SE1101 : COMPUTER ORGANIZATION
DS1106 : COMPUTER SYSTEM ORGANIZATION

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Intended Learning Outcomes

- ILO1:- Outline the concepts of the construction of computer systems.
- ILO2:- Outline working knowledge of a low level & high-level programming of hardware devices.
- ILO3:- Present an overview of the main characteristics of computer memory systems and the use of a memory hierarchy.
- ILO4:- Explain the use of I/O modules as part of a computer organization.
- ILO5:- Present an overview of essential characteristics of machine instructions.

Course Contents

- Topic 01: Basic Concept and Computer evolution: Organization and Architecture, the evolution of the Intel x86 Architecture, Embedded Systems, ARM architecture.
- Topic 02: Computer Performance Issues: Multicore, MIC and GPGPUs, Basic Measures of Computer Performance, benchmark and SPEC.
- Topic 03: Computer Function and interconnection: Computer Bus Interconnection, Point to Point Interconnection.
- Topic 04: Computer Memory System: Cache Memory Principles, Semiconductor main memory, External memory.

Course Contents

- Topic 05: Input/output: External Devices, I/O Modules, Interrupt Driven I/O, Programmed I/O, I/O channels and processors, External Interconnection Standards.
- Topic 06: Arithmetic and Logic: number system, Integer Representation, Floating Point representation, Digital logic, Combinational Circuits, Sequential Circuits, Programmable Logic Devices.
- Topic 07: The central Processing Unit: Machine Instruction Characteristics, Addressing Modes, Assembly language, Processor, Instruction Level Parallelism and superscalar Processor.
- Topic 08: Parallel Organization: Parallel processing, Multicore computers, General purpose Graphic processing Unit.

Assessment Strategy

Continuous Assessment 30%			Final Assessment 70%		
Quizzes 20%	Mid-term 30%	Assignments 50%	Theory 100%	Practical	Other Specify

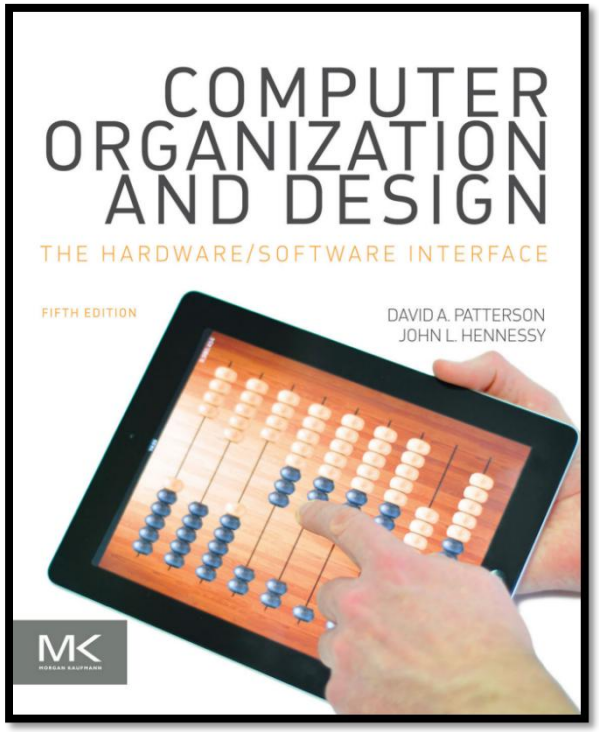
Semester	**1**		
Course Code:	SE1101		
Course Name:	Computer Organization		
Credit Value:	2		
Core/Optional	Core		
Hourly Breakdown	Theory	Practical	Independent Learning
	30		70

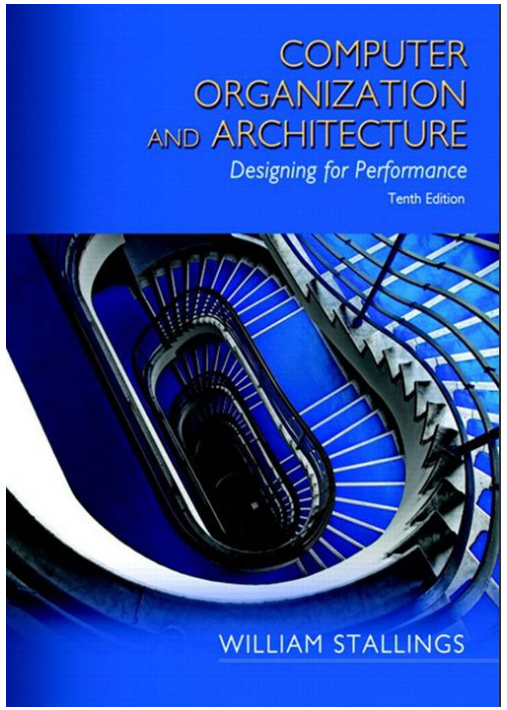
References

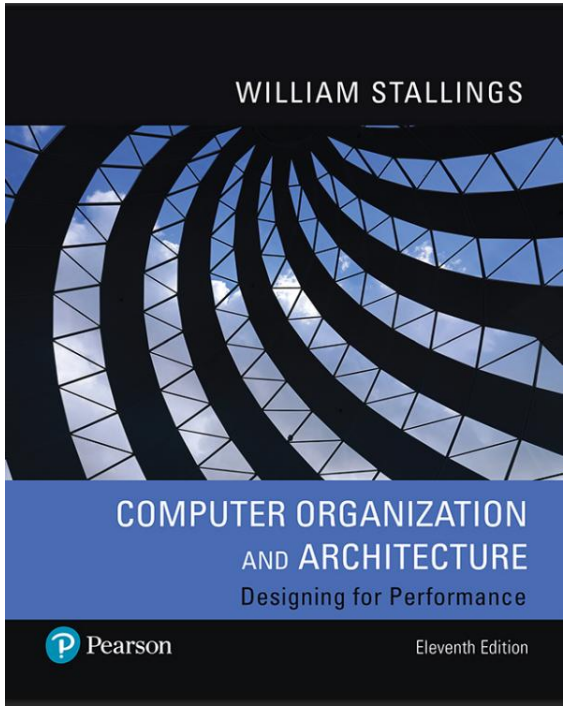
David A. Patterson and John L. Hennessy, *Computer Organization and Design: The Hardware/Software Interface*, 5th ed., Morgan Kaufmann is an imprint of Elsevier, ISBN: 978-0-12-407726-3, 2014.

W.Stallings, *Computer Organization and Architecture: Designing for Performance*, 10th ed., Pearson Education, ISBN-13: 978-0-13-410161-3, 2015.

W.Stallings, Computer Organization & Architecture: Designing for Performance., 11th ed, Pearson Education, ISBN-13: 978-0-13-607373-4, 2019.





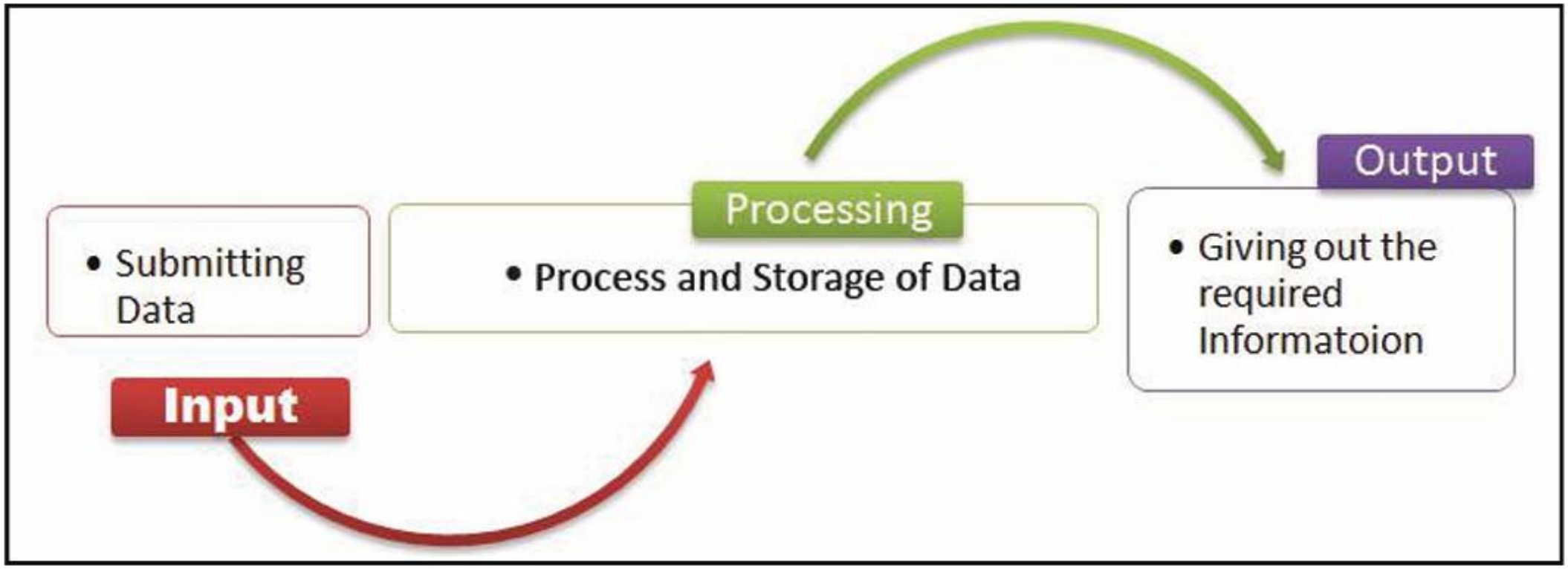


CHAPTER : 01
Introduction to Computer Organization

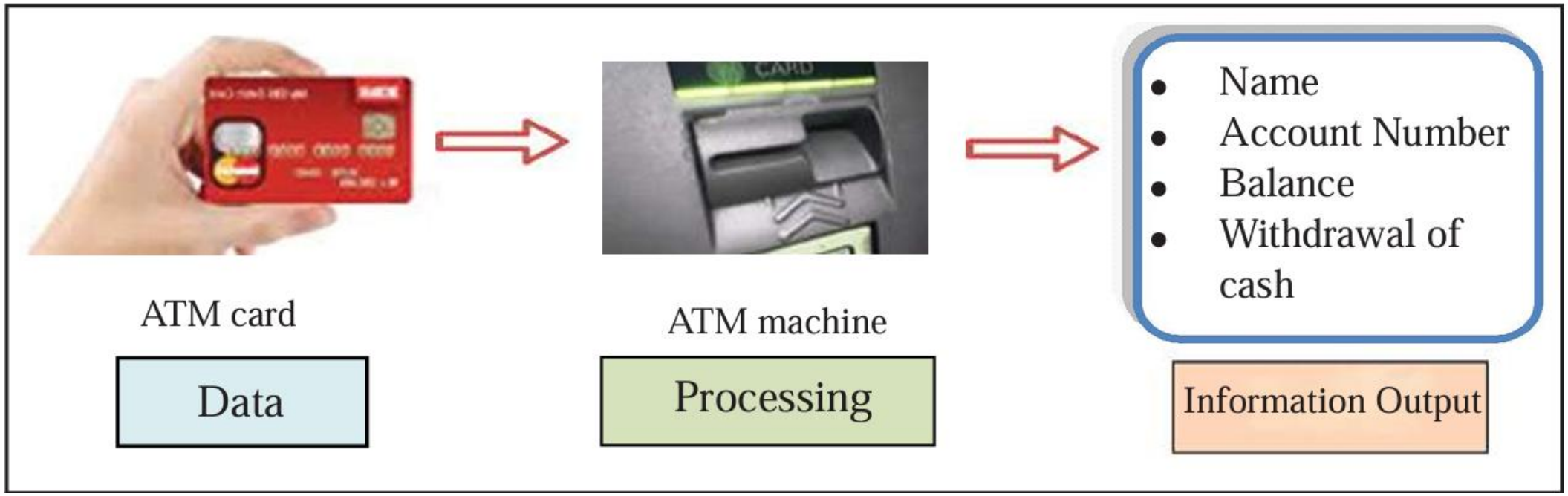
Objectives

- Understand the basic structure of a computer system.
- Distinguish between computer architecture and organization.
- Explain why both architecture and organization are important.
- Recognize key components: CPU, memory, I/O, and system interconnection.

What is Computer System?



Example of Computer System



Architecture Vs Organization
Real World Analogy

Architecture

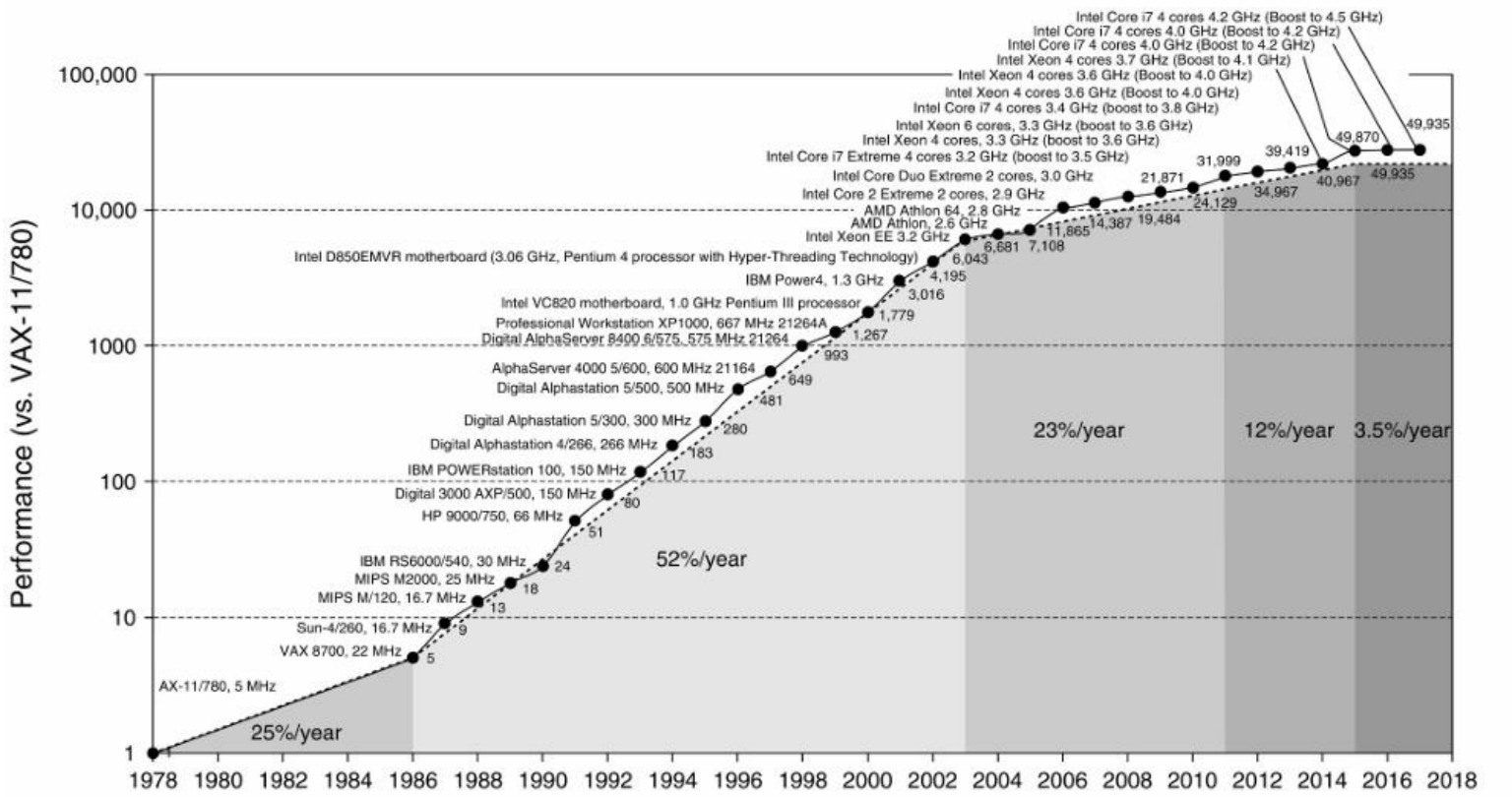
Organization

What is Computer Architecture?

- Attributes of the system visible to the programmer.
- Has a direct impact on how a program executes.
- Commonly referred to as Instruction Set Architecture (ISA).
- ISA includes:
  - Instruction formats and opcodes
  - Registers
  - Instruction & data memory
  - Effects of instructions on memory and registers
  - Control of instruction execution (algorithm)

Why Computer Architecture is important?

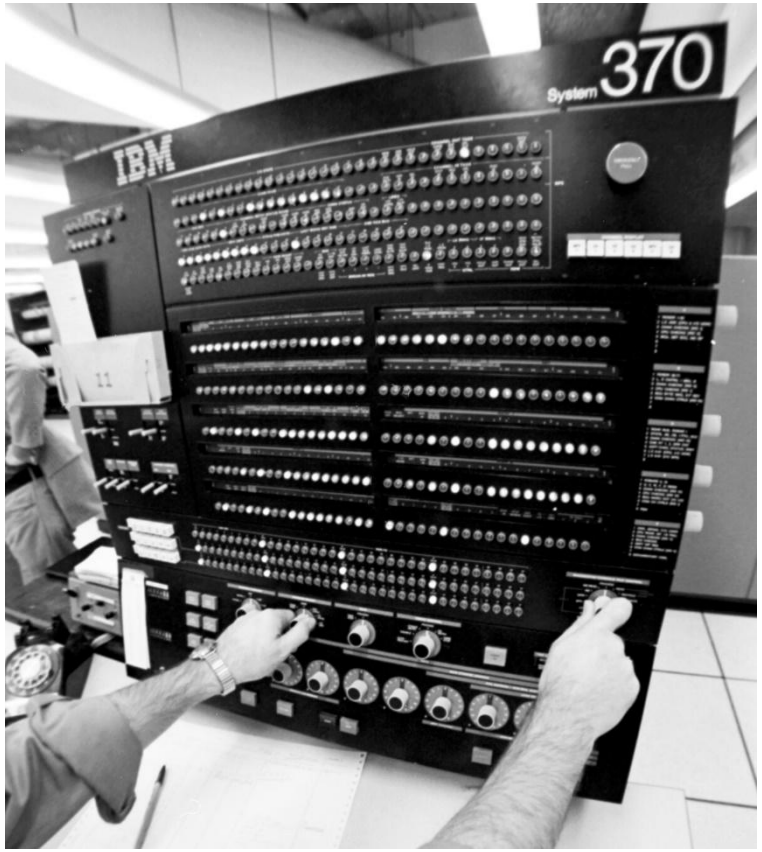
Why Computer Architecture : Historical Trends



What is Computer Organization?

•Internal hardware details that implement the architecture.
•Deals with operational units and their interconnections.
•Focuses on how the system is built, not how it's programmed.
•Examples:
- Control signals
- Interfaces with peripherals
- Memory technology used

Why Computer Organization is important?



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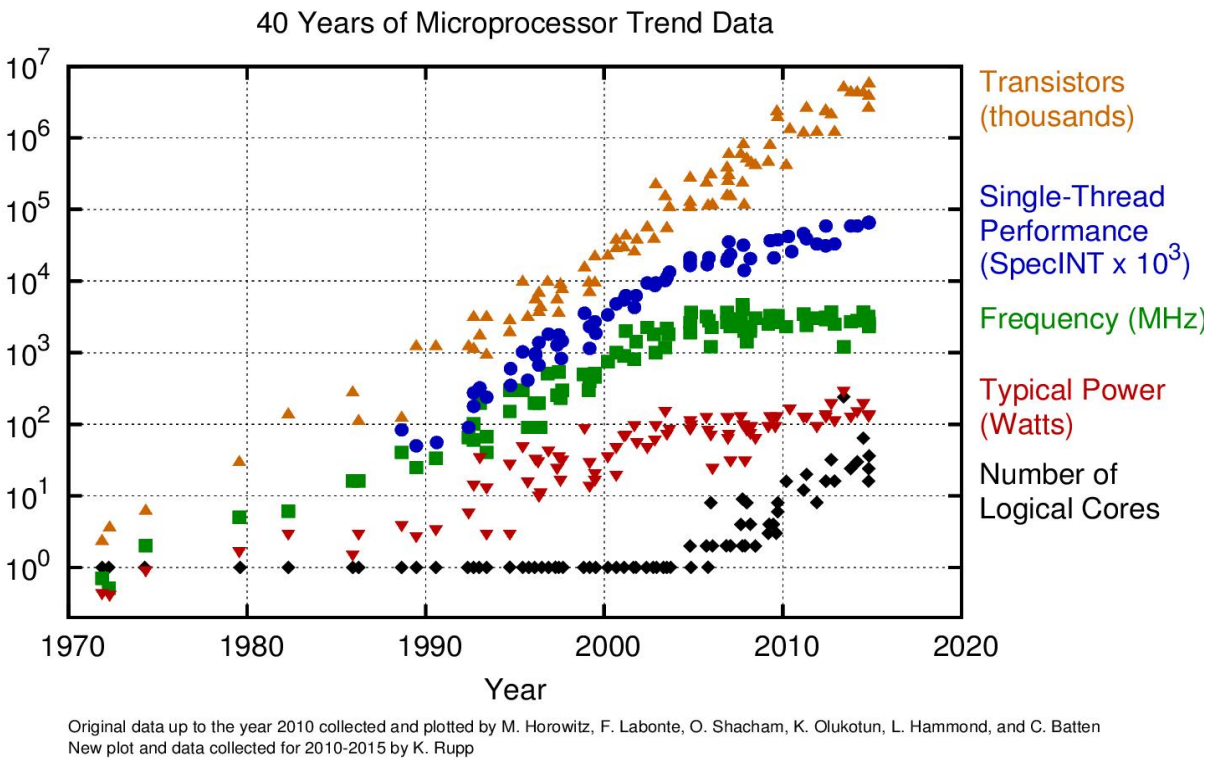
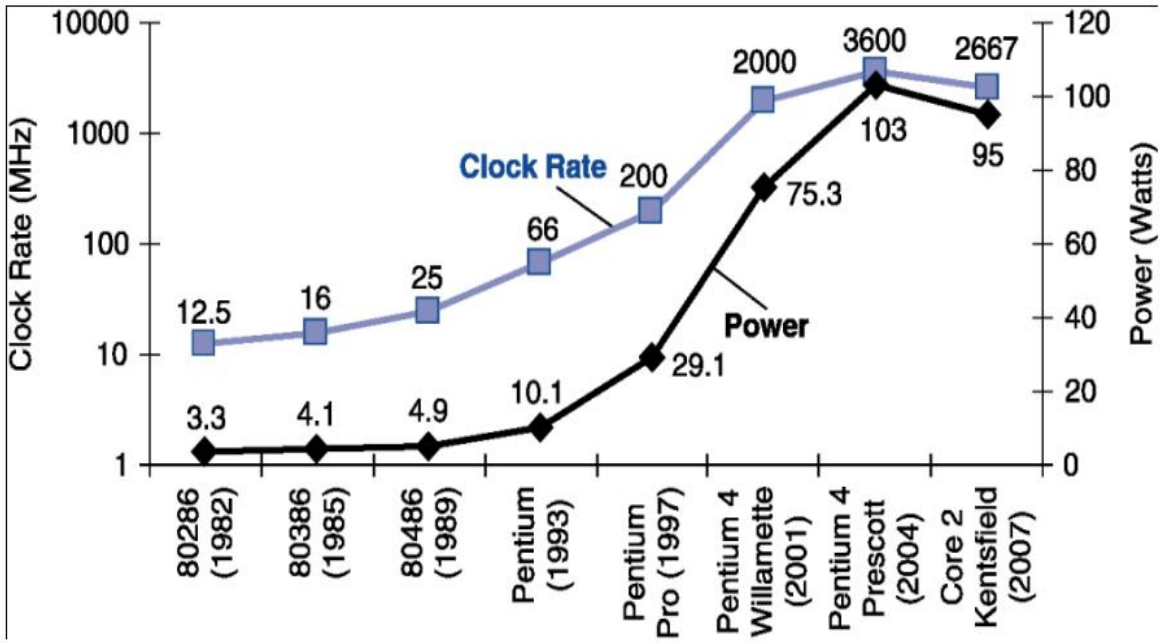
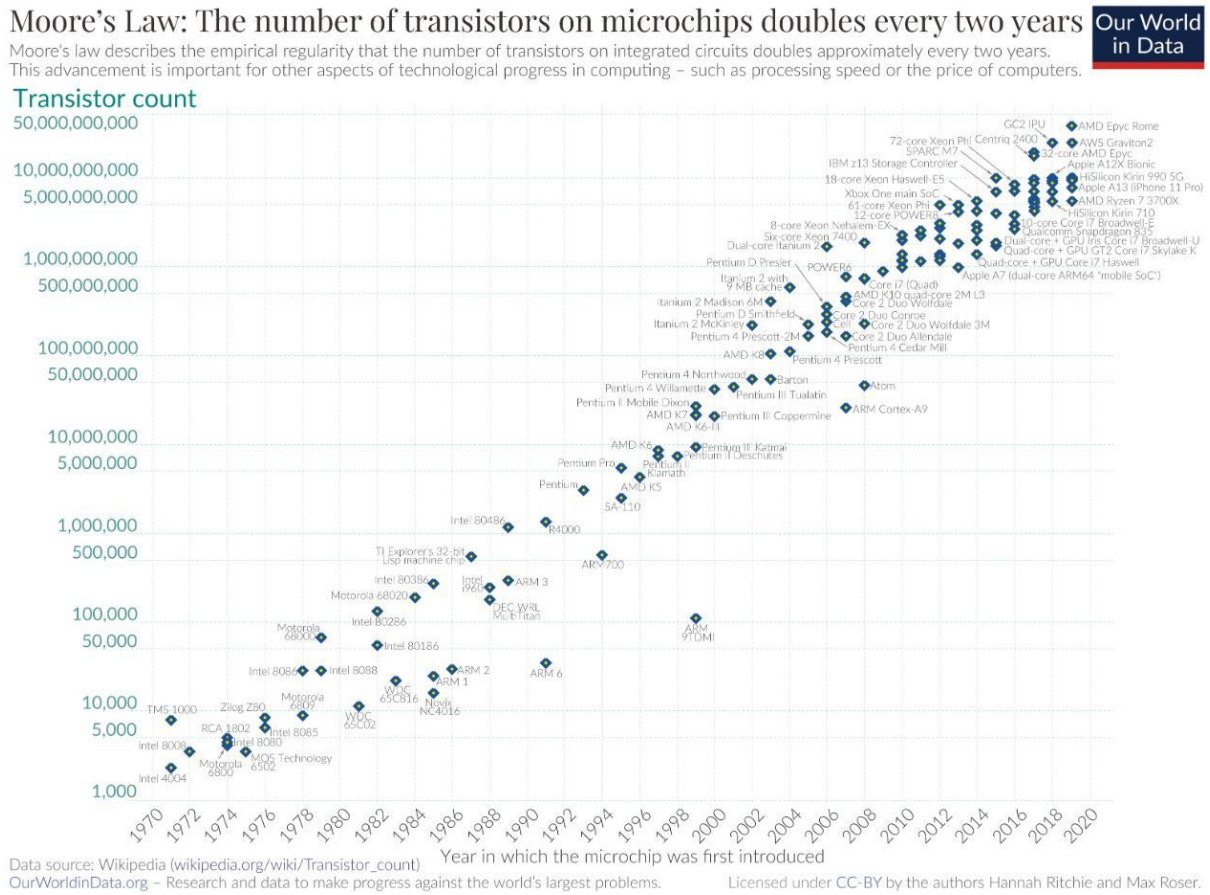
Why Computer Organization : Historical Trends

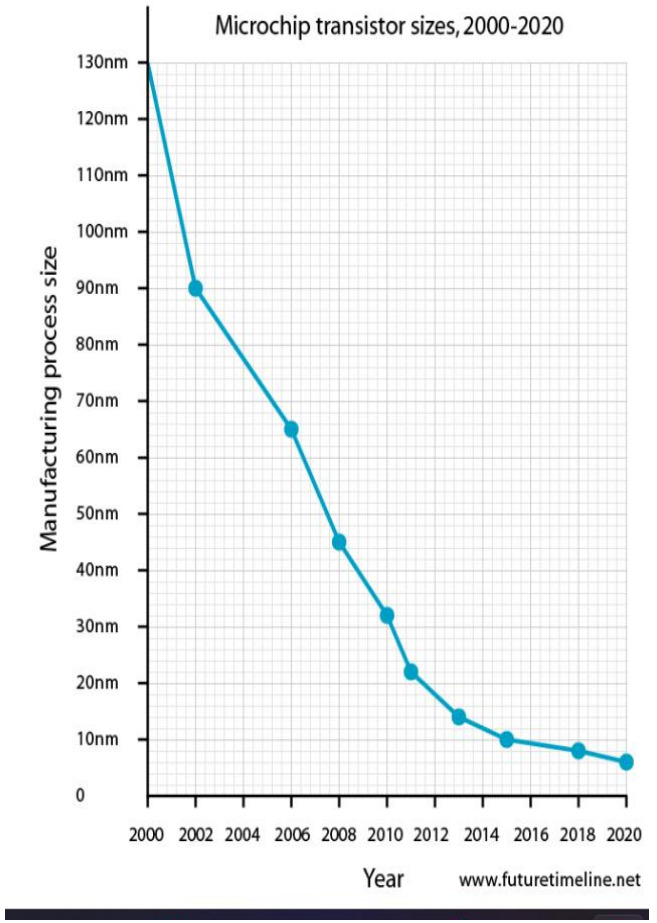


Original data up to the year 2010 collected and plotted by M. Horowitz, F. Labonte, O. Shacham, K. Olukotun, L. Hammond, and C. Batten
New plot and data collected for 2010-2015 by K. Rupp



Why Computer Organization : Historical Trends

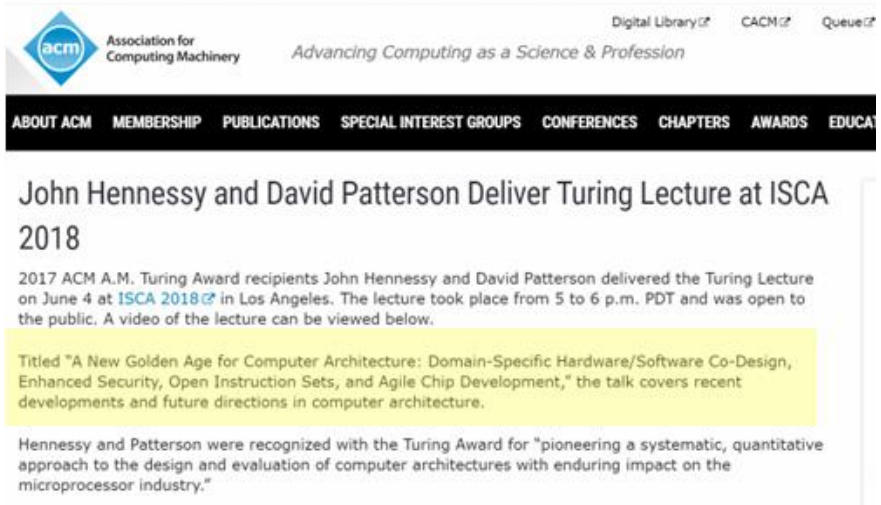




Today Trends : Computer Architecture and Organization

ACM Turing Awards

- The Turing Award is the most prestigious award in computer science – it is the Nobel Price of Computer Science.
- David A. Patterson and Joh L,. Hennessy received the Turing Award 2017 for their work on computer architecture and organization.

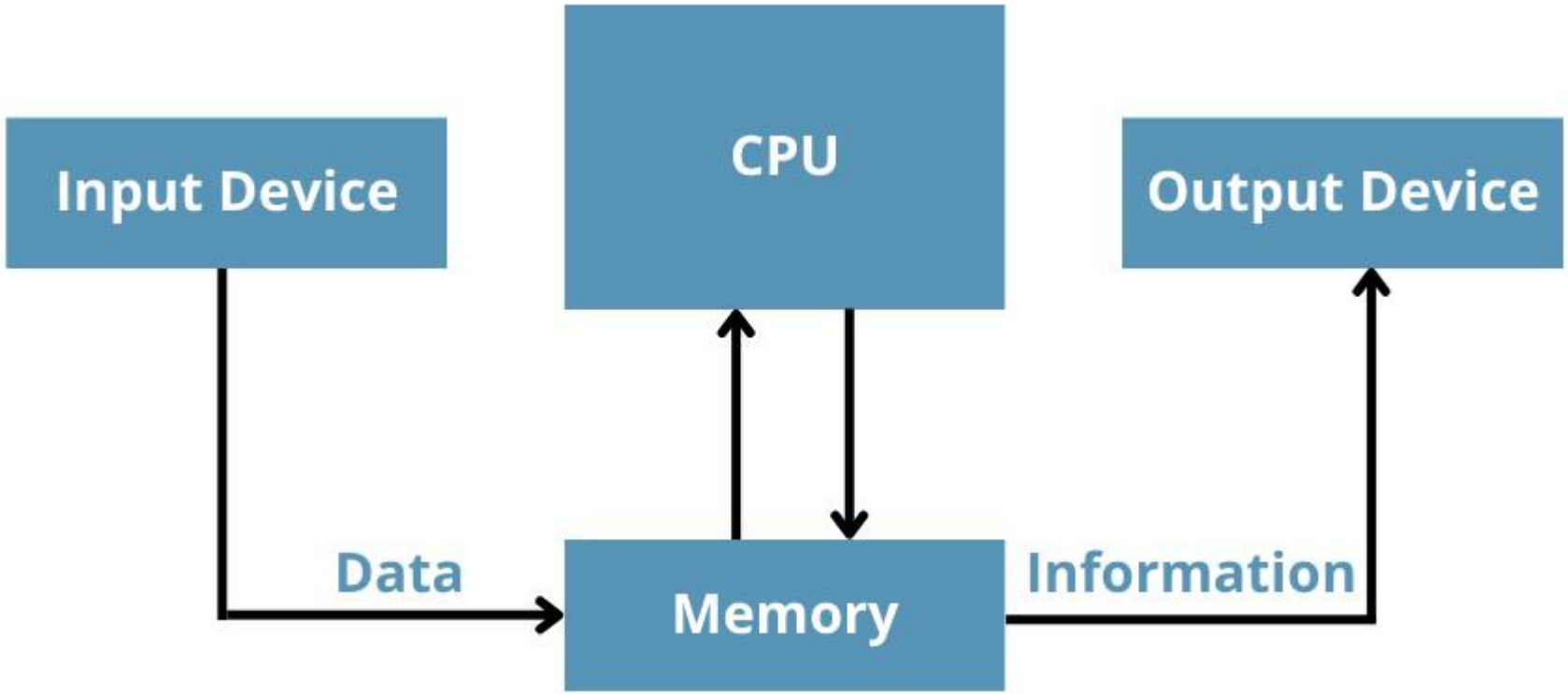


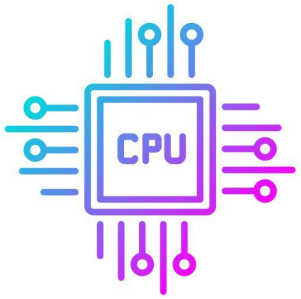
See slides here: http://iscaconf.org/isca2018/docs/HennessyP attersonTuringLectureISCA4June2018.pdf

Computer Architecture Vs Computer Organization : Key Differences

Aspect	Computer Architecture	Computer Organization
Focus	What the computer does	How the computer does it
Key Components	Instruction Set Architecture (ISA), data types, registers, addressing	Control signals, memory tech, buses, ALU design, I/O mechanisms
User Interaction	Directly affects how a programmer writes software	Hidden from the programmer; affects performance & efficiency
Design Concern	Programming model	Hardware implementation & performance trade-offs
Influence Scope	Software and compiler developers	Hardware designers and architects
Analogy	Blueprint of a building	Construction and wiring of the building

Basic Functional Structure of a Computer System





Key Takeaways

•A computer system consists of interrelated components: CPU, memory, I/O devices, and system interconnections.
•Computer Architecture defines what a computer does (e.g., instruction set, data types, addressing modes).
• Computer Organization defines how the computer does it (e.g., control signals, memory technology, bus structures).
•Architecture is visible to programmers, while organization is more hardware-level and transparent to users.
• Understanding the distinction is critical for designing efficient, cost-effective, and compatible systems.


Q
A


Thank
You