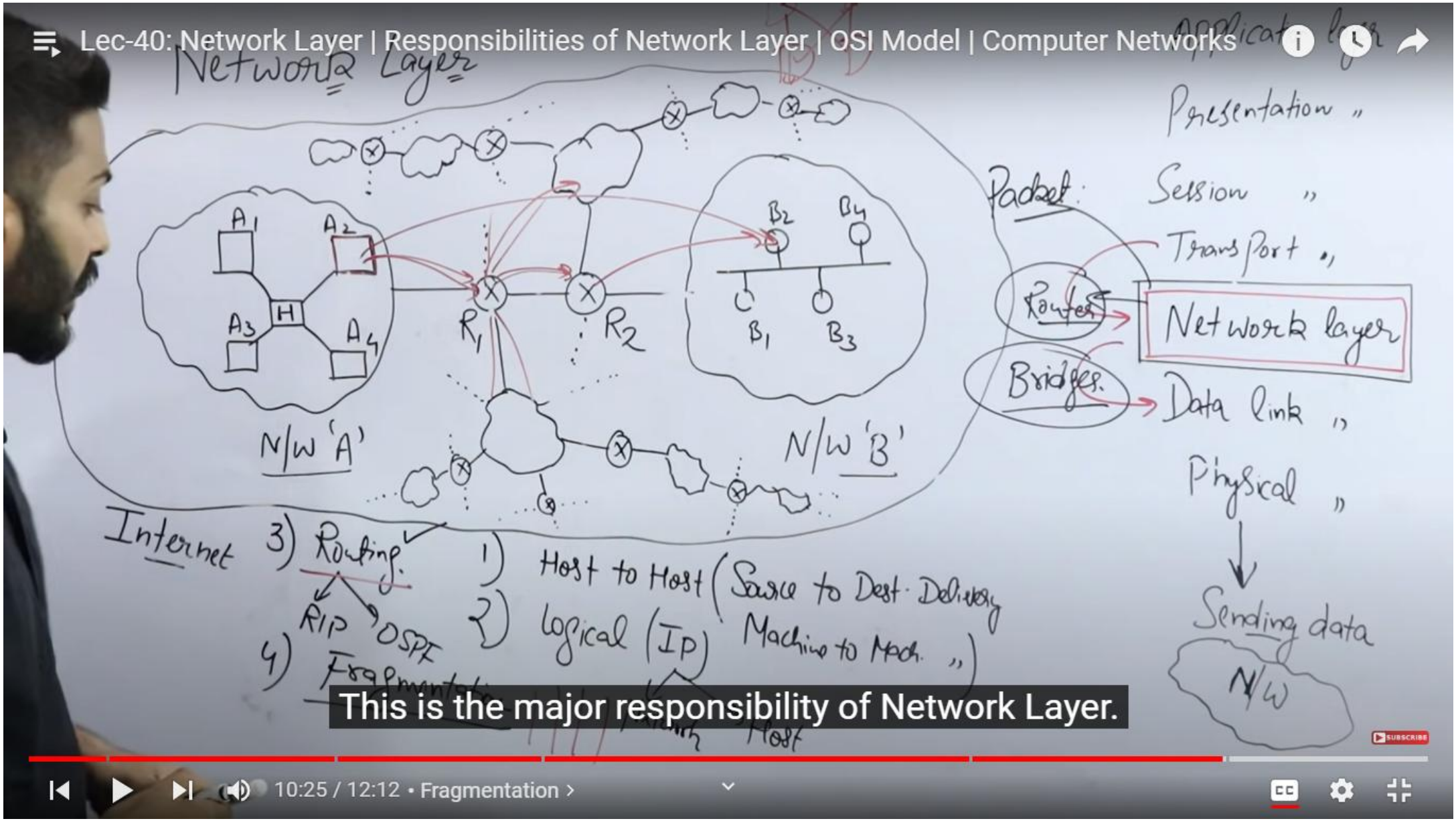
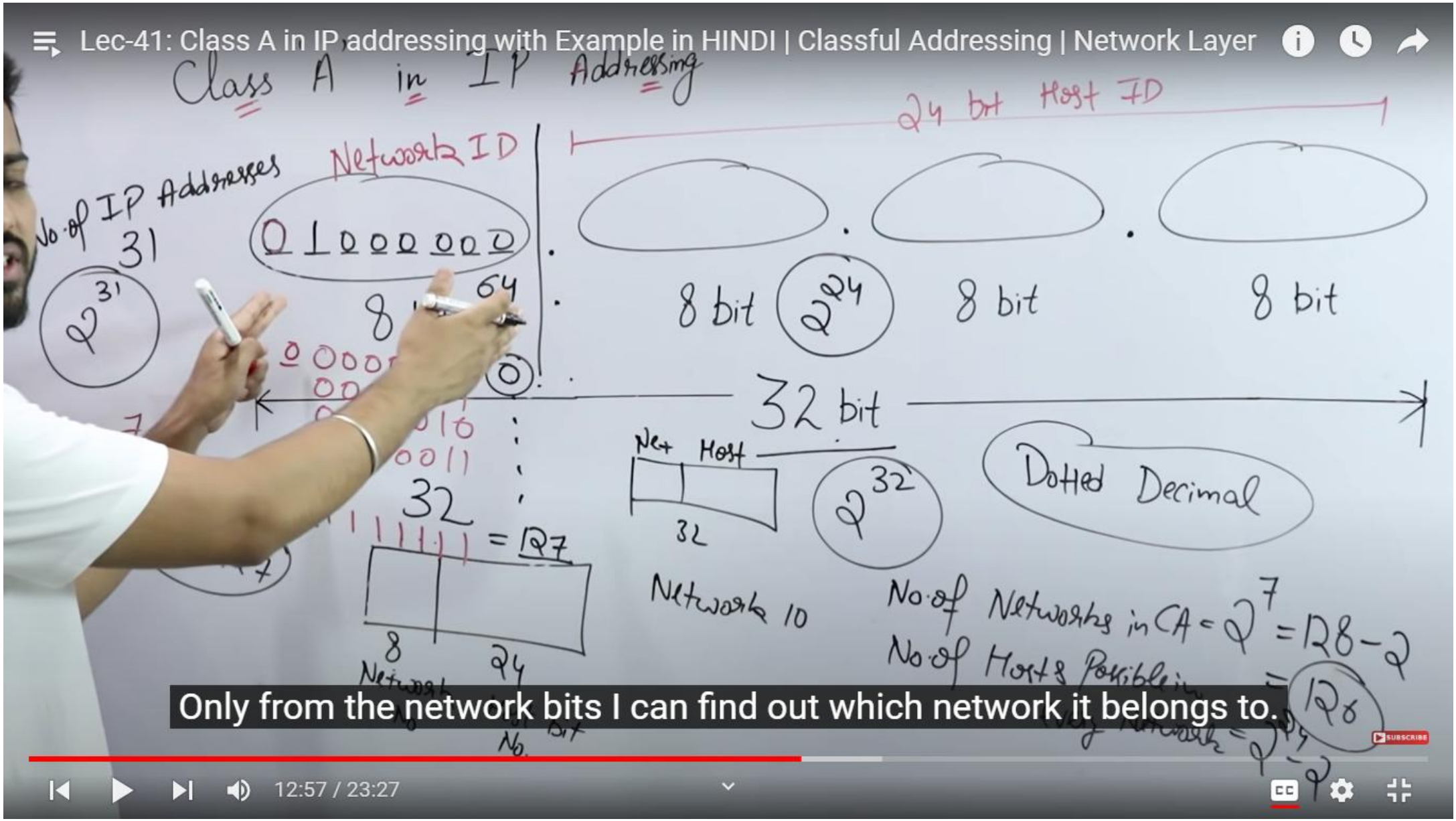
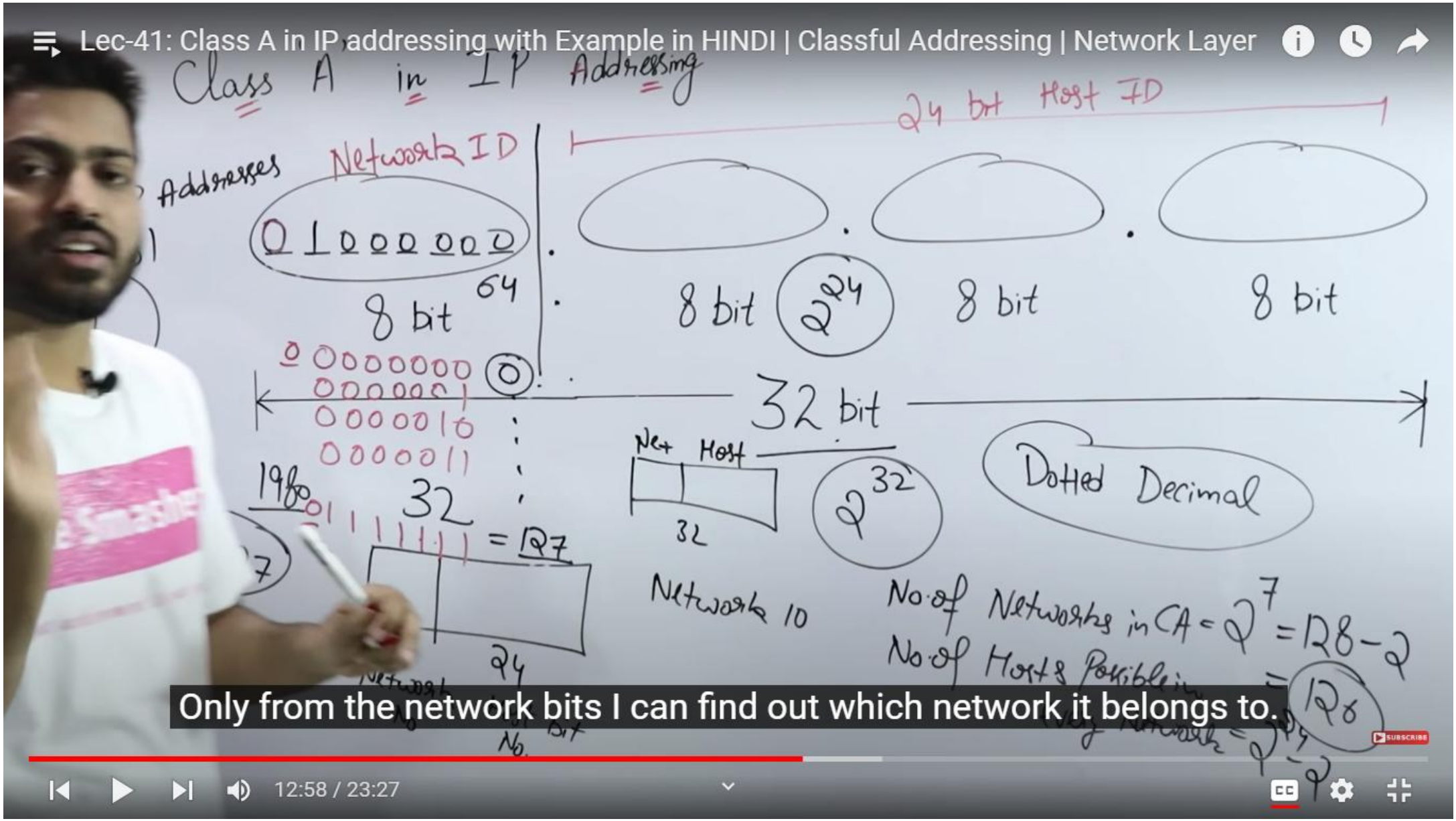
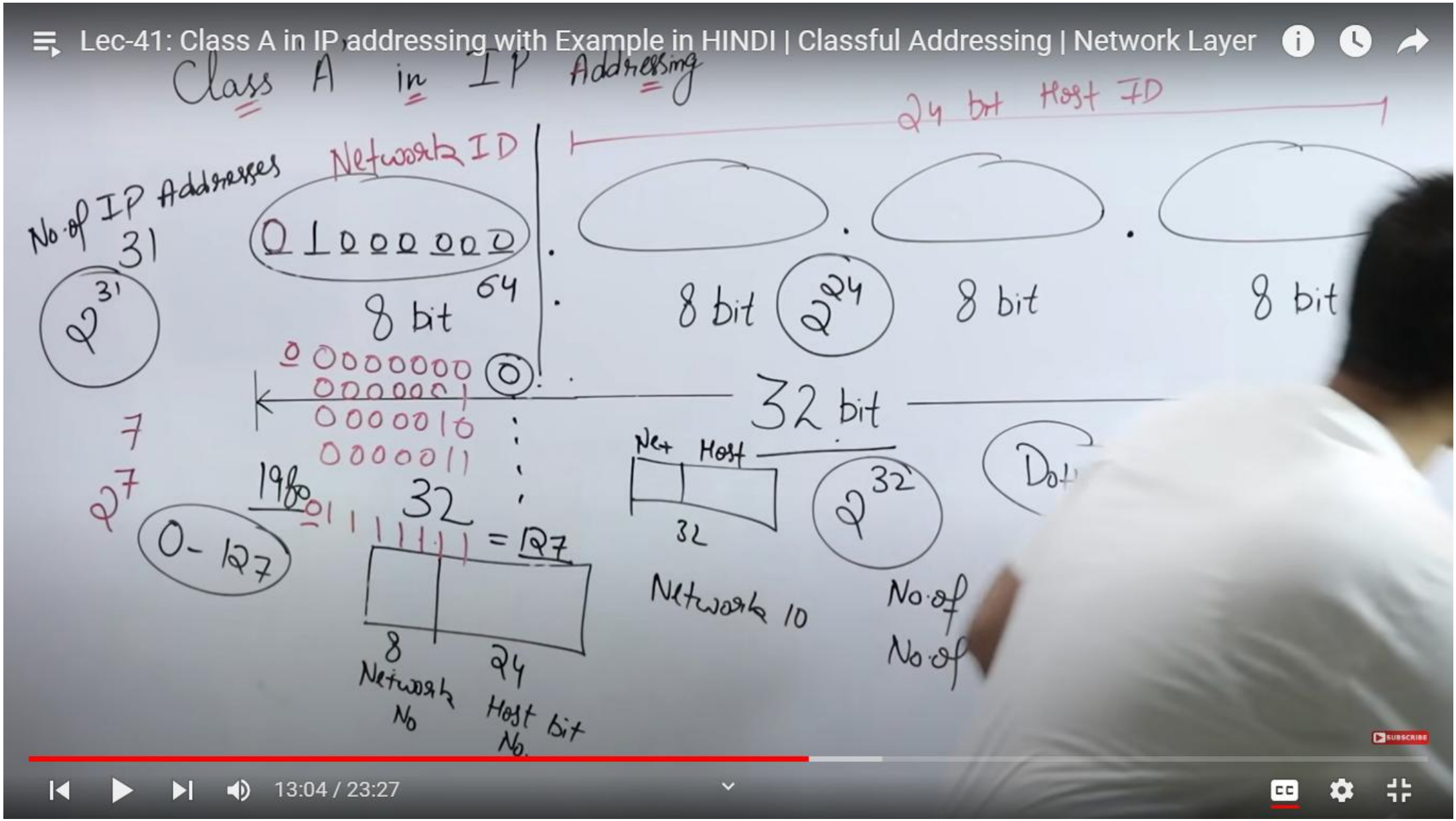
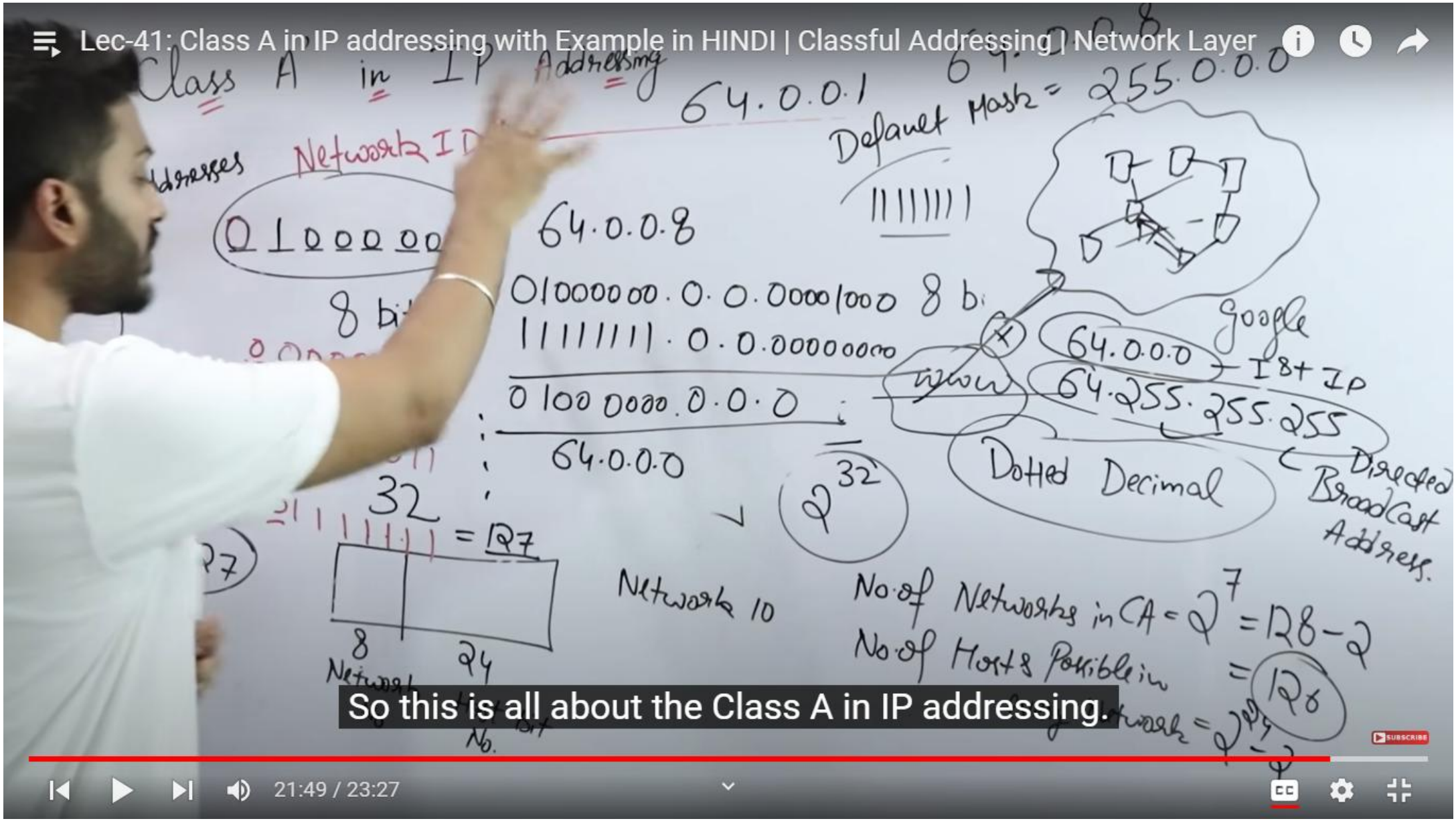
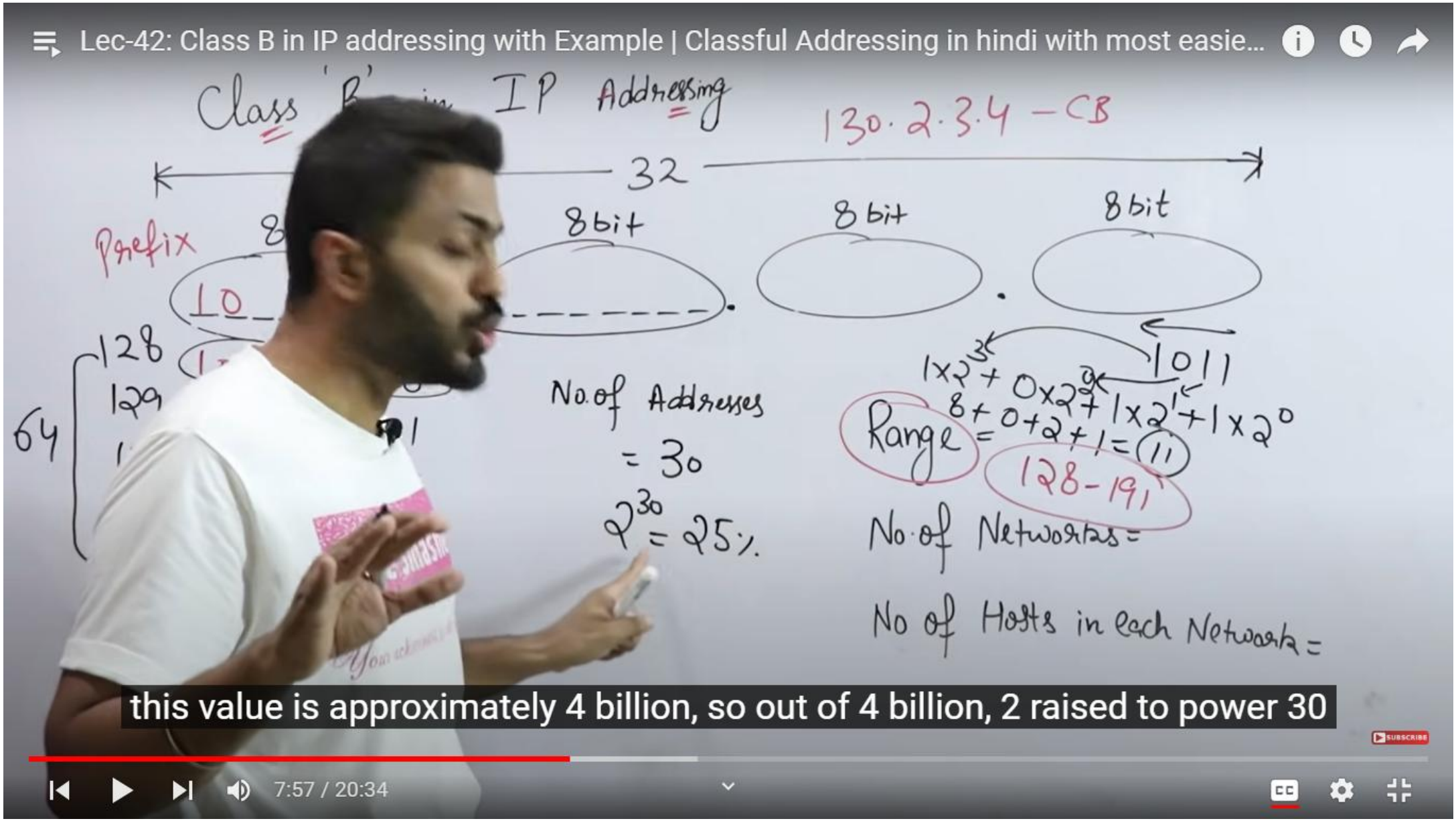

Lec-40: Network Layer | Responsibilities of Network Layer | OSI Model | Computer Networks
Network Layer
A1
A2
A3
H
A4
R1
R2
B2
B4
B1
B3
N/W 'A'
N/W 'B'
Internet
3) Routing:
RIP
OSPF
4) Fragmentation
1) Host to Host (Source to Dest. Delivery
2) logical (IP) Machine to Mach. ,,)
Packet:
Application layer
Presentation ,,
Session ,,
Transport ,,
Routers
Network layer
Bridges.
Data link ,,
Physical ,,
Sending data
N/W
This is the major responsibility of Network Layer.
10:25 / 12:12 • Fragmentation ›

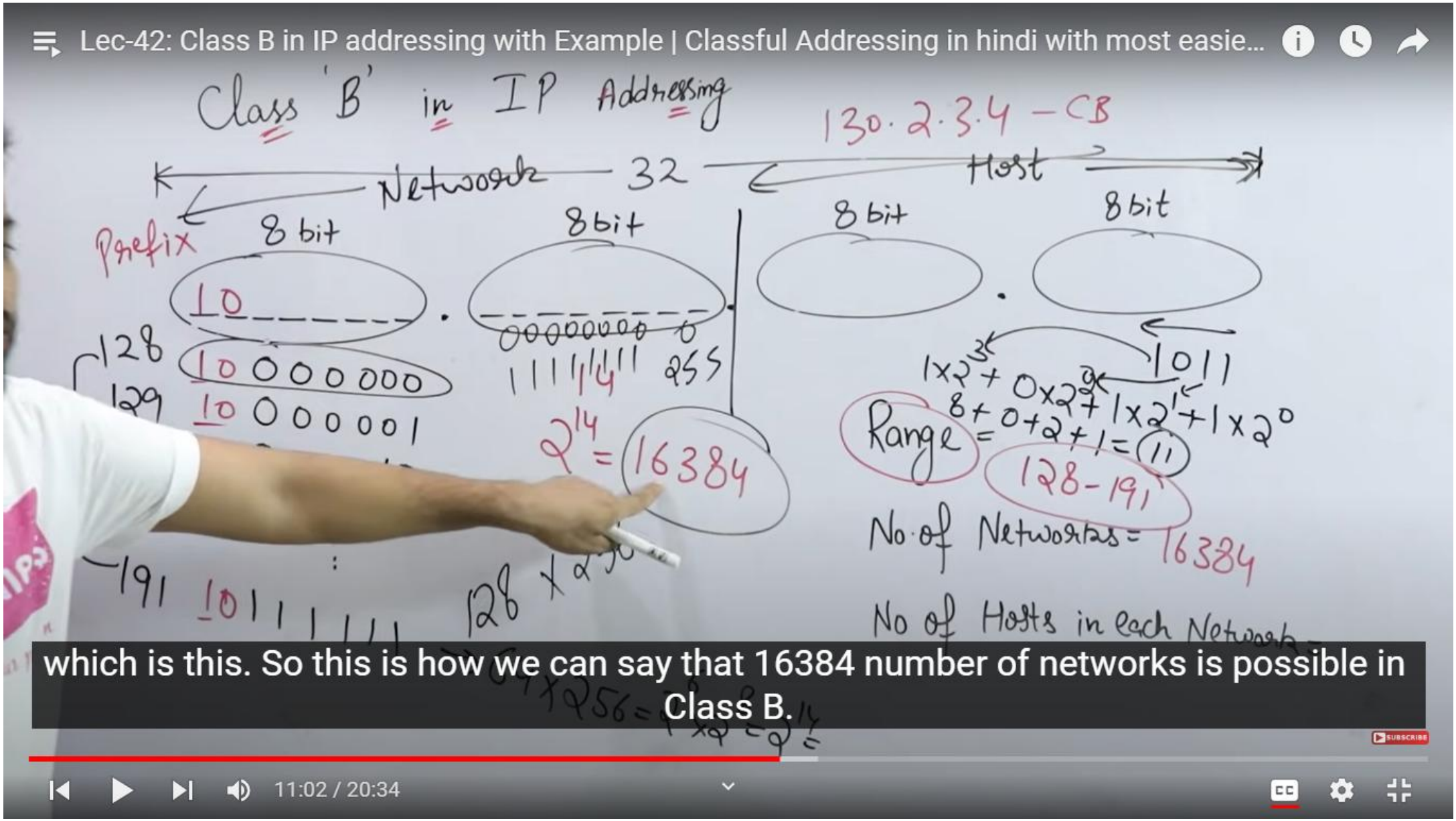

Lec-41: Class A in IP addressing with Example in HINDI | Classful Addressing | Network Layer
Class A in IP Addressing
24 bit Host ID
No. of IP Addresses
Network ID
8 bit
8 bit
8 bit
32 bit
Net
Host
Dotted Decimal
Network 10
No. of Networks in CA = 2^7 = 128 - 2
Only from the network bits I can find out which network it belongs to.
12:57 / 23:27

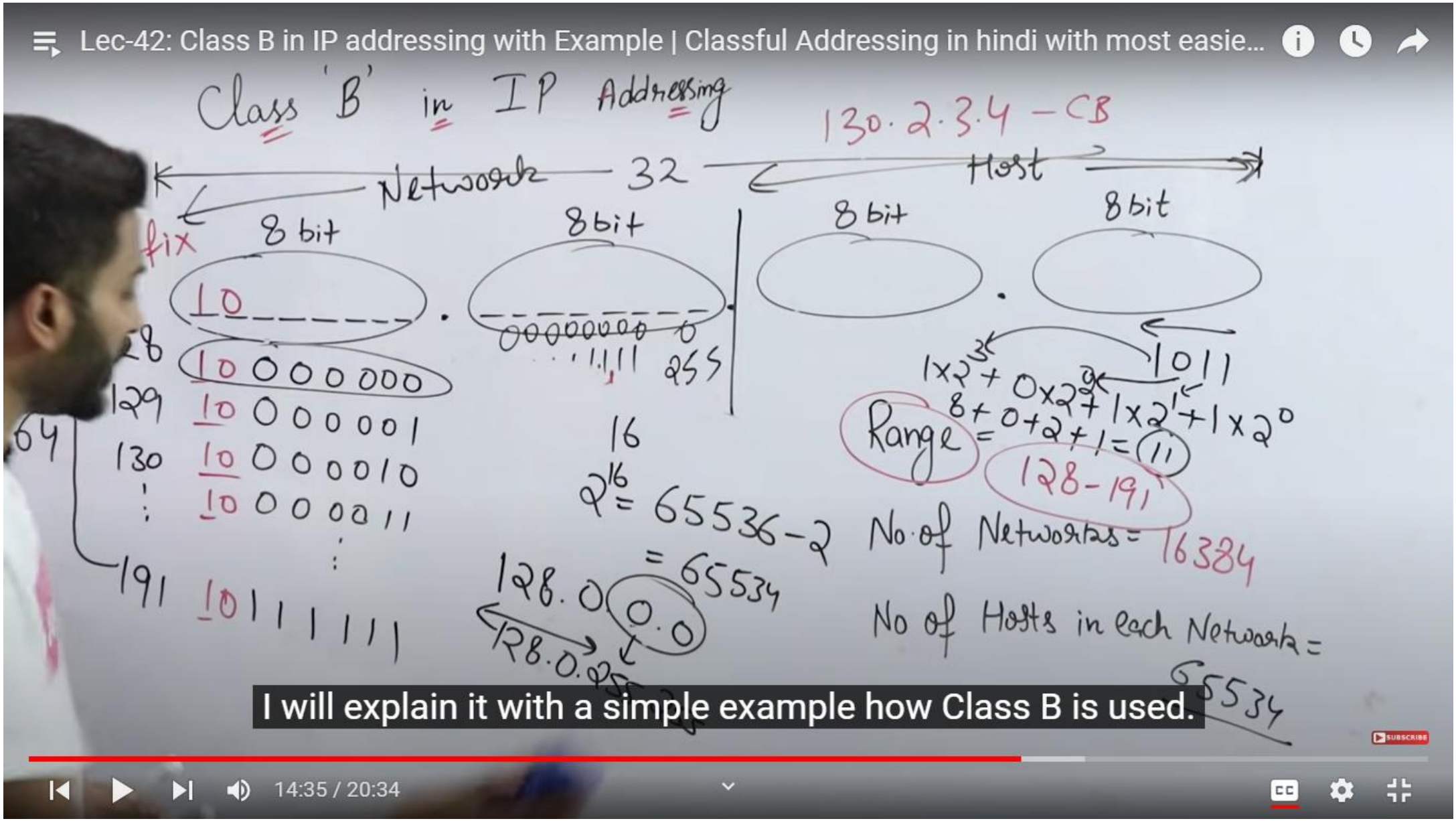

Lec-41: Class A in IP addressing with Example in HINDI | Classful Addressing | Network Layer
Class A in IP Addressing
Addresses
Network ID
24 bit Host ID
8 bit
8 bit
8 bit
8 bit
64
32 bit
Net Host
32
Dotted Decimal
Network 10
No. of Networks in CA = 2^7 = 128 - 2
Only from the network bits I can find out which network it belongs to.
12:58 / 23:27

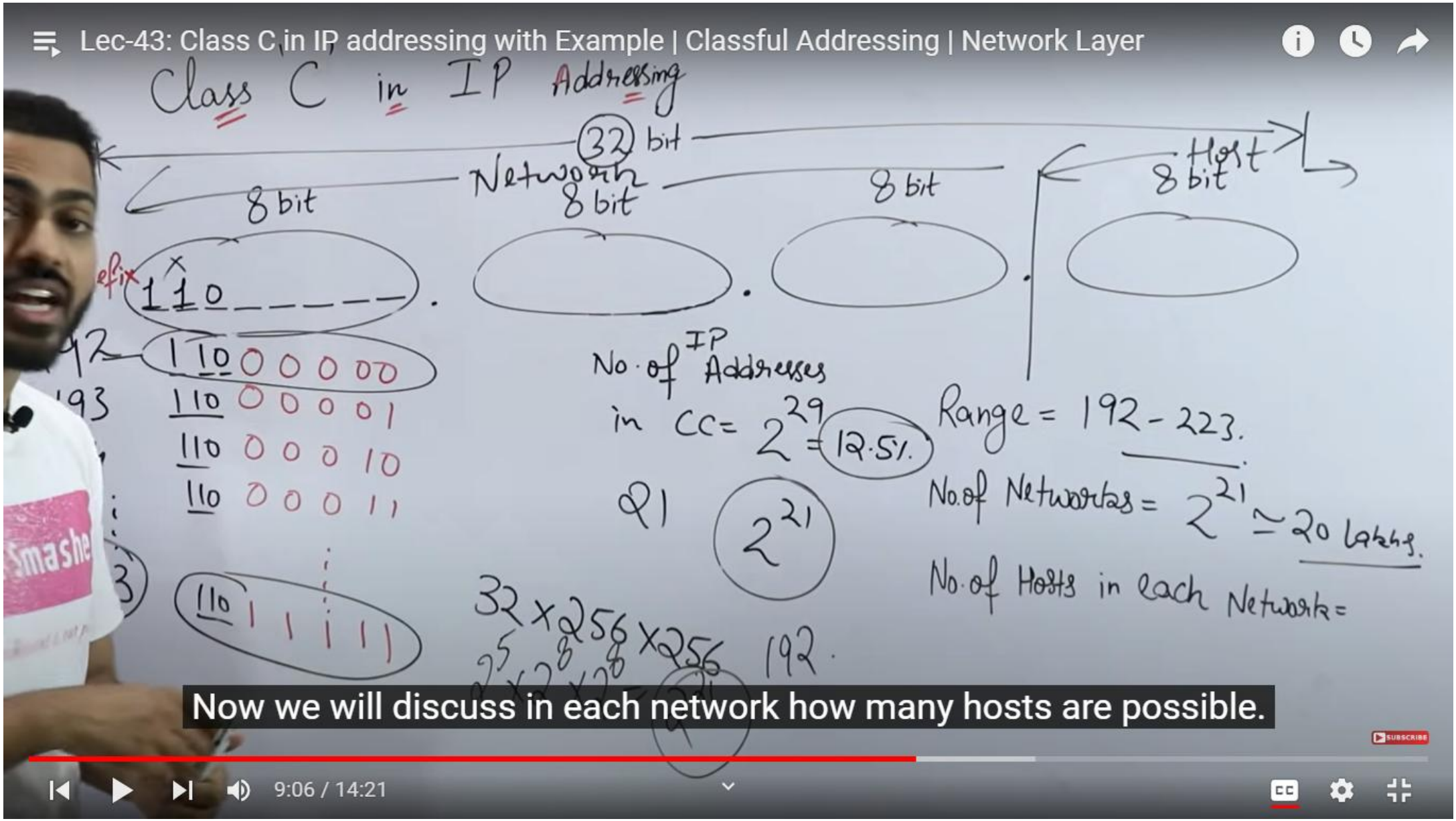

Lec-41: Class A in IP addressing with Example in HINDI | Classful Addressing | Network Layer
Class A in IP Addressing
24 bit Host ID
No. of IP Addresses
Network ID
31
64
8 bit
8 bit
8 bit
8 bit
32 bit
7
0 - 127
128
32
= 127
Net
Host
32
Network 10
8
Network No
24
Host bit No.
13:04 / 23:27

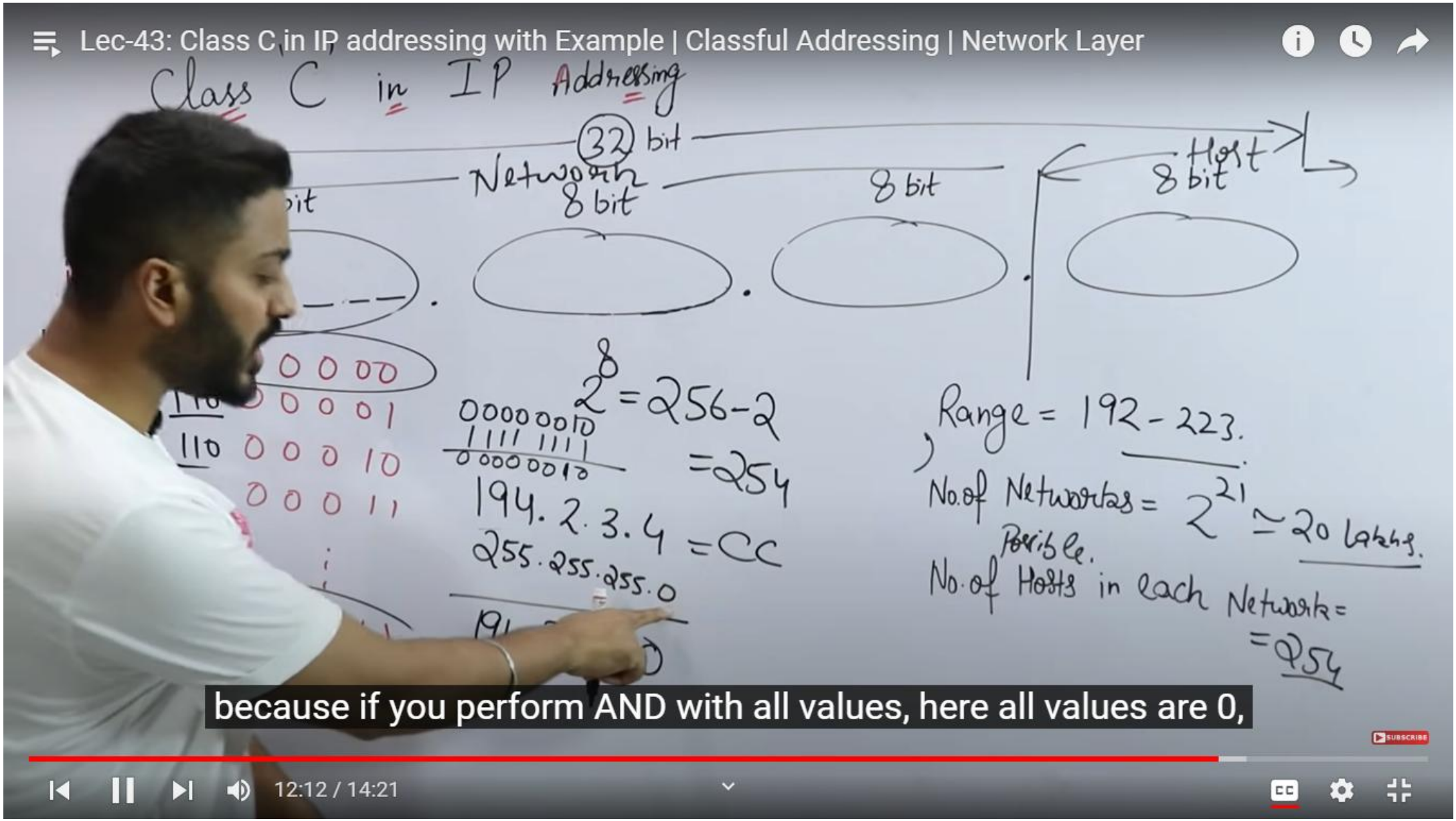

Lec-41: Class A in IP addressing with Example in HINDI | Classful Addressing | Network Layer
Class A in IP Addressing
64.0.0.1
Default Mask = 255.0.0.0
64.0.0.8
01000000.0.0.00001000
11111111.0.0.00000000
01000000.0.0.0
64.0.0.0
64.0.0.0 - First IP
64.255.255.255 - Directed Broadcast Address
Dotted Decimal
Google
www
2^32
32
8
24
Network ID
Network 10
No. of Networks in CA = 2^7 = 128-2
No. of Hosts Possible in
= 126
So this is all about the Class A in IP addressing.
21:49 / 23:27

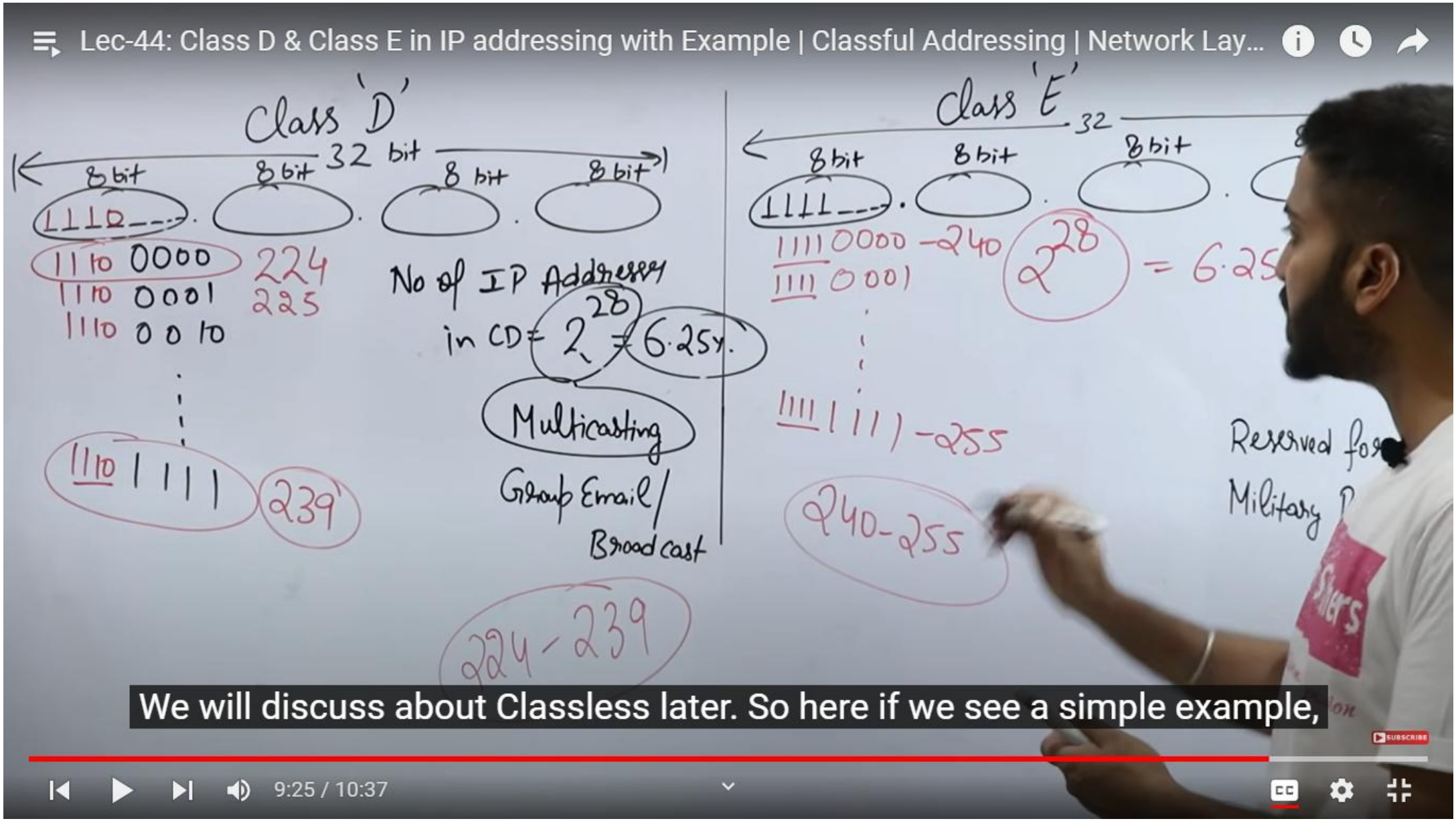

Lec-42: Class B in IP addressing with Example | Classful Addressing in hindi with most easie...
Class 'B' in IP Addressing
130.2.3.4 - CB
32
Prefix
8
8 bit
8 bit
8 bit
10
128
129
64
No. of Addresses
= 30
2^{30} = 25%.
1011
1x2^3 + 0x2^2 + 1x2^1 + 1x2^0
8 + 0 + 2 + 1 = 11
Range
128-191
No. of Networks =
No of Hosts in each Network =
this value is approximately 4 billion, so out of 4 billion, 2 raised to power 30
7:57 / 20:34

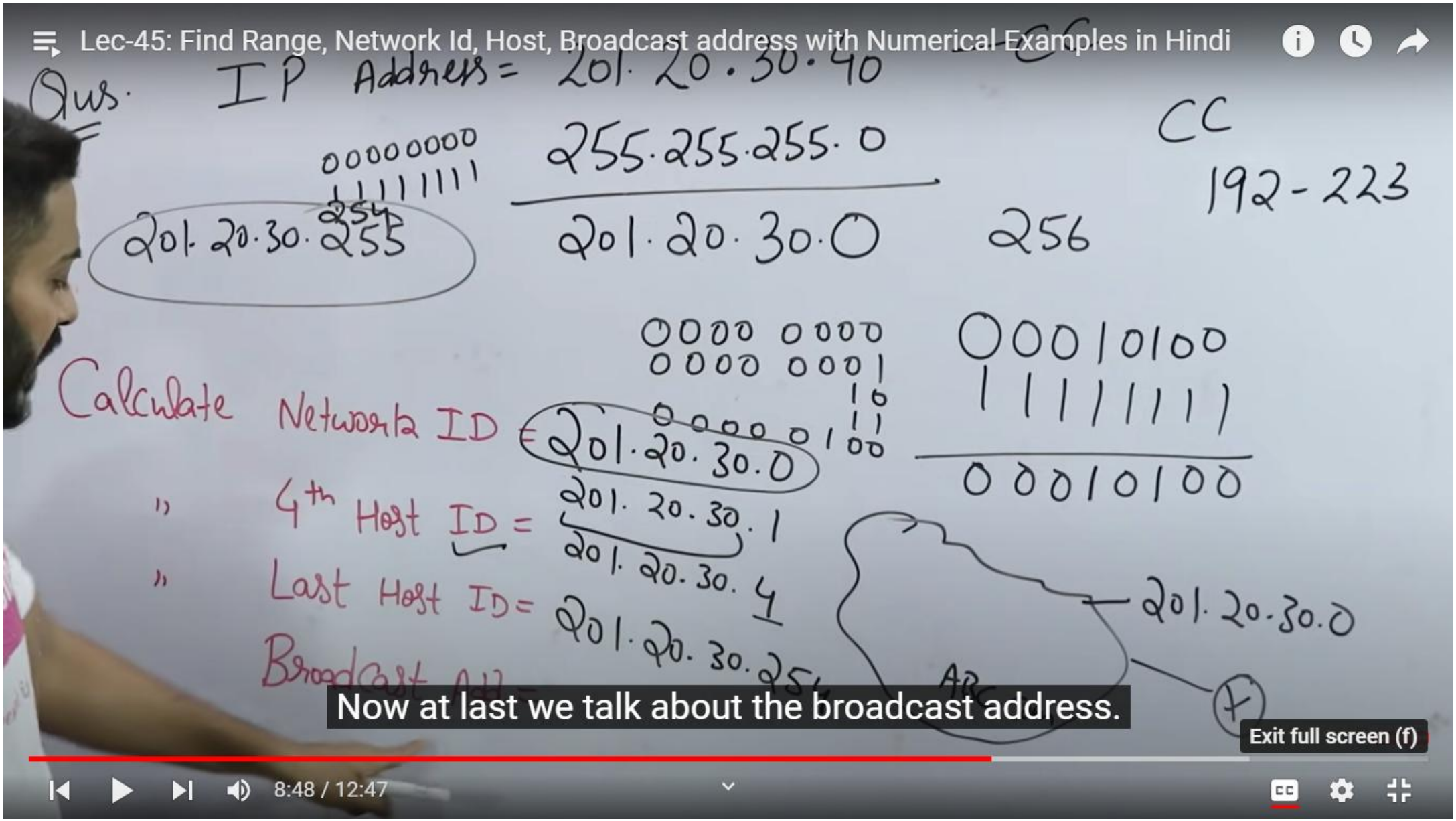

Lec-42: Class B in IP addressing with Example | Classful Addressing in hindi with most easie...
Class 'B' in IP Addressing
130.2.3.4 – CB
Network
32
Host
Prefix
8 bit
8 bit
8 bit
8 bit
10
128
10000000
129
10000001
191
10111111
00000000
0
11111111
255
2^{14} = 16384
$1\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0$
8 + 0 + 2 + 1 = 11
1011
Range
128-191
No of Networks = 16384
No of Hosts in each Network
which is this. So this is how we can say that 16384 number of networks is possible in Class B.
11:02 / 20:34

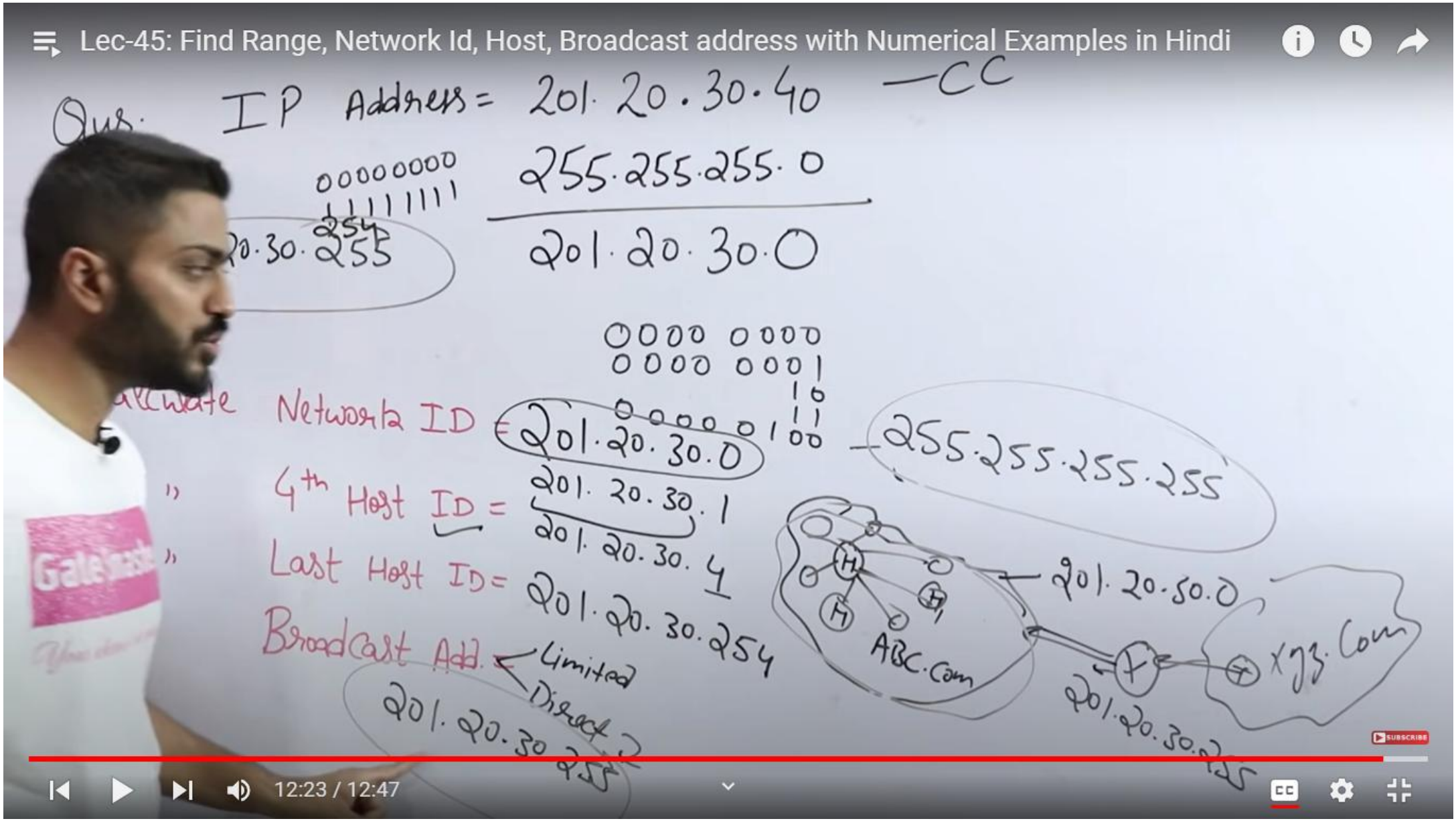

Lec-42: Class B in IP addressing with Example | Classful Addressing in hindi with most easie...
Class 'B' in IP Addressing
130.2.3.4 - CB
Network
32
Host
fix
8 bit
8 bit
8 bit
8 bit
10
10000000
10000001
10000010
10000011
10111111
128
129
130
191
64
16
$2^{16} = 65536 - 2$
$= 65534$
128.0.0.0
128.0.255
$1\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0$
$8 + 0 + 2 + 1 = 11$
1011
Range
128-191
No. of Networks = 16384
No of Hosts in each Network =
65534
I will explain it with a simple example how Class B is used.
14:35 / 20:34

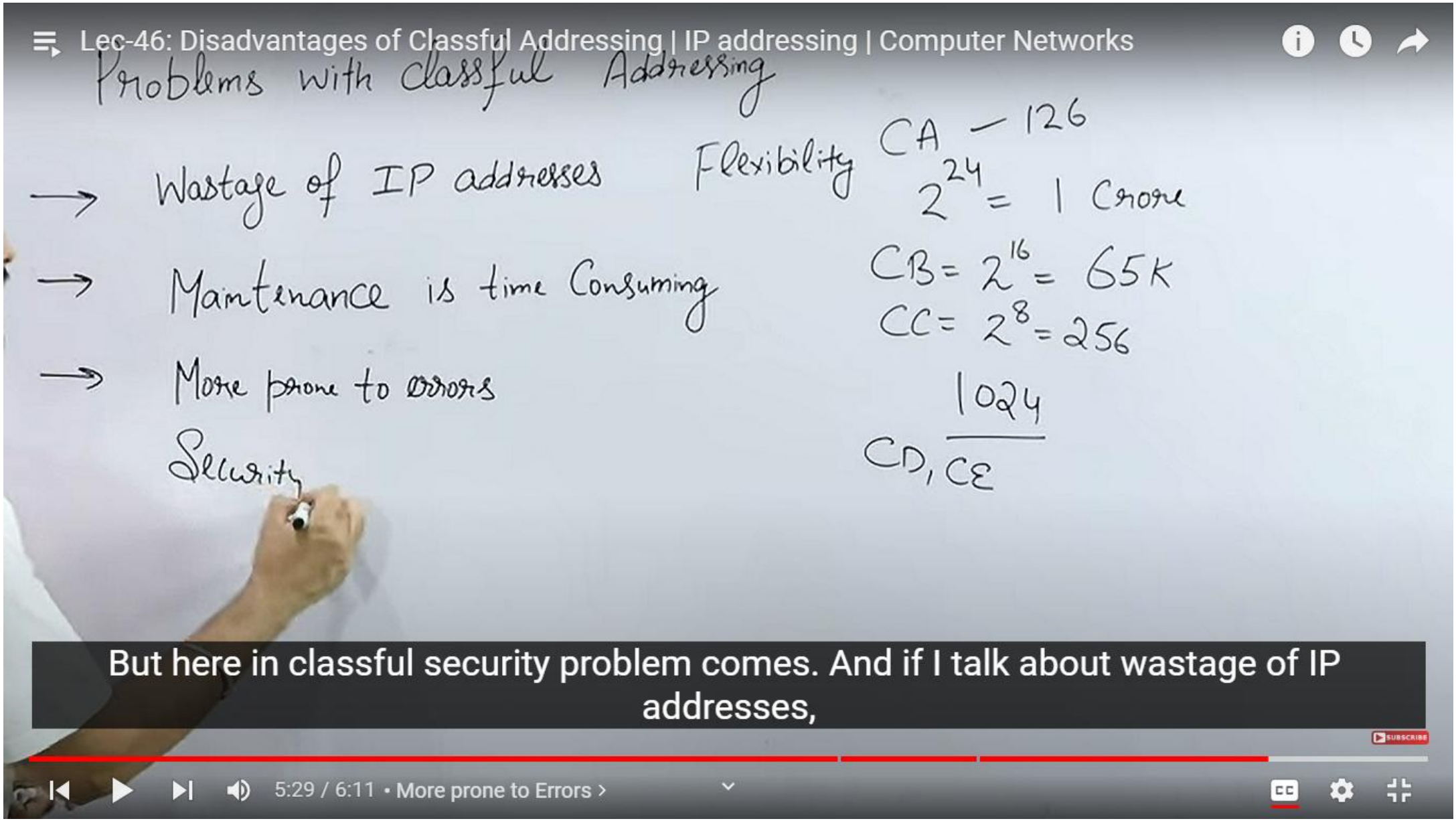

Lec-43: Class C in IP addressing with Example | Classful Addressing | Network Layer
Class C in IP Addressing
32 bit
Network
Host
8 bit
8 bit
8 bit
8 bit
No. of IP Addresses in CC = 2^{29} = 12.5%
Range = 192 - 223.
No. of Networks = 2^{21} ≃ 20 lakhs.
No. of Hosts in each Network =
2^{21}
Now we will discuss in each network how many hosts are possible.
9:06 / 14:21

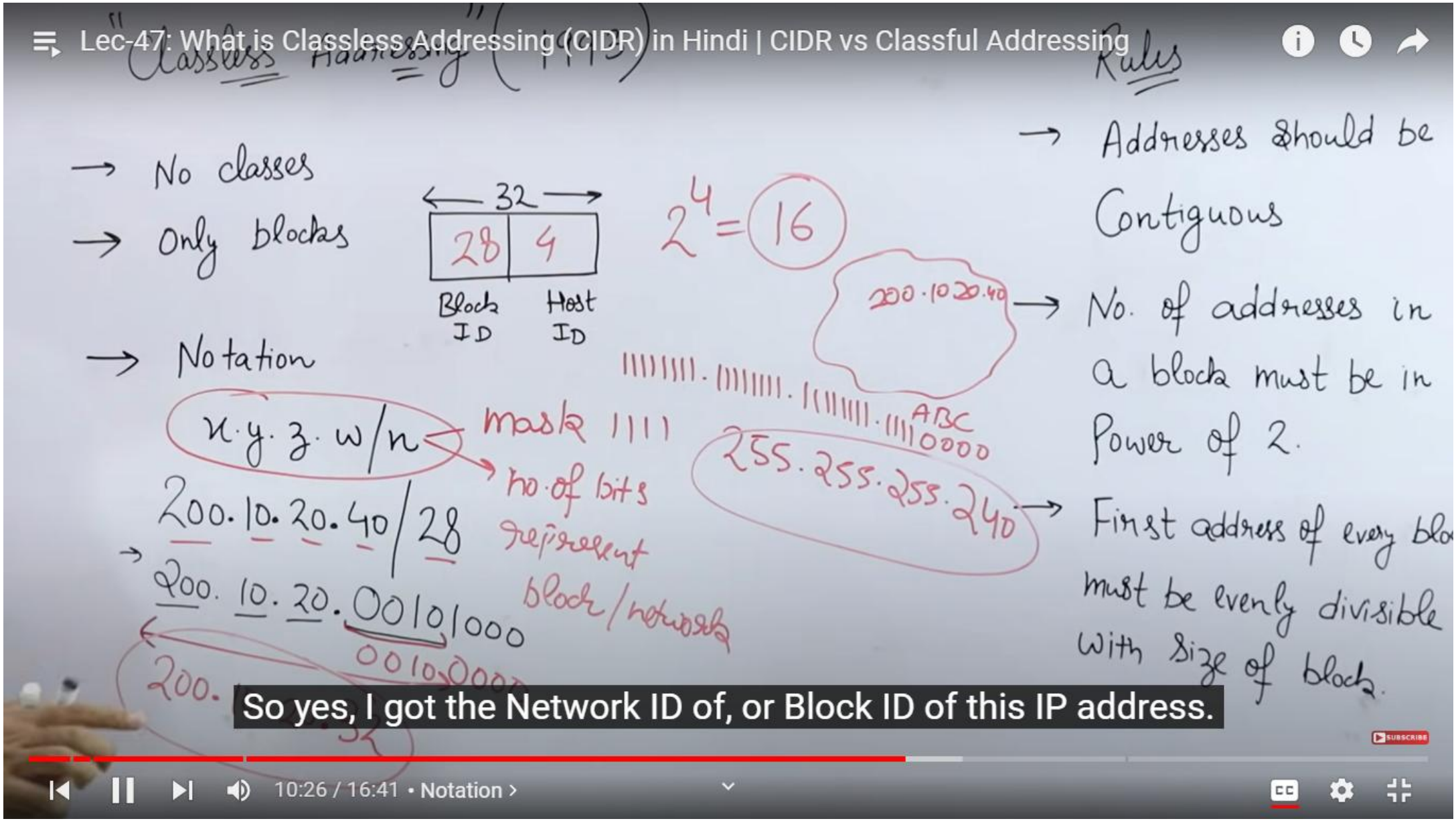

Lec-43: Class C in IP addressing with Example | Classful Addressing | Network Layer
Class C in IP Addressing
32 bit
Network
8 bit
8 bit
Host
8 bit
Range = 192 - 223.
No. of Networks = 2^21 ≃ 20 lakhs.
Possible.
No. of Hosts in each Network =
= 254
2^8 = 256-2
= 254
194.2.3.4 = CC
255.255.255.0
because if you perform AND with all values, here all values are 0,
12:12 / 14:21


Lec-44: Class D & Class E in IP addressing with Example | Classful Addressing | Network Lay...
Class 'D'
32 bit
8 bit
8 bit
8 bit
8 bit
1110----
1110 0000
1110 0001
1110 0010
224
225
1110 1111
239
No of IP Addresses in CD = 2^28 = 6.25x.
Multicasting
Group Email/
Broadcast
224-239
Class 'E'
32
8 bit
8 bit
8 bit
1111----
11110000 -240
11110001
11111111 -255
2^28 = 6.25
240-255
Reserved for
Military
We will discuss about Classless later. So here if we see a simple example,
9:25 / 10:37


Lec-45: Find Range, Network Id, Host, Broadcast address with Numerical Examples in Hindi
Qus. IP Address = 201.20.30.40
255.255.255.0
201.20.30.255
201.20.30.0
CC
192-223
256
Calculate Network ID = 201.20.30.0
" 4th Host ID = 201.20.30.1
" Last Host ID = 201.20.30.4
Broadcast
201.20.30.0
AB
Now at last we talk about the broadcast address.
8:48 / 12:47
Exit full screen (f)


Lec-45: Find Range, Network Id, Host, Broadcast address with Numerical Examples in Hindi
Qus. IP Address = 201.20.30.40 —CC
255.255.255.0
201.20.30.0
Network ID = 201.20.30.0
4th Host ID = 201.20.30.1
Last Host ID = 201.20.30.254
Broadcast Add. = Limited / Direct
255.255.255.255
201.20.50.0
ABC.Com
xyz.Com
201.20.30.255
12:23 / 12:47


Lec-46: Disadvantages of Classful Addressing | IP addressing | Computer Networks
Problems with Classful Addressing
→ Wastage of IP addresses
→ Maintenance is time Consuming
→ More prone to errors
Security
Flexibility
CA – 126
2^{24} = 1 Crore
CB = 2^{16} = 65K
CC = 2^{8} = 256
1024
CD, CE
But here in classful security problem comes. And if I talk about wastage of IP addresses,
5:29 / 6:11 • More prone to Errors ›

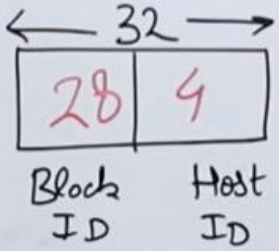


So yes, I got the Network ID of, or Block ID of this IP address.

"Classless Addressing" (1993)

→ No classes

→ Only blocks



$2^4 = 16$

→ Notation

x.y.z.w/n → mask 1111 → no. of bits to represent block/network

200.10.20.40/28

→ 200.10.20.00101000

00100000

200.10.20.32

Rules

→ Addresses should be Contiguous

200.10.20.40 → No. of addresses in a block must be in Power of 2.

11111111.11111111.11111111.ABC10000

255.255.255.240 → First address of every block must be evenly divisible with size of block.

And what is the Block ID? 200.10.20.32, don't forget to put /n which is /28

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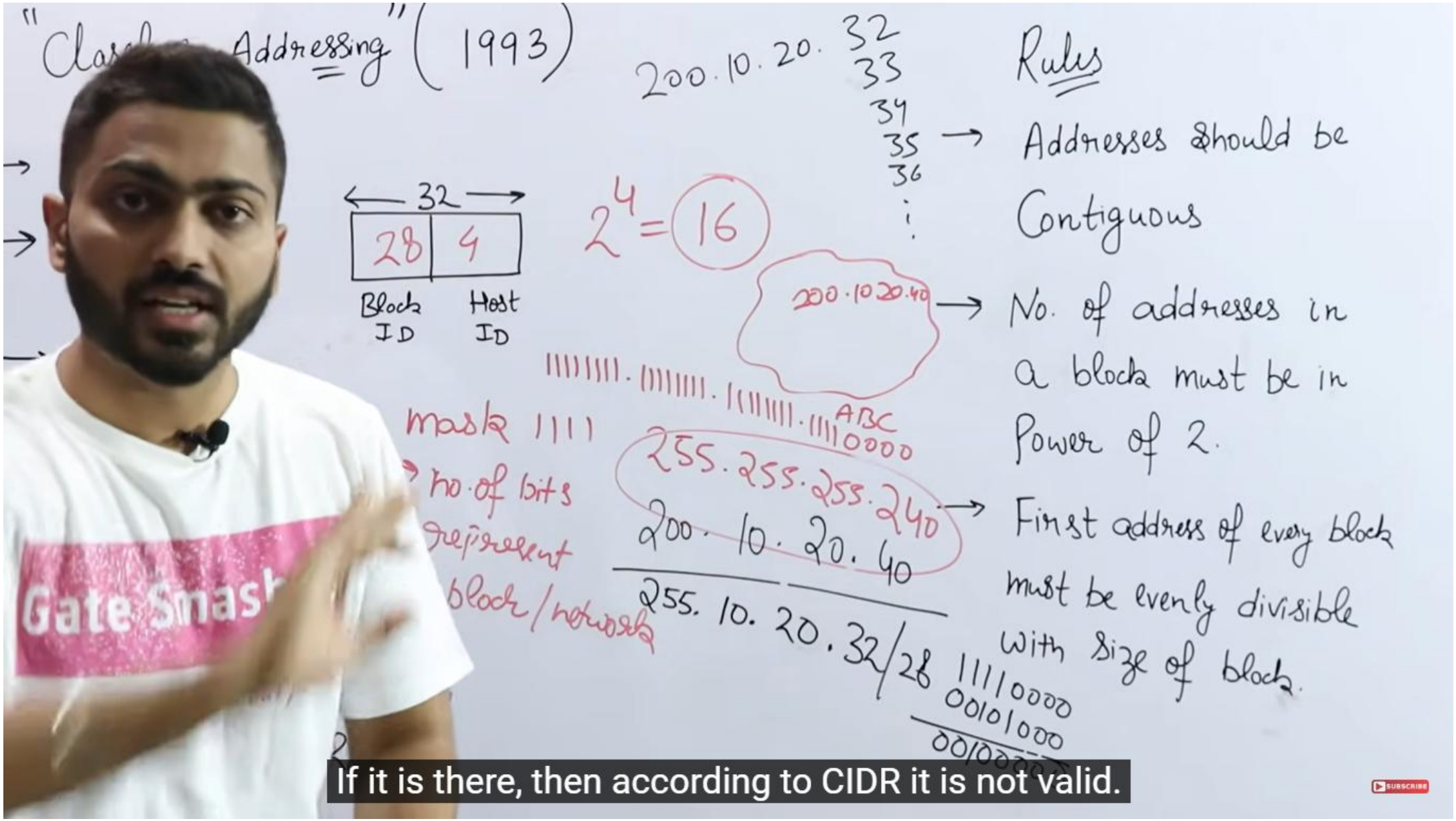
"Classless Addressing" (1993)
200.10.20. 32
33
34
35
36
Rules
Addresses should be Contiguous
32
28
4
Block ID
Host ID
$2^4 = 16$
200.10.20.40
No. of addresses in a block must be in Power of 2.
mask 1111
no. of bits to represent block/network
ABC
255.255.255.240
First address of every block must be evenly divisible with size of block.
200.10.20.40
255.10.20.32/28
11110000
00101000
00100000
Gate Smash
If it is there, then according to CIDR it is not valid.
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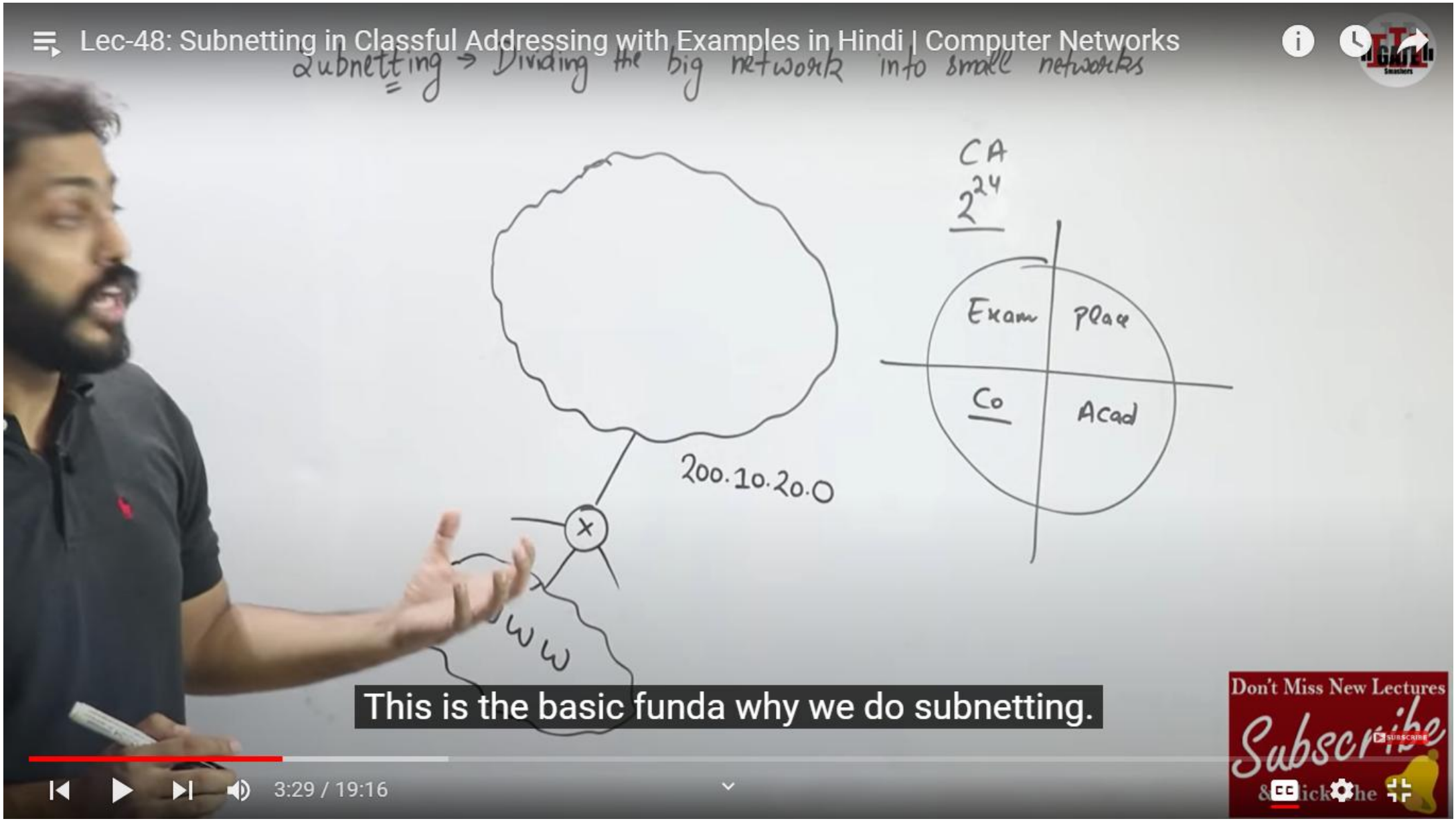
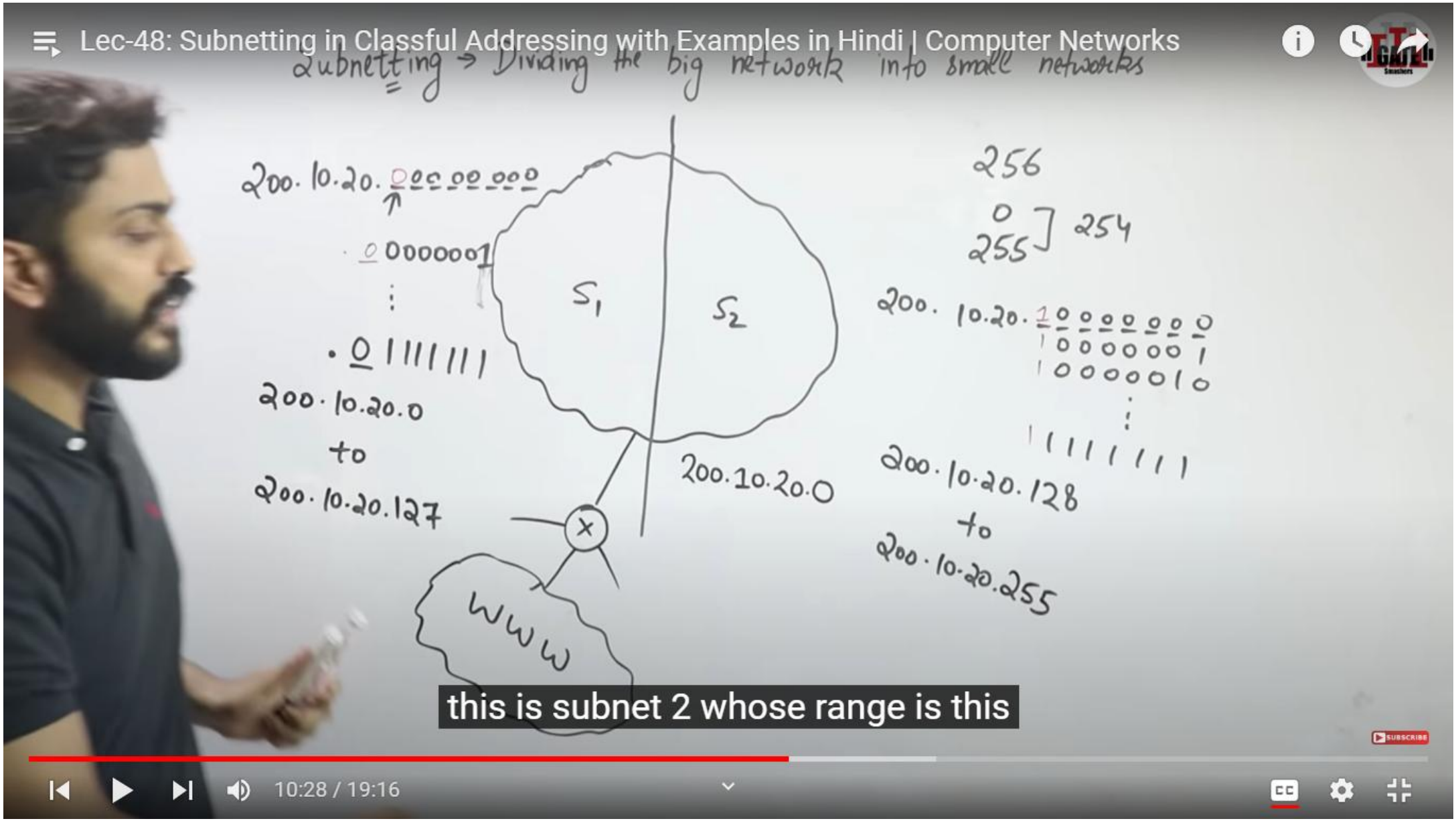
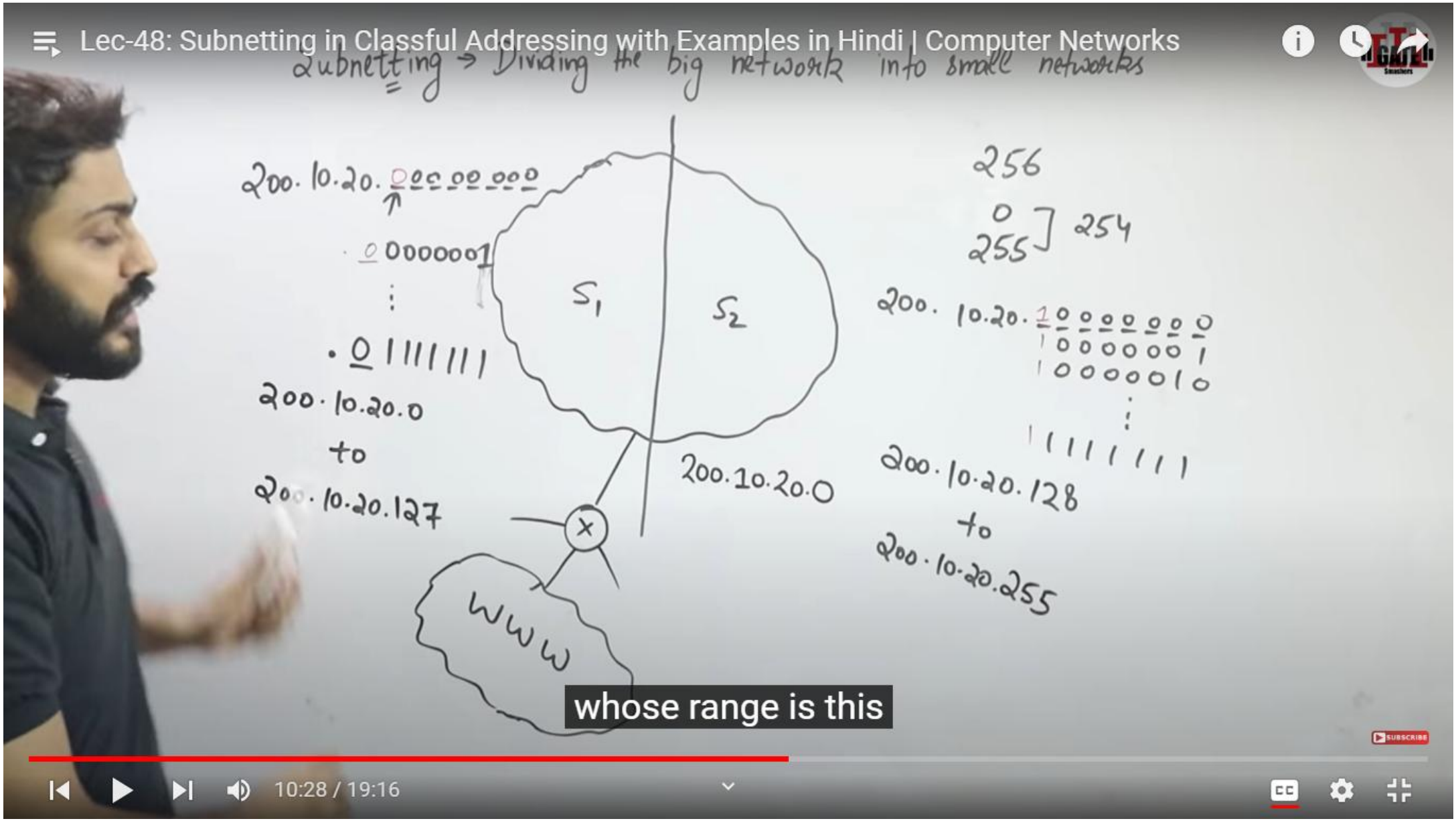
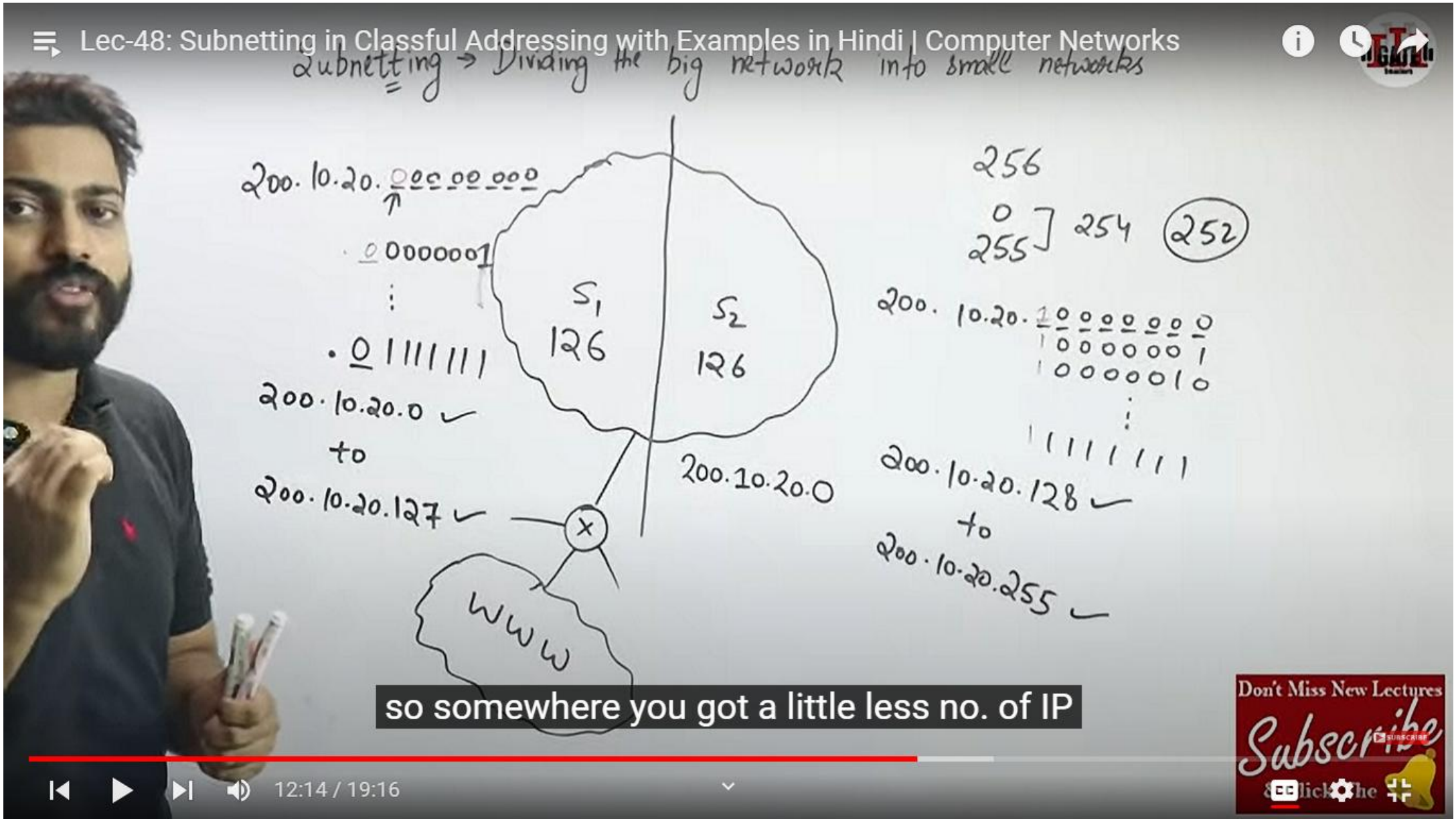
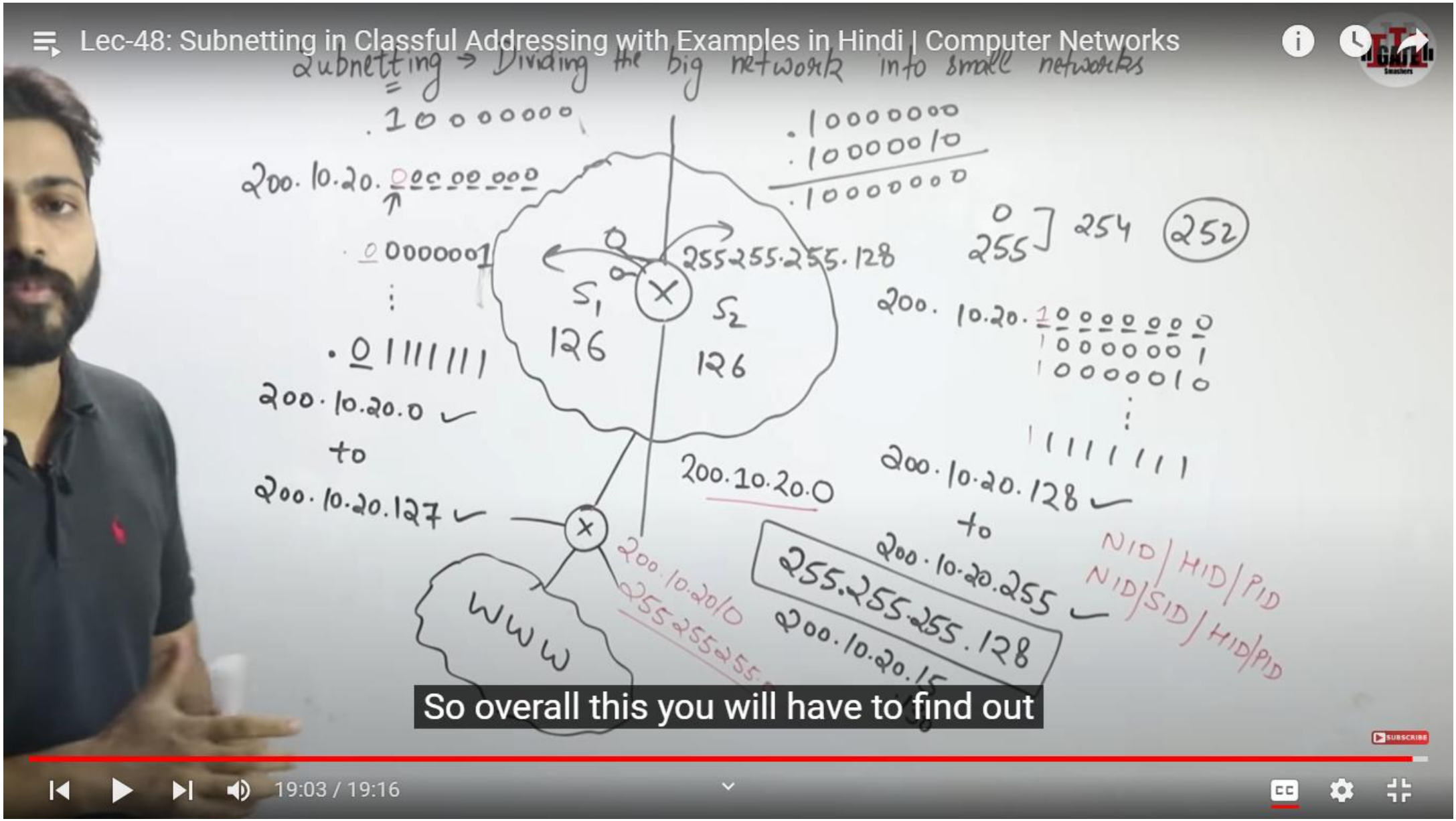
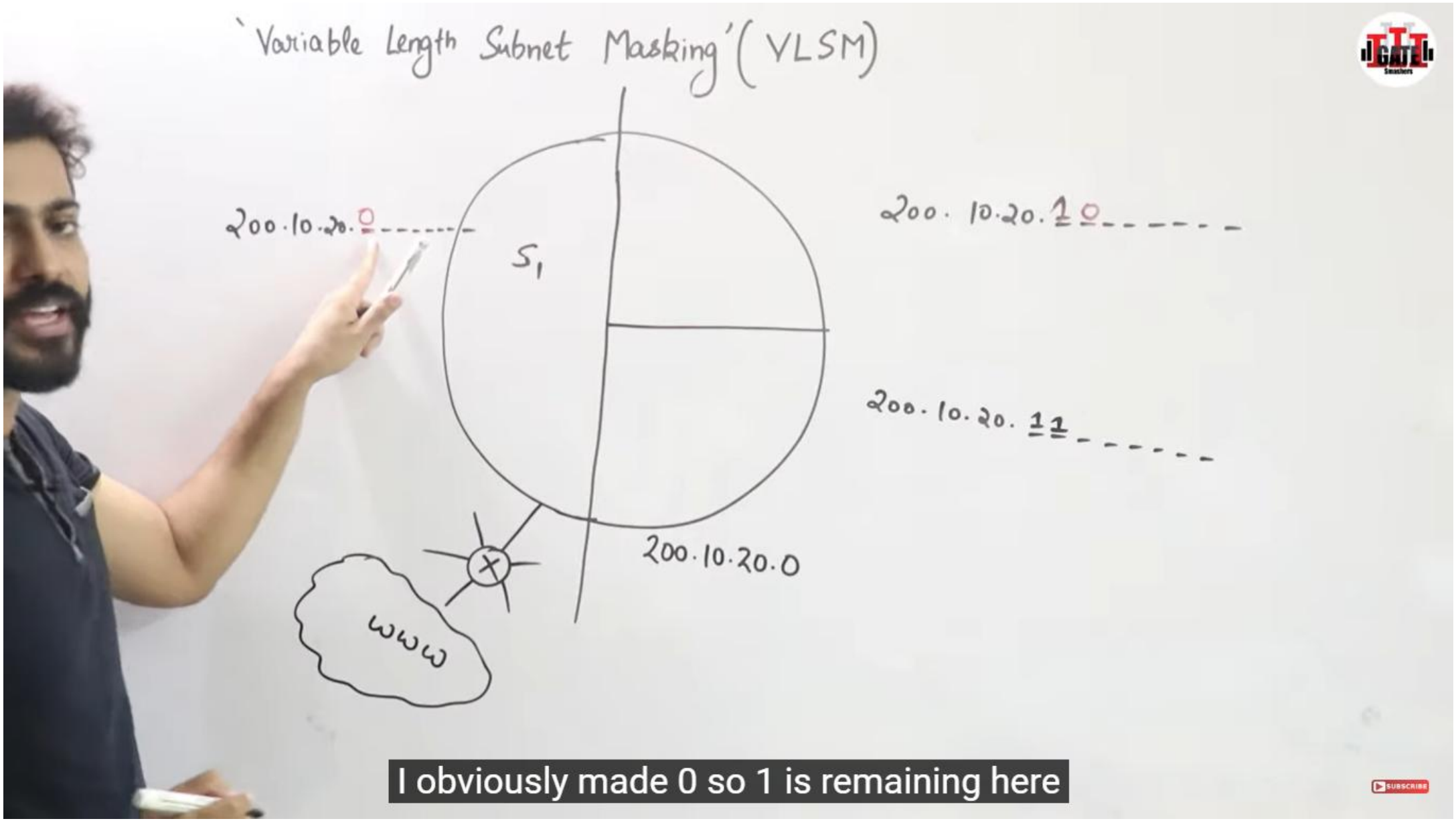

Lec-48: Subnetting in Classful Addressing with Examples in Hindi | Computer Networks
Subnetting → Dividing the big network into small networks
CA
2^{24}
Exam
Plac
Co
Acad
200.10.20.0
WWW
This is the basic funda why we do subnetting.
3:29 / 19:16
Don't Miss New Lectures
Subscribe


Lec-48: Subnetting in Classful Addressing with Examples in Hindi | Computer Networks
Subnetting → Dividing the big network into small networks
200.10.20.00000000
00000001
01111111
200.10.20.0
to
200.10.20.127
S1
S2
200.10.20.0
WWW
256
0
255] 254
200.10.20.10000000
10000001
10000010
11111111
200.10.20.128
to
200.10.20.255
this is subnet 2 whose range is this
10:28 / 19:16


Lec-48: Subnetting in Classful Addressing with Examples in Hindi | Computer Networks
Subnetting → Dividing the big network into small networks
200.10.20.00000000
00000001
01111111
200.10.20.0
to
200.10.20.127
S1
S2
200.10.20.0
WWW
256
0
255
254
200.10.20.10000000
10000001
10000010
11111111
200.10.20.128
to
200.10.20.255
whose range is this
10:28 / 19:16


Lec-48: Subnetting in Classful Addressing with Examples in Hindi | Computer Networks
Subnetting → Dividing the big network into small networks
200.10.20.00000000
00000001
01111111
200.10.20.0
to
200.10.20.127
S1
126
S2
126
200.10.20.0
WWW
256
0
255
254
252
200.10.20.10000000
10000001
10000010
11111111
200.10.20.128
to
200.10.20.255
so somewhere you got a little less no. of IP
12:14 / 19:16
Don't Miss New Lectures
Subscribe


Lec-48: Subnetting in Classful Addressing with Examples in Hindi | Computer Networks
Subnetting → Dividing the big network into small networks
255.255.255.128
200.10.20.0
200.10.20.128
200.10.20.255
255.255.255.128
200.10.20.15
NID | HID | PID
NID | SID | HID | PID
WWW
So overall this you will have to find out
19:03 / 19:16


`Variable Length Subnet Masking'(VLSM)
200.10.20.0
S1
200.10.20.10
200.10.20.11
200.10.20.0
www
I obviously made 0 so 1 is remaining here
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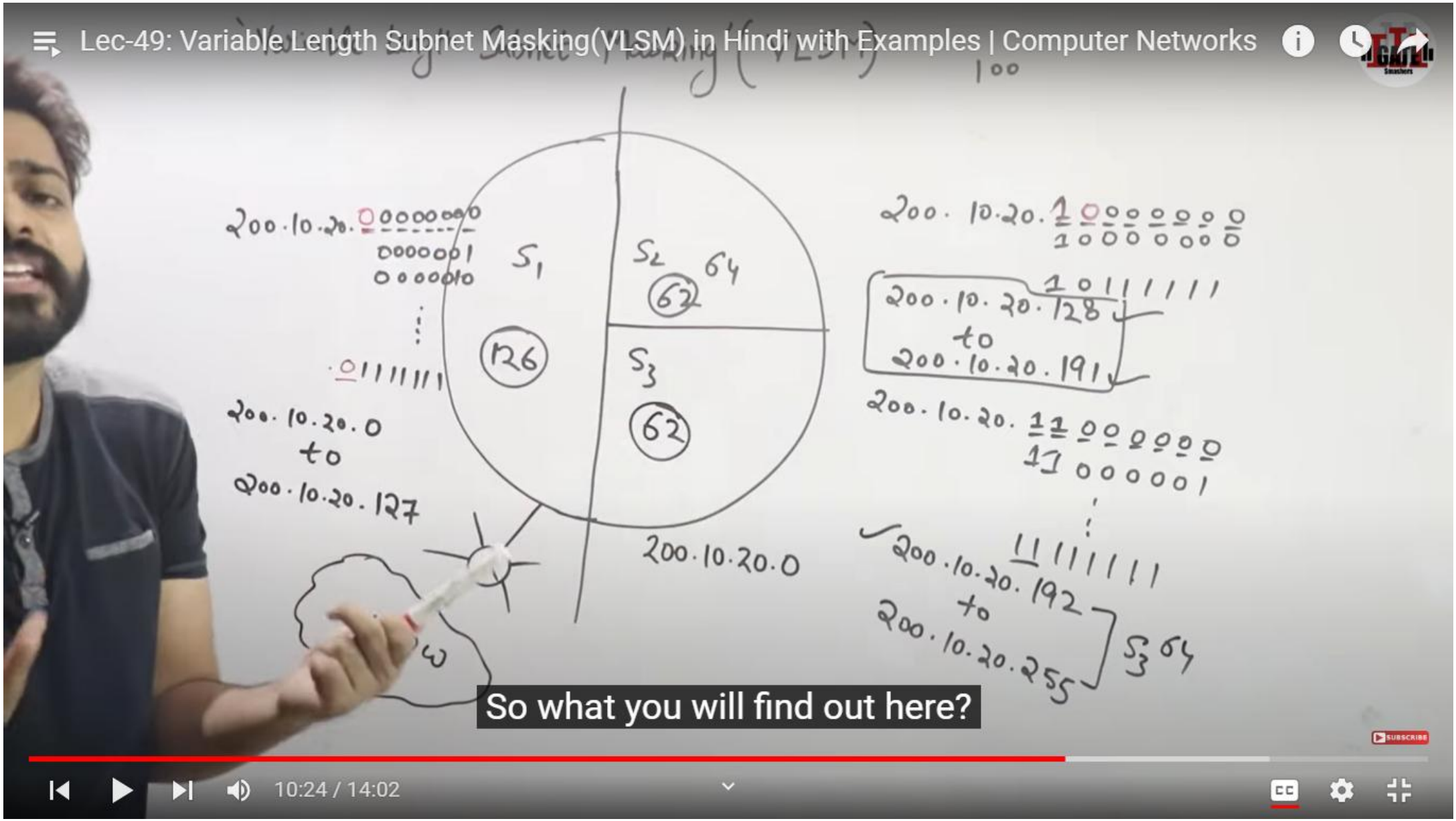
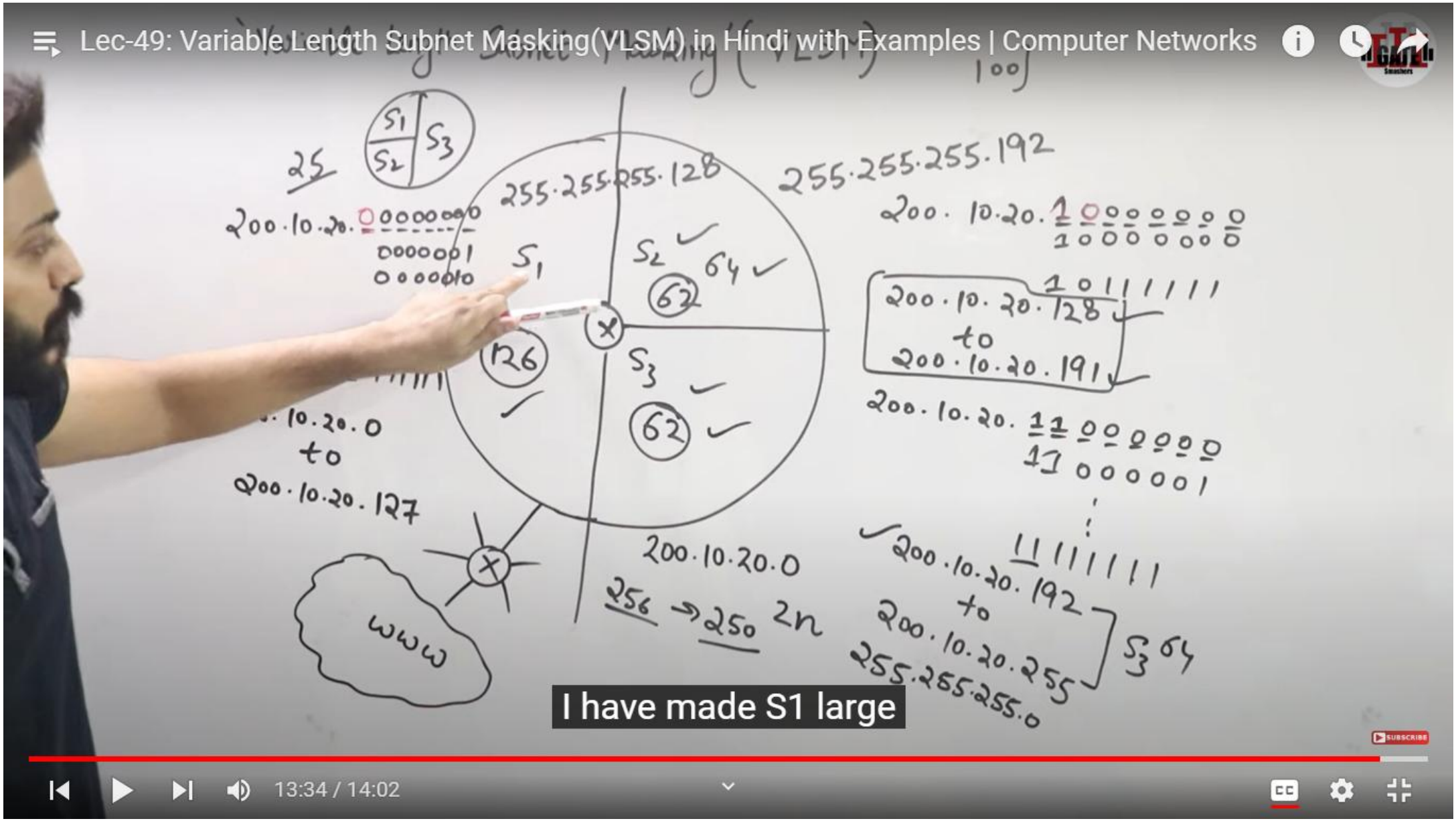
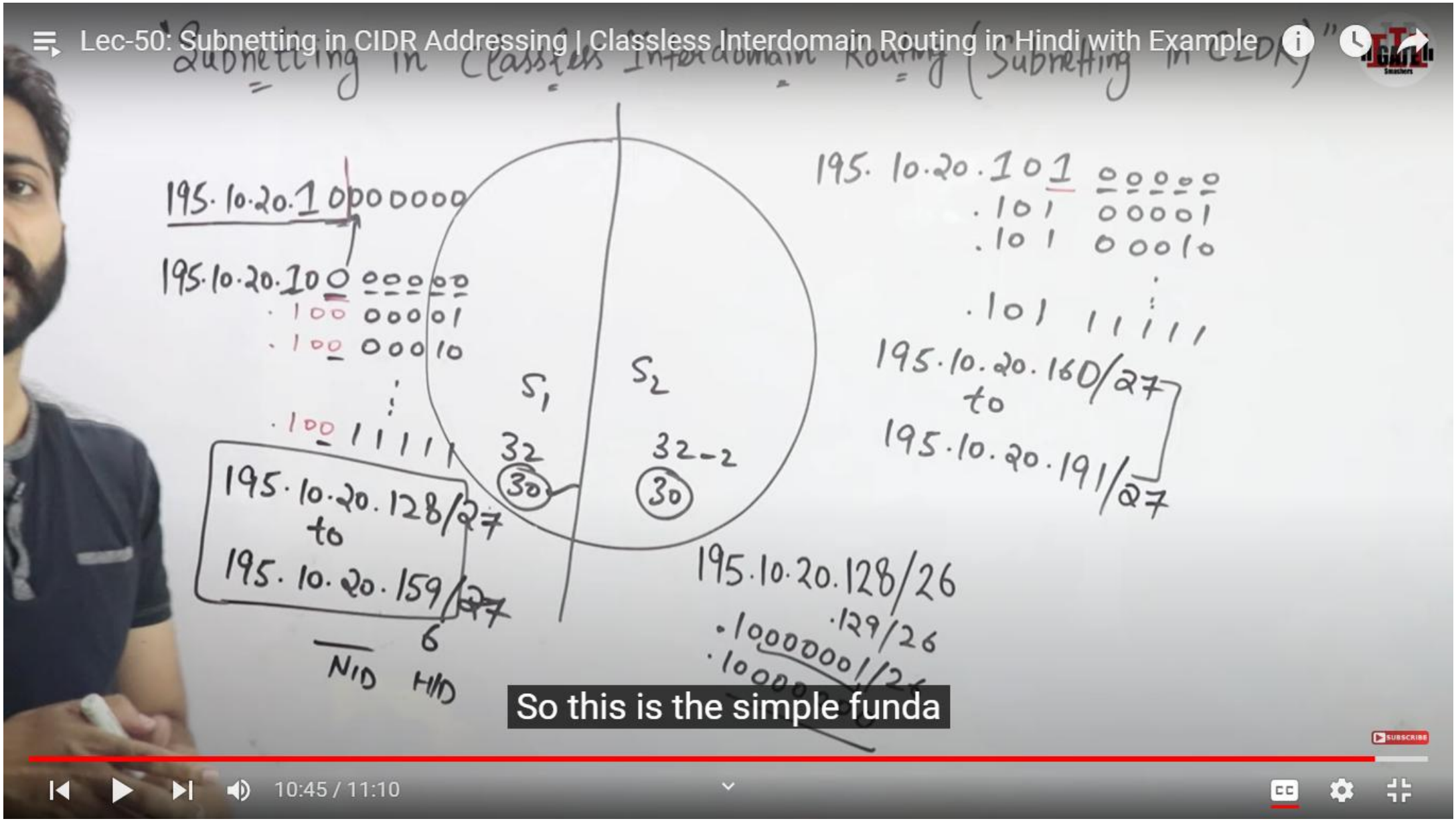
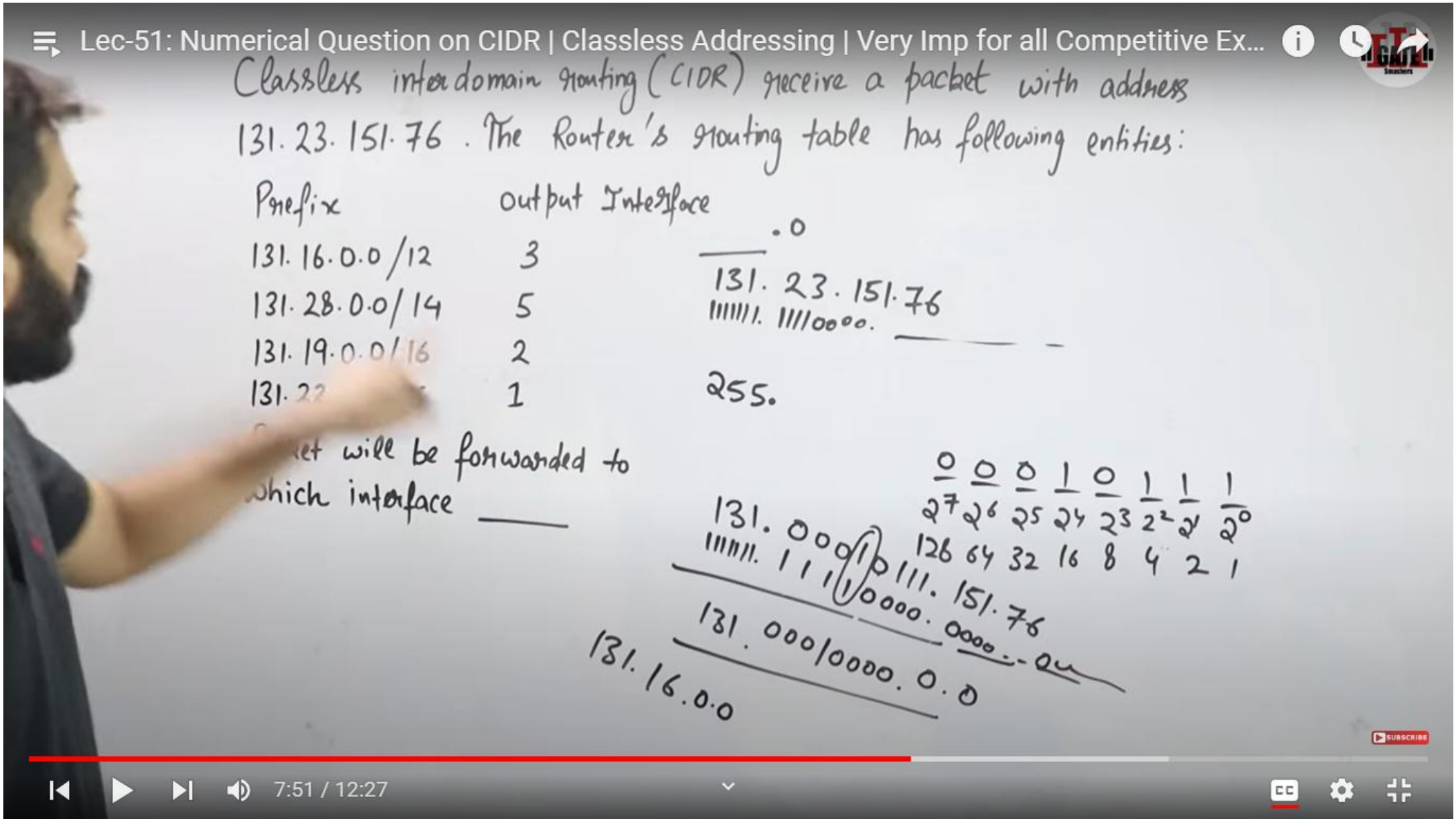
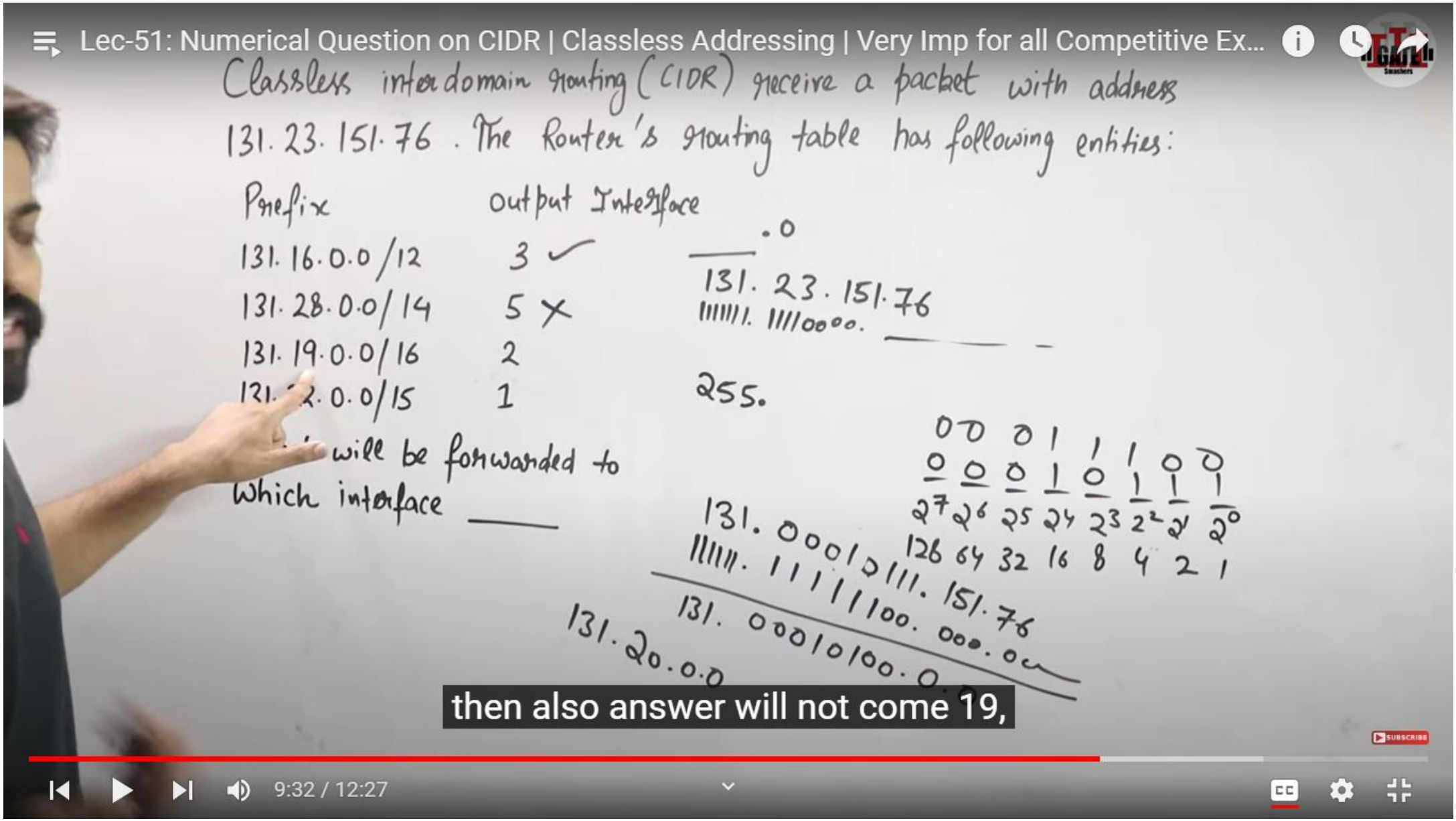
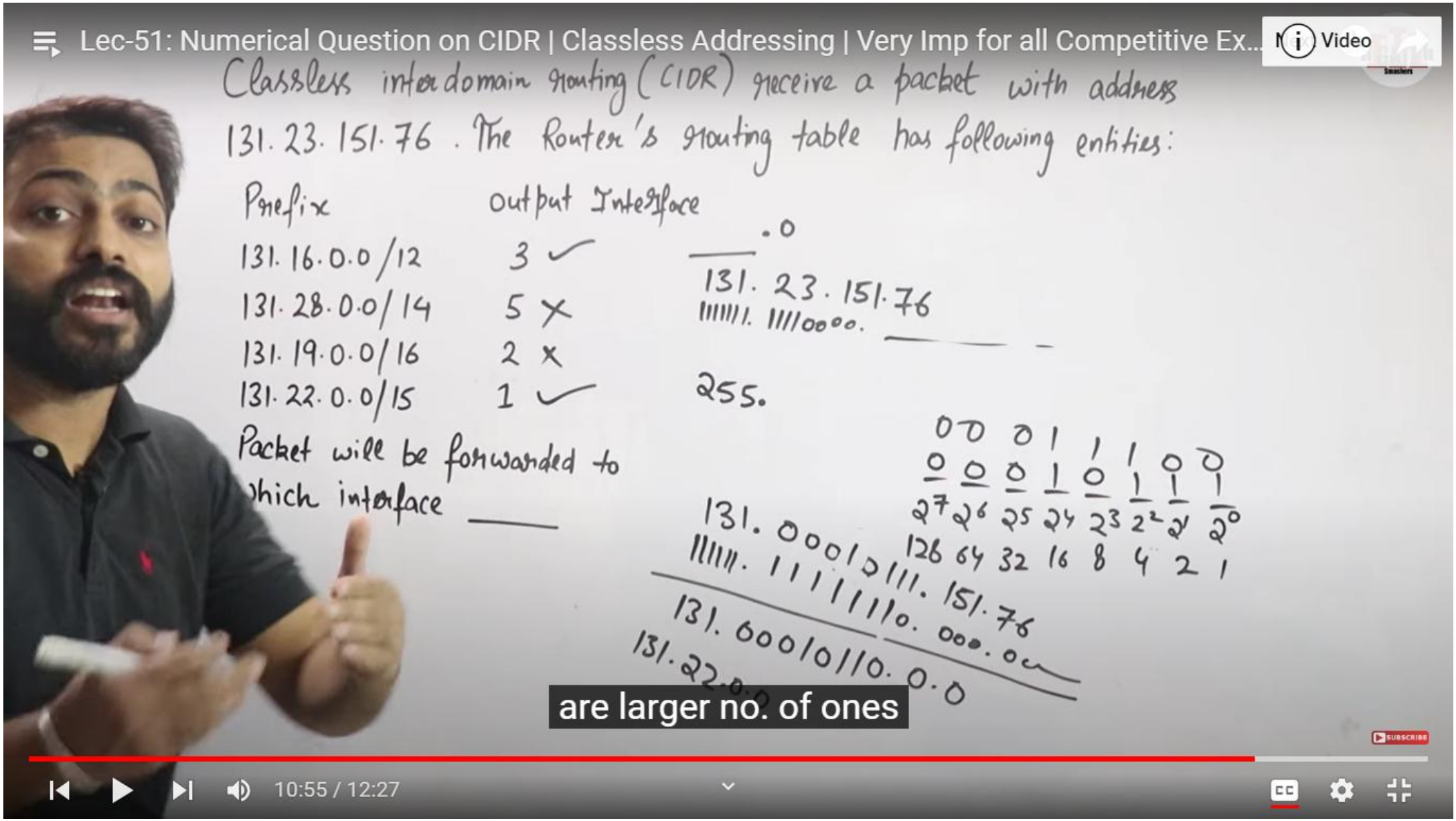

Lec-49: Variable Length Subnet Masking(VLSM) in Hindi with Examples | Computer Networks
200.10.20.0000000
0000001
0000010
0111111
200.10.20.0
to
200.10.20.127
S1
126
S2
64
62
S3
62
200.10.20.0
200.10.20.1000000
1000000
1011111111
200.10.20.128
to
200.10.20.191
200.10.20.11000000
11000001
11111111
200.10.20.192
to
200.10.20.255
S3 64
So what you will find out here?
10:24 / 14:02

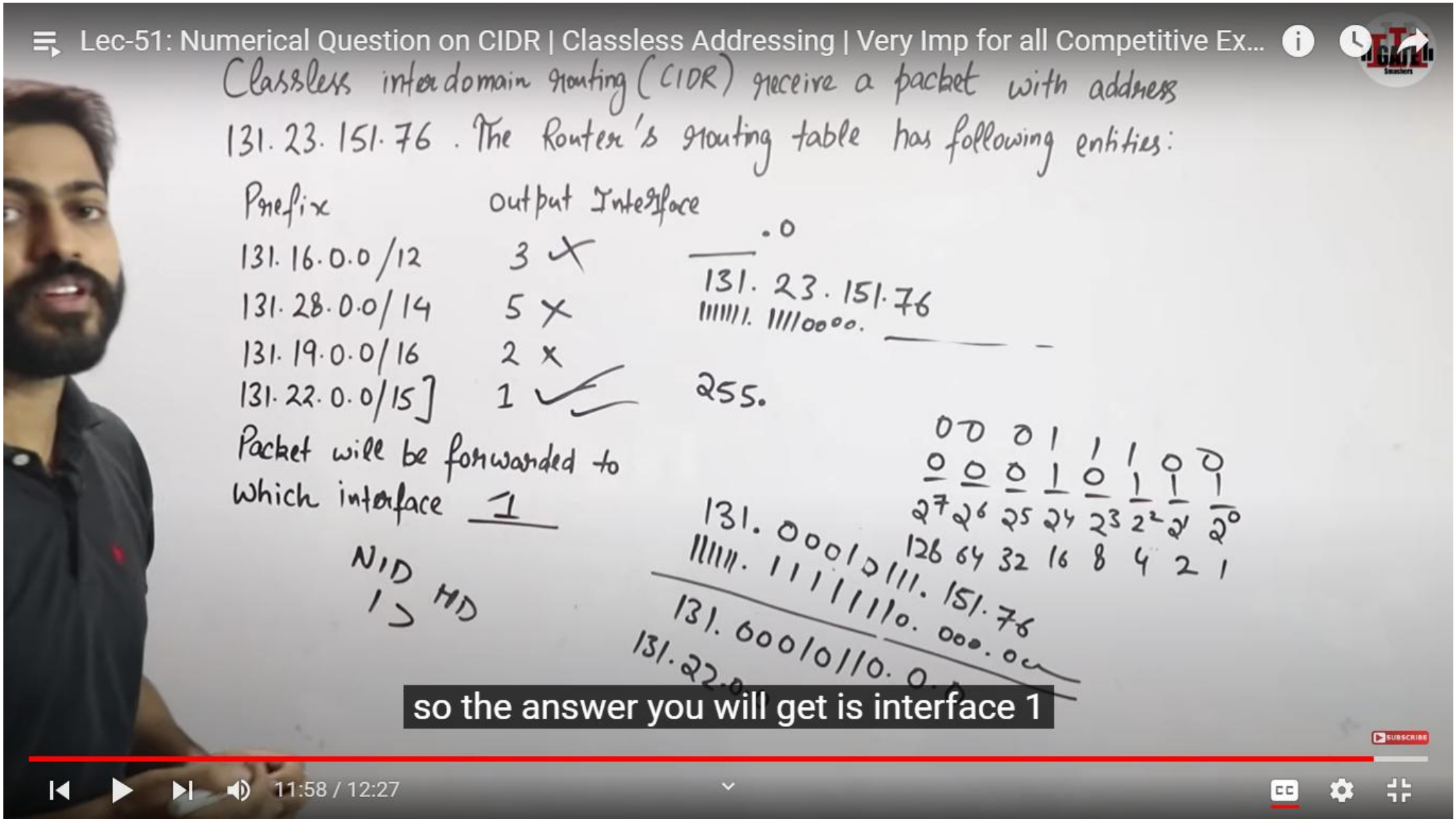

Lec-49: Variable Length Subnet Masking(VLSM) in Hindi with Examples | Computer Networks
S1
S2
S3
25
200.10.20.0000000
0000001
0000010
255.255.255.128
S1
S2
64
62
126
S3
62
200.10.20.0
to
200.10.20.127
200.10.20.0
256 → 250
2n
www
255.255.255.192
200.10.20.10000000
10000000
10111111
200.10.20.128
to
200.10.20.191
200.10.20.11000000
11000001
11111111
200.10.20.192
to
200.10.20.255
255.255.255.0
S3 64
I have made S1 large
13:34 / 14:02

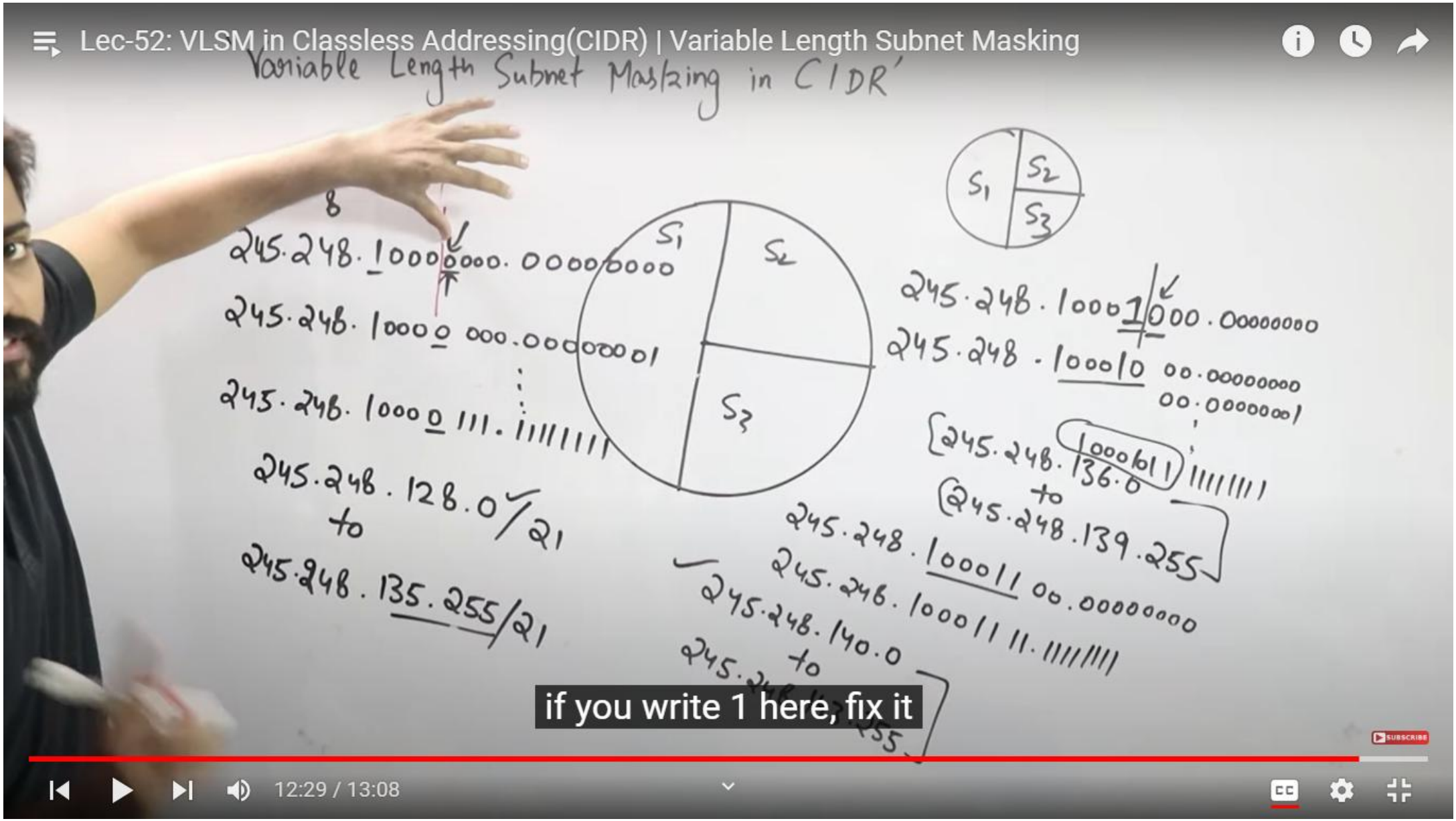

Lec-50: Subnetting in CIDR Addressing | Classless Interdomain Routing in Hindi with Example
Subnetting in Classless Interdomain Routing (Subnetting in CIDR)
195.10.20.100 00000
195.10.20.101 00000
195.10.20.100 00000
.100 00001
.100 00010
.100 11111
.101 00001
.101 00010
.101 11111
195.10.20.160/27
to
195.10.20.191/27
195.10.20.128/27
to
195.10.20.159/27
S1
S2
32
32-2
30
30
6
NID
HID
195.10.20.128/26
.129/26
So this is the simple funda
10:45 / 11:10


Lec-51: Numerical Question on CIDR | Classless Addressing | Very Imp for all Competitive Ex...
Classless interdomain routing (CIDR) receive a packet with address 131.23.151.76. The Router's routing table has following entities:
Prefix
output Interface
131.16.0.0/12
3
131.28.0.0/14
5
131.19.0.0/16
2
131.22
1
131.23.151.76
255.
0 0 0 1 0 1 1 1
128 64 32 16 8 4 2 1
131.00010111.151.76
131.00010000.0.0
131.16.0.0
SUBSCRIBE
7:51 / 12:27


Lec-51: Numerical Question on CIDR | Classless Addressing | Very Imp for all Competitive Ex...
Classless interdomain routing (CIDR) receive a packet with address 131.23.151.76. The Router's routing table has following entities:
Prefix
output Interface
131.16.0.0/12
3
131.28.0.0/14
5
131.19.0.0/16
2
131.22.0.0/15
1
will be forwarded to which interface
131.23.151.76
255.
131.20.0.0
then also answer will not come 19,
9:32 / 12:27


Lec-51: Numerical Question on CIDR | Classless Addressing | Very Imp for all Competitive Ex...
Video
Classless interdomain routing (CIDR) receive a packet with address 131.23.151.76. The Router's routing table has following entities:
Prefix
output Interface
131.16.0.0/12 3
131.28.0.0/14 5
131.19.0.0/16 2
131.22.0.0/15 1
Packet will be forwarded to which interface
131.23.151.76
255.
131.00010111.151.76
131.00010110.0.0
are larger no. of ones
10:55 / 12:27


Lec-51: Numerical Question on CIDR | Classless Addressing | Very Imp for all Competitive Ex...
Classless inter domain routing (CIDR) receive a packet with address 131.23.151.76. The Router's routing table has following entities:
Prefix
output Interface
131.16.0.0/12 3
131.28.0.0/14 5
131.19.0.0/16 2
131.22.0.0/15 1
Packet will be forwarded to which interface 1
NID
HD
131.23.151.76
255.
so the answer you will get is interface 1
11:58 / 12:27

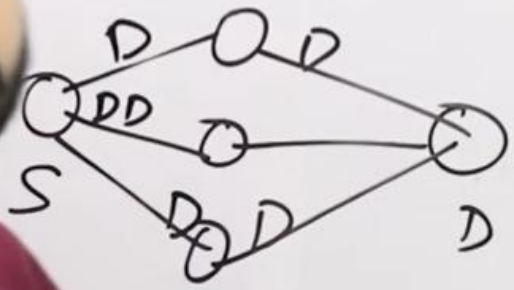

Lec-52: VLSM in Classless Addressing(CIDR) | Variable Length Subnet Masking
Variable Length Subnet Masking in CIDR
245.248.10000000.00000000
245.248.10000 000.00000001
245.248.10000 111.11111111
245.248.128.0/21
to
245.248.135.255/21
S1
S2
S3
245.248.10001000.00000000
245.248.10001 0 00.00000000
245.248.10001 0 11.11111111
245.248.136.0
to
245.248.139.255
245.248.140.0
to
if you write 1 here, fix it
12:29 / 13:08

Lec-53: IPv4 Header Format – All Fields Explained in Hindi | Computer Networks

"IPv4 Header"

Connection less

Datagram Service



VER 4	HLEN 4	Type of Service (DSCP) 8	Total Length 16
Identification bits 16		Flag 3	Fragment offset 13
Time to LIVE TTL 8	Protocol 8	Header checksum 16	
Source IP Address 32 bits			
Destination IP Address 32 bits			
Options & Padding			

Datagram = Header Size = 20-60 Bytes + Payload = 0-65515 Bytes

out of these 12 fields

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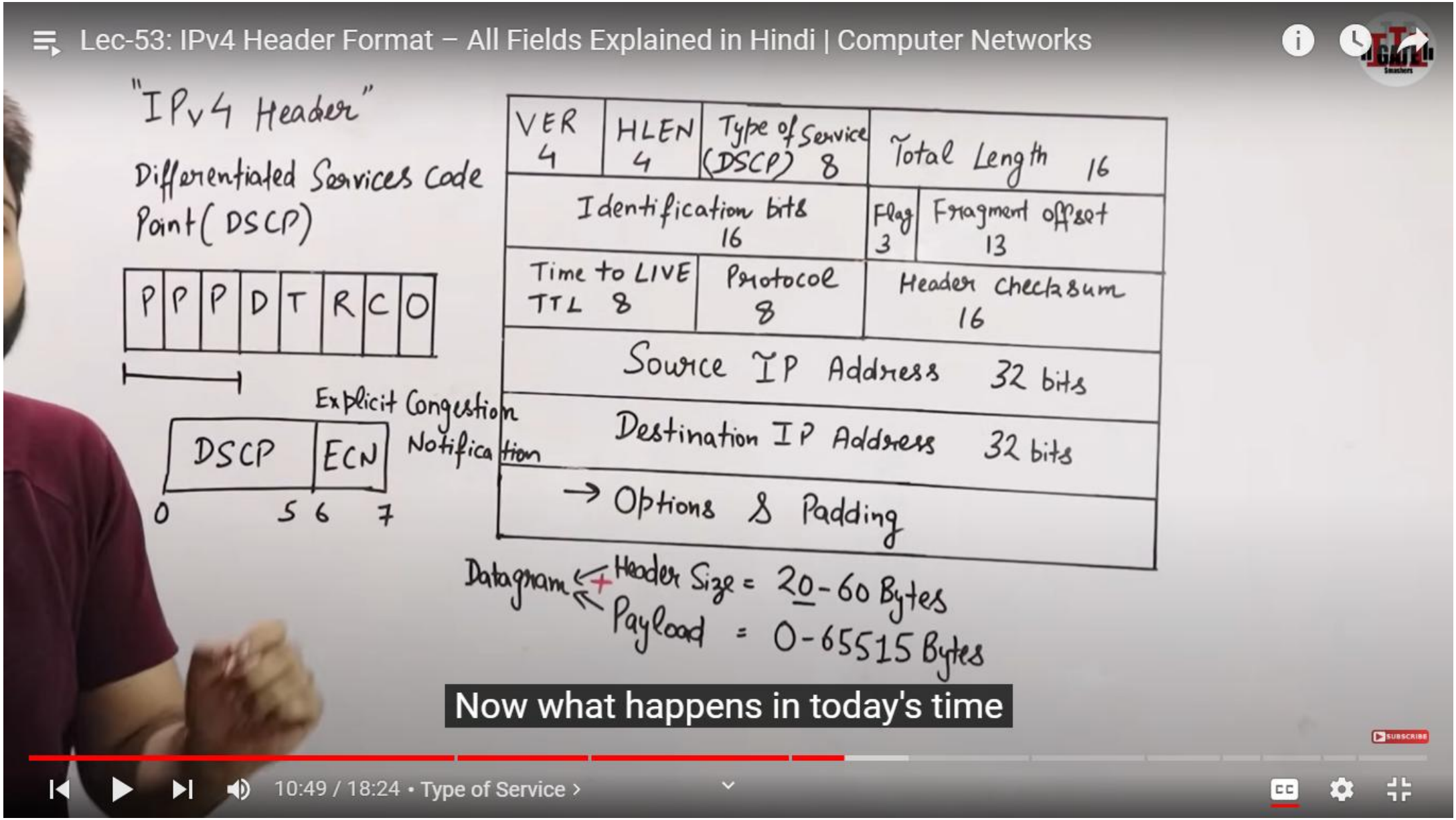
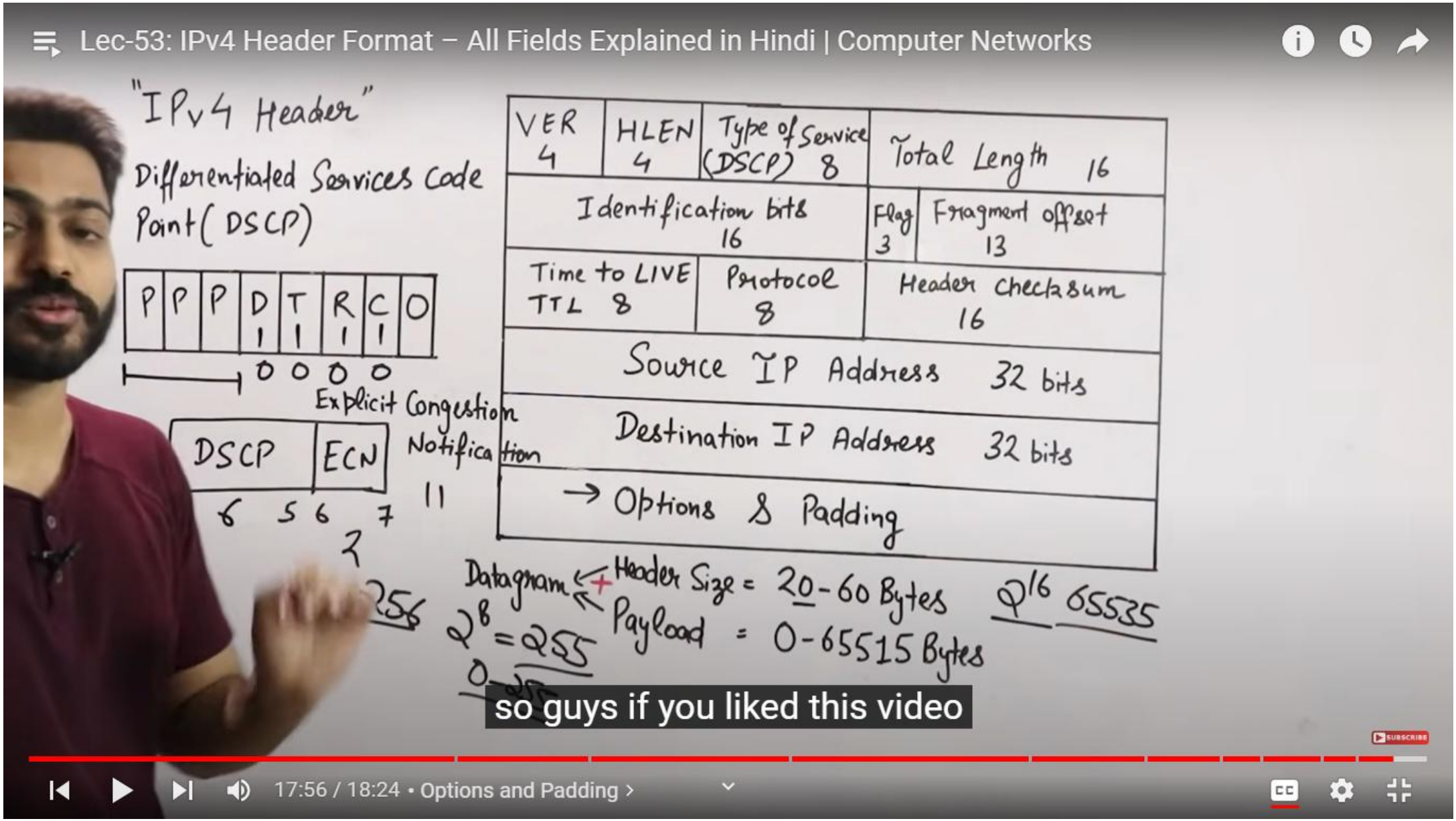
Lec-53: IPv4 Header Format – All Fields Explained in Hindi | Computer Networks



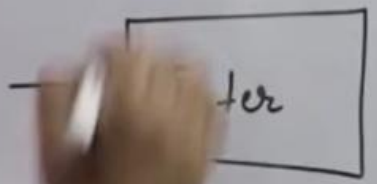
10:49 / 18:24 • Type of Service ›

Lec-53: IPv4 Header Format – All Fields Explained in Hindi | Computer Networks



17:56 / 18:24 • Options and Padding ›

A datagram of 3000 B (20 B of IP header + 2980 B IP Payload) reached at Router and must be forward to link with MTU of 500 B. How many fragments will be generated and also write MF, offset, Total length value for all.



that datagram is of 3000 byte

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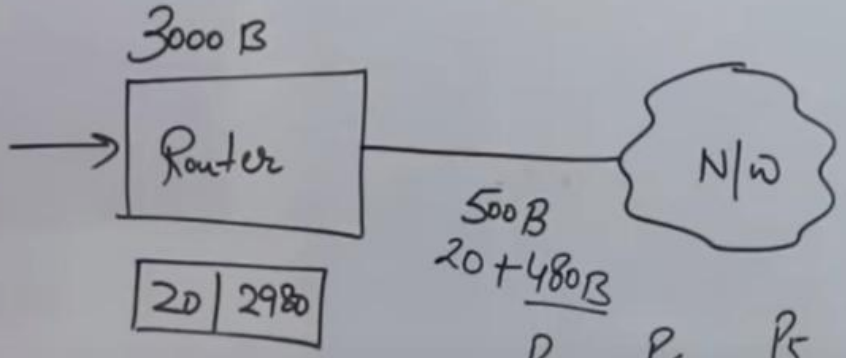
Lec-54: Fragmentation of IPv4 Datagram | Identification, Flags and Fragment Offset | Networ...

A datagram of 3000 B (20 B of IP header + 2980 B IP Payload) reached at Router and must be forward to link with MTU of 500 B. How many fragments will be generated and also write MF, offset, Total length value for all.



$\left\lceil \frac{2980\,B}{480\,B} \right\rceil = 7$

$480 \times 6 = 2880$

2

$\frac{480+480}{8}$ $\frac{480}{8}$ 60

360 × 8 = 2880

	P_7	P_6	P_5	P_4	P_3	P_2	P_1	
	480	480	480	480	480	480+20	480+20	
	100+20	500	500	500	500	500	500	TL
	120	1	1	1	1	1	1	
	0	300	240	180	120	60	0	MF
	360							

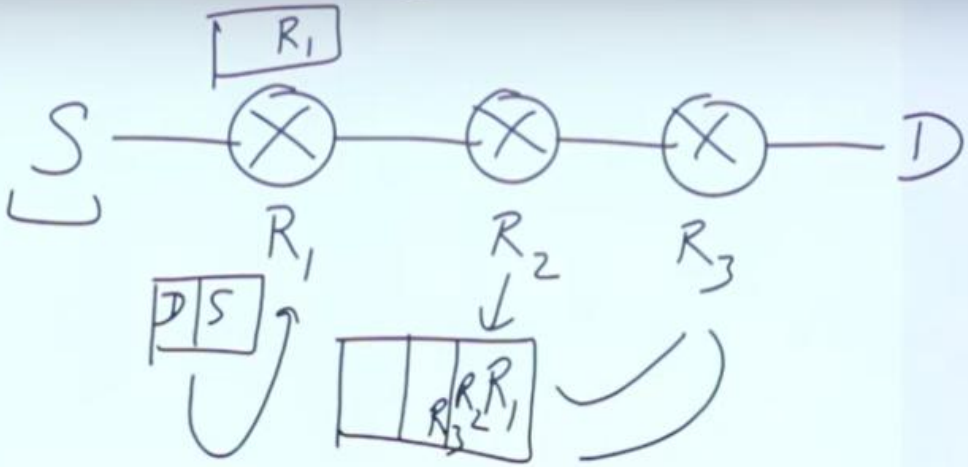
2880

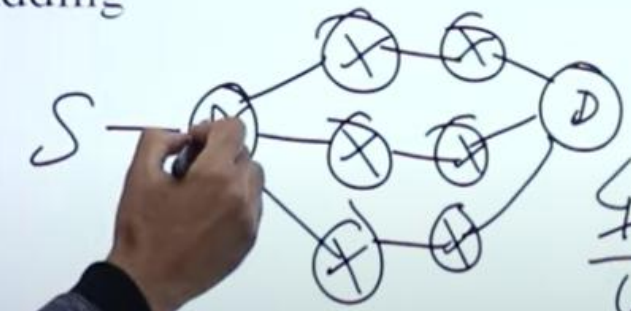
12:55 / 13:21 • Numerical >

Lec-55: Options & Padding in IPv4 Header | Computer Networks

Options & Padding

- Record Route
- Source Routing
  - Strict Source Routing
  - Loose Source Routing
- Padding





4B

40B / 4B = 10

9

now you can say that my packet should go

5:51 / 8:21

Lec-56: IPv6 Header Format in Hindi | IPv4 Vs IPv6 in Computer Networks

"IPv6 Header"

128 bits

32 bits

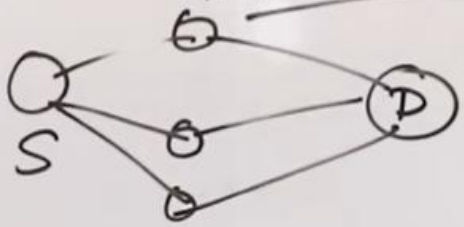
2^{32}

0110

65535 B

2^{128}

Virtual circuit



Base Header	Extension Header 1	.....	Extension Header N

VERSION (4)	Priority (8) Traffic type	Flow Label (16)
Payload Length (16)	Next Header (8)	Hop Limit (8)
Source Address (128)		
Destination Address (128)		

Base Header = 40 Bytes (320 bits) Fixed

Extension Headers:

1) Routing Header (43)
2) Hop by Hop option (0)
3) Fragment Header (44)
4) Authentication Header (51)
5) Destination Options (60)
6) Encapsulating Security Payload (50)

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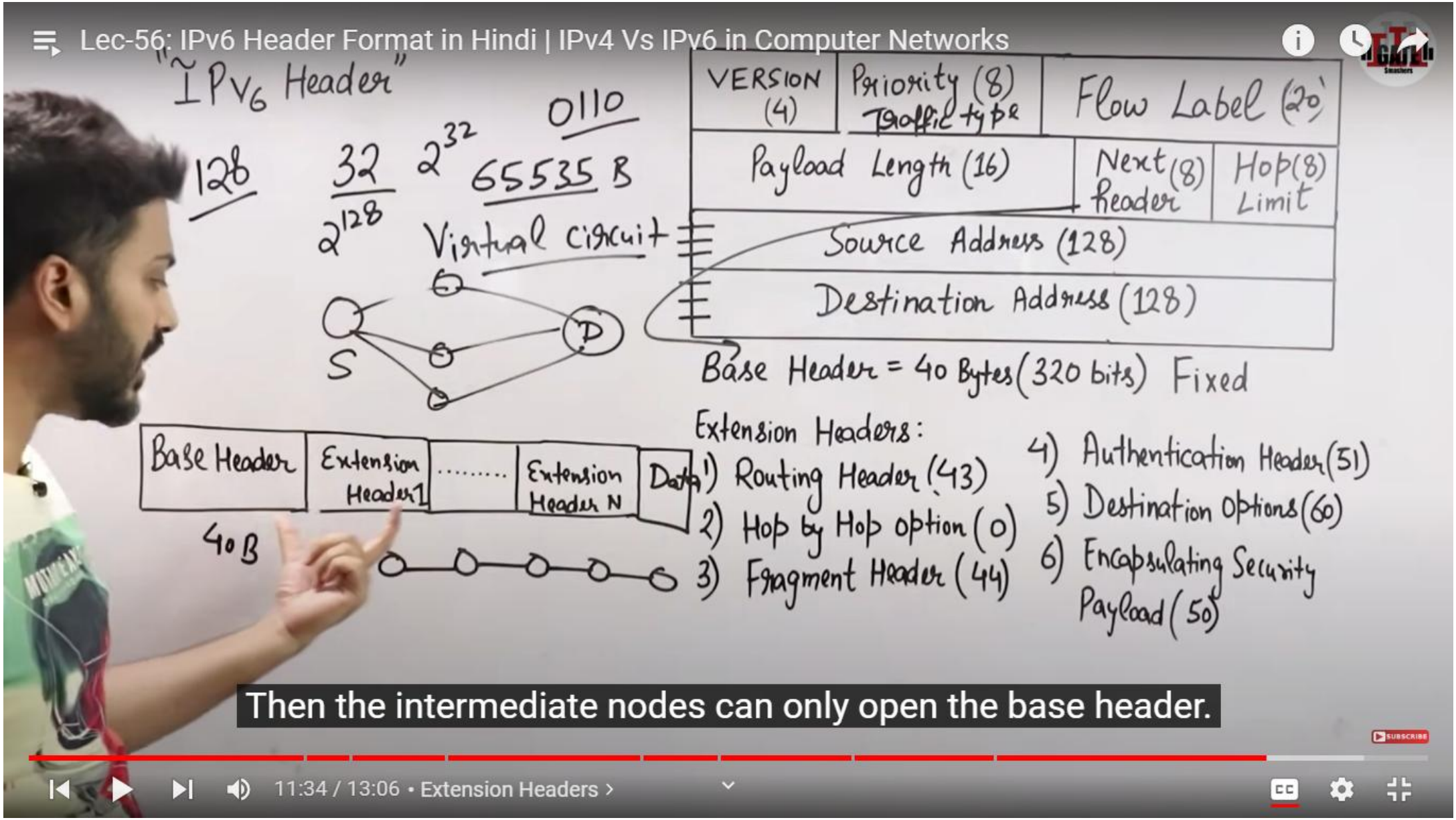
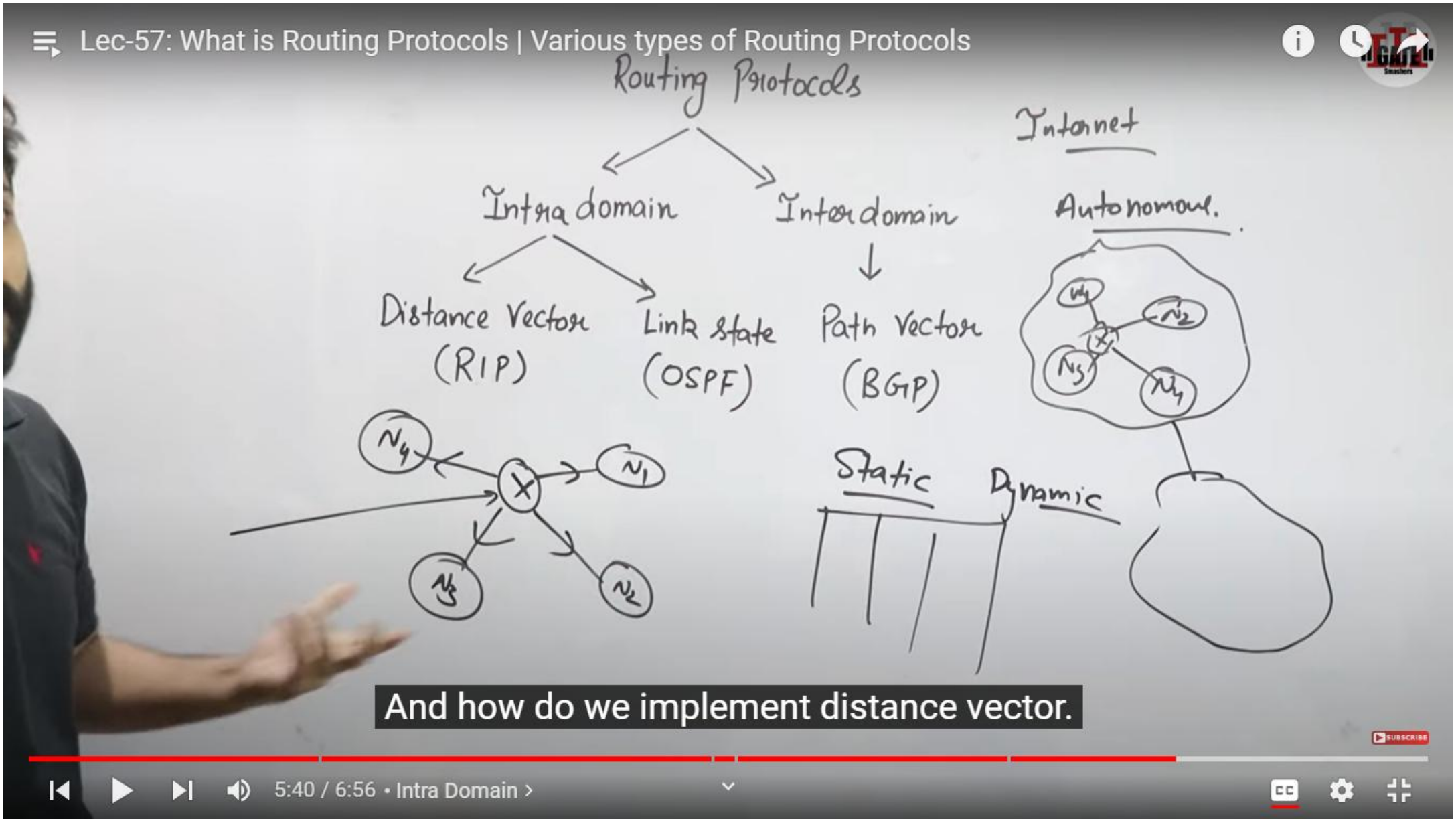
Lec-56: IPv6 Header Format in Hindi | IPv4 Vs IPv6 in Computer Networks

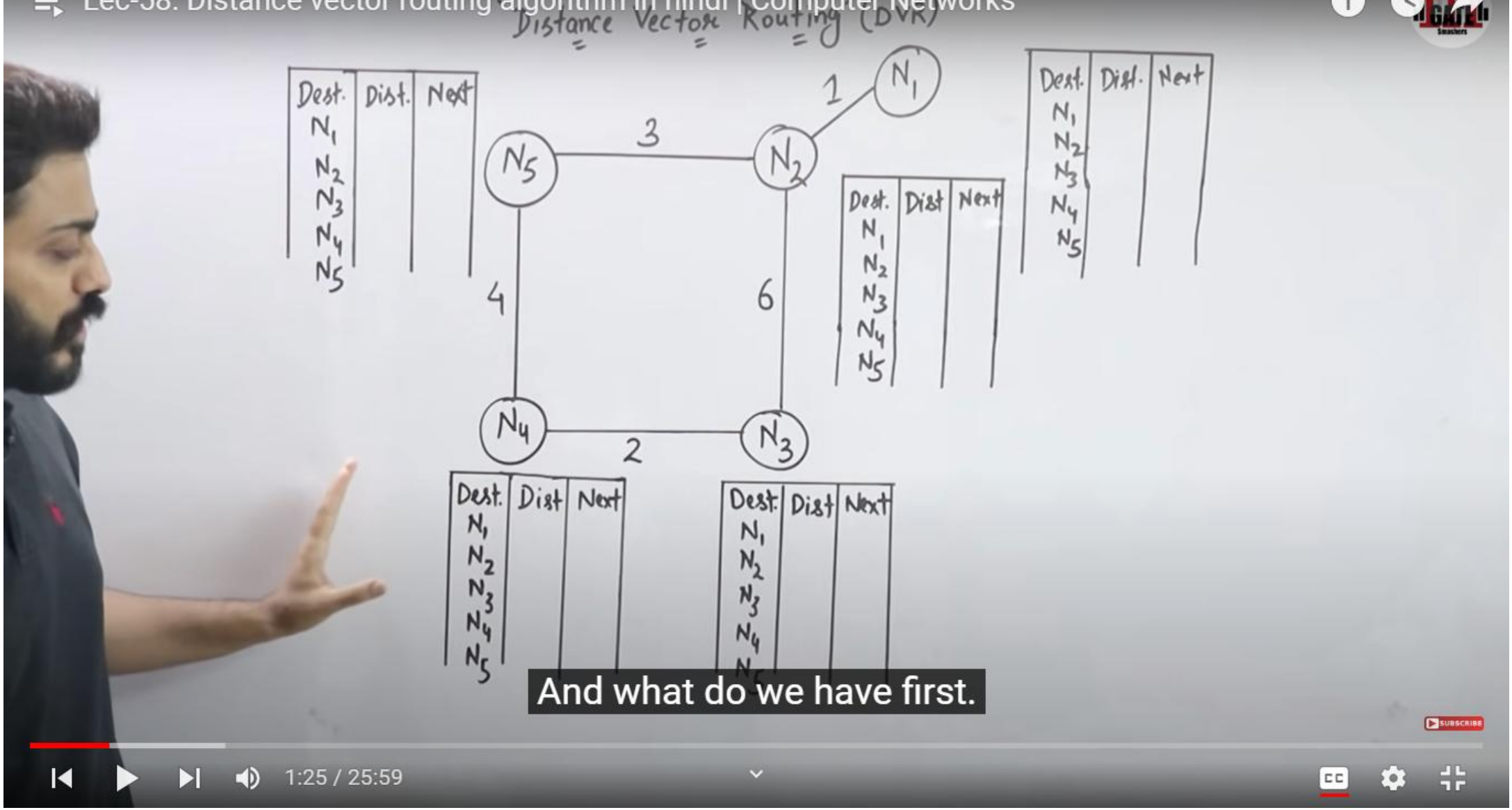


Then the intermediate nodes can only open the base header.

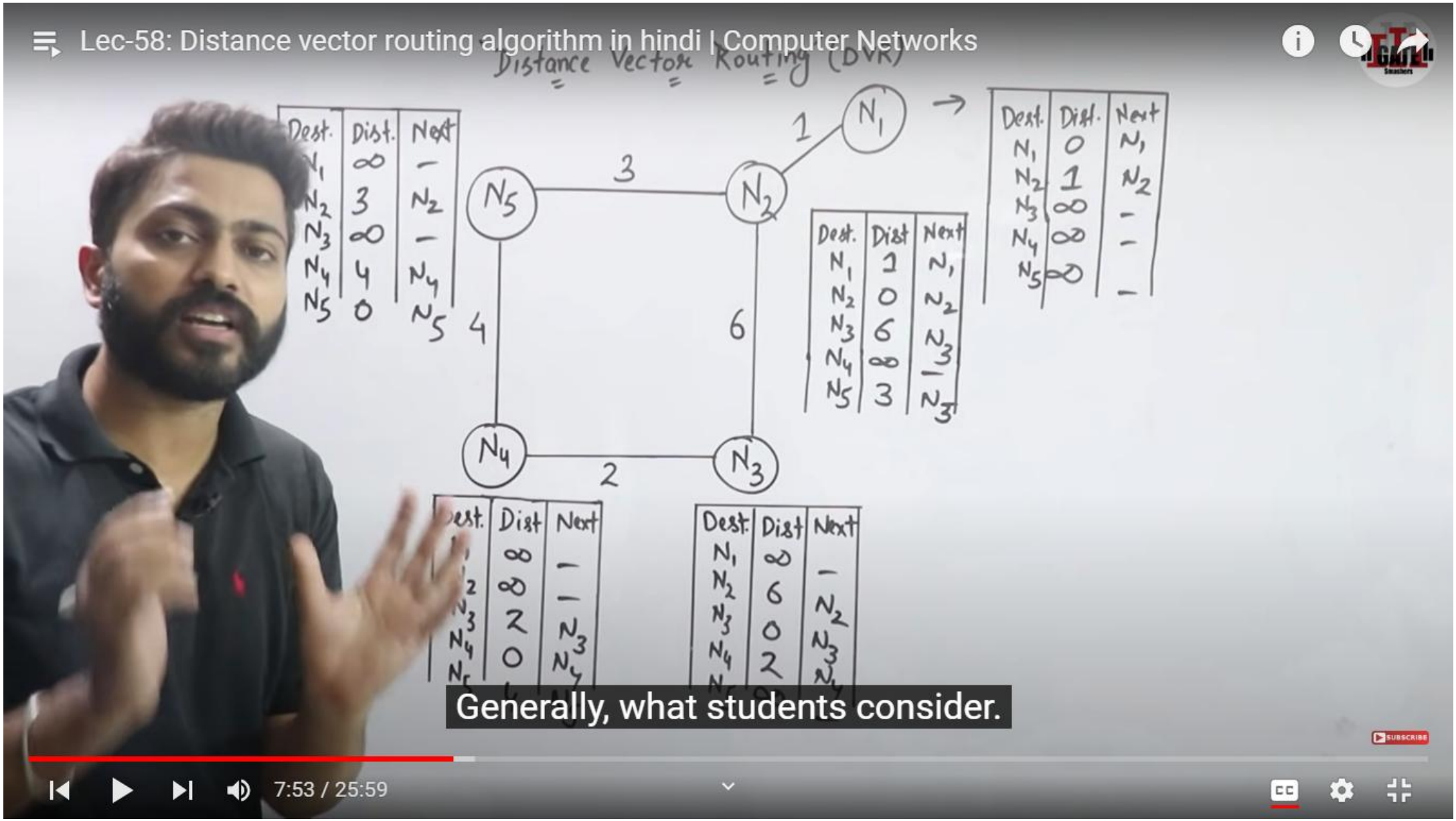
11:34 / 13:06 • Extension Headers ›

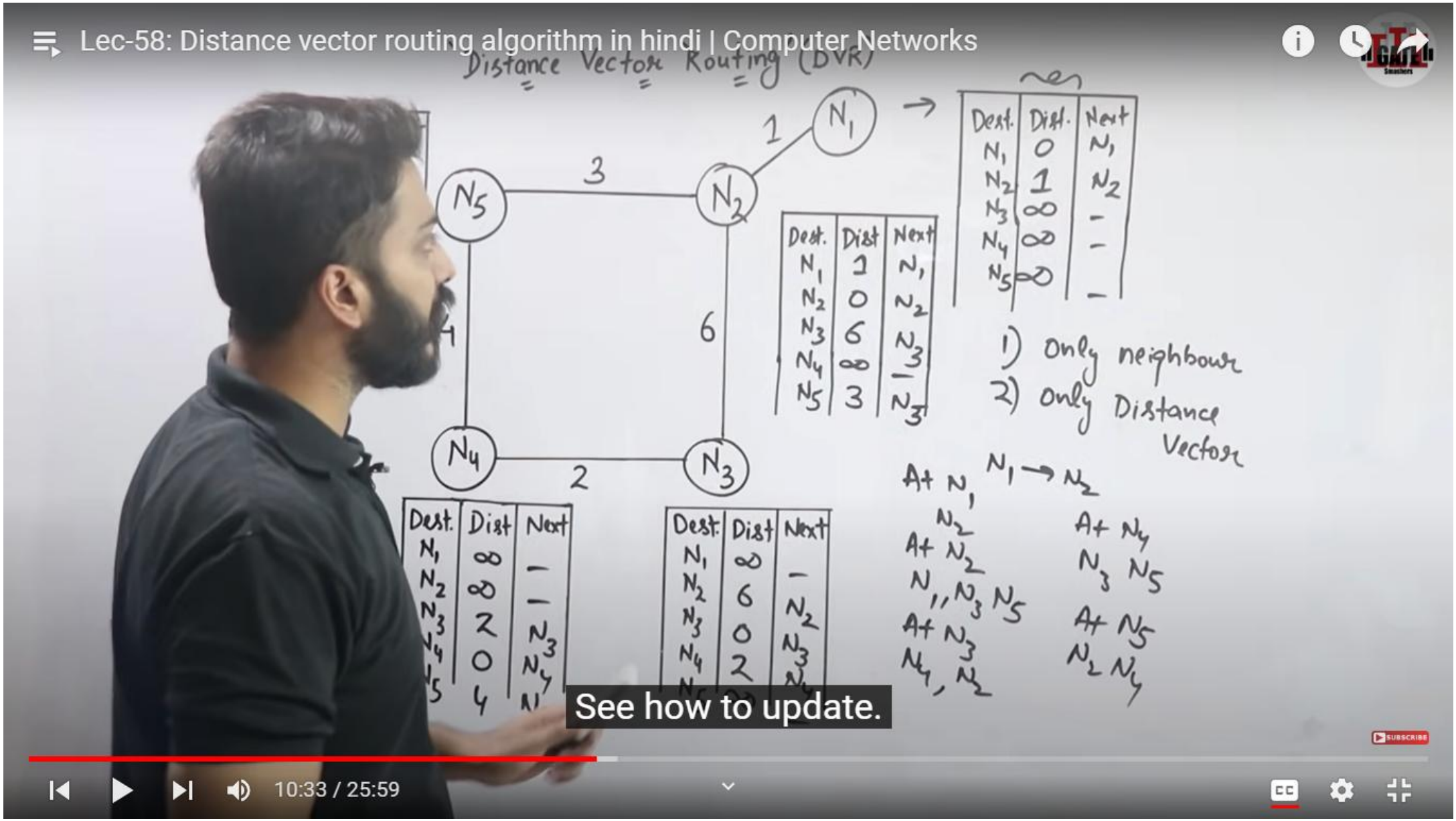

Lec-57: What is Routing Protocols | Various types of Routing Protocols
Routing Protocols
Intra domain
Inter domain
Distance Vector
(RIP)
Link State
(OSPF)
Path Vector
(BGP)
Internet
Autonomous.
Static
Dynamic
And how do we implement distance vector.
5:40 / 6:56 • Intra Domain ›

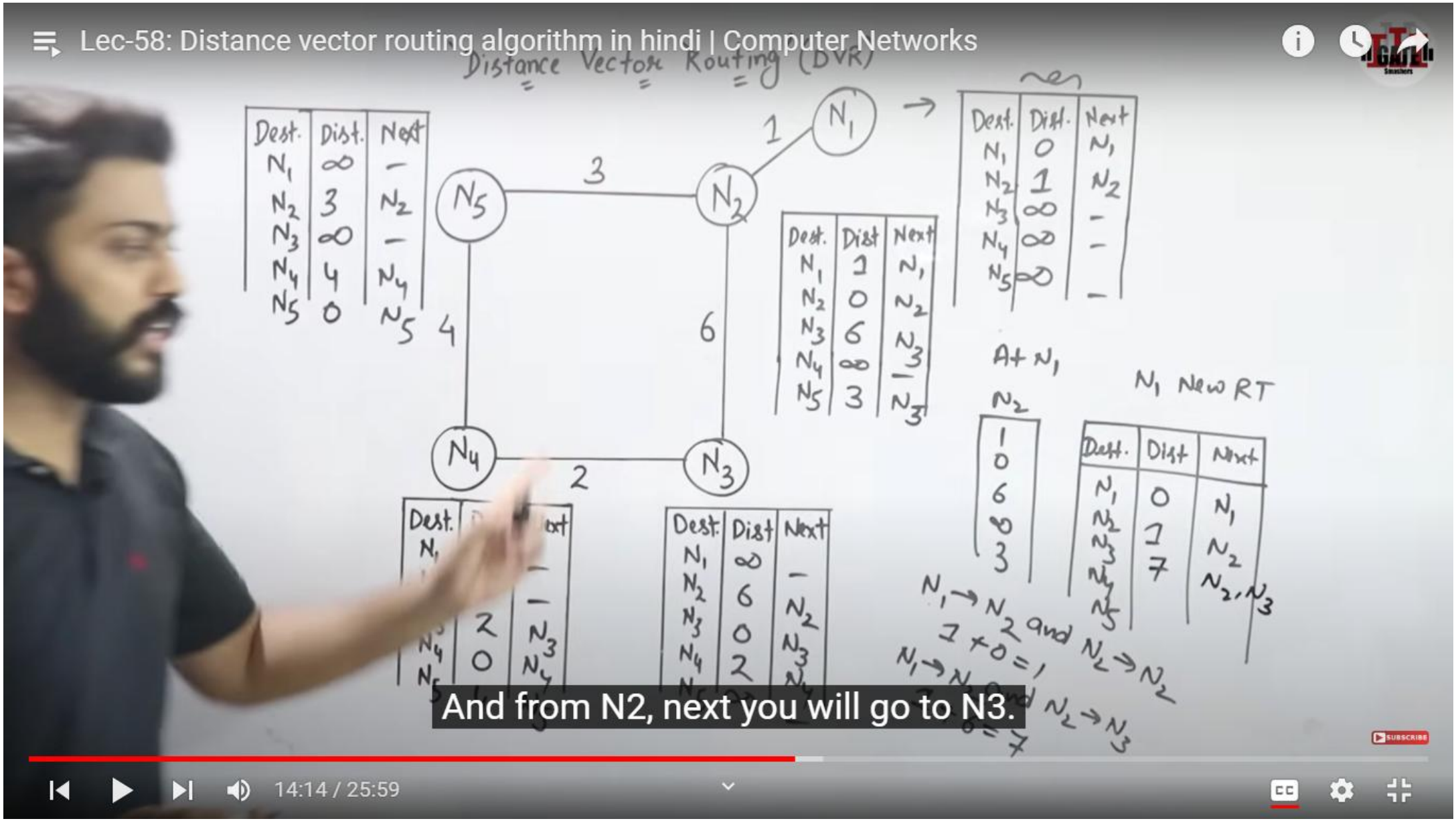
Lec-58: Distance vector routing algorithm in hindi | Computer Networks

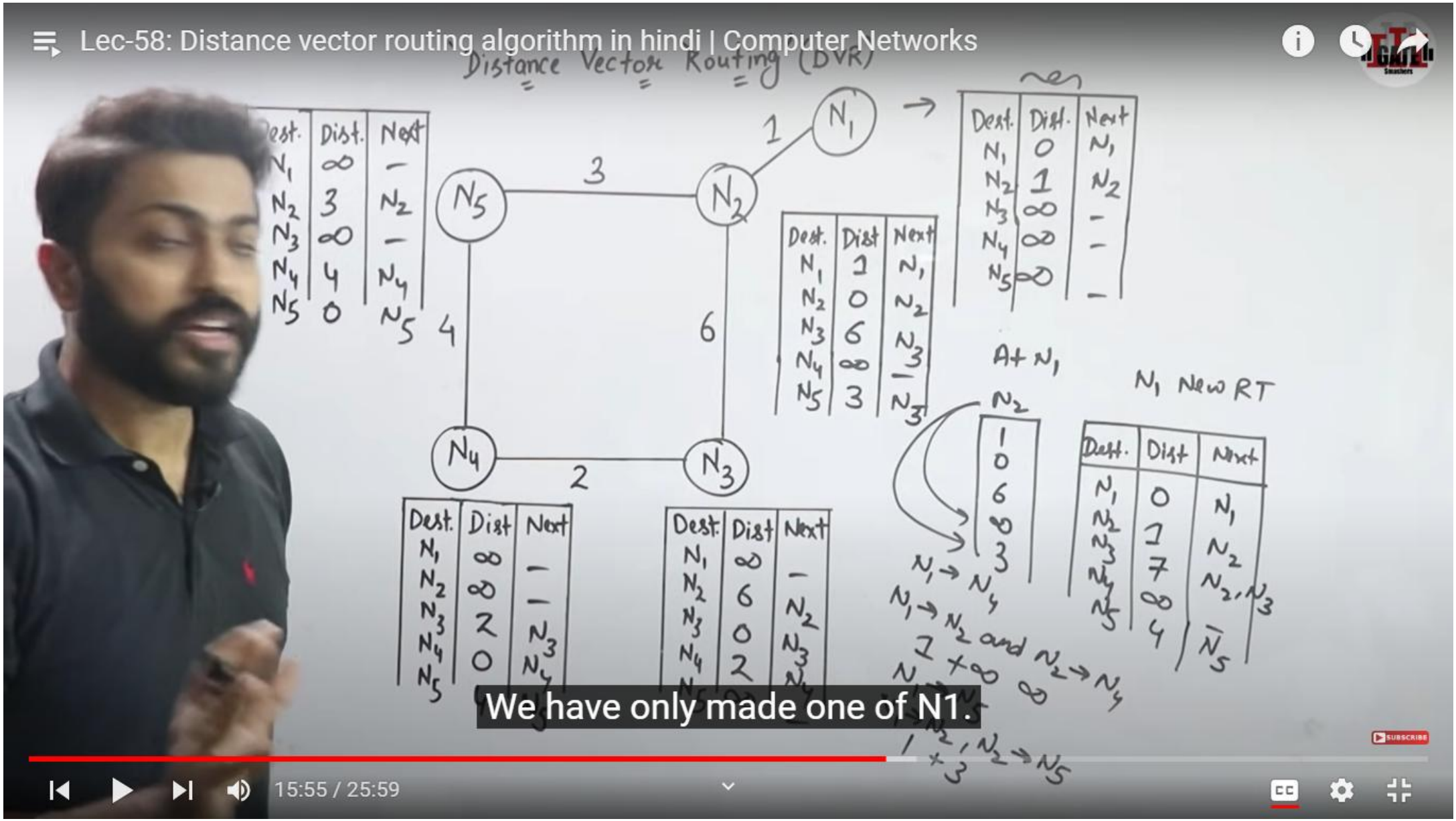


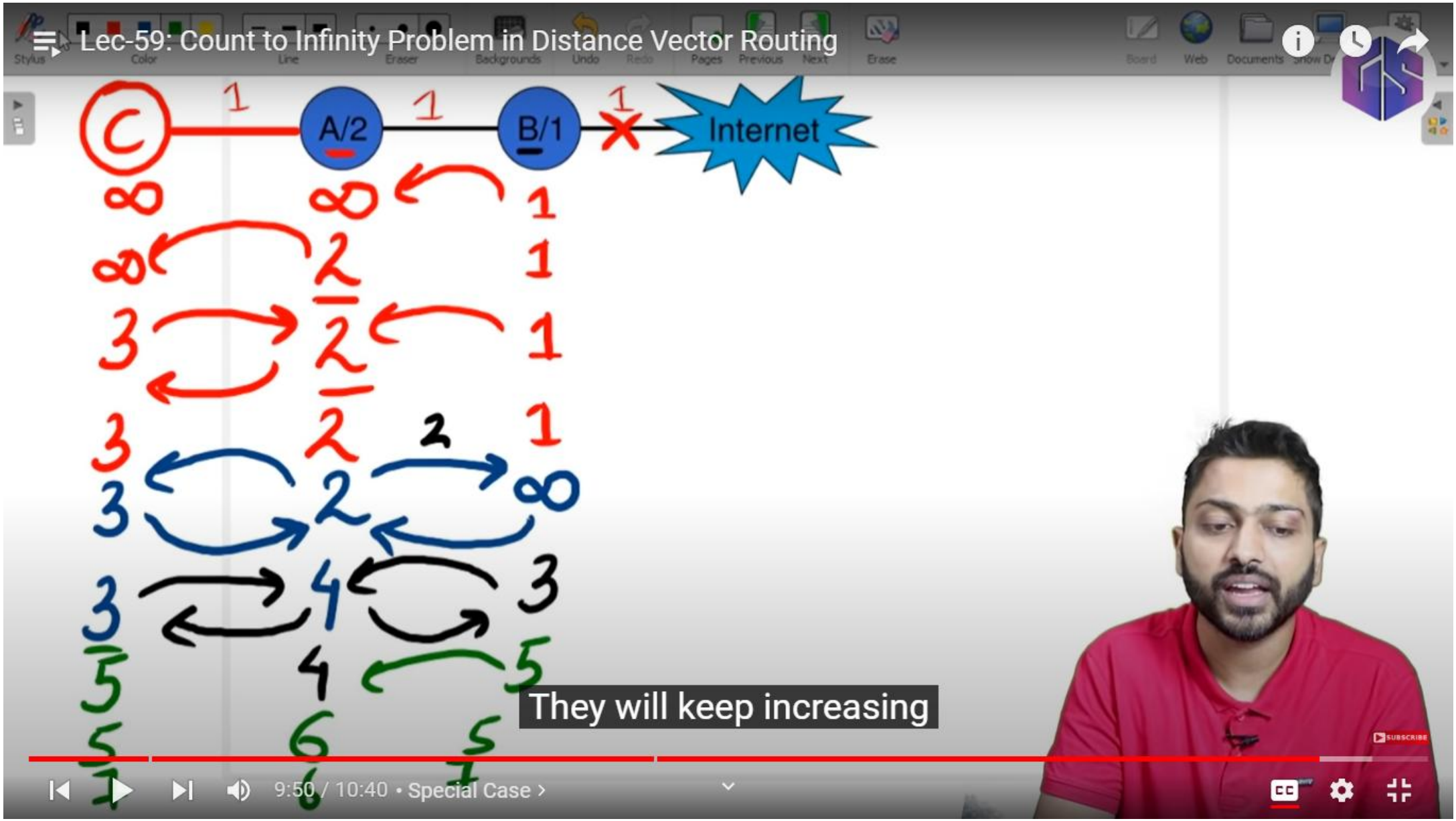
1:25 / 25:59

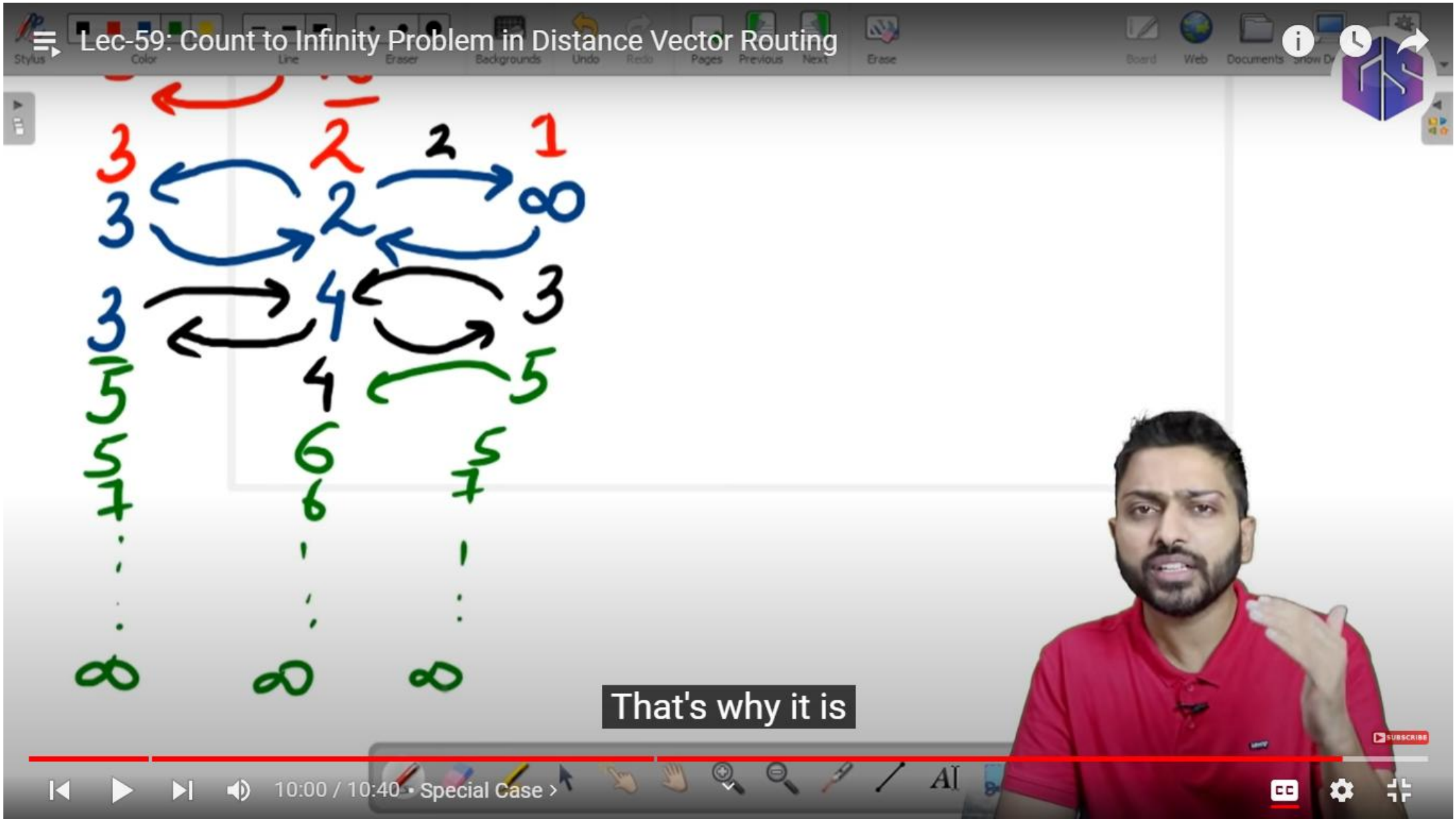

Lec-58: Distance vector routing algorithm in hindi | Computer Networks
Distance Vector Routing (DVR)
Generally, what students consider.
7:53 / 25:59


Lec-58: Distance vector routing algorithm in hindi | Computer Networks
Distance Vector Routing (DVR)
N1
N2
N3
N4
N5
1
3
6
2
Dest. Dist. Next
N1 0 N1
N2 1 N2
N3 ∞ -
N4 ∞ -
N5 ∞ -
Dest. Dist Next
N1 1 N1
N2 0 N2
N3 6 N3
N4 ∞ 1
N5 3 N3
1) only neighbour
2) only Distance Vector
Dest. Dist Next
N1 ∞ -
N2 ∞ 2 -
N3 8 2 N3
N4 0 4 N4
N5 4 N1
Dest. Dist Next
N1 ∞ -
N2 6 N2
N3 0 N3
N4 2 N4
N1 → N2
At N1, N2
At N2, N1, N3 N5
At N3, N4, N2
At N4, N3 N5
At N5, N2 N4
See how to update.
10:33 / 25:59

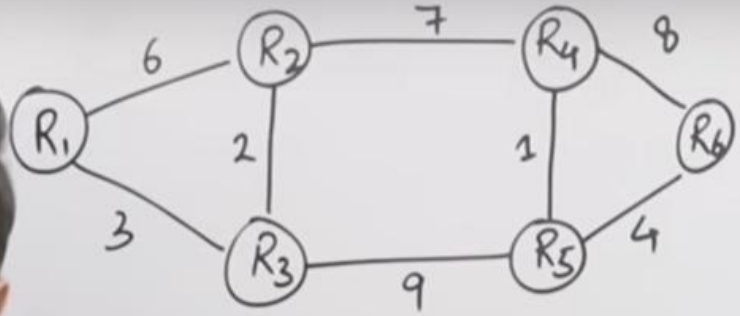

Lec-58: Distance vector routing algorithm in hindi | Computer Networks
Distance Vector Routing (DVR)
And from N2, next you will go to N3.
14:14 / 25:59


Lec-58: Distance vector routing algorithm in hindi | Computer Networks
Distance Vector Routing (DVR)
We have only made one of N1.
15:55 / 25:59


Lec-59: Count to Infinity Problem in Distance Vector Routing
C
A/2
B/1
Internet
1
1
1
∞
∞
1
2
1
3
2
1
3
2
2
1
3
2
∞
3
4
3
5
4
5
6
5
7
They will keep increasing
9:50 / 10:40 • Special Case ›

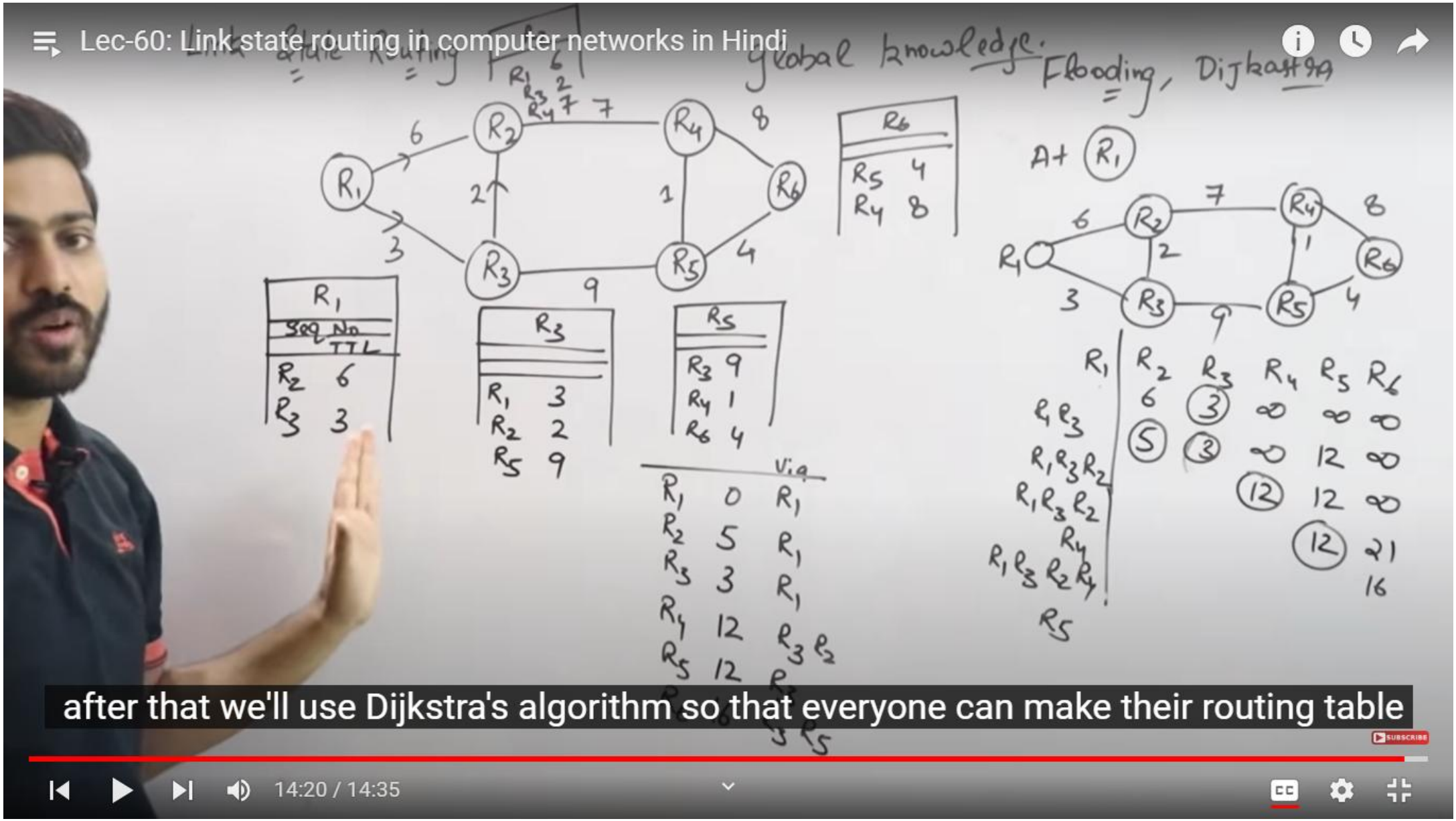

Lec-59: Count to Infinity Problem in Distance Vector Routing
That's why it is
10:00 / 10:40 • Special Case ›

Lec-60: Link state routing in computer networks in Hindi

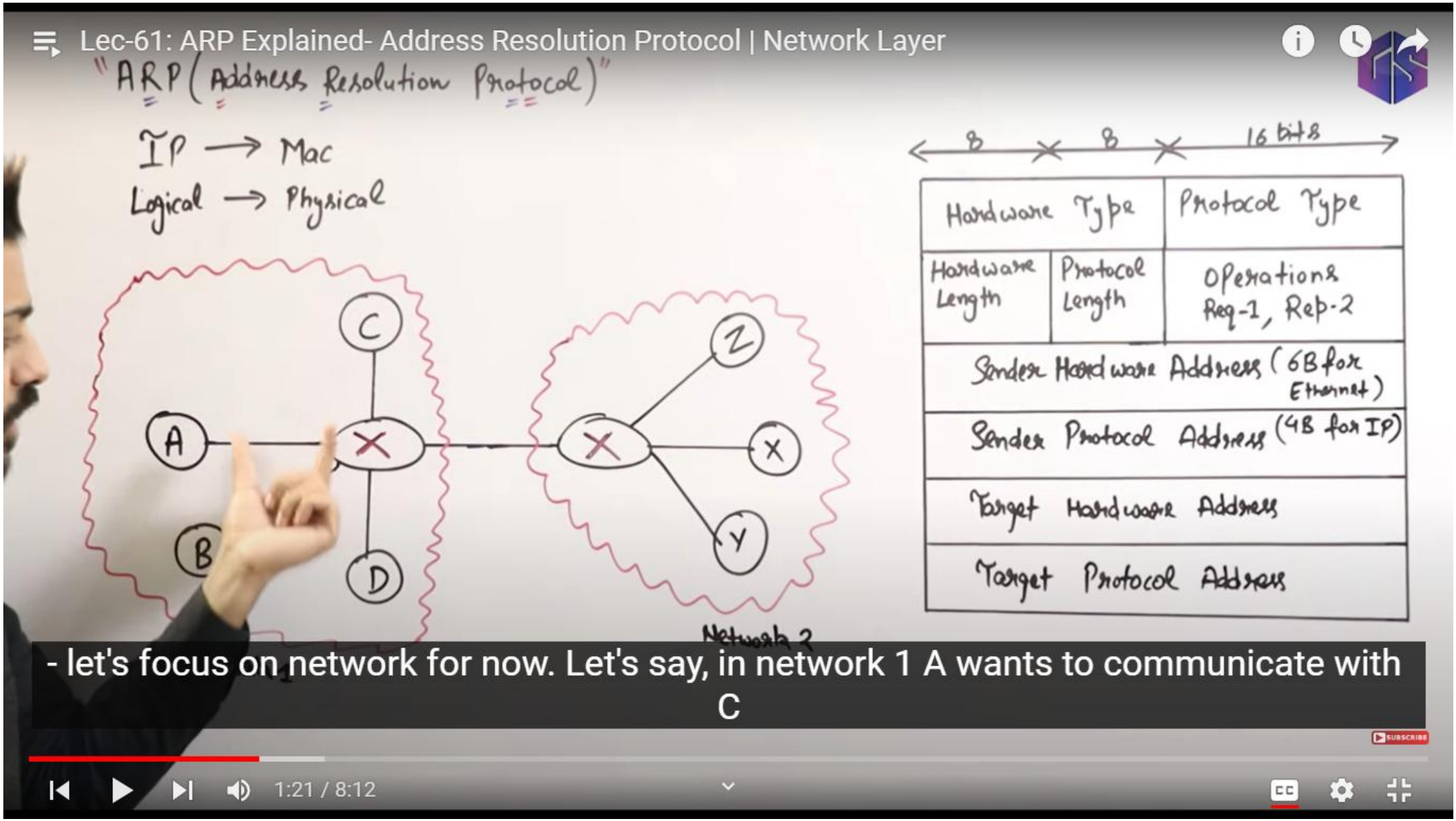


or distance vector, so that the routers

1:16 / 14:35

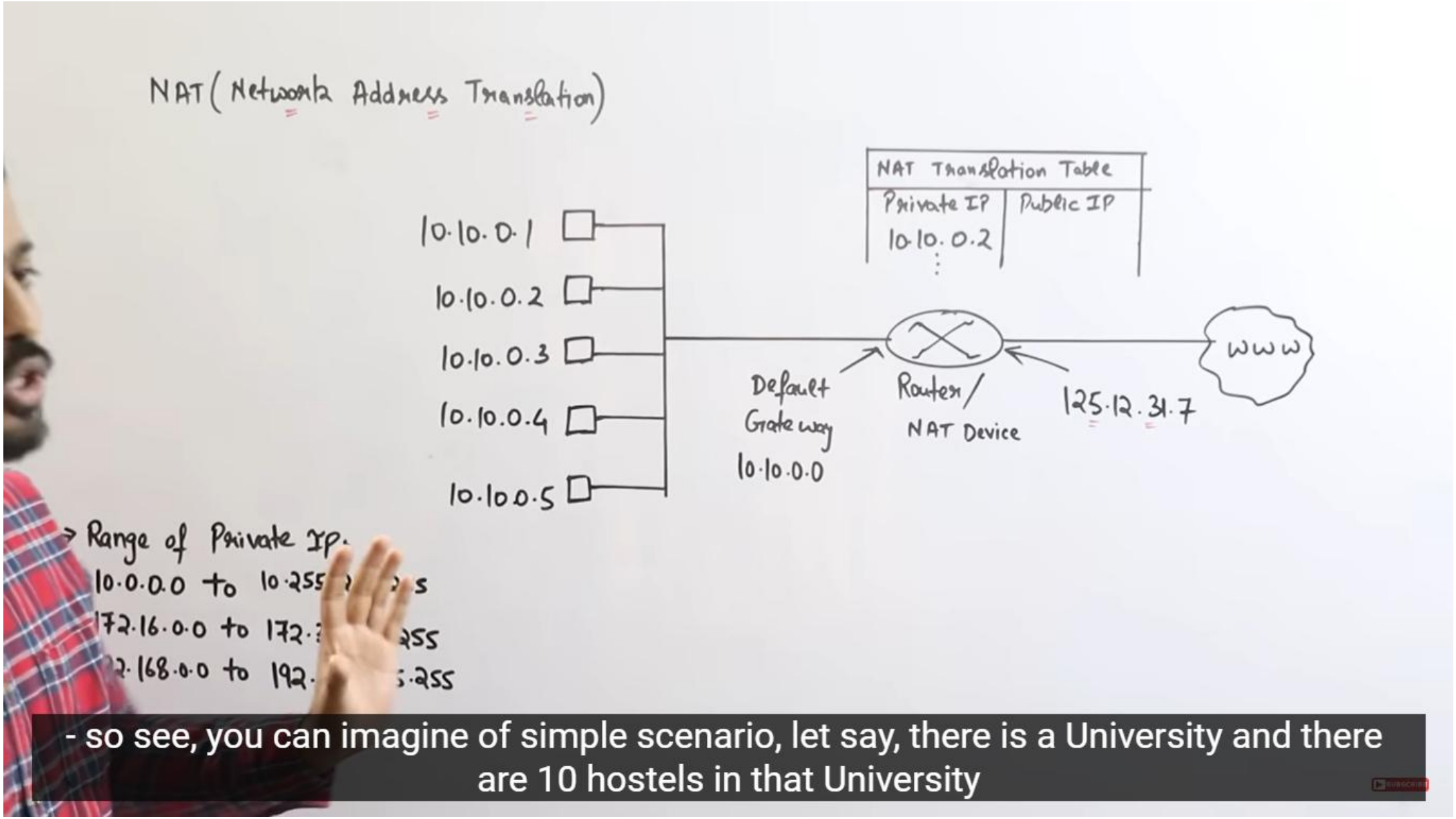

Lec-60: Link state routing in computer networks in Hindi
Global knowledge.
Flooding, Dijkastra
after that we'll use Dijkstra's algorithm so that everyone can make their routing table
14:20 / 14:35

Lec-61: ARP Explained- Address Resolution Protocol | Network Layer



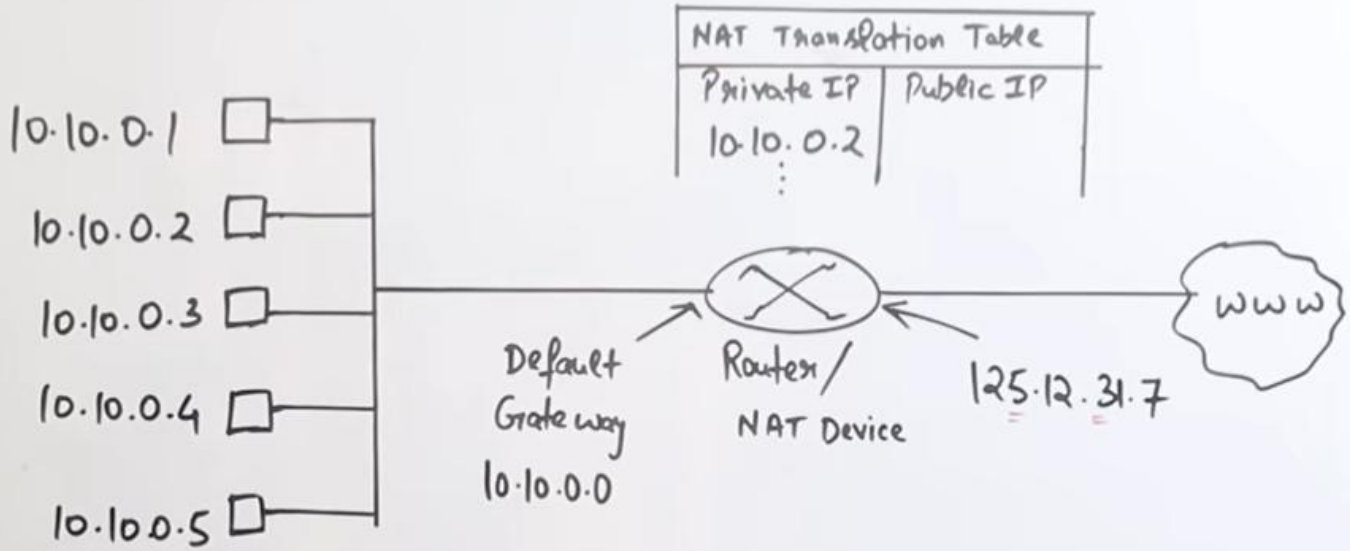
- let's focus on network for now. Let's say, in network 1 A wants to communicate with C

1:21 / 8:12



- so see, you can imagine of simple scenario, let say, there is a University and there are 10 hostels in that University

NAT (Network Address Translation)



→ Range of Private IPs

10.0.0.0 to 10.255.255.255 - 2^{24}

172.16.0.0 to 172.31.255.255 - 2^{20}

192.168.0.0 to 192.168.255.255 - 2^{16}

- so what we'll do is we'll assign private IP addresses. Like if I take example of this college/university