core WEB programming

Advanced Swing

Custom Data Models and Cell Renderers

Agenda

- **Building a simple static JList**
- **Adding and removing entries from a JList at runtime**
- **Making a custom data model**
  - Telling JList how to extract data from existing objects
- **Making a custom cell renderer**
  - Telling JList what GUI component to use for each of the data cells

MVC Architecture

- **Custom data models**
  - Changing the way the GUI control obtains the data. Instead of copying data from an existing object into a GUI control, simply tell the GUI control how to get at the existing data.
- **Custom cell renderers**
  - Changing the way the GUI control displays data values. Instead of changing the data values, simply tell the GUI control how to build a Swing component that represents each data value.
- **Main applicable components**
  - JList
  - JTable
  - JTree

JList with Fixed Set of Choices

- **Build JList: pass strings to constructor**
  - The simplest way to use a JList is to supply an array of strings to the JList constructor. Cannot add or remove elements once the JList is created.

```
String options =
  { "Option 1", ... , "Option N"};
JList optionList = new JList(options);
```

- **Set visible rows**
  - Call setVisibleRowCount and drop JList into JScrollPane

```
optionList.setVisibleRowCount(4);
JScrollPane optionPane =
  new JScrollPane(optionList);
someContainer.add(optionPane);
```

- **Handle events**
  - Attach ListSelectionListener and use valueChanged

Simple JList: Example Code

```
public class JListSimpleExample extends JFrame {
...
  public JListSimpleExample() {
    super("Creating a Simple JList");
    WindowUtilities.setNativeLookAndFeel();
    addWindowListener(new ExitListener());
    Container content = getContentPane();
    String[] entries = { "Entry 1", "Entry 2", "Entry 3",
                         "Entry 4", "Entry 5", "Entry 6"};
    sampleJList = new JList(entries);
    sampleJList.setVisibleRowCount(4);
    sampleJList.addListSelectionListener
                                (new ValueReporter());
    JScrollPane listPane = new JScrollPane(sampleJList);
    ...
  }
```

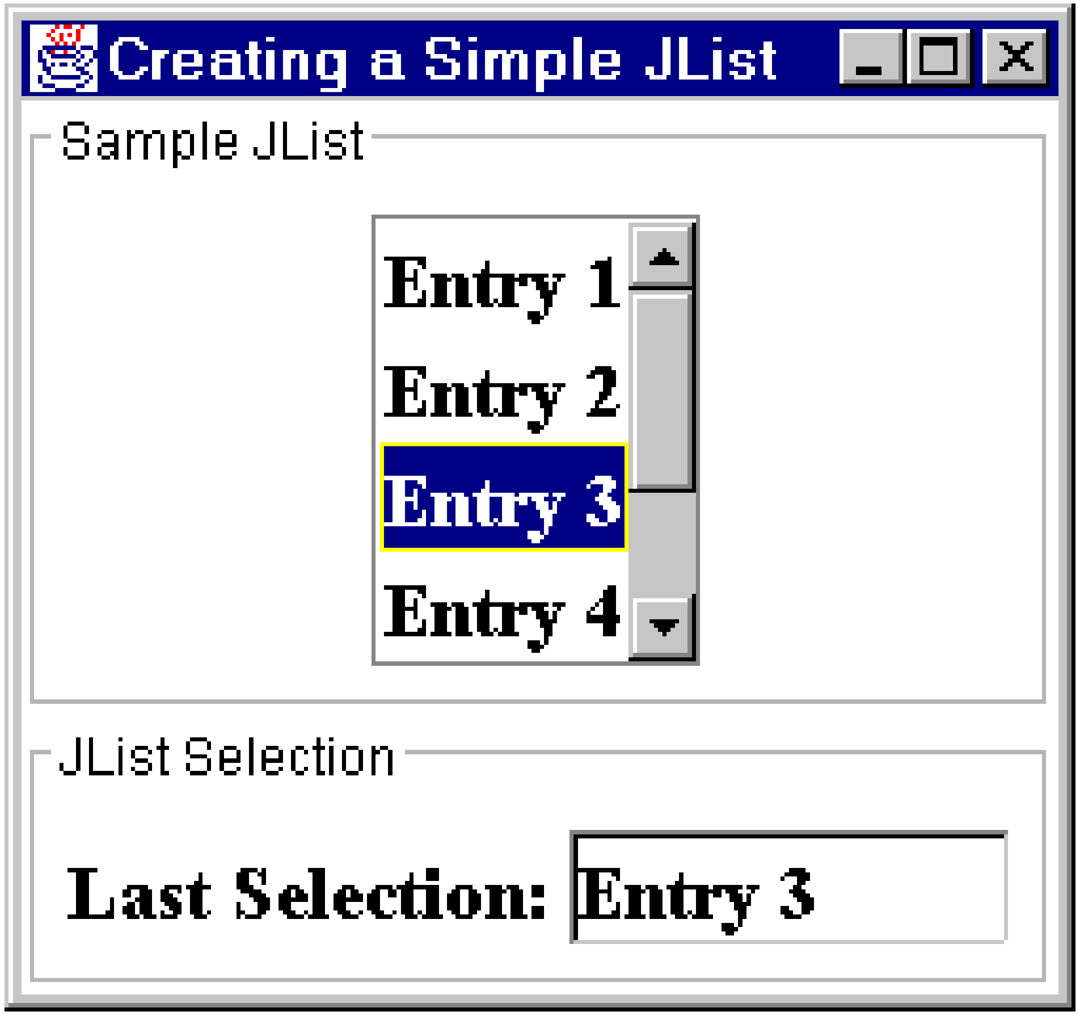
Simple JList: Example Code (Continued)

```
private class ValueReporter implements ListSelectionListener {

  /** You get three events in many cases -- one for the
   *  deselection of the originally selected entry, one
   *  indicating the selection is moving, and one for the
   *  selection of the new entry. In the first two cases,
   *  getValueIsAdjusting returns true; thus, the test
   *  below since only the third case is of interest.
   */

  public void valueChanged(ListSelectionEvent event) {
    if (!event.getValueIsAdjusting()) {
      Object value = sampleJList.getSelectedValue();
      if (value != null) {
        valueField.setText(value.toString());
      }
    }
  }
}
}
```

Simple JList: Example Output


Creating a Simple JList

Sample JList

Entry 1
Entry 2
Entry 3
Entry 4

JList Selection

Last Selection: Entry 3

JList with Changeable Choices

- **Build JList:**
  - Create a DefaultListModel, add data, pass to constructor

```
String choices = { "Choice 1", ... , "Choice N"};
DefaultListModel sampleModel = new DefaultListModel();
for(int i=0; i<choices.length; i++) {
  sampleModel.addElement(choices[i]);
}
JList optionList = new JList(sampleModel);
```

- **Set visible rows**
  - Same: Use setVisibleRowCount and a JScrollPane
- **Handle events**
  - Same: attach ListSelectionListener and use valueChanged
- **Add/remove elements**
  - Use the model, not the JList directly

Changeable JList: Example Code

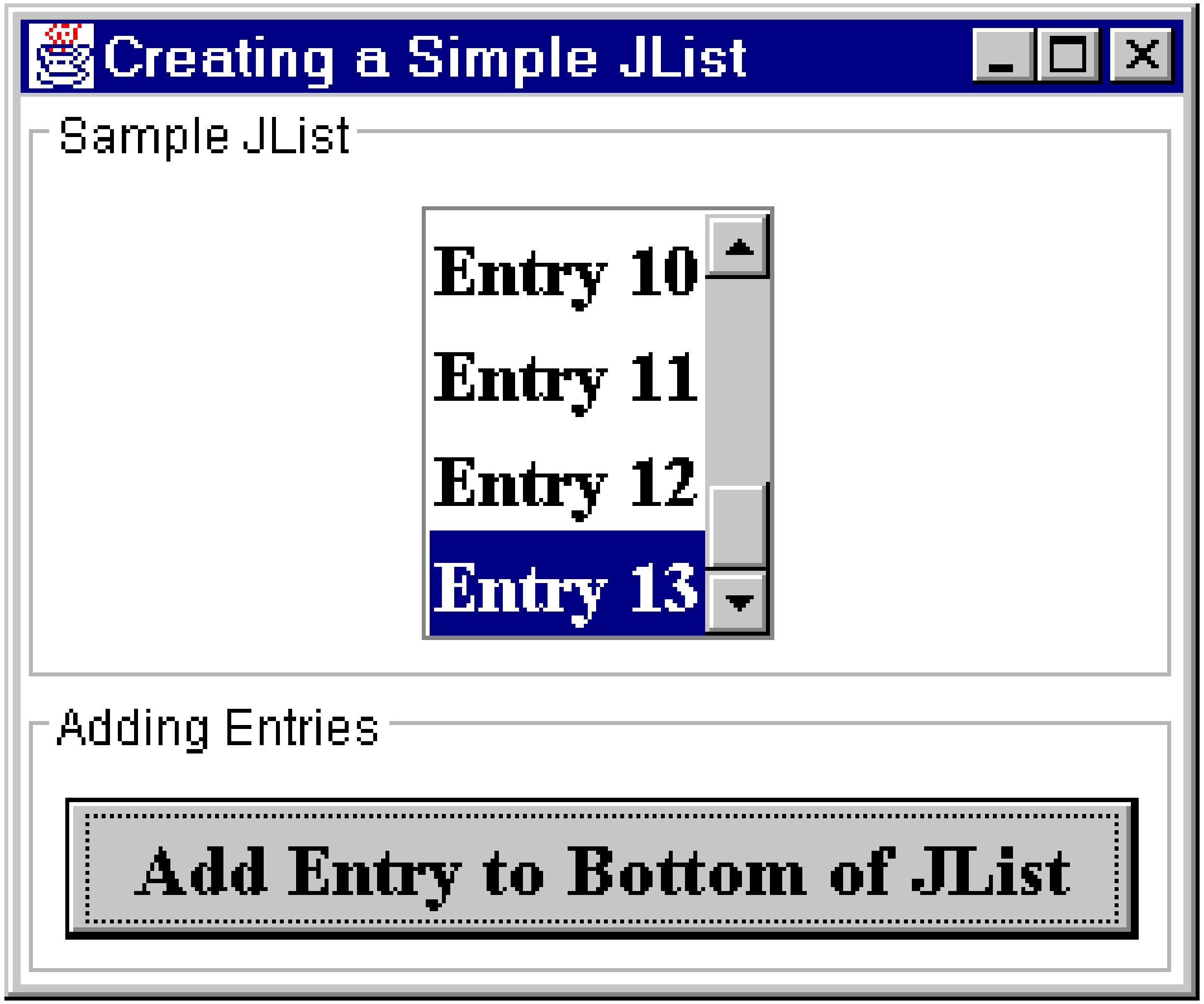
```
String[] entries = { "Entry 1", "Entry 2", "Entry 3",
                     "Entry 4", "Entry 5", "Entry 6"};
sampleModel = new DefaultListModel();
for(int i=0; i<entries.length; i++) {
  sampleModel.addElement(entries[i]);
}
sampleJList = new JList(sampleModel);
sampleJList.setVisibleRowCount(4);
Font displayFont = new Font("Serif", Font.BOLD, 18);
sampleJList.setFont(displayFont);
JScrollPane listPane = new JScrollPane(sampleJList);
```

Changeable JList: Example Code (Continued)

```
  private class ItemAdder implements ActionListener {
    /** Add an entry to the ListModel whenever the user
     *  presses the button. Note that since the new entries
     *  may be wider than the old ones (e.g., "Entry 10" vs.
     *  "Entry 9"), you need to rerun the layout manager.
     *  You need to do this <I>before</I> trying to scroll
     *  to make the index visible.
     */

    public void actionPerformed(ActionEvent event) {
      int index = sampleModel.getSize();
      sampleModel.addElement("Entry " + (index+1));
      ((JComponent)getContentPane()).revalidate();
      sampleJList.setSelectedIndex(index);
      sampleJList.ensureIndexIsVisible(index);
    }
  }
}
```

Changeable JList: Example Output



JList with Custom Data Model

- **Build JList**
  - Have existing data implement ListModel interface
    - getElementAt
      - Given an index, returns data element
    - getSize
      - Tells JList how many entries are in list
    - addListDataListener
      - Lets user add listeners that should be notified when an item is selected or deselected.
    - removeListDataListener
  - Pass model to JList constructor
- **Set visible rows & handle events: as before**
- **Add/remove items: use the model**

Custom Model: Example Code

```
public class JavaLocationListModel implements ListModel {
  private JavaLocationCollection collection;

  public JavaLocationListModel
                  (JavaLocationCollection collection) {
    this.collection = collection;
  }
  public Object getElementAt(int index) {
    return(collection.getLocations()[index]);
  }
  public int getSize() {
    return(collection.getLocations().length);
  }

  public void addListDataListener(ListDataListener l) {}

  public void removeListDataListener(ListDataListener l) {}
}
```

Actual Data

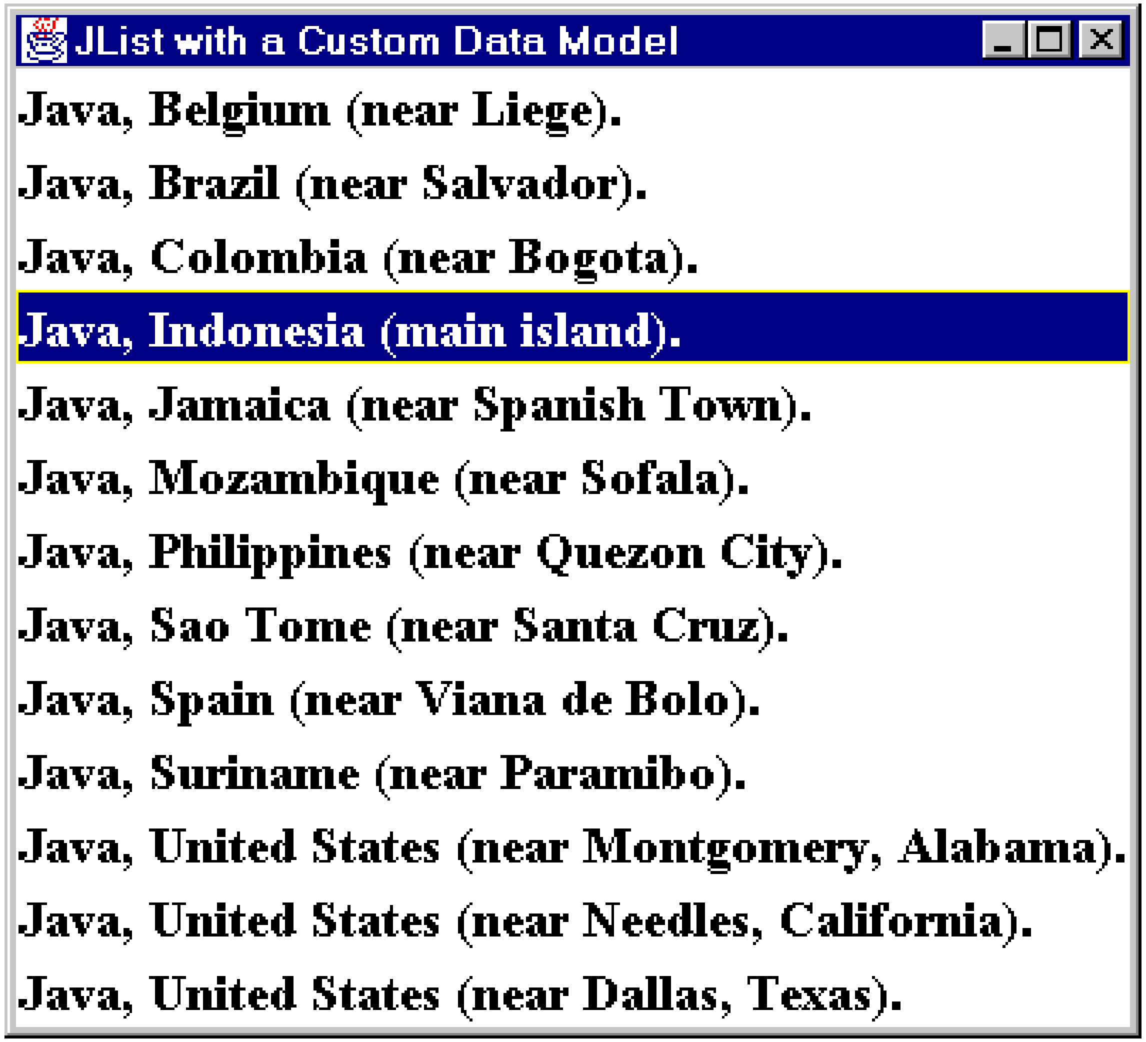
```
public class JavaLocationCollection {
  private static JavaLocation[] defaultLocations =
    { new JavaLocation("Belgium",
                       "near Liege",
                       "flags/belgium.gif"),
      new JavaLocation("Brazil",
                       "near Salvador",
                       "flags/brazil.gif"),
      new JavaLocation("Colombia",
                       "near Bogota",
                       "flags/colombia.gif"),
       ... }; ...
}
```

- **JavaLocation has toString plus 3 fields**
  - Country, comment, flag file

JList with Custom Model: Example Code

```
JavaLocationCollection collection =
  new JavaLocationCollection();
JavaLocationListModel listModel =
  new JavaLocationListModel(collection);
JList sampleJList = new JList(listModel);
Font displayFont =
  new Font("Serif", Font.BOLD, 18);
sampleJList.setFont(displayFont);
content.add(sampleJList);
```

JList with Custom Model: Example Output



```
Java, Belgium (near Liege).
Java, Brazil (near Salvador).
Java, Colombia (near Bogota).
Java, Indonesia (main island).
Java, Jamaica (near Spanish Town).
Java, Mozambique (near Sofala).
Java, Philippines (near Quezon City).
Java, Sao Tome (near Santa Cruz).
Java, Spain (near Viana de Bolo).
Java, Suriname (near Paramibo).
Java, United States (near Montgomery, Alabama).
Java, United States (near Needles, California).
Java, United States (near Dallas, Texas).
```

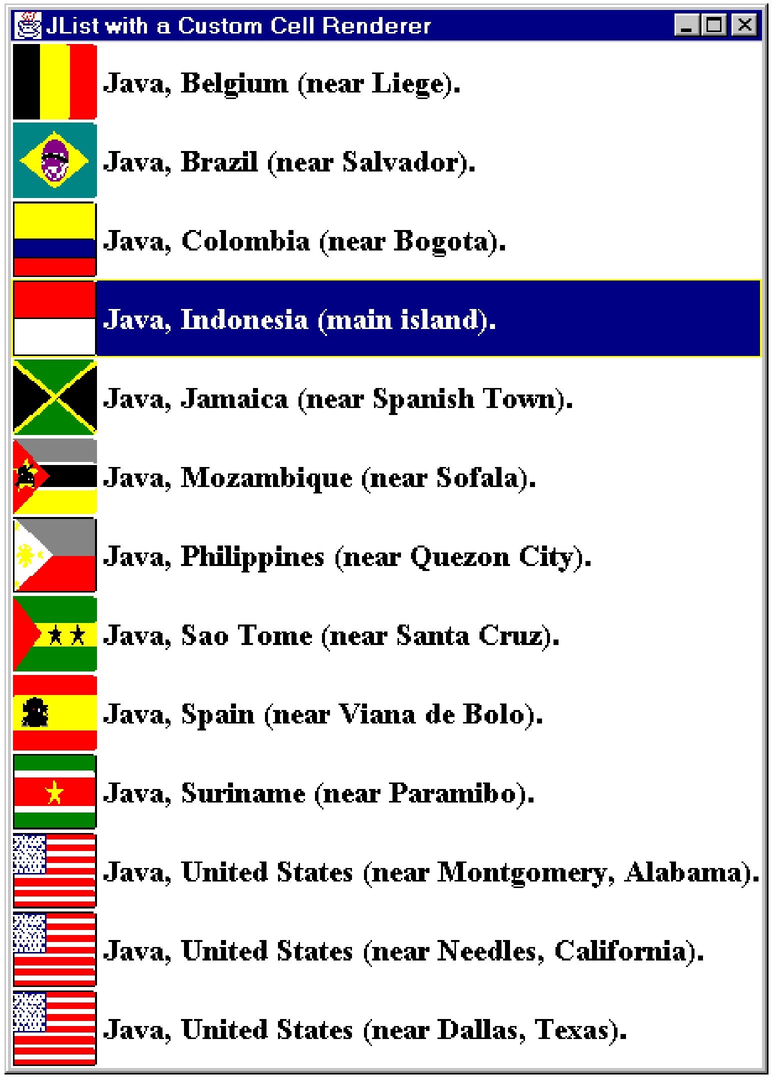
JList with Custom Cell Renderer

- **Idea**
  - Instead of predetermining how the JList will draw the list elements, Swing lets you specify what graphical component to use for the various entries. Attach a ListCellRenderer that has a getListCellRendererComponent method that determines the GUI component used for each cell.
- **Arguments to getListCellRendererComponent**
  - JList: the list itself
  - Object: the value of the current cell
  - int: the index of the current cell
  - boolean: is the current cell selected?
  - boolean: does the current cell have focus?

Custom Renderer: Example Code

```
public class JavaLocationRenderer extends
                                  DefaultListCellRenderer {
  private Hashtable iconTable = new Hashtable();
  public Component getListCellRendererComponent
                 (JList list, Object value, int index,
                  boolean isSelected, boolean hasFocus) {
    JLabel label = (JLabel)super.getListCellRendererComponent
                        (list,value,index,isSelected,hasFocus);
    if (value instanceof JavaLocation) {
      JavaLocation location = (JavaLocation)value;
      ImageIcon icon = (ImageIcon)iconTable.get(value);
      if (icon == null) {
        icon = new ImageIcon(location.getFlagFile());
        iconTable.put(value, icon);
      }
      label.setIcon(icon);
    ...
    return(label);
}}
```

Custom Renderer: Example Output



```
Java, Belgium (near Liege).
Java, Brazil (near Salvador).
Java, Colombia (near Bogota).
Java, Indonesia (main island).
Java, Jamaica (near Spanish Town).
Java, Mozambique (near Sofala).
Java, Philippines (near Quezon City).
Java, Sao Tome (near Santa Cruz).
Java, Spain (near Viana de Bolo).
Java, Suriname (near Paramibo).
Java, United States (near Montgomery, Alabama).
Java, United States (near Needles, California).
Java, United States (near Dallas, Texas).
```

Summary

- **Simple static JList**
  - Pass array of strings to JList constructor
- **Simple changeable JList**
  - Pass DefaultListModel to JList constructor. Add/remove data to/from the model, not the JList.
- **Custom data model**
  - Have real data implement ListModel interface.
  - Pass real data to JList constructor.
- **Custom cell renderer**
  - Assign a ListCellRenderer
  - ListCellRenderer has a method that determines the Component to be used for each cell

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Questions?