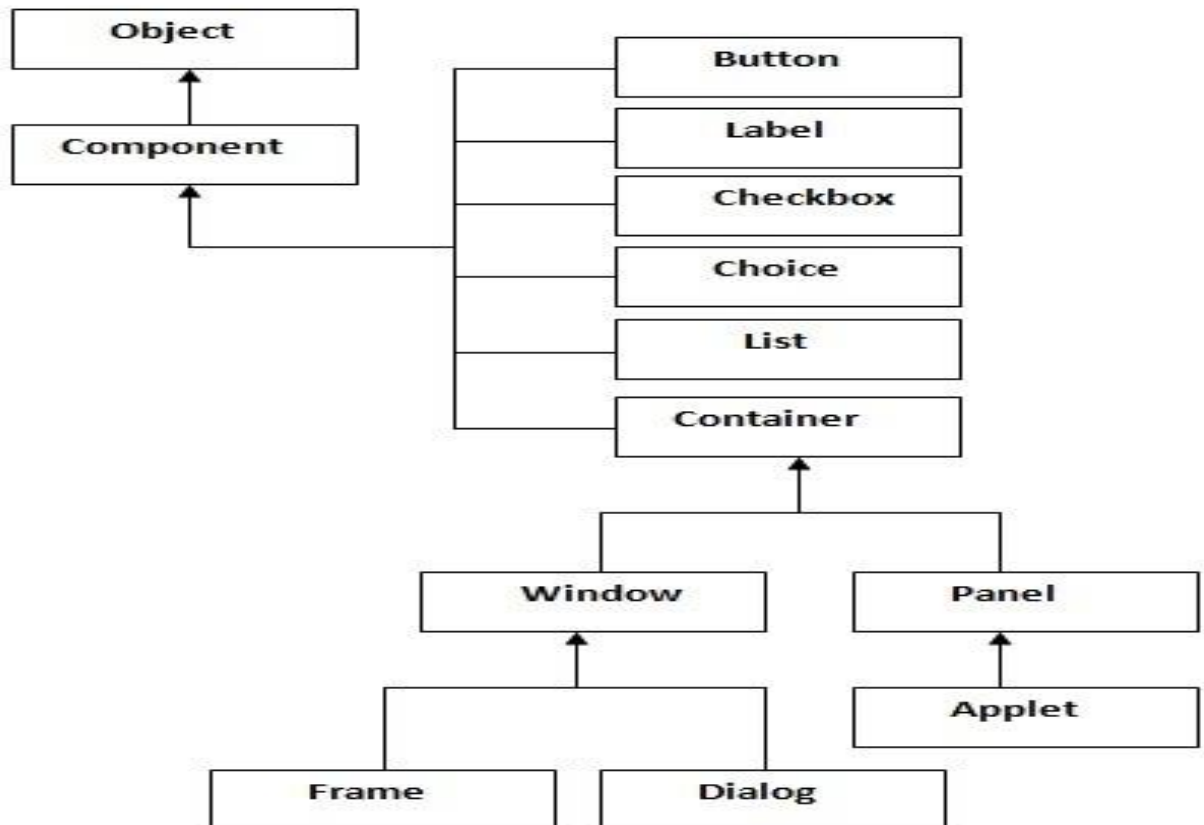


## Unit5

### Abstract Windowing Toolkit (AWT)

Abstract Windowing Toolkit (AWT) is used for GUI programming in java.

#### AWT Container Hierarchy:



**Container:** The Container is a component in AWT that can contain another components like buttons, textfields, labels etc. The classes that extends Container class are known as container.

**Window:** The window is the container that have no borders and MenuBars. You must use frame, dialog or another window for creating a window.

**Panel:** The Panel is the container that doesn't contain title bar and MenuBars. It can have other components like button, textfield etc.

**Frame:** The Frame is the **container** that contain **title bar and can have MenuBars**. It can have other components **like button, textfield** etc.

**Commonly used Methods of Component class:**

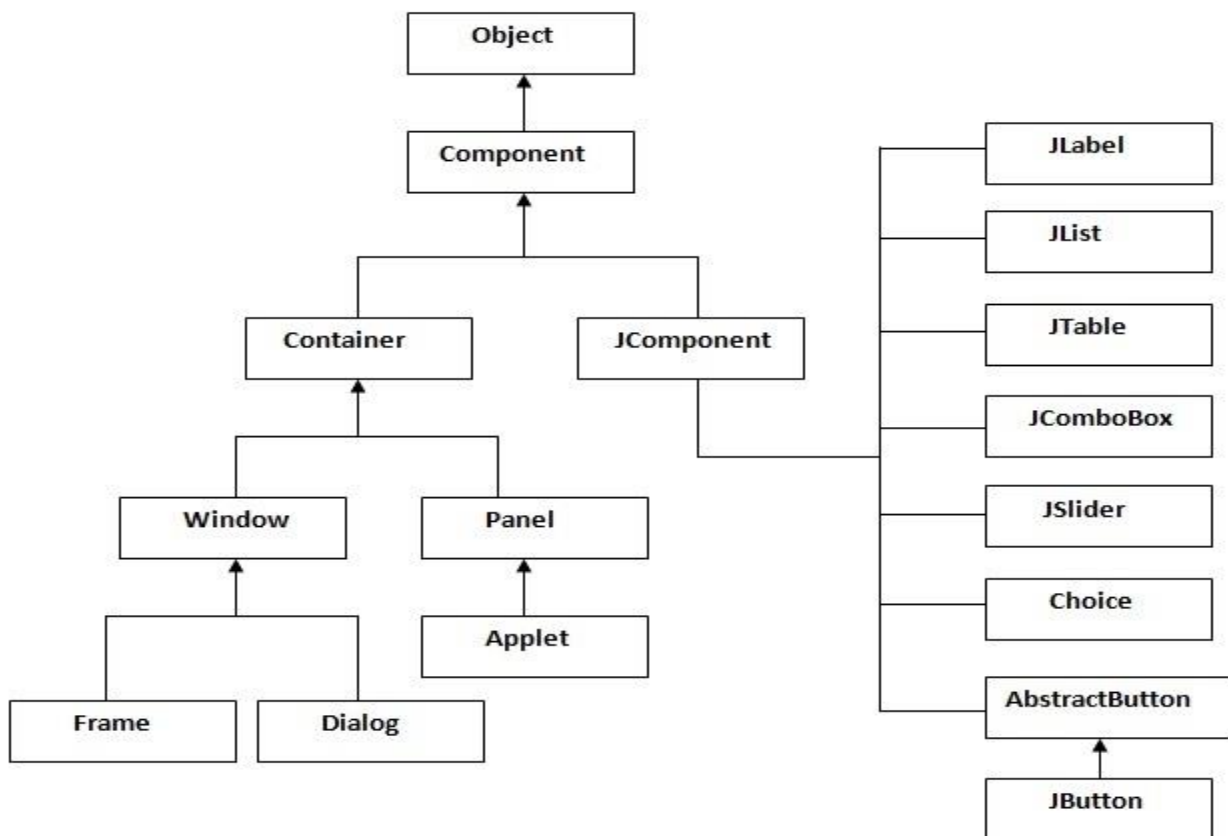
- I.    public void add(Component c)
- II.   public void setSize(int width,int height)
- III.   public void setLayout(LayoutManager m)
- IV.   public void setVisible(Boolean)

## **Swing (GUI Based Programming in java)**

Swing is a part of JFC (Java Foundation Classes) that is used to create GUI application. It is built on the top of AWT and entirely written in java.

**JFC:** The Java Foundation Classes (JFC) are a set of GUI components which simplify the development of desktop applications.

### **Hierarchy of swing**



## Advantage of Swing over AWT:

There are many advantages of Swing over AWT. They are as follows:

1. Swing components are Platform independent.
2. It is lightweight.
3. It supports pluggable look and feel.
4. It has more powerful components like tables, lists, scroll panes, color chooser, tabbed pane etc.
5. It follows MVC (Model View Controller) architecture.

## Commonly used Methods of JComponent class:

1. public void add(Component c)
2. public void setSize(int width,int height)
3. public void setLayout(LayoutManager m)
4. public void setVisible(boolean)

## Creating a Frame:

There are two ways to create a frame:

1. By creating the object of Frame class (association)
2. By extending Frame class (inheritance)

## Example of Swing by Association:

**Ex1.** import javax.swing.\*;

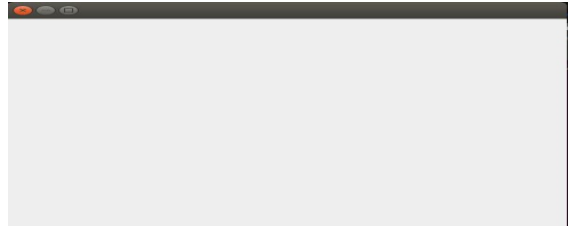
```
public class MyFrame
{
    public static void main(String[] args)
    {
        JFrame mf=new JFrame ();
    }
}
```

**Output:** No Output

**Ex2.** `import javax.swing.*;`

```
public class MyFrame
{
    public static void main(String[] args)
    {
        JFrame mf=new JFrame ();
        mf.setVisible(true);
        mf.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE); // for normal prog.
        termination
    }
}
```

**mf.setDefaultCloseOperation(JFrame.EXIT\_ON\_CLOSE);** // for normal prog. termination



**Output:**

**Ex3.** `import javax.swing.*;`

```
public class MyFrameDemo3
{
    public static void main(String[] args)
    {
        JFrame f=new JFrame();
        f.setSize(400,500);
        f.setLayout(null);
        f.setVisible(true);
        f.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    }
}
```

**OR**

**Ex4.** `import javax.swing.*;`

```
public class MyFrameDemo4
{
    MyFrameDemo4()
    {
        JFrame f=new JFrame();
        f.setSize(400,500);
        f.setLayout(null);
        f.setVisible(true);
        f.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    }
    public static void main(String[] args)
    {
```

```

new MyFrameDemo4 ();
}
}

```

**Ex5.**    import javax.swing.\*;

```

public class MyFrameDemo5
{   public static void main(String[] args)
    {
        JFrame f=new JFrame();
        JButton b=new JButton("click");
        b.setBounds(130,100,100, 40);
        f.add(b);
        f.setSize(400,500);
        f.setLayout(null);
        f.setVisible(true);
f.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    } }

```

**OR**

**Ex6.**    import javax.swing.\*;

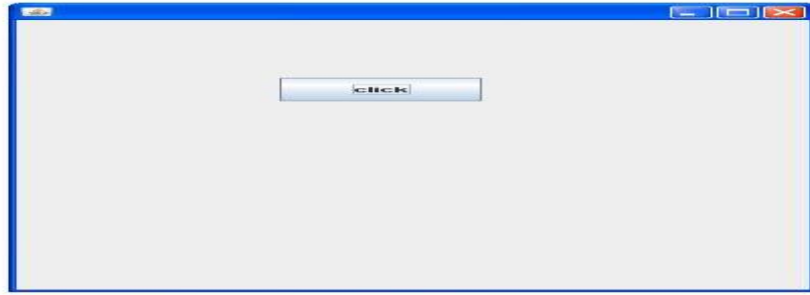
```

public class MyFrameDemo2
{   JFrame f;
        MyFrameDemo2()
    {
        f=new JFrame();
        JButton b=new JButton("click");
        b.setBounds(130,100,100, 40);
        f.add(b);
        f.setSize(400,500);
        f.setLayout(null);
        f.setVisible(true);
f.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

    }
    public static void main(String[] args)
    {
        new MyFrameDemo2 ();
    }
}

```

**Output:**



### Example of Swing by inheritance:

#### Ex7. // Using Inheritance type 1

```
import javax.swing.*;
class MyFrameDemo7 extends JFrame
{
    MyFrameDemo7 () {}
    MyFrameDemo7 (String str){super(str);}
    public static void main(String arg[])
    {
        MyFrameDemo7 mf=new MyFrameDemo7("MY Swing Frame ");
        JButton b=new JButton("ok");
        mf.add(b);
        mf.setVisible(true);
        mf.setSize(300,300);
        mf.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    }
}
```

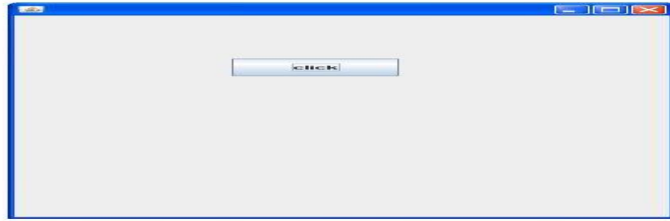
```
Ex8.    import javax.swing.*;
public class MyFrameDemo8 extends JFrame
{
    MyFrameDemo8(){
        JButton b=new JButton("click");
        b.setBounds(130,100,100, 40);
        add(b);
        setSize(400,500);
        setLayout(null);
        setVisible(true);
        setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    }
    public static void main(String[] args)
```

```

    {
new MyFrameDemo8();
    }
}

```

Output



**// using Inheritance to design a frame to find the sum of two numbers**

```

import javax.swing.*;

class MySwing_Add extends JFrame
{
    JLabel l1,l2,l3,l4;
    JTextField t1,t2;
    JButton b;

    MySwing_Add() { }

    MySwing_Add(String str)
        { super(str);}

    public void set_Componet()
    {
        l1=new JLabel(" To find the sum oftwo numbers");
        l2=new JLabel("Enter 1st Number");
        l3=new JLabel("Enter 2nd Number");
        l4=new JLabel();
        t1=new JTextField();
        t2=new JTextField();
        b=new JButton("ADD");
        setLayout(null);
        l1.setBounds(50,50,200,20);
        l2.setBounds(50,80,100,20);
    }
}

```

```

        t1.setBounds(150,80,100,20);
        l3.setBounds(50,100,100,20);
        t2.setBounds(150,100,100,20);
        b.setBounds (150,120,80,20);
        add(l1);
        add(l2);
        add(l3);
        add(l4);
        add(t1);
        add(t2);
        add(b);
    }

    public static void main(String arg[])
    {
        MySwing_Add ms=new MySwing_Add("MY Swing for add");
        ms.set_Componet();
        ms.setVisible(true);
        ms.setSize(300,300);
        ms.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    }
}

```

**BorderLayout (LayoutManagers):**The LayoutManagers are used to arrange components in a particular manner. LayoutManager is an interface that is implemented by all the classes of layout managers. There are following classes that represent the layout managers:

1. java.awt.BorderLayout
2. java.awt.FlowLayout



3. java.awt.GridLayout
4. java.awt.CardLayout
5. java.awt.GridBagLayout
6. javax.swing.BoxLayout
7. javax.swing.GroupLayout
8. javax.swing.ScrollPaneLayout
9. javax.swing.SpringLayout etc.

**BorderLayout:** The BorderLayout is used to arrange the components in five regions: north, south, east, west and center. Each region (area) may contain one component only. It is the default layout of frame or window. The BorderLayout provides five constants for each region:

- public static final int NORTH
- public static final int SOUTH
- public static final int EAST
- public static final int WEST
- public static final int CENTER

**Constructors of BorderLayout class:**

- **BorderLayout():** creates a border layout but with no gaps between the components.
- **JBorderLayout(int hgap, int vgap):** creates a border layout with the given horizontal and vertical gaps between the components.



```
import java.awt.*;  
import javax.swing.*;  
public class Border  
{  
    JFrame f;  
    Border()  
    {  
        f=new JFrame();  
  
        JButton b1=new JButton("NORTH");;  
        JButton b2=new JButton("SOUTH");;  
        JButton b3=new JButton("EAST");;  
        JButton b4=new JButton("WEST");;  
        JButton b5=new JButton("CENTER");;
```

```

        f.add(b1, BorderLayout.NORTH);
        f.add(b2, BorderLayout.SOUTH);
        f.add(b3, BorderLayout.EAST);
        f.add(b4, BorderLayout.WEST);
        f.add(b5, BorderLayout.CENTER);
        f.setSize(300,300);
        f.setVisible(true);
    }

    public static void main(String[] args) {
        new Border();
    }
}

```

**GridLayout:** The GridLayout is used to arrange the components in rectangular grid. One component is displayed in each rectangle.

### **Constructors of GridLayout class:**

**GridLayout():** creates a grid layout with one column per component in a row.

**GridLayout(int rows, int columns):** creates a grid layout with the given rows and columns but no gaps between the components.

**GridLayout(int rows, int columns, int hgap, int vgap):** creates a grid layout with the given rows and columns along with given horizontal and vertical gaps.

### **Example of GridLayout class:**



```
import java.awt.*;
import javax.swing.*;

public class MyGridLayout{
    JFrame f;

    MyGridLayout(){
        f=new JFrame();

        JButton b1=new JButton("1");
        JButton b2=new JButton("2");
        JButton b3=new JButton("3");
        JButton b4=new JButton("4");
        JButton b5=new JButton("5");
        JButton b6=new JButton("6");
        JButton b7=new JButton("7");
        JButton b8=new JButton("8");
        JButton b9=new JButton("9");
```

```

f.add(b1);f.add(b2);f.add(b3);f.add(b4);f.add(b5);
f.add(b6);f.add(b7);f.add(b8);f.add(b9);

f.setLayout(new GridLayout(3,3));
//setting grid layout of 3 rows and 3 columns

f.setSize(300,300);
f.setVisible(true);
}

public static void main(String[] args) {
    new MyGridLayout();
}
}

    // using Inheritance factorial
import javax.swing.*;
import java.awt.event.*;
class MySwing_Fact extends JFrame
{
    JLabel l1,l2,l3,l4;
    JTextField t1,t2;
    JButton b;
    MySwing_Fact() { }
    MySwing_Fact(String str)
        {super(str);}
    public void set_Componet()
    {
        l1=new JLabel(" The sum of two numbers");
        l2=new JLabel("Enter any integer Number");

        l3=new JLabel();
        t1=new JTextField();

        b=new JButton(" Find Factorial");
        setLayout(null);

```

```

11.setBounds(50,50,200,30);
12.setBounds(50,80,100,30);
t1.setBounds(150,80,100,30);
b.setBounds (150,140,80,30);
13.setBounds(100,200,100,30);
b.addActionListener( new Handler2());
add(11);      add(12);      add(13);
add(t1);
add(b);
}
class Handler2 implements ActionListener
{   public void actionPerformed(ActionEvent ae)
    {   int f=1,i;
        int n= Integer.parseInt(t1.getText());
        for(i=1;i<=n;i++)
            f=f*i;
        13.setText("Sum is :"+f);
    }
}
public static void main(String arg[])
{   MySwing_Fact ms=new MySwing_Fact("Fatorial value");
    ms.set_Componet();
    ms.setVisible(true);
    ms.setSize(500,500);
    ms.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
}
}
// using Inheritance
import javax.swing.*;
class MySwing_Add extends JFrame
{   JLabel l1,l2,l3,l4;
    JTextField t1,t2;
    JButton b;
    MySwing_Add() {   }
    MySwing_Add(String str)
        {super(str);}
    public void set_Componet()
    {
        l1=new JLabel(" To find the sum of two numbers");
        l2=new JLabel("Enter 1st Number");
        l3=new JLabel("Enter 2nd Number");
        l4=new JLabel();
    }
}

```

```

        t1=new JTextField();
        t2=new JTextField();
        b=new JButton("ADD");
        setLayout(null);
        l1.setBounds(50,50,200,20);
        l2.setBounds(50,80,100,20);
        t1.setBounds(150,80,100,20);
        l3.setBounds(50,100,100,20);
        t2.setBounds(150,100,100,20);
        b.setBounds (150,120,80,20);
        add(l1);
        add(l2);
        add(l3);
        add(l4);
        add(t1);
        add(t2);
        add(b);
    }

    public static void main(String arg[])
    {
        MySwing_Add ms=new MySwing_Add("MY Swing for add");
        ms.set_Componet();
        ms.setVisible(true);
        ms.setSize(300,300);
        ms.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    }
}

```

## using Inheritance

```

import javax.swing.*;
import java.awt.event.*;
class MySwing_Add2 extends JFrame
{
    JLabel l1,l2,l3,l4;
    JTextField t1,t2;
    JButton b;
    MySwing_Add2() { }
    MySwing_Add2(String str)
        { super(str);}
    public void set_Componet()
    {

```

```

l1=new JLabel(" The sum of two numbers");
l2=new JLabel("Enter 1st Number");
l3=new JLabel("Enter 2nd Number");
l4=new JLabel();
t1=new JTextField();
t2=new JTextField();
b=new JButton("ADD");
setLayout(null);
l1.setBounds(50,50,200,30);
l2.setBounds(50,80,100,30);
t1.setBounds(150,80,100,30);
l3.setBounds(50,110,100,30);
t2.setBounds(150,110,100,30);

b.setBounds (150,140,80,30);
l4.setBounds(100,200,100,30);
b.addActionListener( new Handler());
add(l1);      add(l2);      add(l3);      add(l4);
add(t1);      add(t2);
add(b);
}
class Handler implements ActionListener
{ public void actionPerformed(ActionEvent ae)
  {
    int a= Integer.parseInt(t1.getText());
    int b= Integer.parseInt(t2.getText());
    int c=a+b;
    l4.setText("Sum is :"+c);
  }
}
public static void main(String arg[])
{ MySwing_Add2 ms=new MySwing_Add2("MY Swing2 for add");
  ms.set_Componet();
  ms.setVisible(true);
  ms.setSize(500,500);
  ms.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
}
}

```