



Chapter One: Introduction I

Lecture Goals

- To learn about the architecture of computers
- To learn about machine languages and higher-level programming languages
- To become familiar with your compiler

What Is Programming?

You have probably used a computer for work or fun.

Many people use computers for everyday tasks such as electronic banking or writing a term paper.

Computers are good for such tasks.

They can handle repetitive chores, such as totaling up numbers or placing words on a page, without getting bored or exhausted.

What Is Programming?

Computers can carry out a wide range of tasks because they execute different ***programs***, each of which directs the computer to work on a specific task.

The computer itself is a machine that stores data (numbers, words, pictures), interacts with devices (the monitor, the sound system, the printer), and executes programs.

What Is Programming?

A ***computer program*** tells a computer, in minute detail, the sequence of steps that are needed to fulfill a task.

Hardware

The physical computer and peripheral devices are collectively called the *hardware*.

Software

The programs the computer executes are called the *software*.

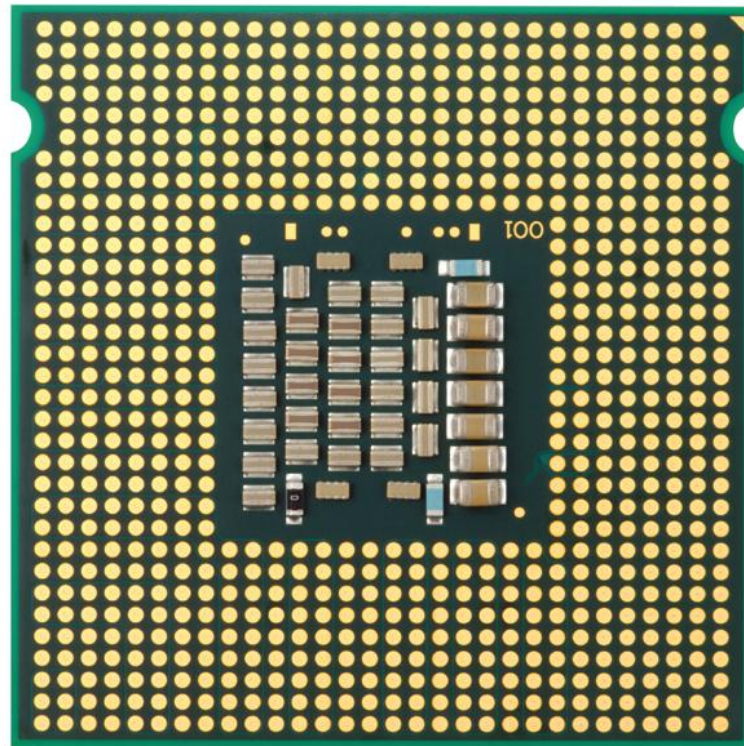
What Is Programming?

Programming

is the act of designing and
implementing computer programs.

The Anatomy of a Computer – The CPU

- The CPU (central processing unit)
 - heart of the computer
 - executes one operation at a time
 - performs program control and data processing

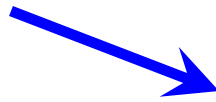


The Anatomy of a Computer – The CPU

- The CPU
 - carries out arithmetic operations such as addition, subtraction, multiplication, and division
 - fetches data from external memory or devices and stores data back.
- All data must travel through the CPU whenever it is moved from one location to another.

The Anatomy of a Computer – The CPU

- The computer stores data and programs in memory
 - Primary memory - memory chips
 - Random access memory (RAM) (read-write memory)
 - Read-only memory (ROM)
 - Secondary storage devices
 - disk drives
 - CDs

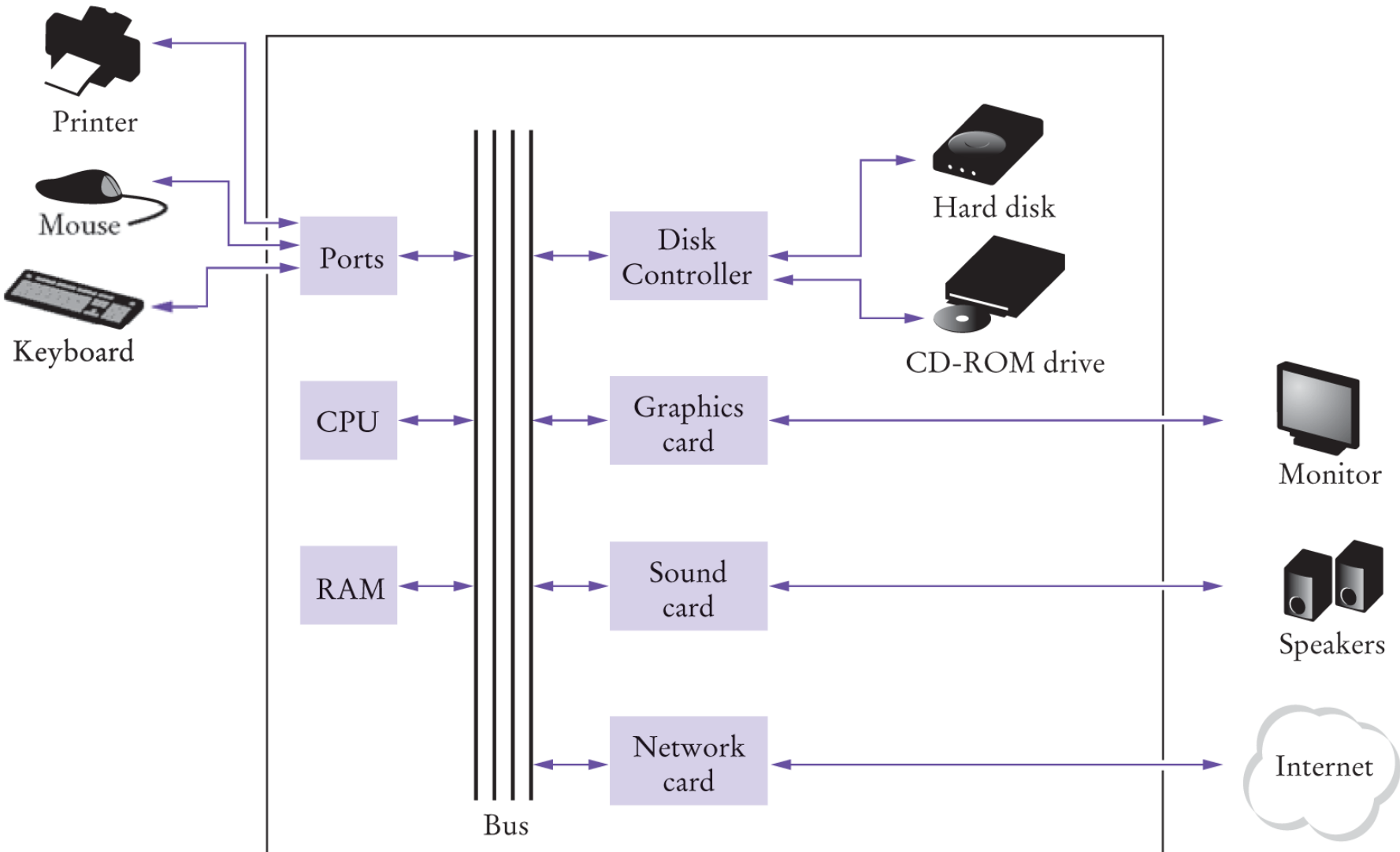


The Anatomy of a Computer – Peripheral Devices

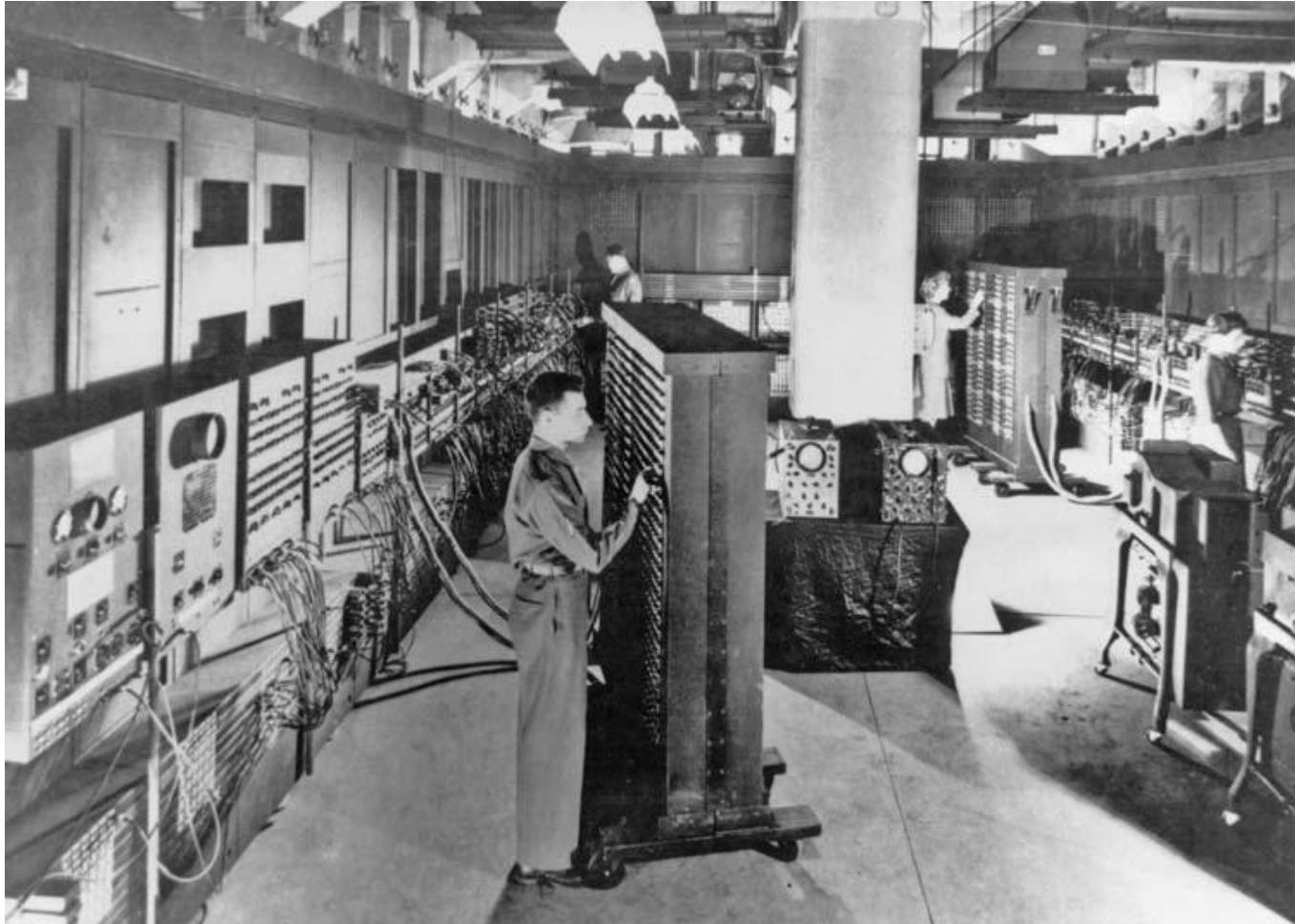
- The *user* is the human using a program that a programmer wrote.
- The computer transmits information (called *output*) to the user through a display screen, speakers, and printers.
- The user can enter information (called *input*) for the computer by using a keyboard or a pointing device such as a mouse.



The Anatomy of a Computer – Schematic Design

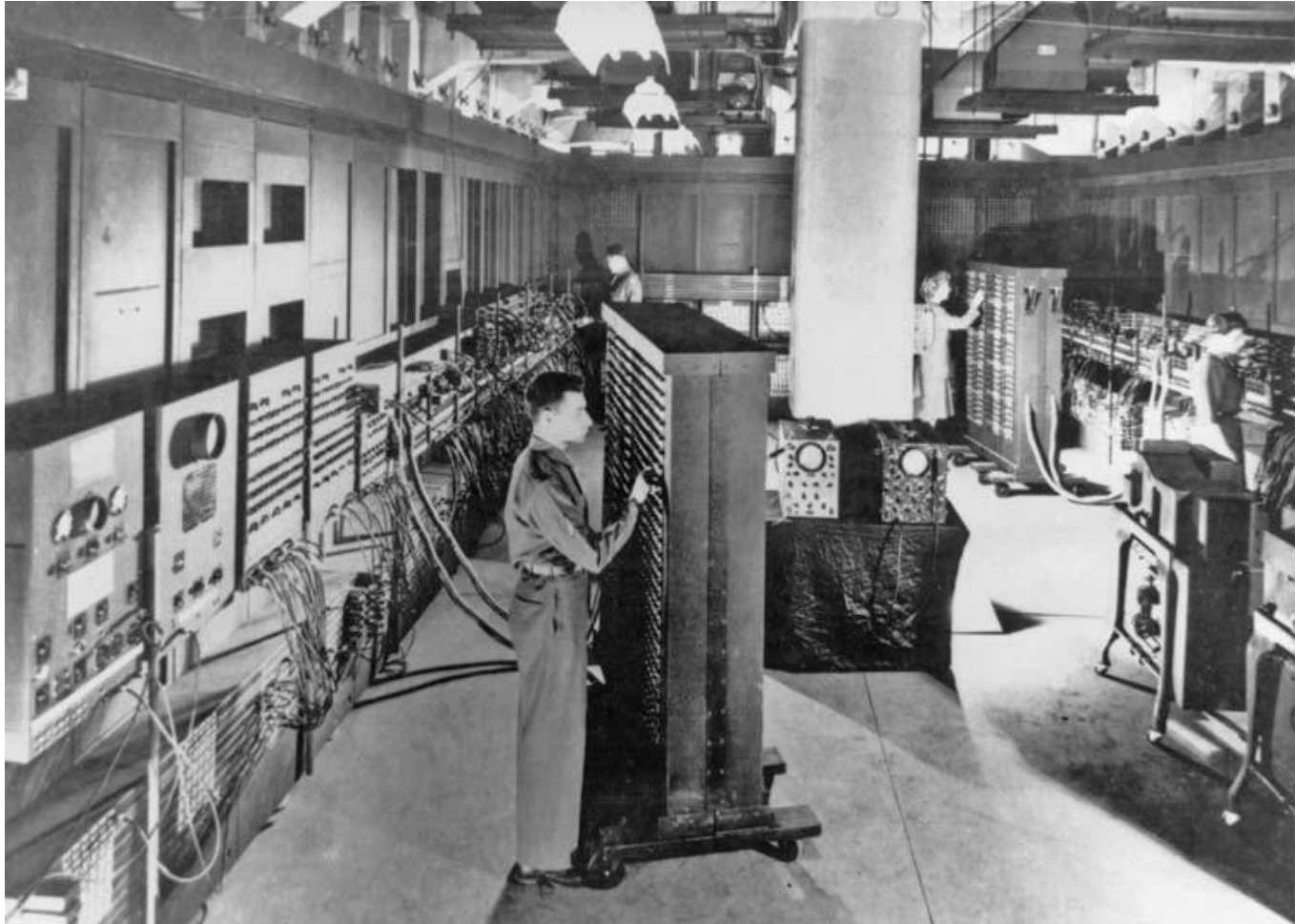


What Is a Computer?



Yes, ALL that is ONE computer!
(except the people)

What Is a Computer?



The *Electronic Numerical Integrator And Computer*
(The ENIAC)

Machine Code and Programming Languages

- Computer programs are stored as machine instructions in a code that depends on the processor type.
- A typical sequence of machine instructions is
 - 1. Move the contents of memory location 40000 into the CPU.
 - 2. If that value is > 100 , continue with the instruction that is stored in memory location 11280.

Machine Code and Programming Languages

- Machine instructions are encoded as numbers so that they can be stored in memory.
- On a Pentium processor, this sequence of instructions from the previous slide is encoded as the sequence of numbers

161 40000 45 100 127 11280

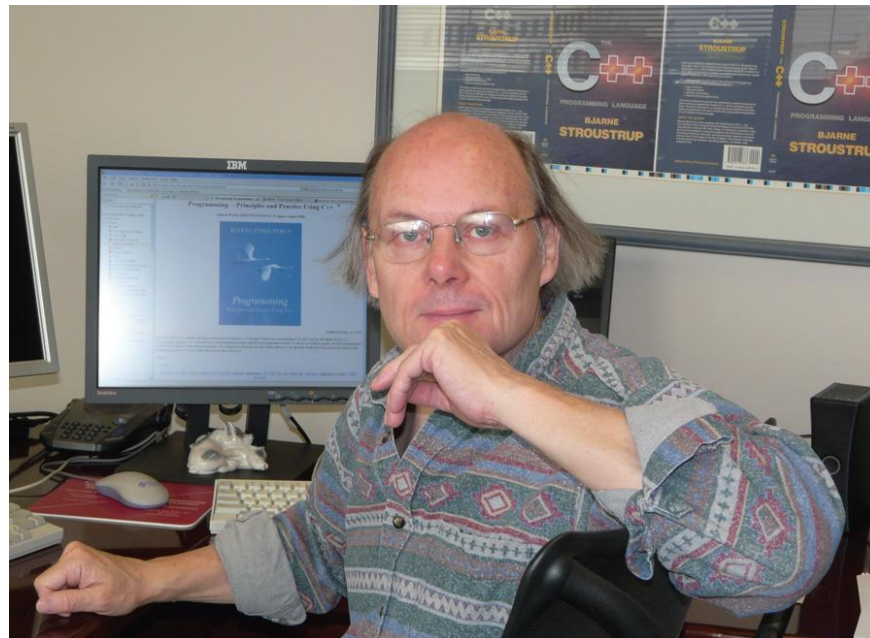
- On a processor from a different manufacturer, the encoding would be different.

High-Level Languages and the Compiler

- High-level languages like C++ are independent of the processor type and hardware. They will work equally well:
 - on an Intel Pentium and a processor
 - in a cell phone
- The compiler
 - a special computer program, that translates the higher-level description (a program) into machine instructions for a particular processor.
- Low-level language: the machine code for a specific CPU
 - the compiler-generated machine instructions are different, but the programmer who uses the compiler need not worry about these differences.

The Evolution of C++

- Ancient history (pre 1972)
- C (1972)
- ANSI Standard C (1989)
- Meanwhile, Bjarne Stroustrup of AT&T adds features of the language Simula (an object-oriented language designed for carrying out simulations) to C resulting in:
- C++ (1985)



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- C++ (1985)
- ANSI Standard C++ (1998)
- ANSI Standard C++ [revised] (2003)
- The present C++
 - a general-purpose language that is in widespread use for systems and embedded
 - the most commonly used language for developing system software such as databases and operating systems

... News 2011-09-11: The new C++ standard -
C++11 - is published!



End Introduction I