Java Language- GUI

Engi- 5895

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Introduction

- Up till now you have written programs that communicate with the end user through a text-based interface
  - Using **System.out** for output
  - Using **Keyboard** for input.
- Java provides two sets of facilities for developing GUIs:
  - The Abstract Window Toolkit (AWT): package java.awt
  - Swing: package javax.swing

  Swing is a package that lets you create applications that use GUI instead of console interface

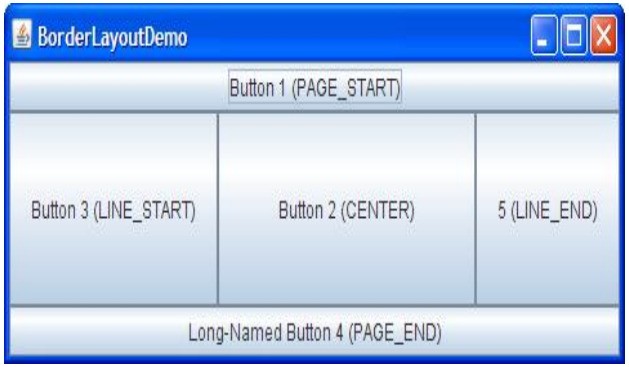
Components and containers

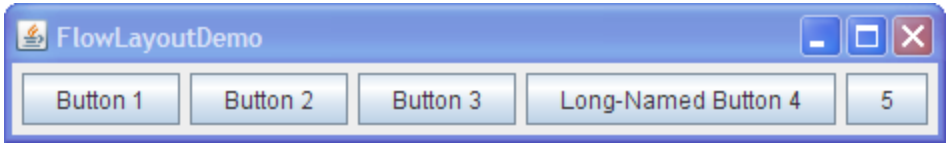
- A component is any GUI element, such as a window, button or label.
- A container is a type of component that has the purpose of containing other components.
- Types of containers:
  - Top-level containers: Every Swing program contains at least one top-level container (e.g. JFrame, JDialog or JApplet). Top-level containers cannot be added to other containers.
  - Intermediate containers: used to group components so that they can be handled as a single component (e.g JPanel, JTabbedPane).
  - Atomic components (basic controls): cannot contain other components (e.g JButton, JTextField).

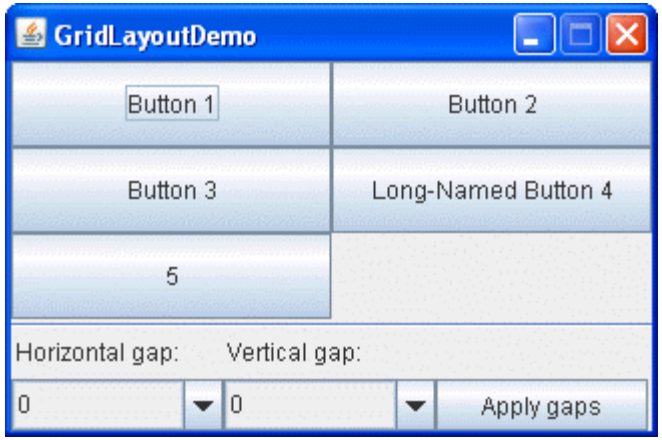
Containers - Layout

- Each container has a layout manager
  - Determines the size, location of contained widgets.
- To use layout mangers, you have to import java.awt.*.
- Setting the current layout of a container:
  `void setLayout(LayoutManager lm)`
- *`LayoutManager`* implementing classes:
  - `BorderLayout`
  - `BoxLayout`
  - `FlowLayout`
  - `GridLayout`

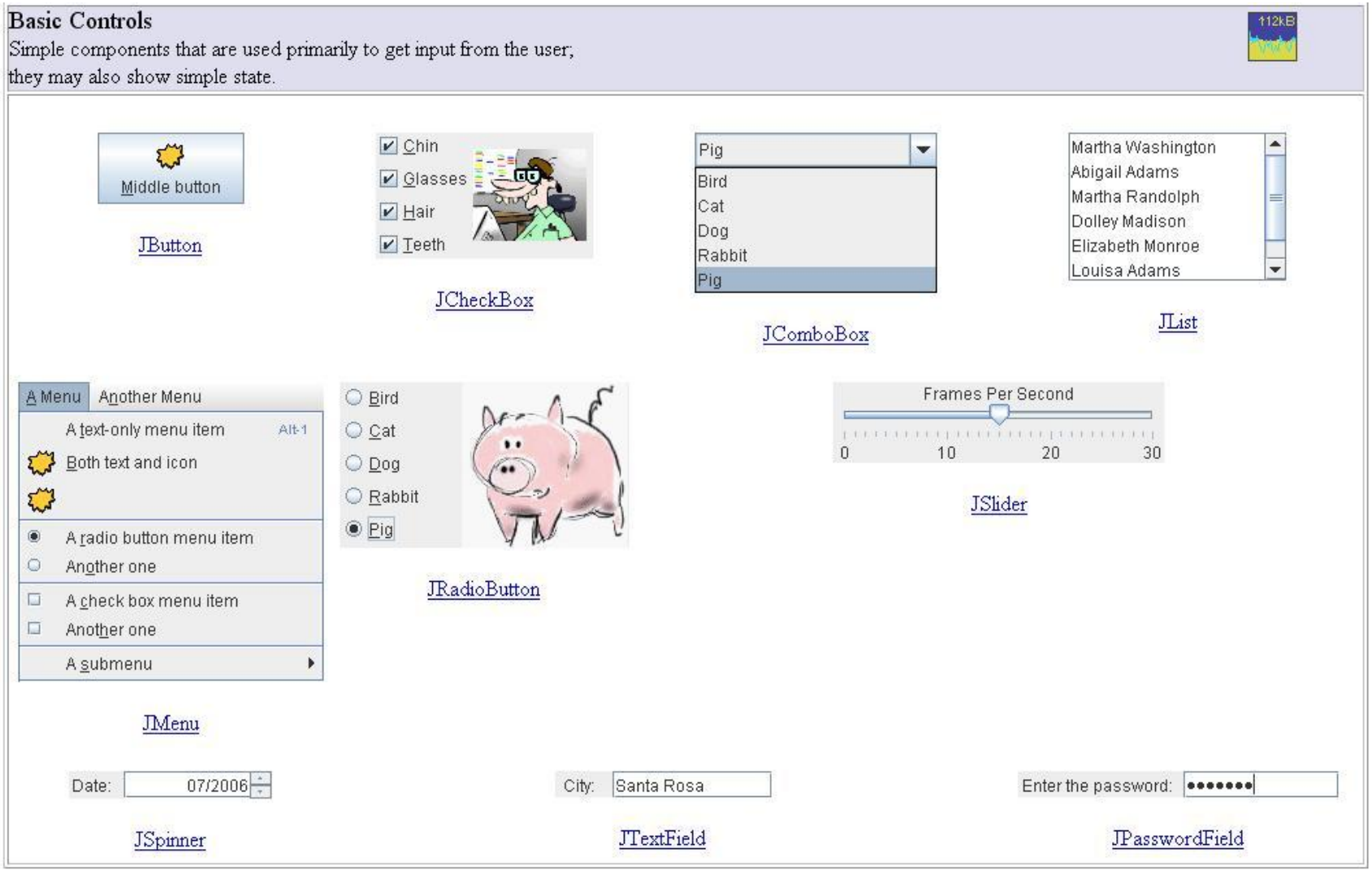
Containers - Layout



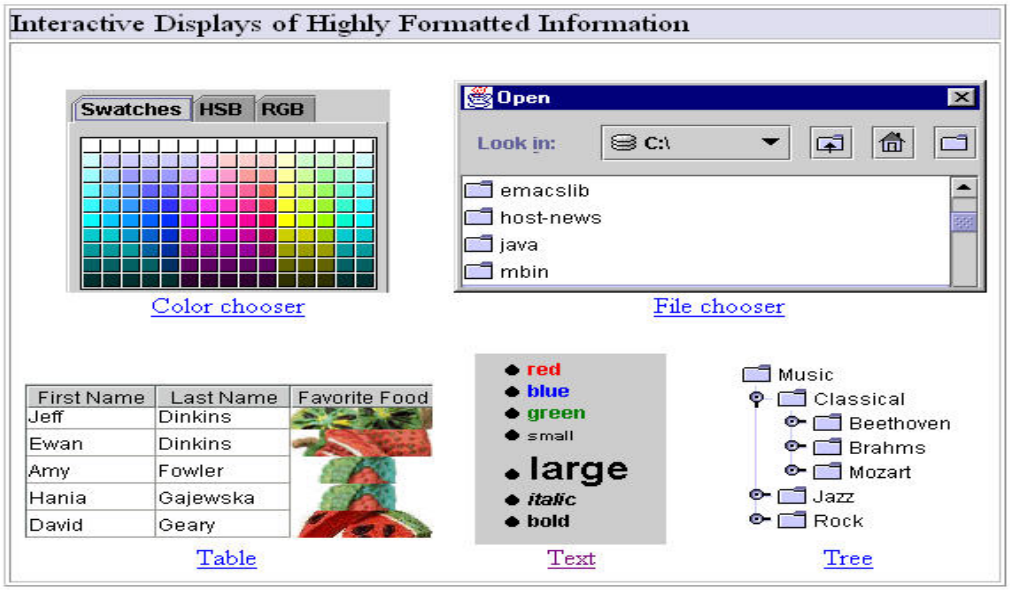


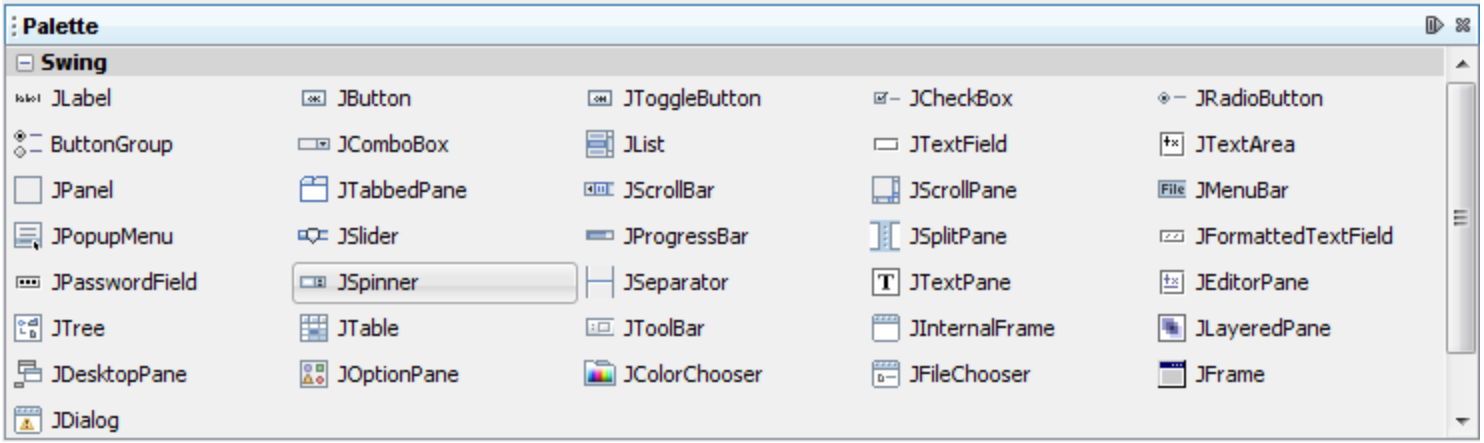


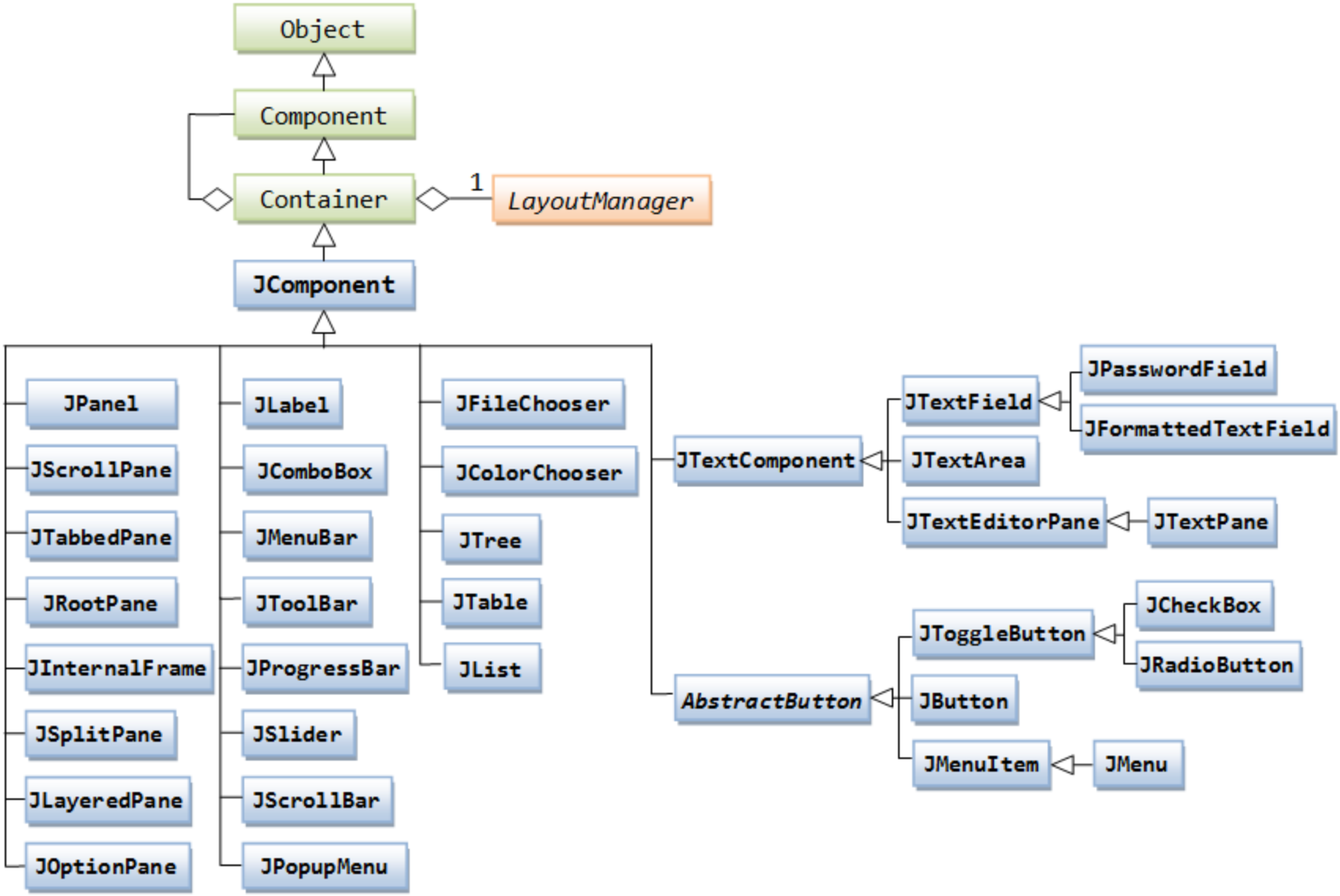
Swing Components



Swing Components






Object
Component
Container
1
LayoutManager
JComponent
JPanel
JScrollPane
JTabbedPane
JRootPane
JInternalFrame
JSplitPane
JLayeredPane
JOptionPane
JLabel
JComboBox
JMenuBar
JToolBar
JProgressBar
JSlider
JScrollBar
JPopupMenu
JFileChooser
JColorChooser
JTree
JTable
JList
JTextComponent
JTextField
JPasswordField
JFormattedTextField
JTextArea
JTextEditorPane
JTextPane
AbstractButton
JToggleButton
JCheckBox
JRadioButton
JButton
JMenuItem
JMenu

Events, Listeners

- A program needs to react to the user's actions
- Examples:
  - When the user presses a button , When the user closes the program
- Swing defines all sorts of Listener interfaces
  - E.g.: `ActionListener, MouseMotionListener, WindowListener, ...`

```
public interface ActionListener extends EventListener {
  public void actionPerformed(ActionEvent e);
}

public interface MouseMotionListener extends EventListener {
  public void mouseDragged(MouseEvent e);
  public void mouseMoved(MouseEvent e);
}
```

Events, Listeners (cont.)

- A listener is an object that implements a listener interface
- If we need to react to an event on a component we register a listener object with that component .
- E.g.: `addActionListener()` registers an action listener with its receiver:

```
JButton button = new JButton();
ActionListener listener = ...;
button.addActionListener(listener);
```

- When an event occurs, all registered listeners are notified
  - The appropriate listener method (e.g: `actionPerformed()`) is invoked
  - An object describing the event is passed as a parameter

Event Handling Demo: Code

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

public class Events implements ActionListener  {
   public Events() {
     JFrame frame = new JFrame("Events");
     frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

     frame.getContentPane().setLayout(new FlowLayout());
     JButton b = new JButton("Click me!");
     b.addActionListener(this);
     frame.getContentPane().add(b);

     frame.pack();
     frame.setVisible(true);
   }
   public void actionPerformed(ActionEvent e) {
     JOptionPane.showMessageDialog(null, "Thank you");
   }
   public static void main(String[] args)  { new Events(); }
}
```