# Object Oriented Programing 1

Lecture 2: Introduction to Java Programing Language

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# Agenda

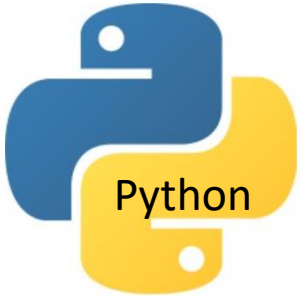
1. Introduction to Java Programing Language



2. Features of Java Programming language

# Recap on Object oriented Programing languages

Before we talk about Java programing language, lets first remind ourselves on object-oriented programming languages commonly used today, including:-


Ruby


TypeScript


Java is a powerful general-purpose programming language. It is used to **develop desktop and mobile applications, big data processing, embedded systems**, and so on. According to Oracle, the company that owns Java, Java runs on 3 billion devices worldwide, which makes Java one of the most popular programming languages.

Java is a platform-independent language because it has runtime environment i.e JRE and API. Here platform means a hardware or software environment in which an application runs.


# How far Java has gone.

Since its release in 1995, Java has gained immense popularity.

1. It is now part of the CPU on Mac OS X and every Android device,
2. It powers most websites that use content management systems like WordPress or Drupal, and
3. It’s used to code everything from iPhone apps to video game consoles.


# Syntax

The syntax of Java is almost the same as C/C++. But java does not support low-level programming functions like pointers. The codes in Java is always written in the form of Classes and objects.


# History

Java was developed by James Ghosling, Patrick Naughton, Mike Sheridan at Sun Microsystems Inc. in 1991. It took 18 months to develop the first working version.

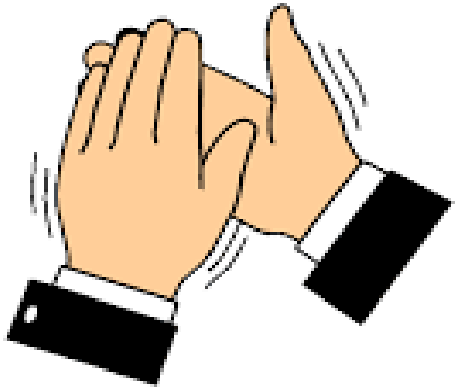
The initial name was **Oak** but it was renamed to **Java** in 1995 as OAK was a registered trademark of another Tech company.

# The Brains behind Java

James Ghosling

Patrick Naughton

Mike Sheridan



# How it started

Originally Java was designed for Interactive television, but this technology was very much advanced for the industry of digital cable television at that time. Java history was started by the Green Team to develop a language for digital devices such as television. But it works best for internet programming.

After some time Java technology was joined by Netscape.

# Objectives of the creation Java Language

The objective for the creation of Java Programming Language was that it should be:-

1. Simple,
2. Robust,
3. Portable,
4. Platform-independent,
5. Secured,
6. High Performance,
7. Multithreaded,
8. Object-Oriented,
9. Interpreted, and Dynamic.

# How the name-java came about

Oak Tree

At the very beginig, Java was called **"Greentalk"** by James Gosling and at that time the file extension was **.gt**.

Later on **Oak** was developed as a part of the Green Team project. Oak is a symbol for strength and Oak is also a national tree in many countries like the USA, Romania etc.

**Oak was renamed** to Java in 1995 because Oak was already a trademark by Oak Technologies. Before selecting the Java word the team suggested many names like **dynamic**, **revolutionary**, **Silk**, **jolt**, **DNA**, etc.

# How the name-java came about+

**Java** is an island in Indonesia, where the first coffee was produced and therefore called Java coffee. Java coffee is a type of espresso bean.


**James gosling chose this name** while having coffee near his office.

**Note!** The word JAVA does not have an acronym. It is just a name.

# Java Versions

Newer Java versions now follow every 6 months. Hence, Java 18 is scheduled for March 2022, Java 19 for September 2022 and so on. In the past, Java release cycles were *much longer*, up to 3-5 years.

As of September 2021, Java 17 was the latest released Java version. It is also the next long-term support version (LTS) after Java 11.

More about Java versions

# Difference between Java SE/EE/ME?

**1. Java SE** = **Standard Edition**. This is the core Java programming platform. It contains all of the libraries and APIs that any Java programmer should learn (java.lang, java.io, java.math, java.net, java.util, etc...).

**2. Java EE** = **Enterprise Edition**. differs from the Java Standard Edition Platform (Java SE) in that it adds libraries which provide functionality to deploy fault-tolerant, distributed, multi-tier Java software, based largely on modular components running on an application server.

In other words, if your application demands a very large scale, distributed system, then you should consider using Java EE. Built on top of Java SE, it provides libraries for database access (JDBC, JPA), remote method invocation (RMI), messaging (JMS), web services, XML processing, and defines standard APIs for Enterprise JavaBeans, servlets, portlets, Java Server Pages, etc...

# Difference between Java SE/EE/ME?

**3. Java ME** = **Micro Edition**. This is the platform for developing applications for mobile devices and embedded systems such as set-top boxes.

Java ME provides a subset of the functionality of Java SE, but also introduces libraries specific to mobile devices. Because Java ME is based on an earlier version of Java SE, some of the new language features introduced in Java 1.5 (e.g. generics) are not available.

**Note!** If you are new to Java, definitely start with Java SE.

# Application of Java

Java is widely used in every corner of world and of human life. Java is used in both softwares development and designing hardware controlling software components. There are more than 930 million JRE downloads each year and over 3 billion mobile phones run java.

**Some other usage of Java include: -**

1. Developing Desktop Applications
2. Web Applications like Linkedin.com, Snapdeal.com etc
3. Mobile Operating System like Android
4. Embedded Systems
5. Robotics and games etc.

# Types of Java Application

Java is used for the development of various types of applications including

1. Standalone Applications
2. Web Applications
3. Enterprise Application
4. Mobile Application

# 1. Standalone Applications

are the application which runs on separate computer process without adding any file processes. The standalone application is also known as Java GUI Applications or **Desktop Applications** which uses some standard GUI components such as AWT(Abstract Windowing Toolkit), swing and JavaFX and this component are deployed to the desktop.

These components have buttons, menu, tables, GUI widget toolkit, 3D graphics etc. using this component a traditional software is developed which can be installed in every machine.

**Example:** Media player, antivirus, Paint, POS Billing software, etc

# 2. Web Applications

are the client-server software application which is run by the client. Servlets, struts, JSP, Spring, hibernate etc. are used for the development of a client-server application. eCommerce application is also developed in java using eCommerce platform i.e Broadleaf.

**Example:** mail, e-commerce website, bank website etc.

# 3. Enterprise Application

Enterprise application is middleware applications. To use software and hardware systems technologies and services across the enterprises. It is designed for the corporate area such as banking business systems.

**Example:** e-commerce, accounting, banking information systems etc.

# 4. Mobile Application

For mobile applications, Java uses ME or J2ME framework. This framework are the cross platform that runs applications across phones and smartphones. Java provides a platform for **application development in Android** too.

**Example:**

Afro Mobile

WhatsApp

Xender

MySword Bible

# Features of Java Programming Language

**Why is Java so popular?**

Java has become a popular and useful programming language because of its excellent features, which play a very important role in contributing its popularity. The Java features are called ***"Java BuzzWords"***.

Sun MicroSystems officially describes Java with the following list of features:

# Features of Java Programming Language

## 1. Simple and Familiar

Java is easy to learn and its syntax is quite simple, clean and easy to understand. The confusing and ambiguous concepts of C++ are either left out in Java or they have been re-implemented in a cleaner way.

***E.g.*** Pointers and Operator Overloading, Storage classes, Preprocessors and header files are not there in java but were an important part of C++.

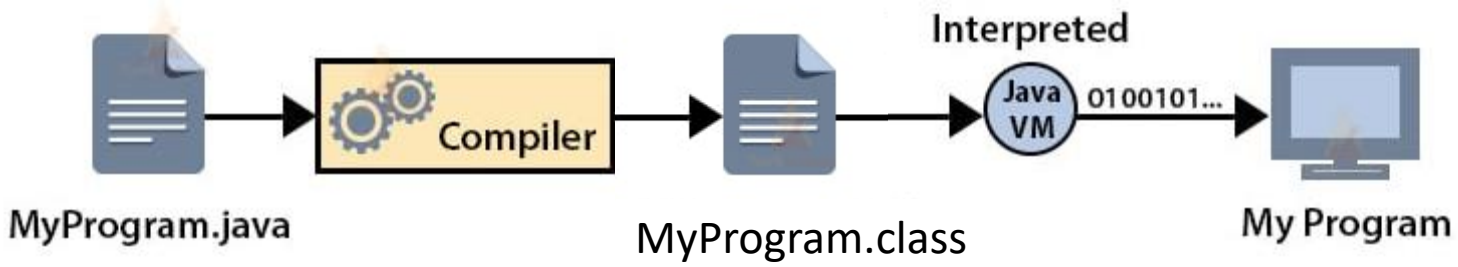
# Features of Java Programming Language

## 2.Compiled and Interpreted

Usually, a computer language can be either compiled or interpreted. Java integrates the power of **Compiled Languages** with the flexibility of **Interpreted Languages**.

Java compiler (javac) compiles the java source code into the bytecode.java, Virtual Machine (JVM) then executes this bytecode to be executable on many operating systems and is portable.

The diagram below shows the above process:



# Features of Java Programming Language

## 3. Platform Independent

Means a program compiled on one machine can be executed on any machine in the world without any change. Java achieves platform independence by using the concept of the **BYTE code**. The Java compiler never converts the source code to machine code like that of the C/C++ compiler.

Instead, it converts the **source code** into an **intermediate code** called the bytecode which is further translated to machine-dependent form by another layer of software called JVM (Java Virtual Machine).

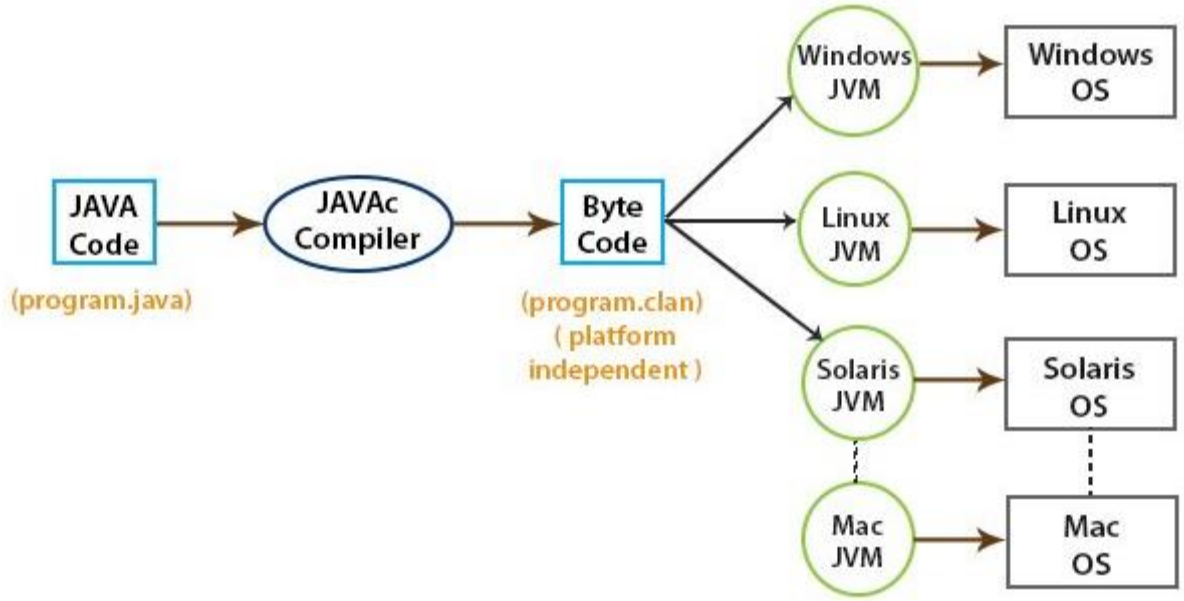
Therefore, JVM can execute bytecode on any platform or OS on which it is present, regardless of the fact that on which machine the bytecode was generated.

# Features of Java Programming Language

## 3. Platform Independent+

This is where the ***"Write Once, run anywhere"*** *(WORA)* slogan for Java comes in, which means that we can develop applications on one environment (OS) and run on any other environment without doing any modification in the code.

Write once run anywhere.



# Features of Java Programming Language

## 4. Portable

Java Byte code can be carried to any platform. No implementation dependent features. Everything related to storage is predefined, E.g.  size of primitive data types

In Java, the size of the primitive data types is **machine-independent**, which were dependent in the case of C/C++. So, these provisions make Java programs portable among different platforms such as Windows, Unix, Solaris, and Mac.

Moreover, any changes and updates made in Operating Systems, Processors and System resources will not enforce any changes in Java programs.

# Features of Java Programming Language

## 5. Architectural Neutral

Compiler generates bytecodes, which have nothing to do with a particular computer architecture, hence a Java program is easy to interpret on any machine.

In other words, it is based on the **'Write-once-run-anywhere' (WORA)** or 'Write-once-run-everywhere' (WORE) approach. Byte-code is not dependent on any machine architecture and Java Virtual Machine (JVM) can easily translate bytecode into a machine-specific code.

This feature is very useful when we develop applets or download applications from the Internet.

# Features of Java Programming Language

## 6. Object-Oriented

In java, everything is an object which has some data and behavior. Java can be easily extended as it is based on Object Model.

The following are basic concept of OOP's.

1. Object
2. Class
3. Inheritance
4. Polymorphism
5. Abstraction
6. Encapsulation

# Features of Java Programming Language

## 7. Robust

Java makes an effort to eliminate error prone codes by emphasizing mainly on compile time error checking and runtime checking.

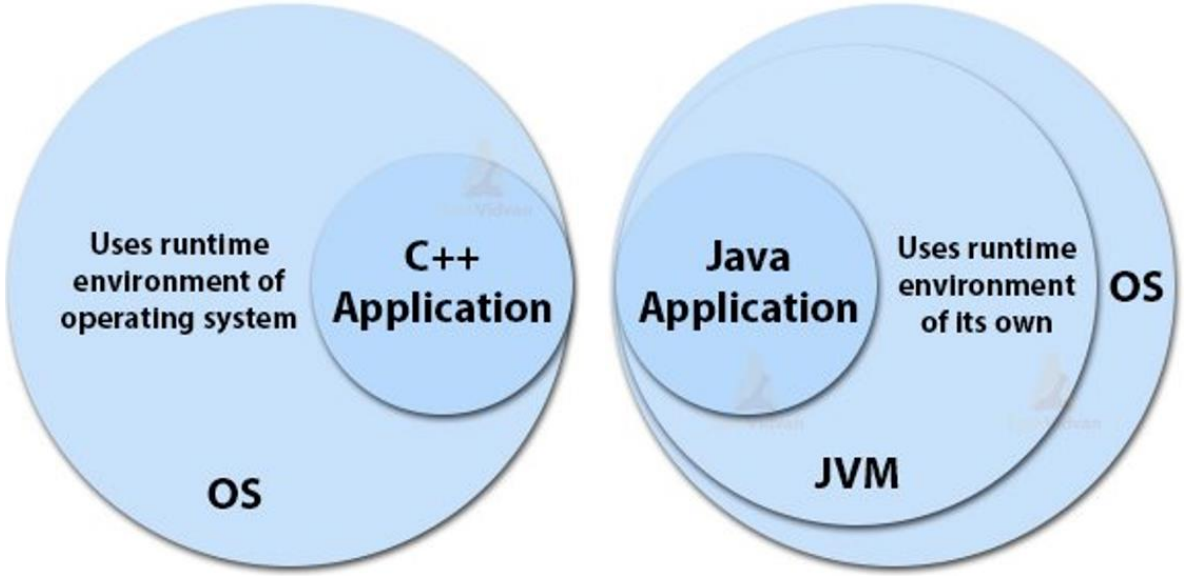
The main areas which Java improved were Memory Management and mishandled Exceptions by introducing automatic **Garbage Collector** and **Exception Handling**.

# Features of Java Programming Language

## 8. Secure

When it comes to security, Java is always the first choice. With java secure features enable us to develop virus free, temper free system. Java program always runs in Java runtime environment with almost null interaction with system OS, hence it is more secure.

E.g. See C++ Vs Java



# Features of Java Programming Language

## 9. Distributed

Java is also a distributed language. Programs can be designed to run on computer networks. Java has a special class library for communicating using TCP/IP protocols. Creating network connections is very much easy in Java as compared to C/C++.

# Features of Java Programming Language

## 10. Multi-threaded and Interactive

A thread is an independent path of execution within a program, executing concurrently. Multithreaded means handling multiple tasks simultaneously or executing multiple portions (functions) of the same program in parallel. The java code is divided into smaller parts and Java executes them in a **sequential** and **timely** manner.

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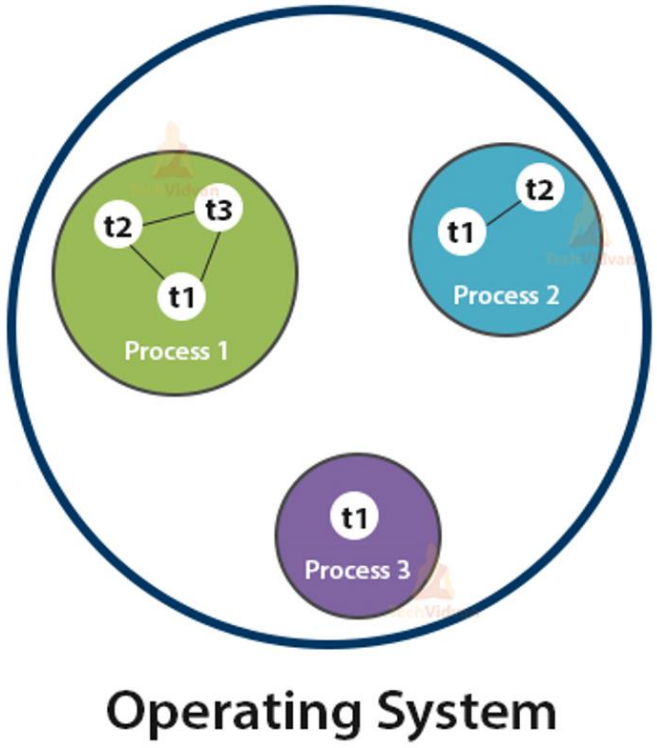


# Features of Java Programming Language

## 10. Multi-threaded and Interactive+

**Advantages:**

1. Maximum utilization of resources is possible.
2. It doesn’t occupy memory for each thread. It shares a common memory area.
3. There is no need to wait for the application to finish one task before beginning another one.
4. There is a decreased cost of maintenance. Also, It is time-saving.
5. It improves the performance of complex applications.

# Features of Java Programming Language

## 11. High Performance

The performance of Java is impressive for an interpreted language because of its intermediate bytecode.

Java provides high performance with the use of **“JIT – Just In Time compiler”**, in which the compiler compiles the code on-demand basis, that is, it compiles only that method which is being called. This saves time and makes it more efficient.

Java architecture is also designed in such a way that it reduces overheads during runtime. The inclusion of multithreading enhances the overall execution speed of Java programs.

Bytecodes generated by the Java compiler are **highly optimized**, so Java Virtual Machine can execute them much faster.

# Features of Java Programming Language

## 12. Dynamic and Extensible

Java is dynamic and extensible means with the help of OOPs, we can add classes and add new methods to classes, creating new classes through subclasses. This makes it easier for us to **expand** our own classes and even **modify** them.

Java gives the facility of dynamically linking new class libraries, methods, and objects. It is highly dynamic as it can adapt to its evolving environment.

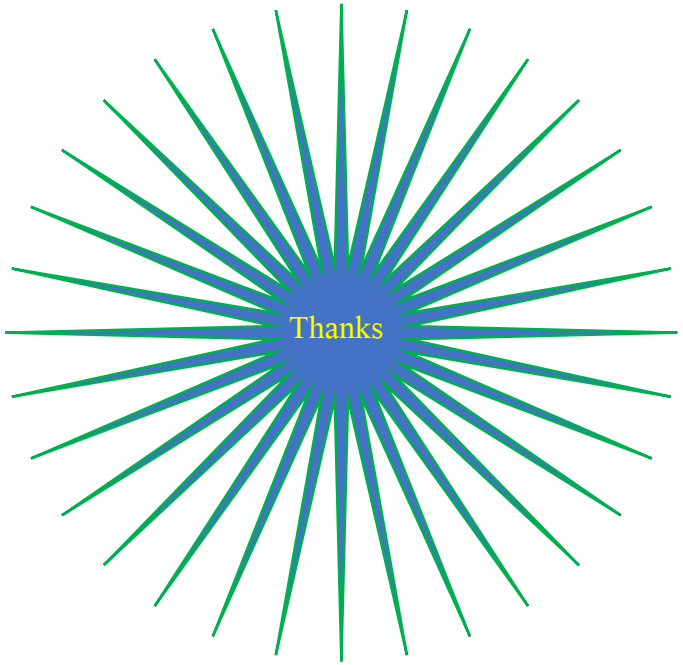
Java even supports functions written in other languages such as C and C++ to be written in Java programs. These functions are called “native methods”. These methods are dynamically linked at runtime.

# Summary

1. Introduced ourselves to Java programming Language (Definition, recap on OOP languages, reason for java's popularity, History of java- the brains behind java, java syntax, how the name came about etc.)

2. Features of Java programing Language (Simple and Familiar, Compiled and Interpreted, Platform Independent, Portable, Architectural Neutral, Object-Oriented, Robust, Secure, Distributed, Multi-threaded and Interactive, High Performance, Dynamic and Extensible)

Thank you for Listening



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