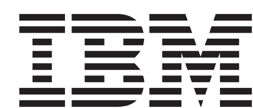


Create a mortgage portal with EGL Rich UI

Contents

Create a mortgage portal with EGL Rich UI 1

Introduction 1
Lesson 1: Plan the mortgage application 4
- Sketch the interface 4
- List the parts 5
- Lesson checkpoint 7

Lesson 2: Set up the workspace 7
- Import the portal and dialog widgets 7
- Create an EGL project 7
- Get the support files. 9
- Change your build path 11
- Lesson checkpoint 11

Lesson 3: Create the mortgage calculation Service. . 11
- Create a Service part 12
- Create a Record part 14
- Lesson checkpoint 15

Lesson 4: Create the user interface for the calculator 15
- Create a Rich UI Handler. 16
- Construct the user interface 16
- Lesson checkpoint 26

Lesson 5: Add code for the MortgageCalculatorHandler functions 26
- Change the Handler code. 26
- Add the calculate() function 27
- Add the showProcessImage() function 27
- Add the hideProcessImage() function. 28
- Add the calculateMortgage() function 28
- Add the displayResults() function 28
- Complete the error display code 28
- Test the calculator 29
- Lesson checkpoint 29

Lesson 6: Create the CalculationResultsHandler widget 30
- Publish the service results 30
- Create the CalculationResultsHandler widget . . 30
- Test the pie chart 32
- Lesson checkpoint 32

Lesson 7: Create the main portal 33
- Create the MainHandler widget 33
- Test the portal 34
- Lesson checkpoint 35

Lesson 8: Add a calculation history portlet 35
- Create the History portlet 36
- Lesson checkpoint 37

Lesson 9: Add the calculation history portlet to the main portal 37
- Change the Results portlet 37
- Change the main portal 38
- Test the portal 38
- Lesson checkpoint 41

Lesson 10: Create the UI for the Map portlet . . . 42
- Get a Yahoo! application ID 42
- Get a Google Maps key 43
- Create the Local Search Interface 43
- Add records to the Interface file 44
- Create the GoogleMap externalType 45
- Create the UI for the MapLocatorHandler widget 46
- Lesson checkpoint 48

Lesson 11: Create the source code for the Map portlet 48
- Finish the source code for MapLocatorHandler.egl 48
- Test the new portlet 50
- Lesson checkpoint 51

Lesson 12: Add the Map portlet to the main portal 51
- Change the main portal 51
- Test the portal 51
- Lesson checkpoint 52

Lesson 13: Install Apache Tomcat 52
- Download and install the server 52
- Lesson checkpoint 54

Lesson 14: Deploy and test the mortgage application 55
- Edit the deployment descriptor. 55
- Deploy the Rich UI application. 56
- Run the generated code 56
- Lesson checkpoint 59

Lesson 15: (Optional) Use validating forms in the Calculation portlet 59
- Edit the Calculation portlet 59
- Test the portlet 63
- Test the portal in Preview view. 64
- Redeploy and test 64
- Lesson checkpoint 65

Summary 65
Finished code for MortgageCalculationService.egl after Lesson 3 65
Finished code for MortgageCalculatorHandler.egl after Lesson 4 66
Finished code for MortgageCalculatorHandler.egl after Lesson 5 67
Finished code for CalculationResultsHandler.egl after Lesson 6 69
Finished code for MainHandler.egl after Lesson 7 . 69
Finished code for CalculationHistoryHandler.egl after Lesson 8 70
Finished code for MainHandler.egl after Lesson 9 . 71
Finished code for IYahooLocalService.egl after Lesson 10 72
Finished code for MapLocatorHandler.egl after Lesson 10 73
Finished code for MapLocatorHandler.egl after Lesson 11 73
Finished code for MainHandler.egl after Lesson 12 75
Finished code for MortgageCalculatorHandler.egl after Lesson 15 76
Notices 79

Index 83

Create a mortgage portal with EGL Rich UI

Create a Rich UI portal application that calculates mortgage payments, compares principal to interest, maintains a history of calculations, and maps mortgage businesses based on a U.S. zip code.

Learning objectives

In this tutorial, you will learn how to complete these tasks:

- Plan the application and design the interface
- Import a custom widget to manage portlets
- Write a service to calculate mortgage payments
- Create a portlet to request input for the calculation service and display the results
- Create a pie chart to compare total principal to total interest
- Pass data between portlets by using the InfoBus widget
- Create a table that lists all calculations
- Create a portlet to find mortgage businesses
- Create a Rich UI portal page to contain the individual portlets
- Install and configure the Apache Tomcat Web server
- Deploy the Web page to the server and test the application
- Replace the Calculation portlet with a version that uses validating forms

Time required

90 minutes

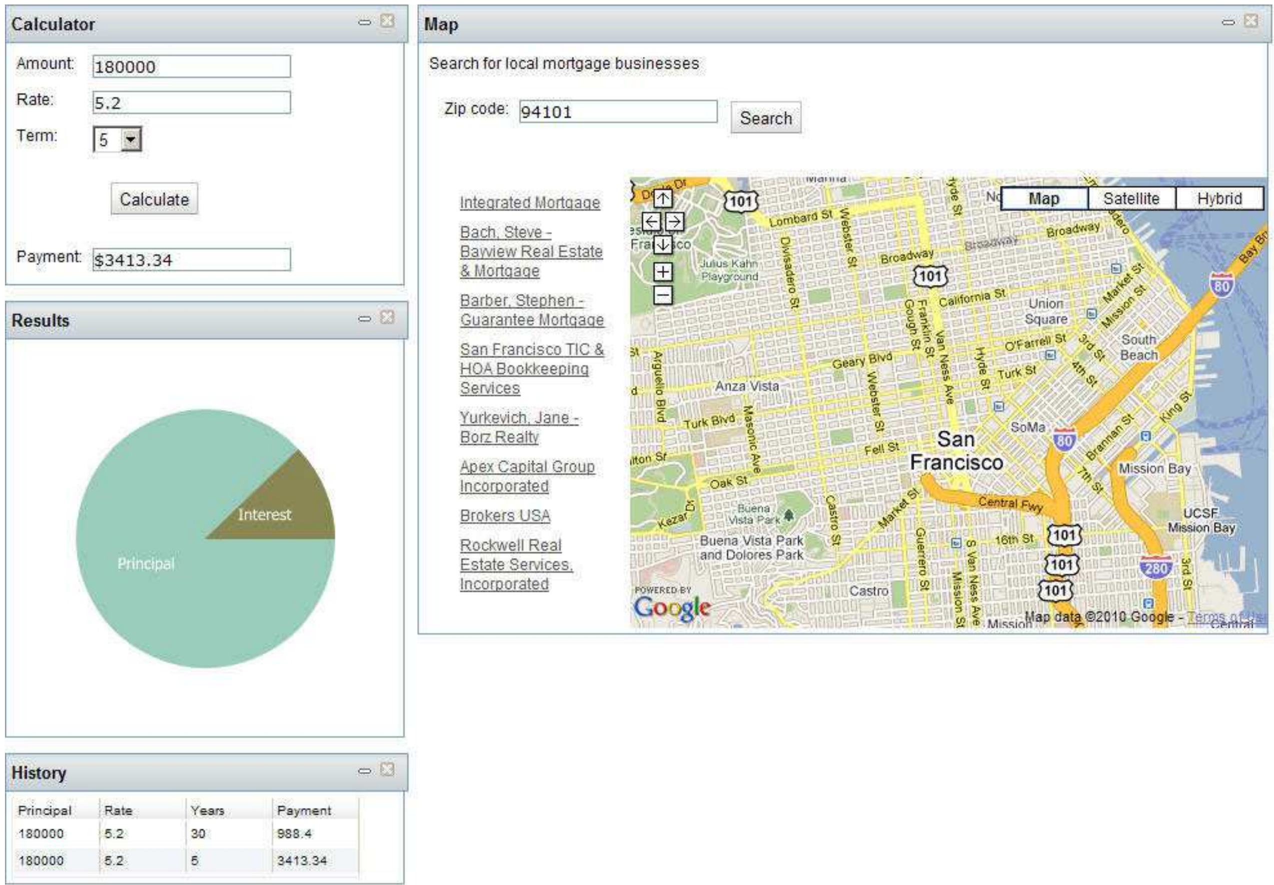
Other tutorials for Rational® EGL Community Edition:

Format a Rich UI logon page

Introduction

Create a Rich UI portal application that calculates mortgage payments, compares principal to interest, maintains a history of calculations, and maps mortgage businesses based on a U.S. zip code.

Portal applications are one of the most popular Web 2.0 user interfaces. These portals collect useful tools in independent areas of the Web page, which are called portlets. The following image shows the portal application that you will create in this tutorial:



Rational EGL Community Edition provides service-oriented architecture (SOA) capabilities. With SOA, you can build applications in which customers interact with Rich UI Web pages while services complete the complicated background calculations.

In this tutorial, you use two services:

- A dedicated EGL service that performs mortgage calculations
- A Web service that lists businesses of a specified type within a specified zip code

In addition, you use an external program to find an address on a map.

You create the dedicated calculation service in this tutorial. A dedicated service is available only to applications that reference the current project. Two protocols are typically used with Web services: SOAP and the Representational State Transfer (REST) protocol. To oversimplify, SOAP is highly extensible, and so allows for great rigor and complexity. REST is more focused on typical HTTP communication. This tutorial uses both protocols.

You can run the application with live data even before you deploy it to a Web project. Deploying the application is a final step that creates the HTML and other files that your customers use to run the application.

Learning objectives

In this tutorial, you will learn how to complete these tasks:

- Plan the application and design the interface

- Import a custom widget to manage portlets
- Write a service to calculate mortgage payments
- Create a portlet to request input for the calculation service and display the results
- Create a pie chart to compare total principal to total interest
- Pass data between portlets by using the InfoBus widget
- Create a table that lists all calculations
- Create a portlet to find mortgage businesses
- Create a Rich UI portal page to contain the individual portlets
- Install and configure the Apache Tomcat Web server
- Deploy the Web page to the server and test the application
- Replace the Calculation portlet with a version that uses validating forms

Time required

This tutorial takes approximately 90 minutes to finish. If you explore other concepts related to this tutorial, it might take longer to complete.

You can create the EGL files you need for this application in one of the following ways:

Line by line (most helpful)
Complete the individual lessons to explore the code in small, manageable chunks, learning important keywords and concepts. This method also requires the longest time commitment.

Finished code files
At the end of each lesson in which you create a file, there is a link to the complete code for that file, which you can copy into the EGL editor.

Skill level

Introductory

Audience

This tutorial is designed for people who know the basic concepts of programming, but have little experience with EGL. It is intended for people who work with Rich UI and generate JavaScript™.

System requirements

To complete this tutorial, you must have the following tools and components installed on your computer:

- Rational EGL Community Edition Version 1.0.1.
- A working Internet connection

Prerequisites

You do not need any experience with EGL to complete this tutorial. The Format a Rich UI logon page tutorial is a useful introduction, but is not required.

Expected results

You will create a working Rich UI application that calculates mortgages and finds mortgage lenders in a specified area.

Lesson 1: Plan the mortgage application

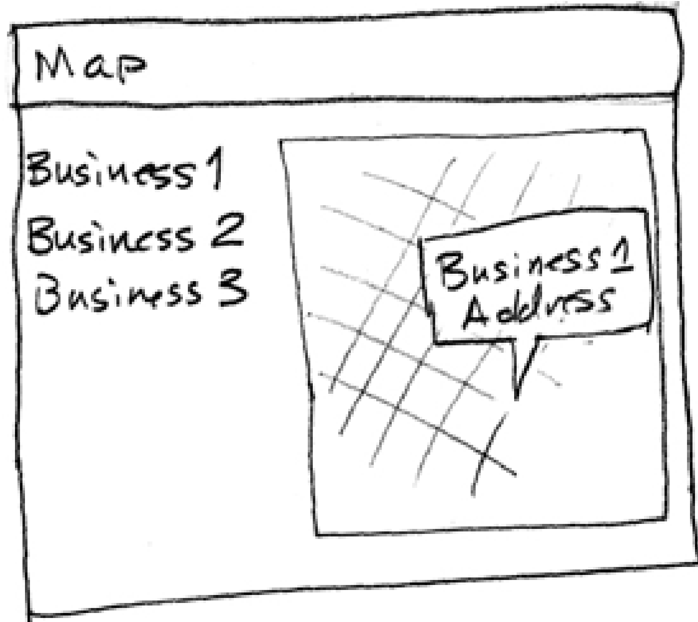
Design your application on paper before you begin coding.

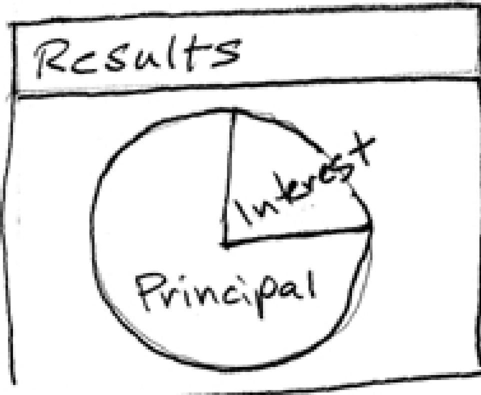
The first step in planning an application is to list your objectives. This tutorial has the following objectives:

- Calculate mortgage payments based on a total amount, interest rate, and term.
- Display the total interest compared to the total principal in a pie chart.
- Display a history of prior calculations.
- Show a map with the locations of mortgage brokers in a specified zip code.
- Create individual, interactive portlets for the various features of the application.
- Use a combination of dedicated services and external Web services to complete standard tasks.

Sketch the interface

When you create an application, sketch the interface before you write code. Use this sketch as a guide when you create the components of the interface:





List the parts

Determine which EGL parts you need to do the job. For an EGL Rich UI interface, you usually need a combination of Services, Handlers, and widgets.

An EGL Rich UI Handler typically corresponds to a Web page. In this case, you also create Handlers that correspond to portlets. The part is called a Handler because it contains code to handle events that might occur on the page or portlet. Widgets provide content, such as boxes, text, fields, and other screen items. Services complete the behind-the-scenes work.

In this tutorial, you use the following existing components to build the application:

com.ibm.egl.rui.portal
Contains widgets for a portal page and individual portlets within the page. You will import this project in Lesson 2.

com.ibm.egl.rui.infobus
Provides communication between portlets. This package is part of the `com.ibm.egl.rui` project in IBM® Rational EGL Community Edition.

com.ibm.egl.rui.widgets
Contains the following widgets that you use in this tutorial:

- Box
- Combo
- HyperLink
- Image
- TextField
- TextLabel

This package is part of the `com.ibm.egl.rui` project in the product.

com.ibm.egl.rui.dojo.widgets
Contains the following widgets that you use in this tutorial:

- Button
- DojoGrid
- DojoGridColumn
- DojoPieChart
- PieChartData

The Dojo Toolkit is an open source collection of JavaScript tools. The `com.ibm.egl.rui.dojo.widgets` project is in the product.

Local Search Web Service
This Web service returns a list of businesses of a specified type within a specified zip code, including the latitude and longitude for each business. Yahoo! hosts the service.

Google Map Widget
This external program calls out a name and address on a map of the surrounding area. Google hosts the program.

In addition, you create the following parts:

MortgageCalculationService
A Web service that calculates monthly payments. Write this service as a dedicated EGL Service so that the code for the Service is part of the same project as your other application files.

MainHandler
The portal page that contains the individual portlets

MortgageCalculatorHandler
The portlet where the application calculates monthly payments

CalculationHistoryHandler
The portlet that displays an interactive list of previous calculations

CalculationResultsHandler
The portlet that displays the pie chart

MapLocatorHandler
The portlet that displays the locations of mortgage providers

Lesson checkpoint

In this lesson, you completed the following tasks:

- Established the objectives for the application
- Sketched the application interface
- Listed the required parts

In the next lesson, you download the external files that are required to run the application and create an EGL project to hold them.

Lesson 2: Set up the workspace

Before you write code for the portlets, import the files you need for the tutorial and create an EGL project.

Import the portal and dialog widgets

The portal widget manages both the main portal page and the individual portlet widgets in the page.
The dialog widget provides function calls that create Windows dialog boxes. Use the **showError()** function from the `DialogLibrary` in this plug-in to display error messages.

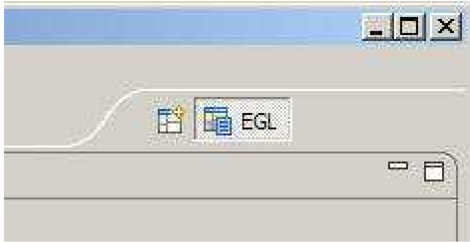
1. Download `com.ibm.egl.rui.portal_`*`version`* at http://www.ibm.com/software/rational/cafe/docs/DOC-3433.
2. Save the downloaded file on your hard disk.
3. Download and save `com.ibm.egl.rui.dialog_`*`version`* at http://www.ibm.com/software/rational/cafe/docs/DOC-3434.
4. When both downloads are complete, import the plug-ins to your workspace. For each downloaded .zip file, complete the following steps:
    a. From the upper menu in the EGL workspace, click **File** → **Import**.
    b. In the Import window, expand **General** and click **Existing Projects into Workspace**.
    c. In the next window, for the **Select archive file** field, browse to one of the files you downloaded. The project is displayed in the left pane of the window.
    d. Click **Finish**.

Create an EGL project

The *project* is the fundamental unit of organization for EGL source files. It typically corresponds to an application. Within a project, you can create packages if you need greater organization. In this tutorial, you group the various kinds of parts in packages.

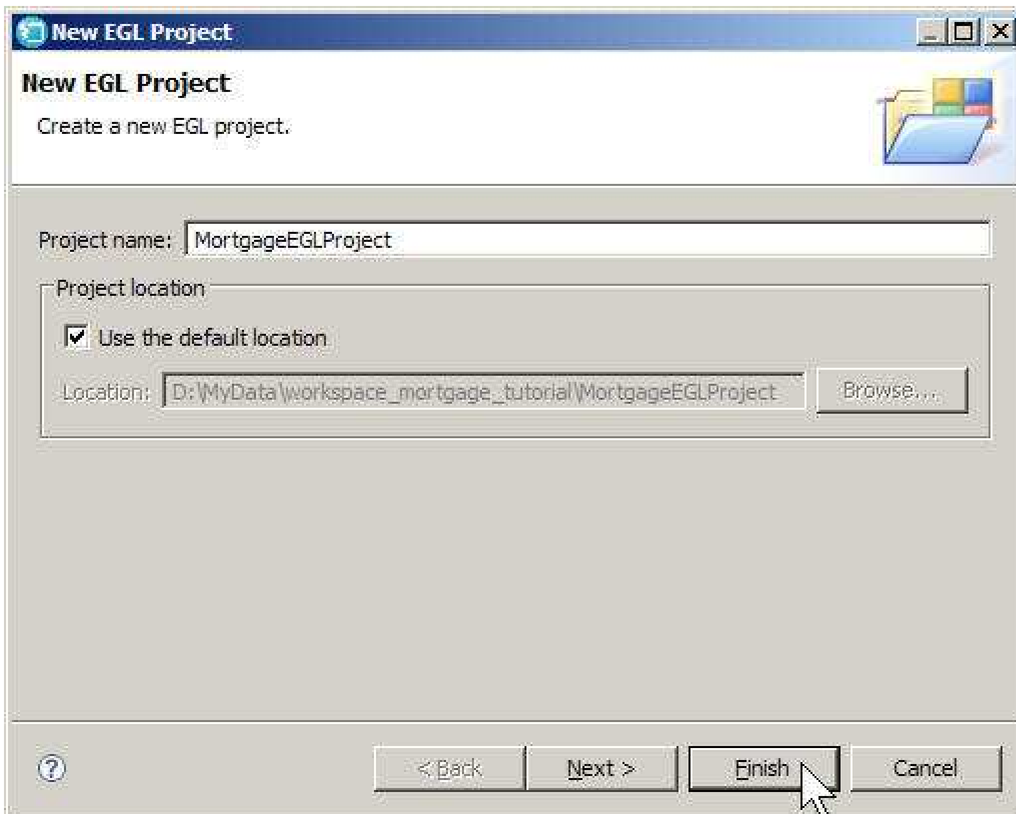
To create an EGL project:

1. If you are in a workbench perspective other than EGL, change to the EGL perspective by clicking **Window** → **Open Perspective** → **[Other]** → **EGL**. The perspective icon is in the upper right corner of the workbench.



2. Click **File** → **New** → **EGL Project**, or click the **New EGL Project** icon on the menu bar.

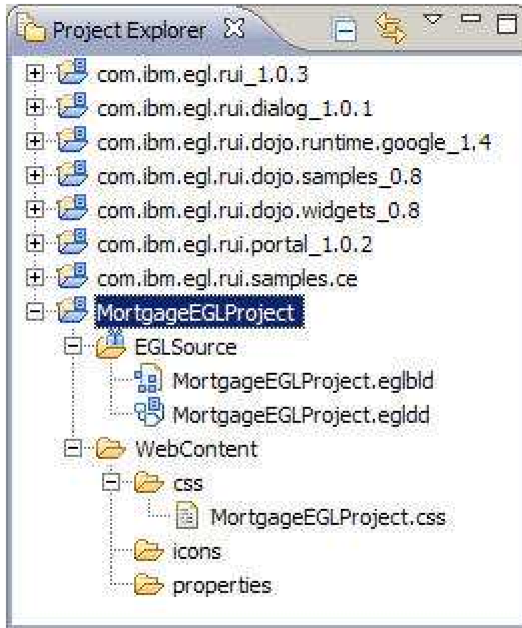
3. In the New EGL Project window, enter the following information:
   a. In the **Project name** field, type the following name:
      `MortgageEGLProject`



   b. Click **Finish**.

EGL creates a project named MortgageEGLProject. Note the two folders inside the directory:

- One for EGL source code
- One for the Web content that you create



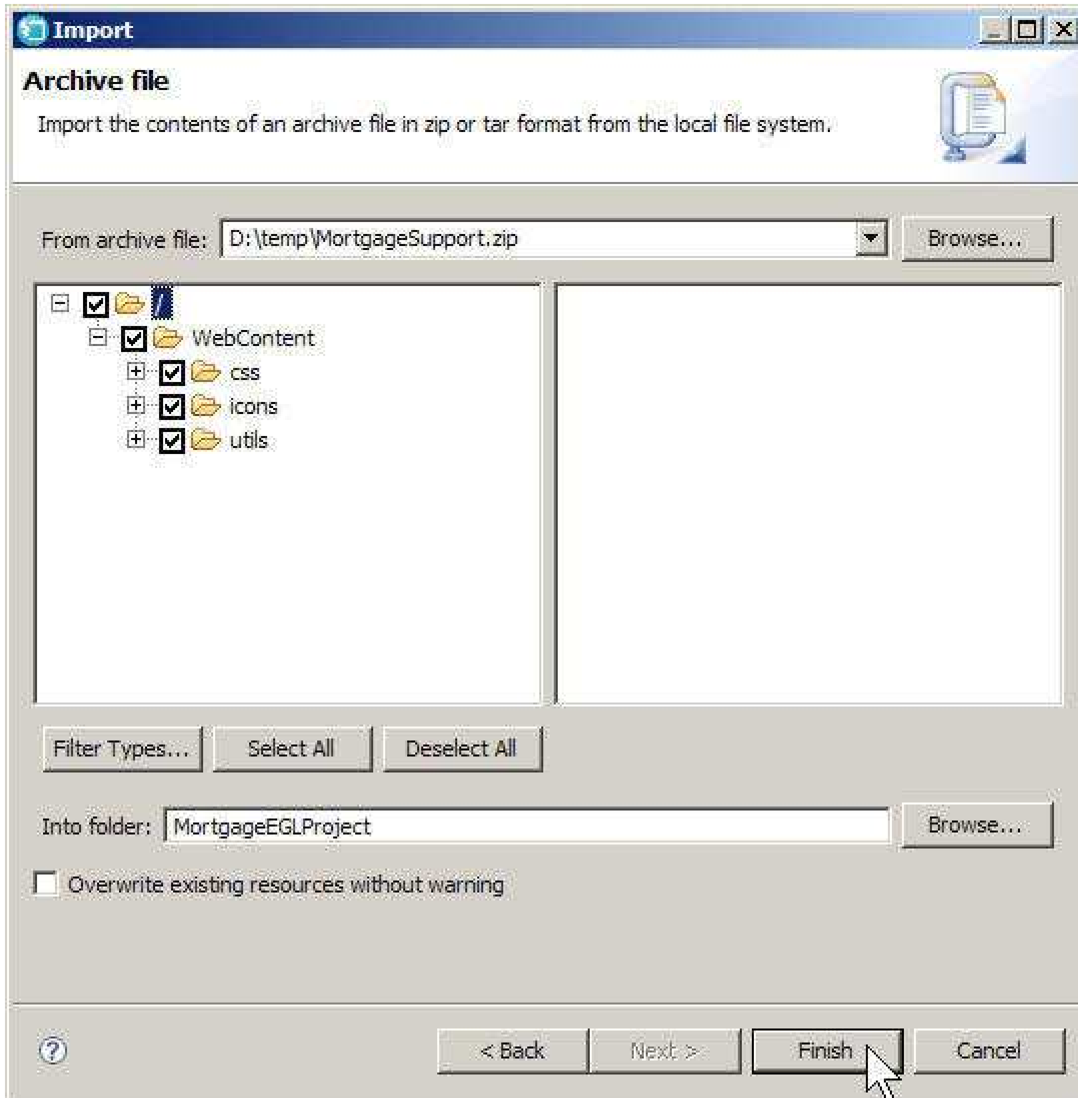
Get the support files

This tutorial provides several files that belong in the `WebContent` directory that EGL created:

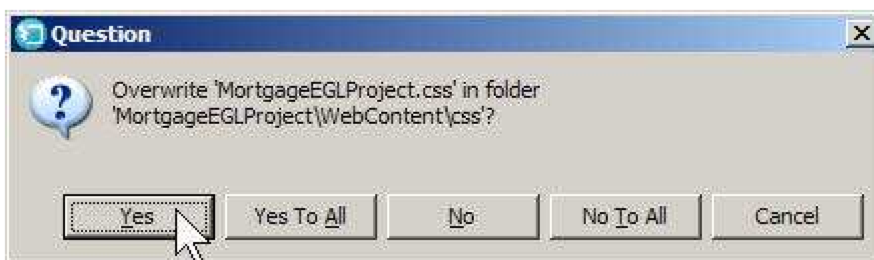
- A cascading style sheet (CSS) file to format the finished Web page
- An animated GIF to indicate background activity in progress
- The JavaScript file for the Google Maps application

To add these support files to your application:

1. Download the `MortgageSupport.zip` file to location that is easy to remember, such as your Desktop. You can download the file at http://www.ibm.com/software/rational/cafe/docs/DOC-3435
2. From inside the workbench, import the contents of the archive:
   a. In the Project Explorer view, select **MortgageEGLProject**. From the upper menu in the EGL workspace, click **File → Import**.
   b. In the Import window, expand **General**, click **Archive File**, and click **Next**.
   c. In the Archive File window, for the **From archive file** field, browse to the directory where you downloaded the archive file and click `MortgageSupport.zip`. The top level of the archive is displayed in the left pane of the window. Expand the directory structure to see the contents.



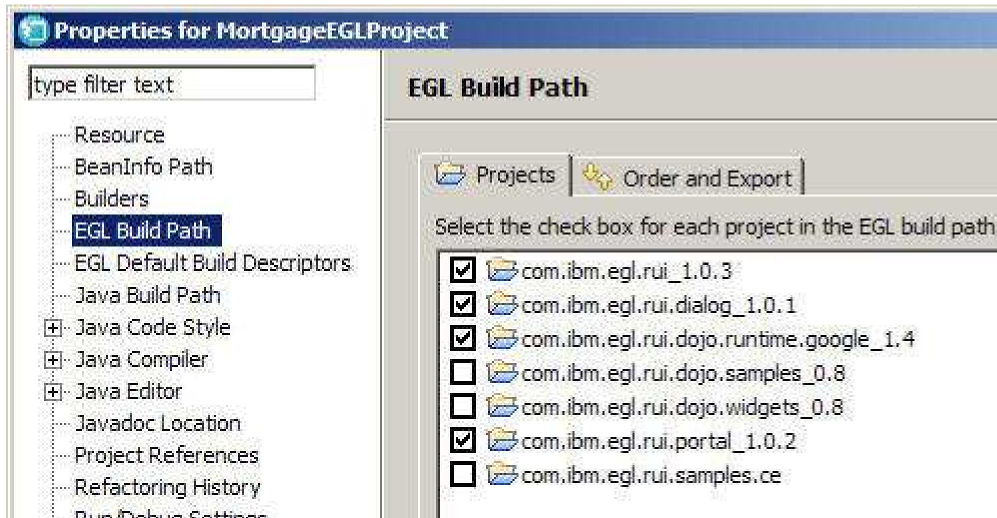
d. Because **MortgageEGLProject** was selected when you started the Import wizard, that project is displayed by default in the **Into folder** field.
e. Click **Finish**.
f. When an error message appears asking permission to overwrite the `MortgageEGLProject.css` file, click **Yes**.
   The default, empty style sheet is replaced with the downloaded version.



Change your build path

The EGL build path determines the projects that EGL examines when trying to resolve references in your programs. To add the projects you just downloaded to your build path:

1. Right click `MortgageEGLProject` in the Project Explorer view, then click Properties. On the left side of the Properties for MortgageEGLProject window, click **EGL Build Path**. EGL displays a list of the projects in your workspace.
2. Select the **com.ibm.egl.rui.portal** project and the **com.ibm.egl.rui.dialog** project. The finished build path window should look like the following image:
   These selections mean that when you organize imports, EGL will look in all of



   the selected projects to resolve references.
3. Click **OK**.

Related reference

EGL build path

Lesson checkpoint

In this lesson, you completed the following tasks:

- Imported the portal widget
- Imported the dialog widget
- Created an EGL project for the Mortgage application
- Imported support files for the application
- Adjusted your build path

In the next lesson, you create a dedicated service to calculate a monthly mortgage payment.

Lesson 3: Create the mortgage calculation Service

Create a dedicated service to calculate monthly payments.

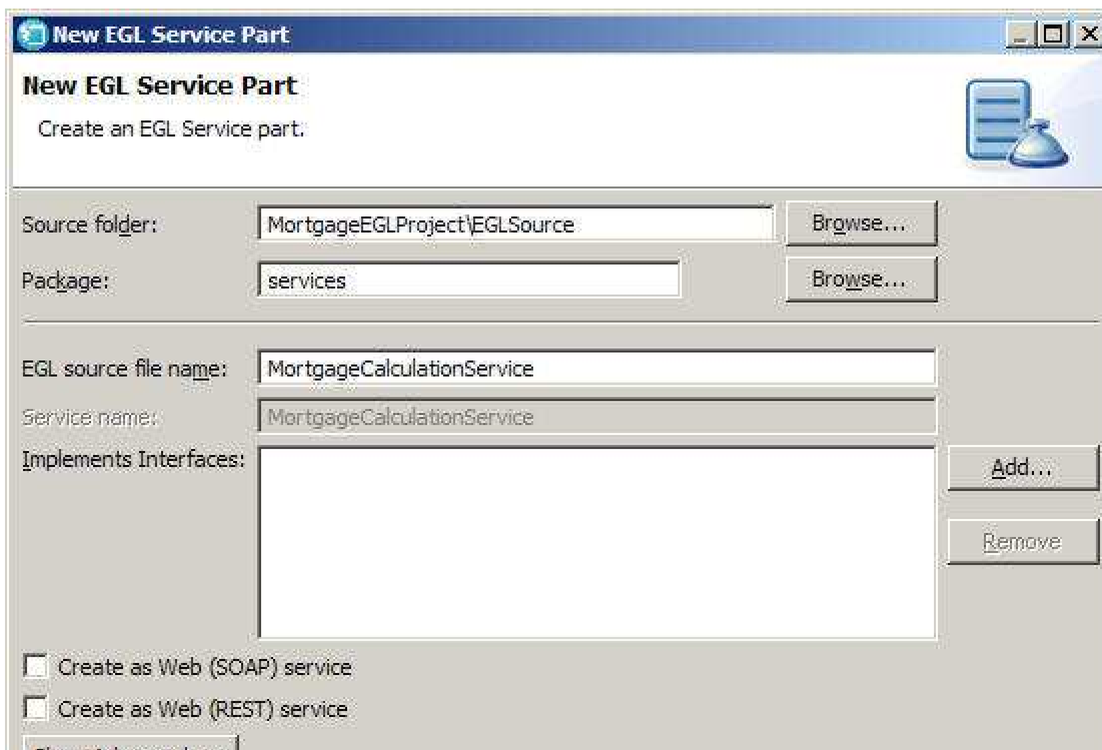
In this lesson, you create an EGL Service part. The *part* is a central concept in EGL, and the term means what it seems to: An EGL part is one separable piece of an EGL application. The Record, the Program, and the Library are examples of parts.

In EGL, *generatable parts* are the pieces of an EGL application that can be generated separately. You must place each generatable part in a separate source file, and the name of the part must be the same as the name of the file. The Service is a generatable part.

Like a Library, the Service contains functions that you call from other programs. You will use the Service you create in this lesson as a dedicated Service, which means that it is available only to applications that reference the current project. For a dedicated Service, you do not need to create an Interface part as you do for a Web Service.

Create a Service part

1. In the Project Explorer window, right-click **MortgageEGLProject**, then click **New** → **Service**.
2. In the New EGL Service Part window, enter the following information:
   a. In the **EGL source file name** field, enter the following name:
      ```
      MortgageCalculationService
      ```
      EGL adds the .egl file extension.
   b. In the **Package** field, enter the following name:
      ```
      services
      ```
   c. Verify that **Create as Web (SOAP) service** and **Create as Web (REST) service** are cleared. You are creating a dedicated service, which does not implement an Interface, so make sure that the **Implements Interfaces** field is empty.



3. Click **Finish**. EGL opens the new Service part in the editor.
4. Remove the boilerplate code from the file, leaving only the following lines:

```
package services;

service MortgageCalculationService

end
```

5. Add the following function before the **end** statement:

```
function amortize(inputData MortgageCalculationResult inOut)
  amt MONEY = inputData.loanAmount;
  // convert to monthly rate
  rate DECIMAL(10, 8) = (1 + inputData.interestRate / 1200);
  // convert to months
  term INT = (inputData.term * 12);

  // calculate monthly payment amount
  pmt MONEY = (amt * (rate - 1) * Mathlib.pow(rate, term)) /
    (MathLib.pow(rate, term) - 1);
  totalInterest MONEY = (pmt * term) - amt;

  // update result record
  inputData.monthlyPayment = pmt;
  inputData.interest = totalInterest;
end
```

When you paste code from these instructions, the formatting may change. Press Ctrl+Shift+F to reformat the code. You can change the formatting rules by clicking **Window** → **Preferences** → **EGL** → **Editor** → **Formatter**.

Note:

EGL marks any code errors with a red X in the left margin and a wavy red line under the error. Move your cursor over the X to see an error message.

```
package services;

service MortgageCalculationService

  IWN.VAL.3260.e 5/30 The type MortgageCalculationResult cannot be resolved. onResult inOut)
        amt MONEY = inputData.loanAmount;
        // convert to monthly rate
        rate DECIMAL(10, 8) = (1 + inputData.interestRate / 1200);
        // convert to months
        term INT = (inputData.term * 12);

        // calculate monthly payment amount
        pmt MONEY = (amt * (rate - 1) * Mathlib.pow(rate, term)) /
                (MathLib.pow(rate, term) - 1);
        totalInterest MONEY = (pmt * term) - amt;

        // update result record
        inputData.monthlyPayment = pmt;
        inputData.interest = totalInterest;
    end
end
```

Because you have not yet defined a type named MortgageCalculationResult, EGL cannot create the inputData variable based on that type. When you create this Record type in the next exercise, EGL will remove the error markers from the display.

6. Save the file by clicking **File** → **Save** or by pressing Ctrl-S.

Related concepts

Introduction to Service parts

Create a Record part

The `amortize()` function uses a `MortgageCalculationResult` record. You can define this record in the same file as the Service.

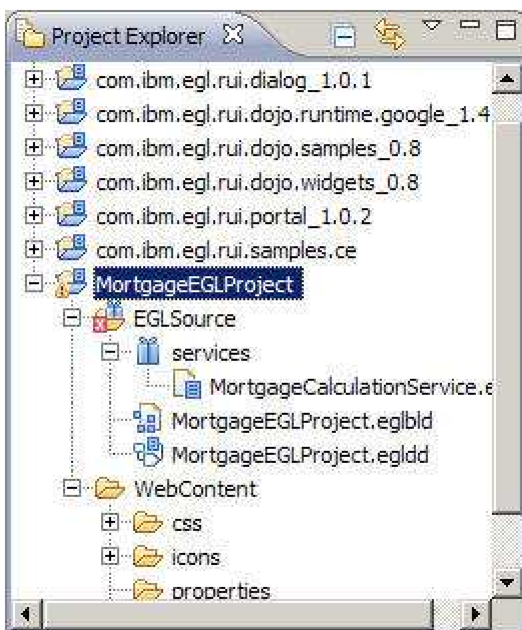
To create the Record part:

1. Add the following code after the `amortize()` function in the `MortgageCalculationService.egl` file. The Record is a part, so you define it outside the Service part, that is, after the final **end** statement in the file:

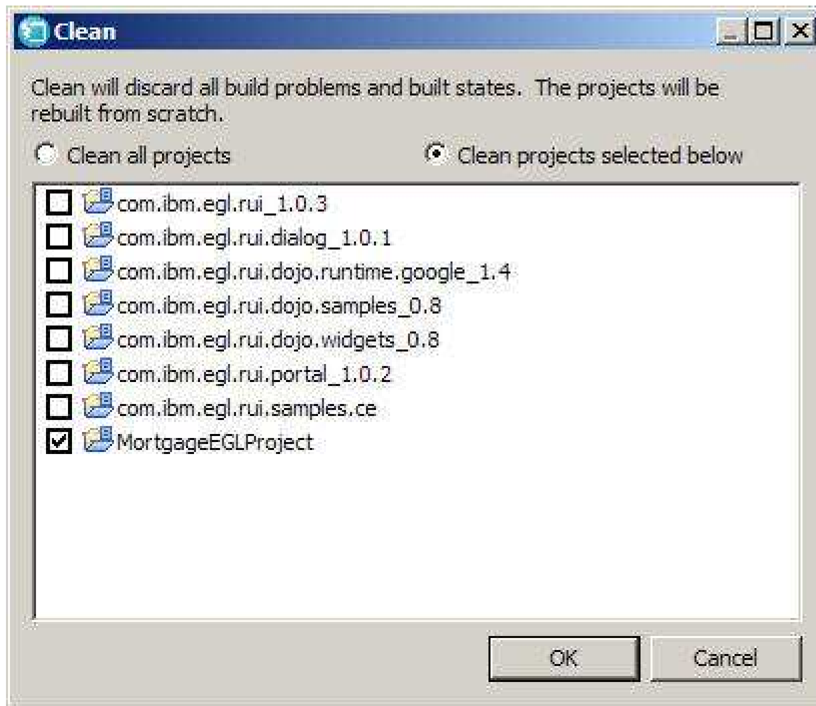
```
record MortgageCalculationResult
 // user input
 loanAmount MONEY;
 interestRate DECIMAL(10,8);
 term INT;

 // calculated fields
 monthlyPayment MONEY;
 interest MONEY;
end
```

2. Save the file. EGL should not display any more error markers in the code. If you see errors in your source file, compare your code to the file contents in "Finished code for MortgageCalculationService.egl after Lesson 3" on page 65. As you work through the tutorial, it is possible that you might see red Xs next to the project or next to one of the folders below it, yet not see any errors in the file itself.



If you encounter this situation, resolve it by clicking **Project** → **Clean**. In the Clean window, click **Clean projects selected below** and then click **MortgageEGLProject**.



Click **OK**. EGL rebuilds the selected project and the red X is removed from the Project Explorer view.

3. Close the file by clicking the X next to the file name in the tab at the top of the editor or by clicking **File** → **Close**.

Lesson checkpoint

You learned how to complete the following tasks:

- Create an EGL Service part
- Create an EGL Record part and add it to the source file for the Service
- Check for errors in your code

In the next lesson, you create the user interface for the first application portlet.

Lesson 4: Create the user interface for the calculator

Each portlet on the finished page is controlled by an EGL Rich UI Handler part.

EGL Rich UI follows the Visual Formatting Model of the World Wide Web Consortium (W3C). This recommendation includes concepts such as containing boxes, default positioning, and the flow of objects on the page. For more information, see http://www.w3.org/TR/CSS2/visuren.html.

In this lesson, you build the page without using absolute positioning of the boxes. With relative positioning, the page can adapt more easily to different screen resolutions, browsers, fonts, and other factors that affect display.

Use the EGL visual editor to drag Rich UI components for the calculator to the portlet. If you are not familiar with EGL Rich UI, you might want to complete the Format a Rich UI logon page tutorial.

Create a Rich UI Handler

1. In the `MortgageEGLProject` folder, right-click the `EGLSource` folder. Click **New** → **Rich UI Handler**, or click the **New Rich UI Handler** button on the menu bar.

2. In the New Rich UI Handler part window, enter the following information:
   a. For **EGL source file name**, enter the following name:
      `MortgageCalculatorHandler`
   b. For **Package**, enter the following name:
      `handlers`
   c. Click **Finish**.

   The new Handler opens in Design view in the EGL editor. EGL creates the `handlers` package for you in the `EGLSource` folder.

Construct the user interface

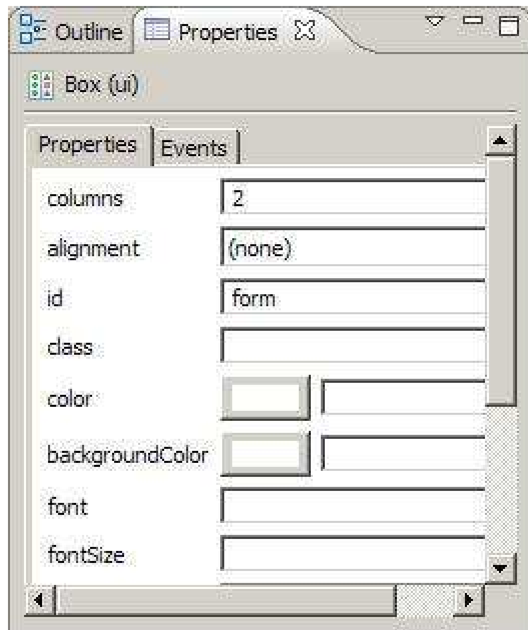
The user interface (UI) for the Calculator portlet collects the information required by the mortgage calculation service:

- The cost of the property
- The interest rate for the loan
- The length of the mortgage

To construct the UI for the calculator:

1. In Design view, go to the **Palette** view, located by default to the right of the EGL editor. You should see palettes available for both **EGL Widgets** and **Dojo Widgets**. If you do not see the **Dojo Widgets** palette, click the **Refresh palette** button to the left of the **Palette** view.

2. Make sure the initial ui Box is selected. Selected objects are surrounded by a dotted line. Locate the **Properties** view, in the lower left of the workspace by default. It shares space with the **Outline** view, so you might need to click **Properties** to see the contents. Enter the following value for the **id** property:
   `form`



The cascading style sheet (CSS) that you imported as part of the MortgageSupport.zip file contains the following entries for `form`:

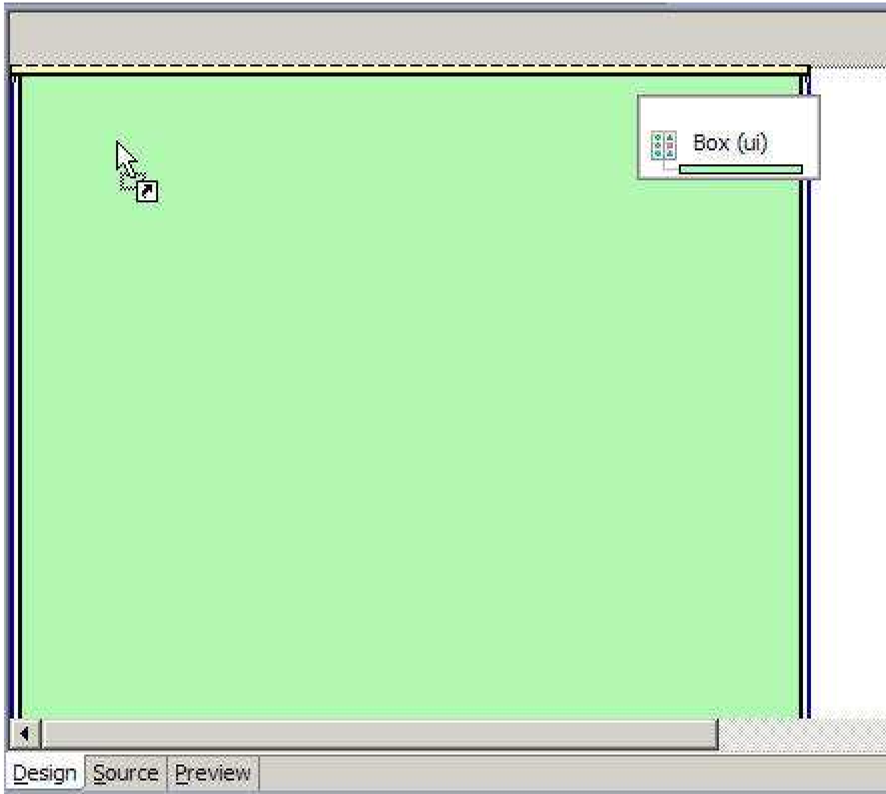
```
#form input {
 font-family: verdana, tahoma, sans-serif;
}

#form td  {
 padding: 4px;
}
```

The second specification, for a table cell, ensures that the various widgets that you place in this box will be separated by enough space to make them easy to read.

3. In the **EGL Widgets** palette, scroll down until you see the TextLabel widget. Drag a TextLabel widget onto the Design interface in the EGL editor.

   When the entire `ui` box turns green, you can drop the widget on the interface.



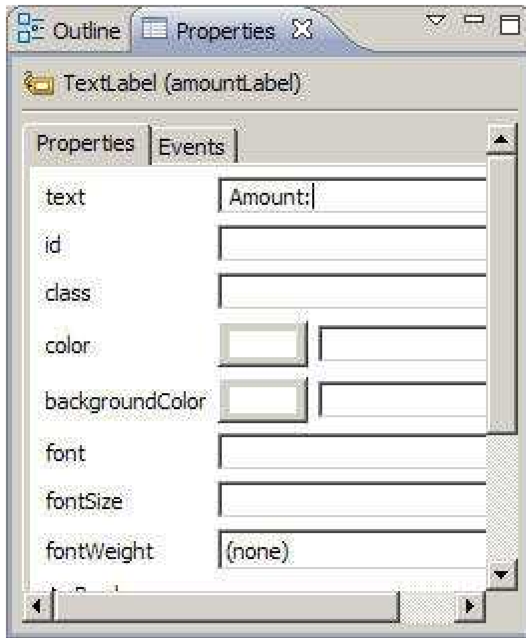
Note the thin yellow area at the top of the screen. If you dragged the widget there, it would be displayed outside and above the `ui` box. When you release the mouse button, the New Variable window opens.

4. In the New Variable window, enter the following name:

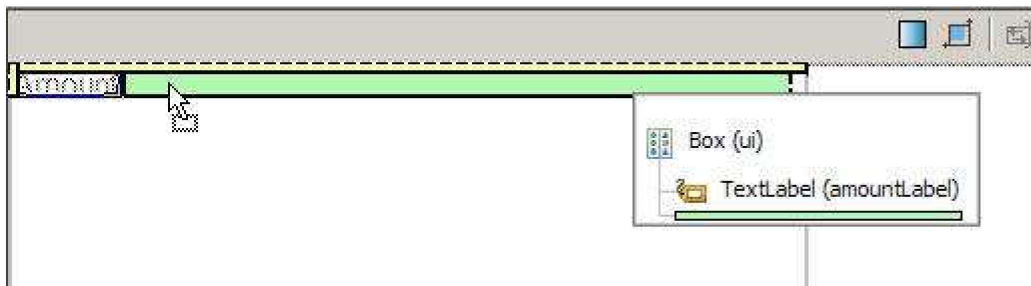
```
amountLabel
```

5. Click **OK**.
6. Make sure that the new `amountLabel` widget is still selected. In the Properties view, enter the following label name for the **text** field:

```
Amount:
```



7. Drag a TextField widget onto the UI to the right of the label.



8. Give this field the following name:
   ```
   amountField
   ```
9. Click **OK**.
10. Change the **text** property of the amountField widget to the following value, which becomes the default value for the field:
    ```
    180000
    ```
    Do not include comma separators or a decimal point.
11. Create a label and field for the mortgage rate:
    a. Add another TextLabel widget and assign it the following name:
       ```
       rateLabel
       ```
       Because the mainBox widget where you are placing these labels and fields defaults to two columns, EGL automatically places the rateLabel widget on a new row.
    b. Change the **text** property of the rateLabel widget to the following label:
       ```
       Rate:
       ```
    c. Add a TextField widget with the following name:
       ```
       rateField
       ```

d. Change the **text** property of the rateField widget to the following value, which becomes the default value for the field:

```
5.2
```

12. Create a label and combo box for the mortgage term:

a. Add a TextLabel widget with the following name:

```
termLabel
```

EGL places the widget on a new row.

a. Change the text property to the following label:

```
Term:
```

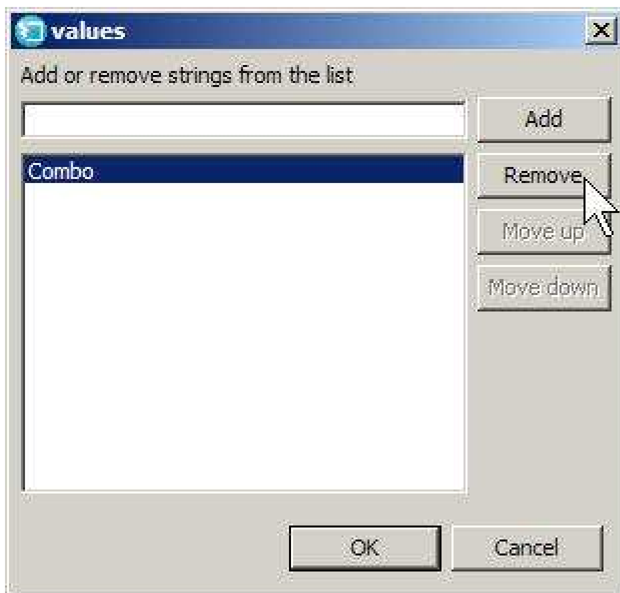
b. Drag a Combo widget onto the line next to the `termLabel` widget.

c. Give the combo the following name:

```
termCombo
```

d. In the Properties view, click the ellipsis (...) next to the **values** property. The values window opens.

e. Select **Combo** and click **Remove**.



f. Type the following number in the **Add** field:

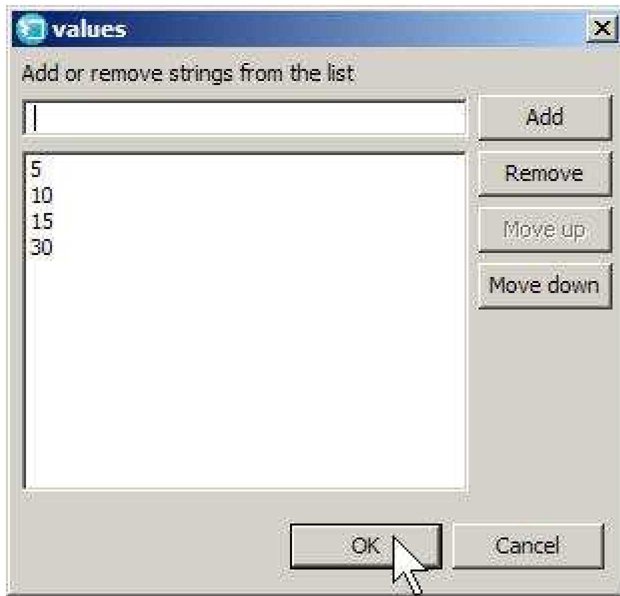
```
5
```

g. Click **Add**.

h. Add each of the following numbers, clicking **Add** after each addition:

```
10
15
30
```

The values window should now look like the following image:



i. Click **OK**.

j. Change the **selection** property of the termCombo widget to the following value, which becomes the default value for the field:

```
4
```

This number indicates the fourth item in the list, which is the number 30.

13. Create a submit button and bind it to a stub function:

a. Drag another text label onto the UI to create a blank space, and assign the following name:

```
blankLabel
```

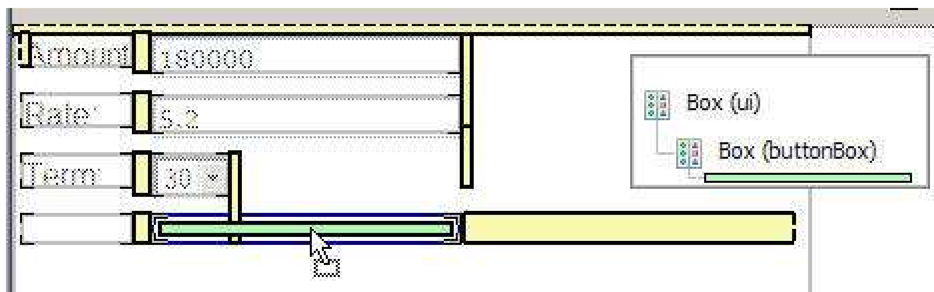
b. In the Properties view, clear the **text** field.

c. Drag a Box widget into the next available position and assign the following name to the variable.

```
buttonBox
```

Use this box to hold your submit button and a graphic that indicates that a calculation is in process.

d. From the Dojo Widgets palette, drag a Button onto the buttonBox widget. Use the Dojo button because it is more stylish than the EGL version.



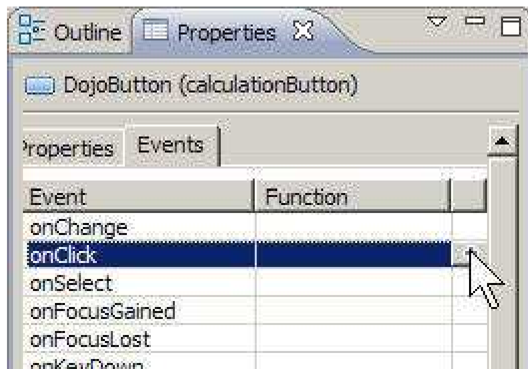
e. Give the button the following name:

```
calculationButton
```

f. In the Properties view, change the **text** property to the following label:

Calculate

g. On the **Events** tab, select the onClick event in the column on the left. At the far right end of that row, click the plus sign to add a new function.



h. In the New Event Handler window, enter the following name for the new function:

calculate

i. Click **OK**. EGL changes to the Source view and creates a stub function, that is, a function with no code, at the end of the file.

```
    function start()
    end

    function calculate(event Event in)

    end
end
```

j. Click **Design** to return to Design view. The calculate function name is now displayed next to the onClick event. The function is bound to the button, so that when you click the **Calculate** button, EGL calls the `calculate()` function. You will add the code for this function later.

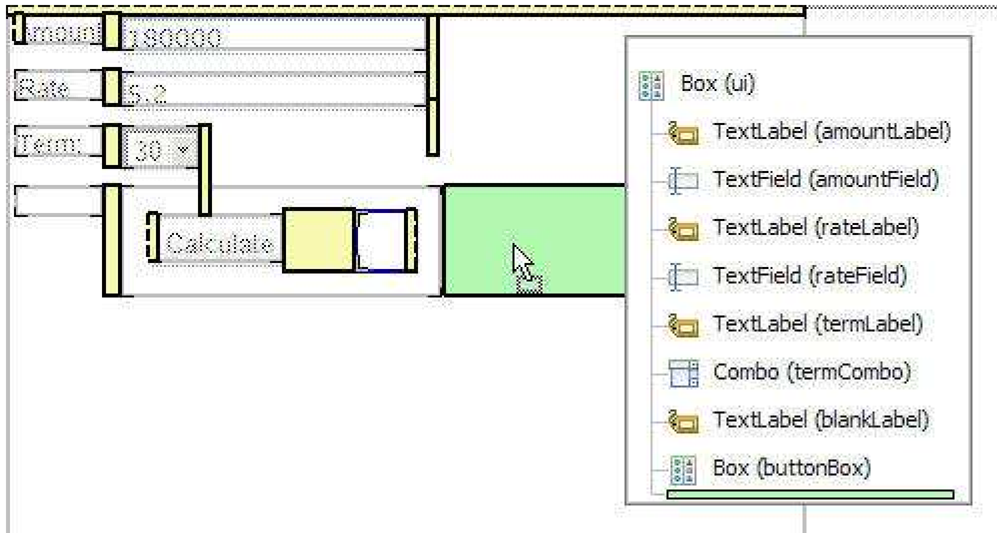
14. Add an animated image to indicate calculation in process.
    a. Drag an Image widget from the **EGL Widgets** palette to the buttonBox widget.
    b. Give the image the following name:

       processImage

    c. In the Properties view, on the Properties page, assign a source for the image in the **src** field:

       icons/progress3.gif

       This is the image you imported from the MortgageSupport.zip archive.
    d. Also in the Properties view, expand **Appearance**. From the list of options for the **visibility** field, select **hidden**. The image remains hidden until the **Calculate** button is clicked.
15. Create a field to hold the result of the calculation:
    a. Drag a TextLabel to the next row on the screen. Place this label *outside* the buttonBox widget.



b. Assign the following name:

   `paymentLabel`

c. In the Properties view, add the following label for the **text** property:

   `Payment:`

16. Drag a TextField widget to the next position on the screen and assign the following name:

    `paymentField`

17. Drag an HTML widget to the next position on the screen.

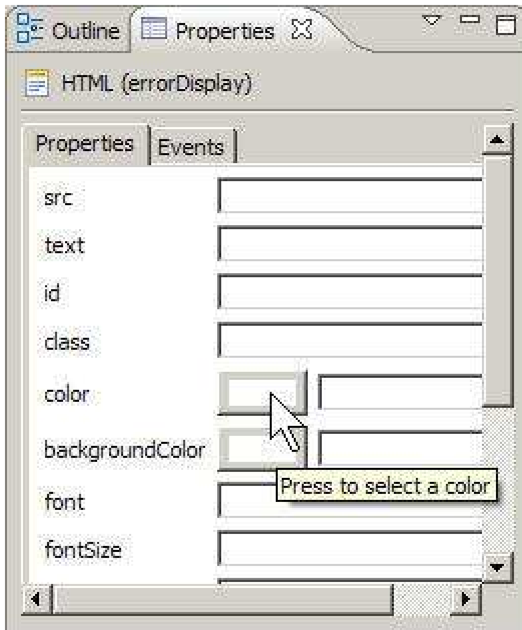
    a. Assign the following name:

       `errorDisplay`

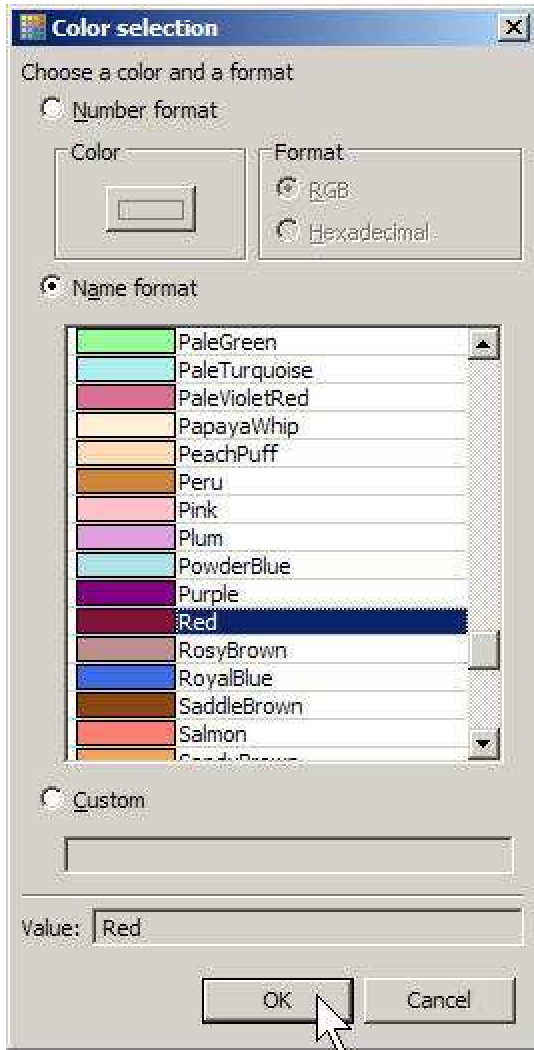
       This widget creates a text area where you can display error messages. Error messages are a normal part of processing and often indicate minor problems like using a comma separator when entering the Amount field.

    b. With the new errorDisplay widget selected, open the Properties view and clear the **text** property.

    c. Click the button next to **color**.

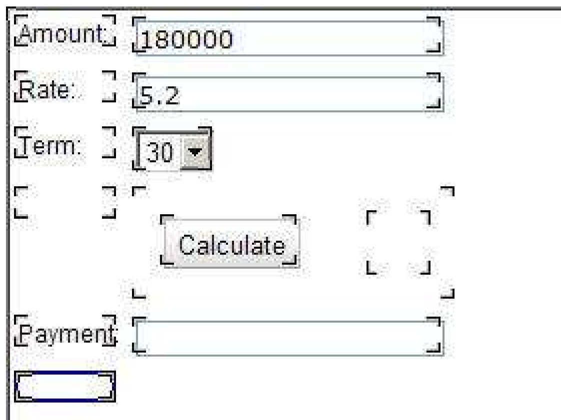


d. From the Color selection window, click **Name format** and scroll through the list of colors until you can click **Red**.



e. Click **OK**.
f. Save the file.

The completed interface should look like the following image:



You will develop the rest of the portlet in Source view. Click the **Source** tab at the bottom of the editor pane. EGL created the code in the **Source** tab based on your

actions in the EGL visual editor. The code should match the file contents in "Finished code for MortgageCalculatorHandler.egl after Lesson 4" on page 66.

Lesson checkpoint

You learned how to perform the following tasks:

- Create a Rich UI Handler
- Use the EGL visual editor to create a user interface
- Use the Properties view to format the interface
- Use CSS to format the interface

In the next lesson, you add code to support the interface that you created in this lesson.

Lesson 5: Add code for the MortgageCalculatorHandler functions

Add functions in the MortgageCalculatorHandler part to support the user interface that you constructed in the previous lesson.

In this lesson, you will work exclusively with EGL source code.

The following exercises show the EGL code for each of the functions in `MortgageCalculatorHandler.egl`, with brief explanations of how the code works. Add each function, in order, before the final **end** statement in the file.

For the moment, ignore the `start()` function. You will add code in a later lesson so that this portlet can communicate with other portlets on the page.

This lesson uses the EGL Model-View-Controller (MVC) framework to manage errors. These functions are included in the `com.ibm.egl.rui` plug-in. MVC is a way of thinking about the various components that are involved in presenting data in a user interface. At its simplest, the *model* is a representation of data, such as a data field, the *view* is the user interface, and the *controller* is the mechanism that defines the relationship between the model and the view. You create an EGL Controller widget to associate the data in a model with the view, in this case, a screen element.

Change the Handler code

You must make a few minor changes to the main Handler section. Use the EGL MVC framework to handle any errors that occur during calculation.

1. In the **Design** view for `MortgageCalculatorHandler.egl`, select the errorDisplay HTML widget. At the bottom of the editor, click the **Source** tab. The source editor opens with the cursor at the beginning of the declaration for `errorDisplay`.
2. Add the following lines above the `errorDisplay` declaration:

   ```
   // use for error messages
   error STRING = "";
   ```

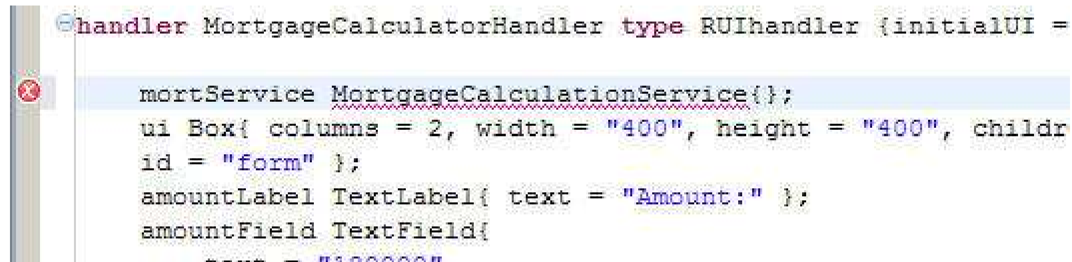
   This string holds any error messages that the Handler receives.
3. Add the following lines below the `errorDisplay` declaration:

   ```
   // associate MVC with errorDisplay widget
   errorController Controller{@MVC{model = error, view = errorDisplay}};
   ```

You are associating the built-in MVC framework with the errorDisplay widget. You will use this errorController widget in the `setError()` function later in this lesson.

4. Below the main declaration for the Handler, declare a variable to represent the service:

```
mortService MortgageCalculationService{};
```



You can use this variable to call the service within the program.

5. Remove the default **width** and **height** measurements from the ui Box declaration. Both fields are initially set to 400 pixels.
6. For a cleaner look, you can delete the comments (lines beginning with "//") that precede the main Handler declaration. These comments are part of the boilerplate Handler code that EGL creates.

Add the calculate() function

This function calls two other functions. The first makes the process GIF visible in order to indicate that the application is working. The second calls the service to complete the calculation.

To code the function in the EGL editor, paste the following lines to replace the `calculate()` stub function that you created in the last lesson:

```
function calculate(event Event in)
 showProcessImage();
 calculateMortgage();
end
```

Note: You do not need to provide arguments for the `calculateMortgage()` function. The necessary information is global to the Handler program. Before you call the service, you will place the necessary information in a record that the service function uses as an argument.

Add the showProcessImage() function

This function makes the animated processing GIF visible. To code the function in the EGL editor, paste the following lines before the final **end** statement:

```
function showProcessImage()
 processImage.visibility = "visible";
end
```

Note: The **visibility** property is part of any Image widget.

Add the hideProcessImage() function

Because you have a function to make the processing GIF visible, you now need a function to make it invisible again. To code the function in the EGL editor, paste the following lines:

```
function hideProcessImage()
 processImage.visibility = "hidden";
end
```

Note: The **visibility** property is part of any Image widget.

Add the calculateMortgage() function

This function calls a service to complete the calculation based on the values displayed in the UI. To code the function in the EGL editor, paste the following lines:

```
function calculateMortgage()
 // new copy of the input record
 inputRec MortgageCalculationResult{};
 // load with values from the ui
 inputRec.loanAmount = amountField.text as MONEY;
 inputRec.interestRate = rateField.text as DECIMAL(10,8);
 inputRec.term = termCombo.values[termCombo.selection] as INT;
 call mortService.amortize(inputRec) returning to displayResults
   onException handleException;
end
```

Note:

1. `inputRec` is a local variable that is based on the `MortgageCalculationResult` record in the `MortgageCalculationService` source file. Passing a record that contains the necessary parameters is a common way of communicating with a Web service. The service then places its results in that same record.
2. The EGL **as** operator casts one type as another. In this case, it converts text fields to numeric ones.
3. The **call** statement here is a variation used with services only. It has the advantage of being asynchronous, so that the UI does not freeze while waiting for the service to respond.

Add the displayResults() function

This function adds a dollar sign to the result of the calculation, and hides the processing GIF. To code the function, paste the following lines before the final **end** statement:

```
function displayResults(retResult MortgageCalculationResult in)
 paymentField.text = "$" + retResult.monthlyPayment as STRING;
 hideProcessImage();
end
```

Complete the error display code

1. Before the final **end** statement, add the following functions:

   ```
   private function setError(err STRING in)
    error = err;
    errorController.publish();
   end
   ```

```
// catch-all exception handler
private function handleException(ae AnyException in)
 setError("Error calling service: " :: ae.message);
end
```

Functions with the **private** modifier cannot be called outside the current program. The `setError()` function uses the errorController widget you created earlier.

2. Right-click an empty space in the editor. Click **Organize imports**. EGL adds **import** statements for all the undefined symbols that it can. If you see errors in your source file, compare your code to the file contents in “Finished code for MortgageCalculatorHandler.egl after Lesson 5” on page 67.
3. After you resolve any errors, save the file.

Test the calculator

You are now ready to test your first portlet.

1. Change to Preview view by clicking the **Preview** tab at the bottom of the editor. You can fully test your application in the Preview view, including services, databases, and the user interface. EGL displays the default values that you entered when you created the UI.
2. Click **Calculate**. EGL displays the monthly payment. Because you are using a local service, the calculation might be too fast for you to see the processing GIF.

Amount: 180000
Rate: 5.2
Term: 30
Calculate
Payment: $988.40

3. Change the values for any of the three fields and click **Calculate** again. The Payment field changes accordingly.

Lesson checkpoint

You learned how to complete the following tasks:

- Work in source mode in the EGL editor
- Use EGL Model-View-Controller functions
- Call an EGL Service inside a function

In the next lesson, you create a pie chart to compare the total principal to the total interest for a given calculation.

Lesson 6: Create the CalculationResultsHandler widget

Add a second portlet on the page to hold a pie chart that shows the relative proportions of principal and interest.

The CalculationResultsHandler does not perform calculations or make service calls. Instead, it relies on messages from the MortgageCalculatorHandler widget that you created in the previous lessons. The mechanism that you use to send and receive messages is the InfoBus library, which is part of the `com.ibm.egl.rui` plug-in.

To tell EGL that you want to receive messages about specific events, you call the `InfoBus.subscribe()` function. To send a message, you call the `InfoBus.publish()` function. In this lesson, you add the `publish()` function to the MortgageCalculatorHandler widget. Then you add the `subscribe()` function to a new Handler, which uses the information to create a pie chart.

Publish the service results

1. In the `MortgageCalculatorHandler.egl` file, find the `displayResults()` function that you created in the previous lesson. Add the following line before the **end** statement:

   ```
   InfoBus.publish("mortgageApplication.mortgageCalculated", retResult);
   ```

   The function now consists of the following code:

   ```
   function displayResults(retResult MortgageCalculationResult in)
    paymentField.text = "$" + retResult.monthlyPayment as STRING;
    hideProcessImage();
    InfoBus.publish("mortgageApplication.mortgageCalculated", retResult);
   end
   ```

   This code shows the payment amount in the payment field, hides the processing image, and publishes the results of the calculation in the `retResult` record. The information in that record is available to any widget that subscribes to the `mortgageApplication.mortgageCalculated` event.

   Note: The names of these events are case-sensitive, so "mortgageApplication" is a different event than "MortgageApplication".

2. Organize imports to resolve the `InfoBus` label, then save and close the file.

   Related reference

   Rich UI Infobus

Create the CalculationResultsHandler widget

1. Create a Rich UI Handler in the `handlers` package, as you did in “Lesson 4: Create the user interface for the calculator” on page 15.
   a. Give the Handler the following name:

      ```
      CalculationResultsHandler
      ```

   b. Place the Handler in the following package:

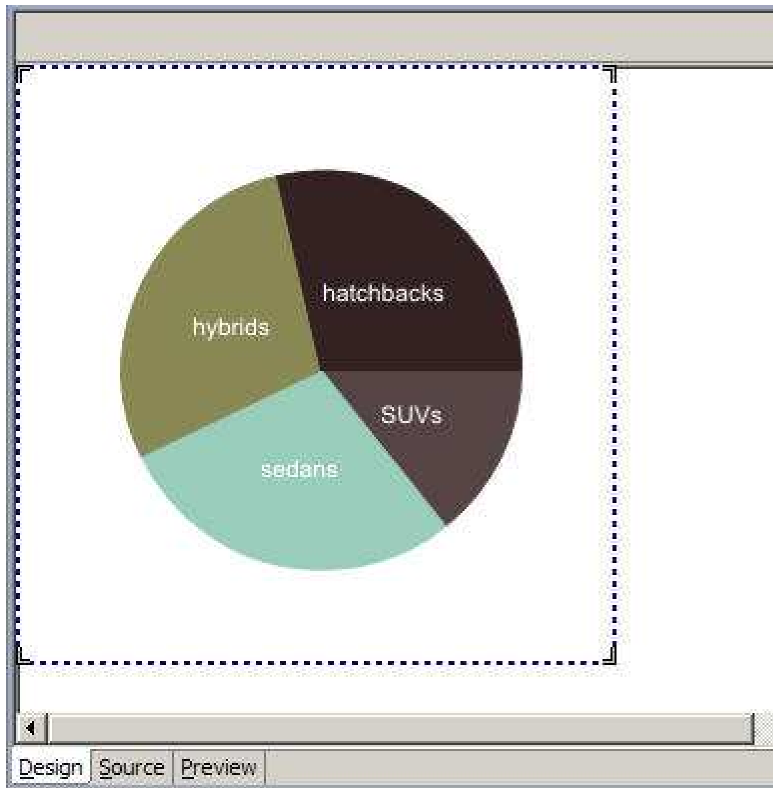
      ```
      handlers
      ```

   The Handler opens in the Design view of the EGL editor.

2. Drag a PieChart widget from the **Dojo Widgets** palette onto the initial uiBox widget for the Handler, and give the widget the following name:

   ```
   interestPieChart
   ```

EGL displays a default pie chart.



3. Change to Source view to complete the rest of the lesson. At the bottom of the editor, click the **Source** tab.
4. In the `ui` Box declaration, reduce the **height** property of the Box to 300 pixels. This adjustment creates more space for the other portlets.
5. You need only two `PieChartData` records. Replace the `data` field of the `interestPieChart` widget with the following code:

```
data = [
  new PieChartData{y=1, text="Principal", color="#99ccbb"},
  new PieChartData{y=0, text="Interest",  color="#888855"}
 ]};
```

   The `y` field contains the amount that is compared to the amounts in the other PieChartData records. You are setting up an initial display of 100 percent principal. This display is a placeholder that the application uses until the first calculation.
6. Set up your communication with the MortgageCalculatorHandler widget by adding the following line to the `start()` function:

```
InfoBus.subscribe("mortgageApplication.mortgageCalculated", displayChart);
```

   This code calls the `displayChart()` function whenever the specified event occurs. You added this event to the MortgageCalculatorHandler widget in the previous exercise.
7. Before the final **end** statement, add the `displayChart()` function:

```
function displayChart(eventName STRING in, dataObject ANY in)
 localPieData PieChartData[];
 localPieData = interestPieChart.data;
 resultRecord MortgageCalculationResult = dataObject as MortgageCalculationResult;
```

```
 localPieData[1].y = resultRecord.loanAmount;
 localPieData[2].y = resultRecord.interest;
 interestPieChart.data = localPieData;
end
```

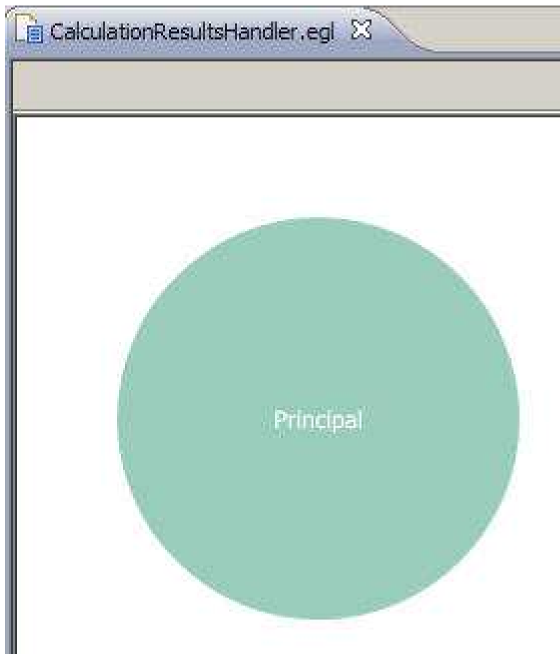
You receive the data record through the InfoBus subscription, as the `dataObject` parameter of the function.

To force the pie chart to refresh, you must set the `data` array equal to a new value. Here you create a new array of PieChartData Records and give them initial values from the interestPieChart widget. Then you update this new array with values from the incoming MortgageCalculationResult Record type. When you set the `interestPieChart.data` array equal to the new array, the pie chart on the screen is refreshed.

8. Organize your imports and save the file. If you see errors in your source file, compare your code to the file contents in "Finished code for CalculationResultsHandler.egl after Lesson 6" on page 69.

Test the pie chart

1. Change to Preview view. EGL displays a default pie chart showing 100% principal.



2. Close the file.

Lesson checkpoint

You learned how to complete the following tasks:

- Use the InfoBus widget to pass information between portlets
- Create a pie chart widget

In the next lesson, you add the two new portlets to a main portal page.

Lesson 7: Create the main portal

The main page uses the EGL portlet widgets to manage communication between the parts of the application.

Create the MainHandler widget

1. Create a Rich UI Handler in the `handlers` package, as you did in "Lesson 4: Create the user interface for the calculator" on page 15.
   a. Give the Handler the following name:
      `MainHandler`
   b. Place the Handler in the following package:
      `handlers`

   The Handler opens in the Design view of the EGL editor.
2. Code the main handler in Source view. At the bottom of the editor, click the **Source** tab.
3. Make the following changes to the declaration of the ui Box:
   a. Remove the default **width** and **height** measurements.
   b. Add a portal widget named `mortgagePortal` to the **children** property. You will declare this widget in the next step.
   c. The revised declaration should look like the following line:
      `ui Box{ columns = 2, children = [ mortgagePortal ] };`
4. Add the following line below the `ui` Box definition:
   `mortgagePortal Portal { columns = 2, columnWidths = [ 300, 650 ] };`
5. Skip a line and add the following code:

```
calculatorHandler MortgageCalculatorHandler{};
resultsHandler CalculationResultsHandler{};
```

   These lines declare variables that represent the two new widget types that you created in the previous lessons.
6. Skip a line and add the following code:

```
calculatorPortlet Portlet{children = [calculatorHandler.ui],
  title = "Calculator"};
resultsPortlet Portlet{children = [resultsHandler.ui],
  title = "Results", canMove = TRUE, canMinimize = TRUE};
```

   Each new portlet variable is declared with the initial UI for the corresponding widget.
7. Add the two portlet variables to the main portal in the `start()` function:

```
function start()
 mortgagePortal.addPortlet(calculatorPortlet, 1);
 mortgagePortal.addPortlet(resultsPortlet, 1);

 // Subscribe to calculation events
 InfoBus.subscribe("mortgageApplication.mortgageCalculated", restorePortlets);

 // Initial state is minimized
 resultsPortlet.minimize();
end
```

   As you did previously, you subscribe to the `mortgageCalculated` event in the `MortgageCalculatorHandler` widget to trigger an action. In this case, you call the `restorePortlets()` function. The main portal minimizes the Results portlet, which contains the pie chart, until you complete a new calculation.

8. Add the following function to manage the layout of the portlets:

```
function restorePortlets(eventName STRING in, dataObject ANY in)
 if(resultsPortlet.isMinimized())
  resultsPortlet.restore();
 end
end
```

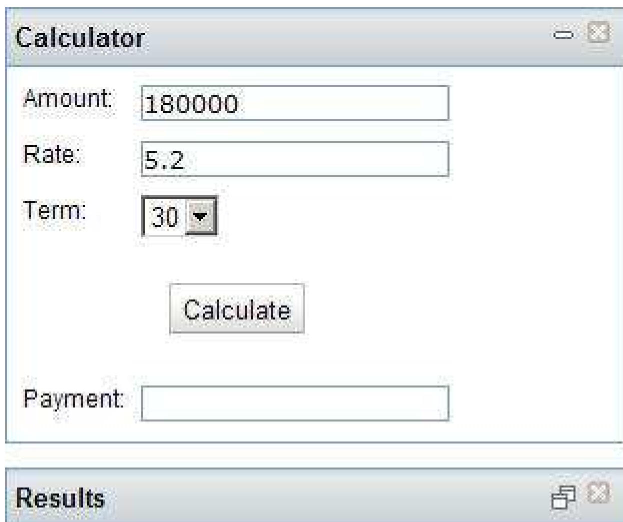
The `restore()` function is automatically available for any variable that is based on the portlet type.

9. Organize your imports and save the file. If you see errors in your source file, compare your code to the file contents in "Finished code for MainHandler.egl after Lesson 7" on page 69.

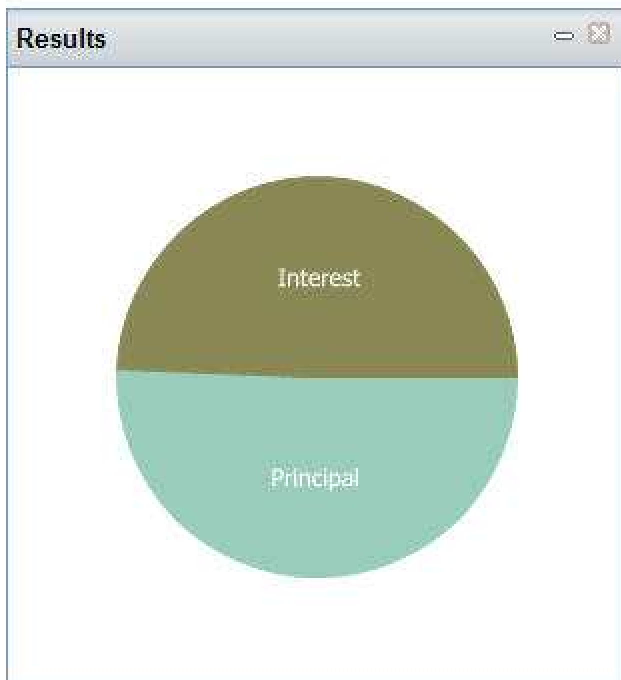
Test the portal

Test the main portal to make sure that the results Portlet receives changes from the Calculation portlet.

1. At the bottom of the editor, click **Preview**. EGL displays the main portal and the two subsidiary portlets.



2. Click **Calculate**. The animated GIF that indicates that processing is in progress is displayed. When the calculation finishes, the pie chart is displayed.



3. Change any of the calculation values and click **Calculate** again. The pie chart reflects changes in the proportion of principal to interest.
4. Close the file.

Lesson checkpoint

You learned how to complete the following tasks:
- Create a portal widget
- Add the portlets that you created in previous lessons to the portal

In the next lesson, you add a portlet to record the calculations you perform.

Lesson 8: Add a calculation history portlet

Create a table where you can click a row to display a previous calculation.

In this lesson, you use the DojoGrid widget to create a table. Although the Grid widget is available in the **Dojo Widgets** palette, no properties are accessible in the Design view, so you code the widget in Source view.

Create the History portlet

1. Create a Rich UI Handler in the `handlers` package, as you did in "Lesson 4: Create the user interface for the calculator" on page 15.
   a. Give the Handler the following name:
      `CalculationHistoryHandler`
   b. Place the Handler in the following package:
      `handlers`

   The Handler opens in the Design view of the EGL editor.
2. Code the calculation history Handler in Source view. At the bottom of the editor, click the **Source** tab.
3. Make the following changes to the declaration of the ui Box:
   a. Remove the default **width** and **height** measurements.
   b. Add a grid widget named `historyGrid` to the **children** property. You will declare this widget in the next step.
   c. The revised declaration should look like the following line:
      ```
      ui Box{ columns = 2, children = [ historyGrid ] };
      ```
4. Add the following declaration below the ui Box declaration:
   ```
   historyGrid DojoGrid { behaviors = [ addSelectionListener ],
    headerBehaviors = [ ],
    columns = [
     new DojoGridColumn { displayName = "Principal", name = "loanAmount", width = 60 },
     new DojoGridColumn { displayName = "Rate", name = "interestRate", width = 60 },
     new DojoGridColumn { displayName = "Years", name = "term", width = 60 },
     new DojoGridColumn { displayName = "Payment", name = "monthlyPayment", width = 60 } ] };
   ```

   A DojoGrid is a table with interactive capabilities. Note the `addSelectionListener` behavior. This code refers to a function that triggers an event when you click a row in the table. You will add that function later in this lesson.
5. Skip a line and add the following code:
   ```
   // array to store calculation results
   historyResults MortgageCalculationResult[0];
   ```

   This code declares an array of the same Record type that you used in the other portlets to store the results of your calculations. This array stores each set of results after it is calculated.
6. Add the following code to the stub of the `start()` function:
   ```
   // Subscribe to calculation events so history table (grid) can be updated
   InfoBus.subscribe("mortgageApplication.mortgageCalculated", addResultRecord);
   ```

   As before, you use InfoBus to notify the program when there is a new calculation. EGL responds by calling the `addResultRecord()` function.
7. Add the `addResultRecord()` function below the `start()` function:
   ```
   // Update grid to show latest mortgage calculation
   function addResultRecord(eventName STRING in, dataObject ANY in)
    resultRecord MortgageCalculationResult = dataObject as MortgageCalculationResult;
   ```

```
historyResults.appendElement(resultRecord);

 historyGrid.data = historyResults as ANY[];
end
```

As you did previously, you cast the incoming `dataObject` as a `MortgageCalculationResult` record. You append the new results to the array, and then replace the entire `data` field in the table widget. As you have seen before, replacing the `data` field causes the widget to refresh.

8. Add the following two functions to manage the selection of a calculation:

```
// Adds a listener to each cell
function addSelectionListener(grid DojoGrid in, cell Widget in,
  row ANY in, rowNumber INT in, column DojoGridColumn in)
 cell.setAttribute("row", rowNumber);
 cell.onClick ::= cellClicked;
end

// Publish event to InfoBus when previous calculation is selected
function cellClicked(e Event in)
 try
  row int = e.widget.getAttribute("row") as INT;
  InfoBus.publish("mortgageApplication.mortgageResultSelected", historyResults[row]);
 onException(ex AnyException)
 end
end
```

The Grid widget calls the `addSelectionListener()` function for each cell it creates. This function saves the row number as a free-form attribute of the cell, to be read later. The function also specifies a second function, `cellClicked()`, that is called when the user clicks the cell. The `cellClicked()` function reads the saved row number and then uses the InfoBus to publish the MortgageCalculationResult record associated with row.

9. Organize your imports and save the file. If you see errors in your source file, compare your code to the file contents in "Finished code for CalculationHistoryHandler.egl after Lesson 8" on page 70.
10. Close the file.

Lesson checkpoint

You learned how to complete the following tasks:

- Create a portlet that contains a DojoGrid table
- Use the behaviors of the table to trigger an event when a cell is clicked
- Add a results record after an InfoBus alert

In the next lesson, you add this portlet to the main portal.

Lesson 9: Add the calculation history portlet to the main portal

To add the new portlet to your page, you must change the Results portlet and the main portal.

Change the Results portlet

As of the end of the previous lesson, the `CalculationResultsHandler` widget checks for only a single event, `mortgageApplication.mortgageCalculated`. Now you also want to redisplay the pie chart when a row in the History portlet is

selected. That action generates the `mortgageApplication.mortgageResultSelected` event. You can use the asterisk wildcard character (*) to represent either event.

1. In the EGL editor, open the `CalculationResultsHandler.egl` file and switch to Source view.
2. In the `start()` function, find the following line:
```
InfoBus.subscribe("mortgageApplication.mortgageCalculated", displayChart);
```
3. Replace the specific event name with a wildcard character:
```
InfoBus.subscribe("mortgageApplication.*", displayChart);
```
   EGL now calls the `displayChart()` function whenever an event that begins with `mortgageApplication.` is published to the InfoBus.
4. Save and close the file.

Change the main portal

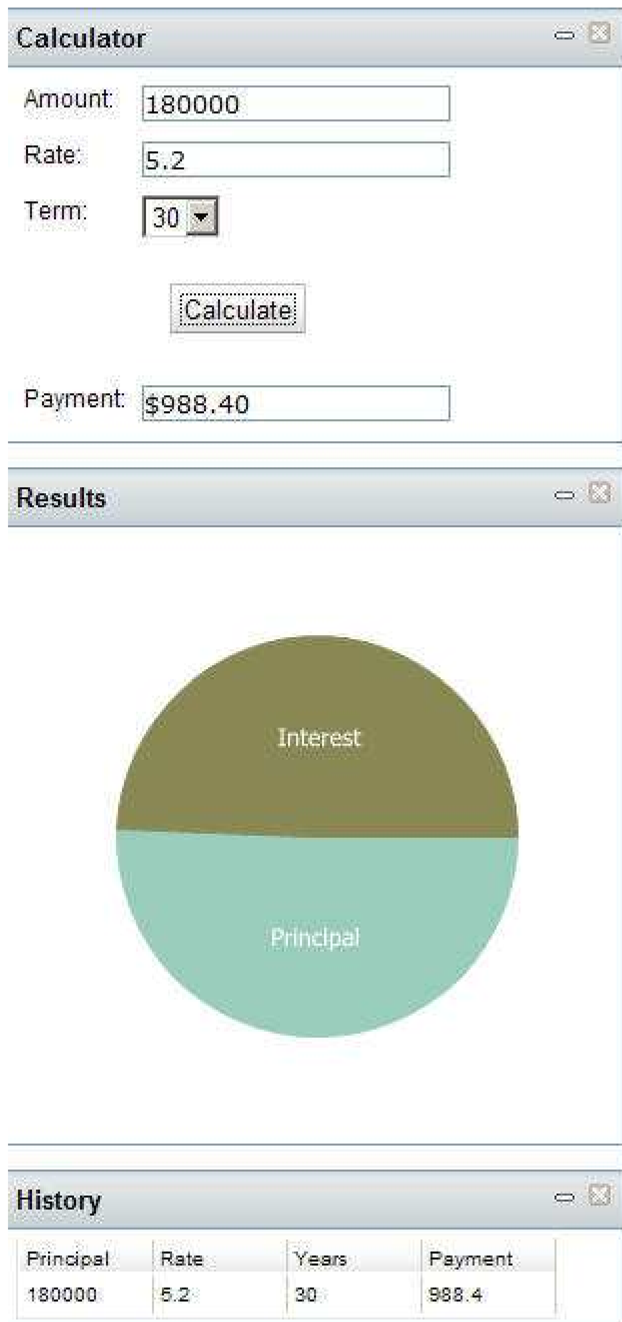
Add lines for the History portlet that are similar to the lines for the other two portlets:

1. In the EGL editor, open the `MainHandler.egl` file and click the **Source** tab.
2. Immediately below the `resultsHandler` declaration, add a similar declaration for `historyHandler`:
```
historyHandler CalculationHistoryHandler{};
```
3. Immediately below the `resultsPortlet` declaration, add a similar declaration for `historyPortlet`:
```
historyPortlet Portlet{children = [historyHandler.ui],
   title = "History", canMove = TRUE, canMinimize = TRUE};
```
4. In the `start()` function, below the existing calls to `addPortlet()`, add the new portlet to the portal:
```
mortgagePortal.addPortlet(historyPortlet, 1);
```
5. As you did with the `resultsPortlet`, set the `historyPortlet` as initially minimized:
```
historyPortlet.minimize();
```
6. Add code for the `historyPortlet` to the end of `restorePortlets()` function:
```
if(historyPortlet.isMinimized())
 historyPortlet.restore();
end
```
7. Save the file. If you see errors in your source file, compare your code to the file contents in "Finished code for MainHandler.egl after Lesson 9" on page 71.

Test the portal

Test the main portal to make sure that the new History portlet is displayed and works correctly.

1. At the bottom of the editor, click **Preview**. EGL displays the main portal and the three subsidiary portlets.
2. Click **Calculate**. The animated GIF that indicates that processing is in progress is displayed. When the calculation finishes, the pie chart and history are displayed.



3. Change the **Term** of the mortgage to 5 years and click **Calculate** again. A second row is added to the history list.
4. Click a cell in the first row of the history list.

Calculator

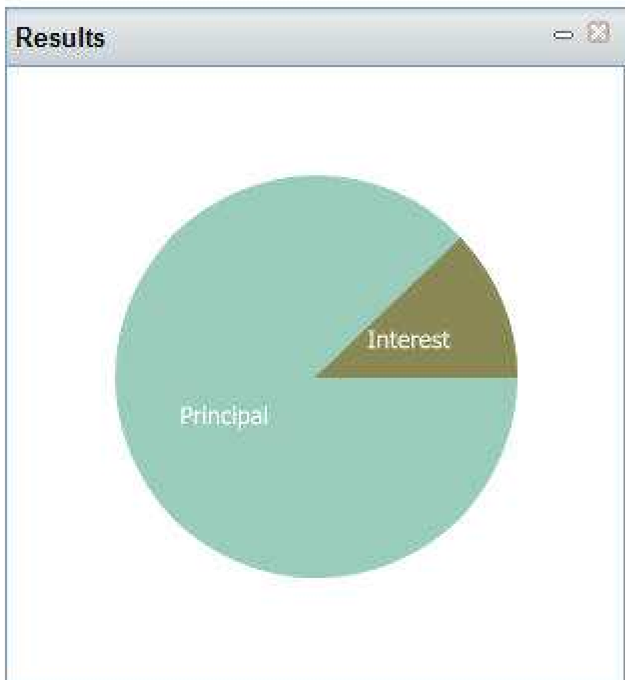
Amount: 180000

Rate: 5.2

Term: 5

Calculate

Payment: $3413.34



History

Principal	Rate	Years	Payment
180000	5.2	30	988.4
180000	5.2	5	3413.34

5. The pie chart displays the values for the selected row from the history list.

Calculator

Amount: 180000

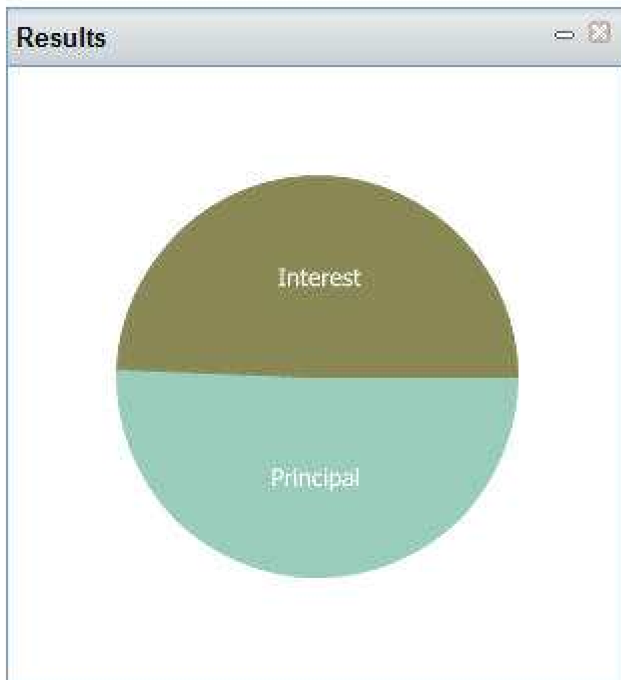
Rate: 5.2

Term: 5

Calculate

Payment: $3413.34

Results



History

Principal	Rate	Years	Payment
180000	5.2	30	988.4
180000	5.2	5	3413.34

Lesson checkpoint

You learned how to complete the following tasks:

- Subscribe to multiple events
- Create and update a portlet widget that contains a table

In the next lesson, you add a portlet that displays a map of mortgage companies in your area.

Lesson 10: Create the UI for the Map portlet

Create a portlet where you can enter a zip code and see a list of nearby mortgage companies and a map. Click the name of a company, and the map displays the location of the company.

This lesson relies on capabilities from two external Web sites:

- The Yahoo! Local Search Service provides information about businesses in a specific zip code
- The Google Maps API provides a map that you can imbed in a portlet to show an address

Each program requires a key, which you can obtain online. To get the keys, you must have accounts with both Google and Yahoo!. If you do not have accounts, you can easily create them for free. The Google key is only necessary if you deploy the application to a live server. You can use a dummy key for testing.

Get a Yahoo! application ID

The Local Search Service is part of the Yahoo! developer network. To use it, you must obtain a Yahoo! application ID:

1. Browse to the following location:

   `http://developer.yahoo.com/search/local/V3/localSearch.html`
2. In the upper right corner, click **Get an App ID**.

3. On the login page, enter your Yahoo! ID and password and click **Sign In**. If you do not have a Yahoo! ID, click **Sign up for Yahoo!** and complete the form. You can complete this process for free.
4. On the Yahoo! Developer Registration page, complete all the fields that are marked with asterisks:
   a. Click **Generic**. This tutorial does not require user authentication.
   b. For **Developer/Company Name**, enter the name associated with your Yahoo! ID.
   c. For **Product Name**, enter the following name:

      `Mortgage Tutorial`
   d. For **Contact email**, you can use the email address that is associated with your Yahoo! account (*yahoo_id*@yahoo.com).
   e. For the Description of the application, enter the following description:

      `Mortgage Tutorial`

5. Click **Continue**. Yahoo! displays your 68-character application ID. Highlight this ID and press Ctrl+C to copy it into your copy buffer.
6. Paste the ID into a text file in a location where you can easily find it, such as your Desktop. In the file, note that the ID is the Yahoo! key.

Get a Google Maps key

If you plan to display the map on a live Web site, the Google Maps API requires a key. If you are only interested in completing this tutorial, you can skip this exercise and use the API without a key.

To get a Google Maps key:

1. Browse to the following location:

   `http://www.google.com/apis/maps/signup.html`
2. In the upper right corner of the page, click the **Sign in** link. If you have a Google account, enter your sign-in credentials. If you do not have an account, click **Create an account now** and complete the free registration process.
3. At the bottom of the Sign Up for the Google Maps API page, complete the following fields:
   a. Select **I have read and agree with the terms and conditions**.
   b. If you plan to use the Google key on a live Web site, enter the URL for that site in the **My web site URL** field.
   c. Click **Generate API key**. Google displays a page with your 84-character key and several code snippets. Note the snippet with the heading "JavaScript Maps API Example". This tutorial provides the JavaScript file that uses this snippet: `WebContent/utils/GoogleMap.js`. However, when you create your own application, you would use this code to create your own JavaScript.
4. Copy this key and paste it in the same file as your Yahoo! application ID. Make a note in the file that this is the Google key.

Create the Local Search Interface

When you use an external Web service, you create an Interface part to give EGL necessary information about the service. The Interface contains function prototypes, consisting of the function name and parameters for all the functions in the service, but not the function code. The Interface might also include any Record definitions that you use in calls to the service.

This is an unusual Interface because the `getSearchResults()` function prototype serves as an alias for an HTTP request. The **uriTemplate** property contains the URI for this request, with variables enclosed in braces.

More information about using the Local Search Interface is available on the Yahoo! site at the following location:

`http://developer.yahoo.com/search/local/V3/localSearch.html`

1. Create a new Interface part by right-clicking **MortgageEGLProject** and clicking **New → Interface**.
2. In the New EGL Interface Part window, complete the following fields:
   a. For **EGL source file name**, enter the following name:

      `IYahooLocalService`
   b. For **Package**, enter the following name:

      `interfaces`
   c. Click **Finish**.
3. Replace the contents of the file with the following code:

```
package interfaces;

interface YahooLocalService
 function getSearchResults(appId string in, zipCode string in) returns(ResultSet)
   {@GetRest{uriTemplate = "http://local.yahooapis.com/LocalSearchService/V3/
   localSearch?appid={appId}&query=mortgage&zip={zipcode}&results=8",
   responseFormat = XML}};
end
```

After you have pasted the code, remove the newlines and tabs within the function prototype. This declaration must appear on a single line, with no spaces in the URI.

The function places the incoming parameters into a URI to call the service on the Yahoo! site. In addition to your Yahoo! ID and the zip code to look up, the URI also provides the keyword "mortgage" to use in the search and specifies a maximum of 8 results.

This is only one example of calling a service from EGL. Others have multiple function calls, and may handle the connection to the service through the EGL deployment descriptor file (for more information about the EGL deployment descriptor, see “Lesson 14: Deploy and test the mortgage application” on page 55).

4. Save the file.

Related reference

Interface part

Add records to the Interface file

The Interface requires three Record definitions. These Record definitions match the XML response that the Yahoo! service returns. You can see samples of this XML at http://developer.yahoo.com/search/local/V3/localSearch.html. The XML uses tags like "<Title>" that you convert into Record fields.
Because a Record is a part, place these definitions after the **end** statement for the Interface part.

1. Create the ResultSet Record by pasting the following code at the end of the `IYahooLocalService.egl` file:

```
record ResultSet{@XMLRootElement{name = "ResultSet", namespace = "urn:yahoo:lcl"}}
 totalResultsAvailable STRING{@xmlelement { namespace = "urn:yahoo:lcl"}};
 results Result[]{@XMLElement{name = "Result", namespace = "urn:yahoo:lcl"}};
end
```

   The ResultSet Record includes an array of Result type Records. You create that Record type in the next step.

2. Create the Result Record by pasting the following code at the end of the file:

```
record Result
 Title STRING{@xmlElement{namespace = "urn:yahoo:lcl"}};
 Address STRING{@xmlElement{namespace = "urn:yahoo:lcl"}};
 City STRING{@xmlElement{namespace = "urn:yahoo:lcl"}};
 State STRING{@xmlElement{namespace = "urn:yahoo:lcl"}};
 Latitude STRING{@xmlElement{namespace = "urn:yahoo:lcl"}};
 Longitude STRING{@xmlElement{namespace = "urn:yahoo:lcl"}};
 rating Rating{@xmlElement{namespace = "urn:yahoo:lcl"}};
end
```

   The Result Record includes a variable based on a Rating type Record. You create that Record type in the next step.

3. Create the Rating Record by pasting the following code at the end of the file:

```
record Rating
 AverageRating STRING{@xmlElement{namespace = "urn:yahoo:lcl"}};
end
```

4. Save the file. If you see errors in your source file, compare your code to the file contents in "Finished code for IYahooLocalService.egl after Lesson 10" on page 72.
5. Close the file.

Create the GoogleMap externalType

A type is like a blueprint. It contains information that you can use to create a variable that you can use in a program. It is an abstraction. A STRING, a Record, and a Service are all examples of types in EGL.
You can also use blueprints from outside EGL to create variables in an EGL program. One example is the GoogleMap widget, which is a map that you can embed in your Web page. You use the EGL **externalType** definition to give EGL the information it needs about such an outside blueprint.
The GoogleMap external type works with the GoogleMap.js file that is included in the MortgageSupport.zip file that you downloaded in Lesson 2.

1. Create a new EGL source file to hold the external type:
   a. Select **MortgageEGLProject** in the Project Explorer view and click the **New EGL Source File** icon.

   b. Give the file the following name:
      `GoogleMap`
   c. Place the file in the following package:
      `widgets`
2. Replace the boilerplate contents of the file with the following code:

```
package widgets;

ExternalType GoogleMap extends Widget type JavaScriptObject {
  relativePath = "utils",
  javaScriptName = "GoogleMap"
 }
 function showAddress(address String in, description string in);

 width STRING{@JavaScriptProperty{setMethod="setWidth", getMethod="getWidth"}};
 height STRING{@JavaScriptProperty{setMethod="setHeight", getMethod="getHeight"}};

end
```

   In terms of how the file is used, this **externalType** definition is similar to the Interface part you created earlier. It includes a function prototype and two fields.
3. Save and close the file.

Related reference

ExternalType part

Create the UI for the MapLocatorHandler widget

In the following instructions, as in any complex sequence of changes to a source file, remember to save the file periodically. To create the MapLocatorHandler widget:

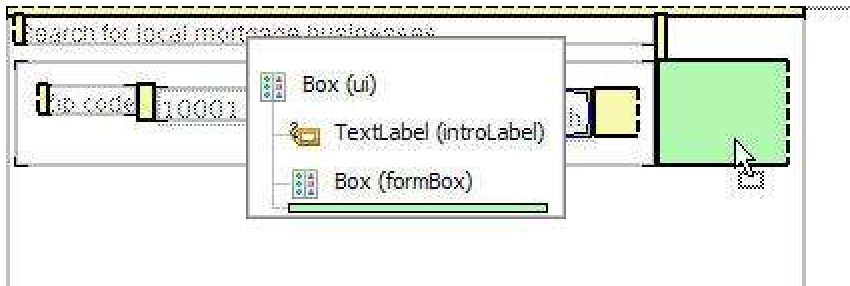
1. Create a Rich UI Handler in the `handlers` package, as you did in "Lesson 4: Create the user interface for the calculator" on page 15.
   a. Give the Handler the following name:
      ```
      MapLocatorHandler
      ```
   b. Place the Handler in the following package:
      ```
      handlers
      ```

   The Handler opens in the Design view of the EGL editor.
2. Highlight the `ui` Box and make the following changes in the **Properties** view:
   a. Change the **columns** property to 1.
   b. Change the **id** property to `form`. This setting assigns styles from the style sheet for your application, `WebContent/css/MortgageEGLProject.css`.
3. Create a line of introductory text:
   a. Drag a TextLabel widget from the **EGL Widgets Palette** to the `ui` Box and give it the following name:
      ```
      introLabel
      ```
   b. In the Properties view, change the text property to the following phrase:
      ```
      Search for local mortgage businesses
      ```
4. Create a box for zip code entry:
   a. Drag a Box widget into the next position and assign the following name:
      ```
      formBox
      ```
   b. In the Properties view, change the **columns** property to 3.
5. Create a label for the zip code input field:
   a. Drag a TextLabel widget into the new Box and assign the following name:
      ```
      zipLabel
      ```
   b. In the **Properties** view, change the **text** property to the following text:
      ```
      Zip code:
      ```
6. Create a text field where the customer can enter a zip code:
   a. Drag a TextField widget into the next position in the formBox widget and assign the following name:
      ```
      zipField
      ```
   b. In the Properties view, add the following value in the text field, which becomes the default value for the field:
      ```
      10001
      ```

      This value represents the zip code for midtown Manhattan.
   c. Click the **Events** tab and click the row for the onKeyDown event. Click the plus sign to add a function for the event.
   d. In the New Event Handler window, enter the following name for the new function:
      ```
      checkForEnter
      ```
   e. Click **OK**. EGL switches to Source view and displays the stub `checkForEnter()` function.

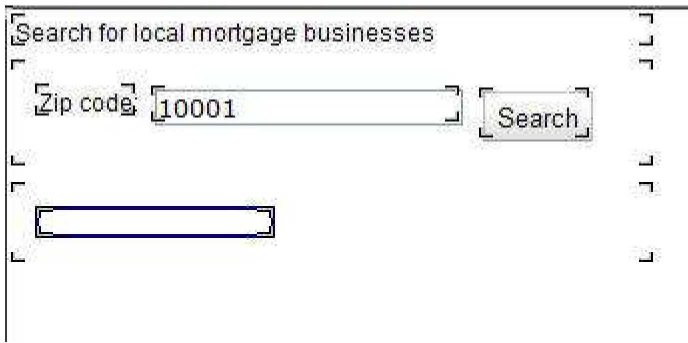
f. Click **Design** to return to Design view. The checkForEnter function name is now displayed next to the onKeyDown event. The function is bound to the zipField field. You will add the code for this function later.

7. Add a button to initiate the search for the specified zip code:
   a. Drag a Button widget from the Dojo Widgets Palette to the third position in the formBox Box. This button is actually a DojoButton and has the correct type in the source code. Assign the following name:
   `zipButton`
   b. In the Properties view, make sure that you are on the Events page. Click the row for the onClick event. Click the plus sign to add a function for the event.
   c. In the New Event Handler window, enter the following name for the new function:
   `buttonClicked`
   d. Click **OK**. EGL switches to Source view and displays the stub `buttonClicked()` function.
   e. Click **Design** to return to Design view. The buttonClicked function name is now displayed next to the onClick event. The function is bound to the zipButton button. You will add the code for this function later.
   f. Click the **Properties** tab to switch back to the Properties page. Change the **text** property for the button to the following name:
   `Search`
8. Drag a Box widget from the EGL Widgets palette into the next position *after* the formBox Box and give it the following name:
   `mapBox`



9. Create a box to contain the list of mortgage companies.
   a. Drag a second box onto the new mapBox Box and give it the following name:
   `listingBox`
   b. In the Properties view, set the **columns** property to 1. Expand the **Position** category and change the **width** property to `120`.

You are finished working in EGL visual editor. In the next lesson, you will add source code to complete the portlet. Your editor pane looks like the following image:



If you click the **Source** tab, you can see code that the EGL visual editor created. This code matches the code in "Finished code for MapLocatorHandler.egl after Lesson 10" on page 73.

Lesson checkpoint

You learned how to complete the following tasks:

- Obtain keys from Yahoo! and Google to use their services
- Create an Interface and Record definitions for the Local Search service
- Create an externalType for the GoogleMaps widget
- Create a user interface for the Map portlet

In the next lesson, you add source code to complete the portlet.

Lesson 11: Create the source code for the Map portlet

Connect the service and the external widget to the user interface you created in the previous lesson.

Finish the source code for MapLocatorHandler.egl

1. Make sure that the `MapLocatorHandler.egl` file is open in the EGL editor. If you are in Design view, click the **Source** tab.
2. In the Handler declaration, change the **height** property of the `ui` Box to `450`. This setting provides adequate space for the GoogleMap widget that you declare later.
3. Add a blank line below the Handler declaration, and then add the following line:
   ```
   const YAHOO_APP_ID STRING = "app_id";
   ```
   where *app_id* is the 68-character application ID you obtained from Yahoo! in the previous lesson. This ID must be surrounded by quotation marks.
4. On the next line, declare a variable to represent the Yahoo! lookup service:
   ```
   lookupService YahooLocalService{@restbinding};
   ```
   The **@restbinding** property indicates that EGL must look for binding information under the heading "YahooLocalService" in the deployment descriptor file. You will learn about the deployment descriptor file in "Lesson 14: Deploy and test the mortgage application" on page 55.
5. In the `MapBox` declaration, add a widget named `localMap` to the **children** property. The result looks like the following code:

```
MapBox Box{ padding=8,
 children = [ listingBox, localMap ] };
```

6. After the `listingBox` declaration, declare the `localMap` widget:

```
localMap GoogleMap{width = 500, height = 350};
```

7. Complete the `start()` function:

```
function start()
 search(); // show search results
end
```

The initial display shows results for the default zip code.

8. Complete the `checkForEnter()` function:

```
function checkForEnter(event Event in)
 if(event.ch == 13)
  search();
  end
end
```

9. Complete the `buttonClicked()` function:

```
function buttonClicked(event Event in)
 search();
end
```

10. Add the `search()` function:

```
function search()
 listingBox.setChildren([new Image{src = "icons/progress3.gif"}]);
 localMap.showAddress(zipField.text, "");  // default map (no address)
 // Call remote Yahoo Service and pass zip code
 call lookupService.getSearchResults(YAHOO_APP_ID, zipField.text)
   returning to showResults onException displayError;
end
```

The `setChildren()` function provides a shorthand way to display a progress GIF, as you did in the Calculator portlet. When you use the `setChildren()` function again later to display the search results in the same Box widget, those results replace the progress image.

The second field of the `localMap.showAddress()` function is used for an address. For the initial display, you do not provide an address.

11. Add the `displayError()` function that is specified in the `search()` function:

```
function displayError(ex AnyException in)
 DialogLibrary.showError("Yahoo Service", "Cannot invoke Yahoo Local Service: "
   + ex.message, null);
end
```

The DialogLibrary is part of the `com.ibm.egl.rui.dialog` plug-in that you added to your workspace in Lesson 2, along with the portlet plug-in. It provides basic message functions for your Web page.

12. Add the `showResults()` function that is specified in the `search()` function:

```
function showResults(retResult ResultSet in)
  linkListing HyperLink[0];
  for(i INT from 1 to retResult.results.getSize() by 1)
   newLink HyperLink{text = retResult.results[i].title, href = "#"};
   newLink.setAttribute("address", retResult.results[i].Address + ", "
     + retResult.results[i].city + ", "
     + retResult.results [i].state);
   newLink.setAttribute("title", retResult.results[i].Title);
   newLink.onClick ::= mapAddress;
   linkListing.appendElement(newLink);
  end
  listingBox.setChildren(linkListing);
 end
```

Your call to the service returns an array of mortgage company addresses. The `showResults()` function reads through that array and creates a new array of business names in the form of hyperlinks, with a maximum of 8, to prevent overflowing the screen. The links point to the current page; all you need is the ability to register an onClick event for each name. That onClick event triggers the `mapAddress()` function, which you create in the next step.

13. Add the `mapAddress()` function specified in the `showResults()` function:

```
function mapAddress(e Event in)
 // Show the address on the map when the link is clicked
 businessAddress STRING = e.widget.getAttribute("address") as STRING;
 businessName STRING = e.widget.getAttribute("title") as STRING;
 localMap.showAddress(businessAddress, "<b>" + businessName + "</b>");
end
```

14. Organize your imports by pressing Ctrl+Shift+O, and save the file. If you see errors in your source file, compare your code to the file contents in "Finished code for MapLocatorHandler.egl after Lesson 11" on page 73.

Test the new portlet

Because this portlet works independently, you can test it separately.

1. Make sure to save the file, and then click **Preview**. EGL displays the entry form with the zip code 10001 selected. A list of mortgage companies is displayed down the left side of the screen. On the right is a map of New York City.

Search for local mortgage businesses

Zip code: 10001 Search

Red Wagon Mortgage
Apple Mortgage Corporation
Champion Credit Repair Services Corona New York
M & T Mortgage
Lynxx Funding Corporation
Wachovia Bank
New York Credit Repair Consultants
First Republic Bank

If the page does not display properly, make sure that the `GoogleMap.js` file is in the `WebContent/utils` directory for your project.

2. Click any of the names in the left column. The map displays an indicator that shows the location of the business.
3. Enter a different zip code and click **Search**. The map displays a new location.
4. Close the file.

Lesson checkpoint

You learned how to complete the following tasks:
- Create and use a variable that is based on the Local Search service
- Create and use a variable that is based on the GoogleMaps widget

In the next lesson, you add the Map portlet to the main portal.

Lesson 12: Add the Map portlet to the main portal

To add the new portlet to your page, you must change the main portal.

Change the main portal

Add lines for the Map portlet that are similar to the lines for the other three portlets:
1. In the EGL editor, open the `MainHandler.egl` file and click the **Source** tab.
2. Immediately below the `historyHandler` declaration, add a similar declaration for `mapHandler`:
```
mapHandler MapLocatorHandler{};
```
3. Immediately below the `historyPortlet` declaration, add a similar declaration for `mapPortlet`:
```
mapPortlet Portlet{children = [mapHandler.ui],
   title = "Map", canMove = FALSE, canMinimize = TRUE};
```
4. In the `start()` function, below the existing calls to `addPortlet()`, add the new portlet to the portal:
```
 mortgagePortal.addPortlet(mapPortlet, 2);
```
   In this case, you are adding the Map portlet to the second, wider column.
5. Save the file. If you see errors in your source file, compare your code to the file contents in "Finished code for MainHandler.egl after Lesson 12" on page 75.

Test the portal

Test the main portal to make sure that the new Map portlet is displayed and that all portlets work correctly.
1. At the bottom of the editor, click **Preview**. EGL displays the main portal and the four subsidiary portlets.
2. Calculate at least two different mortgages and enter a five-digit U.S. zip code in the Map portlet.

3. Close the file.

Lesson checkpoint

There were no new tasks in this lesson.

In the next lesson, you add a portlet to display a map of mortgage companies for a specific area.

Lesson 13: Install Apache Tomcat

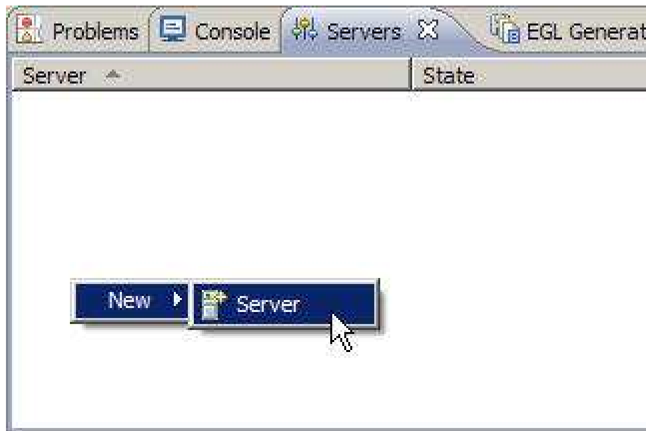
Use the Apache Tomcat open source Web server to display the generated version of your Web page.

Download and install the server

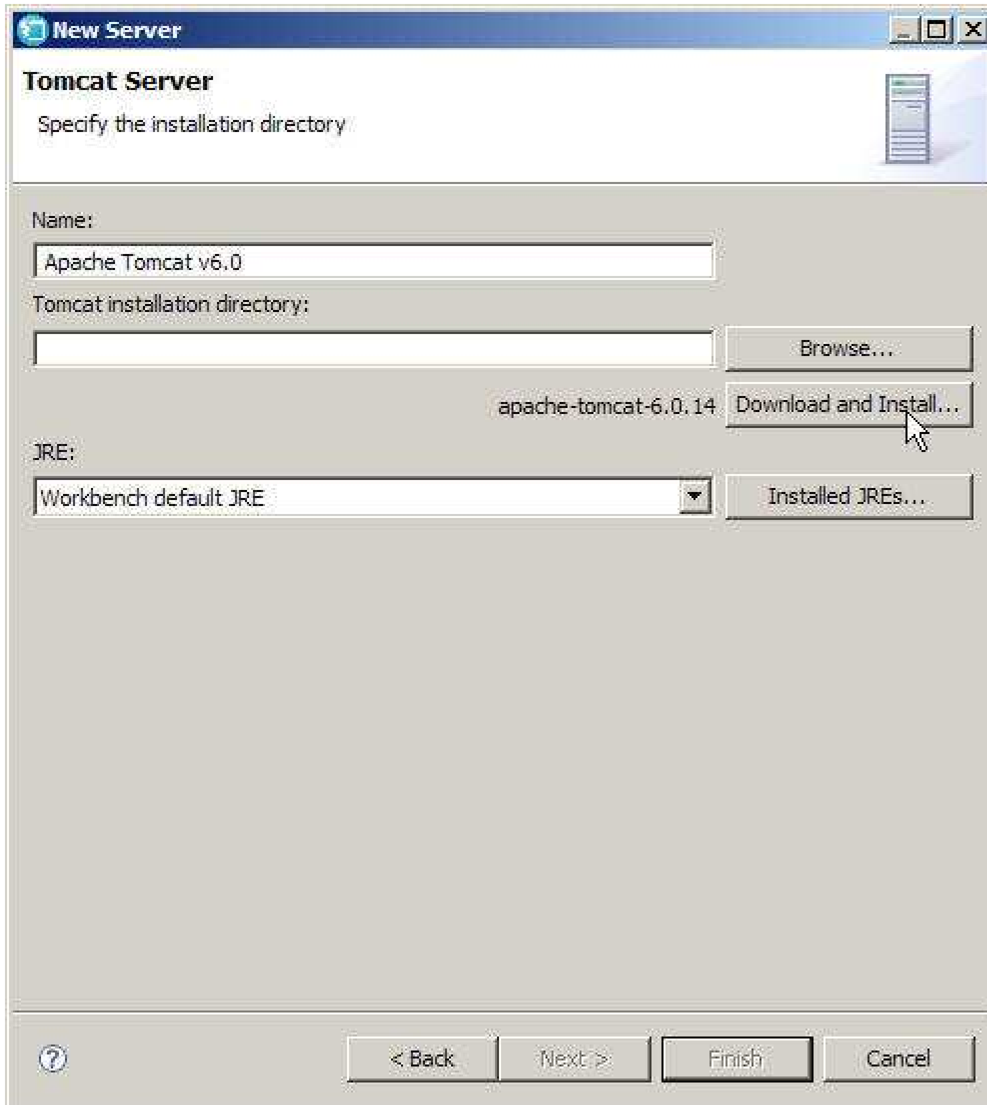
You can download and install the Tomcat Web server in the EGL workbench. If you have the Tomcat server on your system, you still must create a copy of the server for EGL to use.

To install and configure the server:

1. Locate the Servers view, which is by default at the lower right of the workbench. Right-click the empty space and click **New** → **Server**.



2. In the Define a New Server window, expand **Apache** and click **Tomcat v6.0 Server**. Accept the default values for the other fields. Click **Next**.
3. In the Tomcat Server window, click **Download and Install**. If the Tomcat server is already installed, click **Browse** and find the installation directory for the server, and then go to step 4 on page 54



Accept the terms of the license agreement. Browse to a directory for the application files, such as `C:\Program Files\Apache`. While it completes the installation, EGL displays the Define a New Server window again, this time with the installation directory specified. Progress is shown at the bottom right of the workbench.

4. When the installation is completed, click **Finish**.
5. Start the server by clicking the green circle with the white triangle at the top of the Server view.

Lesson checkpoint

In this lesson, you completed the following tasks:

- Downloaded the Apache Tomcat Web server, if necessary
- Installed Tomcat in your workspace

In the next lesson, you deploy the application to the Tomcat server and run it there.

Lesson 14: Deploy and test the mortgage application

During the deployment process, EGL creates HTML files and server-specific code to match your target environment.

Deployment is a two stage process:

1. Deploy your Handlers to a Web project
2. Deploy the Web project to a Web server, which in this case is the Apache Tomcat server you installed in the previous lesson

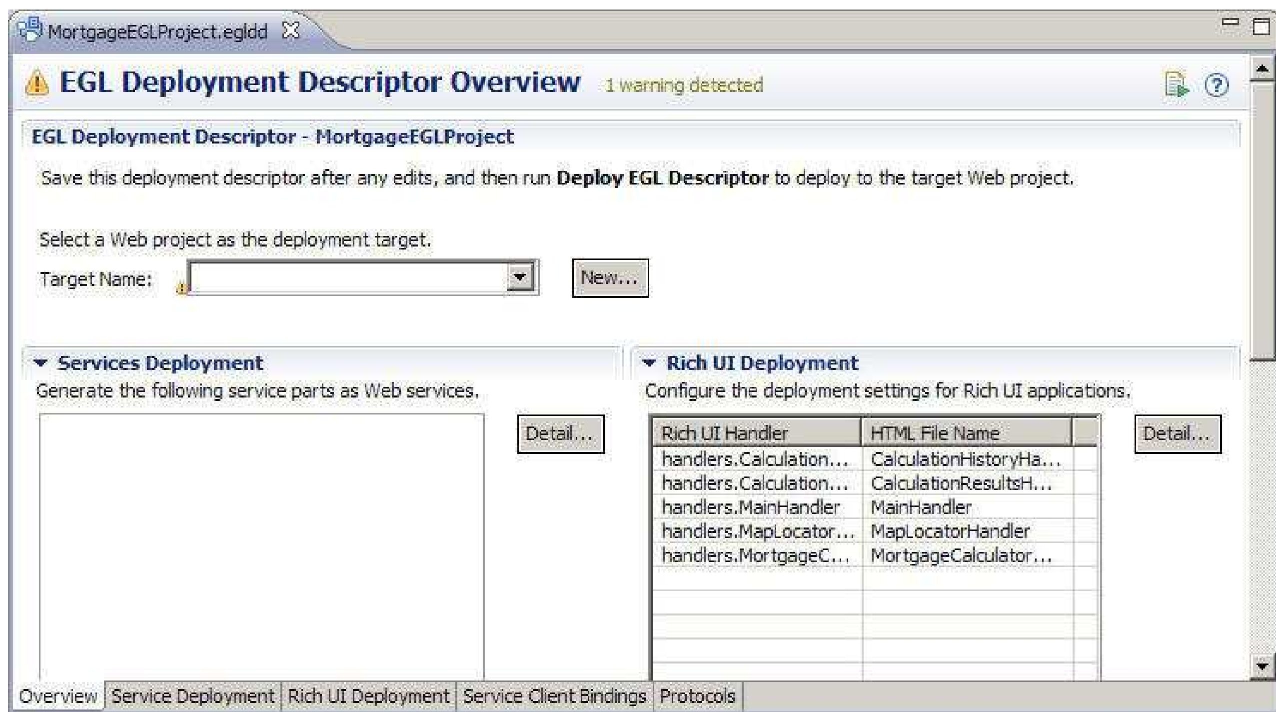
After you deploy the application, you can run it on the server rather than in Preview view.

Edit the deployment descriptor

EGL automatically creates a deployment descriptor file for each `EGLSource` folder. The deployment descriptor file manages the deployment process.

To edit the deployment descriptor:

1. In the `EGLSource` folder, double-click the `MortgageEGLProject.egldd` file. The EGL deployment descriptor opens in the editor. Because you created the various Handler parts with the wizard, EGL automatically added them to the list of Rich UI Handlers to deploy.
2. Because you are using a dedicated service, you do not need to add any information to the **Service Client Bindings** section. The list is empty.



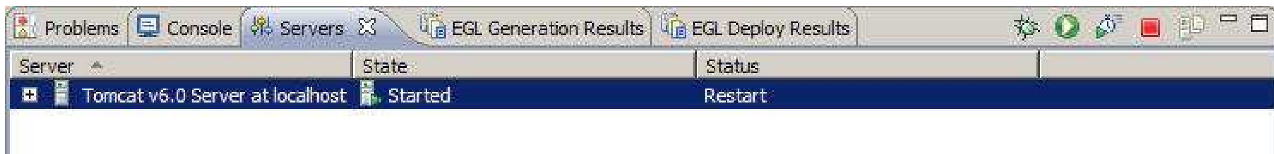
3. Next to the **Target Name** field, click **New**. The Dynamic Web Project wizard opens.

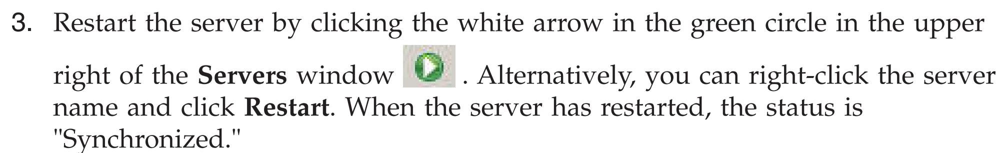
4. For the **Project Name**, enter the following name:
   ```
   MortgageWeb
   ```
   Any Web project is acceptable. You are creating a simple one for the purposes of the tutorial.
5. Click **Finish**. EGL redisplays the deployment descriptor and creates the Web project.
6. Save and close the deployment descriptor.

Deploy the Rich UI application

After you edit the deployment descriptor, the deployment process is automatic:

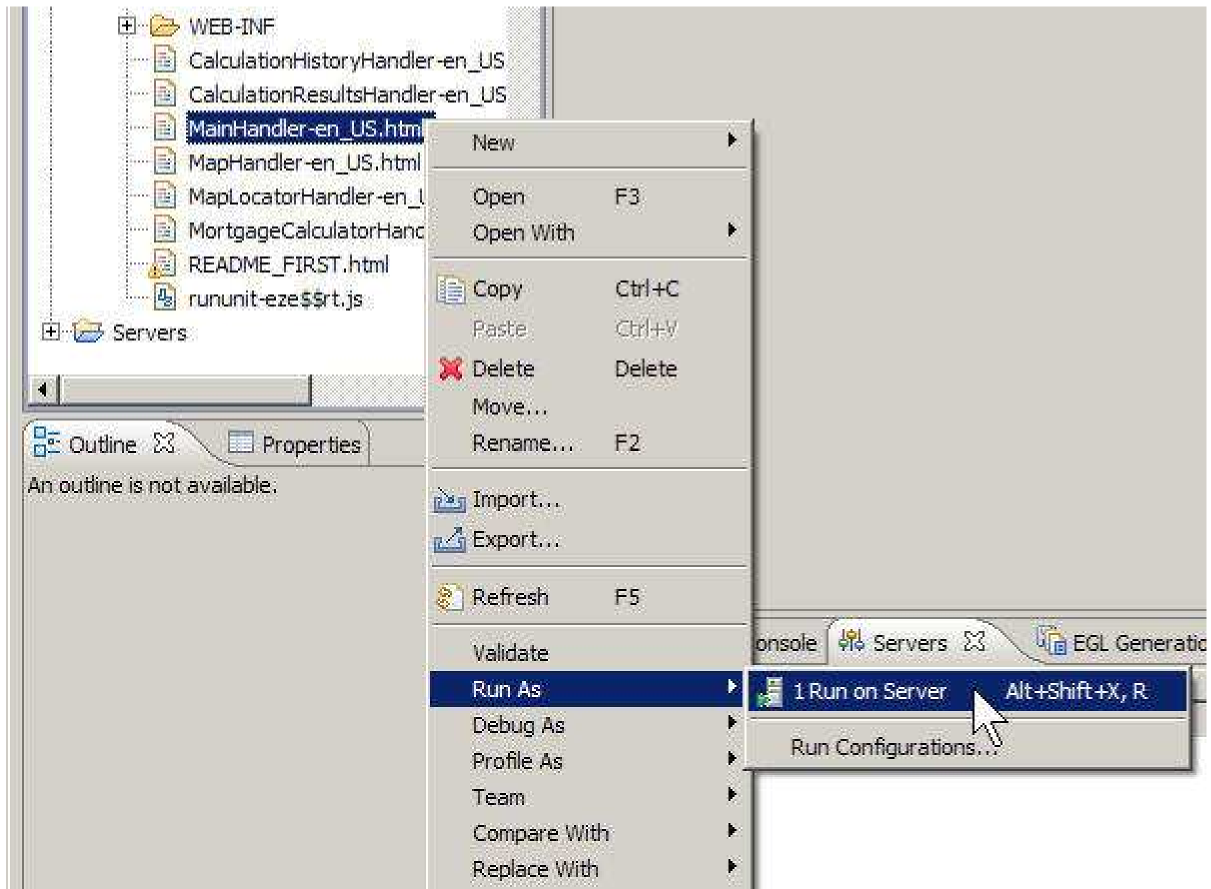
1. In the `EGLSource` folder, right-click the `MortgageEGLProject.egldd` file.
2. Click **Deploy EGL Descriptor**. The deployment process is automatic. At the end of the process, the Tomcat server might show a "Restart" status.



3. Restart the server by clicking the white arrow in the green circle in the upper right of the **Servers** window  . Alternatively, you can right-click the server name and click **Restart**. When the server has restarted, the status is "Synchronized."

Run the generated code

1. In the `MortgageWeb/WebContent` folder, find the generated HTML version of the MainHandler page. The name of the file is `MainHandler-en_US.html`.
2. Right-click the file name and click **Run As** → **Run on Server**



The Run On Server window opens.

3. In the Run On Server window, select the Tomcat 6.0 Server and click **Always use this server when running this project**. Click **Finish**.

Run On Server

Run On Server

Select which server to use

How do you want to select the server?

Choose an existing server

Manually define a new server

Select the server that you want to use:

type filter text

localhost

Tomcat v6.0 Server at localhost Started

Apache Tomcat v6.0 supports J2EE 1.2, 1.3, 1.4, and Java EE 5 Web modules.

Always use this server when running this project

< Back Next > Finish Cancel

4. If you see a page not found error (404), see if the server is showing a Restart status. If so, restart the server and refresh the page.
   The page opens.

5. Test the application by calculating mortgages that are based on different rates, amounts, and terms. Verify that clicking a row in the History portlet displays the appropriate information in the Results portlet. Change the zip code in the Map Portlet and make sure the links cause the map to update.

Lesson checkpoint

You learned how to complete the following tasks:
- Edit a deployment descriptor to deploy a Rich UI handler
- Run the application on the Web server

In the next lesson, which is optional, you use the EGL MVC framework to improve the user interface for the Calculator portlet.

Lesson 15: (Optional) Use validating forms in the Calculation portlet

Replace the simplified code in `MortgageCalculatorHandler.egl` with code that uses the EGL Model-View-Controller (MVC) framework.

You can use EGL Rich UI to define a form for gathering input from a user. Each field in the form can contain a label, a widget for displaying the value, and if necessary, a set of validation routines to verify the user input, You can use the ValidatingForm type to provide basic error checking and formatting tasks. Use a form that is based on this type to replace the **Amount**, **Rate**, and **Term** fields and labels in your original version of the Calculation portlet. Use a second form to replace the **Payment** field.

Edit the Calculation portlet

1. Open `MortgageCalculatorHandler.egl` in Source view.
2. In the ui Box declaration, change the value of the **columns** property to 1.
3. In the ui Box declaration, replace the following widgets with a new structure named `inputForm`:
   - amountLabel
   - amountField
   - rateLabel
   - rateField
   - termLabel
   - termCombo

   At this point, the ui Box declaration looks like the following line:
   ```
   ui Box{ columns = 1, children = [ inputForm, blankLabel, buttonBox, paymentLabel,
      paymentField, errorDisplay ], id = "form" };
   ```

   Be sure to keep the **id** property set to "form" so that the UI does not look crowded.
4. On the same line, remove the blankLabel variable. You will add it to the buttonBox widget later.
5. On the same line, replace the paymentLabel and paymentField variables with a new variable named `paymentForm`. The finished ui Box declaration looks like the following line:
   ```
   ui Box{ columns = 1, children = [ inputForm, buttonBox, paymentForm, errorDisplay ], id = "fo
   ```
6. Instead of setting default values individually, create a variable that is based on the MortgageCalculationResult record to hold the default values, and add it below the :
   ```
    inputRec MortgageCalculationResult{
     loanAmount = 180000,
     interestRate = 5.2,
   ```

```
 term = 30,
 monthlyPayment = 0,
 interest = 0
};
```

7. Create the inputForm variable and define the fields within it:

```
inputForm ValidatingForm{width=530, entries = [
 new FormField{displayName="Amount:", controller=amountController},
 new FormField{displayName="Rate:", controller=rateController},
 new FormField{displayName="Term:", controller=termController}
]};
```

The validating form is part of the MVC framework. You can specify functions for a validating form to screen the user input.

8. Create the controllers that you referred to in the inputForm declaration.
   a. Create the amountController variable:

   ```
   amountController Controller{@MVC{model = inputRec.loanAmount, view = amountField}};
   amountField TextField{};
   ```

   You create two associations here, as you did in the errorController widget "Lesson 5: Add code for the MortgageCalculatorHandler functions" on page 26. The storage area (the "model") for the amount is the loanAmount field in the inputRec record. The display area (the "view") is a TextField widget, just like you used in the original version of this portlet.

   b. Create the rateController variable:

   ```
   rateController Controller{
    formatters ::= formatRate, unformatters ::= unformatRate,
    @MVC{model = inputRec.interestRate, view = rateField}
   };
   rateField TextField{};
   ```

   This code is essentially the same as the code for the amountController variable, except that you also specify two functions:
   - `formatRate()`, which adds a percent sign before you display the rate
   - `unformatRate()`, which strips the percent sign before you store the rate in the record

   You will add these functions later in this lesson.

   c. Create the termController variable:

   ```
   termController Controller{
     retrieveModelHelper = getTermModel,
     retrieveViewHelper = getTermCombo,
     publishHelper = setTermCombo,
     commitHelper = setTermModel,
     @MVC{model = inputRec.term, view = termCombo}};

    const TERM_VALUES String[] = ["5","10","15","30"];
    termCombo Combo{ values = TERM_VALUES, selection = 4 };
   ```

   Again, you create an association with a model and a view, and you specify function calls for formatting. You will create the get and set functions later in this lesson.

9. Delete the declarations for the following variables:
   - amountLabel
   - amountField
   - rateLabel
   - rateField

- termLabel
- termCombo

Your code now looks like the following image:

```
*MortgageCalculatorHandler.egl
handler MortgageCalculatorHandler type RUIhandler {initialUI = [ ui ],onConstructionFunction = start, css

    mortService MortgageCalculationService{};
    ui Box{ columns = 1, children = [ inputForm, buttonBox, paymentForm, errorDisplay ], id = "form" };

    inputRec MortgageCalculationResult{
        loanAmount = 180000,
        interestRate = 5.2,
        term = 30,
        monthlyPayment = 0,
        interest = 0
    };

    inputForm ValidatingForm{width=530, entries = [
        new FormField{displayName="Amount:", controller=amountController},
        new FormField{displayName="Rate:", controller=rateController},
        new FormField{displayName="Term:", controller=termController}
    ]};

    amountController Controller{@MVC{model = inputRec.loanAmount, view = amountField}};
    amountField TextField{};
    rateController Controller{
        formatters ::= formatRate, unformatters ::= unformatRate,
        @MVC{model = inputRec.interestRate, view = rateField}
    };
    rateField TextField{};
    termController Controller{
        retrieveModelHelper = getTermModel,
        retrieveViewHelper = getTermCombo,
        publishHelper = setTermCombo,
        commitHelper = setTermModel,
        @MVC{model = inputRec.term, view = termCombo}};

    const TERM_VALUES String[] = ["5","10","15","30"];
    termCombo Combo{ values = TERM_VALUES,  selection = 4 };

    blankLabel TextLabel{};
```

10. Add the blankLabel widget to the **children** property of the buttonBox widget:

```
buttonBox Box{ padding=8,
children = [ blankLabel, calculationButton, processImage ] };
```

11. Remove the existing paymentLabel and paymentField declarations and replace them with the following code:

```
paymentField TextLabel{};
paymentController Controller{@MVC{model = inputRec.monthlyPayment, view = paymentField}};
paymentForm ValidatingForm{width=530, entries = [
  new FormField{displayName = "Payment:", controller = paymentController}
 ]
};
```

In the previous form, you used TextField widgets for the view. Here, you use a TextLabel widget because the field is used for output only; the user is not permitted to change this information.

12. Change the `start()` function to initially hide the payment form:

```
function start()
 hidePaymentForm();
end
```

13. After the functions that show and hide the process image, add functions to show and hide the payment form:

```
function showPaymentForm()
 paymentForm.visibility = "visible";
end

function hidePaymentForm()
 paymentForm.visibility = "hidden";
end
```

14. In the `calculateMortgage()` function, delete all the lines except the last one, the **call** statement. You do not need to create the inputRec record because it is now a global variable.
15. In the `calculateMortgage()` function, the **call** statement now becomes part of the following code for the function:

```
function calculateMortgage()
 if (inputForm.isValid())
  inputForm.commit();
  inputForm.publish();
  call mortService.amortize(inputRec) returning to displayResults
     onException handleException;
 else
  hideProcessImage();
 end
end
```

16. In the `displayResults()` function, replace the first line, which begins with "paymentField.text", with the following lines:

```
inputRec.monthlyPayment = retResult.monthlyPayment;
paymentForm.publish();
```

The paymentField widget is tied to the inputRec.monthlyPayment field through the paymentController MVC controller. After you change the inputRec field and publish the form, the field is automatically updated.

17. Also in the `displayResults()` function, add the following function call after the hideProcessImage() call:

```
showPaymentForm();
```

This function makes the form, and therefore the payment field, visible.

18. Before the final **end** statement in the handler, add the formatting functions.
    a. The `formatRate()` function adds a percent sign to the rate amount. The `formatRate()` function removes the percent sign.

    ```
    function formatRate(input string in) returns(string)
      return(input+ "%");
     end

     function unformatRate(input string in) returns(string)
      len int = strlib.characterLen(input);
      if (input[len:len] == "%")
       return(input[1:len-1]);
      end
      return(input);
     end
    ```

    b. The `setTermCombo()` function reads a number in STRING form and matches it to a value from the termCombo widget:

    ```
    function setTermCombo(value STRING in)
     // Set the term combo box to the index corresponding by the value of the selected term
     for (i int from 1 to TERM_VALUES.getSize() by 1)
      if(TERM_VALUES[i] == value)
       termCombo.selection = i;
    ```

```
      exit for;
     end
    end
   end
```

c. The `getTermCombo()` function returns the currently selected term in STRING form:

```
function getTermCombo() returns(STRING)
  // Return the selected index of the term combo box
  return (termCombo.selection);
 end
```

d. The `setTermModel()` function validates and stores the index of a term value:

```
function setTermModel(value string in)
 // value represents the index in the combo
 if(value >= 1 && value <= TERM_VALUES.getSize())
  inputRec.term = TERM_VALUES[value as int];
 end
end
```

e. The `getTermModel()` function returns the current value of the term in STRING form:

```
function getTermModel() returns(STRING)
 // returns the term value
 return(TERM_VALUES[termCombo.selection]);
end
```

19. Organize your imports and save the file. If you see errors in your source file, compare your code to the file contents in “Finished code for MortgageCalculatorHandler.egl after Lesson 15” on page 76.

Test the portlet

1. Click the **Source** tab at the bottom of the editor pane. The interface is displayed with the default values.

2. Click **Calculate**. The payment form is displayed.

Amount: $180,000.00

Rate: 5.2%

Term: 30

Calculate

Payment: $988.40

3. Change any of the input fields and recalculate. You can see a number of differences from the previous version of the portlet:
   - The amount is formatted with the appropriate currency symbol, separator, and decimal. This happens automatically because MVC associates the field with the `loanAmount` field of the `inputRec` record, and you declared `loanAmount` as a MONEY type.
   - The rate is formatted with a percent sign. This happens in the `formatRate()` function.
   - You can use a currency symbol, percent sign, separator, or decimal in your input. These characters would have caused an error in the previous version.
   - The payment form is not visible until you perform a calculation.
   - The payment field is formatted as currency because it is associated with a MONEY type field in the `inputRec` record.
   - You cannot overwrite the payment amount.
4. Close the file.

Test the portal in Preview view

1. In the `EGLSource/handlers` directory, open the `MainHandler.egl` file and click the **Preview** tab. The new Calculate portlet is displayed.
2. Click **Calculate**.
3. Change any of the values and click **Calculate** again. The Results and History portlets function just as they did before.
4. Close the file.

Redeploy and test

Because you changed one of the deployed files, you must redeploy the project.

1. In the `EGLSource` directory, right-click the EGL deployment descriptor file, `MortgageEGLProject.egldd`, and then click **Deploy EGL Descriptor**. The deployment process is automatic.
2. In the `MortgageWeb/WebContent` directory, right-click the `MainHandler-en_US.html` file and click **Run As → Run on Server**. As before, you might need to restart the server and refresh the page.
3. Verify that the new version of the portlet is displayed, and that everything functions correctly.

Lesson checkpoint

You learned how to complete the following tasks:
- Use the EGL MVC framework to improve the Calculator interface
- Redeploy the application to reflect program changes

You have completed the tutorial.

Summary

You have completed the *Create a mortgage portal with EGL Rich UI* tutorial.

In addition to explaining the basic steps required to create a portal page, this tutorial provided opportunities to practice the following skills:
- Designing your work on paper before coding
- Creating and deploying a service
- Creating a Rich UI Web page by writing source code in the EGL editor
- Using a service and a widget from an external provider

Lessons learned

You completed the following tasks:
- Plan the application and design the interface
- Import a custom widget to manage portlets
- Write a service to calculate mortgage payments
- Create a portlet to request input for the calculation service and display the results
- Create a pie chart to compare total principal to total interest
- Pass data between portlets by using the InfoBus widget
- Create a table that lists all calculations
- Create a portlet to find mortgage businesses
- Create a Rich UI portal page to contain the individual portlets
- Install and configure the Apache Tomcat Web server
- Deploy the Web page to the server and test the application
- Replace the Calculation portlet with a version that uses validating forms

Additional resources

EGL Rich UI follows the Visual Formatting Model of the World Wide Web Consortium (W3C). For more information, see the W3C site at http://www.w3.org/TR/CSS2/visuren.html.

Finished code for MortgageCalculationService.egl after Lesson 3

The following code is the complete text of the `MortgageCalculationService.egl` file at the end of Lesson 3. The code includes tabs, comments, and blank lines. If you see errors in your source file, compare your code with this version.

```
package services;

service MortgageCalculationService
```

```
 function amortize(inputData MortgageCalculationResult inOut)
  amt MONEY = inputData.loanAmount;
  // convert to monthly rate
  rate DECIMAL(10, 8) = (1 + inputData.interestRate / 1200);
  // convert to months
  term INT = (inputData.term * 12);

  // calculate monthly payment amount
  pmt MONEY = (amt * (rate - 1) * Mathlib.pow(rate, term)) /
    (MathLib.pow(rate, term) - 1);
  totalInterest MONEY = (pmt * term) - amt;

  // update result record
  inputData.monthlyPayment = pmt;
  inputData.interest = totalInterest;
 end
end

record MortgageCalculationResult
 // user input
 loanAmount MONEY;
 interestRate DECIMAL(10,8);
 term INT;

 // calculated fields
 monthlyPayment MONEY;
 interest MONEY;
end
```

Related tasks

"Lesson 3: Create the mortgage calculation Service" on page 11
Create a dedicated service to calculate monthly payments.

Finished code for MortgageCalculatorHandler.egl after Lesson 4

The following code is the complete text of the MortgageCalculatorHandler.egl file after Lesson 4. The code includes tabs, comments, and blank lines. This code was created by the EGL visual editor. If you see errors in your source file, compare your code with this version.

```
package handlers;

// RUI Handler

import com.ibm.egl.rui.widgets.Box;
import com.ibm.egl.rui.widgets.TextLabel;
import com.ibm.egl.rui.widgets.TextField;
import com.ibm.egl.rui.widgets.Combo;
import dojo.widgets.DojoButton;
import com.ibm.egl.rui.widgets.Image;
import com.ibm.egl.rui.widgets.HTML;

//
//
handler MortgageCalculatorHandler type RUIhandler {initialUI = [ ui ],onConstructionFunction = start

 ui Box{ columns = 2, width = "400", height = "400", children = [ amountLabel, amountField, rateLabel
 id = "form" };
 amountLabel TextLabel{ text = "Amount:" };
 amountField TextField{
  text = "180000"
 };
 rateLabel TextLabel{ text = "Rate:" };
 rateField TextField{
  text = "5.2"
 };
```

```
 termLabel TextLabel{ text = "Term:" };
 termCombo Combo{ values = ["5","10","15","30"],
 selection = 4 };
 blankLabel TextLabel{};
 buttonBox Box{ padding=8,
 children = [ calculationButton, processImage ] };
 calculationButton DojoButton{ text = "Calculate", onClick ::= calculate };
 processImage Image{
  src = "icons/progress3.gif",
  visibility = "hidden"
 };
 paymentLabel TextLabel{ text = "Payment:" };
 paymentField TextField{};
 errorDisplay HTML{
  color = "Red"
 };

 function start()
 end

 function calculate(event Event in)

 end
end
```

Related tasks

"Lesson 4: Create the user interface for the calculator" on page 15
Each portlet on the finished page is controlled by an EGL Rich UI Handler part.

Finished code for MortgageCalculatorHandler.egl after Lesson 5

The following code is the complete text of the `MortgageCalculatorHandler.egl` file after Lesson 5. The code includes tabs, comments, and blank lines. If you see errors in your source file, compare your code with this version.

```
package handlers;

import com.ibm.egl.rui.mvc.Controller;
import com.ibm.egl.rui.mvc.MVC;
import com.ibm.egl.rui.widgets.Box;
import com.ibm.egl.rui.widgets.Combo;
import com.ibm.egl.rui.widgets.HTML;
import com.ibm.egl.rui.widgets.Image;
import com.ibm.egl.rui.widgets.TextField;
import com.ibm.egl.rui.widgets.TextLabel;
import egl.ui.rui.Event;
import dojo.widgets.DojoButton;
import services.MortgageCalculationResult;
import services.MortgageCalculationService;

handler MortgageCalculatorHandler type RUIhandler {initialUI = [ ui ],onConstructionFunction = sta

 mortService MortgageCalculationService{};
 ui Box{ columns = 2, children = [ amountLabel, amountField, rateLabel, rateField, termLabel, term
 amountLabel TextLabel{ text = "Amount:" };
 amountField TextField{
  text = "180000"
 };
 rateLabel TextLabel{ text = "Rate:" };
 rateField TextField{
  text = "5.2"
 };
 termLabel TextLabel{ text = "Term:" };
 termCombo Combo{ values = ["5","10","15","30"],
 selection = 4 };
 blankLabel TextLabel{};
```

```
 buttonBox Box{ padding=8,
 children = [ calculationButton, processImage ] };
 calculationButton DojoButton{ text = "Calculate", onClick ::= calculate };
 processImage Image{
  src = "icons/progress3.gif",
  visibility = "hidden"
 };
 paymentLabel TextLabel{ text = "Payment:",
 class = "spacer" };
 paymentField TextField{};
 // use for error messages
 error STRING = "";
 errorDisplay HTML{ color = "Red" };
 // associate MVC with errorDisplay widget
 errorController Controller{@MVC{model = error, view = errorDisplay}};

 function start()
 end

 function calculate(event Event in)
  showProcessImage();
  calculateMortgage();
 end

 function showProcessImage()
  processImage.visibility = "visible";
 end

 function hideProcessImage()
  processImage.visibility = "hidden";
 end

 function calculateMortgage()
  // new copy of the input record
  inputRec MortgageCalculationResult{};
  // load with values from the ui
  inputRec.loanAmount = amountField.text as MONEY;
  inputRec.interestRate = rateField.text as DECIMAL(10,8);
  inputRec.term = termCombo.values[termCombo.selection] as INT;
  call mortService.amortize(inputRec) returning to displayResults
    onException handleException;
 end

 function displayResults(retResult MortgageCalculationResult in)
  paymentField.text = "$" + retResult.monthlyPayment as STRING;
  hideProcessImage();
 end

 private function setError(err STRING in)
  error = err;
  errorController.publish();
 end

 // catch-all exception handler
 private function handleException(ae AnyException in)
  setError("Error calling service: " :: ae.message);
 end
end
```

Related tasks

"Lesson 5: Add code for the MortgageCalculatorHandler functions" on page 26
Add functions in the MortgageCalculatorHandler part to support the user interface that you constructed in the previous lesson.

Finished code for CalculationResultsHandler.egl after Lesson 6

The following code is the complete text of the `CalculationResultsHandler.egl` file after Lesson 6. The code includes tabs, comments, and blank lines. If you see errors in your source file, compare your code with this version.

```
package handlers;

import com.ibm.egl.rui.infobus.InfoBus;
import com.ibm.egl.rui.widgets.Box;
import egl.ui.color;
import dojo.widgets.DojoPieChart;
import dojo.widgets.PieChartData;
import services.MortgageCalculationResult;

handler CalculationResultsHandler type RUIhandler {initialUI = [ ui ],onConstructionFunction = sta

 ui Box{ columns = 2, width = "400", height = "300", children = [ interestPieChart ] };
 interestPieChart DojoPieChart{
   radius = 100,
  width = "300",
  height = "300",
  labelOffSet = 50,
  fontColor = "white",
  data = [
   new PieChartData{y=1, text="Principal", color="#99ccbb"},
   new PieChartData{y=0, text="Interest",  color="#888855"}
 ]};

 function start()
  InfoBus.subscribe("mortgageApplication.mortgageCalculated", displayChart);
 end

 function displayChart(eventName STRING in, dataObject ANY in)
  localPieData PieChartData[];
  localPieData = interestPieChart.data;
  resultRecord MortgageCalculationResult = dataObject as MortgageCalculationResult;

  localPieData[1].y = resultRecord.loanAmount;
  localPieData[2].y = resultRecord.interest;
  interestPieChart.data = localPieData;
 end
end
```

Related tasks

"Lesson 6: Create the CalculationResultsHandler widget" on page 30
Add a second portlet on the page to hold a pie chart that shows the relative proportions of principal and interest.

Finished code for MainHandler.egl after Lesson 7

The following code is the complete text of the `MainHandler.egl` file after Lesson 7. The code includes tabs, comments, and blank lines. If you see errors in your source file, compare your code with this version.

```
package handlers;

import com.ibm.egl.rui.infobus.InfoBus;
import com.ibm.egl.rui.widgets.Box;
import com.ibm.egl.rui.widgets.portal.Portal;
import com.ibm.egl.rui.widgets.portal.Portlet;
import egl.ui.columns;

handler MainHandler type RUIhandler {initialUI = [ ui ],onConstructionFunction = start, cssFile="c

 ui Box{ columns = 2, children = [ mortgagePortal ] };
```

```
 mortgagePortal Portal { columns = 2, columnWidths = [ 300, 650 ] };

 calculatorHandler MortgageCalculatorHandler{};
 resultsHandler CalculationResultsHandler{};

 calculatorPortlet Portlet{children = [calculatorHandler.ui], title = "Calculator"};
 resultsPortlet Portlet{children = [resultsHandler.ui],
   title = "Results", canMove = TRUE, canMinimize = TRUE};

 function start()
  mortgagePortal.addPortlet(calculatorPortlet, 1);
  mortgagePortal.addPortlet(resultsPortlet, 1);

  // Subscribe to calculation events
  InfoBus.subscribe("mortgageApplication.mortgageCalculated", restorePortlets);

  // Initial state is minimized
  resultsPortlet.minimize();
 end

 function restorePortlets(eventName STRING in, dataObject ANY in)
  if(resultsPortlet.isMinimized())
   resultsPortlet.restore();
  end
 end
end
```

Related tasks

"Lesson 7: Create the main portal" on page 33
The main page uses the EGL portlet widgets to manage communication between the parts of the application.

Finished code for CalculationHistoryHandler.egl after Lesson 8

The following code is the complete text of the `CalculationHistoryHandler.egl` file after Lesson 8. The code includes tabs, comments, and blank lines. If you see errors in your source file, compare your code with this version.

```
package handlers;

import com.ibm.egl.rui.infobus.InfoBus;
import com.ibm.egl.rui.widgets.Box;
import egl.ui.columns;
import egl.ui.displayname;
import egl.ui.rui.Event;
import egl.ui.rui.Widget;
import dojo.widgets.DojoGrid;
import dojo.widgets.DojoGridColumn;
import services.MortgageCalculationResult;

handler CalculationHistoryHandler type RUIhandler {initialUI = [ ui ],onConstructionFunction = start

 ui Box{ columns = 2, children = [ historyGrid ] };
 historyGrid DojoGrid { behaviors = [ addSelectionListener ],
  headerBehaviors = [ ],
  columns = [
   new DojoGridColumn { displayName = "Principal", name = "loanAmount", width = 60 },
   new DojoGridColumn { displayName = "Rate", name = "interestRate", width = 60 },
   new DojoGridColumn { displayName = "Years", name = "term", width = 60 },
   new DojoGridColumn { displayName = "Payment", name = "monthlyPayment", width = 60 } ] };

 // array to store calculation results
 historyResults MortgageCalculationResult[0];

 function start()
  // Subscribe to calculation events so history table (grid) can be updated
```

```
  InfoBus.subscribe("mortgageApplication.mortgageCalculated", addResultRecord);
 end

 // Update grid to show latest mortgage calculation
 function addResultRecord(eventName STRING in, dataObject ANY in)
  resultRecord MortgageCalculationResult = dataObject as MortgageCalculationResult;
  historyResults.appendElement(resultRecord);

  historyGrid.data = historyResults as ANY[];
 end

 // Adds a listener to each cell
 function addSelectionListener(grid DojoGrid in, cell Widget in,
   row ANY in, rowNumber INT in, column DojoGridColumn in)
  cell.setAttribute("row", rowNumber);
  cell.onClick ::= cellClicked;
 end

 // Publish event to InfoBus when previous calculation is selected
 function cellClicked(e Event in)
  try
   row int = e.widget.getAttribute("row") as INT;
   InfoBus.publish("mortgageApplication.mortgageResultSelected", historyResults[row]);
  onException(ex AnyException)
  end
 end
end
```

Related tasks

"Lesson 8: Add a calculation history portlet" on page 35
Create a table where you can click a row to display a previous calculation.

Finished code for MainHandler.egl after Lesson 9

The following code is the complete text of the `MainHandler.egl` file at the end of Lesson 9. The code includes tabs, comments, and blank lines. If you see errors in your source file, compare your code with this version.

```
package handlers;

import com.ibm.egl.rui.infobus.InfoBus;
import com.ibm.egl.rui.widgets.Box;
import com.ibm.egl.rui.widgets.portal.Portal;
import com.ibm.egl.rui.widgets.portal.Portlet;
import egl.ui.columns;

handler MainHandler type RUIhandler {initialUI = [ ui ],onConstructionFunction = start, cssFile="c

 ui Box{ columns = 2, children = [ mortgagePortal ] };
 mortgagePortal Portal { columns = 2, columnWidths = [ 300, 650 ] };

 calculatorHandler MortgageCalculatorHandler{};
 resultsHandler CalculationResultsHandler{};
 historyHandler CalculationHistoryHandler{};

 calculatorPortlet Portlet{children = [calculatorHandler.ui], title = "Calculator"};
 resultsPortlet Portlet{children = [resultsHandler.ui],
   title = "Results", canMove = TRUE, canMinimize = TRUE};
 historyPortlet Portlet{children = [historyHandler.ui],
   title = "History", canMove = TRUE, canMinimize = TRUE};

 function start()
  mortgagePortal.addPortlet(calculatorPortlet, 1);
  mortgagePortal.addPortlet(resultsPortlet, 1);
  mortgagePortal.addPortlet(historyPortlet, 1);
```

```
  // Subscribe to calculation events
  InfoBus.subscribe("mortgageApplication.mortgageCalculated", restorePortlets);

  // Initial state is minimized
  resultsPortlet.minimize();
  historyPortlet.minimize();
 end

 function restorePortlets(eventName STRING in, dataObject any in)
  if(resultsPortlet.isMinimized())
   resultsPortlet.restore();
  end
  if(historyPortlet.isMinimized())
   historyPortlet.restore();
  end
 end
end
```

Related tasks

"Lesson 9: Add the calculation history portlet to the main portal" on page 37
To add the new portlet to your page, you must change the Results portlet and the main portal.

Finished code for IYahooLocalService.egl after Lesson 10

The following code is the complete text of the `IYahooLocalService.egl` file at the end of Lesson 10. The code includes tabs, comments, and blank lines. If you see errors in your source file, compare your code with this version.

```
package interfaces;

interface YahooLocalService
 function getSearchResults(appId string in, zipCode string in) returns(ResultSet){@GetRest{uriTempla
end

record ResultSet{@XMLRootElement{name = "ResultSet", namespace = "urn:yahoo:lcl"}}
 totalResultsAvailable STRING{@xmlelement { namespace = "urn:yahoo:lcl"}};
 results Result[]{@XMLElement{name = "Result", namespace = "urn:yahoo:lcl"}};
end

record Result
 Title STRING{@xmlElement{namespace = "urn:yahoo:lcl"}};
 Address STRING{@xmlElement{namespace = "urn:yahoo:lcl"}};
 City STRING{@xmlElement{namespace = "urn:yahoo:lcl"}};
 State STRING{@xmlElement{namespace = "urn:yahoo:lcl"}};
 Latitude STRING{@xmlElement{namespace = "urn:yahoo:lcl"}};
 Longitude STRING{@xmlElement{namespace = "urn:yahoo:lcl"}};
 rating Rating{@xmlElement{namespace = "urn:yahoo:lcl"}};
end

record Rating
 AverageRating STRING{@xmlElement{namespace = "urn:yahoo:lcl"}};
end
```

Related tasks

"Lesson 10: Create the UI for the Map portlet" on page 42
Create a portlet where you can enter a zip code and see a list of nearby mortgage companies and a map. Click the name of a company, and the map displays the location of the company.

Finished code for MapLocatorHandler.egl after Lesson 10

The following code is the complete text of the `MapLocatorHandler.egl` file at the end of Lesson 10. The code includes tabs, comments, and blank lines. For the most part, this code was created by the EGL visual editor. If you see errors in your source file, compare your code with this version.

```
package handlers;

// RUI Handler

import com.ibm.egl.rui.widgets.Box;
import com.ibm.egl.rui.widgets.TextLabel;
import com.ibm.egl.rui.widgets.TextField;
import dojo.widgets.DojoButton;

//
//
handler MapLocatorHandler type RUIhandler {initialUI = [ ui ],onConstructionFunction = start, cssF

 ui Box{ columns = 1, width = "400", height = "400", children = [ introLabel, formBox, mapBox ],
 id = "form" };
 introLabel TextLabel{ text = "Search for local mortgage businesses" };
 formBox Box{ padding=8,
 columns = 3,
 children = [ zipLabel, zipField, zipButton ] };
 zipLabel TextLabel{ text = "Zip code:" };
 zipField TextField{
  text = "10001", onKeyDown ::= checkForEnter
 };
 zipButton DojoButton{ text = "Search", onClick ::= buttonClicked };
 mapBox Box{ padding=8,
 children = [ listingBox ] };
 listingBox Box{ padding=8,
 columns = 1,
 width = "120" };

 function start()
 end

 function checkForEnter(event Event in)

 end

 function buttonClicked(event Event in)

 end
end
```

Related tasks

"Lesson 10: Create the UI for the Map portlet" on page 42
Create a portlet where you can enter a zip code and see a list of nearby mortgage companies and a map. Click the name of a company, and the map displays the location of the company.

Finished code for MapLocatorHandler.egl after Lesson 11

The following code is the complete text of the `MapLocatorHandler.egl` file at the end of Lesson 11. The code includes tabs, comments, and blank lines. If you see errors in your source file, compare your code with this version.

```
package handlers;

import com.ibm.egl.rui.widgets.Box;
import com.ibm.egl.rui.widgets.HyperLink;
```

```
import com.ibm.egl.rui.widgets.Image;
import com.ibm.egl.rui.widgets.TextField;
import com.ibm.egl.rui.widgets.TextLabel;
import com.ibm.egl.rui.widgets.dialog.DialogLibrary;
import egl.core.restbinding;
import egl.ui.rui.Event;
import dojo.widgets.DojoButton;
import interfaces.ResultSet;
import interfaces.YahooLocalService;
import widgets.GoogleMap;

handler MapLocatorHandler type RUIhandler {initialUI = [ ui ],onConstructionFunction = start, cssFile

 const YAHOO_APP_ID STRING = "app_id";
 lookupService YahooLocalService{@restbinding};

 ui Box{ columns = 1, width = "400", height = "450", children = [ introLabel, formBox, mapBox ],
 id = "form" };
 introLabel TextLabel{ text = "Search for local mortgage businesses" };
 formBox Box{ padding=8,
 children = [ zipLabel, zipField, zipButton ],
 columns = 3 };
 zipLabel TextLabel{ text = "Zip code:" };
 zipField TextField{
  text = "10001", onKeyDown ::= checkForEnter
 };
 zipButton DojoButton{ text = "Search", onClick ::= buttonClicked };
 mapBox Box{ padding=8,
 children = [ listingBox, localMap ] };
 listingBox Box{ padding=8,
 columns = 1,
 width = "120" };
 localMap GoogleMap { width = 500, height = 350 };

 function start()
  search(); // show search results
 end

 function checkForEnter(event Event in)
  if(event.ch == 13)
   search();
   end
 end

 function buttonClicked(event Event in)
  search();
 end

 function search()
  listingBox.setChildren([new Image{src = "icons/progress3.gif"}]);
  localMap.showAddress(zipField.text, "");  // default map (no address)
  // Call remote Yahoo Service and pass zip code
  call lookupService.getSearchResults(YAHOO_APP_ID, zipField.text)
   returning to showResults onException displayError;
 end

 function displayError(ex AnyException in)
  DialogLibrary.showError("Yahoo Service", "Cannot invoke Yahoo Local Service: " + ex.message, null)
 end

 function showResults(retResult ResultSet in)
  linkListing HyperLink[0];
  for(i INT from 1 to retResult.results.getSize() by 1)
   newLink HyperLink{text = retResult.results[i].title, href = "#"};
   newLink.setAttribute("address", retResult.results[i].Address + ", "
     + retResult.results[i].city + ", "
     + retResult.results [i].state);
```

```
      newLink.setAttribute("title", retResult.results[i].Title);
      newLink.onClick ::= mapAddress;
      linkListing.appendElement(newLink);
    end
    listingBox.setChildren(linkListing);
  end

  function mapAddress(e Event in)
    // Show the address on the map when the link is clicked
    businessAddress STRING = e.widget.getAttribute("address") as STRING;
    businessName STRING = e.widget.getAttribute("title") as STRING;
    localMap.showAddress(businessAddress, "<b>" + businessName + "</b>");
    end
end
```

Related tasks

"Lesson 11: Create the source code for the Map portlet" on page 48
Connect the service and the external widget to the user interface you created in the previous lesson.

Finished code for MainHandler.egl after Lesson 12

The following code is the complete text of the `MainHandler.egl` file at the end of Lesson 12. The code includes tabs, comments, and blank lines. If you see errors in your source file, compare your code with this version.

```
package handlers;

import com.ibm.egl.rui.infobus.InfoBus;
import com.ibm.egl.rui.widgets.Box;
import com.ibm.egl.rui.widgets.portal.Portal;
import com.ibm.egl.rui.widgets.portal.Portlet;
import egl.ui.columns;

handler MainHandler type RUIhandler {initialUI = [ui],onConstructionFunction = start, cssFile="css

 ui Box{ columns = 1, children = [mortgagePortal]};
 mortgagePortal Portal {columns = 2, columnWidths = [300, 650]};

 calculatorHandler MortgageCalculatorHandler{};
 resultsHandler CalculationResultsHandler{};
 historyHandler CalculationHistoryHandler{};
 mapHandler MapLocatorHandler{};

 calculatorPortlet Portlet{children = [calculatorHandler.ui], title = "Calculator"};
 resultsPortlet Portlet{children = [resultsHandler.ui],
   title = "Results", canMove = TRUE, canMinimize = TRUE};
 historyPortlet Portlet{children = [historyHandler.ui],
   title = "History", canMove = TRUE, canMinimize = TRUE};
 mapPortlet Portlet{children = [mapHandler.ui],
   title = "Map", canMove = false, canMinimize = true };

 function start()
  mortgagePortal.addPortlet(calculatorPortlet, 1);
  mortgagePortal.addPortlet(resultsPortlet, 1);
  mortgagePortal.addPortlet(historyPortlet, 1);
  mortgagePortal.addPortlet(mapPortlet, 2);

  // Subscribe to calculation events
  InfoBus.subscribe("mortgageApplication.mortgageCalculated", restorePortlets);

  // Initial state is minimized
  resultsPortlet.minimize();
  historyPortlet.minimize();
 end
```

```
 function restorePortlets(eventName STRING in, dataObject any in)
  if(resultsPortlet.isMinimized())
   resultsPortlet.restore();
  end
  if(historyPortlet.isMinimized())
   historyPortlet.restore();
  end
 end
end
```

Related tasks

"Lesson 12: Add the Map portlet to the main portal" on page 51
To add the new portlet to your page, you must change the main portal.

Finished code for MortgageCalculatorHandler.egl after Lesson 15

The following code is the complete text of the `MortgageCalculatorHandler.egl` file after Lesson 15. The code includes tabs, comments, and blank lines. If you see errors in your source file, compare your code with this version.

```
package handlers;

import com.ibm.egl.rui.infobus.InfoBus;
import com.ibm.egl.rui.mvc.Controller;
import com.ibm.egl.rui.mvc.FormField;
import com.ibm.egl.rui.mvc.MVC;
import com.ibm.egl.rui.mvc.ValidatingForm;
import com.ibm.egl.rui.widgets.Box;
import com.ibm.egl.rui.widgets.Combo;
import com.ibm.egl.rui.widgets.HTML;
import com.ibm.egl.rui.widgets.Image;
import com.ibm.egl.rui.widgets.TextField;
import com.ibm.egl.rui.widgets.TextLabel;
import egl.ui.displayname;
import egl.ui.rui.Event;
import dojo.widgets.DojoButton;
import services.MortgageCalculationResult;
import services.MortgageCalculationService;

handler MortgageCalculatorHandler type RUIhandler {initialUI = [ ui ],onConstructionFunction = start

 mortService MortgageCalculationService{};
 ui Box{ columns = 1, children = [ inputForm, buttonBox, paymentForm, errorDisplay ], id = "form" };

 inputRec MortgageCalculationResult{
  loanAmount = 180000,
  interestRate = 5.2,
  term = 30,
  monthlyPayment = 0,
  interest = 0
 };

 inputForm ValidatingForm{width=530, entries = [
  new FormField{displayName="Amount:", controller=amountController},
  new FormField{displayName="Rate:", controller=rateController},
  new FormField{displayName="Term:", controller=termController}
 ]};

 amountController Controller{@MVC{model = inputRec.loanAmount, view = amountField}};
 amountField TextField{};
 rateController Controller{
  formatters ::= formatRate, unformatters ::= unformatRate,
  @MVC{model = inputRec.interestRate, view = rateField}
 };
 rateField TextField{};
 termController Controller{
```

```
 retrieveModelHelper = getTermModel,
 retrieveViewHelper = getTermCombo,
 publishHelper = setTermCombo,
 commitHelper = setTermModel,
 @MVC{model = inputRec.term, view = termCombo}};

const TERM_VALUES String[] = ["5","10","15","30"];
termCombo Combo{ values = TERM_VALUES, selection = 4 };

blankLabel TextLabel{};
buttonBox Box{ padding=8,
children = [ blankLabel, calculationButton, processImage ] };
calculationButton DojoButton{ text = "Calculate", onClick ::= calculate };
processImage Image{
 src = "icons/progress3.gif",
 visibility = "hidden"
};
paymentField TextLabel{};
paymentController Controller{@MVC{model = inputRec.monthlyPayment, view = paymentField}};
paymentForm ValidatingForm{width=530, entries = [
  new FormField{displayName = "Payment:", controller = paymentController}
 ]
};

// use for error messages
error STRING = "";
errorDisplay HTML{
 color = "Red"
};
// associate MVC with errorDisplay widget
errorController Controller{@MVC{model = error, view = errorDisplay}};

function start()
 hidePaymentForm();
end

function calculate(e Event in)
 showProcessImage();
 calculateMortgage();
end

function showProcessImage()
 processImage.visibility = "visible";
end

function hideProcessImage()
 processImage.visibility = "hidden";
end

function showPaymentForm()
 paymentForm.visibility = "visible";
end

function hidePaymentForm()
 paymentForm.visibility = "hidden";
end

function calculateMortgage()
 if (inputForm.isValid())
  inputForm.commit();
  inputForm.publish();
  call mortService.amortize(inputRec) returning to displayResults
     onException handleException;
 else
  hideProcessImage();
 end
end
```

```
 function displayResults(retResult MortgageCalculationResult in)
  inputRec.monthlyPayment = retResult.monthlyPayment;
  paymentForm.publish();
  hideProcessImage();
  showPaymentForm();
  InfoBus.publish("mortgageApplication.mortgageCalculated", retResult);
 end

 private function setError(err STRING in)
  error = err;
  errorController.publish();
 end

 // catch-all exception handler
 private function handleException(ae AnyException in)
  setError("Error calling service: " :: ae.message);
 end

 function formatRate(input string in) returns(string)
  return(input+ "%");
 end

 function unformatRate(input string in) returns(string)
  len int = strlib.characterLen(input);
  if (input[len:len] == "%")
   return(input[1:len-1]);
  end
  return(input);
 end

 function setTermCombo(value STRING in)
  // Set the term combo box to the index corresponding by the value of the selected term
  for (i int from 1 to TERM_VALUES.getSize() by 1)
   if(TERM_VALUES[i] == value)
    termCombo.selection = i;
    exit for;
   end
  end
 end

 function getTermCombo() returns(STRING)
  // Return the selected index of the term combo box
  return (termCombo.selection);
 end

 function setTermModel(value string in)
  // value represents the index in the combo
  if(value >= 1 && value <= TERM_VALUES.getSize())
   inputRec.term = TERM_VALUES[value as int];
  end
 end

 function getTermModel() returns(STRING)
  // returns the term value
  return(TERM_VALUES[termCombo.selection]);
 end
end
```

Related tasks

"Lesson 15: (Optional) Use validating forms in the Calculation portlet" on page 59
Replace the simplified code in `MortgageCalculatorHandler.egl` with code that uses the EGL Model-View-Controller (MVC) framework.

Notices

© Copyright IBM Corporation 2000, 2010.

U.S. Government Users Restricted Rights - Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.

For license inquiries regarding double-byte (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

Intellectual Property Licensing
Legal and Intellectual Property Law
IBM Japan, Ltd.
1623-14, Shimotsuruma, Yamato-shi
Kanagawa 242-8502 Japan

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law: INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web

sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

Intellectual Property Dept. for Rational Software
3600 Steeles Avenue East
Markham, ON
Canada L3R 9Z7

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this document and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement or any equivalent agreement between us.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

If you are viewing this information in softcopy, the photographs and color illustrations may not appear.

Trademark acknowledgments

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies.

A current list of IBM trademarks is available on the Web at www.ibm.com/legal/copytrade.shtml.

Index

A

Apache Tomcat
  installing 52
applications
  running from generated code 56

C

calculate() 27
calculateMortgage() 28
CalculationHistoryHandler
  overview 36
CalculationHistoryHandler.egl
  source code 70
CalculationResultsHandler.egl
  source code 69

D

deployment descriptor, EGL
  editing 55
displayResults() 28
Dojo Widget library
  overview 5

E

expenseGrid
  overview 30

G

generatable parts
  overview 11
generated code
  running 56

H

Handler, EGL Rich UI
  definition 5
hideProcessImage() 28

I

IYahooLocalService.egl
  source code
    lesson 9 72

M

MainHandler
  overview 33
MainHandler.egl
  source code
    lesson 12 75
    lesson 7 69
    lesson 9 71
MapLocatorHandler
  overview 42
MapLocatorHandler.egl
  source code
    lesson 10 73
    lesson 11 73
MortgageCalculationService.egl
  source code
    Lesson 3 65
MortgageCalculatorHandler.egl
  source code
    lesson 15 76
    lesson 4 66
    lesson 5 67
MVC
  forms 59

P

packages
  creating 7
parts
  overview 11
portal widget
  importing 7
portals
  definitions 1
portlet
  definitions 1
Project Interchange File
  overview 3
projects
  creating 7

R

Record parts
  creating 14
REST protocols
  definitions 1
Rich UI Handler
  definition 5
Rich UI Handler partparts
  creating 16
Rich UI Handlers
  deploying 55

S

Service parts
  creating 12
  overview 11
showProcessImage() 27
sketch
  UI 4
SOAP protocols
  definitions 1

T

Tomcat Web server
  installing 52
tutorials
  Format logon page 3

W

widgets
  overview 5