Information Communication Technologies

Lecture 1. Introduction to Computer Systems

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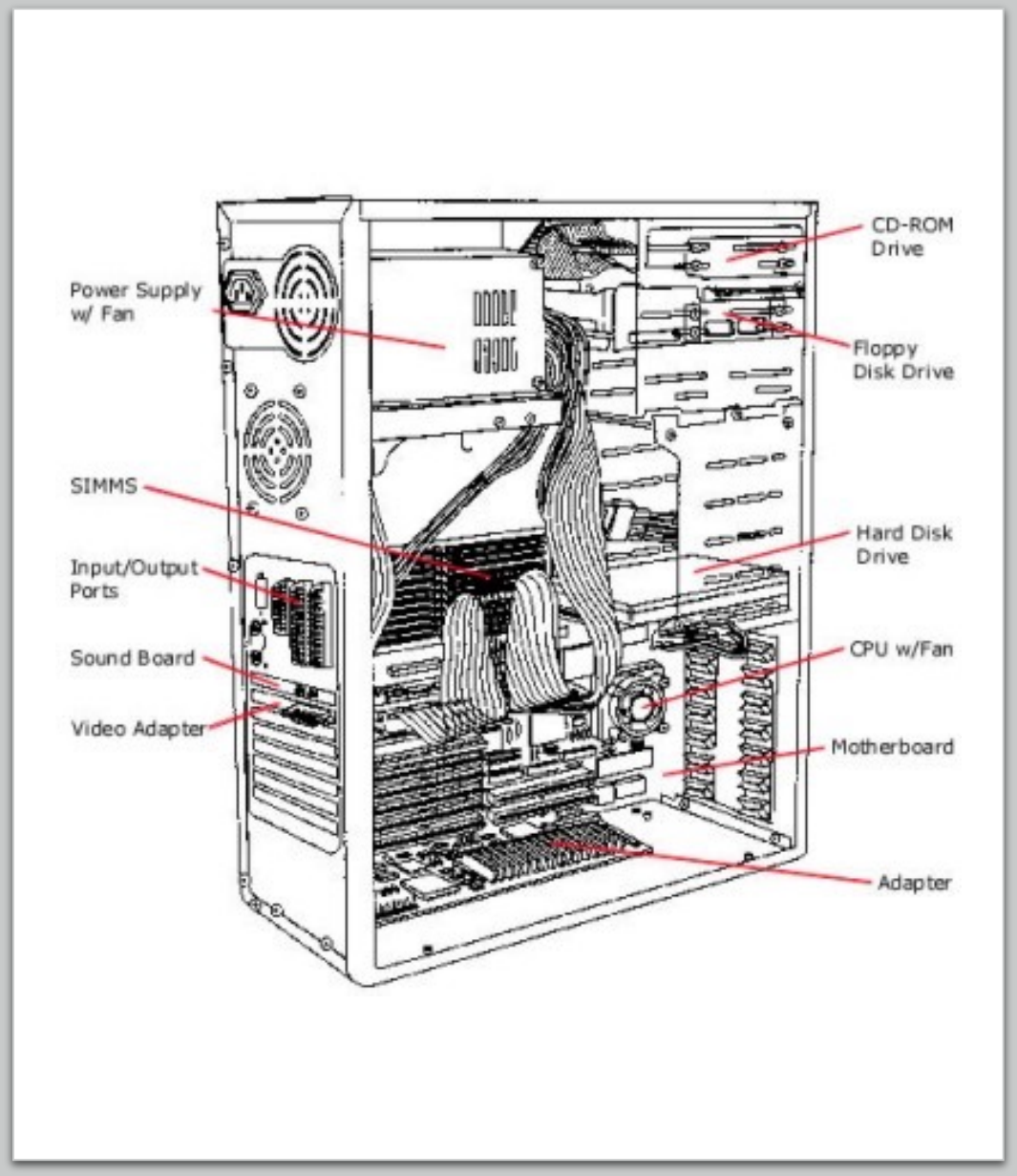
Agenda

- **1. Computer Systems**
- 1.1 Overview of Computer Systems
- 1.1.1Components of a Computer System
- 1.2 Evolution of Computer Systems
- 1.2.1 Brief History
- 1.2.2 Applications of Computer Systems

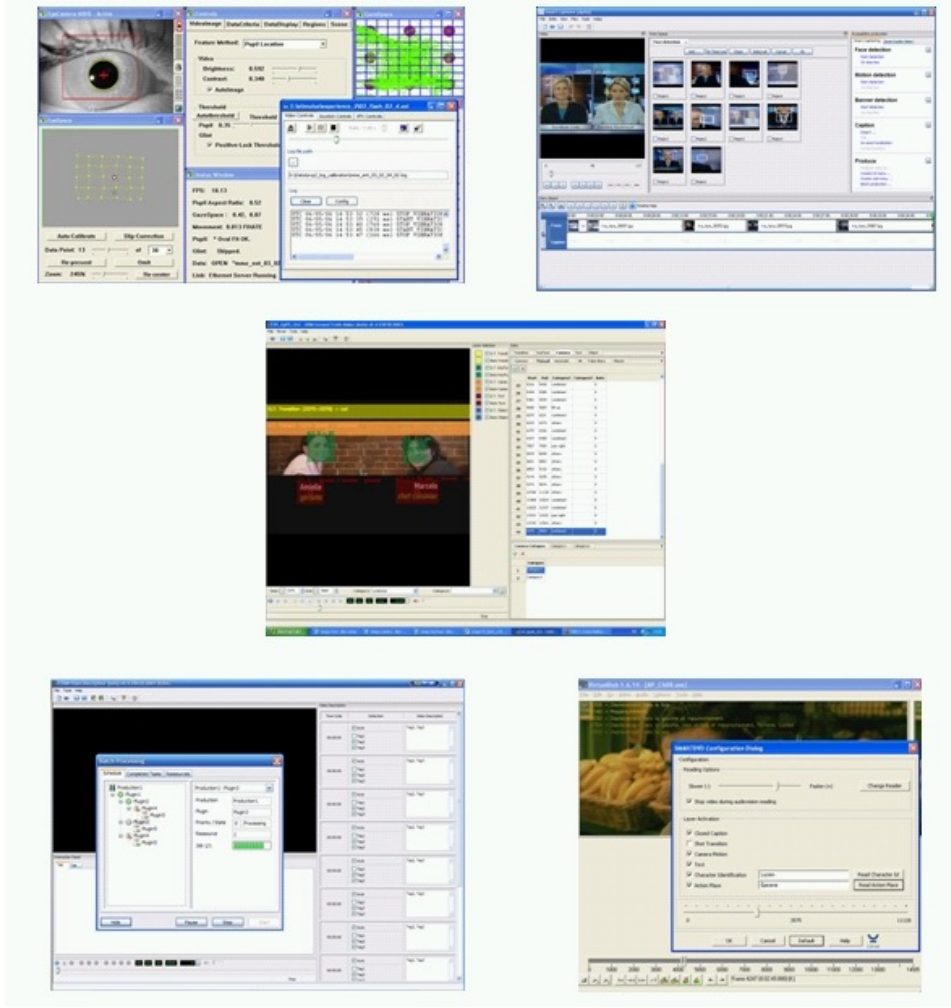
The purpose of ICT is for students to

1. Learn the basic components and functions of a computer and network.



The purpose of ICT is for students to

2. Become familiar with procedures and software tools for system operation and maintenance.



The purpose of ICT is for students to

3. Gain exposure to future trends.

Some future topics:

Machine architecture

Operating system concepts (processes, concurrency, address spaces)

Basics of processing, storage and communication capacity

Command processors and scripting

File systems

Network

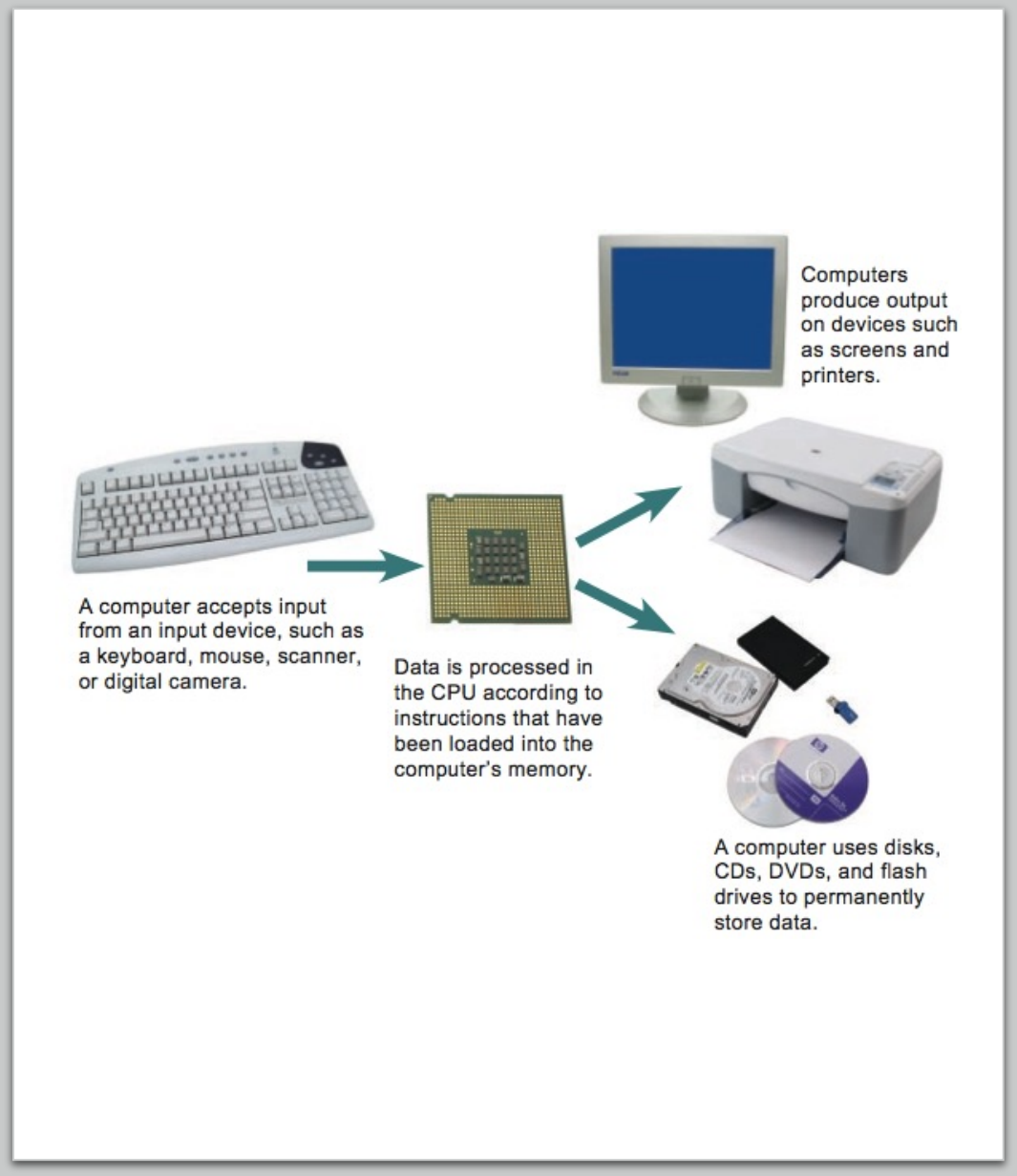
Security

Backups, compression, and encryption

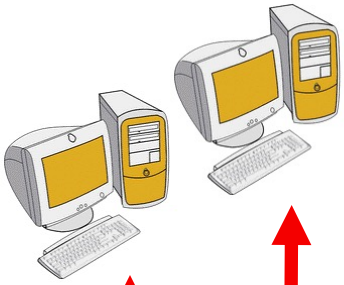
Overview of Computer Systems

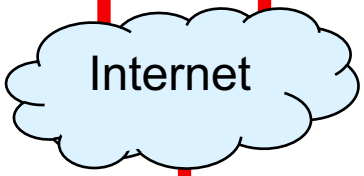
A **computer** is a multipurpose device that accepts

- **1) input**
- **2) processing**
- **3) storing**
- **4) output**



Subsystems of a Computer



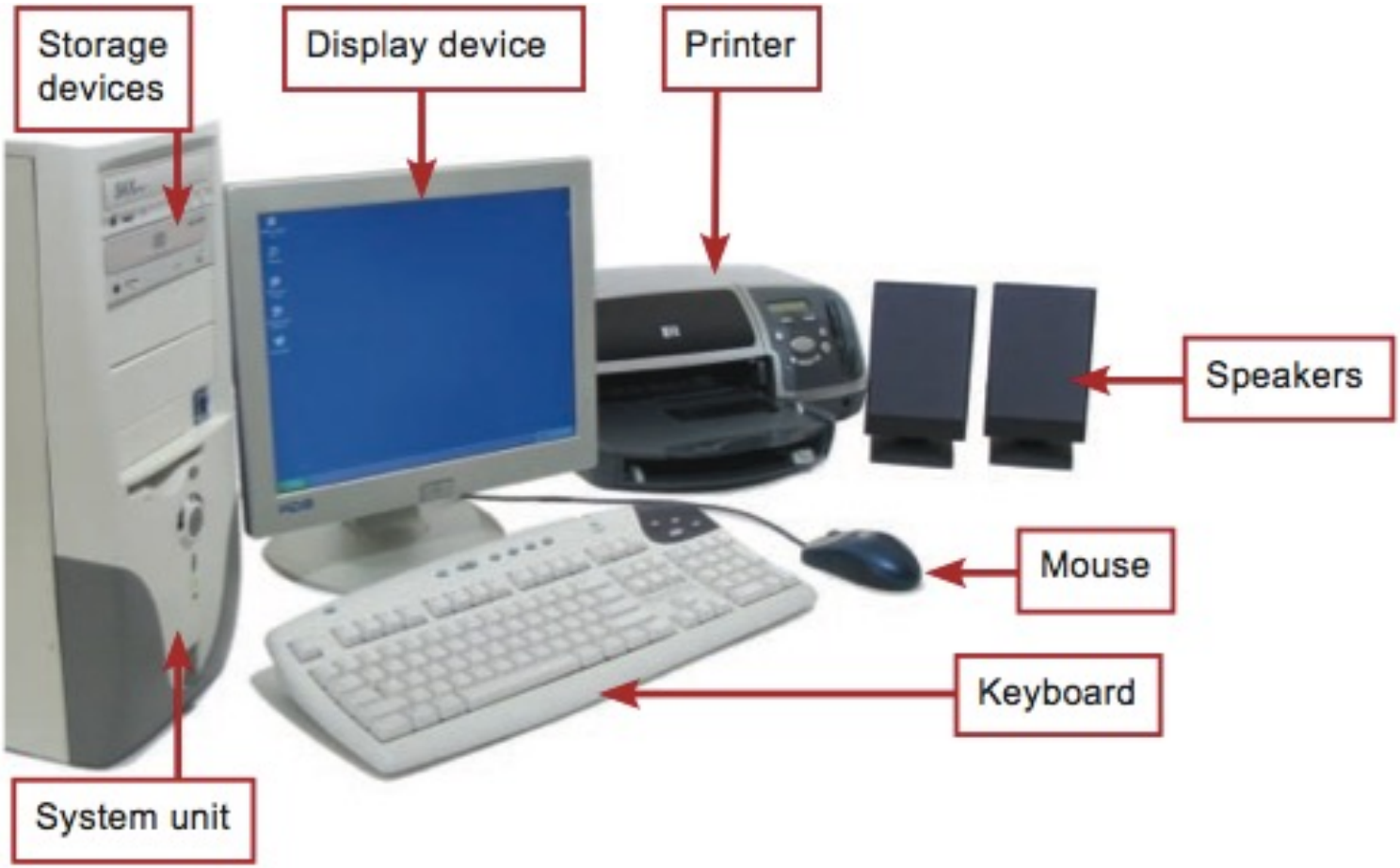


Network System
- Internet services (email)
- Network connections (modems, network cards)

Hardware System
- Keyboard
- Monitor
- System unit

Software System
- Operating System (Unix, Mac OS, Microsoft Windows)
- Web browser (Firefox, Internet Explorer)
- Office productivity applications (Microsoft Office, Star Office)

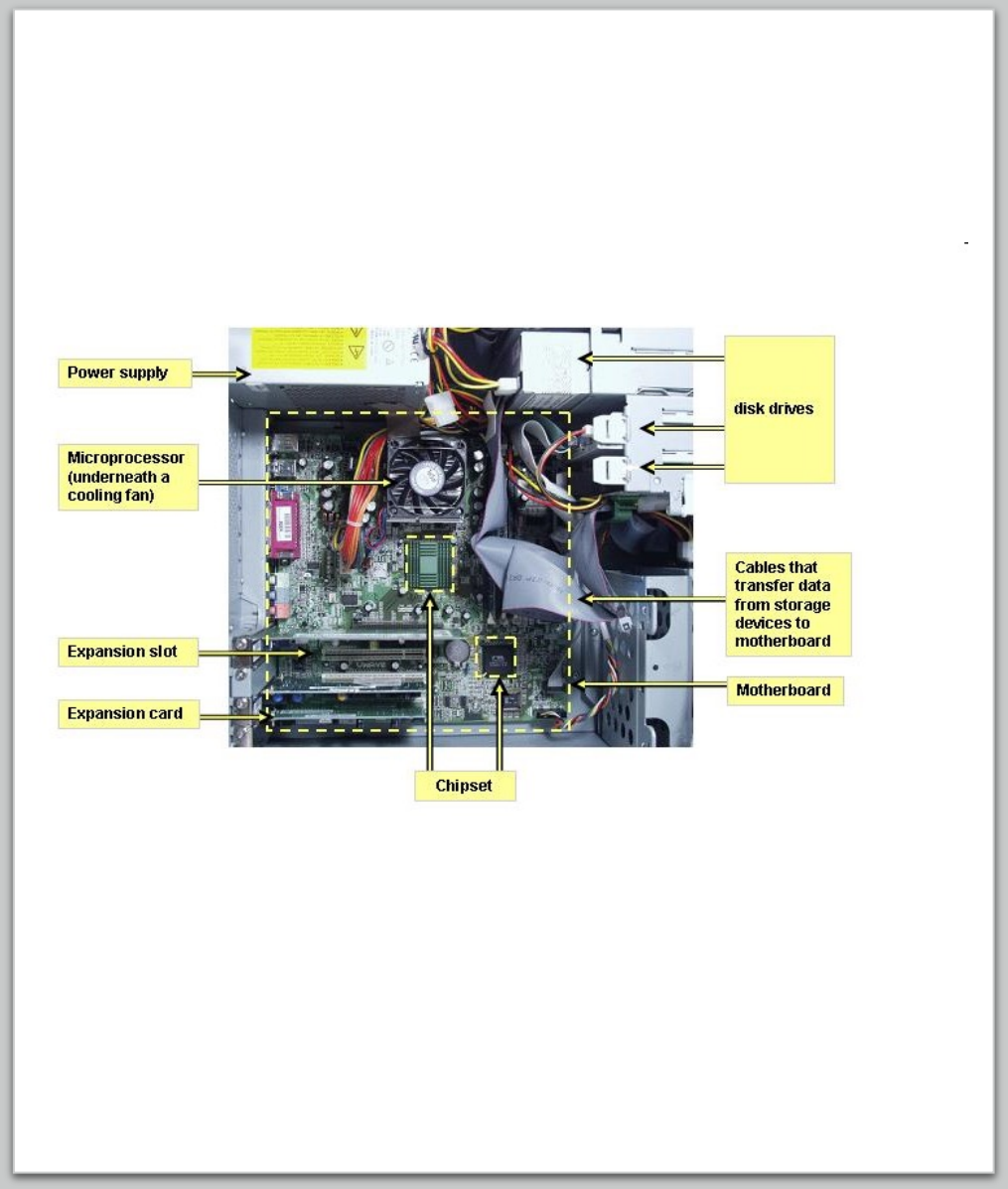
Hardware System



Hardware Components: Peripheral Devices

- Equipment added to computer to enhance its functionality
- Examples of peripheral devices:
  - Keyboard
  - Monitor
  - Mouse
  - Graphic Tablet
  - Printer
  - Joy Stick

Hardware components inside the system unit

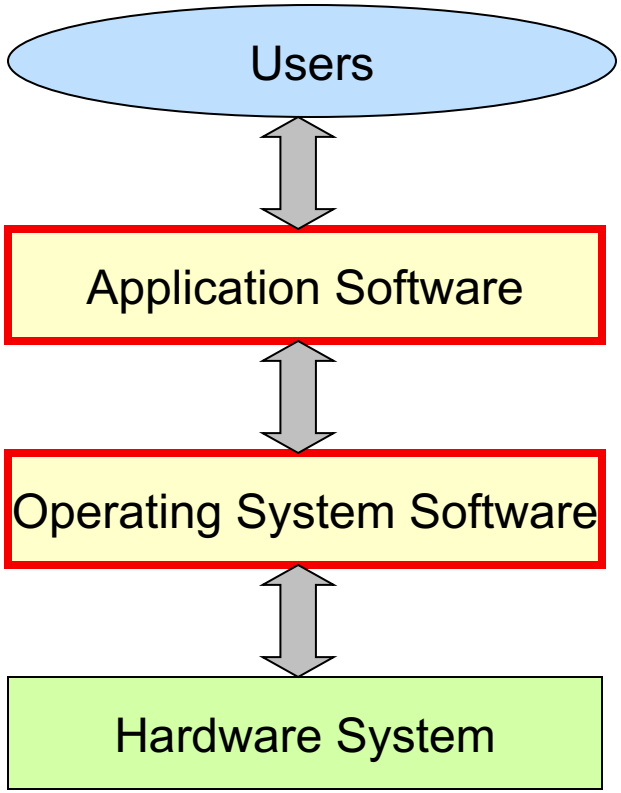


What is Software?

- Computer instructions or data

Software System

- Two categories:
- ***Operating system software***, (system software) - the master controller for all activities that take place within a computer
  - Examples of OS software:
    - Microsoft Windows, Unix, Mac OS
- ***Application software*** - a set of one or more computer programs that helps a person carry out a task
  - Examples of application software:
    - Microsoft Word
    - Internet Explorer
    - Macromedia Dreamweaver
    - Adobe Acrobat Reader



Network System

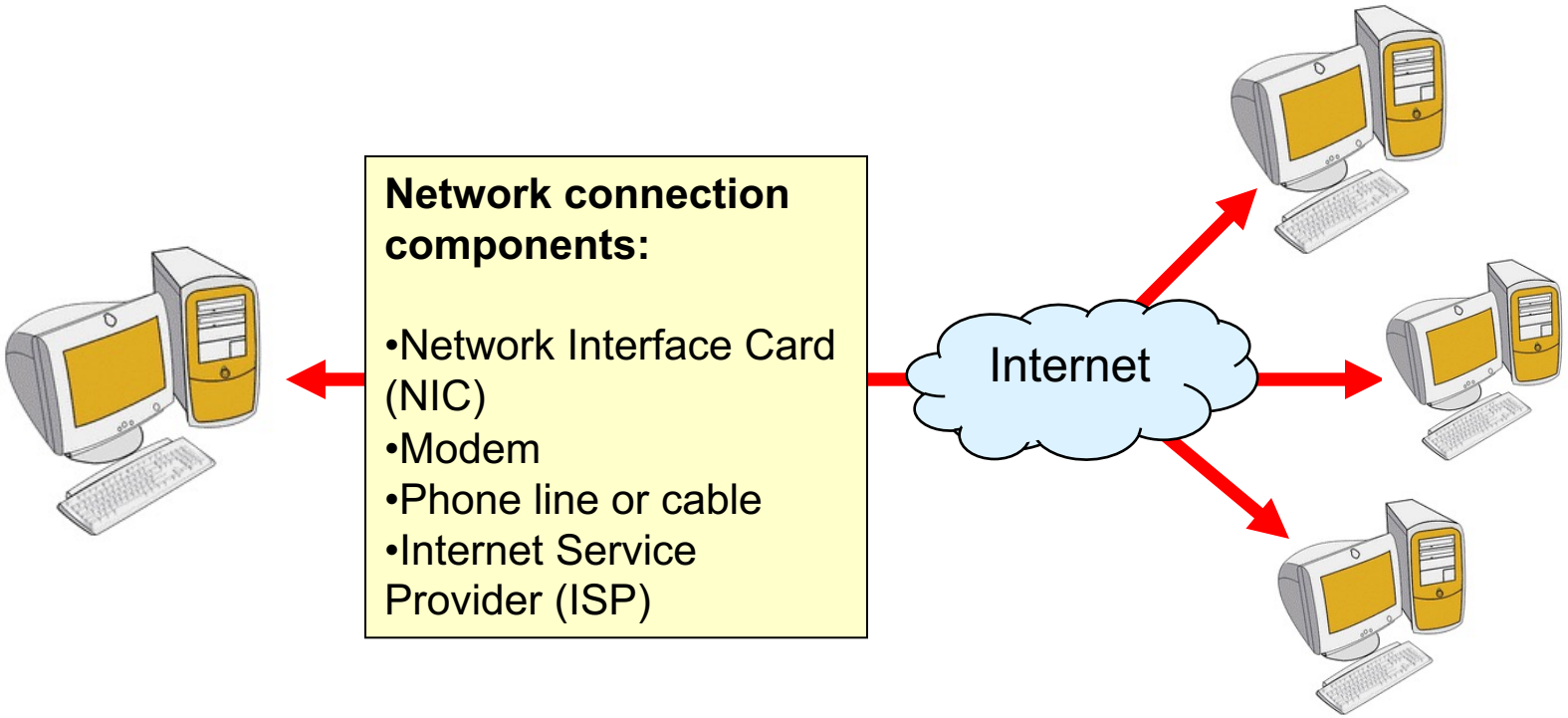
- A network provides connections among computers to enable computers on a network

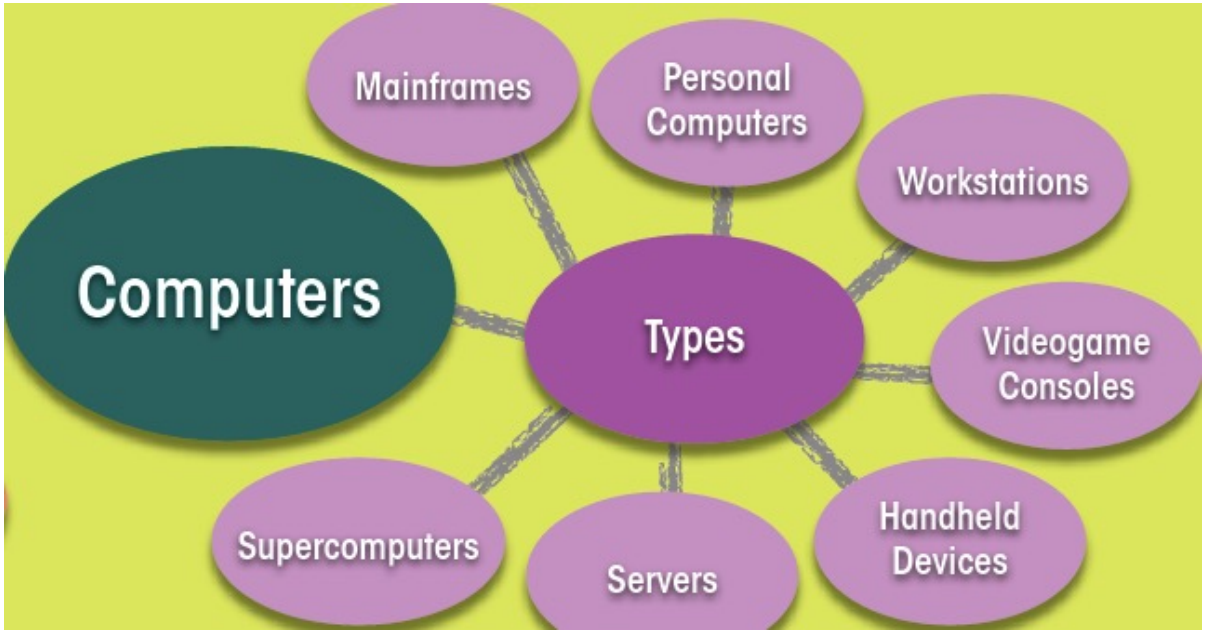
- To share data (e.g. documents)

- To share hardware (e.g. printers)

- To share software resources (e.g. application programs).

- Network users can also send messages to each other.





Categories of Computers

- Computers are classified based on their ***technology, function, physical size, performance and cost***.

Personal Computer (PC)

- A **personal computer** is a microprocessor-based computing device designed to meet the computing needs of an individual. It typically provides access to a wide variety of computing applications, such as word processing, photo editing, and e-mail.

Workstation

Has two meanings:

- Ordinary personal computer that is connected to a network.
- Powerful desktop computers used for high-performance tasks, such as medical imaging and computer-aided design, that require a lot of processing speed.

- Some workstations contain more than one microprocessor, and most have circuitry specially designed for creating and displaying three-dimensional and animated graphics.

Videogame console

Videogame consoles originated as simple digital devices that connected to a TV set and provided only a pair of joysticks for input.

Nintendo's Wii, Sony's PlayStation, Microsoft's Xbox

- Today's videogame consoles contain microprocessors that are equivalent to any found in a fast personal computer, and they are equipped to produce graphics that rival those on sophisticated workstations.
- Add-ons such as keyboards, DVD players, and Internet access make it possible to use a videogame console to watch DVD movies, send and receive e-mail, and participate in online activities such as multiplayer games.

Server

- The purpose of a **server** is to serve computers on a network (such as the Internet or a home network) by supplying them with data.
- Any software or digital device, such as a computer, that requests data from a server is referred to as a **client**.
- Does not require a specific type of hardware. Any personal computer, workstation, mainframe, or supercomputer can be configured to perform the work of a server. Server prices vary, depending on configuration, but tend to be more similar to workstation prices.

Handheld Computer

- Designed to fit into a pocket, run on batteries, and be used while you are holding it
- Also called a ***PDA*** (**Personal Digital Assistant**)
  - Internet
  - E-mail
  - GPS
  - Contacts list, to-do lists, memos, etc.
  - Make voice calls using cellular service

Mainframe Computer

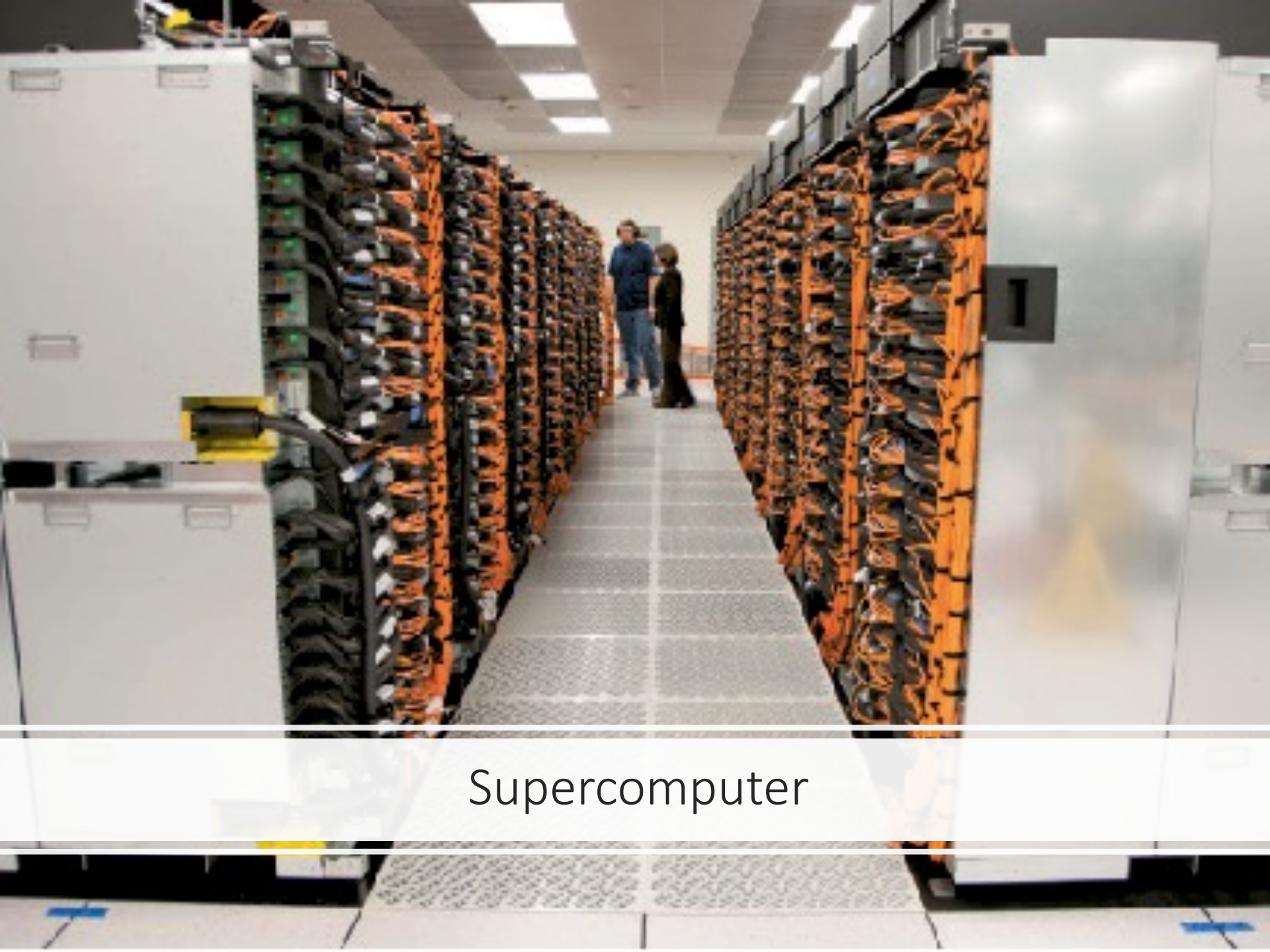
- It is a large and expensive computer capable of simultaneously processing data for hundreds or thousands of users.
- Generally used by businesses or governments to provide centralized storage, processing, and management for large amounts of data.
- Mainframes remain the computer of choice in situations where reliability, data security, and centralized control are necessary.
- The price of a mainframe computer typically starts at $100,000 and can easily exceed $1 million. Its main processing circuitry is housed in a closet- sized cabinet (Figure 1-17); but after large components are added for storage and output, a mainframe computer system can fill a good-sized room.

Mainframe Computer

This IBM z10 E12 mainframe computer weighs 2,807 pounds and is about 6.5 feet tall.

Supercomputer

- It is the **fastest type of computer**.
- Very expensive and are employed for specialized applications that require immense amounts of mathematical calculations.
  - Simulate nuclear explosions - Break codes
  - Model weather systems - Research simulations
- Capable of performing **over 600 billion floating-point operations per second**.
- Examples: Deep Blue, PARAM 1000, Hitachi's SR2201



Supercomputer

Microcontroller

- Special-purpose microprocessor that is built into the machine it controls.
- A microcontroller is sometimes called a computer-on-a-chip or an embedded computer because it includes many of the elements common to computers.
- A microcontroller seems to fit the input, processing, output, and storage

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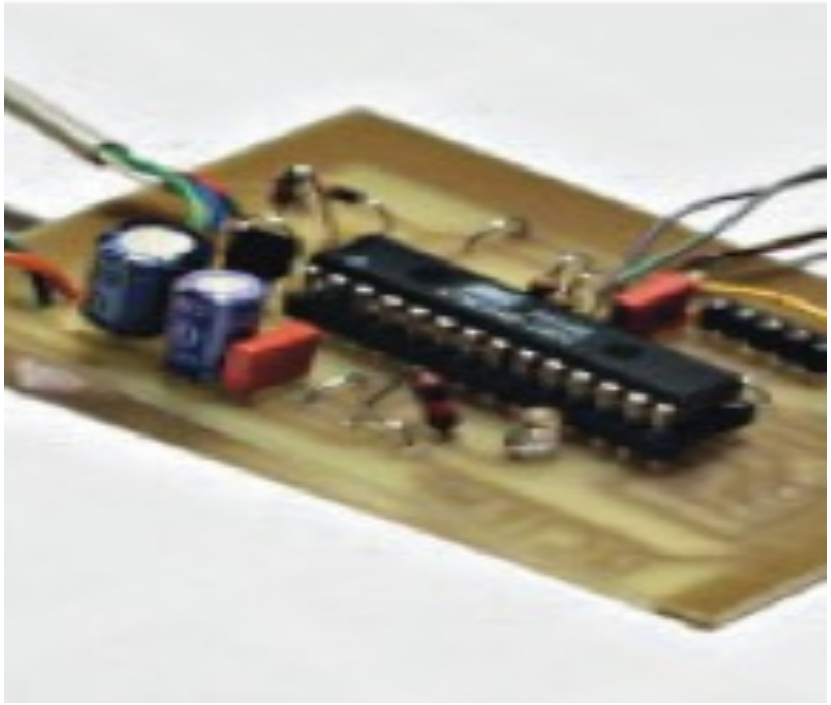
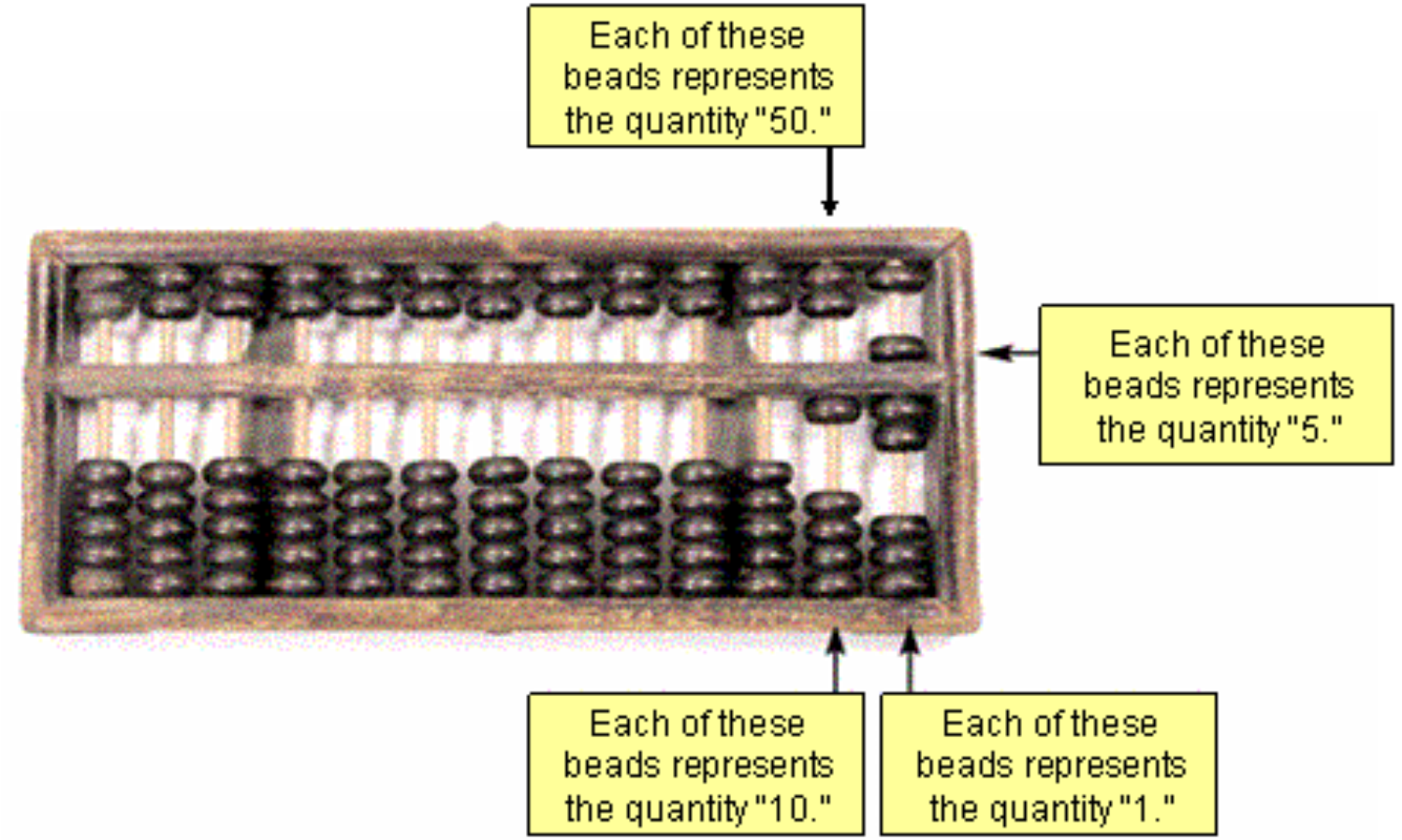
installed in a machine
ance using wires to c
and output signals.



Evolution of Computers

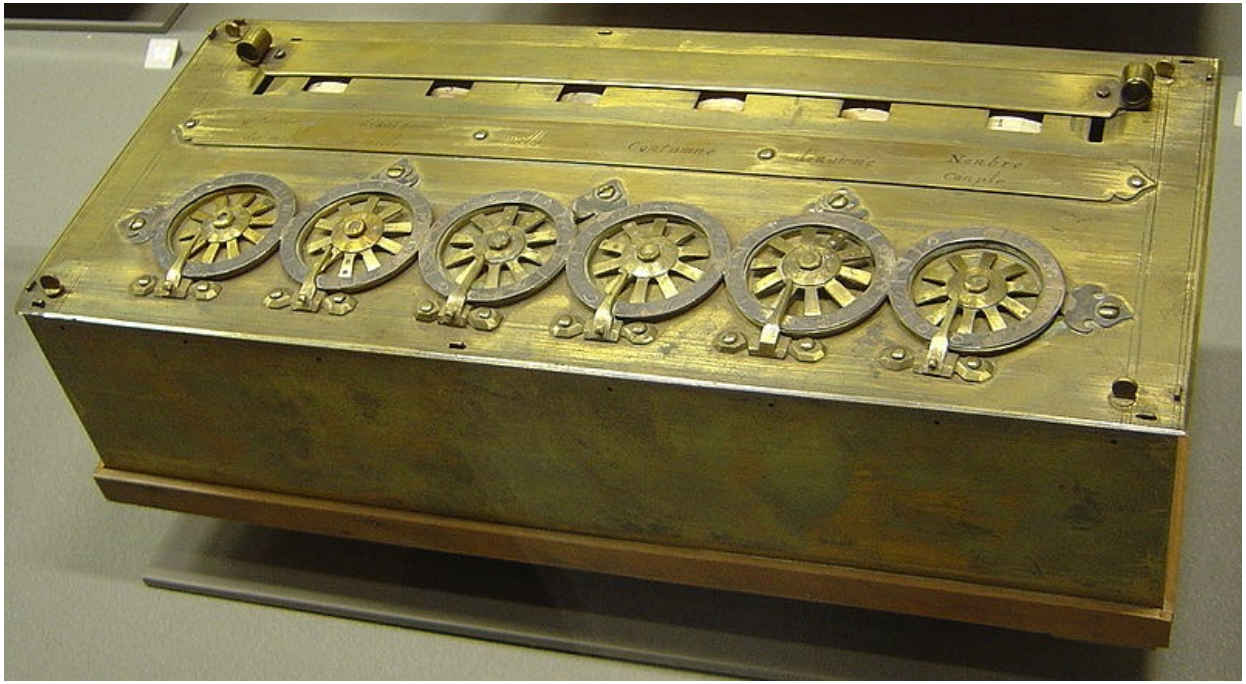
- Needed calculation devices to keep track of accounting for commerce
- 1200s—Manual Calculating Devices:

the **abacus**

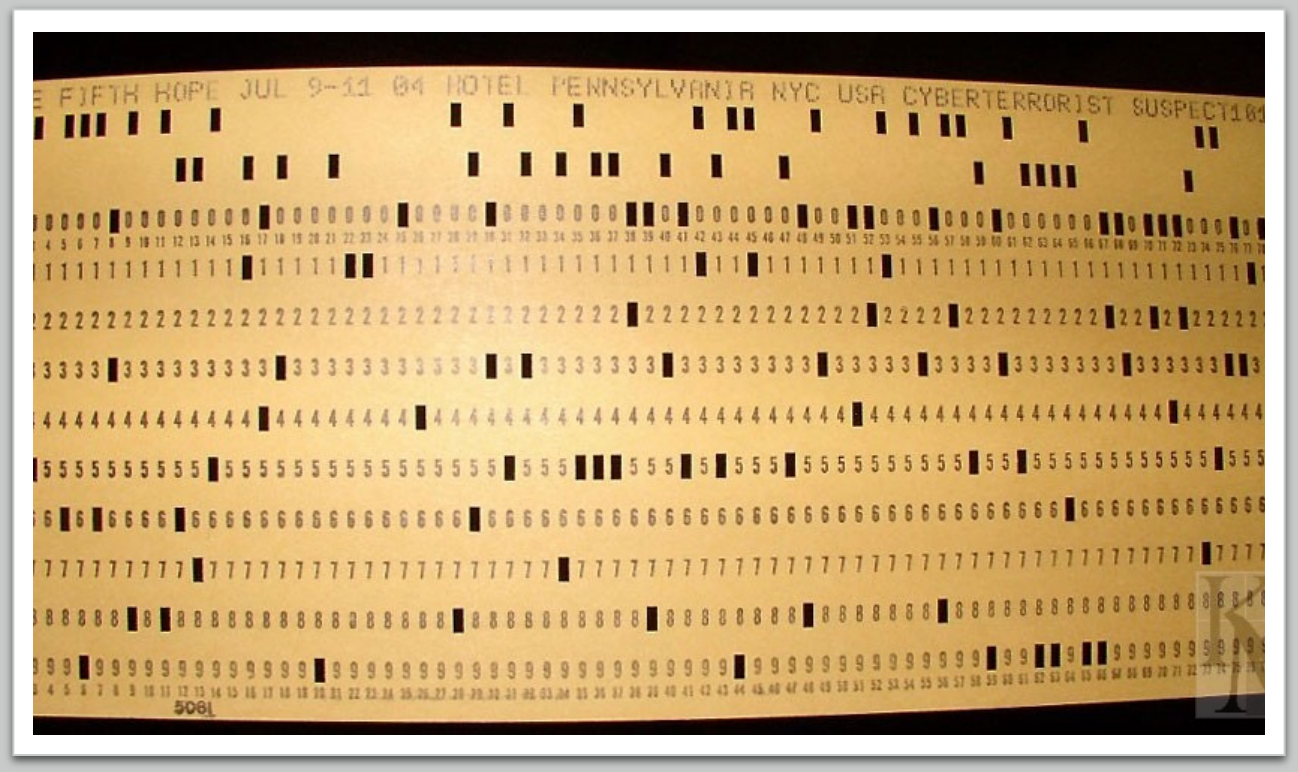


Evolution of Computers (continued)

- 1600s—**Mechanical Calculators**
  - Used wheels, gears, and counters
  - The operator enters the numbers for a calculation, and then pulls a lever or turns a wheel to carry out the calculation
  - **Example:** the Pascaline invented by Blaise Pascal.



Pascaline (Pascal's calculator)

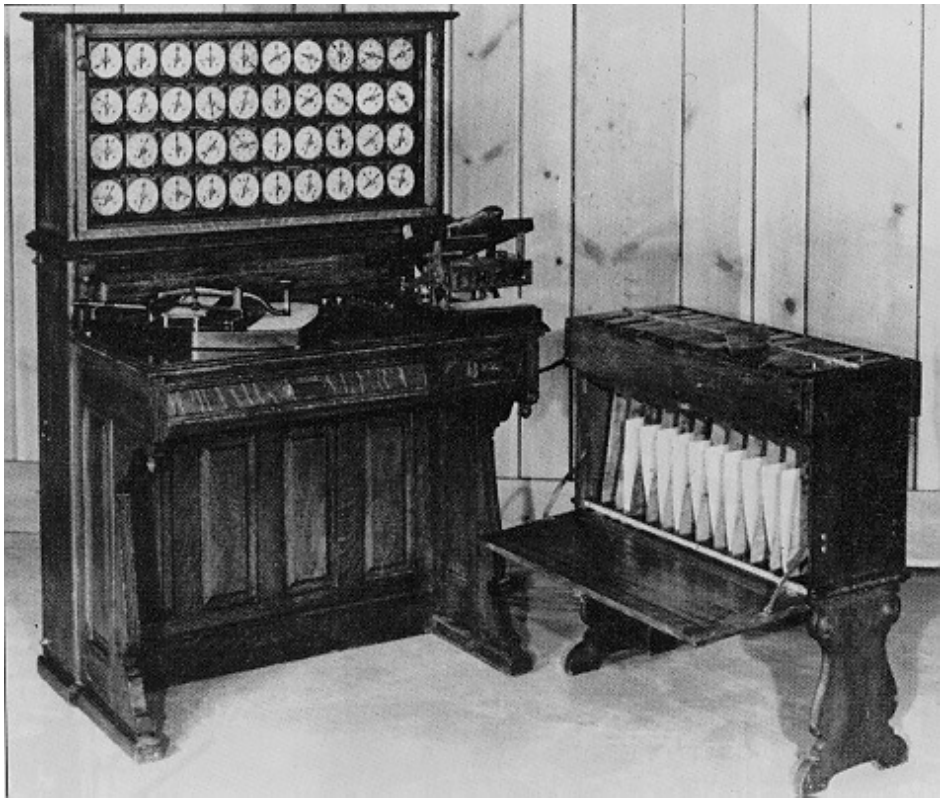


Evolution of Computers (continued)

- 1800s—Punched Cards

Evolution of Computers (continued)

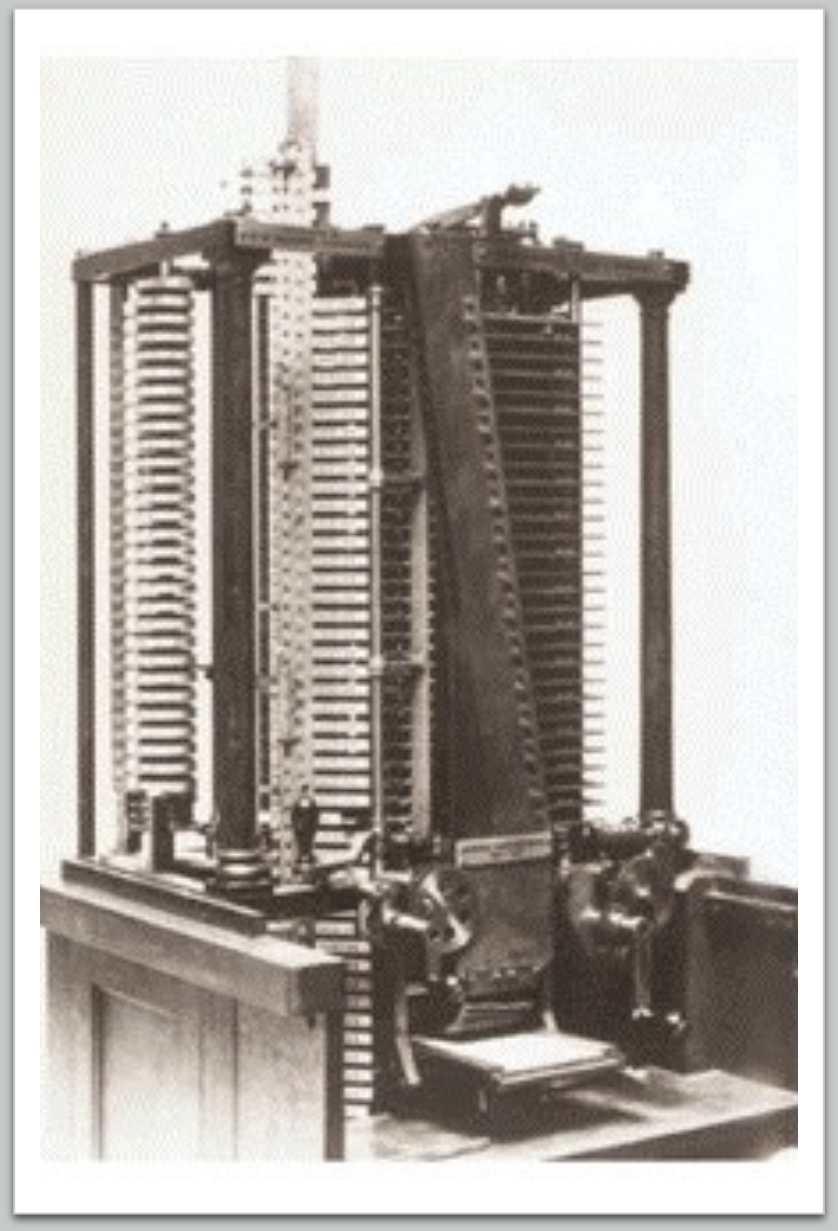
- Used holes following a specific pattern to represent the instructions given to the machine or stored data
- Once punched, the cards were fed into a card reader that used an array of metal rods to electronically read the data from the cards and tabulate the results. This is called the ***Hollerith Tabulating Machine***
- Hollerith incorporated ***The Tabulating Machine*** better known today as ***IBM***.

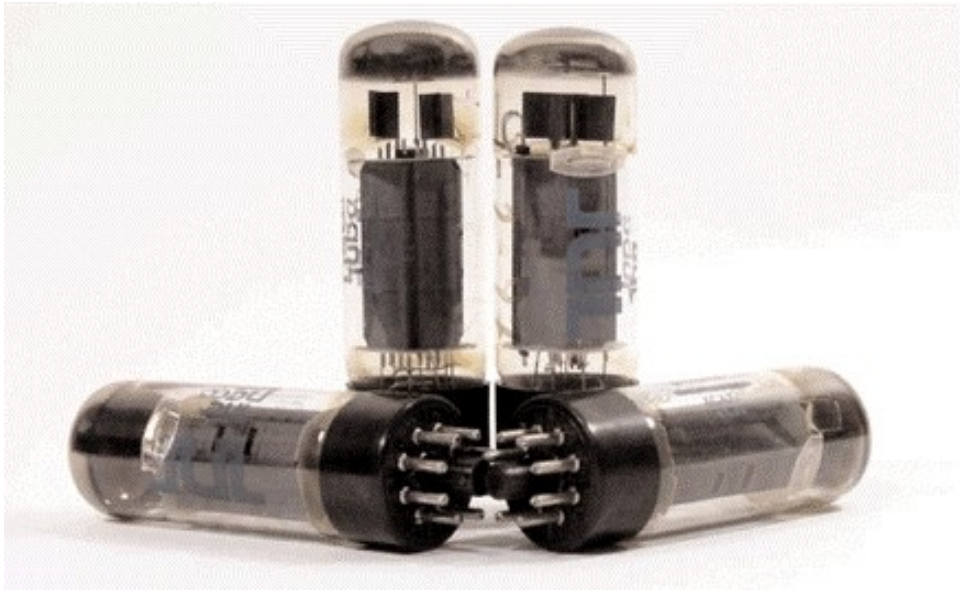


Hollerith Tabulating Machine

Evolution of Computers (continued)

- Charles Babbage designed a new general-purpose calculating device, the ***Analytical Engine***, which is the ancestor of modern computers.
  - It included the essential components of present-day computers, which are input, process, storage, and output of data.





Evolution of Computers (continued)

- 1940s—Vacuum Tubes
  - Used to control the flow of electrons.
  - **Faster computations were possible**.
  - But **burned out quickly**.

  - **ENIAC** (Electronic Numerical Integrator and Computer) - calculate trajectory tables for the U.S. Army during World War II,

Admiral Grace Hopper

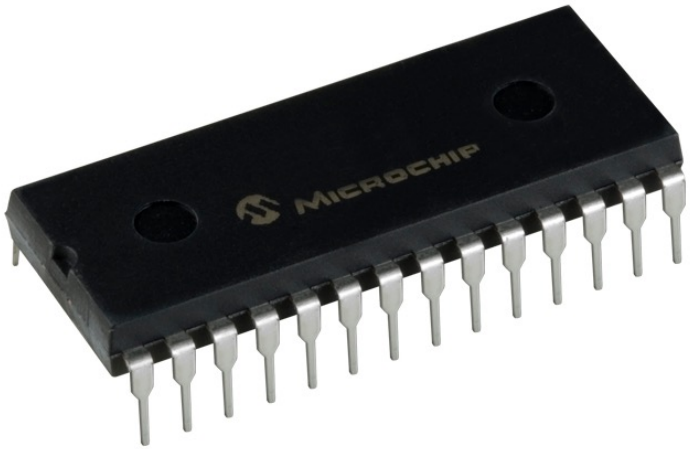
- The invention of the compiler by Admiral Grace Hopper who was working at Eckert-Mauchly Computer Corporation

Evolution of Computers (continued)

- 1950s—Transistors
  - **Smaller, cheaper, more reliable**, and consumed less power than vacuum tubes.
  - Could perform 200,000 to 250,000 calculations per second.

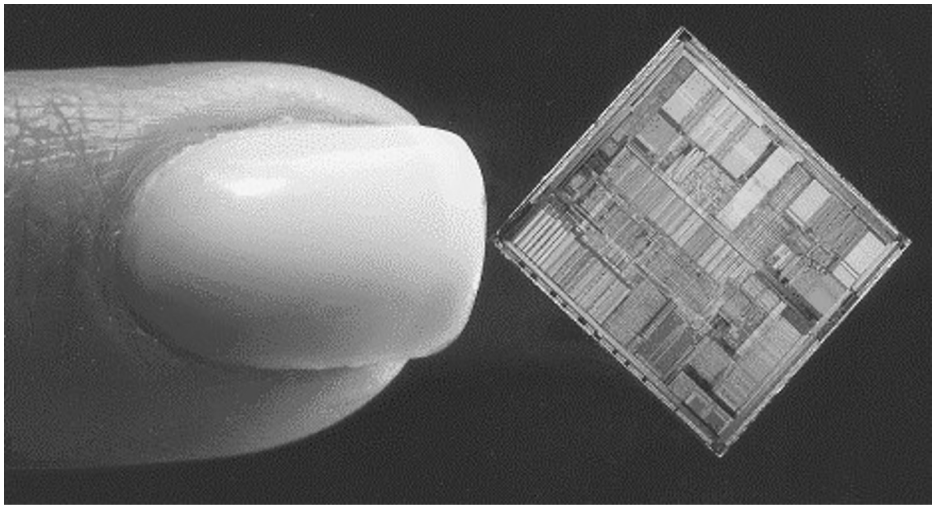
Evolution of Computers (continued)

- 1960s—Integrated Circuits
  - Thin slice of silicon packed with microscopic circuit elements such as wire, transistors, capacitors, and resistors.
  - Reduces the physical size, weight, and power requirements for devices such as computers



Evolution of Computers (continued)

- 1970s to Present—**Microprocessor**
  - Combined components of a computer on a microchip
  - Can be manufactured and then programmed for various purposes

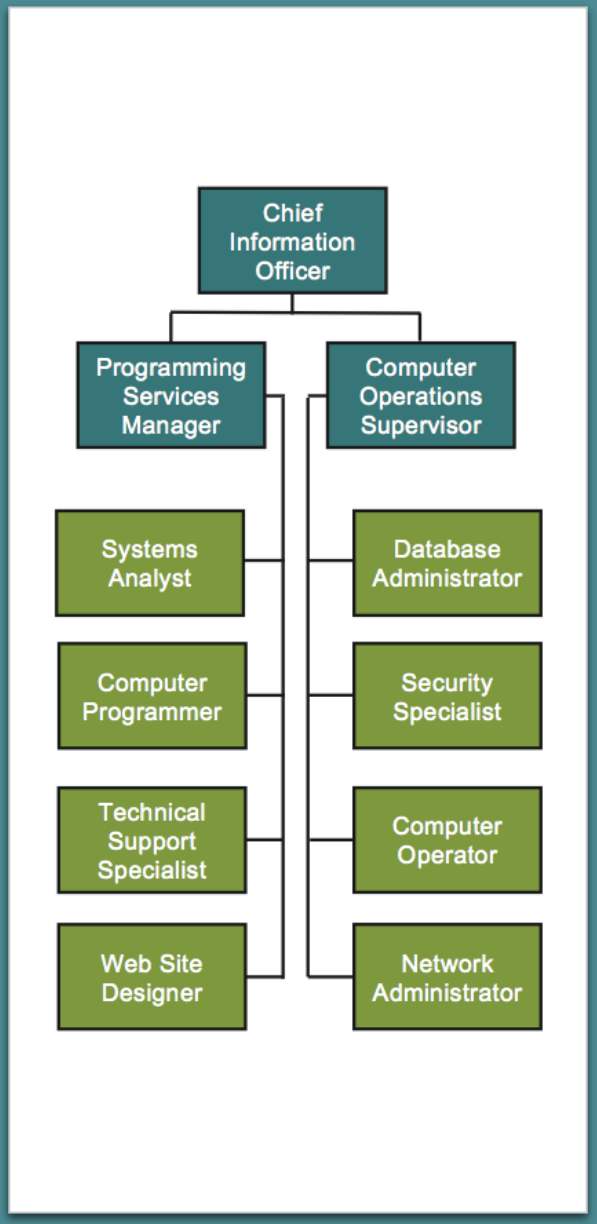


Applications of Computer Systems

- **In Education**
  - Multimedia-Facilitated Learning
  - Simulation-Based Education
  - Intelligent Machine-Based Training
  - Interactive Learning
- **In Business**
  - Supply Chain Management
  - Project Management
  - Customer Relationship Management
  - Sales and Marketing Using Electronic Commerce
  - Manufacturing Research

Computer Industry

- Computer industry encompasses those companies that manufacture handheld computers, personal computers, high-end workstations, servers, mainframes, and supercomputers
- ***Information technology industry*** (or IT industry), is typically used to refer to the companies that develop, produce, sell, or support computers, software, and computer-related products
- IT companies include:
  - Equipment manufacturers
  - Chipmakers
  - Software publishers
  - Retailers
  - Service companies

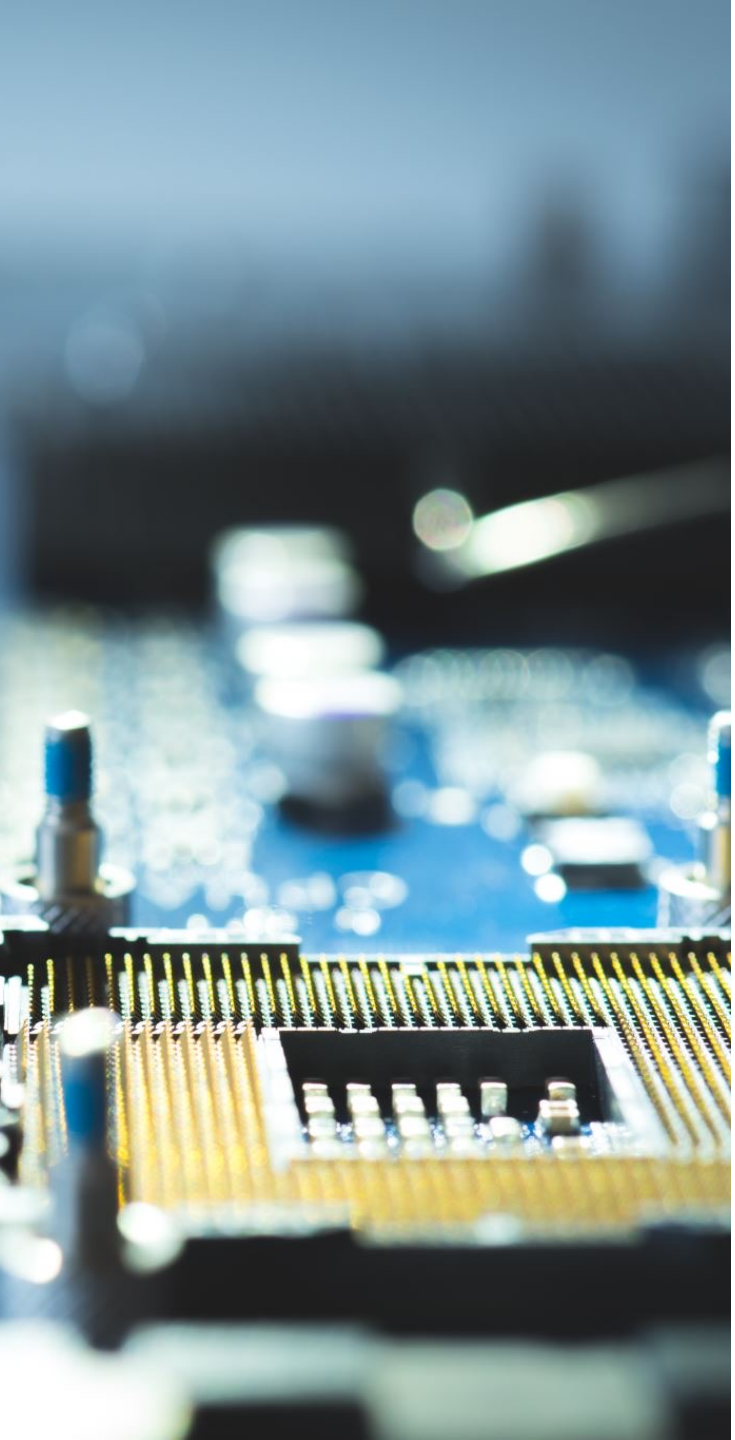


Computer professional

- In 1999, the U.S. Congress crafted an amendment to the Fair Labor Standards Act that essentially defines a **computer professional** as any person whose primary occupation involves the design, configuration, analysis, development, modification, testing, or security of computer hardware or software.

Careers in Computing

- A ***systems analyst*** investigates the requirements of a business or organization, its employees, and its customers in order to plan and implement new or improved computer services
- A ***security specialist*** analyzes a computer system's vulnerability to threats from viruses, worms, unauthorized access, and physical damage
- A ***computer programmer*** designs, codes, and tests computer programs
- A ***quality assurance specialist*** participates in alpha and beta test cycles of software
- A ***database administrator*** analyzes a company's data to determine the most effective way to collect and store it



Careers in Computing (continued)

- A ***network specialist/administrator*** plans, installs, and maintains one or more local area networks
- A ***computer operator*** typically works with minicomputers, mainframes, and supercomputers
- A ***computer engineer*** designs and tests new hardware products, such as computer chips, circuit boards, computers, and peripheral devices
- A ***technical support specialist*** provides phone or online help to customers of computer companies and software publishers

Careers in Computing (continued)

- A ***technical writer*** creates documentation for large programming projects, and writes the online or printed user manuals that accompany computers, peripheral devices, and software
- A ***computer salesperson***, or "sales rep," sells computers
- A ***Web site designer*** creates, tests, posts, and modifies Web pages
- A ***manufacturing technician*** participates in the fabrication of computer chips, circuit boards, system units, or peripheral devices

END of Lecture 1