CS & IT ENGINEERING

COMPUTER ORGANIZATION AND ARCHITECTURE

Basics of COA

Lecture No.- 01

By- Vishvadeep Gothi sir

Topics to be Covered

- Topic: Prerequisites
- Topic: Why COA
- Topic: Data In Computers
- Topic: Components of Computer
- Topic: Binary Numbers

GATE AIR - 2010 19, 119, 440, 682 — 2009, 3rd year

IISc B'lor

BITS pilani MTech in D.S.

↳ 2018 - 2020

GATE - 2011 | 2007

Topic : Prerequisites

- Basic components of computer: CPU, memory (RAM, ROM, HDD), I/O
- Number system: Binary, Decimal, Hexadecimal etc.
- Digital logic basics: Mux, Decoder etc.

Powers of 2:

Unit	Time	Bit or Byte
K (Kilo)	10^3	$2^{10} = 1024$
M (Mega)	10^6	2^{20}
G (Giga)	10^9	2^{30}
T (Tera)	10^{12}	2^{40}

or addresses

$2^1 = 2$
$2^2 = 4$
$2^3 = 8$
$2^4 = 16$
$2^5 = 32$
$2^6 = 64$
$2^7 = 128$
$2^8 = 256$
$2^9 = 512$
$2^{10} = 1024$

Topic : Why COA

- To understand: How a computer works
- To understand other courses: OS, Compiler, Programming etc.
- Help in real world development: DBMS, Hardware Design, IoT problems etc.

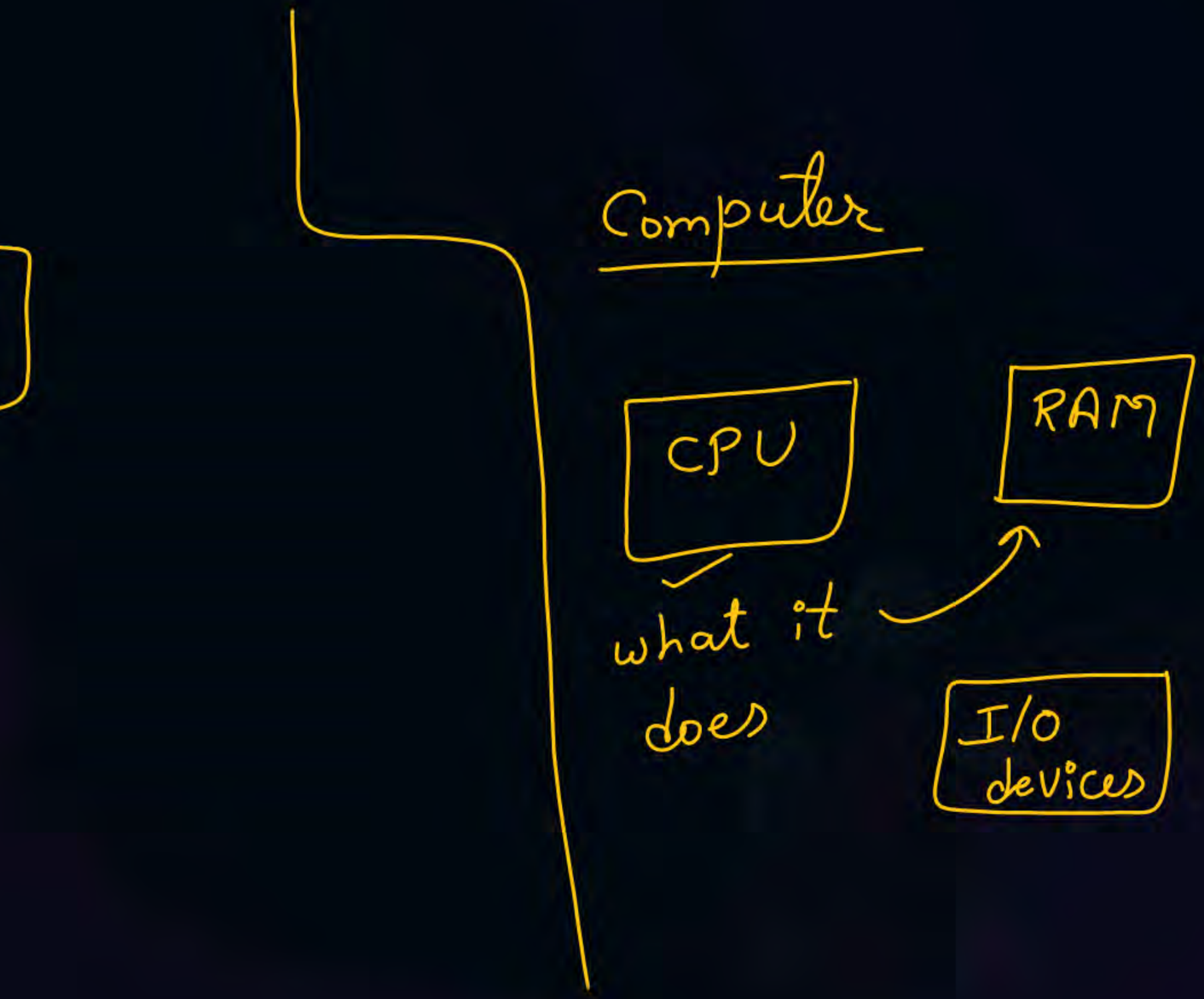
Bit → 0 or 1 ⟹ b

Byte → Collection of 8-bits ⇒ B

16 Mbps


ALU

Reg.


Computer
CPU
RAM
what it does
I/O devices

Topic : Computer Organization & Architecture

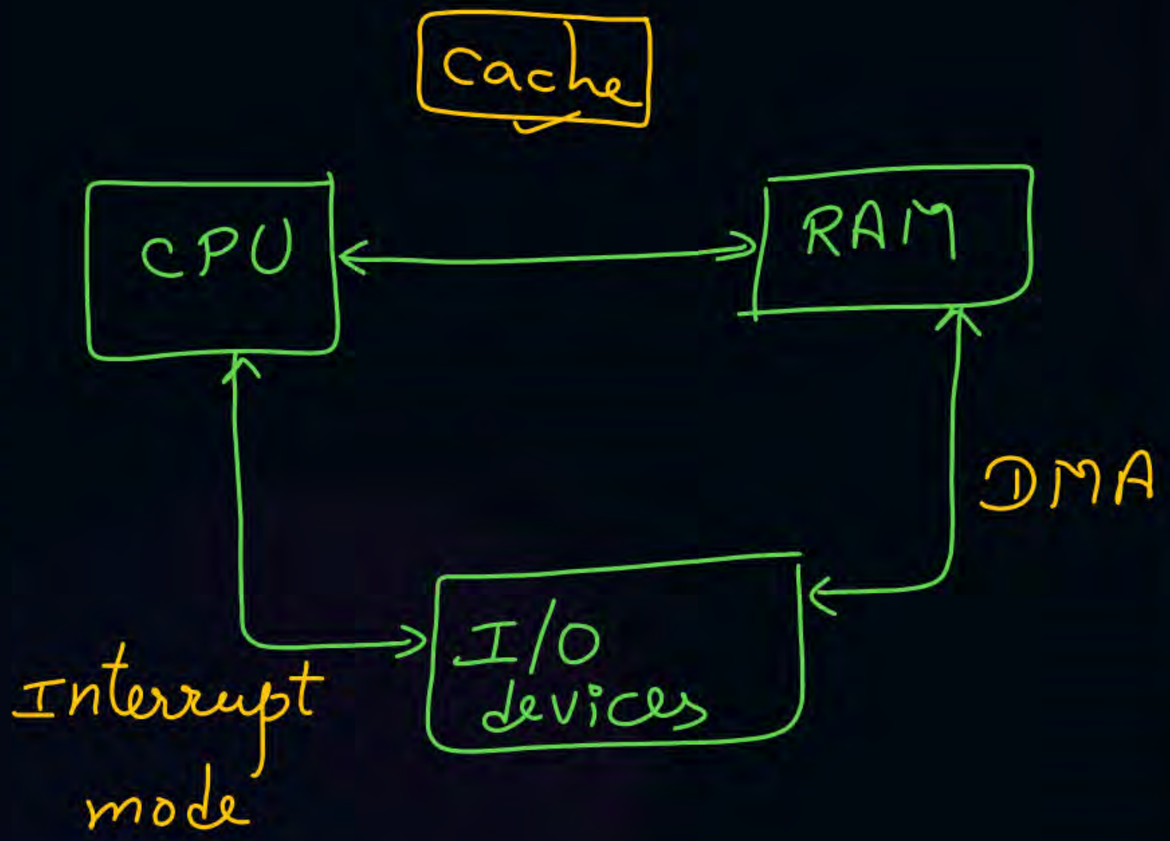
Computer Architecture:

- Conceptual design and fundamental operational structure.

Computer Organization: → Implementation of architecture

- Deals with physical devices and their interconnections
- With a perspective of improving the performance.

Computer Architecture	Computer Organization
• CPU Design	• I/O Organization
• Instructions	• Memory Organization
• Addressing modes	• Performance
• Data format	



Data format:-

The format in which data is represented in binary to process in CPU.

Syllabus

C.A.
1. Basics
2. Instruction & Addressing modes
3. CPU & control Unit
4. Floating point representation
5. I/O organization
6. Memory
   - ↳ Cache ☆n
7. Disk
8. pipelining ☆n

Topic : Data In Computers

- Data (Binary)
  - Number
    - Fixed point
      - Unsigned
      - Signed
        - 1's complement
        - 2's "
        - Sign magnitude
    - Floating point representation
  - char
    - ASCII
    - EBCDIC

Topic : Binary Numbers

$5 \Rightarrow (101)_2$

$15 \Rightarrow (1111)_2$

Topic : Components of Computer

- CPU
  - C. U. (Control Unit)
  - A.L.U. (Arithmetic Logic Unit)
- Memory:
  - Primary / main ⇒ RAM, ROM
  - Secondary ⇒ Hard disk
- I/O Devices:
  - Input devices
  - output devices

Topic : Other Components

- System Buses
- CPU Registers

Topic : Other Components

System Buses: Collection of communication lines (Used) to connect CPU with other components

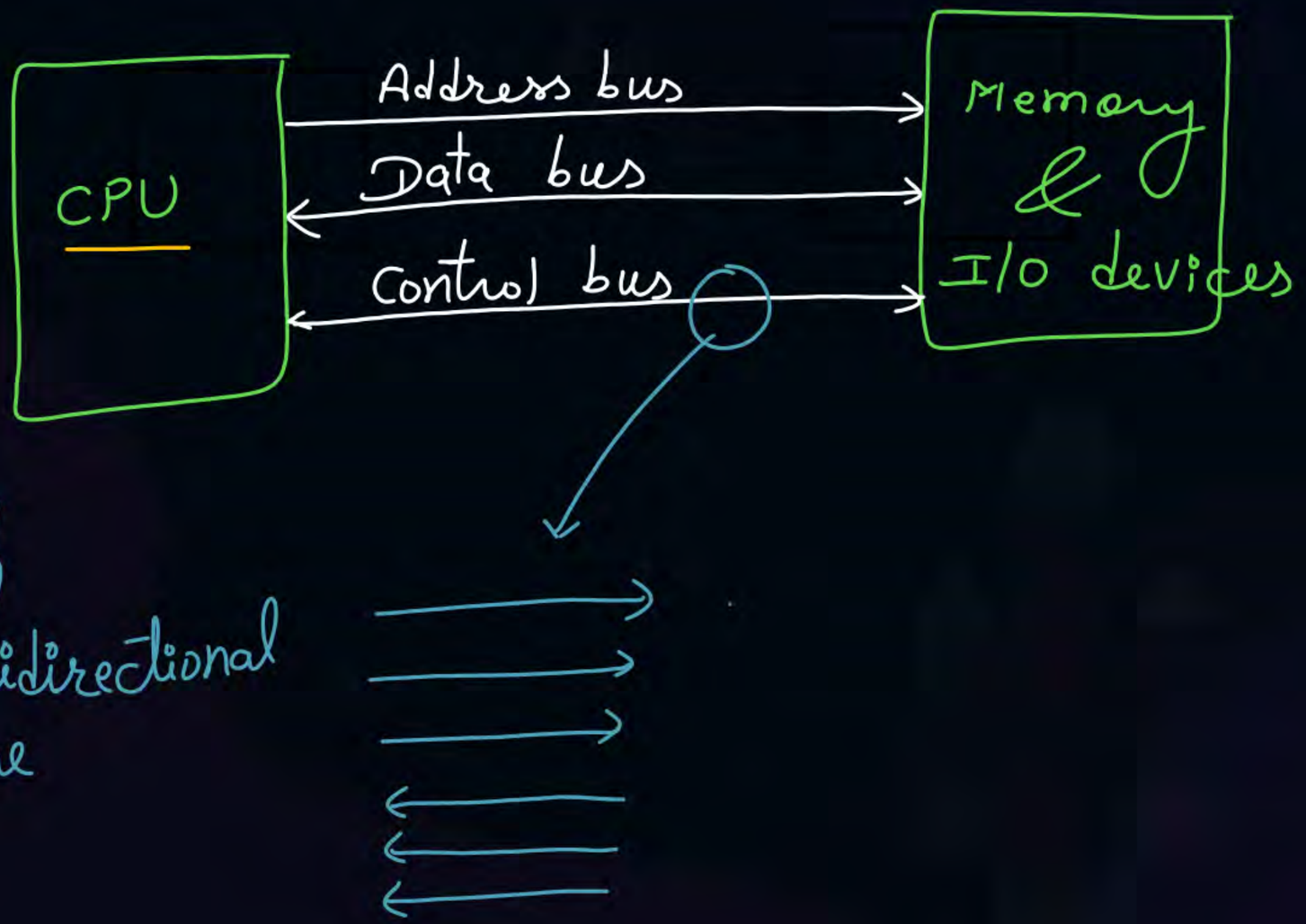
⇐ 4 bits can be transmitted at a time

4-bits wide bus
or
4-lines wide bus

Topic : Other Components

System Buses:

- Address Bus
- Data Bus
- Control Bus



Individual lines of control bus are unidirectional & dedicated for one control operation

Topic : System Buses

⇒ Data bus can transmit data in both directions but at a time only in one direction

Prerequisites

t.me/vishvadeepsir

- **Number System**
  - Binary, Hexadecimal, Decimal
  - Conversion from one system to another
  - Signed numbers: Sign-Magnitude, 1's Complement, 2's Complement
- **Decoder**
- **Multiplexer**

3-4 days

2 mins Summary

- **Topic** Architecure vs Organization
- **Topic** Numbers & Data in Computers
- **Topic** Components of Computer
- **Topic** System Buses
- **Topic** Types of Buses

Tom.

{ CPU Reg.
Arch. Types

8-10 M

Happy Learning

THANK - YOU