

bit

Building Block of Computers

Random Access Memory

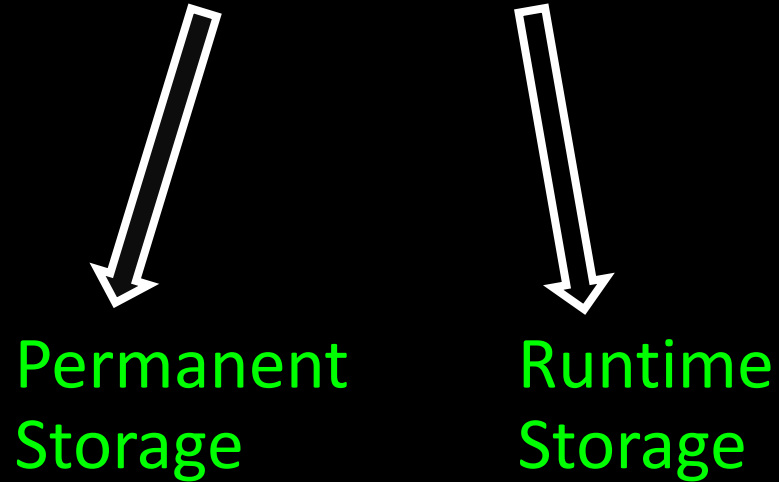
We use RAM to store runtime data.



Data Structure

What is Data Structure?

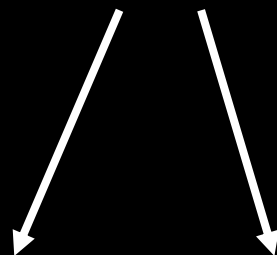
Structuring of Data {in Storage || RAM}



- This **Data Structures** are **stored** in **RAM** during **Program Runtime**.
- Examples of Data Structures are
 - **int**
 - 1, 2, 3, -5, ...
 - **float**
 - 1.1, 3.8, ...
 - **char**
 - a, A, b, c, ... \$, #, ₹, ...
 - **User built**
 - Gender Class

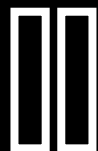
It is very common for RAM to come in 4GB, 8GB, 12GB, 16GB, 32GB, 64GB, ...

8 GB



Giga

Byte



10^9

8 bits

{ Approx Billion }

1 bit is either 0 or 1



bit

- A bit is either 0 or 1 in an Abstract form.
- In Reality:
 - 0 means Low Voltage
 - 1 means High Voltage
- Computers works with low and high voltages.

To Store, for example, {1, 7} in computer:

1

00000000 00000000 00000000 00000001

7

00000000 00000000 00000000 0000111

(integer: takes 4 bytes)

2^n ... 64 32 16 8 4 2 1

“Bits are in the form of 2^n .”

What is an *Array*?

Array is a contiguous block of data.

How arrays are stored in RAM?

1	7	11
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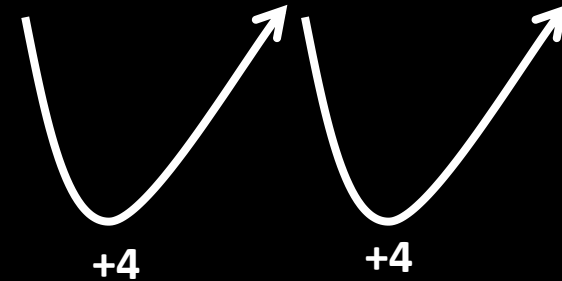
Most integers are stored
in bytes of 4.

a	b	c
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Most ASCII characters are
stored in 1 byte.

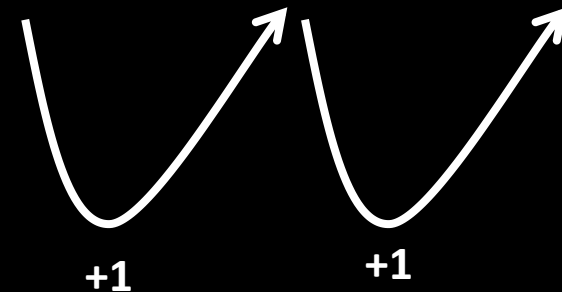
Value
Address

	1	7	11	
\$XX	\$0	\$4	\$8	\$ZZ



Value
Address

	a	b	c	
\$XX	\$0	\$1	\$2	\$ZZ



Bit Operations

Manipulating the bits

AND	
$0 \& 0$	0
$0 \& 1$	0
$1 \& 0$	0
$1 \& 1$	1

AND

$N = 1 \& 1$

OR	
$0 \mid 0$	0
$0 \mid 1$	1
$1 \mid 0$	1
$1 \mid 1$	1

OR

$N = 1 \mid 0$

XOR	
$0 \wedge 0$	0
$0 \wedge 1$	1
$1 \wedge 0$	1
$1 \wedge 1$	0

XOR

$N = 0 \wedge 1$

Truth Tables

NOT	
~ 0	1
~ 1	0

NOT

N = ~ 1

Bit Shifting (<<, >>)

- N = 11 (1011)

>> (Right Shift) – Shift the bit to the right, add 0 from the left

<< (Left Shift) – Shift the bit to the left, add 0 from the right.

Operation	Bits
Load	1011
>> (Right Shift)	1011 >> 1 → 0101
<< (Left Shift)	0101 << 1 → 1010
>>	1010 >> 1 → 0101
>>	0101 >> 1 → 0010
>>	0010 >> 1 → 0001
>>	0001 >> 1 → 0000

Shukriya | Thanks

May God Show us his will. May he show us his path for us.