INTERFACES

- An **interface in java** is a blueprint of a class.
- It has static constants and abstract methods.
- The interface in java is **a mechanism to achieve abstraction**.
- There can be only abstract methods in the java interface not method body.
- It cannot be instantiated just like abstract class.
- An interface is not extended by a class; it is implemented by a class.
- An interface can extend multiple interfaces.

DECLARING INTERFACE

- The **interface** keyword is used to declare an interface.
- Syntax:

```
public interface NameOfInterface
{
    // Any number of final, static fields
    // Any number of abstract method declarations
}
```

Why interfaces are required ?

- Interfaces allow you to implement common behaviors in different classes that are not related to each other

- Interfaces are used to describe behaviors that are not specific to any particular kind of object, but common to several kind of objects

- Defining an interface has the advantage that an interface definition stands apart from any class or class hierarchy

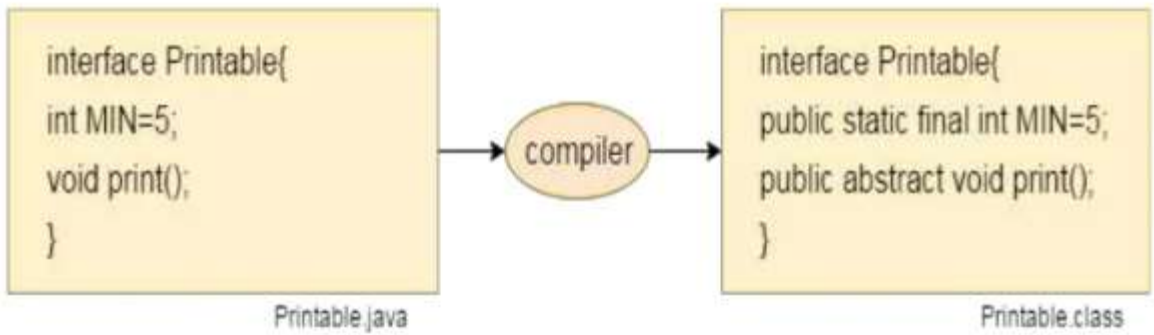
- This makes it possible for any number of independent classes to implement the interface

Why interfaces are required ?

- Thus, an interface is a means of specifying a consistent specification, the implementation of which can be different across many independent and unrelated classes to suit the respective needs of such classes
- Interfaces reduce coupling between components in your software
- Java does not support multiple inheritance
- This is a constraint in class design, as a class cannot achieve the functionality of two or more classes at a time
- Interfaces help us make up for this loss as a class can implement more than one interface at a time
- Thus, interfaces enable you to create richer classes and at the same time the classes need not be related

interface

- An interface is implicitly abstract.
- So not need to use the **abstract** keyword while declaring an interface.
- Each Fields in an interface is also implicitly **static** and **final**, so the static and final keyword is not needed (Refer below diagram).
- Methods in an interface are also implicitly public.



Interface members

- All the methods that are declared within an interface are always, by default, public and abstract
- Any variable declared within. an interface is always, by default, public static and final

Default Method in Interface

```
Interface Inf1{
default return type method name(args)
{
//statements
}
}
```

Static method in Interface

```
Interface Inf1
{
static return type method name(args)
{
//statements
}
}
```

Private method in interface

```
Interface Inf1
{
private return type method name(args)
{
//statements
}
}
```

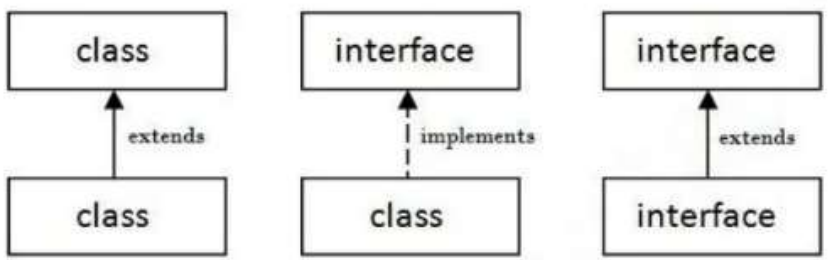
Interface example

Example:

```
Interface ItemConstants                    //interface declared
{
    int code = 1001;              // Variable declared in interface
    string name = "Fan";
    void display();               // Method declared in interface
}
```

Extending interface

- An interface can extend another interface like class.
- The **extends** keyword is used to extend an interface.
- A **class implements an interface**.




```
interface Name2 extends Name1
{
        Body of Name2
}
```

implementing interface

- Interfaces are used as “Super classes” whose properties are inherited by classes.
- syntax

```
Class className implements interfacename
{
        Body of classname
}
```

implementing interface

Example:

```
interface Drawable          // Interface declared
{
void draw();
}
class Rectangle implements Drawable    //implementing
{
public void draw()
{
System.out.println("drawing rectangle");
}}
```

OUTPUT: drawing rectangle

implementing interface

```
interface Printable
 {
void print();
}
interface Showable
{
void show();
}
class A7 implements Printable,Showable

 {
public void print()
{
System.out.println("Hello");
}
public void show()
{
System.out.println("Welcome");
}
public static void main(String args[])
{
A7 obj = new A7();
obj.print();

obj.show();
 } }
```

OUTPUT:

Hello
Welcome

Quiz

- Will the following code compile successfully ?

```
interface I1 {

private int a=100;
protected void m1();

}
class A1 implements I1 {
public void m1() {
System.out.println(“In m1 method”);
}

}
```

Quiz

```
interface I1 {

static int a=100;
static void m1();

}

class A1 implements I1 {
public void m1() {
System.out.println(“In m1 method”);
}

}
```

PACKAGES

Package is similar to folders in your Disk

People normally group their related data in various folders.

- For example, a programmer may group his programs into the following folders.
- C_programs, CPP_programs, SQL_queries, PLSQL_programs.. etc.
- We also use sub-folders for organizing our data more conveniently.

- The advantage is we can easily locate the files if they are organized.

Need for packages

Till now, you did not use any package since all your classes were stored in the default package. Imagine a situation where all the classes are stored in one package.

It would lead to tremendous confusion as it may lead to classes with similar names that is not allowed by the language.

This scenario is also referred to as a namespace collision.

Need for packages

Packages are containers used to store the classes and interfaces into manageable units of code.

Packages also help control the accessibility of your classes. This is also called as visibility control.

- Example:

```
package MyPackage;

class MyClass {...}

class YourClass{...}
```

Access Protection using Packages

- Packages facilitate access-control

Once a class is packaged, its accessibility is controlled by its package

That is, whether other classes can access the class in the package depends on the access specifiers used in its class declaration

There are four visibility control mechanisms packages offer:

- private
- no-specifier (default access)
- protected
- public

Access Protection using Packages

Specifier	Accessibility
private	Accessible in the same class only
No-specifier (default access)	Subclasses and non-subclasses in the same package
protected	Subclasses and non-subclasses in the same package, and subclasses in other packages
public	Subclasses and non-subclasses in the same package, as well as subclasses and non-subclasses in other packages. In other words, total visibility

- Packages are containers for classes.

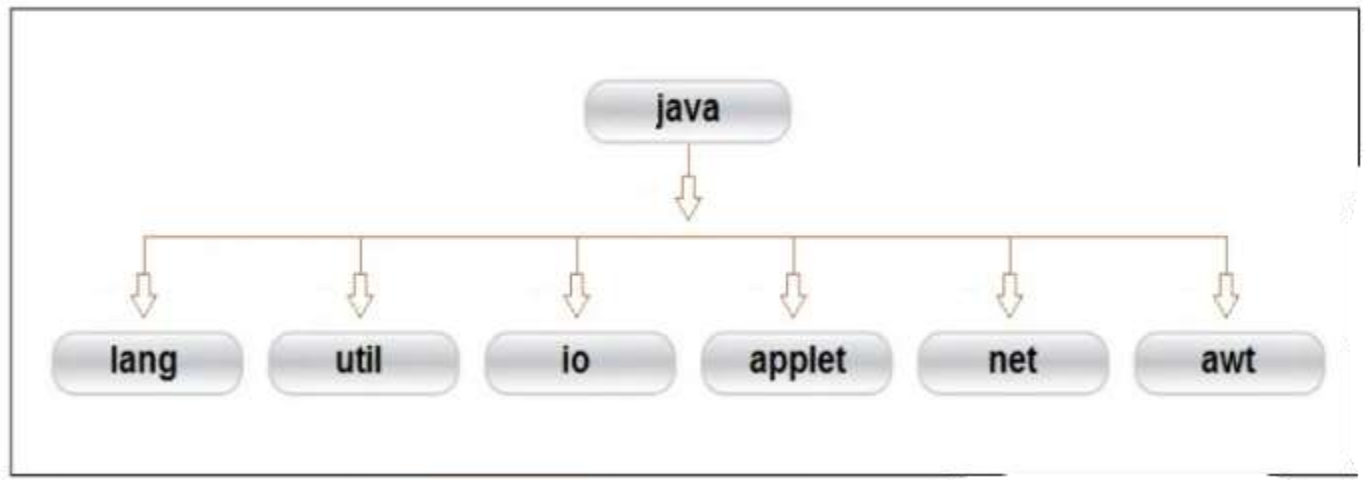
- They are used to keep the class name space
- compartmentalized.

- Packages are stored in a hierarchical manner and are
- explicitly imported into new class definitions.

- A **java package** is a group of similar types of classes, interfaces and sub-packages.
- Package in java can be categorized in two types,
    1. Java API package (Built-in package)
    2. User-defined package. (Defined by user)
- There are many built-in packages such as java, lang, awt, javax, swing, net, io, util, sql etc.
- Java package provides access protection.

1. JAVA API PACKAGES

- Java **API(Application Program Interface)** provides a large numbers of classes grouped into different packages according to functionality.
- Most of the time we use the packages available with the Java API.



1. JAVA API PACKAGES

PACKAGE	CONTENTS
java.lang	Language support classes. They include classes for primitive types, string, math functions, thread and exceptions.
java.util	Language utility classes such as vectors, hash tables, random numbers, data, etc.
java.io	Input/output support classes. They provide facilities for the input and output of data.
java.applet	Classes for creating and implementing applets.
java.net	Classes for networking. They include classes for communicating with local computers as well as with internet servers.
java.awt	Set of classes for implementing graphical user interface. They include classes for windows, buttons, lists, menus and so on.

USING API PACKAGES

- The import statements are used at the top of the file, before any class declarations.
- The first statement allows the specified class in the specified package to be imported.
- For example,

Import java.awt.color;

- The above statement imports class color and therefore the class name can now be directly used in the program.
- The below statement imports every class contained in the specified package.

Import java.awt.*;

- The above statement will bring all classes of java.awt package.

USER DEFINED PACKAGES
CREATE A PACKAGE

- To create a package, a name should be selected for the package.
- Include a **package** statement along with that name at the top of every source file that contains the classes, interfaces.
- The package statement should be the first line in the source file.
- There can be only one package statement in each source file, and it applies to all types in the file.

CREATING A PACKAGE

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

CREATING A PACKAGE

To compile and run the package,

To Compile: javac -d . Simple.java

To Run: java mypack.Simple

- The -d is a switch that tells the compiler where to put the class file i.e. it represents destination.
- The . (dot) represents the current folder.

OUTPUT: Welcome to package

ACCESSING A PACKAGE

ACCESSING A PACKAGE:

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

1. import package.*;
2. import package.classname;
3. fully qualified name.

ACCESSING A PACKAGE

1. USING IMPORT PACKAGE.*;

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

Output: Hello

```
//save by B.java
package mypack;
import pack.*;  //Package.*
 class B
{
public static void main(args[])
{
   A obj = new A();
   obj.msg();
 }}
```

ACCESSING A PACKAGE

2. USING PACKAGE.CLASSNAME

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

Output: Hello

```
//save by B.java
package mypack;
import pack.A;  //Package.classname
 class B
{
public static void main(args[])
{
   A obj = new A();
   obj.msg();
 }}
```

ACCESSING A PACKAGE

2. USING FULLY QUALIFIED NAME

- Using fully qualified name can declared a 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 contain Date class.

ACCESSING A PACKAGE

2. USING FULLY QUALIFIED NAME

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

```
//save by B.java
package mypack;
class B
{
public static void main(args[])
{
pack.A obj = new pack.A();
(Fully qualified name)
   obj.msg();
 } }
```

Quiz

Which is not a correct inbuilt java package?

A) java.io

B) java.sql

C) java.dbms

D) java.net

Quiz

Which is a correct inbuilt java package?

A) java.text

B) java.errors

C) java.dbms

C) java.network