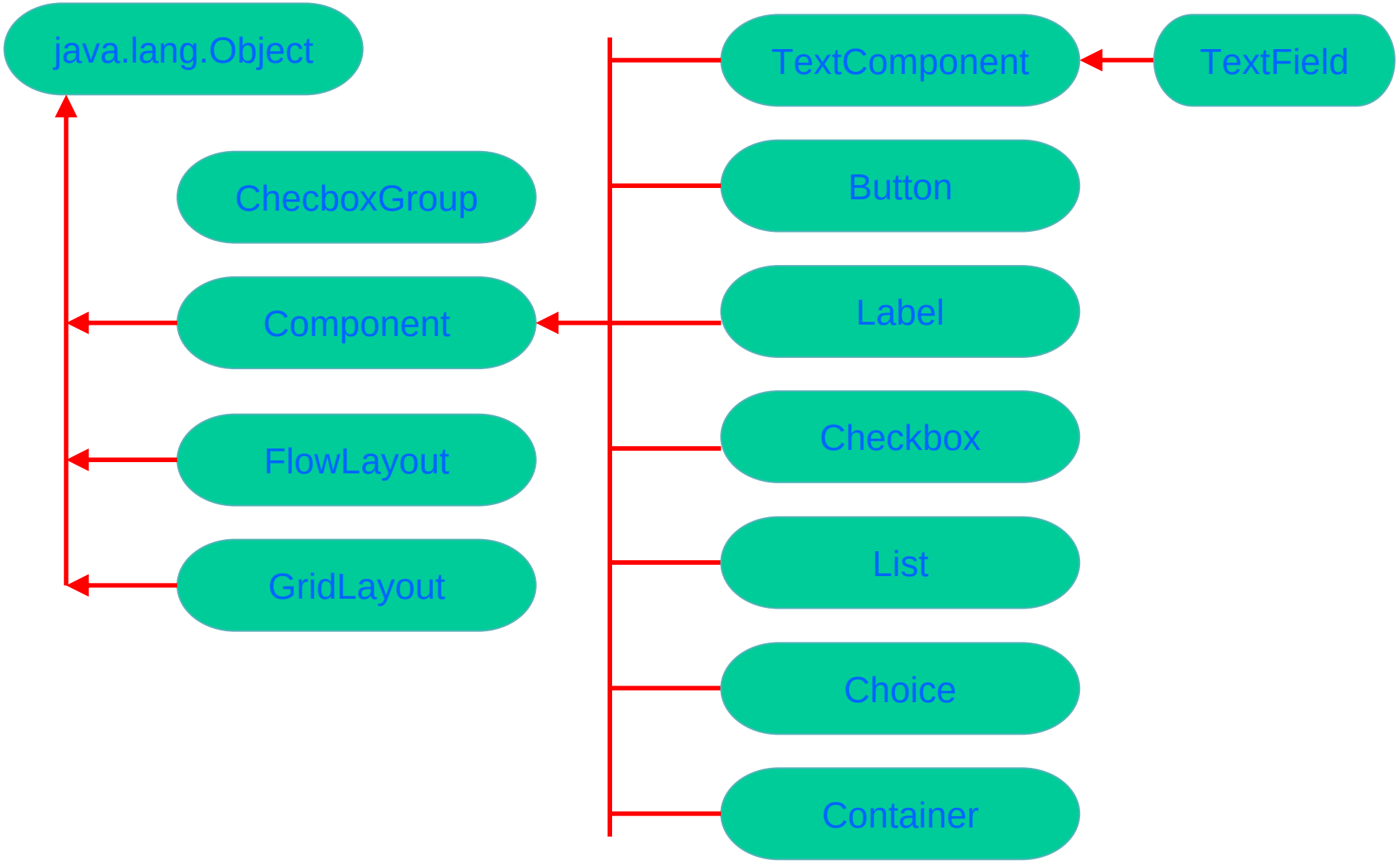
12 GUI-Based Applications

GUI-Based Applications

- Identify key AWT components
- Use AWT components to build user interfaces for real programs
- Control the colors and fonts used by an AWT component
- Use the Java printing mechanism


java.lang.Object
ChecboxGroup
Component
FlowLayout
GridLayout
TextComponent
TextField
Button
Label
Checkbox
List
Choice
Container

Label

- public Label()

  constructs an empty Label- text is not displayed

- public Label(String s)

  Constructs a Label that displays the text s with default left-justified alignment

- public Label(String s, int alignment)

  Label.LEFT, Label.CENTER, Label.RIGHT

- public String getText()

- public void setText(String s)

- public void setAlignment(int alignment)

TextField

- public TextField()

  constructs a TextField object

- public TextField(int columns)

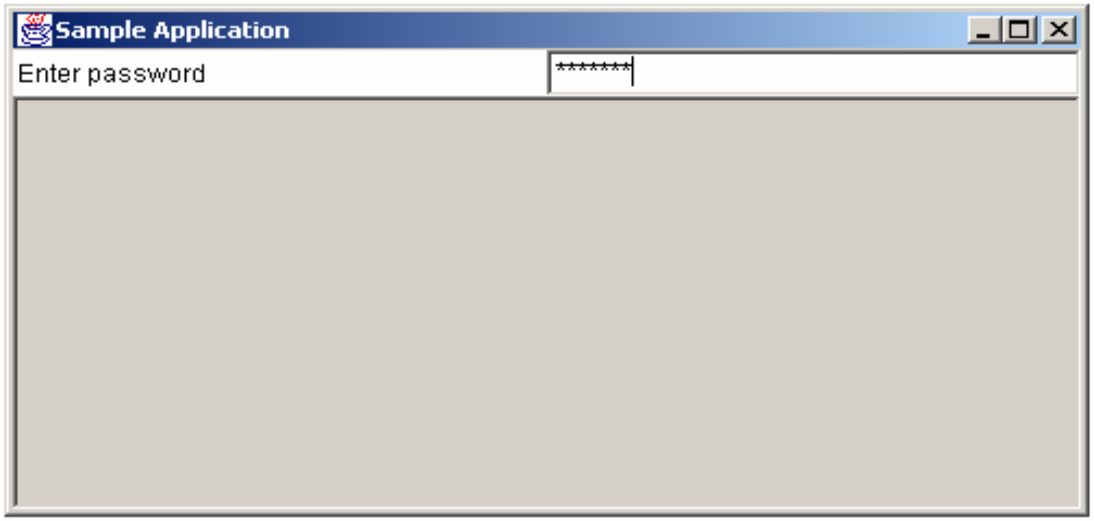
  constructs an empty TextField object with specified number of columns

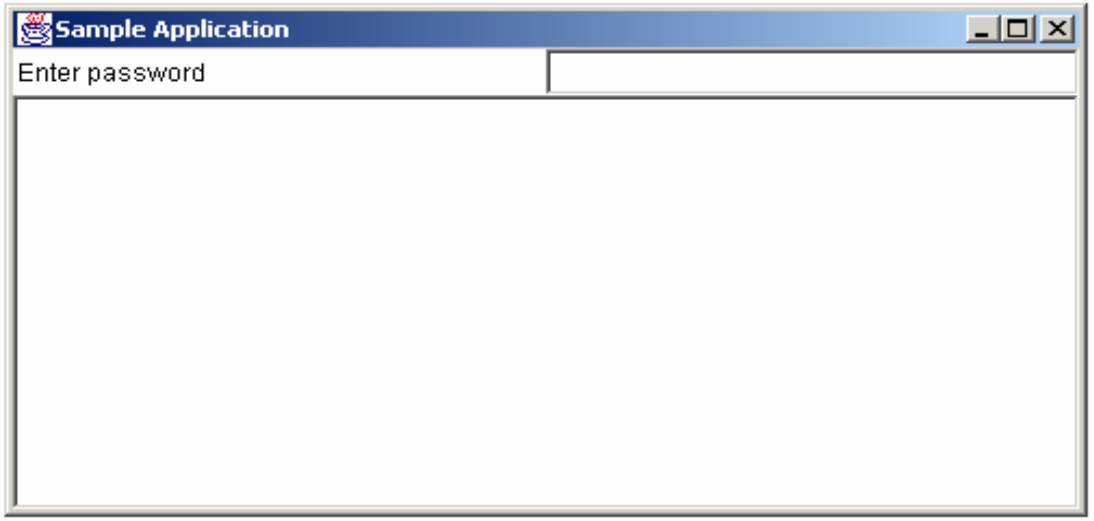
- public TextField(String s, int columns)
- public void setEchoChar(char c)
- public void setEditable(boolean b) // true == editable
- public String getText()
- public void setText(String s)

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

public class TextFieldApp implements ActionListener {
        private Frame myFrame      ;
        private Label myLabel      ;
        private Panel myPanel      ;
        private TextField password  ;
        private TextField tf              ;

        public TextFieldApp ()          {
                myFrame = new Frame("Sample Application") ;
                myPanel = new Panel() ;
                // Label
                myLabel = new Label("Enter password") ;
                // TextField
                password = new TextField("") ;
                password.setEchoChar('*') ;
                password.addActionListener(this) ;
```

```
                // Panel
                myPanel.setLayout(new GridLayout(1,2)) ;
                myPanel.add(myLabel) ;
                myPanel.add(password) ;
                // Text Field
                tf = new TextField() ;
                tf.setEditable(false) ;
                myFrame.add(myPanel,BorderLayout.NORTH) ;
                myFrame.add(tf,BorderLayout.CENTER);
                // setSize and setVisible
                myFrame.setSize(500,256) ;
                myFrame.setVisible(true) ;
        }
        public void actionPerformed(ActionEvent e)    {
                String s ;
                password.setText("");
                s = e.getActionCommand() ;
                if(s.compareTo("keyword") == 0) tf.setEditable(true)    ;
                else  tf.setEditable(false)            ;

        }
```

```
public static void main(String[] args) {
                    TextFieldApp tfa = new TextFieldApp() ;
        }
}
```


Sample Application
Enter password
****


Sample Application
Enter password

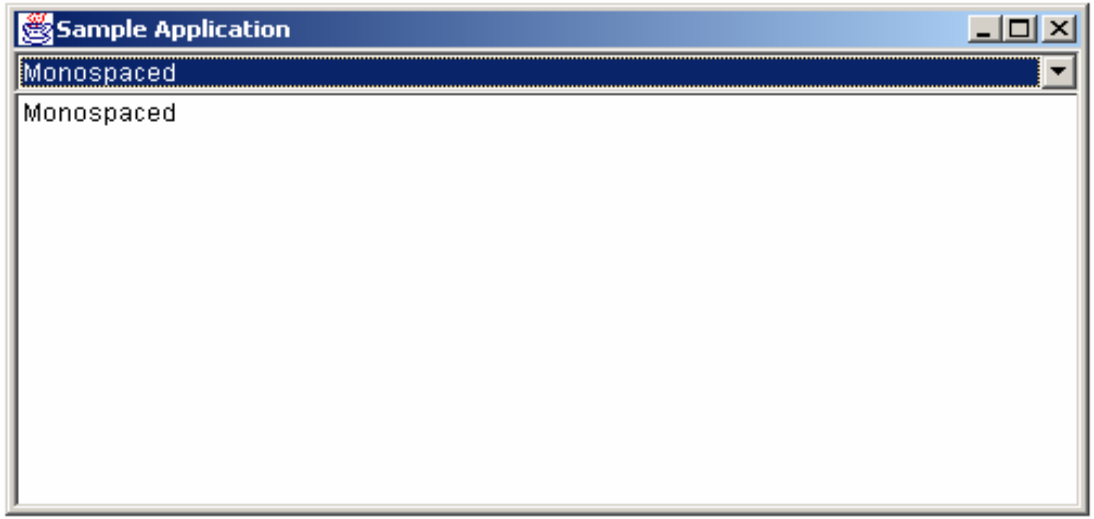
Choice

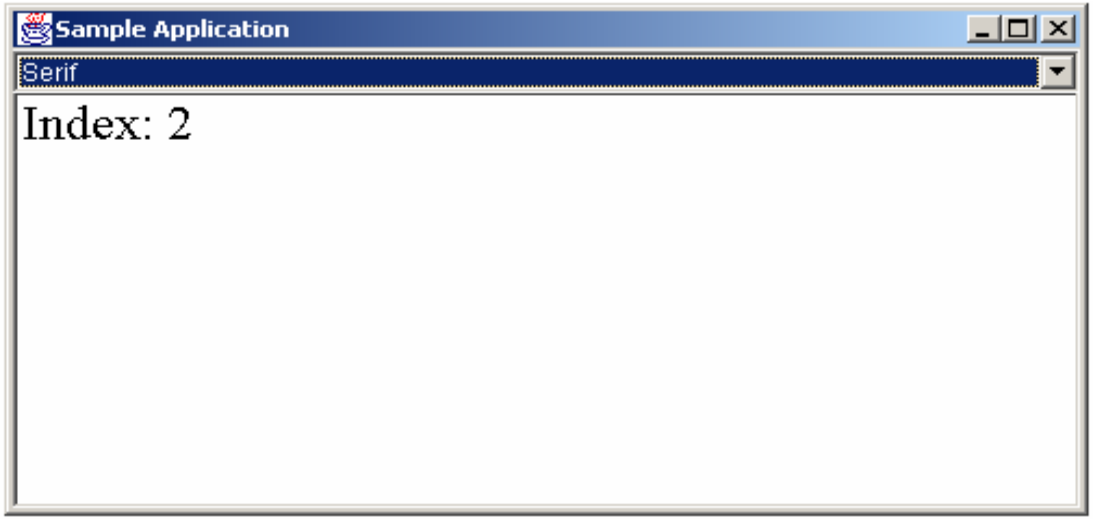
- public String getItem(int index)
- public synchronized void add(String s)
- public synchronized String getSelectedItem()
- public int getSelectedIndex()
- public synchronized String insert(String s, int index)
- public synchronized void remove(String s)

```
import java.awt.* ;
import java.awt.event.* ;
public class ChoiceApp implements ItemListener {
        private Frame myFrame      ;
        private TextField tf                    ;
        private Choice fonts       ;
         static int size = 10 ;
        public ChoiceApp () {
             myFrame = new Frame("Sample Application") ;
             // Choice
            fonts = new Choice() ;
            fonts.add( "Monospaced") ; // Courier
            fonts.add( "SansSerif") ; // Helvetica
            fonts.add( "Serif") ; // Times
            fonts.addItemListener(this) ;
```

```
                // TextField
                tf = new TextField(fonts.getItem(0), 30) ;
                myFrame.add(fonts,BorderLayout.NORTH) ;
                myFrame.add(tf,BorderLayout.CENTER);
                // setSize and setVisible
                myFrame.setSize(500,256) ;
                myFrame.setVisible(true) ;
        }
        public void itemStateChanged( ItemEvent e)          {
                tf.setText( "Index: " + fonts.getSelectedIndex()) ;
                tf.setFont(new Font(fonts.getSelectedItem(),
                        tf.getFont().getStyle(),ChoiceApp.size++)) ;
        }
```

```
        public static void main(String[] args) {
                ChoiceApp ca = new ChoiceApp() ;
        }
}
```


Sample Application
Monospaced
Monospaced


Sample Application
Serif
Index: 2

Checkbox and CheckboxGroup

- public Checkbox(String s)
- public Checkbox(String s, CheckboxGroup c, boolean state)
- public CheckboxGroup()

```
import java.awt.* ;
import java.awt.event.* ;
public class CheckboxApp implements ItemListener {
        private Frame myFrame      ;
        private TextField tf                    ;
        private Checkbox bold,italic ;
        public CheckboxApp () {
                myFrame = new Frame("Sample Application") ;
                // Checkbox
                bold   = new Checkbox( "Bold" ) ;
                italic = new Checkbox( "Italic" ) ;
                bold.addItemListener(this) ;
                italic.addItemListener(this) ;
```

```
                    // TextField
                    tf = new TextField("", 30) ;
                    myFrame.add(tf,BorderLayout.NORTH) ;
                    myFrame.add(bold,BorderLayout.CENTER) ;
                    myFrame.add(italic,BorderLayout.EAST);
                    // setSize and setVisible
                    myFrame.setSize(500,128) ;
                    myFrame.setVisible(true) ;
            }
            public void itemStateChanged( ItemEvent e) {
               int valBold = (bold.getState() ? Font.BOLD : Font.PLAIN ) ;
               int valItalic = (italic.getState() ? Font.ITALIC : Font.PLAIN ) ;
tf.setFont(new Font("Serif",valBold+valItalic,18) );
            }
```

```
    public static void main(String[] args)
    {
        CheckboxApp ca = new CheckboxApp() ;
    }
}
```

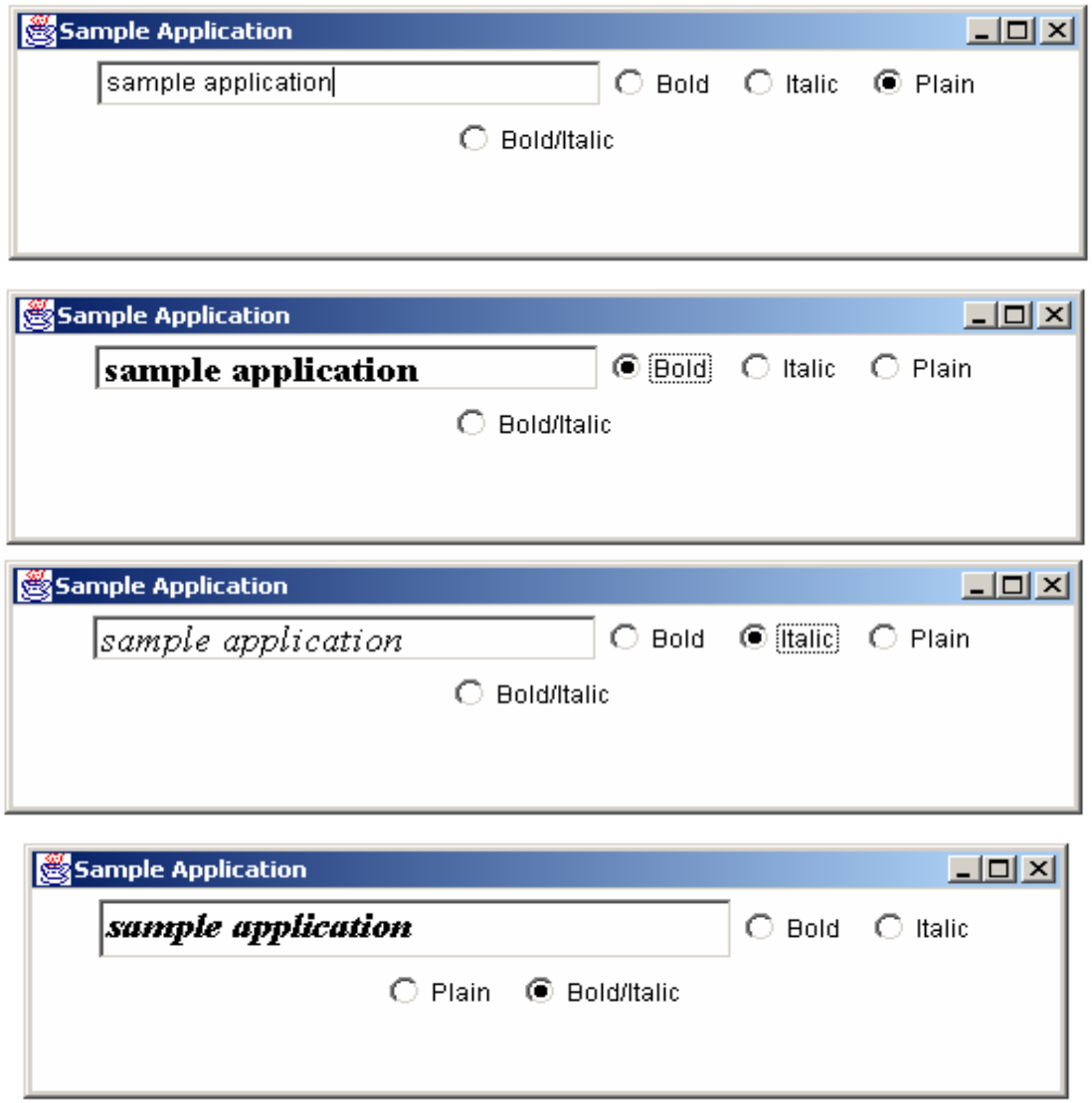

Sample Application
normal text
Bold
Italic
Sample Application
normal text
Bold
Italic
Sample Application
normal text
Bold
Italic
Sample Application
normal text
Bold
Italic

```
import java.awt.* ;
import java.awt.event.* ;
public class GroupCheckboxApp implements ItemListener {
        private Frame myFrame      ;
        private TextField tf                    ;
        private Checkbox plain,bold,italic,boldItalic ;
        private CheckboxGroup fontStyle ;
        private Font boldFont,italicFont,plainFont,boldItalicFont ;
        public GroupCheckboxApp () {
          myFrame = new Frame("Sample Application") ;
          myFrame.setLayout(new FlowLayout());
          // Predefined Fonts
          boldFont = new Font("Serif",Font.BOLD,18) ;
          italicFont = new Font("Serif",Font.ITALIC,18) ;
          plainFont = new Font("Serif",Font.PLAIN,18) ;
boldItalicFont = new Font("Serif",Font.BOLD+Font.ITALIC,18) ;
```

```
// GroupCheckbox
CheckboxGroup fontStyle = new CheckboxGroup() ;
// Checkbox
bold   = new Checkbox( "Bold" ,fontStyle,false) ;
italic = new Checkbox( "Italic" ,fontStyle,false) ;
plain  = new Checkbox( "Plain" ,fontStyle,true) ;
boldItalic = new Checkbox( "Bold/Italic" ,fontStyle,false) ;
// add ItemListener
bold.addItemListener(this) ;
italic.addItemListener(this) ;
plain.addItemListener(this) ;
boldItalic.addItemListener(this) ;
// TextField
tf = new TextField("", 30) ;
```

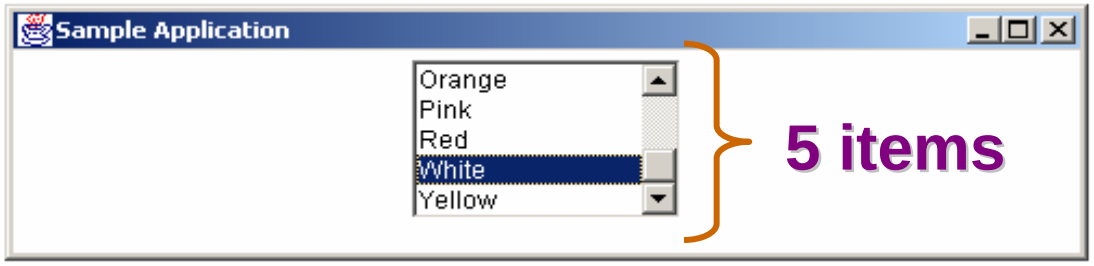
```
    myFrame.add(tf) ;
    myFrame.add(bold) ;
    myFrame.add(italic);
    myFrame.add(plain) ;
    myFrame.add(boldItalic);
    // setSize and setVisible
    myFrame.setSize(500,128) ;
    myFrame.setVisible(true) ;
  }
  public void itemStateChanged( ItemEvent e) {
     if( e.getSource() == plain )
       tf.setFont( plainFont);
     else  if( e.getSource() == bold )
       tf.setFont( boldFont);
     else  if( e.getSource() == italic )
       tf.setFont( italicFont);
     else if( e.getSource() == boldItalic )
       tf.setFont( boldItalicFont);
  }
```

```
        public static void main(String[] args)
        {
                GroupCheckboxApp ca = new GroupCheckboxApp() ;
        }
}
```


Sample Application
sample application
Bold
Italic
Plain
Bold/Italic
Sample Application
sample application
Bold
Italic
Plain
Bold/Italic
Sample Application
sample application
Bold
Italic
Plain
Bold/Italic
Sample Application
sample application
Bold
Italic
Plain
Bold/Italic

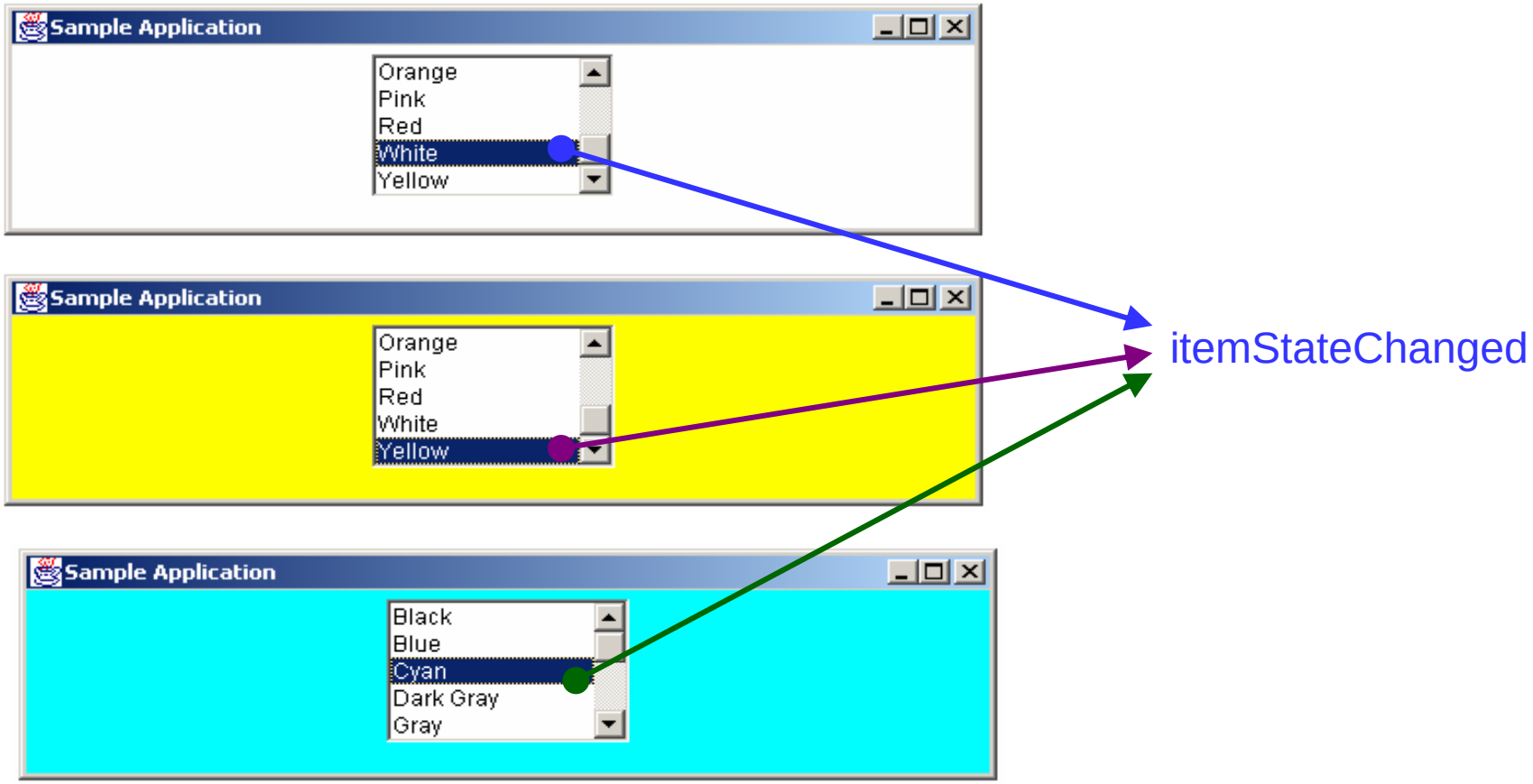
Single-Selection List

colorList = new List(5 , false) ; // single-select



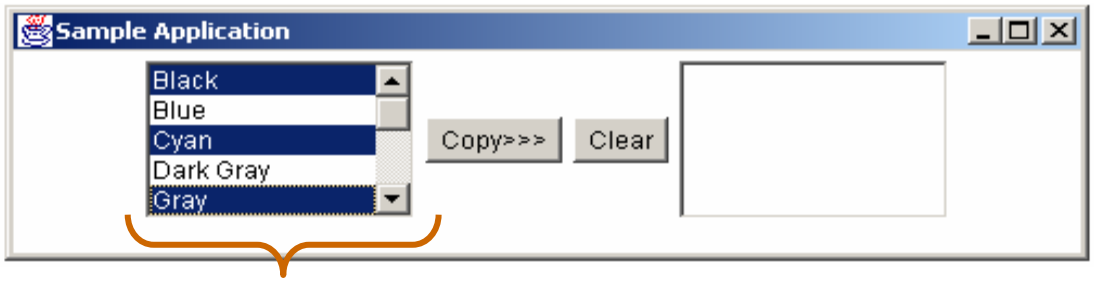
```
public class SingleSelectListApp implements ItemListener {
      private Frame myFrame       ;
      private List colorList      ;
      private String[] colorNames = {
         "Black" , "Blue", "Cyan", "Dark Gray", "Gray", "Green",
         "Light Gray","Magenta","Orange", "Pink","Red","White","Yellow“ } ;
       private Color[] colors = {
           Color.black ,Color.blue,Color.cyan,Color.darkGray,Color.gray,
           Color.green,Color.lightGray,Color.magenta,Color.orange,
           Color.pink, Color.red, Color.white, Color.yellow  } ;
       public SingleSelectListApp ()  {
                myFrame = new Frame("Sample Application") ;
                myFrame.setLayout(new FlowLayout());
                // List
                colorList  = new List( 5 , false) ;
                // add ItemListener
                colorList.addItemListener(this) ;
                // add items to the list
                for(int i=0;i< colorNames.length;i++)
                     colorList.add(colorNames[i]) ;
                myFrame.add(colorList)    ;
                // setSize and setVisible
                myFrame.setSize(500,128) ;
                myFrame.setVisible(true) ;
              }
```

```
    public void itemStateChanged( ItemEvent e) {
        myFrame.setBackground(colors[colorList.getSelectedIndex()]) ;
    }

    public static void main(String[] args)  {
        SingleSelectListApp ssla = new SingleSelectListApp() ;
    }
}
```


Sample Application
Orange
Pink
Red
White
Yellow
Sample Application
Orange
Pink
Red
White
Yellow
Sample Application
Black
Blue
Cyan
Dark Gray
Gray
itemStateChanged

Multiple-Selection List

colorList = new List(5 , true) ; // multiple-select

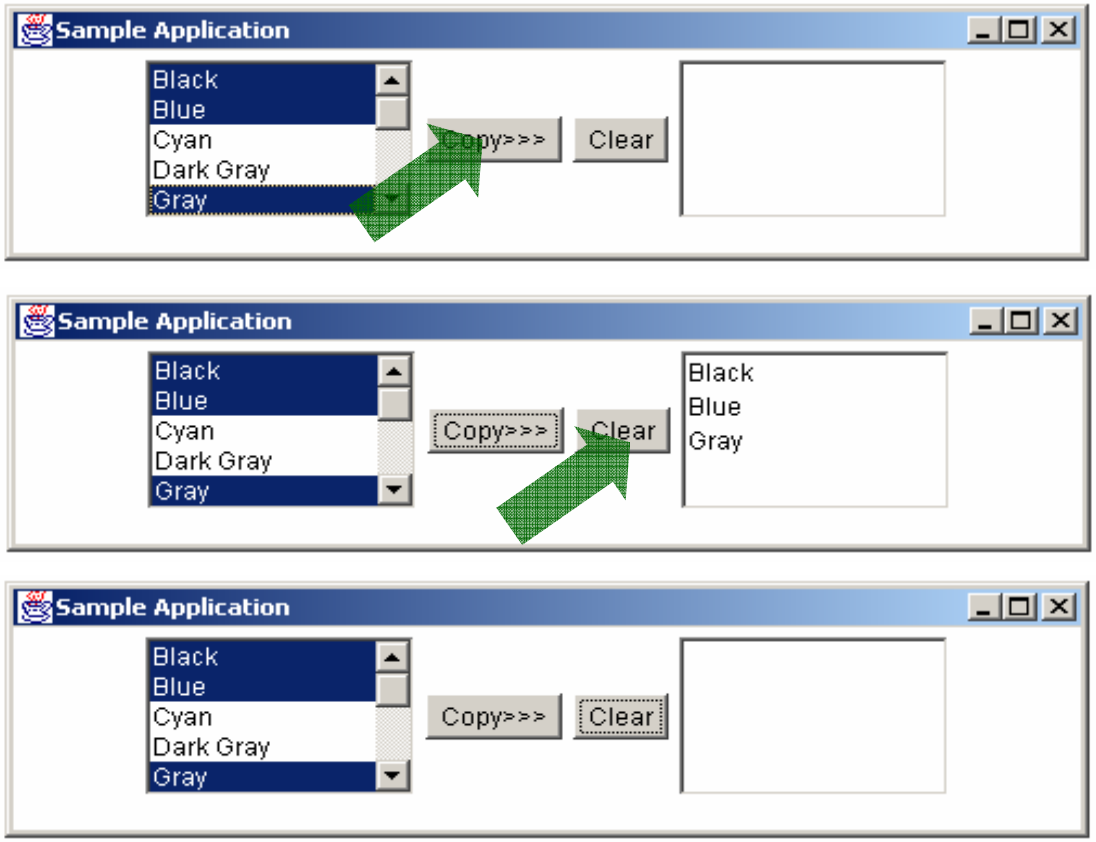


there are 5 items
3 items selected

```
public class MultipleSelectListApp implements ActionListener {
        private Frame myFrame      ;
        private List colorList     ;
        private List copyList      ;
        private Button copy        ;
        private Button clear       ;

        public MultipleSelectListApp () {
            myFrame = new Frame("Sample Application") ;
            myFrame.setLayout(new FlowLayout());
            // Lists
            colorList  = new List( 5 , true) ;
            copyList  = new List( 5 , false) ;
            // Button
            copy = new Button("Copy>>>") ;
            copy.addActionListener(this) ;
            clear = new Button("Clear") ;
            clear.addActionListener(this) ;
            // add items to the list
            for(int i=0;i< colorNames.length;i++)
                colorList.add(colorNames[i]) ;
```

```
                myFrame.add(colorList)    ;
                myFrame.add(copy)         ;
                myFrame.add(clear)        ;
                myFrame.add(copyList)     ;
                // setSize and setVisible
                myFrame.setSize(500,128) ;
                myFrame.setVisible(true) ;
        }
        public void actionPerformed( ActionEvent e) {
                if ( e.getSource() == copy ) {
                   String[] colors ;
                   // get the selected states
                   colors = colorList.getSelectedItems() ;
                   // copy them to copyList
                   for( int i=0 ; i < colors.length ; i++ )
                       copyList.add( colors[i] ) ;
                }else{
                  copyList.clear();
                }
        }
```

```
    public static void main(String[] args)
    {
      MultipleSelectListApp ssla = new MultipleSelectListApp() ;
    }
}
```

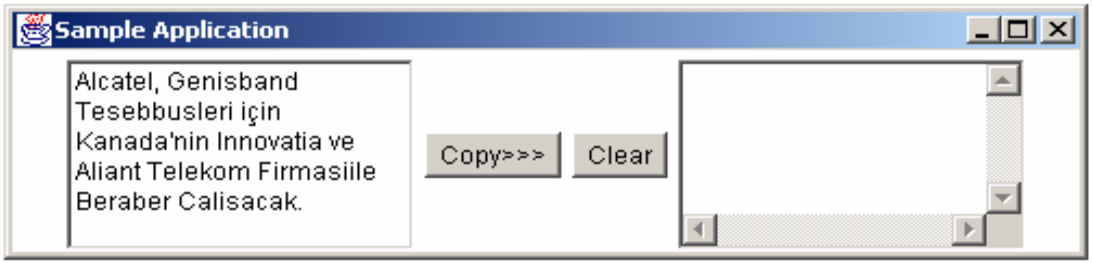


TextArea

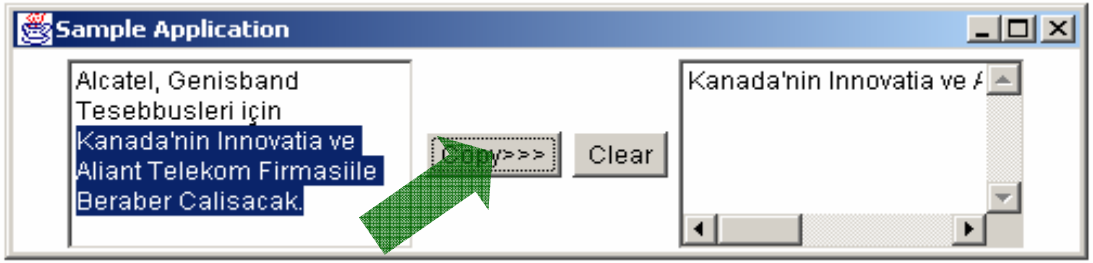
- public TextArea( )
- public TextArea(int rows, int columns)
- public TextArea(String s)
- public TextArea(String s, int rows, int columns)
- public TextArea(String s, int rows, int columns,
  int scrollbars)

```
public class TextAreaApp implements ActionListener, TextListener {
        private Frame myFrame   ;
        private TextArea t1,t2      ;
        private Button copy         ;
        private Button clear        ;

        public TextAreaApp ()  {
          String s = "Alcatel, Genisband Tesebbusleri için " +
                     "Kanada'nin Innovatia ve Aliant Telekom Firmasi" +
                     "ile Beraber Calisacak." ;
         myFrame = new Frame("Sample Application") ;
         myFrame.setLayout(new FlowLayout());
         // TextArea
    t1  = new TextArea( s , 5 , 20 ,TextArea.SCROLLBARS_NONE ) ;
        t2  = new TextArea( 5 , 20 ) ;
         // Button
         copy = new Button("Copy>>>") ;
         copy.addActionListener(this) ;
         clear = new Button("Clear") ;
         clear.addActionListener(this) ;
         myFrame.add(t1)              ;
         myFrame.add(copy)                    ;
         myFrame.add(clear)                   ;
         myFrame.add(t2)              ;
```

```
        // setSize and setVisible
         myFrame.setSize(500,128) ;
         myFrame.setVisible(true) ;
       }
       public void textValueChanged( TextEvent e )
       {
           TextComponent source = (TextComponent) e.getSource() ;
                   t2.setText( source.getText() ) ;
       }
       public void actionPerformed( ActionEvent e){
                  if ( e.getSource() == copy ) {
                    t2.setText( t1.getSelectedText() )    ;
                  }else{
                    t2.setText("") ;
                  }
       }

       public static void main(String[] args) {
                    TextAreaApp taa = new TextAreaApp() ;
       }
}
```


Sample Application
Alcatel, Genisband
Tesebbusleri için
Kanada'nin Innovatia ve
Aliant Telekom Firmasiile
Beraber Calisacak.
Copy>>>
Clear


Sample Application
Alcatel, Genisband
Tesebbusleri için
Kanada'nin Innovatia ve
Aliant Telekom Firmasiile
Beraber Calisacak.
Copy>>>
Clear

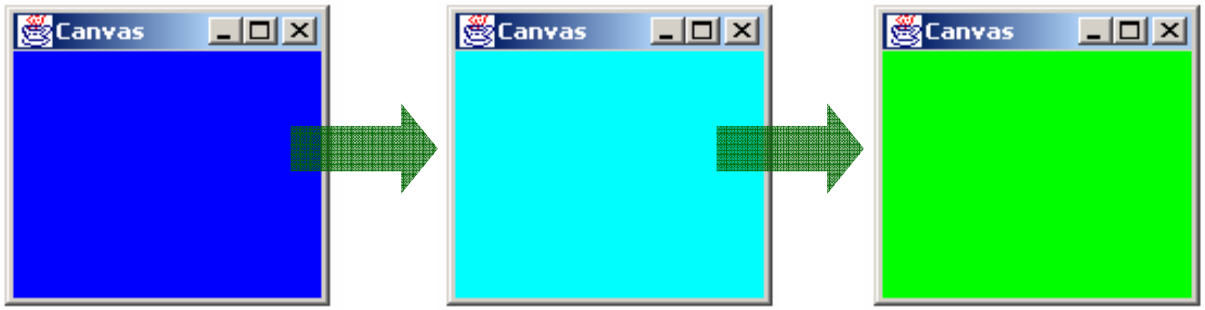

Sample Application
Alcatel, Genisband
Tesebbusleri için
Kanada'nin Innovatia ve
Aliant Telekom Firmasiile
Beraber Calisacak.
Clear
Kanada'nin Innovatia ve

Canvas

- A canvas is a dedicated drawing area that can also receive mouse events.
- Class Canvas inherits from Component
- The paint method for a Canvas must be overriden to draw on the Canvas
- Drawing on a Canvas is performed with coordinates that are measured from the upper-left corner (0,0) of the Canvas.

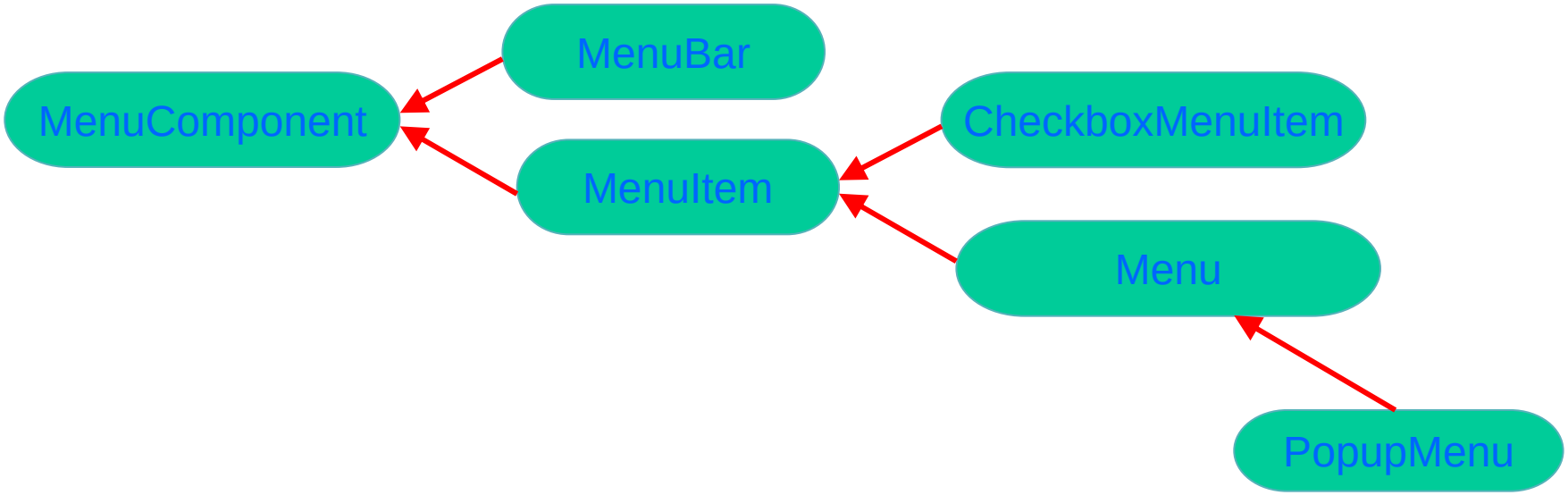
```
import java.awt.*;
import java.awt.event.*;
import java.util.*;
public class MyCanvas extends Canvas implements KeyListener {
        int index;
        Color[] colors =   {
        Color.black , Color.blue, Color.cyan, Color.darkGray, Color.gray,
        Color.green,Color.lightGray, Color.magenta, Color.orange,
        Color.pink, Color.red, Color.white,Color.yellow } ;
        public void paint(Graphics g) {
                g.setColor(colors[index]);
                g.fillRect(0,0,getSize().width,getSize().height);
        }
       public void keyTyped(KeyEvent ev) {
          index++;
          if (index == colors.length)
             index =0;
         repaint();
    }
  public void keyPressed(KeyEvent ev) {}
  public void keyReleased(KeyEvent ev) {}
```

```
    public static void main(String args[]) {
        Frame f = new Frame("Canvas");
        MyCanvas mc = new MyCanvas();
        f.add(mc,BorderLayout.CENTER);
        f.setSize(150, 150);
        mc.requestFocus();
        mc.addKeyListener(mc);
       f.setVisible(true);
    }
}
```

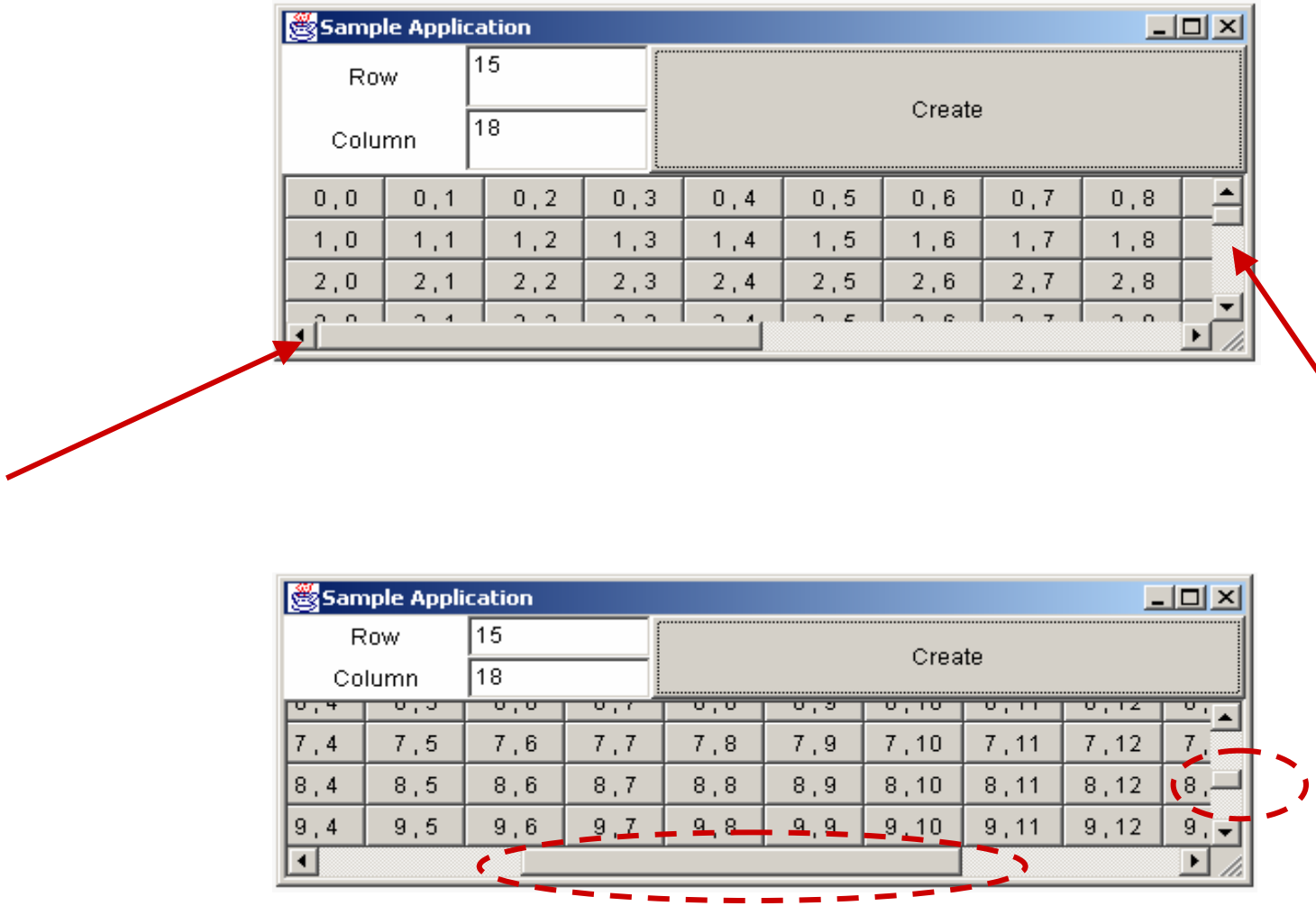


Menus with Frames

- Menus are an integral part of GUIs
- Menus allow the user to perform actions without unneccessarily cluttering a graphical user interface with extra GUI components
- Menus can only be used with Frames
- PopupMenus can be used with any GUI component


MenuBar
MenuComponent
CheckboxMenuItem
MenuItem
Menu
PopupMenu

ScrollPane


Sample Application
Row
15
Column
18
Create
0,0 0,1 0,2 0,3 0,4 0,5 0,6 0,7 0,8
1,0 1,1 1,2 1,3 1,4 1,5 1,6 1,7 1,8
2,0 2,1 2,2 2,3 2,4 2,5 2,6 2,7 2,8
Sample Application
Row
15
Column
18
Create
7,4 7,5 7,6 7,7 7,8 7,9 7,10 7,11 7,12
8,4 8,5 8,6 8,7 8,8 8,9 8,10 8,11 8,12
9,4 9,5 9,6 9,7 9,8 9,9 9,10 9,11 9,12

```
import java.awt.* ;
import java.awt.event.* ;
public class ScrollPaneApp implements ActionListener, TextListener {
        private Frame myFrame       ;
        private Panel np            ;
        private Panel innerPanel    ;
        private ScrollPane sp       ;
        private Button[] buttons    ;
        private Label rlabel,clabel ;
        private TextField rtf,ctf   ;
        private Button create       ;
        private int row=10,column=10 ;
        private Dialog d            ;
```

```
public ScrollPaneApp () {
    myFrame = new Frame("Sample Application") ;
    np = new Panel() ;
    np.setLayout(new GridLayout(2,2)) ;
    rlabel = new Label( "Row" , Label.CENTER ) ;
    clabel = new Label( "Column" , Label.CENTER ) ;
    rtf    = new TextField( 10 ) ;
    rtf.addTextListener(this)    ;
    ctf    = new TextField( 10 ) ;
    ctf.addTextListener(this)    ;
    np.add(rlabel)               ;
    np.add(rtf)                  ;
    np.add(clabel)               ;
    np.add(ctf)                  ;
```

```
        // ScrollPane
        sp = new ScrollPane() ;
        innerPanel = new Panel() ;
        sp.add(innerPanel)    ;
        // Button
        create = new Button("Create") ;
        create.addActionListener(this);
        // setSize and setVisible
        myFrame.add(np,BorderLayout.WEST) ;
        myFrame.add(create,BorderLayout.CENTER) ;
        myFrame.add(sp,BorderLayout.SOUTH) ;
        myFrame.setSize(500,200) ;
        myFrame.setVisible(true) ;
    }
```

```
public void textValueChanged( TextEvent e ) {
        if ( e.getSource() == rtf ) {
            row = Integer.parseInt( rtf.getText() ) ;
        }else {
            column = Integer.parseInt( ctf.getText() ) ;
        }
}
```

```
public void actionPerformed( ActionEvent e) {
    if( (row>0) && (column>0) ) {
    innerPanel.setLayout(new GridLayout(row,column)) ;
    buttons = new Button[row*column] ;
    for(int i=0;i<row;i++)
      for(int j=0;j<column;j++) {
        buttons[i*column+j] = new Button( i + " , " + j) ;
            innerPanel.add(buttons[i*column+j]);
      }
     myFrame.pack();
}else {
```

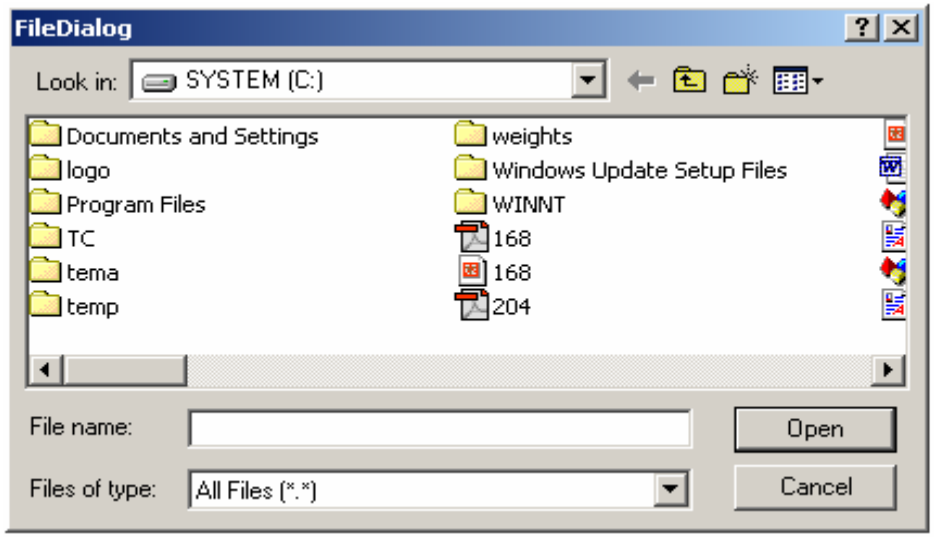
```
            d = new Dialog(myFrame, "Ooops Dialog", false);
            Button b = new Button("OK") ;
            b.addActionListener(this) ;
            d.add(new Label("Oooppps..."),BorderLayout.CENTER);
            d.add(b,BorderLayout.SOUTH);
            d.pack();
            d.setVisible(true);
        }
    }
    public static void main(String[] args) {
            ScrollPaneApp spa = new ScrollPaneApp() ;
    }
}
```

Dialog

```
Dialog d = new Dialog(myFrame, "Dialog", false);
Button b = new Button("OK") ;
b.addActionListener(this) ;
d.add(new Label("Hello,I'm a Dialog"),BorderLayout.CENTER);
d.add(b,BorderLayout.SOUTH);
d.pack();
d.setVisible(true);
```

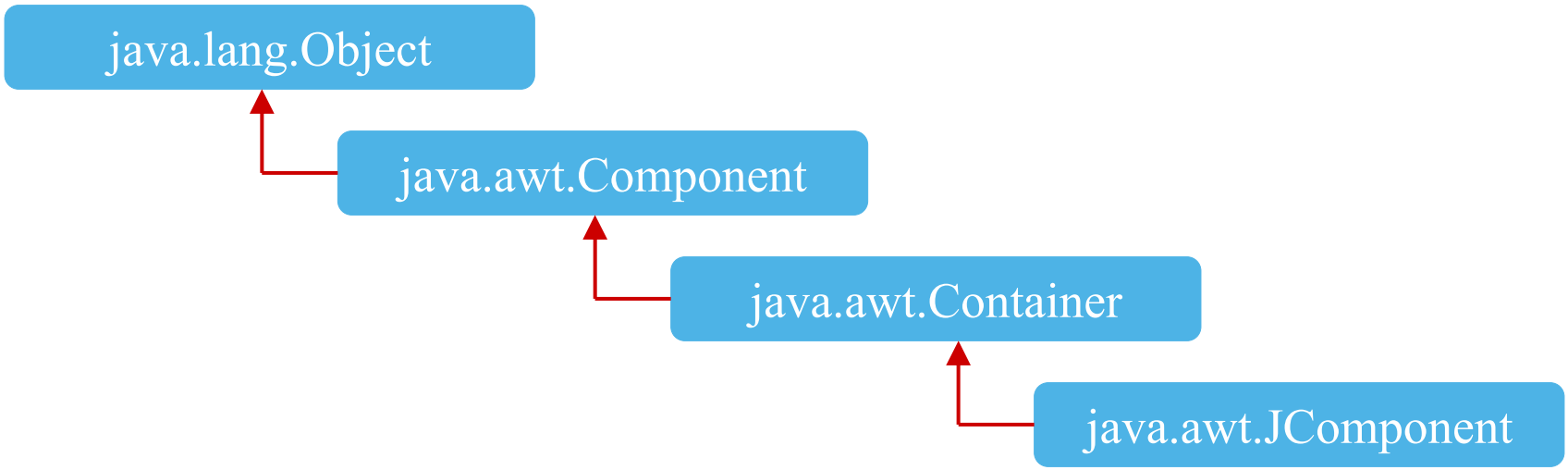
Creating a FileDialog

```
FileDialog d = new FileDialog(parentFrame, "FileDialog");

d.setVisible(true); // block here until OK selected

String fname = d.getFile();
```



A SWING

- Swing GUI components
  - Defined in package **javax.swing**
  - Original GUI components from Abstract Windowing Toolkit in **java.awt**
    - Heavyweight components - rely on local platform's windowing system for look and feel
  - Swing components are lightweight
    - Written in Java, not weighed down by complex GUI capabilities of platform
    - More portable than heavyweight components
  - Swing components allow programmer to specify look and feel
    - Can change depending on platform
    - Can be the same across all platforms



- **Component** defines methods that can be used in its subclasses
  (for example, **paint** and **repaint**)
- **Container** - collection of related components
  - When using **JFrames**, attach components to the content pane
    (a **Container**)
  - Method **add**
- **JComponent** - superclass to most Swing components
- Much of a component's functionality inherited from these classes

Swing Overview

- Some capabilities of subclasses of **JComponent**
  - Pluggable look and feel
  - Shortcut keys (mnemonics)
    - Direct access to components through keyboard
  - Common event handling
    - If several components perform same actions
  - Tool tips
    - Description of component that appears when mouse over it

JLabel

- Labels
  - Provide text instructions on a GUI
  - Read-only text
  - Programs rarely change a label's contents
  - Class **JLabel** (subclass of **JComponent**)
- Methods

```
18      label1 = new JLabel( "Label with text" );
```

- **myLabel.setToolTipText("Text")**
  - Displays **"Text"** in a tool tip when mouse over label
- **myLabel.setText("Text")**
- **myLabel.getText()**

Icon

- Object that implements interface **Icon**

- One class is **ImageIcon** (**.gif** and **.jpeg** images)

```
Icon bug = new ImageIcon( "bug1.gif" );
```

- Display an icon with **setIcon** method (of class **JLabel**)

  - **myLabel.setIcon(myIcon);**

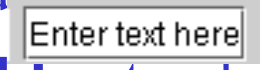
```
label3.setIcon( bug );
```

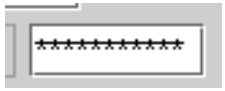
- Alignment
  - By default, text appears to right of image
  - **`JLabel`** methods **`setHorizontalTextPosition`** and **`setVerticalTextPosition`**
    - Specify where text appears in label
    - Use integer constants defined in interface **`SwingConstants`** (**`javax.swing`**)
      - **`SwingConstants.LEFT, RIGHT, BOTTOM, CENTER`**
- Another **`JLabel`** constructor
  - **`JLabel( "Text", ImageIcon, Text_Alignment_CONSTANT)`**

JTextField, JPasswordField

- Single line areas in which text can be entered or displayed
- **JPasswordField**s show inputted text as an asterisk *

- **JTextField** extends **JTextComponent**
  - **JPasswordField** extends **JTextField**





- When **Enter** pressed
  - **ActionEvent** occurs
  - Currently active field "has the focus"

- Methods
  - Constructors
    - **`JTextField( 10 )`**
      - Textfield with 10 columns of text
      - Takes average character width, multiplies by 10
    - **`JTextField( "Hi" )`**
      - Sets text, width determined automatically
    - **`JTextField( "Hi", 20 )`**
  - **`setEditable( boolean )`**
    - If **`false`**, user cannot edit text
    - Can still generate events

  - **`getPassword`**
    - Class **`JPasswordField`**
    - Returns password as an **`array`** of type **`char`**

JButton

- Button
  - Component user clicks to trigger an action
  - Several types of buttons
    - Command buttons, toggle buttons, check boxes, radio buttons
- Command button
  - Generates **ActionEvent** when clicked
  - Created with class **JButton**
    - Inherits from class **AbstractButton**
    - Defines many features of Swing buttons
- **JButton**
  - Text on face called button label
  - Each button should have a different label
  - Support display of **Icon**s

- Methods of class **`JButton`**
  - Constructors

```
JButton myButton = new JButton( "Label" );
JButton myButton = new JButton( "Label", myIcon );
```

  - **`setRolloverIcon( myIcon )`**
    - Sets image to display when mouse over button
- Class ActionEvent
  - **`getActionCommand`**
    - Returns label of button that generated event

JCheckBox, JRadioButton

- State buttons
  - **JToggleButton**
    - Subclasses **JCheckBox**, **JRadioButton**
  - Have on/off (true/false) values

- Class **JCheckBox**

  - Text appears to right of checkbox
  - Constructor

    JCheckBox myBox = new JCheckBox("Title");

- When **JCheckBox** changes
  - **ItemEvent** generated
    - Handled by an **ItemListener**, which must define **itemStateChanged**
  - Register handlers with with **addItemListener**

```
private class CheckBoxHandler implements ItemListener {
        public void itemStateChanged( ItemEvent e ) {
}
```

  - **getStateChange**
    - Returns **ItemEvent.SELECTED** or **ItemEvent.DESELECTED**
- **JTextField**
  - Method **setText(fontObject)**
    - **new Font(name, style_CONSTANT, size)**
    - **style_CONSTANT - FONT.PLAIN, BOLD, ITALIC**
      - Can add to get combinations

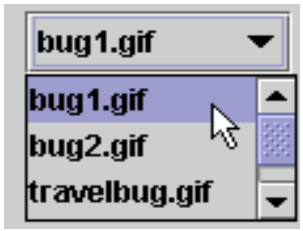
- Radio buttons
  - Have two states: selected and deselected
  - Normally appear as a group
    - Only one radio button in the group can be selected at time
    - Selecting one button forces the other buttons off
  - Used for mutually exclusive options
  - **ButtonGroup** - maintains logical relationship between radio buttons
- Class **JRadioButton**
  - Constructor
    - **JRadioButton("Label", selected)**
    - If selected **true**, **JRadioButton** initially selected

- Class **JRadioButton**
  - Generates **ItemEvents** (like **JCheckBox**)
- Class **ButtonGroup**
  - **ButtonGroup myGroup = new ButtonGroup();**
  - Binds radio buttons into logical relationship
  - Method **add**
    - Associate a radio button with a group

myGroup.add(myRadioButton)

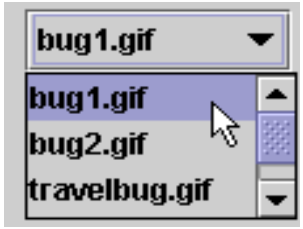
JComboBox

- Combo box (drop down list)
  - List of items, user makes a selection
  - Class **JComboBox**
    - Generate **ItemEvents**



- **JComboBox**
  - Constructor

    JComboBox (arrayOfNames)
  - Numeric index keeps track of elements
    - First element added at index **0**
    - First item added is appears as currently selected item when combo box appears



- **JComboBox** methods
  - **getSelectedIndex**
    - Returns the index of the currently selected item
    - **myComboBox.getSelectedIndex()**
  - **setMaximumRowCount(n)**
    - Set max number of elements to display when user clicks combo box
    - Scrollbar automatically provided
    - **setMaximumRowCount(3)**

JList

- List
  - Displays series of items, may select one or more
  - This section, discuss single-selection lists
- Class **JList**
  - Constructor **JList(arrayOfNames)**
    - Takes array of **Objects** (**String**s) to display in list
  - **setVisibleRowCount(n)**
    - Displays **n** items at a time
    - Does not provide automatic scrolling

- **JScrollPane** object used for scrolling

```
c.add( new JScrollPane( colorList ) );
```

  - Takes component to which to add scrolling as argument
  - Add **JScrollPane** object to content pane
- **JList** methods
  - **setSelectionMode(selection_CONSTANT)**
  - **SINGLE_SELECTION**
    - One item selected at a time
  - **SINGLE_INTERVAL_SELECTION**
    - Multiple selection list, allows contiguous items to be selected
  - **MULTIPLE_INTERVAL_SELECTION**
    - Multiple-selection list, any items can be selected

- **JList** methods
  - **getSelectedIndex()**
    - Returns index of selected item
- Event handlers
  - Implement interface **ListSelectionListener** (**javax.swing.event**)
  - Define method **valueChanged**
  - Register handler with **addListSelectionListener**

Multiple Selection List

- Multiple selection lists
  - **SINGLE_INTERVAL_SELECTION**
    - Select a contiguous group of items by holding *Shift* key
  - **MULTIPLE_INTERVAL_SELECTION**
    - Select any amount of items
    - Hold *Ctrl* key and click each item to select
- **JList** methods
  - **getSelectedValues()**
    - Returns an array of **Objects** representing selected items
  - **setListData(arrayOfObjects)**
    - Sets items of **JList** to elements in **arrayOfObjects**

JPanel

- Complex GUIs
  - Each component needs to be placed in an exact location
  - Can use multiple panels
    - Each panel's components arranged in a specific layout
- Panels
  - Class **JPanel** inherits from **JComponent**, which inherits from **java.awt.Container**
    - Every **JPanel** is a **Container**
  - **JPanels** can have components (and other **JPanels**) added to them
    - **JPanel** sized to components it contains
    - Grows to accomodate components as they are added

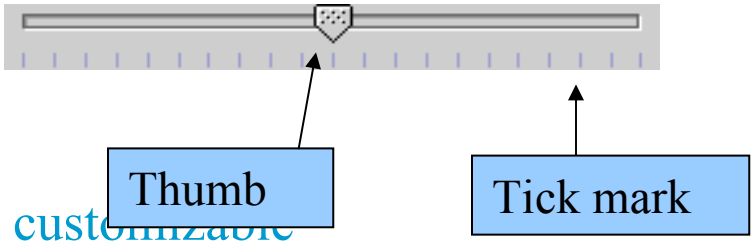
JTextArea

- **JTextArea**
  - Area for manipulating multiple lines of text
  - Like **JTextField**, inherits from **JTextComponent**
    - Many of the same methods
  - Does not have automatic scrolling
  - Methods
    - **getSelectedText**
      - Returns selected text (dragging mouse over text)
    - **setText(string)**
  - Constructor
    - **JTextArea(string, numrows, numcolumns)**
- **JScrollPane**
  - Provides scrolling for a component

- Initialize with component
  - **new JScrollPane(myComponent)**
- Can set scrolling policies (always, as needed, never)
- Methods **setHorizontalScrollBarPolicy**, **setVerticalScrollBarPolicy**
  - Constants:
  - **JScrollPane.VERTICAL_SCROLLBAR_ALWAYS**
  - **JScrollPane.VERTICAL_SCROLLBAR_AS_NEEDED**
  - **JScrollPane.VERTICAL_SCROLLBAR_NEVER**
    - Similar for **HORIZONTAL**
  - If set to **JScrollPane.HORIZONTAL_SCROLLBAR_NEVER**, word wrap

JSlider

- Select from a range of integer values



- Highly customizable
  - Snap-to ticks, major and minor ticks, labels
- When has focus (currently selected GUI component)
  - Use mouse or keyboard
    - Arrow or keys to move thumb, *Home*, *End*
- Have horizontal or vertical orientation
  - Minimum value at left/bottom, maximum at right/top
  - Thumb indicates current value

- Methods
  - Constructor
  - **JSlider(orientation_CONSTANT, min, max, initialValue)**
    - **orientation_CONSTANT**
      - **SwingConstants.HORIZONTAL**
      - **SwingConstants.VERTICAL**
    - **min, max** - range of values for slider
    - **initialValue** - starting location of thumb

```
diameter = new JSlider( SwingConstants.HORIZONTAL,
                        0, 200, 10 );
```

- Methods
  - **setMajorTickSpacing(n)**
    - Each tick mark represents **n** values in range
  - **setPaintTicks(boolean)**
    - **false** (default) - tick marks not shown
  - **getValue()**
    - Returns current thumb position
- Events
  - JSliders generates **ChangeEvent**s
    - **addChangeListener**
    - Define method **stateChanged**

JFrame

- **JFrame**
  - Inherits from **java.awt.Frame**, which inherits from **java.awt.Window**
  - **JFrame** is a window with a title bar and a border
    - Not a lightweight component - not written completely in Java
    - Window part of local platform's GUI components
      - Different for Windows, Macintosh, and UNIX
- **JFrame** operations when user closes window
  - Controlled with method **setDefaultCloseOperation**
    - Interface **WindowConstants** (**javax.swing**) has three constants to use
    - **DISPOSE_ON_CLOSE**, **DO_NOTHING_ON_CLOSE**, **HIDE_ON_CLOSE** (default)

- Windows take up valuable resources
  - Explicitly remove windows when not needed
  - Method **dispose** (of class **Window**, indirect superclass of **JFrame**)
    - Or, use **setDefaultCloseOperation**
  - **DO_NOTHING_ON_CLOSE** -
    - You determine what happens when user wants to close window
- Display
  - By default, window not displayed until method **show** called
  - Can display by calling method **setVisible(true)**
  - Method **setSize**
    - Set a window's size else only title bar will appear

Menu

- Menus
  - Important part of GUIs
  - Perform actions without cluttering GUI
  - Attached to objects of classes that have method **setJMenuBar**
    - **JFrame** and **JApplet**
  - **ActionEvent**s
- Classes used to define menus
  - **JMenuBar** - container for menus, manages menu bar
  - **JMenuItem** - manages menu items
    - Menu items - GUI components inside a menu
    - Can initiate an action or be a submenu
    - Method **isSelected**

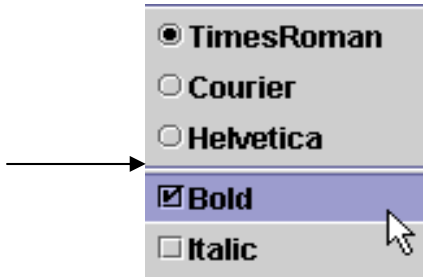
- Classes used to define menus (continued)
  - **JMenu** - manages menus
    - Menus contain menu items, and are added to menu bars
    - Can be added to other menus as submenus
    - When clicked, expands to show list of menu items
  - **JCheckBoxMenuItem** (extends **JMenuItem**)
    - Manages menu items that can be toggled
    - When selected, check appears to left of item
  - **JRadioButtonMenuItem** (extends **JMenuItem**)
    - Manages menu items that can be toggled
    - When multiple **JRadioButtonMenuItem**s are part of a group (**ButtonGroup**), only one can be selected at a time
    - When selected, filled circle appears to left of item

- Mnemonics
  - Quick access to menu items (File)
    - Can be used with classes that have subclass **`javax.swing.AbstractButton`**
  - Method **`setMnemonic`**

```
JMenu fileMenu = new JMenu( "File" )
fileMenu.setMnemonic( 'F' );
```

    - Press **`Alt + F`** to access menu
- Methods
  - **`setSelected( true )`**
    - Of class **`AbstractButton`**
    - Sets button/item to selected state

- Methods (continued)
  - **addSeparator()**
    - Of class **JMenu**
    - Inserts separator line into menu



- Dialog boxes
  - Modal - No other window can be accessed while it is open (default)
    - Modeless - other windows can be accessed

Dialogs

- **JOptionPane.showMessageDialog(parentWindow, text, title, messageType)**
- **parentWindow** - determines where dialog box appears
  - **null** - displayed at center of screen
  - Window specified - dialog box centered horizontally over parent


```
JOptionPane.showMessageDialog( MenuTest.this,
                               "This is an example\nof using menus",
                               "About", JOptionPane.PLAIN_MESSAGE );
```

- Using menus
  - Create menu bar
    - Set menu bar for **JFrame**
      - **setJMenuBar(myBar);**
  - Create menus
    - Set Mnemonics
  - Create menu items
    - Set Mnemonics
    - Set event handlers
  - If using **JRadioButtonMenuItem**s
    - Create a group: **myGroup = new ButtonGroup();**
    - Add **JRadioButtonMenuItem**s to the group

- Add menu items to appropriate menus
  - **`myMenu.add( myItem );`**
  - Insert separators if necessary:
    `myMenu.addSeparator();`
- If creating submenus, add submenu to menu
  - **`myMenu.add( mySubMenu );`**
- Add menus to menu bar
  - **`myMenuBar.add( myMenu );`**