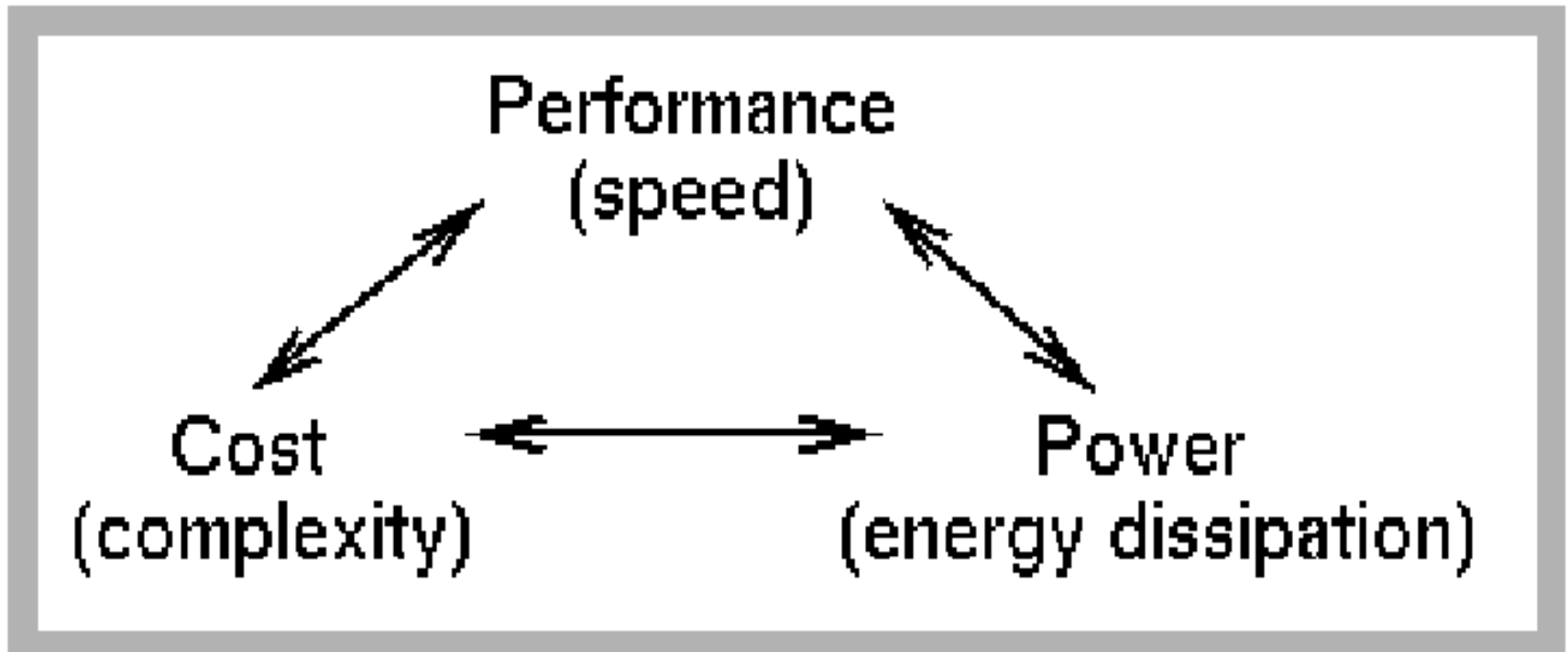


Basics of Processor based Systems

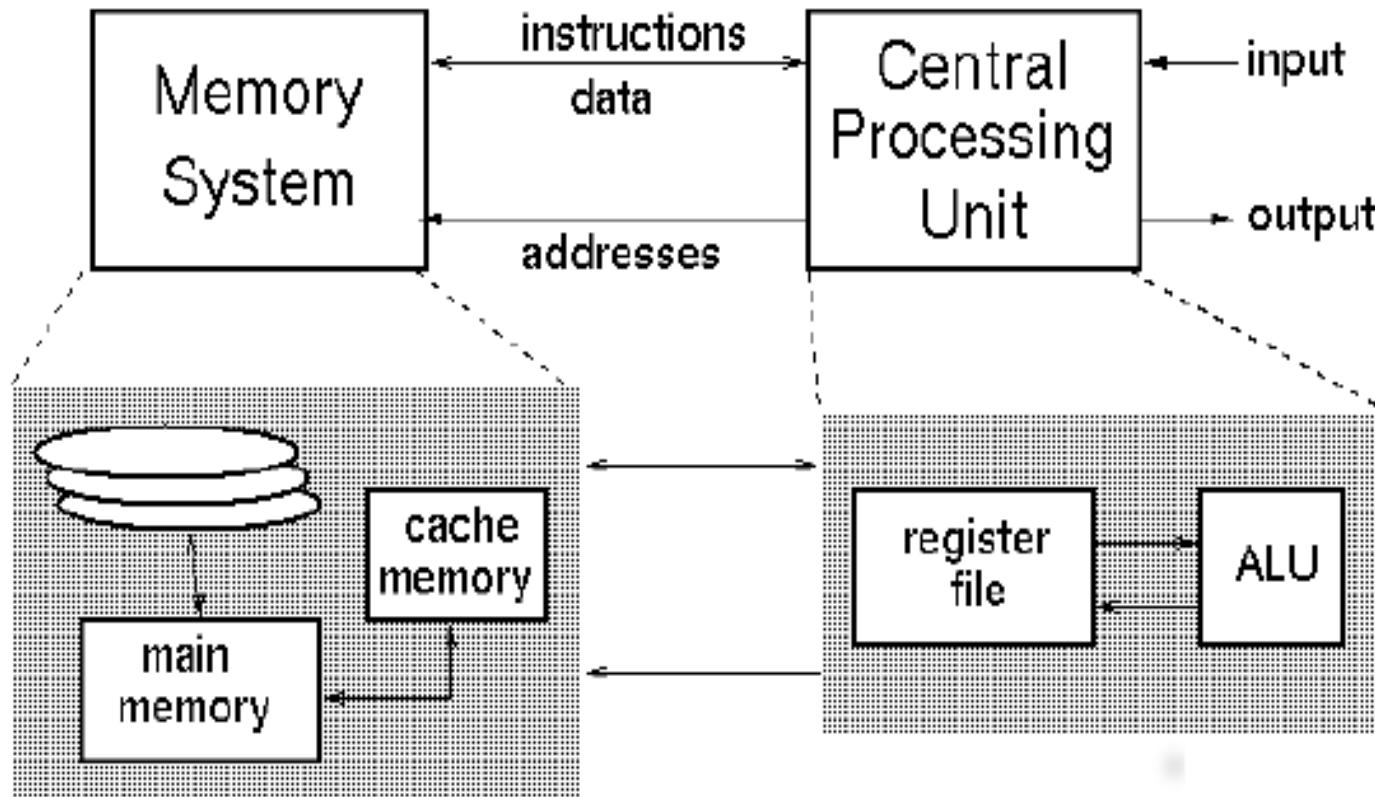
Dr. Tassadaq Hussain

Riphah International University
Microsoft and Barcelona Supercomputing Center
UCERD Pvt Ltd

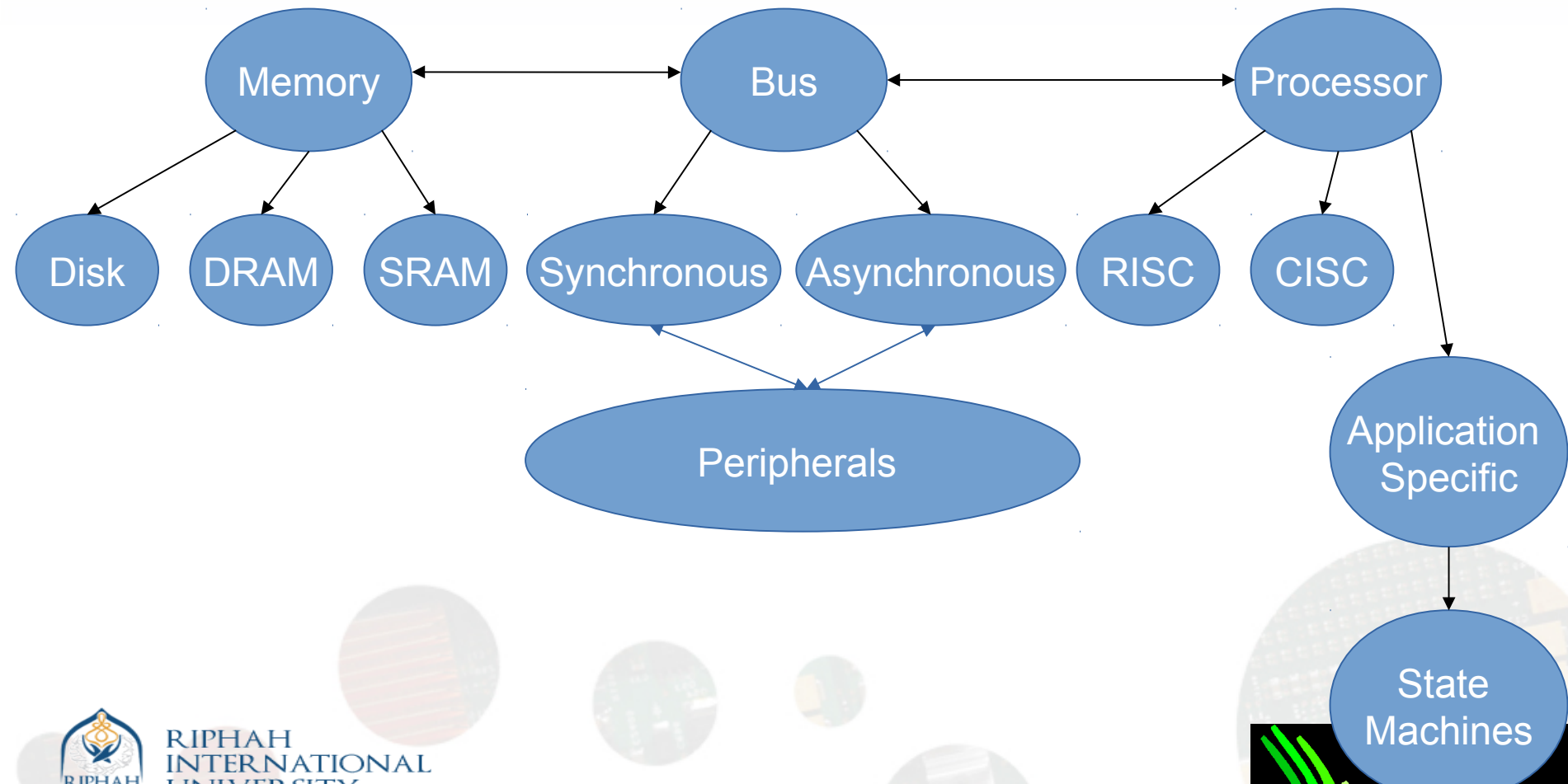
Design Trade off



Processor System



Digital System Components



Processor System Architecture

➤ Hardware

- Processor
- Bus
- Memory
- Peripherals

➤ Software

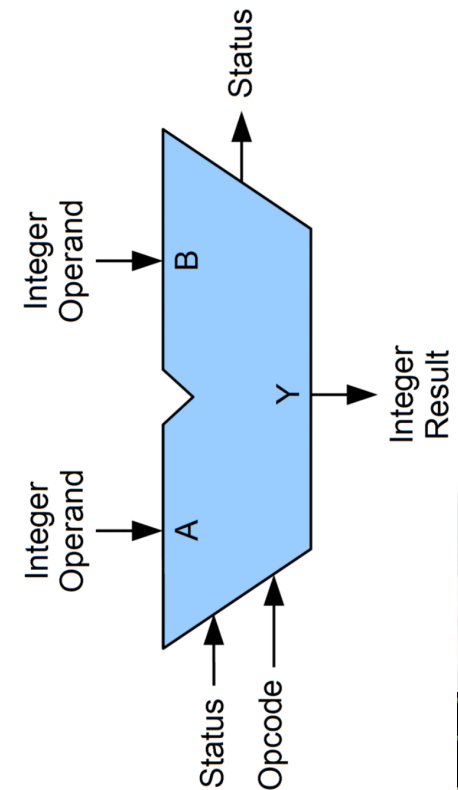
- System Software
- User Software
- Software Programming Languages

Processor

A simple processor takes a single instruction and generate results in a given time called instruction cycles.

An instruction includes two values (operands) and an arithmetic or a logic operation (operator).

Values (operands) can be from memory or peripherals.



Important Parameters of a Processor

Clock

Data Bus

Instruction Bus

Instructions Per Cycles

Pipeline Stage

Processor Architectures

SISD

RISC

SIMD

CISC

MISD

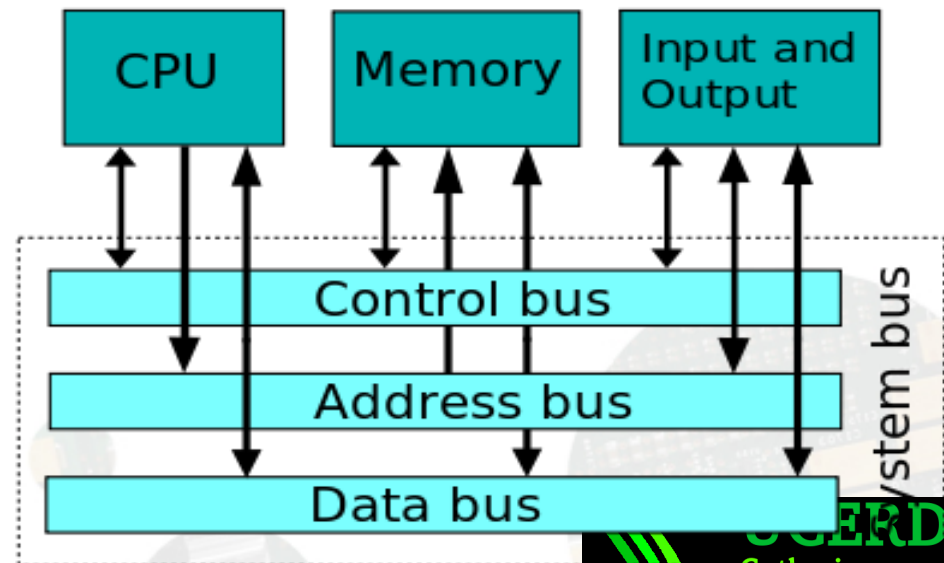
MIMD

Multi-core

Bus System

The bus system connects the memories and input output peripherals with the processor using data, address and control buses.

The data bus carries information, the address bus to determine where it should be sent, and a control bus to determine its operation.



Important Parameters of Bus System

Bus Clock

Data bus width

Address bus width

Types of Bus Systems

- Single Layer
- Multi-layer
- Network On a Chip
- Peripheral Bus
 - ✓ Serial Bus
 - ✓ Parallel Bus

➤ Synchronous bus:

- Transmitter and receivers are synchronized of clock.
- Data bits are transmitted with synchronization of clock.
- Character is received at constant Rate.
- Data transfer takes place in block.
- Start and stop bit are required to establish communication of each character.
- Used in high – speed transmission.

➤ Asynchronous bus:

- Transmitters and receivers are not synchronized by clock.
- Bit's of data are transmitted at constant rate.
- Character may arrive at any rate at receiver.
- Data transfer is character oriented.
- Start and stop bits are required to establish communication of each character.
- Used in low – speed transmission.

Memory

- Local Memory (SRAM)
 - On Chip Memory Volatile
 - SRAM
- Global/Main Memory (DRAM)
 - Off Chip Memory Volatile
 - DRAMs
- External Memory
 - Non Volatile
 - SDCard, Disk etc

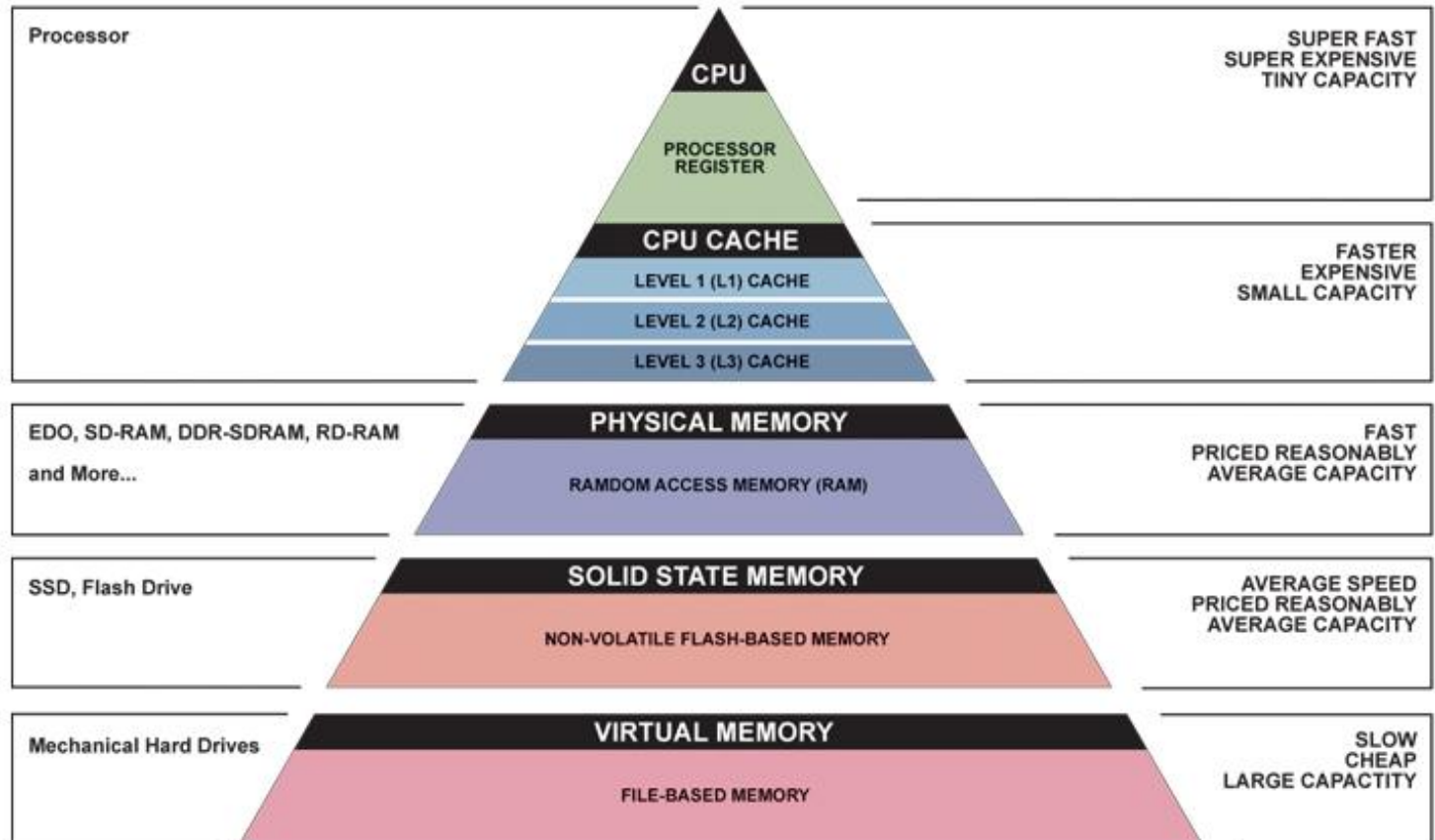
Important Parameters

Read/Write Clocks (time)

Memory Width

Memory Depth or Size

Memory Hierarchies



▲ Simplified Computer Memory Hierarchy
Illustration: Ryan J. Leng

Software

A software is combination of processor instructions used to process specific task or application.

- System Software
- User Software
- Software Programming Languages

System Software

The system software manages and supports resources and tasks of a processor system.

The tasks include Scheduling Tasks, Memory Management, Network Management, I/O Management, Power Management, Disk and Network Management

User Software

User softwares are application used to perform user defined tasks. (calculator, security program, etc)

Software Programming Languages

Machine Language

Assembly Language

Programming Language

Scripting Language

Tasks

Start your semester project

- Place order of Odroid board

Clear your concept about

- bits and bytes.
- Prefix - pico, nano, micro, kilo, mega, giga, tera etc.
- Million, billion etc.

Major steps involved in Solving a problem

- Understand the problem
- Technique
 - Write methodology to solve problem
 - Theoretical Model
 - Mathematical Model
 - Simulation Model
- Technology
 - Processor System
- Tool
 - Programming Language
 - Assembly
 - C/C++
 - Python



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