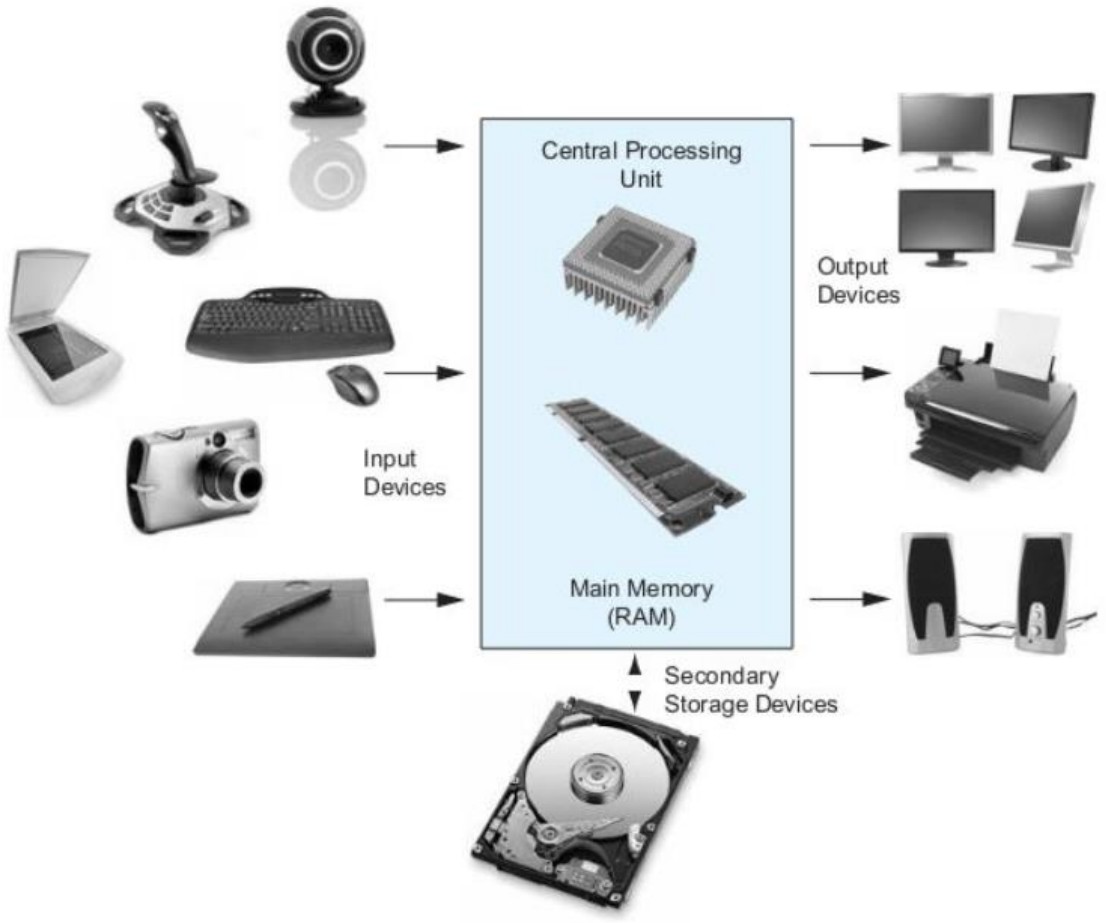
Introduction to Computer Programming

Spring 2021

Computers

- Computer – General purpose machine that can be programmed to perform a variety of tasks
- Program – Set of instructions a computer follows to perform a specific task

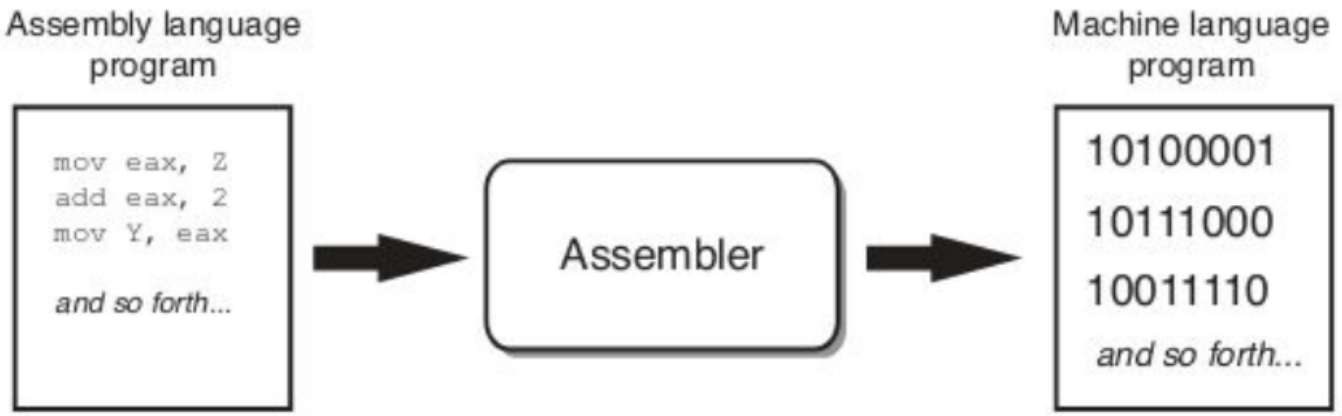


Hardware vs Software

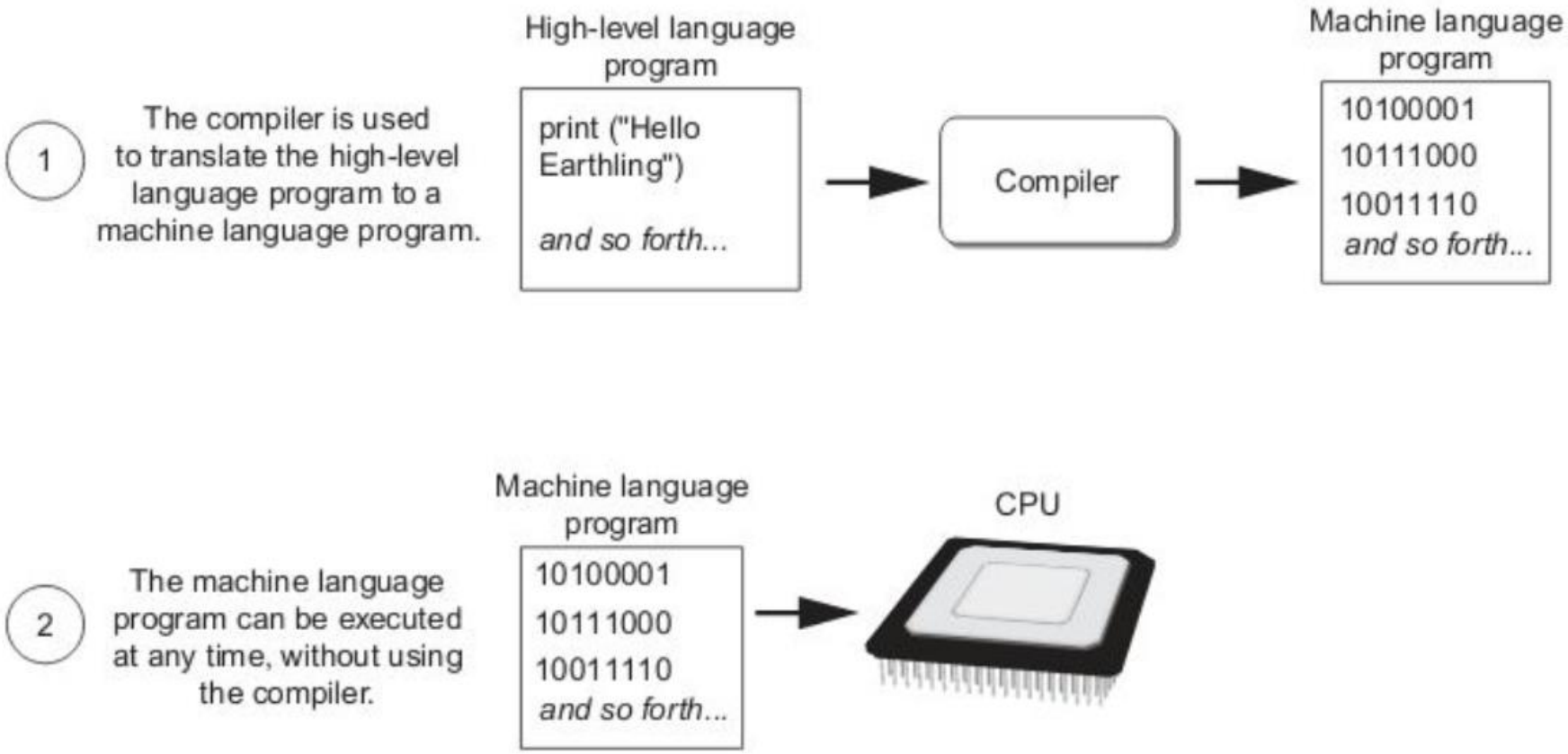
- Hardware
  - Physical devices or components a computer is made of (RAM, CPU, graphics card, etc.)
- Software
- Programs that tell the hardware what to do
  - System Software
    - Operating systems, file compression, etc.
  - Application Software
    - Internet browsers, messaging services, etc.

Programming Languages

- Low Level Languages
  - Machine code (binary)
  - Assembled
- High Level Languages
  - Compiled
  - Interpreted



Compiled Languages



Examples compiled languages would be C/C++ and Rust

Compiled – Benefits and Drawbacks

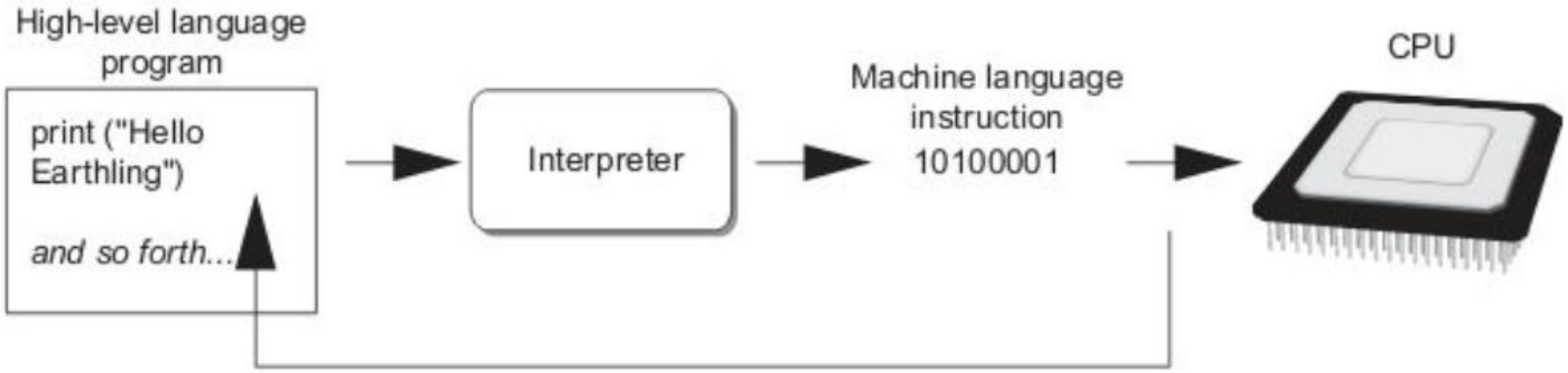
Benefits

- Faster to run/execute the finished program
  - Especially apparent for larger programs
- Provides companies privacy for proprietary/closed-source projecgts
  - Can’t view what the compiled code looks like
- Executables contain everything to run the code outside of external libraries

Drawbacks

- Slow to develop and test
  - Make edits, compile, and run
- Can be a bit heavy for small, simple programs
- More platform specific

Interpreted Languages



The interpreter translates each high-level instruction to its equivalent machine language instructions and immediately executes them.

This process is repeated for each high-level instruction.

Examples interpreted languages would be Python, PHP, and Perl

Interpreted Benefits and Drawbacks

Benefits

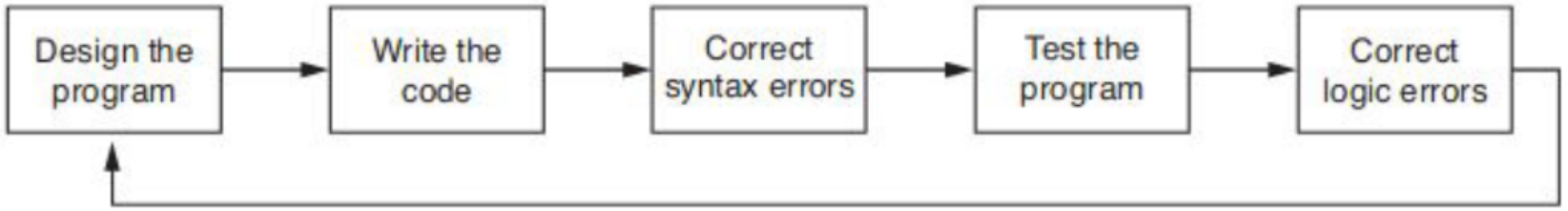
- Fast to develop
  - Making edits, testing, and running
- Good for small, quick programs
- Cross platformability
  - Runs on many types of machines (macOS, Windows, etc)
- Dynamic typing

Drawbacks

- Slow to execute
  - Becomes more apparent the larger the program
- Susceptible to code injection attacks
- Easy to reverse engineer

Production Lifecycle

- Designing
  - Pseudo-code
  - Flowcharts
- Testing
  - Unit testing
  - System testing
- Error Checking
  - Logical errors
  - Syntax errors



Development


- Text editors
  - Command-line execution
  - Can use external debugging programs
- IDE (Integrated Development Environment)
  - Executes programs within application
  - Often contains internal debugger
  - Contains built in libraries for that language