

Introduction and Overview of Computer Architecture



Syllabus

CS104	Computer Organization	3-1-0-8
<p>Basic Computer Architecture; ARM Instruction Set and Assembly Language Programming; Computer Arithmetic: integer addition (carry look-ahead), multiply (booth's algorithm), division (restoring and non-restoring), floating point arithmetic; Processor Design – single cycle, multi-cycle; pipelined design; memory architecture (static and Dynamic RAM; row and column addressing; interleaving, banks), cache memory (direct, set-associative, multi-level); storage basics: disks, tapes, printers, displays, flash memory; Buses (daisy chaining; synchronous and asynchronous; point-to-point; PCI, PCIe); Intel Sandy Bridge Architecture; Intel X86 instruction set introduction.</p>		
<p><i>Texts:</i></p> <p>J. L. Hennessy and D. A. Patterson, <i>Computer Organization and Design: The hardware/Software Interface</i>, Morgan Kaufmann, fourth edition, 2014.</p>		
<p><i>References:</i></p> <ol style="list-style-type: none">1. William Stallings, <i>Computer Organization and Architecture</i>, Pearson, 8th edition, 2010.2. Randal E. Bryant and David R.O'Hallaron, <i>Computer Systems: A Programmers Perspective</i>, 3rd edition. Pearson Edu.		

Overview of the Syllabus

- ◆ Basic Computer Architecture
- ◆ Computer Arithmetic
- ◆ MIPS Instruction Set and Assembly Language Programming
- ◆ Processor Design
- ◆ Pipelined Design
- ◆ Memory Architecture
- ◆ Storage Devices
- ◆ Buses
- ◆ Recent Trends in Computer Architecture

Course Objectives

- ◆ To provide basic concepts of computer architecture and organization
- ◆ To impart the knowledge of implementation of arithmetic operations in the computer.
- ◆ To develop a deeper understanding of the hardware environment upon which all processing are carried out.
- ◆ To provide knowledge about internals of memory system, interfacing techniques and subsystem devices.

Timing

- ◆ Lectures
- ◆ S1: Monday (3:00-3:55), Tuesday (12:00-12:55), Wednesday (12:00-12:55), **Thursday (9:00-9:55)**
- ◆ Tutorials
- ◆ G3: Wednesday (4:00-4:55)
- ◆ G1: Thursday (2:00-2:55)
- ◆ **G3: Friday (2:00-2:55), G1: Friday (4:00-4:55)**
- ◆ Red coloured classes (S1) will be scheduled for any nine weeks
- ◆ Red coloured tutorials will be scheduled for any three weeks

Assessment

- ◈ Mid semester
- ◈ End semester
- ◈ Hands-on and/or Assign. and/or Quiz / or Class Participation

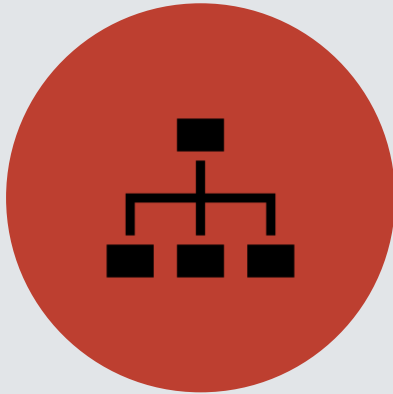
Additional info:

- Course related email's subject prefix by **CS104:**
 - Email ID: **phrangboklang.thangkhiew@iiitg.ac.in**

Assessment methods

Assessment Type	Date	Max Marks	Weightage
Quiz 1	To be Announced	10	10
Quiz II	To be Announced	10	10
Assignment/ Class Participation/ Extra Quiz	According to Routine		10
Mid Semester	As per the announcement made by the Institute		30
End Semester			40

Outline



INTRODUCTION TO COMPUTER
SYSTEMS



DIFFERENCE BETWEEN
COMPUTER ARCHITECTURE
AND ORGANIZATION



FUNCTIONAL COMPONENTS OF
A COMPUTER

Introduction to Computer Systems



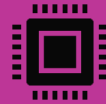
Architecture v/s Organization



Computer architecture - It acts as the interface between hardware and software.



Computer Organization - It deals with the components of a connection in a system.

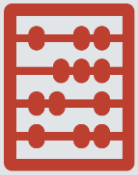


Architecture involves Logic (Instruction sets, Addressing modes, Data types, Cache optimization)



Organization involves Physical Components (Circuit design, Adders, Signals, Peripherals)

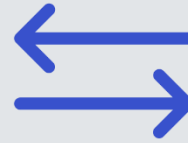
Functions of a computer



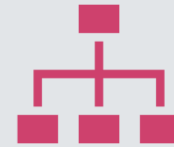
Processing the
data



Storage of the
data

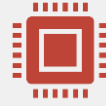


Movement of
the data



Controlling

Functional components of a computer



The CPU



Main Memory

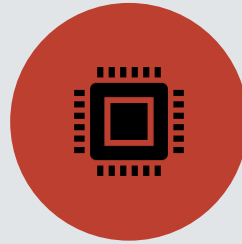


Input/Output (I/O)

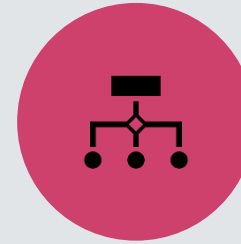


System Interconnection

CPU



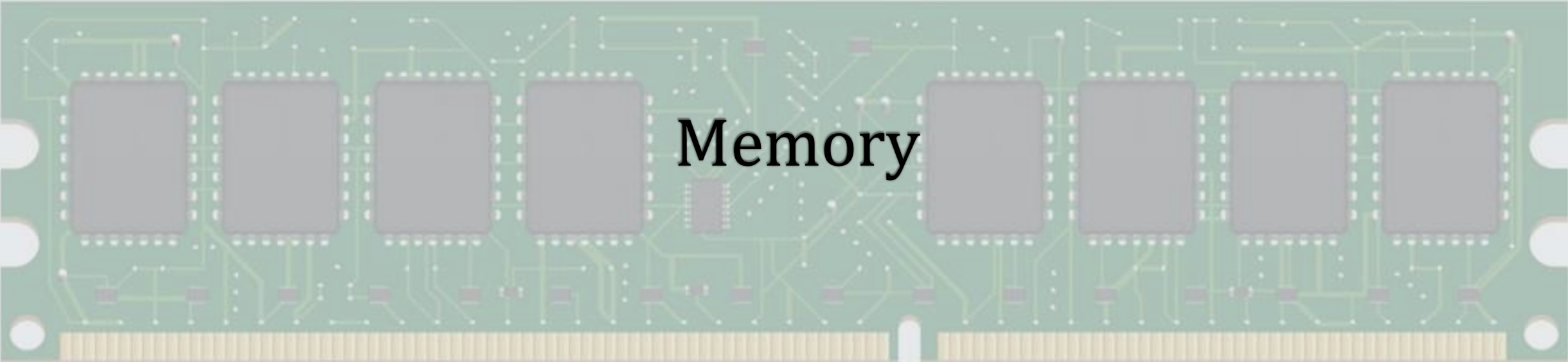
ARITHMETIC AND LOGIC
UNIT – DATA
PROCESSING FUNCTIONS
OF A COMPUTER



CONTROL UNIT – TAKES
DATA, SEND IT TO
PROCESSING AND SEND
IT TO THE OUTPUT

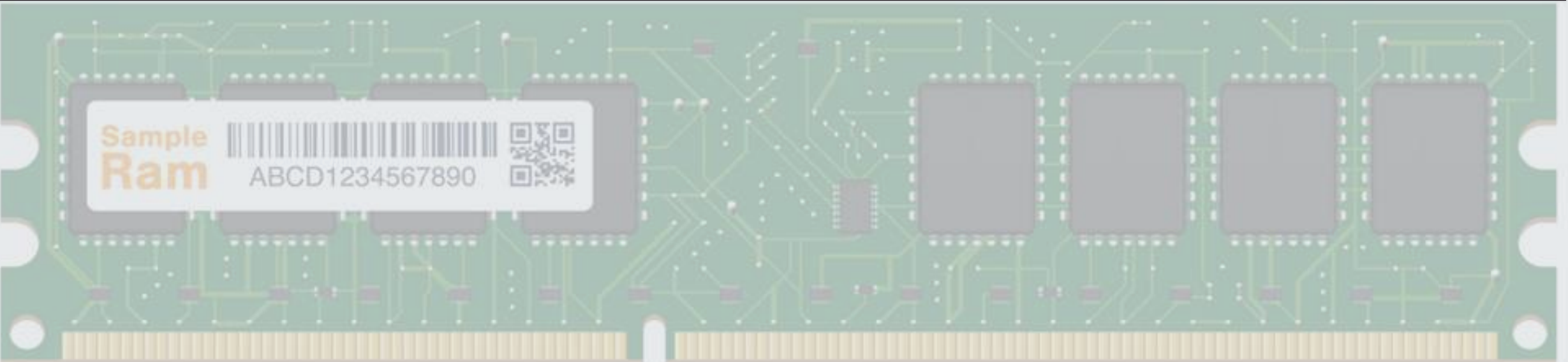


REGISTERS – CONTAIN
DATA USED FOR
EXECUTION



Memory

- ◇ RAM- In a nutshell, it's an extremely fast component that temporarily stores all the information your PC needs right now and in the near future. Accessing that information in RAM is insanely fast, unlike slower hard drives, which provide longer-term storage.



Input Unit

Provide input data to the computer



Output Unit

Produce the results which
are processed by the system



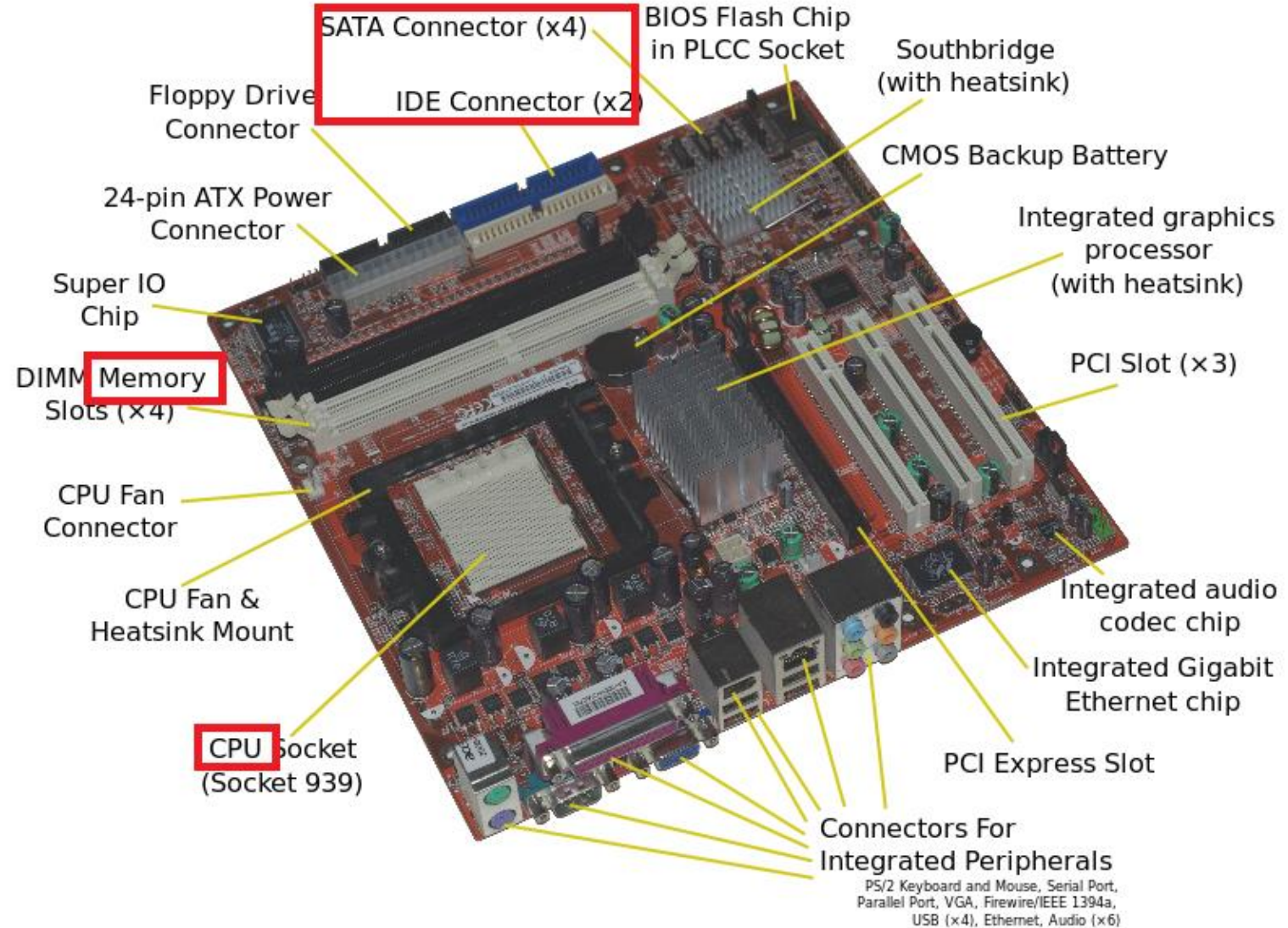
System Interconnections

- ◆ Provide communication among various components
- ◆ System bus, Address bus, Data bus.

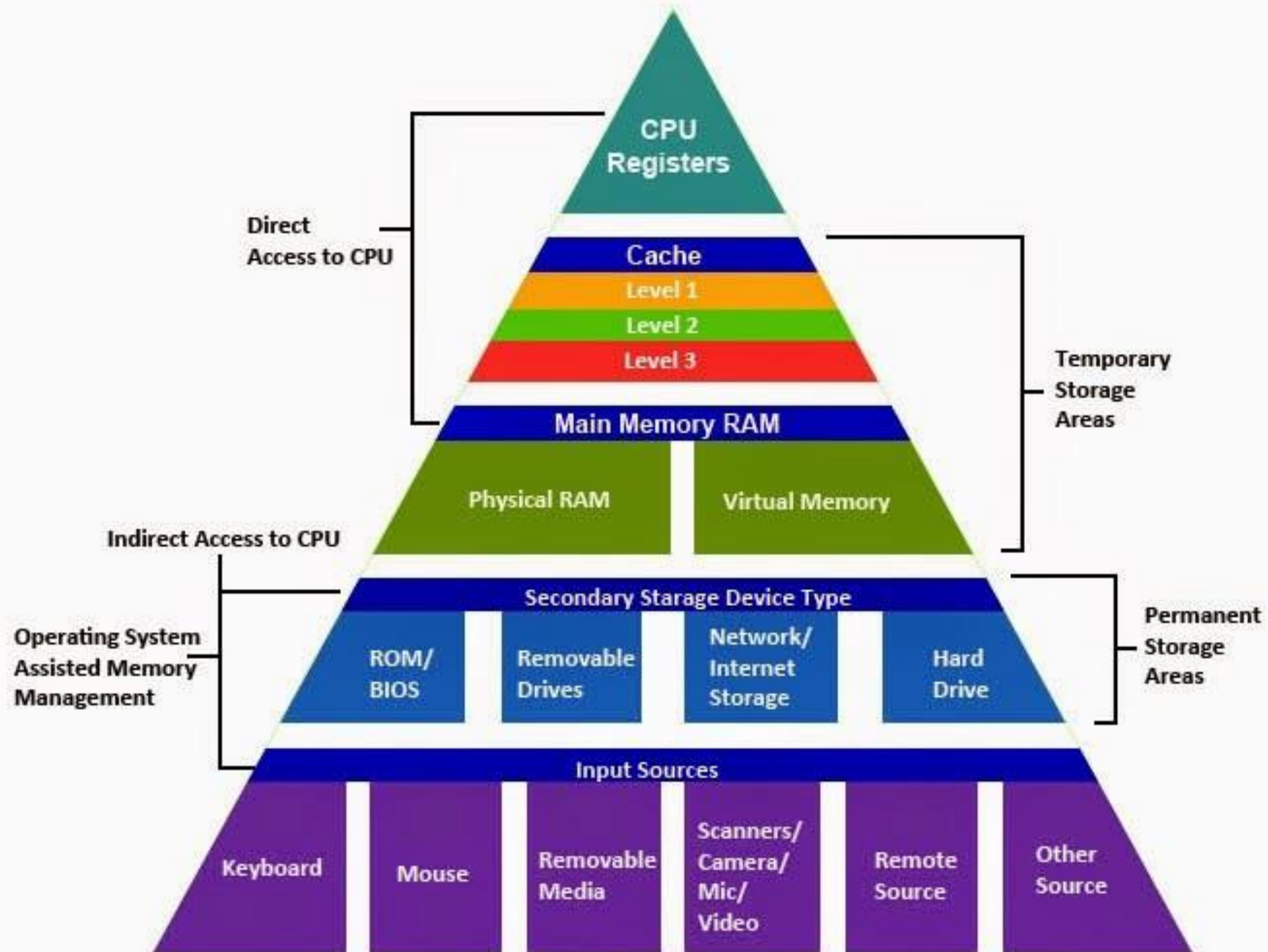


Motherboard

- ❖ The main components are the CPU Socket, the Memory sockets and the IDE/SATA sockets for the Hard Drive(s).
- ❖ These sockets are where the various components are connected to the motherboard.
- ❖ The thin silver lines running throughout the motherboard are the conduits (or circuits) along which instructions/data/signals are sent between the various components on the motherboard and to connecting devices.



Memory Hierarchy





Thank You