

- Chapter 1

# Introduction to Java

# Objectives

- *Explain the history of Java*
- *Explain Java in brief*
- *List the types of Java programs*
- *List Java Capabilities*
- *Differentiate between applets and applications*
- *Explain the Java Virtual Machine (JVM)*
- *List the features of some IDEs*
- *Examine the JDK and tools under it*
- *Analyze future trends and technologies*

# Introduction to Java

- Introduced in 1995 by Sun Microsystems
- Its objective was to develop a software for embedding in consumer electronic devices.
- Initially called 'Oak'
- Internet users had problems of portability and platform independence.
- Java being secure, portable, and platform independent was found to be capable of addressing large scale problems across the Internet.



# What is Java?

- An object-oriented programming language
  - A cross platform language
  - It is used to create stand-alone applications, net based programs and consumer devices programs.
    - Example : cellular phones, palm pilots



# Java and the Internet

- Programs on the net are either static or dynamic.
- Applets helps to develop dynamic programs.
- Applets run on a Java enabled web browser.




- Applets can respond to user input and actions.





# Security issues

- An Applet has to be downloaded on the user's system before it can work.
  - This can be a potential risk for the user's system.
- 
- Hence, applets are restricted from accessing all areas of the disk.



# Security issues Contd...

- The control is exercised by the

**Java Virtual Machine (JVM)**

- JVM generates byte codes as a result of compilation
- Byte codes cannot be executed without the JVM

# Features in Java2

- **Swing**: new set of classes and interfaces used to create an advanced GUI
- **Drag and Drop**: interactively transfers information across different applications. Also transfers information interactively from one part of a program's interface to another.

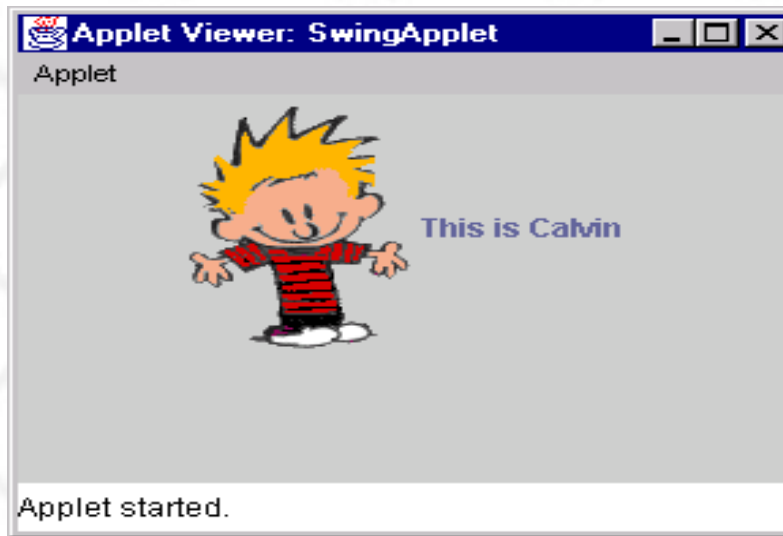


# Features in Java2 Contd...

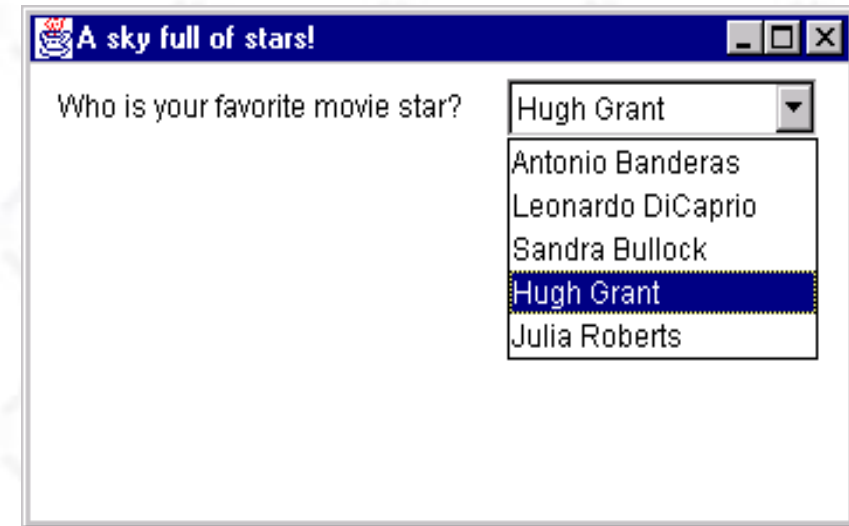
- **Java 2D API**: set of classes for advanced 2D graphics and imaging
- **Java Sound**: totally new set of features pertaining to Java's audio features
- **RMI**: Remote Method Invocation allows applications to call objects located at remote sites and communicate with them

# Types of Java Programs

- **Applets**
  - Programs created specially to work with the Internet



Displays an image

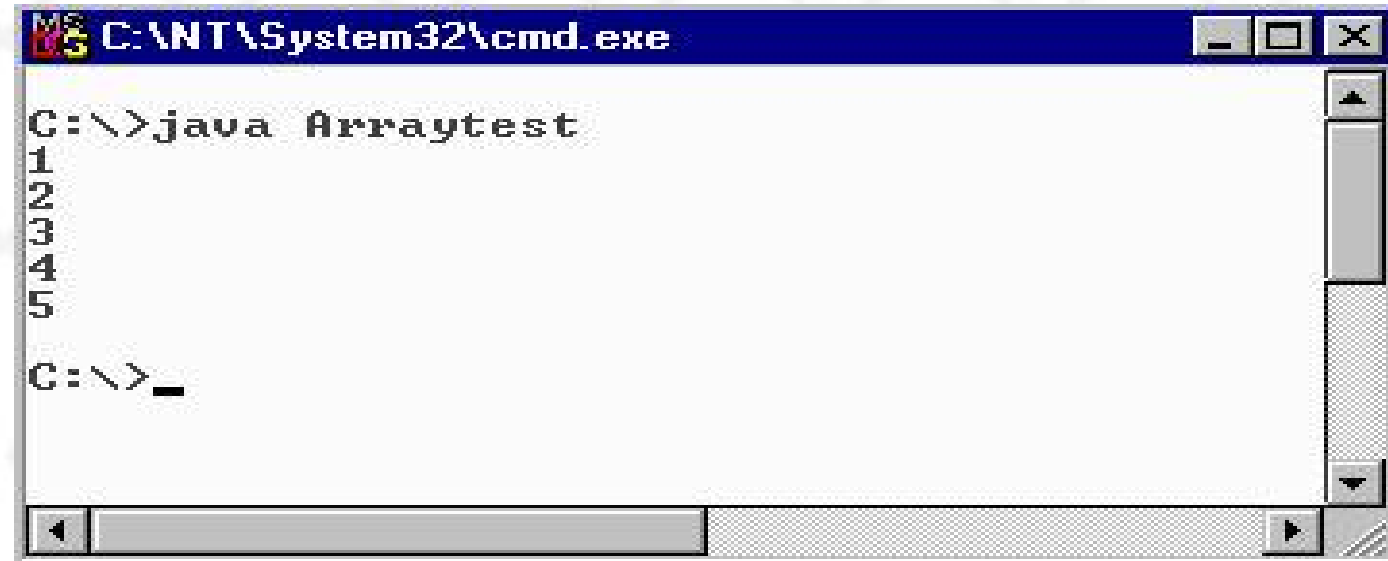


GUI to accept user input

# Types of Java Programs Contd...

- **Console applications**

- Java programs that run from a command prompt and do not display any GUI screen

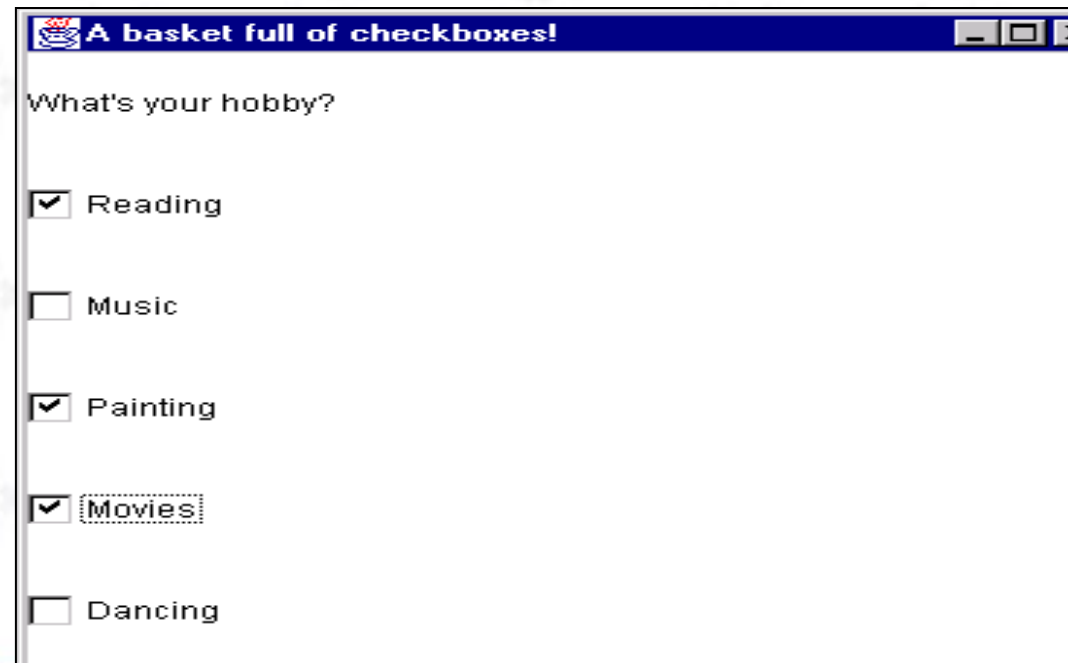


```
C:\NT\System32\cmd.exe  
C:\>java Arraytest  
1  
2  
3  
4  
5  
C:\>_
```

# Types of Java Programs

## Contd...

- **GUI Applications:** Java programs that run stand-alone and accept user input through a GUI based screen.



# Types of Java Programs Contd...

## ■ **Servlets**

- Suitable for web based n-tier application development
  - Client sends request which is processed by the server
  - The server side APIs extend capabilities of standard APIs and are known as Servlets
  - Also called server side applets
  - Example – HTML form processing, processing databases and performing server side transactions



# Types of Java Programs Contd...

## ■ Packages

### ■ Class libraries in Java

- Programmers can create their own packages or use the built-in packages
  - `java.awt`, `java.io` and `java.applet` are some examples

## • Database applications

- Uses JDBC API for database connectivity
- Programs can be either applets or application

# What can we do with Java?

- Create a wide variety of applications from a simple computation program to complex distributed application
- One can develop:
  - Colorful scrolling banner for web pages
  - Interactive quizzes
  - A program that plays audio, displays a banner and animates images at the same time
  - Interactive games that can run as stand alone or be deployed on the web

# Difference between Applets and Applications

## Applications

- Do not need a browser to execute
- These run within JVM

## Applets

- Executed in a java compatible web browser
- Applets load and run on a Java-enabled web browser

# Difference between Applets and Applications

## Contd...

### **Applications**

- Manages its own flow of execution
- No restrictions about reading or writing from/to the local file system

### **Applets**

- Flow of execution is partly managed by the browser context
- Cannot read/write from/to the local file system

# Similarities in Applets and Applications

- Both need to use the standard Java class libraries
- Both can use the Abstract Windowing Toolkit (AWT)





# Java Virtual Machine (JVM)

- Has an interpreter component that enables communication between Java byte code and a computer's operating system
- Java code can run on any platform by using JVM
- JVM normally reads and executes Java statements one at a time
- JVM is responsible for platform independence and small size compiled code
- Recognizes only a particular binary format called a class file

# Visual Development Tools

- Helps in quick and efficient development of Java applications and applets
  - Simplifies the software development process
  - Includes class browser for viewing and navigating through the class hierarchy
  - Includes a source code editor that helps code programs

# Some Visual Development Tools

- **Visual Age for Java** from IBM
  - Works with existing databases, applications and transactions
  
- **Borland Jbuilder** from Borland/Inprise
  - Includes an integrated editor, debugger, compiler, visual designer, wizards and sample applications
  
- **Forte for Java**, Community Edition from Sun Microsystems
  - Integrated visual design, editing, compilation and debugging capabilities to create applets and applications

# Java Development Kit (JDK)

- Contains the software and tools needed to compile, debug and execute applets and applications
- A set of command line tools
- Three major releases are:
  - Java 1.0 – first release
  - Java 1.1 – 1997 release
  - Java 1.4.2 – latest release
- Freely available at Sun's official website

# Tools under JDK

- **javac**: compiler used to compile Java source code
  - Syntax: `javac [option] source`
  - Source files ends with an extension of `.java`
  - Options include:
    - `-classpath`
    - `-d`
    - `-g`
    - `-o`
    - `-verbose`



# Tools under JDK Contd...

- **java**: interpreter used to execute Java byte codes
  - java [option] classname [arguments]
  - Options can include
    - -classpath
    - -Dname name
    - -help
    - -v or -verbose
    - -X

# Tools under JDK Contd...

- **appletviewer**: Used to view and test applets
  - Syntax: `appletviewer [options] url`
- **javadoc**: This is the Java documentation tool
  - Generates detailed documentation in HTML form for any `.java` source code or package

# New Features of Java 1.4.2

- Improved
  - Compiling Speeds
  - Divisions of integers and floating point numbers
- Provides support to IE and Netscape for redirecting URLs
- New I/O Class added
- Few bugs have been removed in AWT

# New Features of Java 1.4.2 Contd...

- A new class to provide endless support for mouse wheel scrolling.
- Supports the standard Microsoft Windows XP appearance as default when running on Windows XP platform.
- Indeterminate progress bars have been added.
- JTabbedPane displays a single, scrollable run of tabs.
- A spinner is a single line input field that lets the user select a number or an object value from an ordered set.

# Present Java Technologies

- Creation and deployment of applications that can run on any operating system
  - Support for distributed computing in the form of features such as RMI
  - Database management support in the form of JDBC
  - Reusable software components in the form of JavaBeans



# Present Java Technologies Contd...

- Java 2 Enterprise Edition (J2EE) which includes:

**Enterprise Java Beans (EJB)**  
**Java Server Pages (JSP)**  
**Java Servlets**

# Future trends

- New products in the area of embedded technologies for consumer devices by making use of mobile computing.
- Miniature devices such as Palm pilots and mobile phones are equipped with a features such as email, gaming options and many others.
- They are based upon Java 2 Micro Edition (J2ME).

# Summary

- Java was introduced by Sun Microsystems in 1995.
- Java is a programming language popularly used to build programs that can work on the Net.
- Its primary features are that it is object-oriented and a cross platform language.
- Swing, Drag and Drop, Java 2D API, Java Sound and RMI are some of the features added to the existing version of Java.
- A Java applet is designed to work in a pre-defined “sandbox” only. This makes it safe to be used on the Internet.
- Java bytecodes are machine language instructions understood by the Java Virtual Machine and usually generated as a result of compiling Java language source code.

# Summary Contd...

- Java programs can be divided into following categories - applets, applications, GUI applications, servlets and database applications.
- Java visual development tools help to develop Java applications and applets more quickly and efficiently.
- The JDK contains the software and tools needed to compile, debug and execute applets and applications written in the Java language. It's basically a set of command-line tools.
- Enhancement in Swing, AWT, a new I/O class and so on has been added in the latest version of Java 1.4.2.
- The future will use a lot of Java related programs for consumer gadgets with embedded technologies.