Nets ⇒ 27

0.127.1

0.0.0.0 → 0.255.255.255

1st Organization 1.0.0.0 → 1.255.255.255

2nd Organization. 2.0.0.0 → 2.255.255.255

last Organization. 126.0.0.0 → 126.255.255.255

only for class A.

0.0.0.0
0.255.255.255.

127.0.0.0
127.255.255.255.

These both Ip address are reserved.

class-B

$n=5$ $val=2$ $k=2$

128.0.0.0 → 191.255.255.255

1st Organization 128.0.0.0 → 128.0.255.255.
2nd Organization 128.1.0.0 → 128.1.255.255
3rd Organization 128.3.0.0 → 128.3.255.255.

256th Organization 128.255.0.0 → 128.255.255.255
257th Organization 129.0.0.0 → 129.0.255.255

$2^{14} \simeq 16384$ organization 191.255.0.0 → 191.255.255.255

---

class-C

192.0.0.0 → 223.255.255.255

1st Organization 192.0.0.0 → 192.0.0.255
2nd Organization 192.0.1.0 → ~~192.0.0.255~~ ~~192.0.255.~~ 192.0.1.255
3rd Organization 192.0.2.0 → 192.0.2.255

256th Organization 192.0.256.0 → 192.0.256.255
257th Organization 192.1.0.0 → 192.1.0.255
$2^{21} \simeq 2097152$ organ. 223.255.255.0 → 223.255.255.255.

150.40.50.60 → IP address.
255.255.192.0 → subnet mask.

Subnet Id ~~255~~ 150.40.192.0

Total No. of Subnets 2^2 ⇒ 4 subnet. → 1st organ.

Subnet NO ⇒ 150.40.~~50~~.00 10000 1.000

255 − 192 = 63

Start IP ⇒ 150.40.0.0.
End IP ⇒ 150.~~63~~.~~255~~.255
40 63

32 16 8 4 2 1

Que.

IP addr = 100.40.50.60
Subnet m = 255.252.0.0

class A

101000
111111
00101000

Subnet Id: ~~255~~ 100.40.0.0.

100.40.50.60
0 0.255.255
100.40.255.255

Total No. of Subnet ⇒ 2^6 subnet ⇒ 64

100.~~255~~ 101000 11 .101011

41 margin

43

Start IP ⇒ 100.40.50.0
47th organization
100.43.~~50~~.255
255

255 − 192 = 63
1st
2nd

1011 32 16 8 4 2 1
000 101000
101101011
101011
150.40.50.
0.0.63

OR

100.40.50.60
0.3.255.255
100.43.255.255

150.

PRACTICE QUESTIONS ON SUBNETTING

Q1 IP address in a block → 150.150.40.50

Subnet mask → 255.255.224.0

a) 1st host in 2nd subnet =

b) 3rd host in 4th subnet =

c) 4th host in 3rd subnet ·

Class B

255.255.224.0

001 00000 · 0 - - - 1

2^{13}

$2^3 \Rightarrow 8$ subnets

150.150.32.1

00000 · 00 - - 11

0.150.96.3

150.150.

PRACTICE QUESTIONS ON SUBNETTING

Q1 IP address in a block → 200·150·40·50

Subnet mask → 255·255·255·240

a) 1st host in 2nd subnet = 200·150·40·17

b) 3rd host in 4th subnet = 200·150·40·51

c) 4th host in 3rd subnet = 200·150·40·36

0010 0100

PRACTICE QUESTIONS ON SUBNETTING

Q2

IP1 → 140 · 41 · 40 · 50 ✓   00101000

IP2 → 140 · 41 · 50 · 40   00110010

IP3 → 140 · 41 · 68 · 40   01000100

Subnet mask → 255 · 255 · 192 · 0   11 → 2 bit $2^2 = 4$

which of the following IP addresses belong to same subnet

IP1, IP2   1st 2 bit ✓

PRACTICE QUESTIONS ON SUBNETTING

Q7

IP1 → 100.41.40.50   0 0 1

IP2 → 100.92.50.40   0 1 0

IP3 → 100.83.68.40   0 1 0

$$64 + 32 = 96$$

Subnet mask → 255.224.0.0

Which of the following IP addresses belong to same subnet

IP2 & IP3 belong to same subnet

3rd

PRACTICE QUESTIONS ON SUBNETTING

Q3

IP1 → 200 · 41 · 40 · 50 → 2nd, 18th

IP2 → 200 · 41 · 40 · 60 →

IP3 → 200 · 41 · 40 · 40

Class C

255·255·255·0

Subnet mask → 255·255·255·224 → 3 bit

which host of which subnet ??

001 | 00010

2nd subnet

18th

$2^3 \Rightarrow 8$ subnets

2^5

i.e.

$2^5 - 2$ hosts

001 00000 → ✗

00001 → 1

PRACTICE QUESTIONS ON SUBNETTING

Q3

IP1 → 200 · 41 · 40 · 50 → 2nd, 18th

IP2 → 200 · 41 · 40 · 60 → 2nd, 28th

IP3 → 200 · 41 · 40 · 40 → 2nd, 8th   class C

255.255.255.0

Subnet mask → 255.255.255.224 → 3 bit

Which host of which subnet??

001 01000

$2^3 \Rightarrow 8$ subnets

2^5

IP

$2^5 - 2$ hosts

PRACTICE QUESTIONS ON SUBNETTING

Q3

IP1 → 150 · 41 · 40 · 50 → 11th Subnet, 50th

IP2 → 150 · 41 · 60 · 60 → 16th Subnet, 60th

IP3 → 150 · 41 · 80 · 40 → 21th Subnet, 40th

Subnet mask → 255·255·252·0

Which host of which Subnet ??

255 · 255 · 0 · 0

11111100

2^6 ⇒ 64 Subnets

00101000 · 00110010

11th Subnet

50th

01010000 · 00101000

2^{10} IP address in each subnet

PRACTICE QUESTIONS ON SUBNETTING

Q3

IP1 → 100 . 40 . 0 . 8 → 11th subnet ⇒ 8th

IP2 → 100 . 80 . 0 . 6 → 21th sub → 6th

IP3 → 100 . 96 . 0 . 5 → 25th sub → 5th

Subnet mask → 255.252.0.0

Which host of which subnet??

64 subnets

IP address in each subnet ⇒ 2^{18}

00101000 00 00 - - - . 0000 1000

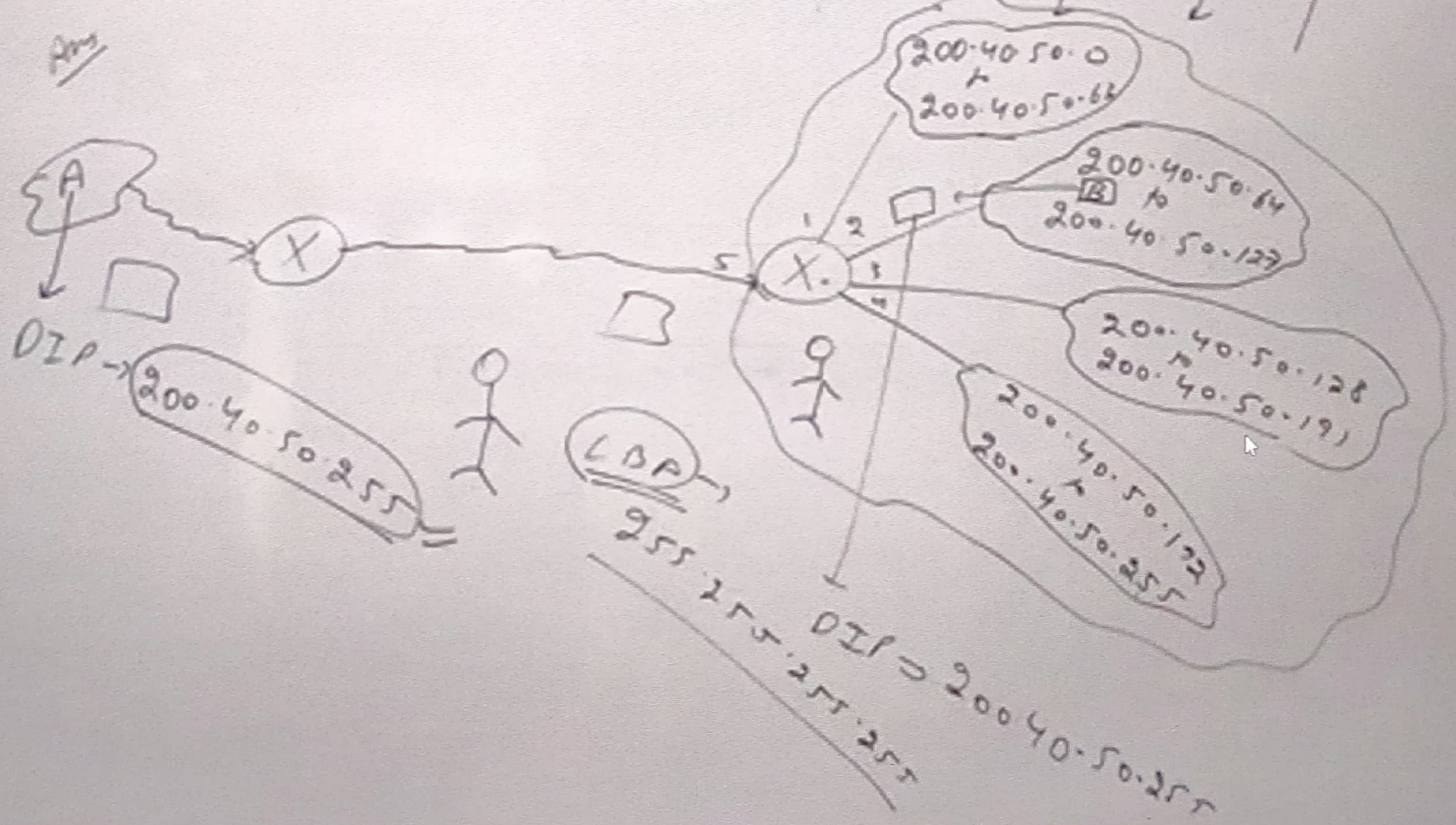
01010000

01100000

PRACTICE QUESTIONS ON SUBNETTING

Q4 Class C block having starting address 200.40.50.0 is distributed among 4 organizations find DBA of 2nd & 4th subnet.

Ans



PRACTICE QUESTIONS ON SUBNETTING

Q. IP address in a block is 200.40.50.60

Subnet mask → 255.255.255.45

a) No. of subnets ⇒ 2^4 ⇒ 16

b) Subnet id of 10^{th} subnet ⇒ 200.40.50.33

c) DBA of 6^{th} subnet → 200.40.50.219

d) 3^{rd} host of 2^{nd} subnet ⇒ 200.40.50.19

128
1 9 1

0000

0011

6^{th} subnet

5

255
− 36
219

VLSM ⇒

Variable length subnet masking

Class A ⇒

$x \rightarrow 2^{22}$

$y \rightarrow 2^{22}$

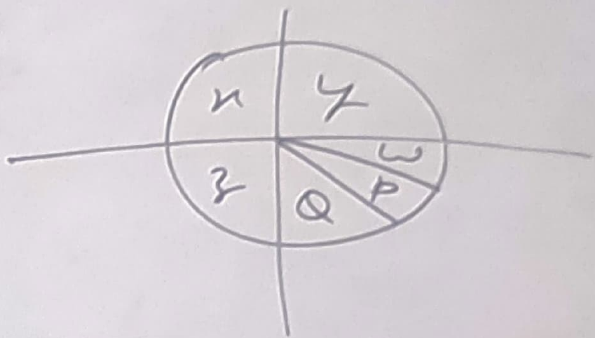
$z \rightarrow 2^{22}$

$w \rightarrow 2^{20}$

$p \rightarrow 2^{20}$

$Q \rightarrow 2^{21}$

10.0.0.0 ⇒ 2^{24}



$$\frac{2^{24}}{2^{22}} \Rightarrow 4$$

0 0 → x

0 1 → y

1 0 → z

1 1 → 110 → Q

111 → 1110 → P

1111 → W

VLSM ⇒

Variable length Subnet masking

200.40.50.0

Routing ??

class

250

200.40.50.250
255.255.255.192

200.40.50.192

x → 128
y → 64
z → 32
w → 32

200.40.50.0 – 200.40.50.127 x

200.40.50.128 – 200.40.50.191 y

200.40.50.192 – 200.40.50.255 z

200.40.50.0	255.255.255.128	1
200.40.50.128	255.255.255.192	2
200.40.5.192	255.255.255.192	3

Que. 130.34.12.0/22 find starting addr & last address of each subnet.

8 subnets

~~9.130.130.~~

~~130.34.111111 - - . -~~

Subnet mask. $\boxed{255.255.255.128}$

00001100.0

$\boxed{1101.0}$

1110.0

0 4 2 1

1st → 130.34.12.0
→ 130.34.12.127

2nd → 130.34.12.128
→ 130.34.12.225

3rd → 130.34.13.0
→ 130.34.13.127

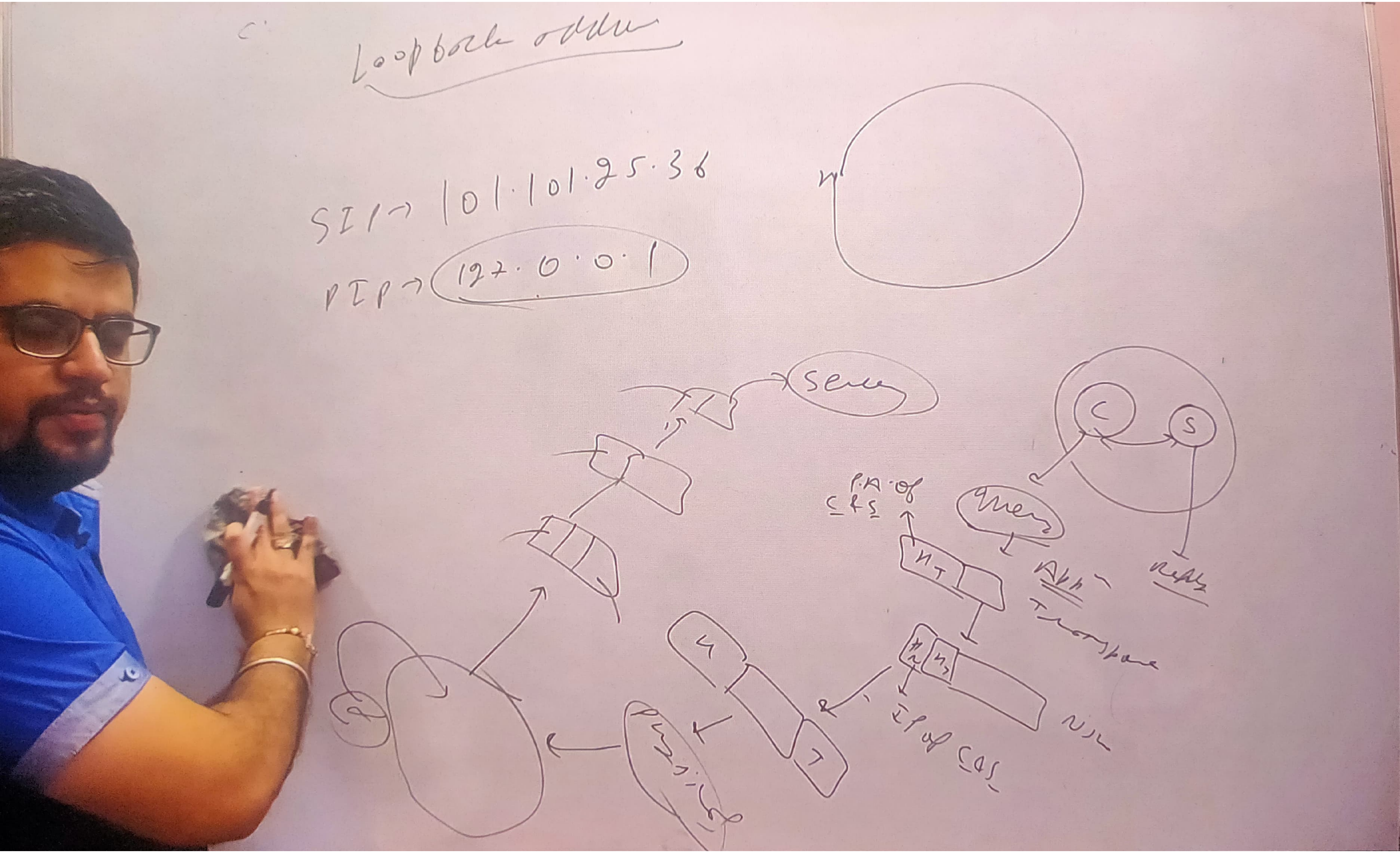
4th → 130.34.13.128
→ 130.34.13.255

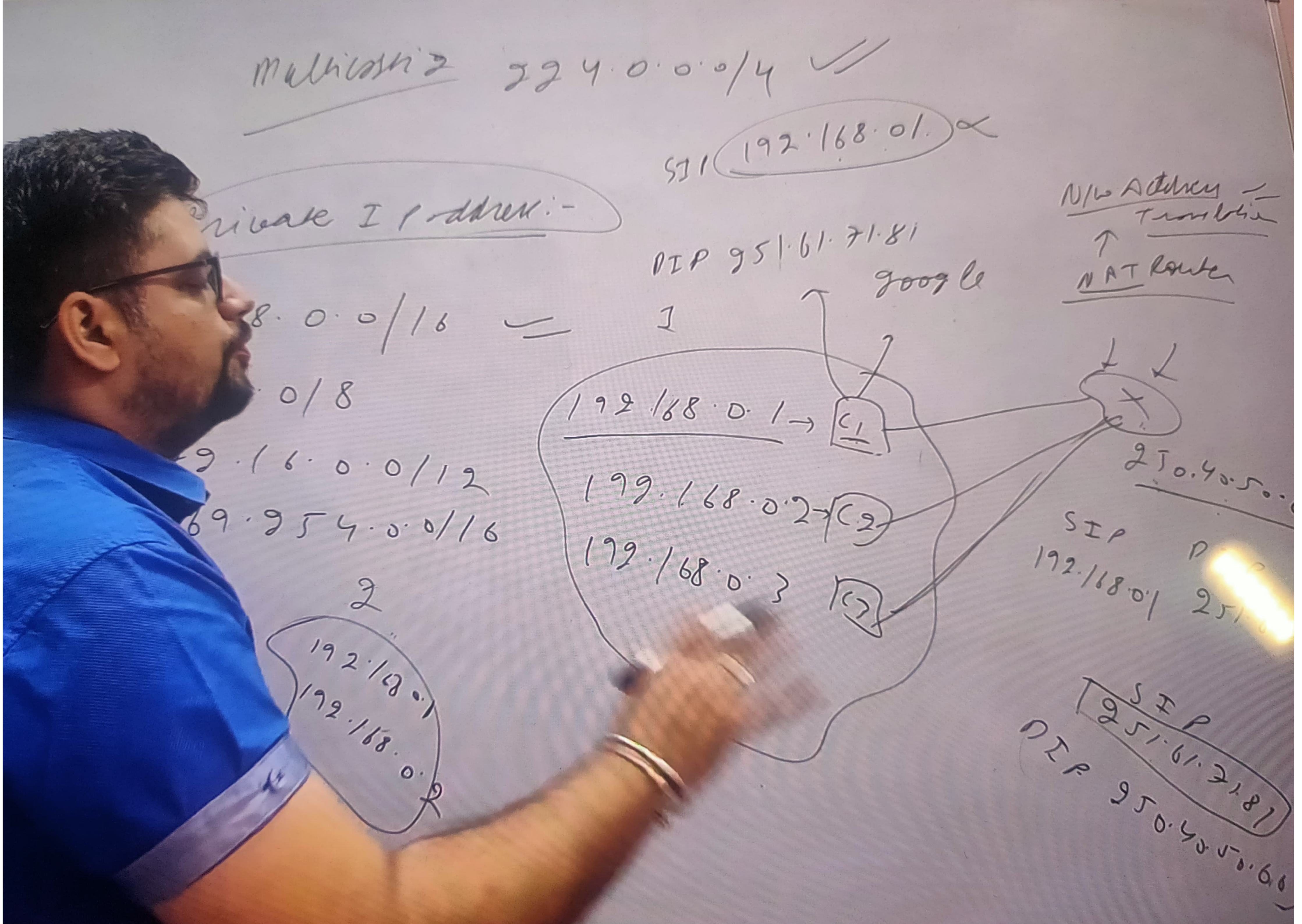
5th → 130.34.14.0.
→ 130.34.14.127.

6th → 130.34.14.128
→ 130.34.14.255

7th → 130.34.15.0
→ 130.34.15.127

8th → 130.34.15.128
→ 130.34.15.225.


Loopback address
SIP → 101.101.25.36
PIP → 127.0.0.1
Server
C
S
Query
P.A. of C&S
Appn
Transport
Results
N/W
IP of C&S



Multicast :- 224.0.0.0/4
SIP 192.168.01.
Private IP address :-
DIP 951.61.71.81
google
N/W Address Translation
NAT Router
8.0.0/16
0/8
16.0.0/12
69.254.0.0/16
192.168.0.1 → C1
192.168.0.2 → C2
192.168.0.3
C3
250.40.50.
SIP
192.168.0.1
SIP
251.61.71.81
DIP 250.40.50.60

It is unreliable & connection less

Best effort delivery system

Each datagram can be transported separately & can follow different routes

→ header included

Q If length of IP datagram is 1000 bytes & we need to make fragments of 100 bytes. How many fragments will be constructed assuming header is of 20 bytes =

Ans $\frac{1000}{100} = 10$ A 10 fragments

Payload/ Data

Data in fragment = size of fragment − header
Payload
$= 100 - 20$
$= 80$ bytes

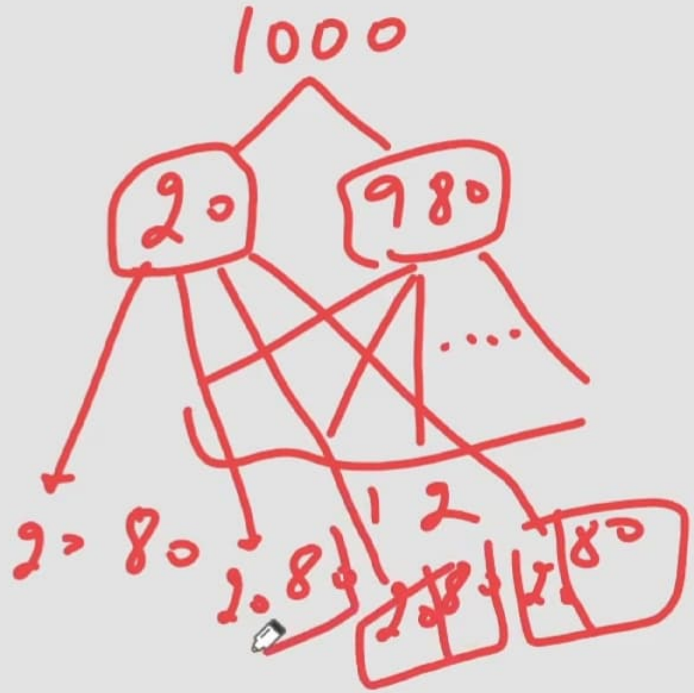
$1000 - 20$
$= 980$ byte
Data/Payload

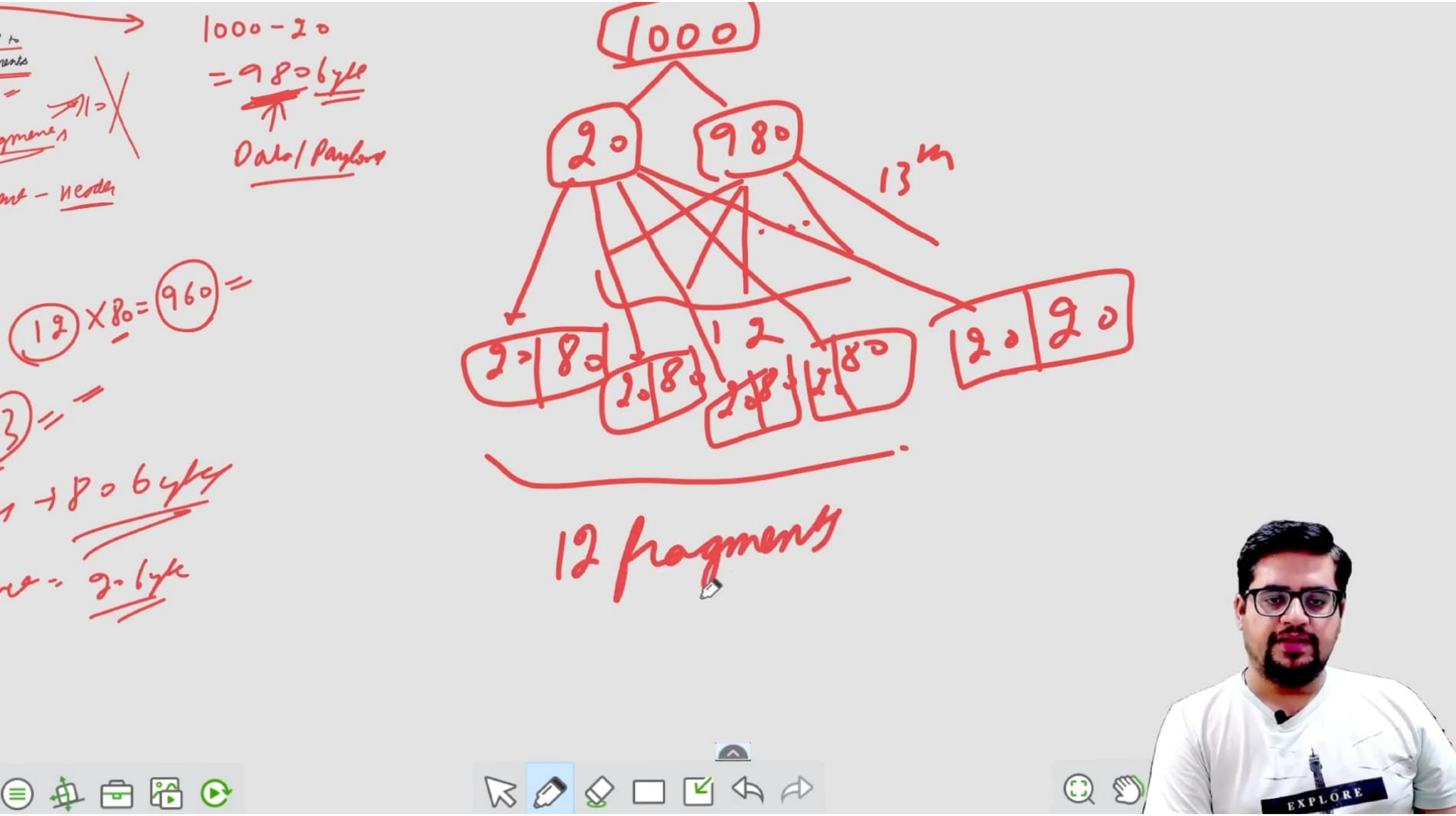
$\frac{980}{80}$ 12. $12 \times 80 = 960$ =

13 =

12 fragments → 80 byte

13^{th} fragment = 20 byte





1000 - 20
= 980 byte
Data / Payload
header
12 × 80 = 960
80 byte
20 byte
1000
20
980
13th
12
20 | 80
20 | 20
12 fragments
EXPLORE

FO = 22, m = 1, HLEN = 5, TL = 108, ID = 100

If MTU of N/W is 60. How many fragments will be generated & give values of all these 5 fields for each fragment.

ID = 100

20 | 88 → 176 – 263

Fragments

	20 | 40	20 | 40	20 | 8
	176 – 215	216 – 255	256 – 263
FO	22	27	32
m	1	1	1
HLEN	20	20	20
TL	60	60	28
ID	100	100	100

176 + 87 = 263

60 → 20 | 40

176 + 39 = 215

216 + 39 = 255

MSO =

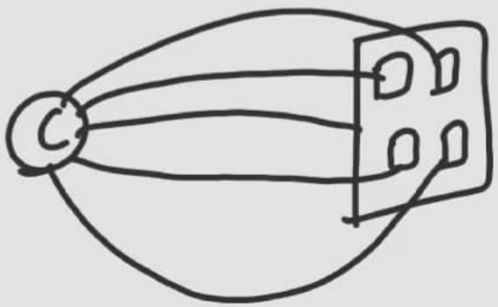
216 / 8 = 27

256 / 8 = 32

Versions of HTTP

HTTP 1.0

[Non Persistent Connection]



HTTP 1.1

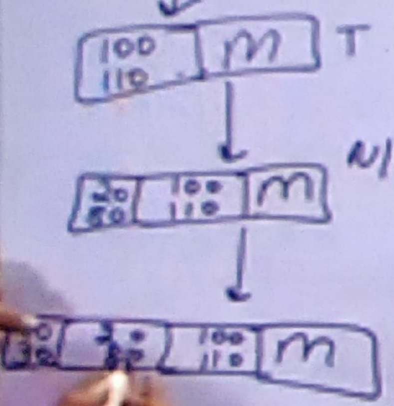
[Persistent Connection]

Types of Addresses

- Physical → MAC → 48 bit
- Logical → IP → 32 bits
- Port → Process
- Others → U.R.L

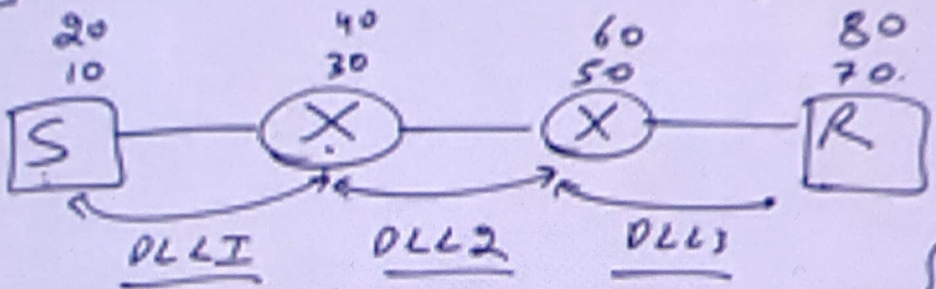
Physical ⟷ concepts ⟷ Logical

sender



100

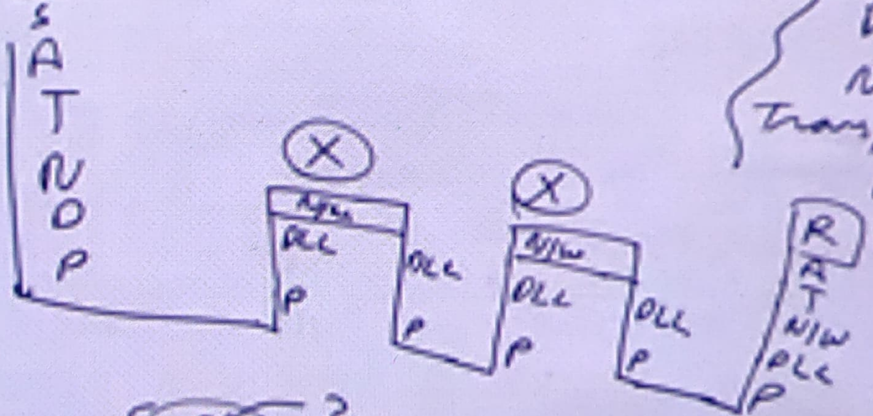
110



n → intermediate Nodes/Routers

- P → 2*n + 2
- DLL → 2*n + 2
- N/W → n + 2
- Transport → 2
- APP → 2 → End to End

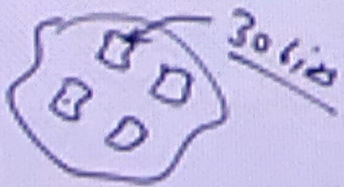
Process to Process or End to End



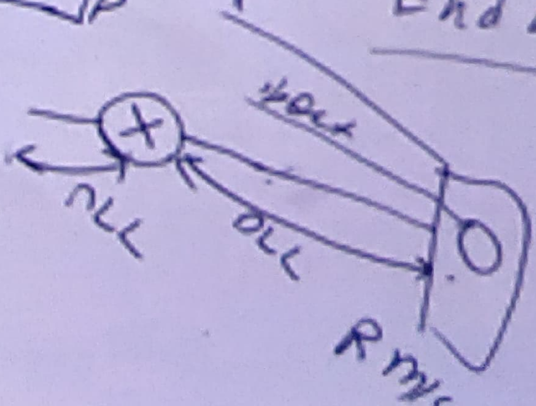
→ Unique in L.A.N

Logical → Unique in internet

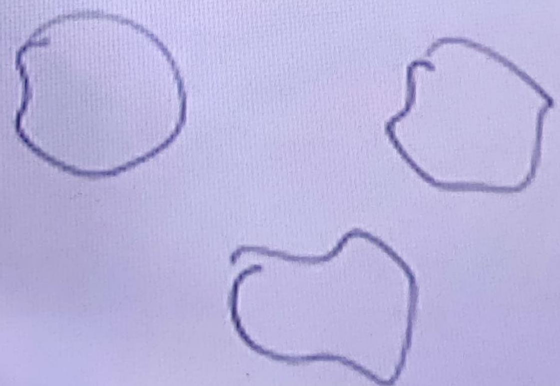
N/W of N/W



S M/C



IP	MAC → Media Access Control Address
→ Implimentation of Logical Address	→ Implimentation of Physical Address
→ 32 bits	→ 48 bits
→ Unique in Internet	→ Unique in Internet
→ Stored in RAM	→ Stored in ROM of NIC card (Hard coded)
Header of N/W layer [illegible]	→ Header of DLL contain MAC



Read item(x) → Name of item (DB is a collection of named items)

① Get disk address of block that contain item x. (HOW?? implimentation dependent)

② Read in block (i.e transfer block from H.D. to RAM) [Why entire block??]

③ Copy value of item x from RAM into program variable x

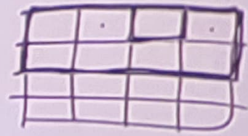
buffer

int x;

x ⟵ item x

x - 500;

x + 200;



Write item(x):-

① same

② same

③ Copy value of pro[...]ble x into block in RAM containing item x.

[...] H.D. [This step make changes in Database]

[...] → All 3 steps

r(x) → may or may not need all 3 steps

If we assume block containing item x is still in RAM then step 1 & 2 not need

block not in RAM ∵ it has been replaced by some other block.

What if T2 do r(x) immediately after r(x) of T1 ??

... of [pipelining] is used to improve efficiency i.e, in place of sending 1 frame sender will send multiple frame to improve efficiency.

Qu.

$1+2a = 13$

$n = 4$ window size min $(13, 2^4) = 13$.

| 0 | 1 | 2 | 3 ---- 12 | 13 | 14 | 15 | .....

Buffer or window (copy maintained)

0 1 2 3 [4 5 6 7] 8 9 10

sent ✓ Ack ✓ — sent ✓ Ack ✗ — sent ✗ Ack ✗

Summary.

① To get maximum efficiency of window size = $1+2a$

also known as optimal window size

Sequence No $= 1+2a$.

No. of bits needed in header of each frame $= \lceil \log_2(1+2a) \rceil$

Qu. $T_T = 1$ sec. $T_p = 5$ sec.

1) Find window size to achieve max efficiency.

$w.s = 1+2a = 1+2\left(\frac{5}{1}\right) = 11$ size frames

2) 11 sequence No needed [0 - 10] to distinguish 11 frames.

3) Bits overhead needed $\lceil \log_2(10) \rceil = 4$ bits.

4) If header allow overhead of 3 bits then η & window size.

1 2 3 4 5 6 7 8 9 10 11

[0 1 2 3 4 5 ... 7] 0 1 2

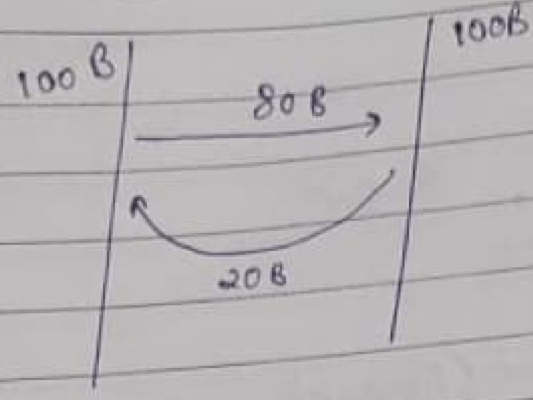
maximum $2^3 = 8$ frames can be send

$\boxed{W.S = 8}$

$\eta = \frac{\text{actual}}{\text{Total}}$

$\eta = \frac{8 \to \text{sent}}{11 \to \text{max}} =$

Flow Control and Window Size Advertisement



Lec 28-31

Que On a TCP connection, current congestion window size is 4KB. The window advertised by the receiver is 6KB. The last byte sent by sender is 10240 and last byte Acknowledged by receiver is 8192. The current window size at the ~~[illegible]~~ sender is

Ans Maximum Window = ~~[illegible]~~ 4KB

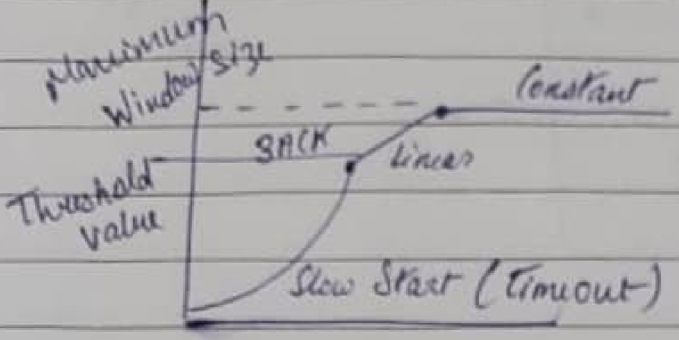
Effective/current Window Size = Max window − (last byte sent − last byte Ack)

= 4KB − (10240 − 8192)

= 4KB − (2048B)

= 2048B = 2KB

Congestion Control



Qu- Let the size of congestion window of TCP connection in two cases when
Case I - Timeout occurs
Case II - 3ACK recieved
Is 32KB. The RTT of the connection is 100 ms. And MSS = 2KB the time taken by TCP connection to get back to 32KB congestion window is?

☆ If 3ACK, then start from linear
☆ If Timeout, then start from slow start

☆ If value is in points take floor value

Threshold = $\frac{32}{2}$ = ~~16~~ 16 $\frac{WS}{MSS}$

Case I ⇒ 2 | 4 | 8 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32

↳ 12×100 = 1200 ms

Case II ⇒ 9×100 = 900 ms

16 / 18 / 20 / 22 / 24 / 26 / 28 / 30 / 32

	R_2	R_3	R_4	R_5	R_6
R_1	6	3	∞	∞	∞
R_1, R_3	5	3	∞	12	∞
R_1, R_3, R_2	5	3	12	12	∞
R_1, R_3, R_2, R_4	5	3	12	12	20
R_1, R_3, R_2, R_4, R_5	5	3	12	12	16

19th April Class Test 2
29nd April MCQ-2

* ~~Int~~ lecture 17, 18, 19, 20, 22, 24, 28, 29, 31

	Distance	Via
R_1	0	—
R_2	5	R_3
R_3	3	R_1
R_4	12	R_3, R_2
R_5	12	R_3, ~~R_2, R_4~~
R_6	16	R_3, ~~R_2, R_4~~ R_5

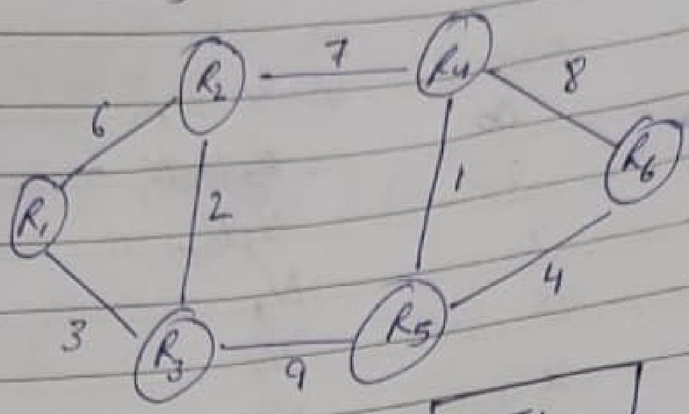
Subnet Mask
Rule → 0 denotes Host
1 denotes network

~~35~~ 1

1110000 0 $2^n - 2$

0000

Link State Routing



☆ Flooding is done

Disjkatra Algorithm

R1

TTL	
Seq.	Dist
R2	6
R3	3

R4

TTL	
Seq.	Dist
R2	7
R5	1
R6	8

R2

TTL	
Seq	Dist
R1	6
R3	2
R4	7

R5

TTL	
Seq	Dist
R3	9
R4	1
R6	4

R3

TTL	
Seq	Dist
R1	3
R2	2
R5	9

R6

TTL	
Seq	Dist
R4	8
R5	4

Updated Table N_4

Dest	Dist	Next Hop
N_1	∞	~~N_3 N_2~~ N_1 —
N_2	8	N_3, N_2
N_3	2	N_3
N_4	0	N_4
N_5	4	N_5

Updated table N_5

Dest	Dist	Next Hop
N_1	4	N_2 ~~N_1~~
N_2	3	N_2
N_3	6	N_4 ~~N_3~~
N_4	4	N_4
N_5	0	N_5

Count to infinity problem

↳ Count to infinity problem occurred due to routing loops from the distance vector routing protocol because it uses the Bellmanford Algorithm and cannot prevent routing loops.

↳ Routing loops in the network can occur due to failure of the link b/w two routers in the network

$N_1 \rightarrow N_3$

$\hookrightarrow N_1 \rightarrow N_2$ and $N_2 \rightarrow N_3$

Updated table N_1

Dest	Dist	Next Hop
N_1	0	N_1
N_2	1	N_2
N_3	7	N_2, N_3
N_4	∞	—
N_5	4	N_2, N_5

Updated table N_2

Dest	Dist	Next Hop
N_1	1	N_1
N_2	0	N_2
N_3	6	N_3
N_4	8	N_3, N_4
N_5	3	N_5

Updated table N_3

Dest	Dist	Next Hop
N_1	7	N_2, N_1
N_2	6	N_2
N_3	0	N_3
N_4	2	N_4
N_5	6	$N_4 N_5$

Dest.	Dist.	Next Hop
N_1	1	N_1
N_2	0	N_2
N_3	6	N_3
N_4	∞	—
N_5	3	N_5

N_2 Table

Dest.	Dist.	Next Hop
N_1	∞	—
N_2	6	N_2
N_3	0	N_3
N_4	2	N_4
N_5	∞	—

N_3 Table

Dest.	Dist.	Next Hop
N_1	∞	—
N_2	∞	—
N_3	2	N_3
N_4	0	N_4
N_5	4	N_5

N_4 Table

Dest.	Dist.	Next Hop
N_1	∞	—
N_2	3	N_2
N_3	∞	—
N_4	4	N_4
N_5	0	N_5

N_5 Table

when our router sends data to another router

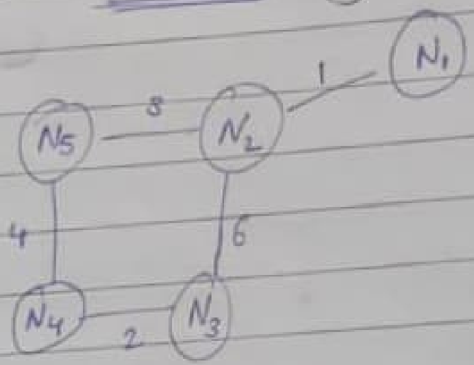
Routing Protocols

- Intra Domain
  - Distance Vector
  - Link State
- Inter Domain
  - Path Vector

Routing Types

↳ Static
↳ Dynamic

Distance Vector Routing



Destination	Distance	Next Hop
N_1	0	N_1
N_2	1	N_2
N_3	∞	–
N_4	∞	–
N_5	∞	–

N_1 Table

CSMA / CA

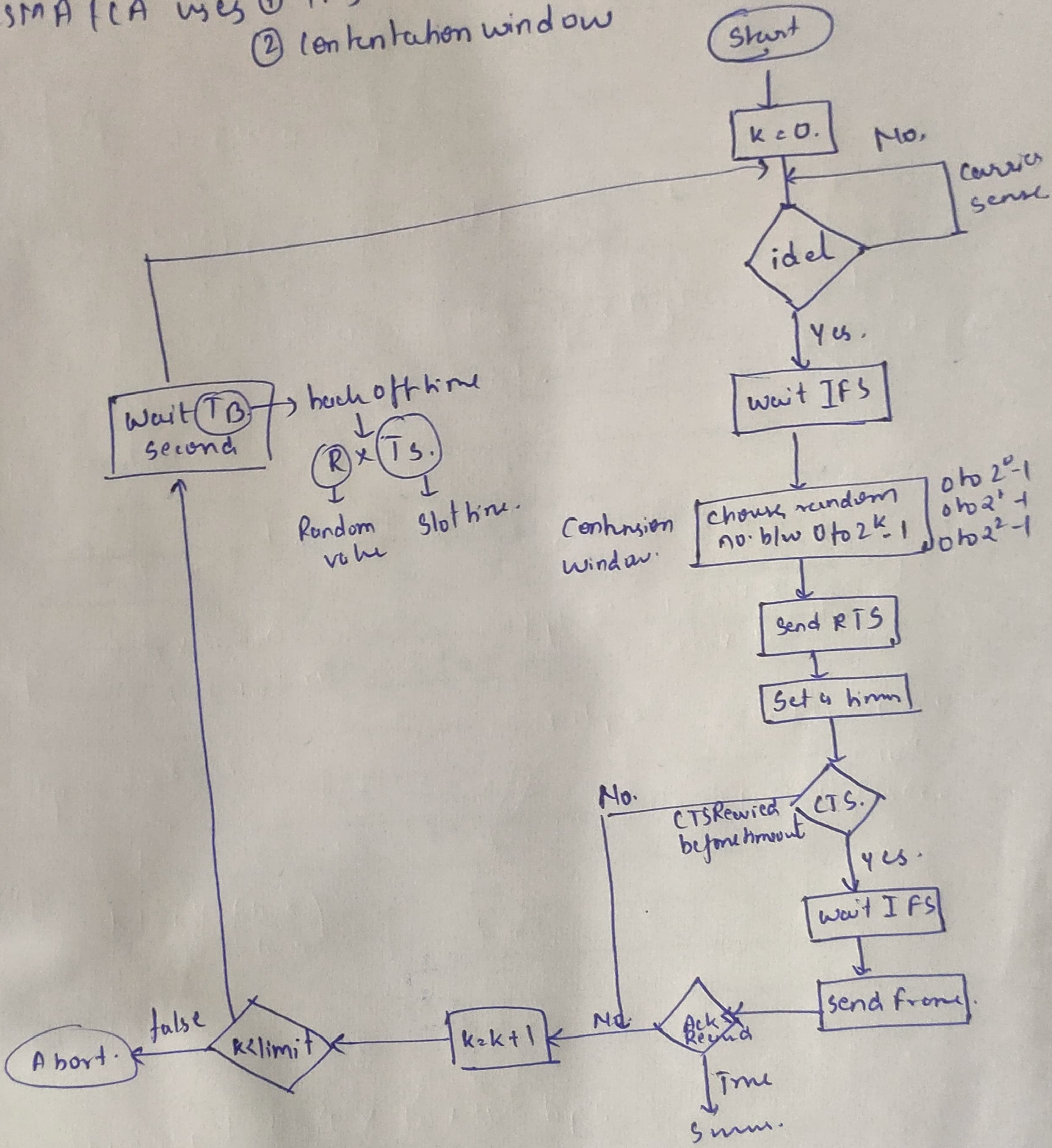
→ used in wirless Networks.

→ In wirless less the energy of signal is lost while the tramission, hence low signal received at receiver / station.

∴, we can't use collision detection method.

→ CSMA / CA uses ① IFS

② contentation window



k = No. of attempts.

T_B = Backoff time.

Eg. limit = max 10 attempts allowed

IFS = interframe space.

RTS = Ready to send

CTS = clear to send.

ull addressing

CLASSFULL ADDRESSING

Net id & Host id

→ Host identification

→ Each computer connected to internet has an IP address & that address is known as Host id

Network identification

Each N/w connected to internet also has an IP address known as Net id

Advantage → No. of entries in Routing table would ↓↓

→ Net id is not assigned to any computer or Router in N/w

Ist address in the block of IP addresses assigned to N/W

CLASSFULL ADDRESSING

A

B

C → Multicasting

D → Future use

class A → 1 octet → Nid →

Organization ↕ N/w

1 class A IP addresses can be assigned to 126 N/w

2 Each N/w will have 2^{24} IP addresses & $2^{24} - 2$ hosts

1st ⇒ Net id

last ⇒ reserved

CLASSFULL ADDRESSING

A 0 . — . — . —
B — . — . — . —
C — . — . — . —
D — . — . — . — → Multicasting
E — . — . — . — → Future use

class A → 1 octet → Nid → 128

Q1 class A IP addresses can be assigned to 126 N/w ↔ Organization

Q2 Each N/w will have 2^{24} IP addresses & $2^{24}-2$ hosts

1st → ~~0.0.0.0~~ → ~~0.255.255.255~~

2^{24} 0

1.0.0.0
1.255.255.255

2.0.0.0
2.255.255.255

last → 126.0.0.0 to 126.255.255.255

128th → ~~127.0.0.0~~
~~127.255.255.255~~

for, 80.150.50.60
255.192.0.0

80.128.0.0

Port

1100
10
128
64

c) 80.200.50.60
255.192.0.0

~~255~~ 80.192.0.0

Port No. 4.

11
11

Internet routers $\xrightarrow{\text{apply Net mask}}$ to find ~~apply~~ $\boxed{\text{Net id}}$ → Site routers $\xrightarrow{\text{apply subnet mask}}$ to get Subnet id

Net $\boxed{\text{Id}}$ $\boxed{\text{host}}$ id.

Sub $\boxed{\text{net Id}}$ $\boxed{\text{host}}$ id

2^{n} → Bits flip.
organization

PRACTICE QUESTIONS ON SUBNETTING

Q3

IP1 → 150 . 41 . 40 . 50 → 9th Subnet, 50th

150 . 41 . 60 . 60 →

IP2 → 150 . 41 . 60 . 60

IP3 → 150 . 41 . 80 . 40 →

255 . 255 . 0 . 0

Subnet mask → 255 . 255 . 252 . 0

Which host of which Subnet??

11111100

2^6 Subnets ⇒ 64

00101000 . 00110010

9th Subnet

50th

00111100 . 00111100

2^{10} IP address

in each subnet

PRACTICE QUESTIONS ON SUBNETTING

Q. IP address in a block is 200.40.50.60

Subnet mask → 255.255.255.160

a) No. of subnets ⇒ 4

b) Subnet id of each subnet

→ 200.40.50.0

→ 200.40.50.32

→ 200.40.50.128

→ 200.40.50.160

c) DBA of each subnet

→ 200.40.50.95

→ 200.40.50.127

→ 200.40.50.223

→ 200.40.50.255

d) 3rd host of 2nd subnet

0 1 0 0 0 1 1

Nid	Host

Sid	Hid

Contineous 1,

26 1,

$2^2 = 4$

Subnet ← 26 IP

6 0 5

PRACTICE QUESTIONS ON SUBNETTING

Q. IP address in a block is 200.40.50.60 ($\subseteq$ C)

Subnet mask $\rightarrow$ 255.255.255.45

a) No. of subnets $\Rightarrow 2^4 \Rightarrow 16$

Subnet id of each subnet

A of each subne

host of 2^{nd} net

00101101

t if
host
est 0 on host.

IR w
Site
Rout

256 → 200.40.50.0…. (0-127)

→ 200.40.50.1…. (128-255)

128 → 200.40.50.$\boxed{1}$0 (128-191) 64

→ 200.40.50.$\boxed{1}$1 (192-255) 64

64 → 200.40.50.$\boxed{11}$0 (192-223) 32

→ 200.40.50.$\boxed{11}$1 (224-255) 32

...ow to
...lculate Subnet
2 bits borrow host
so make it 1. rest 0 on host.

11.1 00 ...0.0 (128.0 - 159.255)

140.41.1 01 ...0.0 (160.0 - 191.255)

140.41.1 10 ...0.0 (192.0 - 223.255)

140.41.1 11 ...0.0 (224.0 - 255.255)

IR was not me...
Site
Routes uses S...

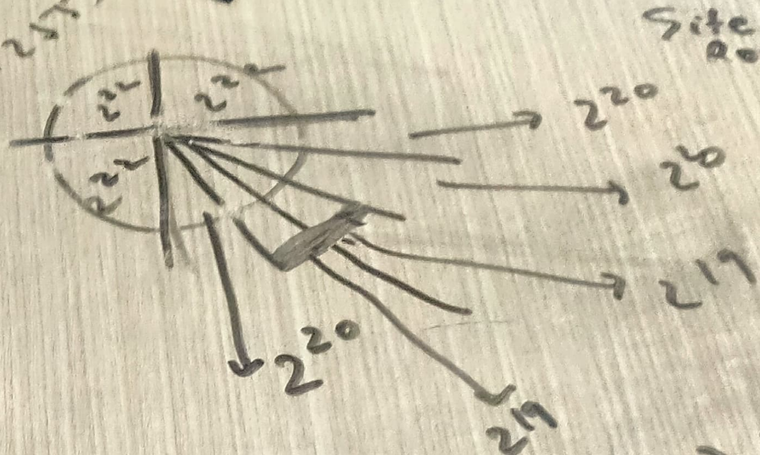
... Subnet it
... rrow host
it to rest 0 on host.

100.00 [ ] .0.0 (0.0.0 - (63.255.255.255)

100.01 [ ] .0.0 (64-127.255.255.255)

100.10 [ ] .0.0 (128-191.255.255.255)

100.11 [ ] .0.0 (192-255.255.255)



100.[11]00 .0 ⟶ (192-207) 2^{20}

100.[11]01 .0 ⟶ (208-223)

100.[1101]0 ⟶ (224-215)

100.[1101]1 ⟶ (216-255)

VLSM ⇒

Variable length Subnet masking

200.40.50.0

Routing ?

Class C

x → 128
y → 64
z → 32
w → 32

200.40.50.250
255.255.255.192
200.40.50.192

200.40.50.0 – 200.40.50.127 x
200.40.50.128 – 200.40.50.191 y
200.40.50.192 – 200.40.50.255 z

1
2
3

200.40.50.0	255.255.255.128	1
200.40.50.128	255.255.255.192	2
200.40.5..192	255.255.255.192	3

Block Allocation

IANA subgroup of ICANN

Internet Assigned Numbers Authority

Internet Corporation for Assigned Names & Numbers

$2^{32-29} \rightarrow 2^3$

2^{32-25}

$\Rightarrow 2^7$

10.20.12.0/22

Restrictions Block Allocation

1. Power of 2 — 1000 → 1024, 500 → 512
2. Contiguous
3. 1st address of block must be divisible by total no. of addresses in block

40.30.40.0/29 → 8

Supernetting

0 0 0 - - 0

Subnetting in Classless Addressing

Q An ISP is granted with block 190.100.0.0/16. It wants to distribute these addresses into 3 group of customers

1. 64 customers each need 256 IP addresses → $2^6 * 2^8 \Rightarrow 2^{14}$
2. 128 " " " 128 " " → $2^7 * 2^7 \Rightarrow 2^{14}$
3. 128 " " " " " → $2^7 * 2^6 \rightarrow 2^{13}$

Design the subnets

(2) 2^{16}

2^{14}

(1)

190.100.00 00-0.00 —

111111.111111

0 0 000000 → 0 to 1111… 255

…3.255/18

1:00:44

How to
Calculate Subnet it
2 bits borrow host
so make it 1. rest 0 on host.

120 → 128
60 → 64
10 → 16

$\frac{256}{2^1} = \frac{2^8}{2^1} = 2^7$

(0-127)
(128-255)

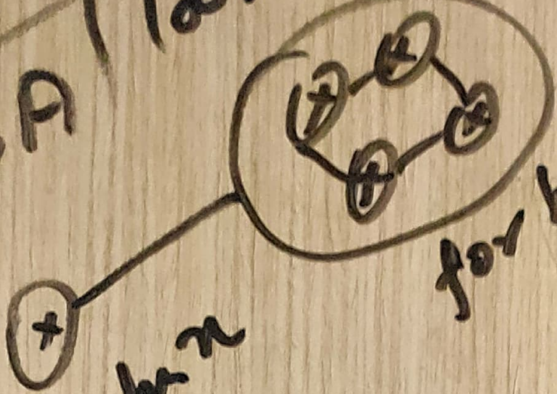
36.46.56.0 → (a)
36.46.56.$\boxed{1}$0
36.46.56.$\boxed{\boxed{1}\,1}$0 0

(128-191)

(192-207)
(208-223)
(224-239)
(240-255)

1st Subnet id

DBA / last ip



computer

for broadcast in lan ntw.

1st address in block of Ip address assigned to network.

= Net id.

M.S.G =

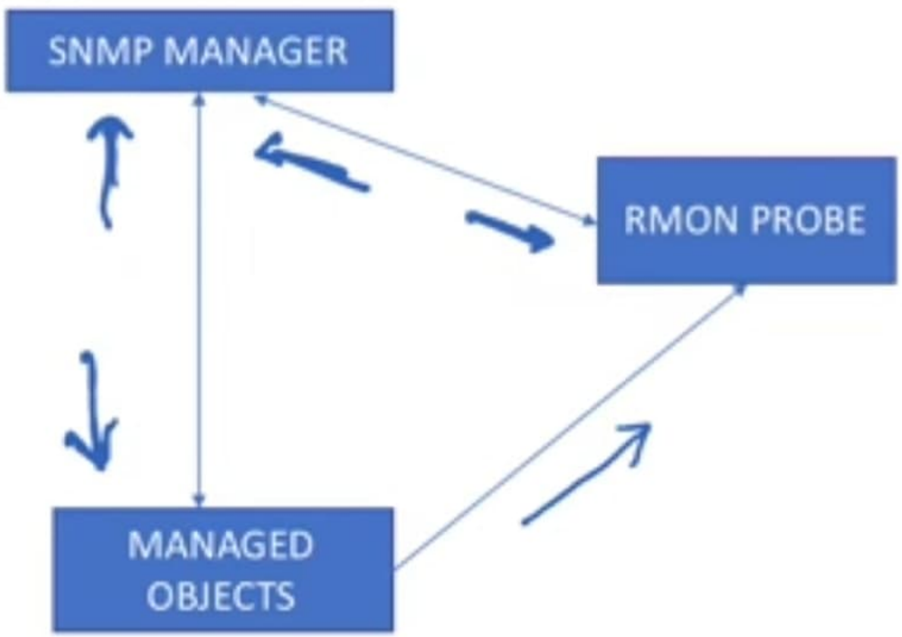
LBA: limited => 255.255.255.255

How to
Calculate Subnet id
2 bits borrow host
So make it 1. rest 0 on host.

Routing
Subnet Id / Subnet mask / Port No.

- Instead of the network manager continuously monitoring ,the events and calculating information an intermediate agent called as remote monitoring (RMON)is inserted between managed objects and network manager

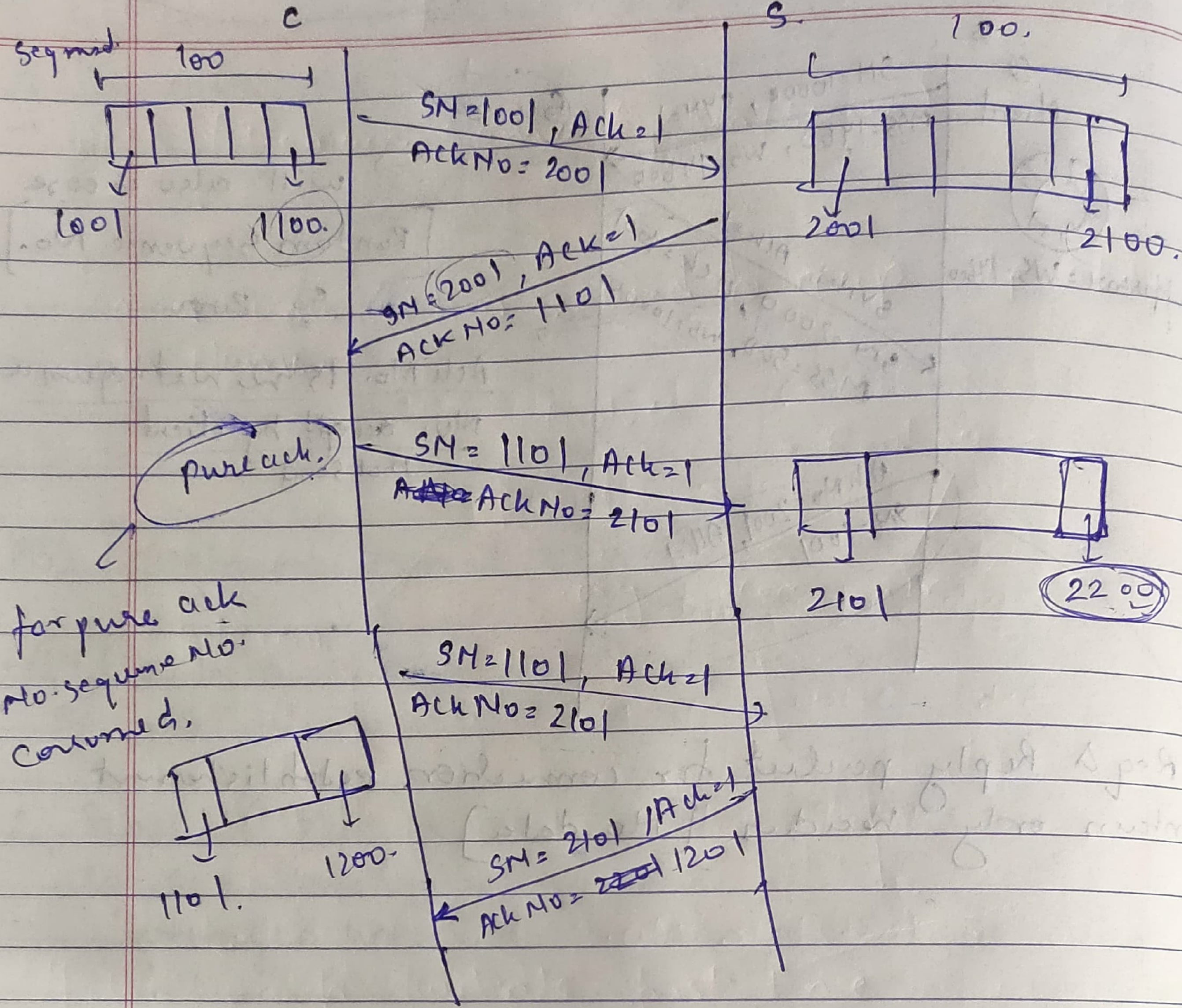
SNMP with RMON



- The network manager receives the data from managed objects as well as from remote monitor(RMON) agent about managed objects
- Remote monitoring function implemented in a distributed fashion of the network has greatly increased the centralized management of network
- The pure SNMP management system consists of SNMP agents and managers
- However an SNMP manager can manage a network element that does not have an SNMP agent .This will be proxy server

Data Transfer TCP

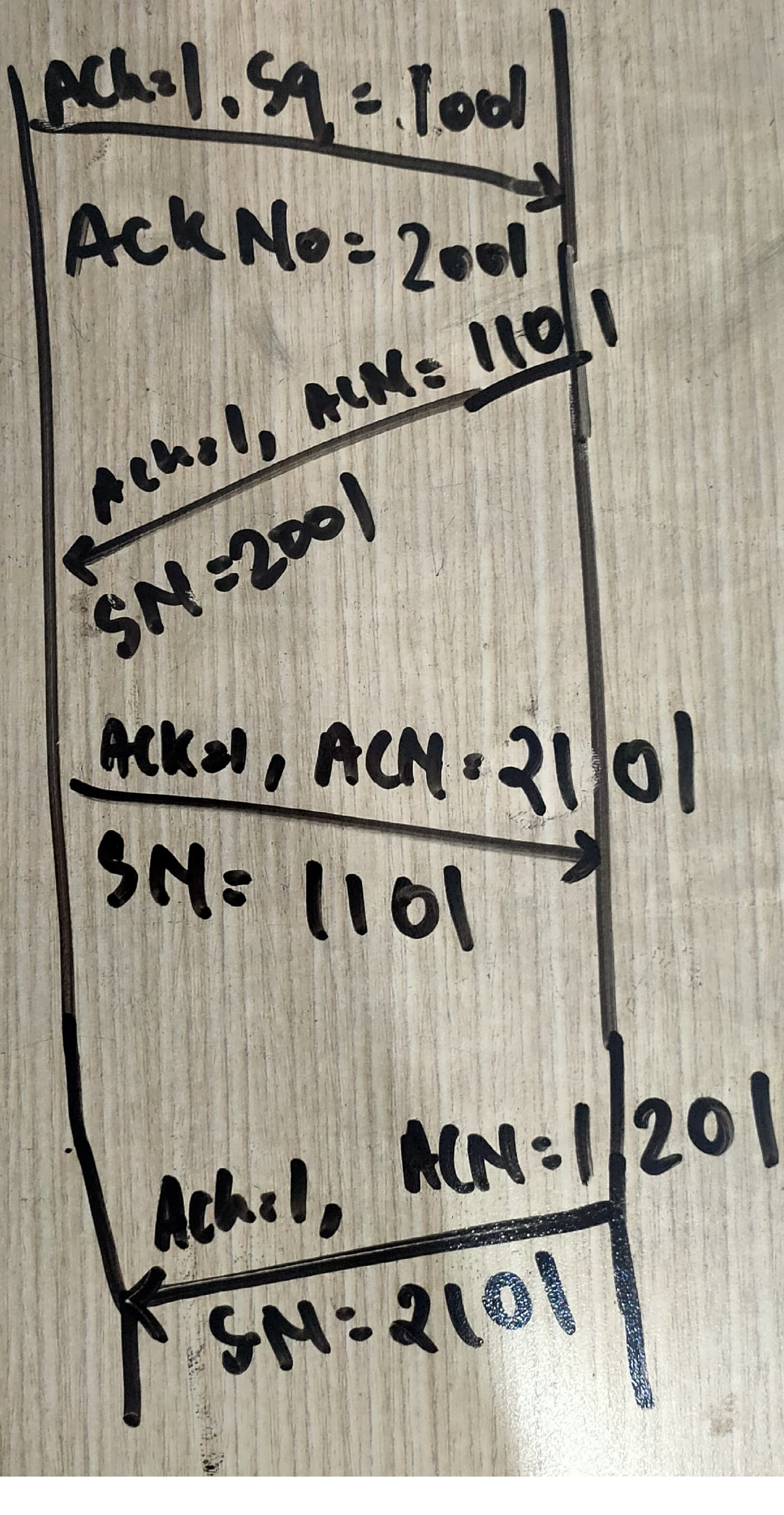
Date
Page No.



SN = Last Ack

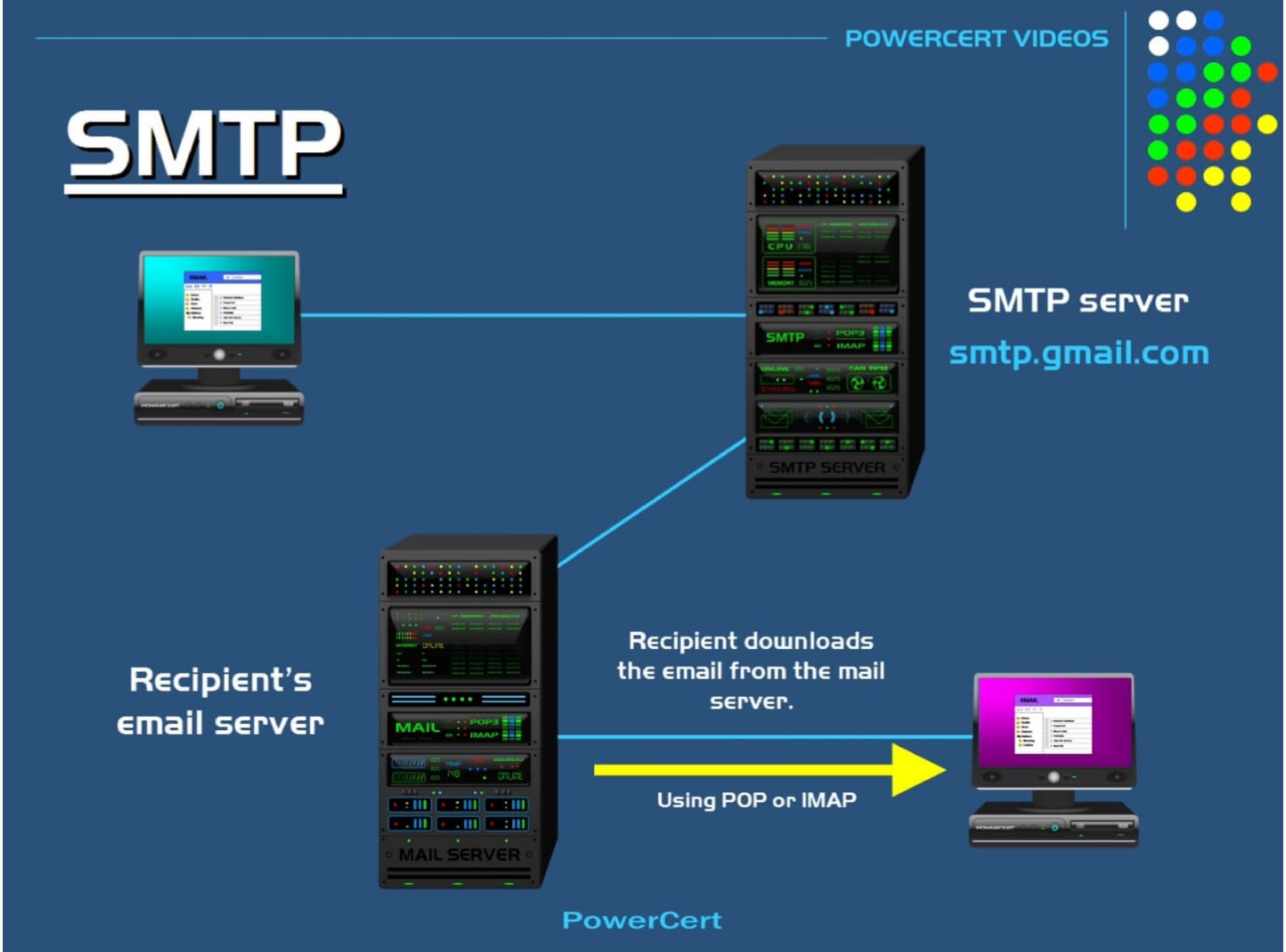
Ack No = $\boxed{\text{Last byte of SN + 1}}$ of previous round.

for last byte ⇒ SN + segment size − 1

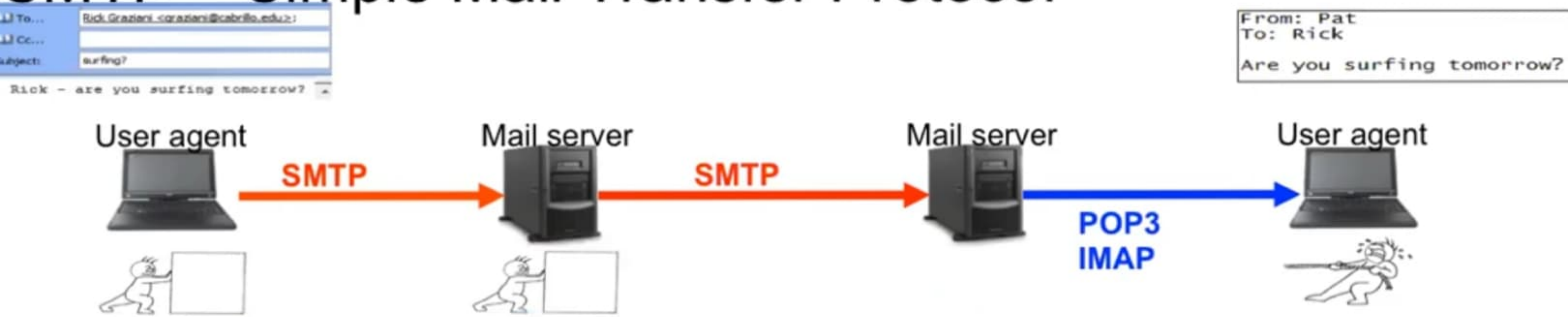

Ack=1, Sq = 1001
Ack No = 2001
Ack=1, ACN= 1101
SN=2001
ACK=1, ACN = 2101
SN= 1101
Ack=1, ACN=1201
SN=2101

SMTP

A set of commands that authenticates and directs the transfer of email.


POWERCERT VIDEOS
SMTP
SMTP server
smtp.gmail.com
SMTP SERVER
Recipient's email server
MAIL SERVER
Recipient downloads the email from the mail server.
Using POP or IMAP
PowerCert

SMTP – Simple Mail Transfer Protocol



- Internet mail involves:
  - **User agents**
    - Allows users to read, reply, compose, forward, save, etc., mail messages
    - GUI user agents: Outlook, Eudora, Messenger
    - Text user agents: mail, pine, elm

Signal to Noise ratio (SNR)

- It is defined as a ratio of signal power to noise power.

$$\frac{S}{N} = \frac{P_S}{P_N}$$

where, P_S = Signal Power

P_N = Noise Power.

- In dB,

$$\left(\frac{S}{N}\right)_{dB} = 10 \log\left(\frac{P_S}{P_N}\right)$$

$$\left(\frac{S}{N}\right)_{dB} = 10 \log\left(\frac{P_S}{P_N}\right)$$

- Power in terms of voltage.

$$P_S = V_S^2/R \quad , \quad P_N = V_N^2/R$$

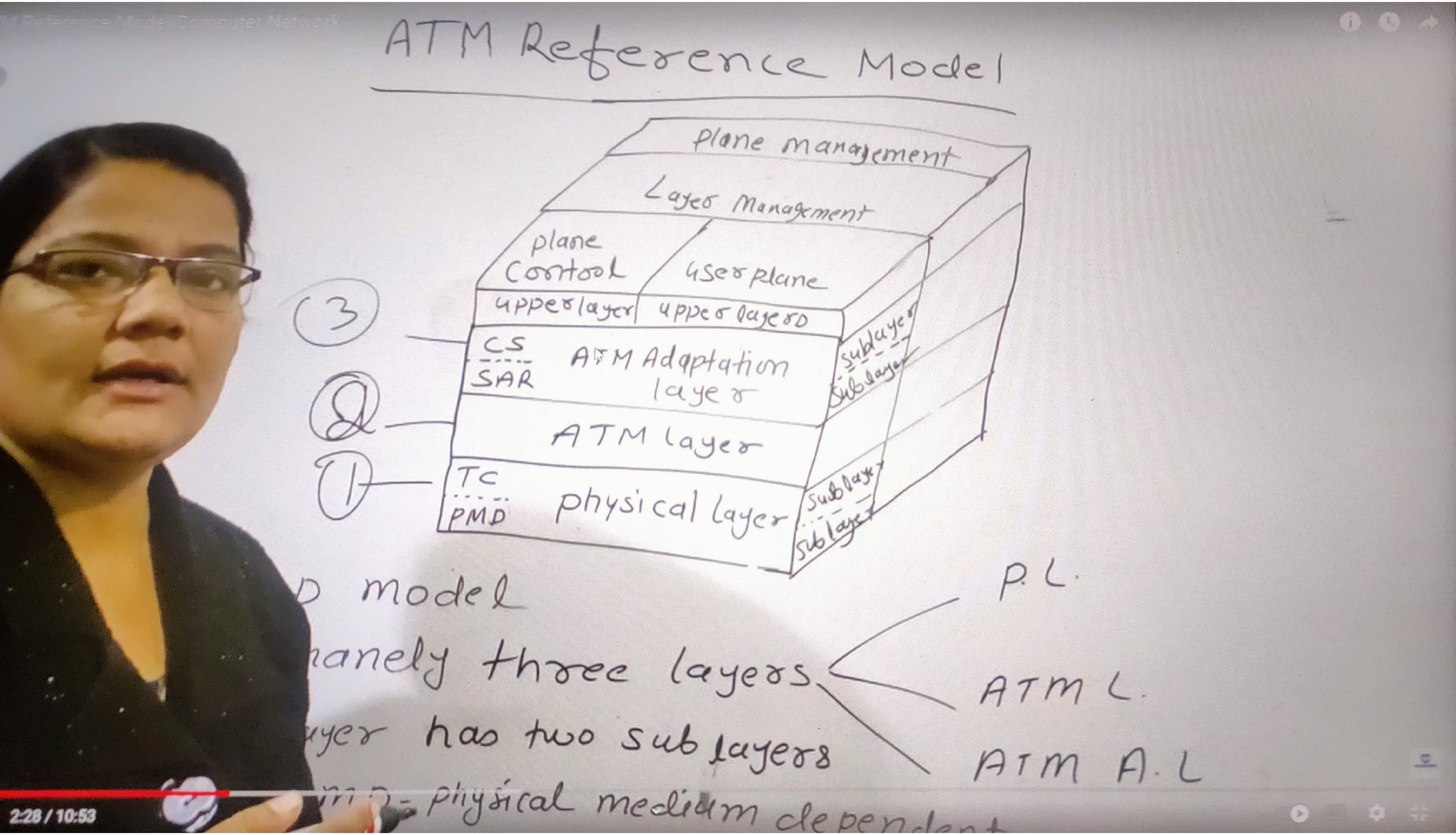
- So SNR will be.

$$\left(\frac{S}{N}\right)_{dB} = 10 \log\left(\frac{V_S^2/\cancel{R}}{V_N^2/\cancel{R}}\right)$$

$$= 10 \log\left(\frac{V_S}{V_N}\right)^2$$

$$\boxed{\left(\frac{S}{N}\right)_{dB} = 20 \log\left(\frac{V_S}{V_N}\right)}$$

- high SNR is good for Tx an[illegible] Rx


ATM Reference Model
plane management
Layer Management
plane Control
user plane
upper layer
upper layer
CS
SAR
ATM Adaptation layer
sublayer
sublayer
ATM layer
TC
PMD
physical layer
sublayer
sublayer
(3)
(2)
(1)
D model
namely three layers
P.L.
ATM L.
ATM A.L
ayer has two sub layers
PMD - physical medium dependent
2:28 / 10:53

Example

The power of a signal is 10 mW and the power of the noise is 1 μW; what are the values of SNR and SNR_{dB} ?

Solution

The values of SNR and SNRdB can be calculated as follows:

$$\boxed{\begin{gathered} SNR = \frac{10{,}000\ \mu W}{1\ mW} = 10{,}000 \\ SNR_{dB} = 10 \log_{10} 10{,}000 = 10 \log_{10} 10^4 = 40 \end{gathered}}$$

Example

Consider a noiseless channel with a bandwidth of 3000 Hz transmitting a signal with two signal levels. The maximum bit rate can be calculated as

Formula : Bit Rate= 2 X Bandwidth X $\log_2 L$, Where L= number of signal levels.

$$\boxed{\text{BitRate} = 2 \times 3000 \times \log_2 2 = 6000 \text{ bps}}$$

We need to send 265 kbps over a noiseless channel with a bandwidth of 20 kHz. How many signal levels do we need?

Solution

We can use the Nyquist formula as shown:

$$265{,}000 = 2 \times 20{,}000 \times \log_2 L$$

$$\log_2 L = 6.625 \qquad L = 2^{6.625} = 98.7 \text{ levels}$$

Since this result is not a power of 2, we need to either increase the number of levels or reduce the bit rate. If we have 128 levels, the bit rate is 280 kbps. If we have 64 levels, the bit rate is 240 kbps.

$SNR_{db} = 10 * log_{10}SNR$

Given SNR_{db} as 63, so keeping in above formula, we get SNR as

$63 = 10 * log_{10}SNR$

$6.3 = log_{10}SNR$

$SNR = 2,000,000$

We have,

$BitRate = B * log_2(1 + SNR)$

where,

B = bandwidth, given as 1 Mhz

SNR we found as $2,000,000$

So, putting these values, we get

$BitRate = 1 * 10^6 * log_2(1 + 2000000)$

$BitRate = 1 * 10^6 * log_2(2000001)$

$BitRate = 1 * 10^6 * 20.93$

$BitRate = 20.93$ **Mbps**

In order to find levels, we have

$N = 2 * B * log_2L$

where,

$BitRate = 1 * 10^6 * log_2(1 + 2000000)$

$BitRate = 1 * 10^6 * log_2(2000001)$

$BitRate = 1 * 10^6 * 20.93$

$BitRate = 20.93$ Mbps

In order to find levels, we have

$N = 2 * B * log_2 L$

where,
L = Signal Levels, which we have to find
B = Bandwidth, given as 1 MHz
N = Rate, given as 20.93 Mbps

On putting these values, we get

$20.93 * 10^6 = 2 * 1 * 10^6 * log_2 L$

$20.93 = 2 * 1 * log_2 L$

$10.46 = log_2 L$

So, L is approx 1090

answered Apr 6, 2017 · selected Apr 6, 2017 by LavTheRawkstar

comment Follow share this

Arunav Khare

asked in Computer Networks Apr 6, 2017

12,386 views

1

1)We need to send 256 kbps over a noiseless channel with a bandwidth 20 KHz.How many signal levels do we need?

2) We have a channel with a 1 Mhz bandwidth. The SNR for this channel is 63.What are the appropriate bit rate and singal level?

computer-networks

answer comment Follow share this

LavTheRawkstar

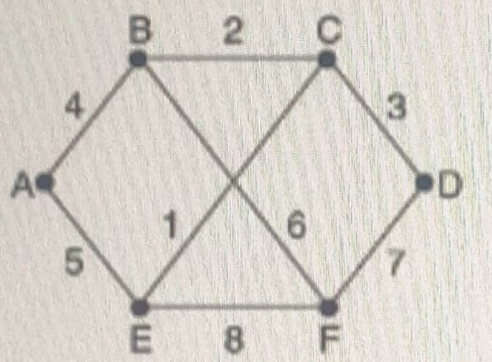
1 Answer

(b)

5. Link State Routing

The idea behind link state routing is simple and can be stated as five parts. Each router must:

1) Discover its neighbors and learn their network addresses.
2) Measure the delay or cost to each of its neighbors.
3) Construct a packet telling to all it has just learned.
4) Send the packet to all other routers.
5) Compute the shortest path to every other router.



(a)

Link State Packets

A	
Seq.	
Age	
B	4
E	5

B	
Seq.	
Age	
A	4
C	2
F	6

C	
Seq.	
Age	
B	2
D	3
E	1

D	
Seq.	
Age	
C	3
F	7

E	
Seq.	
Age	
A	5
C	1
F	8

F	
Seq.	
Age	
B	6
D	7
E	8

(b)

In effect, the complete topology and all delays re experimentally measured and distributed to every router. Then any shortest path algorithm (e.g. Dijkstra's algorithm) can be used to find the shortest path to every other router.

6. Hierarchical Routing

As the network grows larger the amount of resources necessary to take care or routing table

12:52

Dccn Unit - 1 Formula

1) Bit rate = 2 * Bw * logbase 2(Level)
2) (S/N) = 10 * log base 10(Ps/Pn)
3) No. of bits = log base 2(Level)
4) Bit rate = Bw * log base 2(1 + SNR)

Edited 12:52

$$\therefore 0.6 = \frac{N}{1+2a}$$

$$\implies N = 0.6(1+2a)$$

$$a = \frac{T_p}{T_t} = \frac{T_p}{L}.B = \frac{50\times10^{-3}\times1.5\times10^6}{1024\times8} = 9.155$$

$$\therefore N = 0.6\times(1+2\times9.155) = 11.58$$

$$w_s + w_R \le \text{ASN}$$

$$\implies 2N \le \text{ASN}$$

$$\implies 2\times11.58 \le \text{ASN}$$

$$\implies \text{ASN} \ge \lceil 23.172\rceil$$

$$\implies \text{ASN} \ge 24$$

$\therefore$ Minimum number of bits required for sequence number field $= \lceil \log_2 24\rceil = 5.$

answered Nov 15, 2014 • selected Jun 27, 2018 by Arjun

comment Follow share this

Vikrant Singh

Comparison

Circuit Switching	Datagram Packet Switching	VC Packet Switching
Dedicated transmission path	No dedicated transmission path	No dedicated transmission path
Continuous transmission	Transmission of packets	Transmission of packets
Path stays fixed for entire connection	Route of each packet is independent	Path stays fixed for entire connection
Call setup delay	No setup delay	Call setup delay
Negligible transmission delay	Transmission delay for each packet	Transmission delay for each packet
No queueing delay	Queueing delays at switches	Queueing delays at switches
Busy signal overloaded network	Delays increase in overloaded networks	Delays increase in overloaded networks
Fixed bandwidth for each circuit	Bandwidth is shared by all packets	Bandwidth is shared by all packets
No overhead after call setup	Overhead in each packet	Overhead in each packet

Case 2 :- 3 ACK

Q1 The RTT of a connection is 100 ms. MSS = 2KB. Time taken by TCP connection to get back to 32KB congestion window is ?

⇒ Threshold = $\frac{\text{Window size}}{\text{MSS}} = \frac{32KB}{2KB} = 16KB$

Case 1 : Time out

2	4	~~6~~	8	16	18	20	22	24	26	28	30	32

Multiple of 2 — Threshold — Addition of 2 — MWS

Total time = 12 segment × RTT
= 12 × 100 = 1200

Case 2 : ACK received
9 × 100
= 900

⇒ Conges

Q Current congesti
window size ad
The last byte
last byte by
WS at sender

window size ⇒ Max win

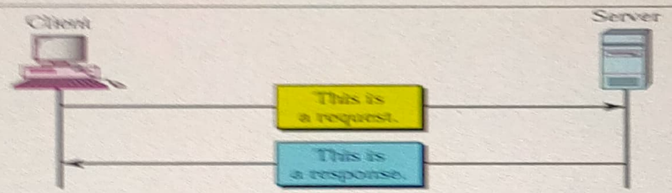
Current WS

Current WS

Points	OSPF	BGP
Acronym For	Open Shortest Path First.	Border Gateway Protocol.
Gateway Protocol	OSPF is an internal gateway protocol.	BGP is an external gateway protocol.
Implementation	Easy to Implement.	Complex to Implement.
Convergence	Fast.	Slow.
Design	Hierarchical Network Possible.	Fully Meshed.
Need of Device Resources	Memory & CPU Intensive.	Depends on the size of the routing table but scales better than OSPF.
Scaled Networks	OSPF is mainly used on smaller scale networks that are centrally administered.	BGP protocol is mainly used on very large-scale networks, like the internet.
Function	OSPF will always search for the fastest route, and not the shortest, in spite of its name.	BGP focuses in determining the best path for a datagram.
Algorithm Used	Dijkstra Algorithm.	Best Path Algorithm.
Protocol	IP Protocol.	TCP Protocol.
Port	89.	179.
Type	Link State.	Path Vector.

c) TDM vs FDM

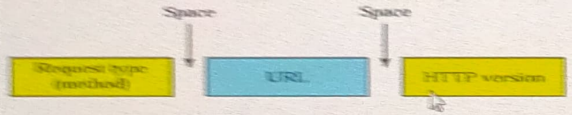
Sr no.	FDM	TDM
1.	The signals which are to be multiplexed are added in the time domain. But they occupy	The signals which are to be multiplexed can occupy the entire bandwidth in the time



There are two general types of HTTP messages: **request** and **response**. Both message types follow almost the same format.

Request message

A request message consists of a request line, headers, and sometimes a body.



A response message consists of a status line, a header, and sometimes a body.

$R_{TT} = 2T_p + T_D$

$T_T >= 2 * T_p$

Current w.s by sender = (Data sender - Data Receiver)

$w.s_{sender} = \min(w.s_c, w.s_R)$