Core Java 8 and Development Tools

Lesson 04 : Classes and Objects

Lesson Objectives

- After completing this lesson, participants will be able to:
  - Define classes and objects
  - Create Packages
  - Work with Access Specifiers
  - Define Constructors
  - understand **this** reference
  - Understand memory management in java
  - use **static** keyword
  - Declaring and using Enum
  - Best Practices

Classes and Objects

- Class:
  - A template for multiple objects with similar features
  - A blueprint or the definition of objects
- Object:
  - Instance of a class
  - Concrete representation of class

```
class < class_name>
{
    type var1; …
    Type method_name(arguments )
     {
        body
      } …
} //class ends
```

Introduction to Classes

- A class may consist the following elements:
  - Fields
  - Methods
  - Constructors
  - Initializers

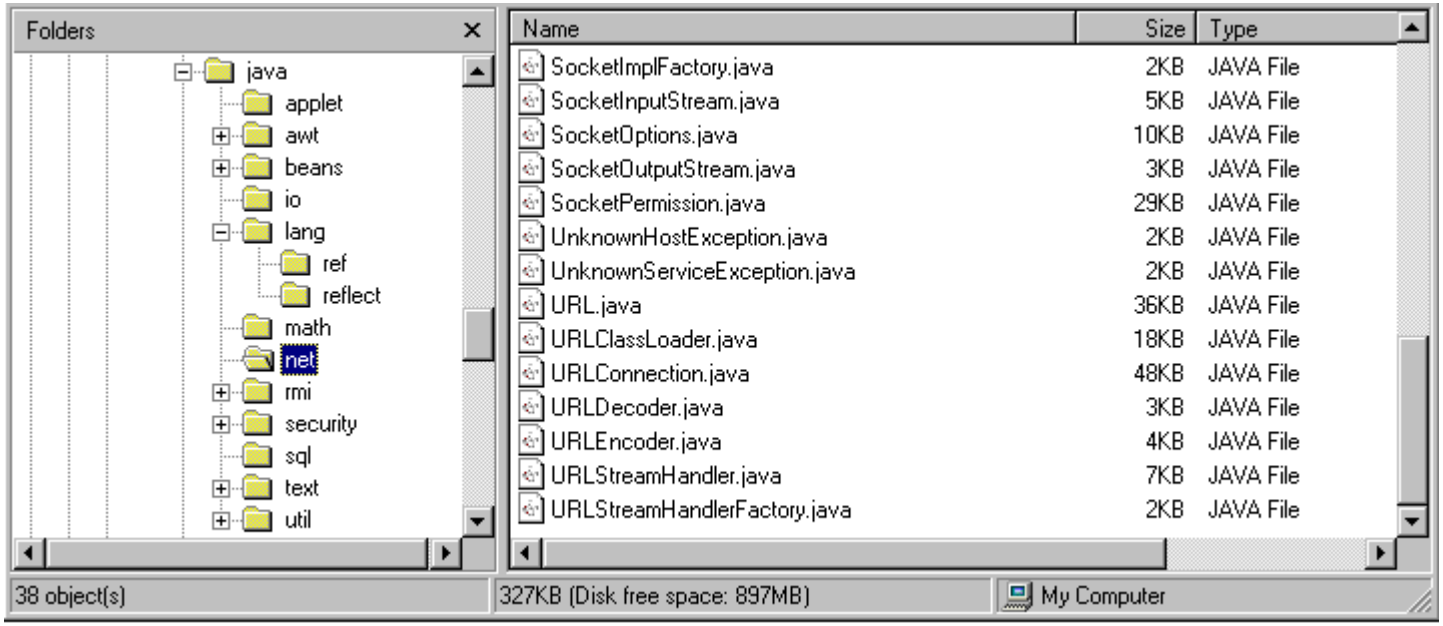
Introduction to Classes

```
class Box{
        double dblWidth;
        double dblHeight;
        double dblDepth;
        double calcVolume(){
                return dblWidth * dblHeight * dblDepth;
        } //method calcVolume ends.
}//class Box ends.
```

```
class BoxDemo{
    public static void main(String a[])
    {
        Box box;                    //declare a reference to object
        box = new Box();            //allocate a memory for box object.
        box.calcVolume();           // call a method on that object.
} }
```

Packages

- In Java, by the use of packages, you can group a number of related classes and/or interfaces together into a single unit.



Benefits of Packages

- These are the benefits of organising classes into packages:
  - It prevents name-space collision.
  - It indicates that the classes and interfaces in the package are related.
  - You know where to find the classes you want if they're in a specific package.
  - It is convenient for organizing your work and separating your work from code libraries provided by others.

Creating Your Own Package

```
package com.igate.trg.demo;
public class Balance {
    String name;
    public Balance(String n) {
        name = n;
    }
   public void show() {
    ……
     if( bal < 0)
          System.out.println(name + ": $" + bal);
}
```

Package should be the first statement

Packages and Name Space Collision

- Namespace collision can be avoided by accessing classes with the same name in multiple packages by their fully qualified name.

package pack1;

class Teacher

class Student

package pack2;

class Student

class Courses

```
import pack1.*;
import pack2.*;
pack1.Student stud1;
pack2.Student stud2;
Teacher teacher1;
Courses course1;
```

Using Packages

- Use fully qualified name.

```
java.util.Date = new java.util.Date();
```

- You can use import to instruct Java where to look for things defined outside your program.

```
import java.util.Scanner;
Scanner sc = new Scanner (System.in);
```

You can use multiple import statements

- You can use * to import all classes in package:

```
import java.util.*;
Scanner sc = new Scanner (System.in);
```

Use * carefully; you may overwrite definitions

Static Import

- Static import enables programmers to import static members.
- Class name and a dot (.) are not required to use an imported static member.

```
import static java.lang.Math.*;
public class StaticImportTest
{
 public static void main( String args[] )
 {
 System.out.printf( "sqrt( 900.0 ) = %.1f\n", sqrt( 900.0 ) );
 } // end main
}
```

Note: It's not Math.sqrt

Some Java Packages

Package Name	Description
java.lang	Classes that apply to the language itself, which includes the Object class, the String class, and the System class. It also contains the Wrapper classes. "Classes belonging to java.lang package need not be explicitly imported".
java.util	Utility classes, such as Date, as well as collection classes, such as Vector and Hashtable
java.io	Input & output classes for writing to & reading from streams (such as standard input and output) & for handling files
java.net	Classes for networking support, including Socket and URL (a class to represent references to documents on the WWW)
java.applet	Classes to implement Java applets, including the Applet class itself, as well as the AudioClip interface

Demo : Package

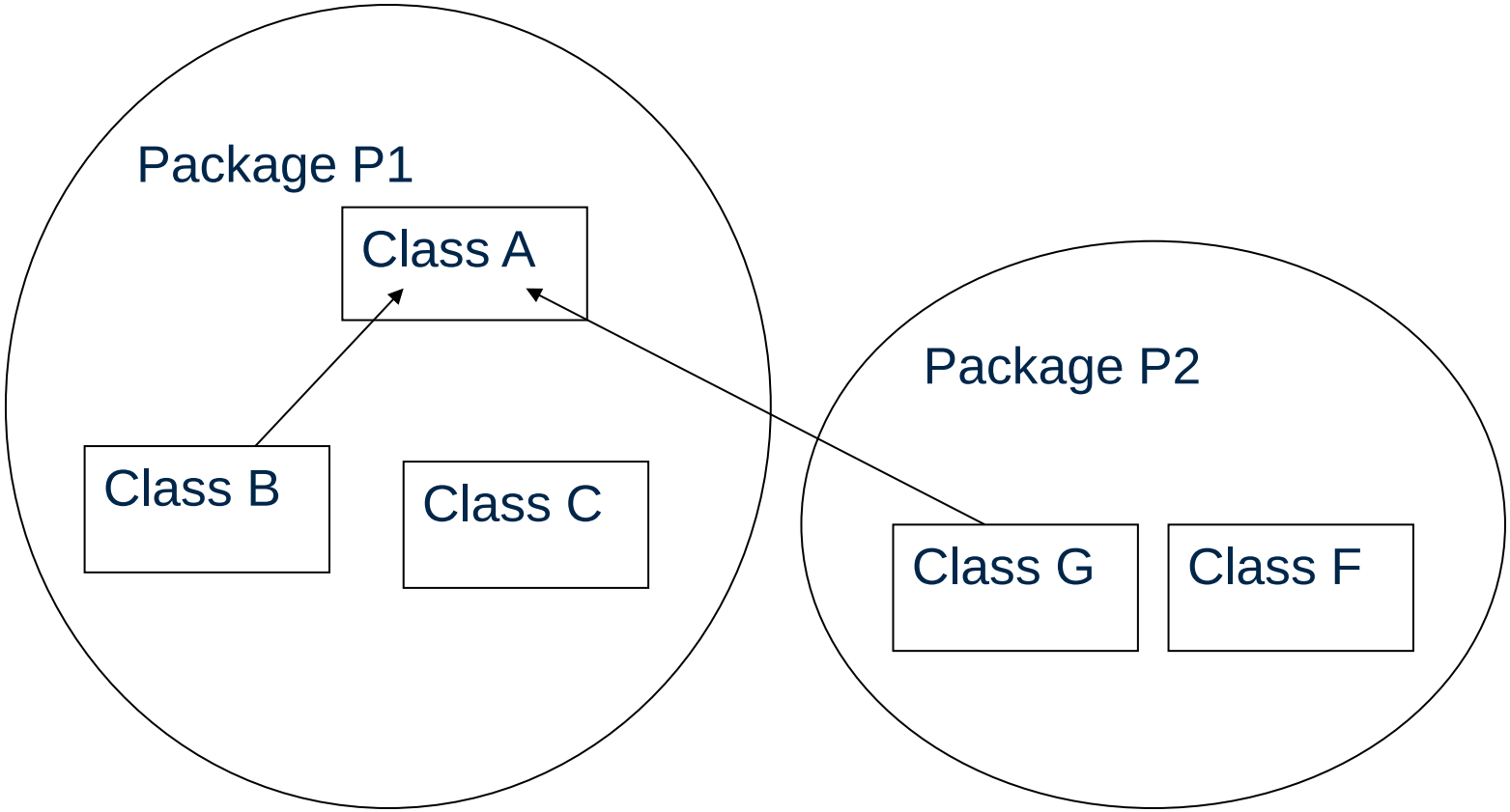
- Execute the following programs:
  - Balance.java
  - AccountBalance.java
  - StaticImportDemo.java
  - StaticImportNotUsed.java

Types of Access Modifiers

- Default
- Private
- Public
- Protected

Location/Access Modifier	Private	Default	Protecte d	Public
Same class	Yes	Yes	Yes	Yes
Same package subclass	No	Yes	Yes	Yes
Same package non-subclass	No	Yes	Yes	Yes
Different package subclass	No	No	Yes	Yes
Different package non-subclass	No	No	No	Yes

What is access protection?



Default Constructors

- All Java classes have *constructors*
  - Constructors initialize a new object of that type
- Default no-argument constructor is provided if program has no constructors
- Constructors:
  - Same name as the class
  - No return type, not even void

```
class Box {
  double dblWidth;
  double
dblHeight;
  double dblDepth;
}
```

→ Compiler →

```
class Box {
  double dblWidth;
  double dblHeight;
  double dblDepth;
  Box() { }
}
```

Demo

- Execute the BoxDemo.java program.
  - This uses the Box.java

this reference

- The this keyword is used to refer to the current object from any method or constructor.
- There are mainly two uses of this keyword:
  - Refer the class level fields
  - Chaining constructors

```
// Field reference using this
class Point {
        int xCord;   // instance variable
        int yCord;

        Point(int xCord, int yCord) {
            this.xCord = xCord;
            this.yCord = yCord;
        }
}
```

Static modifier

- Static modifier can be used in conjunction with:
  - A variable
  - A method
- Static members can be accessed before an object of a class is created, by using the class name
- Static variable :
  - Is shared by all the class members
  - Used independently of objects of that class
  - Example: static int intMinBalance = 500;

Static modifier

- Static methods:
  - Can only call other static methods
  - Must only access other static data
  - Cannot refer to this or super in any way
  - Cannot access non-static variables and methods
- Static constructor:
  - used to initialize static variables

Method main() is a static method. It is called by JVM.

Static modifier

```
// Demonstrate static variables, methods, and blocks.
public class UseStatic {
   static int intNum1 = 3;                          // static variable
   static int intNum2;
static {                                        //static constructor
        System.out.println("Static block initialized.");
        intNum2 = intNum1 * 4;
    }
   static void myMethod(int intNum3) {              // static method
         System.out.println("Number3 = " + intNum3);
         System.out.println("Number1 = " + intNum1);
         System.out.println("Number2 = " + intNum2);
    }
public static void main(String args[]) {
   myMethod(42);
  }}
```

Output:
Static block initialized.
Number3 = 42
Number1 = 3
Number2 = 12

Constructor

- Initializing fields to default values is redundant
- Constructors should not call *overridables*
- Beware of mistaken field *redeclares*

```
public final class Quark {
//private String fName;
//private double fMass;
 public Quark(String aName, double aMass){
      fName = aName;
      fMass = aMass;
    }
//WITH redundant initialization to default values
private String fName = null;
private double fMass = 0;
}


>javap -c -classpath . Quark
```

Static and Constants

- Declare constants as static and final
- Static, final and private methods are faster
- If possible, use constants in *if* conditions

Lab

- Lab 1: Language Fundamentals , Classes and Objects

Summary

- In this lesson you have learnt:
  - Classes and Objects
  - Packages
  - Access Specifiers
  - Constructors - Default and Parameterized
  - this reference
  - Memory management
  - Using static keyword
  - Enums
  - Best Practices

Review Questions

- Question 1: Which of the following are the benefits of using Package?
  - **Option1:** prevents name-space collision.
  - **Option2:** To implement security of contained classes.
  - **Option3:** Better code library management.
  - **Option4:** To increase performance of your class.
- Question 2: Which of the following is true regarding static variable?
  - **Option1:** static variable cannot be used inside instance methods.
  - **Option2:** static variable can be used in static methods only.
  - **Option3:** static variable can be used in static methods as well as instance methods.
  - **Option4:**. static variable cann't be used in constructor .