Chapter 1 – Introduction

1. The Anatomy of a Computer

2. Machine Code & The Java

   Programming Language

3. The Structure of a Simple Program:

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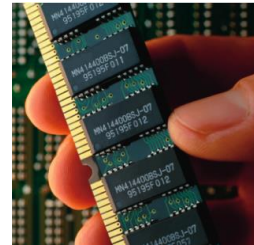# The Anatomy of a Computer

- **Central processing unit**

  - *Chip*
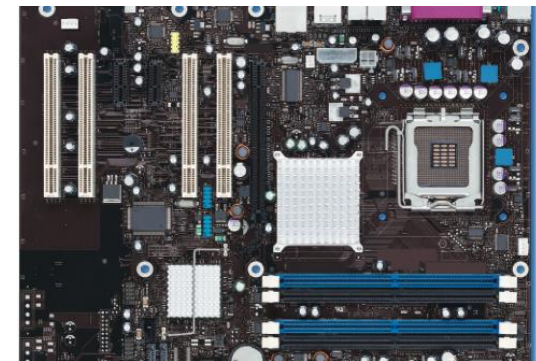
  - *Transistors*

  - Peripherals

  - Executes very simple instructions

  - Executes instructions very rapidly

  - General purpose device

- **Storage**

  - *Primary storage: Random-access memory (RAM)*

  - *Secondary storage: e.g. hard disk*

  - *Removable storage devices: e.g.: floppy disks,…*

  A Motherboard

Machine Code

- Generally, machine code depends on the CPU type

- The instruction set of the Java virtual machine (JVM) can be executed on many types of CPU

The Java Programming Language

- Safe

- Platform-independent ("write once, run anywhere")

- Rich library (packages)

- Designed for the internet

The Structure of a Simple Program: Class Declaration

- Classes are the fundamental building blocks of Java programs:

- Every source file can contain at most one public class

- The name of the public class must match the name of the file containing the class:

 - *Class* `HelloPrinter` *must be contained in a file named* `HelloPrinter.java`

- When the application starts, the instructions in the main method are executed

- Every Java application contains a class with a main method

```
public static void main(String[] args)
{
    . . .
}
```

Compiling and Running a Java Program

- The Java compiler translates source code into class files that contain instructions for the JVM

- A class file has extension `.class`

- The JVM loads instructions from the program's class file, starts the program, and loads the necessary library files as they are required

- The compiler does not produce a class file if it has found errors in your program

Editor → Source File → Compiler → Class files / Library files → Virtual Machine → Running Program
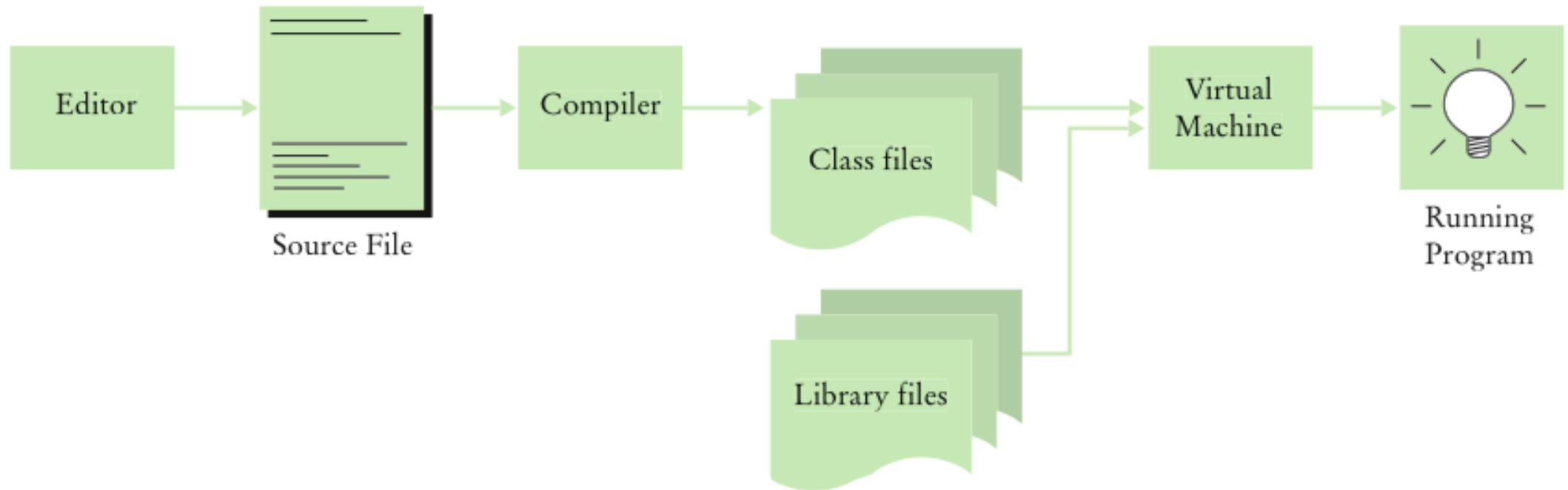
Errors

- **Compile-time error:** A violation of the programming language rules that is detected by the compiler

- **Run-time error:** Causes the program to take an action that the programmer did not intend

- The compiler does not produce a class file if it has found errors in your program

Algorithms & Pseudocode

- **Algorithm:** A sequence of steps that is:

  - *unambiguous*

  - *executable*

  - *terminating*

- **Pseudocode:** An informal description of an algorithm:

- **Program Development Process**

| Understand the problem | Develop and describe an algorithm | Test the algorithm with different inputs | Translate the algorithm into Java | Compile and test your program |