* Package :-

A package is a group of classes, interfaces and sub-packages.

packages are used in java, in-order to avoid name conflicts and to control access of class, interface and enumeration and etc. using package it becomes easier to locate the related classes.

package are categorized into two forms

-> Built-in package
-> user-defined package.

* There are many built-in packages such as java, lang, awt, javax, swing, net, io, util, sql and etc.

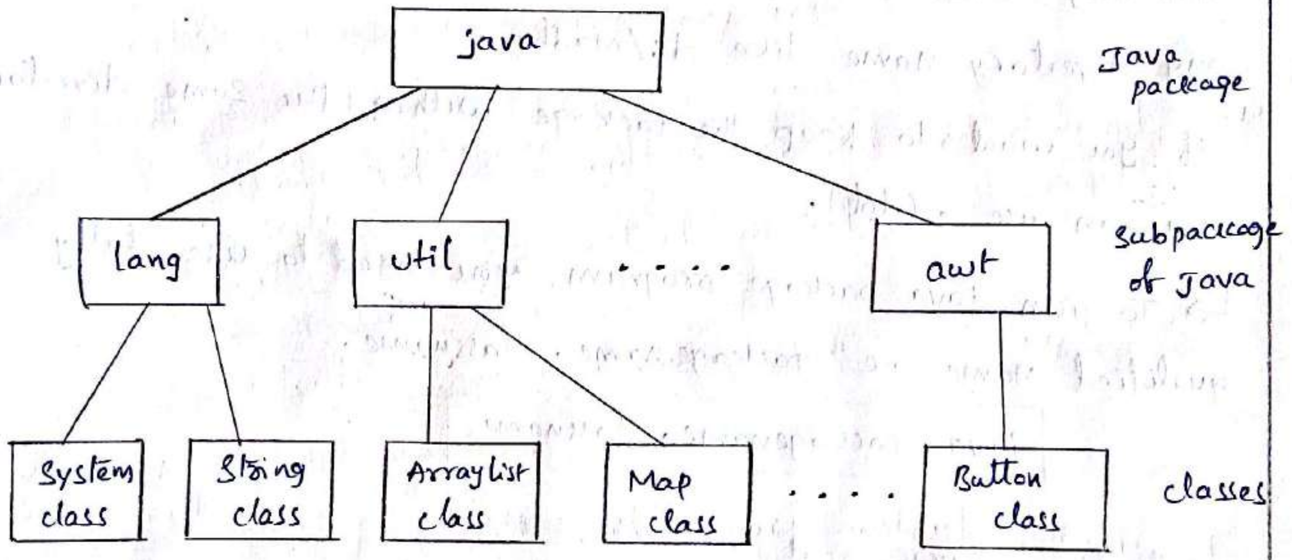


fig:- Built-in package

In the above figure, java is main package and it has many sub packages (lang, util, io, net, ... awt). And each subpackage has several classes (system, string, map ... Button class).

* In Java, the user can able to create package by using a keyword i.e "package". The package keyword is used to create a package in Java.

```
package <package name> ;
```

example :- Simple . java

```
package mypack;
public class Simple
{
public static void main(String args[])
{
System.out.println("Welcome to package");
}
}
```

↳ To compile java package, you need to follow the syntax

```
javac -d directory javafilename
```

In the above syntax, The -d specifies the destination (or) directory where to put the generated class file. you can say any directory name like d:/madhu.

If you want to keep the package within the same directory, you can use . (dot).

↳ To run java package program, you need to use fully qualified name. i.e packagename . classname.

```
java packagename. classname
```

output:-
```
javac -d . Simple.java
java mypack.Simple
Welcome to package
```

Note:- If we declare package in source file, The package declaration must be the first statement in the source file.

Since the package creates a new namespace there won't be any name conflicts with names in other packages. using packages, it is easier to provide access control and it is also easier to locate the related classes.

* Importing packages :-

The import Keyword is used to import built-in and user-defined packages into your java source file. So that your class can import to a class that is in another package by directly using its name.

There are three ways to access the package from outside the package.

1. using fully qualified name
2. import the only class you want to use.
3. import all the classes from the particular package.

1. using fully qualified name:

If you use fully qualified name then only declared class of This package will be accessible. Now there is no need to import. But you need to use fully qualified name every time when you are accessing the class or interface.

It is generally used when two packages have same class name e.g java.util and java.sql packages contains 'Date' class.

Example:-

A.java

```
package pack;
public class A
{
public void msg()
{
 System.out.println("Hello");
}
}
```

B.java

```
package mypack;
Class B
{
public static void main(String args[])
{
pack.A obj = new pack.A(); // using fully qualified name
obj.msg();
}
}
```

output:-

```
javac -d . A.java
javac -d . B.java
java mypack.B
Hello.
```

2. using packagename.classname (or) import the only class you want to use:

If you import package.classname then only declared class of this package will be accessible.

* In this, we can import only class that you want to use. i.e we can able to access that class in another package.

Example:- X.java

```
package pack;
public class X
{
 public void msg()
 {
  System.out.println("Hello");
 }
}
```

Y.java

```
package mypack;
import pack.X;
class Y
{
public static void main(String args[])
{
```

```
X  obj = new  X();
obj.msg();
}
}
```

output:-
```
javac  -d  .  X.java
javac  -d  .  Y.java
java mypack.Y
Hello.
```

3. Import all the classes from the particular package (or) using packagename.x :-

If you use package.* then all the classes and interfaces of this package will be accessible but not subpackages.

The import keyword is used to make the classes and interface of another package accessible to the current package.

Example:-

Humans.java

```
package  animals;
class  Animals
{
public  void  display()
{
 System.out.println(" All are the animals in the world");

}
}
public  class  Humans  extends  Animals
{
public  void  msg()
{
 System.out.println(" class A animals are Humans");
}
public  void  msgB()
{
 System.out.println("Humans are animals with intelligence");

}
}
```

World.java

```
package world;
import animals.*;
class World
{
 public static void main(String args[])
 {
  Humans  obj = new  Humans();
  obj. display();
  obj. msg();
  obj. msgB();
 }
}
```

output:-
```
javac  -d  .  Humans.java
javac  -d  .  World.java
java  world.World
All are the animals in The World
Class A animals are Humans
Humans are animals with intelligence.
```

Note:- If you import a package, subpackages will not be imported. i.e If you import a package, all the classes and interfaces of that package will be imported excluding the classes and interfaces of subpackages. Hence, you need to import the subpackages as well.

Note:- Sequence of the program must be package then import then class. i.e import statement is kept after the package statement.

Ex:
```
package statement  }
import statement   }  This is sequence in java program.
class statement    }
      ⋮
```

Rule:- There can be only one public class in java source file and it must be saved by the public class name.

* Subpackage :-

package inside the package is called the subpackage. It should be created to categorize the package further.

The standard of defining subpackage is package name . sub packagename. for example "pack . subpack".

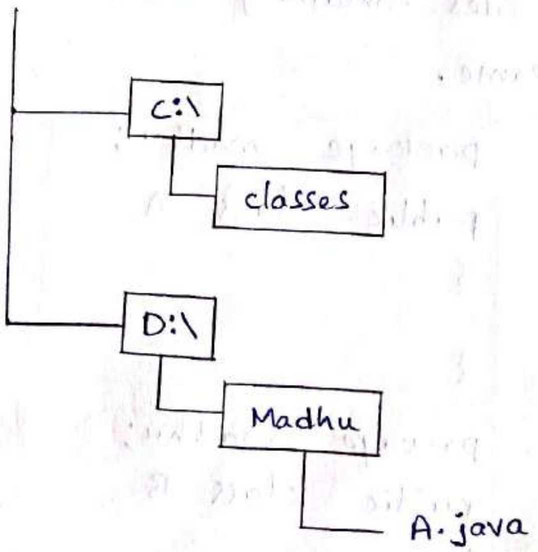
Example :- Simple . java

```
package pack. subpack;
class Simple
{
public static void main (String args[])
{
System. out. println (" Hello subpackage");
}        output:- javac -d . Simple . java
}                 java pack. subpack. Simple
                  Hello subpackage.
```

* Setting CLASSPATH :-

If you want to save (or) put Java source files and class files in different directories or drives then we need to set classpath to run or execute those class files.

for example:



Now, I want to put the class file of A.java source file in the folder of C: drive.

Example:-

S.java

```
package pack;
public class S
{
public static void main (string avgs[])
{
System.out.println("This is example of setting classpath");
}
}
```

To compile:

```
D:\Madhu > javac -d c:\classes S.java
```

To Run:

To run This program from D:\Madhu directory, you need to set classpath of the directory where the class file resides.

```
D:\Madhu > set classpath = c:\classes;.;
D:\Madhu > java pack.S
This is example of setting classpath.
```

* How to put two public classes in a package:-

In java, There can be only one public class in a package. If you want to put two public classes in a single package, have two java source files containing one public class, but keep the package name same.

for example:

```
package madhu;           // Save as A.java
public class A
{
   ≡
}
```

```
package madhu;           // Save as B.java
public class B
{
 ≡
}
```

* Interface :-

An interface is a collection of abstract methods which are public in scope.

(or)

It is a collection of methods, which are public and abstract by default.

Abstract method :-

It is a method with no body (or) implemenation, ie there is no code at all associated with method.

↳ The best part of an interface is that a class can inherit any number of interfaces, thus allowing multiple inheritance in java.

↳ Java does not support multiple inheritance among classes, but interfaces allow java to support this feature.

→ Interfaces are declared with help of keyword "Interface".

Note :- In interface, None of methods have body.

Syntax :-

```
interface interfacename
{
returntype methodname (arguments);
 ⋮
}
```

* In simple words, Interface is a blueprint of class, it has static constants and abstract methods.

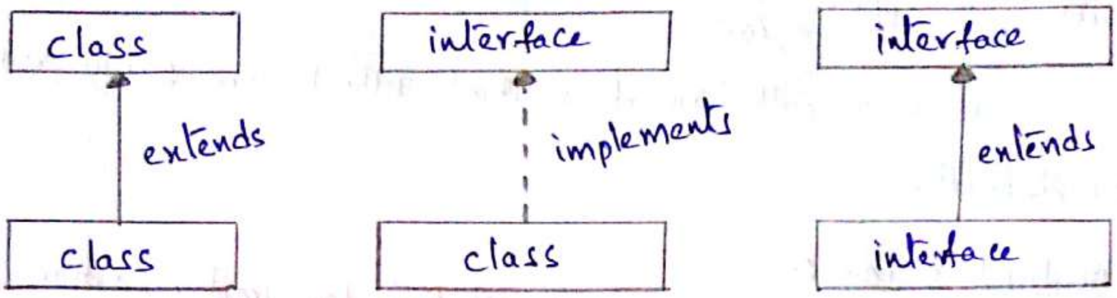
* The interface in java is a mechanism,

↳ to achieve abstraction

↳ to achieve Multiple inheritance

Note :- It is mandatory to add the access specifier public to the method declaration, otherwise the compiler will not compile the program (The older version of java, i.e before Java 8).

* In Java, a class extends another class, an interface extends another interface but a class implements an interface.



Example:-

Calculator.java

```
interface Calinterface
{
 int add (int a, int b);
 int sub (int a, int b);
}
class Calculator implements Calinterface
{
 public int add (int a, int b)
 {
  return a+b;
 }
 public int sub (int a, int b)
 {
  return a-b;
 }
public static void main(String args [])
{
 Calculator cal = new Calculator();
 System.out.println ("value after addition =" + cal. add (5,2));
 System.out.println ("value after substraction =" +cal. sub(5,2));
 }
}
```

output:-
```
javac Calculator.java
java Calculator
value after addition = 7
value after Subtration = 3
```

* Extending interfaces :- (or) Inheritance in interfaces

Just like inheritance in classes, the interfaces can also be extended. An interface can inherit another interface using the same keyword "extends".

Example :-

InherDemo.java

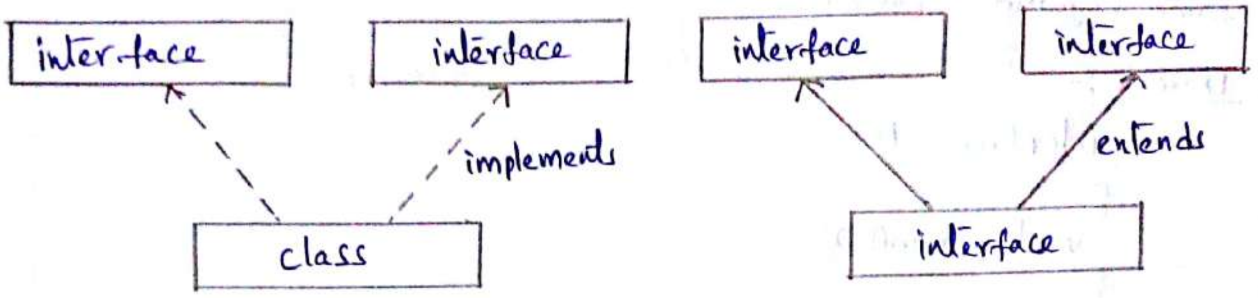
```
interface A
{
 void showA();
}
interface B extends A
{
 void showB();
}
class InherDemo implements B
{
 public void showA()
 {
  System.out.println(" Method of interface A");
 }
 public void showB()
 {
  System.out.println("Method of interface B");
 }
public static void main(String args[])
{
 InherDemo d= new InherDemo();
 d.showA();
 d.showB();
}
}
```

output:-

```
javac InherDemo.java
java InherDemo
Method of interface A
Method of interface B
```

* Multiple inheritance in Java by interface :-

If a class implements multiple interfaces (or) an interface extends multiple interfaces is known as Multiple inheritance.



Example :-

MultipleInheritanceDemo.java

```
interface printable
{
 void print();
}
interface Showable
{
 void show();
}
class MultipleInheritanceDemo implements printable, Showable
{
 public void print()
 {
 System.out.println("Hai");
 }
 public void show()
 {
 System.out.println("Welcome");
 }
public static void main (String args[])
{
MultipleInheritanceDemo obj = new MultipleInheritanceDemo();
  obj.print();
  obj.show();
 }      output:- javac MultipleInheritanceDemo.java
}                jara MultipleInheritance
                 Hai
                 Welcome.
```