Chapter 0 Introduction

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https://wdsseu.github.io/java/

Something about Teaching in English

- Motivation
  - For a better preparation for bilingual communication in your long career;
- Something special
  - We will teach and study at a slow pace;
  - Teaching / Question Answering / Examination in English;
    - For teaching, ~100% English;
    - For question answering, up to you;
    - For examination, 100% English;

About QA

- I will ask you a lot of questions in this class;
  - Some questions are open questions;
- Voluntarily answering questions will gain extra class performance points!!!
- Being shy is OK, but you may lose a good opportunity to gain a high score easily
  - A full usual score is 30 points

About the Attendance

- I NEVER call the roll !! I promise!!
- Feel free to skip the class
  - We are adults, and we have the right to choose;
  - It will NOT affect your final grade;
  - But you will have no chance to gain extra class performance points;
  - And you need to work hard on your assignments;

Course Information

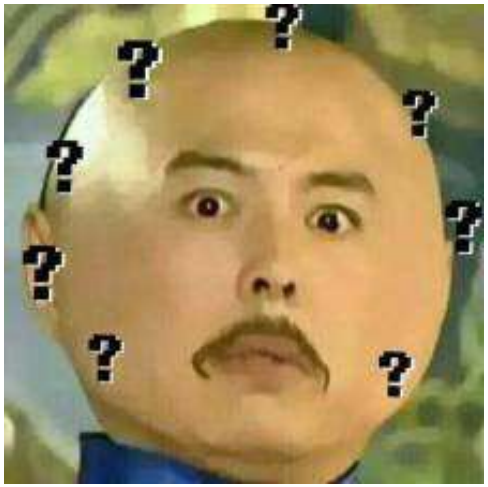
- Syllabus
  - Java Grammar (a few classes)
    - Similar to C++
  - OOP (less than one month)
    - Abstraction | Inheritance | Polymorphism
  - Advanced Topics (two months)
    - The focus
  - ~~Flipped Classroom (one month)~~
    - ~~Students give presentations on stage~~

Course Information

- Professor
  - Xiang Zhang 张祥
  - javaseu@163.com
  - Teaching Assistant
- Remember to bring your laptop!!

First of All

- Currently, learning Java (or any language) is easy
  - plenty of textbooks, videos and online materials
  - open source communities like Github and Kaggle
  - QA communities like Quora and StackOverFlow
- So the question is:
  - why we still sit in this classroom to learn Java??



for fun

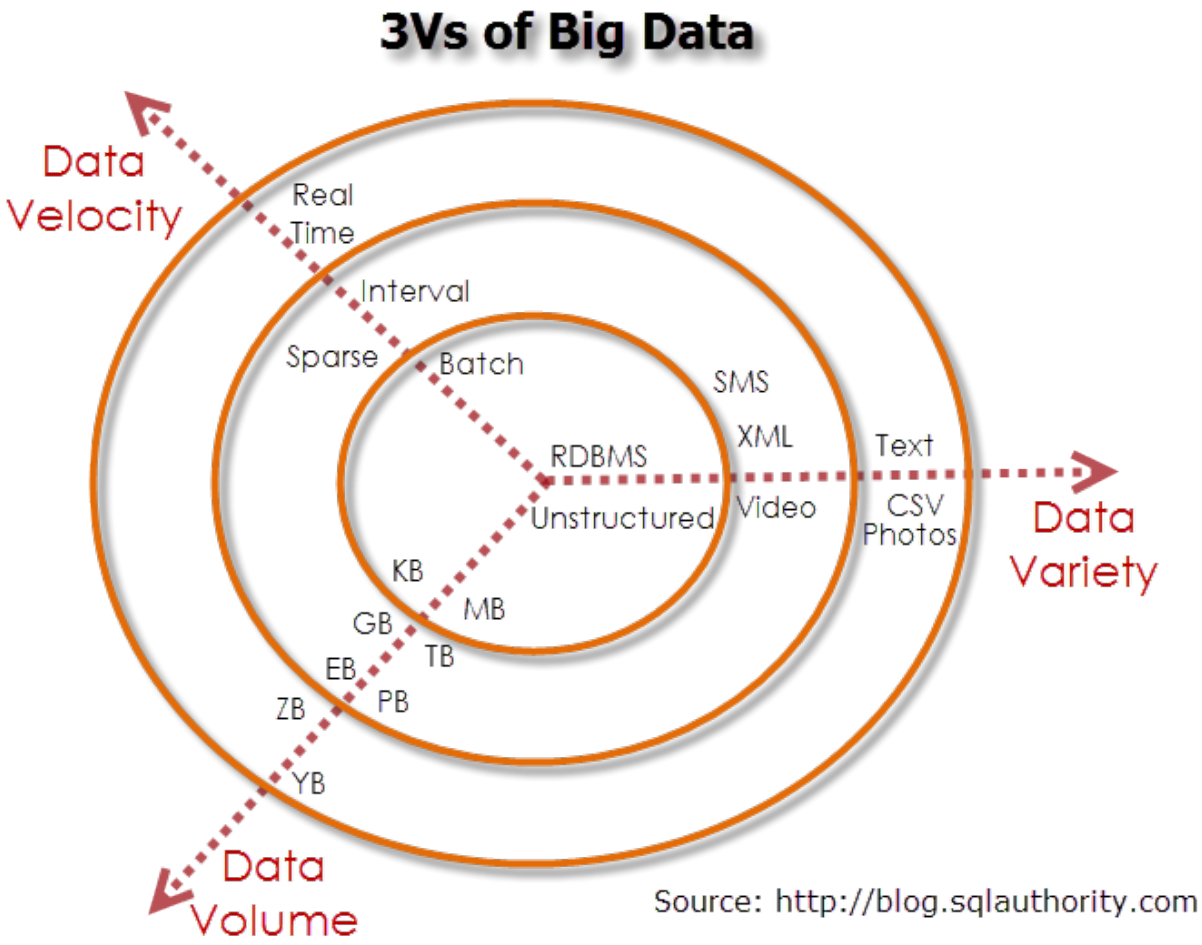
First of All

- For Fun
- For Communication
- For a marathon with the friends

Content

- Bloating of Complexity
- Java vs. C++
- About this course
  - Course Arrangement
  - Materials
  - How to Learn
  - Self-study
- Course Design

Era of Big Data



Challenge: Complexity

- Increasing Complexity
  - Complexity of both problems and data
  - Managing the complexity by programming
    - More abstract models
    - Easier grammar
- Example:
  - OICQ vs. QQ. vs. WeChat

Open Discussion

How can we estimate how many web pages are on the WWW?

Open Discussion

- Find some applications that need to make use of extremely large data

Open Discussion

- What do you think is hard to understand in C and C++?
- What do you think is not easy to use in C and C++?
- What features do you most look forward to in future programming languages?

Dilemma

Open Discussion: what happens to an ATM in case of power off

- Dilemma in programming
  - Increasing user need (Security, Transaction…)
  - Increasing size of software modules (from 10s to thousands)
  - Decreasing efficiency of software development
  - Increasing cost of maintenance (a week coding, but a year maintenance)
- The goal of Java since its birth
  - Using precise, easy-to-read, secured program for problem solving
  - Thinking in Java – Pure Object-Oriented Thinking

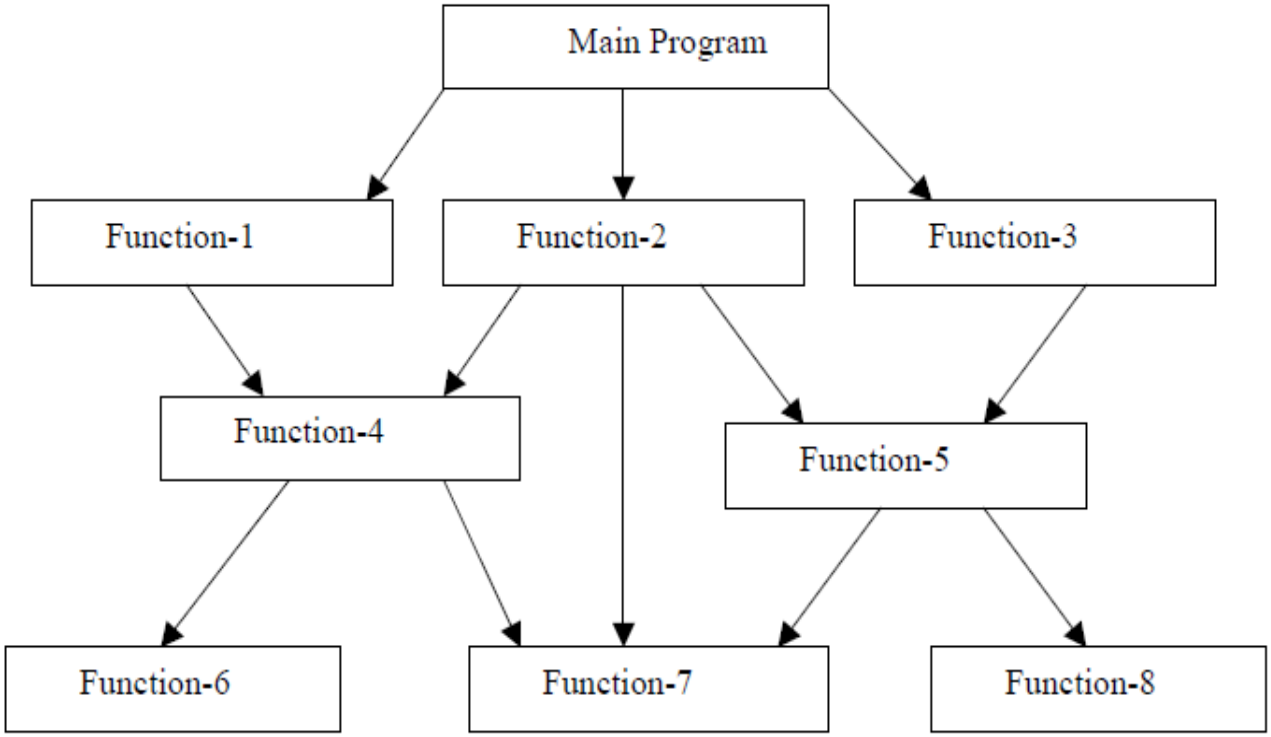
Evolution of Programming

- Evolution of program language
  - Machine、Assembly
  - Procedure oriented
  - Object -oriented / Aspect-oriented
- Evolution of capsulation
  - Class Library
  - Design pattern
  - Framework
  - Service

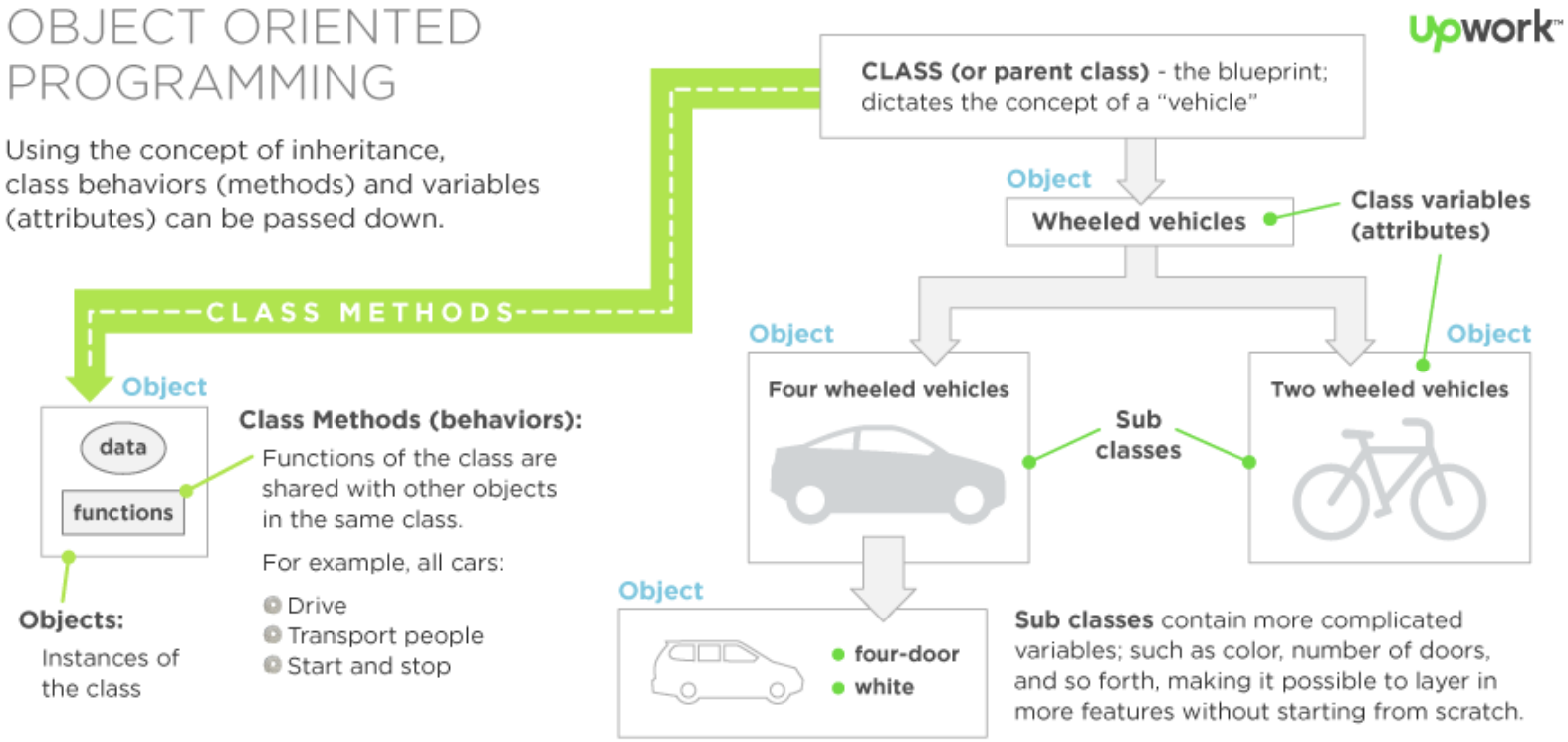
Increase of capsulation

Java

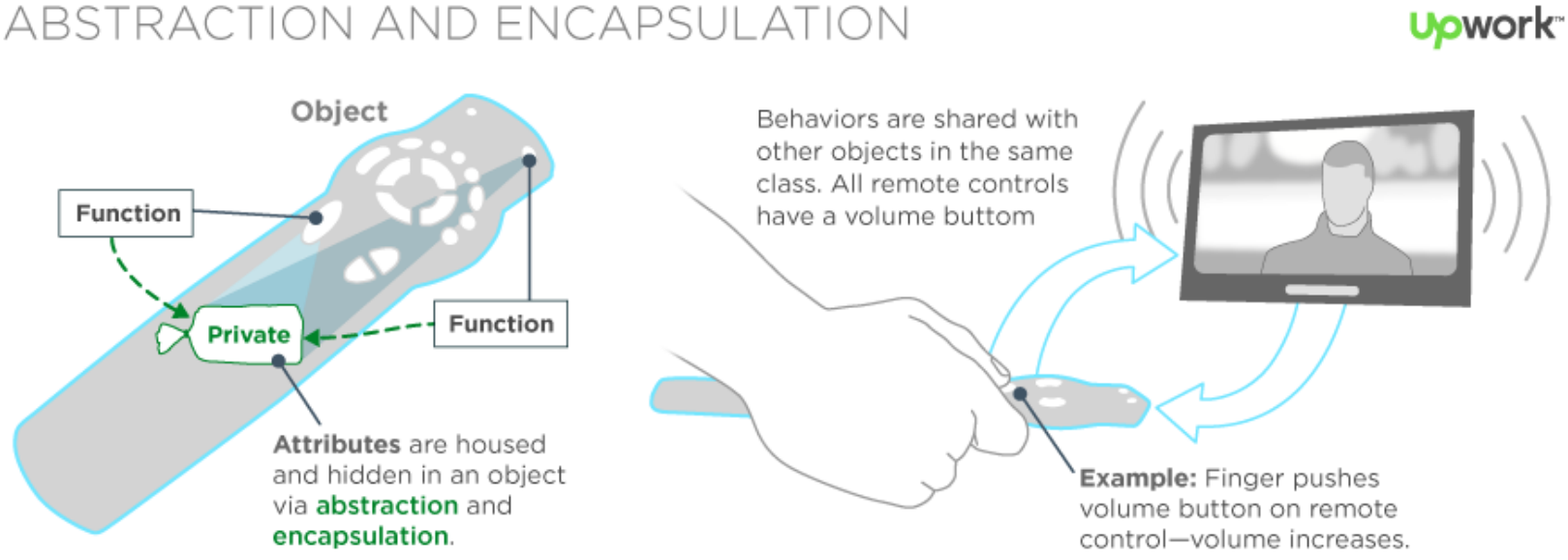
POP vs. OOP


Main Program
Function-1
Function-2
Function-3
Function-4
Function-5
Function-6
Function-7
Function-8

OOP



credit: https://www.upwork.com/hiring/development/object-oriented-programming/



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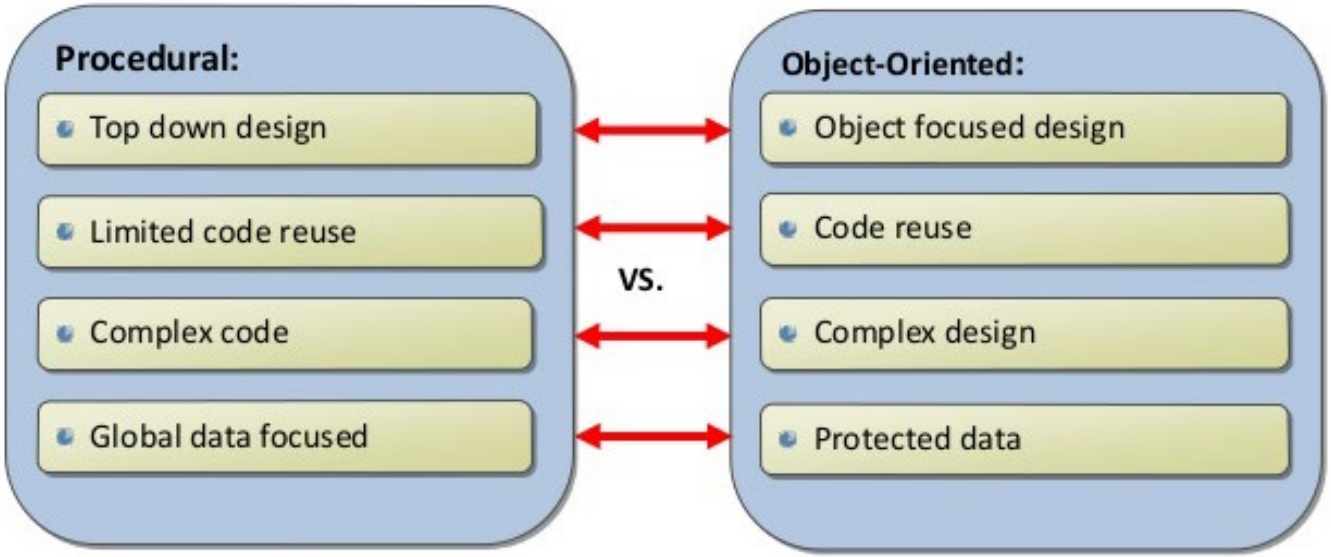
Procedural vs. OOP



credit: https://www.slideshare.net/HarisBinZahid/procedural-vs-object-oriented-programming

Java and C++

- The pointer
- String
- DLL
- Portability
- Multiple inheritance
- Garbage Collection

Java and C++ - Problems in C++

- The pointer

```
// Move and inverse memory
int i;
for(i=0;i<=size;i++){
    to_block[size-i] = from_block[i]; // Can you see the bug?
}
```

Java and C++ - Problems in C++

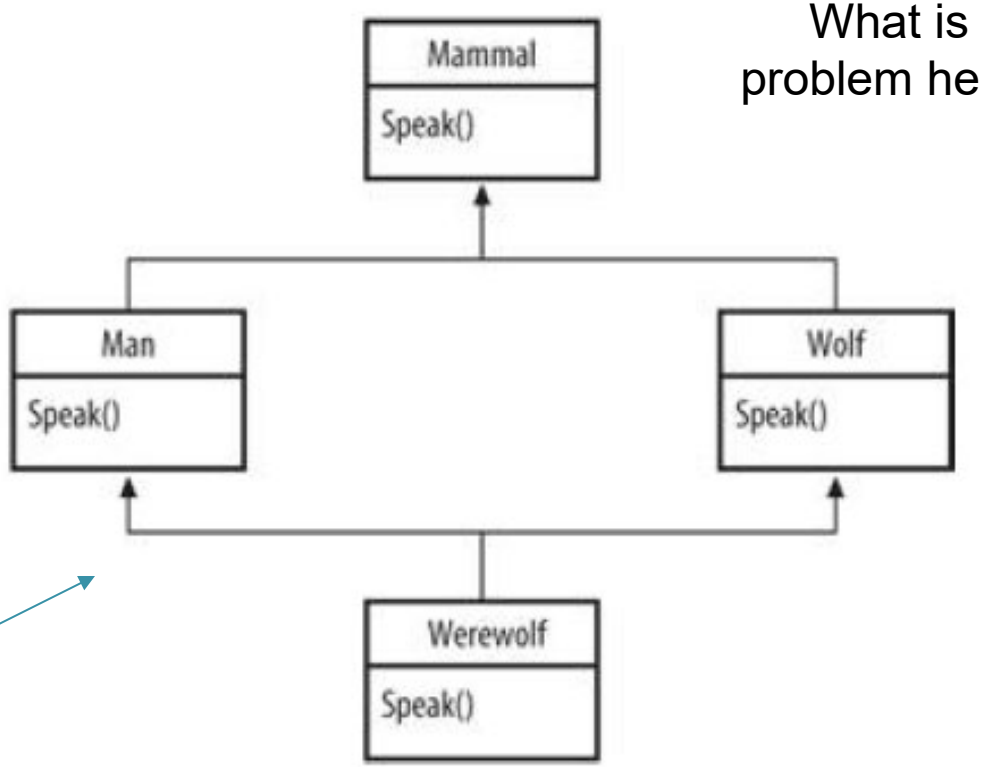
- String

```
char str [] = "Hello"; //C-style
...
String str = "Hello, I'm feeling a little better."; //ANSI C++ from 1997
```

Java and C++ - Problems in C++

- DLL version compatibility
- Portability
- Multiple inheritance

Open Discussion:
What is the problem here?



Diamond Inheritance Problem
Or the Werewolf Problem

Java and C++ - Problems in C++

- Garbage Collection

```
System.gc();
```

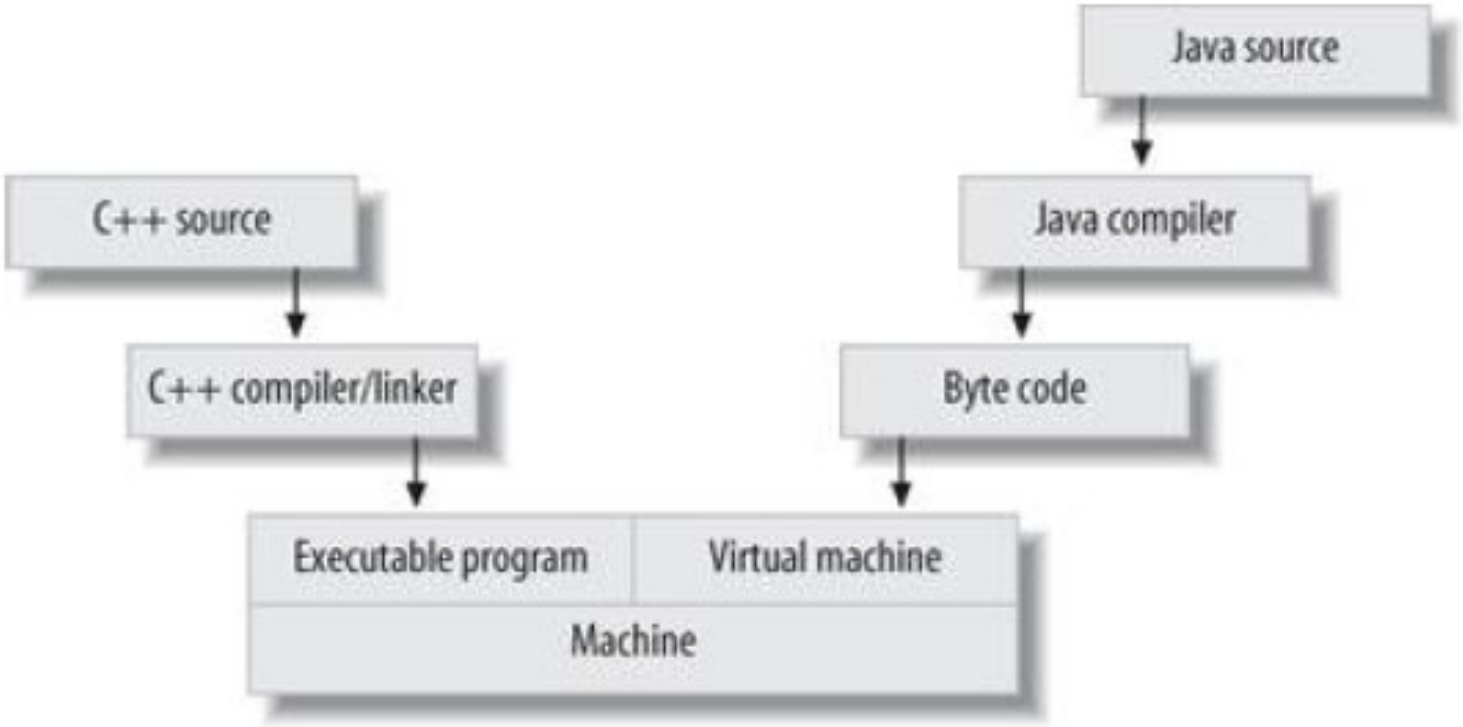
Open Discussion:
Is it possible that the JVM can automatically find out all possible garbage? How can it be done?

Java and C++ - Java Solution

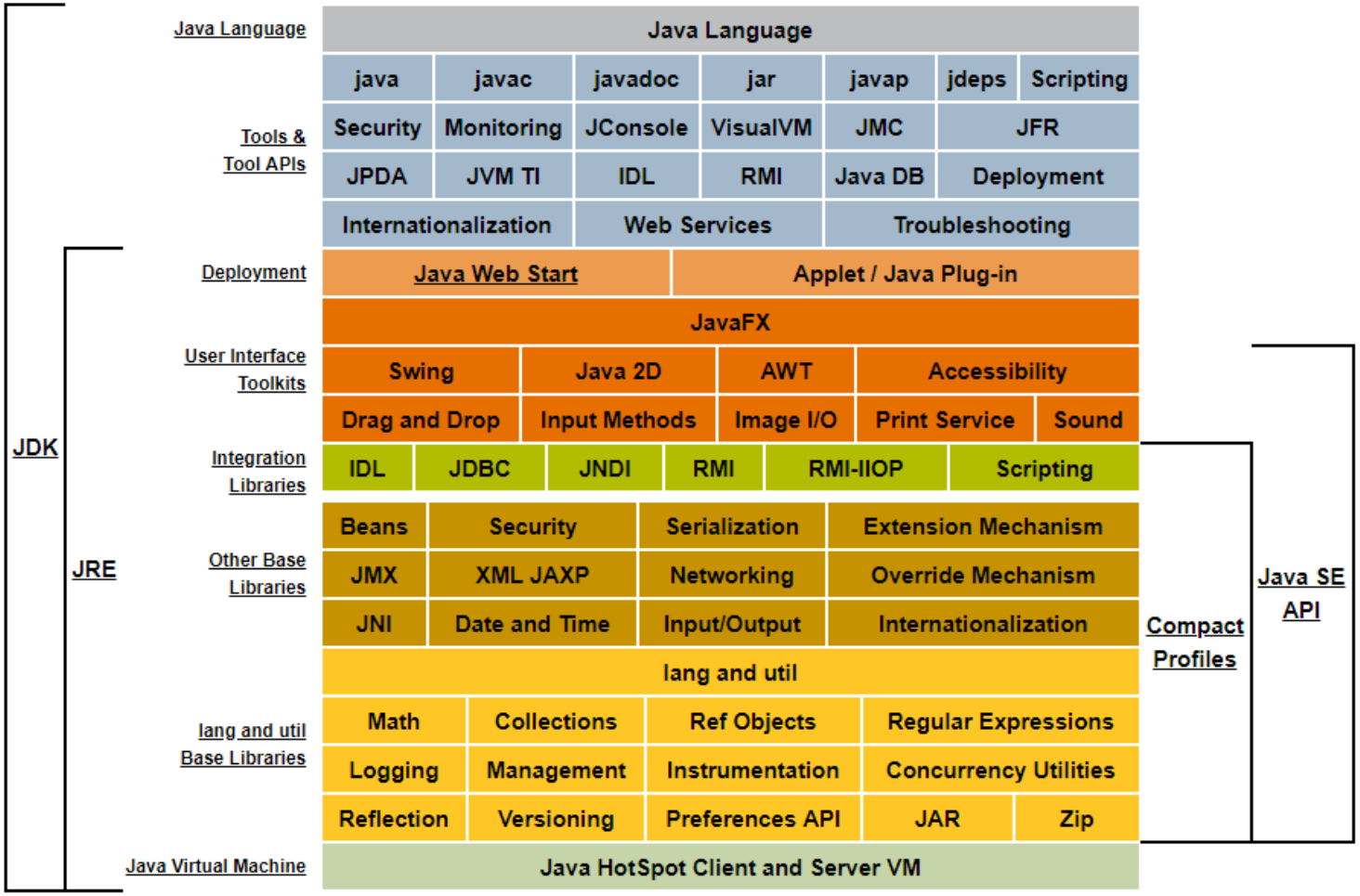
- JVM portability: Write Once, Run Anywhere
- Byte code specification: specified JVM and Java language
- Limited memory access by JVM: sandbox
- Meta-model： Reflective Programming
- Automatic garbage collection
- Pointer removed / Reference is used

Open Discussion

- *What is the pros and cons of Java?*



JDK | JRE | JVM


Java Language
Java Language
java
javac
javadoc
jar
javap
jdeps
Scripting
Tools & Tool APIs
Security
Monitoring
JConsole
VisualVM
JMC
JFR
JPDA
JVM TI
IDL
RMI
Java DB
Deployment
Internationalization
Web Services
Troubleshooting
Deployment
Java Web Start
Applet / Java Plug-in
JavaFX
User Interface Toolkits
Swing
Java 2D
AWT
Accessibility
Drag and Drop
Input Methods
Image I/O
Print Service
Sound
Integration Libraries
IDL
JDBC
JNDI
RMI
RMI-IIOP
Scripting
Other Base Libraries
Beans
Security
Serialization
Extension Mechanism
JMX
XML JAXP
Networking
Override Mechanism
JNI
Date and Time
Input/Output
Internationalization
lang and util
lang and util Base Libraries
Math
Collections
Ref Objects
Regular Expressions
Logging
Management
Instrumentation
Concurrency Utilities
Reflection
Versioning
Preferences API
JAR
Zip
Java Virtual Machine
Java HotSpot Client and Server VM
JDK
JRE
Compact Profiles
Java SE API

Week	Content
W1	Introduction, Java Fundamentals
W2	Java OOP I (Classes and Objects)
W3	Java OOP II (Abstract, Inheritance, Polymorphism)
W4	Java OOP II (Abstract, Inheritance, Polymorphism)
W5	Java Exception
W6	Java I/O
W7	Java I/O
W8	Java I/O
W9	Java Collection
W10	Mid-term Lab Work
W11	Java Multithread
W12	Java Multithread
W13	Java Multithread
W14	JDBC
W15	Java Network Programming
W16	Course Project

homepage: https://wdsseu.github.io/java/

Java Programming

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Preparing the Environment

- Installing JDK 8 (J2SE version 8) into your computer: https://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html;
- Verifying if JDK 8 has been succesfully installed by typing "java -version" in your comannd line like this. If you see "java version "1.8.xxxxx"", congradulations!

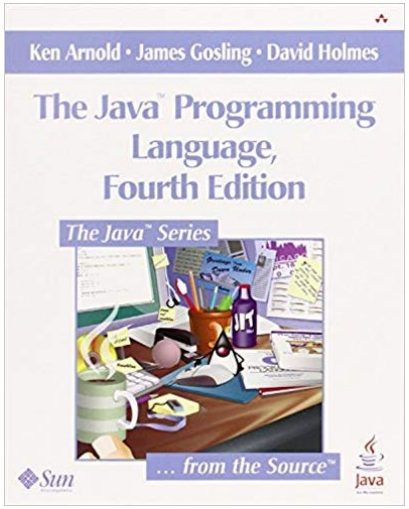
```
C:\Users\Administrator>java -version
java version "1.8.0_221"
Java(TM) SE Runtime Environment (build 1.8.0_221-b11)
Java HotSpot(TM) 64-Bit Server VM (build 25.221-b11, mixed mode)
```

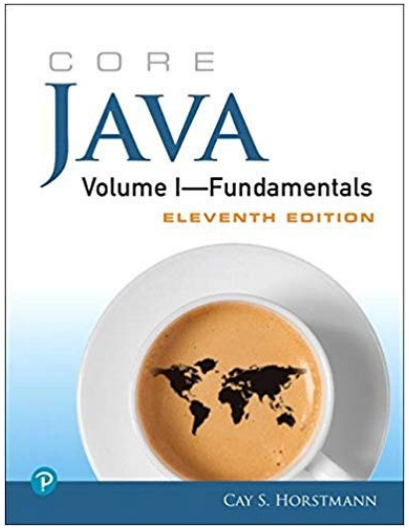
- Then installs Eclipse IDE for J2SE (https://www.eclipse.org)(the latest version is 2019-06, "Eclipse IDE for Java Developers", please DO NOT download the "Eclipse IDE for Enterprise Java Developers", that is for J2EE, which is another edition of Java) OR IntelliJ IDEA (https://www.jetbrains.com/idea/).
- Verifying if the IDE is correctly installed by running a HelloWorld program, taking Eclipse as the example: example

Recommended Textbooks

- The best textbook is Javadoc
- The best professor is JDK/JRE
- Recommended Textbooks:

Title	Edition	ISBN
The Java Programming Language	4th	9780321349804
Thinking in Java	4th/5th	9787111212508
Core Java	11th	0135166306
Head First Java	2nd	0596009208
Inside Java Virtual Machine	2nd	0071350934





How to Learn

- How to study Java in a AGILE way?
  - TYPE the examples in the textbook
  - Learn to use Javadoc
  - Don’ t focus too much on the grammar details
  - Resources:
    - Github, Kaggle…

Lab work

- The installation of JDK/JRE
- Setup the PATH / Classpath
- Install Eclipse / IntelliJ …