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JAVA

Basics

Introduction to Java

Session 1

Agenda

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Java History

- **James Gosling, Mike Sheridan, and Patrick Naughton** initiated the Java language project in June 1991. The small team of sun engineers was called Green Team.

- Originally designed for small, embedded systems in electronic appliances like set-top boxes. It was called Oak and was developed as a part of the Green project.

- In 1995, Oak was renamed as "Java" because it was already a trademark by Oak Technologies.

- Originally developed by James Gosling at Sun Microsystems (which is now a subsidiary of Oracle Corporation) and released in 1995.

James Gosling

Java Version History

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- There are many Java versions that have been released. Current stable release of Java is **Java SE 8.**

  - JDK Alpha and Beta (1995)
  - JDK 1.0 (23rd Jan, 1996)
  - JDK 1.1 (19th Feb, 1997)
  - J2SE 1.2 (8th Dec, 1998)
  - J2SE 1.3 (8th May, 2000)
  - J2SE 1.4 (6th Feb, 2002)
  - J2SE 5.0 (30th Sep, 2004)
  - Java SE 6 (11th Dec, 2006)
  - Java SE 7 (28th July, 2011)
  - Java SE 8 (18th March, 2014)

JDK Editions

- Java Standard Edition (J2SE)

  J2SE can be used to develop client-side standalone applications or applets.

- Java Enterprise Edition (J2EE)

  J2EE can be used to develop server-side applications such as Java servlets and Java ServerPages.

- Java Micro Edition (J2ME)

  J2ME can be used to develop applications for mobile devices such as cell phones.

What is Java Technology?

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- Java technology is both a programming language and a platform.

- The Java programming language is a high-level language that can be characterized by following buzzwords:

  - Simple
  - Object-Oriented
  - Platform independent
  - Portable
  - High Performance
  - Secured
  - Robust
  - Multithreaded
  - Architecture Neutral

Java Feature: Simple

According to Sun, Java language is simple because:

- Syntax is based on C++ (so easier for programmers to learn Java after C++).
- Removed many confusing and/or rarely-used features, for example; explicit pointers, operator overloading etc.
- No need to remove unreferenced objects because there is Automatic Garbage Collection in Java.

Java Feature: Object Oriented

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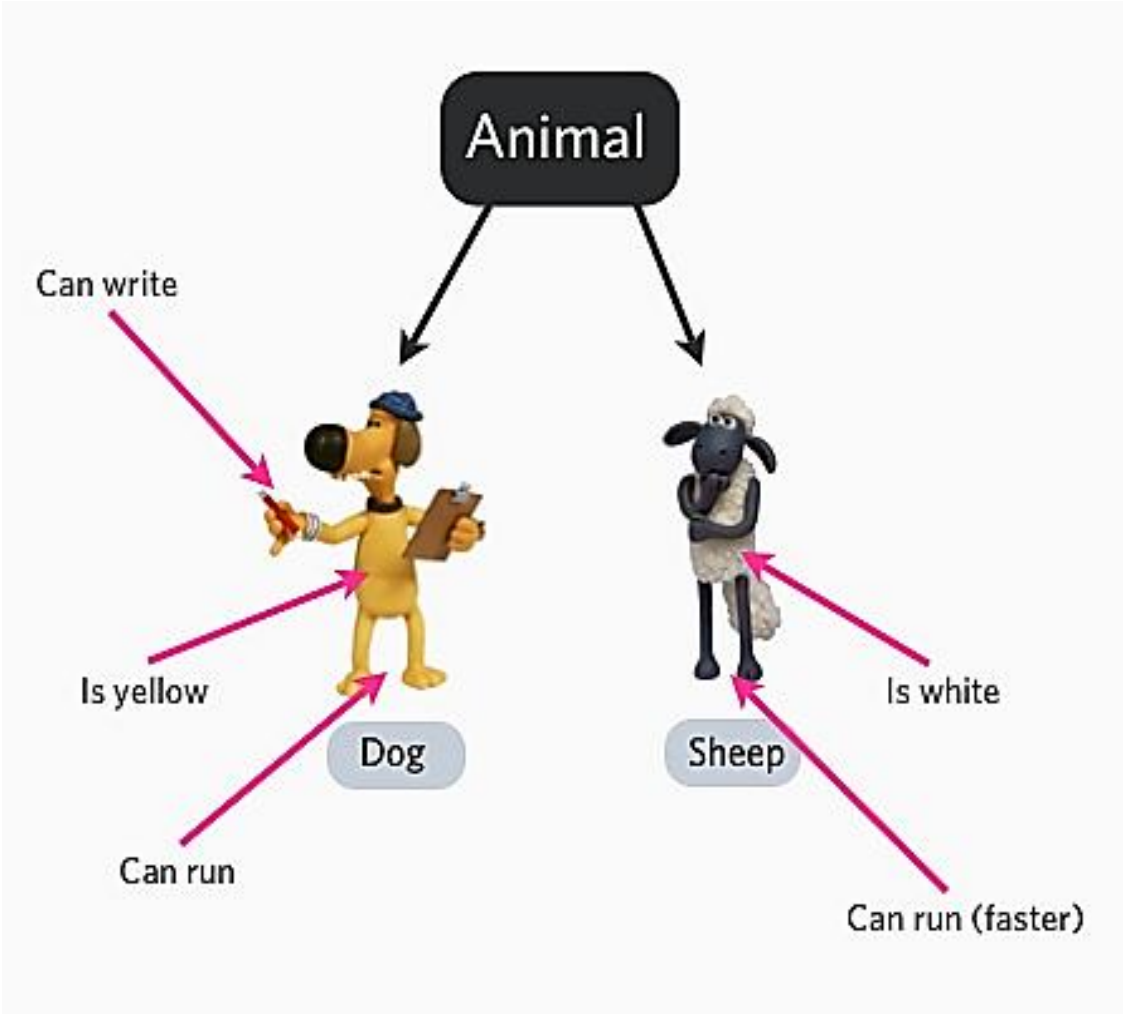
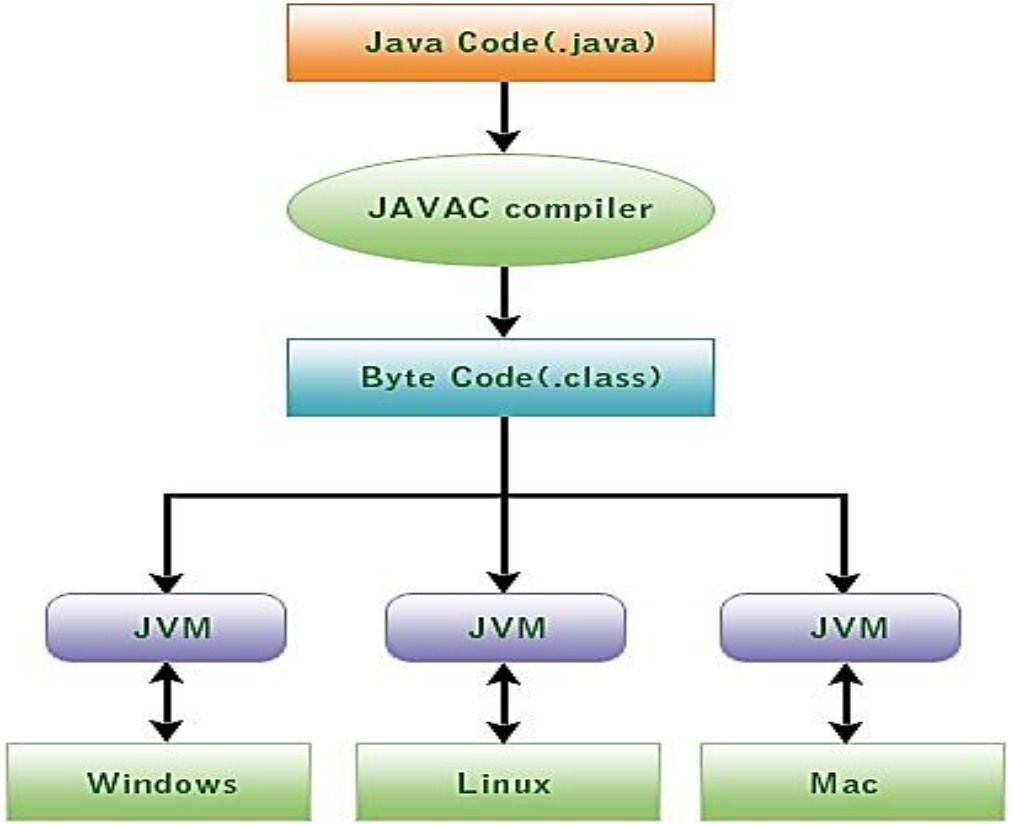
- Object-Oriented Programming Language (OOPs) is the methodology which provides software development and maintenance by using object state, behavior, and properties.



Java Feature: Platform Independence

- **Java Language is platform-independent** due to its hardware and software environment. Java code can run on multiple platforms e.g. Windows, Linux, Sun Solaris, Mac/Os etc.

- **Java code is compiled by the compiler and converted into byte code**. This byte code is a platform independent code because it can be run on multiple platforms i.e. Write Once and Run Anywhere (WORA).



Java Feature: Portable and High Performance

- **Portable:** We may carry the Java bytecode to any platform.

- **High performance:** For all but the simplest or most infrequently used applications, performance is always a consideration for most applications, including graphics-intensive ones such as the ones that are commonly found on the world wide web, the performance of Java is more than adequate.

Java Feature: Secure

- Java apps are used in distributed environments too. Thus, lot of emphasis is on security.

- The Java language is secure in the sense that it is very difficult to write incorrect code for viruses that can corrupt/steal your data, or harm hardware such as hard disks.

- There are some main lines of defense:

- Interpreter level:
  - No pointer arithmetic
  - Garbage collection
  - Array bounds checking
  - No illegal data conversions
  - Byte Code Verifier

Java Feature: Robust

- Reliable
- Early checking for potential problems.
- Dynamic checking to eliminate error-prone situations.
- Developer doesn’t have to worry about
  - Bad pointers
  - Memory allocation errors
  - Memory leakage

Java Feature: Multithreaded

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- **Thread-safe:** Lib functions implemented such that it can be executed by multiple concurrent threads
- Built-in support for threads

Java Feature: Architecture Neutral

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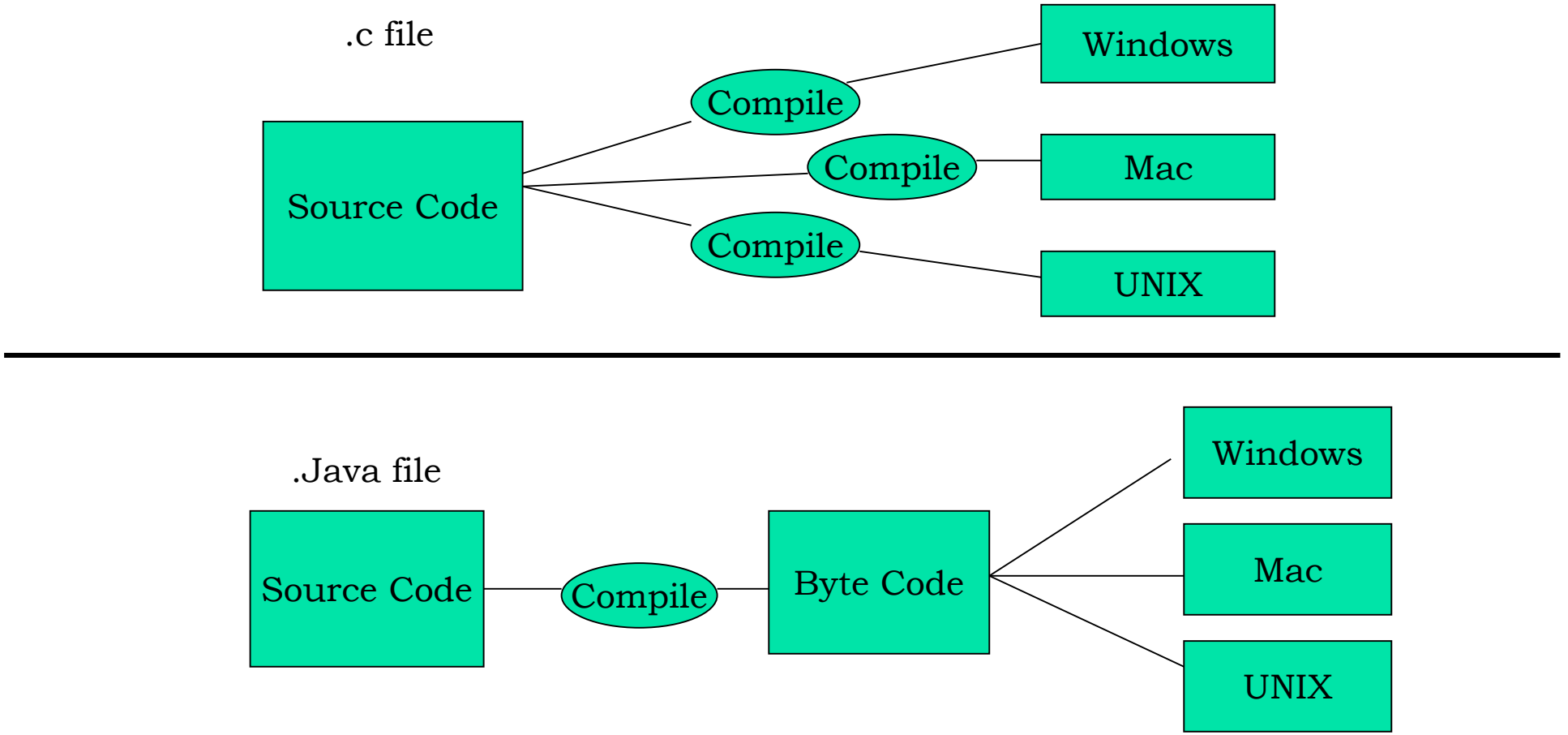

Structured Vs Object Oriented Approach

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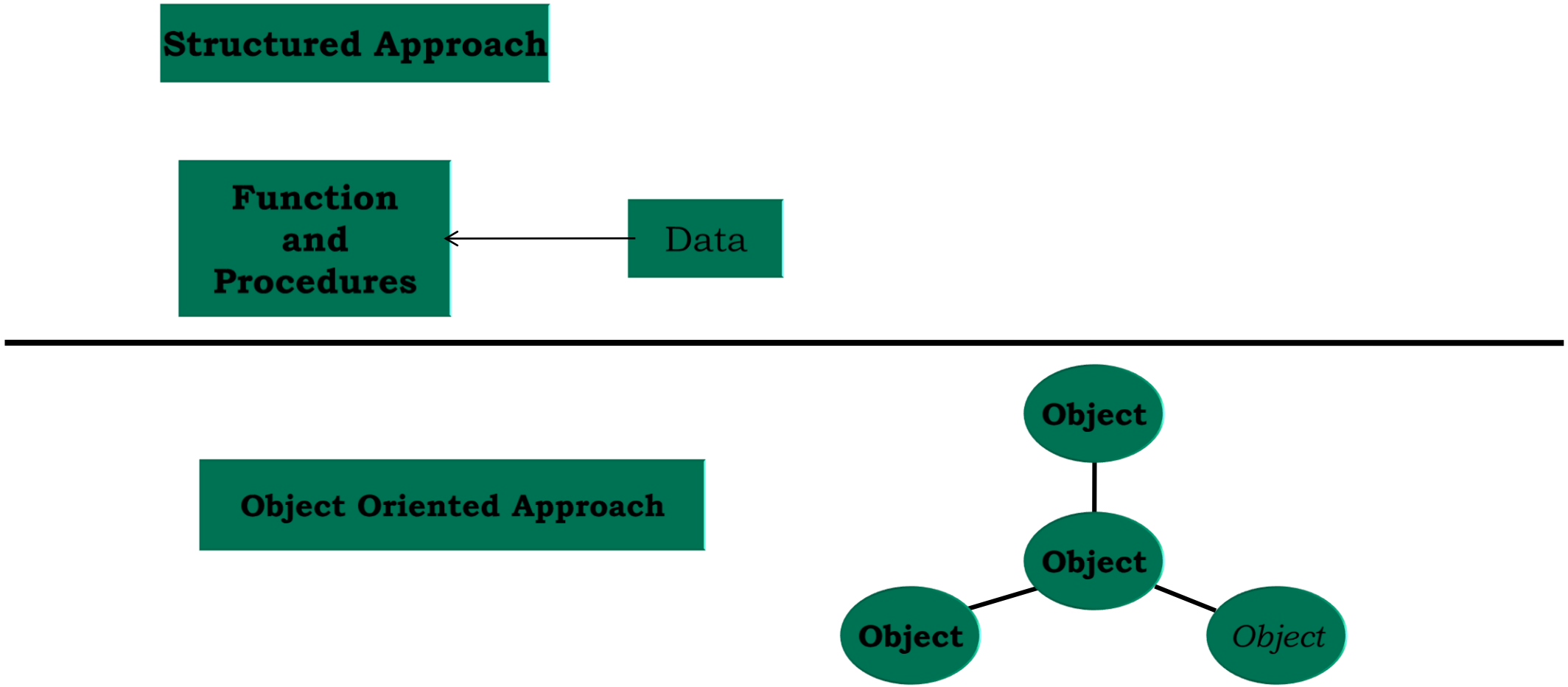

Need for Object Oriented Approach

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- Object-oriented approach is a popular technical approach for analyzing, designing an application and system.
- Applying the object-oriented principles throughout the development life cycles leads to better stakeholder communication and product quality.

Need

- Changing Requirements during development.
- Difficulty of managing software development process.
- Easy User Interface.
- Clients want systems to be adaptable and Extensible.

Need of Object Oriented Approach (Contd.)

The Claim

- Object oriented approach helps to handle the complexity of software development and aids in generation of adaptable and extensible systems.

- An object oriented software is composed of discrete objects interacting with each other to give rise to the overall (complex) behavior of the system.

Introduction to OOPs

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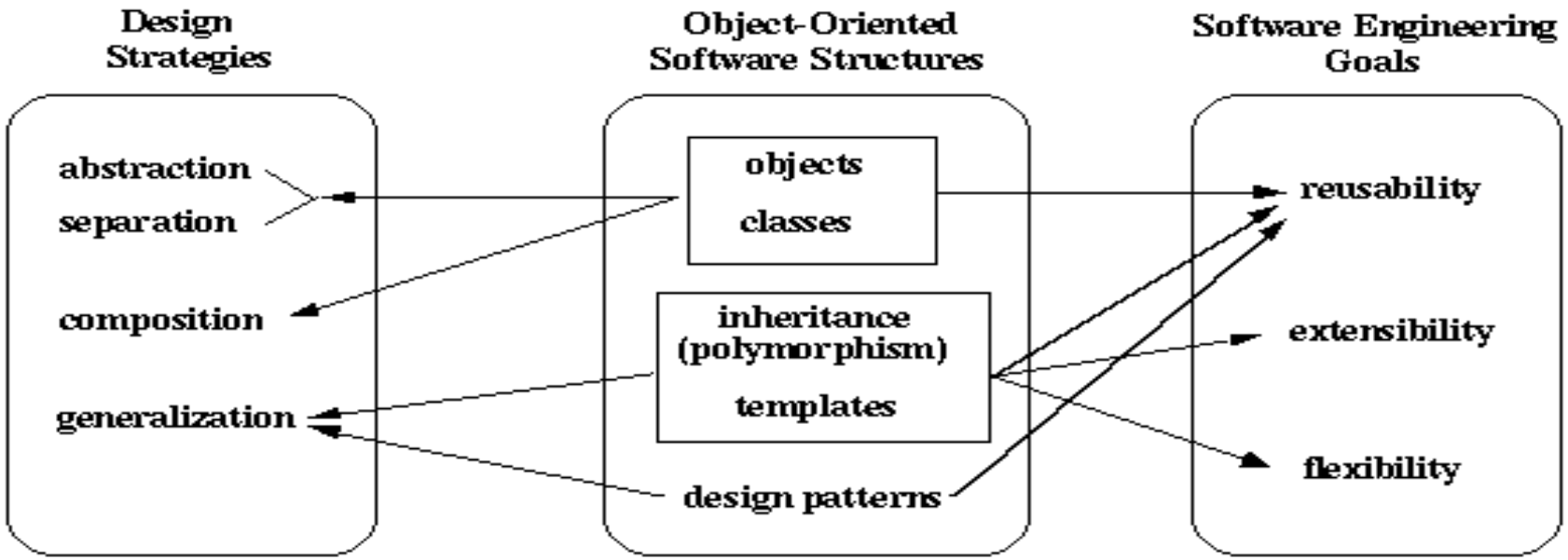
- A methodology or paradigm to design a program using classes and objects.
- It simplifies the software development and maintenance.



Concept of Class and Object

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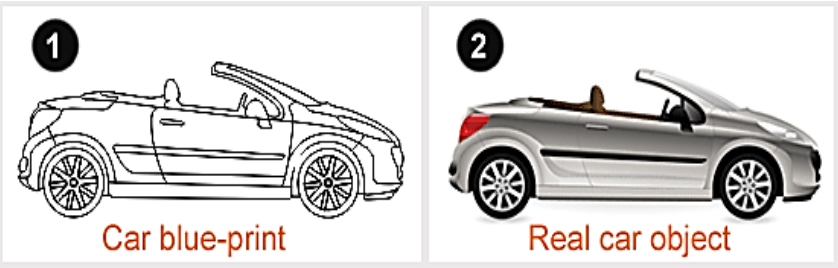
Class

- A class can be defined as a template/blue print from which individual objects are created. And that describes the behaviors/states that object of its type support.
- Class is a design whereas object is a real entity based on the class.



Object

- An object is a real world entity that can be a tangible, intangible or a conceptual entity.
- An instance of a class
- An object can be considered as a "thing" that can perform a set of activities. The set of activities that the object performs defines the object's behavior. For example, the hand(object) can Grip something or a Student (object) can give the name or address.

Setting Up of Environment

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For executing any Java program, you need to follow the steps below:

1. Install the JDK. If you don't have it, download the JDK and install it. http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html
2. Set path of the jdk/bin directory on Command Prompt or create Environment variable called path.
3. Create the java program using a Text Editor.
4. Compile and run the java program on Command Prompt.

Otherwise, start using any IDE like eclipse or Netbeans just after installing Java.

Writing First Java Program

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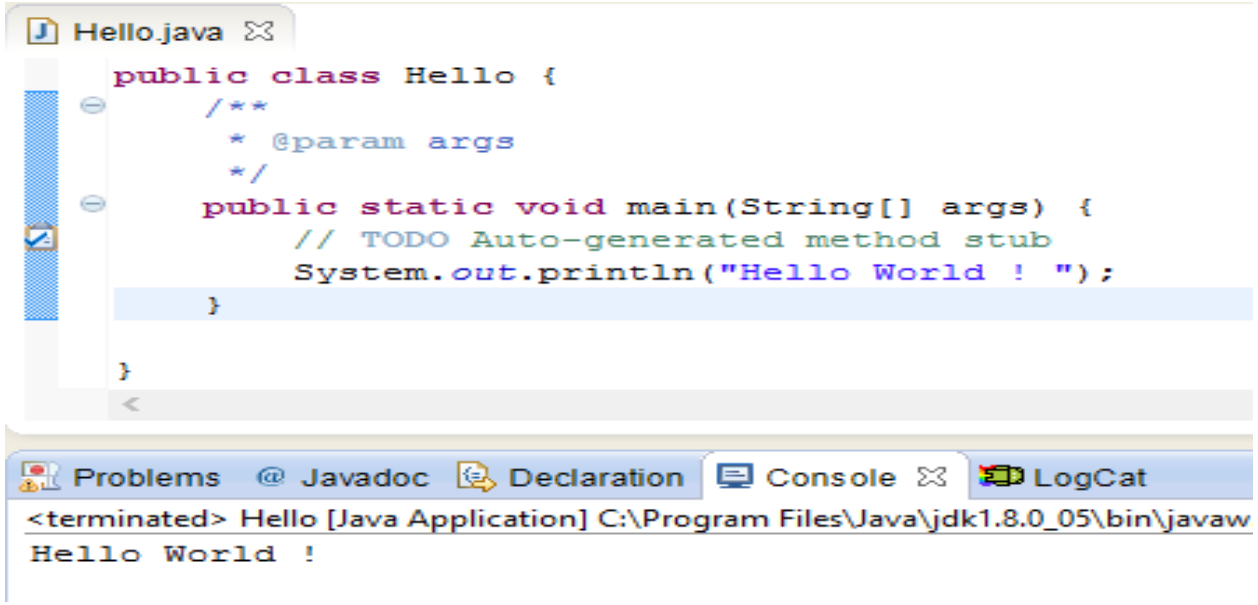
Writing a Java Class

<accessModifier> class <ClassName>{

// data member; // variable declaration and initial assignment of value

// methods & constructors }

Main method is the point from where the program execution starts



Keywords

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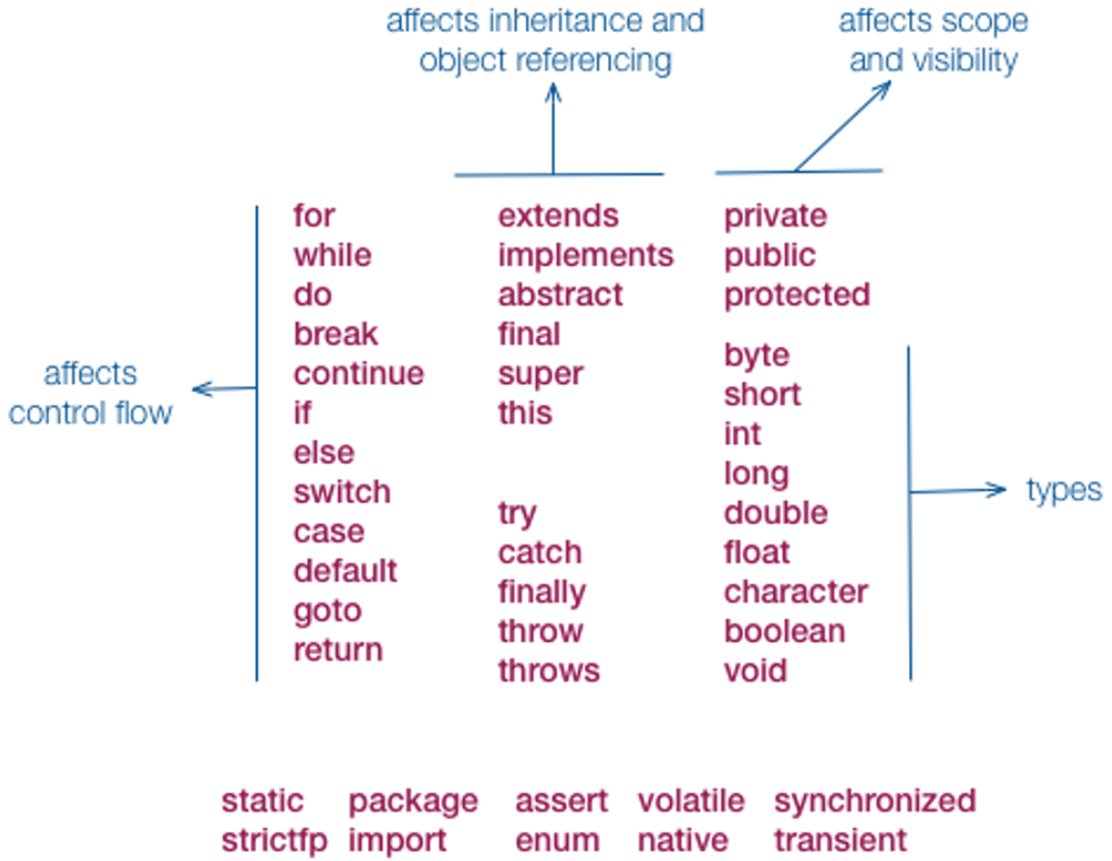
- Every programming language uses some reserved words known as keywords.
- They are an essential part of the language. In Java, keywords are defined in lower case and cannot be used as identifiers.



Data Types and Variables

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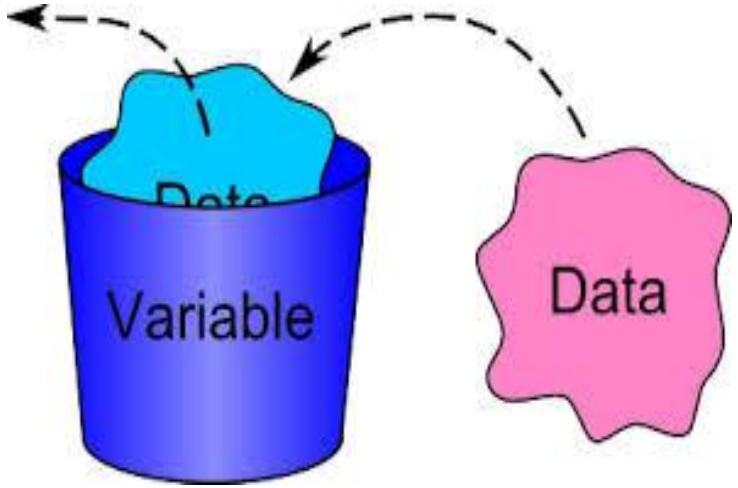
- Data Types determines the values it may contain, plus the operations that may be performed on it.
- Variables provides us with named storage that our programs can manipulate.

Variable Declaration & Initialization



Syntax for declaration of variable:
DataType variableName;

Syntax for assignment of value to a variable:
variableName=value;

In a single statement declaration and assignment of variable:
DataType variableName=value;

In a single statement declaration and assignment of many variables:
DataType variableName=value, variableName1=value1…;

Different Data Types

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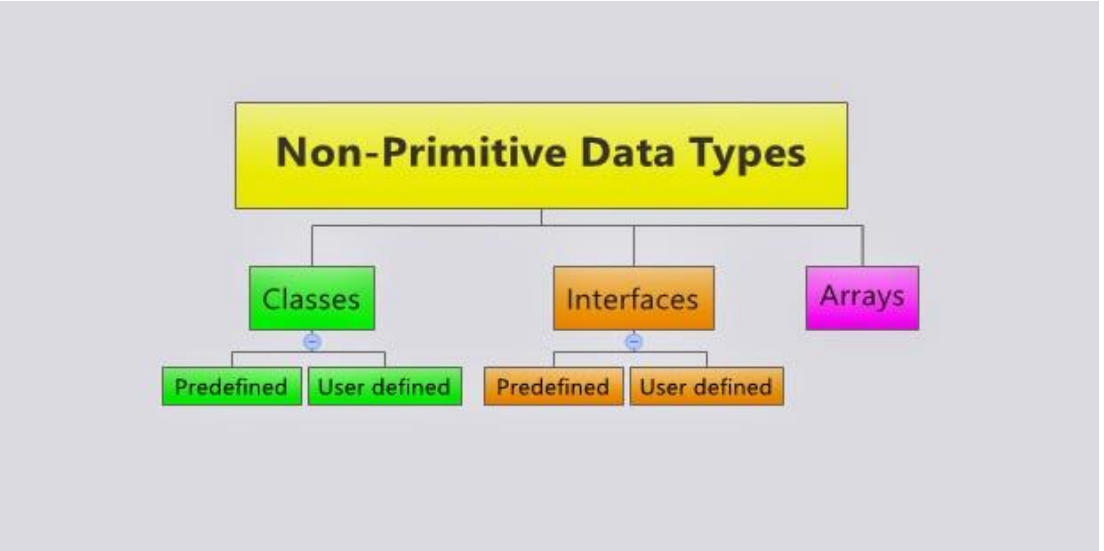
- Java Data Types can be classified into two types:
  - Primitive
  - Non-Primitive

Primitive:

Type Name	Kind of Value	Memory Used	Range of Values
byte	Integer	1 byte	–128 to 127
short	Integer	2 bytes	–32,768 to 32,767
int	Integer	4 bytes	–2,147,483,648 to 2,147,483,647
long	Integer	8 bytes	–9,223,372,036,8547,75,808 to 9,223,372,036,854,775,807
float	Floating-point	4 bytes	$\pm 3.40282347 \times 10^{+38}$ to $\pm 1.40239846 \times 10^{-45}$
double	Floating-point	8 bytes	$\pm 1.79769313486231570 \times 10^{+308}$ to $\pm 4.94065645841246544 \times 10^{-324}$
char	Single character (Unicode)	2 bytes	All Unicode values from 0 to 65,535
boolean		1 bit	True or false

Different Data Types (Contd.)

- **Non-Primitive:**



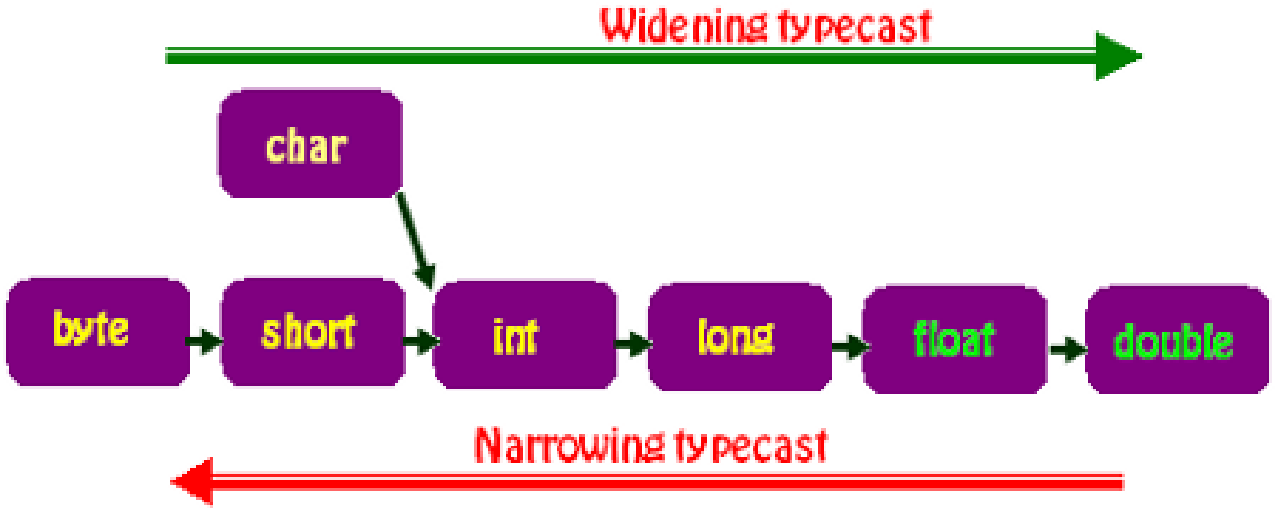
String

- Strings, which are widely used in Java programming, are a sequence of characters.
- It is an inbuilt class in java.
- The most direct way to create a string is to write:
- String greeting = "Hello world!";

Type Casting

Assigning a value of one type to a variable of another type is known as Type Casting.

- Widening Casting/Implicit/Casting/Automatic Type casting - It takes place when the two types are compatible & the target type is larger than the source type.
- Narrowing Casting/Explicit type casting - When you are assigning a larger type value to a variable of smaller type, then you need to perform explicit type casting.



Operators in Java

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- Java provides a rich set of operators to manipulate variables. We can divide all the Java operators into the following groups:

Category	Operator	Associativity
Postfix	() [] -> . ++ - -	Left to right
Unary	+ - ! ~ ++ - - (type) * & sizeof	Right to left
Multiplicative	* / %	Left to right
Additive	+ -	Left to right
Shift	<< >>	Left to right
Relational	< <= > >=	Left to right
Equality	== !=	Left to right
Bitwise AND	&	Left to right
Bitwise XOR	^	Left to right
Bitwise OR	|	Left to right
Logical AND	&&	Left to right
Logical OR	||	Left to right
Conditional	?:	Right to left
Assignment	= += -= *= /= %= >>= <<= &= ^= |=	Right to left
Comma	,	Left to right

User Input in Java

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- Java provides a rich API for data input(java.io) from user but to start with, lets discuss java.util.Scanner class.
- Scanner class allows you to take input for different types of variables by providing different method for each type. For e.g.,
  - nextInt() for input in int variable
  - nextFloat() for input in float variable

//for more see the documentation of Scanner class

https://docs.oracle.com/javase/7/docs/api/java/util/Scanner.html

Steps of Using Scanner class:

- First of import java.util.Scanner class.
- Create object of Scanner class
- Start using its methods.

Introduction to JDK, JVM and JRE

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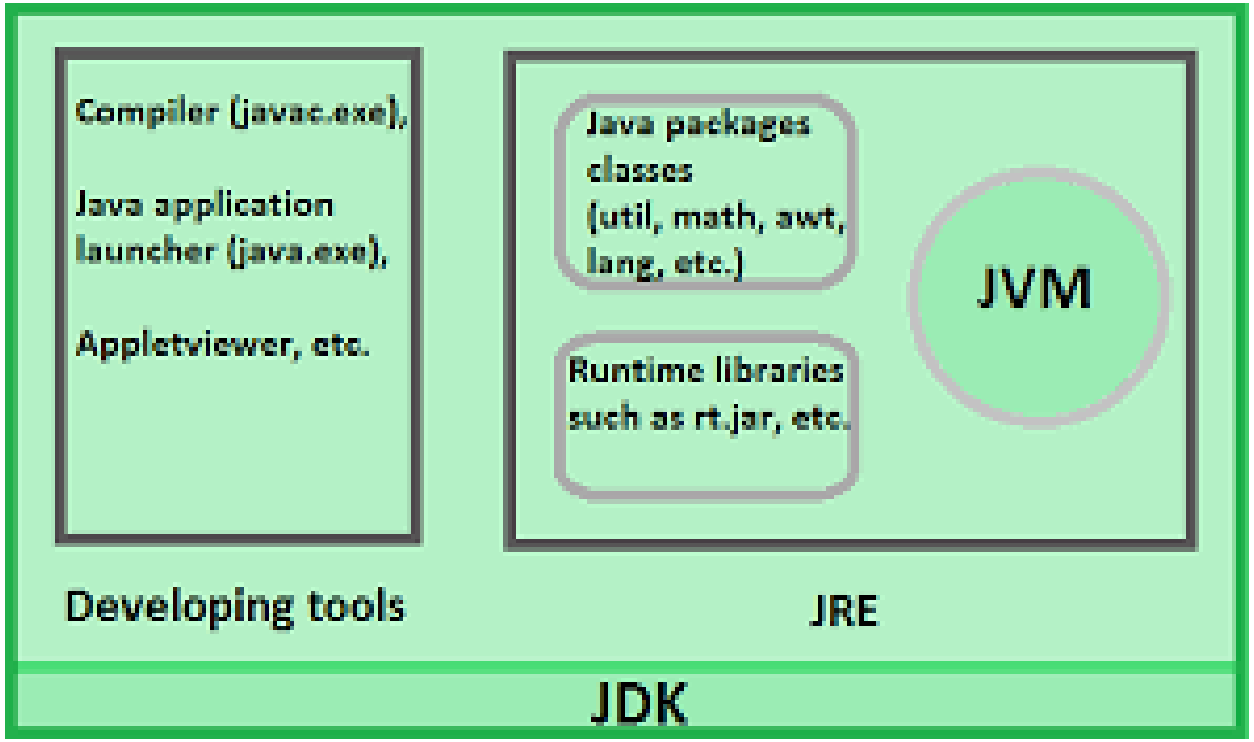
- JDK is Java Developer Kit which you need to compile Java source code
- JVM is Java Virtual Machine which runs Java bytecode.
- JRE is Java Runtime Environment which you need to run a java program. It contains a JVM, among other things.



Short Assignments

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- A Vehicle has an owner and a registration number. A Car is a Vehicle that has a steering wheel and a model name. Choose the fields which must be included in the Car class. (The Vehicle class is already defined) Choose at least one answer.

a. Steering s;

b. Person owner;

c. String registrationNo;

d. String modelName;

e. Vehicle c;

- A blueprint for a software object is called a ___.

THANK YOU

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