MODULE 5: Applets and Swings

Syllabus:

The Applet Class: Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); ApletContext and showDocument(); The AudioClip Interface; The AppletStub Interface; Output o the Console

Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable.

Beautiful thought: "What you do today can improve all your tomorrows". - Ralph Marston

Introduction

Swing contains a set of classes that provides more powerful and flexible GUI components than those of **AWT**. **Swing** provides the look and feel of modern Java GUI. Swing library is an official Java GUI tool kit released by Sun Microsystems. It is used to create graphical user interface with Java.

Swing is a set of program component s for **Java** programmers that provide the ability to create graphical user interface (GUI) components, such as buttons and scroll bars, that are independent of the windowing system for specific operating system . **Swing** components are used with the **Java** Foundation Classes (JFC).

The Origins of Swing

The original Java GUI subsystem was the Abstract Window Toolkit (AWT).
AWT translates it visual components into platform-specific equivalents (peers).
Under AWT, the look and feel of a component was defined by the platform.
AWT components are referred to as **heavyweight**.

Swing was introduced in 1997 to fix the problems with AWT.

Swing offers following key features:

1. Platform Independent
2. Customizable
3. Extensible
4. Configurable
5. Lightweight

✓ Swing components are **lightweight** and don't rely on peers.

✓ Swing supports a pluggable look and feel.

✓ Swing is built on AWT.

Model-View-Controller

One component architecture is MVC - Model-View-Controller.

The **model** corresponds to the state information associated with the component.

The **view** determines how the component is displayed on the screen.

The **controller** determines how the component responds to the user.

Swing uses a modified version of MVC called "Model-Delegate". In this model the view (look) and controller (feel) are combined into a "delegate". Because of the Model-Delegate architecture, the look and feel can be changed without affecting how the component is used in a program.

Components and Containers

A component is an independent visual control: a button, a slider, a label, ...

A container holds a group of components.

In order to display a component, it must be placed in a container.

A container is also a component and can be contained in other containers.

Swing applications create a containment-hierarchy with a single top-level container.

Components

Swing components are derived from the **JComponent** class. The only exceptions are the four top-level containers: JFrame, JApplet, JWindow, and JDialog.

JComponent inherits AWT classes Container and Component.

All the Swing components are represented by classes in the javax.swing package.

All the component classes start with **J**: JLabel, JButton, JScrollbar, ...

Containers

There are two types of containers:

1) Top-level which do not inherit JComponent, and

2) Lightweight containers that do inherit JComponent.

Lightweight components are often used to organize groups of components.

Containers can contain other containers.

All the component classes start with **J**: JLabel, JButton, JScrollbar, ...

Top-level Container Panes

Each top-level component defines a collection of "panes". The top-level pane is **JRootPane**.

JRootPane manages the other panes and can add a menu bar.

There are three panes in JRootPane: 1) the glass pane, 2) the content pane, 3) the layered pane.

The content pane is the container used for visual components. The content pane is an instance of JPanel.

The Swing Packages:

Swing is a very large subsystem and makes use of many packages. These are the packages used by Swing that are defined by Java SE 6.

The main package is **javax.swing**. This package must be imported into any program that uses Swing. It contains the classes that implement the basic Swing components, such as push buttons, labels, and check boxes.

Some of the Swing Packages are:

javax.swing	javax.swing.plaf.synth
javax.swing.border	javax.swing.table
javax.swing.colorchooser	javax.swing.text
javax.swing.event	javax.swing.text.html
javax.swing.filechooser	javax.swing.text.html.parser
javax.swing.plaf	javax.swing.text.rtf
javax.swing.plaf.basic	javax.swing.tree
javax.swing.plaf.metal	javax.swing.undo
javax.swing.plaf.multi	

A simple Swing Application;

There are two ways to create a frame:

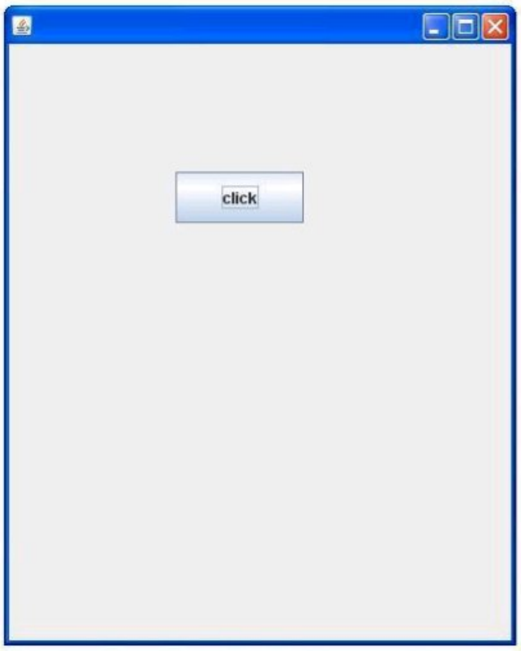
By creating the object of Frame class (association)
By extending Frame class (inheritance)

We can write the code of swing inside the main(), constructor or any other method.

By creating the object of Frame class

```
import javax.swing.*;
public class FirstSwing
{
        public static void main(String[] args)
        {
                JFrame f=new JFrame(" MyApp");
                      //creating instance of JFrame and title of the frame is MyApp.
                JButton b=new JButton("click");
                   //creating instance of JButton  and name of the button is click.
               b.setBounds(130,100,100, 40);     //x axis, y axis, width, height
               f.add(b);                          //adding button in JFrame
               f.setSize(400,500);               //400 width and 500 height
               f.setLayout(null);                 //using no layout managers
               f.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
               f.setVisible(true);              //making the frame visible
        }
}
```

Output:



Explanation:

- ✓ The program begins by importing javax.swing. As mentioned, this package contains the components and models defined by Swing.
- ✓ For example, javax.swing defines classes that implement labels, buttons, text controls, and menus. It will be included in all programs that use Swing. Next,
- ✓ the program declares the FirstSwing class
- ✓ It begins by creating a JFrame, using this line of code:

```
JFrame f = new JFrame("My App");
```

- ✓ This creates a container called f that defines a rectangular window complete with a title bar; close, minimize, maximize, and restore buttons; and a system menu. Thus, it creates a standard, top-level window. The title of the window is passed to the constructor.

Next, the window is sized using this statement:

```
f.setSize(400,500);
```

- ✓ The setSize( ) method (which is inherited by JFrame from the AWT class Component) sets the dimensions of the window, which are specified in pixels. in this example, the width of the window is set to 400 and the height is set to 500.
- ✓ By default, when a top-level window is closed (such as when the user clicks the close box), the window is removed from the screen, but the application is not terminated.
- ✓ If want the entire application to terminate when its top-level window is closed. There are a couple of ways to achieve this. The easiest way is to call setDefaultCloseOperation( ), as the program does:

```
    f.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
```

Swing by inheritance

- ✓ We can also inherit the JFrame class, so there is no need to create the instance of JFrame class explicitly.

```
import javax.swing.*;
public class MySwing extends  JFram   //inheriting JFrame
{
   JFrame f;
   MySwing()
   {
        JButton b=new JButton("click");//create
        button b.setBounds(130,100,100,  40);

        add(b);//adding button on
        frame setSize(400,500);
        setLayout(null);
        setVisible(true);
   }
   public static void main(String[] args)
   {
       new MySwing();
   }
}
```

Jlabel, JTextField and JPassword

- ✓ **JLabel** is Swing's easiest-to-use component. It creates a label and was introduced in the preceding chapter. Here, we will look at JLabel a bit more closely.
- ✓ JLabel can be used to display text and/or an icon. It is a passive component in that it does not respond to user input. JLabel defines several constructors. Here are three of them:

```
JLabel(Icon icon)

JLabel(String str)

JLabel(String str, Icon icon, int align)
```

- ✓ **JTextField** is the simplest Swing text component. It is also probably its most widely used text component. JTextField allows you to edit one line of text. It is derived from JTextComponent, which provides the basic functionality common to Swing text components.

Three of JTextField's constructors are shown here:

JTextField(int cols)

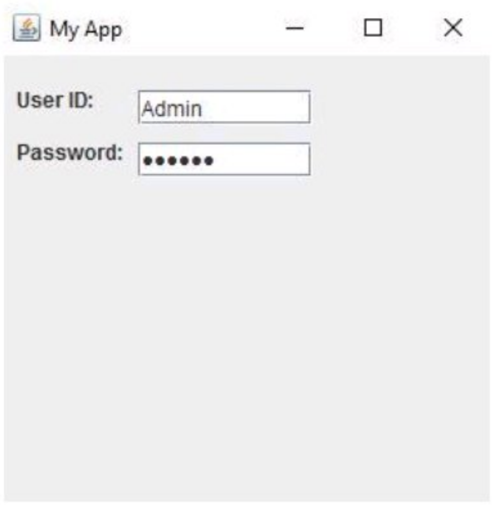
JTextField(String str, int cols)

JTextField(String str)

- ✓ Here, str is the string to be initially presented, and cols is the number of columns in the text field. If no string is specified, the text field is initially empty. If the number of columns is not specified, the text field is sized to fit the specified string.

- ✓ ***JPasswordField*** is a lightweight component that allows the editing of a single line of text where the view indicates something was typed, but does not show the original characters.

```
import javax.swing.*;
public class JTextFieldPgm
{

    public static void main(String[] args)
    {

        JFrame f=new JFrame("My App");

        JLabel namelabel= new JLabel("User ID: ");
        namelabel.setBounds(10, 20, 70, 10);
        JLabel passwordLabel = new JLabel("Password: ");
            passwordLabel.setBounds(10, 50, 70, 10);

                    JTextField userText = new JTextField();
                    userText.setBounds(80, 20, 100, 20);

JPasswordField  passwordText = new JPasswordField();
                    passwordText.setBounds(80, 50, 100, 20);

                    f.add(namelabel);
                    f.add( passwordLabel);
                    f.add(userText);
                    f.add(passwordText);

                    f.setSize(300, 300);
                    f.setLayout(null);
                    f.setVisible(true);

        }

}
```


My App

User ID: Admin

Password: ••••••

ImageIcon with JLabel

- ✓ JLabel can be used to display text and/or an icon. It is a passive component in that it does not respond to user input. JLabel defines several constructors. Here are three of them:

```
JLabel(Icon icon)
JLabel(String str)
JLabel(String str, Icon icon, int align)
```

- ✓ Here, str and icon are the text and icon used for the label.
- ✓ The align argument specifies the horizontal alignment of the text and/or icon within the dimensions of the label. It must be one of the following values: LEFT, RIGHT, CENTER, LEADING, or TRAILING.
- ✓ These constants are defined in the Swing Constants interface, along with several others used by the Swing classes. Notice that icons are specified by objects of type Icon, which is an interface defined by Swing.
- ✓ The easiest way to obtain an icon is to use the ImageIcon class. ImageIcon implements Icon and encapsulates an image. Thus, an object of type ImageIcon can be passed as an argument to the Icon parameter of JLabel's constructor.

```
ImageIcon(String filename)
```

- ✓ It obtains the image in the file named filename. The icon and text associated with the label can be obtained by the following methods:

```
Icon getIcon( )
String getText( )
```

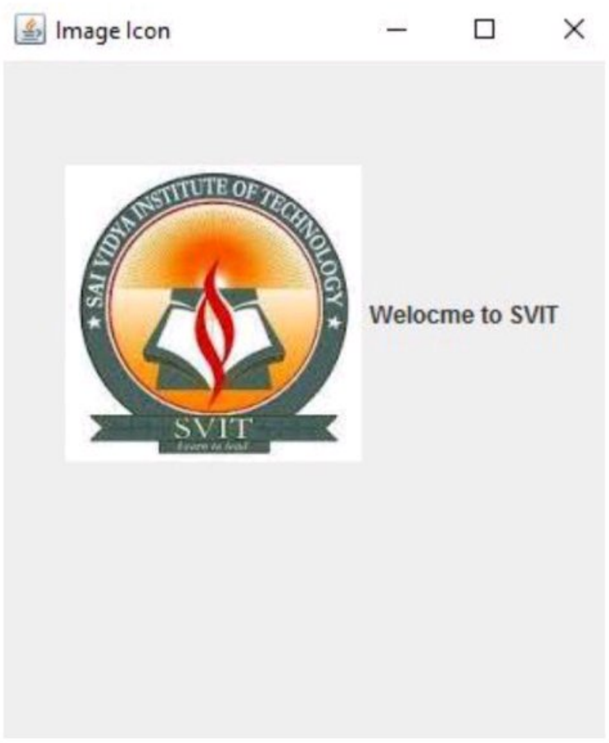
The icon and text associated with a label can be set by these methods:

void setIcon(Icon icon)

void setText(String str)

- ✓ Here, **icon** and **str** are the icon and text, respectively. Therefore, using setText( ) it is possible to change the text inside a label during program execution.

```
import javax.swing.*;

public class PgmImageIcon
{

     public static void main(String[] args)
     {

          JFrame jf=new
          JFrame("Image Icon");
          jf.setLayout(null);

          Icon icon = new ImageIcon("a.jpg");
 JLabel label1 = new JLabel("Welocme to    SVIT",icon,JLabel.RIGHT);
         label1.setBounds(20, 30,
         267, 200); jf.add(label1);


         jf.setSize(
         300,400);
         jf.setVisib
         le(true);
     }

}
```



The Swing Buttons:

There are four types of Swing Button

1. JButton
2. JRadioButton
3. JCheckBox
4. JComboBox

JButton class provides functionality of a button. A JButton is the Swing equivalent of a Button in AWT. It is used to provide an interface equivalent of a common button.

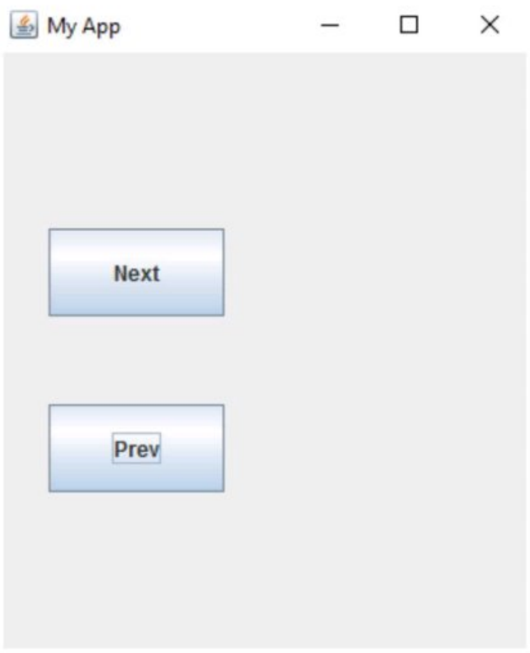
JButton class has three constuctors,

JButton(Icon *ic*)

JButton(String *str*)

JButton(String *str*, Icon *ic*)

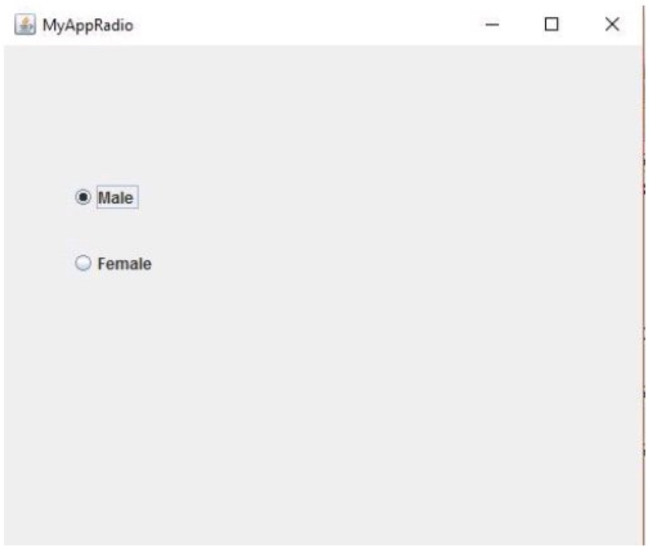
```
import javax.swing.*;

class FirstSwing
{
    public static void main(String args[])
    {
        JFrame jf=new JFrame("My App");

        JButton jb=new JButton("Next");
        jb.setBounds(30, 100, 100, 50);

        JButton jb1=new JButton("Prev");
        jb1.setBounds(30, 200, 100, 50);

        jf.add(jb);
        jf.add(jb1);

        jf.setSize(300, 600);
        jf.setLayout(null);
        jf.setVisible(true);

    }
}
```



A **JRadioButton** is the swing equivalent of a RadioButton in AWT. It is used to represent multiple option single selection elements in a form. This is performed by grouping the JRadio buttons using a ButtonGroup component. The ButtonGroup class can be used to group multiple buttons so that at a time only one button can be selected.

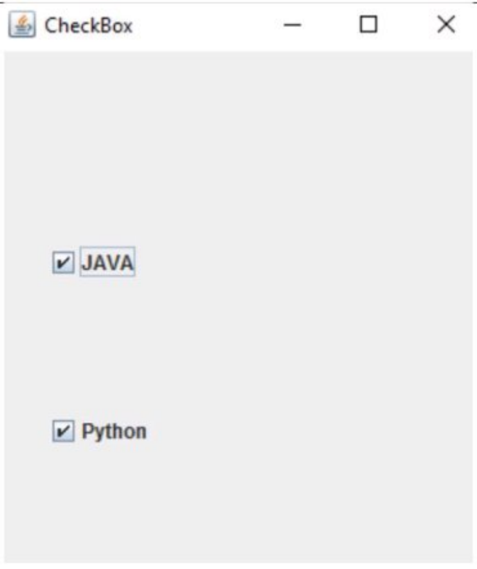
```
import javax.swing.*;

import javax.swing.*;
public class RadioButton1
{
    public static void main(String args[])
    {

        JFrame f=new JFrame("MyAppRadio");

    JRadioButton r1=new JRadioButton("Male ");

    JRadioButton r2=new JRadioButton("Female");

        r1.setBounds(50, 100, 70, 30);
```

```
            r2.setBounds(50,150,70,30);

            ButtonGroup bg=new
            ButtonGroup(); bg.add(r1);
            bg.add(r2);


            f.add(r1)
            ;
            f.add(r2)
            ;

            f.setSize(500,500);
            f.setLayout(null);
            f.setVisible(true);
      }
}
```



A **JCheckBox** is the Swing equivalent of the Checkbox component in AWT. This is sometimes called a ticker box, and is used to represent multiple option selections in a form.

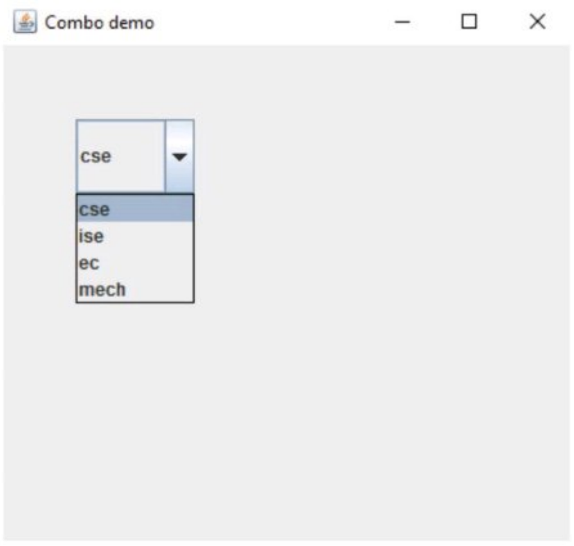
```
import javax.swing.*;

class FirstSwing
{
     public static void main(String args[])
     {
          JFrame jf=new JFrame("CheckBox");

          JCheckBox jb=new JCheckBox("JAVA");
          jb.setBounds(30, 100, 100, 50);

          JCheckBox jb1=new JCheckBox("Python");
          jb1.setBounds(30, 200, 100, 50);

          jf.add(jb);
          jf.add(jb1);

          jf.setSize(300, 600);
          jf.setLayout(null);
          jf.setVisible(true);

     }
}
```



JComboBox

The JComboBox class is used to create the combobox (drop-down list). At a time only one item can be selected from the item list.

```
import java.awt.*;

import javax.swing.*;

public class Comboexample

{

        public static void main(String[] args)

        {

                JFrame f=new JFrame("Combo demo");

                String Branch[]={"cse","ise","ec","mech"};

                JComboBox jc=new JComboBox(Branch);

                jc.setBounds(50,50,80,50);

                f.add(jc);

                f.setSize(400, 400);

                f.setLayout(null);

                f.setVisible(true);

        }

}
```



JTable and JScrollPane:

The JTable class is used to display the data on two dimensional tables of cells.

Commonly used Constructors of JTable class:

JTable(): creates a table with empty cells.

JTable(Object[ ][ ] rows, Object[ ] columns): creates a table with the specified data.

- ✓ JScrollPane is a lightweight container that automatically handles the scrolling of another component.
- ✓ The component being scrolled can either be an individual component, such as a table, or a group of components contained within another lightweight container, such as a JPanel.
- ✓ In either case, if the object being scrolled is larger than the viewable area, horizontal and/or vertical scroll bars are automatically provided, and the

component can be scrolled through the pane. Because JScrollPane automates scrolling, it usually eliminates the need to manage individual scroll bars.

- ✓ The viewable area of a scroll pane is called the viewport.
- ✓ It is a window in which the component being scrolled is displayed.
- ✓ Thus, the view port displays the visible portion of the component being scrolled. The scroll bars scroll the component through the viewport.
- ✓ In its default behavior, a JScrollPane will dynamically add or remove a scroll bar as needed. For example, if the component is taller than the viewport, a vertical scroll bar is added. If the component will completely fit within the viewport, the scroll bars are removed.

```
import javax.swing.*;
public class TableExample1
{
     public static void main(String[] args)
     {
          // TODO Auto-generated method stub
          JFrame f=new JFrame("Table Demo");

          String data[][]={
                                        {"100","CSE","VTU"}
                                        ,
                                        {"101","ISE","VTU"}
                                        ,
                                        {"102","CSE","VTU"}
                                        ,
                                        {"103","ISE","VTU"}
                                        ,
                                        {"105","ISE","VTU"}
                                        ,
                                        {"106","ISE","VTU"}
                                   };
     String column[]={"courseID","Branch","University"};

          JTable jt=new JTable(data,column);
```

```
            JScrollPane js=new JScrollPane(jt);
            js.setBounds(30,100,300,100);
            f.add(js);

             f.setSize(300,400);
             f.setLayout(null);
             f.setVisible(true);

      }
}
```

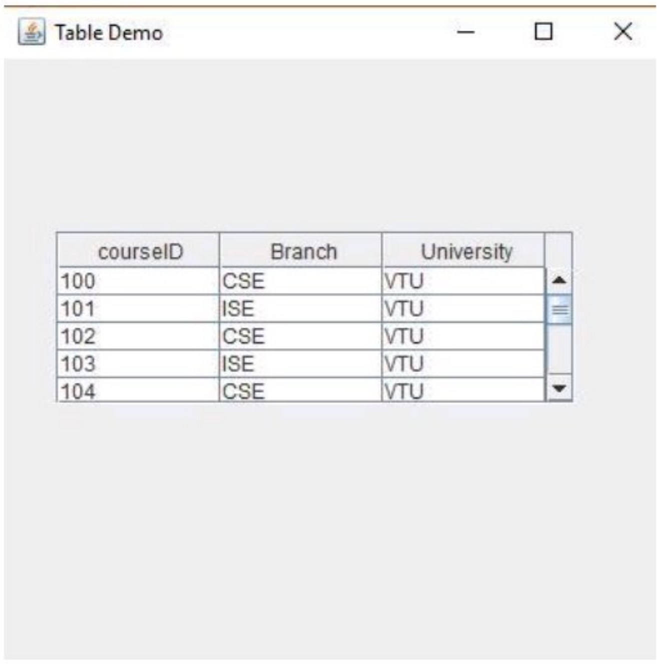


Table Demo

courseID	Branch	University
100	CSE	VTU
101	ISE	VTU
102	CSE	VTU
103	ISE	VTU
104	CSE	VTU

JTabbedpane

- ✓ JTabbedPane encapsulates a tabbed pane. It manages a set of components by linking them with tabs.
- ✓ Selecting a tab causes the component associated with that tab to come to the forefront. Tabbed panes are very common in the modern GUI.

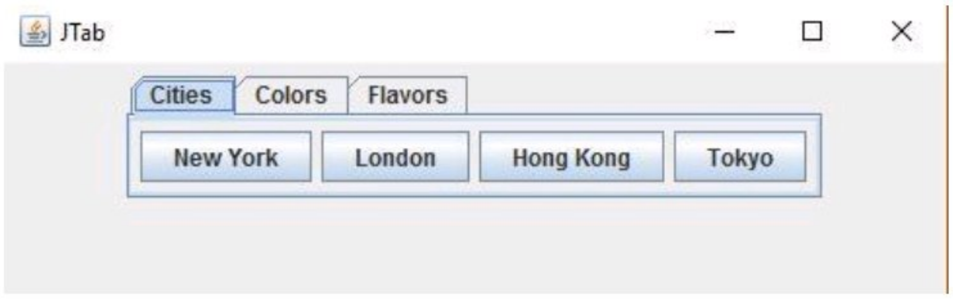
- ✓ Given the complex nature of a tabbed pane, they are surprisingly easy to create and use. JTabbedPane defines three constructors. We will use its default constructor, which creates an empty control with the tabs positioned across the top of the pane.
- ✓ The other two constructors let you specify the location of the tabs, which can be along any of the four sides.
- ✓ JTabbedPane uses the SingleSelectionModel model. Tabs are added by calling **addTab( ) method.** Here is one of its forms:

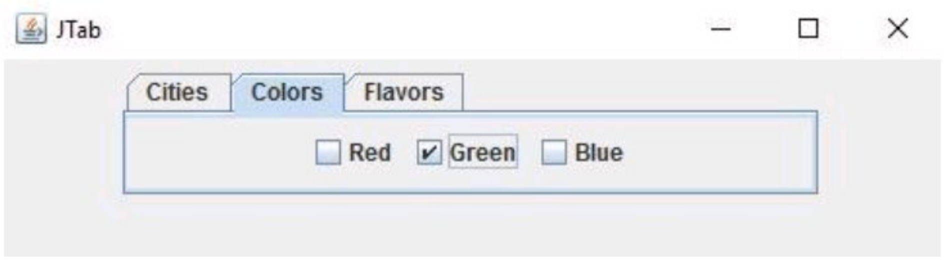
  void addTab(String name, Component comp)

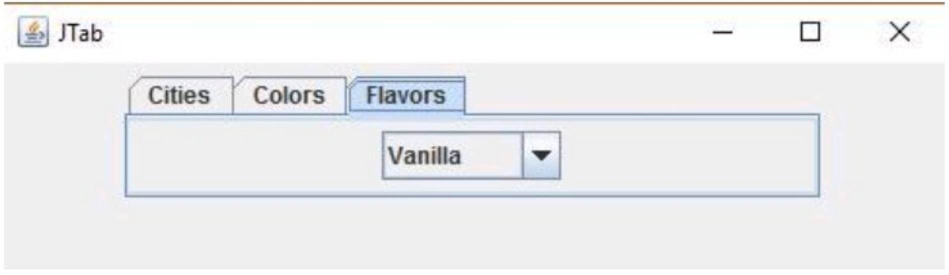
- ✓ Here, **name** is the name for the tab, and **comp** is the component that should be added to the tab. Often, the component added to a tab is a JPanel that contains a group of related components. This technique allows a tab to hold a set of components.

```
import javax.swing.*;



public class MainClass

{

  public static void main(String[] a)

  {

    JFrame f = new JFrame("JTab");


    f.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

    f.add(new JTabbedPaneDemo());
    f.setSize(500, 500);

    f.setVisible(true);

  }

}

class JTabbedPaneDemo extends JPanel

{

                JTabbedPaneDemo()

                {

                        makeGUI();

                }

              void makeGUI()

                {

                            JTabbedPane jtp = new JTabbedPane();

                            jtp.addTab("Cities", new CitiesPanel());

                            jtp.addTab("Colors", new ColorsPanel());

                            jtp.addTab("Flavors", new FlavorsPanel());

                            add(jtp);

                }

}
```

```
class CitiesPanel extends JPanel

{

  public CitiesPanel()

  {

    JButton b1 = new JButton("NewYork");

    add(b1);

    JButton b2 = new JButton("London");

    add(b2);

    JButton b3 = new JButton("Hong Kong");

    add(b3);

    JButton b4 = new JButton("Tokyo");

    add(b4);

  }

}

class ColorsPanel extends JPanel

{

  public ColorsPanel()

  {

   JCheckBox cb1 = new

    JCheckBox("Red"); add(cb1);

    JCheckBox cb2 = new

    JCheckBox("Green"); add(cb2);
    JCheckBox cb3 = new

    JCheckBox("Blue"); add(cb3);

  }

}



class FlavorsPanel extends JPanel

{

  public FlavorsPanel()

  {

    JComboBox jcb = new JComboBox();

    jcb.addItem("Vanilla");

    jcb.addItem("Chocolate");

    jcb.addItem("Strawberry");

    add(jcb);

  }

}
```







JList:

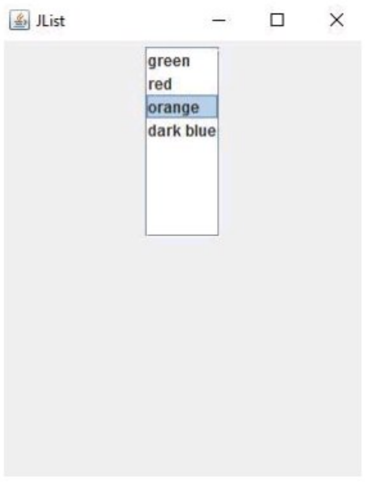
- ✓ In Swing, the basic list class is called JList.
- ✓ It supports the selection of one or more items from a list.
- ✓ Although the list often consists of strings, it is possible to create a list of just about any object that can be displayed.
- ✓ JList is so widely used in Java that it is highly unlikely that you have not seen one before.

JList provides several constructors. The one used here is

```
JList(Object[ ] items)
```

- ✓ This creates a JList that contains the items in the array specified by items.
- ✓ JList is based on two models. The first is ListModel. This interface defines how access to the list data is achieved.
- ✓ The second model is the ListSelectionModel interface, which defines methods that determine what list item or items are selected.

```
import java.awt.FlowLayout;

import javax.swing.*;

public class JListPgm
{
  public static void main(String[] args)
  {

    JFrame frame = new JFrame("JList");

String[] selections = { "green", "red", "orange", "dark blue"
    }; JList list = new JList(selections);

    list.setSelectedIndex(1);

    frame.add(new JScrollPane(list));

    frame.setSize(300, 400);
    frame.setLayout(new FlowLayout());
    frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

    frame.setVisible(true);
  }

}
```



	Java AWT	Java Swing
1)	AWT components are **platform-dependent**.	Java swing components are **platform-independent**.
2)	AWT components are **heavyweight**.	Swing components are **lightweight**.
3)	AWT **doesn't support pluggable look and feel**.	Swing **supports pluggable look and feel**.
4)	AWT provides **less components** than Swing.	Swing provides **more powerful components** such as tables, lists, scrollpanes, colorchooser, tabbedpane etc.
5)	AWT **doesn't follows MVC**(Model View Controller) where model represents data, view represents presentation and controller acts as an interface between model and view.	Swing **follows MVC**.

Questions

1. Write a swing applet program to demonstrate with two JButtons named India and Srilanka. When either of button pressed, it should display respective label with its icon. Refer the image icon
   "india.gif" and "srilanka.gif". set the initial label is "press the button" **(Jan 2015)10marks**
2. Explain JscrollPane with an example. **(Jan 2015) 5marks**
3. Explain IComboBox with an example. **(Jan 2015) 5marks**
4. Name & Explain the different types of Swing Buttons with syntax.
   (Jan 2014) 10 Marks
5. Write the steps to create J-table.write a program to create a table with column heading "fname,lname,age" and insert at least five records in the table and display. (Jan 2014) 10 Marks

6. Differentiate between AWT and Swings? (Jan 2013) 05 Marks

7. Explain the MVC architecture of swings?(Jan 2013)10 Marks

8. Describe the different types of swing button? ?(Jan 2013)10 Marks

9. What is a swing ? explain the components and containers in the swings (Dec 2011)08Marks

10. Explain the following with an example for each

    i)JTextField class ii)JButton class iii)JComboBox Class

    (Dec 2011)12Marks

11. Explain the following swing buttons.

    A. JButton **B**. JToggleButton

    C. ChekBoxes **D**. Radio Buttons

12. Explain the concept of JComboBox and JTable. (Jan-2010)

13. Write a program which displays the contents of an array in the tabular format.