# CS & IT ENGINEERING

## COMPUTER NETWORKS

## IPv4 Addressing

**Lecture No-20**

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Classless Addressing

**Supernetting in Classless Addressing**

# Subnetting in CIDR

① 100.100.100.14/25

NID = 25 bit

HID = 32 - 25 = 7 bit

No. of IP Addresses = $2^7$ = 128

No. of Host = $2^7 - 2$

100.100.100.00001110

8 + 8 + 8 + 1 | 8

NID | HID

100.100.100.0 -------

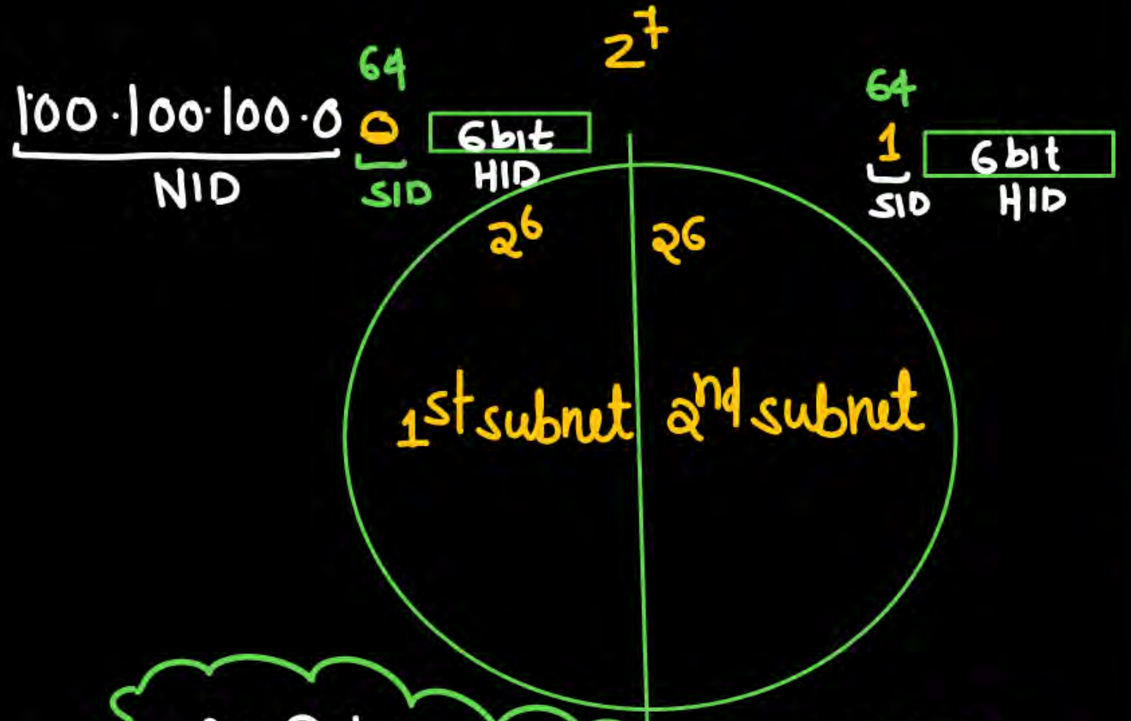
NID | HID = 7 bit

2 subnet

100.100.100.0 □ 6bit

NID | SID | HID

SID → 0/1




## ADRule

1st subnet
- SID : 100·100·100·0/26
- DBA 100·100·100·63/26

2nd subnet
- SID 100·100·100·64/26
- DBA 100·100·100·127/26

## 1st subnet

100·100·100·0 | 0 | ------
NID | SID | HID

100·100·100·0 | 0 | 000000 → 100·100·100·0] SID

100·100·100·0 | 0 | 000001 → 100·100·100·1] 1st Host

100·100·100·0 | 0 | 0000 10 → 100·100·100·2

⋮

100·100·100·0 | 0 | 1 1 1 1 10 → 100·100·100·62] last Host

100·100·100·0 | 0 | 1 1 1 1 1 1 → 100·100·100·63] DBA

(२) 100.100.100.14/25

NID = २५ bit

HID = 32 - २५ = 7 bit

No. of IP Addresses = $2^7$ = 128

No. of Host = $2^7 - 2$ = 126

100.100.100.00001110

8 + 8 + 8 + 1 | 7 bit

NID | HID = 7 bit

100.100.100.0 -------

NID | HID = 7 bit

4 subnet

100.100.100.0 □□ 5bit

SID | HID

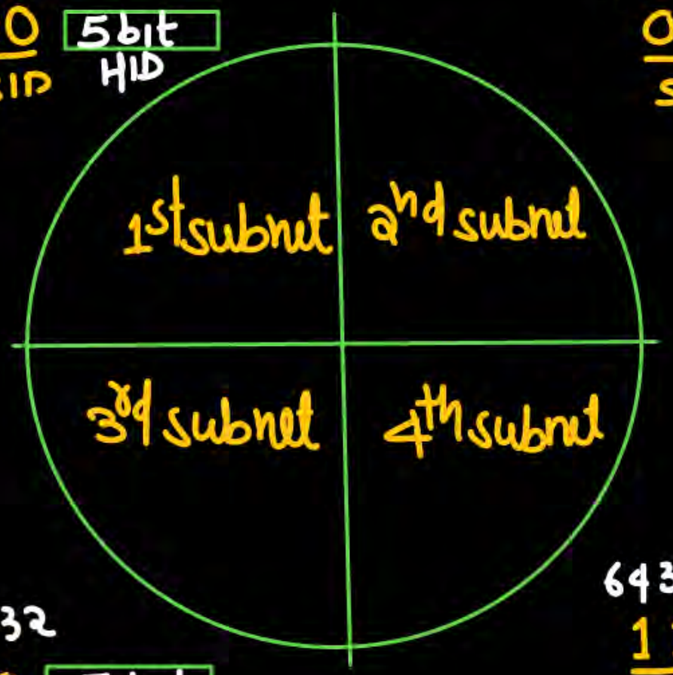
1st subnet : 00

2nd " : 01

3rd " : 10

4th " : 11

100.100.100.0 / NID — 00 / SID — 5bit HID — 6432




6432 01 / SID 5bit HID

6432 10 / SID 5bit HID

6432 11 / SID 5bit HID

1st subnet
SID 100.100.100.0/27
DBA 100.100.100.31/27

2nd subnet
SID 100.100.100.32/27
DBA 100.100.100.63/27

3rd subnet
SID 100.100.100.64/27
DBA 100.100.100.95/27

4th subnet
SID 100.100.100.96/27
DBA 100.100.100.127/27

# VLSM IN CIDR

① 100.100.100.14/25

NID = 25 bit

HID = 32 - 25 = 7 bit

No. of IP Addresses = $2^7 = 128$

No. of Host = $2^7 - 2 = 126$

100.100.100.00001110

8 + 8 + 8 + 1 | 7 bit

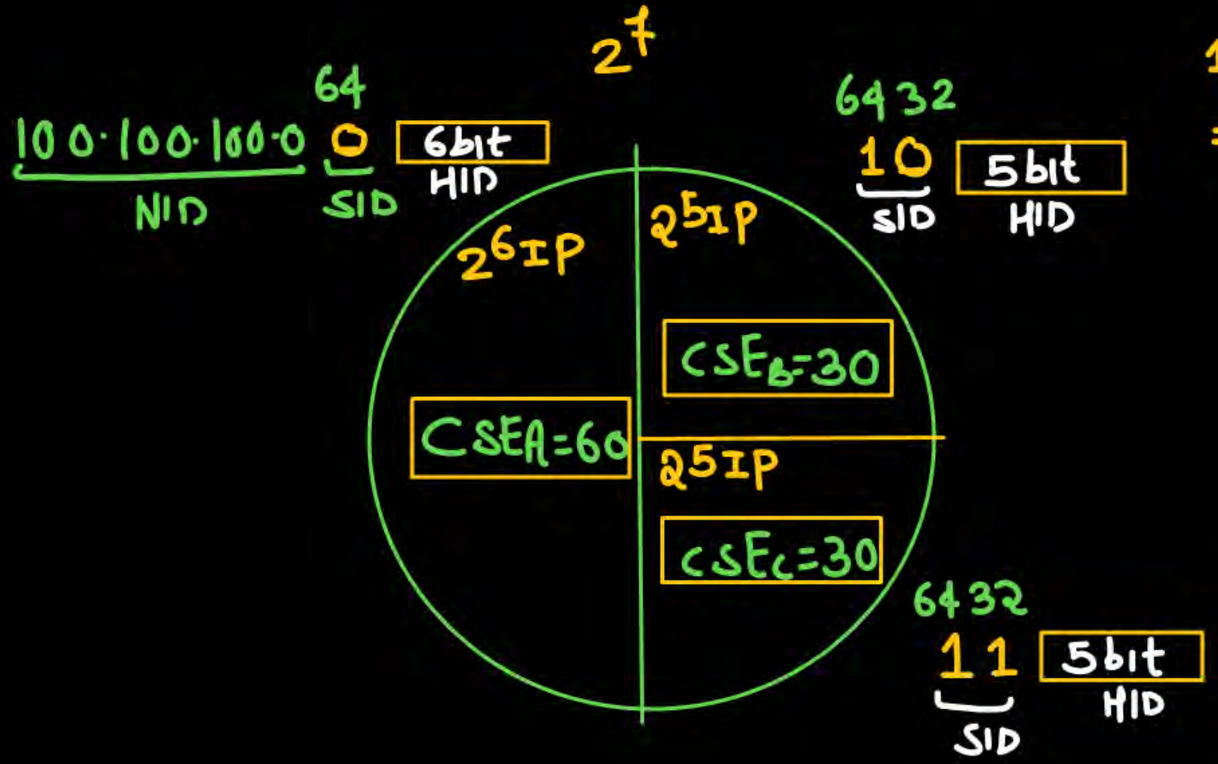
NID | HID = 7 bit

$CSE_A = 60$

$CSE_B = 30$

$CSE_C = 30$

$120 \leq 2^8 - 2$ (Yes)




1st way

CSEA
- SID: 100·100·100·0/26
- DBA: 100·100·100·63/26

CSE_B
- SID: 100·100·100·64/27
- DBA: 100·100·100·95/27

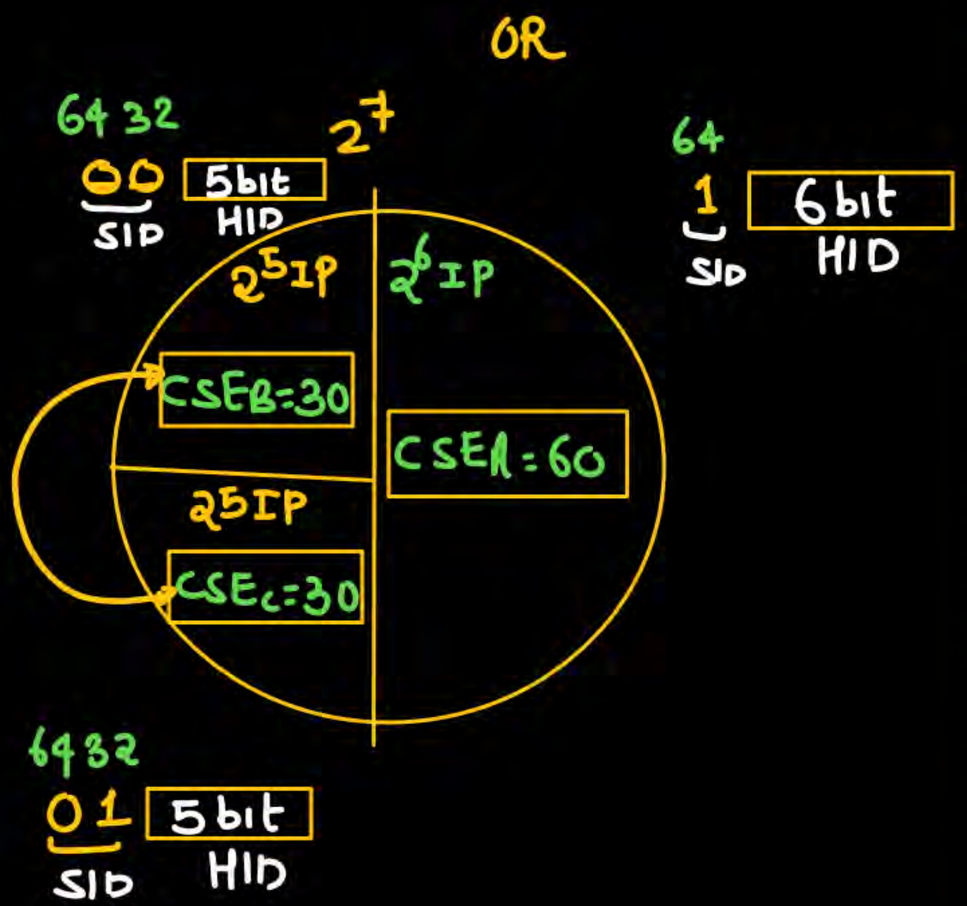
CSE_C
- SID: 100·100·100·96/27
- DBA: 100·100·100·127/27

2nd way

CSE_A

CSE_B

CSE_C




3rd way

CSEA
- SID: 100.100.100.64/26
- DBA: 106.100.100.127/26

CSEB
- SID: 100.100.100.0/27
- DBA: 100.100.100.31/27

CSEC
- SID: 100.100.100.32/27
- DBA: 100.100.100.63/27

4th way

CSEA

CSEB

CSEC

(२) 100.100.14.14/20

NID = 20 bit

HID = 32 - 20 = 12 bit

No. of IP Addresses = $2^{12}$ = 4096

No. of Host = $2^{12} - 2$ = 4094

100.100.0000 | 1110.00001110

8 + 8 + 4 | HID = 12 bit

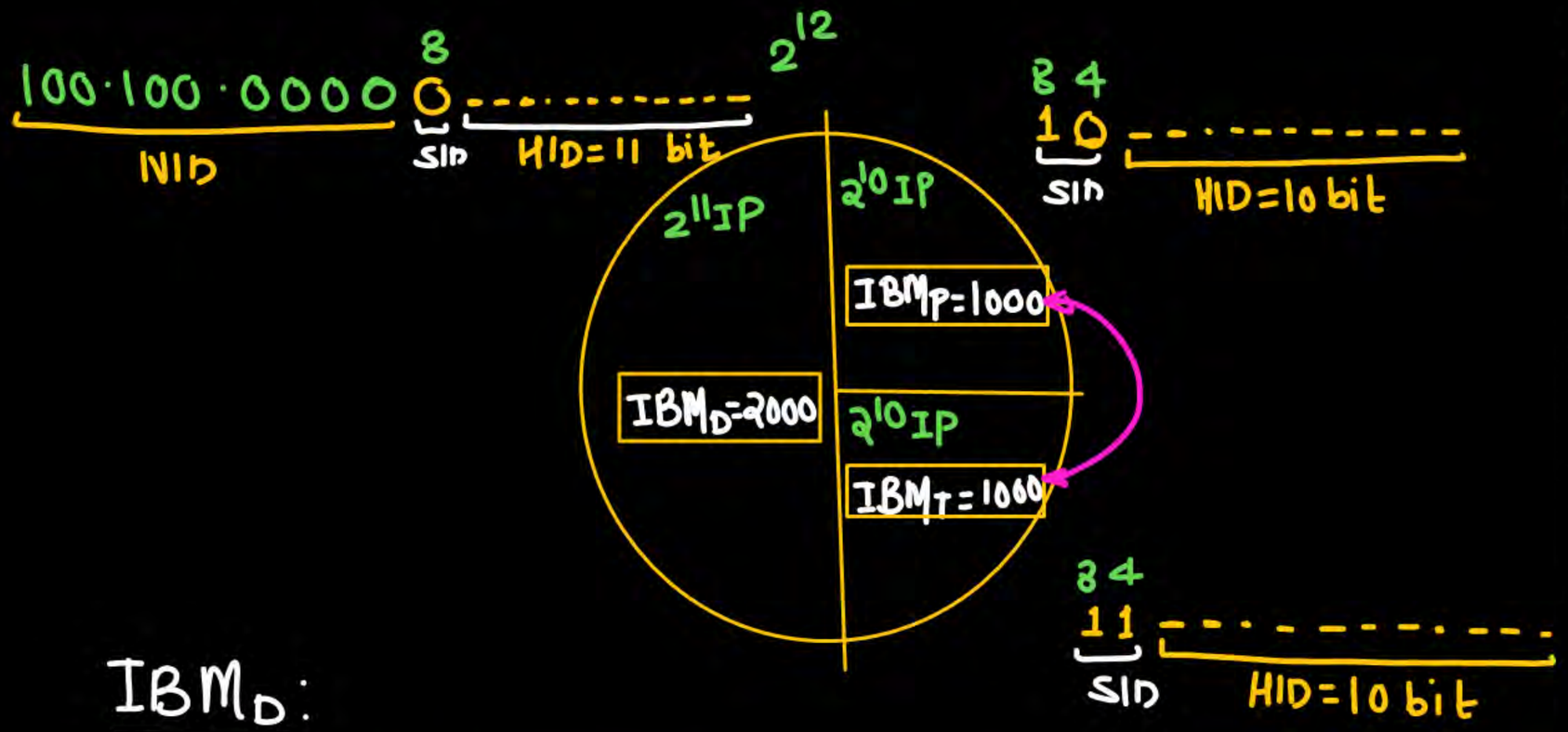
NID

$IBM_D$ = 2000

$IBM_P$ = 1000

$IBM_T$ = 1000

4000 ≤ $2^{12} - 2$ (4094) yes




## AD Rule

1st way

$IBM_D$ [SID : 100·100·0·0/21, DBA : 100·100·7·255/21]

$IBM_P$ [SID : 100·100·8·0/22, DBA : 100·100·11·255/22]

$IBM_T$ [SID : 100·100·12·0/22, DBA : 100·100·15·255/22]

2nd way

$IBM_D$

$IBM_P$

$IBM_T$

## $IBM_D$:

100·100·0000 0 000·00000000 → 100·100·0·0 ] SID

NID

100·100·0000 0 000·00000001 → 100·100·0·1

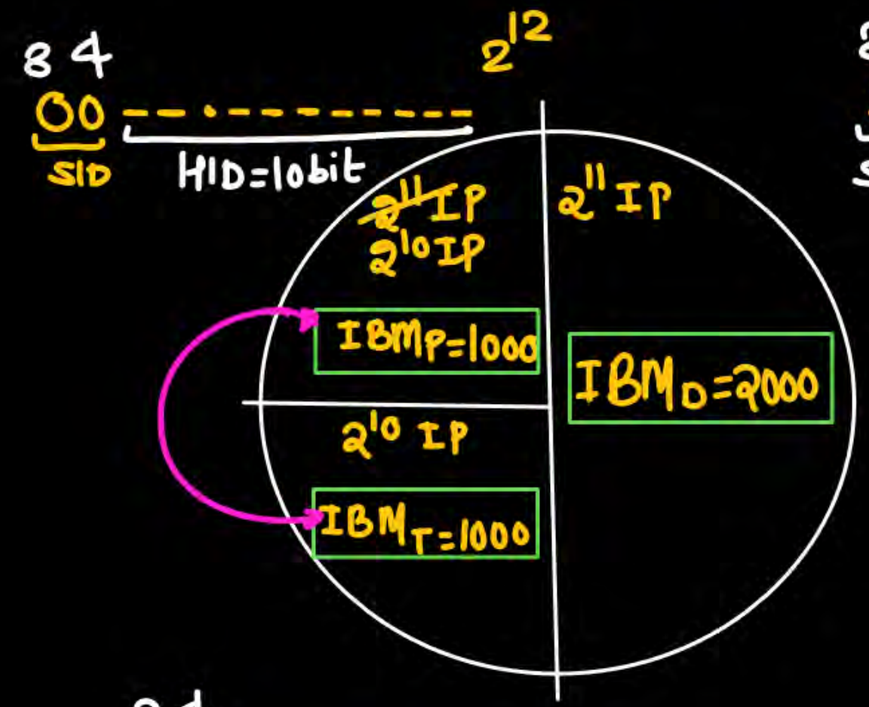
⋮

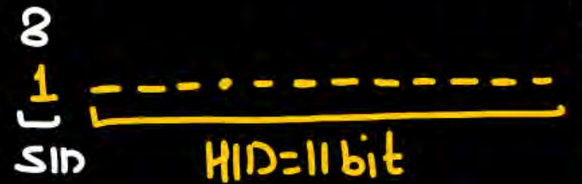
100·100·0000 0 111·11111110 → 100·100·7·254

100·100·0000 0 111·11111111 → 100·100·7·255 ] DBA

} Valid Host

OR




3rd way

IBM$_D$ — SID 100.100.8.0/21 — DBA 100.100.15.255/21

IBM$_P$ — SID 100.100.0.0/22 — DBA 100.100.3.255/22

IBM$_T$ — SID 100.100.4.0/22 — DBA 100.100.7.255/22

4th way

IBM$_D$

IBM$_P$

IBM$_T$

# PROBLEM SOLVING ON CLASSLESS ADDRESSING

**Q.1** In the network 200.10.11.144/27 , the fourth octet (in decimal) of last IP address of the network which can be assigned to a host ---158---

Gate-2M

200.10.11.10010000

8 + 8 + 8 + 3 | 5

NID | HID = 5 bit

200.10.11.100 -----

HID

200.10.11.100 11110 → 200.10.11.158

200.10.11.100 _ _ _ _ _
HID

200.10.11.100 00000 → 200.10.11.128 ] BID

200.10.11.100 00001 → 200.10.11.129 ] 1st Host

⋮

200.10.11.100 11110 → 200.10.11.158 ] Last Host
NID

200.10.11.100 11111 → 200.10.11.159 ] DBA

Gate-2012 (2m)

**Q.2** An Internet Service Provider (ISP) has the following chunk of CIDR-based IP addresses available with it: 245.248.128.0/20. The ISP wants to give half of this chunk of addresses to Organization A, and a quarter to Organization B, while retaining the remaining with itself. Which of the following is a valid allocation of addresses to A and B?

A. 245.248.136.0/21 and 245.248.128.0/22

B. 245.248.128.0/21 and 245.248.128.0/22

C. 245.248.132.0/22 and 245.248.132.0/21

D. 245.248.136.0/24 and 245.248.132.0/21

245.248.128.0/20

NID = 20 bit

HID = 32 - 20 = 12 bit

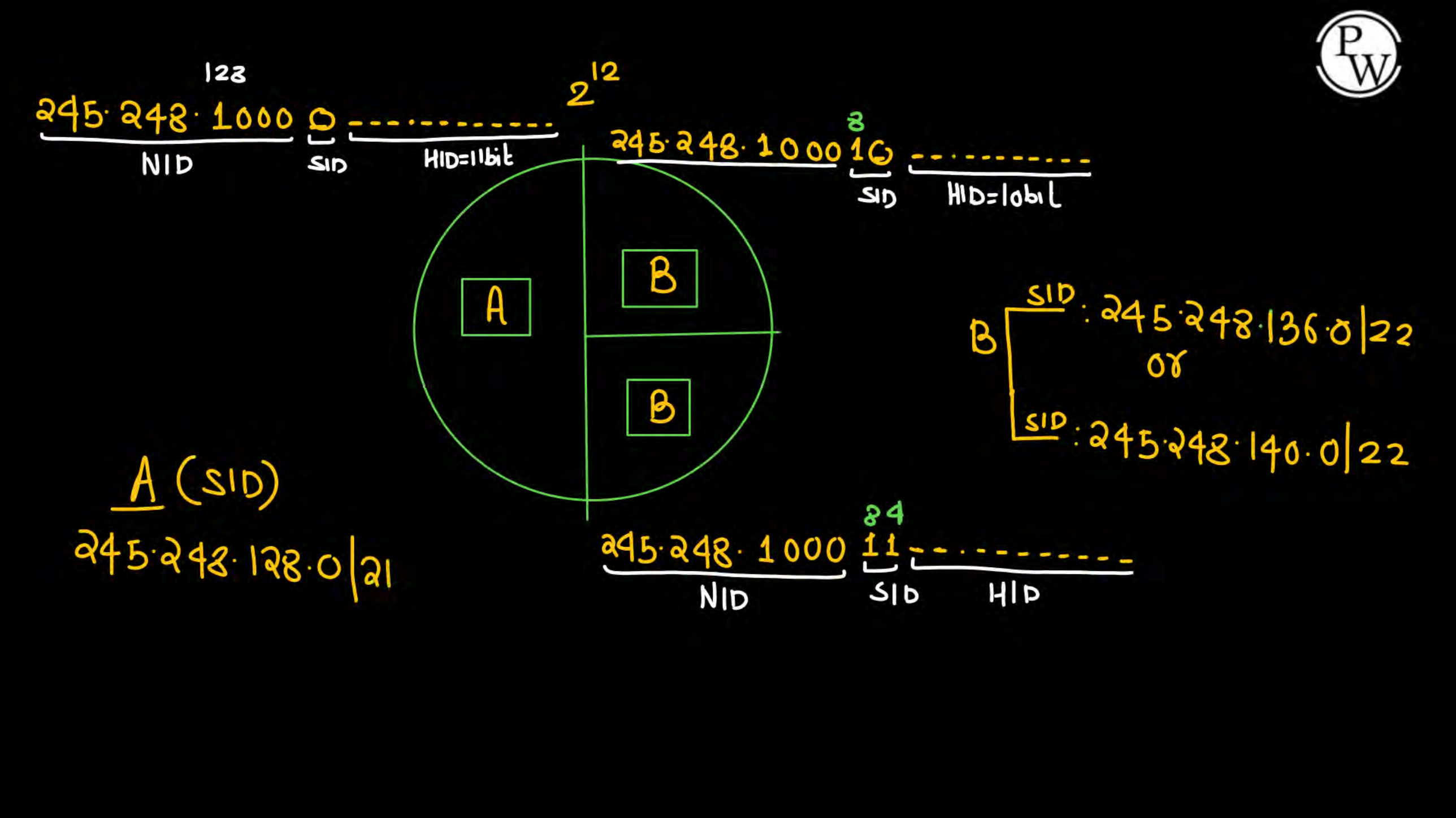
No. of IP Addresses = $2^{12}$ = 4096

No. of Host = $2^{12} - 2$ = 4094

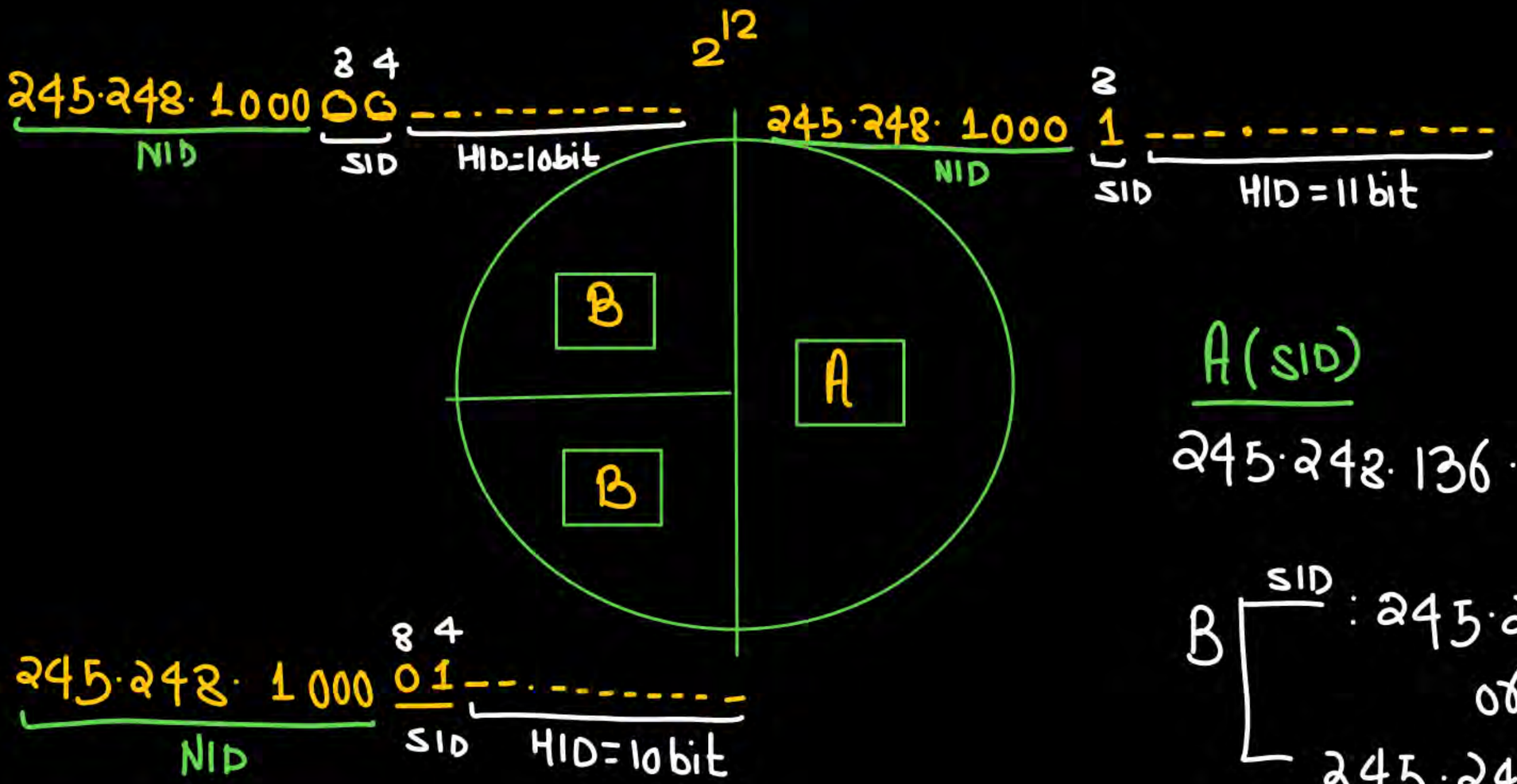
245.248.1000 0000.00000000

8 + 8 + 4 | HID = 12 bit

NID


128
245.248.1000 0 ----------
NID
SID
HID=11bit
2^12
245.248.1000 10 ---------
8
SID
HID=10bit
A
B
B
A (SID)
245.248.128.0/21
B
SID
245.248.136.0/22
or
SID
245.248.140.0/22
245.248.1000 11 ---------
24
NID
SID
HID

OR




A (SID)

245·248·136·0/21

B [ SID : 245·248·128·0/22
or
245·248·132·0/22

**Q.3** In IPv4 match the corresponding host IP address with their network ID.

| List-1 (Network ID) | | List-II (Host IP) | |
|---|---|---|---|
| P. | 203.207.208.0 | 1. | 203.207.175.45/20 |
| Q. | 203.207.160.0 | 2. | 203.207.190.37/20 |
| R. | 203.207.176.0 | 3. | 203.207.210.42/20 |

Codes: P Q R

A. 3 1 2

B. 2 3 1

C. 3 2 1

D. 2 1 3

1. 203.207.175.45/20

NID = 20 bit, HID = 12 bit

203.207.1010 ---- ----

8 + 8 + 4 | HID

NID

203.207.1010 0000.00000000 → 203.207.160.0

2. 203.207.1011----------
8+8+4 (NID) ; ---------- (HID = 12bit)

203.207.10110000.00000000 → 203.207.176.0

3. 203.207.1101----------
NID ; HID = 12bit

203.207.11010000.00000000 → 203.207.208.0

**Q.4** An organization is granted the block 150.36.0.0/16. The Administrator want to create 512 subnets. What is the subnet mask.

A. 255.255.255.192/26

B. 255.255.255.224/27

C. 255.255.255.128/25 ✓

D. 255.255.255.240/28

11111111.11111111.11111111.10000000

255.255.255.128/25

156.36.0.0/16

NID 16 | HID 16

512 Subnet

16 NID | 9 SID | 7 HID

No. OF 1's in the SM = NID+SID = 16+9 = 25

No. of 0's in the SM = HID = 7

**Q.5** Block contains 64 IP address which of the following can be first address of the block

No. of Addresses in the Block = 64 = $2^6$

Block size = $2^6$

HID = 6 bit

First IP Address of the Block must be divisible by size of the Block

A. 200.50.60.32 : 200.50.60.00 100000 | $2^6$ (Rem or HID)

B. 200.50.60.192 : 200.50.60.11 000000 | $2^6$ (Rem or HID)

C. 200.50.60.191 : 200.50.60.10 111111 | $2^6$ (Rem or HID)

D. None

**Q.6** Block contains 16 IP address which of the following can be the first address of the block?

MSQ

A. 199.16.16.0

B. 199.16.16.160

C. 199.16.16.161

D. None

**Q.7** Block contains 2048 IP address which of the following can be the first address of the block

H.W

A. 16.15.19.0

B. 16.15.16.0

C. 16.16.16.8

D. None

**Q.8** Which of the following would support best point to point link?

A. /30

B. /24

C. /26

D. /27

**Q.9** Which of the following is/are true: MSQ

A. 192.54.10.96 is a valid IP address in the 192.54.10.64/26 subnet

B. 127.0.0.1 is a valid source address

C. 255.255.255.255 is a valid destination address

D. The subnet 193.10.32.0/19 has a subnet mask of 255.255.32.0

**Q.10** What is the Network ID, Broadcast address, First Usable IP, or Last Usable IP on the subnetwork that the host 172.30.118.230/23 is a part of?

MSQ

A. Network ID: 172.30.118.0

B. Broadcast address: 172.30.255.255

C. First usable IP : 172.30.118.1

D. Last Usable IP : 172.30.119.254

**Q.11** In the network 143.128.67.235/20, if x represent the decimal value of 3rd octet and y represent the decimal value of 4th octet of last address assigned to any host, then value of x + y is____.

NAT


THANK YOU
GW
SOLDIERS !