

Graphical User Interfaces

CSC 2014 – Java Bootcamp

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Some slides in this presentation are adapted from the slides accompanying Java Software Solutions by Lewis & Loftus

Graphical User Interface (GUI)

- A *GUI component*
 - an object that represents a screen element
 - examples: buttons, text fields, labels, panels, frames
- GUI-related classes from packages:
 - `java.awt` *Abstract Windowing Toolkit (AWT)*: the original Java GUI package
 - `javax.swing` *Swing* provides additional and more versatile components



containers

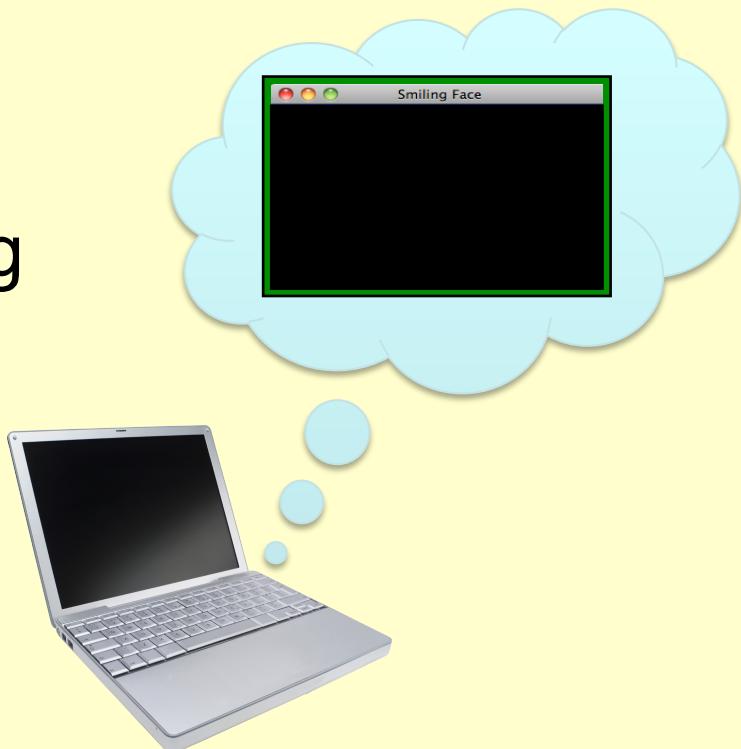
GUI Containers - Frames

frame : a container displayed as a separate window

- can be repositioned and resized on the screen as needed
- has its own title bar with close-minimize-resize buttons

a *heavyweight* container:

- managed by the underlying operating system



GUI Containers - Panels

panel – a container used to organize other components

- must be added to another container (eg, frame or other panel) to be displayed

a *lightweight* container:

- managed by the Java program itself

```
/*
 * Authority.java      Author: Lewis/Loftus
 *
 * Demonstrates the use of frames, panels, and labels.
 */
import java.awt.*;
import javax.swing.*;

public class Authority
{
    //-----
    // Displays some words of wisdom.
    //-----
    public static void main (String[] args)
    {
        JFrame frame = new JFrame ("Authority");

        frame.setDefaultCloseOperation (JFrame.EXIT_ON_CLOSE);

        JPanel primary = new JPanel();
        primary.setBackground (Color.yellow);
        primary.setPreferredSize (new Dimension(250, 75));
        JLabel label1 = new JLabel ("Question authority,");
        JLabel label2 = new JLabel ("but raise your hand first.");

        primary.add (label1);
        primary.add (label2);

        frame.getContentPane () .add(primary);
        frame.pack ();
        frame.setVisible(true);
    }
}
```

Question authority, but raise your hand first.

GUI Containers - Panels

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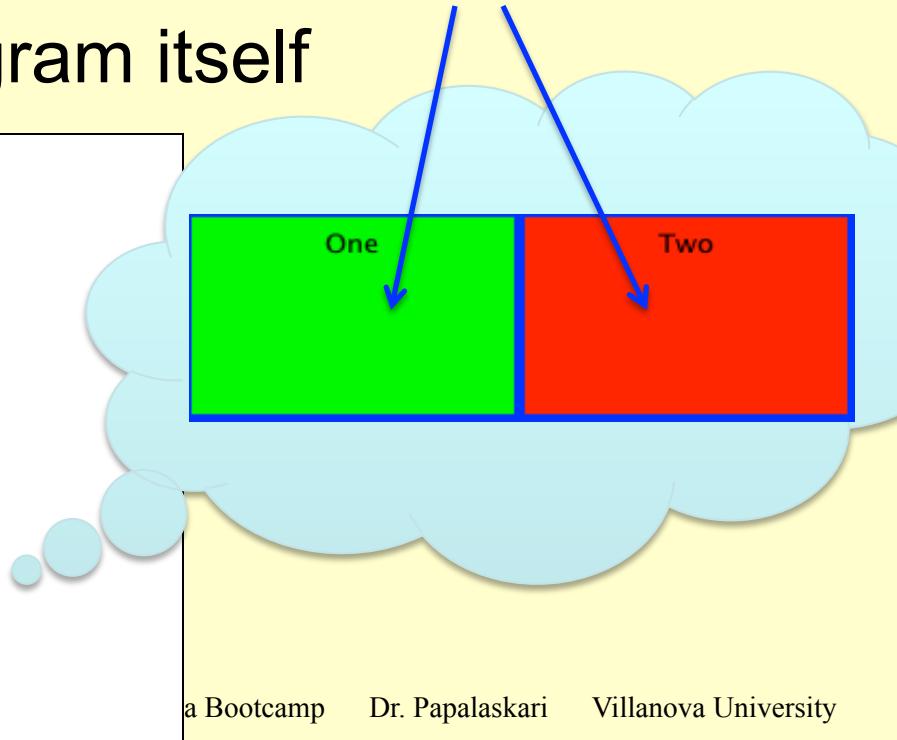
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        primary.add (label1);
        primary.add (label2);

        frame.getContentPane ().add(primary);
        frame.pack();
        frame.setVisible(true);
    }
}
```

Nested Panels



Other components: Labels

label – a GUI component that displays a line of text and/or an image

- See [Authority.java](#)

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/*
 * Authority.java      Author: Lewis/Loftus
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 * Demonstrates the use of frames, panels, and labels.
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import java.awt.*;
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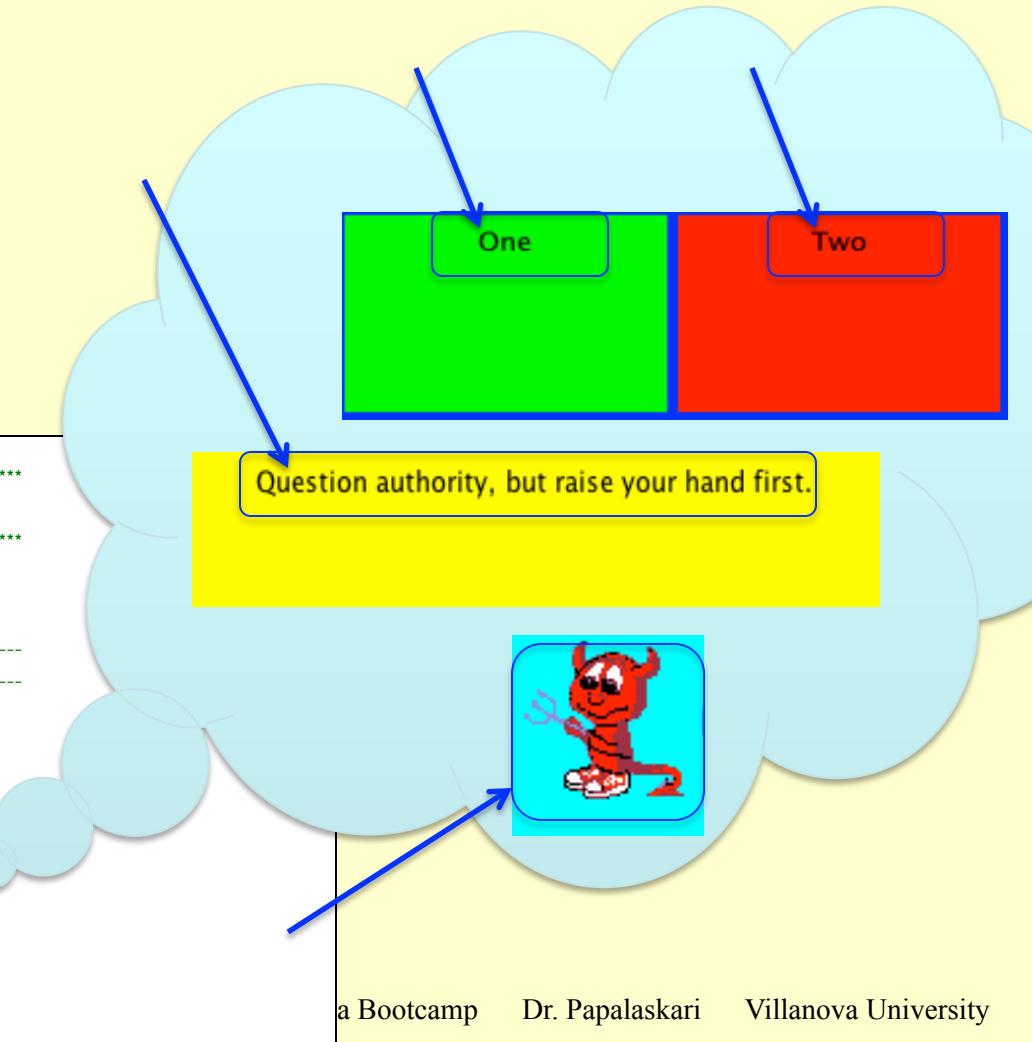
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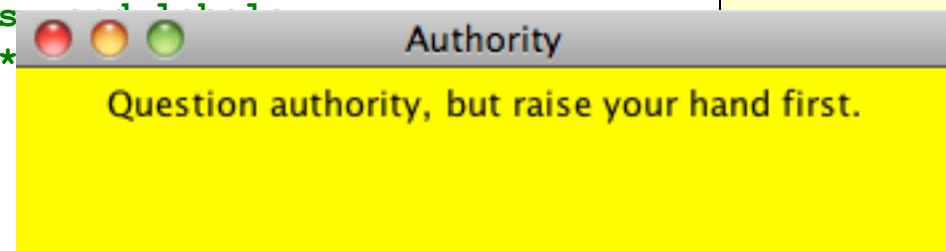
        primary.add (label1);
        primary.add (label2);

        frame.getContentPane () .add(primary);
        frame.pack();
        frame.setVisible(true);
    }
}
```



Example: Authority.java

```
//*****  
// Authority.java          Author: Lewis/Loftus  
// Demonstrates the use of frames, panels  
//*****  
  
import java.awt.*;  
import javax.swing.*;  
  
public class Authority  
{  
    public static void main (String[] args)  
    {  
        JFrame frame = new JFrame ("Authority");  
  
        frame.setDefaultCloseOperation (JFrame.EXIT_ON_CLOSE);  
  
        JPanel primary = new JPanel();  
        primary.setBackground (Color.yellow);  
        primary.setPreferredSize (new Dimension(250, 75));  
        JLabel label1 = new JLabel ("Question authority,");  
        JLabel label2 = new JLabel ("but raise your hand first.");  
  
        primary.add (label1);  
        primary.add (label2);  
  
        frame.getContentPane().add(primary);  
        frame.pack();  
        frame.setVisible(true);  
    }  
}
```



Example: Nested panels [NestedPanels.java](#)

```
//*****  
// NestedPanels.java          Author: Lewis/Loftus  
//  
// Demonstrates a basic component hierarchy.  
//*****  
  
import java.awt.*;  
import javax.swing.*;  
  
public class NestedPanels  
{  
    //-----  
    // Presents two colored panels nested within a third.  
    //-----  
    public static void main (String[] args)  
    {  
        JFrame frame = new JFrame ("Nested Panels");  
        frame.setDefaultCloseOperation (JFrame.EXIT_ON_CLOSE);  
  
        // Set up first subpanel  
        JPanel subPanel1 = new JPanel();  
        subPanel1.setPreferredSize (new Dimension(150, 100));  
        subPanel1.setBackground (Color.green);  
        JLabel label1 = new JLabel ("One");  
        subPanel1.add (label1);  
    }  
}
```

continued

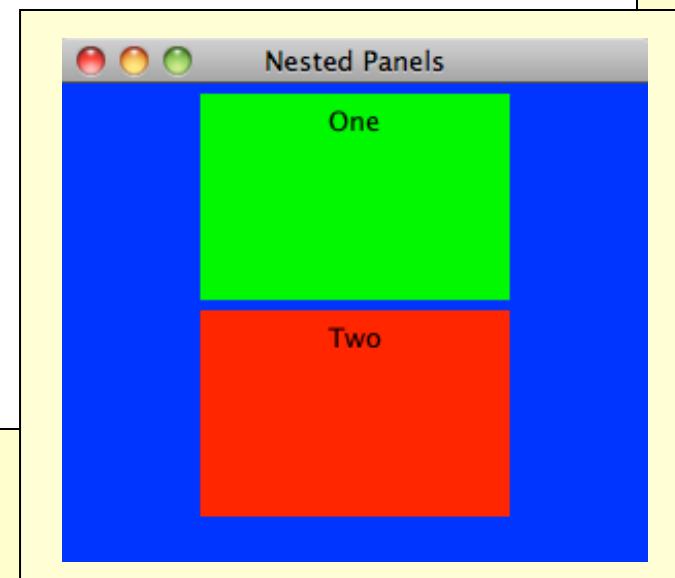
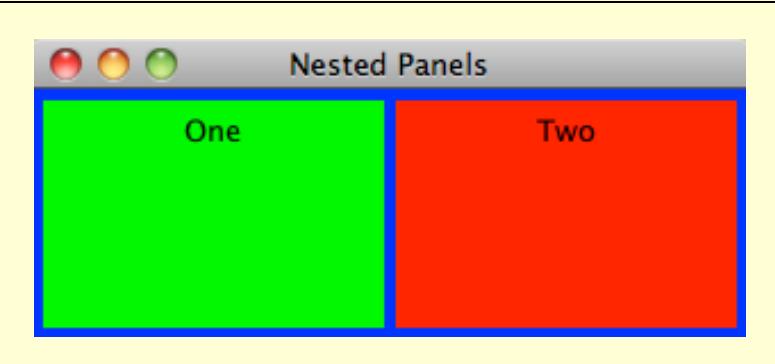
ersity

continued

```
// Set up second subpanel
JPanel subPanel2 = new JPanel();
subPanel2.setPreferredSize (new Dimension(150, 100));
subPanel2.setBackground (Color.red);
JLabel label2 = new JLabel ("Two");
subPanel2.add (label2);

// Set up primary panel
JPanel primary = new JPanel();
primary.setBackground (Color.blue);
primary.add (subPanel1);
primary.add (subPanel2);

frame.getContentPane().add(primary);
frame.pack();
frame.setVisible(true);
}
```



Example: LabelDemo.java

```
//*****
//  LabelDemo.java          Author: Lewis/Loftus
//
//  Demonstrates the use of image icons in labels.
//*****  
  
import java.awt.*;  
import javax.swing.*;  
  
public class LabelDemo  
{  
    //-----  
    // Creates and displays the primary application frame.  
    //-----  
    public static void main (String[] args)  
    {  
        JFrame frame = new JFrame ("Label Demo");  
        frame.setDefaultCloseOperation (JFrame.EXIT_ON_CLOSE);  
  
        ImageIcon icon = new ImageIcon ("devil.gif");  
  
        JLabel label1, label2, label3;  
  
        label1 = new JLabel ("Devil Left", icon, SwingConstants.CENTER);
```

continued

continued

```
label2 = new JLabel ("Devil Right", icon, SwingConstants.CENTER) ;  
label2.setHorizontalTextPosition (SwingConstants.LEFT) ;  
label2.setVerticalTextPosition (SwingConstants.BOTTOM) ;  
  
label3 = new JLabel ("Devil Above", icon, SwingConstants.CENTER) ;  
label3.setHorizontalTextPosition (SwingConstants.CENTER) ;  
label3.setVerticalTextPosition (SwingConstants.BOTTOM) ;  
  
JPanel panel = new JPanel();  
panel.setBackground (Color.cyan);  
panel.setPreferredSize (new Dimension (200, 250));  
panel.add (label1);  
panel.add (label2);  
panel.add (label3);  
  
frame.getContentPane () .add(panel);  
frame.pack ();  
frame.setVisible(true);  
}  
}
```



Custom JPanel

- The next example shows how to draw your own Graphics on a panel

Example: SmilingFacePanel

[SmilingFacePanel.java](#) (custom JPanel with smiling face)

[SmilingFace.java](#) (program that uses SmilingFacePanel – driver class)



```
//*****  
//  SmilingFace.java      Author: Lewis/Loftus  
//  
//  Demonstrates the use of a separate panel class.  
//*****  
  
import javax.swing.JFrame;  
  
public class SmilingFace  
{  
    //-----  
    // Creates the main frame of the program.  
    //-----  
    public static void main (String[] args)  
    {  
        JFrame frame = new JFrame ("Smiling Face");  
        frame.setDefaultCloseOperation (JFrame.EXIT_ON_CLOSE);  
  
        SmilingFacePanel panel = new SmilingFacePanel();  
  
        frame.getContentPane().add(panel);  
  
        frame.pack();  
        frame.setVisible(true);  
    }  
}
```

```
//*****  
//  SmilingFacePanel.java          Author: Lewis/Loftus  
//  
//  Demonstrates the use of a separate panel class.  
//*****  
  
import javax.swing.JPanel;  
import java.awt.*;  
  
public class SmilingFacePanel extends JPanel  
{  
    private final int BASEX = 120, BASEY = 60; // base point for head  
  
    //-----  
    // Constructor: Sets up the main characteristics of this panel.  
    //-----  
    public SmilingFacePanel ()  
    {  
        setBackground (Color.blue);  
        setPreferredSize (new Dimension(320, 200));  
       setFont (new Font("Arial", Font.BOLD, 16));  
    }  
}
```

continue

continue

```
//-----  
//  Draws a face.  
//-----  
  
public void paintComponent (Graphics page)  
{  
    super.paintComponent (page);  
  
    page.setColor (Color.yellow);  
    page.fillOval (BASEX, BASEY, 80, 80); // head  
    page.fillOval (BASEX-5, BASEY+20, 90, 40); // ears  
  
    page.setColor (Color.black);  
    page.drawOval (BASEX+20, BASEY+30, 15, 7); // eyes  
    page.drawOval (BASEX+45, BASEY+30, 15, 7);  
  
    page.fillOval (BASEX+25, BASEY+31, 5, 5); // pupils  
    page.fillOval (BASEX+50, BASEY+31, 5, 5);  
  
    page.drawArc (BASEX+20, BASEY+25, 15, 7, 0, 180); // eyebrows  
    page.drawArc (BASEX+45, BASEY+25, 15, 7, 0, 180);  
  
    page.drawArc (BASEX+35, BASEY+40, 15, 10, 180, 180); // nose  
    page.drawArc (BASEX+20, BASEY+50, 40, 15, 180, 180); // mouth  
    page.setColor (Color.white);  
    page.drawString ("Always remember that you are unique!",  
                    BASEX-105, BASEY-15);  
    page.drawString ("Just like everyone else.", BASEX-45, BASEY+105);  
}  
}
```