Internationalization with JFC™/Swing Look and Feels

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Internationalization, Localization and Java

Java is ready for creating internationalized applications:

- Unicode support
- Locale classes and locale sensitive classes like:
  - *Collator, BreakIterator, Calendar, DateFormat, NumberFormat, MessageFormat, Currency*
- Resource bundles

However:

- JFC/Swing only support *static* internationalization.
- With customized UI classes we can achieve *dynamic* internationalization.

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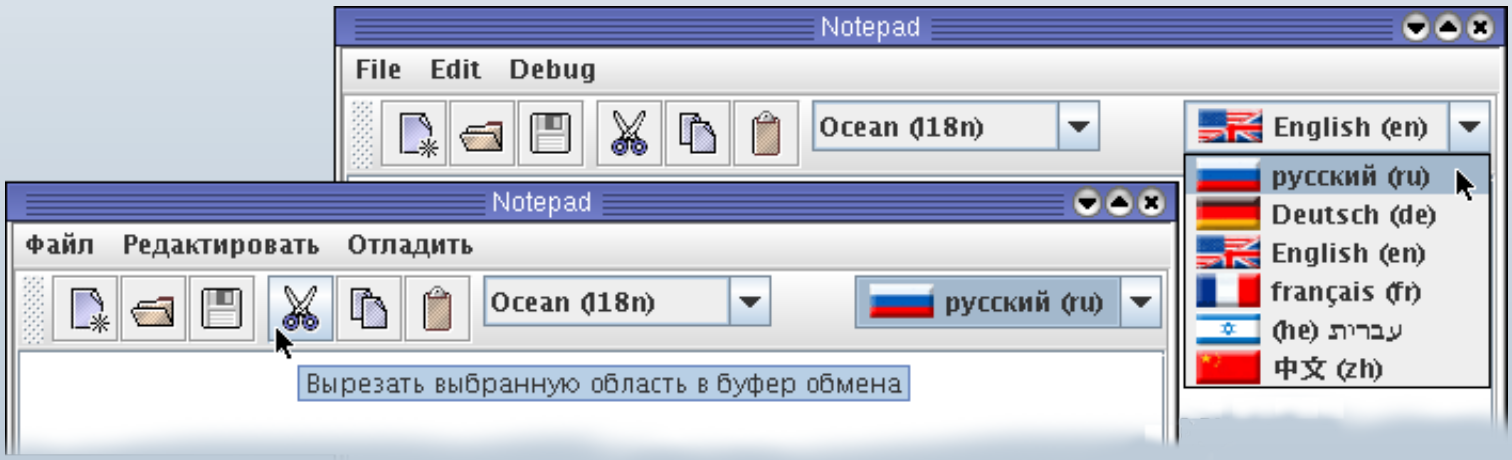
Static vs. Dynamic Internationalization

Static Internationalization:

- *The locale of the application is determined once at startup.*

Dynamic Internationalization:

- *The locale of the application can be changed at runtime.*



Use cases for dynamic internationalization:

- *Multilingual applications, long running applications with complex GUI, enable "best choose" if none of the GUI languages is the user's native language.*

How to use the new I18n Look and Feels

- Typical coding in an application that is not internationalized:

```
JLabel label = new JLabel();
label.setText("Monday");
```

- Coding in an application that is *statically* internationalized:

```
ResourceBundle resource = ResourceBundle.getBundle("MyApplication", Locale.getDefault());
...
JLabel label = new JLabel();
label.setText(resource.getString("MyApplication.Monday"));
```

- Coding in a *dynamically* internationalized application (with an I18n L&F):

```
JLabel label = new JLabel();
label.setText("<i18n>MyApplication.Monday</i18n>");
```

..which can be abbreviated as:

```
JLabel label = new JLabel();
label.setText(I18nUtils.wrapI18nKey("MyApplication.Monday"));
```

Resource bundles

Resource bundles contain key/value pairs of locale-specific objects:

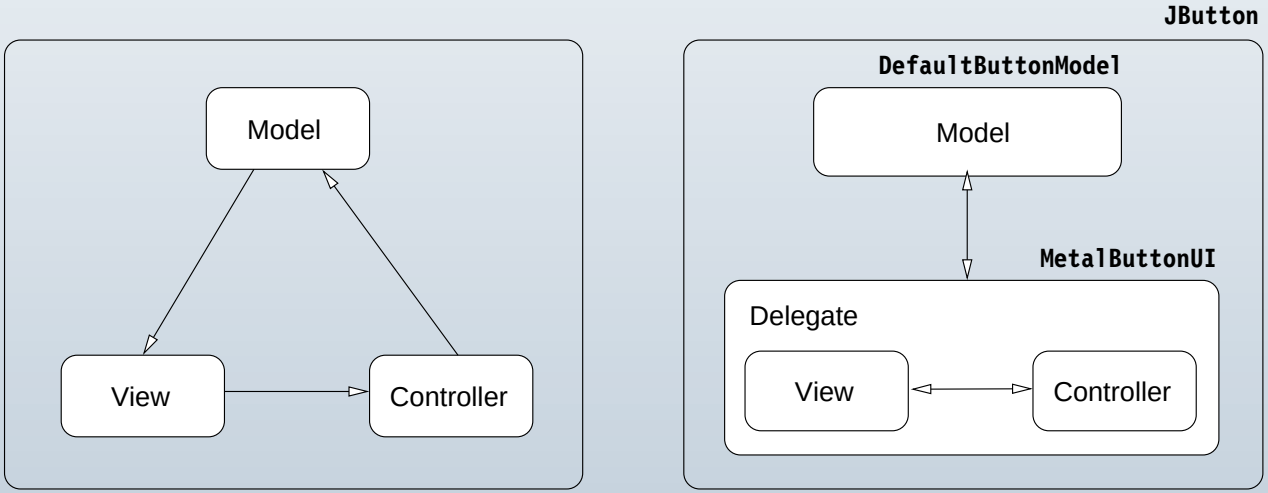
- *A resource bundle can be a class or a property file.*
- *A resource bundle is identified by a base name and a locale.*
- *All resource files with the same base name share the same keys.*
- *Resource bundles are chained together with the most specialized bundle being at the top of the chain:*

```
baseName + "_"+ language1 + "_"+ country1 + "_"+ variant1
baseName + "_"+ language1 + "_"+ country1
baseName + "_"+ language1
baseName + "_"+ language2 + "_"+ country2 + "_"+ variant2
baseName + "_"+ language2 + "_"+ country2
baseName + "_"+ language2
baseName
```

- *Resources in classes take precedence over property files.*

The Swing MVC architecture

Swing uses a simplified MVC pattern called Model-Delegate:



- *The `UI`-classes are the delegate part responsible for painting a component. (Every components `paintComponent` method calls the `paint` method of its UI class)*

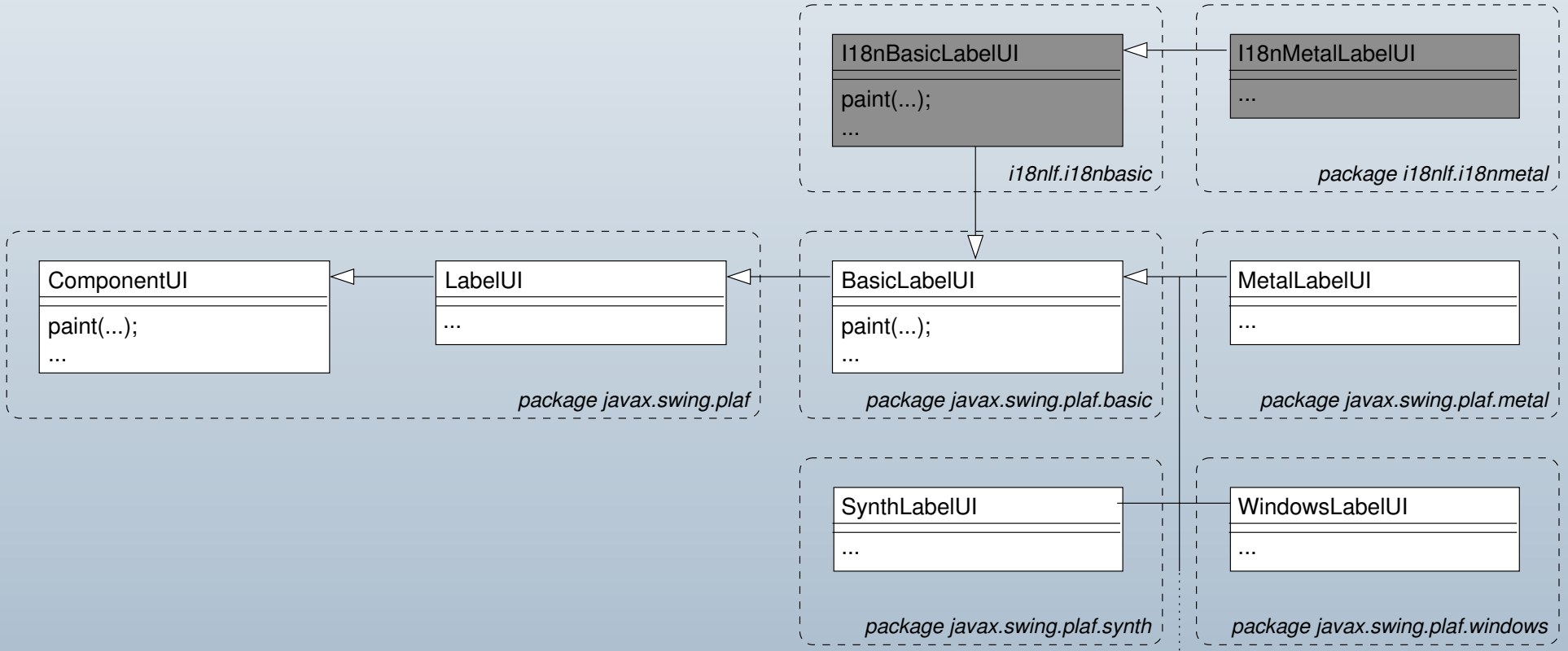
```
protected void paintComponent(Graphics g) {
  UIManager.getUI(this).paint(g, this);
}
```

- *The `UI`-classes are Look and Feel dependent (e.g. `MetalButtonUI`, `WindowsButtonUI`)*

The Swing Pluggable Look and Feel architecture

Every Swing component has a Look and Feel dependent UI delegate:

- *e.g. `MetalLabelUI` is the UI delegate of `JLabel`*



How to convert a classical L&F into an I18n L&F

The UI class queries the data of the model and uses it for layout and painting.

- *I18n L&F introduces a new level of indirection*
- *It uses the data and the current locale as key to query the real data*

```
// From BasicLabelUI.java

public void paint(Graphics g, JComponent c) {
  JLabel label = (JLabel)c;
  String text = label.getText();

  ...
  g.drawString(x, y, text);
}

public Dimension getPreferredSize(JComponent c) {
  JLabel label = (JLabel)c;
  String text = label.getText();

  Font font = label.getFont();
  ... // compute dimension based on font and text
  return dimension;
}
```

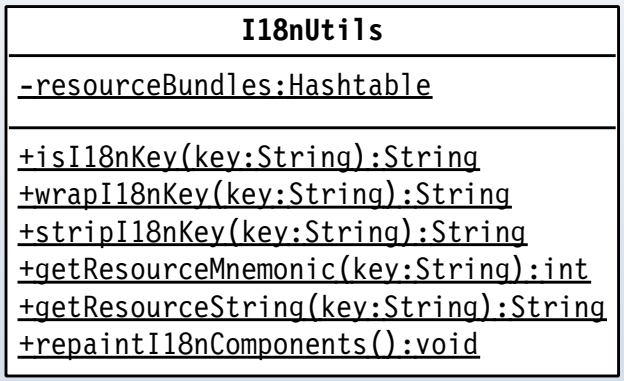
```
// From I18nBasicLabelUI.java

public void paint(Graphics g, JComponent c) {
  JLabel label = (JLabel)c;
  String text = label.getText();
  text = I18nUtils.getResourceString(text);//(*)
  ...
  g.drawString(x, y, text);
}

public Dimension getPreferredSize(JComponent c) {
  JLabel label = (JLabel)c;
  String text = label.getText();
  text = I18nUtils.getResourceString(text);//(*)
  Font font = label.getFont();
  ... // compute dimension based on font and text
  return dimension;
}
```

The I18nUtils utility class

- Convenience functions for key handling:
  - *isI18nKey(), wrapI18nKey(), stripI18nKey()*
- Convenience functions for resource handling:
  - *getResourceMnemonic(), getResourceString()*
- Repainting the whole GUI according to the new locale:




```
public static void repaintI18nComponents() {
  Frame[] frames = Frame.getFrames();
  boolean ltr = ComponentOrientation.getOrientation(Locale.getDefault()).isLeftToRight();
  for (int i = 0; i < frames.length; i++) {
    if (ltr) {
      frames[i].applyComponentOrientation(ComponentOrientation.LEFT_TO_RIGHT);
    }
    else {
      frames[i].applyComponentOrientation(ComponentOrientation.RIGHT_TO_LEFT);
    }
    javax.swing.SwingUtilities.updateComponentTreeUI(frames[i]);
  }
}
```

The LocaleChooser

A nice component for locale switches:

- *Takes a directory which contains subdirectories for supported locales.*
- *Subdirectories have the name of the locale they represent.*
- *Subdirectories may contain a flag picture of the locale:*

```
i18n/
i18n/de
i18n/de/flag.gif
i18n/de_CH
i18n/de_CH/flag.gif
```

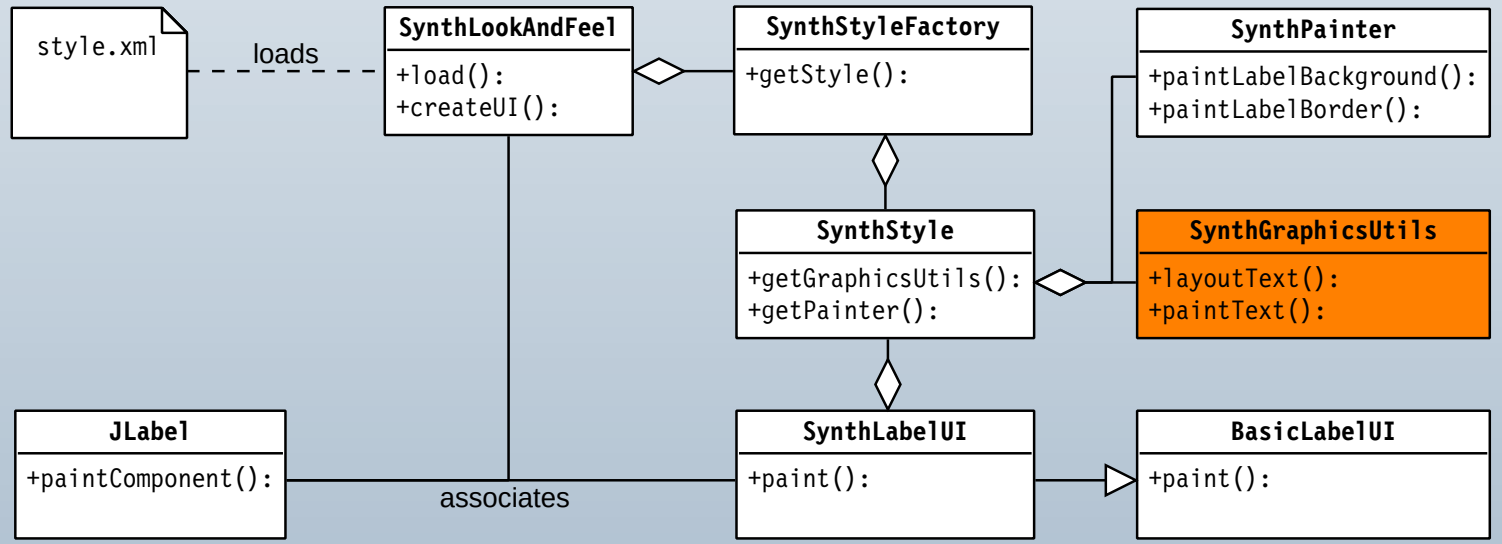
- *It changes the default locale and repaints the whole application.*

```
public void actionPerformed(ActionEvent e) {
  ...
  Locale locale = getSelectedLocale();
  if (!Locale.getDefault().equals(locale)) {
    Locale.setDefault(locale);
    System.setProperty("user.locale", localeStr);
    I18nUtils.repaintI18nComponents();
  }
}
```

The architecture of the Synth Look and Feel

In Synth all text-related painting and layout is done by `SynthGraphicsUtils`.

- *The changes for dynamic internationalization have to be done only in one central place.*
- *We have to workaround the fact that the rendering of HTML labels is still handled by the `BasicUI`classes!*



A customized SynthGraphicsUtils class


```
public class I18nSynthUtils extends SynthGraphicsUtils {

  public void paintText(SynthContext ss, Graphics g, String text,
                        Rectangle bounds, int mnemonicIndex) {
    // Fetch the localized version of text according to the current locale.
    text = I18nUtils.getResourceString(text);
    JComponent comp = ss.getComponent();
    if (BasicHTML.isHTMLString(text)) {
      BasicHTML.updateRenderer(comp, text);
    }
    super.paintText(ss, g, text, bounds, mnemonicIndex);
  }

  public Dimension getPreferredSize(...) {
  ...
  }

  public String layoutText(...) {
  ...
  }

  ...
}
```