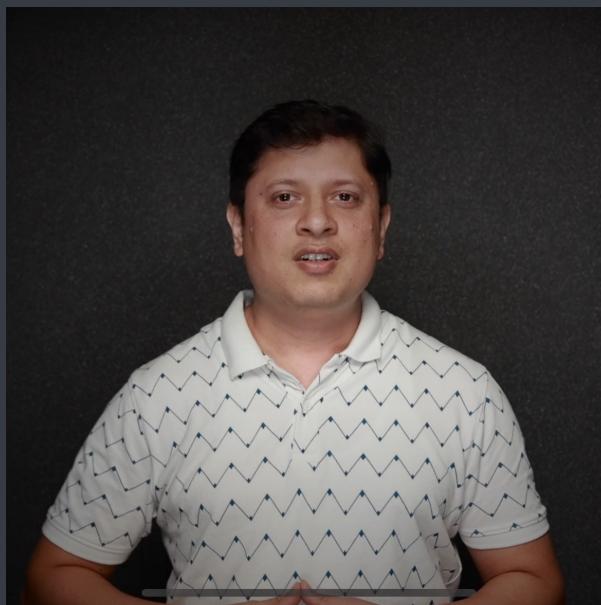


C Language

# Fundamentals of Computers



Saurabh Shukla (MySirG)

## Agenda

- ① What is a computer?
- ② Number System
- ③ Concept of 0s and 1s

# Computer

- Computer is an electronic device which takes some input, processes it and gives output



# Binary Number System

Decimal NS      0 1 2 3 4 5 6 7 8 9

Octal NS      0 1 2 3 4 5 6 7

Hexadecimal NS      0 1 2 3 4 5 6 7 8 9 A B C D E F

Binary NS      0 1

DNS	ONS	HNS	BNS	DNS	ONS	HNS	BNS
0	0	0	0	19	23	13	10011
1	1	1	1	20	24	14	10100
2	2	2	10	21	25	15	10101
3	3	3	11	22	26	16	10110
4	4	4	100	23	27	17	10111
5	5	5	101	24	30	18	11000
6	6	6	110	25	31	19	11001
7	7	7	111	26	32	1A	11010
8	10	8	1000	27	33	1B	11011
9	11	9	1001	28	34	1C	11100
10	12	A	1010	29	35	1D	11101
11	13	B	1011	30	36	1E	11110
12	14	C	1100	31	37	1F	11111
13	15	D	1101	32	40	20	1000000
14	16	E	1110	33	41	21	1000001
15	17	F	1111	34	42	22	1000100
16	20	10	10000	35	43	23	1000111
17	21	11	10001				
18	22	12	10010				

Any system  $\longrightarrow$  Decimal System

$$(253)_{10} \longrightarrow 2 \times 10^2 + 5 \times 10^1 + 3 \times 10^0 \\ 200 + 50 + 3 \\ (253)_{10}$$

$$(127)_8 \longrightarrow 1 \times 8^2 + 2 \times 8^1 + 7 \times 8^0 \\ 64 + 16 + 7 \\ (87)_{10}$$

$$(a2)_{16} \longrightarrow a \times 16^1 + 2 \times 16^0 \\ 16a + 2 \\ (16a+2)_{10}$$

$$\begin{array}{r} 10110 \\ \times 10010 \\ \hline 10110 \end{array}$$

$(10110)_2 \rightarrow 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2$   
 $+ 1 \times 2^1 + 0 \times 2^0$

$2^4 + 2^2 + 2^1$

$16 + 4 + 2$

$(22)_{10}$

# Place Value

DNS

...  $10^3$   $10^2$   $10^1$   $10^0$

ONS

...  $8^3$   $8^2$   $8^1$   $8^0$

HNS

...  $16^3$   $16^2$   $16^1$   $16^0$

BNS

...  $2^3$   $2^2$   $2^1$   $2^0$

# Convert Decimal to Binary

$$(25)_{10} = (11001)_2$$

Binary Place Value Chart:

$2^7$	$2^6$	$2^5$	$2^4$	$2^3$	$2^2$	$2^1$	$2^0$
128	64	32	16	8	4	2	1

Decimal Division:

2	25	
2	12	1
2	6	0
2	3	0
2	1	1
	0	

Binary Representation: 11001

Diagram showing the conversion process:

- A vertical yellow bracket connects the decimal division steps to the binary digits.
- An orange arrow points from the bottom of the division steps up towards the binary digits.
- The binary digits 11001 are aligned with the powers of 2 from right to left:  $2^0, 2^1, 2^2, 2^3, 2^4$ .

# Convert Binary to Decimal

1100110  
65 21

$$2^6 + 2^5 + 2^2 + 2^1 \\ 64 + 32 + 4 + 2 = (102)_{10}$$

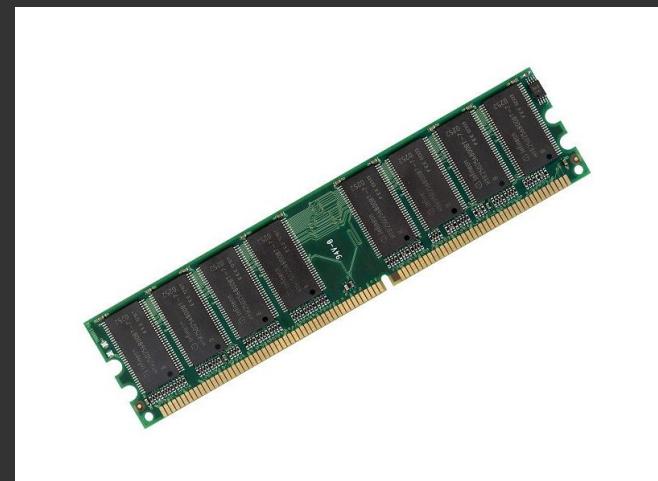
10101  
4 2 0

$$2^4 + 2^2 + 2^0 \\ 16 + 4 + 1 \\ (21)_{10}$$

# Concept of 0's and 1's

There is no physical significance of 0's and 1's in computer

They are just representation of two states in the hardware



## Binary Language

Computer can understand only binary signals, which can be stored, transmitted and processed