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Consulting
Development
Education

Creating a GUI with Swing

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User Interface

- **User interface** is the part of a computer and its software that people can see, hear, touch, talk to, or otherwise understand or direct
- A **user interface** is a collection of techniques and mechanisms to interact with something
- Proper interface design will provide a mix of well-designed **input and output mechanisms**
- User interface design is a subset of a field of study called **human-computer interaction** (HCI)
- **Graphical User Interface** – primary interaction mechanism is a **pointing device** of some kind

Wilbert O. Galitz: The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, 2nd Edition, John Wiley & Sons, 2002, 736 pp.

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Swing and AWT

- Collection of APIs for developing interactive GUI applications
- **AWT** (`java.awt`) – Abstract Window Toolkit
  - Some AWT components use native code
  - Platform-dependent look
- **Swing toolkit** (`javax.swing`)
  - Written entirely using the Java programming language
  - Platform-independent
  - Ensures applications deployed across different platforms have the same appearance – look and feel

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GUI Components

- A **component** is an object having a **graphical representation** that can be displayed on the screen and that **can interact with the user**
- Parent of GUI Swing components classes is class `JComponent`

Sun Microsystems: Java Look and Feel Design Guidelines. 2nd Edition, Addison Wesley Professional, 2001, 416 pp.
Sun Microsystems: Java Look and Feel Design Guidelines: Advanced Topics. Addison Wesley Professional, 2002, 200 pp.
Mauro Marinilli: Professional Java User Interfaces. Wiley, 2006, 668 pp.

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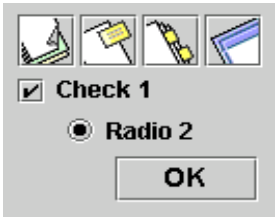
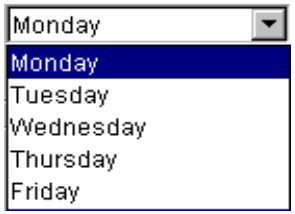
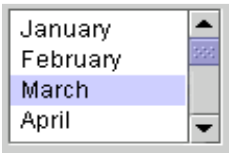
GUI Components



JButton, JToggleButton,
JCheckBox, JRadioButton

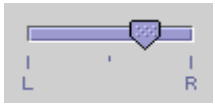


JComboBox



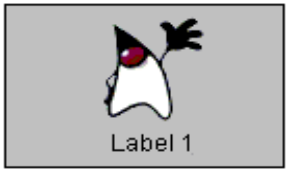
JList

JMenu



JSlider

JTextField
JPasswordField

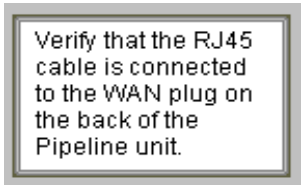


JLabel

JProgressBar

JToolTip

JTable

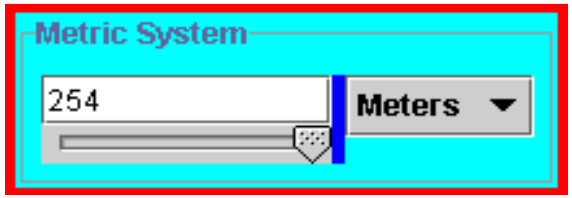


JTextArea
JTextPane, JEditorPane

JTree

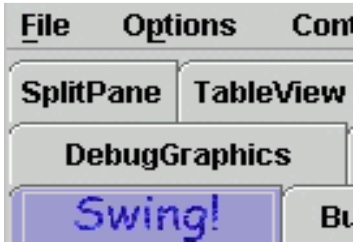
GUI Container

- **Container** is a component that can contain other components



JPanel

JScrollPane



JTabbedPane

JToolBar

JSplitPane

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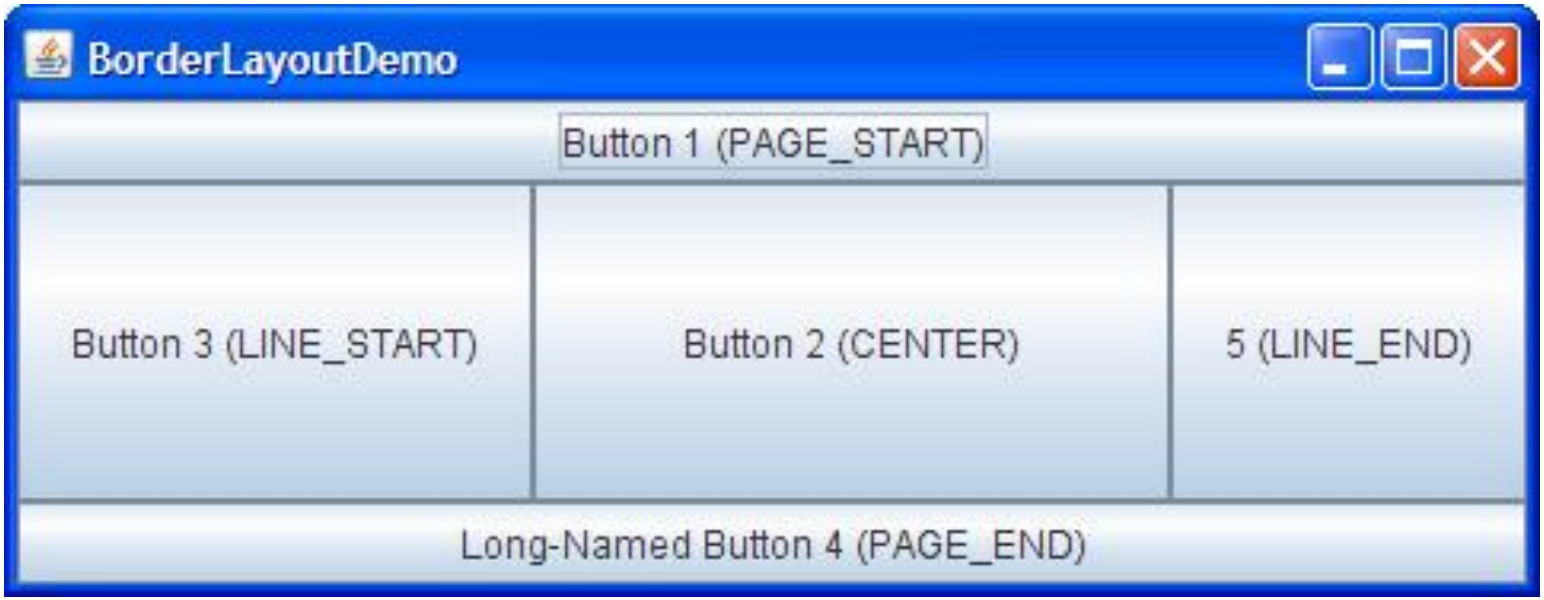
Layout Manager

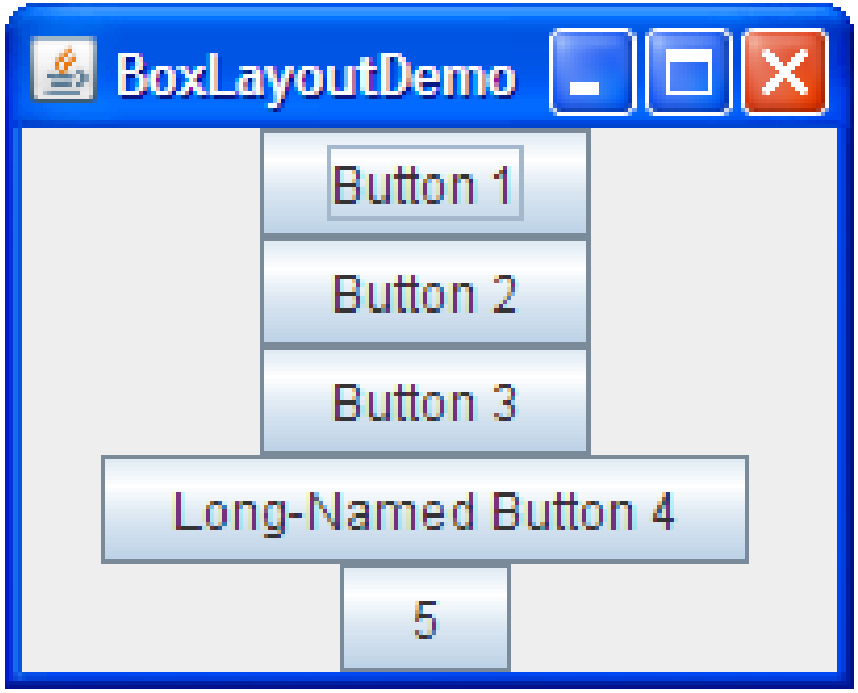
- A **layout manager** is an object that **determines the size and position of the components** within a **container**
- Layouts in Swing
  - `BorderLayout`
  - `BoxLayout`
  - `FlowLayout`
  - `GridBagLayout`
  - `GridLayout`
  - `GroupLayout`

BorderLayout



BorderLayoutDemo.java

BoxLayout



BoxLayoutDemo.java

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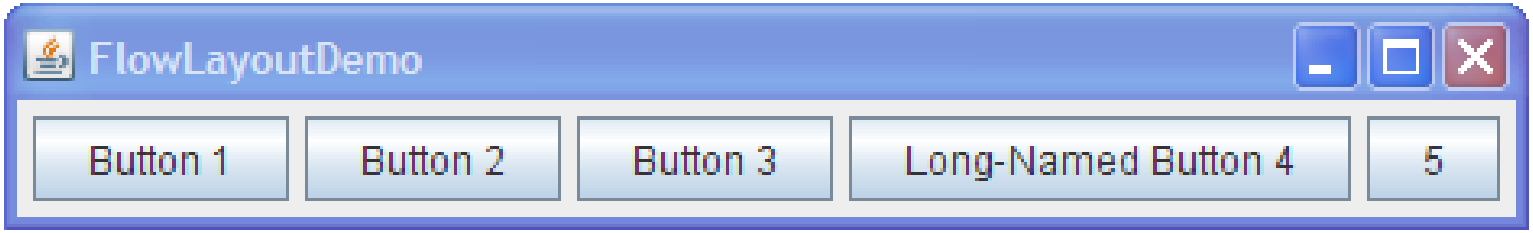
FlowLayout



FlowLayoutDemo.java

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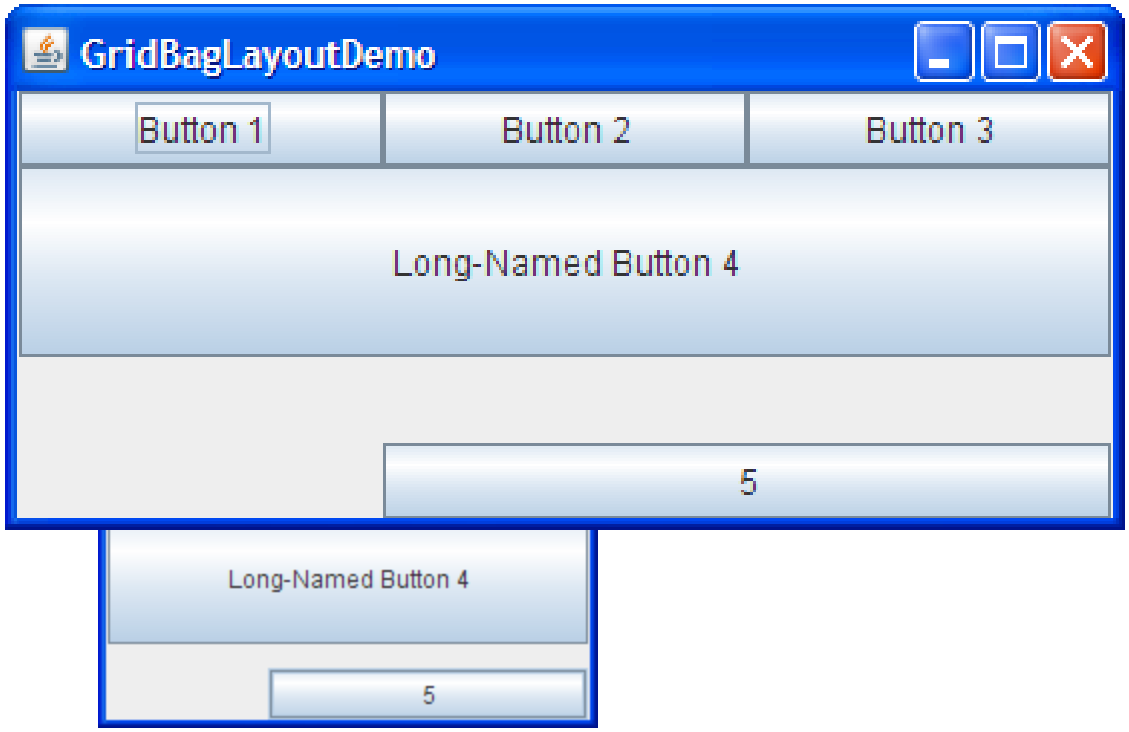
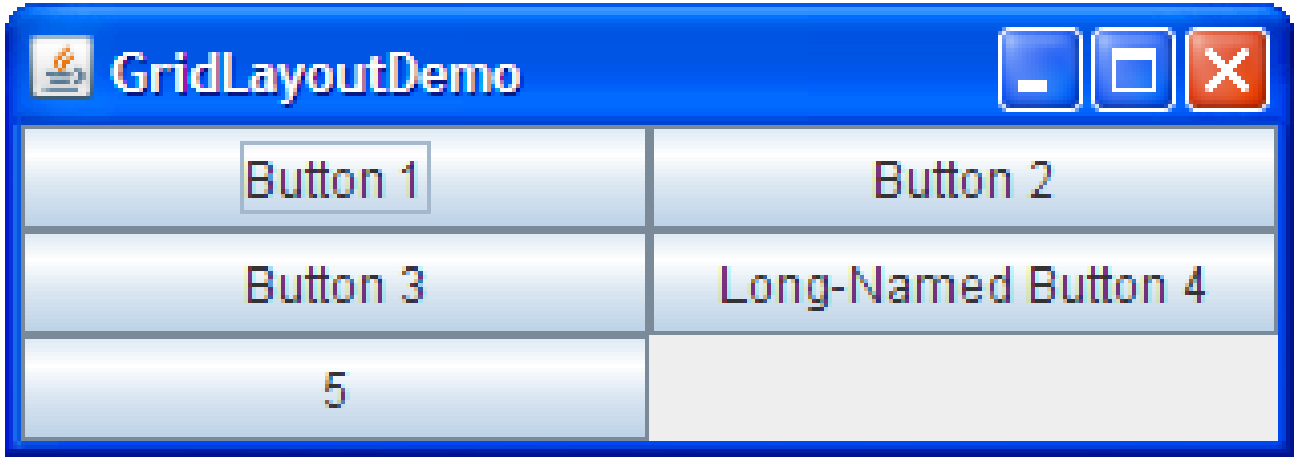
GridBagLayout



GridBagLayoutDemo.java

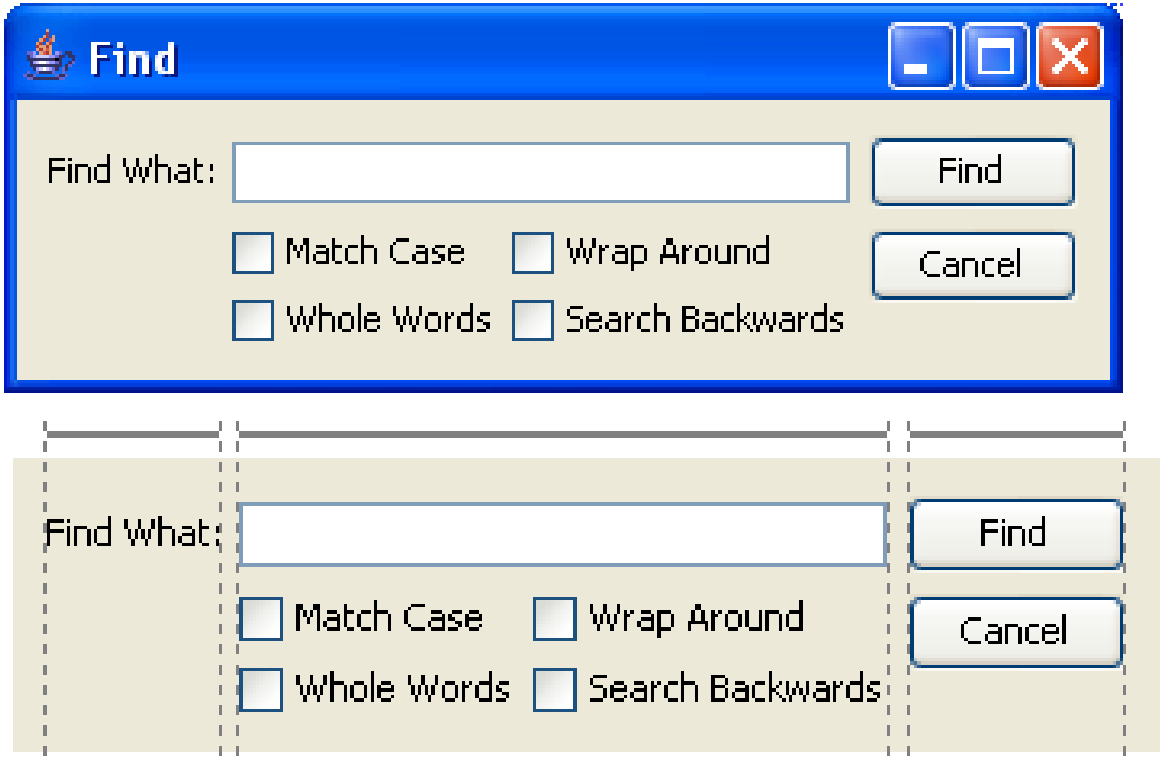
GridLayout



GridLayoutDemo.java

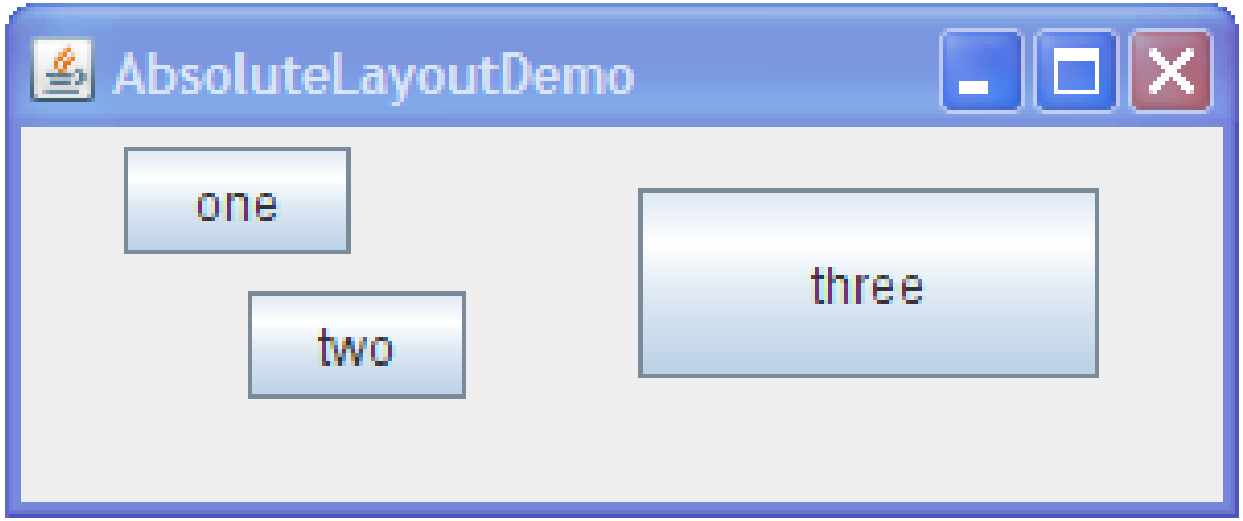
GroupLayout

- Basic layout in Netbeans GUI Builder
- Since JDK 1.6



Find.java

Without a Layout Manager (Absolute Positioning)



AbsoluteLayoutDemo.java

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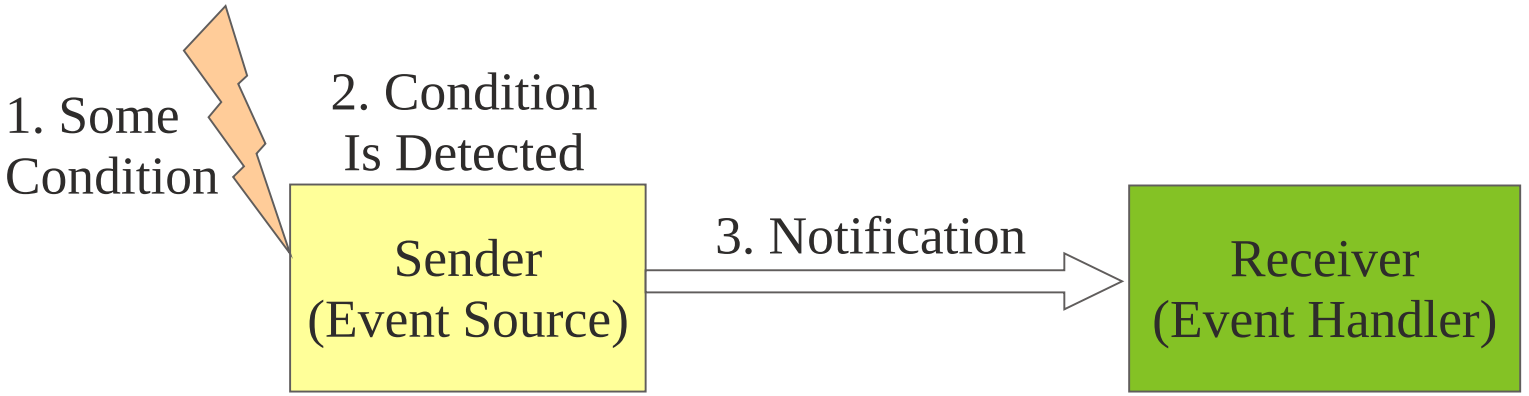
Event Driven Programming

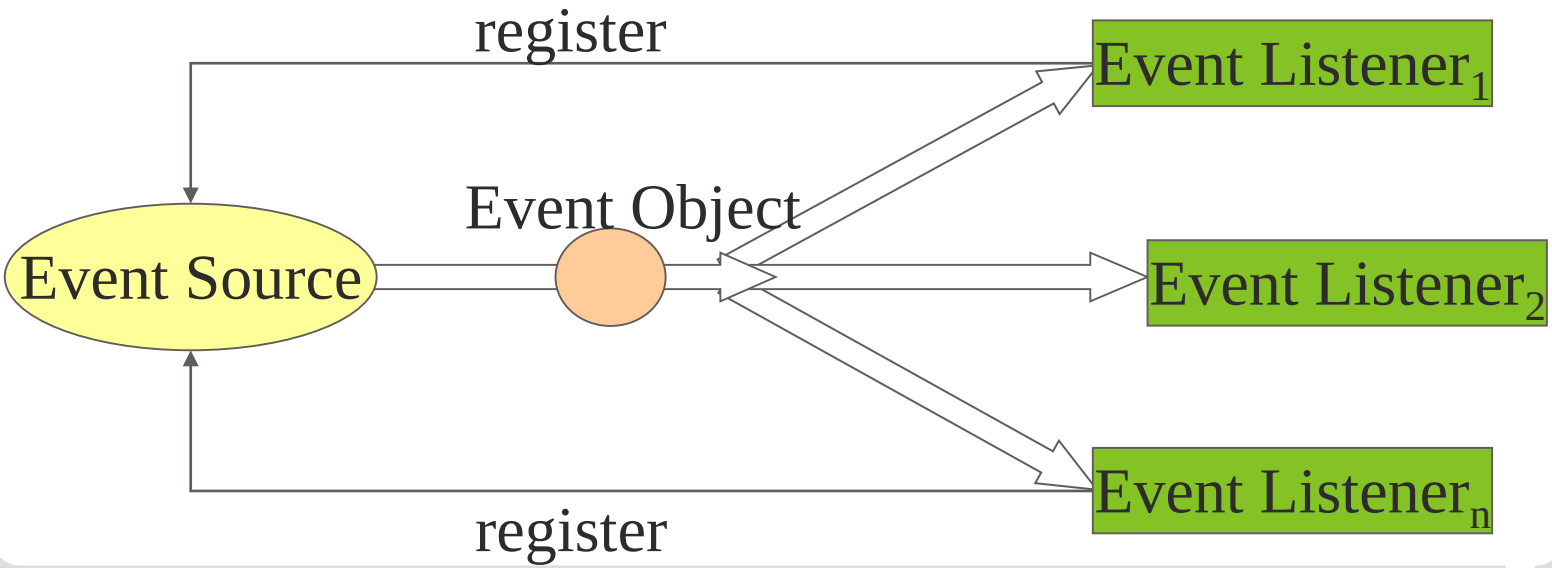
- The flow of the program is controlled/determined by **events**
- An **event** is a detectable condition that can trigger a notification
- A **notification** is an event-triggered signal sent to a run-time–defined recipient



Ted Faison: Event-Based Programming: Taking Events to the Limit. Apress, 2006, 700 pp.

Events in Java

- **Events** are objects sent from **event sources** to **event listeners**
- **Listeners** are **added** to event **sources**
- **Listeners handle events** by providing methods that are invoked when the **event source fires the event**



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Event Objects and Listeners

Event Type	Event Object	Event Listener
component-defined action occurred	`ActionEvent`	`ActionListener`
window has changed its status	`WindowEvent`	`WindowListener`
mouse action occurred in a component	`MouseEvent`	`MouseListener` `MouseMotionListener`

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Event Objects and Listeners

Event Type	Event Object	Event Listener
gained or lost the input focus	`FocusEvent`	`FocusListener`
keystroke occurred in a component	`KeyEvent`	`KeyListener`
component moved, changed size, or changed visibility	`ComponentEvent`	`ComponentListener`

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Event Handling Examples (ActionListener)

```
package java.awt.event;

public interface ActionListener extends
  EventListener {

  /**
   * Invoked when an action occurs.
   */
  public void actionPerformed(ActionEvent e);
}
```

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Event Handling I

```
public class EventDemo1 extends JFrame
  implements ActionListener {

  public EventDemo1() {
    JButton button = new JButton("Click Me!");
    button.addActionListener(this);
    //...
  }

  public void actionPerformed(ActionEvent e) {
    JOptionPane.showMessageDialog(this,
      "Clicked!");
  }
}
```

EventDemo1.java

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Event Handling II (Inner class)

```
public class EventDemo2 extends JFrame {

    public EventDemo2() {
        JButton button = new JButton("Click Me!");
        button.addActionListener(new Action());
        //...
    }

    private class Action implements ActionListener {
        public void actionPerformed(ActionEvent e) {
                JOptionPane.showMessageDialog(
                        EventDemo2.this, "Clicked!");
        }
    }
}
```

EventDemo2.java

Event Handling III (Anonymous class)

```
public class EventDemo3 extends JFrame {

 public EventDemo3() {
    JButton button = new JButton("Click Me!");
    button.addActionListener(
       new ActionListener(){
      public void actionPerformed(ActionEvent e){
        JOptionPane.showMessageDialog(
                    EventDemo3.this, "Clicked!");
       }
    });
    //...
  }
}
```

EventDemo3.java