Java and its Evolution

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- Java Environment
- Build your first Java Program
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Java - An Introduction

- Java - The new programming language developed by Sun Microsystems in 1991.
- Originally called Oak by James Gosling, one of the inventors of the Java Language.
- Java -The name that survived a patent search
- Java Authors: James , Arthur Van , and others
- Java is really “C++ -- ++ “

Java Introduction

- Originally created for consumer electronics (TV, VCR, Freeze, Washing Machine, Mobile Phone).
- Java - CPU Independent language
- Internet and Web was just emerging, so Sun turned it into a language of Internet Programming.
- It allows you to publish a webpage with Java code in it.

Java Milestones

Year	Development
1990	Sun decided to developed special software that could be used for electronic devices. A project called Green Project created and head by James Gosling.
1991	Explored possibility of using C++, with some updates announced a new language named “Oak”
1992	The team demonstrated the application of their new language to control a list of home appliances using a hand held device.
1993	The World Wide Web appeared on the Internet and transformed the text-based interface to a graphical rich environment. The team developed Web applets (time programs) that could run on all types of computers connected to the Internet.

Java Milestones

Year	Development
1994	The team developed a new Web browsed called "Hot Java" to locate and run Applets. HotJava gained instance success.
1995	Oak was renamed to Java, as it did not survive "legal" registration. Many companies such as Netscape and Microsoft announced their support for Java
1996	Java established itself it self as both 1. "the language for Internet programming" 2. a general purpose OO language.
1997-	A class libraries, Community effort and standardization, Enterprise Java, Clustering, etc..

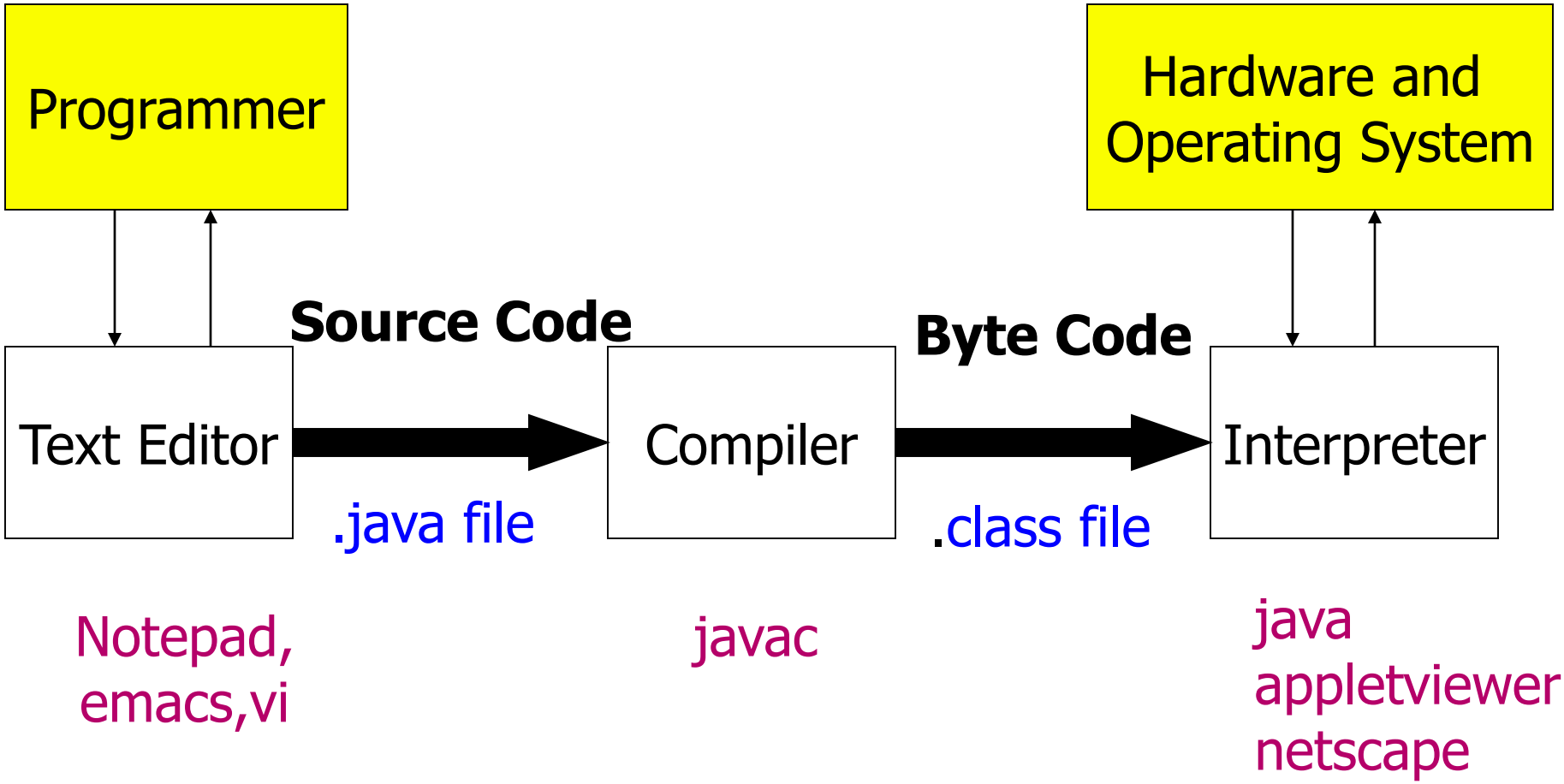
Sun white paper defines Java as:

- Simple and Powerful
- Safe
- Object Oriented
- Robust
- Architecture Neutral and Portable
- Interpreted and High Performance
- Threaded
- Dynamic

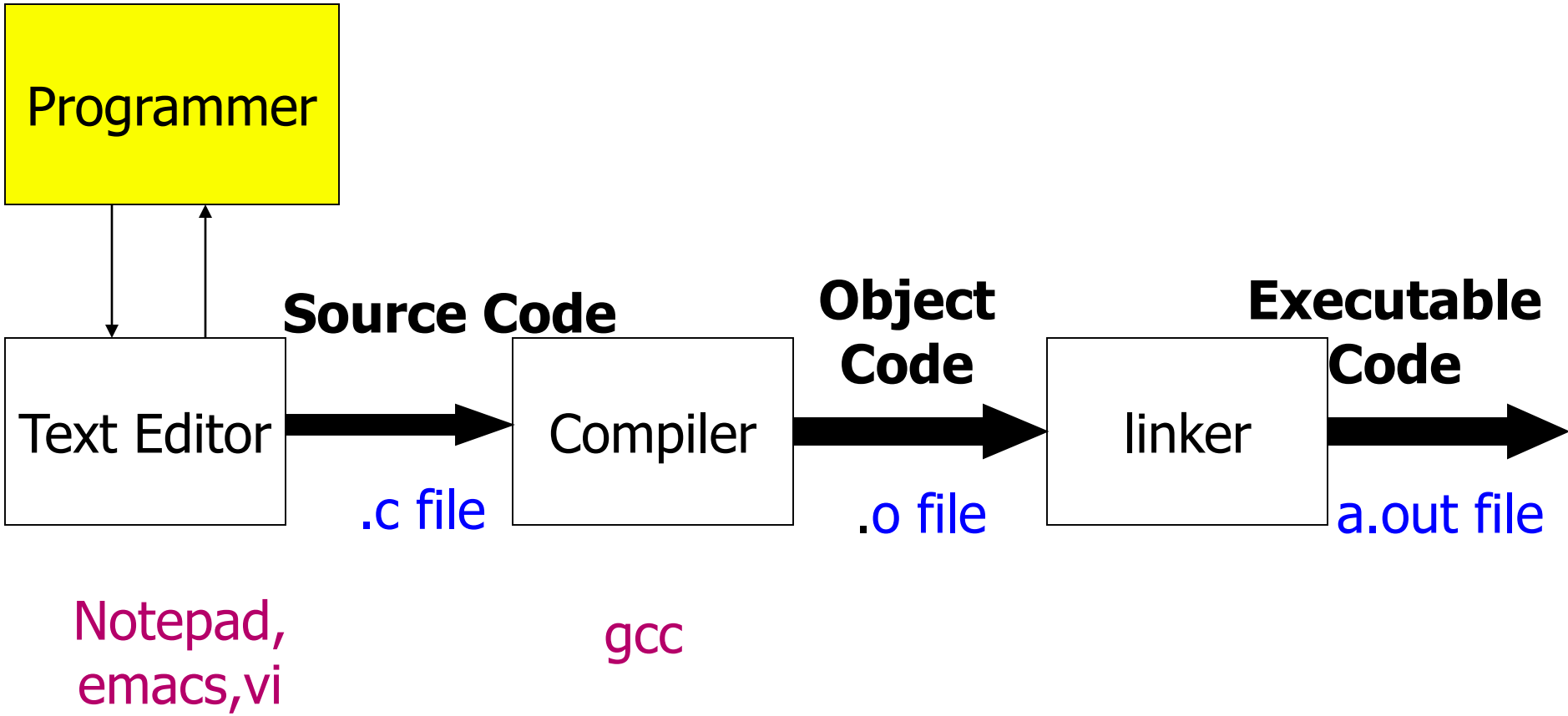
Java Attributes

- Familiar, Simple, Small
- Compiled and Interpreted
- Platform-Independent and Portable
- Object-Oriented
- Robust and Secure
- Distributed
- Multithreaded and Interactive
- High Performance
- Dynamic and Extensible

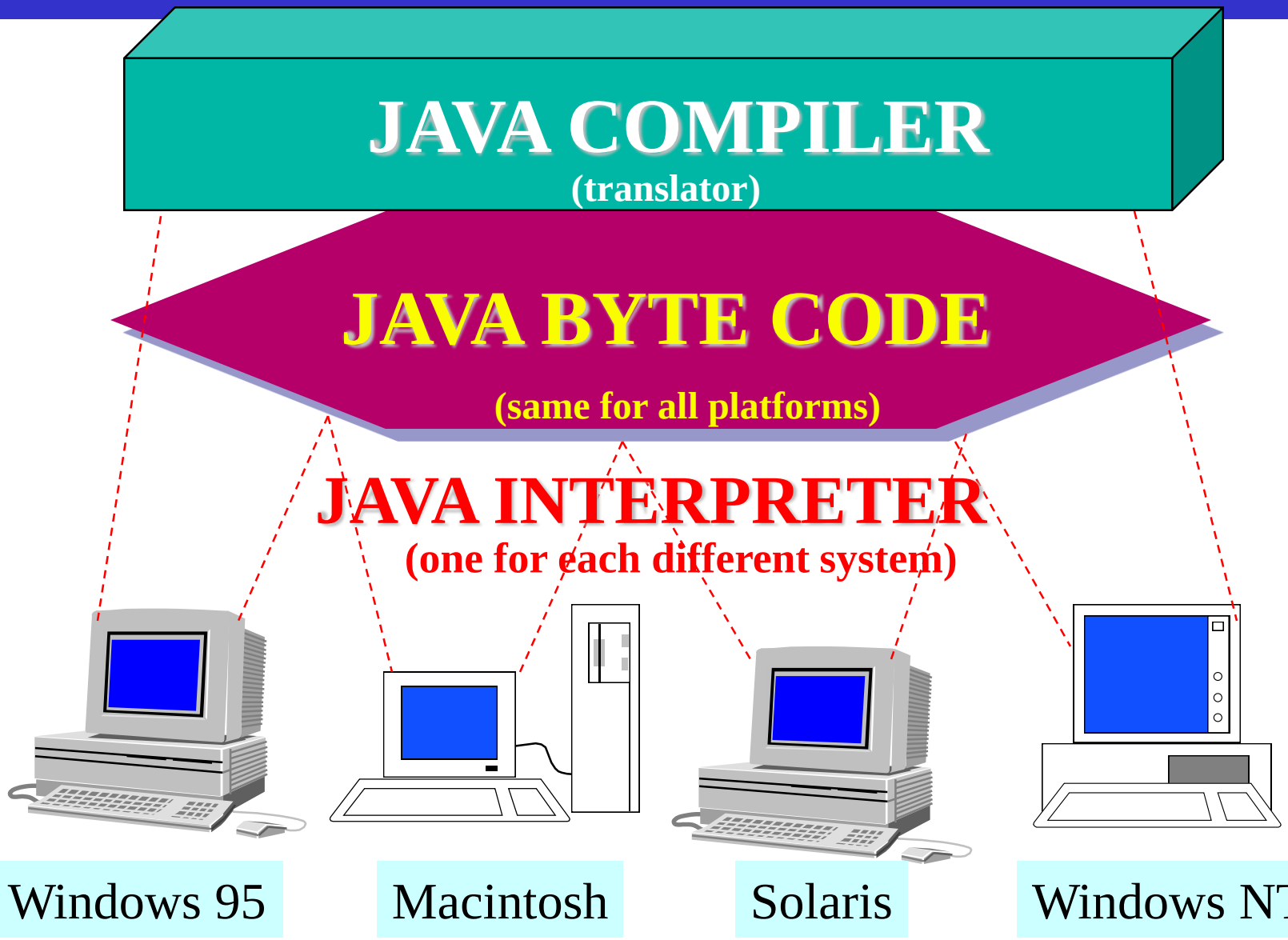
Java is Compiled and Interpreted



Compiled Languages



Total Platform Independence



Architecture Neutral & Portable

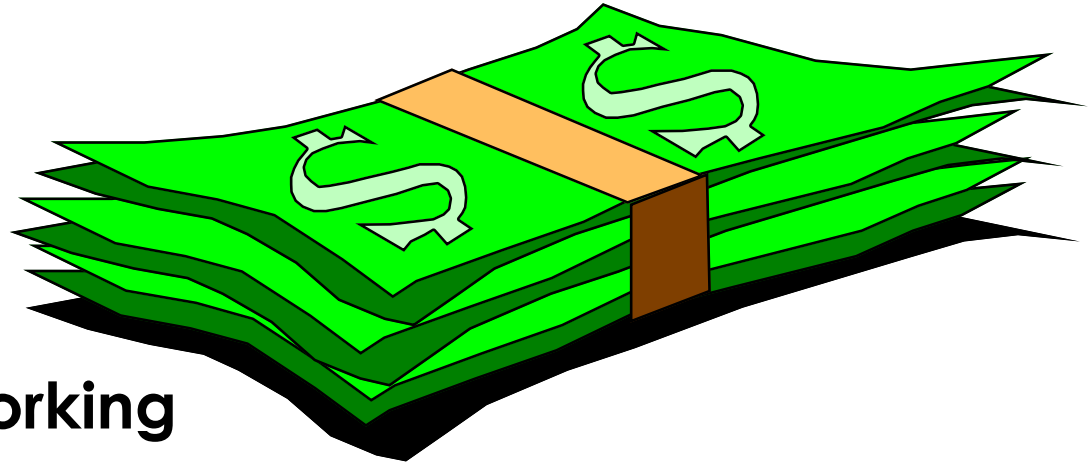
- Java Compiler - Java *source code* (file with extension .java) to *bytecode (*file with extension .class*)*
- *Bytecode* - an intermediate form, closer to machine representation
- A interpreter (virtual machine) on any target platform interprets the bytecode.

Architecture Neutral & Portable

- Porting the java system to any new platform involves writing an interpreter.
- The interpreter will figure out what the equivalent machine dependent code to run

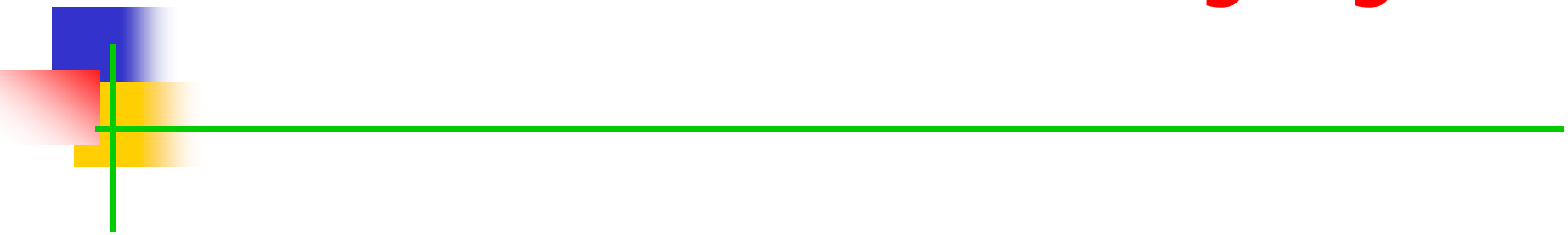
Rich Class Environment

- Core Classes
  - language
  - Utilities
  - Input/Output
  - Low-Level Networking
  - Abstract Graphical User Interface

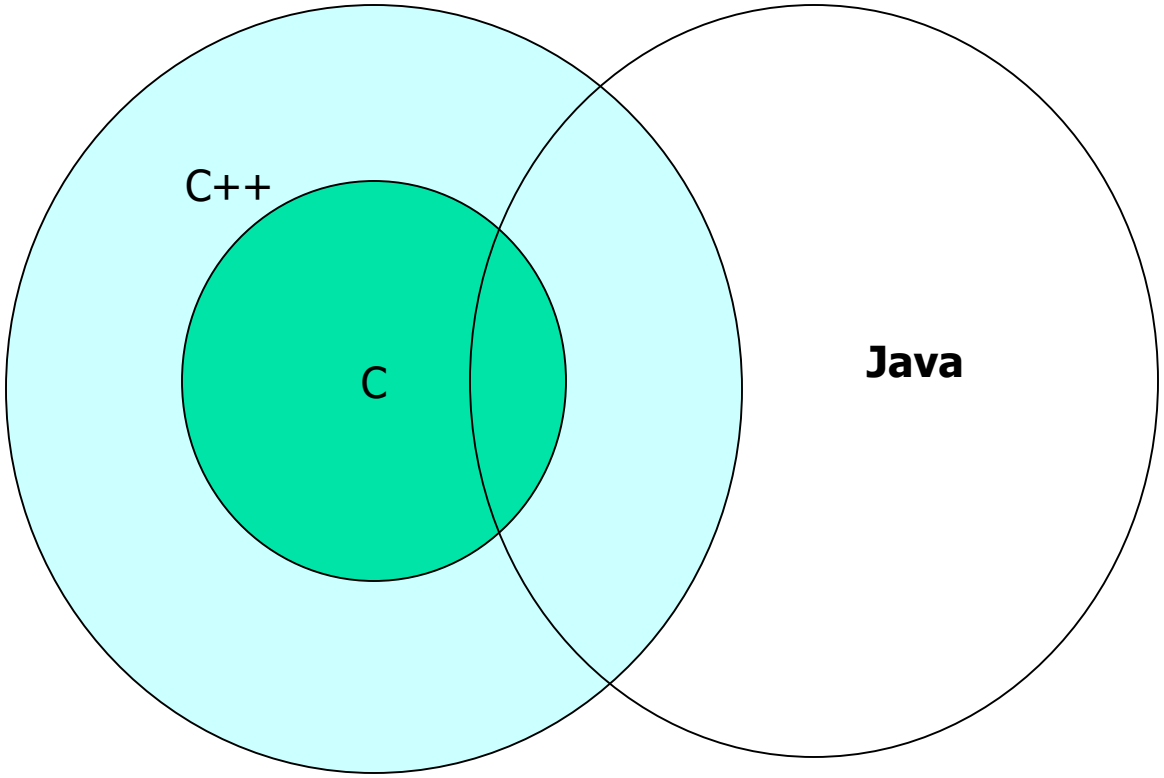


- Internet Classes
  - TCP/IP Networking
  - WWW and HTML
  - Distributed Programs

How Does Java Compares to C++ and Other OO Languages



Overlap of C, C++, and Java



Java better than C++ ?

- No Typedefs, Defines, or Preprocessor
- No Global Variables
- No Goto statements
- No Pointers
- No Unsafe Structures
- No Multiple Inheritance
- No Operator Overloading
- No Automatic Coercions
- No Fragile Data Types

Object Oriented Languages -A Comparison

Feature	C++	Objective C	Ada	Java
Encapsulation	Yes	Yes	Yes	Yes
Inheritance	Yes	Yes	No	Yes
Multiple Inherit.	Yes	Yes	No	No
Polymorphism	Yes	Yes	Yes	Yes
Binding (Early or Late)	Both	Both	Early	Late
Concurrency	Poor	Poor	Difficult	Yes
Garbage Collection	No	Yes	No	Yes
Genericity	Yes	No	Yes	Limited
Class Libraries	Yes	Yes	Limited	Yes

Java Integrates
Power of Compiled Languages
and
Flexibility of Interpreted
Languages

Java Applications

- We can develop two types of Java programs:
  - Stand-alone applications
  - Web applications (applets)

Applications v/s Applets

- Different ways to run a Java executable are:

  Application- A stand-alone program that can be invoked from command line . A program that has a "main" method

  Applet- A program embedded in a web page , to be run when the page is browsed . A program that contains no "main" method

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- Application –Executed by the Java interpreter.
- Applet- Java enabled web browser.

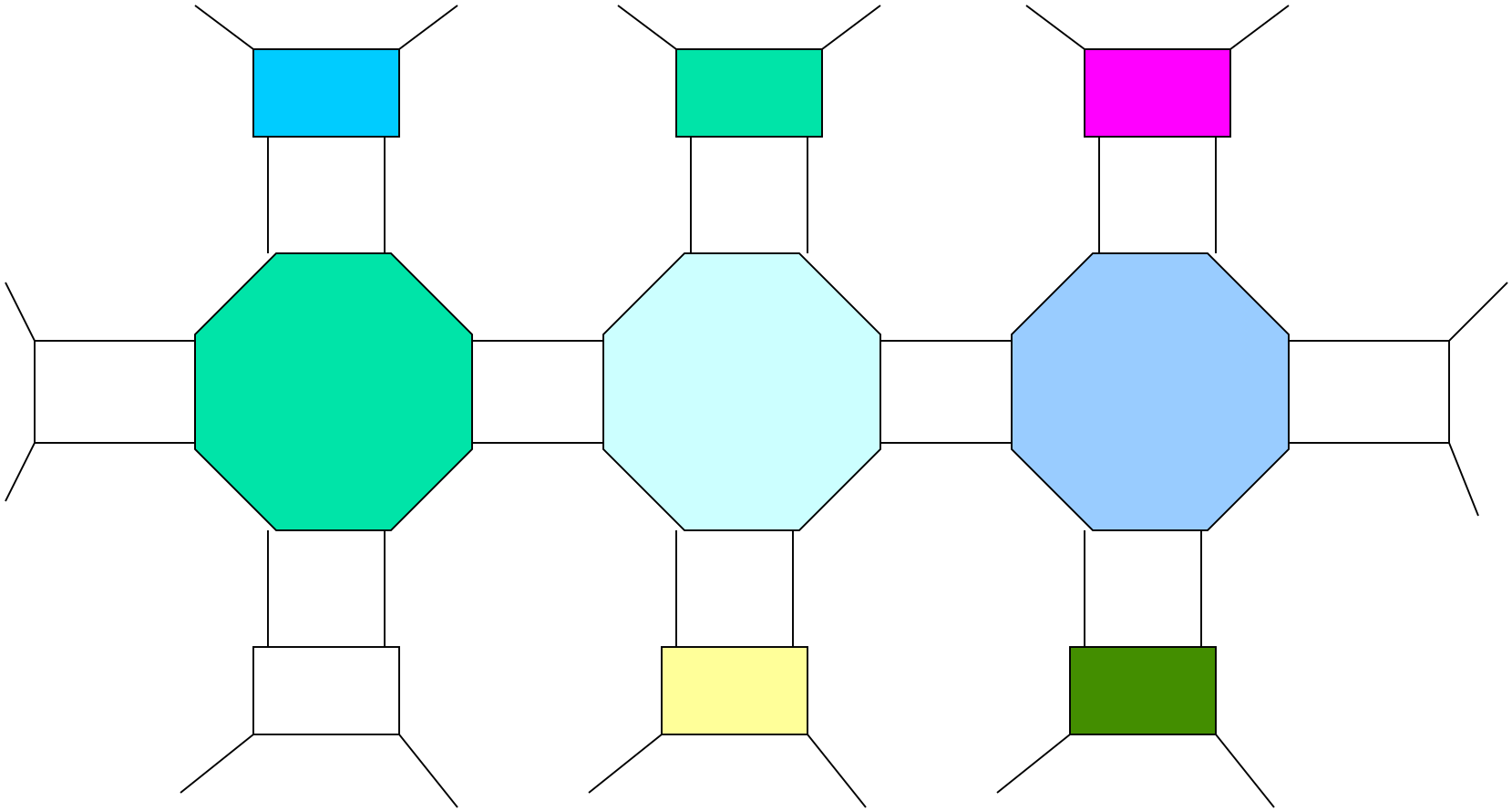
Java and World Wide Web

Turning the Web into an Interactive and Application Delivery Platform

What is World Wide Web ?

- Web is an open-ended information retrieval system designed to be used in the Internet wide distributed system.
- It contains Web pages (created using HTML) that provide both information and controls.
- Unlike a menu driven system--where we are guided through a particular direction using a decision tree, the web system is open ended and we can navigate to a new document in any direction.

Web Structure of Information Search/Navigation

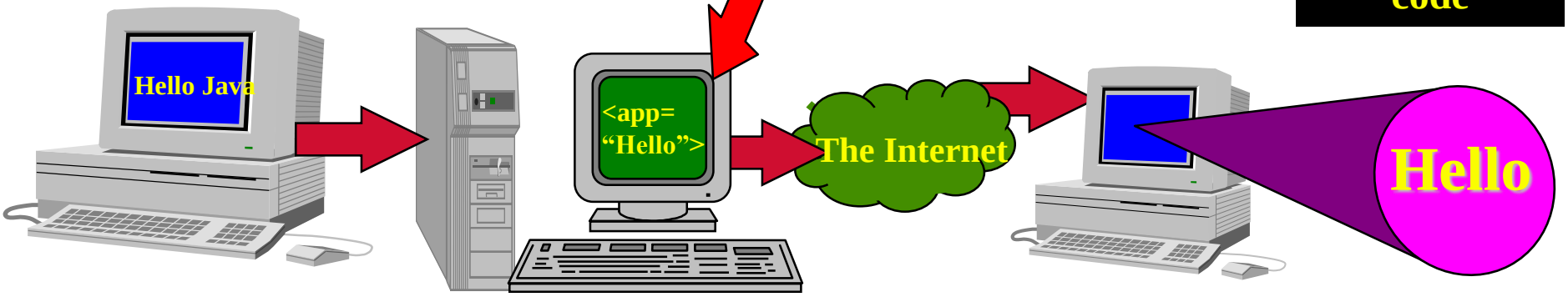


Web as a delivery Vehicle

book reviews	captions to cartoons	fairy tales	flora/fauna report
food reviews	greeting cards or post cards	grocery lists	how-to pages
interviews	job descriptions	jokes	local menus
local legends / myths	local remedies	local folklore	movie critiques
newpapers	news analyses	problem solving	protest signs
puzzles	questionnaires	quotations	real estate notices
recipes	sayings	schedules	serialized stories
song lyrics	sports page	superstitions	traffic rules
TV reviews	used car descriptions	want ads	wanted posters

Execution of Applets

1. APPLET Development "hello.java" AT SUN.COM
2. hello.class AT SUN'S WEB SERVER
3. Create Applet tag in HTML document
4. Accessing from Unimelb.edu.au
5. The browser creates a new window and a new thread and then runs the code



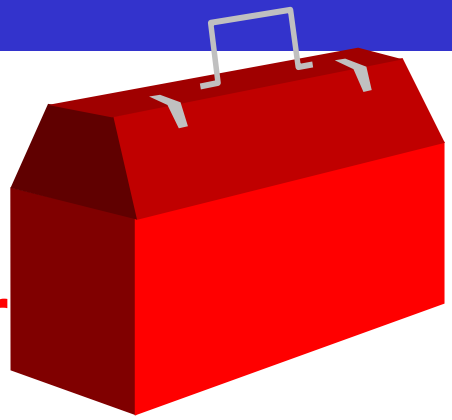
Significance of downloading Applets

- Interactive WWW
- Flashy animation instead of static web pages
- Applets react to users input and dynamically change
- Display of dynamic data
- WWW with Java - more than a document publishing medium
- http://www.javasoft.com/applets/alpha/applets/StockDemo/standalone.html

Power of Java and the Web

- Deliver applications, not just information
- Eliminate porting
- Eliminate end-user installation
- Slash software distribution costs
- Reach millions of customers - instantly

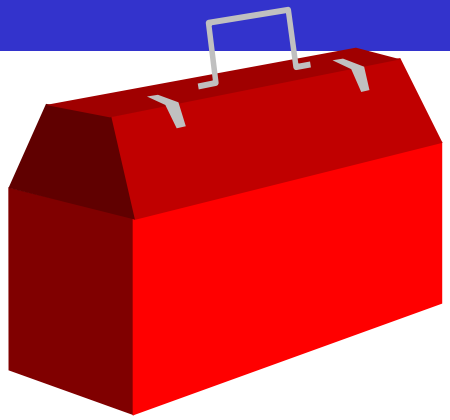
Java Development Kit



- javac - The Java Compiler
- java - The Java Interpreter
- jdb- The Java Debugger
- appletviewer -Tool to run the applets
- javap - to print the Java bytecodes
- javaprof - Java profiler
- javadoc - documentation generator
- javah - creates C header files

Java Environment

Java Development Kit



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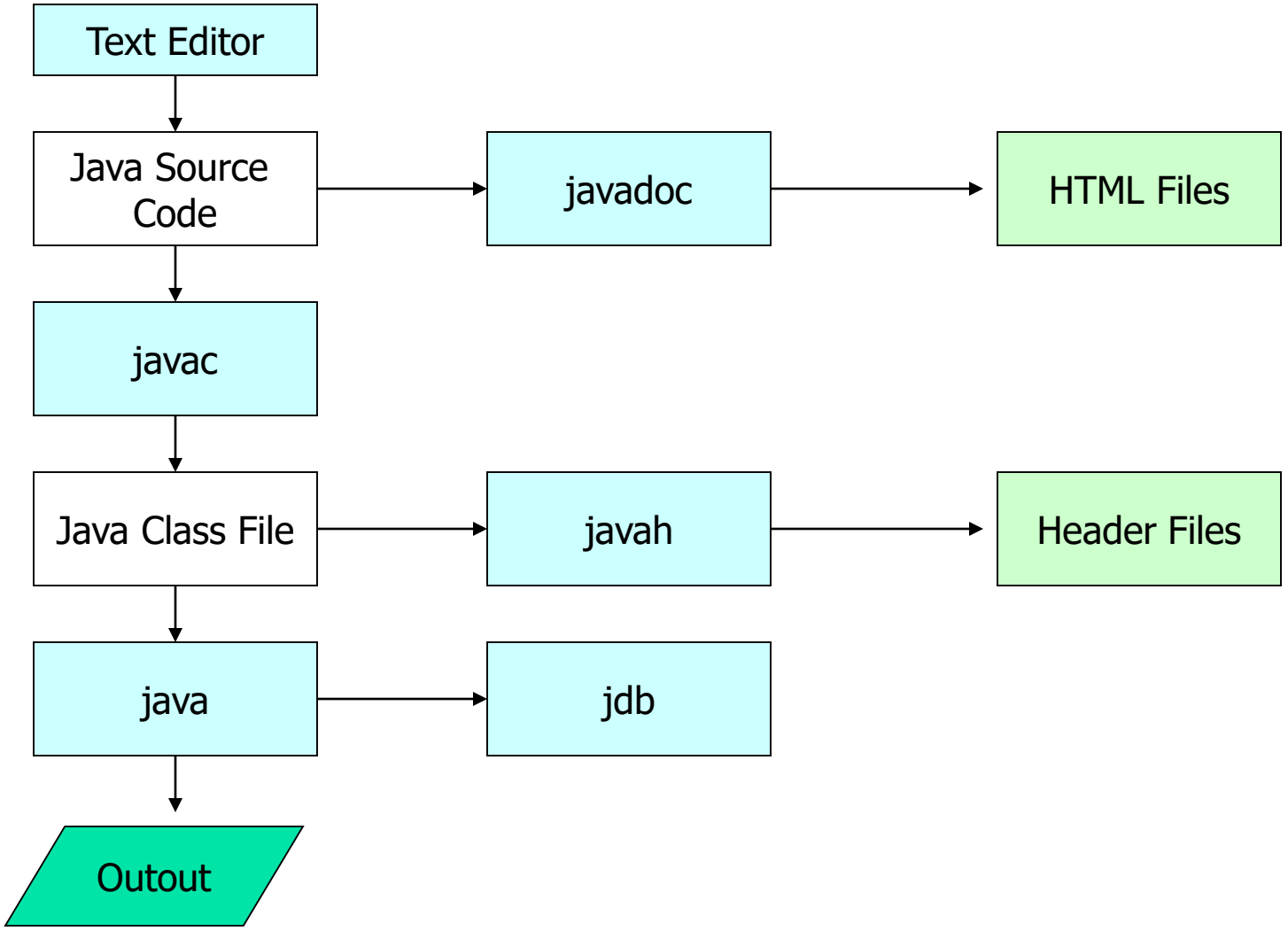
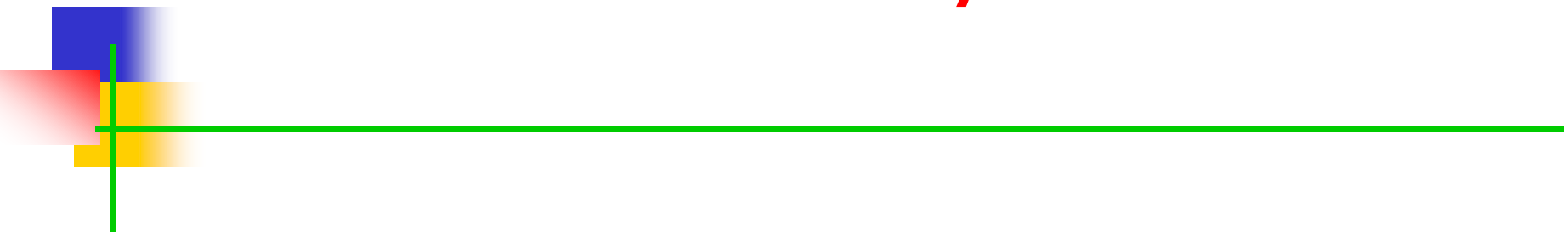
Process of Building and Running Java Programs

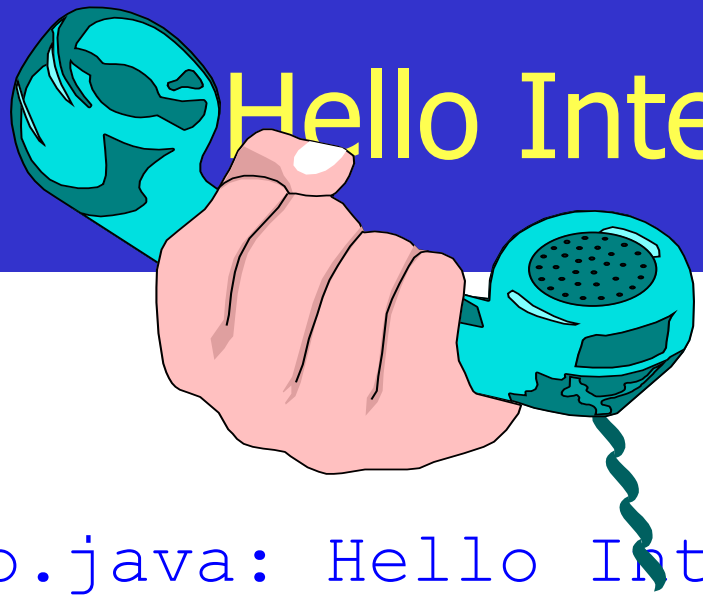


Let us Try Out



Building your first Java Program

Hello Internet



```
// hello.java: Hello Internet program
class HelloInternet
{
   public static void main(String args[])
   {
      System.out.println("Hello Internet");
   }
}
```

Program Processing

- Compilation

  ```
  # javac hello.java
  ```

  results in HelloInternet.class

- Execution

  ```
  # java HelloInternet
  ```

  Hello Internet

  #

Simple Java Applet

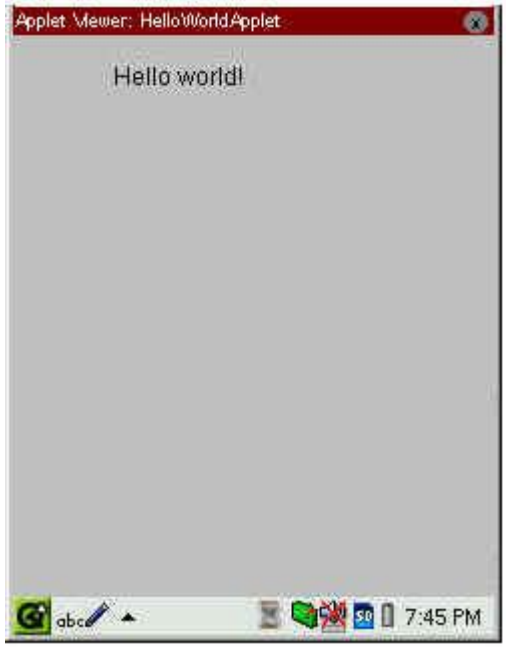
```
//HelloWorld.java
import java.applet.Applet;
import java.awt.*;

public class HelloWorld extends Applet {
   public void paint(Graphics g) {
     g.drawString ("Hello World !",25, 25);
   }
}
```

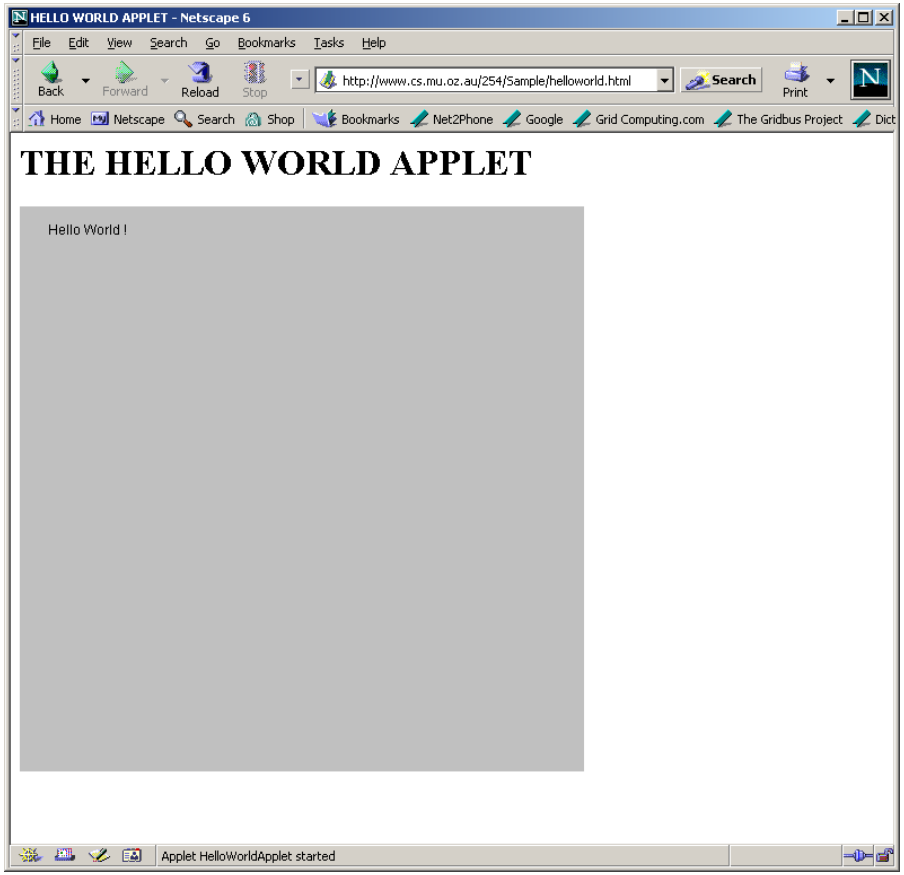
Calling an Applet

```
<HTML>
<TITLE>HELLO WORLD APPLET</TITLE>
<HEAD>THE HELLO WORLD APPLET</HEAD>
<APPLET CODE="HelloWorld.class" width=500
   height=500>
</APPLET>
</HTML>
```

Applet Execution



Using AppletViewer



Using Browser

Java on my platform ?

- Sun (SPARC) ftp://java.sun.com
- Sun(x86) ftp://xm.com:/pub/
- IBM(Aix, OS/2)ftp://ncc.hursley.ibm.com/javainfo
- DEC(Alpha OSF/1) http://www.gr.osf.org:8001/projects/web/java/
- SGI http://liawww.epfl.ch/~simon/java/irix-jdk.html
- HP http://www.gr.osf.org:8001/projects/web/java
- linux http://www.blackdown.org
- AT & T http://www.gr.osf.org:8001/projects/web/java
- Windows 3.1 http://www.alphaworks.ibm.com

Summary

- Java has emerged as a general purpose OO language.
- It supports both stand alone and Internet Applications.
- Makes the Web Interactive and medium for application delivery.
- Provides an excellent set of Tools for Application Development.
- Java is ubiquitous!

References

- Chapter 2: “Java Evolution”, Programming with Java by Balagurusamy, TMH, New Delhi, India
- Optional:
  - Chapter 1: “Mastering C++” by V. Rajuk and R. Buyya, Tata McGraw Hill, New Delhi, India.