

## CSCI 209: Software Development

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## What is Programming?

"If you don't think carefully, you might think that programming is just typing statements in a programming language."  
 --Ward Cunningham

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## Discussion: What Is *Good* Software?

- What are its outcomes?
- What are the characteristics of the software?
- How can we write good software?

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## Characteristics of *Good* Software?

- Free of bugs
    - Robust, reliability
  - Code is easy to read, extend, maintain
    - Readability, extensibility, maintainability
  - Application is easy to use
    - Usability
  - Efficiency
  - Scalability
- ➔ Referred to as the \*ilities

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## Ward Cunningham

"If you don't think carefully, you might think that programming is just typing statements in a programming language."  
 --Ward Cunningham

- American computer programmer
- Developed the first **Wiki** (1994)
  - Pioneer in **design patterns** and **Extreme Programming**

Will mean more to you later this semester

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## Course Content

- Software Design Principles
- Java
  - Statically typed language
- Software development tools
  - Eclipse
  - UNIX commands

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## What to Expect from this Class

- Programming intensive
  - Interesting assignments and projects
  - More freedom in design, \*ilities
    - Larger portion of your grade
    - Correctness is **NOT** enough
  - Building on large library of classes
  - Building larger applications
- Compare/Contrast with Python
- Learning on your own
  - Online resources

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## Class Details

- Course Web Site
  - Example code, lecture slides, readings, resources
  - Course wiki/blog
- Optional Textbooks
  - Use plentiful online resources instead!
- Participation
  - Class discussions

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## Class Details

- Reading assignments
  - Write up short summaries on blog/wiki
  - Class discussions
- Programming Assignments
  - Various sizes
- Several Projects
  - Demos with me
- 2 Exams

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## Course Dynamics

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• Professor's Responsibilities:               <ul style="list-style-type: none"> <li>➢ Be <b>prepared</b> for class</li> <li>➢ Correct students non-judgmentally</li> <li>➢ Treat students with <b>respect</b></li> <li>➢ Challenge and encourage students</li> <li>➢ Make class material as clear as possible</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Student's Responsibilities               <ul style="list-style-type: none"> <li>➢ Be <b>prepared</b> for class (do readings and homework)</li> <li>➢ Give attention and effort in class to learning</li> <li>➢ Ask questions (<b>during class</b> and via email)</li> <li>➢ Use professor's office hours</li> <li>➢ Let professor know if something is going wrong</li> <li>➢ Treat other students and professor with <b>respect</b></li> </ul> </li> </ul> |
|--|--|

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## My Bio

- From Dallastown, PA
- B.S., Gettysburg College
- M.S., Duke University
- Ph.D., University of Delaware
- For fun: ultimate, pop culture, ACC basketball



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## My Research Interests

- General: Software engineering
- Automated testing of web applications
  - Develop algorithms
  - Implement in tools

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## Your Bios

- Where you're from
- What activities you're involved in
- What you do in your free time


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## What is Java?

... and, why should I learn it?

- From Sun Microsystems 
  - 1995, James Gosling and Patrick Naughton
  - Specifications
- Object-oriented
- Rich and **large** library
- Develop cross-platform applications
  - Web, desktop, embedded
  - Frameworks
- Widely used



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## What is Java?

- Java Programming Language
- Java Virtual Machine
- Java Class Libraries

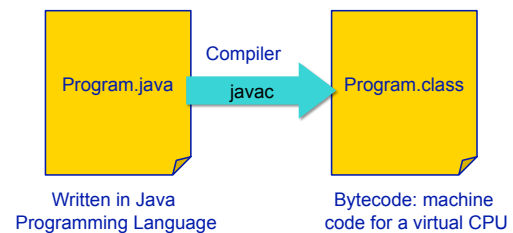
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## Java Programming Language

- Similar to Python
- But *entirely* object-oriented

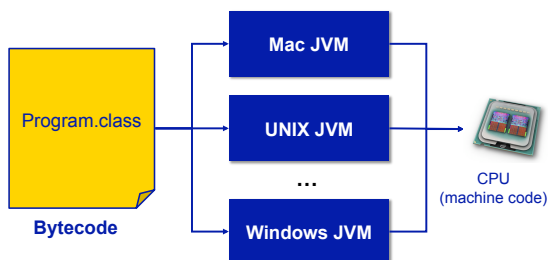


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## Java Virtual Machine (JVM)



- Same **bytecode** executes on each platform

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## Java Virtual Machine (JVM)

- Emulates the CPU, usually specified in software
- Executes the program's bytecode
  - Bytecode: virtual machine code
- Different versions for each platform Java supports
  - Enables program portability
- Sun's Hotspot VM
  - Code dynamically compiled to machine code
- Garbage Collection

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## Traditional Way



- Executable is not portable

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## Java Editions

- Edition: Version of Java
- Three different editions
  - SE: Standard Edition
  - EE: Enterprise Edition
    - Server-side applications
    - Web applications, Communication (mail)
  - ME: Micro Edition
    - For PDAs, mobile devices, etc.

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## Java Class Libraries

- Pre-defined classes
  - Included with Java 2 Software Development Kit (SDK) and Java 2 Runtime Environment (JRE)
  - View the available classes online:
    - <http://java.sun.com/javase/6/docs/api/>
- Similar in purpose to modules included with Python

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## Summary of Java Platform SE 6.0

Java Language	Java Language									
	java	javac	javadoc	apt	jar	javap	JPDA	jconsole		
Tools & Tool APIs	Security	Int'l	RMI	IDL	Deploy	Monitoring	Troubleshoot	Scripting	JVM TI	
Deployment Technologies	Deployment		Java Web Start				Java Plug-in			
User Interface Tools	AWT		Swing				Java 2D			
Integration Libraries	Accessibility	Drag n Drop	Input Methods		Image I/O	Print Service		Sound		
Other Base Libraries	IDL	JDBC™	JNDI™	RMI	RMI-IIOP	Scripting				
lang and util	Beans	Intl Support	I/O	JMX	JNI	Math				
Preferences API	Networking	Override Mechanism	Security	Serialization	Extension Mechanism	XML JAXP				
Ref Objects	lang and util	Collections	Concurrency Utilities	JAR	Logging	Management				
Reflection	Preferences API	Ref Objects	Reflection	Regular Expressions	Versioning	Zip	Instrument			
Java Virtual Machine	Java Hotspot™ Client VM					Java Hotspot™ Server VM				
Platforms	Solaris™		Linux		Windows		Other			

Image from Sun's site

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## Benefits of Java

- Rapid development of programs
  - Large library of classes, including GUIs, Enterprise-level applications, Web applications
- Portability
  - Run program on multiple platforms without recompiling
- Statically-typed language
  - Compiling - find some errors before execution
  - Can give performance boost

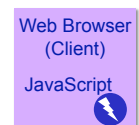
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## Aside: JavaScript vs Java

- JavaScript is *not* Java
  - JavaScript is a scripting language, primarily embedded in HTML, executed by Web browsers



```

<script type="text/javascript">
function myFunction() {
    return ("Hello, have a nice day!")
}
</script>
</head>
<body>
<script type="text/javascript">
document.write(myFunction())
</script>
  
```

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## Which 'Java' is this class about?

- Java programming language
- Java class libraries
- Use the JVM but won't learn about how it works
  - For more information:
    - <http://java.sun.com/docs/books/vmspec/>

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## Java Development Kit (J2SDK)

- J2SDK: Java 2 Software Development Kit
- Free from Sun
- Contains
  - `javac`: Java compiler
  - `java`: Java Virtual Machine
  - Java class libraries

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## Java Development Kit (J2SDK)

- Installed on Linux machines
  - Java 1.6 should be reachable using default path
  - To see which executable you're executing use
    - `which java`
    - Should be `/usr/local/bin/java`
- Run `java -version` to determine which version you're running
- You can download the JDK for your machine from <http://java.sun.com/javase/downloads/index.jsp>
  - JRE is for *running* Java applications
    - Does not include the compiler

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## Using the J2SDK

- Copy `First.java` from `/home/courses/cs209/handouts/`
- Compile and run `First.java`
  - `javac First.java`
    - Compiles the program into `First.class`
  - `java First`
    - Runs the JVM, which executes the bytecode
- View `First.java` in jEdit

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## Intro to Java Programming Language

- Example
- Next time:
  - Data types
  - Control structures

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