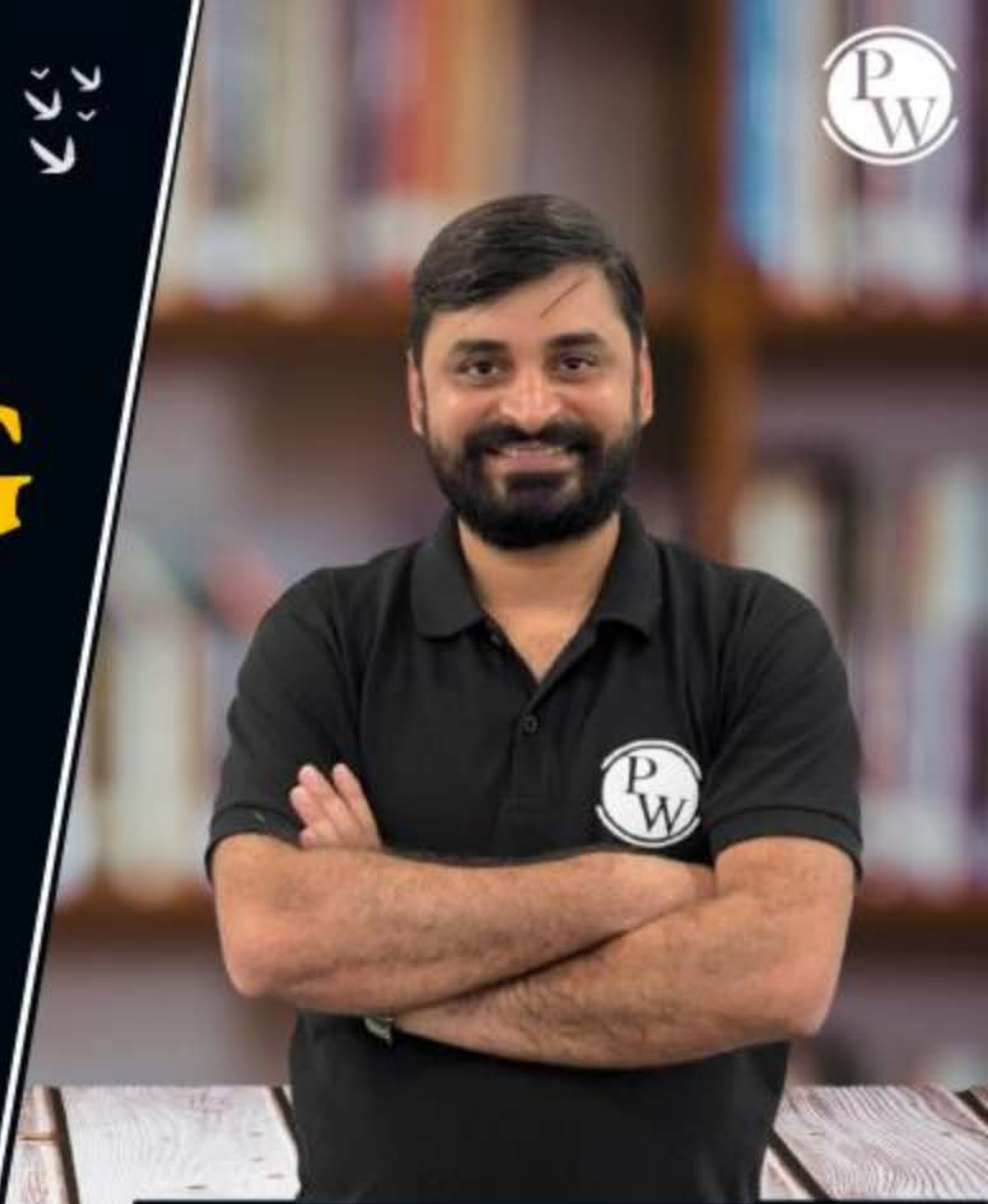
CS & IT ENGINEERING

Computer Network

1500 Series

Lecture No.- 02



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Recap of Previous Lecture

Topic One topic IP Addressing

Topic Two topic subnetting , supernetting

Topics to be Covered

Topic Error control

Topic CRC, checksum, Hamming code

[MSQ]

#Q. An ISP has the following CIDR based IP-address available with it: 200.200.128.0/20.

The ISP wants to give half of this IP-address to Org-A and quarter to Org-B. If first IP-Address will be assigned to a network which consumes more number of IP-address, then what is possible value of 3rd octed of Org-B___________?

A. 136

B. 140

C. 128

D. 132

200.200.128.0/20

NID = 20 bit, HID = 32 - 20 = 12 bit

No. of IP Addresses possible = 2^{12}

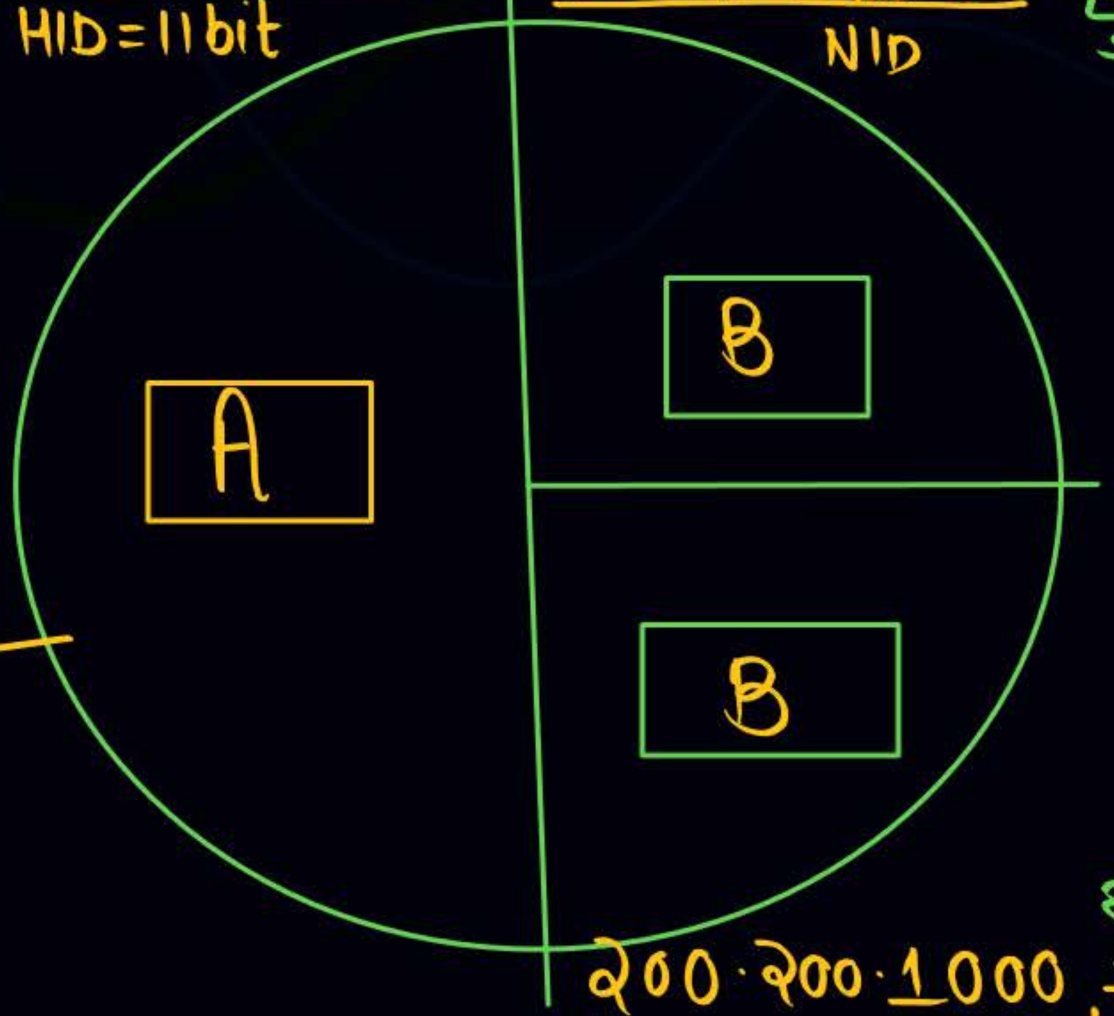
$$\underbrace{200.200.\,1000}_{\substack{8+8+4 \\ \text{NID}}}\,|\,\underbrace{0000.00000000}_{\text{HID}}$$

$$200.200.1000\underbrace{\_\_\_\_.\_\_\_\_\_\_\_\_}_{\text{HID}}$$

2^{12}

$\underbrace{200.200.1000}_{NID}\ \underbrace{\overset{8}{0}}_{SID}\ \underbrace{---.---------}_{HID = 11\,bit}$

$\underbrace{200.200.1000}_{NID}\ \underbrace{\overset{8\,4}{10}}_{SID}\ \underbrace{---.---------}_{HID}$



$A \xrightarrow{SID} 200.200.128.0$

$B \begin{cases} \xrightarrow{SID} 200.200.\underline{136}.0 \\ OR \\ \xrightarrow{SID} 200.200.\underline{140}.0 \end{cases}$

Range :

200.200.128.0
↓
200.200.135.255

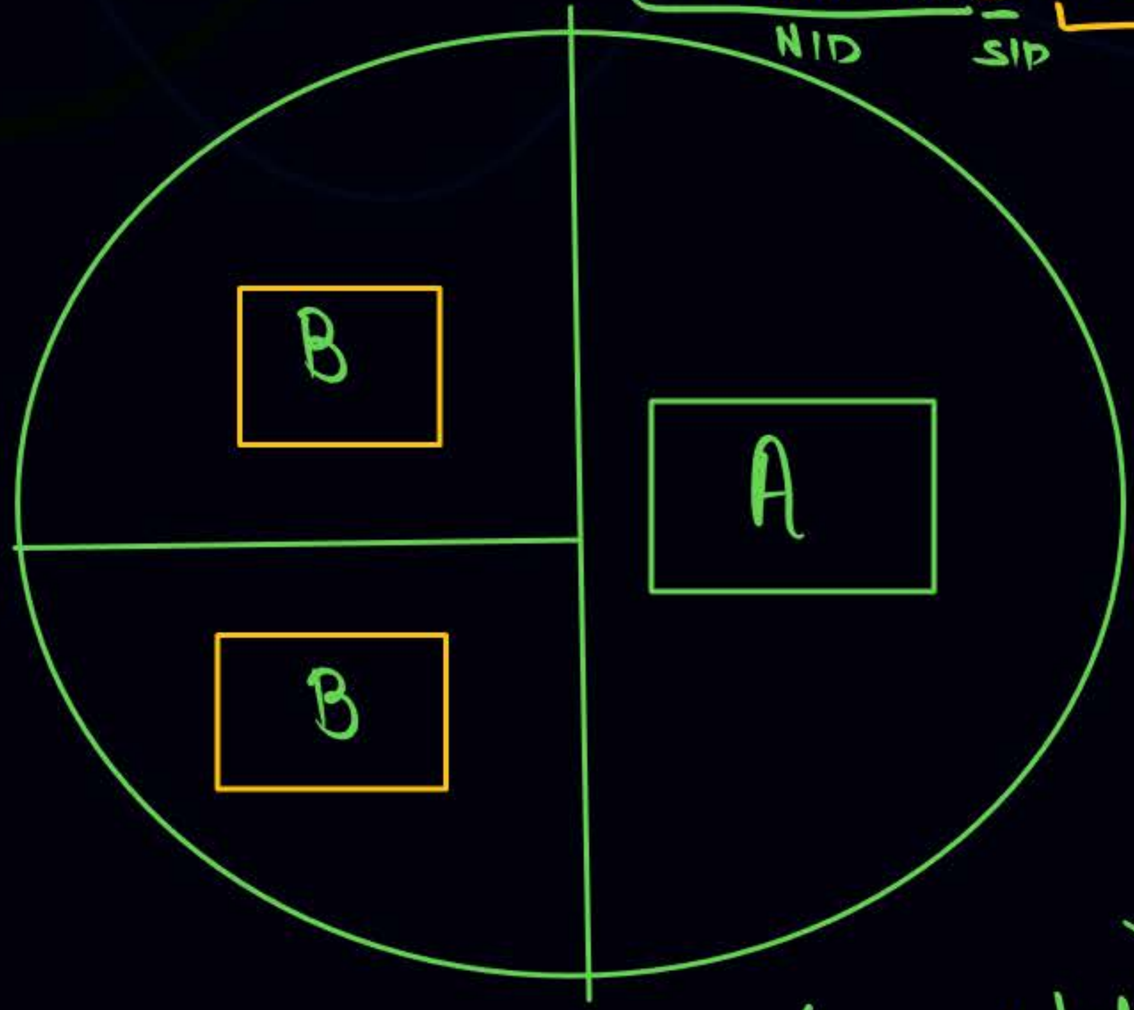
$\underbrace{200.200.1000}_{NID}\ \underbrace{\overset{8\,4}{11}}_{SID}\ \underbrace{---.---------}_{HID}$

OR

00

2^{12} $\underbrace{200.200.1000}_{NID}\underbrace{1}_{SID}^{8}$ $\underbrace{\text{- - - - - - - - - - -}}_{HID}$

$$\begin{array}{r} 128 \\ +\ 15 \\ \hline 143 \end{array}$$



Range

200.200.136.0

↓

200.200.143.255

01

(Invalid)

#Q. Checksum value of 1001001110010011 and 1001100001001101 of 16 bit segment is-

A 0010101000011111

B 0011111000100101

C 1101010000011110

D 1101010000111111

$$
\begin{array}{r}
1001001110010011 \\
+\ 1001100001001101 \\
\hline
1\ 0010101111100000 \\
+1 \\
\hline
0010101111100001 \\
\hline
1101010000011110 \\
\hline
\end{array}
$$

1's comp

[MCQ]

#Q. The Hamming codeword 11010110011 is received by receiver. For this codeword, the Hamming code(even parity) check at the receiver indicates that:

A. There is an error in the third bit transmitted

B. There is an error in the fourth bit transmitted

C. There is an error in the seventh bit transmitted

D. There is no error, codeword is accepted by receiver

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

$\underline{P_1}$

1 3 5 7 9 11

1 0 0 1 0 1 $\rightarrow$ odd$(P_1 = 1)$

$\underline{P_2}$

2 3 6 7 10 11

1 0 1 1 1 1 $\rightarrow$ odd$(P_2 = 1)$

$\underline{P_4}$

4 5 6 7

1 0 1 1 $\rightarrow$ odd$(P_4 = 1)$

$\underline{P_8}$

8 9 10 11

0 0 1 1 $\rightarrow$ even$(P_8 = 0)$

P_8	P_4	P_2	P_1
0	1	1	1

$\rightarrow 7^{th}$ bit got corrupted

[MCQ]

14 4 15

#Q. A 12-bit Hamming code whose hexadecimal value is 0xE4F arrives at a receiver. What was the original value in hexadecimal? Assume that not more than 1 bit in error. If we are using every parity.

A. E4F

B. C4F

C. D4F

D. A4F

1 2 3 4 5 6 7 8 9 10 11 12

1 1 1 0 0 1 0 0 1 1 1 1

$\underbrace{1\ 0\ 1\ 0}_{A}\ \underbrace{0\ 1\ 0\ 0}_{4}\ \underbrace{1\ 1\ 1\ 1}_{F}$

Original msg = A4F

P_1

1 3 5 7 9 11

1 1 0 0 1 1 → even ($P_1 = 0$)

P_4

4 5 6 7 12

0 0 1 0 1 → even ($P_4 = 0$)

P_2

2 3 6 7 10 11

1 1 1 0 1 1 → odd ($P_2 = 1$)

P_8

8 9 10 11 12

0 1 1 1 1 → even ($P_8 = 0$)

P_8	P_4	P_2	P_1
0	0	1	0

→ 2^{nd} bit (Error)

[MCQ]

#Q. Assume that a 12-bit hamming codeword consisting of 8 bit data = 110×0101 and check bits = y000, what are the value of x and y if data in encoded using even parity?

A. $x = 0, y = 0$

B. $x = 0, y = 1$

C. $x = 1, y = 0$

D. $x = 1, y = 1$

P_1	P_2	3	P_4	5	6	7	P_8	9	10	11	12
y	0	1	0	1	0	X	0	0	1	0	1

$\underline{P_1}$

1	3	5	7	9	11
y	1	1	X	0	0
0	1	1	0	0	0

(Y=0 For even parity)

$\underline{P_2}$

2	3	6	7	10	11
0	1	0	X	1	0
0	1	0	0	1	0

→ even

$\underline{P_4}$

4	5	6	7	12
0	1	0	X	1

(X=0 For even parity)

$\underline{P_8}$

8	9	10	11	12
0	0	1	0	1

→ even

[MCQ]

#Q. The codeword c(x) = x9 + x 6 + x5 + x3 + x + 1 has arrived on a network link where the sender and receiver are using CRC with the generator polynomial g(x) = x3 + x2 + 1. For this particular transmission, the CRC check at the receiver indicates that:

A. there is an error in the fourth bit transmitted

B. there is an error in the fifth bit transmitted

C. there is an error, but we cannot say about which bit contains error

D. There is no error, codeword is accepted by receiver.

$c(x) = 1001101011$

$g(x) = 1101$

Receiver

$$
\begin{array}{r}
1101\,\overline{)\,1001101011\,}\\
1101\\
\hline
0100101011\\
1101\\
\hline
01000011\\
1101\\
\hline
0101011\\
1101\\
\hline
0110011\\
1101\\
\hline
000111
\end{array}
$$

$\Rightarrow$ Remainder or syndrom $\neq 0$ (error)

2 mins Summary

Topic One

Topic Two

Topic Three

Topic Four

Topic Five

Error control

CRC, checksum, Hamming code

THANK - YOU