COMS W3101-1 Programming Language: Java (Spring 2012)

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Prerequisites

- A good knowledge of programming is required.
- A good background in at least one programming language is recommended. Course overview
- Course overview – See
  - http://www.cs.columbia.edu/~ramana

Syllabus Overview

- Java programming
  - JVM, data types, control structures, functions
- Object Oriented Programming principles of Java
  - Concepts of class/object, methods, inheritance, polymorphism, abstraction, data encapsulation
- Exception handling in Java
- Java Packages
- Threads, Javadoc
- Other topics.

Lecture-1

- Overview of Java
  - Java programming language philosophy
  - Java virtual machine
  - Brief introduction to "class"
  - Basic data types
  - Operators

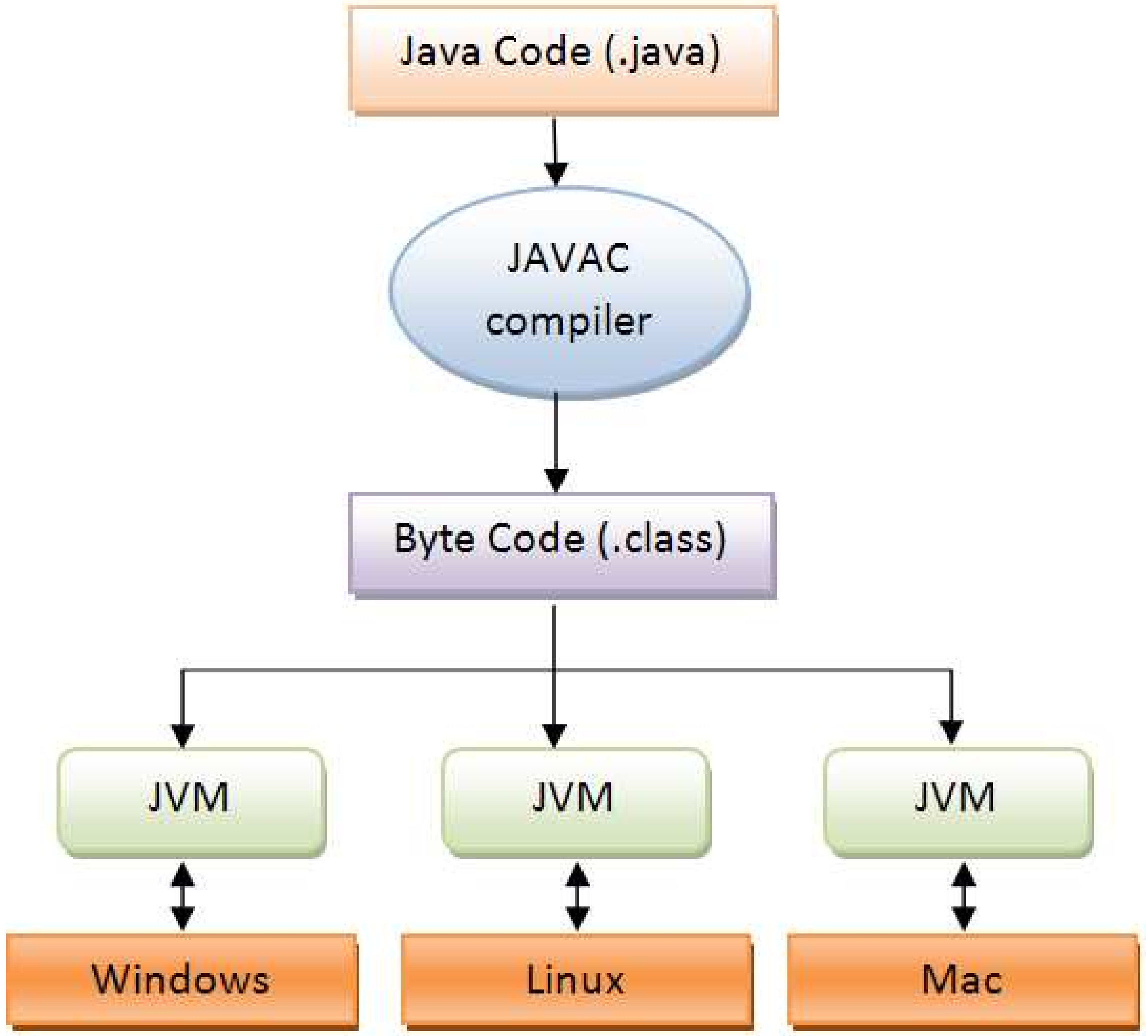
Different types of Java

- Java “Standard Edition” (SE)
  - Basic Programming support using strings, math, I/O operations, file systems, network programming, applets, etc.
- Java “Enterprise Edition” (EE)
  - Include JDBC, RMI, servlets, JSP, etc. in addition to basic Java programming functionality.
- Java “Micro Edition” (ME)
  - Specifically designed for mobile devices applications.
- We will talk only about Java SE in this course

Design philosophy of Java

- Java design philosophy
  - Write Once Run Anywhere (WORA)
  - Based on "Java Virtual Machine" (JVM)
  - Uses bytecode that runs on JVM
- This is in contrast to other languages like C, C++
  - They use "Write Once Compile Anywhere" (WOCA)
  - Compiled code runs directly on the machine.

Java virtual machine



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Java Virtual Machine … contd.

- Runs on a real machine.
- Forms an intermediate layer
  - Between a real machine and the user program
- Keeps user programs independent from the machine architectures.
- A Java program generates bytecode
- Bytecode can be run on any JVM on any machine
  - Compile Once Run Anywhere

Java - classes and objects

- Java is an Object Oriented Programming (OOP) language.
  - Real world entities are treated as objects.
  - objects are instances of class.
  - class are user defined.
    - Contain data and methods.
  - A class is a starting point for writing code in Java.
- We will cover details of OOP later.

A simple Java program

```
import java.io.*;                            // Include all files under "io"
public class SimpleExample                   // Define a class "SimpleExample
 {
   public static void main (String[ ] args)  // main method, program starts here
    {
      System.out.println ("Simple example"); // Just print "Simple example"
    }
}
```

- In Netbeans, just "Run" it
  - (Netbeans compiles and runs for you)
- On a shell prompt (e.g., UNIX shell)
  - Compile this using "javac SimpleJava.java"
    - Creates a file called SimpleJava.class – bytecode
  - Run this using "java SimpleJava.java"

Java programs - some rules

- The class to be run should
  - Be present in a file with the same name.
    - with a .java extension.
  - Be declared public.
  - ONLY the class to be run should be public.
    - This file can have other non-public classes.
  - Have a main method that is
    - Declared public and static.
  - Can have other functions
    - That may or may not be public, static, etc.

Java basic data types and operators

- Basic data types
  - byte, char, short, int, long, float, double, boolean
- Operators:
  - Arithmetic: +, -, *, /, %, ++, --
  - Logical: ==, !=, >, <, >=, <=, &&, ||, !, ?:
  - Bitwise: &, |, ^, <<, >>, ~

Java basic data types

Type	#bits	Default value	Min value	Max value
byte	8	0	-128	127
short	16	0	-32768	32767
int	32	0	-2147483648	2147483647
long	64	0L	-2^63	(2^63) – 1
float	32	0.0f		
double	64	\u0000		
Boolean	Not clearly defined	null	NA	NA
char	16	false	NA	NA

Variables

- Those used in any program to store data of any type.
  - E.g.
    - int i = 2;   // i is a variable of type int
    - double j = 2.4 // j is a variable of type double
- Value of variables can change in a program
  - i = i + 2; // value of I is two more than
                     // what it was before