Introduction to Java

Outline

• Introduction
• Java 2 Platform

What Is Java?

• History
• Characteristics of Java

History

• James Gosling at Sun Microsystems
• Previous called Oak in 1991 for consumer electronic applications
• Renamed to Java and redesigned for Internet applications in May 1995
• HotJava
  • The first Java-enabled Web browser

Java 2 Platform

• Java 2 Platform Standard Edition
• Java 2 Platform Enterprise Edition
• Java 2 Platform Micro Edition

Java 2 Platform Standard Edition
For developing stand-alone applications
• JVM to execute Java programs
• Development tools -- compiler, debugger, profiler, and documentation generator
• Core APIs (Application Program Interfaces) -- core language support, utilities, input and output, networking, preferences, collections, security, locale support, logging, Java beans, XML processing, and native interface
• GEL/APIs -- AWT (Abstract Window Toolkit), Swing, 2-dimensional graphics, and sound support
• Integration APIs -- remote method invocation (RMI), database connectivity (JDBC), naming and directory services (JNDI)
• Deployment tools -- Java Web start and Java plug-in
Java 2 Platform Enterprise Edition

For developing server applications
- Java servlets and Java server pages (JSP)
- Enterprise Java beans (EJB)
- E-mail and messaging services
- Transaction management

Java 2 Platform Standard Edition

Java 2 Platform Micro Edition

For developing small applications
- Connected Device Configuration (CDC) for high-end consumer electronic devices - Web appliances
- Connected, Limited Device Configuration (CLCD) for low-end information devices -- PDAs, cellular phones

Characteristics of Java

- Java is simple
  - Automatic memory allocation and garbage collection
- Java is object-oriented
- Java is distributed
- Java is interpreted
  - JVM code -- bytecode
- Java is robust or reliable
  - Java has a runtime exception-handling feature
- Java is secure
- Java is architecture-neutral (platform independent)
  - Java programs can be run on any platform

Characteristics of Java

- Java is portable
  - Java programs can run on any platform without having to be recompiled
- Java’s performance
- Java is multithreaded
  - Java program is capable of performing several tasks simultaneously within a program
- Java is dynamic
  - Methods and properties can be added in a class without affecting their clients

JDK Versions

- JDK 1.02 (1995)
- JDK 1.1 (1996)
- Java 2 SDK v 1.2 (1998)
- Java 2 SDK v 1.3 (2000)
- Java 2 SDK v 1.4 (2001)
Java IDE Tools

- JBuilder
- Microsoft Visual J++ (no longer exist)
- Symantec Café (no longer exist)
- Forte or Sun One Studio by Sun Microsystems
- IBM Visual Age for Java

Java Run-Time Architecture

- Platform independent
- Security
- Efficiency

Program Execution Models

- Compilation
  - Translates the source code of a program into machine code
  - Platform dependent
- Interpretation
  - Directly parse and execute the source code of a program without generating machine code

Java Virtual Machine

- Stage 1 -- Compilation of the source code to bytecode
- Stage 2 -- Execution of bytecode
  - Interpretation
  - JIT (Just-in-time) compilation
  - Direct execution -- use firmware, embedded java bytecode in a chip

Compiling Java Programs

Executing Applications
Java Bytecode

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<th>Opcode (1-byte)</th>
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Security of JVM

- Shield memory addresses
- Verification of bytecode
- Run-time security manager

A Simple Application

```java
// This application program prints Welcome to Java!
public class Welcome {
    public static void main(String[] args) {
        System.out.println("Welcome to Java!");
    }
}
```

A Simple Applet

```java
/* This is an example of Java applets */
import java.awt.Graphics;
public class WelcomeApplet extends java.applet.Applet {
    public void paint(Graphics g) {
        g.drawString("Welcome to Java!", 10, 10);
    }
}
```

Creating an HTML File

```html
<html>
<body>
<applet code="WelcomeApplet.class" width=100 height=40>
</applet>
</body>
</html>
```

Applications vs. Applets

- Similarities
- Differences
Security Restrictions on Applets

- Applets are not allowed to read from, or write to, the file system of the computer viewing the applets.
- Applets are not allowed to run any programs on the browser's computer.
- Applets are not allowed to establish connections between the user's computer and another computer except with the server where the applets are stored.