

# CS & IT ENGINEERING

COMPUTER NETWORKS

IPv4 Header & Fragmentation

**Lecture No-1**



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A stylized laptop with a blue screen and an orange base. The screen displays the text 'TOPICS TO BE COVERED'.

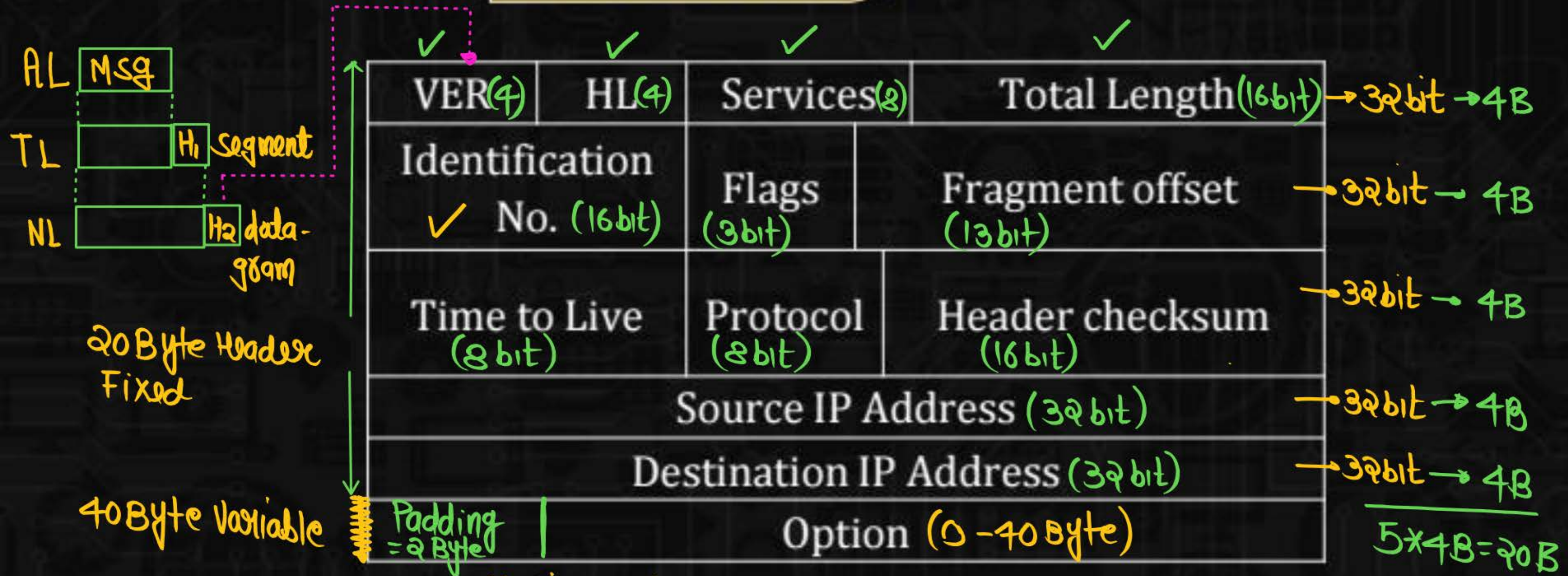
TOPICS TO  
BE  
COVERED

A dotted orange arrow pointing from the laptop screen to the 'IPv4 Header' box.

**IPv4 Header**



# IPv4 Header



Minimum Header size = 20 + 0 B = 20 Byte

Maximum Header size = 20 + 40 B = 60 Byte



## Header Length (HL)

HL = 4 bit Maximum No → 1111 → 15

Maximum Header size = 60 Byte

$$\frac{60}{4} = 15$$

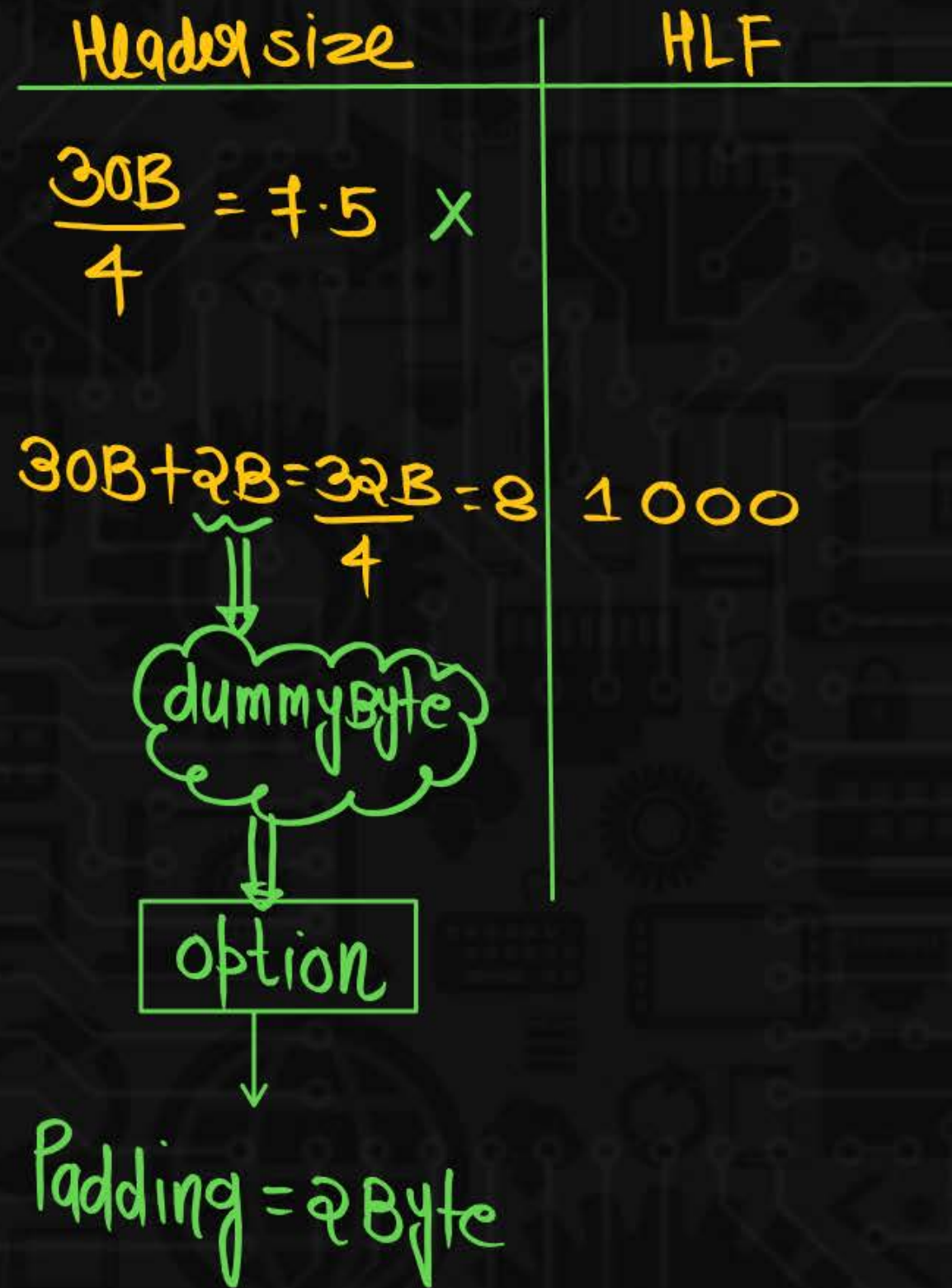
(S.F) → 15

$$\frac{60}{4} = 15$$

(S.F) → 15

Header size	HLF
$\frac{20B}{4} = 5$	0101
$\frac{32B}{4} = 8$	1000
$\frac{40B}{4} = 10$	1010
$\frac{60B}{4} = 15$	1111





HLF	Header size
0101 = 5	5 * 4 = 20Byte
1000 = 8	8 * 4 = 32Byte
1100 = 12	12 * 4 = 48Byte
1010 = 10	10 * 4 = 40Byte
1110 = 14	14 * 4 = 56Byte
1111 = 15	15 * 4 = 60Byte
HLF (5-15)	Header size (20Byte-60Byte)

## VERSION (4 bit):

It is used to indicate IPv4 or IPv6

IPv1 X

IPv2 X

IPv3 X

IPv4 ✓ → [0100]

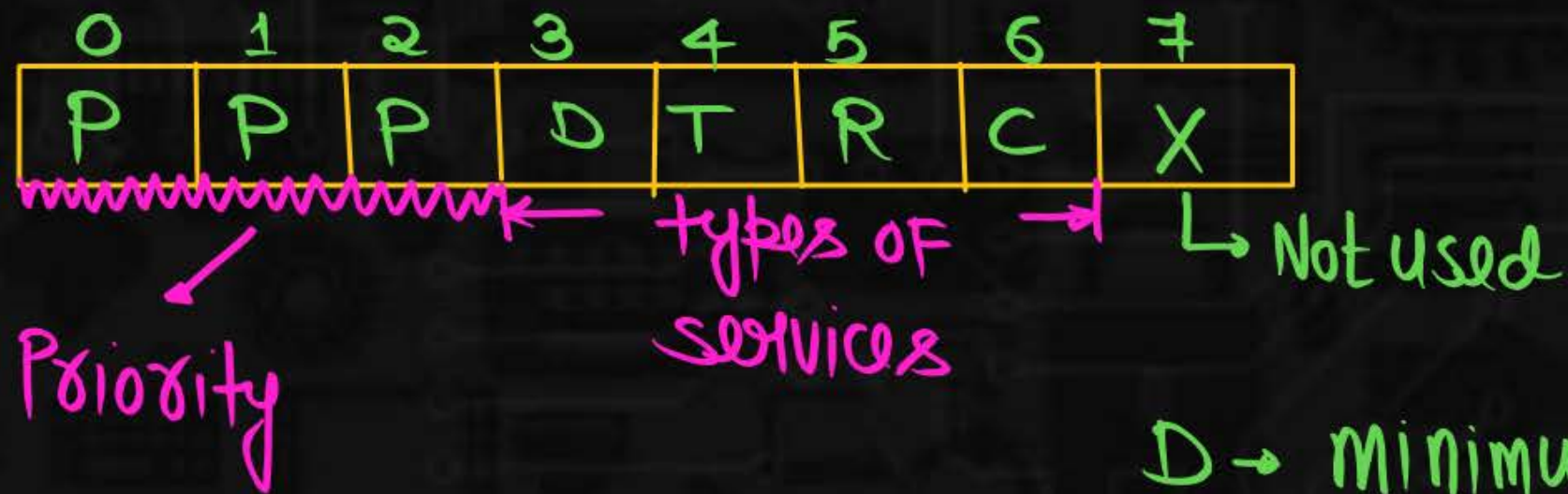
IPv5 X

IPv6 ✓ → [0110]



## Services : (8bit)

In this Interpretation the first 3 bit are called precedence bit (Priority\_bit) and Next 4 bit are called types of services bits and last bit is Not used.



D → minimum delay

T → maximum throughput

R → High Reliability

C → min cost



## Priority :

It is a 3 bit subfield ranging from 0 to 7 (000 to 111 in binary ).  
 Priority field is needed if a router is congested need to discard  
some datagram , those datagram which have the lowest priority  
are discarded first

D	T	R	C	
0	0	0	0	Default
1	0	0	0	minimum Delay
0	1	0	0	Maximum Throughput
0	0	1	0	High Reliability
0	0	0	1	minimum cost



## Types of Services :

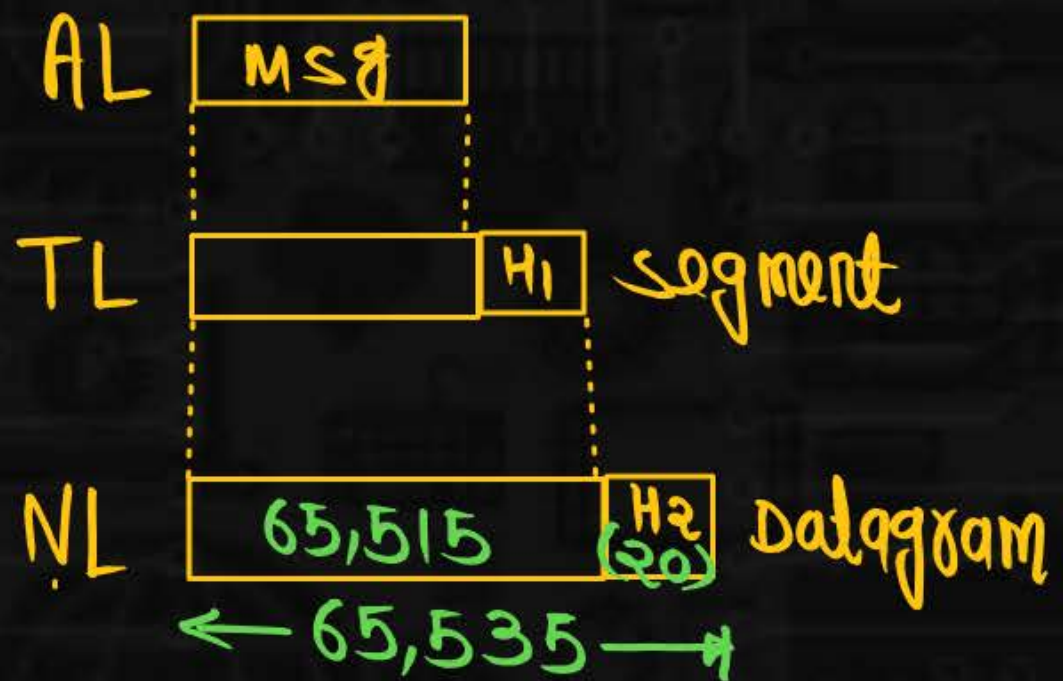
It is a 4 bit subfield . Each bit having a special meaning .although a bit can be 0 or 1 . One and only one of the bits can have the value 1 in each datagram.



Total Length: = 16 bit

$$\text{Total length} = 16 \text{ bit} \xrightarrow{\text{max. Number}} 2^{16} - 1 = 65,535$$

Total length = Data + Header



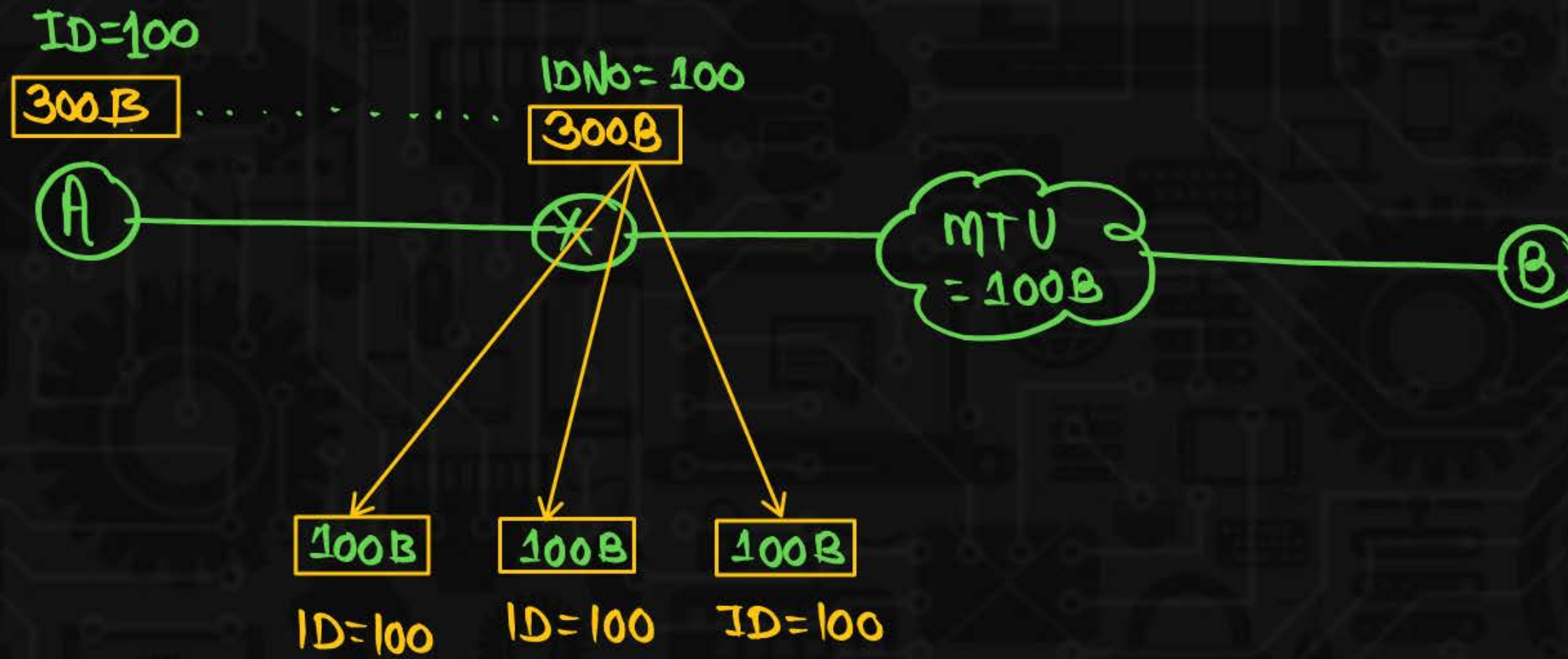
Maximum data size at NL = 65,515



## Identification Number OR Datagram Number (16 bit)

1. Each datagram is associated with a sequence no. is called as datagram no. or identification no.
2. It is used to identify all the fragment of same datagram.
3. All the fragment of same datagram will have the same identification no.







## Flags :

It is the 3 bit Field or shown in the figure.

X	D	M
	F	F

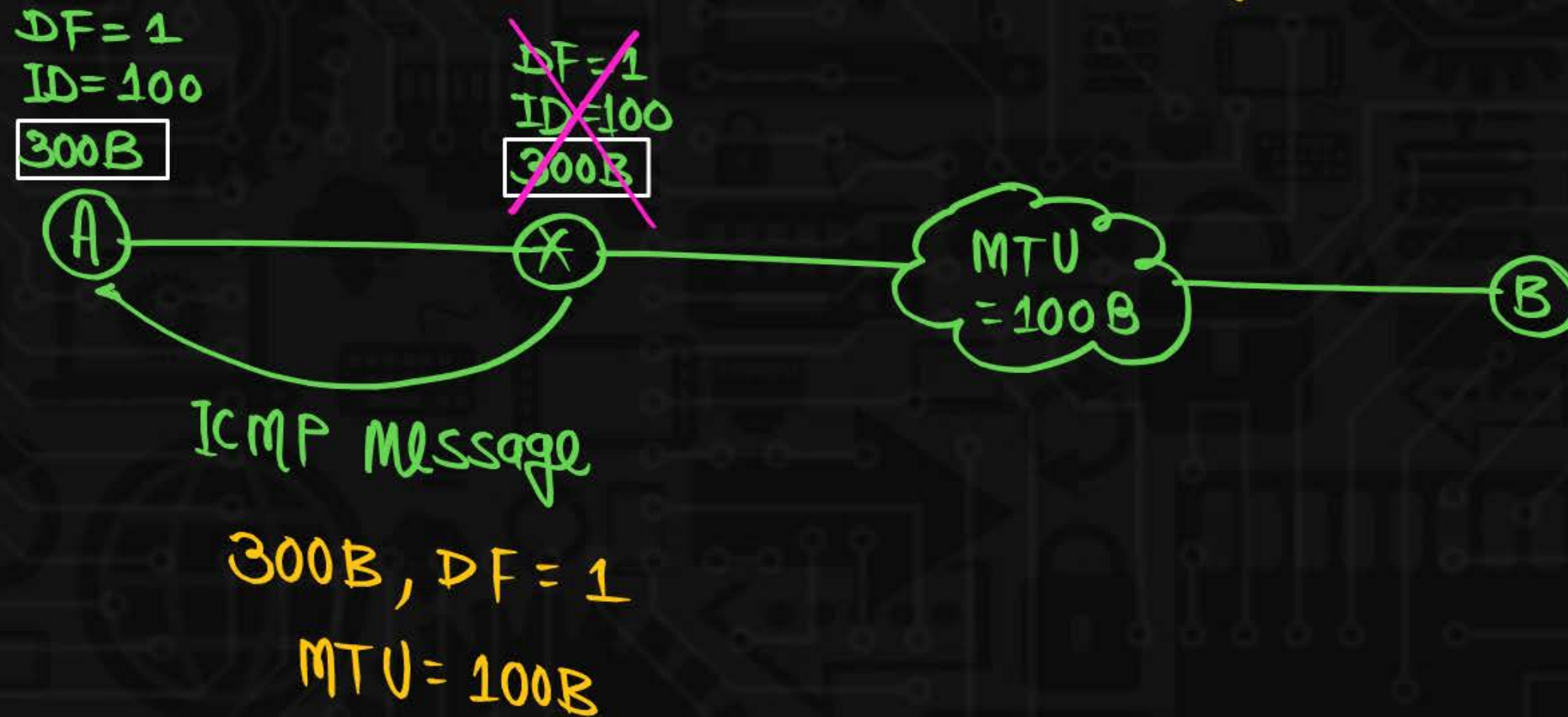
- 1<sup>st</sup> bit is not used
- 2<sup>nd</sup> bit is called as Don't Fragment
- 3<sup>rd</sup> bit is called as More Fragment

## DF (Don't Fragment)

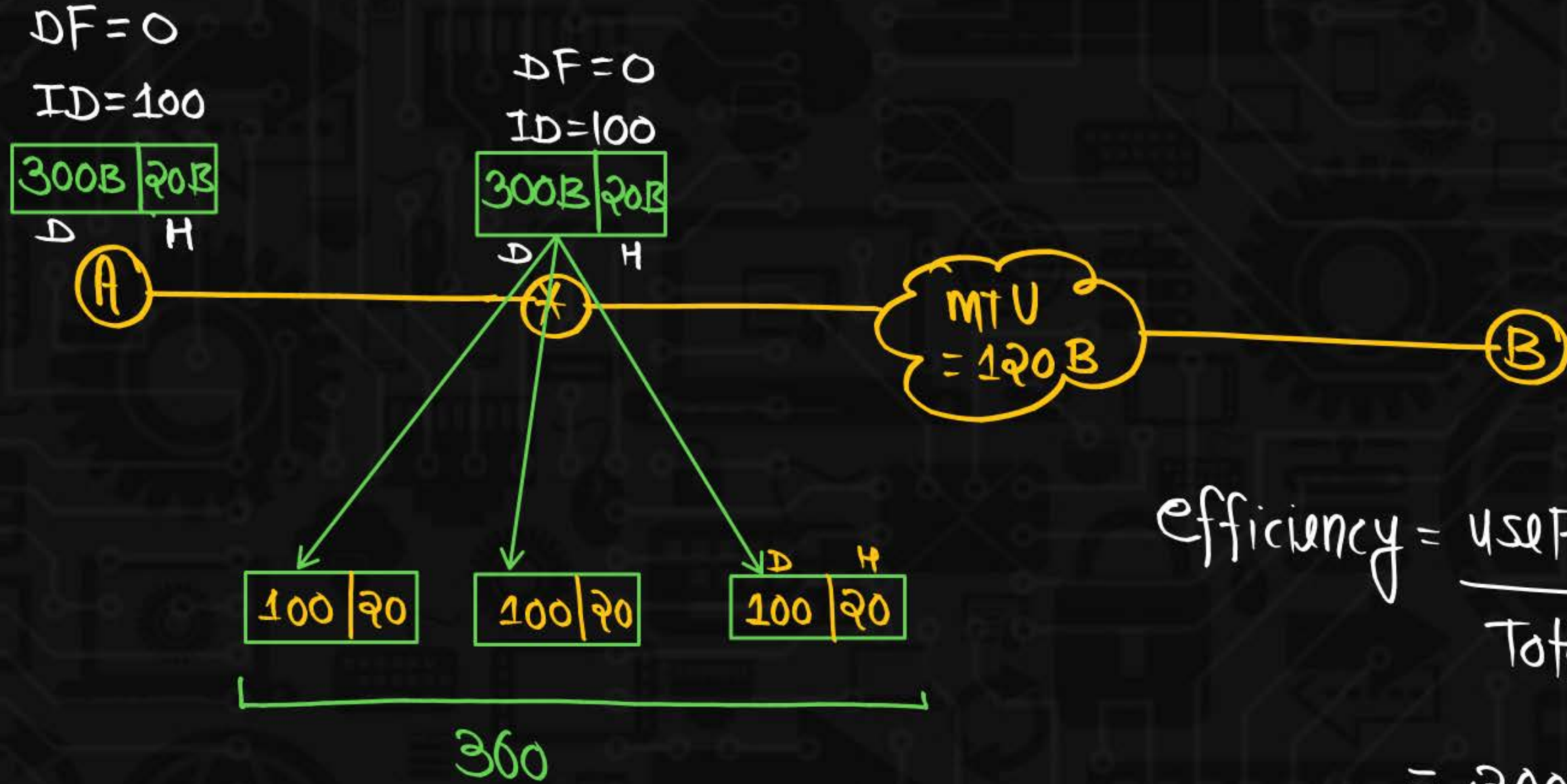


1.  $DF = 1 \rightarrow$  means datagram can not be Fragment

2.  $DF = 0 \rightarrow$  means datagram can be Fragmented







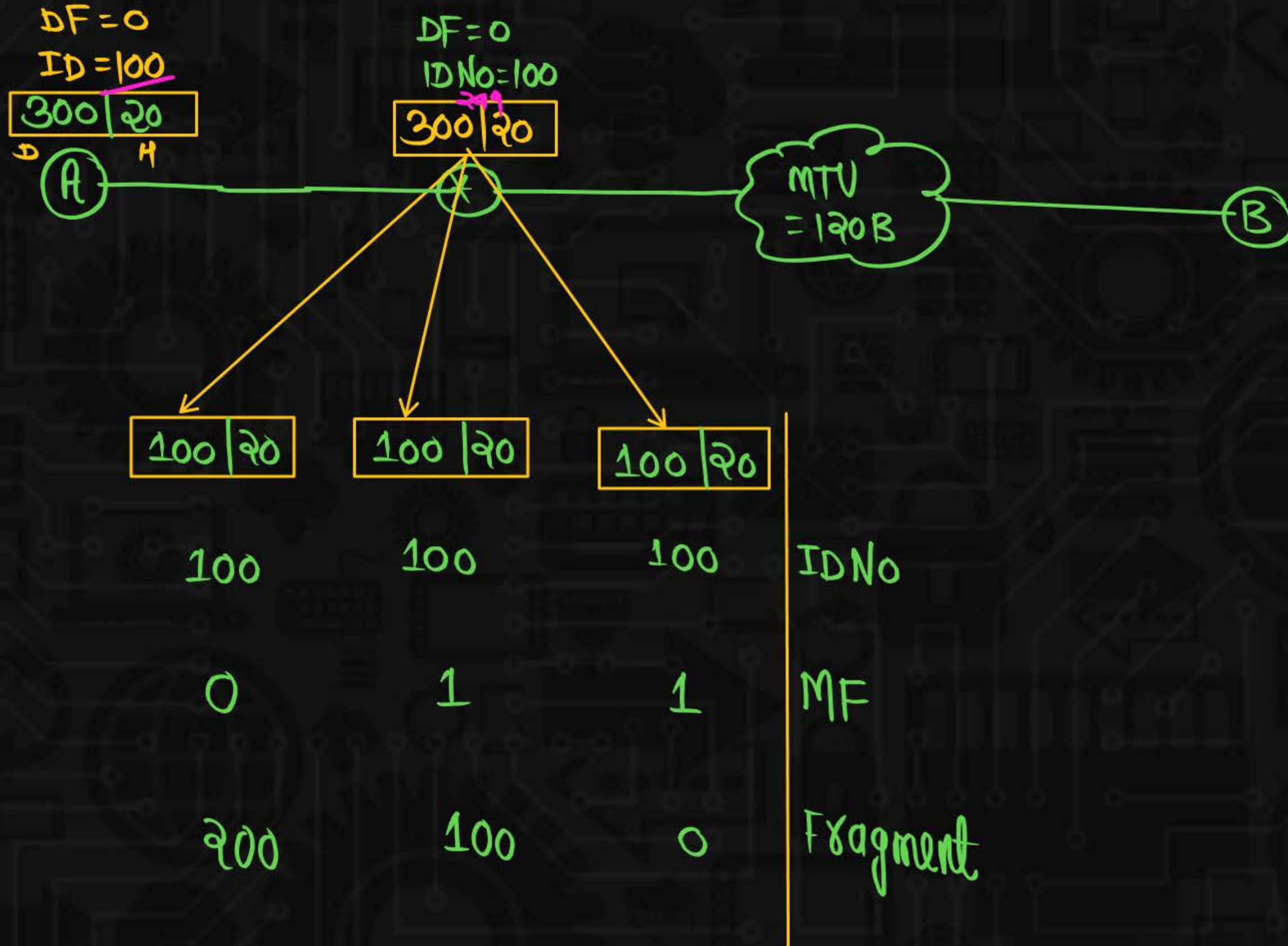
## MF (More Fragment)



$MF = 1 \rightarrow$  means this is not the Last Fragment there are more Fragment after this Fragment

$MF = 0 \rightarrow$  means this is Last Fragment or only Fragment





## Fragment offset : (13bit)

Fragment offset indicate no of data byte ahead of this fragment in that particular packet.

Note(1) IP is a Packet stream Protocol i.e every Packet is associated with one sequence Number

(2) TCP is a Byte stream Protocol i.e every Byte is associated with one sequence Number



