DOS commands + Networking protocols (http, ftp, Dhcp, —)]

Assigning Private IP addresses in LAN (stateful protocol)

admin
server   provides
→ DHCP [Group of private Ip]

[10.0.0.1 — 10.0.0.100]

10.0.0.7

Client

10.0.0.5

broadcast within network

| D | 0.0.0.0 | 10.0.0.5 |

+
[Mac address → DHCP client
14:1A:12:13:14:15
to Identify uniquely the system, mac address is added]

S.I.P   D.I.P

| D | 10.0.0.5 | 255.255.255.255 |

(to inform all clients, its source IP)

Mapping table
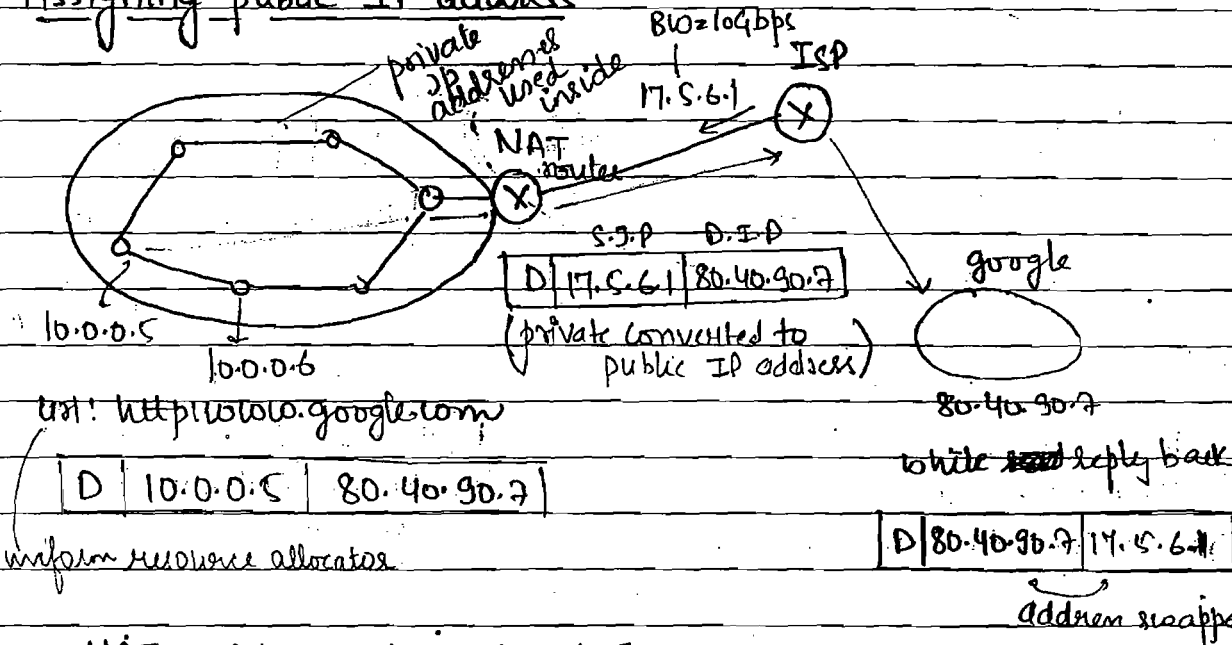
MAC	IP
14:1A:12:13:14:15	10.0.0.7

① Once the server is loaded with network operating system, it will get group of private IP addresses, out of which one IP is assigned to server

② the servers IP is informed to all the clients using limited Broadcast address.

③ Every client will put a request to the server using DHCP client as the source IP address, along with it Mac address is

4

✱ Stateful → cannot be removed freely, but
informed to mapping table and all
that entry in mapping table too, then
remove (otherwise problem like
Dangling pointer
Page No:
Date:

transmitted, so that server can understand which computer is
requesting.

④ In response to it, server will assign 1 IP address to that client,
by maintaining mapping table.

⑤ The purpose of mapping table is to Identify which IP is
assigned to which computer.

Assigning public IP address

private IP addresses used inside

810 = 10Gbps   ISP
17.5.6.1

NAT router

	S.I.P	D.I.P
D	17.5.6.1	80.40.90.7

(private converted to public IP address)

google

10.0.0.5
10.0.0.6

url: http://www.google.com

D	10.0.0.5	80.40.90.7

uniform resource allocator

80.40.90.7

while reply back

D	80.40.90.7	17.5.6.1

address swapped

NAT → Network address Translation

⊙ NAT Router converts Private IP into Public IP, when the packet
is going out of the network. It converts public IP into private IP,
when the packet is coming inside the network.

⊙ Public IP addresses are effectively utilized using private IP
addresses. (if private IP not available, difficult to Then only
public IP addresses will be assigned and they will get exhausted
early)