

Cards

Token Ring

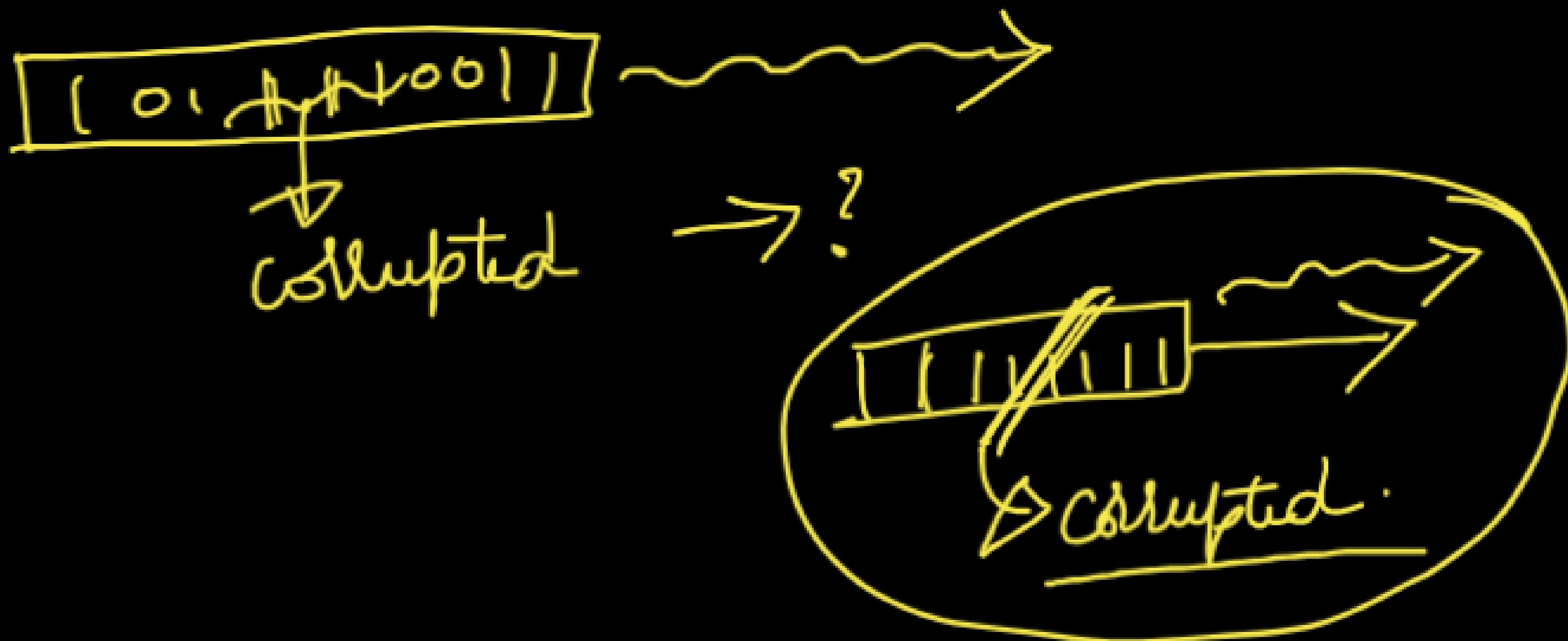


beautiful concept



Removed from the syllabus

Error handling



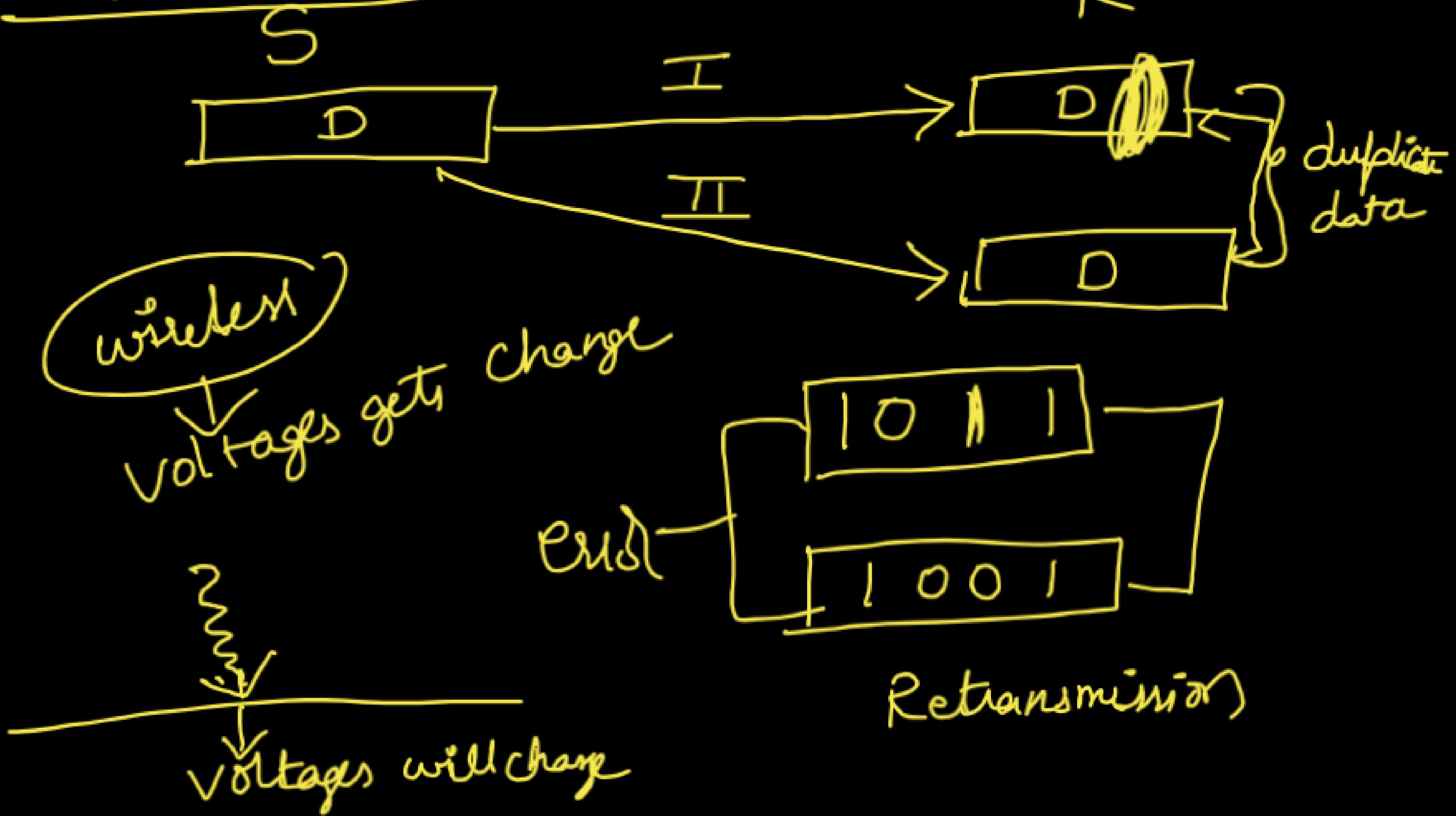
Error handling

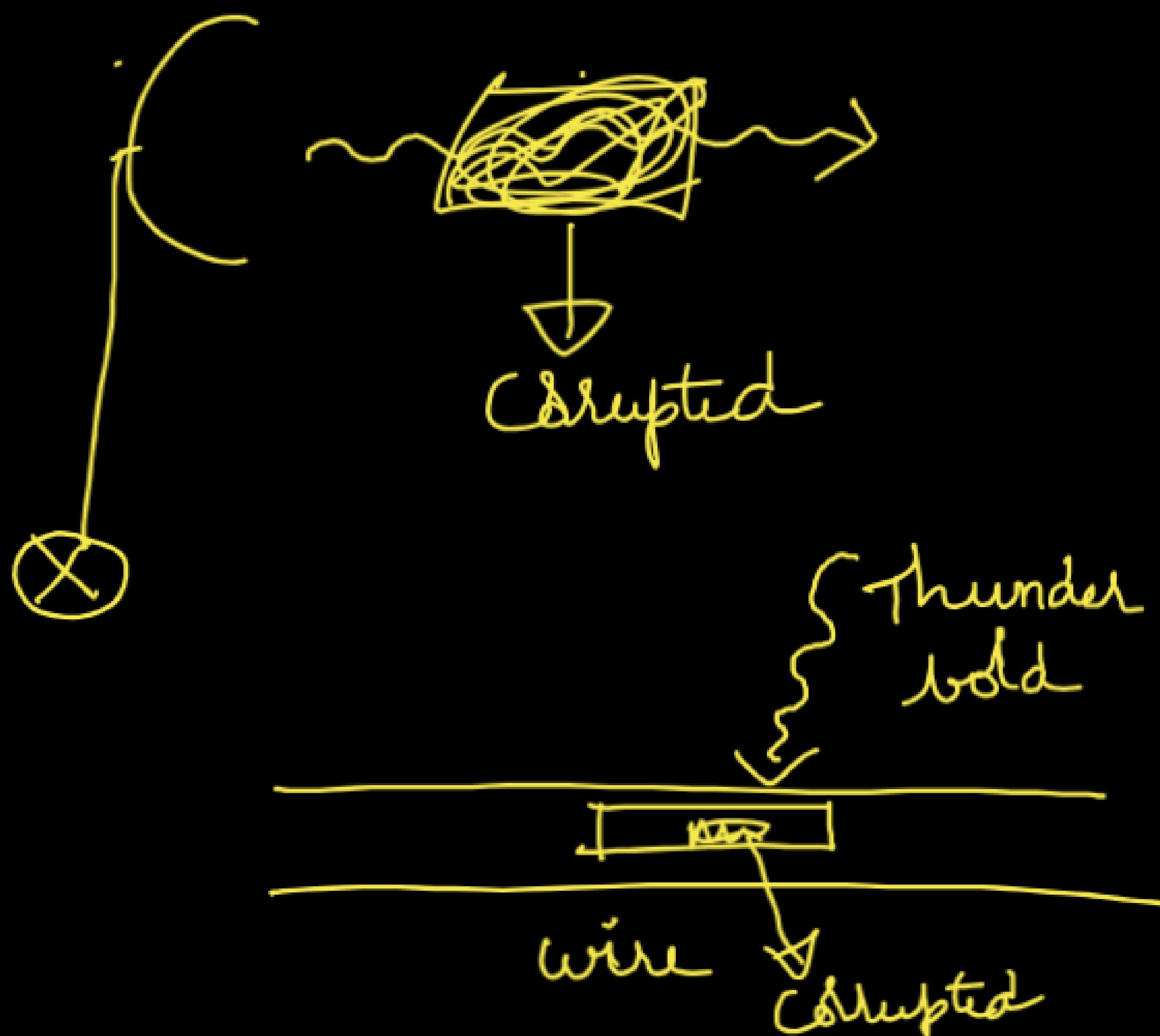
Error detection

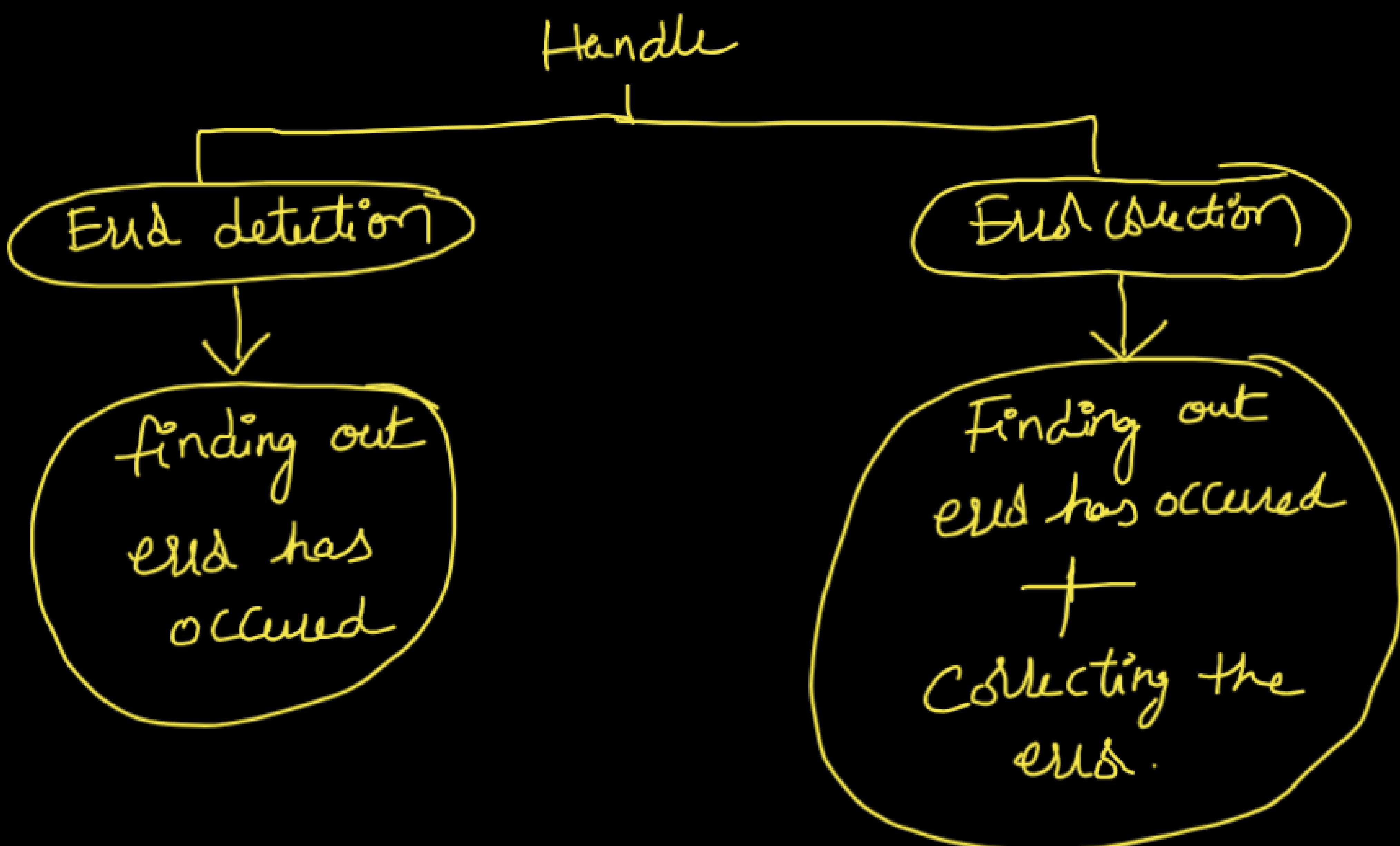
Error correction

- 1) Sending the data
two times

Duplicate data for error detection \rightarrow not used

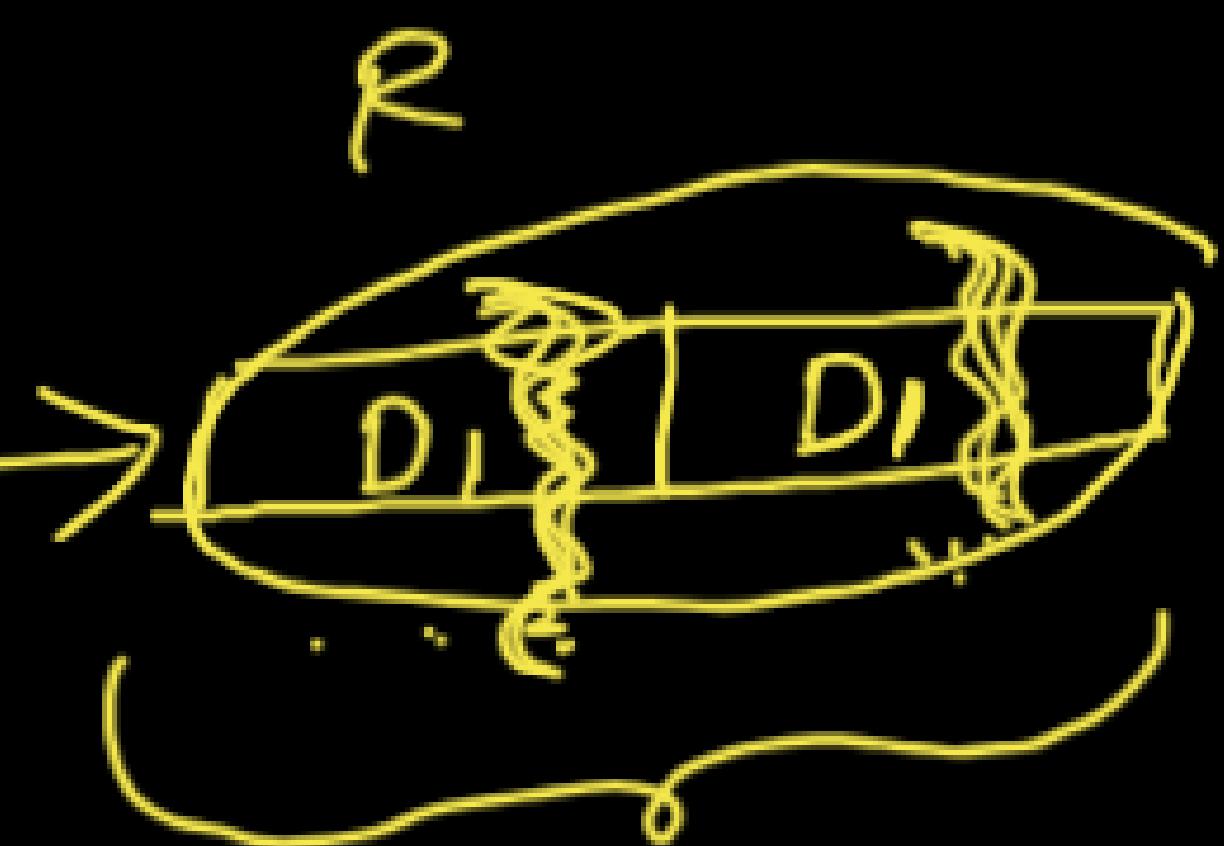
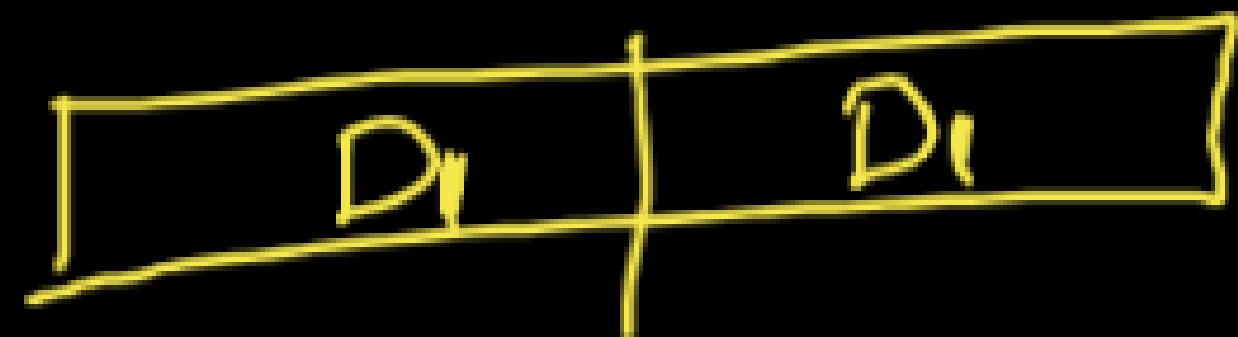






Simple Error detection method:

Send data 2 times

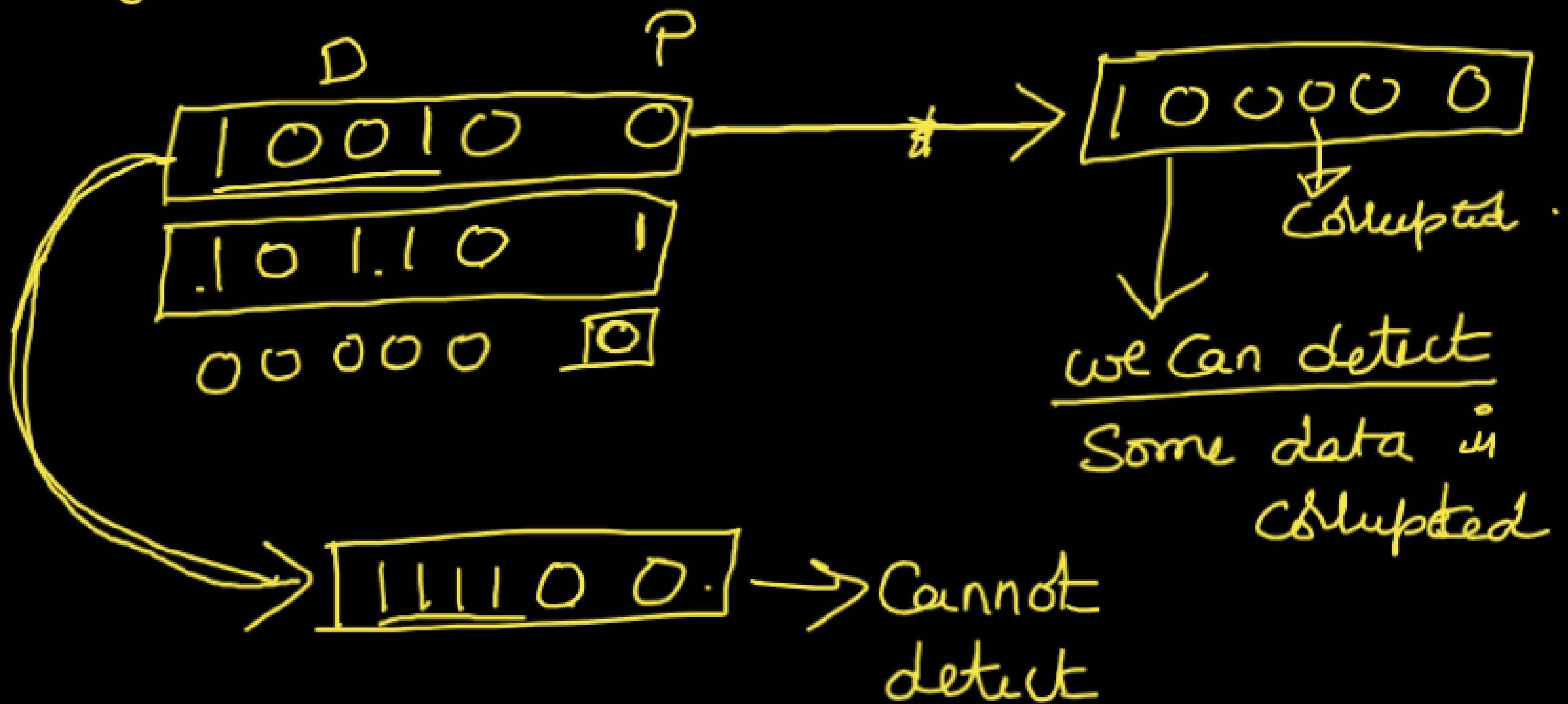


Disadv: Too much traffic

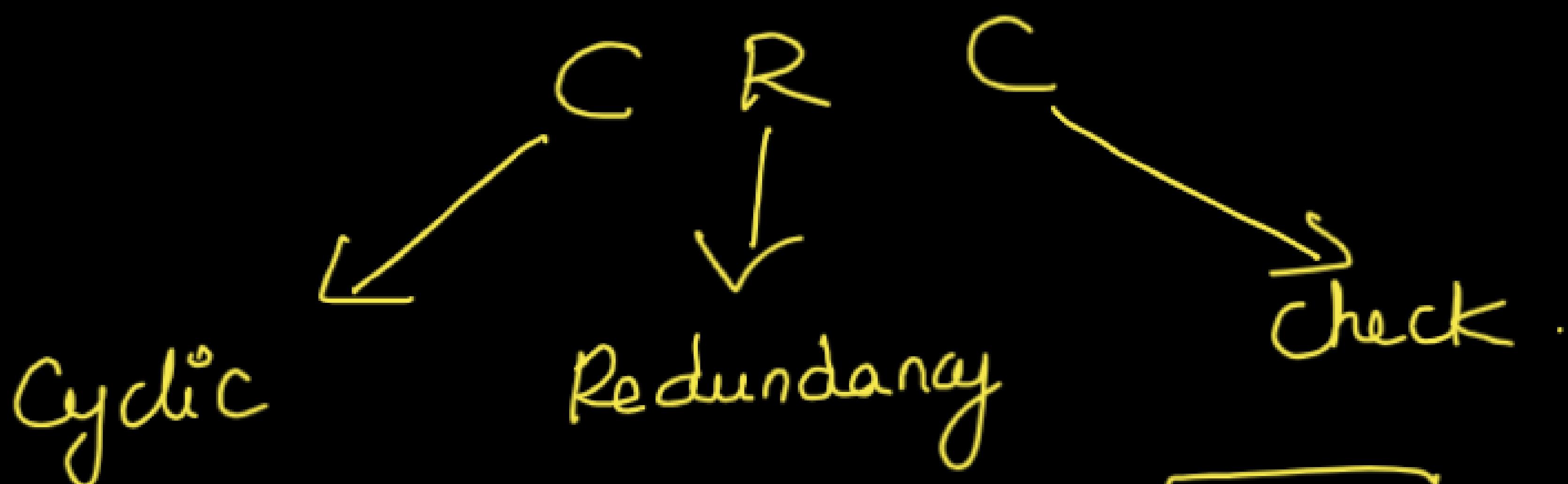
Both the
data will
be different

Error detection detection ② X useless in CN's

Parity bit \rightarrow total 1's in packet are even.



Error detection ③ .



Very important \rightarrow [Gate] ✓
Used in Computer Networks ✓

DLL \rightarrow uses it.

Let Data = 1011011, CRC generator = 1101

then what is data transmitted.

division +

$$\begin{array}{r} 1101 \\ \times 1101 \\ \hline 0110011000 \end{array}$$

add 3 zeros



1101

4 bits

↓

$$\begin{aligned} \text{CRC} &= 4 - 1 \\ &= 3 \text{ bits} \end{aligned}$$

1011011001

last 3 bits = CRC

Total data

transmitted

1101

\oplus → Shortcut → modulo 2 sum

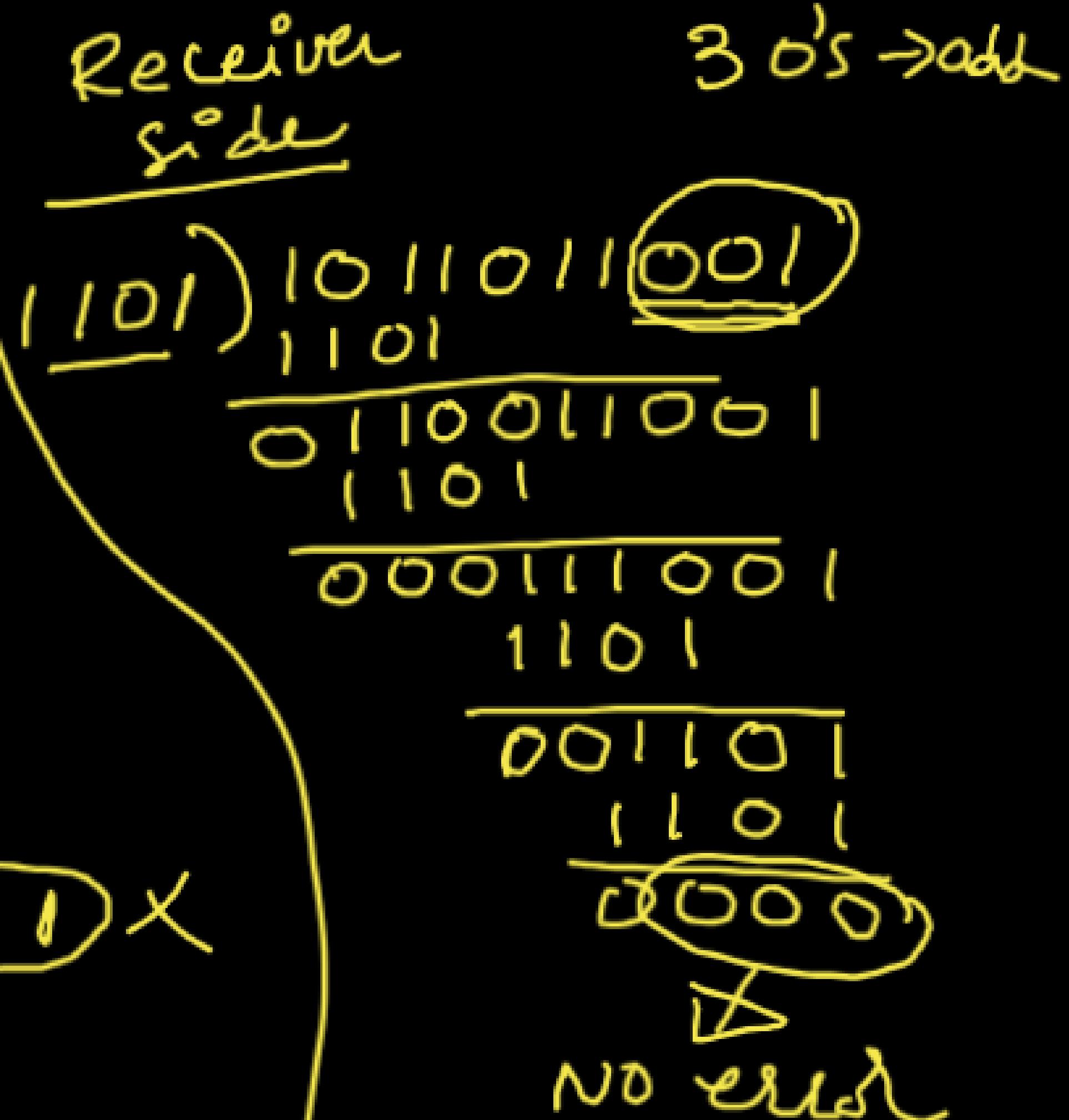
$$\left\{ \begin{array}{l} 1 \oplus 1 = 1+1 = \frac{2 \% 2}{2 \% 2} = 0 \\ 1 \oplus 0 = 1+0 = 1 \% 2 = 1 \\ 0 \oplus 0 = 0+0 = 0 \% 2 = 0 \\ 1 \oplus 1 \oplus 1 \oplus 1 = 1+1+1+1 = 4 \% 2 = 0 \\ 1 \oplus 0 \oplus 0 \oplus 1 = 1+1 = 2 \% 2 = 0 \end{array} \right.$$

Data : 1011011 CRC gen = 1101 CRC = 3 bits

Sender side



Receiver side



The diagram illustrates a sequence of binary digits: 1011011001. This sequence is enclosed in a rectangular box labeled "Data Sent". An arrow points from the end of the sequence to the right, where the same sequence is shown again but with the last two digits underlined as 11. This underlined portion is labeled "Corrupted", indicating that the final two bits of the transmitted data have been altered.

at R side:

at R side.

```

11011110110010
|
1101
-----
1101
1101
-----
1001001
1101
-----
100001
1101
-----
10101
1101
-----
01111
01101

```

Retransmission

Error detection
only

not correction

D CRC

C CRC

Retransmit

one in the pocket

X zero

0010

Data = 1100111 CRC = 1011
Gene CR€ = ?
 CRC = 3 bits

$$\begin{array}{r} 1011 \\ \times 1100111 \\ \hline 011111000 \\ -1011 \\ \hline 010011000 \\ -1011 \\ \hline 000100000 \\ -1011 \\ \hline 0000100 \end{array}$$

Exam → CRC generator polynomial

$$x^3 + x + 1 \rightarrow \text{CRC generator}$$

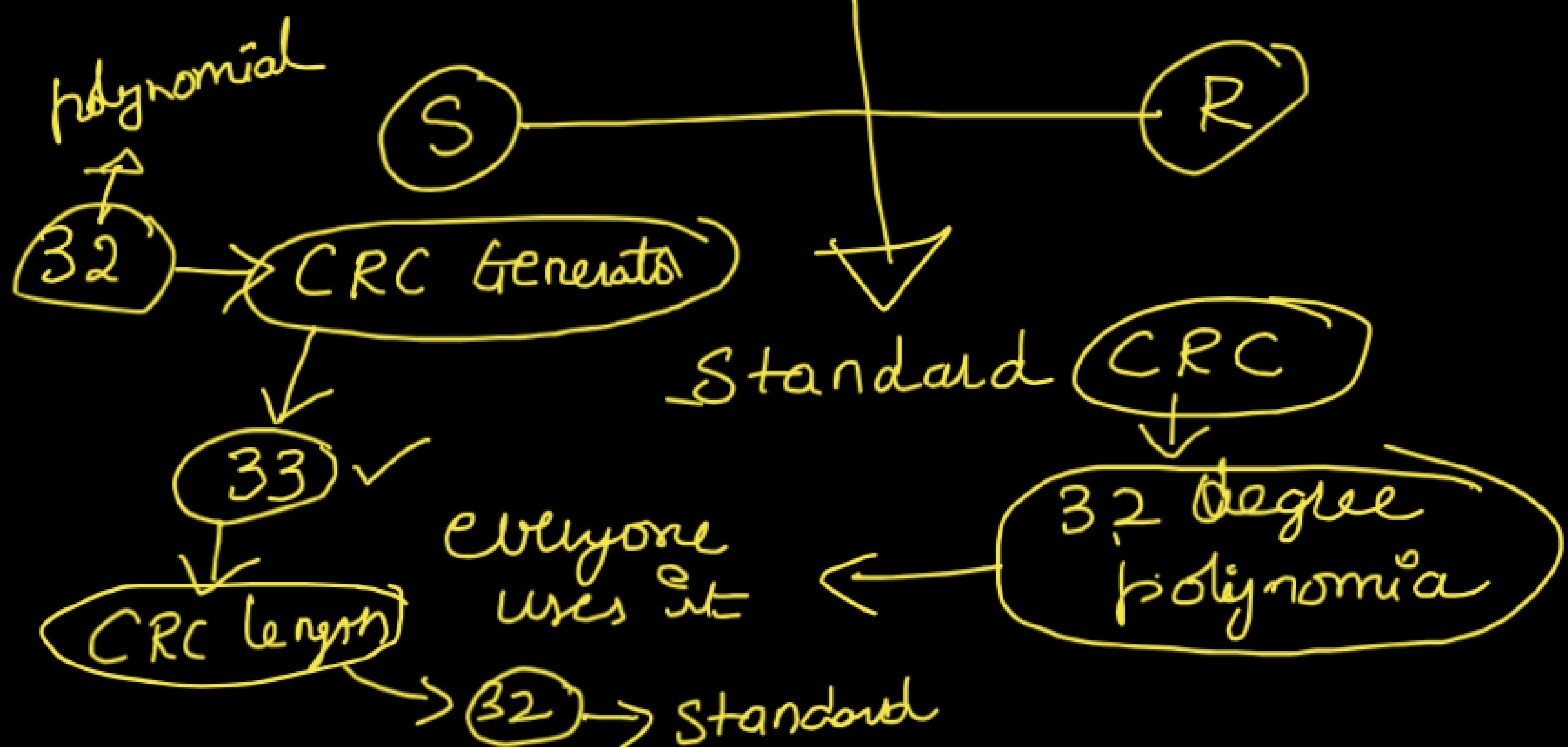
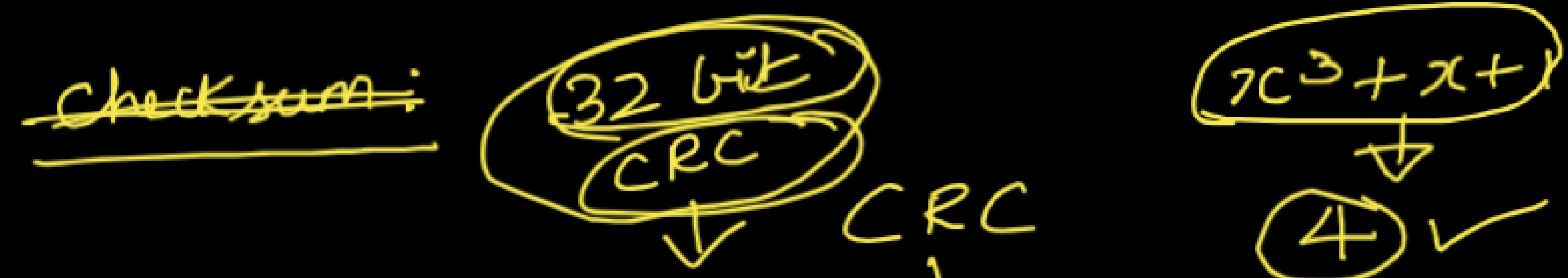
$$1 \cdot x^3 + 0 \cdot x^2 + 1 \cdot x + 1 \cdot x^0$$



→ CRC length = 3 bits

Data = 11010, CRC poly = $x^3 + x + 1$, CRC = ?
CRC G = 1011

$$\begin{array}{r} 1011 \\ \times 11010 \boxed{000} \\ \hline 01100000 \\ 1011 \\ \hline 0111000 \\ 1011 \\ \hline 0101000 \\ 1011 \\ \hline 00010 \end{array} \quad 010$$



Bleach - 5 min

if CRC Generator = K bits, then add $(K-1)$ 0's

and CRC = $(K-1)$ bits (at sender size)

(at R side) \rightarrow don't add 0's

If CRC generator poly is ' K ' degree, then

CRC generator = $(K+1)$ bits and CRC = K bits

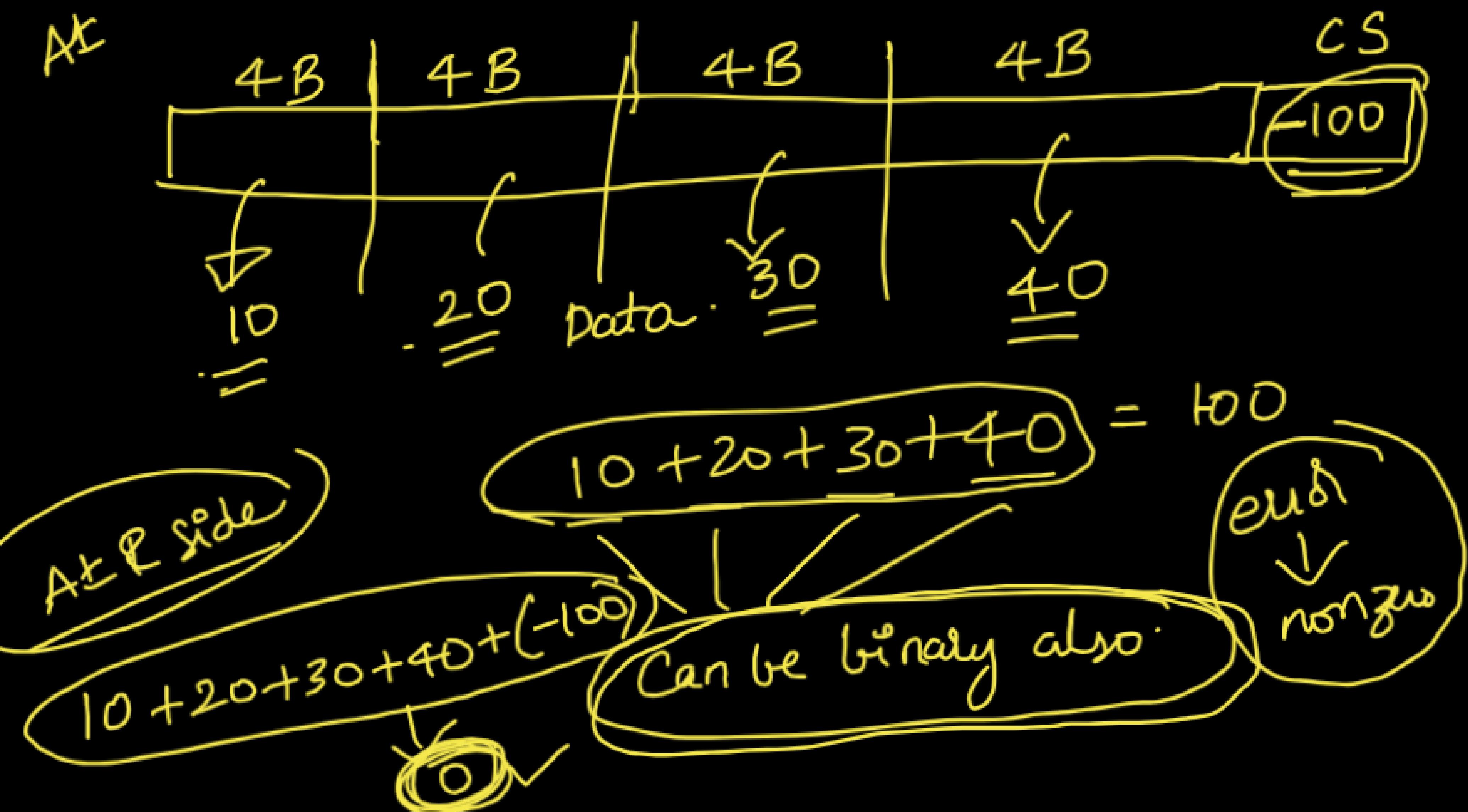
Check Sum: → Important

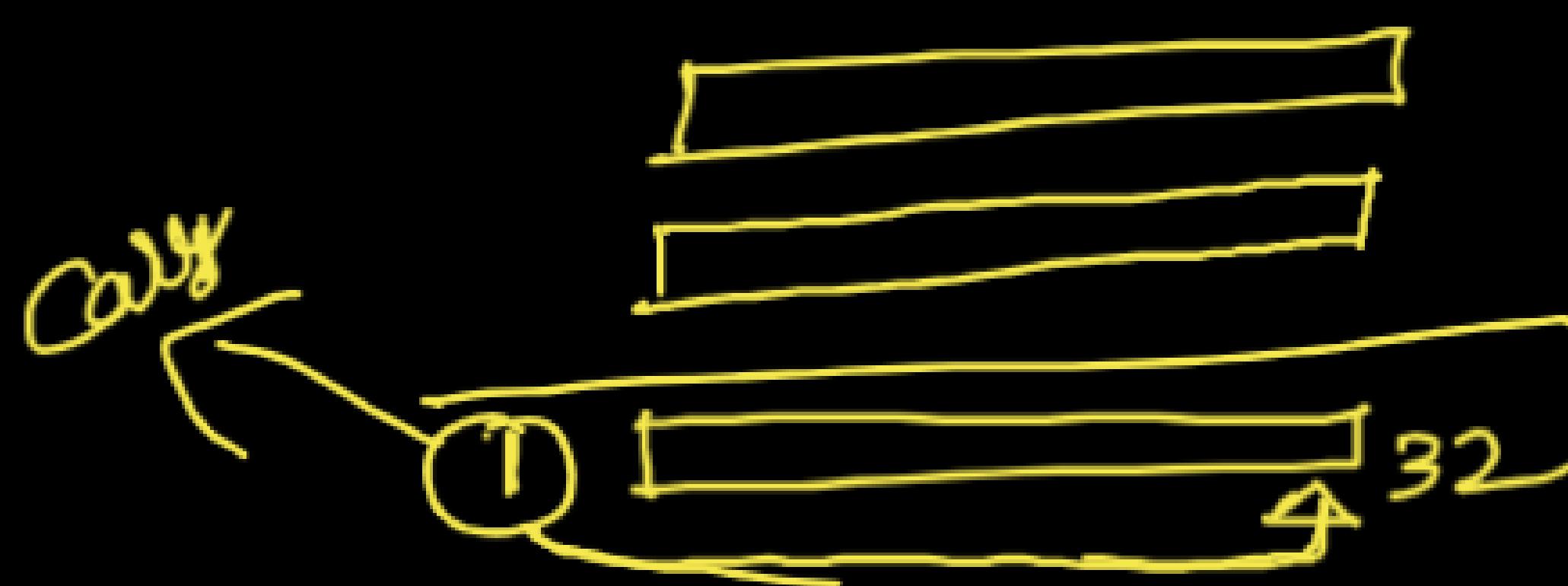
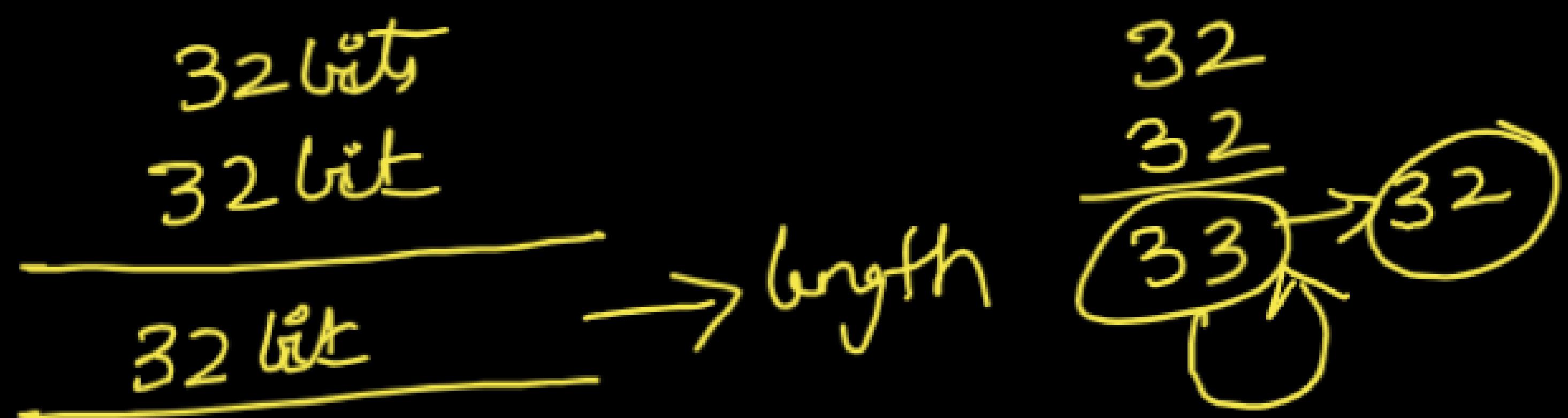
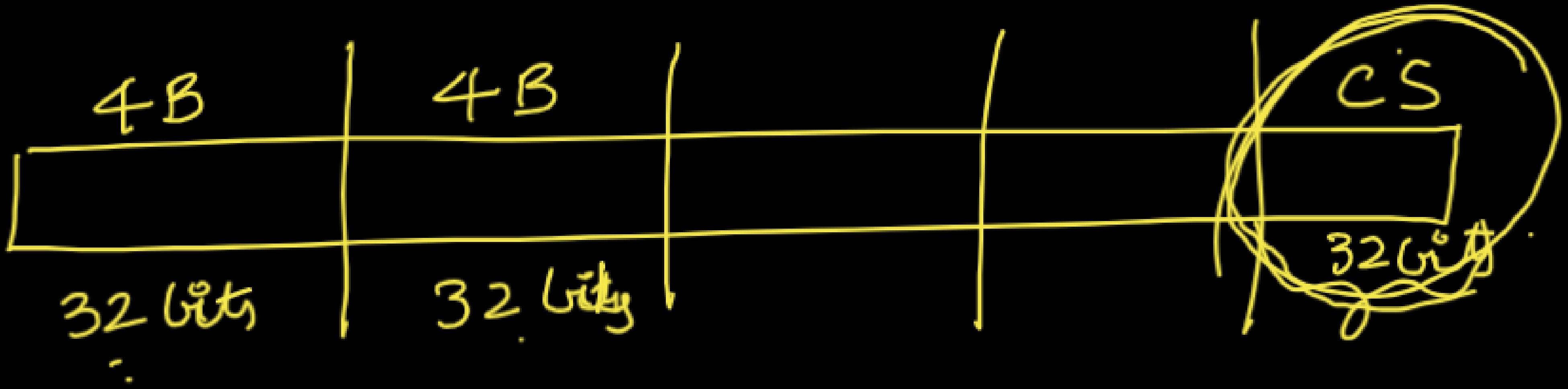
↓

used in TCP and IP

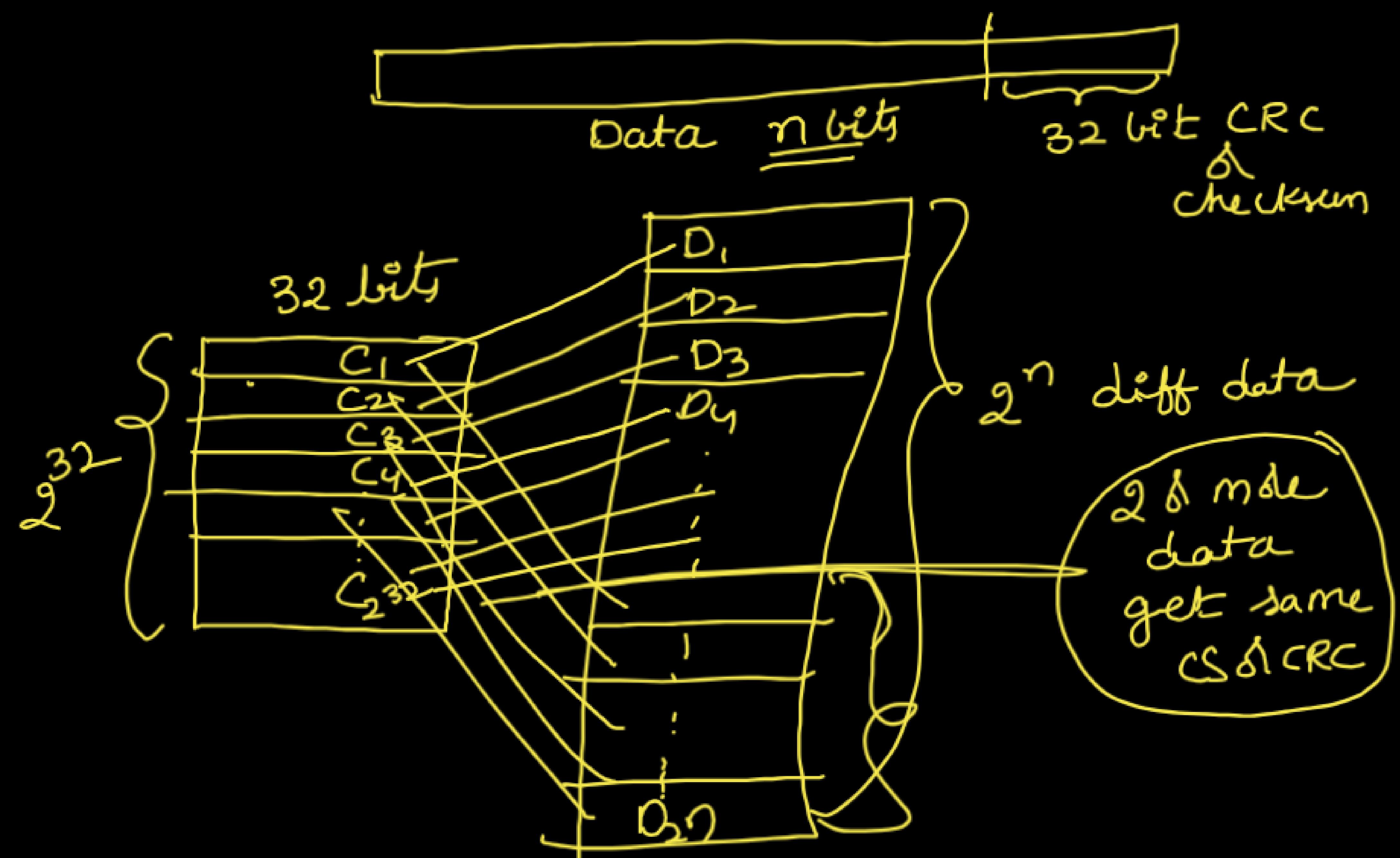
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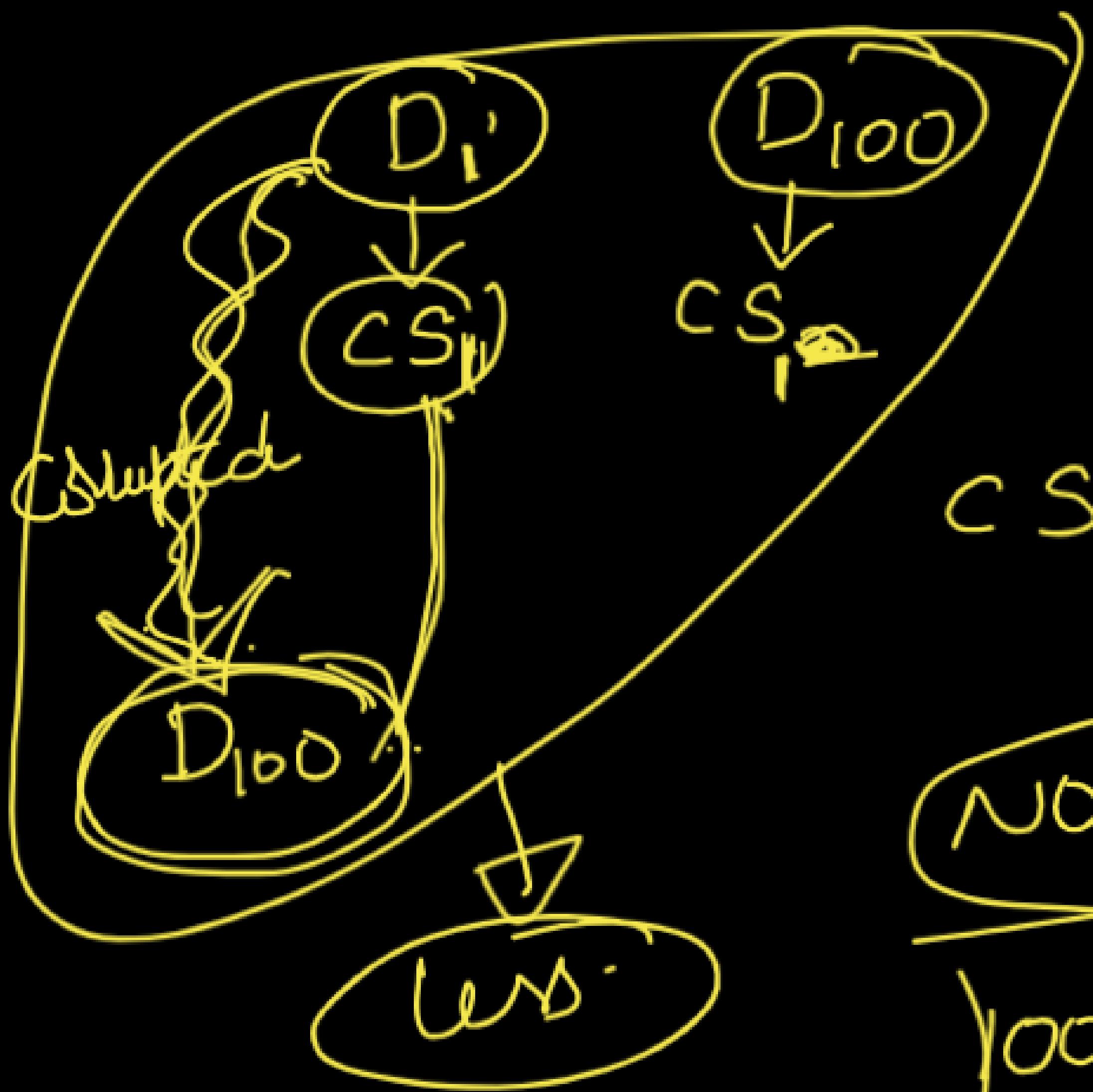
Practically used





*slap around
carry*





CS or CRC

NO guarantee

100% error detection
is not possible

Error correction

→ hamming code

not used in CN

Too costly to compute

Resource intensive

ISO / OSI

International Standards
organisation

open systems interconnect
model

responsibility functions in CN

mandatory

- 1) End Control
- 2) Flow control
- 3) Access control
- 4) mul & demux
- 5) addressing

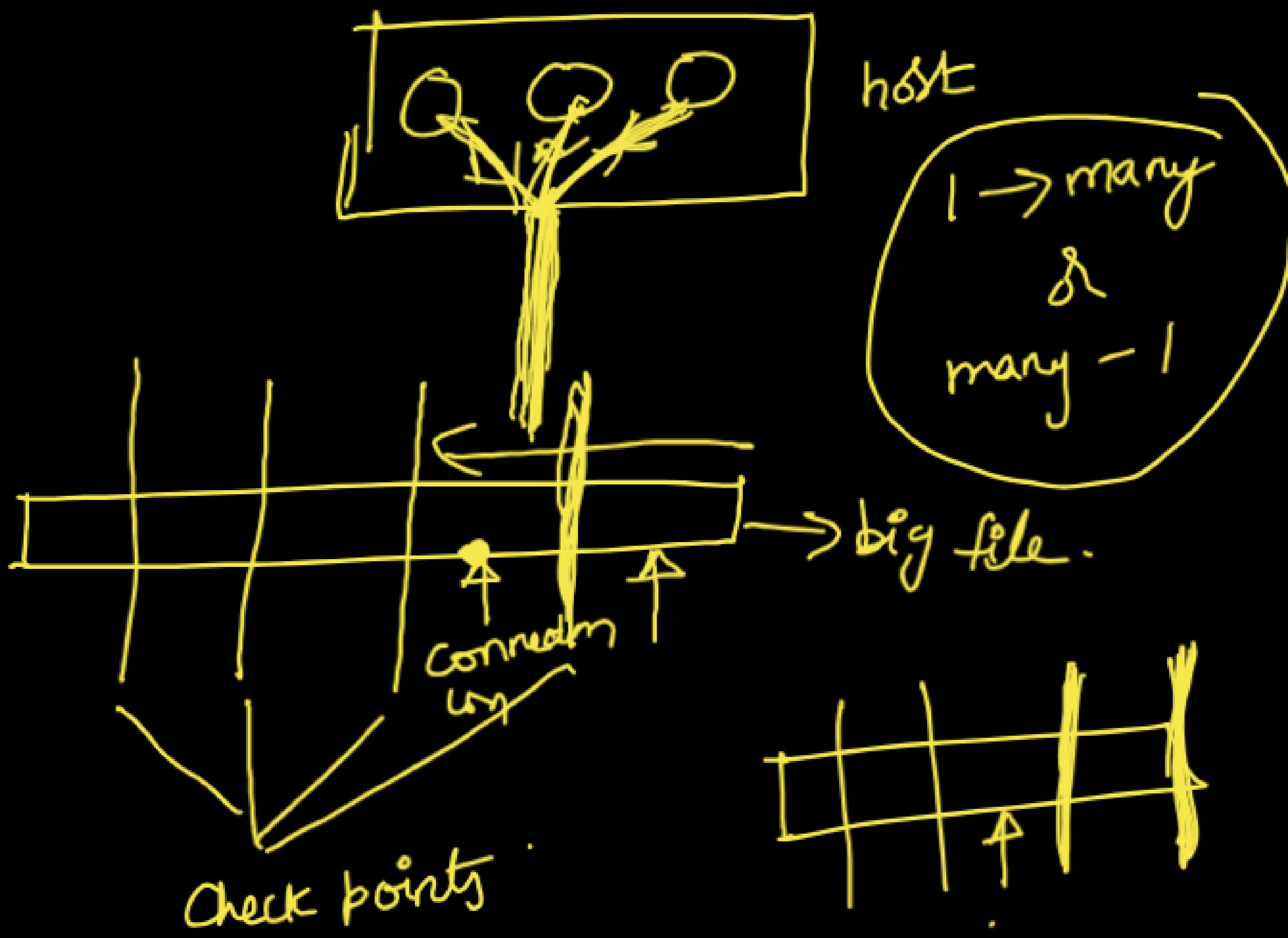
optional

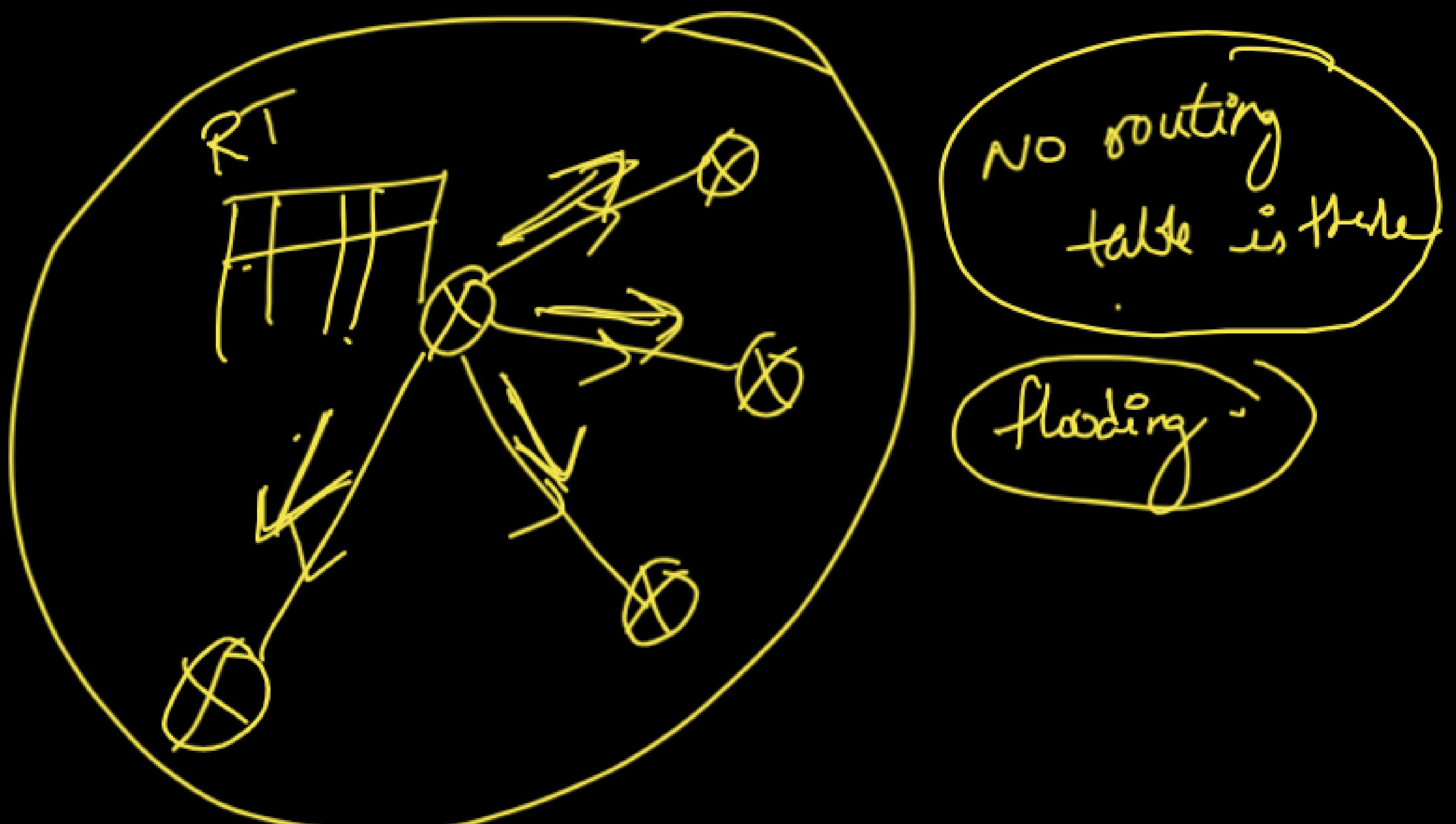
Encryption and decryption

- 2) check pointing
- 3) Routing (optional)

Nearly 70 functions

in CN





Routing → optional

R/T

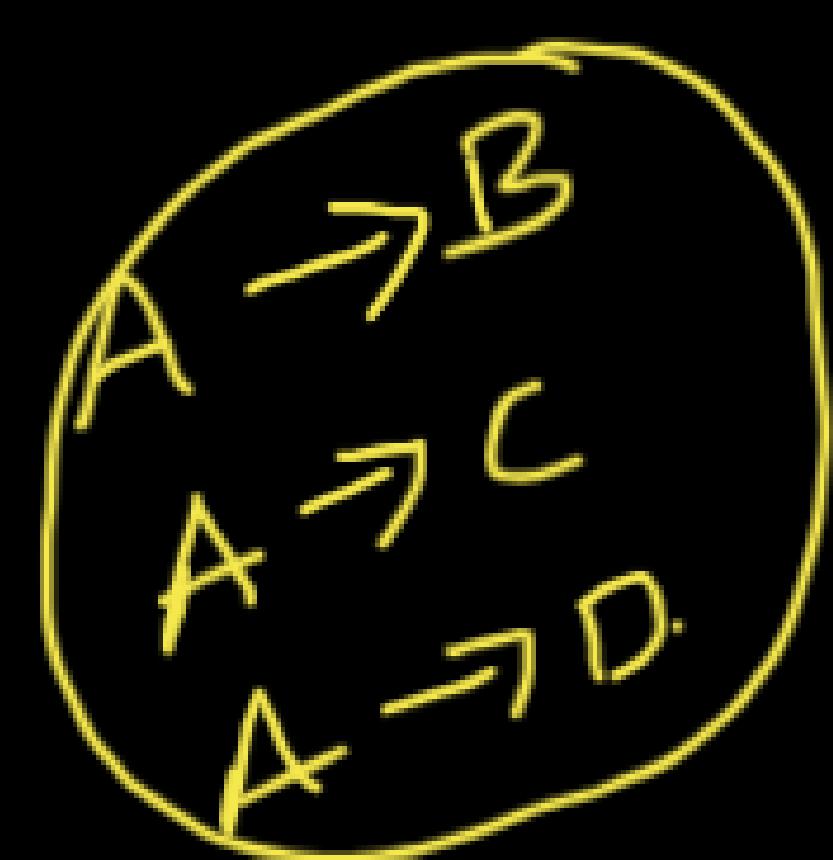
→ Because

A



C

B

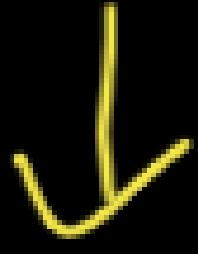


Dodging

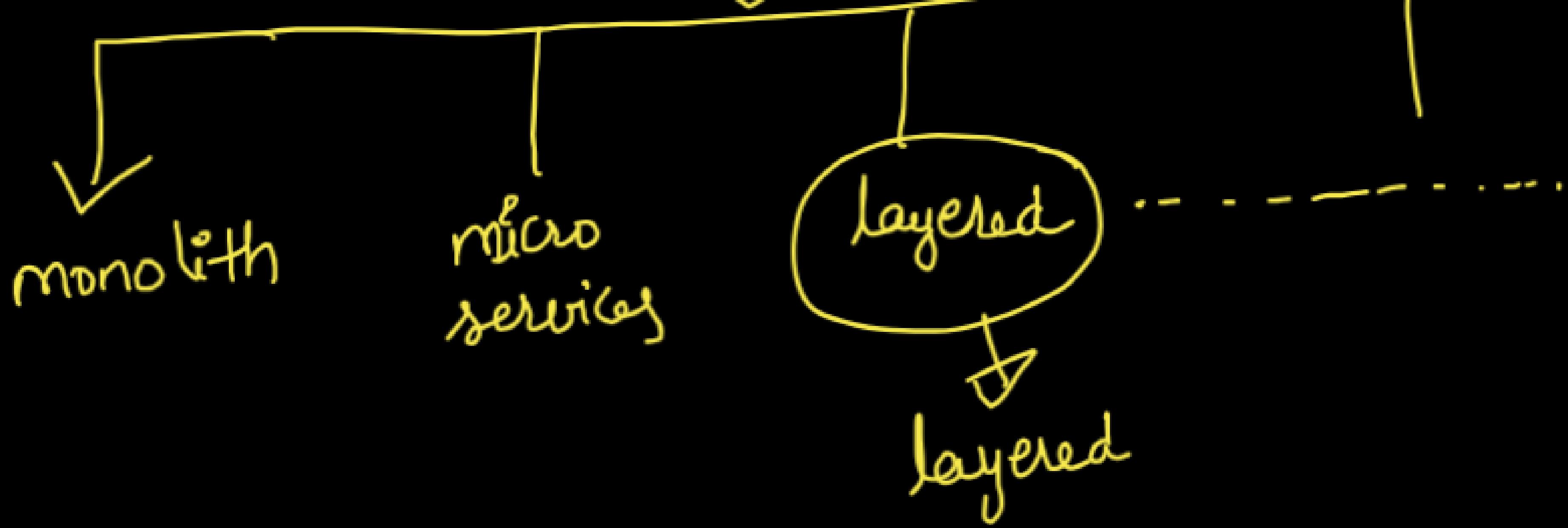
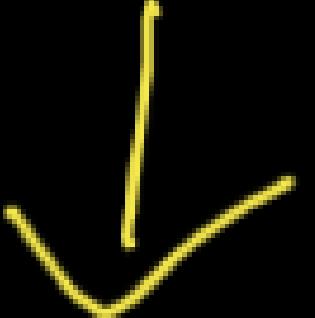
Flooding

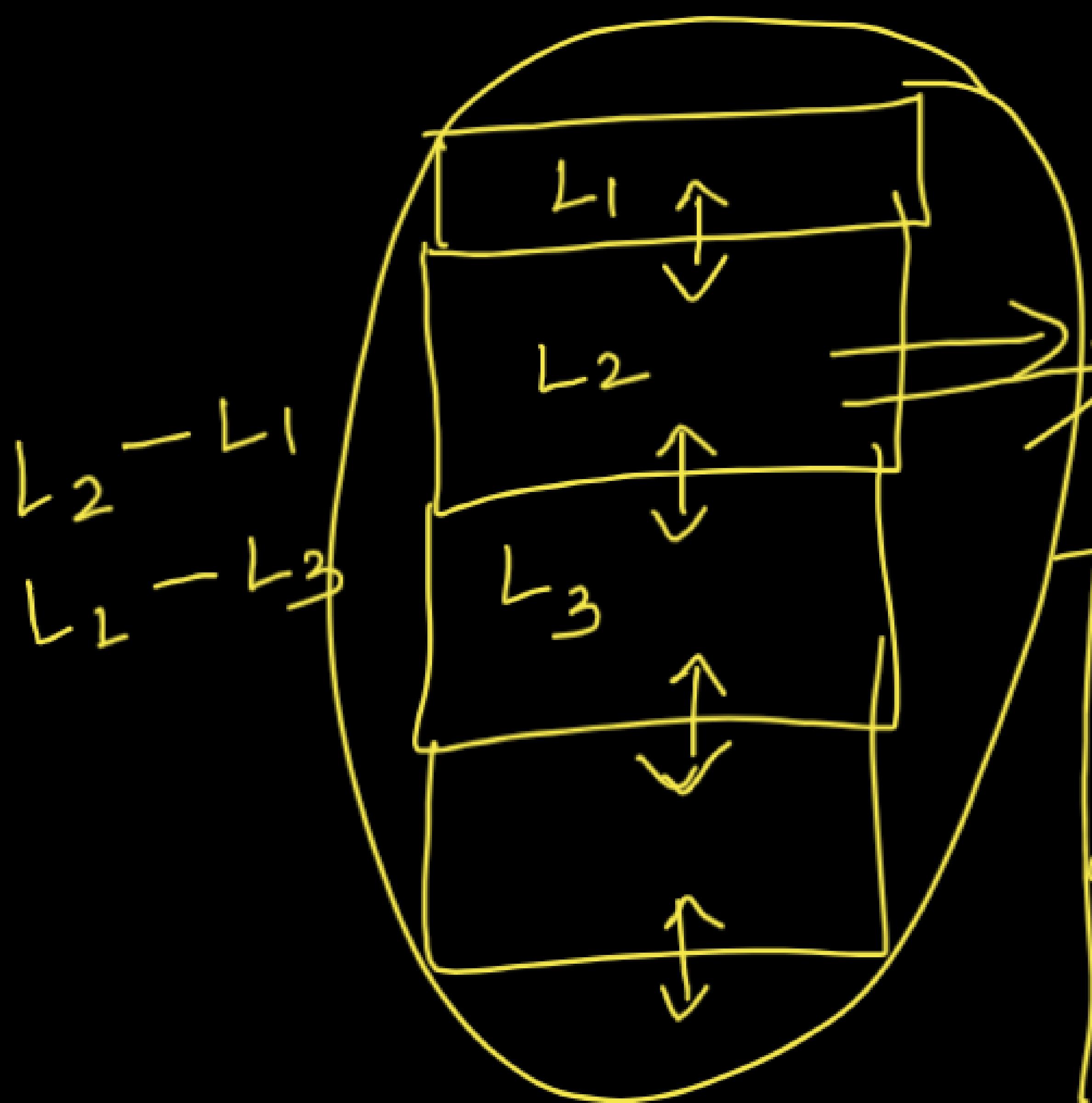
we use flooding

To responsibilities & requirements



design S/w





Several responsibilities

only a layer
can communicate
with layers above
it and below it.

Grouping all functions into various layers. Various grouping possible → models.

1. ISO-OSI → Theory

2. TCP-IP

3. ATM

4. X.25

5) IEEE

⋮
⋮

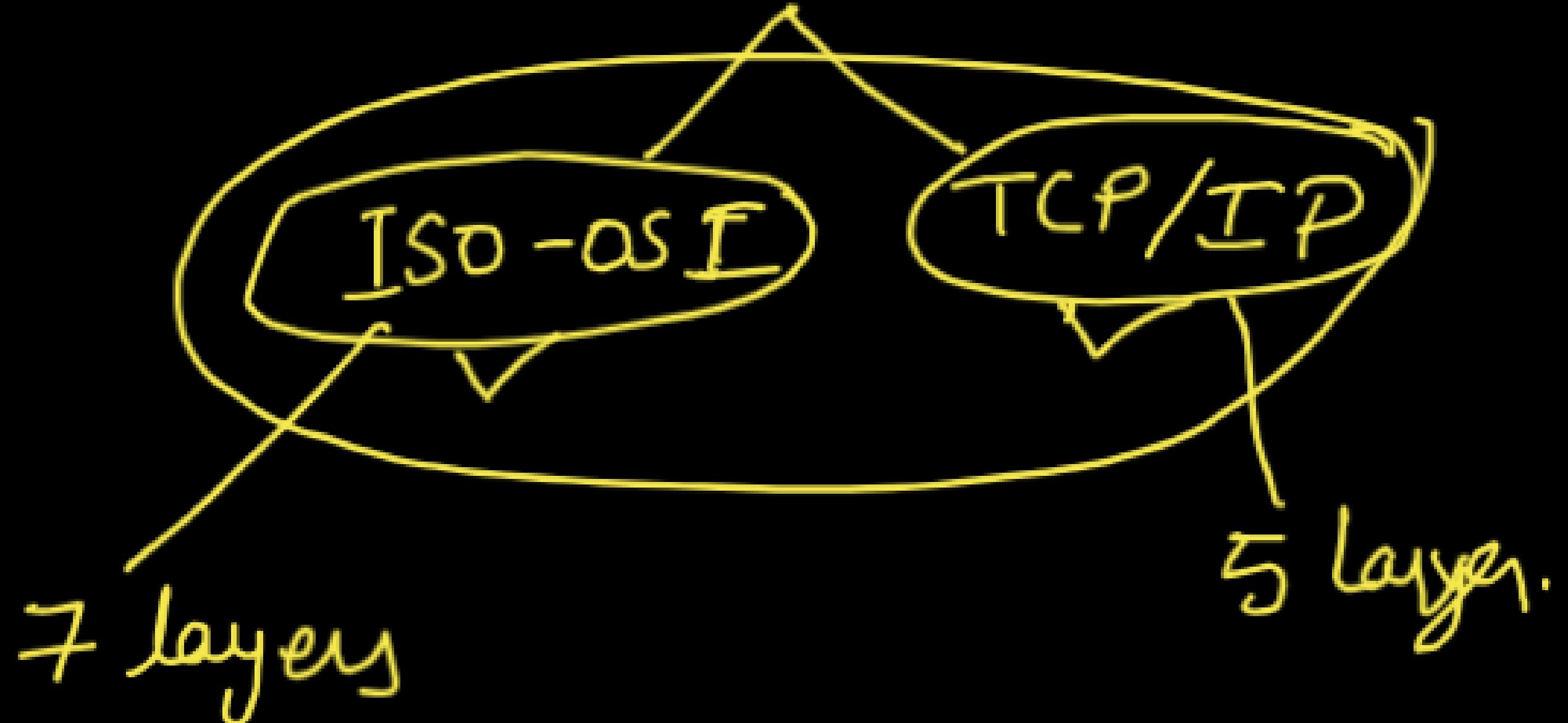
}

Practical

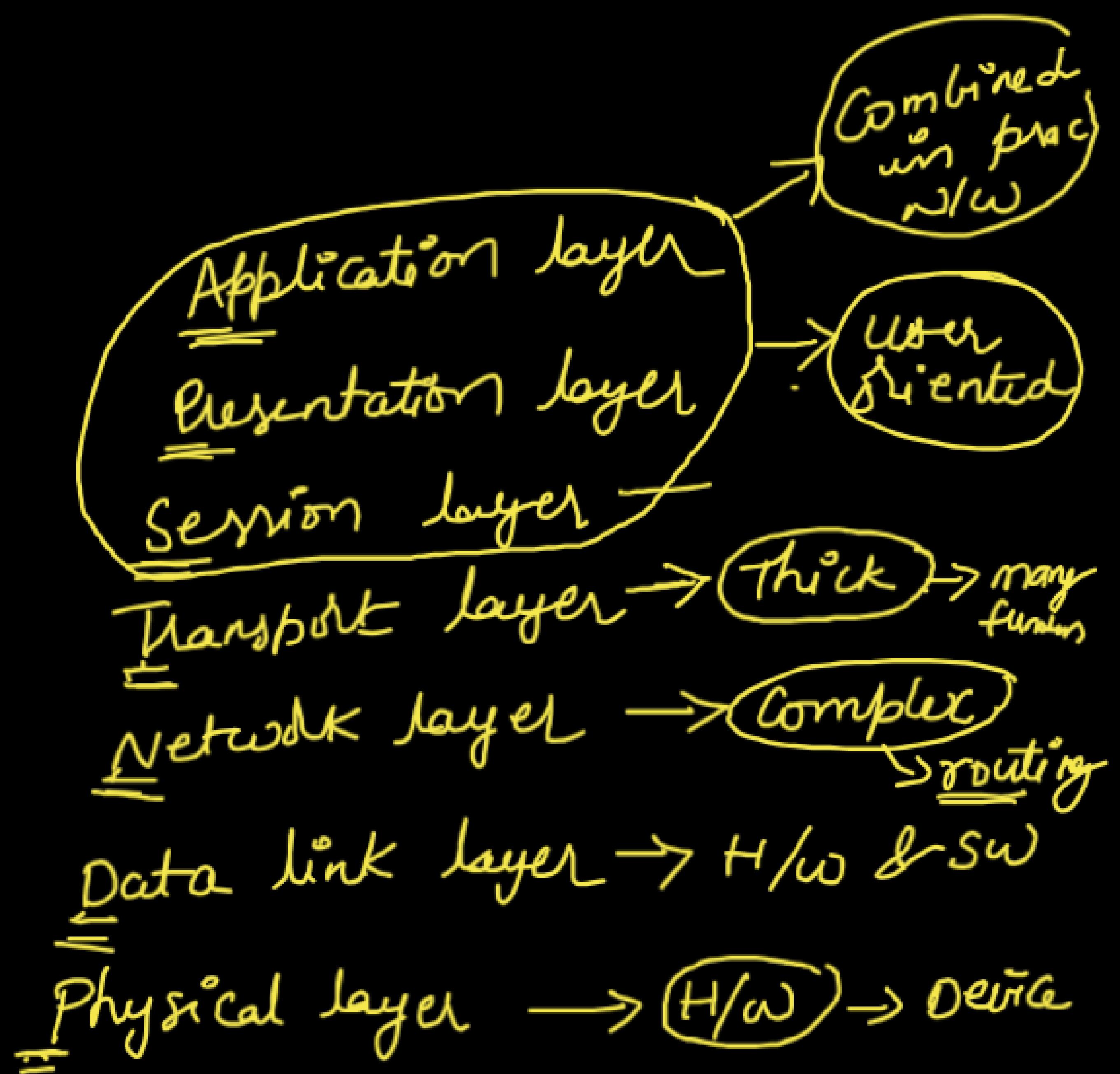
many models



Syllabus



ISO-OSI Model:

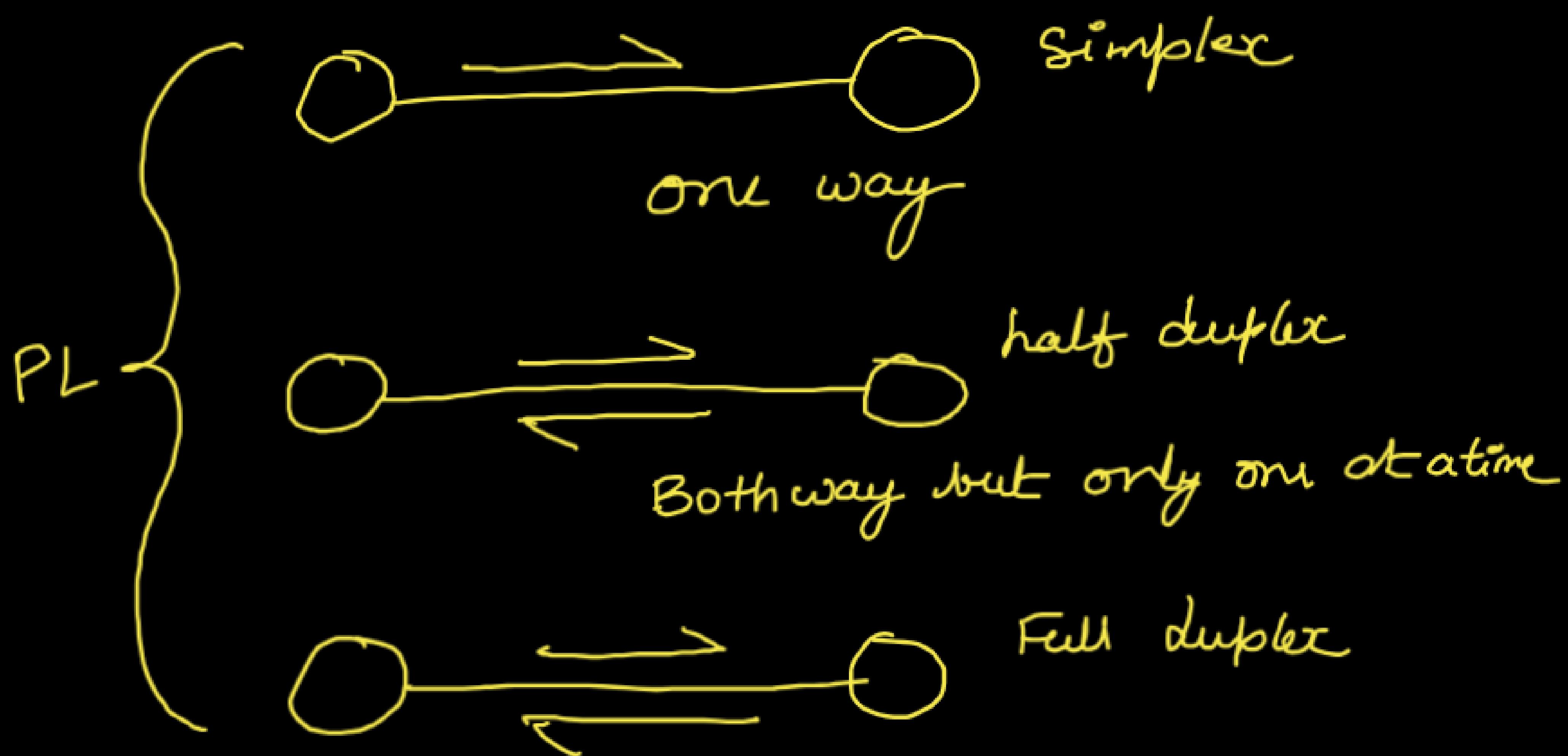


Physical layer:

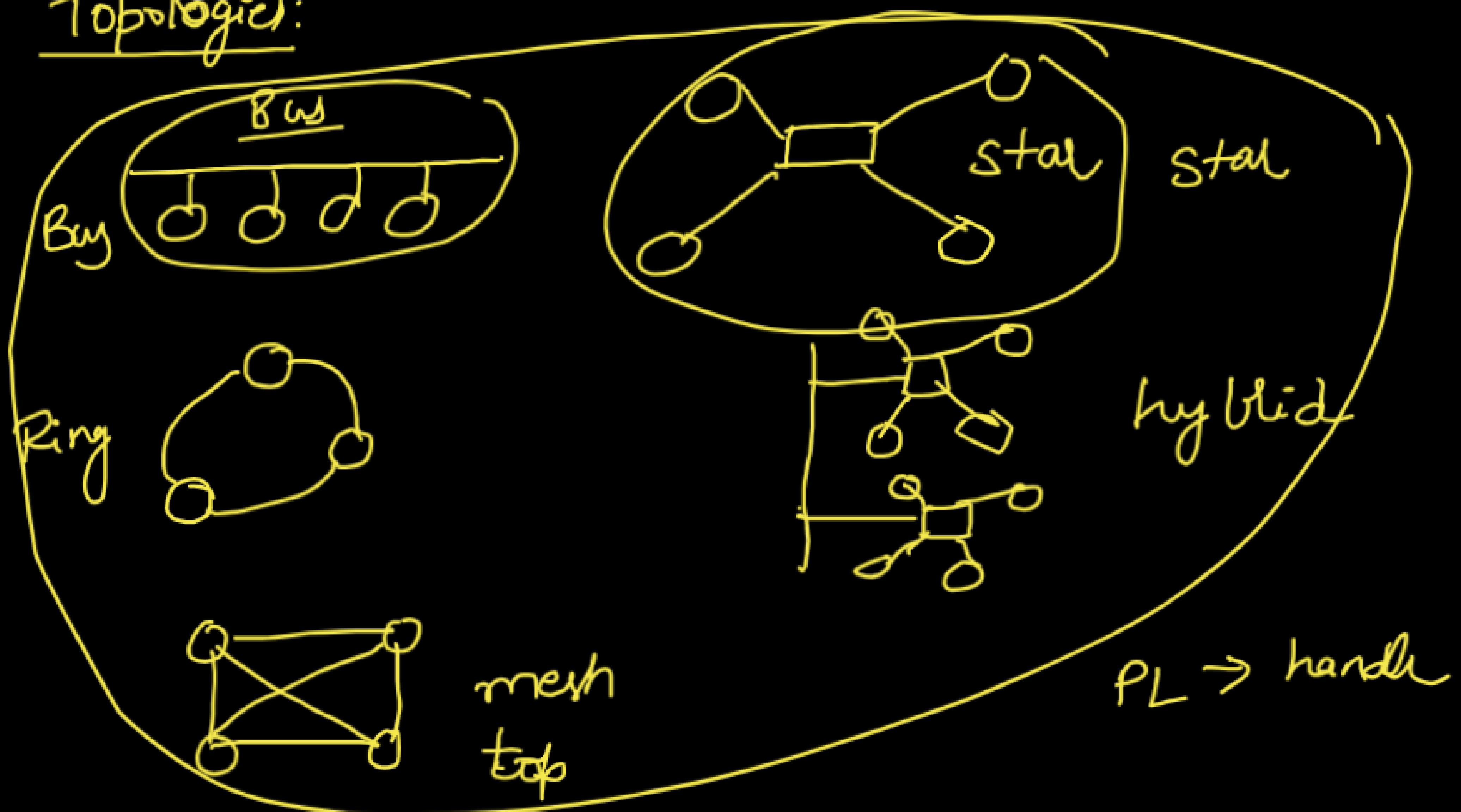
Electrical, mechanical, functional, procedural
characteristics of physical links.



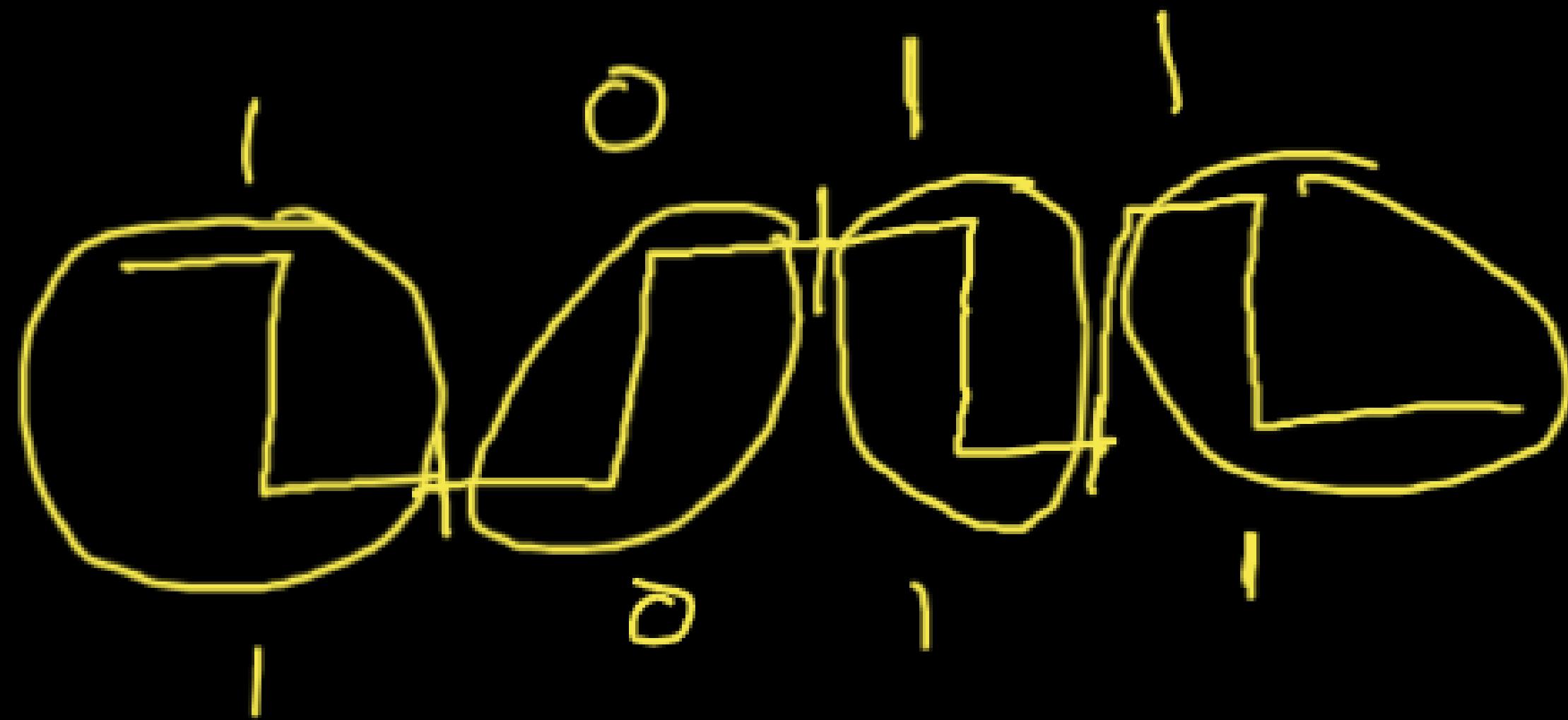
Transmission modes:



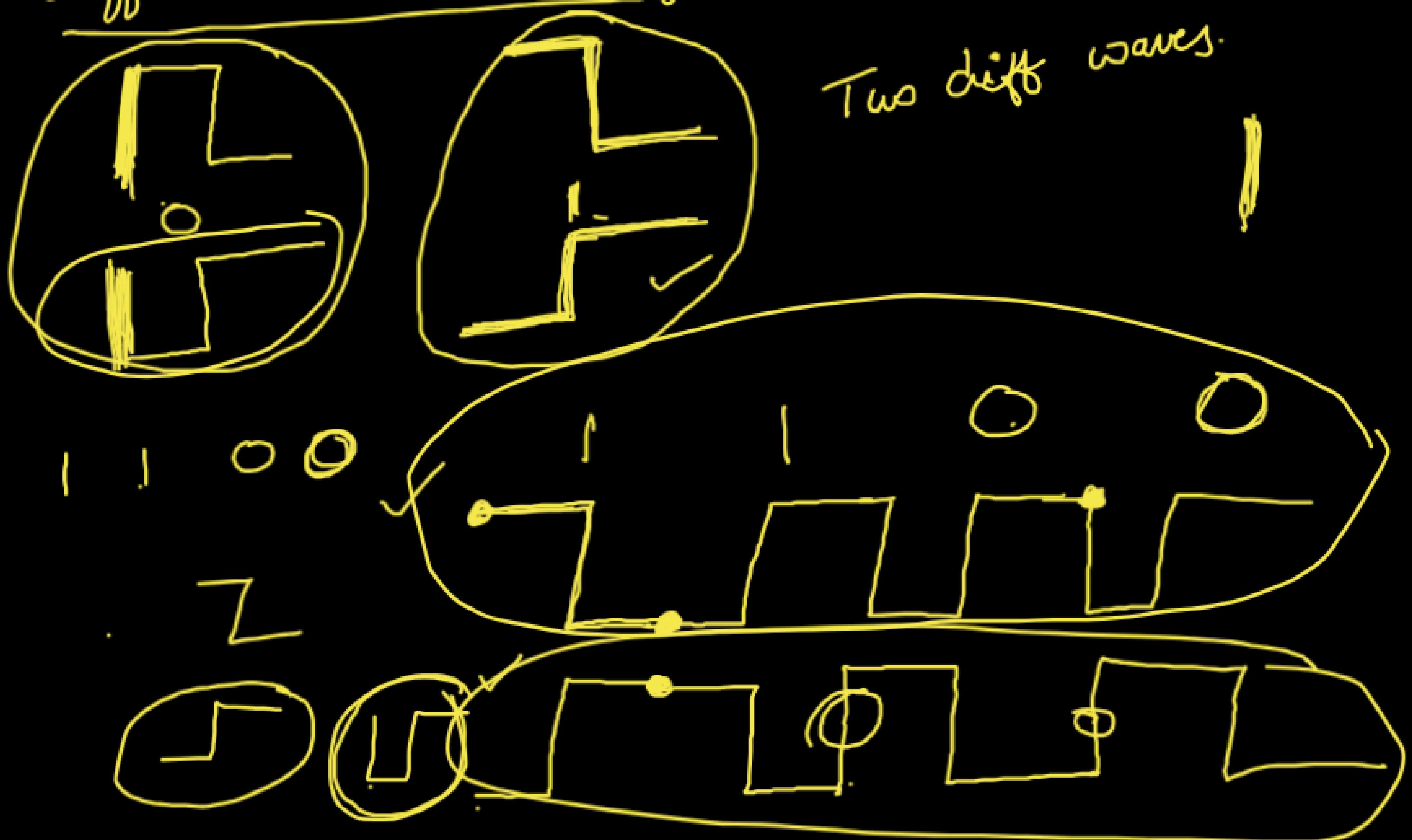
Topologies:



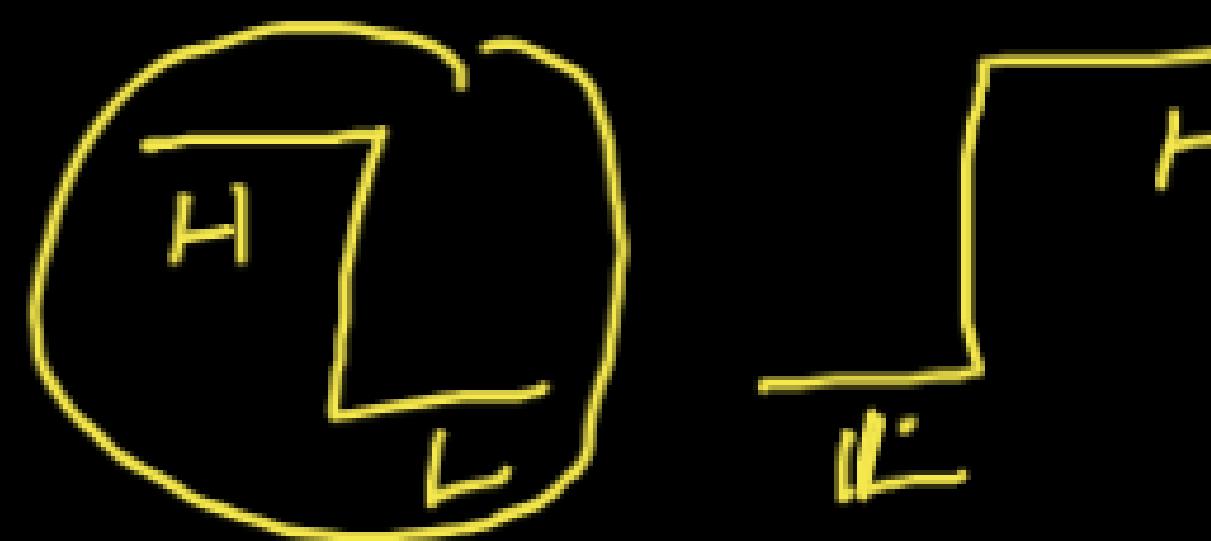
Encoding: manchester encoding:



Diff manchester encoding:



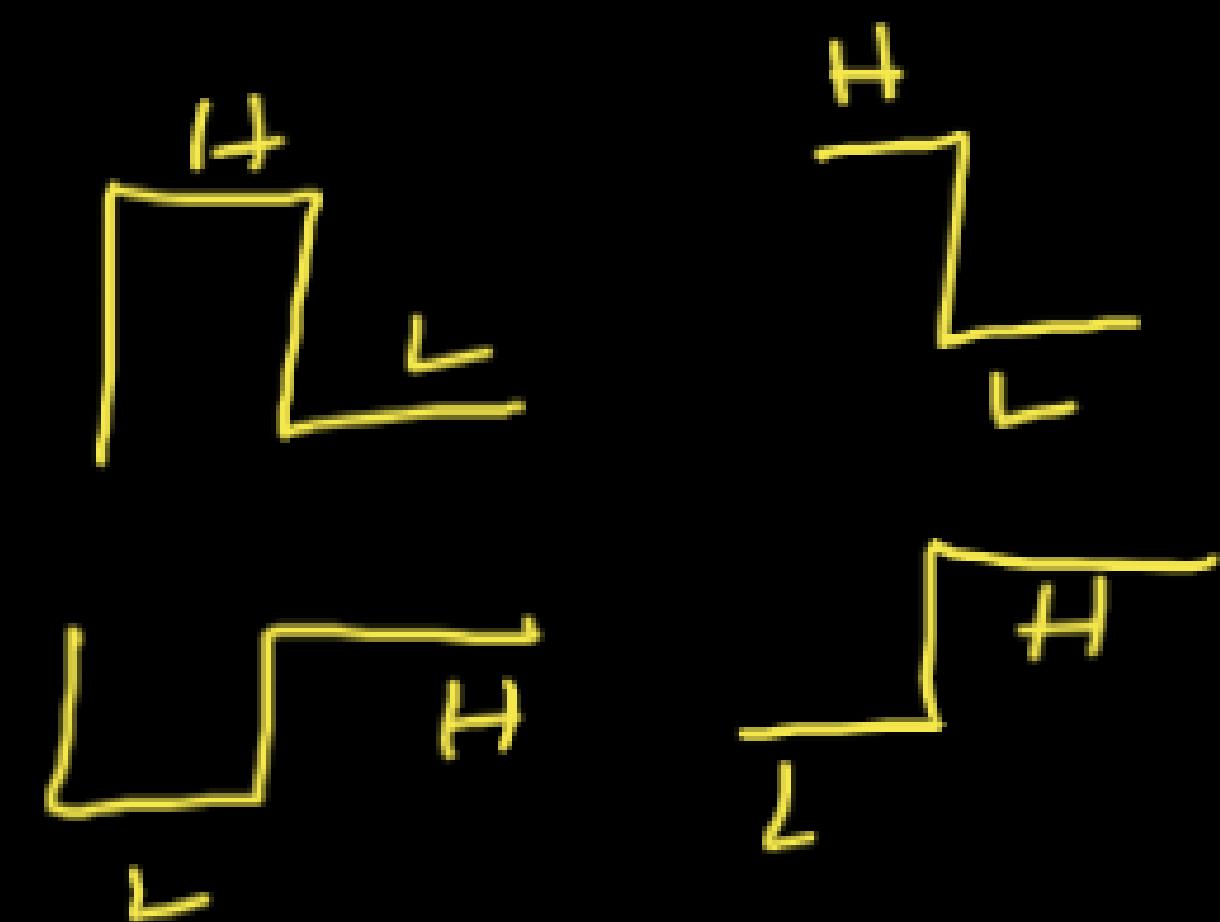
1 Bit \rightarrow manchester



1 bit \rightarrow 2 voltages

In Diff manch \rightarrow 1 bit \rightarrow

1 bit - 2 voltages



100 b \rightarrow 200 voltages

100 b/s \rightarrow 200 vol/sec \Rightarrow

(4) ~~Band width~~
~~= 2 * bit rate~~

