

# Swing

## ECE 155B – Spring 2012

### Discussion Section 1.2

#### **What is Swing?**

Swing is the second version of Java's Graphical User Interface (GUI) toolkit; the first version was the Advanced Windows Toolkit (AWT). Swing provides interface elements (widgets) that can be combined to form useful (and not so useful) GUIs.

#### **How do I use Swing?**

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

Some useful functionality exists in `java.awt.*` and `java.awt.event.*`, but we will not be using the AWT toolkit for GUI components.

#### **Where can I find more info about Swing?**

##### Online References

<http://www.apl.jhu.edu/~hall/java/Swing-Tutorial/>

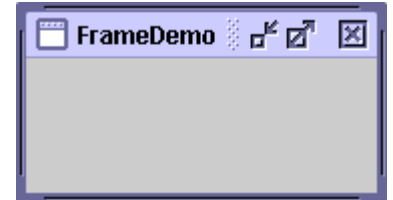
<http://www.thejavatutorial.com>

<http://java.sun.com>, the definitive reference for API's

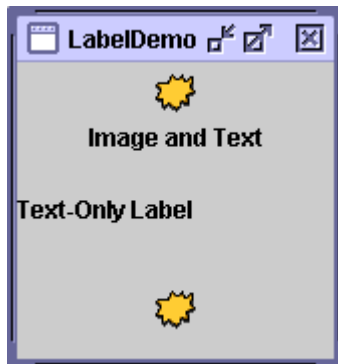
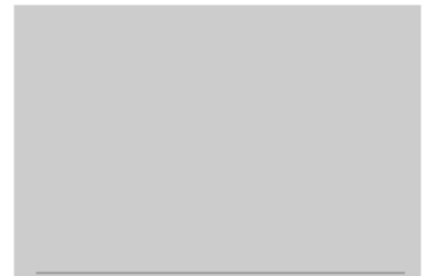
## Swing

### Most common GUI components:

A **JFrame** is a window that typically has decorations such as a border, a title, and buttons for closing and iconifying the window. We can add other components into JFrame to create our own GUI.



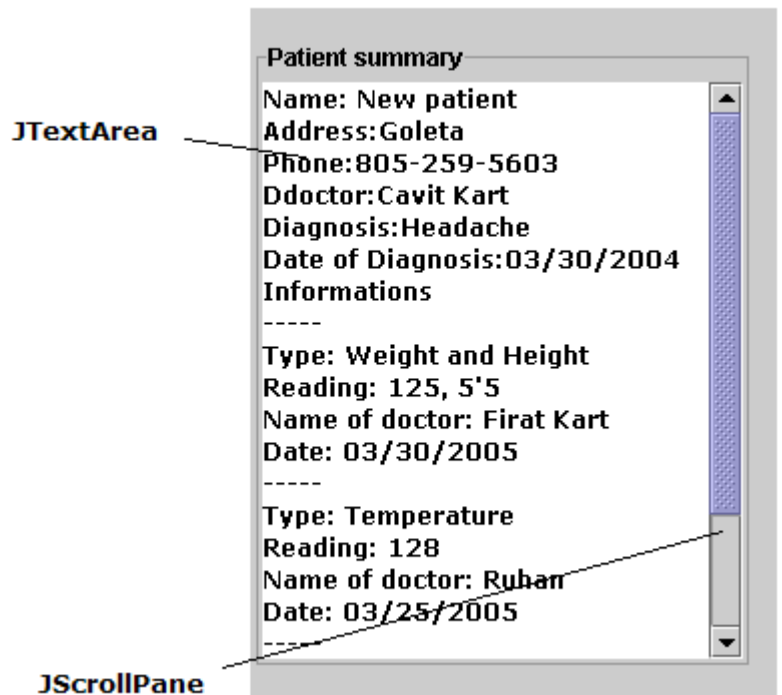
**JPanel** is a container to which we can add GUI components such as JLabel, JButton, JTextArea, JTextField, etc. A panel has its own layout, which we will discuss later. The components are placed according to the layout.



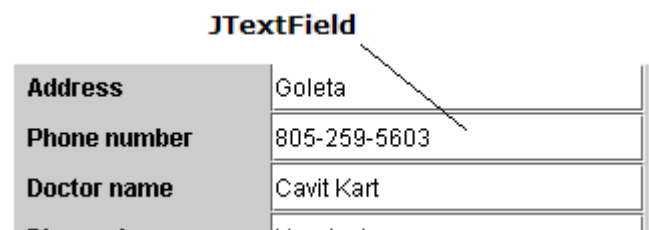
**JButton**, images, **checkbox**, **radiobox**, etc. These are common components of any graphical user interface. The actions for each component will be discussed in the actions section.



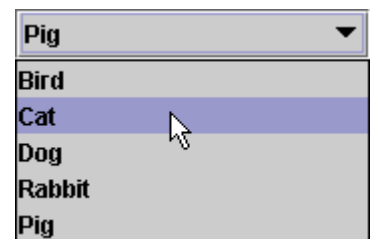
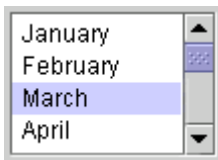
**TextArea** is another commonly used component. It is good to use it with a **ScrollPane**. Example code makes it easier to understand. TextArea may have more than one line, which is why we need a scroller to make it easier to use. It is similar to the textarea tag of HTML.



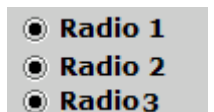
**TextField** Unlike TextArea, TextField has at most one line. It is similar to the text type of input in HTML.



**JList** and **JComboBox** work the same way. The difference is that JList can show more than one line of list data. However, JComboBox pops up a window where the content with some number of items is listed, and the rest is accessible via a scroller. These kinds of components are good for selecting information from possible choices. Additionally, with JList, one can select more than one input at a time.



**JRadioButton** and **JCheckBox** It is possible that you will need to use radio buttons in an application. One can create a radio button group so that only one of them is selected at a time. JCheckBox is similar.



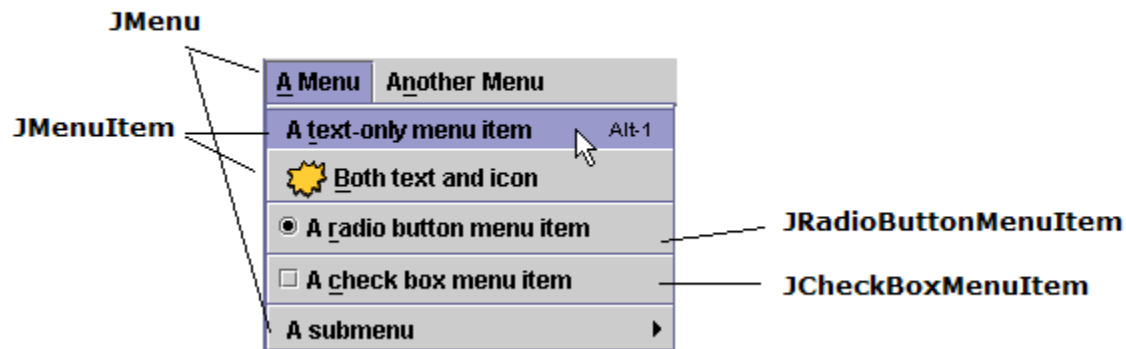
| First Name | Last Name | Favorite Food                                                                     |
|------------|-----------|-----------------------------------------------------------------------------------|
| Jeff       | Dinkins   |  |
| Ewan       | Dinkins   |                                                                                   |
| Amy        | Fowler    |                                                                                   |
| Hania      | Gajewska  |                                                                                   |
| David      | Geary     |                                                                                   |

In most database applications, you will need **JTable** to display your information.



**JToolBar** is another component that you can use if you want to display commonly used buttons in a panel. It has several features, can move in or out of a window (i.e., toolbar in PhotoShop, or Paint)

### JMenuBar



Often an application will have a menu at the top of the application. A JMenuBar is attached to JFrame or another window component. One or more JMenu objects can be added, each of which may contain more than one JMenu or JMenuItem. You can see the effect of adding a JMenu into Jmenu in the above diagram.



In some applications, a progress bar may be needed. Generally speaking, the more windows components you have in your GUI, the more interactive your program becomes. We advise you to study these components.

## Example Code

| Code                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre>import javax.swing.*;  public class HelloWorldSwing {      public HelloWorldSwing()     {         super("Hello World");         setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);          JLabel label = new JLabel("Hello World");         getContentPane().add(label);          setSize(200,200);         setVisible(true);     }      public static void main(String[] args)     {         new HelloWorldSwing();     } }</pre> | <p>Import necessary packages</p> <p>Set title of the window<br/>When we press the close button of the window, close it<br/>Create a JLabel object that will display the indicated text<br/>Add that object to the main panel</p> <p>Set the size of the window<br/>Make it visible</p> <p>Create an instance of the class</p> |
| GUI                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                               |

| Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| <pre>import java.awt.*; import javax.swing.*;  public class JButtons extends JFrame {     public static void main(String[] args) {         new JButtons();     }      public JButtons() {         super("Using JButton");         Container content = getContentPane();         content.setBackground(Color.white);         content.setLayout(new FlowLayout());          JButton button1 = new JButton("Java");         content.add(button1);         ImageIcon cup = new ImageIcon("images/cup.gif");         JButton button2 = new JButton(cup);     } }</pre> | <p>Layout will be discussed</p> <p>A button may have text and/or images</p> |

|                                                                                                                                                                                                                                                       |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <pre> content.add(button2); JButton button3 = new JButton("Java", cup); content.add(button3); JButton button4 = new JButton("Java", cup); button4.setHorizontalTextPosition(SwingConstants.LEFT); content.add(button4);  setVisible(true); } } </pre> |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

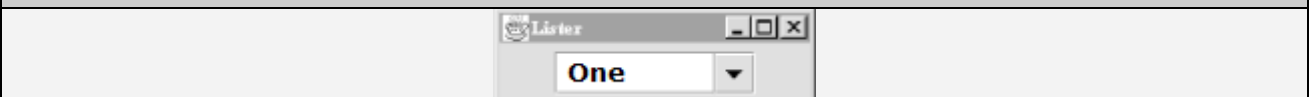
#### GUI



#### Code

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <pre> import java.awt.*; import java.awt.event.*; import javax.swing.*;  public class Lister {     public static void main(String[] args) {         JFrame f = new JFrame("Lister");         f.setSize(200, 200);         f.setLocation(200, 200);          String [] items = { "one", "two", "three", "four", "five",                            "six", "seven", "eight", "nine", "ten",                            };         JComboBox comboBox = new JComboBox(items);         comboBox.setEditable(true);          // Put the controls the content pane         Container c = f.getContentPane( );         JPanel comboPanel = new JPanel( );         comboPanel.add(comboBox);         c.add(comboPanel, BorderLayout.CENTER);         f.setVisible(true);     } } </pre> |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

#### GUI



#### Code

```

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

public class DinnerMenu extends JFrame {

    public DinnerMenu( ) {
        super("DinnerMenu v1.0");
        setSize(200, 200);
        setLocation(200, 200);

        // Create the Utensils menu
        JMenu utensils = new JMenu("Utensils");
        utensils.setMnemonic(KeyEvent.VK_U);
        utensils.add(new JMenuItem("Fork"));
        utensils.add(new JMenuItem("Knife"));
        utensils.add(new JMenuItem("Spoon"));
        JMenu hybrid = new JMenu("Hybrid");
        hybrid.add(new JMenuItem("Spork"));
        hybrid.add(new JMenuItem("Spife"));
        hybrid.add(new JMenuItem("Knork"));
        utensils.add(hybrid);
        utensils.addSeparator( );

        // Do some fancy stuff with the Quit item
        JMenuItem quitItem = new JMenuItem("Quit");
        quitItem.setMnemonic(KeyEvent.VK_Q);
        quitItem.setAccelerator(
            KeyStroke.getKeyStroke(KeyEvent.VK_Q,      Event.CTRL_MASK));
        utensils.add(quitItem);

        // Create the Spices menu
        JMenu spices = new JMenu("Spices");
        spices.setMnemonic(KeyEvent.VK_S);
        spices.add(new JCheckBoxMenuItem("Thyme"));
        spices.add(new JCheckBoxMenuItem("Rosemary"));
        spices.add(new JCheckBoxMenuItem("Oregano", true));
        spices.add(new JCheckBoxMenuItem("Fennel"));

        // Create the Cheese menu
        JMenu cheese = new JMenu("Cheese");
        cheese.setMnemonic(KeyEvent.VK_C);
        ButtonGroup group = new ButtonGroup( );
        JRadioButtonMenuItem rbmi;
        rbmi = new JRadioButtonMenuItem("Regular", true);
        group.add(rbmi);
        cheese.add(rbmi);
        rbmi = new JRadioButtonMenuItem("Extra");
        group.add(rbmi);
        cheese.add(rbmi);
        rbmi = new JRadioButtonMenuItem("Blue");
        group.add(rbmi);
        cheese.add(rbmi);
    }
}

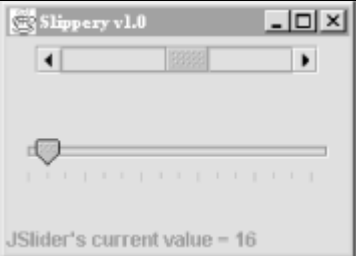
```

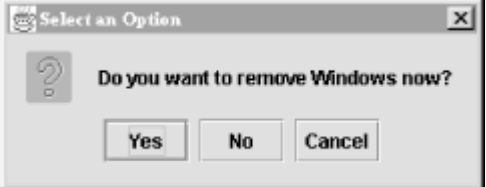
| <pre>// Create a menu bar and use it in this JFrame JMenuBar menuBar = new JMenuBar( ); menuBar.add(utensils); menuBar.add(spices); menuBar.add(cheese); setJMenuBar(menuBar); setVisible(true); }  public static void main(String[] args) {     new DinnerMenu( ); } }</pre> |                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| GUI                                                                                                                                                                                                                                                                           |                                                                                    |
|                                                                                                                                                                                                                                                                               |  |

| Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre>import java.awt.*; import java.awt.event.*; import javax.swing.*; import javax.swing.border.*;  public class TabbedPaneFrame {     public static void main(String[] args) {         // Create a JFrame to hold everything         JFrame f = new JFrame("TabbedPaneFrame");         f.setSize(200, 200);         f.setLocation(200, 200);          JTabbedPane tabby = new JTabbedPane( );          // Create a controls pane         JPanel controls = new JPanel( );         controls.add(new JLabel("Service:"));         JList list = new JList(             new String[] { "Web server", "FTP server" });         list.setBorder(BorderFactory.createEtchedBorder( ));         controls.add(list);         controls.add(new JButton("Start"));          // Create an image pane         String filename = "Piazza di Spagna.jpg";</pre> | <p>A tab requires separate JPanels that are attached to it.</p> <p>Using addTab(Component) method, you can add a new tab.</p> <p>For example, from one tab you can input data and from another tab see it, or another GUI of the program.</p> |

| <pre> Image image = Toolkit.getDefaultToolkit().getImage(filename); JComponent picture = new JScrollPane(new ImageComponent(image));  tabby.addTab("Controls", controls); tabby.addTab("Picture", picture);  f.getContentPane().add(tabby); f.setVisible(true); } } </pre> |                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| GUI                                                                                                                                                                                                                                                                        |                                                                                    |
|                                                                                                                                                                                                                                                                            |  |

| Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <pre> import java.awt.*; import java.awt.event.*; import javax.swing.*; import javax.swing.event.*;  public class Slippery extends JFrame {      public Slippery( ) {         super("Slippery v1.0");         setSize(220, 160);         setLocation(200, 200);         Container content = getContentPane( );          JPanel main = new JPanel(new GridLayout(2, 1));         JPanel scrollBarPanel = new JPanel( );         final JScrollBar scrollBar =             new JScrollBar(JScrollBar.HORIZONTAL, 0, 48, 0, 255);         int height = scrollBar.getPreferredSize( ).height;         scrollBar.setPreferredSize(new Dimension(175, height));         scrollBarPanel.add(scrollBar);         main.add(scrollBarPanel);          JPanel sliderPanel = new JPanel( );         final JSlider slider =             new JSlider(JSlider.HORIZONTAL, 0, 255, 128);         slider.setMajorTickSpacing(48);         slider.setMinorTickSpacing(16); </pre> |  |

| <pre> slider.setPaintTicks(true); sliderPanel.add(slider); main.add(sliderPanel); content.add(main, BorderLayout.CENTER); final JLabel statusLabel =     new JLabel("Welcome to Slippery v1.0"); content.add(statusLabel, BorderLayout.SOUTH);  }  public static void main(String[] args) {     JFrame f = new Slippery( );     f.setVisible(true); } } </pre> |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| GUI                                                                                                                                                                                                                                                                                                                                                            |  |
|                                                                                                                                                                                                                                                                             |  |

| Code                                                                                                                                                                                                                                                                                                               |                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <pre> JOptionPane.showMessageDialog(frame, "You are low on memory.",     "Apocalyptic message", JOptionPane.WARNING_MESSAGE);  int result = JOptionPane.showConfirmDialog(null,     "Do you want to remove Windows now?");  String name = JOptionPane.showInputDialog(null,     "Please enter your name."); </pre> | <p>JOptionPane is Java's predefined objects and used to inform user, or prompt for data.</p> <p>It is better to check all of these.</p> |
| GUI                                                                                                                                                                                                                                                                                                                |                                                                                                                                         |
|                                                                                                                                                                                                                                |                                                                                                                                         |

| Code                                                                            |  |
|---------------------------------------------------------------------------------|--|
| <pre> import java.awt.*; import java.awt.event.*;  import javax.swing.*; </pre> |  |

```

public class DriveThrough {
    public static void main(String[] args) {
        JFrame f = new JFrame("Lister v1.0");
        f.setSize(300, 150);
        f.setLocation(200, 200);
        f.addWindowListener(new WindowAdapter() {
            public void windowClosing(WindowEvent we) {
                System.exit(0);
            }
        });

        JPanel entreePanel = new JPanel();
        final ButtonGroup entreeGroup = new ButtonGroup();
        JRadioButton radioButton;
        entreePanel.add(radioButton = new JRadioButton("Beef"));
        radioButton.setActionCommand("Beef");
        entreeGroup.add(radioButton);
        entreePanel.add(radioButton = new JRadioButton("Chicken"));
        radioButton.setActionCommand("Chicken");
        entreeGroup.add(radioButton);
        entreePanel.add(radioButton =
            new JRadioButton("Veggie", true));
        radioButton.setActionCommand("Veggie");
        entreeGroup.add(radioButton);

        final JPanel condimentsPanel = new JPanel();
        condimentsPanel.add(new JCheckBox("Ketchup"));
        condimentsPanel.add(new JCheckBox("Mustard"));
        condimentsPanel.add(new JCheckBox("Pickles"));

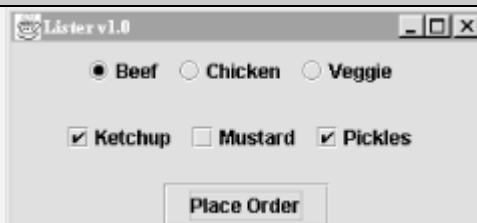
        JPanel orderPanel = new JPanel();
        JButton orderButton = new JButton("Place Order");
        orderPanel.add(orderButton);

        Container content = f.getContentPane();
        content.setLayout(new GridLayout(3, 1));
        content.add(entreePanel);
        content.add(condimentsPanel);
        content.add(orderPanel);

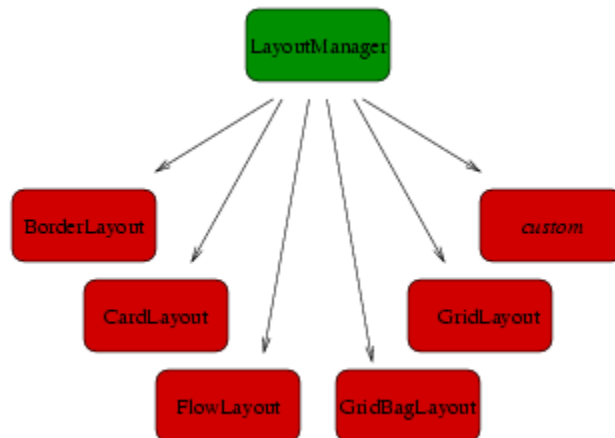
        f.setVisible(true);
    }
}

```

#### GUI



## About Layouts



### Custom

You define the location of components by window reference.

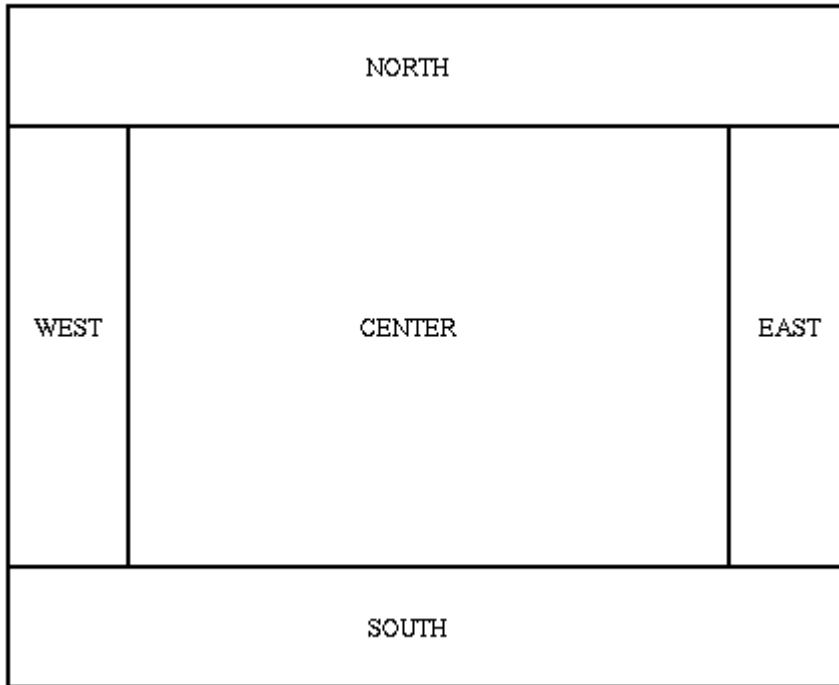
### Flow Layout

Data is not information is  
not knowledge is not wisdom.

Data is  
not  
information  
is not  
knowledge  
is not  
wisdom.

Objects will be located according to window size. When a row cannot hold the next component, the new line is used.

## Border Layout



This is the most popular layout, and we advise you to use this one. Prepare a sketch of your GUI and try to find which objects will go in which part of the layout. Keep in mind that a panel can include another panel. The following is a possible GUI for our project. We split the main container into two parts, left and right. In the right panel we have a text field object, and in the left panel we have three items. We can use the Grid Layout, which is discussed below. In the three inner panels we need to use another layout, with similar left and right parts. So we will use Border Layout and locate inner panels in the WEST and EAST parts of the layout.

Distributor - Firat
File Help

Company Information

Name
Contact

Address

Items sold & Availability

Items required

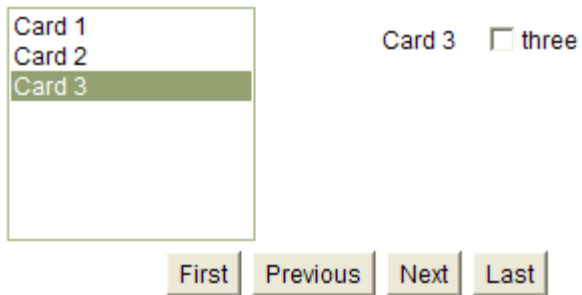
Store Information

## Grid Layout

|    |    |    |    |
|----|----|----|----|
| 1  | 2  | 3  | 4  |
| 5  | 6  | 7  | 8  |
| 9  | 10 | 11 | 12 |
| 13 | 14 | 15 |    |

Grid Layout is a neat way of putting your components into a panel. You specify the number of items in a column and optionally in a row. In the example above we created layout object as `new GridLayout()`.

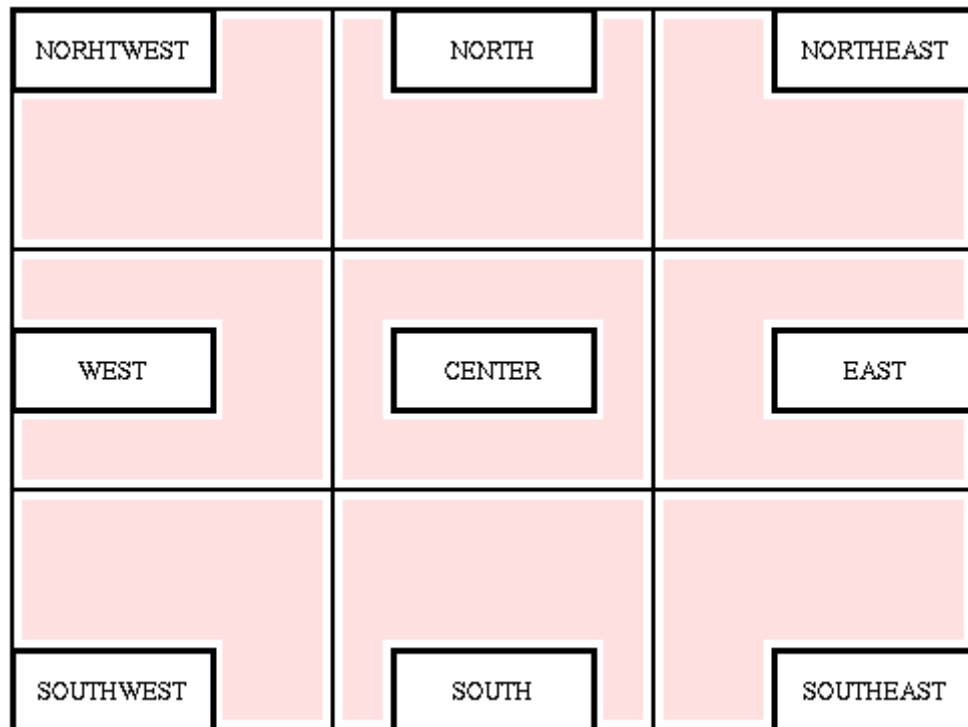
## Card Layout



Card Layout locates objects as cards, each having the same size.

## Grid Bag Layout

| constraint | Description                                                | values     | default |
|------------|------------------------------------------------------------|------------|---------|
| anchor     | where in cell                                              | CENTER     | CENTER  |
|            |                                                            | EAST       |         |
|            |                                                            | NORTH      |         |
|            |                                                            | NORTHEAST  |         |
| fill       | directions to stretch                                      | HORIZONTAL | NONE    |
|            |                                                            | VERTICAL   |         |
|            |                                                            | BOTH       |         |
|            |                                                            | NONE       |         |
| gridx      | horizontal grid component                                  |            |         |
| gridy      | vertical grid component                                    |            |         |
| gridwidth  | span of component in columns                               | RELATIVE   | 1       |
|            |                                                            | REMAINDER  |         |
| gridheight | span of component in rows                                  | RELATIVE   | 1       |
|            |                                                            | REMAINDER  |         |
| ipadx      | horizontal padding outside cell                            |            |         |
| ipady      | vertical padding outside cell                              |            |         |
| insets     | internal padding around component<br>top,left,bottom,right |            | 0,0,0,0 |
| weightx    | horizontal proportion of this cell                         |            |         |
| weighty    | vertical proportion of this cell                           |            |         |



## Actions

### JButtons

When a button is pressed, an action is performed and you need to write that function.

```
button.addActionListener(new ActionListener(){
    public void actionPerformed(ActionEvent e)
    {
        ... // Events
    }
});
```

### JComboBox

Here are some methods that you should know:

***getSelectedIndex ()***

returns the selected index, starting from 0

***getComponentCount ()***

returns the selected index as object

***updateUI ()***

when a change in the data content is present, call this method to see the effect.

```
combobox.addActionListener(new ActionListener(){
    public void actionPerformed(ActionEvent e)
    {
        ... // Events
    }
});
```

In most components, the `addActionListener` method will be present and most of the time it will suffice to do basic tasks. Some components have `ItemStatusChanged`, `addComponentListener`, `addContainerListener`, etc.

## Helpful Hints

When designing your GUI

1. Draw a sketch first
2. Consider the number of panels, and where and how they will be located in the space available
3. Add components to these panels
4. Add action listeners to components
5. Test the behavior of each of the action listeners

When developing a large system, try to design it with separate components. Choose methods that will make it easy to find your mistakes quickly and that are easy for the reader to understand. Add a component first and test it, and later add an action listener.