Web Component Development Using Java

Session: 14

Internationalization

Objectives

- Explain the concept of internationalization
- Explain the concept of localization
- Explain the role of Unicode character set in internationalization
- Explain the resource bundling mechanism and resource bundle for various locales
- Explain how to format dates in servlets for internationalization
- Explain how to format currency in servlets for internationalization
- Explain how to format numbers in servlets for internationalization
- Explain how to format percentages in servlets for internationalization
- Explain how to format messages in servlets for internationalization
- Explain various tags available in the JSTL internationalization tag library
- Explain how to format dates and currencies using JSTL I18N tags
- Explain how to format percentages and messages using JSTL I18N tags

Internationalization

- Is the method of designing an application that can be adapted to a region or a language without much change in the technology.
- Is used in creating internationalized Web applications that standardize formatted numeric and date-time output.

Localization

- Localization is a process of making a product or service language, culture, and local 'look-and-feel' specific.

- Localizing a product does not only mean a language translation, but also formatting of time, currencies, messages, and dates.

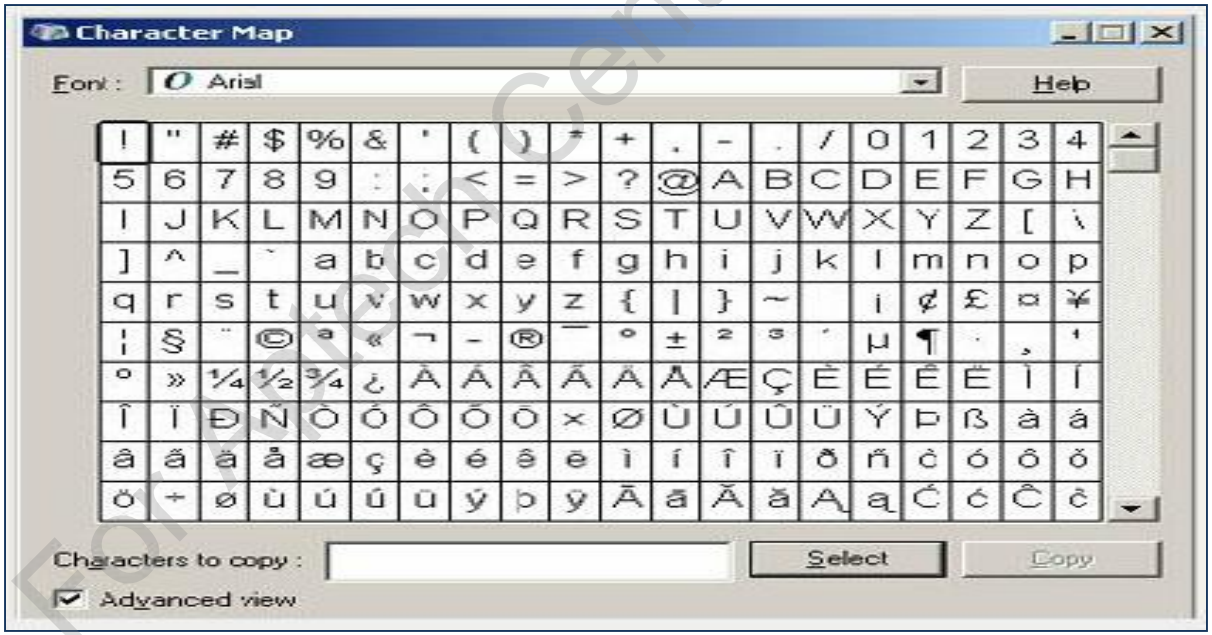
- In Java:
  - A `Locale` is a simple object, which identifies a specific language and a geographic region.

  - To create international Java applications, the use of `java.util.Locale` class is a must.

  - Locales are used in entire Java class libraries data for formatting and customization.

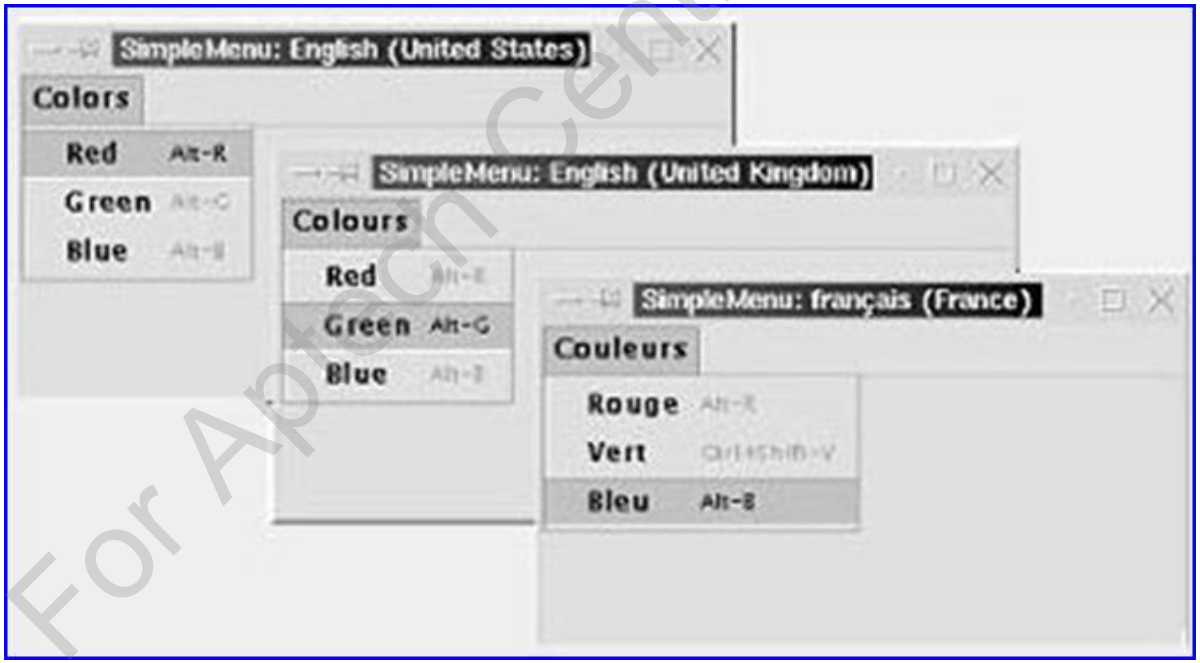
Unicode

- Is a coding system that has codes for all the major language of the world.
- Is a 16-bit character encoding.
- Uses UCS-2- a fixed-width two byte encoding that simply encodes each code point from U+0000 to U+FFFF as itself.
- Allows Java to handle international characters for most of the languages of the world.
- Figure depicts the symbol table supported in Unicode.



Locale

- Locale represent specific geographical, political, or cultural region.
- Locale is denoted by the standard format **xx_YY**, where, xx stands for two-letter language code in lower case, and **YY** stands for two-letter country code in upper case.
- Some of the examples of locales are zh_CN for Shanghai, China; ko_KR for Seoul, Korea; and en_US for English, US.
- Figure depicts the use of various locales.



Creating a ResourceBundle 1-2

How to create a internalization of Web application in Java?

Create text files with key/value pairs representing text from different locales and store them under WEB-INF folder.

- For example, the key "**`Welcome`**" is associated with a value or message in different `ResourceBundle` property files.
  - Key – Represents the word.
  - Value – Represents the translation in the specific locale.

Creating a ResourceBundle 2-2

- The code snippet shows the `ResourceBundle` property file named `DemoResources_es_ES.properties` containing **Spanish** equivalent for the key "**`Welcome`**".

```
#Spanish language resources
Welcome = Hola y recepción
```

- The code snippet shows the `ResourceBundle` property file named `DemoResources_en_US.properties` containing **United States English** equivalent for the key "**`Welcome`**".

```
#English language resources
Welcome = Hello and welcome
```

Internationalizing Servlets 1-6

- Internationalization of an application can be achieved with the help of resource bundles.
- **Resource Bundle**:
  - Is a set of related classes that inherit from the `ResourceBundle`.
  - The subclass of `ResourceBundle` has the same base name with an additional component that identifies locales.
  - For example, if resource bundle is named `DemoResources` and along with it, locale-specific classes can be related as in `DemoResources_en_US`.
  - Helps to build server-side code that gives output based on the location and language of the user.
  - Makes the job easier by avoiding the writing of multiple version of a class for different locales.

Internationalizing Servlets 2-6

- There are several methods in `ResourceBundle` class.

```
public static final ResourceBundle getBundle(String
baseName)
```

  - In order to get resource bundle for getting the locale-specific data, the `getBundle()` method is used.
  - This method gets a resource bundle using the specified base name, the default locale, and the class loader of the caller.

- The code snippet demonstrates the method to get a resource bundle using the specified base name and locale.

```
/* This snippet creates ResourceBundle by invoking
getBundle() method, specifying the base name */

ResourceBundle labels =
ResourceBundle.getBundle("DemoLabelsBundle");
```

Internationalizing Servlets 3-6

public abstract Enumeration getKeys()

- Returns an enumeration of the keys present in the property file.

- The code snippet shows the use of the `getKeys()` method.

```
// this snippet displays the value of the keys

static void iterateKeys(Locale currentLocale) {

 ResourceBundle labels =
ResourceBundle.getBundle("LabelsBundle",currentLocale)
;

  Enumeration bundleKeys = labels.getKeys();

 while (bundleKeys.hasMoreElements()) {
     String key = (String)bundleKeys.nextElement();
     String value = labels.getString(key);
     System.out.println("key = " + key + ", " +
          "value = " + value);
  }
}
```

Internationalizing Servlets 4-6

public Locale getLocale()

- Returns the locale of this resource bundle.
- Can be used after the calling of `getBundle()` to check whether the returned resource bundle really corresponds to the requested locale or not.
- Returns the locale for the current resource bundle.

- The code snippet shows the use of the `getLocale()` method.

```
// This snippet gets the user's Locale

  Locale locale = request.getLocale();

ResourceBundle bundle =
ResourceBundle.getBundle("i18n.WelcomeDemoBundle"
, locale);

String welcome = bundle.getString("DemoWelcome");
```

Internationalizing Servlets 5-6

`public final Object getObject(String key)`

- Gets an object for the given key from the resource bundle.
- Gets the object from the resource bundle and if it fails, the parent resource bundle is called using parent's `getObject()` method.
- Throws a `MissingResourceException` if it fails.
- For example, `int[] myDemoIntegers = (int[]) myDemoResources.getObject ("intList");`

Internationalizing Servlets 6-6

public final String getString(String key)

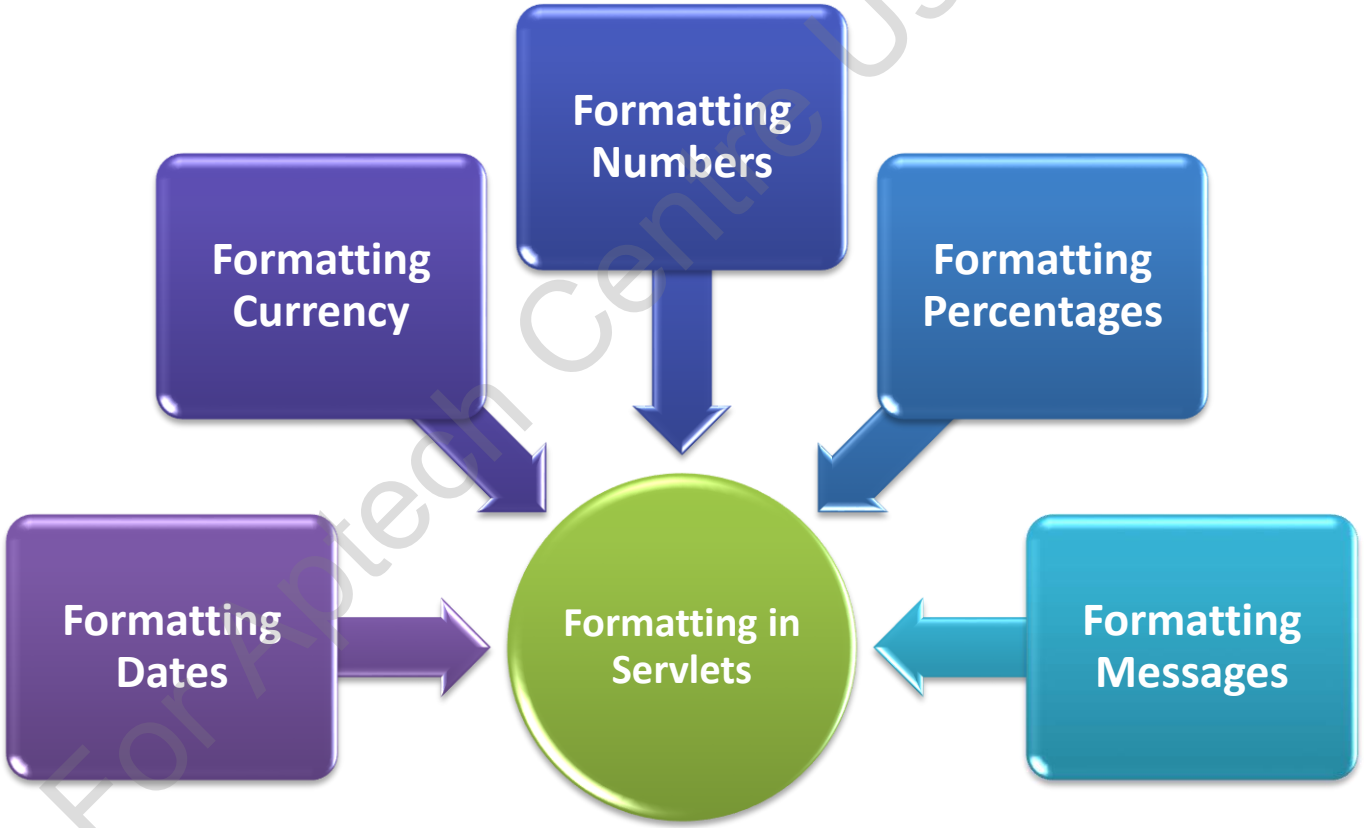
- Returns a string for the given key from the resource bundle or one of its parents.

- The code snippet shows the use of `getString()` method.

```
/** Retrieves the translated value from the
ResourceBundle by invoking the getString method as
follows **/

String value = labels.getString(key);
```

Formatting in Servlets

- The formatting of the numbers, currency, date, and percentage helps the programmer to format these values based on the locale or the region of the user.



Formatting Dates 1-4

- The formats in which dates can be displayed include **Predefined Formats** and **Customizing Formats.**

Predefined Formats

- The `DateFormat` style is predefined and locale-specific and is easy to use. The styles are as follows:
  - **`SHORT`** - it is completely numeric, such as `11.14.50` or `3:30pm`.
  - **`MEDIUM`** - it is longer, such as `Jan 10, 1954`.
  - **`LONG`** - it is longer, such as `January 10, 1954` or `3:50:32pm`.
  - **`FULL`** - it is completely specified, such as `Tuesday, April 14, 1954 AD` or `3:50:42pm PST`.
- The two steps in formatting of date using the `DateFormat` class are as follows:

Step 1
- Creating a formatter with the `getDateInstance()` method

Step 2
- Invoking the `format()` method, which returns formatted date in the form of string

Formatting Dates 2-4

Customizing Formats

- Most of the time, the predefined formats are enough, but sometimes customized format is required.
- To achieve custom formatting, the `SimpleDateFormat` class is used.
- `SimpleDateFormat` class:
  - Formats and parses dates in a locale-sensitive manner.
  - The code snippet demonstrates the use of the `SimpleDateFormat` class.

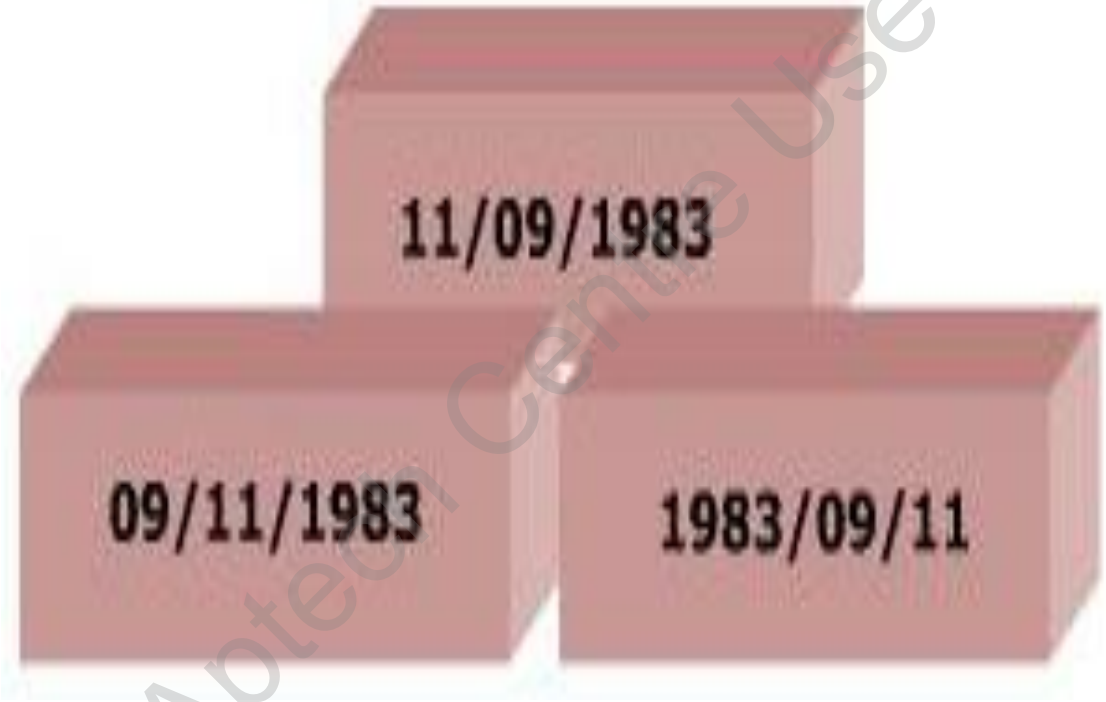
```
/* this snippet formats the date as per the
specified style */

SimpleDateFormat fmt = new SimpleDateFormat("yyyy-
MM-dd", Locale.US);
```

Formatting Dates 3-4

- The several classes for formatting dates are as follows:
  - **DateFormat** - Formats and parses the dates and time in a language independent manner.
  - **DateFormat.Field** - Is a nested class that is used as attribute keys in the `AttributedCharacterIterator`.
  - **DateFormatSymbol** - Encapsulates localizable date-time formatting data, such as names of months, days of week, and the time zone data.
  - **DateFormatter** - Formats the date as per the format of the current locale.

Formatting Dates 4-4

❖ Figure depicts the various date formats.



Formatting Currency 1-4

- The formatting of the currency is necessary, so that the users can be benefited by the availability of the locale specific formatting.
- Conversion of one currency to another requires some conversion in value.
- The formatting of currency value is much more involved compared to formatting date and time.

- Some of the classes used for formatting currency are as follows:

`Currency`	• This class represents currency. The currencies are identified by ISO 4217 currency codes.
`NumberFormat`	• It provides methods to determine the number formats of the locales and their name. It helps to format and parse numbers for any locales.

Formatting Currency 2-4

- Some of the methods of currency class are as follows:

public String getCurrencyCode()

- This method gets the currency code of the currency as per the ISO 4217 codes.
- The code snippet shows the use of the `getCurrencyCode()` method.

```
/* this snippet returns the currency code of the
currency as per the ISO 4217 codes */

public String getCurrencyCode(){
    return currency.getCurrencyCode();
}
```

Formatting Currency 3-4

public String getSymbol()

- This method gets the currency symbol for the default locale.
- The code snippet shows the use of `getSymbol()` method.

```
/* this snippet gets the currency symbol for
default locale */


public String getCurrencySymbol(){
    return currency.getSymbol();
}
```

Formatting Currency 4-4

public static Currency getInstance(Locale locale)

- This method returns the `Currency` instance for the country of the specified locale.
- The code snippet shows the use of `getInstance()` method.

```
// this snippet gets the currency instance //
import java.text.NumberFormat;
import java.util.Currency;

public class CurrencyClass {
    public static void main ( String args []){

// returns locale-specific currency instance
Currency localeCurrency =
Currency.getInstance(locale);
    }
}
```

Formatting Numbers 1-5

- Some of the methods of `NumberFormat` class are as follows:

```
public final String format(double number)
```

  - This method is the specialization of the format.
  - The code snippet shows the use of `format()` method.

```
/* getPercentInstance() returns a percentage
format for the current default locale */

NumberFormat nft =
NumberFormat.getPercentInstance(locale);

String formatted = nft.format(0.51);
```

Formatting Numbers 2-5

public Currency getCurrency()

- This method provides the number format while formatting currency values.
- The value derived initially is locale dependent.
- If no valid currency is determined and no currency has been set using `setCurrency` the returned value may be null.
- The code snippet shows the use of `getCurrency()` method.

```
// This snippet display the currency as per the locale
import java.text.NumberFormat;
import java.util.Currency;

public class CurrencyClass{
 public static void main ( String args []){
 NumberFormat formatter = NumberFormat.getInstance () ;
  System.out.println ( formatter.getCurrency ()) ;
    }
}
```

Formatting Numbers 3-5

public static final NumberFormat getInstance()

- This method returns the default number format for the current default locale.
- The code snippet shows the use of `getInstance()` method.

```
// this snippet display the currency as per the locale //
import java.text.NumberFormat;
import java.util.Currency;

public class CurrencyClass{
 public static void main ( String args[]){
 NumberFormat formatter = NumberFormat.getInstance();
 System.out.println ( formatter.getCurrency());
 }
}
```

Formatting Numbers 4-5

```
public Number parse(String str) throws ParseException
```

- This method parses text from the beginning of the specified string to produce a number.
- The code snippet shows the use of `parse()` method.

```
NumberFormat nf = NumberFormat.getInstance ( );
Number myDemoNumber = nf.parse(myDemoString);
```

Formatting Numbers 5-5

```
public void setCurrency(Currency currency)
```

- This method sets the currency used by the number format when formatting currency values.
- This does not update the minimum or maximum number of fraction digits used by the number format.
- The code snippet shows the use of `setCurrency()` method.

```
// Sets the currency to new amountCurrency
NumberFormat formatter =
NumberFormat.getInstance();
formatter.setCurrency(amountCurrency);
```

Formatting Percentages 1-2

- The format for displaying percentages can be changed using `getPercentInstance()` method of `NumberFormat` class.
- For example, with this format, a fraction as `0.82` can be displayed as `82%`.
- The two methods for formatting percentage are as follows:

`getPercentInstance()`

- This method returns a percentage format for the current default locale.
- **Syntax**: `public static final NumberFormat getPercentInstance()`

`getPercentInstance (Locale inLocale)`

- This method returns a percentage format for the specified locale.
- **Syntax**: `public static NumberFormat getPercentInstance(Locale inLocale)`

Formatting Percentages 2-2

❖ Figure depicts the code for formatting of percentages.

```
static public void displayPercent(Locale currentLocale) {

    Double percent = new Double(0.75);
    NumberFormat percentFormatter;
    String percentOut;

    percentFormatter = NumberFormat.getPercentInstance(currentLocale);
    percentOut = percentFormatter.format(percent);
    System.out.println(percentOut + "    " + currentLocale.toString());
  }
}
```

Output:

```
75%     en_US
```

Formatting Messages 1-2

Formatting also helps provide messages in user's language.

In order to format a message, the `MessageFormat` object is used.

The array of objects using the format specifiers embedded in the pattern is formatted by `MessageFormat.format()` method.

It returns the result as a `StringBuffer`.

Formatting Messages 2-2

- The classes for formatting the message are as follows:

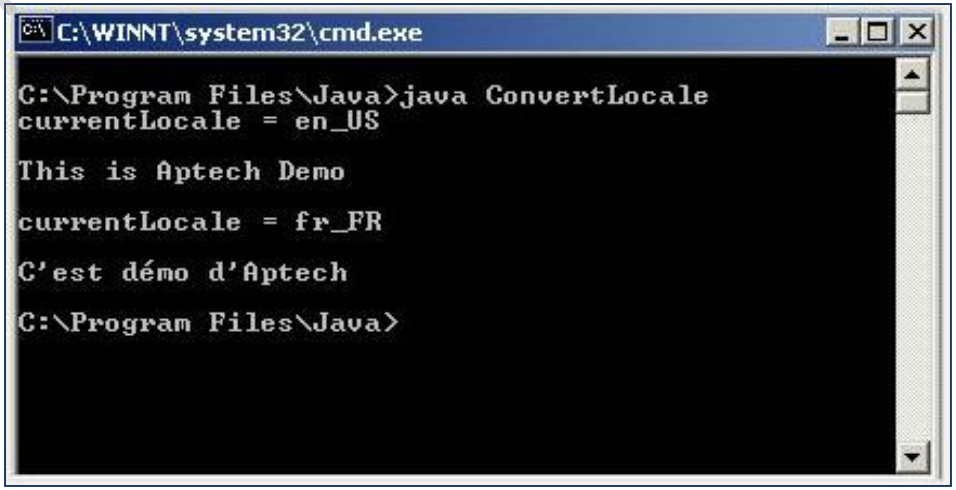
MessageFormat

- This class provides a means to generate related messages in a language-neutral way.
- `MessageFormat` takes a set of objects, formats them, then inserts the formatted strings into the pattern at the appropriate places.
- It can also be used to construct messages displayed for end users.

MessageFormat.Field

- This class defines constants that are used as attribute keys in the `AttributedCharacterIterator` object returned from `MessageFormat.formatToCharacterIterator()`.

- Figure depicts message formatting.



Internationalizing JSP Pages

- JSP Standard Tag Library (JSTL) provides a set of internationalization or I18N tags that are used for applying various internationalization formats.
- The tag library helps reduce and manage the complexities of internationalized applications.
- Several tags available in I18n tag library are as follows:
  - `formatDate`
  - `formatNumber`
  - `message`

Formatting Dates in JSP

- The tag `<fmt:formatDate>` is used for formatting dates and/or time in JSP for internationalization.
- The value attribute or the body content of the `<fmt:formatDate>` tag formats the date value.
- The formatted date is written to the JSP's writer.
- The value can also be stored in a string named `var` and an optional `scope` attribute.
- **Syntax**:

```
<fmt:formatDate value="date" [type="{time|date|both}"]
[dateStyle="{default|short|medium|long|full}"]
[timeStyle="{default|short|medium|long|full}"]
[pattern="customPattern"]
[timeZone="timeZone"]
[var="varName"]
[scope="{page|request|session|application}"]/>
```

- **Example:** `<fmt:formatDate value="${FinishDate}" type="date" dateStyle="full"/>`

Formatting Currencies in JSP 1-3

- The currencies can be formatted in JSP for internationalization using JSTL I18N tags.
- The `<fmt:setLocale>` stores the specified locale in the `javax.servlet.jsp.jstl.fmt.locale` configuration variable.
- The formatting is done as per the set locale.
- The tag `<fmt:formatNumber>` can be used to format the currencies.
- The number is specified to be formatted either with an EL expression in value attribute or as the tag's body content.
- The desired formatting is specified by the type attribute.

```
<fmt:setLocale>
```

- **Syntax**:

```
<fmt:setLocale value="locale"
[variant="variant"]
[scope="{page|request|session|application}"]/>
```

Formatting Currencies in JSP 2-3

```
<fmt:formatNumber>
```

- **Syntax**:

```
<fmt:formatNumber value="numericValue"
[type="{number|currency|percent}"]
[pattern="customPattern"]
[currencyCode="currencyCode"]
[currencySymbol="currencySymbol"]
[groupingUsed="{true|false}"]
[maxIntegerDigits="maxIntegerDigits"]
[minIntegerDigits="minIntegerDigits"]
[maxFractionDigits="maxFractionDigits"]
[minFractionDigits="minFractionDigits"]
[var="varName"]
[scope="{page|request|session|application}"]/>
```

Formatting Currencies in JSP 3-3

- The code snippet demonstrates the formatting of currency in JSP.

```
//formatting for currency

<fmt:setLocale value="en_GB"/>

Formatting salary with Locale <B>en_GB</B> becomes :

<fmt:formatNumber type="currency" value="${salary}"
/><BR>
```

Formatting Percentages in JSP

- The `<fmt:formatNumber>` tag formats a number in integer, decimal, currency, and percentage.
- By specifying the type attribute in `<fmt:formatNumber>` percentage of a number can be obtained.
- This happens when the value is multiplied with hundred.

  Example: `<fmt:formatNumber value="0.82" type="percent"/>`

Formatting Messages in JSP 1-2

- The `<fmt:message>` tag retrieves a message from a resource bundle and optionally, uses the `java.util.MessageFormat` class to format the message.
- The key attribute specifies the message key.
- If the `<fmt:message>` tag occurs within a `<fmt:bundle>` tag, the key is appended to the bundle's prefix, if there is one.
- If the `<fmt:message>` tag occurs outside of a `<fmt:setbundle>` tag, the bundle attribute must be present and must be an expression that evaluates to a `LocalizationContext` object.
- A variable is initialized with the `<fmt:setBundle>` tag.

- **Syntax**:

```
<fmt:message key="messageKey"
[bundle="resourceBundle"][var="varName"]
[scope="{page|request|session|application}"]/>
```

Formatting Messages in JSP 2-2

- The code snippet demonstrates the formatting of messages in JSP.

```
// This snippet formats the message
<fmt:message key="welcome">
  <fmt:param value="${userNameString}"/>
</fmt:message>
```

- Figure depicts formatting of messages.

Summary

- Internationalization can be defined as the method of designing an application that can be adapted to a region or a language without much change in the technology.
- Localization is a process of making a product or service, language, culture, and local 'look-and-feel' specific.
- Internationalization of server-side code reduces the task of writing multiple versions of a class for different locales.
- Resource bundles are used to achieve the locale specific output.
- Internationalization requires formatting of dates, numbers, currencies, and messages with the help of resource bundle.
- The internationalization or I18N tags in JSTL help to reduce and manage the complexities of internationalized applications. There are several tags available in I18N.