

# Introduction to Computer Systems

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# EXAMPLES FOR COMPUTER SYSTEMS

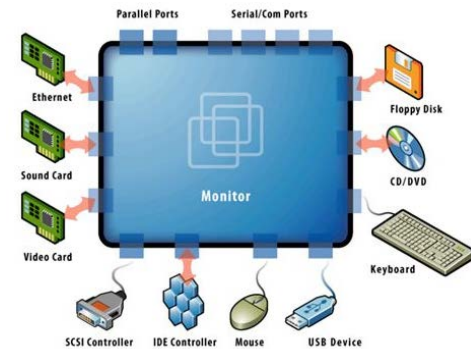
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# MAJOR COMPONENTS OF A COMPUTER SYSTEM

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- ▶ All computer systems, no matter how complex, consists of:
  - ▶ At least one CPU
  - ▶ Memory to hold programs and data
  - ▶ I/O devices
  - ▶ Long-term storage



# WHY STUDY COMPUTER SYSTEMS?

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## ▶ User

- ▶ Understand system capabilities and limitations
- ▶ Make informed decisions
- ▶ Improve communications with information technology professionals

## ▶ Programmer

- ▶ Create efficient application software for specific processing needs

## ▶ Systems Architect or Systems Analyst

- ▶ Specify computer systems and architecture to meet application requirements
- ▶ Make intelligent decisions about system strategy



# WHY STUDY COMPUTER SYSTEMS?

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## ▶ System Administrator / Manager

- ▶ Install, configure, maintain, and upgrade computer systems
- ▶ Maximize system availability and efficiency
- ▶ Optimize system performance
- ▶ Ensure system security

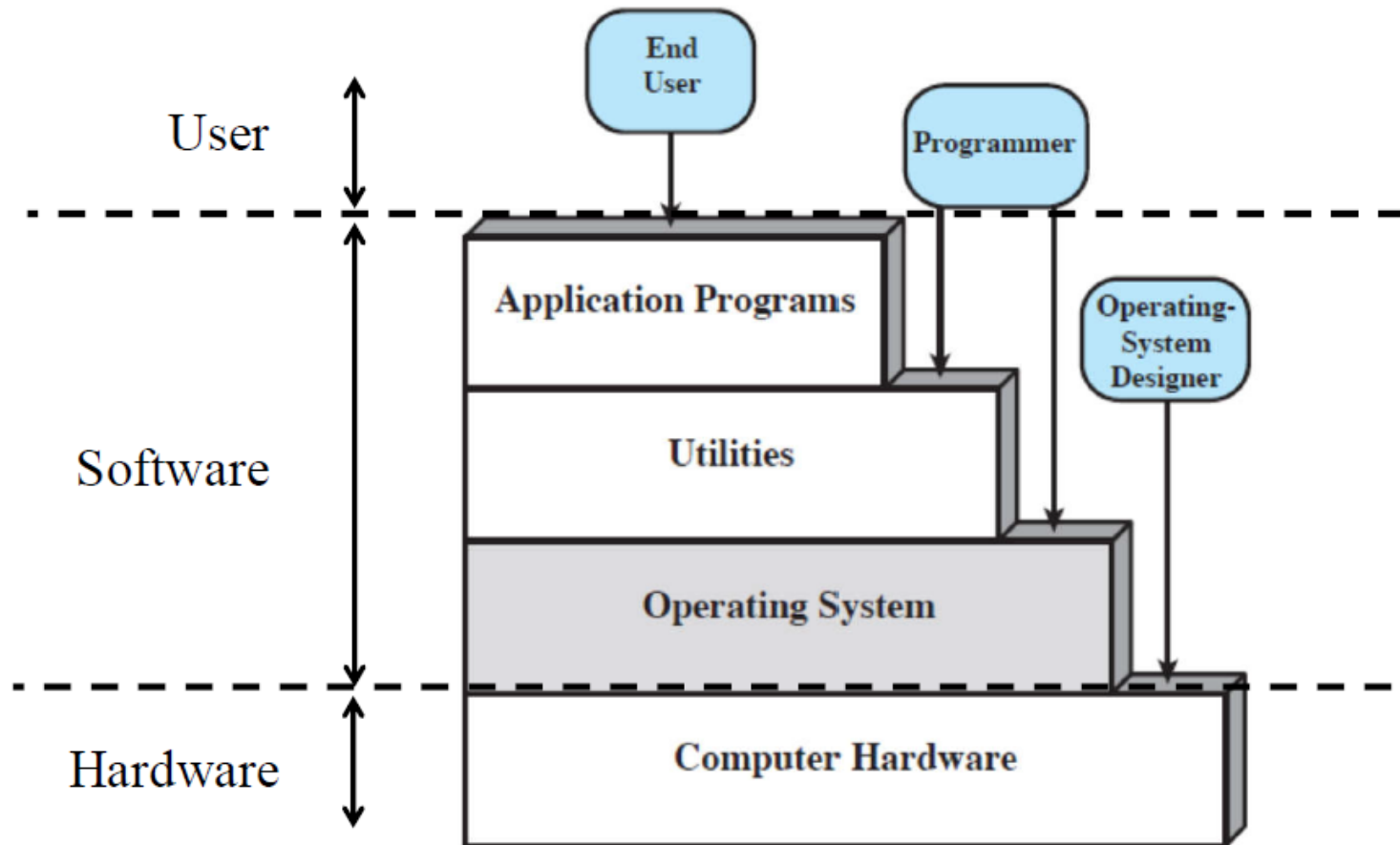
## ▶ Web Services Designer

- ▶ Optimize customer accessibility to Web services
- ▶ Optimize web system configurations
- ▶ Select appropriate data formats, page designs and scripting languages
- ▶ Design efficient Web pages



# LEVELS OF ABSTRACTION

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- ▶ Image Source :William Stallings, Operating Systems: Internals and Design Principles, Sixth Edition. New Delhi, India

# LEVELS OF ABSTRACTION – High Level View

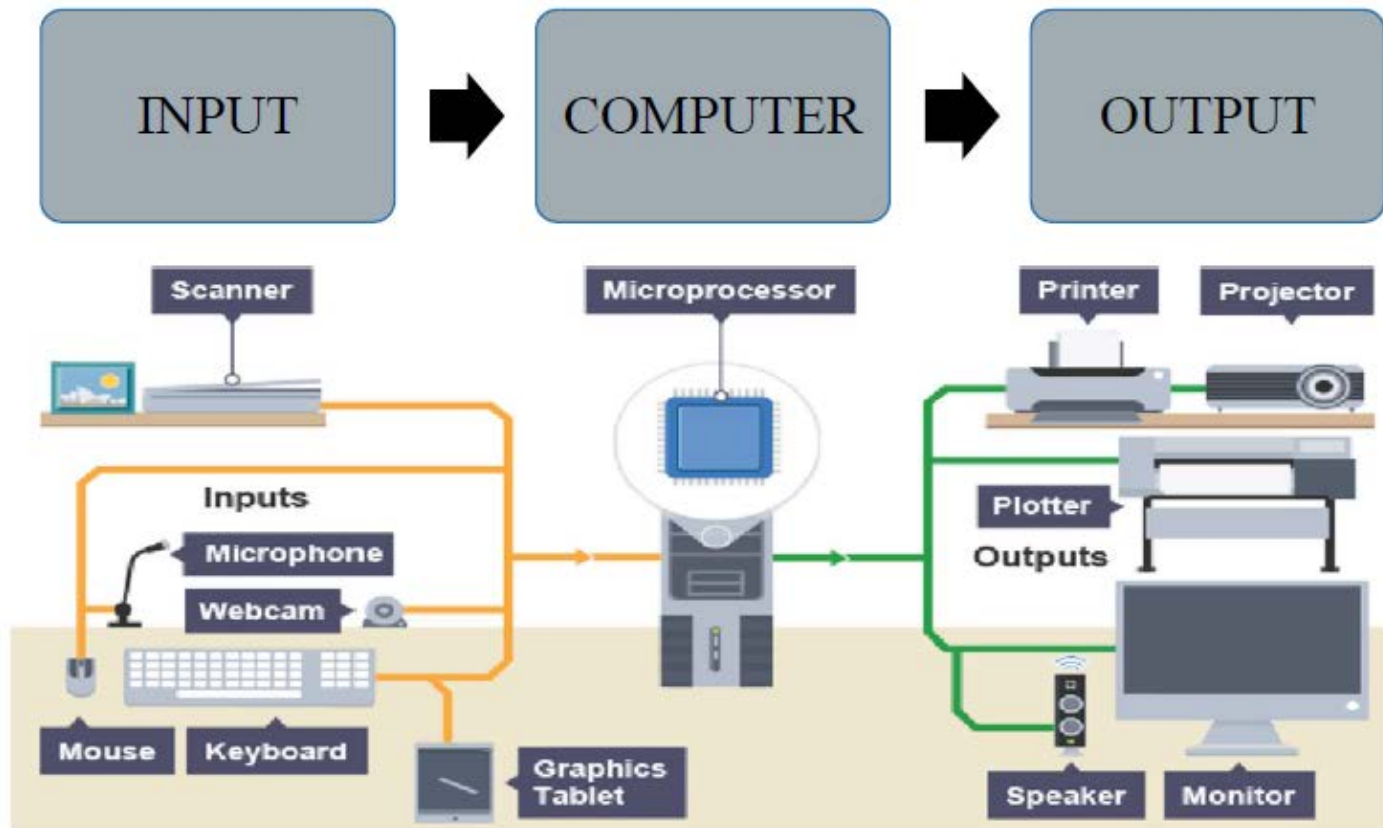
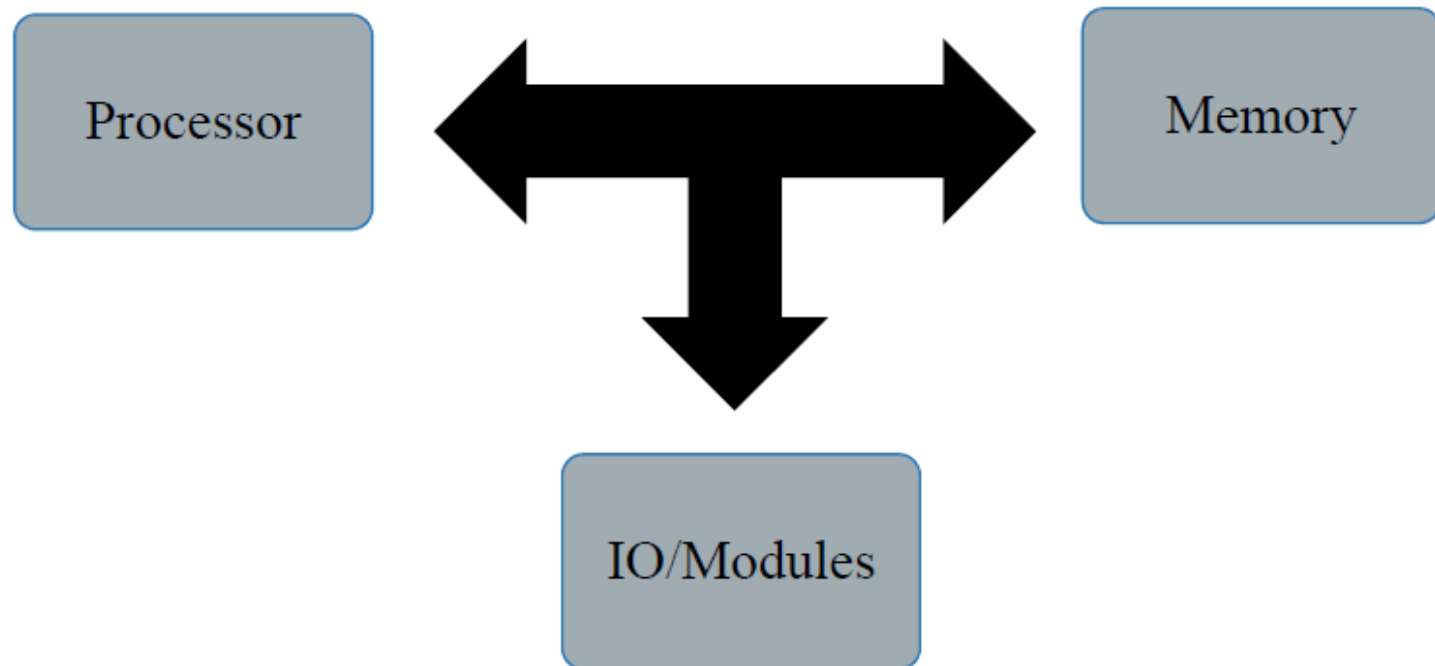


Image Source : <http://pluspng.com/input-and-output-devices-png-2844.html>

# LEVELS OF ABSTRACTION – Detailed View

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# LEVELS OF ABSTRACTION – Inside View

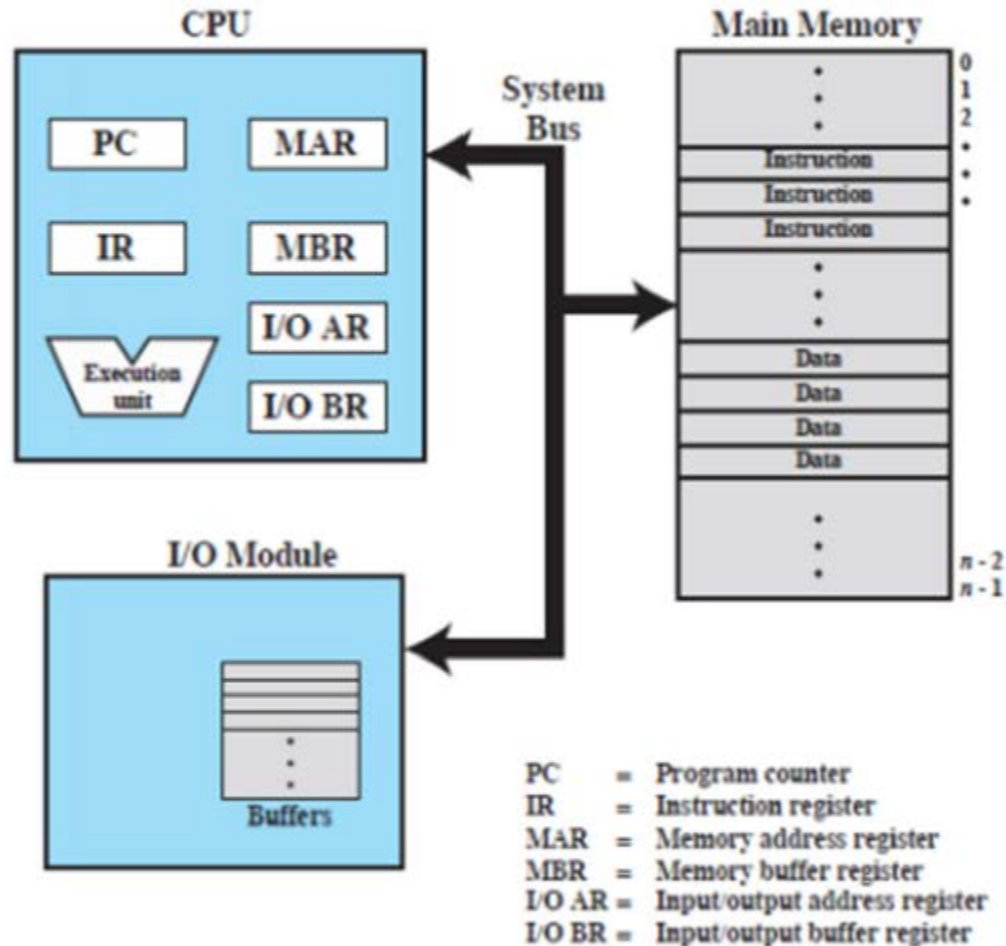
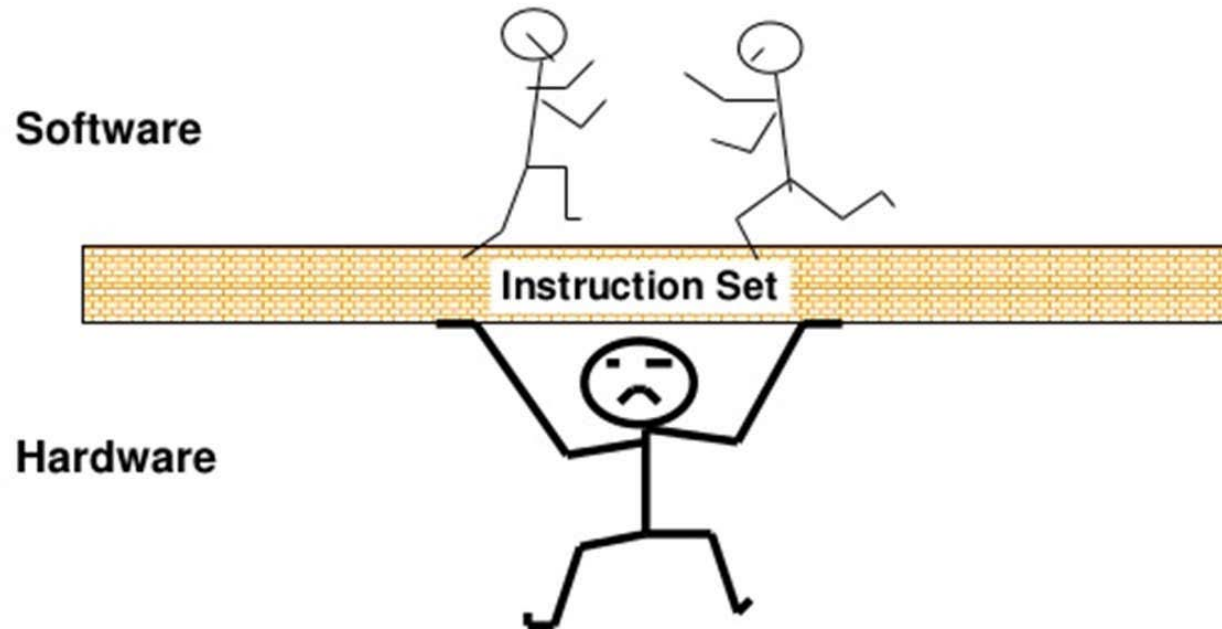


Image Source : William Stallings, Operating Systems: Internals and Design Principles, Sixth Edition. New Delhi, India

# LEVELS OF ABSTRACTION – Instruction Set Level

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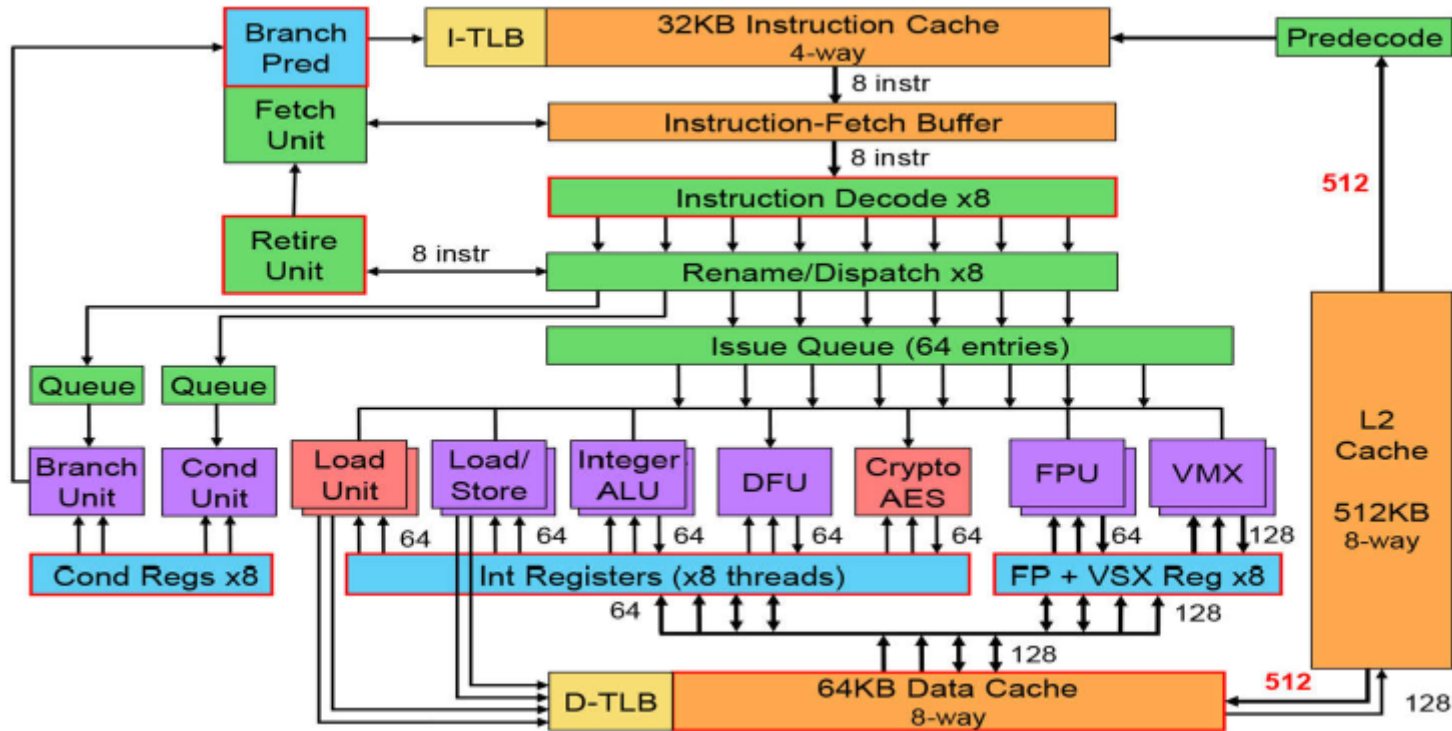
- ▶ Details the instruction set the computer supports
- ▶ Abstraction for an assembly language programmer

Image Source : Computer Architecture: A Quantitative Approach, J. L. Hennessy & D.A. Patterson, 3rd Edition

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# LEVELS OF ABSTRACTION – Hardware Design Level



- ▶ Known as microarchitecture / computer organization
- ▶ Concentrates on how the instruction set is implemented using hardware

Image Source : [http://www.learnitwithmrc.co.uk/KS5/BTEC\\_CS/Year12CS/Unit2/B2/](http://www.learnitwithmrc.co.uk/KS5/BTEC_CS/Year12CS/Unit2/B2/)

# OUR SCOPE

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- ▶ Instruction set level view of computer systems
- ▶ Role of operating system in computer systems
  - ▶ As an extended machine
  - ▶ As a resource manager
- ▶ Interfacing I/O devices to computer systems



# OUR SCOPE

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## ▶ Operating System As An Extended Machine

- ▶ Program development
- ▶ Program execution
- ▶ Access to I/O devices
- ▶ Controlled access to files
- ▶ System access
- ▶ Error detection and response
- ▶ Accounting

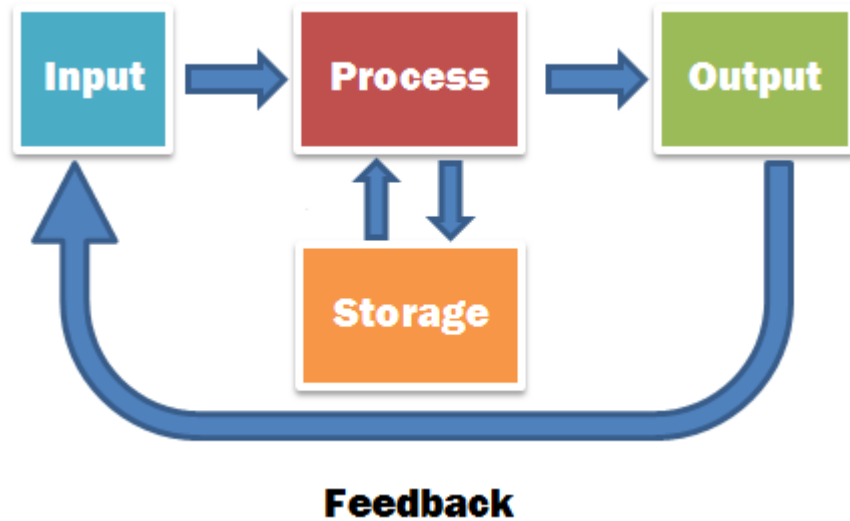
## ▶ Operating System As An Resource Manager

- ▶ Processor
  - ▶ Memory
  - ▶ I/O
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# INPUT-PROCESS-OUTPUT (IPO) MODEL

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- ▶ **Input:** Resources to input data to a system
- ▶ **Processing:** Steps that lead to a result
- ▶ **Output:** Results that comes out of the system
- ▶ **Storage:** Place to store the results of the processing step
- ▶ **Feedback:** Compare results to the original need and adjustments

# IPO MODEL EXAMPLES

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- ▶ Burglar Alarm System
- ▶ Cruise Controller

# COMPONENTS OF A COMPUTER SYSTEM

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## ▶ Hardware

- ▶ Processes data by executing instructions
- ▶ Provides input and output
- ▶ Electronically control input, output and storage components

## ▶ Software

- ▶ Applications and system software
- ▶ Provide instructions tell hardware exactly what tasks to perform and in what order

## ▶ Data

- ▶ Fundamental representation of facts and observations

## ▶ Communications

- ▶ Sharing data and processing among different systems



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# **HARDWARE**



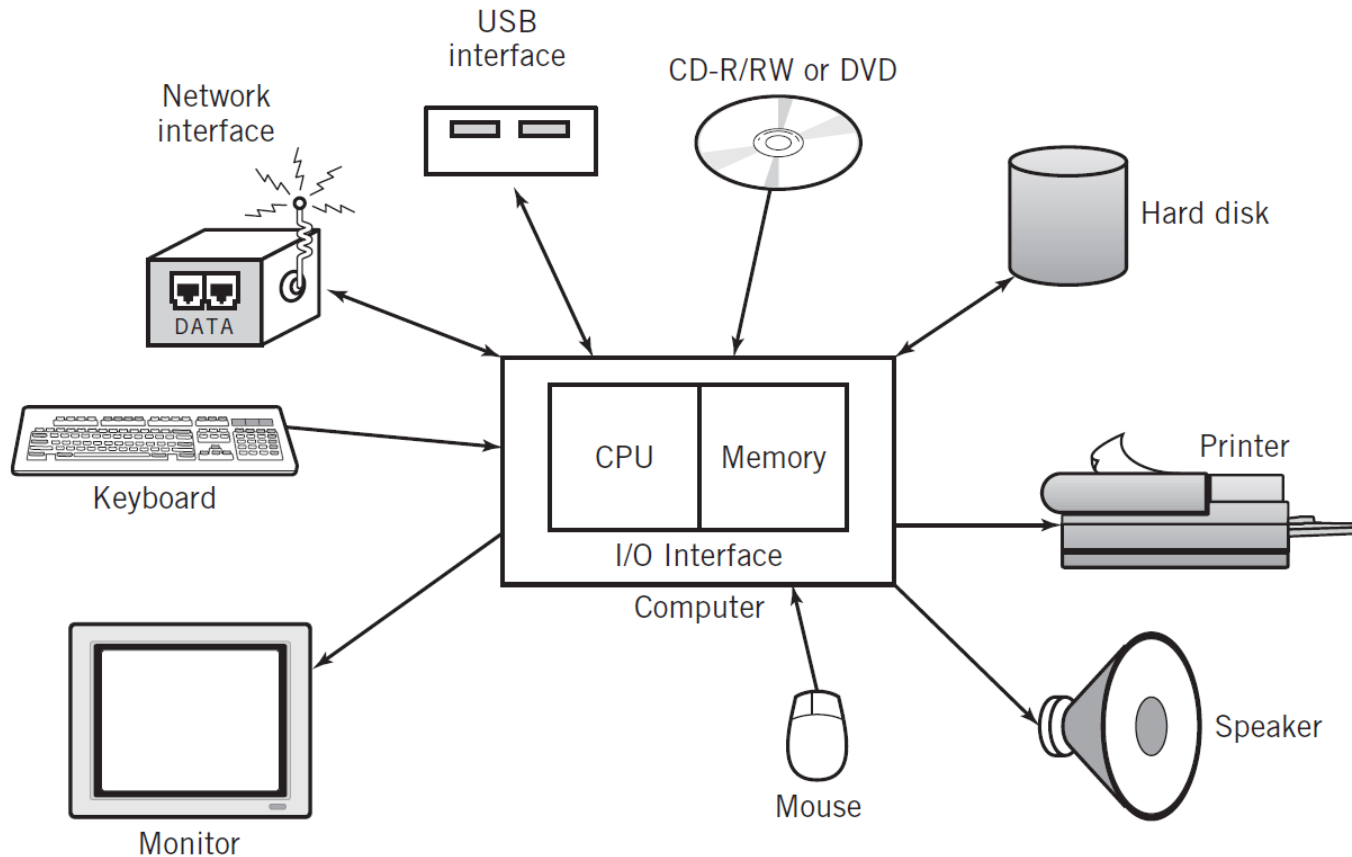
# HARDWARE COMPONENTS

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- ▶ Input Output devices
- ▶ Storage Devices
- ▶ Memory
  - ▶ Short term storage for CPU calculations
- ▶ CPU Central Processing Unit
  - ▶ ALU: arithmetic/logic unit
  - ▶ CU: control unit
  - ▶ Interface unit

# HARDWARE COMPONENTS

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# CENTRAL PROCESSING UNIT-CPU

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# THANK YOU

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