DIT948 Programming H16
Lecture 1

Instructor: Musard Balliu, musard@chalmers.se

http://www.cse.chalmers.se/~musard

August 29, 2016

Overview

- Welcome
- Course Organization
- Computers and Programs
- Course Overview
- A Taste of Java Programming

Welcome

Team

Instructor: Musard Balliu

Teaching Assistants:

- Omar Abu Nabah
- Sarah Aldelame
- ABdulkader Bayrakdar
- Ma Theresa Catalina Lirit
- Sanja Colak
- Linus Eiderström Swahn
- Thomas Emilsson
- Amanda Hoffström
- Maria Chiara Lucatello
- Monica-Alexandra Murgescu
- Dennis Nielsen

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Course webpage:

`http://gul.gu.se/public/courseId/74300/coursePath/39959/ecp/lang-sv/publicPage.do`

Google

Course Organization

Organization

Lectures: Room Alfons, Patricia building

- Mondays 9:15 - 12:00
- Wednesdays 9:15 - 12:00
- Week 39: No lectures (study week)
- Breaks?

Exercise sessions:

- Mondays 13:00 - 15:00
- Wednesdays 15:00 - 17:00
- Thursday 15:00 - 17:00
- TAs will be there

Written exam: Thursday, October 27, 8:30 - 12:30
Written re-exam: Thursday, December 22, 8:30 - 12:30

Organization

Examination and Grading:

- pass with distinction (VG), pass (G), fail (U)
- composed out of grade for three assignments and grade for exam

Organization

Examination and Grading:

- pass with distinction (VG), pass (G), fail (U)
- composed out of grade for three assignments and grade for exam
- To pass the course with a VG, you need to get a VG in the exam and at least two VGs in the assignments
- To pass the course (G) you need to pass the exam and all three assignments

Organization

Assignments:

- Assignments consists in small programming projects
- You are allowed to work in groups of 2 students. Exceptions must be agreed with the instructor
- To be solved by a given deadline (strict) and send to me via GUL
- To be presented during exercise sessions to TAs
- You have at most 3 chances to pass the assignments

Organization

Literature:

- In the first part of the course (Lecture 1-8): Daniel Liang *Introduction to Java Programming, Comprehensive Version*, any edition from the 7th on. This is the main book of the course and you can bring it to the exam.
- For the second part of the course: *Java: Learning to Program with Robots*, Course Technology 2007. Out of print, but available at: `http://www.learningwithrobots.com`.
- Another good book: *Introduction to Programming Using Java*, David Eck. Available online.
  Any other comprehensive book will do just as well. If in doubt, try to find a table of contents and email me.

Organization

Communication:

- Ask in person during the lectures and in the break
- Check the course webpage
- Excercise (supervision) sessions
- Course email address: `dit948.programming16@gmail.com`
- Instructor email address: `musard@chalmers.se`
- Direct feedback
- Course evaluation group?
- **Messages in GUL will NOT be answered**

Computers and Programs

History

An approximate picture of an early computer:

An approximate picture of an early computer:

An approximate picture of an early computer:

- slow, unreliable, expensive, needed lots of down-time
- extremely flexible, could be instructed in natural language

History


intel
revolution in evolution
Highlights from the Journey to 1 Billion PCs
1,000,000,000
900,000,000
800,000,000
700,000,000
600,000,000
500,000,000
400,000,000
300,000,000
200,000,000
100,000,000
1971 – Intel, founded by Robert Noyce, Gordon Moore and Andy Grove, introduces the world's first microprocessor and calls it the Intel® 4004.
1974 – Intel introduces the 8080 microprocessor, which was used in the first commercially successful personal computer – the Altair.
1976 – Apple Computer, Inc. releases the Apple I, the first single circuit board computer.[7] The following year, the company introduces the Apple II. A first for a personal computer, the Apple II featured colored graphics.[7]
1981 – IBM introduces its first personal computer featuring the Intel® 8088 microprocessor. It sparked the PC revolution and set industry standards that still exist today. The IBM platform enabled hardware makers and software programmers to develop programs and add-on accessories. Until then, most PCs had been closed and proprietary.
Shugart Associates introduces the hard drive, bringing high-capacity data storage to the PC.
Adam Osborne completes the first portable computer, the Osborne I. It weighs 24 pounds and plugs into the wall.[7]
1982 – Lotus Development Corporation introduces Lotus 1-2-3, which becomes a best-seller application.[7]
GRiD Systems Corporation brings to market the first battery-powered laptop and launches the portable computer industry.
1983 – The IBM PC/XT establishes the IBM format PC featuring an Intel processor, Microsoft DOS and a hard drive as the most popular personal computing platform.
1984 – Apple introduces the Macintosh with a GUI. A GUI is a graphical user interface that provides visual representation – for what was previously lines of DOS code, making PCs more usable for non-technical people.
1985 – Intel introduces the 386™ microprocessor featuring 275,000 transistors – more than 100 times as many as the original 4004. The 386™ microprocessor was a 32-bit chip that brought "multi-tasking" capabilities to the PC.
Microsoft ships the Windows™ operating system with a graphical user interface.
America Online is founded.[7]
1986 – The number of PCs shipped worldwide reaches nearly 64 million and a 15-year period of continuous growth begins.[2]
1987 – Toshiba introduces the T1000 laptop PC, making portable computing more widely available.
1988 – Recordable CD discs become available.[4]
1989 – The number of PCs shipped worldwide reaches nearly 120 million.[1]
1990 – In Geneva, Switzerland, Tim Berners-Lee develops a new technique for distributing information on the Internet; eventually called the World Wide Web.
Leading PC manufacturers begin to introduce laptops equipped with Microsoft Windows® and the Intel® 386SL™ — the first processor designed specifically for a mobile computer.
1991 – Creative Labs introduces a Multimedia Upgrade Kit, containing a CD-ROM drive, Sound Blaster® Pro board, speakers and multimedia software.
1992 – The number of PCs shipped worldwide reaches 202 million.[2]
1993 – Intel introduces the Pentium® processor and Microsoft introduces Windows® 3.1, providing a solid multimedia platform for consumer games and learning applications. Increased processing capabilities, coupled with the availability of affordable CD-ROM drives and sound cards, usher in multimedia on the PC.
Marc Andreessen creates an Internet browser called Netscape.[4]
PC gaming comes of age when id Software® unleashes DOOM, one of the most popular PC games ever. DOOM also introduced multiplayer gaming to the masses, allowing players to compete in intense 4-player LAN or head-to-head modem competitions.[3]
1994 – The number of PCs shipped worldwide reaches nearly 288 million.[1]
1995 – Microsoft launches Windows® 95 and its browser Internet Explorer. Selling more than 1 million copies in the first four days, the operating system helps move PCs into more than 250 million businesses, homes, and schools around the world.[4]
The number of PCs shipped worldwide reaches more than 347 million.[2]
1996 – The Digital Versatile Disc (DVD) debuts at the Consumer Electronics Show.[7] Fujitsu introduces the technology into the FMV Deskpower series, powered by the Pentium®.[3]
The first 3-D graphics accelerators bring advanced PC gaming to the home.[2]
Approximately 40 million people are connected to the Internet and more than 1 billion dollars change hands online.[5]
1997 – Intel introduces the Pentium® II processor and the number of PCs shipped worldwide reaches more than 497 million.[2]
Recordable and re-writable DVD discs become available.[4]
1998 – Diamond Multimedia Systems, Inc. pioneers portable MP3 digital music technology with the launch of the Rio PMP 300.
The number of PCs shipped worldwide reaches 590 million.[2]
1999 – Napster is founded and users share digital music online.[10]
Intel introduces the Pentium® III processor. Americans are sending 2.2 billion e-mail messages a day, compared with just 293 million pieces of first-class mail.[11]
The number of PCs shipped worldwide is nearly 706 million.[2]
2000 – Intel introduces the Pentium® 4 processor and an estimated 400 million people worldwide are connected to the Internet by the end of the year – more than double the number of people connected in September 1999.[12]
2001 – 20th anniversary of IBM's first personal computer; Microsoft introduces the Windows® XP operating system; Nearly half a billion people around the world have access to the Internet from their homes.[12]
The number of PCs shipped worldwide reaches 961 million.[2]
2002 – Intel introduces the Mobile Intel® Pentium® 4 Processor-M, bringing desktop performance to the laptop PC.
The PC industry ships the 1 billionth PC, according to industry analyst firm Gartner Dataquest.[2]
2007-2008 – The number of PCs shipped worldwide may reach 2 billion, according to industry analyst firm Gartner Dataquest.[2]
For more information, please visit http://www.intel.com

Supercomputers: Tianhe-2

Supercomputers: Tianhe-2

- fast, cheap, huge memory
- need to program it

Computability at a glance

A mathematical view

-Problems as mathematical functions

- $f : Input \rightarrow Output$

-Algorithms

- An complete, unambiguous procedure to solve a problem

-Computing Machines

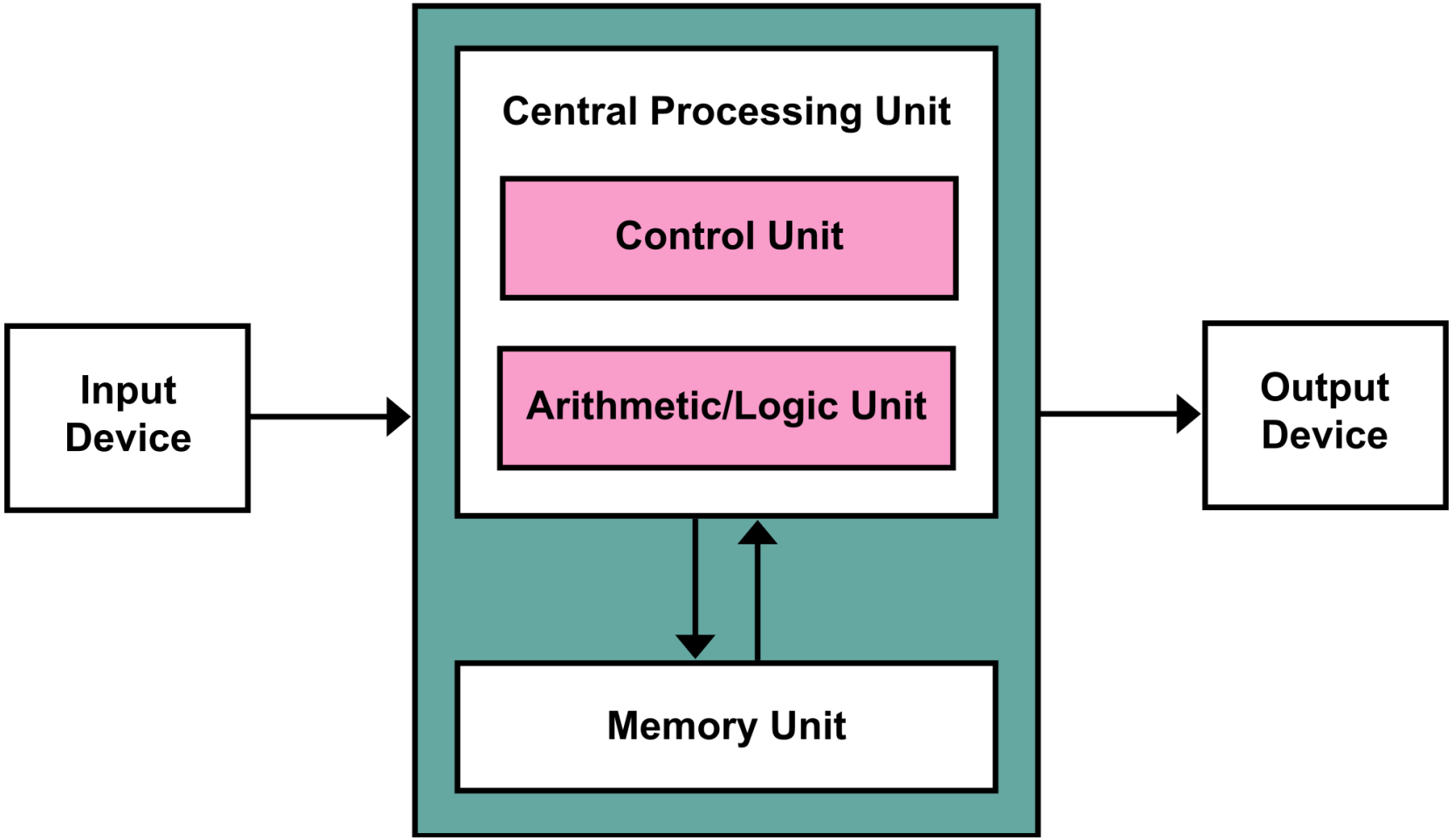
- Von Neumann machine
- Other models: Turing machine, quantum machine, RAM machine

-Programming languages

- JAVA
- C, C++, Assembly

Von Neumann architecture

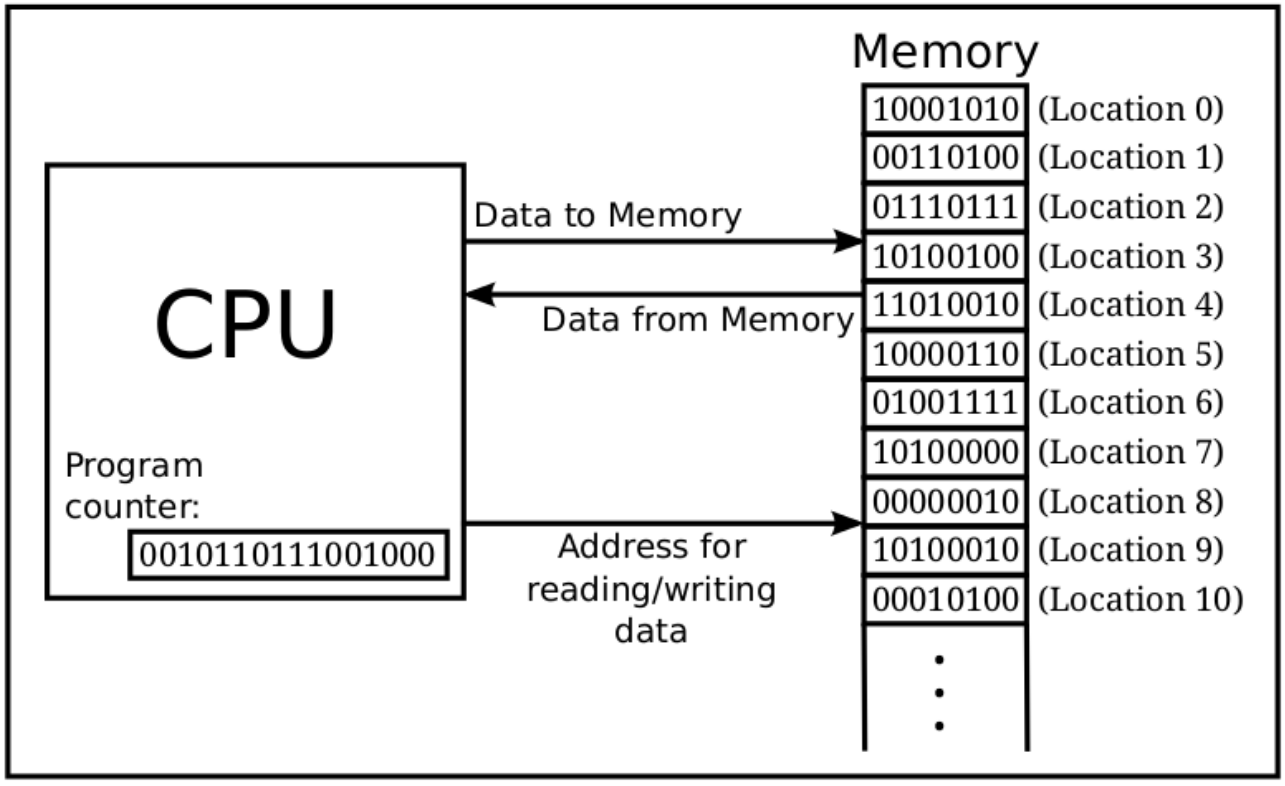
Mental landscape



CPU and Memory

First zoom in

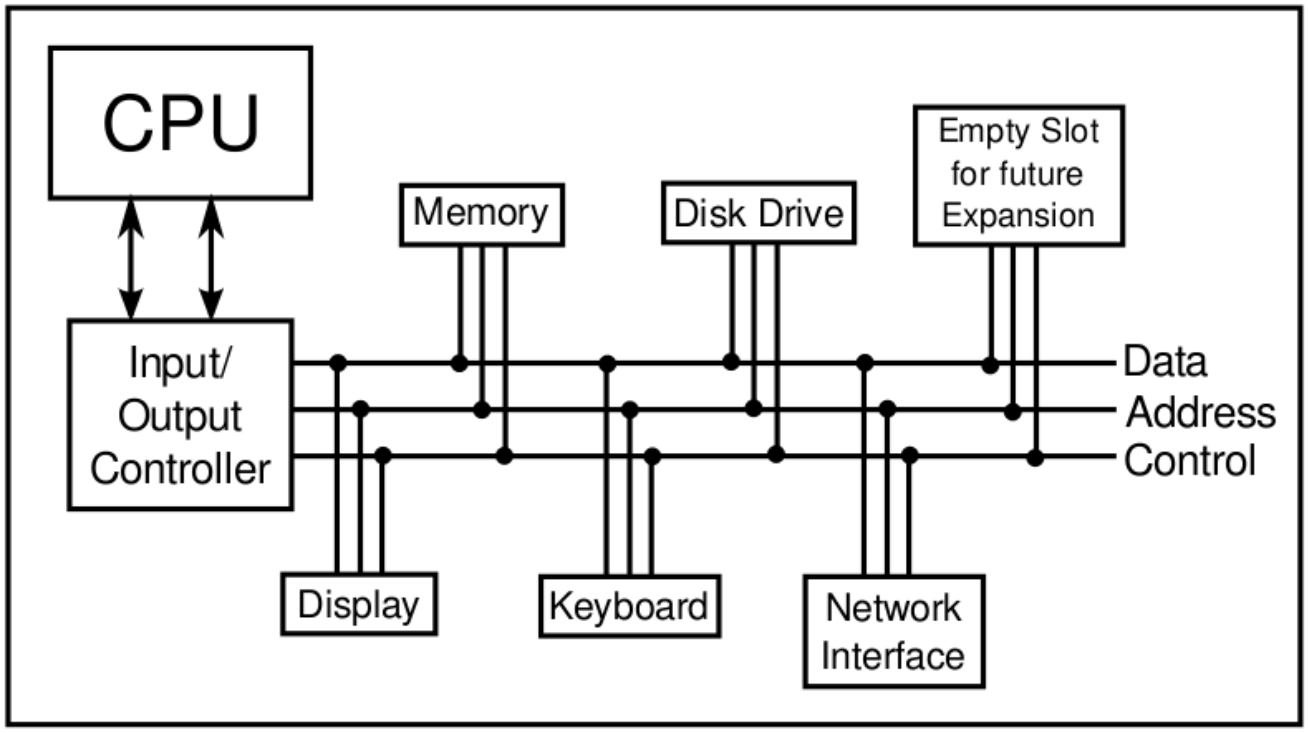
Mental landscape



-CPU and Memory
-Fetch/Decode/Execute cycle
-Binary encoding and machine language

Second zoom in

Mental landscape

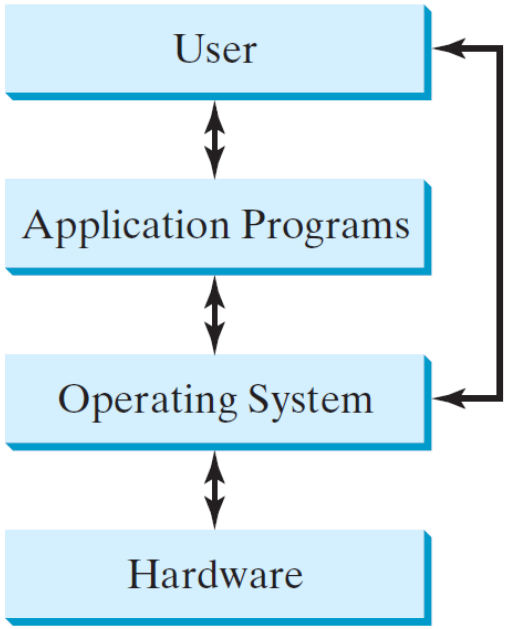


-Devices, disks, monitor, keyboard

- Bus

Big picture: Hardware/Software stack

Mental landscape



- Operatiing System (OS): a program that manages and controls a computer's activities
- allocates and assigns system resources
- schedules operations

Programming languages

Mental landscape

Machine language:

- set of primitive instructions build into every computer
- instructions are in the form of binary code 1101101010011010
- programs are highly difficult to read and modify

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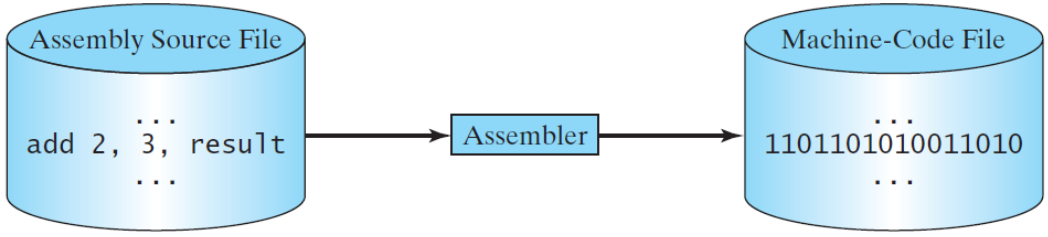
Assembly language:

- developed to make programming easy
- a program called assembler is used to convert assembly programs into machine programs
- e.g. to add two numbers *ADD* R_1 R_2 R_3



Compilers and interpreters

Mental landscape

High-level language:

- easy to learn and program
- provide useful abstractions to the programmer
- e.g. to compute the area of a circle with radius 5:
  $area = 5 * 5 * 3.1415;$

Compilers and interpreters

Mental landscape

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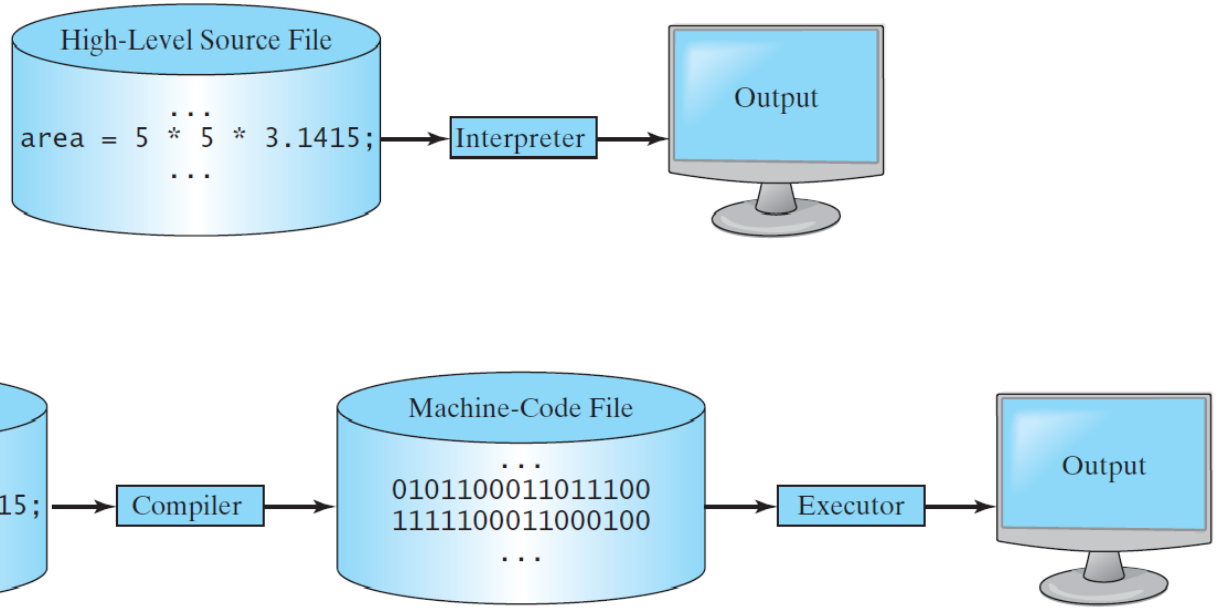
Translating a souce program into machine code for execution:



Compilers and interpreters

Mental landscape

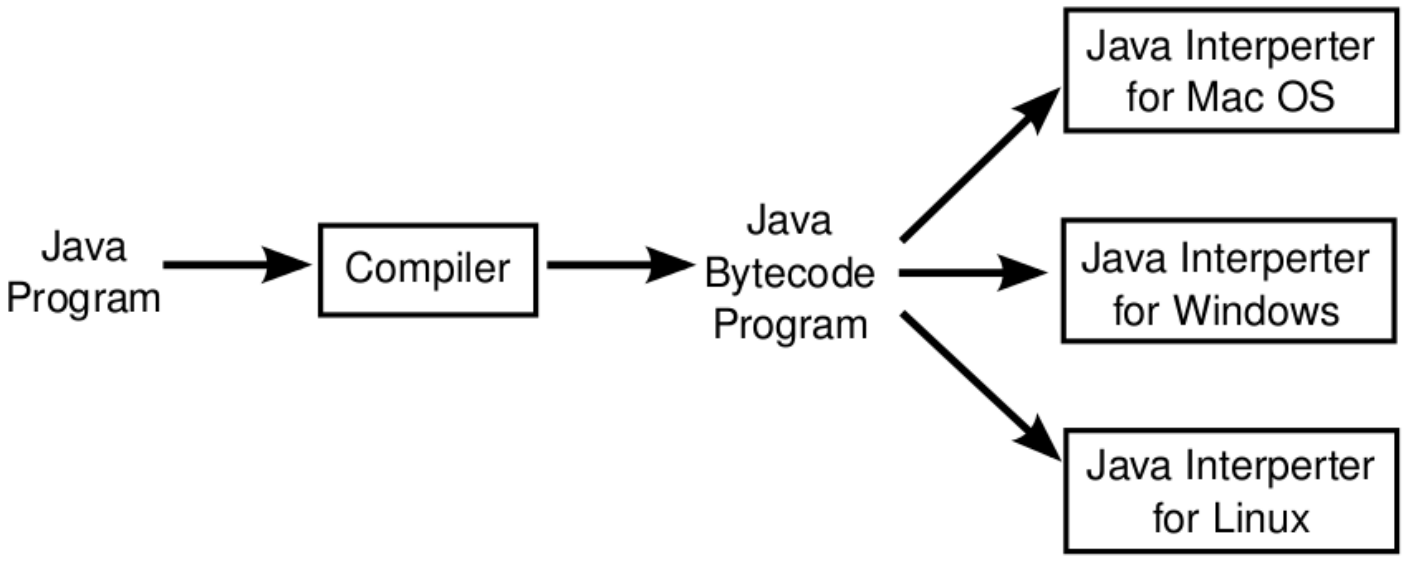
- Machine code: directly executed on CPU
- High-level code: most programs are written in JAVA, C, C++
- Compiler: Translates a program from one language to another, e.g. source code to machine code
- Interpreter: Reads one statement from the source code, translates it to machine code and executes it on a CPU

Compilers vs Interpreters

- CPU-independence: interpreters allow to execute a program meant for one type of CPU on a completely different type of CPU
- Interpreter much smaller and easier to implement

Java and JVM

Mental landscape



- Java compiler: translates Java program into intermediate language (bytecode)
- Java Virtual Machine: machine that executes bytecode programs, an interpreter
- Java: widely used (Android), flexibility, security, architecture independance, ...

Course Overview

Course overview

Course objectives:

- basics of programming language concepts
- basics of the object-oriented programming
- use and understand Application Programming Interfaces (APIs)
  - graphical user interfaces (GUIs)
  - database connectivity
- develop small software applications in Java using a modern development environment
- formulate and implement algorithms to solve elementary programming problems
- assess the comprehensibility of a program and adopt a professional attitude to software development

Fundamental abstractions

Course Overview

Imperative programming:

- Data and instructions
- Variables, types and asssignments
- Control structures and methods/subroutines

Object-oriented programming

- Bottom-up vs top-down
- Classes and objects
- Information hiding and polymorphism
- Inheritance and GUIs

A Taste of Java

Introduction to Java

The only way to learn a new programming language is by writing programs in it. The first program to write is the same for all languages: *Print the string:* `Hello, World!`

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The problem is that even a simple program such as "Hello, World!" requires a certain amount of machinery to run in Java.

To simplify matters, you should use the files `Template.java` and the small `dit948` library available from the course home page.

Ask the supervisors to help you use these.

"Hello, World!" in Java, beginner style

We begin by opening a new file, appropriately entitled `HelloWorld.java`.

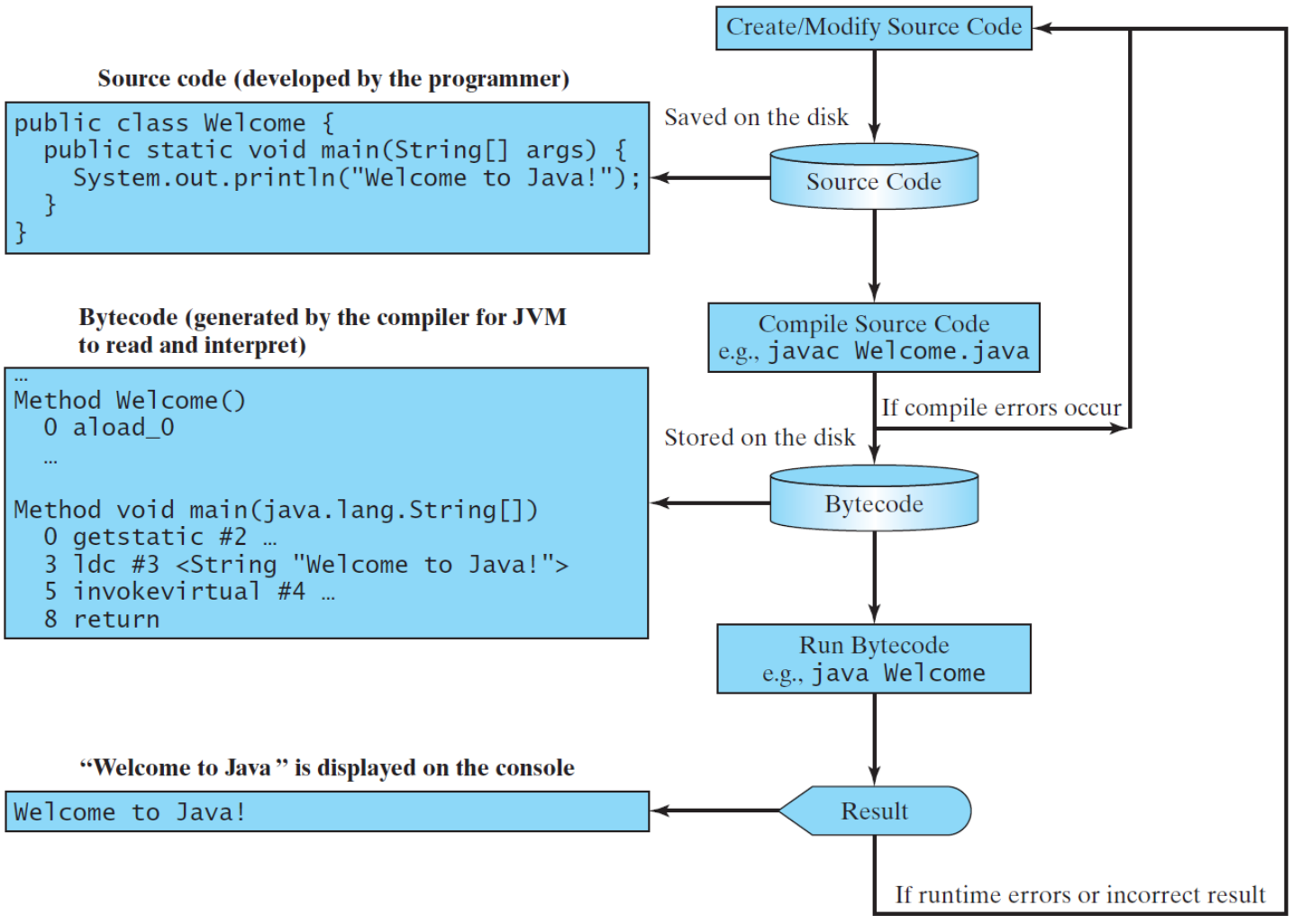
We then copy the contents of the file Template.java in the new file and make the appropriate changes. In this case, we uncomment the line `// import static dit948.SimpleIO.*;` since we want to do some printing and change the word `Template` to `HelloWorld`.

We then enter the instructions to do the printing inside the curly braces that delimit the *body* of the main function.

The final result

Create, compile and execute

Workflow



Exercises

- Read Chapter 1 and 2 of *Introduction to Java Programming, Comprehensive Version*, by Daniel Liang

- Install Eclipse and JDK 1.8 on your computer, and make sure you can compile and run the "Hello, World!" program