Building Rich Enterprise JSF Applications with Oracle JHeadstart for ADF (11.1.1)

A step-by-step, end-to-end tutorial on how to be effective immediately with JEE application development using Oracle tools.

Authors: Steve Muench, Oracle ADF Development Team and Steven Davelaar, JHeadstart Team.

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1. Introduction

On their own, the Oracle Application Development Framework (ADF) together with the Oracle JDeveloper 11g IDE give developers a productive, visual environment for building richly functional JEE applications without having to implement JEE design patterns and low-level plumbing code by hand.

As its name implies, Oracle JHeadstart 11g offers a significant additional productivity advantage in creating sophisticated web-based, JEE business applications. Standing squarely on the shoulders of the base Oracle ADF framework, Oracle JHeadstart adds an additional capability for iteratively generating a fully-working web tier using Rich ADF Faces as View layer and ADF Task Flows as Controller layer.

By following this tutorial, you'll experience first-hand how Oracle JHeadstart 11g can help you in building a best-practice ADF web application. You will built a transactional web application based on 6 tables of the Oracle HR schema, that includes rich functionality like quick and advanced search, a wizard in a popup window, a shuttle picker, a tree control, validation using list of values, conditionally dependent items, a graph, dynamic breadcrumbs, context-sensitive linking, validation rules and multi-language support. In addition, you will see how you can easily customize the generated artifacts and how you can preserve these customizations upon regeneration. Since no Java coding is required to implement the tutorial, even developers with minimal-to-no Java skills can follow along.

If you are a more experienced ADF developer, it will be interesting to see how the JHeadstart-generated web tier auto-implements a host of ADF best practices that can be found on Oracle's Technology Network and on various ADF-related blogs. If you are excited about new ADF 11 features like (un)bounded task flows, page fragments, page templates, (dynamic) regions, XML Menu Model and model-driven LOV's, but struggle how they can be used best, then JHeadstart will make your life much easier.

As we'll see in this step-by-step demo, the JHeadstart Application Generator does not generate any Java code. Instead, it generates web pages and page fragments, ADF metadata describing the data needed on those pages ("page definitions"), ADF metadata describing the page flow ("ADF Task Flow definitions"), and translatable message bundle files. We'll also see that all of the basic functionality provided by the underlying Oracle ADF framework components in the demo does not require any generated Java code either. We hope you'll walk away impressed by what you can do without writing a single line of Java code using this powerful combination of JEE tools and frameworks from Oracle. Any lines of code that you would eventually write in a real application would be squarely focused on enhancing all of the built-in functionality provided with your own custom business application logic.

Tip: If you prefer reading this document offline, a PDF version of this paper [1] is available. In addition, the tutorial files download [2] contains this same HTML page and images for offline viewing as well. A completed version of the tutorial application [3] is available for your reference.

Tip: Oracle JHeadstart 11g for ADF is a separate extension for Oracle JDeveloper 11g for which a fully-functional trial version is available for your evaluation purposes. Complete information on pricing, support, and additional services available for JHeadstart 11g is available in the **JHeadstart Frequently Asked Questions** document on the JHeadstart Product Center [5] on OTN.

Tip: After you've followed the demo steps yourself, the same steps work well as a scripted demo you can show to others to spread the good word about the many powerful features provided by the combination of Oracle JDeveloper 11g, Oracle ADF, and Oracle JHeadstart working together.

2. Tutorial Setup

This section outlines the steps you'll need to follow to get your machine ready to go through this tutorial. We recommend not skipping any steps in this section without reading them!

2.1. Download the Tutorial Files

If you are reading this tutorial online, download the JhsTutorialFiles.zip [2] file that contains the database setup scripts. Extracting this zip file into the root directory of your C:\ drive will create a jhs-step-by-step directory. You can browse the index.html page to read this same tutorial offline. The database setup scripts (described more in detail below) are in the hr_schema subdirectory.

2.2. Start with JDeveloper 11g, Release 11.1.1.2

This tutorial requires Oracle JDeveloper 11g *Studio Edition*, release 11.1.1.2 Production. If you have a version of Oracle JDeveloper installed, you can verify what version it is by selecting the **Help | About** option from the main menu.

NOTE: JHeadstart 11.1.1.2 will **only** work with JDeveloper release 11.1.1.2 Production. It is **not** certified against earlier versions.

If you need to download JDeveloper 11g Release 11.1.1.2 look for the correct version on this JDeveloper Downloads [6] page. Installation instructions can be found in the Oracle Fusion Middleware Guide for Oracle JDeveloper [21].

2.3. Install Oracle JHeadstart 11g 11.1.1.2 Using "Check for Updates"

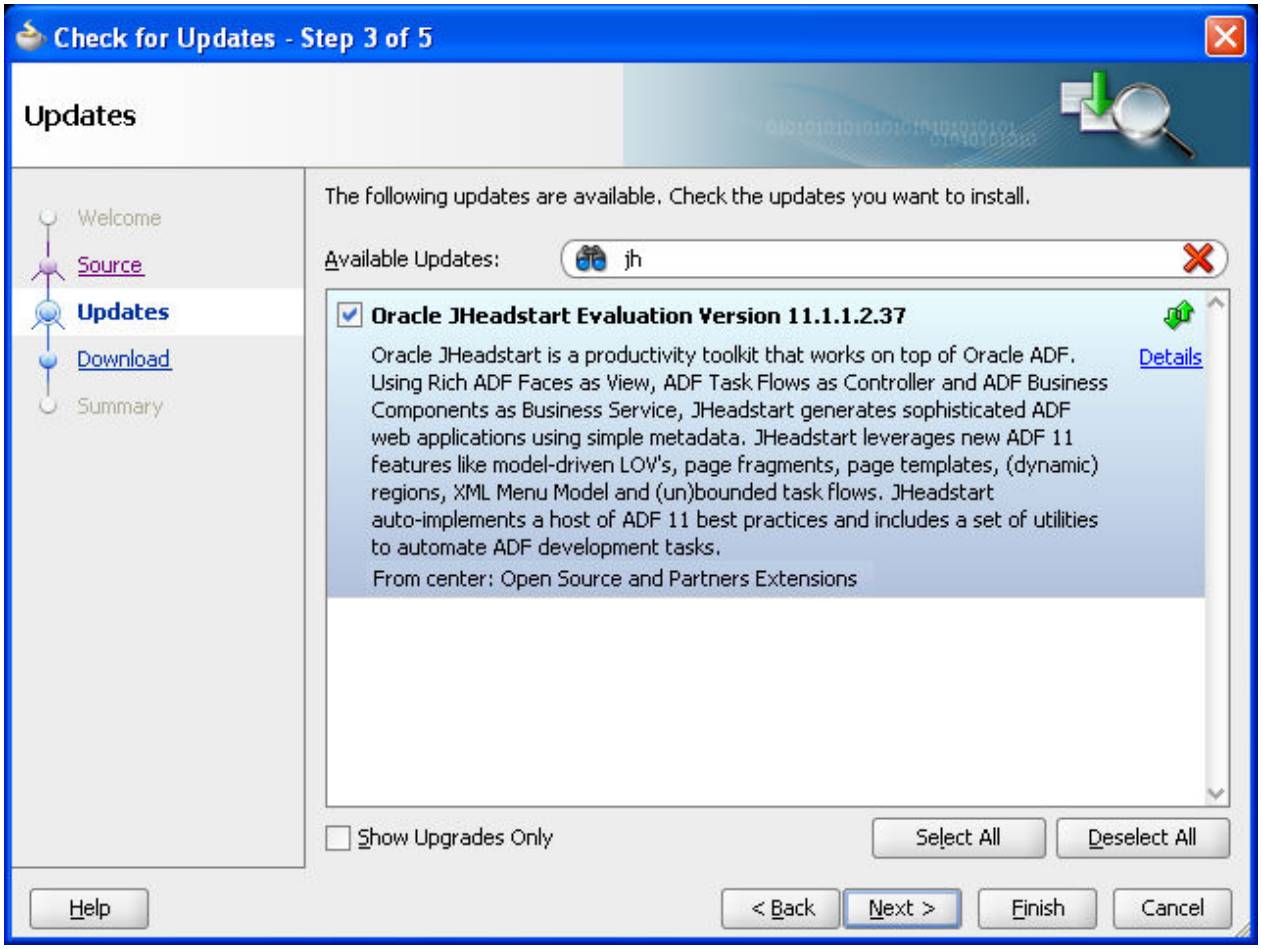
Oracle JHeadstart is an Oracle JDeveloper extension (or "plug-in") that you install using JDeveloper's "Check for Updates" functionality. If anything about these installation instructions doesn't work for you as indicated, check the JHeadstart 11g Product Center [5] on OTN, under the **Downloads** heading, for further assistance.

To install the JHeadstart 11g Evaluation Version into your JDeveloper 11g 11.1.1.2 environment, perform the steps below.

Run the "Check for Updates" wizard
With JDeveloper 11.1.1.2 running, choose **Help | Check for Updates...** from the main menu. Click **(Next>)** on the **Welcome** page of the **Check for Updates** dialog.

Select the Source for Extensions
In **Step 2 of 5: Source** ensure that you have selected the **Open Source and Partners Extensions** update center, then click **(Next >)**.

Select the Oracle JHeadstart Evaluation Version Extension to Install
In **Step 3 of 5: Updates**, enter `jh` in the search field, and choose the Oracle JHeadstart Evaluation Version 11.1.1.2.37 extension as shown below, then press **(Next >)**.

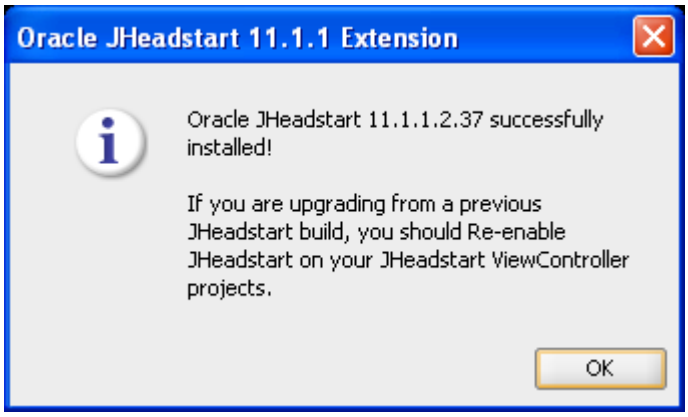


Acknowledge the Legal Agreement
Read and acknowledge the Oracle Technology Network license for the evaluation version of Oracle JHeadstart by clicking **(I Agree)**. JDeveloper begins the download of the selected updates...

Exit and Restart JDeveloper
When the download is completed, on the **Summary** page of the wizard, click **(Finish)**. The **Confirm Exit** alert appears because you need to exit and restart JDeveloper to install the service update. Click **(Yes)** to exit. On Windows, JDeveloper will exit and automatically restart. On Mac, Linux, or other platforms, JDeveloper will exit and you will need to launch it again.

Acknowledge the Installation Alerts
When JDeveloper restarts, you may see the **Confirm Overwrite** alert, making you aware that the automatic installer will be replacing a file in your JDeveloper installation. This is expected, so check the **Skip this Message Next Time** checkbox, and click **(Yes)** to continue. When the **Migrate User Settings** alert appears, click **(No)** to continue.

Acknowledge the Successful Installation Alert
After the installation is completed, you'll see the alert shown below confirming the successful installation. Press **(OK)** to continue.



2.4. Setup the Oracle HR Schema and Sample Data

This tutorial uses the sample HR schema that comes with the recent versions of the Oracle database.

Create the HR Schema If Necessary

If you don't already have an HR user account created in your database, you can follow these steps to create it.

```
C:\jhs-step-by-step> sqlplus /nolog
SQL> connect sys as sysdba
SQL> create user hr identified by hr;
created.
SQL> alter user hr default tablespace users;
altered.
SQL> grant connect, resource to hr;
SQL> connect hr/hr
connected.
SQL> quit
```

Create the HR Schema Sample Tables

In the hr_schema subdirectory of this tutorial, you'll find the hr.sql script. This script drops, recreates, and repopulates all the tables in the HR sample schema. Change directory to the hr_schema subdirectory, and run the script as the HR user, with the command:

C:\jhs-step-by-step> cd hr_schema
C:\jhs-step-by-step\hr_schema> sqlplus hr/hr @hr.sql

Unlock the HR Schema If Necessary

If you already have an HR schema in your database it might be locked for security reasons. To unlock the schema, follow these steps:

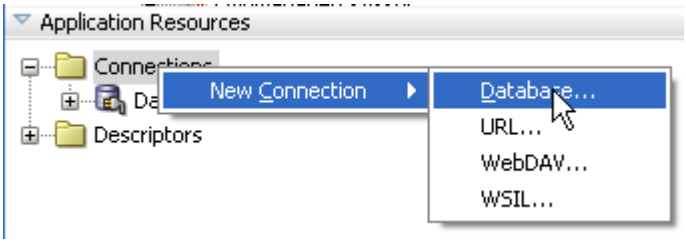
```
C:\jhs-step-by-step> sqlplus /nolog
SQL> connect sys as sysdba
SQL> alter user hr identified by hr account unlock;
User altered.
SQL> quit
```

2.5. Define a JDeveloper Connection for the HR Schema

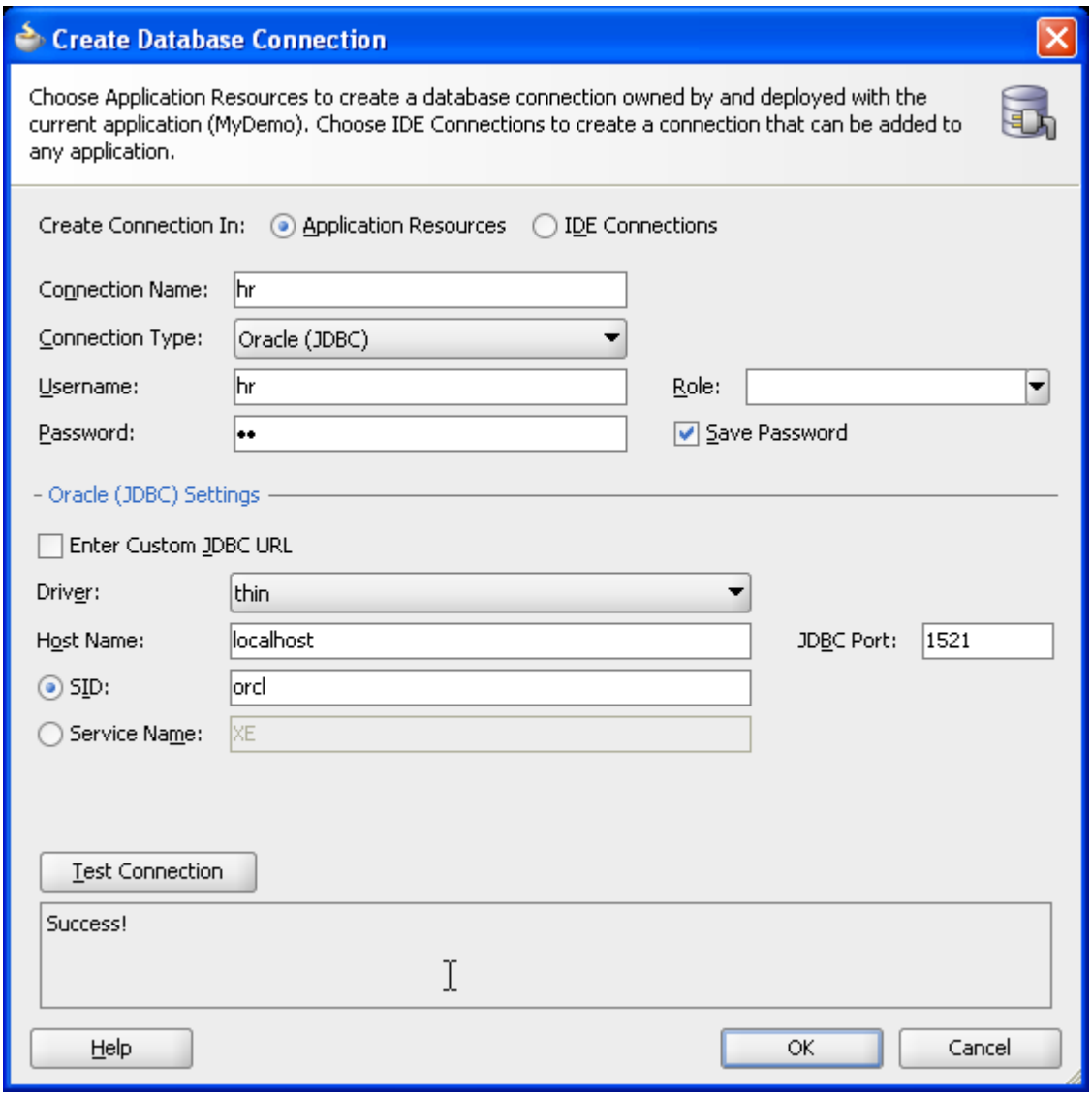
Select View | Resouce Palette to show the Application Resources palet and follow these steps:

Create a New Database Connection.

Click on the Database folder, and select ***New Connection -> Database ...*** from the right-mouse menu.



Enter Connection Details.
Provide connection details as shown below.



3. Creating a Default Web Application

In this section we will:

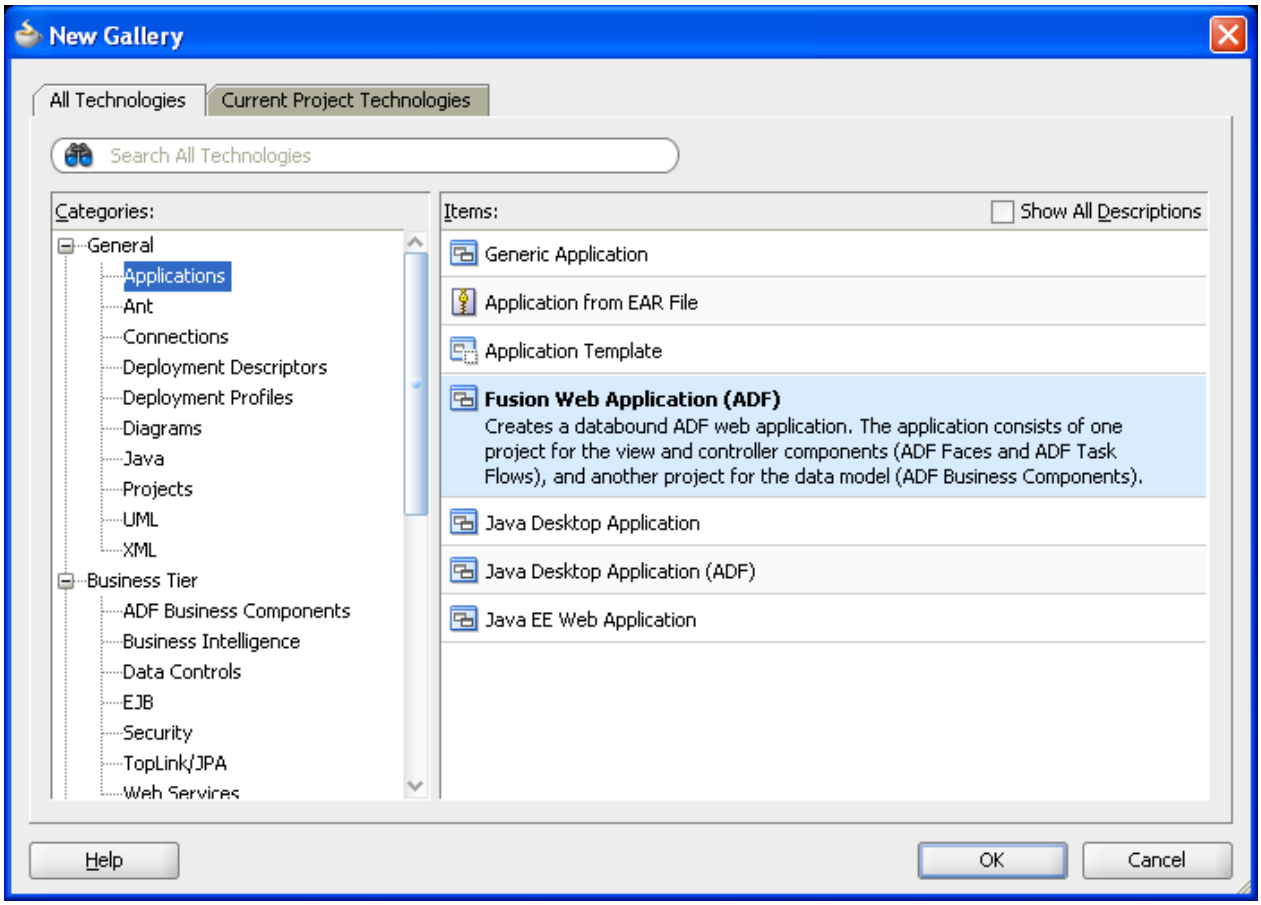
- Create a new application,

- Create the ADF Business Components to handle our backend database access, and
- Generate a default set of web pages with JHeadstart

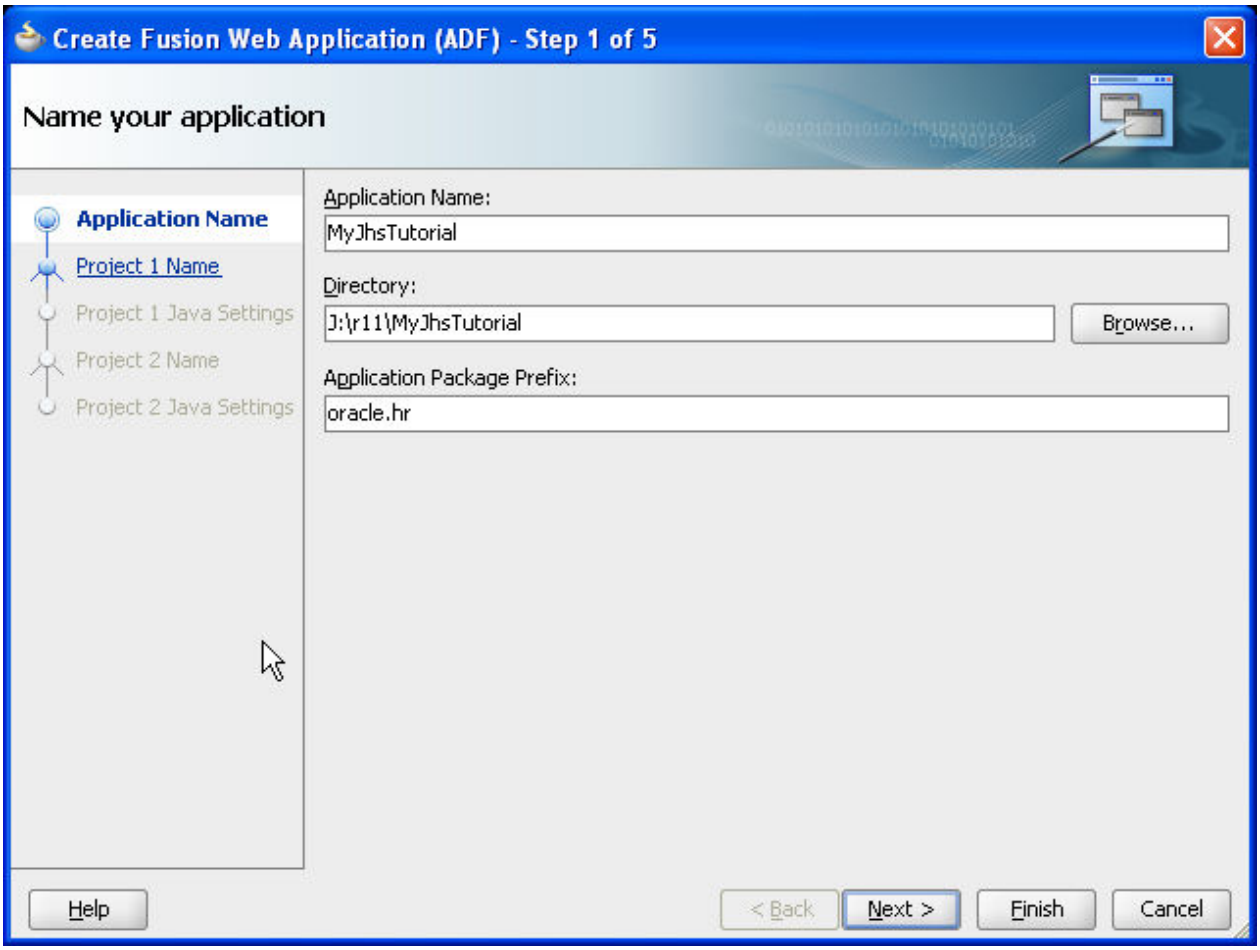
Then, we'll run the application inside JDeveloper 11g to see what default behavior we get before starting to iteratively modify the application to further tailor it to work like our end users want.

3.1. Create and Configure a New Application

In JDeveloper, click 'File', 'New' and select 'General > Applications' in the category tree on the left. Next, select ***Fusion Web Application (ADF)***. Click OK.



Give your Application an appropriate name and select a directory for usage. You can also specify a default Java package where newly created classes will be stored.



You do not have to click Next, instead, click Finish to accept all defaults on the other pages of the wizard. JDeveloper will now create a new application for you, with two projects: `Model` and `ViewController`.

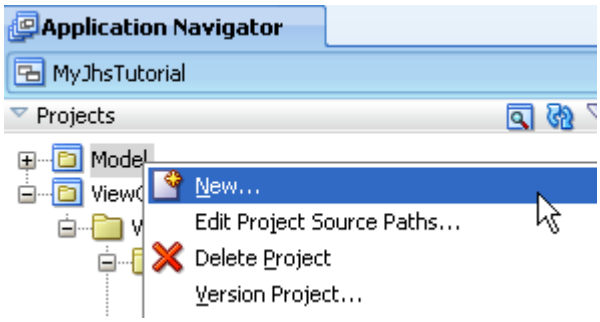
3.2. Create Default ADF Business Components

The ADF Business Components handle all of the database access for you in a way that is cleanly separated from the user interface. The application module provides the transactional component clients use to browse and modify view object data. The view object performs SQL queries and coordinates with entity objects to handle updates. The entity object encapsulates business domain data and validation for rows in a table. In this step we'll use wizards to create all three types of components based on existing tables in the database.

Tip: For additional background to ADF Business Components, including information on how their functionality maps to features of Oracle Forms, see the Fusion Developer's Guide for Oracle ADF [7] and ongoing columns in the Oracle Magazine DEVELOPER: Frameworks [8] series.

Run the Business Components from Tables Wizard

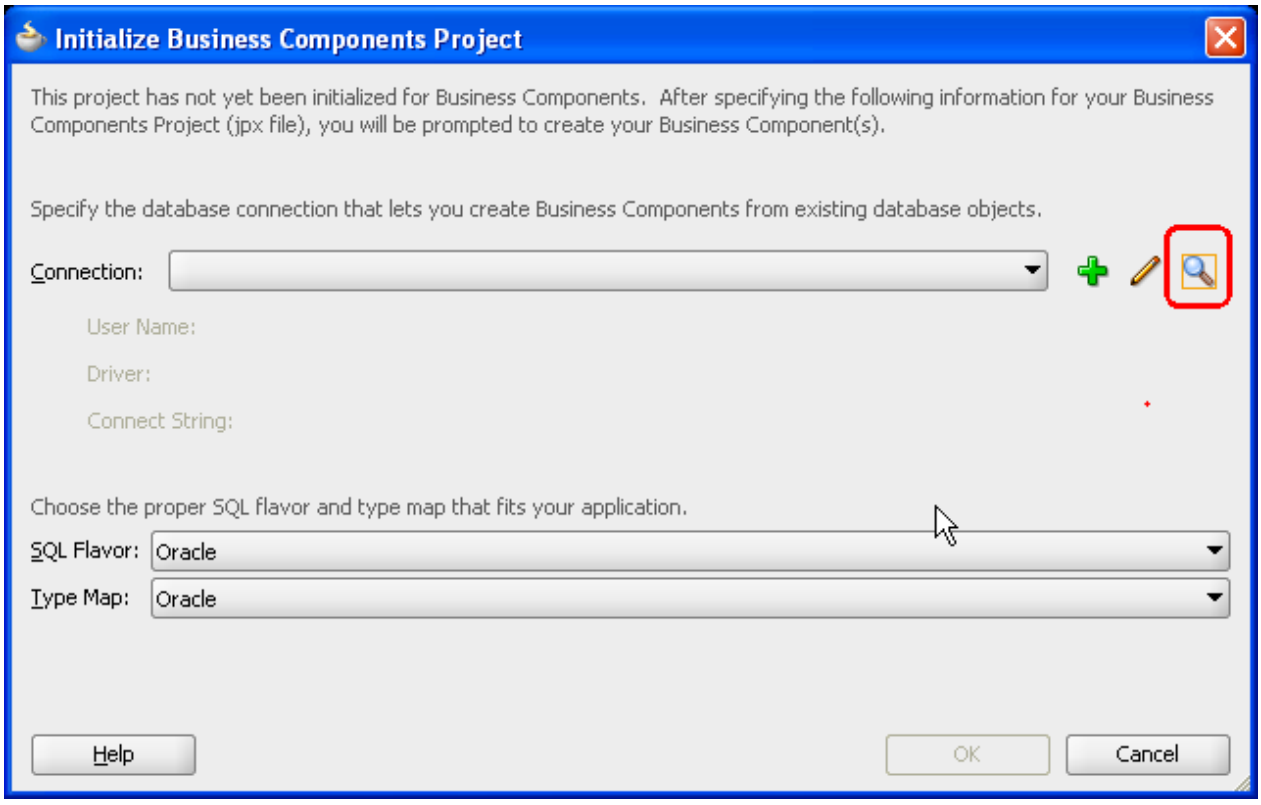
Right click the Model project and select 'New'.



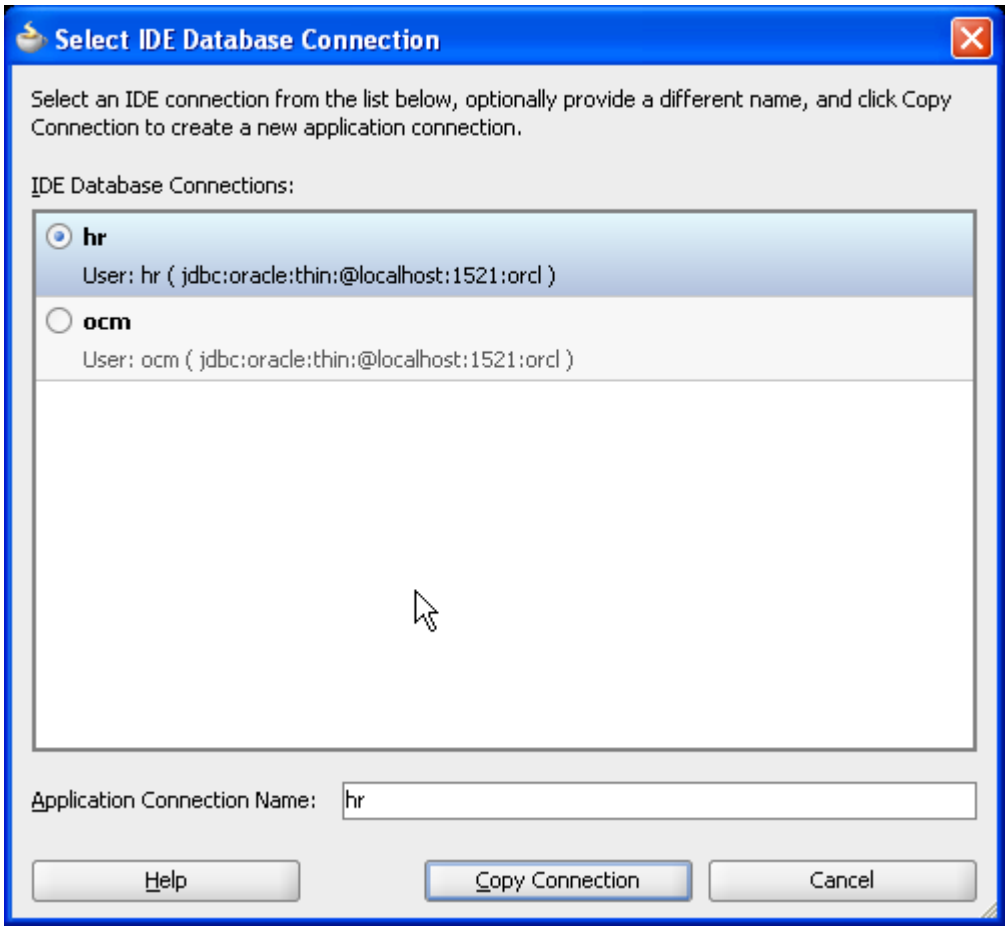
Select Business Tier > ADF Business Components on the left, and ***Business Components From Tables*** on the right. Click OK.

Set the Database Connection to Use

You will now be asked to create a connection to your HR schema. Click the magnifier icon to copy the HR connection from your JDeveloper environment into your project.

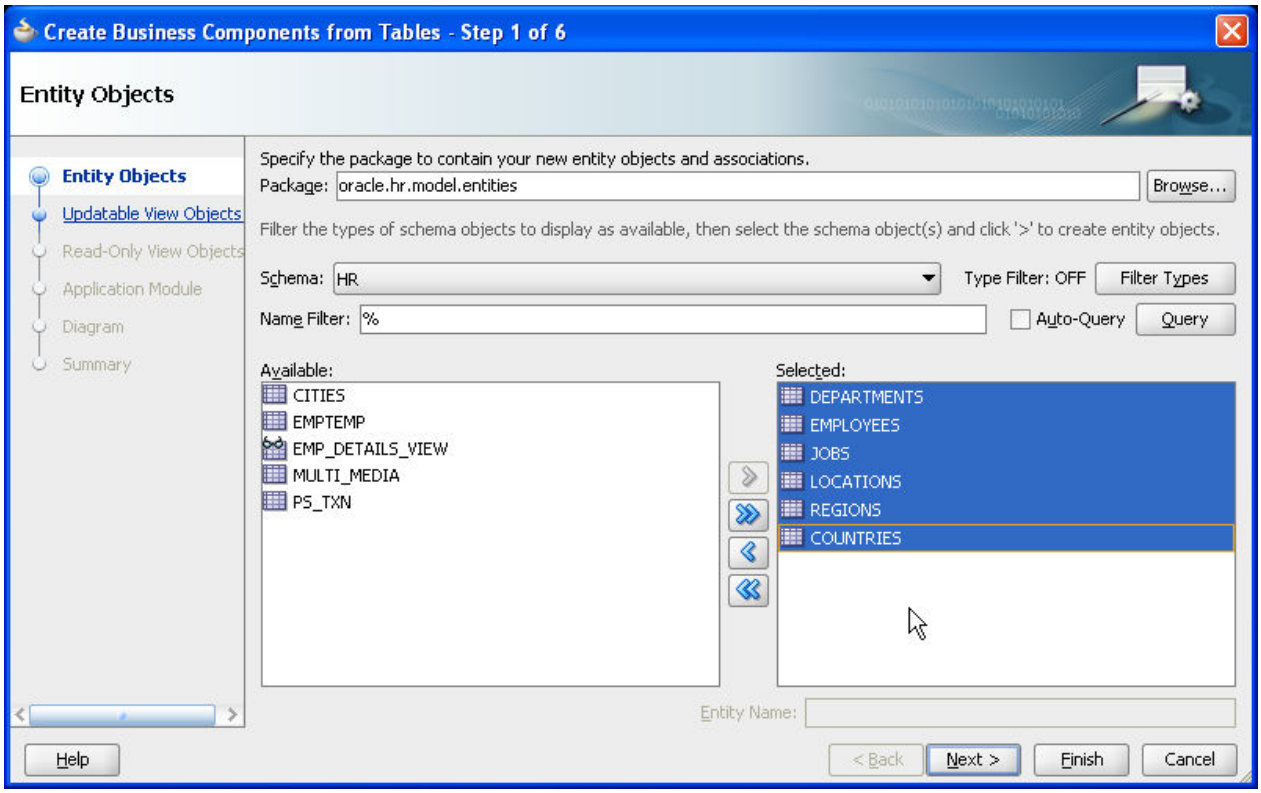


Select the HR connection and click ***Copy Connection***.



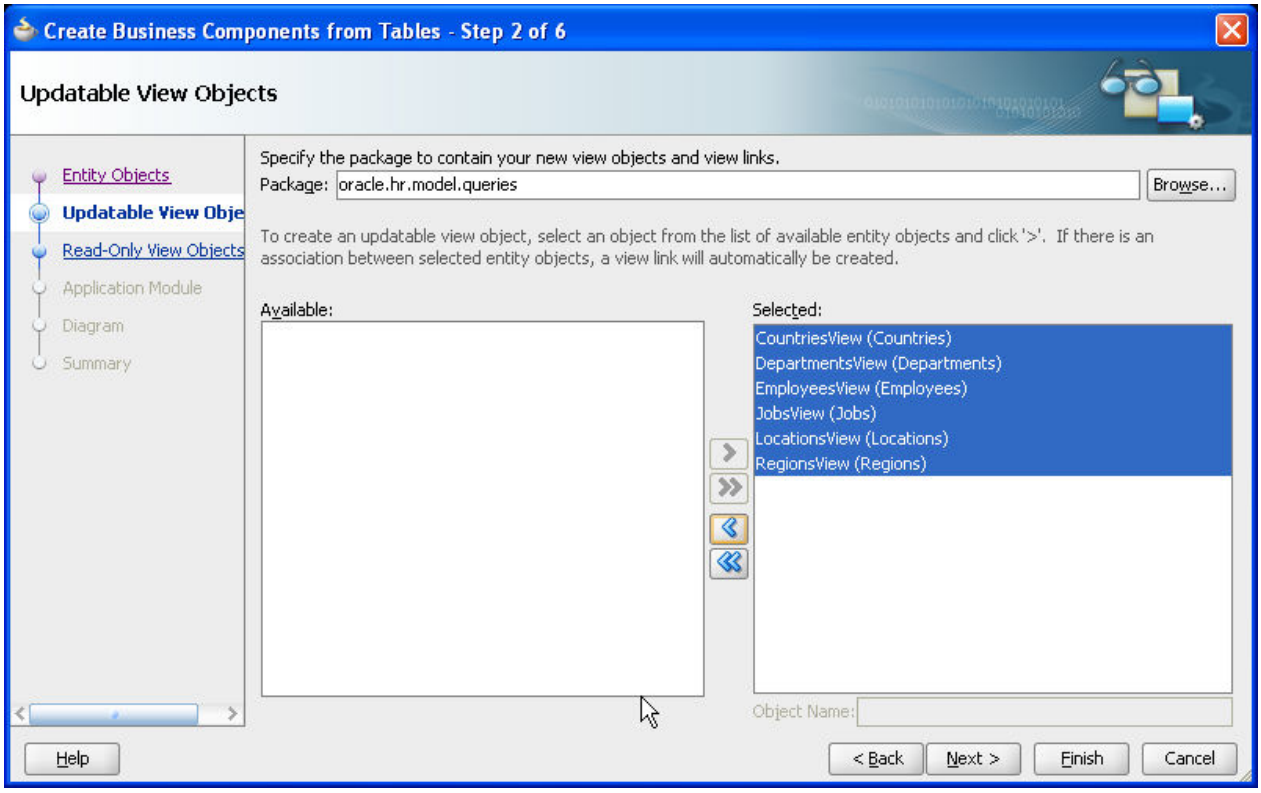
Create Entity Objects for Selected HR Tables

On the ***Entity Objects*** screen, click the ***Query*** button to see the available tables in the schema. As shown below, shuttle the six tables COUNTRIES, DEPARTMENTS, EMPLOYEES, JOBS, LOCATIONS, and REGIONS tables into the Selected list, and enter the package name of `oracle.hr.model.entities` in which to create the entity objects.



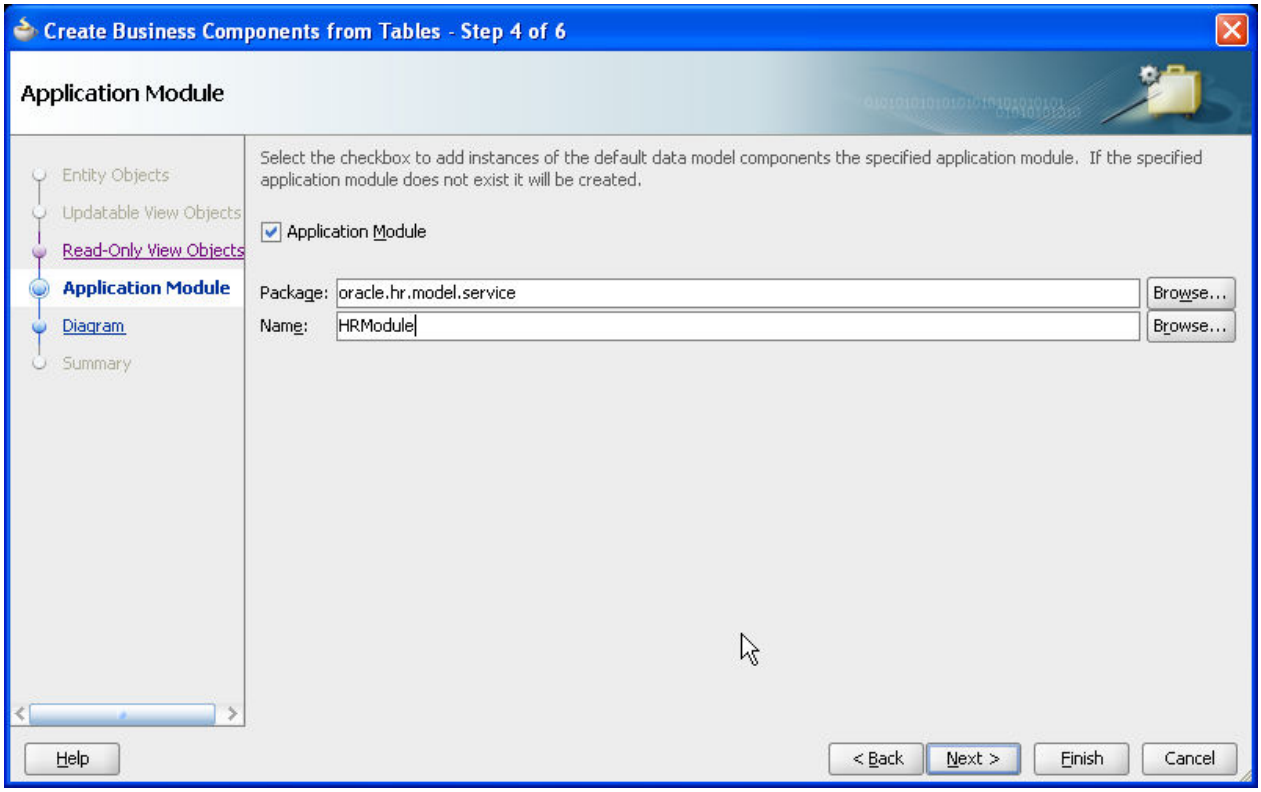
Create Updateable View Objects for All Entity Objects

Click ***Next*** to create Updateable View Objects and shuttle all available entity objects on the left to the right, by clicking the double blue-arrow icon. Set the package name `to oracle.hr.model.queries`.



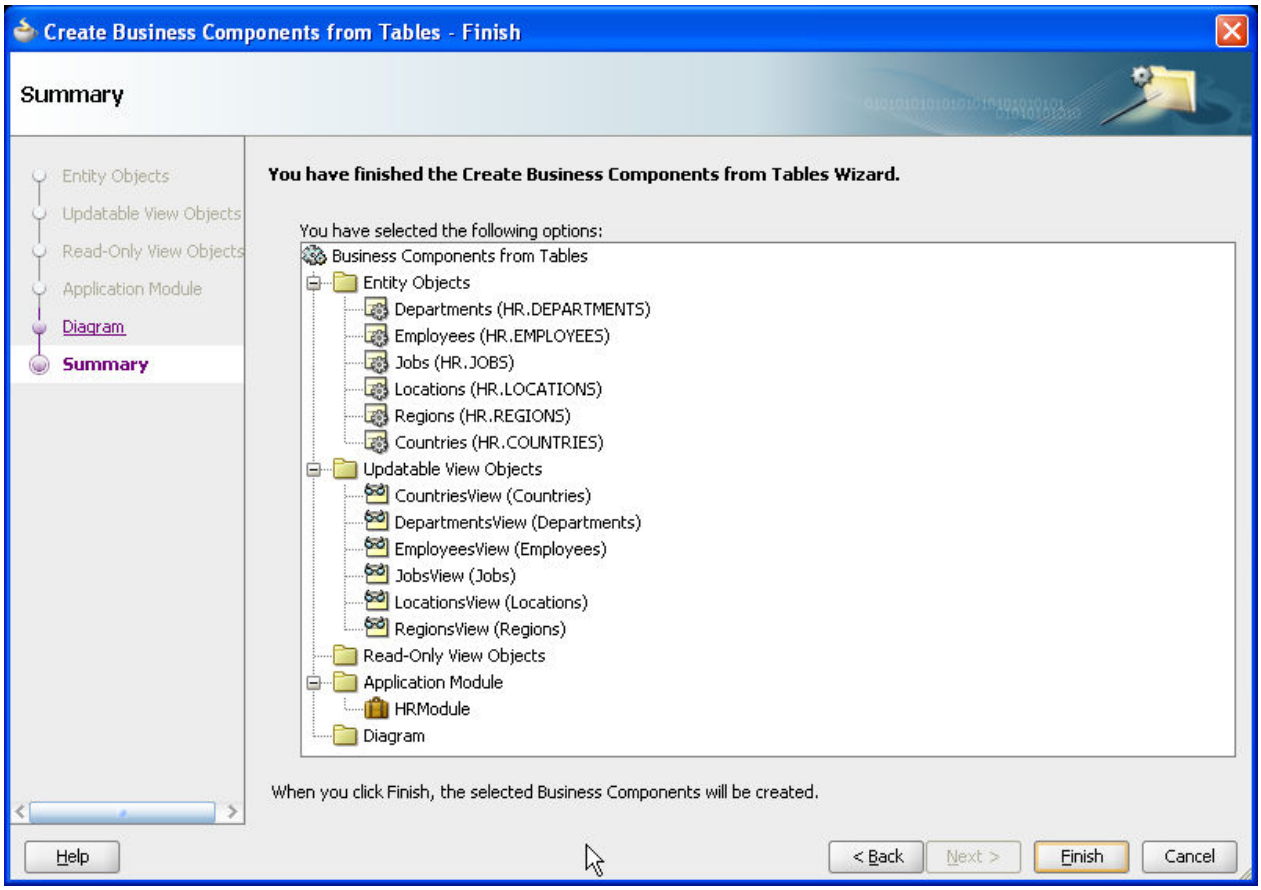
Skip Past the Read-Only View Objects Panel
Just skip past the Step 3 of 6: Read-Only View Objects page of the wizard since we don't need any read-only view objects for this tutorial.

Give Your Application Module Component a Meaningful Name
On the Step 4 of 6: Application Module page of the wizard, enter a package name of `oracle.hr.model.service` and choose a meaningful name for your application module like `HRModule`, then click (**Finish**) to create all of your business components.



Skip Diagram Panel
Just skip past the Step 5 of 6: Diagram page of the wizard since we don't need a diagram for this demo.

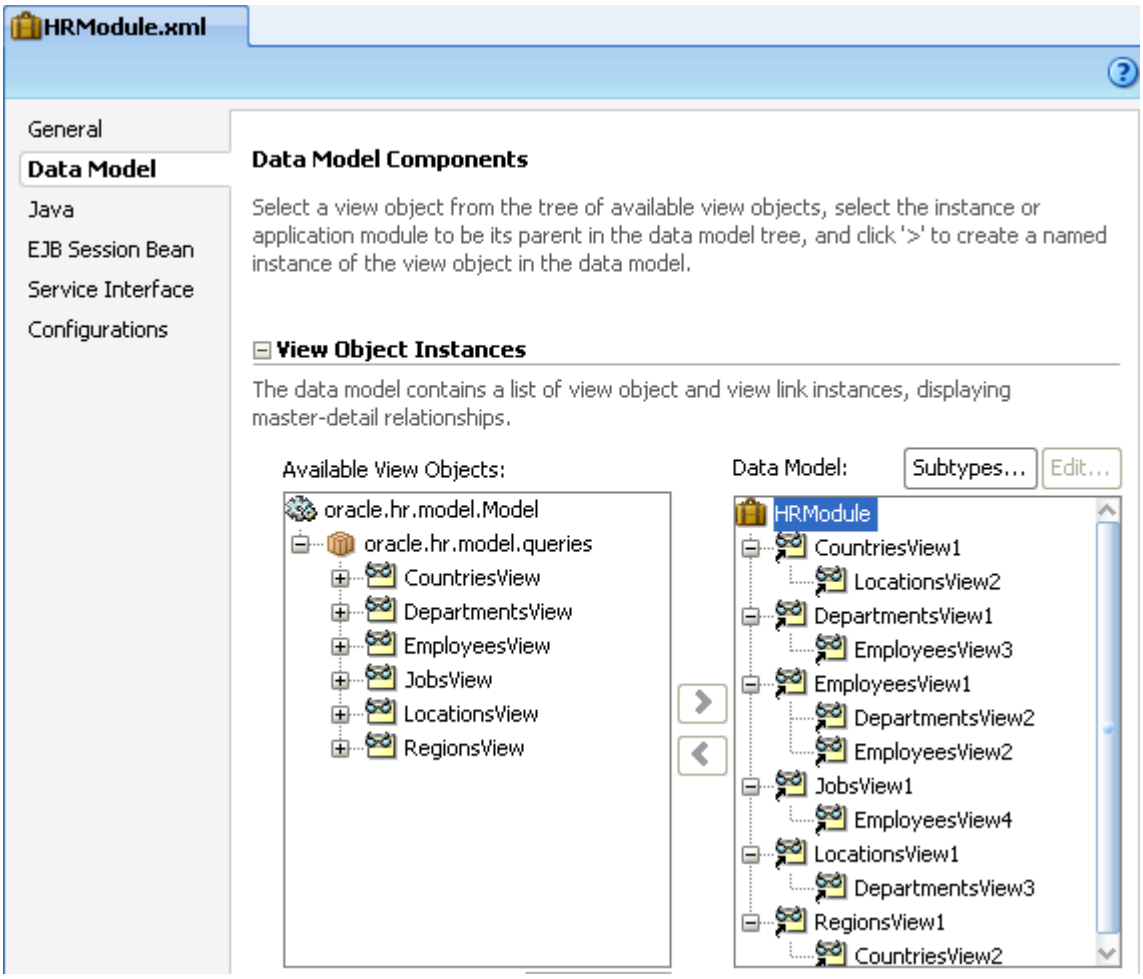
Inspect Summary Panel
Inspect the ADF Business Components that will be created and click Finish.



JDeveloper will now create various Business Components for you in the Model project.

Add Five-level Master/Detail to the Application Module's Data Model

In the Application Navigator, inside your Model project find the HRModule component. It's in the oracle.hr.model.service package. Edit the HRModule application module by double-clicking it. This will open the Application Module Editor. Visit the Data Model panel, and as shown below you'll see both the list of Available View Objects from the current project, and the named, master/detail-coordinated usages of those view objects in this application module's Data Model. The view object usages in the data model are also known as view object instances since at runtime they represent an instance of the reusable view object component.



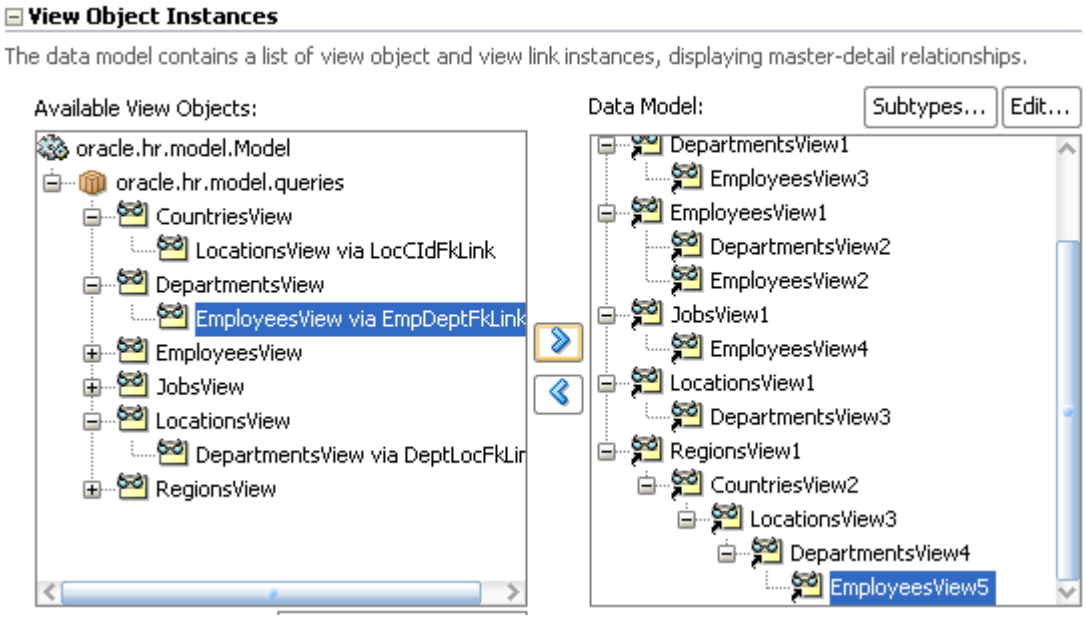
We're going to modify the default data model to add nested view object usages in order to get a 5-level deep nesting of region → country → location → department → employee.

We start by adding a `LocationsView` view object instance as a child/detail of `CountriesView2`, by doing the following:

- In the Data Model tree control (on the right), select the existing view instance `CountriesView2` that will become the new master (for the next-level detail we're about to add).
- Expand the `CountriesView` view object in the **Available View Objects** list
- Select the `LocationsView` view object that is indented under `CountriesView` in the **Available View Objects** list. This indenting means that it is an available detail view for any instance of a CountriesView master in the data model.
- Click the **(>)** button to shuttle a new `LocationsView3` instance into the data model as detail of the existing, selected `CountriesView2`.

We can repeat the process to add an instance of `DepartmentsView` as a detail of the `LocationsView3`, and then again to add an instance of `EmployeesView` as a detail of the `DepartmentsView4`.

When finished adding the three extra levels, your application module's data model will look like below. Click **(OK)** to save your changes.



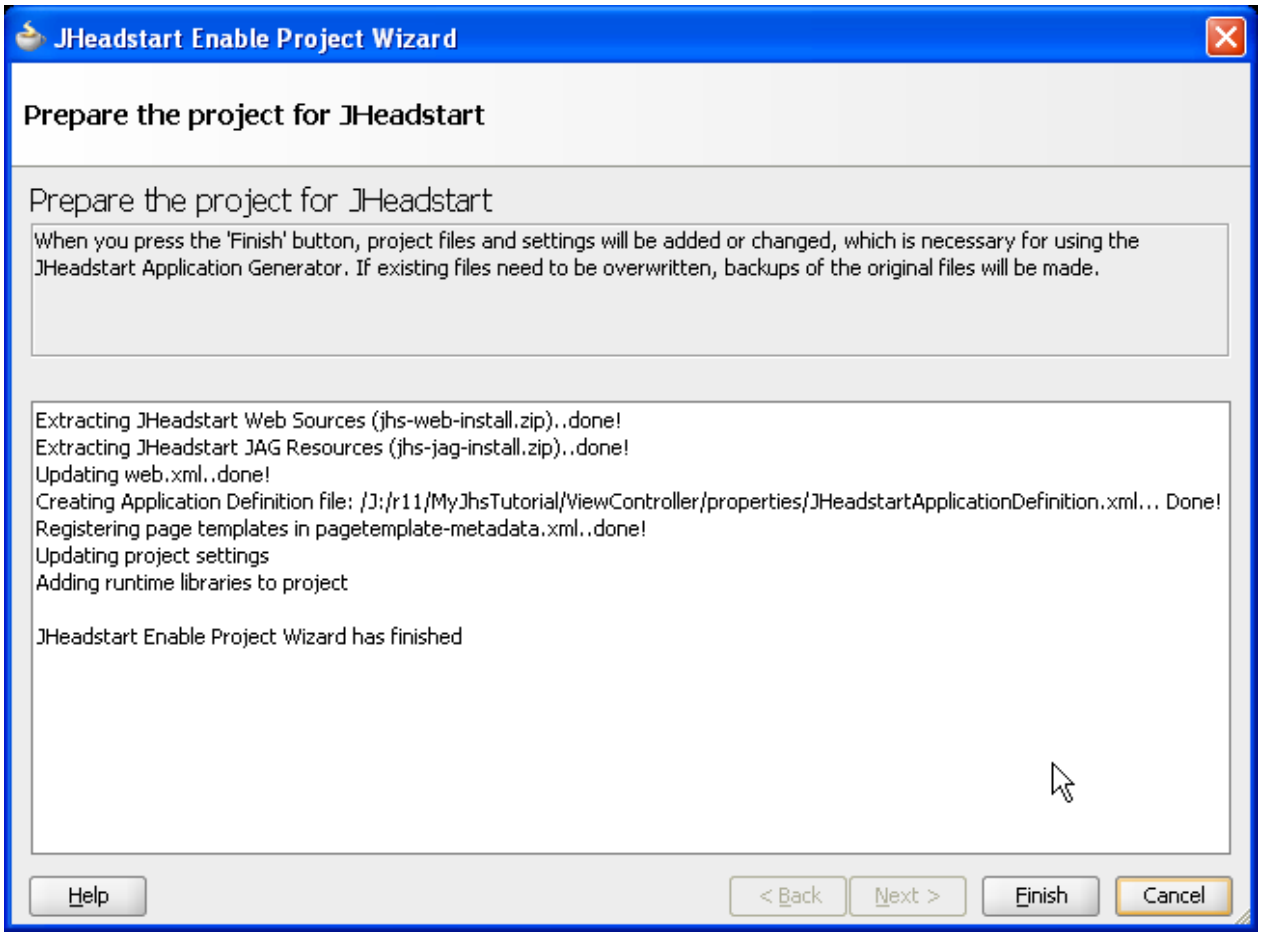
3.3. Generate Default Web Tier with JHeadstart

The Oracle JHeadstart extension for JDeveloper uses metadata to capture the high-level definition of the layout and features of your desired web application. The JHeadstart application generator then uses that application definition metadata to generate the set of web pages that comprise your web application user interface. In this section we'll enable our project to use JHeadstart, ask JHeadstart to create a default application definition metadata file, and then kick off the JHeadstart application generator to see what kind of web application we get before proceeding to tailor the output further in subsequent steps of the tutorial.

Enable JHeadstart on the ViewController Project

Select the `ViewController` project in the navigator and choose **Enable JHeadstart on this Project** from the right-mouse menu. Click **(Next>)** from the welcome page, then click **(Finish)** to proceed with enabling JHeadstart. Click **(Yes to All)** in the following alert that will be shown.

The wizard will then proceed to create a number of necessary files and configure your project appropriately to contain them. Each step it performs is listed in the text box in this panel of the wizard. When done, click **(Finish)** again to close the wizard. Then, click the **Save All** button in the JDeveloper main toolbar to save all the changes



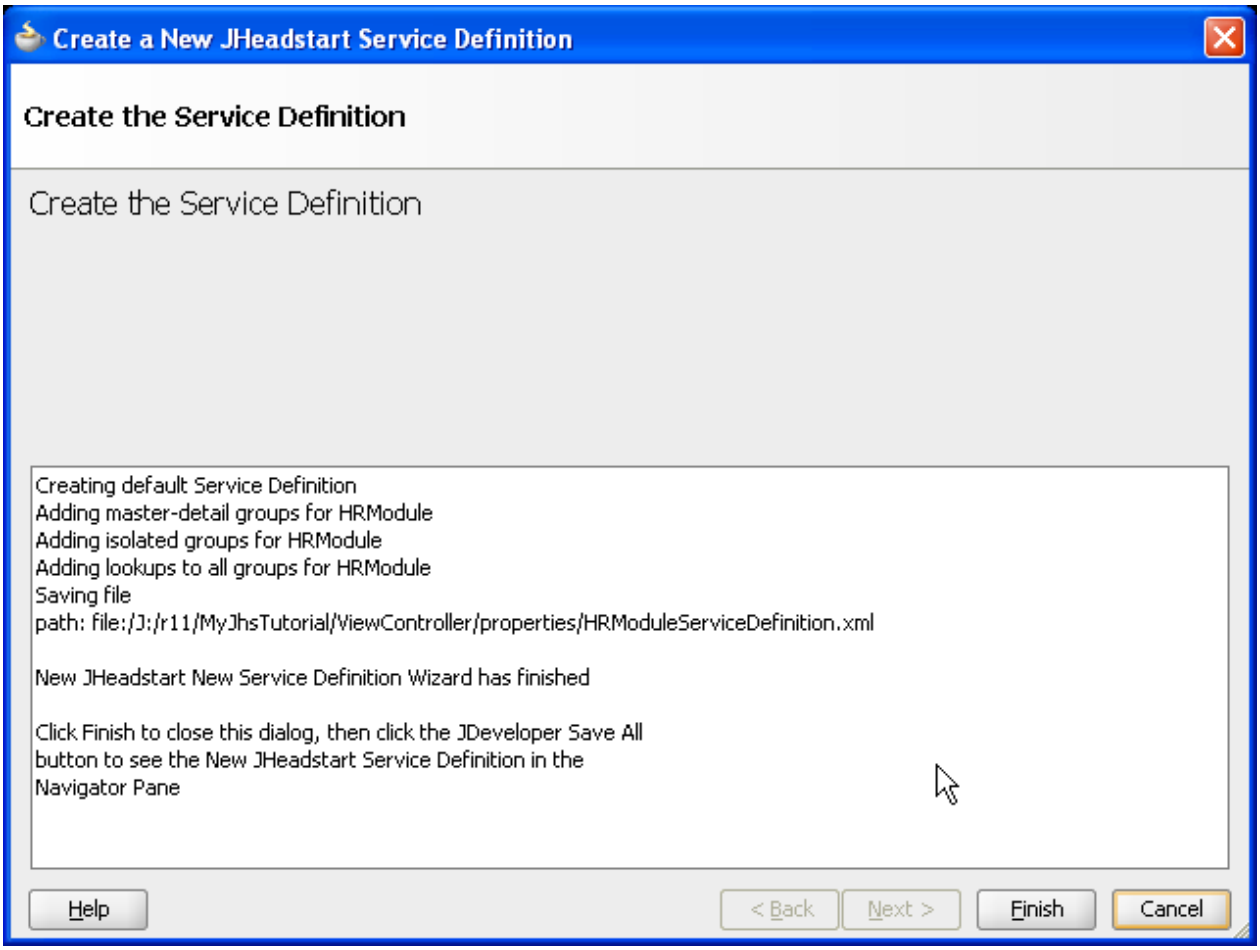
Create Default JHeadstart Service Definition

Right-mouse-click on `ViewController` project again to run the **New Service Definition Wizard** to create the JHeadstart metadata that will be used to generate your application.

In the wizard, leave all settings to their defaults. Keep clicking Next until you hit the last page.

Tip: You can learn more about the various settings in this wizard in the JHeadstart Developer's Guide, chapter 4 "Using JHeadstart".

Click Finish to create the JHeadstart Service Definition. After it is finished, you should see the following:



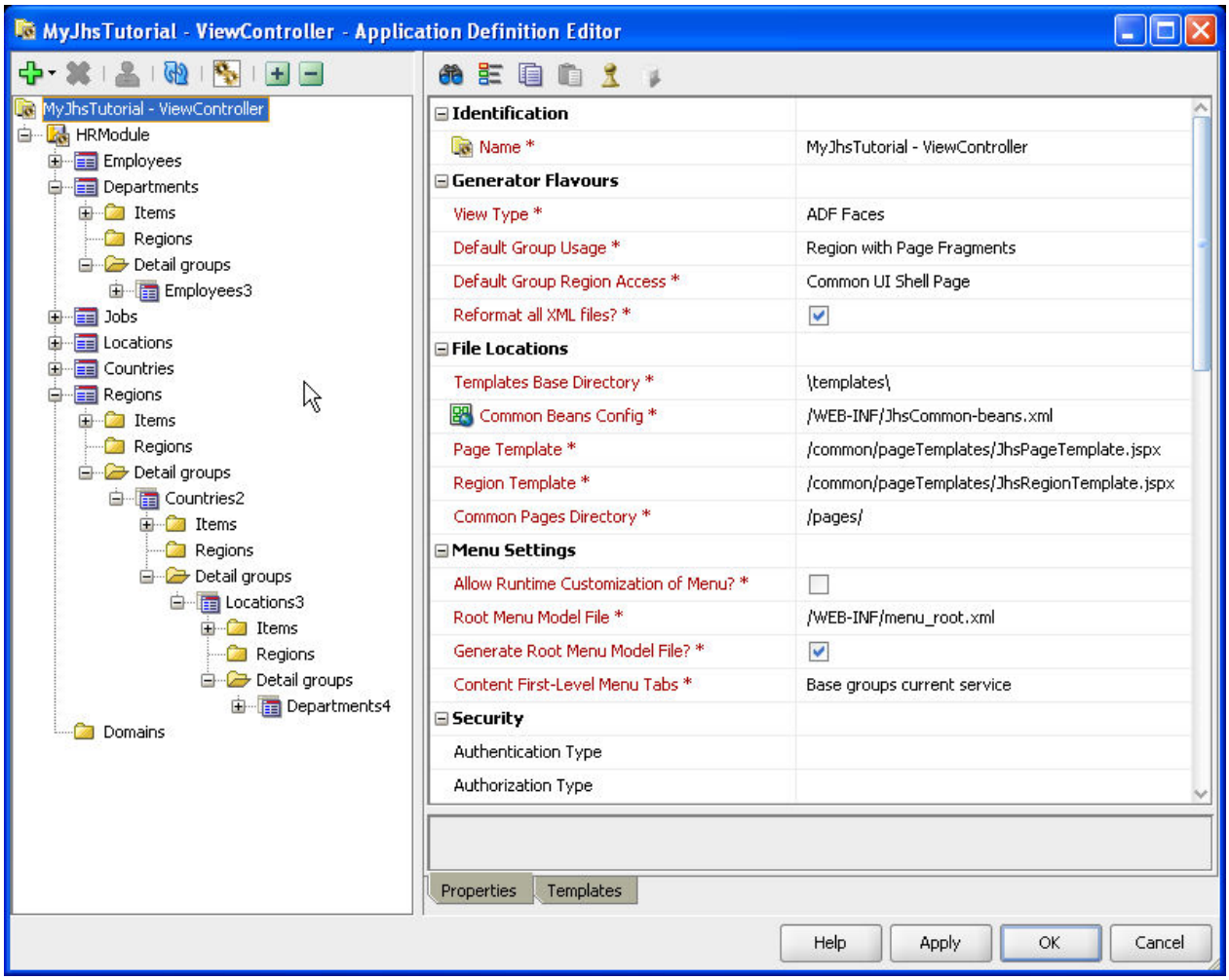
Click Finish and press the 'Save all' button in JDeveloper to save all files.

Observe the Default Service Definition

To view the JHeadstart service definition you just created, select the `ViewController` project and choose Edit JHeadstart Application Definition from the right-mouse menu. This opens the JHeadstart Application Definition Editor, which shows all service definitions, and is a modeless window that you can keep open while you continue to work with the main JDeveloper window.

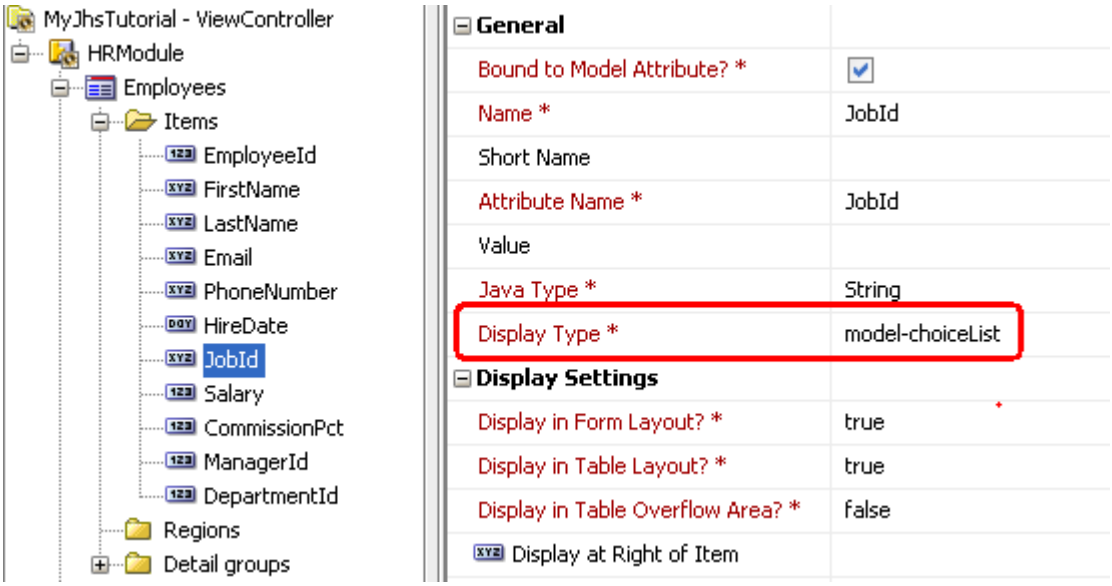
Notice that JHeadstart has used the hierarchical structure of the application module's data model to create the default service definition. In practice you will end up iteratively changing the default service definition, but having a nice default definition to start with is a big plus as we'll see.

As shown below, you can see the 5-level nesting of the view object instances for regions, countries, locations, departments, employees .

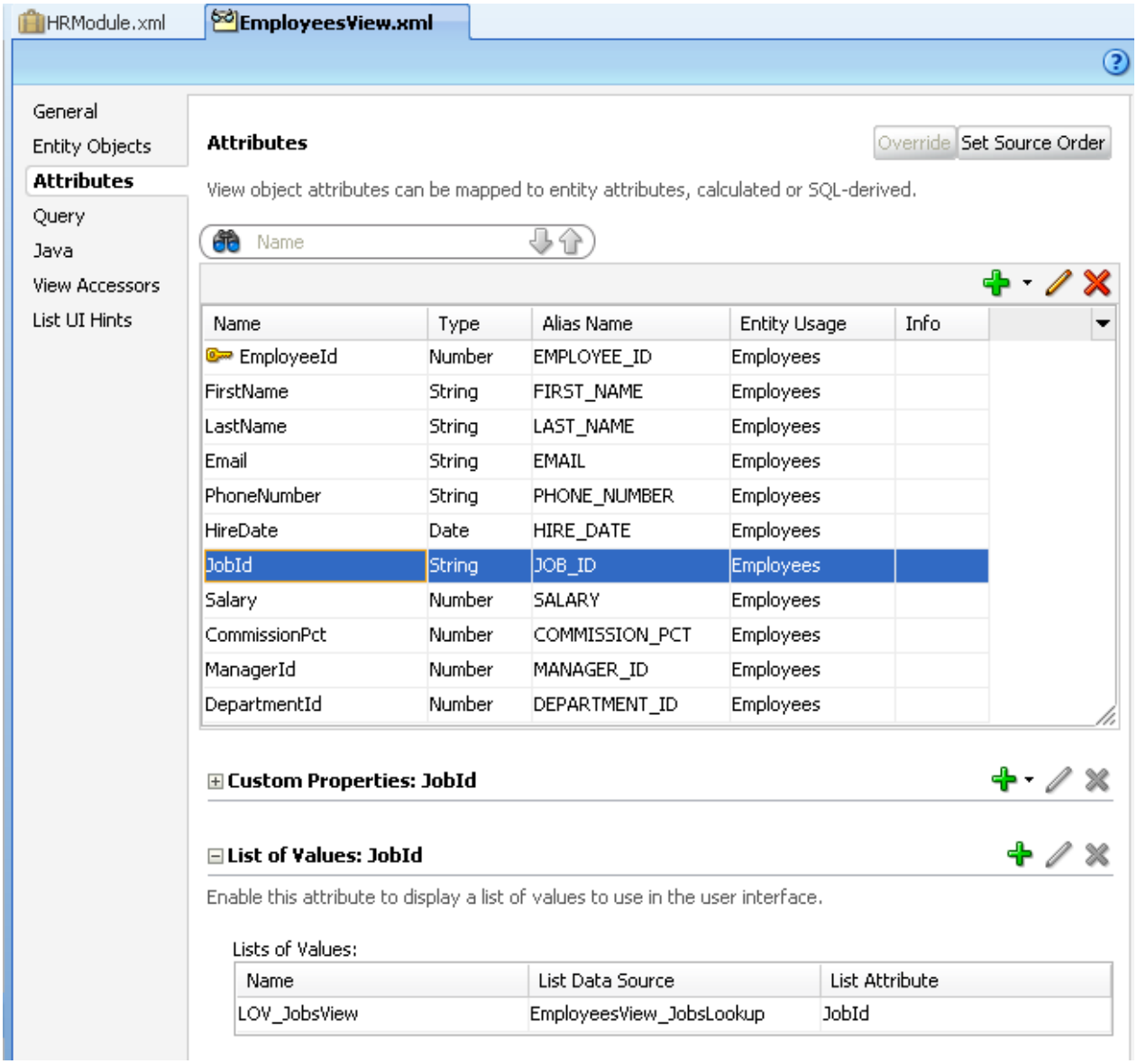


Observe Auto-Created List of Values definition in View Objects

When you open the Employees group, and click on the JobId item, you will notice the display type of the item: “model-choiceList”. This display type leverages the declarative List of Values that can be defined against view object attributes and entity object attributes.



The JHeadstart New Service Definition wizard auto-created List-of-Values (LOV) definitions in the View Objects for each attribute where a foreign key relationships exist in the base business component model. To inspect such an LOV definition, go to the Model project, double click on the `EmployeesView` view object, click on the Attributes tab and select the `JobId` attribute.

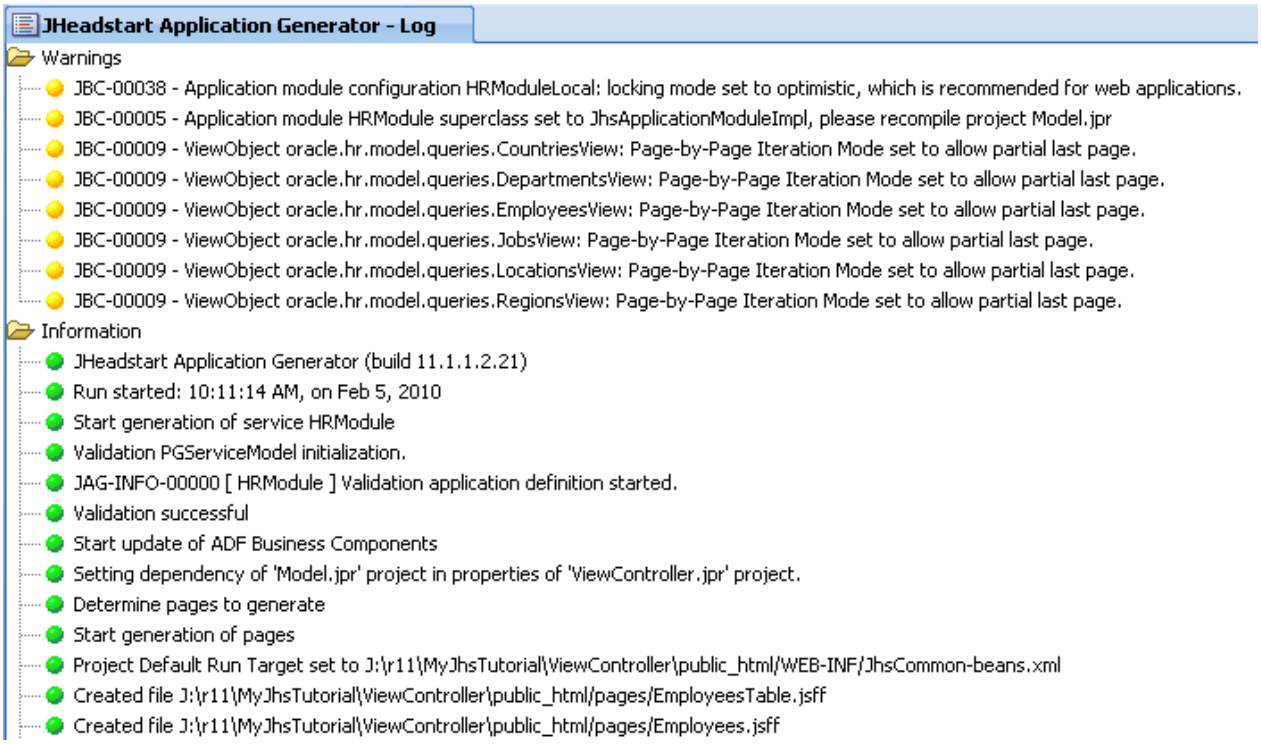


Note that instead of using model-based List of Values, we can also configure JHeadstart to generate web-tier List of Values. Which type of LOV to use is one of the settings in the New Service Definition wizard. In this tutorial we used the default setting of model-based LOV's, displayed as dropdown list (choice list) in the pages. A typical use case for JHeadstart-generated LOV's is when you want to implement a multi-select LOV where the user can select multiple rows, typically to populate an intersection table.

Generate the Application

To run the JHeadstart application generator, select your `ViewController` project in the Application Navigator and choose **Run JHeadstart Application Generator** from the right-mouse menu.
During the generation process, the JHeadstart Application Generator log window tab will display the detailed progress, including errors (if any), warnings, and informational messages. The figure below shows what this log window tab should look like after your first successful generation run. If you should see entries in an Errors category, which would appear at the top of the list with a "red ball" icon, the message always gives helpful details about how to correct the problem. Note that even when you see a few Warnings, these are suggestions of "next steps" you need to do as the developer or best-practices suggestions that the Generator cannot do automatically. Scrolling through the messages in the Information section gives you an idea of the amount of work that the JHeadstart application generator is saving you. In this case, it has generated six (6) bounded task flows, one for each top-level group in the

service definition, twenty-two (22) JSF page fragments and their corresponding declarative databinding metadata, along with numerous other declarative artifacts that support the application!

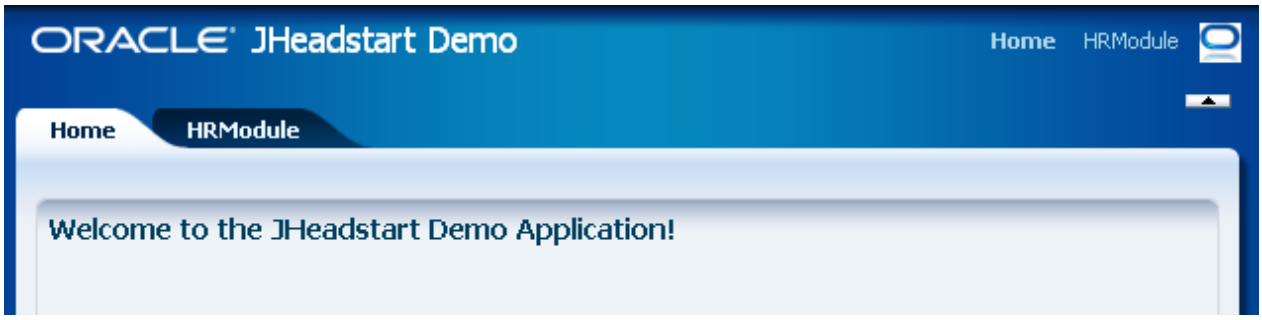


For your convenience, on future runs of the JHeadstart application generator, in addition to the right-mouse menu option we picked here, you can also just click on the ***Run JHeadstart Application Generator*** toolbar button () at the top of the JHeadstart Application Definition Editor window. Both actions do the same thing.

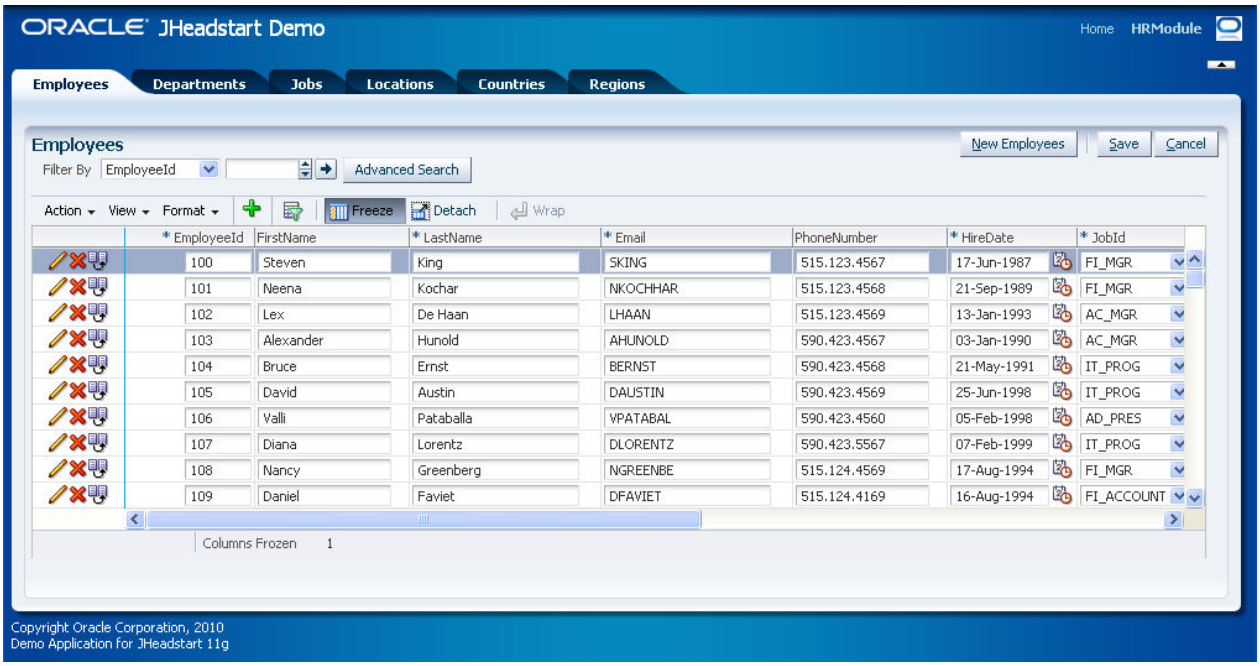
When generation has finished, you will be presented with an outcome message. Click OK and save all files in JDeveloper.

Run the Application

Run the `ViewController` project by selecting it in the application navigator and then pressing F11 (or clicking on the toolbar run icon (). A dialog pops up (after a while) where you can choose the default run activity for the unbounded task flow. Choose the Home activity and click **OK**. JDeveloper will then startup the embedded WebLogic server (this may take some time), deploy your web application to the WebLogic Server and start the application with yoyur default browser. You will be presented with the following screen in your browser:



You will get the default Home page, with a menu showing all services available (only one in this tutotial). Note that you can easily customize this home page, as well as the menu entries shown.
Click on the HRModule tab, you should see a page like below.

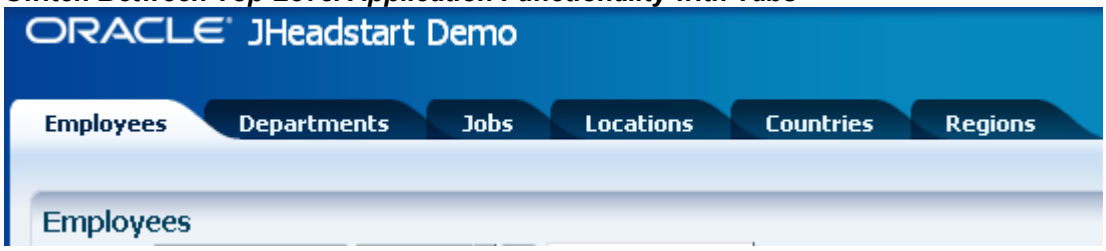


Observe Default Application Functionality

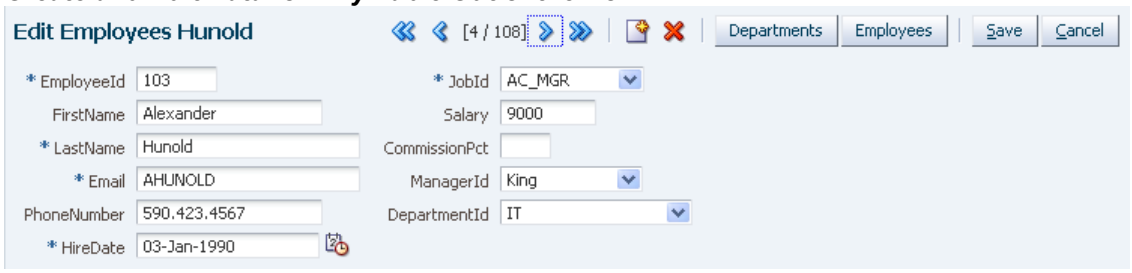
By playing with the default application yourself, you can experience some of the built-in features that Oracle ADF and JHeadstart support by default, and which the Oracle JHeadstart Application Generator generates for you based on your declarative service definition file.

Highlights of these features include:

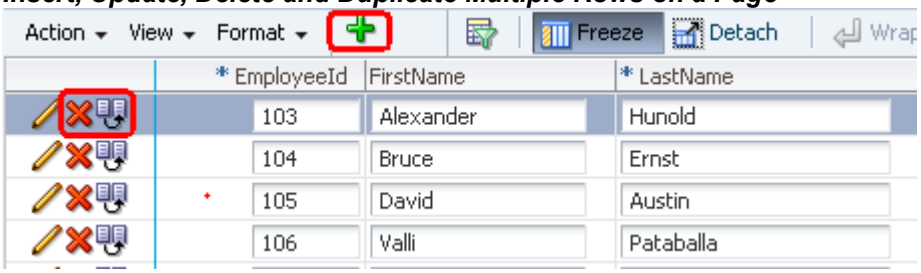
- ***Switch Between Top-Level Application Functionality with Tabs***



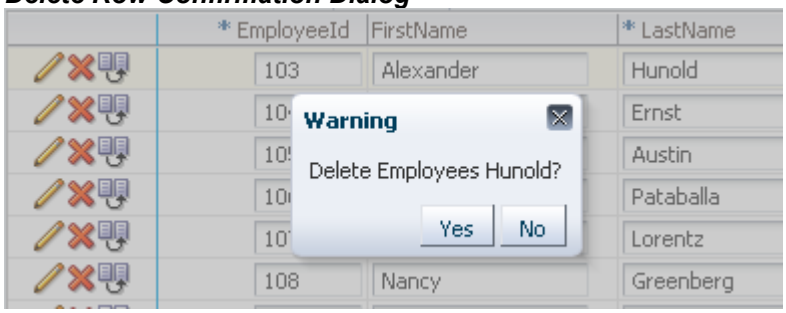
- ***Create and Edit Data for Any Table Out of the Box***



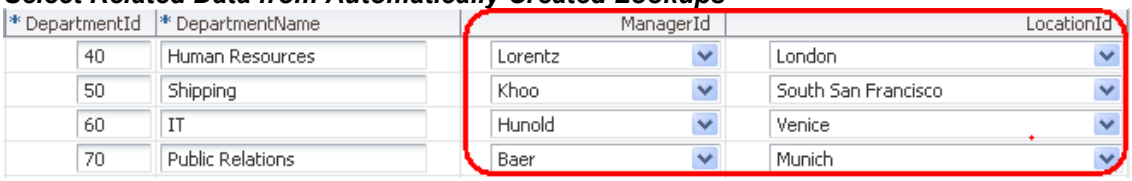
- ***Insert, Update, Delete and Duplicate Multiple Rows on a Page***



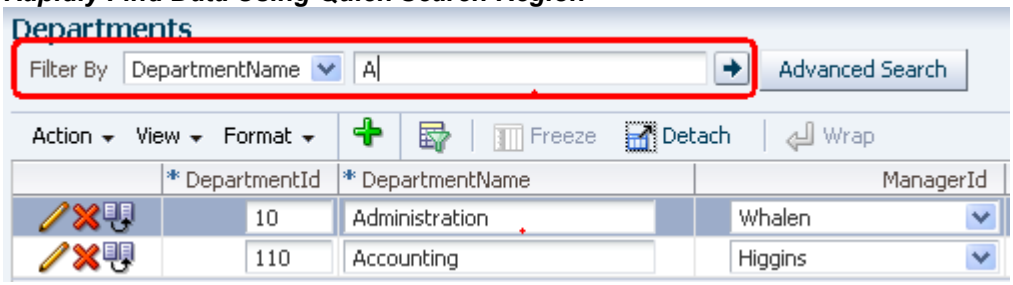
- ***Delete Row Confirmation Dialog***



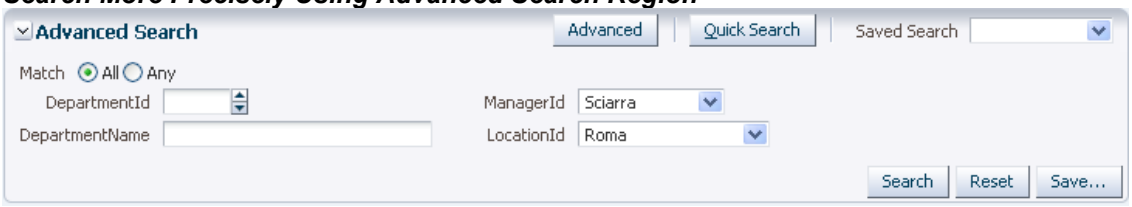
- ***Select Related Data from Automatically Created Lookups***



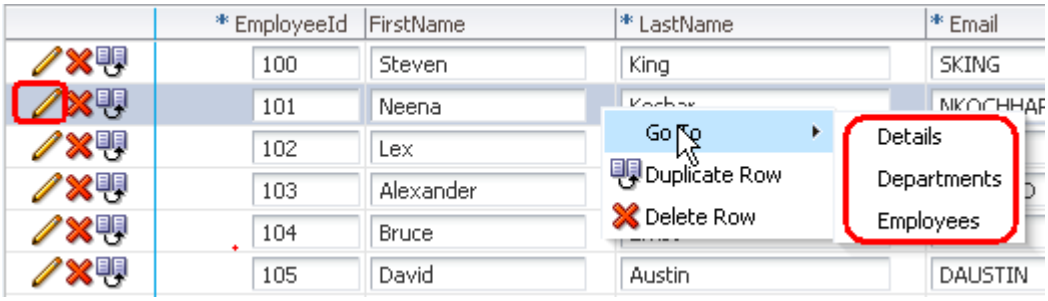
- ***Rapidly Find Data Using Quick Search Region***



- ***Search More Precisely Using Advanced Search Region***

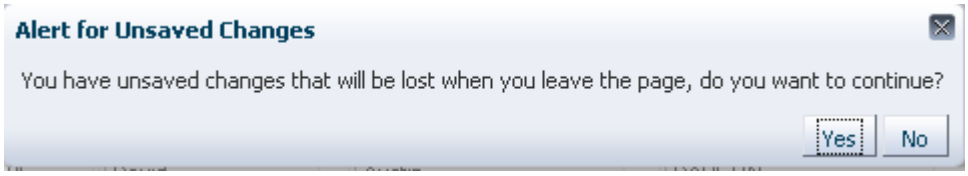


- ***Browse Data and Drill-Down to Details or Related Information***

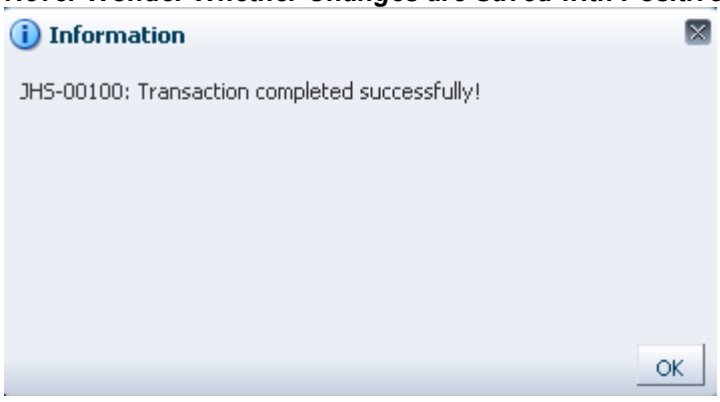


- ***Automatic "Breadcrumbs" Provide User Hierarchical Navigation Assistance***

- ***Avoid Accidentally Losing Pending Changes When Switching Top-Level Application Function***



- ***Never Wonder Whether Changes are Saved with Positive User Feedback***



Under the covers: While running the generated web application, you might have noticed that the URL in the browser window does not change if you navigate between the various tabs within the HRModule service. This is because JHeadstart generates by default a so-called one-page application. There is one `UIShell` page based on an ADF Faces page template, and within this `UIShell` page an ADF Faces dynamic region is used to display actual page content. When clicking on a menu tab, the current region displayed within the dynamic region switches. Each region displays a bounded taskflow with page fragments. The advantages of this structure include:

- Optimal performance: only the dynamic region part of the page needs to be refreshed when clicking on another menu tab, and user actions within a region only update the region in the page, not the page as a whole.
- Optimal reuse: Since bounded taskflow based on page fragments can be embedded in any page using an ADF faces (dynamic) region, it very easy to reuse JHeadstart groups acrross pages, as we will see later in this tutorial. Furthermore, using drag-and-drop, it is as easy to include a JHeadstart-generated taskflow as a region in a handbuilt page. In summary: JHeadstart generates a menu-driven application out of the box, but you can easily reuse the generated artifacts in other user interaction patterns, for example in a workflow-driven application where the transactions are launched from a personal task list.

4. Change Layout Styles and Query Behavior

In this step of the demo, we'll change a number of declarative application definition properties about the `Employees`, `Departments`, `Jobs`, and `Regions` groups to affect how the JHeadstart application generator generates the web tier pages. We'll wait until making them all before re-running the application generator.

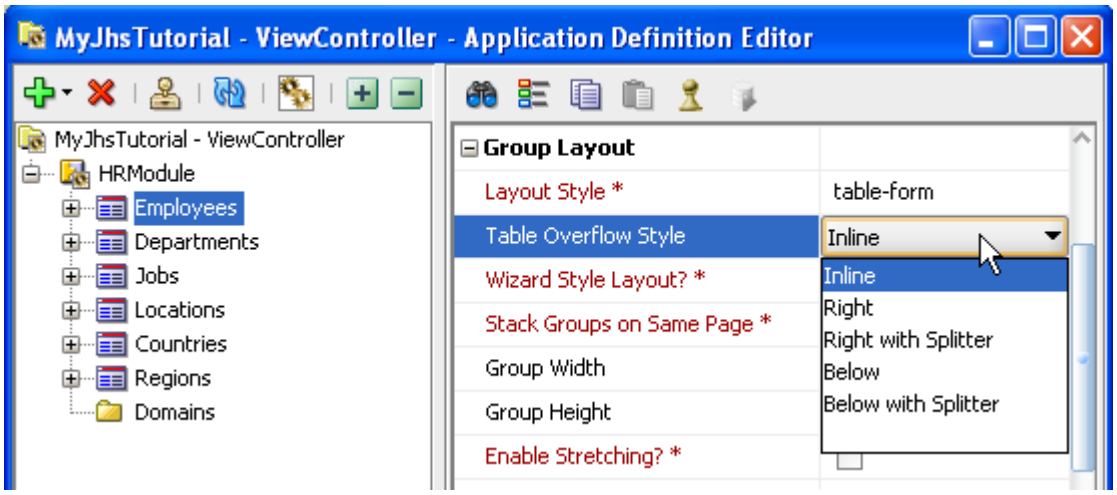
To make the changes described here, make sure you have the JHeadstart Application Definition Editor open. If you don't, just select your `ViewController` project and select **Edit JHeadstart Application Definition** from the right-mouse menu.

Tip: Since the JHeadstart Application Definition Editor dialog is modeless, you can keep it open and Alt+Tab between it and the main JDeveloper IDE window.

4.1. Change How Employees Group Gets Generated

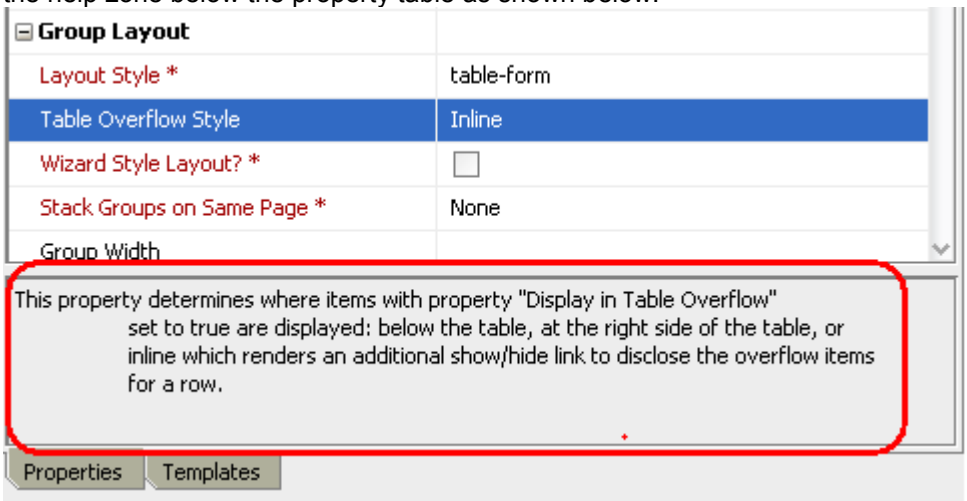
Use an Inline "Table Overflow" Area to Hide Less Common Employee Fields

As shown in the figure below, in the `Employees` group, set the **Table Overflow Style** property (in the Group Layout category) to the value "inline".

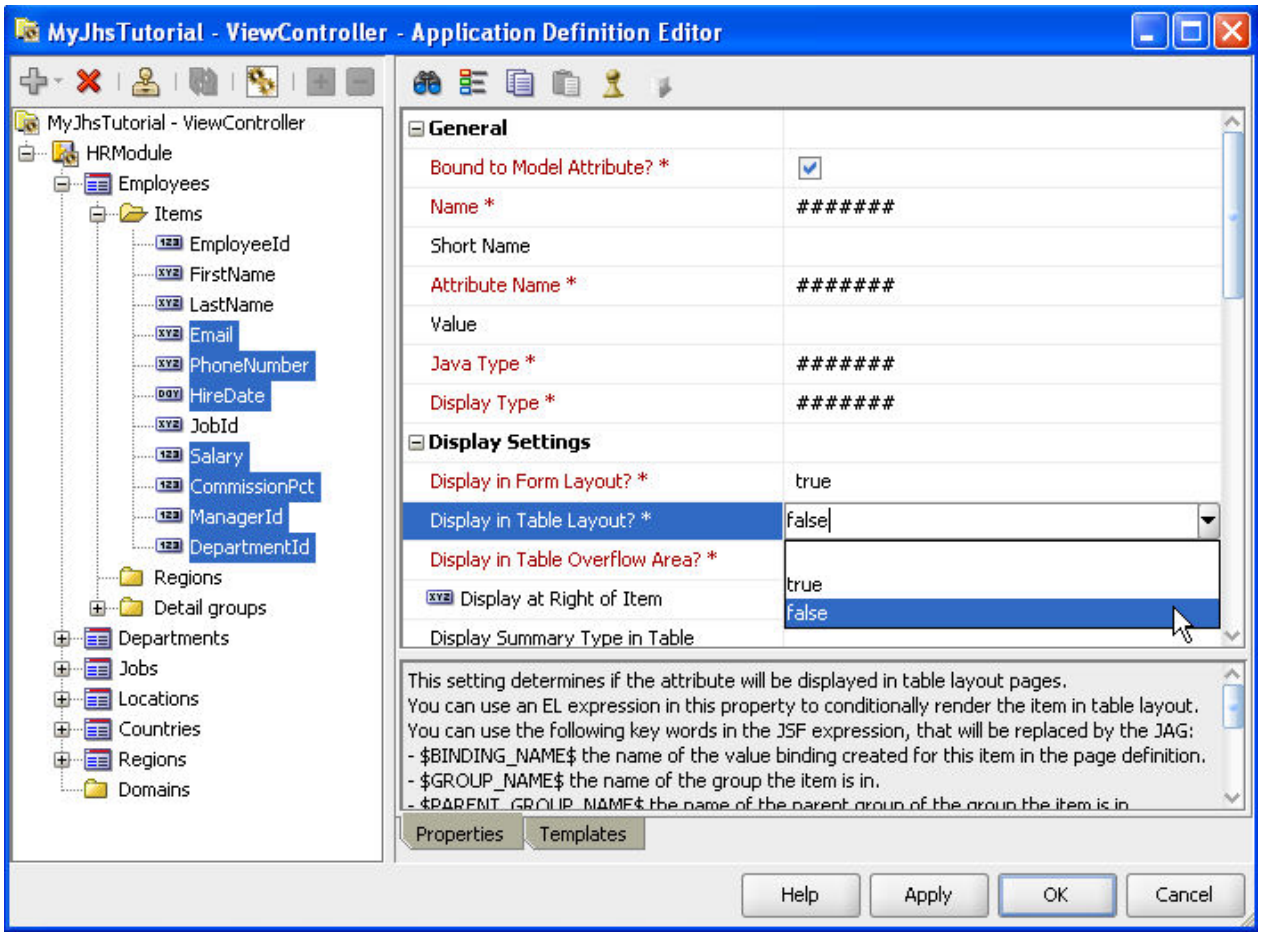


Tip: If you have trouble finding a property, you can click on the "Binoculars" search icon in the JHeadstart Application Definition Editor and type in some characters of the name you're looking for

Tip: Every property in the JHeadstart editors is documented with a helpful usage message in the help zone below the property table as shown below.



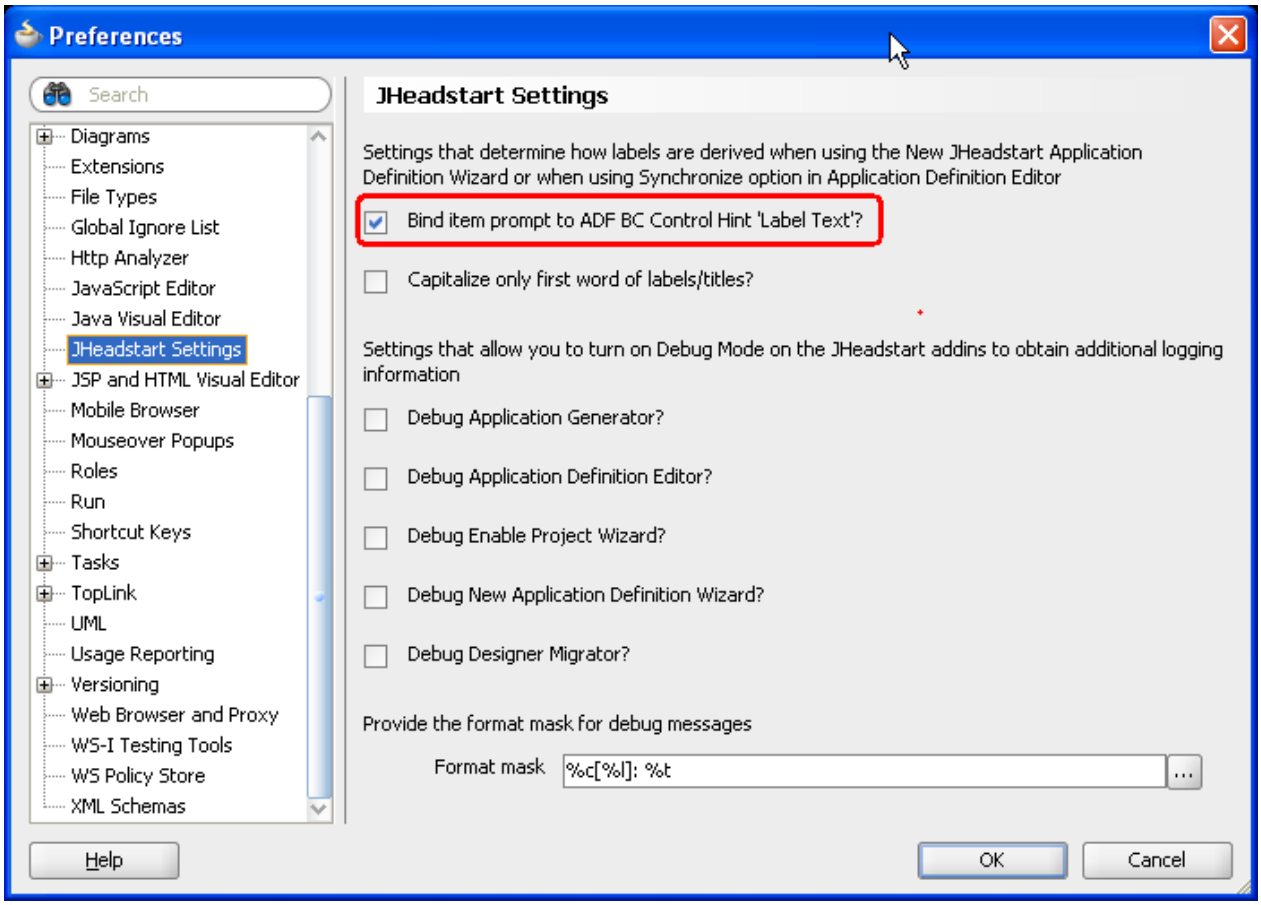
Next, we need to indicate which attributes should be hidden by default when displayed in a table. To accomplish this, expand the *Employees* group and its **Items** folder to see the names of the items in that group. The default application definition includes an item for each attribute of each view object in the data model. Set the **Display in Table Layout?** property (in the **Display** `Settings` category) to `false` for all attributes except: `EmployeeId`, `FirstName`, `LastName`, and `JobId`. As shown below, we can multi-select attributes using the mouse in combination with the **Shift** or **Control** keys, then set the desired property.



Next, on the same set of attributes, set the **Display in Table Overflow Area?** property to true.

Set the Prompt of DepartmentId to be More User-Friendly

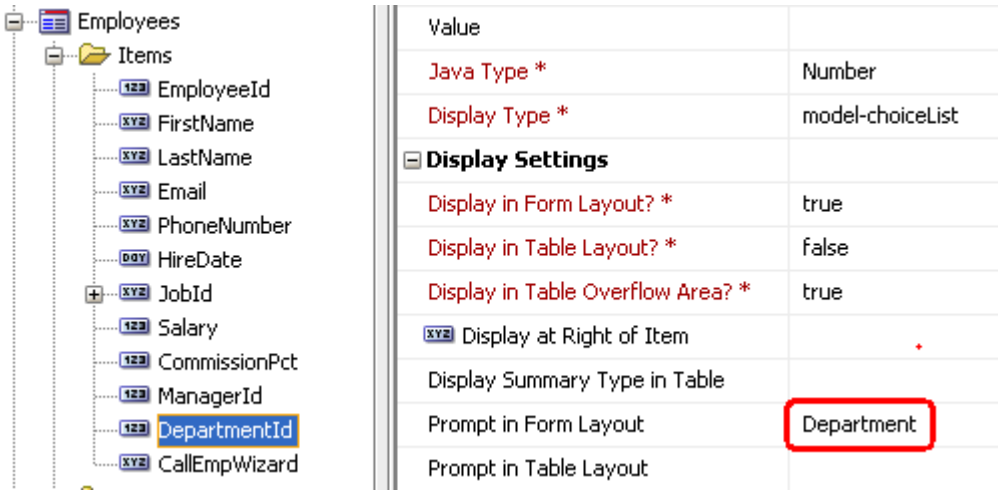
The **Prompt in Form Layout** property of all items is set to **#{$HINTS$.label}.** This will generate the appropriate EL expression to retrieve the prompt from the Label UI Hint that can be set against the underlying View Object attribute or Entity Object attribute. By default, JHeadstart uses the Label UI Hint but this can be changed. If you go to the **Tools** menu in JDeveloper and then choose **Preferences…** you can click on JHeadstart Settings.



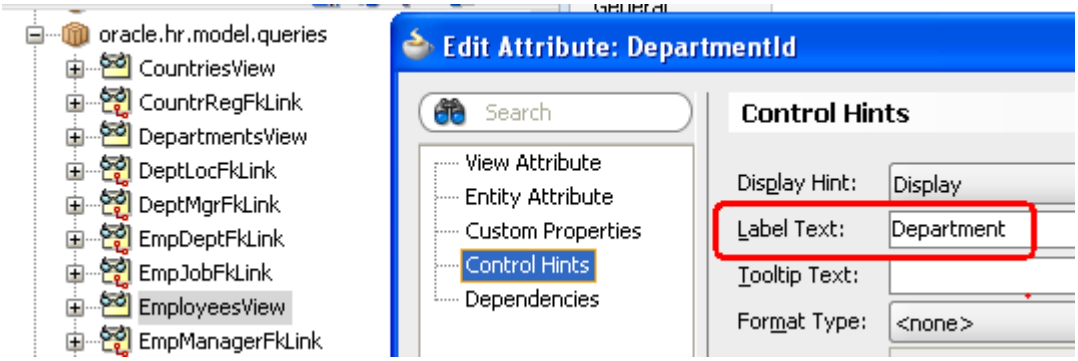
In this panel, the checkbox option **Bind item prompt to ADF BC Control Hint "Label text"?** determines this behavior. When you run the New Service Definition wizard with this checkbox checked, it will create the above EL expression that references the UI Hint. When unchecked, it will set the **Prompt in Form Layout** property to the name of the attribute (or current Label Hint of this attribute if already set).

Now, you can easily switch this behavior later on for a group. If you change the setting of this JHeadstart Preference, and then use the **Synchronize** ( )button in the JHeadstart Application Definition Editor, JHeadstart will update the **Prompt in Form Layout** property or **Label Text** UI Hint accordingly.
We can also use this synchronize feature to quickly update the Label text UI Hint in the View Object attribute *through* the JHeadstart Application Definition Editor, which you are going to do now:

- Change the **Prompt in Form Layout** property of `DepartmentId` item to "Department".

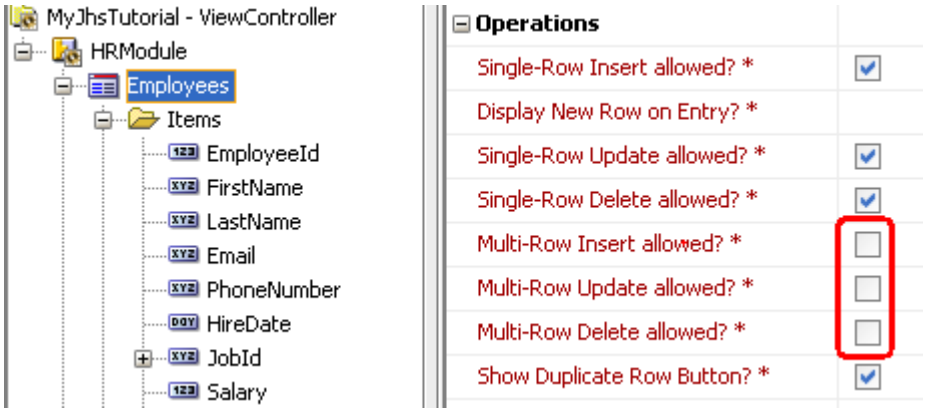


- Select the `Employees` group in the navigator, and click the **Synchronize** button.
- Click again on the `DepartmentId` item and notice that the value of the **Prompt in Form Layout** property has been reset to **#{$HINTS$.label}.**
- Go to the Model project, click on the `EmployeesView` View Object, select the `DepartmentId` attribute, click the edit icon and then click the Control Hints tab. You will see that JHeadstart has updated the Label Text property with the value you entered in the JHeadstart Application Definition Editor.



Make the Table Display for Employees be Browse-Only

Select the `Employees` group and, as shown below uncheck the **Multi-Row Insert Allowed, Multi-Row Update Allowed** and **Multi-Row Delete Allowed** checkboxes. These properties are in the Operations category.

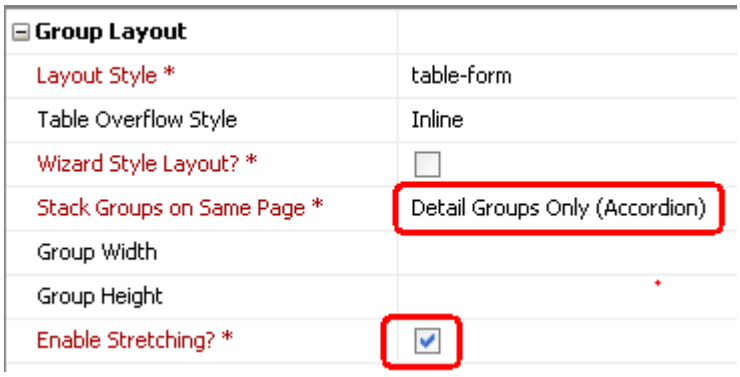


Default the Quick Search Item to an Employees Last Name

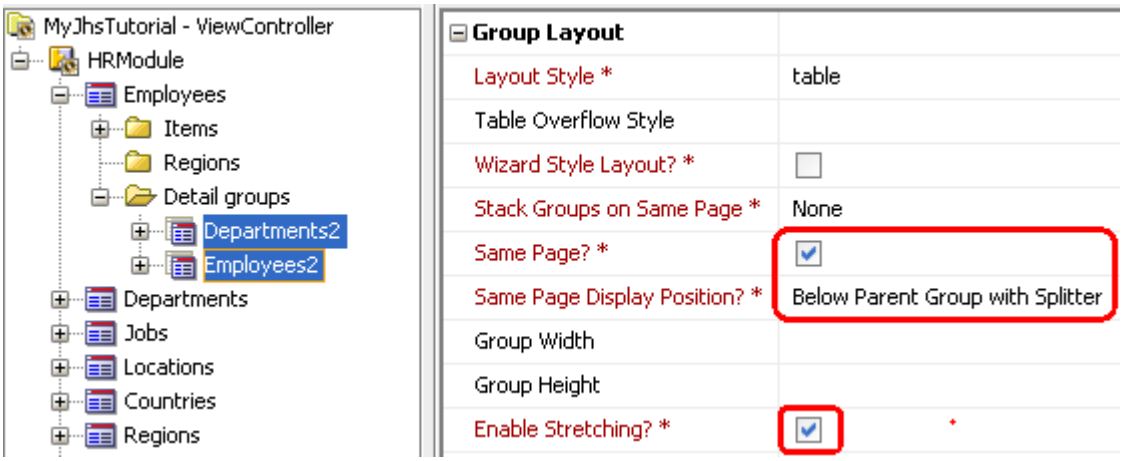
Set the **Single or Default Search Item** property to `LastName`, as shown below.

Cause Child Groups to Display in Accordion on the Same Page

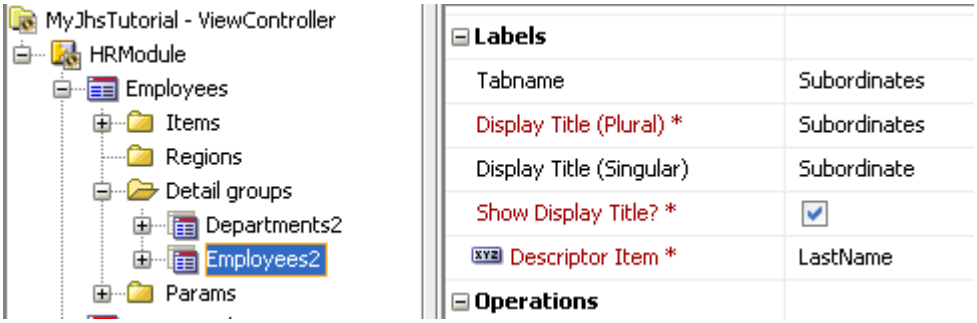
As shown below, set the **Stack Detail Groups on Same Page?** property to "Detail groups Only (Accordion) and check the checkbox property **Enable Stretching?**.



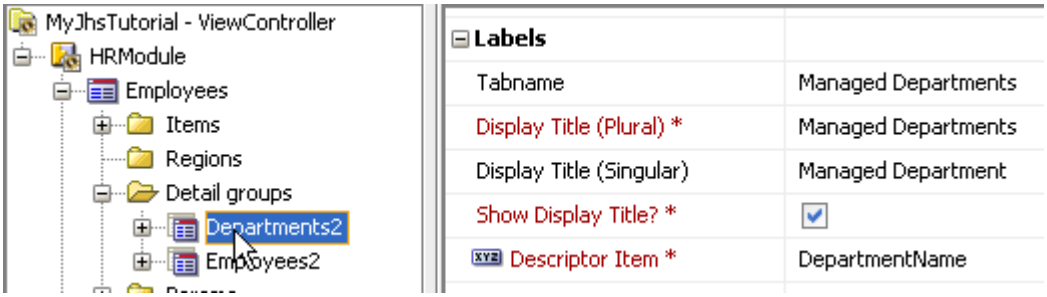
Expand the top-level Employees group and its Detail Groups folder. As shown below, check the **Same Page?** property of all the detail groups of Employees. Set the property **Same Page Display Position** to "Below Parent Group With Splitter". Also check the **Enable Stretching?** property.



Select the `Employees2` group and set its **Tabname**, **Display Title (Plural)**, and **Display Title (Singular)** properties (in the Labels category) as shown below. Since this group represents employees managed by the current employee in the Employees group, we choose a more understandable name like "Subordinates".



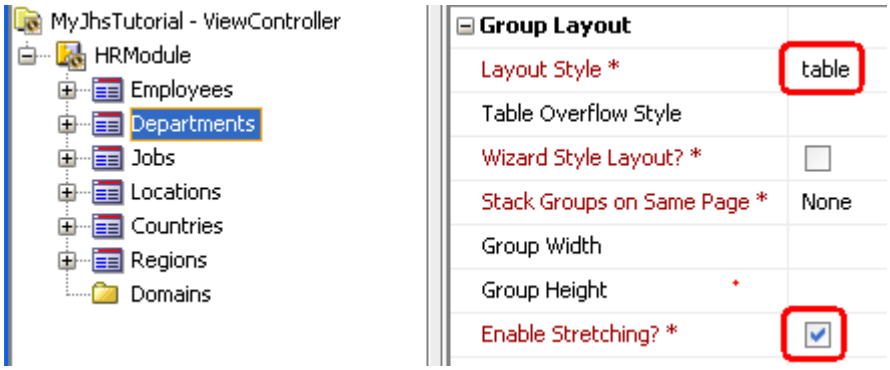
Repeat the same steps to change the **Tabname**, **Display Title (Plural)**, and **Display Title (Singular)** properties of the `Departments2` group to be "Managed Departments" as shown below.



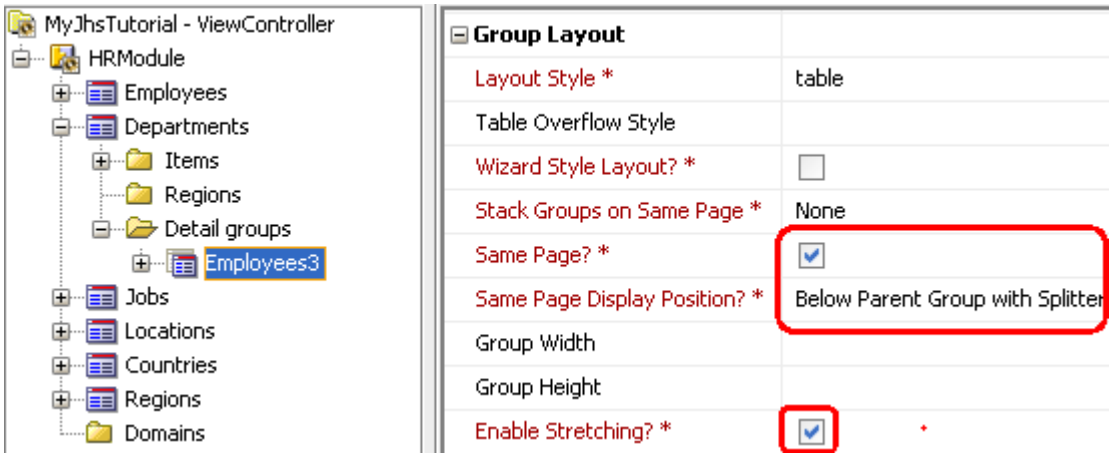
4.2. Change How the Departments Group Gets Generated

Display Employees in Department on Same Page, Separated by a Splitter

Change the **Layout Style** of the `Departments` group to `table`, and check the **Enable Stretching?** checkbox.



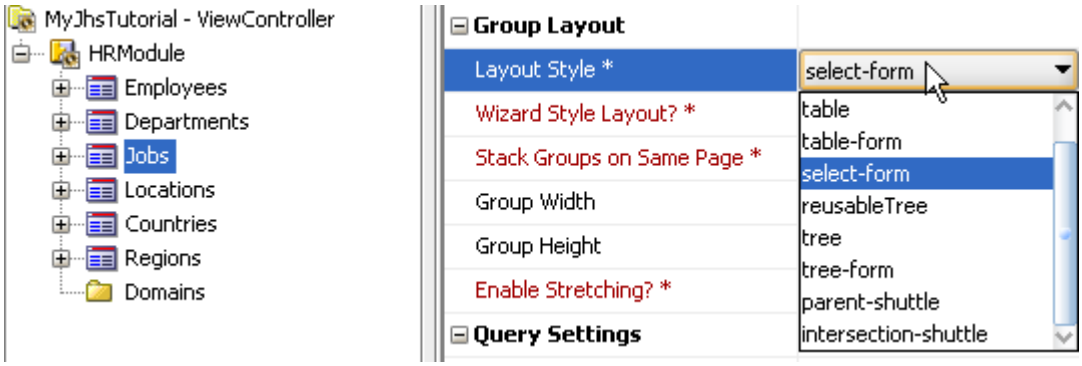
In child group `Employees3` set the **Same Page Display Position** as shown below and check the **Same Page** checkbox and **Enable Stretching** checkbox in the Group Layout category.



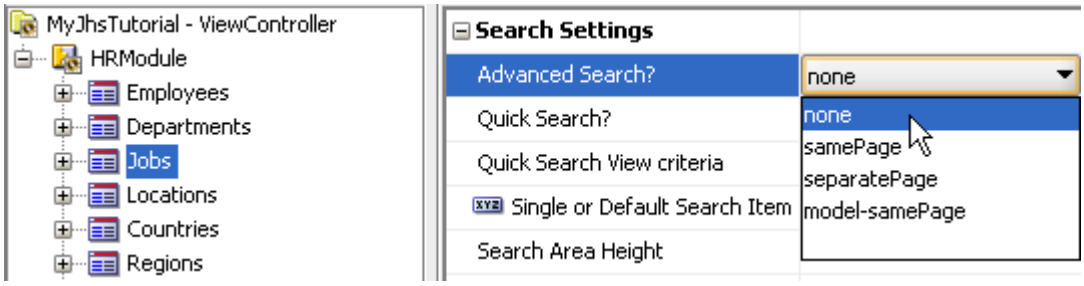
4.3. Change How the Jobs Group Gets Generated

To apply the changes in this section, make sure you've selected the top-level `Jobs` group in the JHeadstart Application Definition Editor.

Allow End-User to Select Job to Edit Using a List Display
As shown below, select the `Jobs` group and set its **Layout Style** property to `select-form`.

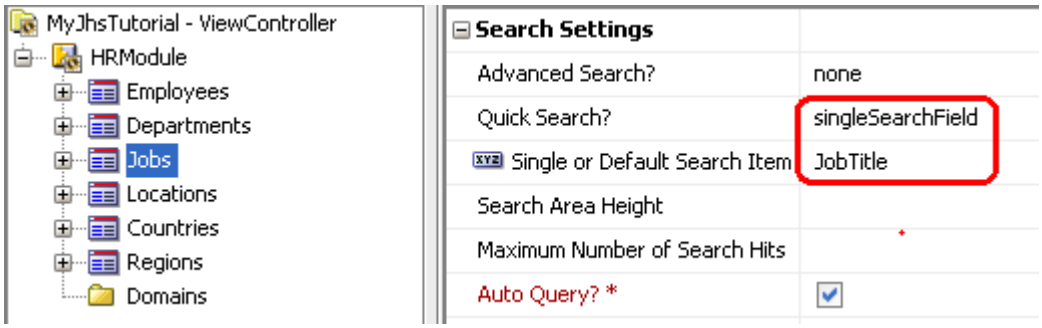


Disable Advanced Search for Jobs
As shown below, set the **Advanced Search?** property of the Jobs group to none. The property is in the Search Settings category.



Limit Quick Search Feature to the JobTitle Field

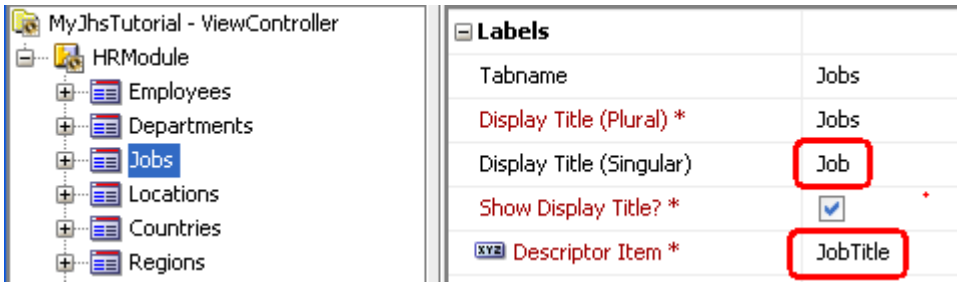
Set the **Quick Search?** property of the `Jobs` group to `singleSearchField` and the **Single or Default Search Item** to `JobTitle` as shown below.



Define JobTitle as the Descriptor Item for the List

For each group you can specify the attribute JHeadstart will use to show context information. This attribute is called the descriptor item. The New JHeadstart Service Definition Wizard derives a default descriptor item for each group based on its underlying view object. If you want to use a different attribute, just set the **Descriptor Item** property yourself to the attribute name you prefer.

As shown below, set the **Descriptor Item** property of the `Jobs` group to `JobTitle`. And set the **Display Title (Singular)** to `Job`.

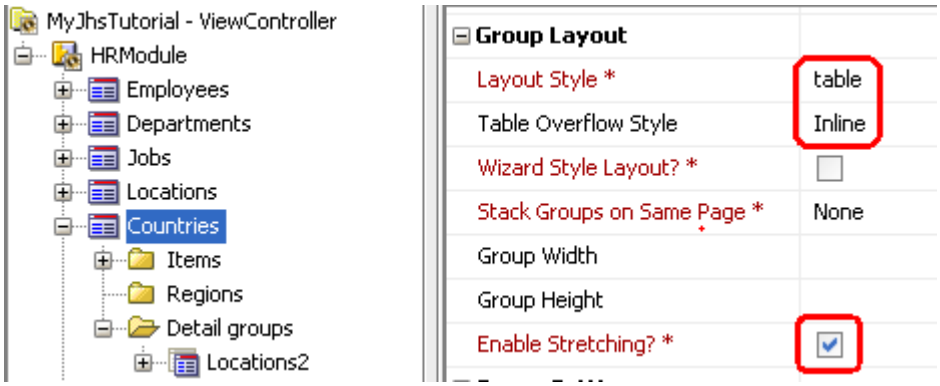


4.4. Change How the Countries Group Gets Generated

We'll change the `Countries` group and its `Locations2` child group to display as a table with a nested table display.

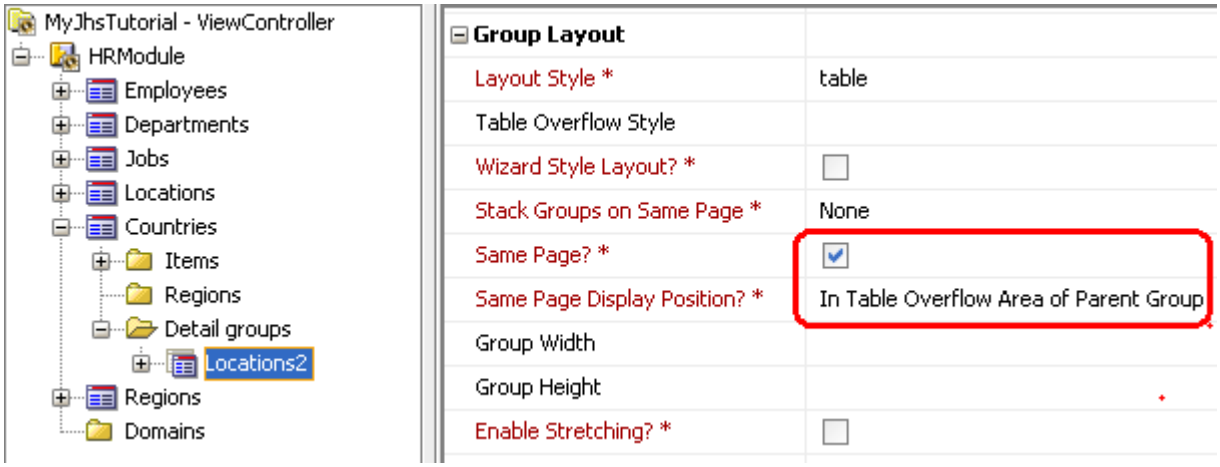
Set Layout Style of Countries Group to 'Table' with Inline Table Overflow

As shown below, change the **Layout Style** of the `Countries` group from `table-form` to just `table` instead. This will avoid having a drill-down detail form along with the table. Also, check the **Enable Stretching?** Checkbox and set the **Table Overflow Style** to `Inline`.



Set Child Locations2 Group to Display on Same Page as Parent

As shown below, check the **Same Page?** property of the `Locations2` child group and set the **Same Page Display Position** to `In Table Overflow Area of Parent Group.`

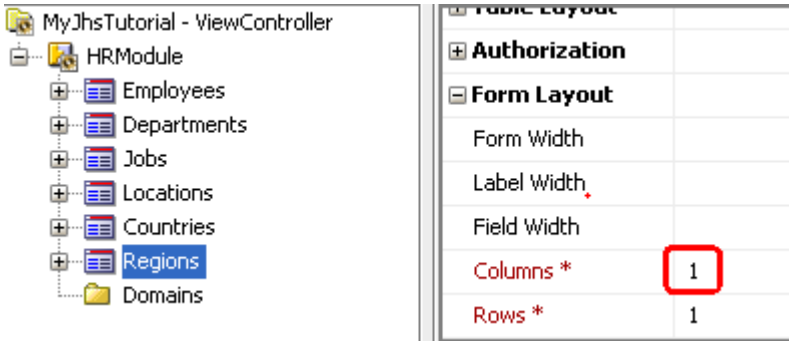


4.5. Change How the Regions Group Gets Generated

We're going to change the Regions group, and its four child groups, to display as a tree with multi-level form editing by doing the following steps...

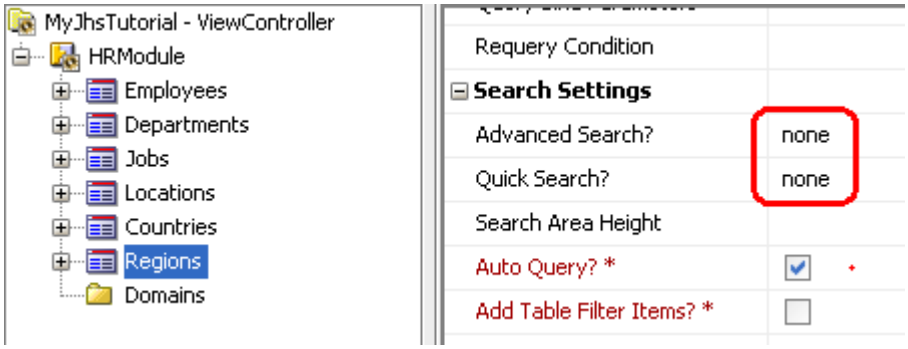
Make Regions Edit Fields Layout in a Single Column

As shown below, set the **Columns** property of the `Regions` group to 1 in the **Form Layout** category.



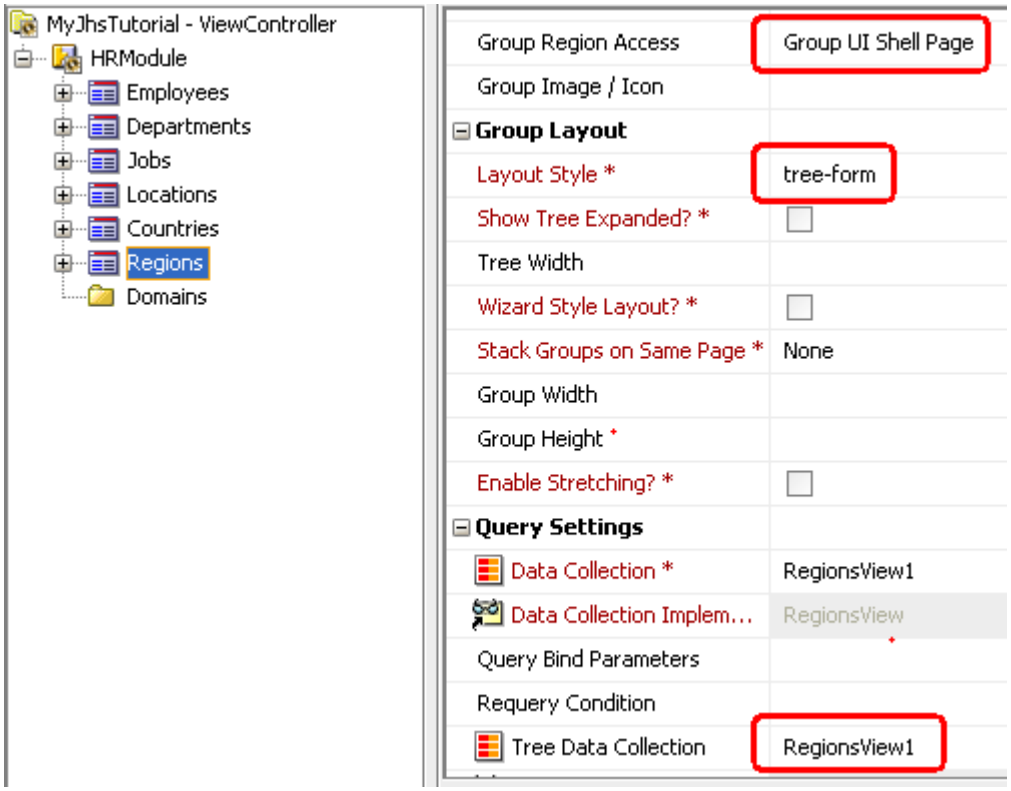
Disable Searching on Regions Group

The user will see all the regions in the tree so searching won't be that useful in this case. We'll disable both Quick Search and Advanced Search for the `Regions` group by setting the **Quick Search** and **Advanced Search** properties both to none as shown below.



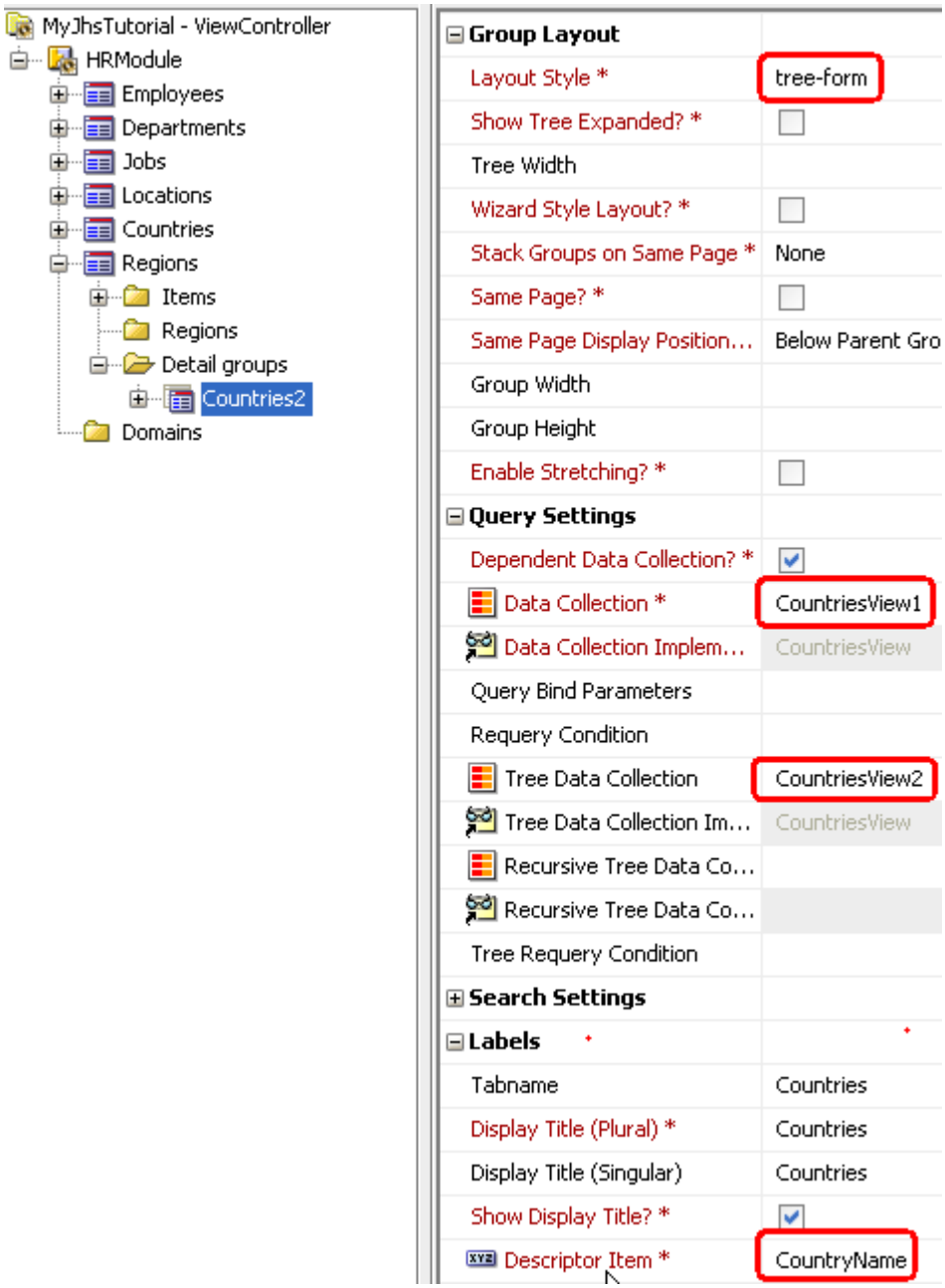
Change Regions Group to Display as a Tree with Edit Form

As shown below, start by setting the **Layout Style** property to tree-form, set the **Tree Data Collection** to RegionsView1, and set the **Group Region Access** to `Group UI Shell Page`



Change Countries2 Group to Display as a Tree with Edit Form

Next we setup the `Countries2` child group to also display as a tree by setting the four properties as shown in Figure 63. Specifically, we set the **Layout Style** to `tree-form`, the **Data Collection** to `CountriesView1`, the Tree Data Collection to `CountriesView2`, and the **Descriptor Item** to `CountryName`.



Repeat to Change Departments3 and Locations4 Child Groups to Tree

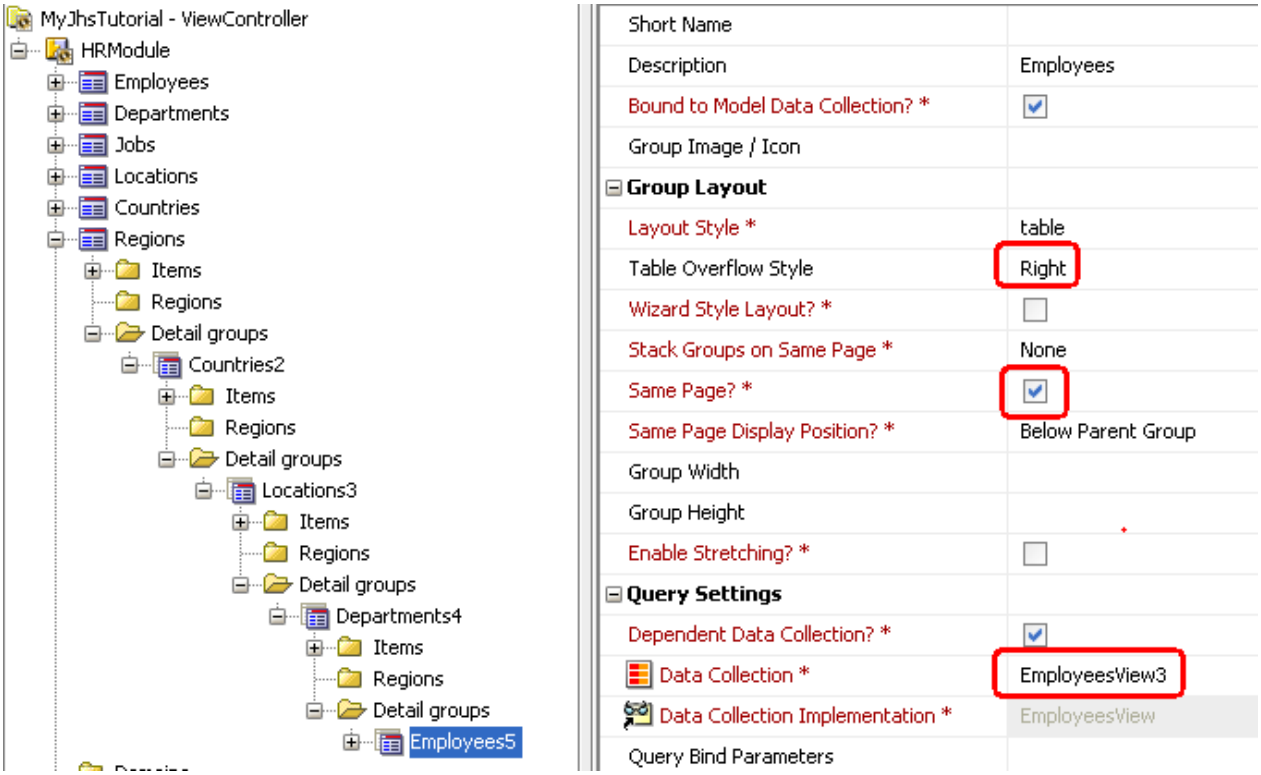
After selecting the 3rd-level child group `Locations3`, we set its **Layout Style** to `tree-form`, its **Data Collection** to `LocationsView1`, the **Tree Data Collection** to `LocationsView3`. The **Descriptor Item** is already defaulted to City, so we don't need to change it.

Next, after selecting the 4th-level child group `Departments4`, we set the **Layout Style** to `tree-form`, the **Data Collection** to DepartmentsView1, the **Tree Data Collection** to `DepartmentsView4`. The **Descriptor Item** is already defaulted to `DepartmentName`, so we don't need to change it.

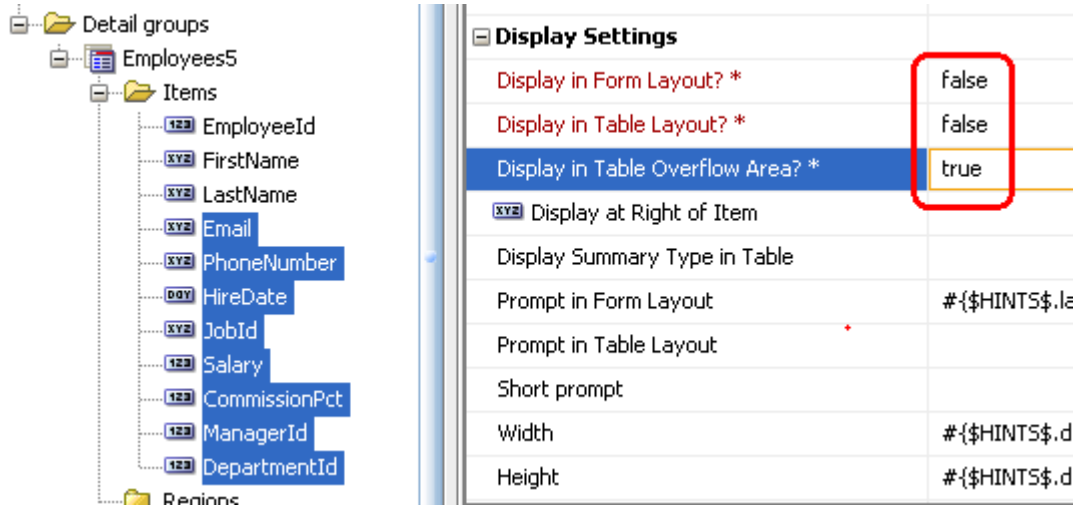
Change Employees5 Group to Display with Departments4 and Overflow Right

The last child group, Employees5, will be displayed together with its parent group Departments4. We will also configure the Employees5 group to display some items at the right of the table, using tabs.

Select the `Employees5` group, and make the changes as shown below.

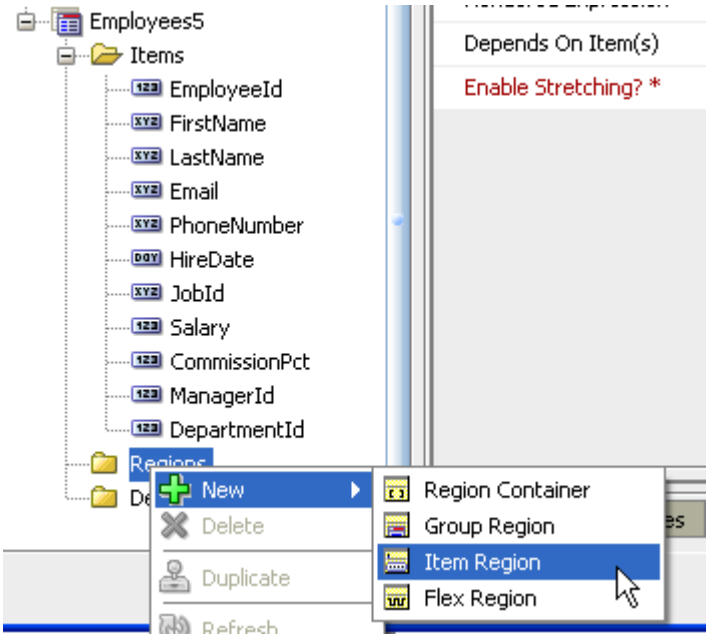


For all items except EmployeeId, FirstName, and LastName, as shown below set **Display in Table Layout?** to false and **Display in Overflow Area?** to true.

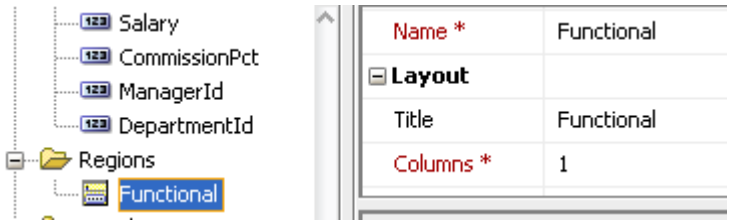


Show Employees5 Overflow Items Using Tabs

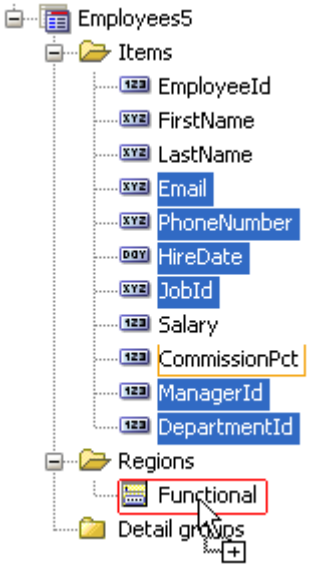
We will group the overflow items in two tabbed regions. Right-mouse-click on the Regions node in the Employees5 group, and choose **New -> Item Region.**



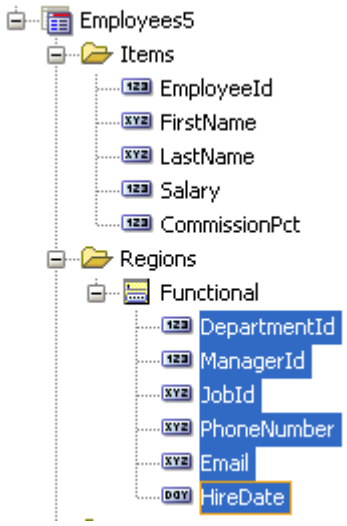
Set the **Name** and **Title** of the new item region to `Functional`.



Now select all overflow items except `Salary` and `CommissionPct`, and drag and drop them into the Functional item region, as shown below.

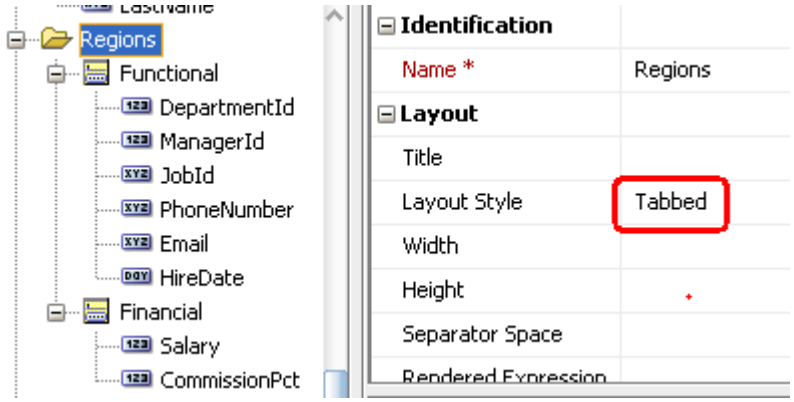


When you release the mouse, the `Employees5` group should look like below.



Now, create a second item region with **Name** and **Title** set to `Financial`, and drag and drop the `Salary` and `CommisionPct` items into this item region.

Finally, set the **Layout Style** of the `Regions` container in the `Employees5` group to `Tabbed` as shown below.



4.6. Regenerate and Run the Application

At this point we're done making our goodly number of iterative, declarative changes to the application definition, so all that's left is to regenerate the application using the JHeadstart application generator, and running it to see the effects of our changes.

Regenerate the Application

From the JHeadstart Application Definition Editor, click the Run the JHeadstart Application Generator toolbar button (). Alternatively, you can select your `ViewController` project in the Application Navigator and choose **Run JHeadstart Application Generator** from the right-mouse menu. When completed, the **Generation Finished** alert will appear confirming the generation has finished successfully with warnings. You can ignore the warning you get about the usage of **Layout Style** tree-form for this tutorial.

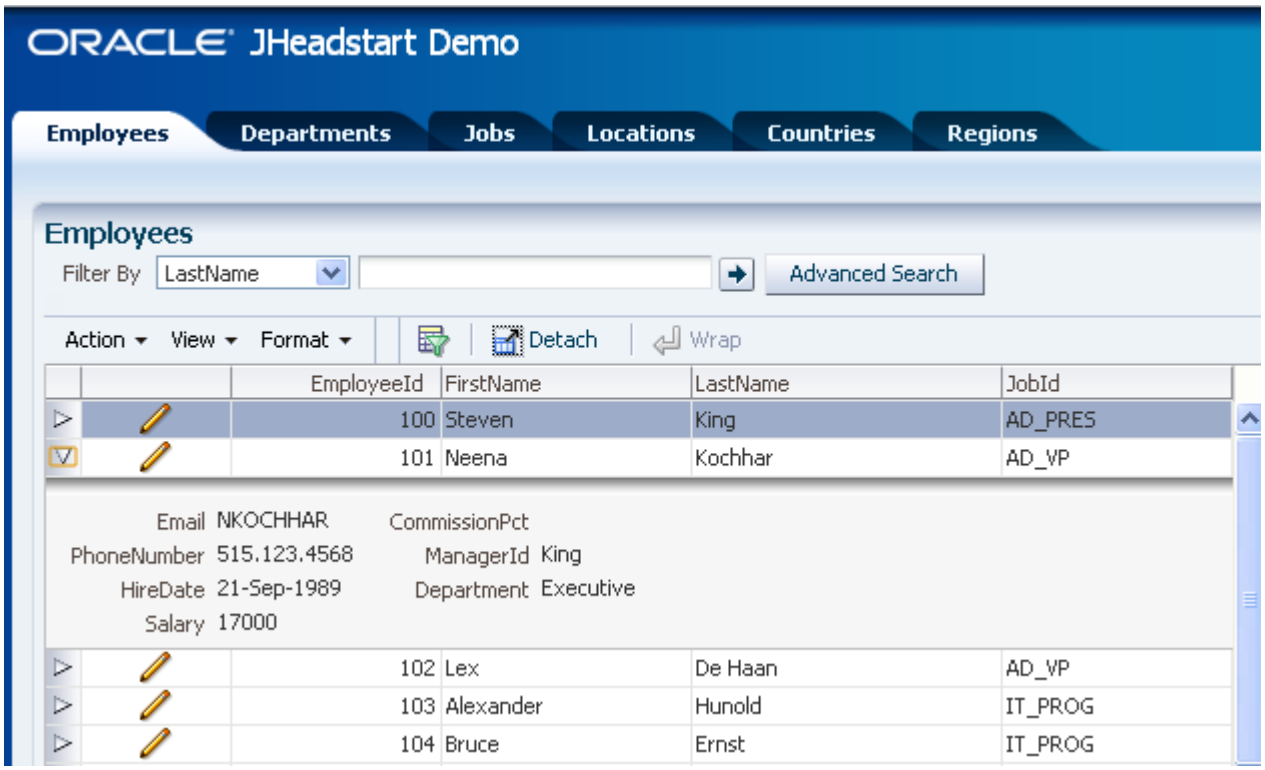
Run the Application

Run the `ViewController` project by selecting it in the application navigator and then pressing F11 (or clicking on the toolbar run icon).

After regenerating, once the application is running in your default browser, we can try the following things to see how our changes to the application definition were realized in the generated pages...

Employee Table is Browse-Only with Detail Disclosure

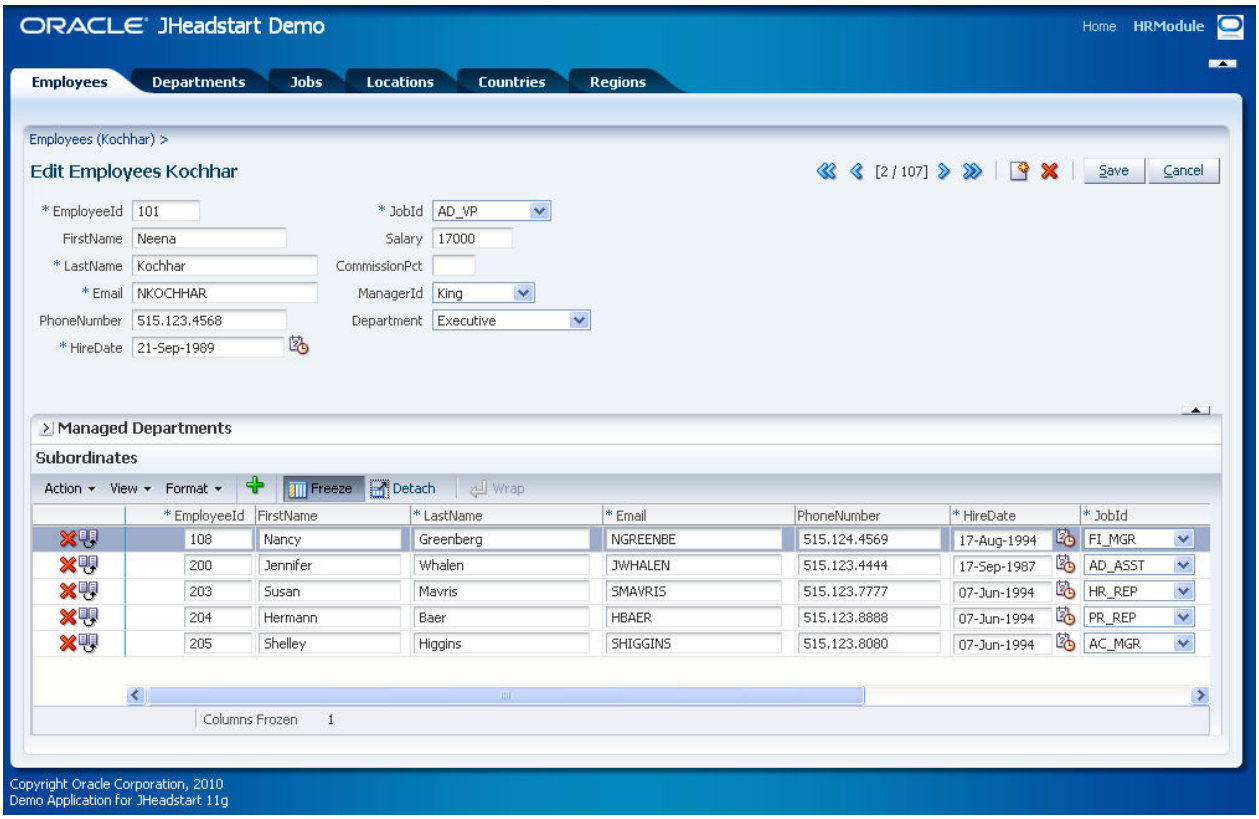
As shown below, the Employees table is now browse-only and supports a Hide/Show icon in each row to expand or collapse the visibility of the less frequently used detail information. Note that the table stretches vertically. If you resize the browser window, you will see that the table size auto adjusts to fit in the browser window. The default search item is set to `LastName`. The prompt of the `DepartmentId` item is now `Department`.



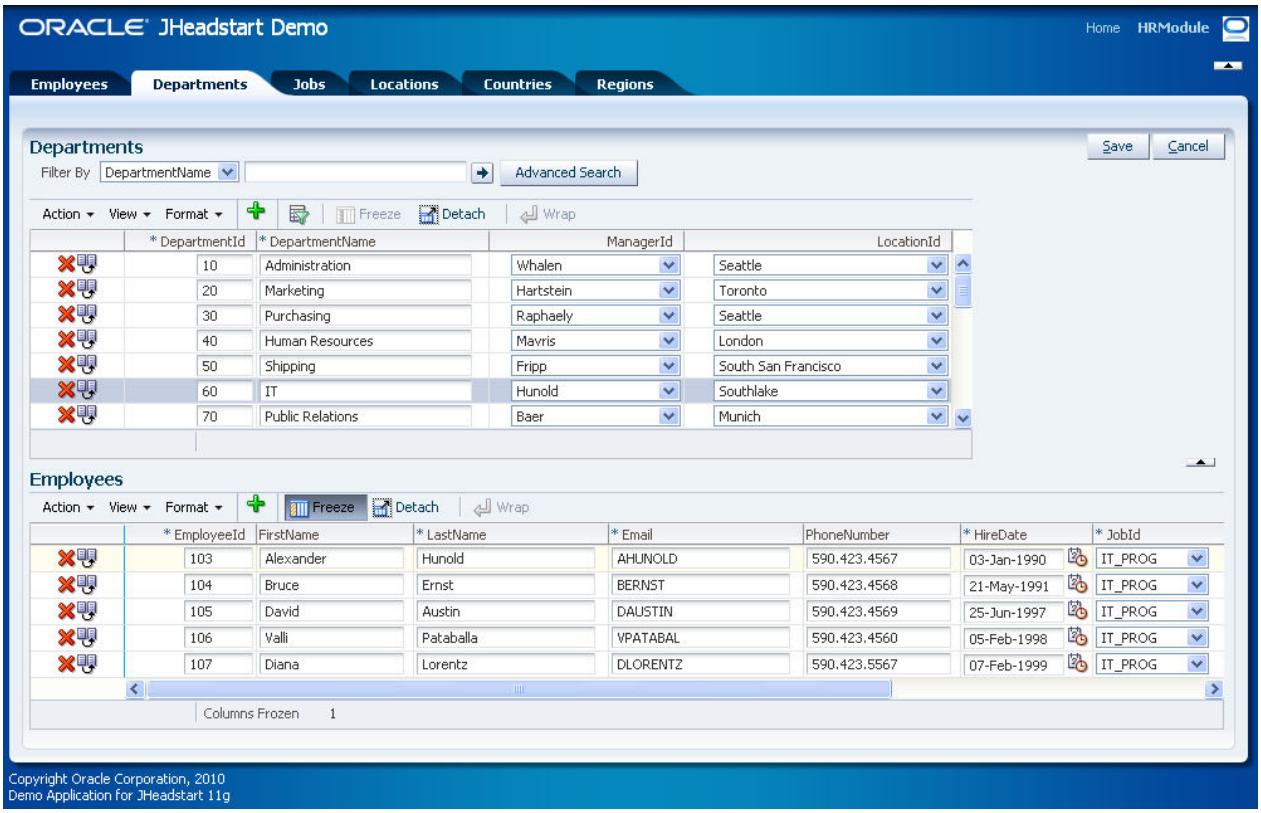
Also note in the expanded detail information that the prompt for the DepartmentId field is now Department as we set above.

Customized Child Group Tab Names Appear on Same Page as Employee Detail

Selecting an employee with subordinates like `Neena Kochar`, and clicking on the Edit button to drill-down to her employees detail form, you can see as shown below that the "Subordinates" and "Managed Departments" child groups appear on the same page and stacked into an accordion with our customized tab names. You can use the splitter to resize the space taken by the employee detail information. A vertical scrollbar will appear if the items no longer fit the available space.



User Works with Employees in Department on Same Page, with Splitter to Resize the Tables.
Click on the Departments tab, you will see the departments table and employees table, separated by a splitter. Click on a department row and notice how the employees table is refreshed to se the employees within the selected department. Note how you can use the splitter to allocate more space to either the departments table or employees detail table.

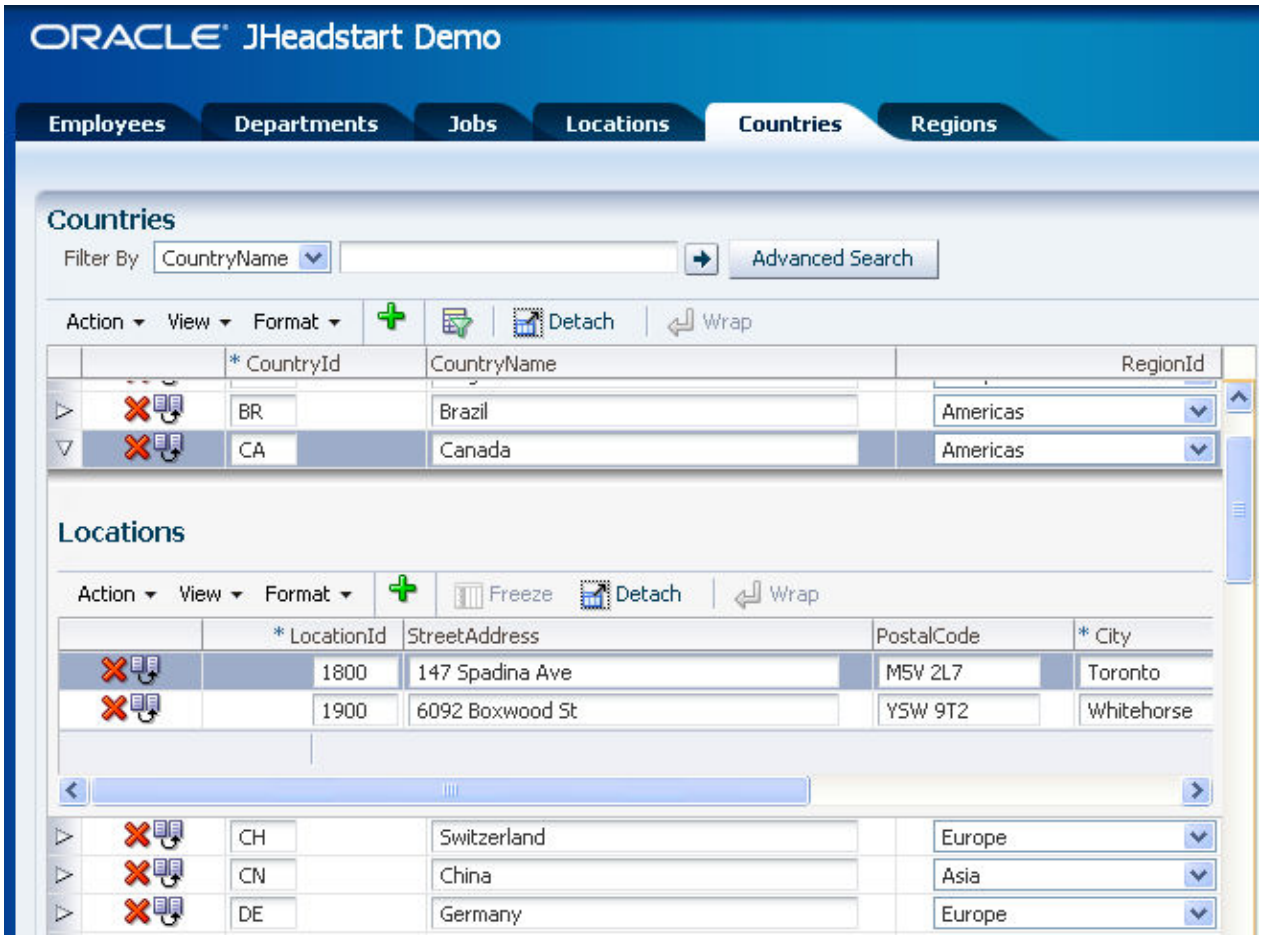


User Selects Job to Edit from Simple List

Click on the Job tab and notice, as shown in Figure 71, that instead of the default table display to browse and select a Job to edit, the user now just selects the job name to edit from a simple list. Clicking on the (Edit) button brings you to the edit page for that job.

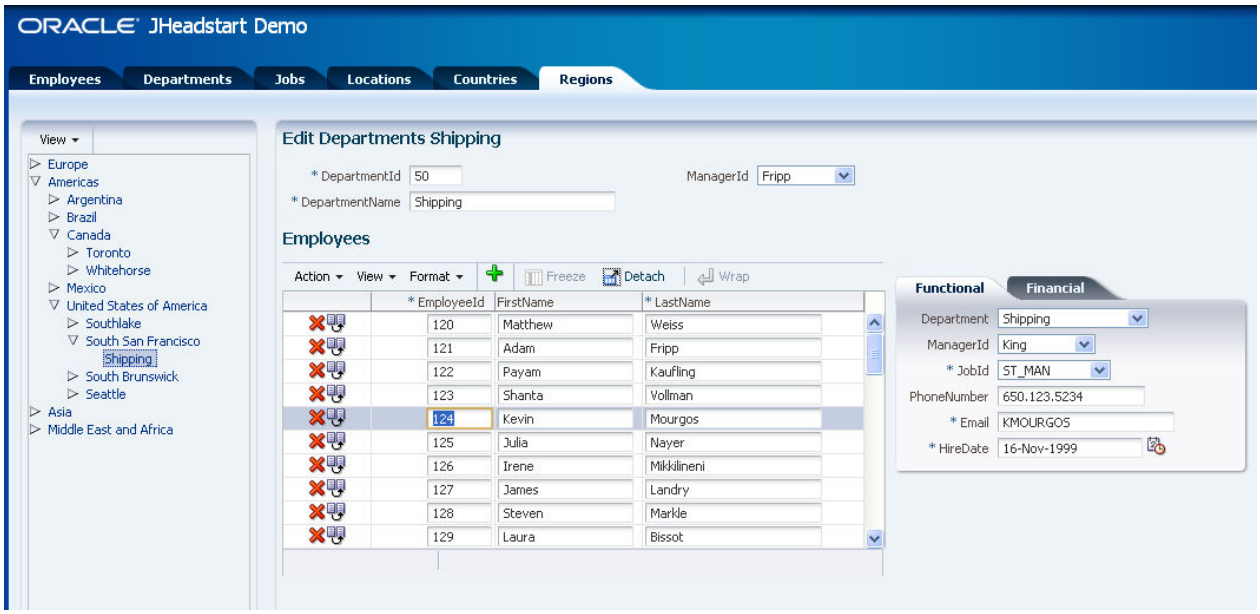
Countries Table Displays with Inline Locations Table

As shown below, visiting the Countries tab, you can expand the inline table overflow area to see that the Locations table displays on the same page and as an inline, editable table.



User Navigates Five-Level Hierarchy Using Tree Display

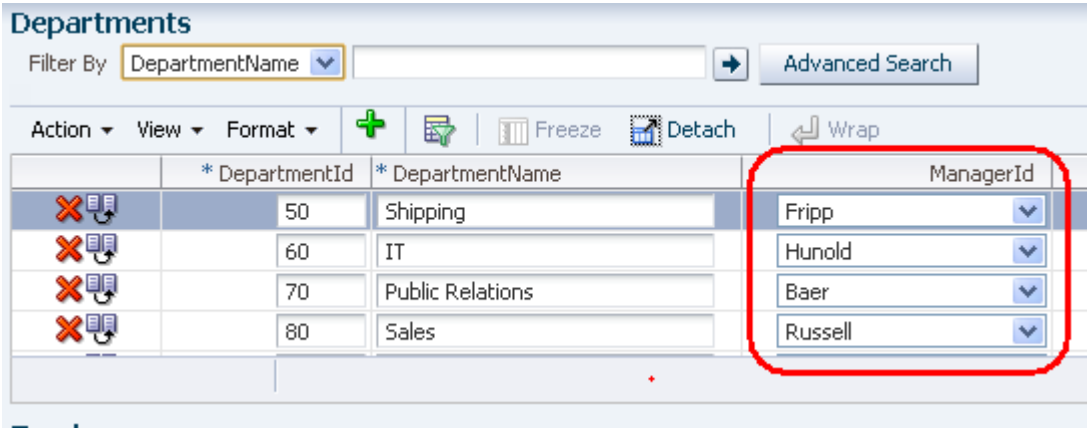
Click the Regions tab, and you can drill down to departments in locations in countries in those regions. As shown below, you can edit the data at any level.



Notice, too, that the EmployeeId, FirstName, and LastName display in a table below the department selected in the tree, while the remainder of the details about the currently-selected employee row appear in a tabbed "overflow area" at the right the table. As you select different rows in the Employees table, the items in the overflow area below automatically update (without refreshing the entire page) to display the correct values for the currently selected employee.

5. Create Department Manager List of Values (LOV)

In this step, we are going to change the dropdown list for selecting the manager of a department to be a popup list-of-values (LOV) window instead. When valid choices for a foreign key value are large in number, this kind of LOV window is more appropriate than a dropdown list. Specifically, we want to change the ManagerId dropdown list shown below to be a text field with a popup LOV instead.



If we were to choose to show the ManagerId as a text field, the value that the user will see would be the numeric id of the manager which is not exactly what we want. It would be nicer for our end-users to show the manager's last name in the text field, and hide the numeric ManagerId value altogether. Then the user will see the last name, and popup the LOV to select last names from list. This will provide a lot better usability for our application. The following sections lead you through the few steps required to accomplish this.

5.1. Add Manager Name and Email to Departments Query

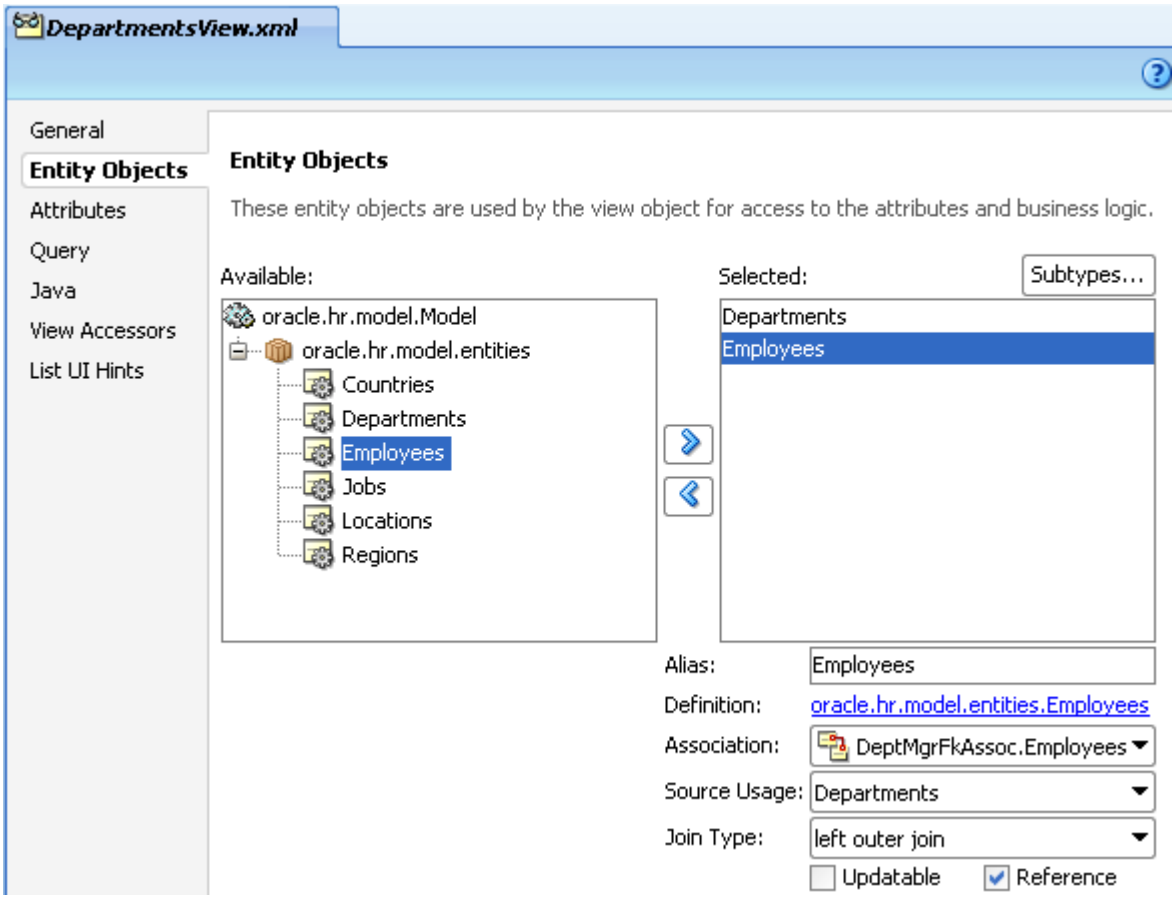
If we're going to show the name of a department's manager, we need to edit the definition of our DepartmentsView view object — back in our Model project — to include that bit of information.

Add Employees Entity Object to the DepartmentsView View Object

Select the `oracle.hr.model.queries.DepartmentsView` view object in the application navigator, and double-click it to launch the **View Object Editor**. On the **Entity Objects** panel of the editor, notice that the `Departments` entity object is already in use in this query. To add the `Employees` entity object as a second entity usage, as shown below select it in the **Available** list, and press (**>**) to shuttle it into the **Selected** list.

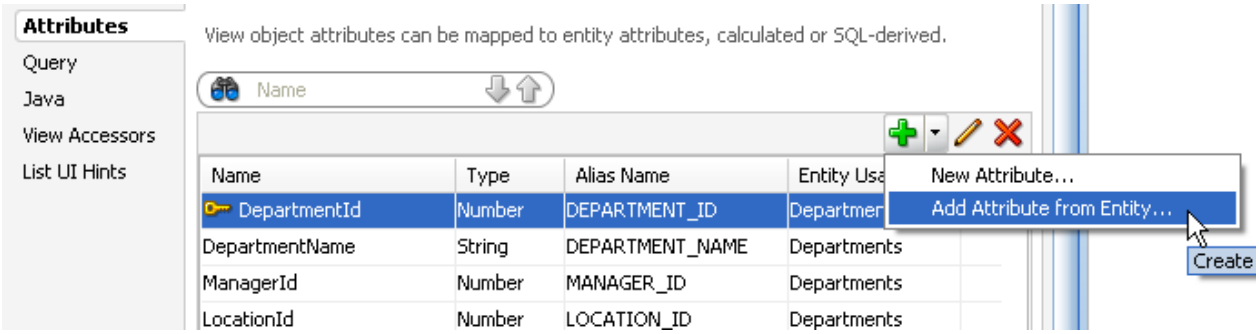
Notice that by default the second entity object participating in this view object is marked as being **Reference** information and not updateable. While you can override this default setting, in this case the information we need to display from the `Employees` entity is read-only reference information — showing the department manager's last name — so we'll leave the default setting intact.

Since departments are allowed to have no manager, their `ManagerId` foreign key attribute value might be null. To insure that we query all departments, whether or not they have a corresponding employee as their manager, we need to change the **Join Type** to be a `left outer join`.

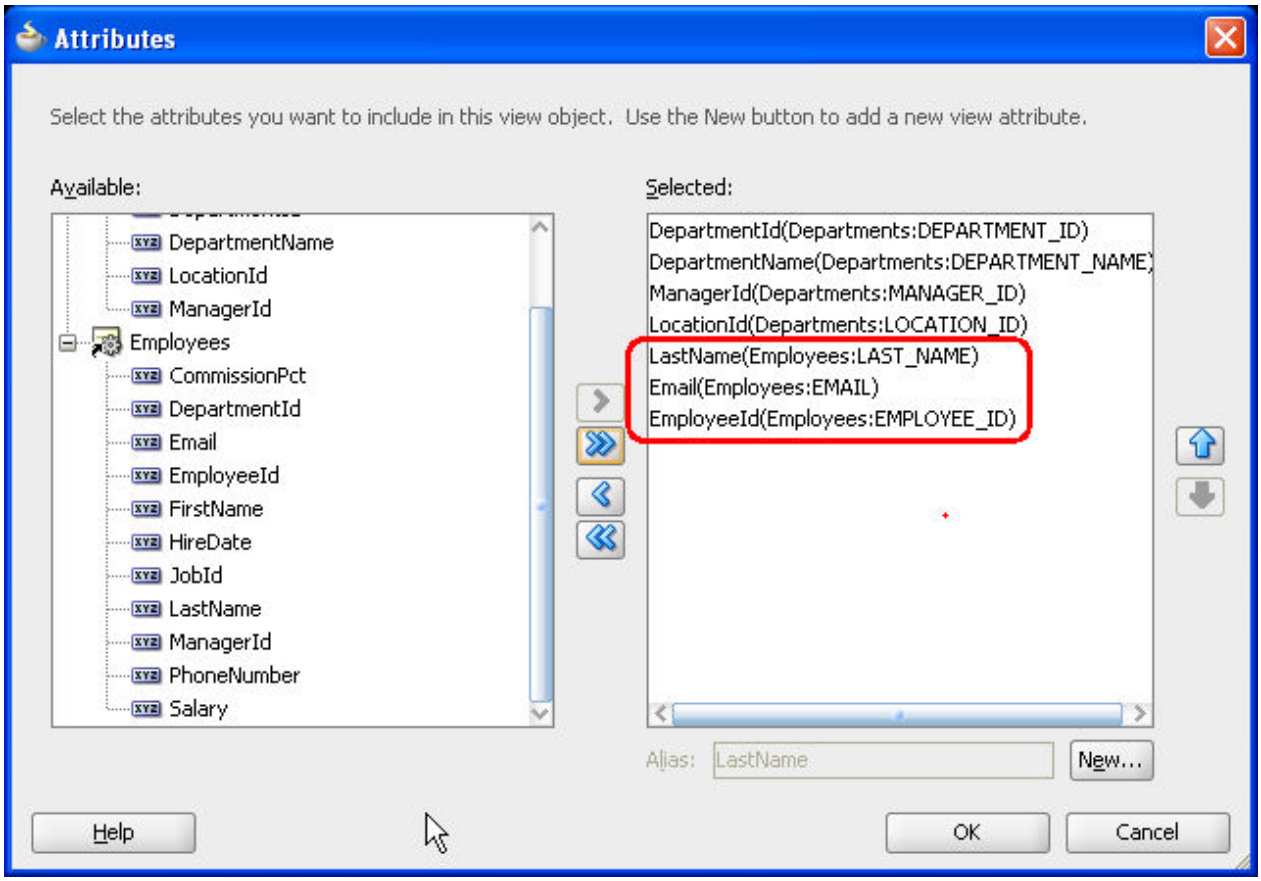


Add LastName and Email Attribute to the Attributes List

On the **Attributes** panel of the editor, click on the down arrow at the right of the green plus icon and choose **Add Attribute from Entity….**

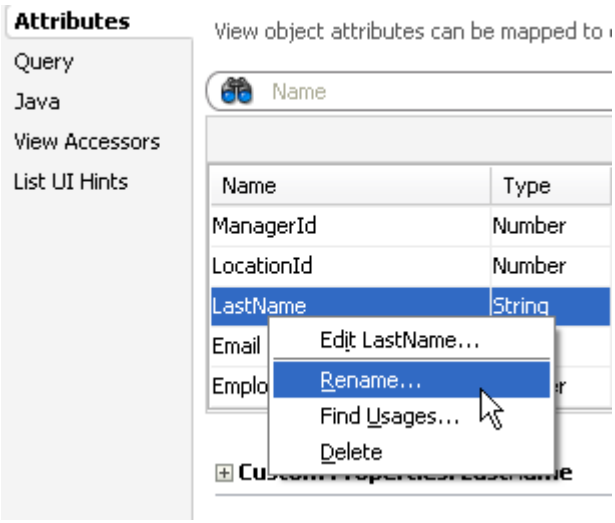


In the **Attributes** dialog window select the `Employees` entity's `LastName` and `Email` attributes in the **Available** list, and press (**>**) to shuttle it into the **Selected** list as shown below. Notice that the primary key attribute (`EmployeeId`) is also automatically added by the wizard.

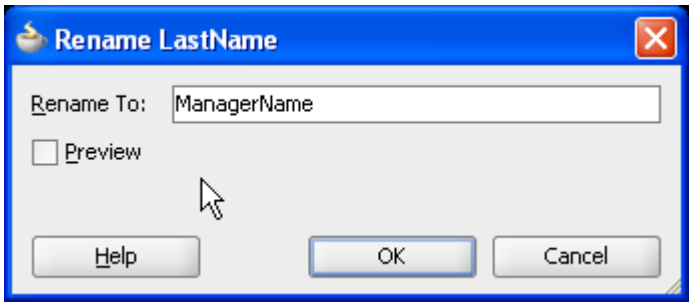


Rename the LastName Attribute to ManagerName and Email attribute to ManagerEmail

To make it clearer that this employee last name is the name of the department's manager in this particular view object, we can rename the attribute from `LastName` to `ManagerName`. To do this, select the `LastName` attribute, right-mouse click on it and choose **Rename…**



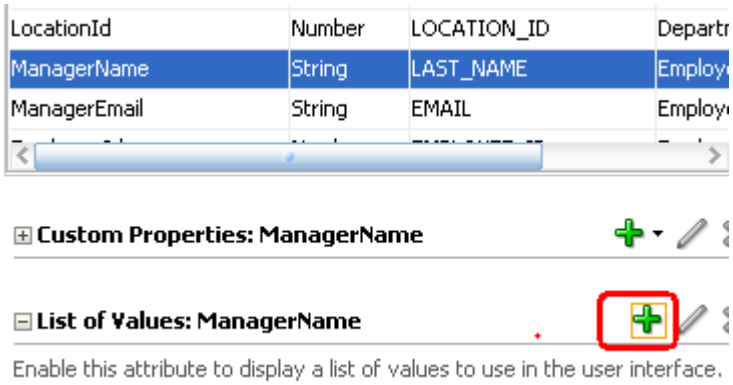
In the dialog that appears, change the name to `ManagerName`.



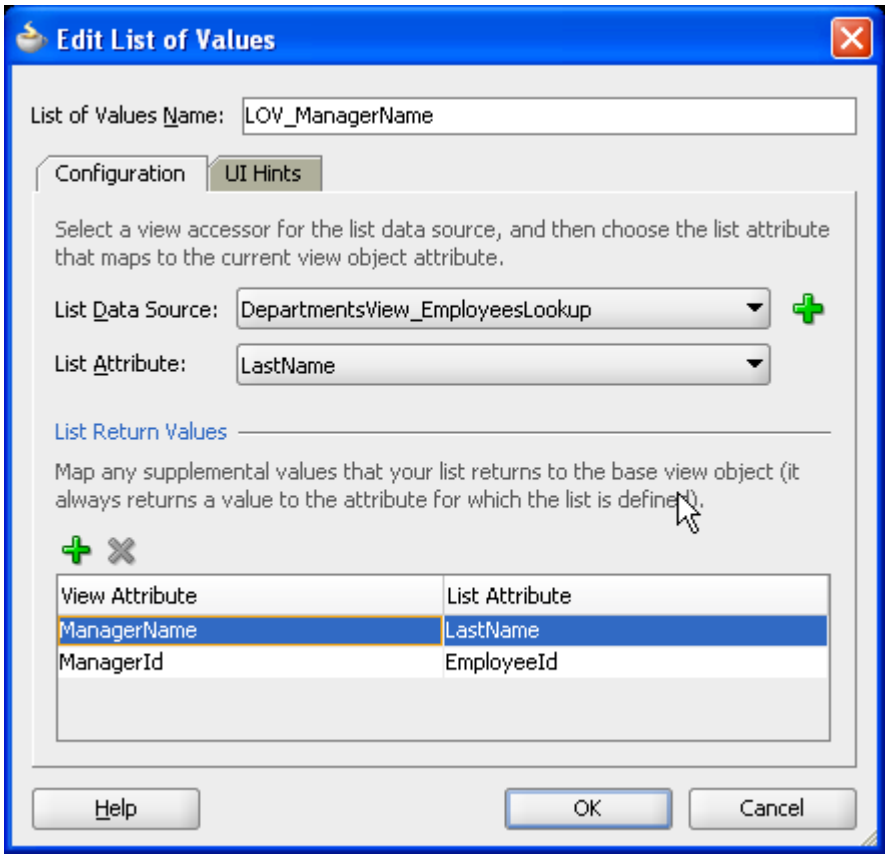
Repeat these steps to rename the `Email` attribute to `ManagerEmail`.

5.2. Create a Model List of Values (LOV)

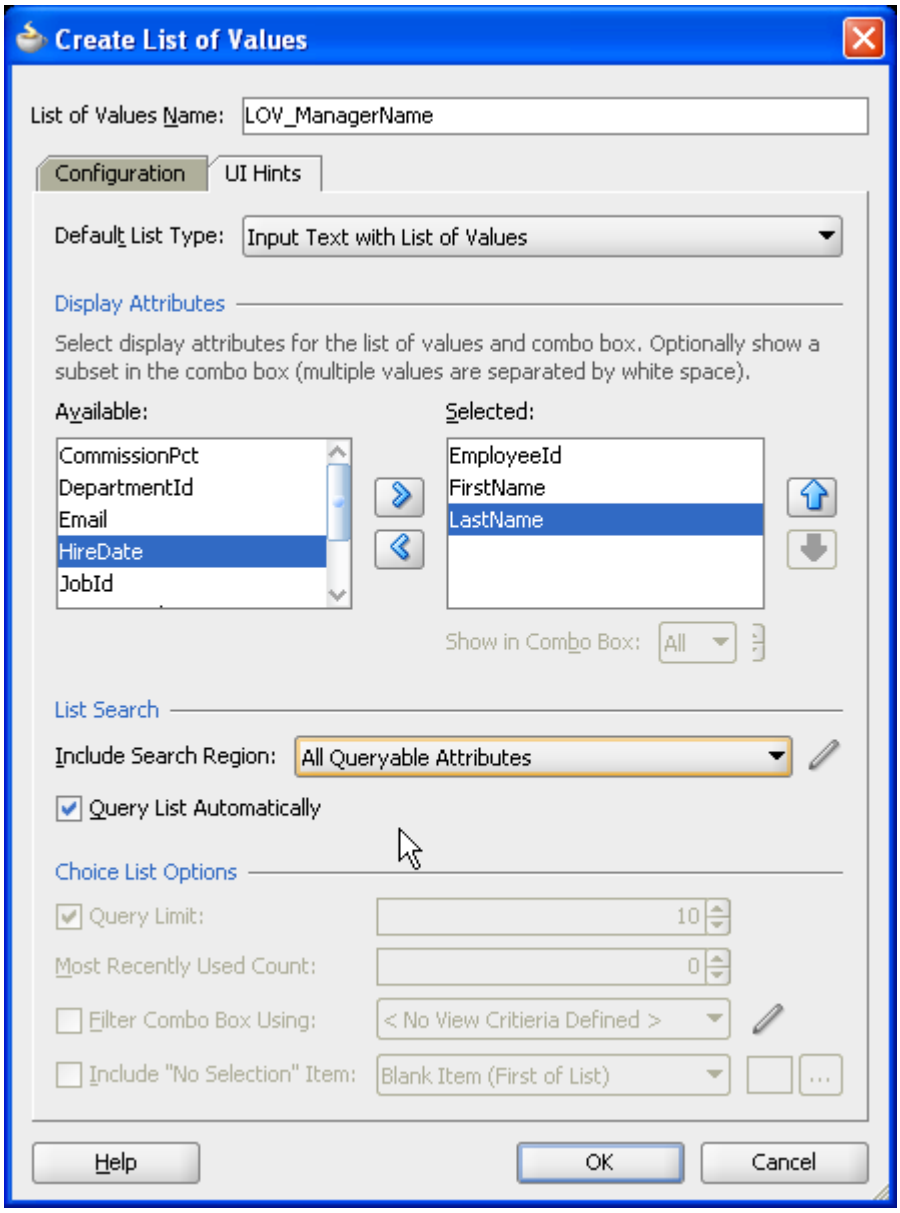
With our view object modified to include the `ManagerName` attribute, we're ready to define a List of Values against this attribute. In the attribute panel, select the `ManagerName` and click the green plus icon in the List of Values section.



In the **Create List of Values** dialog that appears, enter the values as shown below. Note that the `DepartmentsView_EmployeesLookup` data source was created by JHeadstart as part of creating the new service definition. This same data source was used before to populate the drop down list on `ManagerId`.



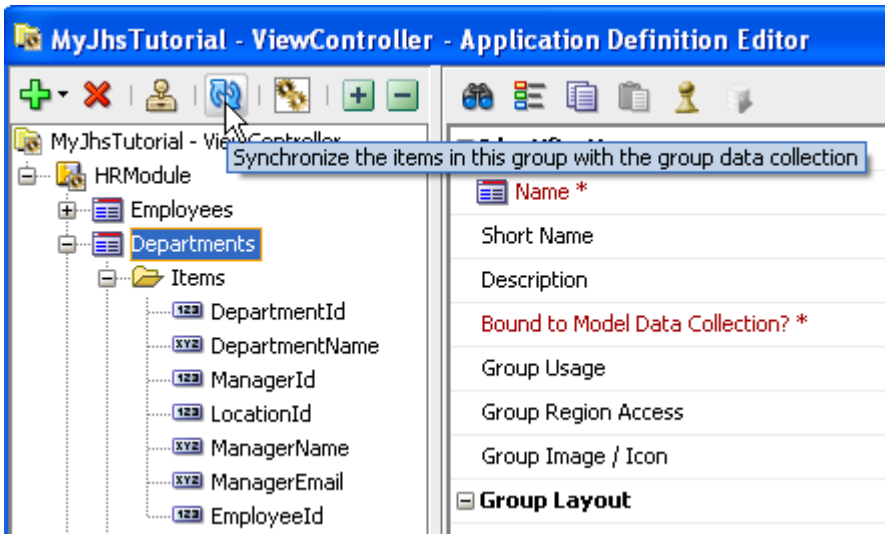
Click on the **UI Hints** tab in the same dialog and enter values as shown below.



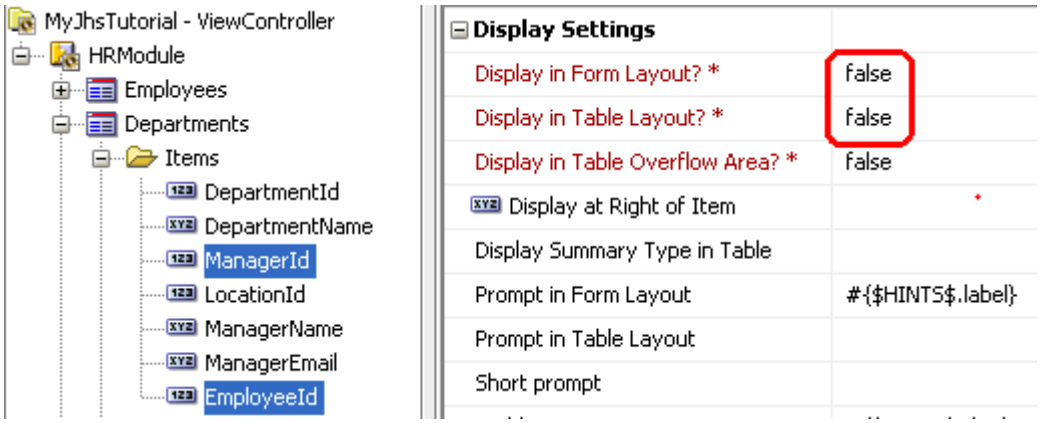
5.3. Use the LOV on ManagerName and Hide the ManagerId

Refresh the Department Group's Item List

Select the `Departments` group in the JHeadstart Application Definition Editor and as shown below, click the **Synchronize** button in the toolbar to refresh its list of items. Notice that the `ManagerName`, `EmployeeId`, and `ManagerEmail` attributes we added to the view object in step 5.1 above now appear in the tree.

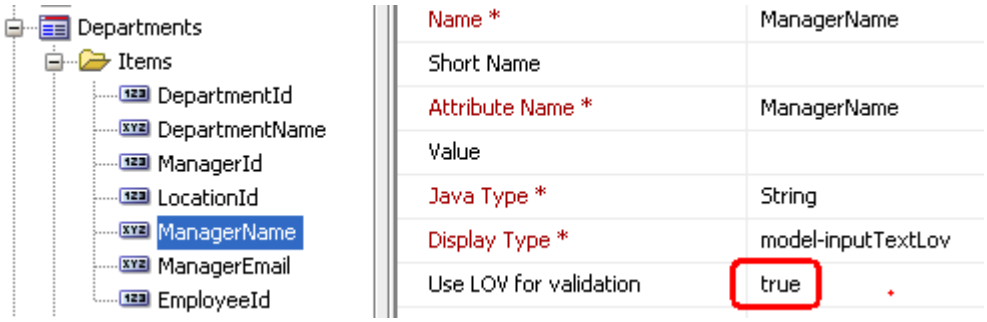


As shown below, select the `ManagerId` and `EmployeedId` items and set their **Display in Form Layout?** and **Display in Table Layout?** properties to false.

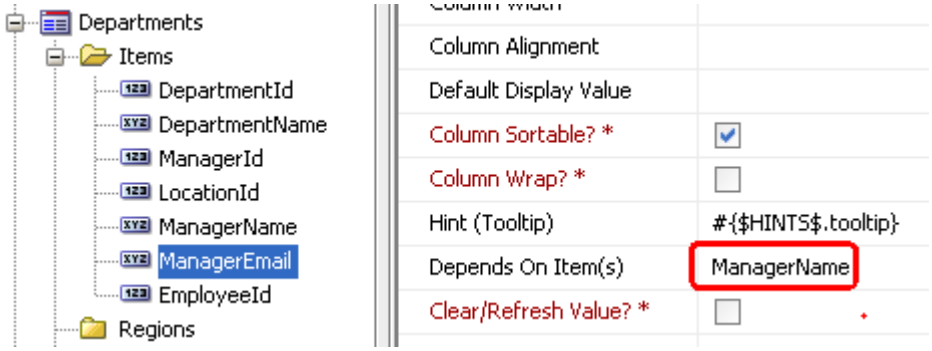


Configure ManagerName to be a Model-based LOV Field

Select the ManagerName and check its **Display Type**. During the synchronize action, JHeadstart has set the **Display Type** to `model-inputTextLov` as it recognized the LOV we defined against the view attribute in step 5.2. Since we want the LOV to appear autmatically when we enter an invalid or incomplete value for manager name, we set the **Use LOV for validation** property to `true`, as shown below. We also need to set the **Required** property to `false`, because if we keep inheriting this setting from the model, it will evaluate to true since the underlying `Lastname` attribute is required in the `Employees` entity object.



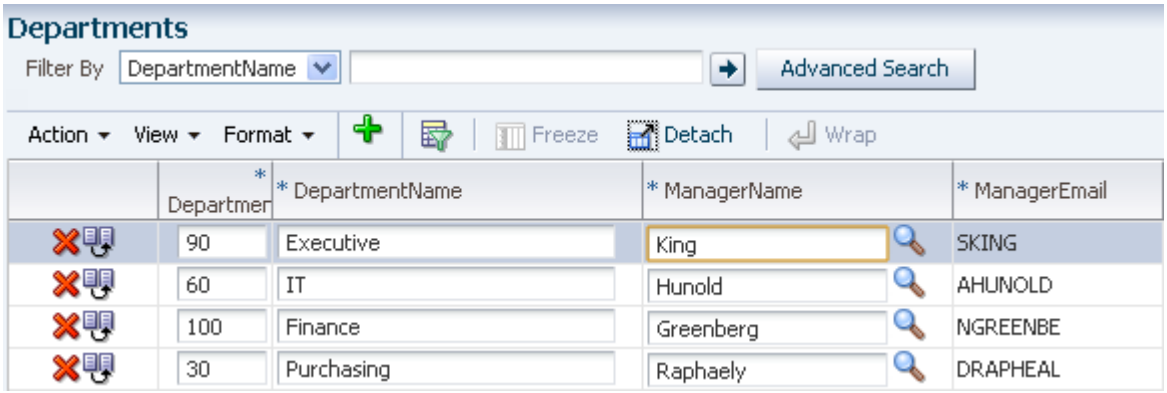
We want the `ManagerEmail` item to be updated immediately when we choose a new value using the LOV, therefore we set the **Depends on Item(s)** property of `ManagerEmail` to `ManagerName` as shown below.



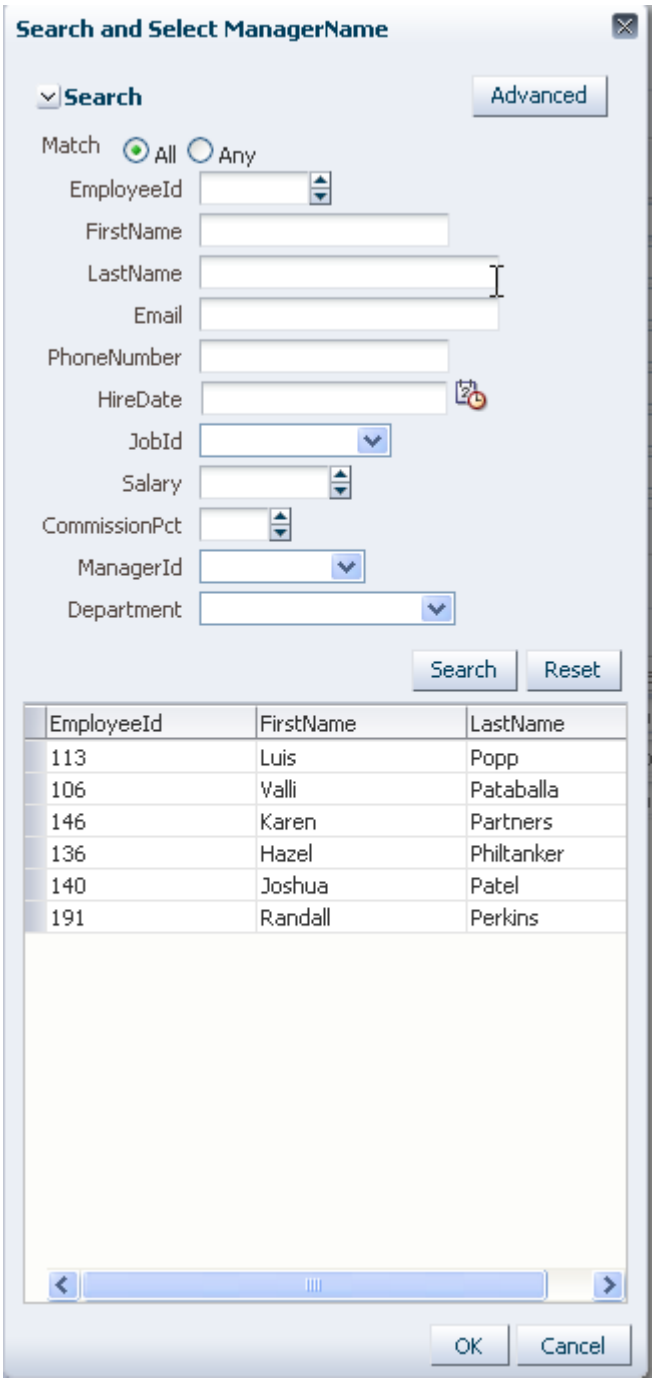
5.4. Regenerate and Run the Application

We're done setting up our list of values (LOV) field on `ManagerName`, so let's regenerate the application and run it. When generation finishes, run the application again by clicking on the `ViewController` project in the application navigator and press F11.

The figure below shows what the Departments tab looks like after the above changes. The changes we made to the `DepartmentsView` view object show up in the table page with a `ManagerName` LOV field and read-only `ManagerEmail` field in every row.



If you try typing a letter "P" in the `ManagerName` field for the "Executive" department — or alternatively, changing one of the existing manager names in a different department to the letter "P" — and then pressing Tab to leave the field, you'll see the LOV window pop-up automatically showing the filtered list of choices that start with the letter "P" as shown below.



Back on the Departments table page, if instead of typing just the letter "P" in one of the `ManagerName` fields, you type "Ph" instead and Tab out of the field, you'll see another treat. Without bringing up the LOV window at all, the manager named "Philtanker" is automatically filled in, along with the manager's email id "HPHILTAN". This is the "**Use LOV for Validation**" behavior at work that we enabled.

Of course, you can also just click on the "searchlight" icon and pop-up the LOV window for you to filter and select the choice yourself.

Note: Although a roundtrip from the browser to the application server is made to check the number of matching rows, only the ManagerName and ManagerEmail fields in the current row are actually refreshed on the page. This is accomplished through an ADF Faces feature called Partial Page Rendering (PPR) that we will explain in more detail in the **Adding a Conditionally Dependent Field section**.

6. Creating a Wizard Including a Shuttle Control

In this step we will generate a wizard consisting of four pages to enter a new employee. The fourth wizard page will contain a shuttle control to assign subordinates to the new employee if applicable.

6.1. Add View Object Instances to the Data Model to Support the Wizard and Shuttle

To ensure that the employee creation wizard and its shuttle control behaves in a way that is independent of other employee and subordinate data queried in the application, we can add an additional instances of the appropriate view object components to the data model of our `HRModule`, and then use these new view object instances as the data collections for the groups involved in the wizard. To accomplish this, follow these steps:

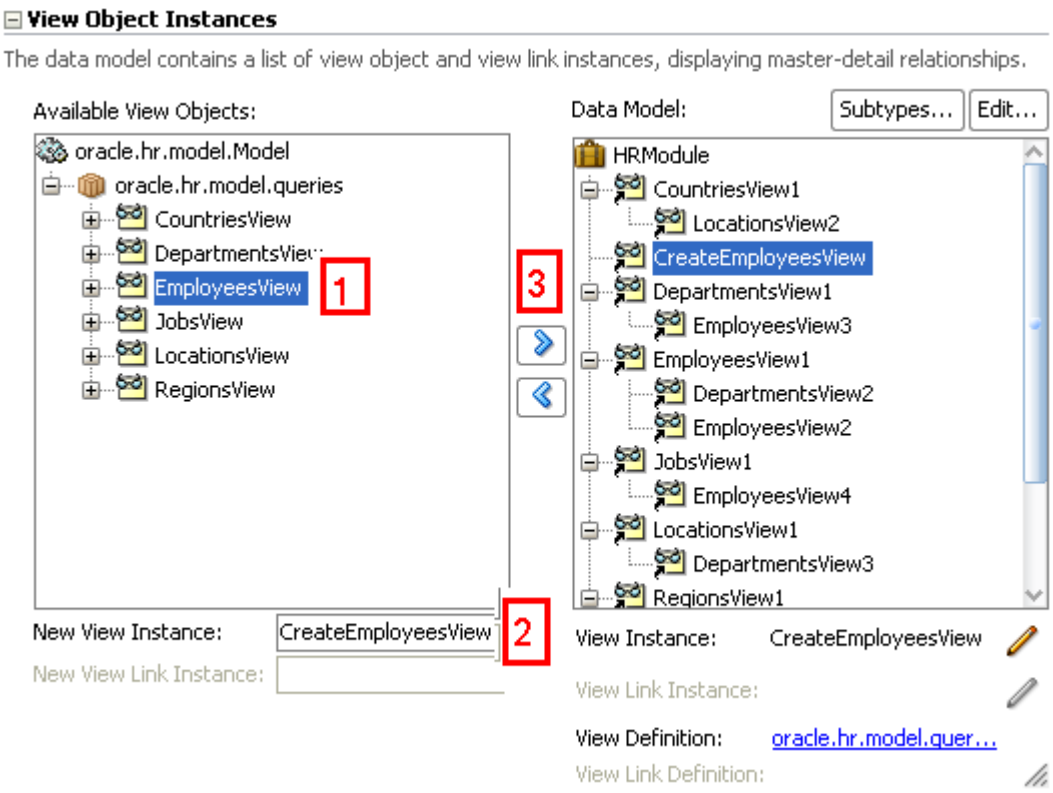
Add a New Instance of the EmployeesView View Object to the Data Model

In your Model project, find the `HRModule` application module component in the `oracle.hr.model.service` package and double-click it to open the Application Module Editor.

Visit the **Data Model** panel and expand the `oracle.hr.model.queries` package in the **Available View Objects** tree on the left.

As shown below:

1. Select the `EmployeesView` view object in the **Available View Objects** list,
2. Enter a view instance name of `CreateEmployeesView` in the `Name View Instance` field below, and
3. Click the (**>**) button to add the new view object instance with this name to the data model.

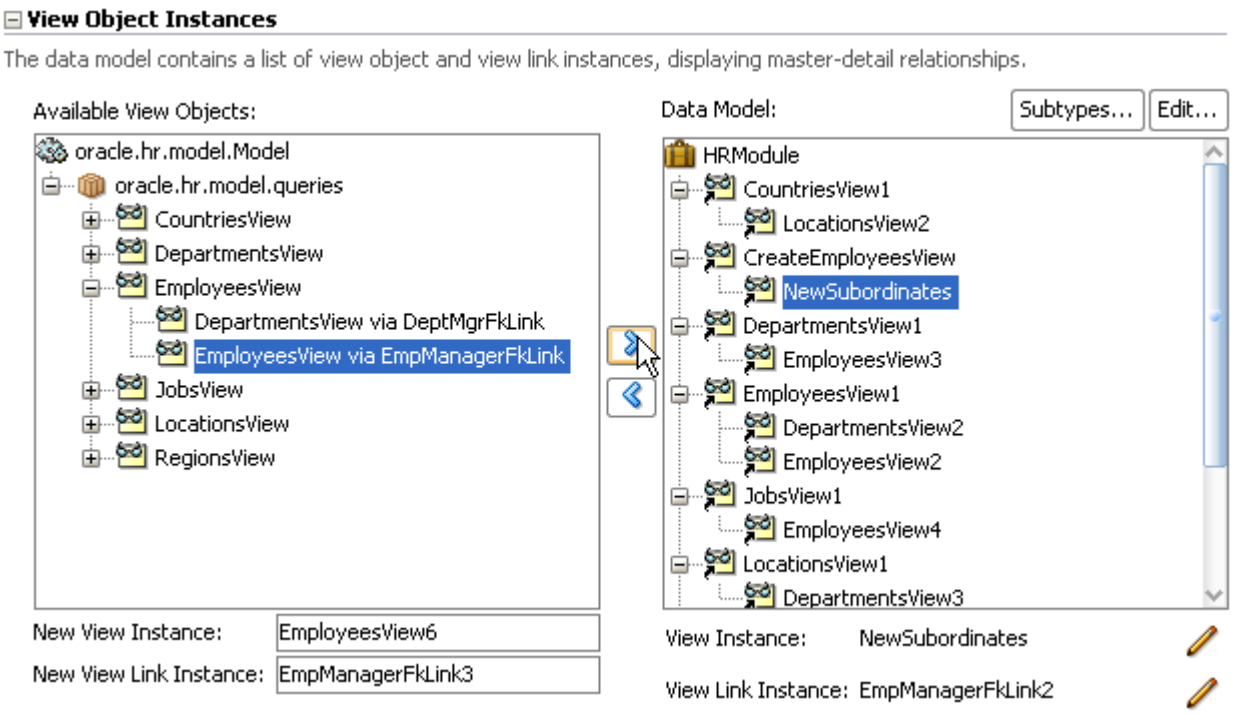


Add a New Detail View Object for New Subordinates

When creating a new employee, we want to optionally be able to add a related set of subordinates that have the new employee as their manager. To have this set of subordinates be independent of the other subordinate queries in the data model, we'll add a new detail instance of the EmployeesView based on the EmpManagerFKLink view link that was created by default when JDeveloper initially reverse-engineers ADF business components from the tables. To perform this task, do the following:

1. Select the `CreateEmployeesView` view instance in the Data Model to be the existing parent view,
2. Select the `EmployeesView` via `EmpManagerFKLink` in the **Available View Objects** list
3. Enter a view instance name of `NewSubordinates` in the `Name View Instance` field below, and
4. Click the (**>**) button to add the new view object instance with this name to the data model.

After performing these steps, your Data Model tree will look like what you see below.

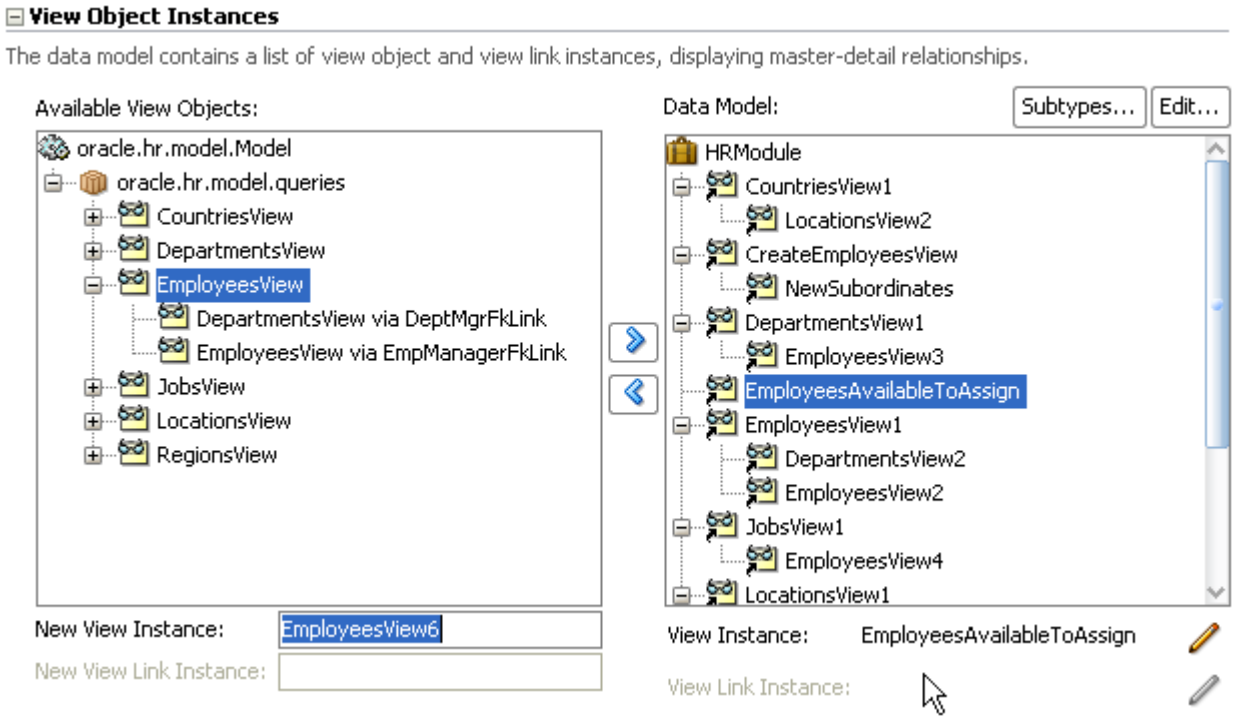


Add an Instance of the EmployeesView for Use by the Subordinates Shuttle

The shuttle control we'll use to assign subordinates to the newly created employee requires a list of available employees. In practice this list of available choices will be some appropriately filtered list of employees based on some application-specific criteria that make them "available" for assignment. However, to keep things simpler for the tutorial, we'll just add another instance of the existing `EmployeesView` to serve this purpose.

To accomplish this task, do the following:

1. Select the `EmployeesView` view object in the **Available View Objects** list,
2. Enter a view instance name of `EmployeesAvailableToAssign` in the `New View Instance` field below, and
3. Click the (**>**) button to add the new view object instance with this name to the data model.



We're done making the required data model changes, so click the **Save All** button in the JDeveloper main toolbar to save them.

6.2. Create and Configure a New EmpWizard Group

To create and configure a new group with a wizard layout, perform these steps:

Create a New EmpWizard Group by Copying an Existing One

In the JHeadstart Application Definition Editor, copy the `Employees` group using the **Duplicate Group** option in the right-mouse menu.
Set its **Name** property (in the **Identification** group) to "`EmpWizard`" to rename the new group.
Set the **Data Collection** property of the new `EmpWizard` group to `CreateEmployeesView`.

Change the EmpWizard to Come After the Existing Employees Group

In the HRModule tree on the left of the JHeadstart Application Definition Editor, drag the `EmpWizard` node and drop it after the existing `Employees` node to resequence it.

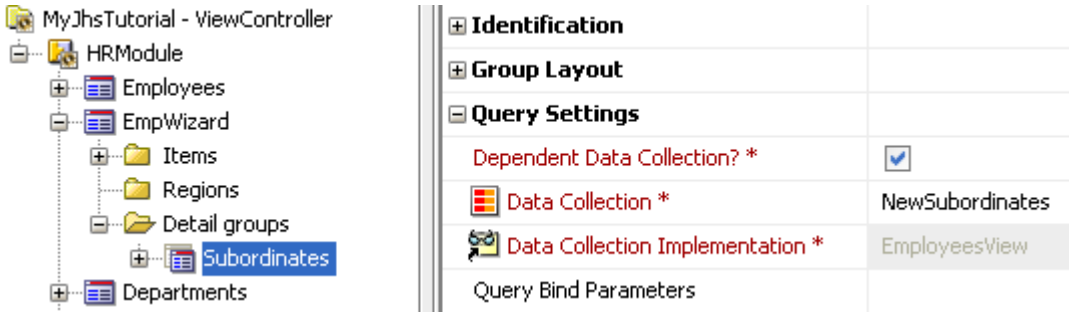
Rename the Copied Employees2 Detail Group to Subordinates

Select the `EmpWizard` group's detail group named `Employees2` and set its **Name** property to `Subordinates` to rename it.

Set the **Data Collection** property of the renamed `Subordinates` detail group to `NewSubordinates`.

Remove the Copied Departments2 Detail Group

The `EmpWizard` group's copied `Departments2` detail group won't be needed for this task, so select it in the tree and click the **Remove a component** toolbar icon to remove it. After performing these steps, your JHeadstart Application Definition Editor should look like below.



Finish Configuring the New EmpWizard Group
Set the following properties of the new `EmpWizard` group:

Property Category	Property Name	Set to Value
Labels	TabName	Employee Wizard
Labels	Display Title (Singular)	Employee
Group Layout	Layout Style	Form
Group Layout	Wizard Style Layout?	(checked)
Group Layout	Enable Stretching?	(unchecked)
Search Settings	QuickSearch?	None
Search Settings	Advanced Search?	None
Operations	Single-Row Update Allowed?	(unchecked)
Operations	Single-Row Delete Allowed?	(unchecked)
Operations	Display New Row on Entry?	true

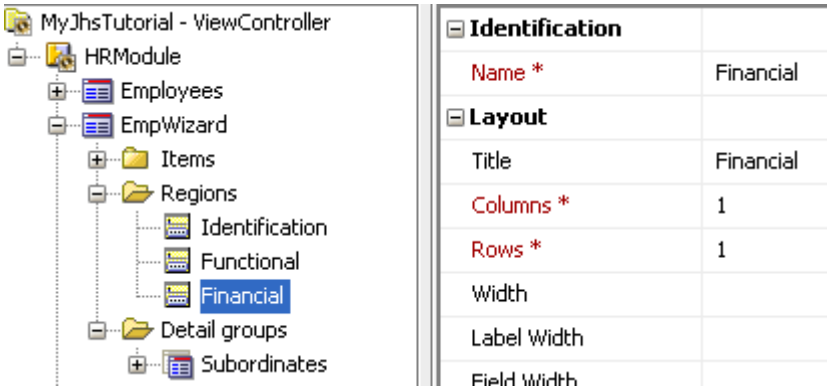
6.3. Create and Configure Three Item Regions for the EmpWizard Group

To define three item regions and assign group items to them, follow these steps:

Define Three Item Regions in the EmpWizard Group
Use the **New > Item Region** option in the right-mouse menu on the `Regions` folder of the `EmpWizard` group.

Set the **Name** of the new item region to `Identification`, and set its **Title** property to the same value `Identification`.

Repeat this step to define two additional item regions named and titled `Functional` and `Financial`. When done, your tree will look like below.

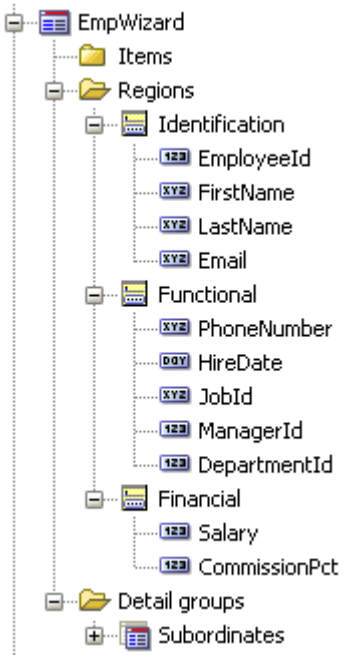


Assign EmpWizard Group Items to Respective Item Regions

Expand the `EmpWizard` group's Items folder and drag and drop to assign the following `EmpWizard` group items to belong to the indicated item region. Remember that you can use Ctrl or Shift while selecting the items to perform multiple section before dragging.

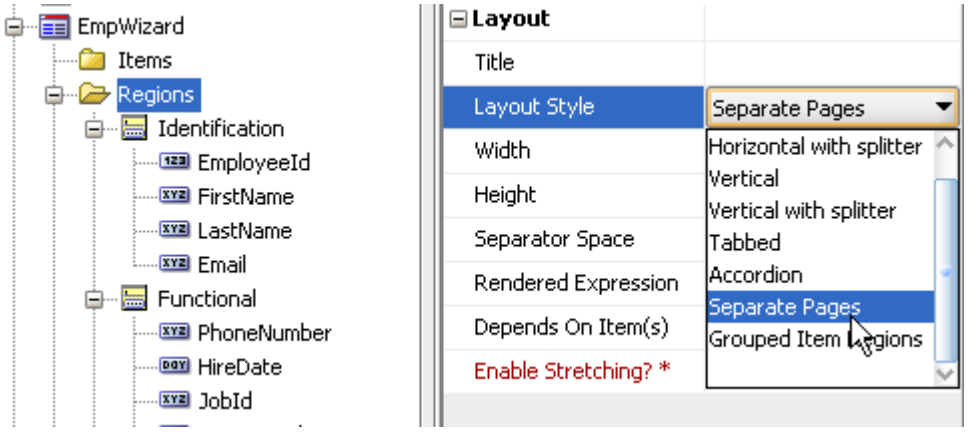
`Identification` item region: `EmployeeId, FirstName, LastName, Email`
`Functional` item region: `PhoneNumber, HireDate, JobId, ManagerId, DepartmentId`
`Financial` item region: `Salary, CommissionPct`

When done, your application definition will look like what you see below.



Set the Region Layout Style to Use Separate Pages

Select the `Regions` folder as shown below and set its **Layout Style** property to `separatePages`.



6.4. Configure Subordinates Detail Group to Use Shuttle

Select the `EmpWizard` group's detail group named `Subordinates` and set the following properties on it:

Property Category	Property Name	Set to Value
Labels	TabName	Unassigned
Labels	Display Title (Plural)	Assign Subordinates
Labels	Display Title (Singular)	Assigned
Group Layout	Layout Style	Parent-shuttle
Group Layout	Same Page?	(unchecked)
Group Layout	Enable Stretching?	(unchecked)

Like a dropdown list or radio group, a shuttle control presents the user with a list of available choices. This list contains a **Meaning Attribute** that reflects what the end-user will see in the list, and a **Value Attribute** that represents the underlying value in the database row. In your JHeadstart application definition, a named domain defines a list of available choices that can either be a static set (e.g. Open, Pending, Closed) or a dynamic set based on a view object's query results.

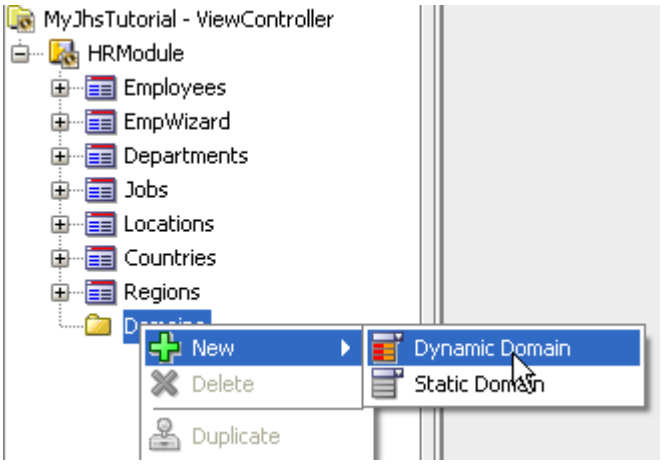
Since we introduced a new `EmployeesAvailableToAssign` view object instance to provide the list of available choices for the "`Subordinates`" shuttle above, the last two steps in configuring the shuttle require:

- Defining a new dynamic domain for this data collection, and then
- referencing that new domain in the Subordinate group's Domain for Unselected List in Shuttle property.

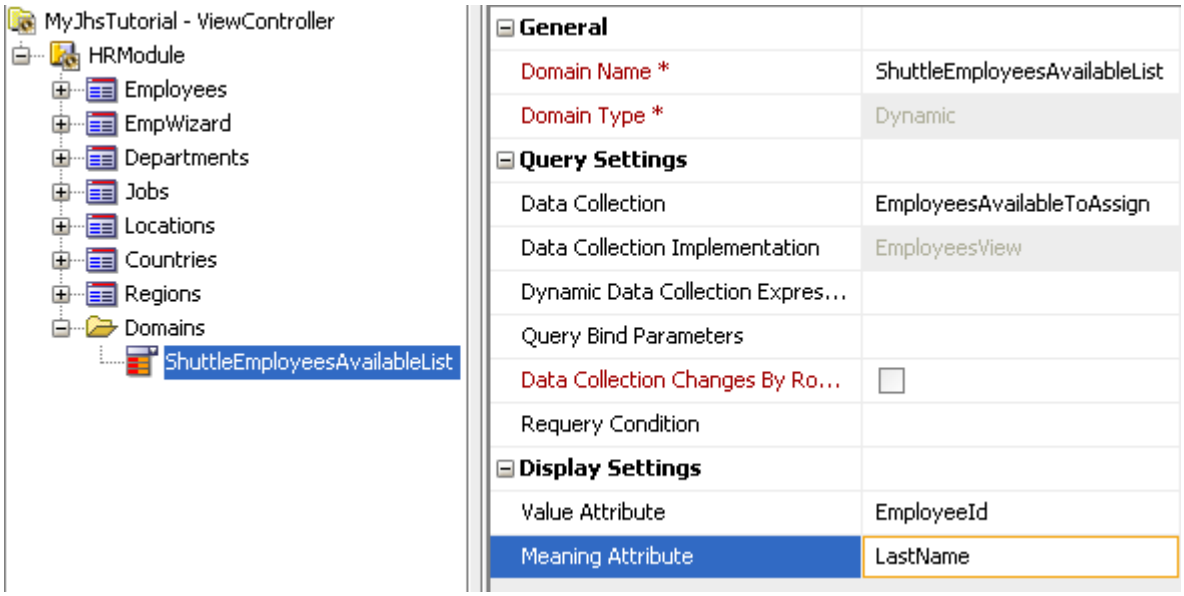
To accomplish this task, perform these steps:

Create a New Domain for the Shuttle's Available List

As shown below, select the **Domains** folder in the JHeadstart Application Definition Editor, use the right mouse click menu abd choose **New -> Dynamic Domain**.

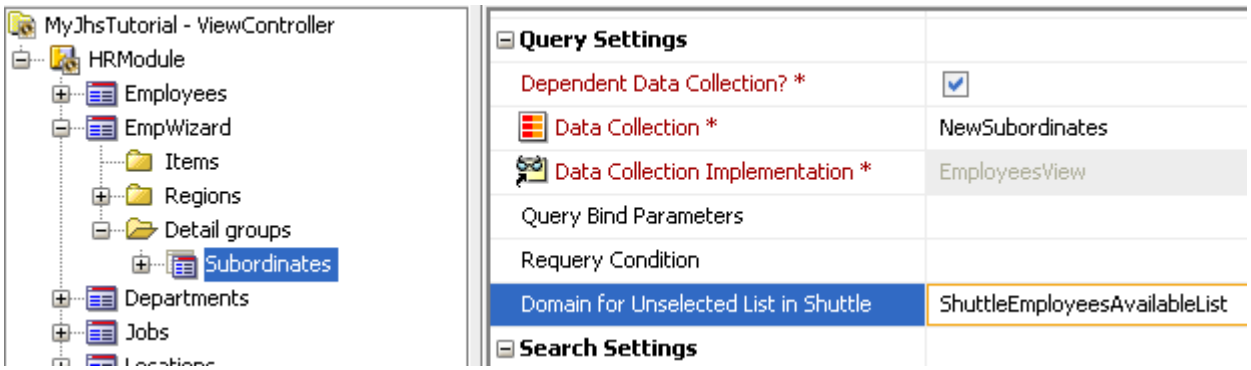


Configure the new domain by setting the properties as shown below.



Set the Shuttle's Unselected List to Use the New Domain

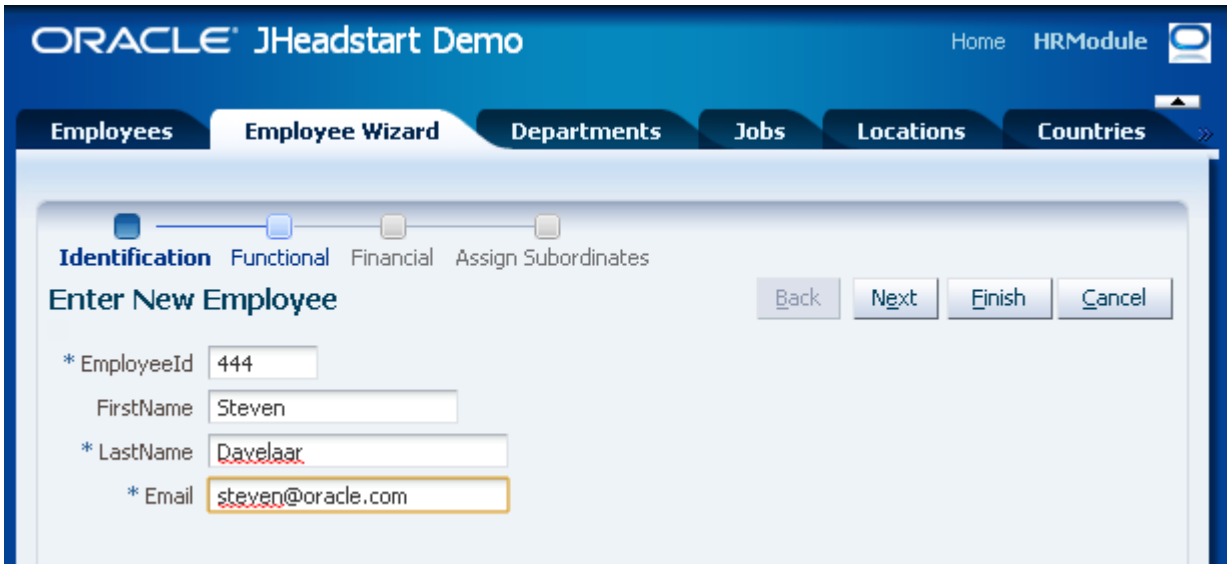
As shown below, expand the `EmpWizard` group, select the `Subordinates` detail group, and set its **Domain for Unselected List in Shuttle** property to `ShuttleEmployeesAvailableList`.



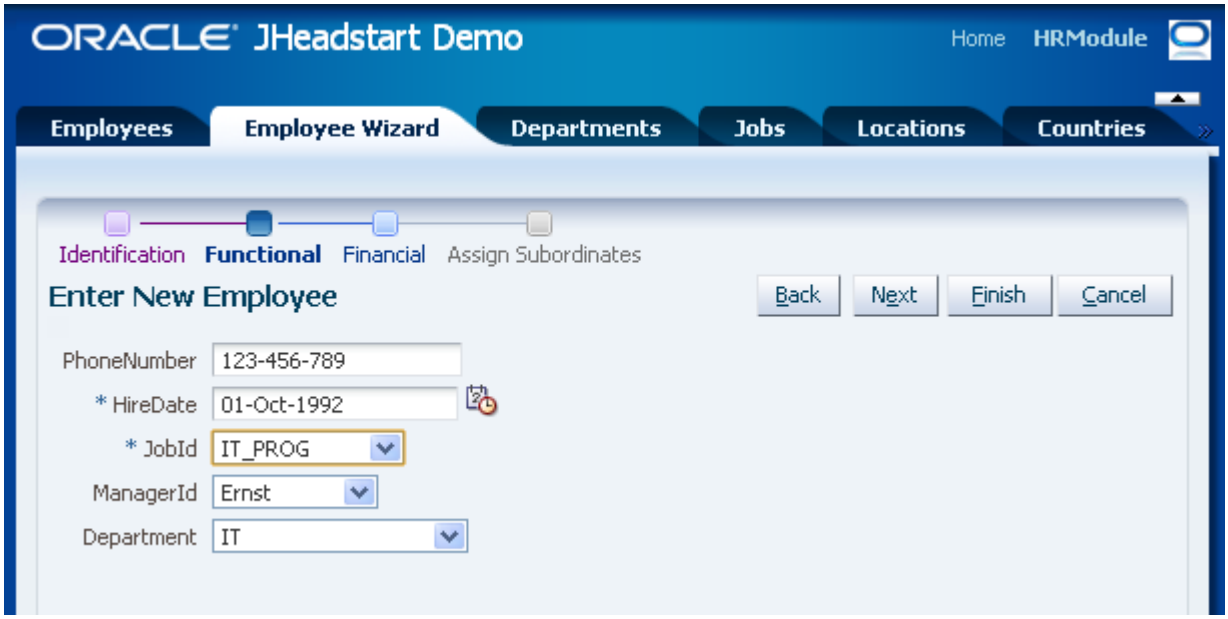
6.5. Regenerate and Run the Application

We're done defining the new employee wizard, so regenerate the application and run it. When generation finishes successfully, run the application again by clicking on the `ViewController` project in the application navigator and press F11.

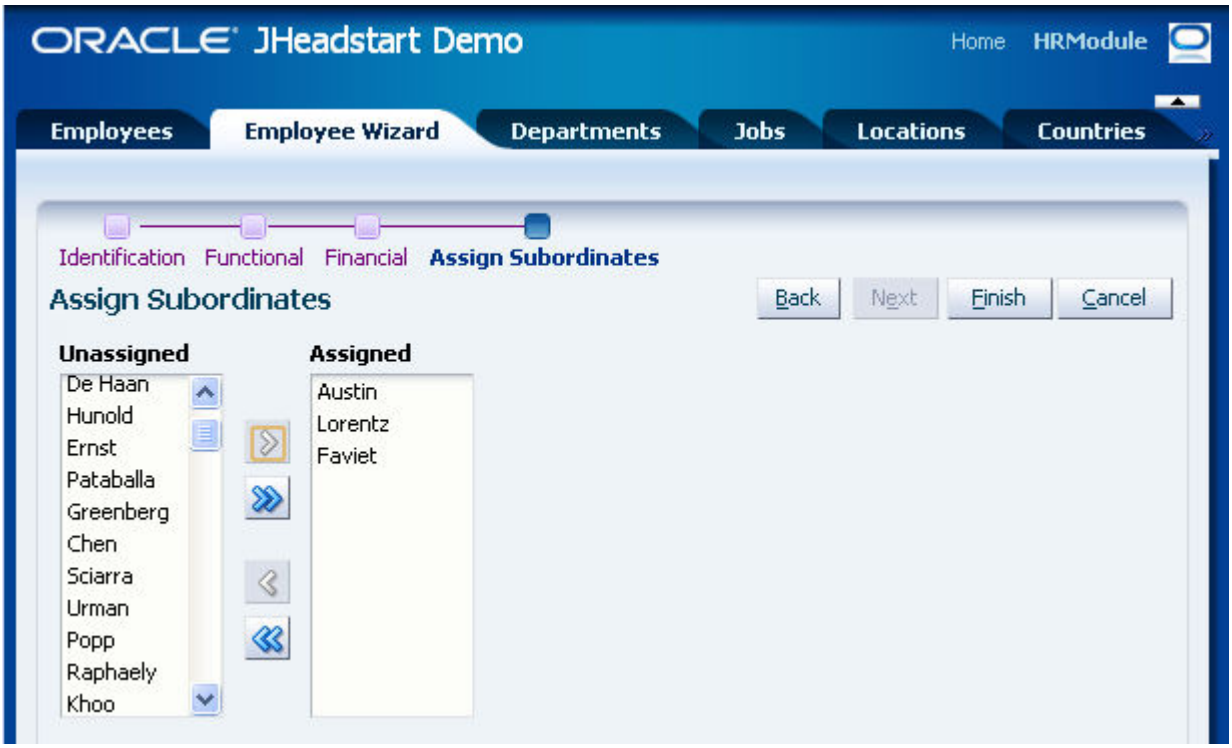
Clicking on the `Employee Wizard` tab in the browser, you'll see the first page of the wizard as shown below, ready to collect the information related to the `Identification` step of the process.



Clicking (**Next**) or the `Functional` link in the *train* component to proceed onto subsequent steps, you can enter the information for the `Functional` step in the process as shown below.



Clicking (**Next**) to enter the Financial information in step 3, and clicking (**Next**) again, you can see that the last step of the wizard is the `Subordinates` step that we configured to generate as a shuttle. As shown in below, you can select a few subordinates, then click (**Finish**) to commit the transaction.



Note that in addition to the (**Next**) and (**Back**) buttons to navigate through the wizard pages, you can also use the hyperlinked *train stops* in the so-called *train* component at the top of the page.

7. Adding a Conditionally Dependent Field

The ADF Faces components that JHeadstart application generator uses for your web tier pages cleverly combine Asynchronous JavaScript, XML, and Dynamic HTML to deliver a much more interactive web client interface for your business applications. In ADF Faces, the feature is known as partial page rendering because it allows selective parts of a page to be re-rendered to reflect server-side updates to data, without having to refresh and redraw the entire page. This combination of web technologies for delivering more interactive clients is known more popularly by the acronym AJAX [9]. ADF Faces supports this powerful feature for any Java Server Faces (JSF) page with no coding. JHeadstart automatically configures the necessary properties on the controls to enable a maximal use of this great feature. We've seen a few examples of this AJAX-style partial-page rendering in previous sections of the tutorial. Here we'll study a final example that involves using it to enable dynamically-changing, conditionally-dependent fields.

Sometimes, one field value (or its enabled status) might depend on another field. JHeadstart makes it simple to generate pages that support this kind of conditionally-dependent field. For example, imagine that the commission percentage of an employee only is relevant if they are an Account Manager. In this section we'll configure a simple example to implement the disabling of the `CommissionPct` item in the `Employees` group unless the value of the `JobId` is equal to `'AC_MGR'`. To accomplish this task, follow these steps:

Conditionalize the Value of the Disabled Property Using an Expression

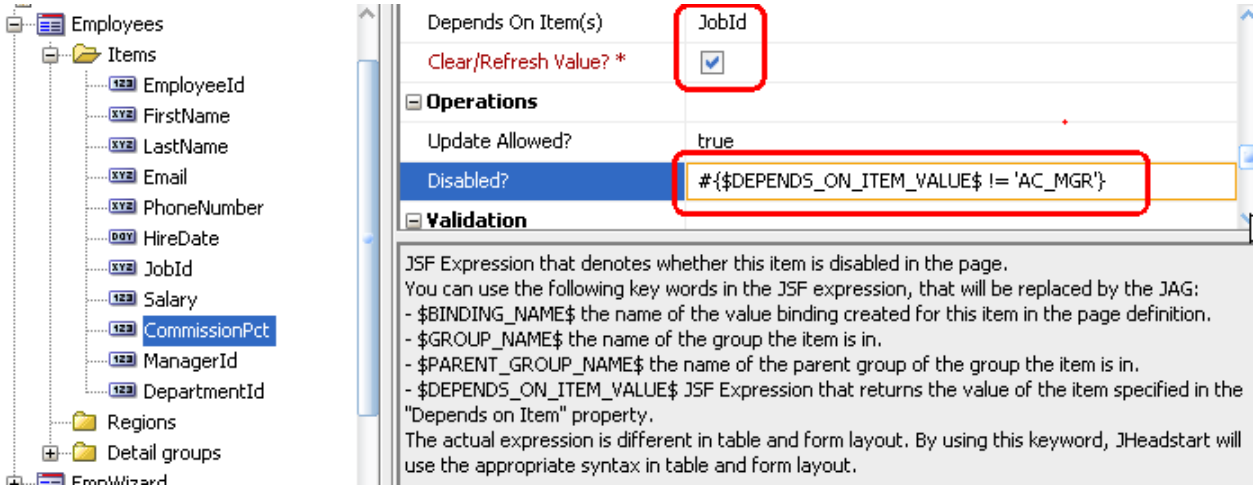
In the JHeadstart Application Definition Editor, expand the top-level `Employees` group, its `Items` folder, and select the `CommissionPct` item. Set its **Disabled?** property to the expression value:

```
#{$DEPENDS_ON_ITEM_VALUE$ != 'AC_MGR'}
```

As explained in the help text of this property, the token `$DEPENDS_ON_ITEM_VALUE$` gets substituted by the JHeadstart application generator so that the expression ends up referencing the correct value of the item on which the current item depends. We'll setup this item dependency next...

Set the CommisionPct Item to Depend on the JobId Item

Set the **Depends on Item** property of the `CommissionPct` item to `JobId`. After doing this, your application definition will look like below.



Also check the **Clear/Refresh Value** property. When an employee is no longer an Account Manager, the value for `CommissionPct` will then automatically be cleared.

After regeneration and running the application, in the `Employees` tab, if you use the `Quick Search` area to find all employees whose `LastName` starts with the letter H, and then drill down to the details, you can navigate between employees like Michael Hartstein and Shelly Higgins to notice that the `CommissionPct` field on the screen as disabled for Michael, as shown below, but enabled for Shelly (whose JobId = 'AC_MGR').

Perhaps even more interesting is the fact that the screen updates dynamically as you change the value of the dependent `JobId` field. For example, if you use the dropdown list to change the `JobId` of an employee who is currently not an account manager to have the new value of AC_MGR, you'll see that the `CommissionPct` field becomes enabled automatically, without refreshing the entire web page

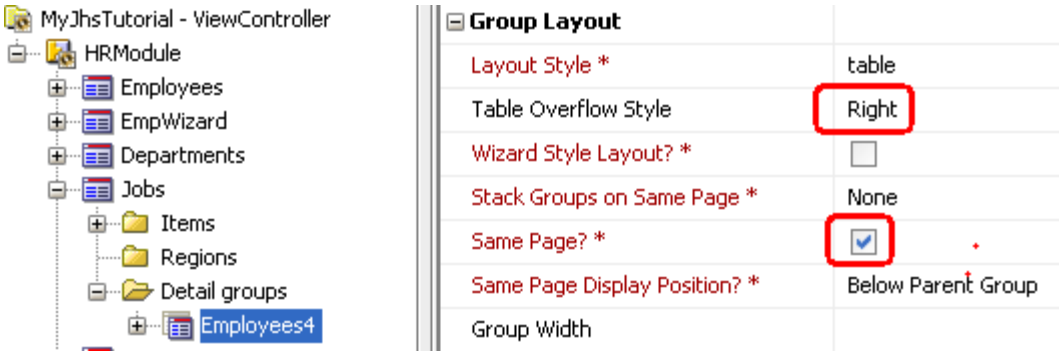
In this simple example, we made one item dependent on one other item. Using the same technique, you can make multiple items dependent on multiple other items. When dependent items are grouped in an **Item Region**, you can use the **Depends on Item(s)** property of the **Item Region** as a shortcut, rather than setting the property on each and every dependent item.
The **Depends on Item(s)** property has a drop down list to quickly select one item, but you can also type in a comma-delimited list of item names.

8. Adding a Graph and Summary Information

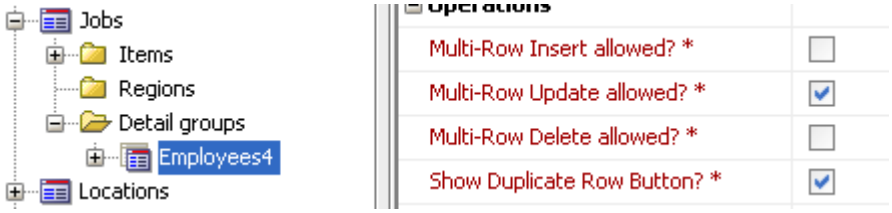
In this section we will add some Business Intelligence functionality to the top-level `Jobs` group and its `Employees4` detail group. Assume an HR employee who needs to evaluate salary differences for employees with the same job. For this task it is convenient to see the average salary for a job, as well as a graph visualizing the differences in salary within a job. To add this functionality to our application, follow these steps:

8.1. Configure the Employees4 Group

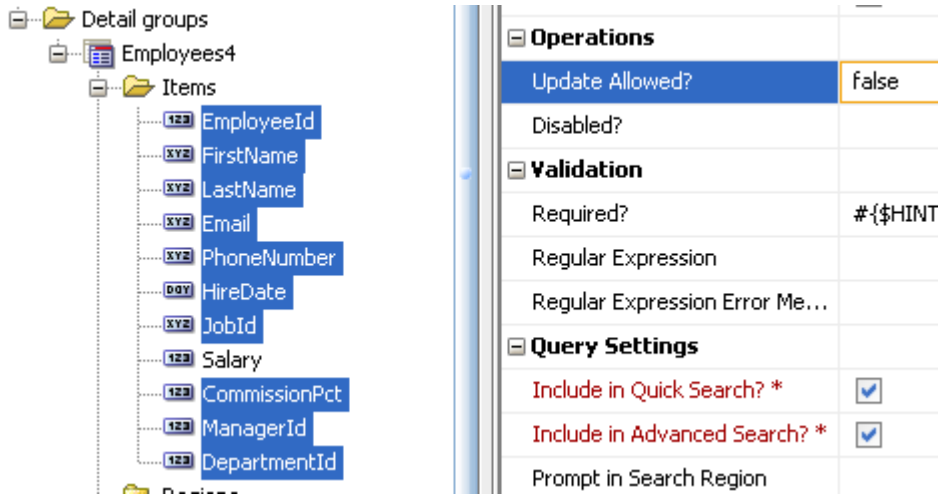
Configure the Employees4 Detail Group to Display on the Same Page with Overflow Right
In the JHeadstart Application Definition Editor, expand the top-level `Jobs` group, and select its `Employees4` detail group. Check the **Same Page?** checkbox, and set the **Table Overflow Style** property to `Right`.



Do not Allow Insert nor Delete in Employees4 Detail Group
Uncheck the **Multi-Row Insert allowed?** and **Multi-Row Delete allowed?** Checkboxes.

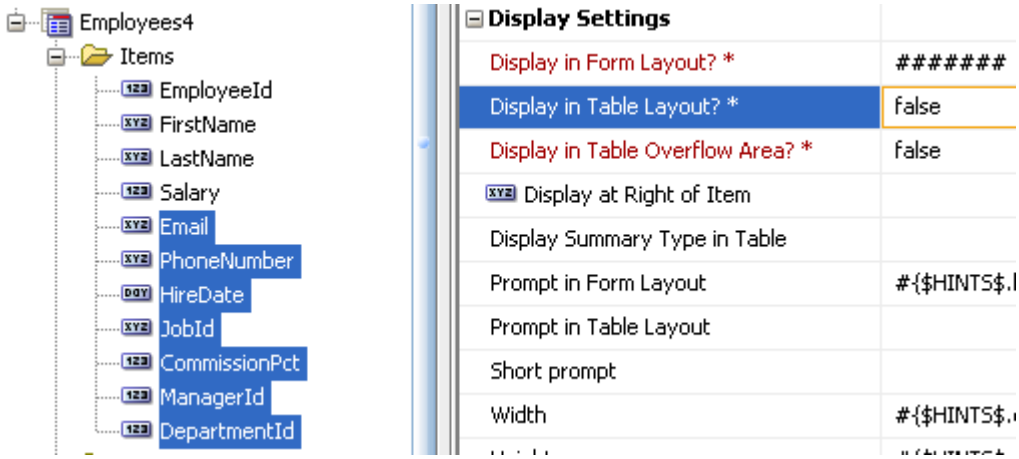


Make Only Salary Updateable in Employees4 Detail Group
Select all items in the `Employees4` group using Shift-Click, and unselect the `Salary` item using Ctrl-Click. Set the **Update Allowed?** property for all selected items to false.



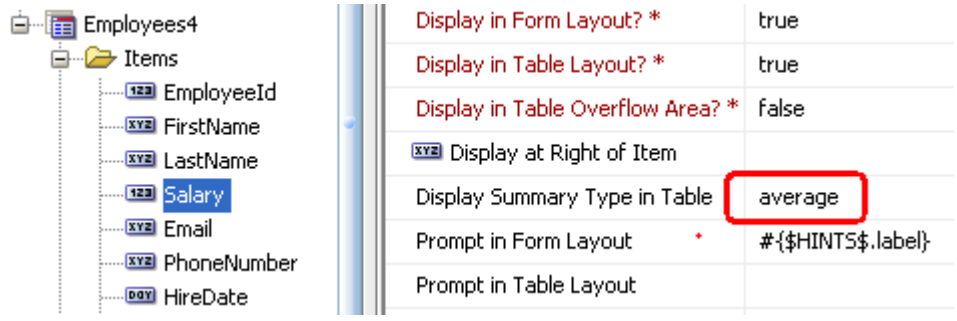
Only Display EmployeeId, FirstName, LastName and Salary in Table

Using drag and drop, move the `Salary` Item up to display right below the `LastName` item. Then select all items starting with `Email` up to `DepartmentId` and set the **Display in Table Layout?** property for the selected items to false.



Display Salary Average at Bottom of Table

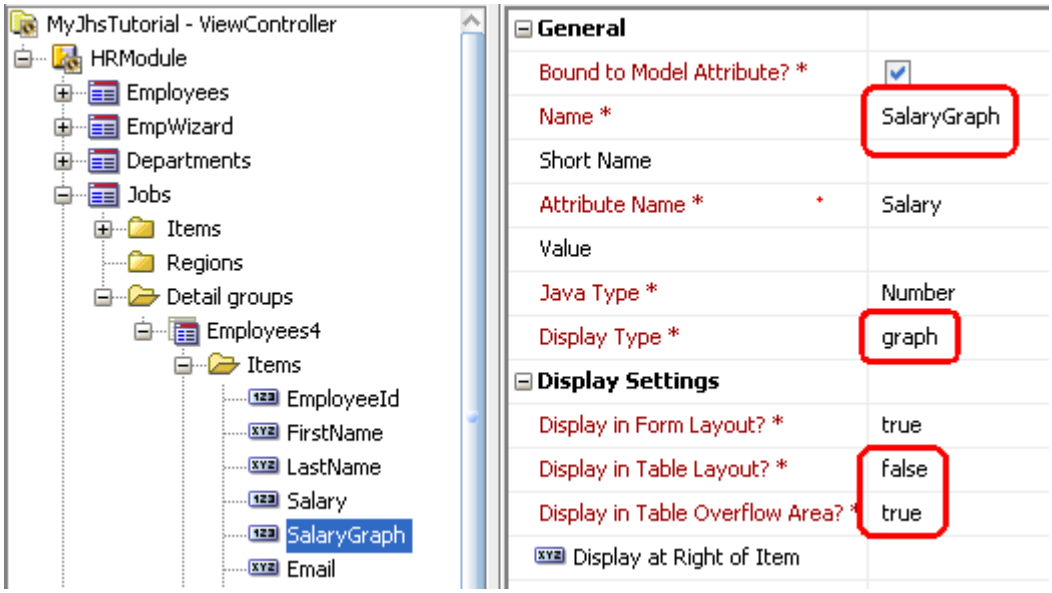
Select the `Salary` Item and set the **Display Summary Type in Table** property to `average`.



Adding the Graph Item

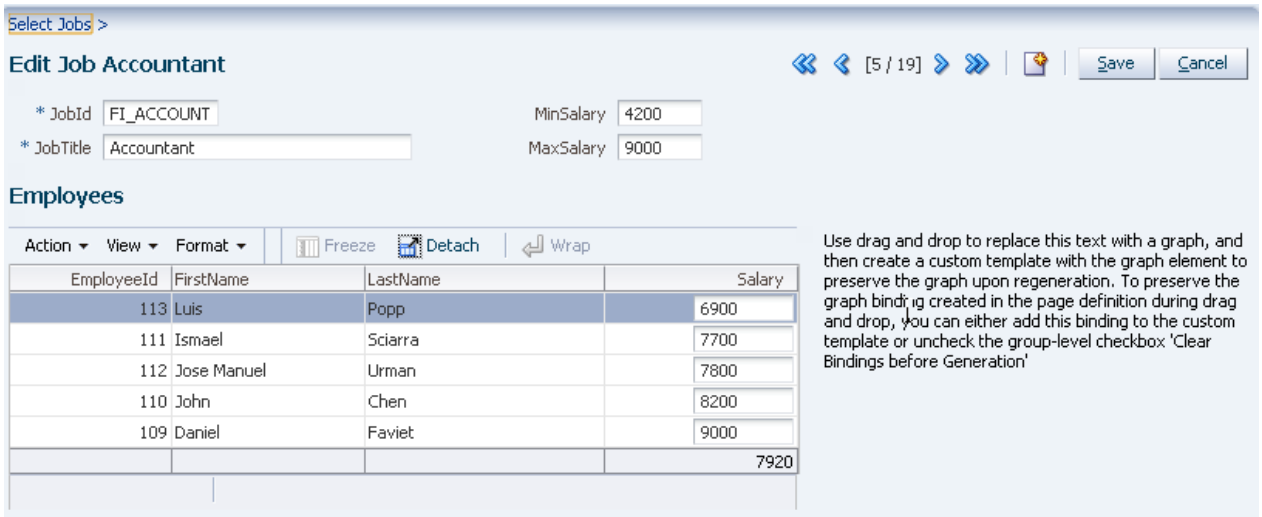
Right-mouse-click on the `Salary` Item and choose **Duplicate Item** from the popup window.

A new item named `Salary` is added to the group. Rename the item to `SalaryGraph` and move this new item using drag and drop to display right below the `Salary` item. Set the `Display Type` to graph, **Display in Table?** to false and **Display in Table Overflow?** to true.



Renenerate and Run the Application.

You are done with the required changes in the Application Definition Editor to generate the graph. You can now run the JHeadstart Application Generator again. When you subsequently run the application, click on the `Jobs` tab, select job `Accountant` and navigate to the form page using the (**Edit**) button, you will see a page like shown below.

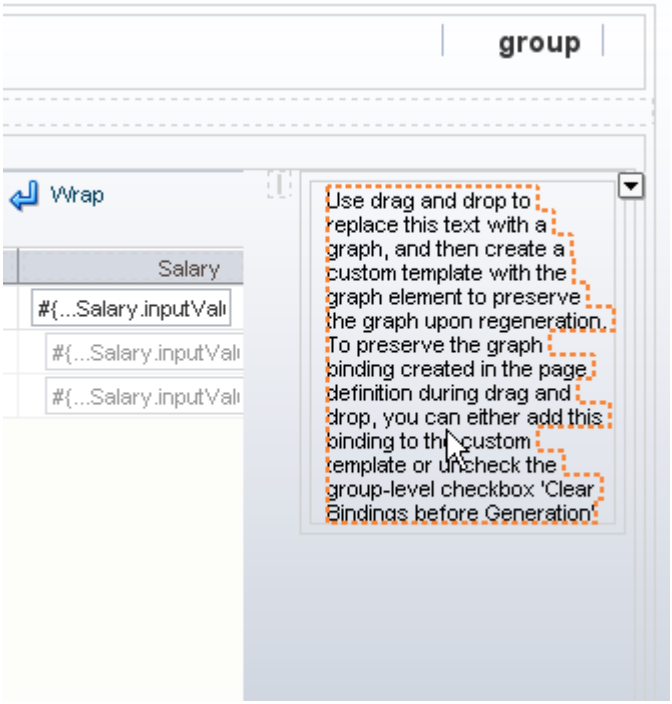


You see the average salary for this job, and when you change the salary of one of the employees of the job, and tab out the field, the average salary is updated immediately.
The graph probably doesn't show the way you expected it ☺.
JHeadstart has made the deliberate choice to leave out graph generation since there are so many graph types and graph settings available. To add a graph it is faster and easier to use drag-and-drop on the visual page editor in JDeveloper, as we will see in the next section.

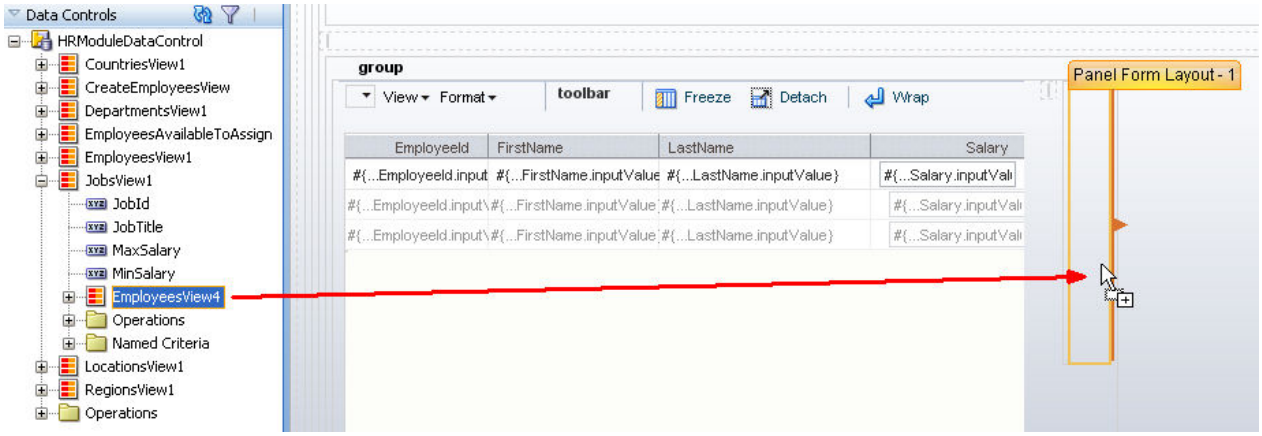
8.2. Add a Graph Using the JDeveloper Visual Page Editor

In JDeveloper, click on the ViewController project in the Application Navigator, and then use the following key combination: Ctrl-Shift-Minus. This will open the **Go to File** dialog. Enter Jobs.jsff in the search area, and click (**Enter**).

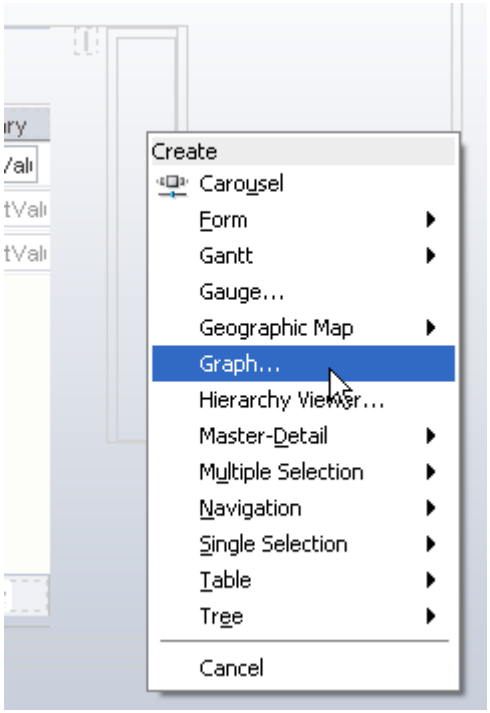
After a while, the page editor opens in the visual **Design** mode. Click on the outputText element with the graph text to select it, as shown below.



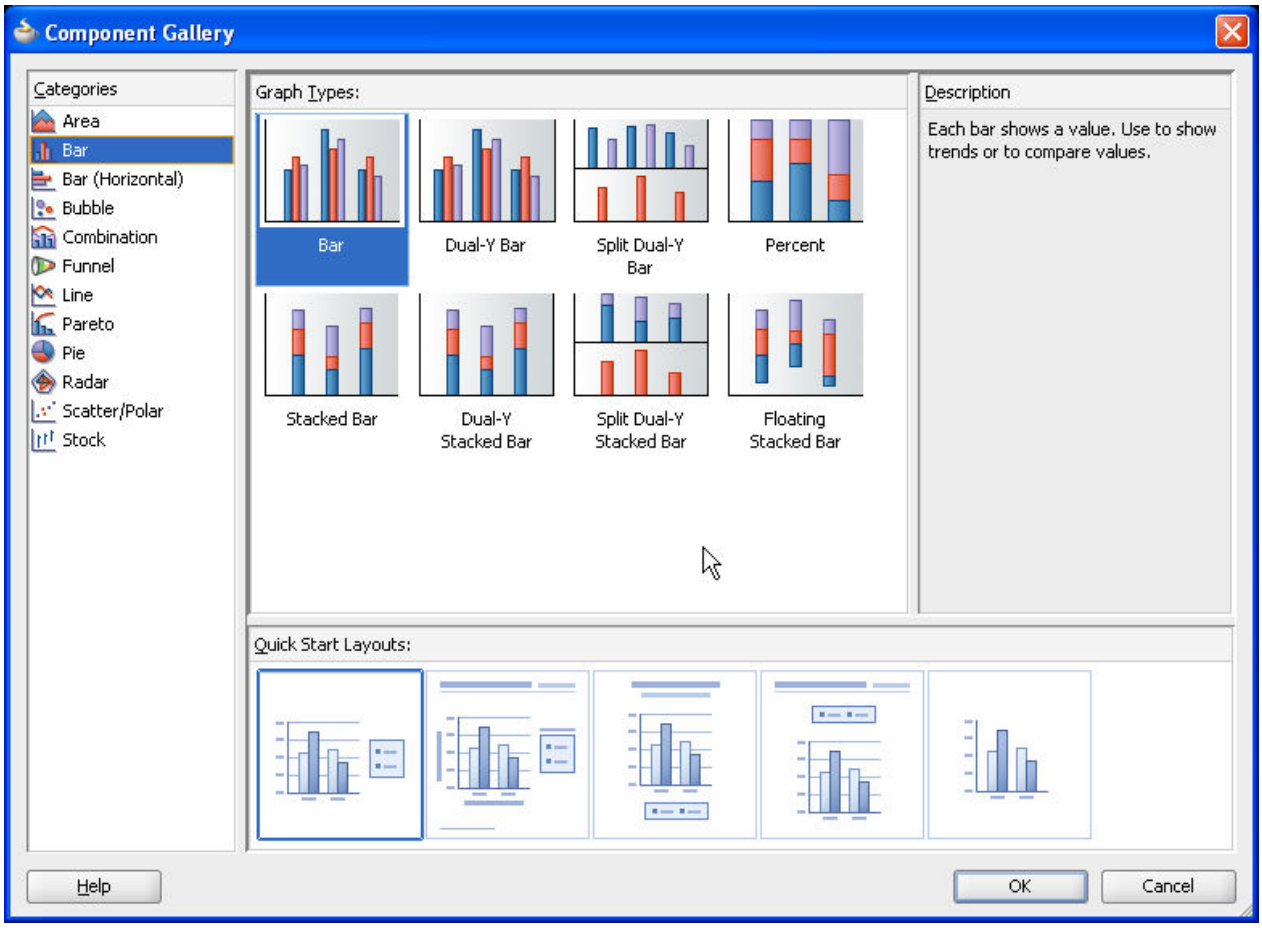
Click the (**Delete**) button to delete the outputText.
Now, in the **Data Controls** palette, expand the `JobsView1` node. Drag and drop the `EmployeesView4` node onto the `PanelFormLayout` that was previously holding the outputText, as shown below.



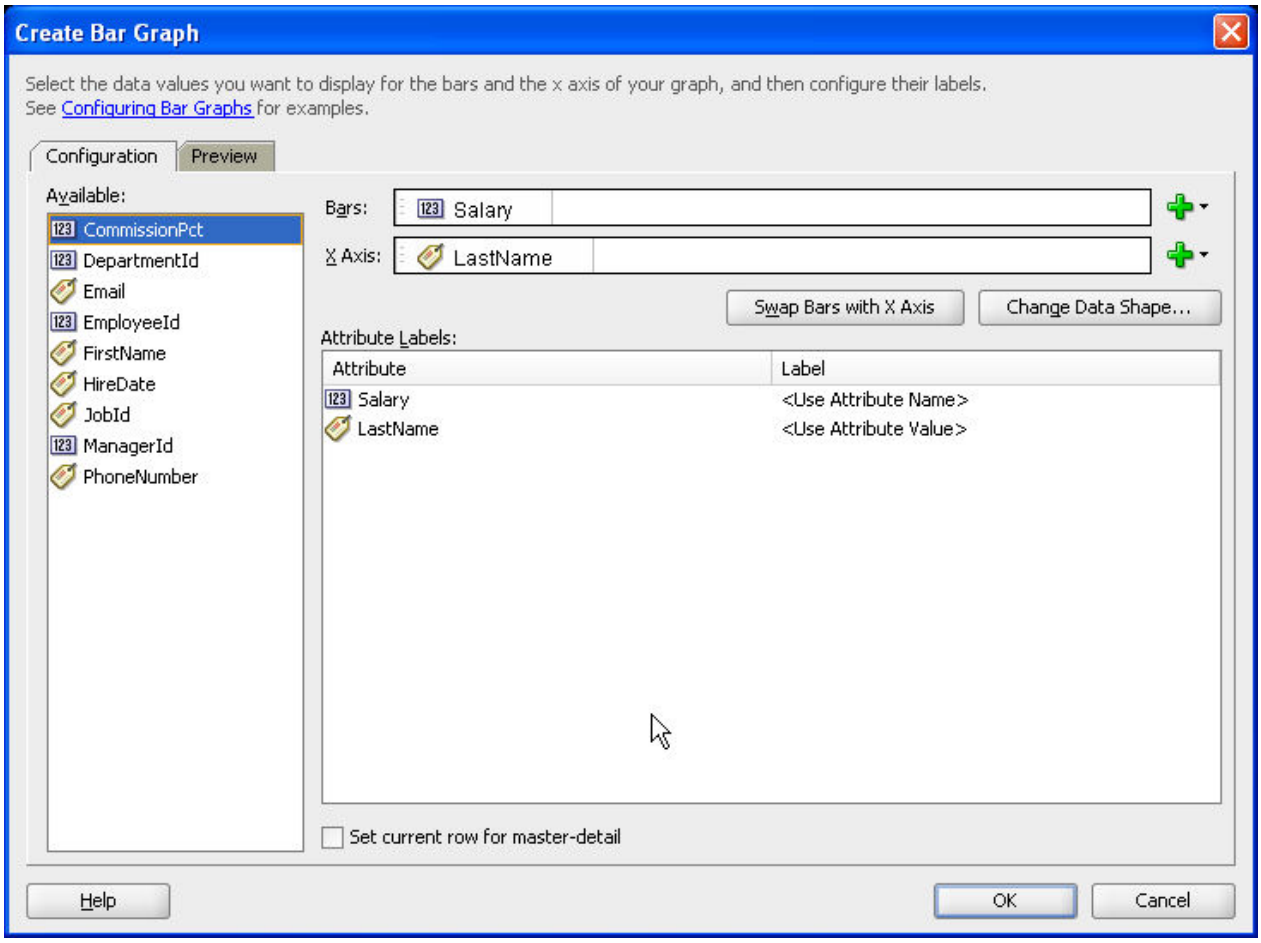
As shown below, choose **Graph…** in the popup menu that appears when you dropped the `EmployeesView4` node.



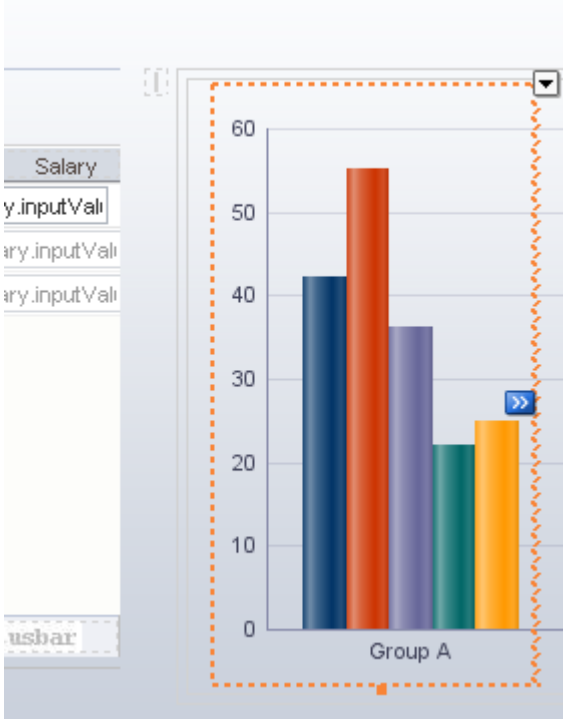
The **Component Gallery** dialog appears that allows you to choose a graph type from the more than hundred (!) graph types that are supported by JDeveloper and ADF. We will keep it relatively simple and go for the simple `Bar` graph with the default Quick Start Layout as shown below.



In the **Create Bar Graph** dialog that appears, drag and drop the `Salary` attribute into the `Bars` field, and `LastName` into the `X Axis` field as shown below.



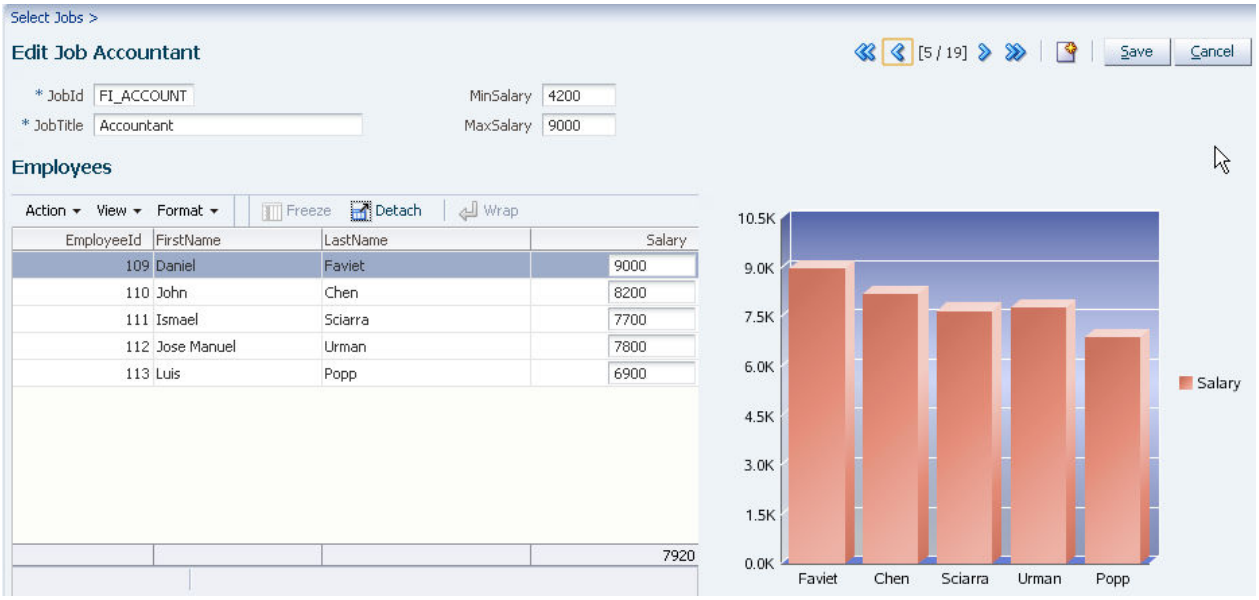
Click OK. The graph is now displayed in the visual page editor as shown below.



With the graph item selected, go to the **Properties** panel and in the **Appearance** category, make the following changes to configure a nice animated 3D-style rendering:

Property Name	Set to Value
Style	Confetti
3D Effect	true
AnimationOnDisplay	AUTO
SeriesRolloverBehavior	RB_HIGHLIGHT

Now, *without regenerating*, run the application again. The `Jobs` form page should now look like this:



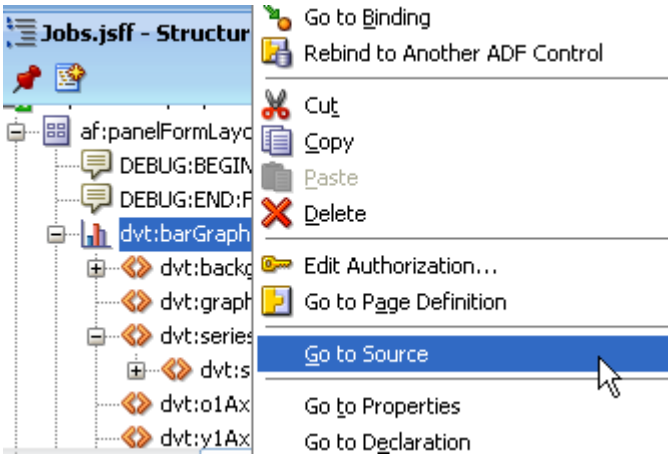
If you change the salary of one of the employees and tab out the field, you will notice that the graph and average salary is updated immediately using ADF Faces Partial Page Rendering.

8.3. Preserving Customizations Using Generator Templates

Once you've changed a JHeadstart-generate page using the visual design-time tools in JDeveloper, you need to preserve these changes upon regeneration of your application.
Instead of disabling future generation of the corresponding JHeadstart group in the application definition, you can also "teach" the JHeadstart application generator how to generate your preferred layout in the future by creating a custom generator template. This enables you to have the JHeadstart application generator generate the page in a customized way going forward, allowing you to continue making iterative application definition changes to the corresponding group.

In this step we'll illustrate an example of this second, more powerful approach. We will create a new custom generator template based on the customization we made in the previous section to the `SalaryGraph` item in the `Jobs.jsff` page fragment.

Get Page Snippet for Salary Graph
Before we create the custom template, we need to put the graph element we added to the page on the clipboard, so we can add it to the custom template later on.
In the Visual Page Editor of `Jobs.jsff`, select the graph by clicking on it. In the **Structure Pane**, the graph is also selected. Right-mouse-click on the `dvt:barGraph` element in the structure pane and choose **Go to Source**, as shown below.



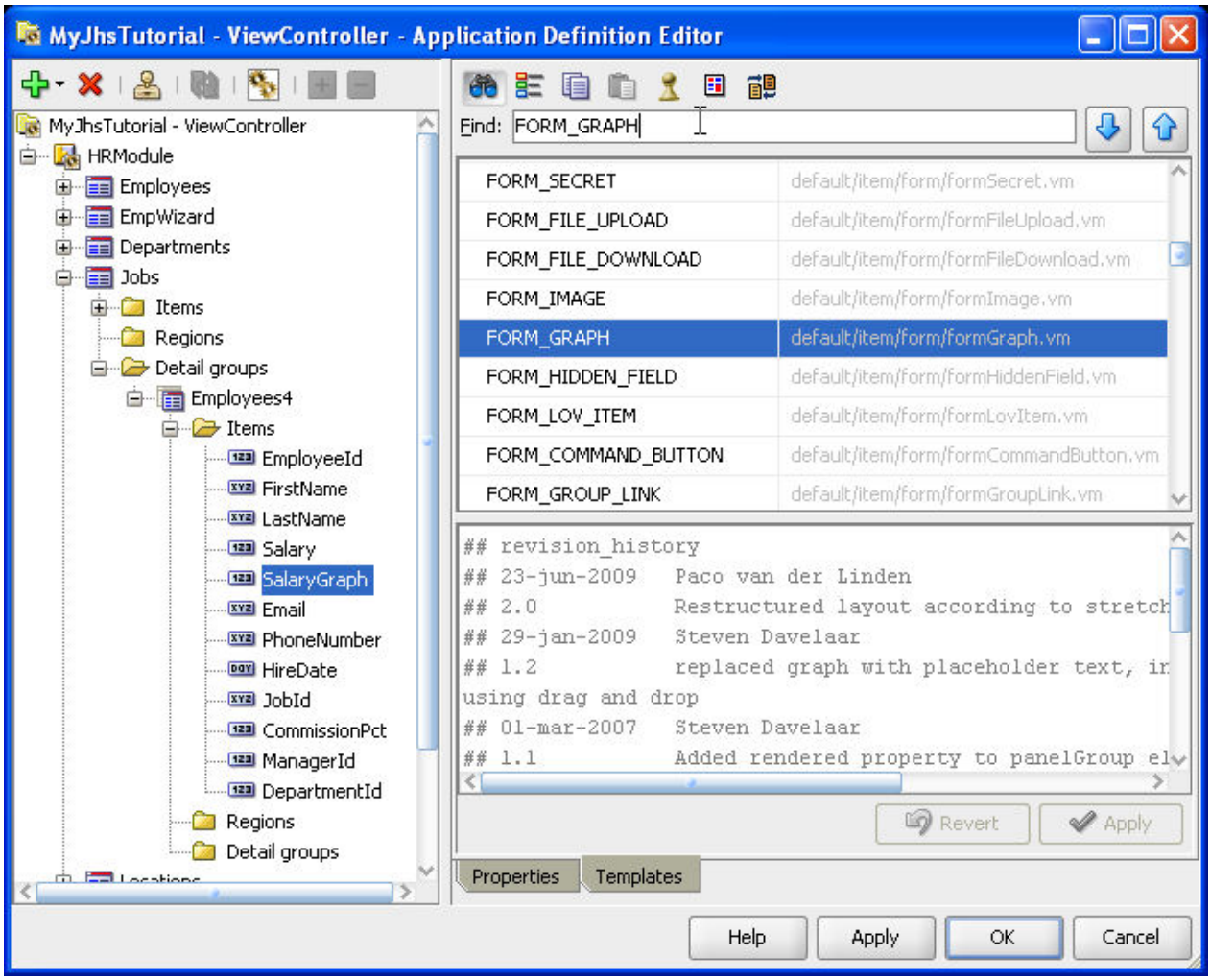
This will show the `Jobs.jsff` page in source mode, with the page snippet for the bar graph selected. Copy the selection to the clipboard by pressing `Ctrl-C`. Also note the comments generated into the page for the SalaryGraph item as shown below.

```
<!-- DEBUG:BEGIN:FORM_GRAPH : default/item/form/formGraph.vm, nesting level: 9 -->
<!-- DEBUG:END:FORM_GRAPH : default/item/form/formGraph.vm, nesting level: 9-->
```

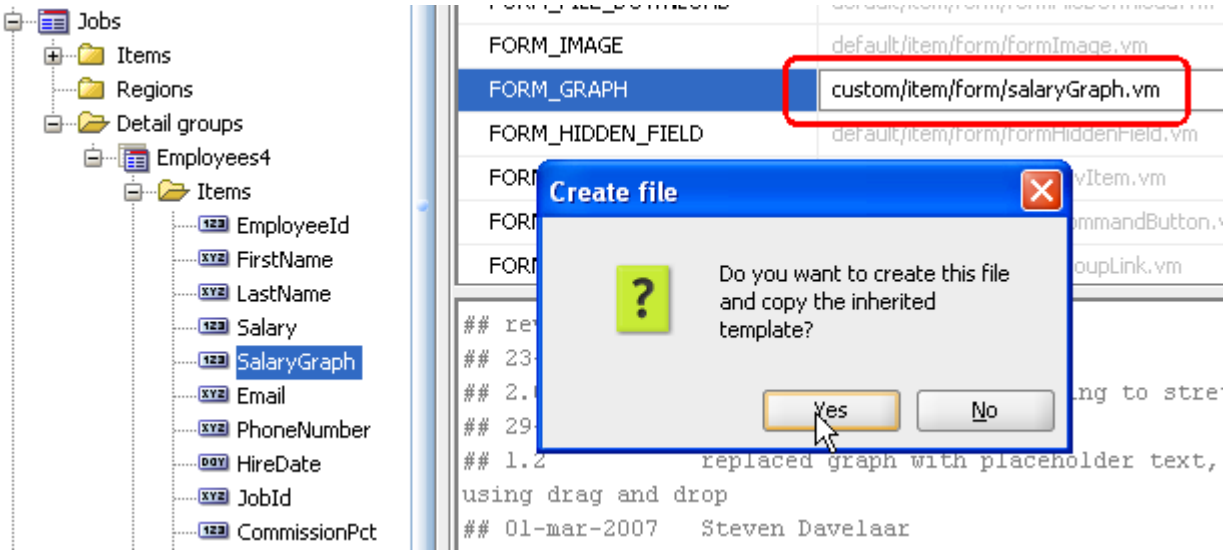
Each page snippet generated from a JHeadstart template is surrounded by begin and end comments indicating the logical name of the template, FORM_GRAPH in this case, and the actual template used to generate the page snippet, which is the default template, `default/item/form/formGraph.vm`. There is no content between the comments anymore because we deleted the ADF Faces outputText element in the previous step.

Create Custom Template for SalaryGraph

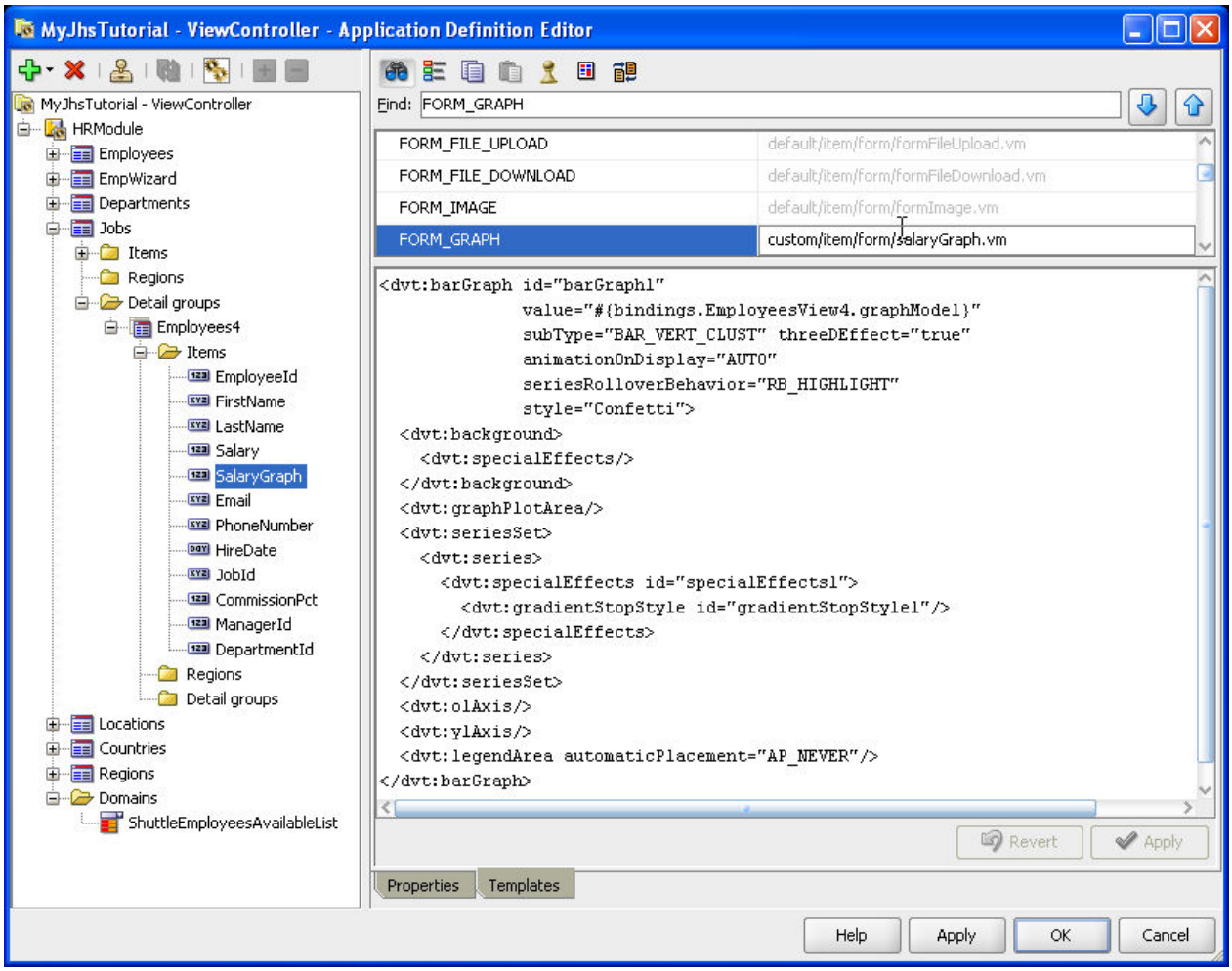
Back in the JHeadstart Application Definition Editor, select the `SalaryGraph` item of the `Employees4` group and click on the **Templates** tab. In the toolbar at the top of the Templates tab, click the Find icon, and enter `FORM_GRAPH` in the `Find` item and click (**Enter**). The editor should now look the figure below.



Click on the FORM_GRAPH template path field. At the bottom of the **Templates** tab you see the content of the actual template file displayed in light grey which means you cannot change it (yet). Now change the temlate path to `custom/item/form/salaryGraph.vm`. When you tab out the field the **Create File** dialog appears as shown below.



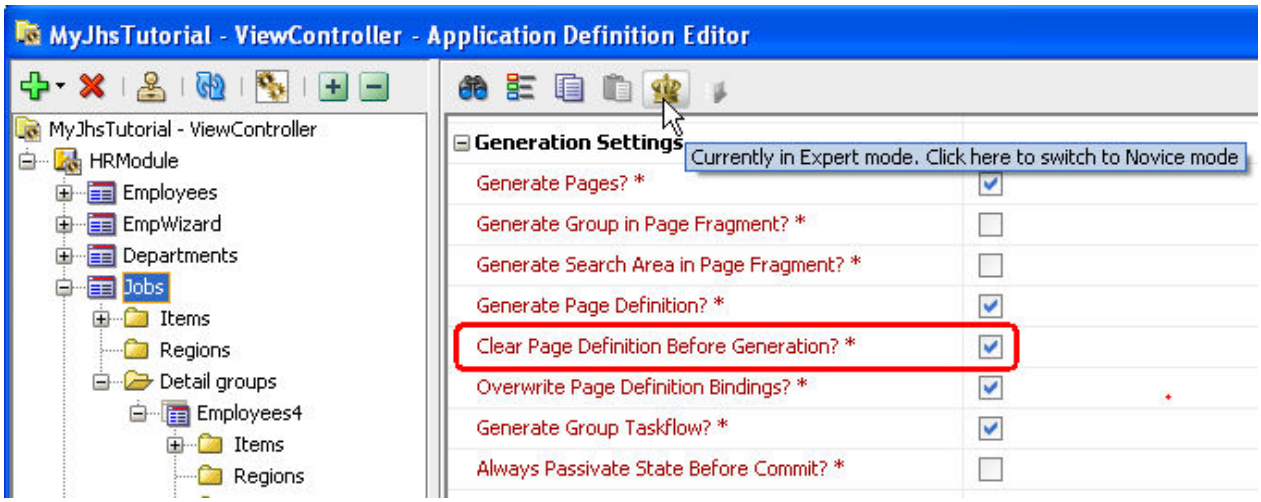
Click (**Yes**) to create a custom template that initially contains the same content as the default template. While in this example we don't need any of the original content of the default template, it is in general a good idea to start with a copy of the default template. The template content is now displayed in black and we can edit our custom template. Click in the template content pane and select all content using `Ctrl-A`. Then paste the content of the clipboard using Ctrl-V and click (**V Apply**). The editor should look like this:



Preserve Graph Binding in Page Definition

There are two ways to preserve the graph binding that was added to the page definition during the graph drag-and-drop action:

- Configure JHeadstart to leave non-generated bindings in the page definition by unchecking the group-level checkbox **Clear Page Definitions Before Generation**. This property is only visible in so-called expert mode, you can switch between novice and expert mode using the chess icon in the toolbar.



- Add code to the custom template that will re-add the graph binding to the page definition each time the application is generated.

The first approach is easier but has the disadvantage that over-time the page definition might contain many unused bindings since JHeadstart no longer clears unused bindings. Furthermore, page definition generation time will decrease with this setting, in particular for large page definitions.

The second approach is a bit more work, but does not have the above disadvantages.
In this tutorial we will use the second approach, since it is a useful technique that can be applied in many use cases where you want to add new bindings or override generated bindings in the page definition.

To add the binding through the custom template, the first step is to go to the XML source of the page definition and copy the graph binding to the clipboard. Go to the visual page editor of `Jobs.jsff`, right-mouse-click on the page and choose **Go To Page Definition** from the popup menu. Click the Source tab, and scroll to the bottom of the page definition. The graph binding is the last binding in the file. Select the source of the binding and click Ctrl-C.

Now, go back to the Application Definition Editor, to the **Templates** tab with the `SalaryGraph` item in `Employees4` group selected, and add the graph binding at the top (or bottom, doesn't matter) of your custom template. Surround the binding with the following code:

```
#macro (CUSTOM_BINDING)
  ## graph binding code goes here
#end
${JHS.pageDefGenerator.addBinding($JHS.page,"EmployeesView4","#CUSTOM_BINDING(
)")}
```

These statements are part of the open source Velocity Template Language [10] used in JHeadstart templates. The statements turn the graph binding in a so-called macro, and then we call a method that adds the content of this macro as a binding to the page definition of the current page, using the binding id EmployeesView4.

The complete content of the custom template `custom/item/form/salaryGraph.vm` should now look like this:

```
#macro (CUSTOM_BINDING)
    <graph IterBinding="Employees4Iterator" id="EmployeesView4"
           xmlns="http://xmlns.oracle.com/adfm/dvt" type="BAR_VERT_CLUST">
      <graphDataMap leafOnly="true">
        <series>
          <data>
            <item value="Salary"/>
          </data>
        </series>
        <groups>
          <item value="LastName"/>
        </groups>
      </graphDataMap>
    </graph>
#end
${JHS.pageDefGenerator.addBinding($JHS.page,"EmployeesView4","#CUSTOM_BINDING()")}
<dvt:barGraph id="barGraph1"
              value="#{bindings.EmployeesView4.graphModel}"
              subType="BAR_VERT_CLUST" threeDEffect="true"
              animationOnDisplay="AUTO"
              seriesRolloverBehavior="RB_HIGHLIGHT"
              style="Confetti">
  <dvt:background>
    <dvt:specialEffects/>
  </dvt:background>
  <dvt:graphPlotArea/>
  <dvt:seriesSet>
    <dvt:series>
      <dvt:specialEffects id="specialEffects1">
        <dvt:gradientStopStyle id="gradientStopStyle1"/>
      </dvt:specialEffects>
    </dvt:series>
  </dvt:seriesSet>
  <dvt:o1Axis/>
  <dvt:y1Axis/>
  <dvt:legendArea automaticPlacement="AP_NEVER"/>
</dvt:barGraph>
```

Renenerate and Run the Application.

The custom template will now preserve the changes you made to both the page fragment as the poage definition. Now you can rerun the JHeadstart application generator and run the application again. You'll see that the feature you added using the JDeveloper visual design time tools, is now something you can regenerate automatically!

9. Navigating Context-Sensitive to Another Group Taskflow

Sometimes you might want to allow a user to navigate to a page in your application to display or edit a particular row that they identify based on information in the source page. For example, in a page that displays employees, you might want to navigate to a jobs page that displays the job information of the employee you selected in the source page.

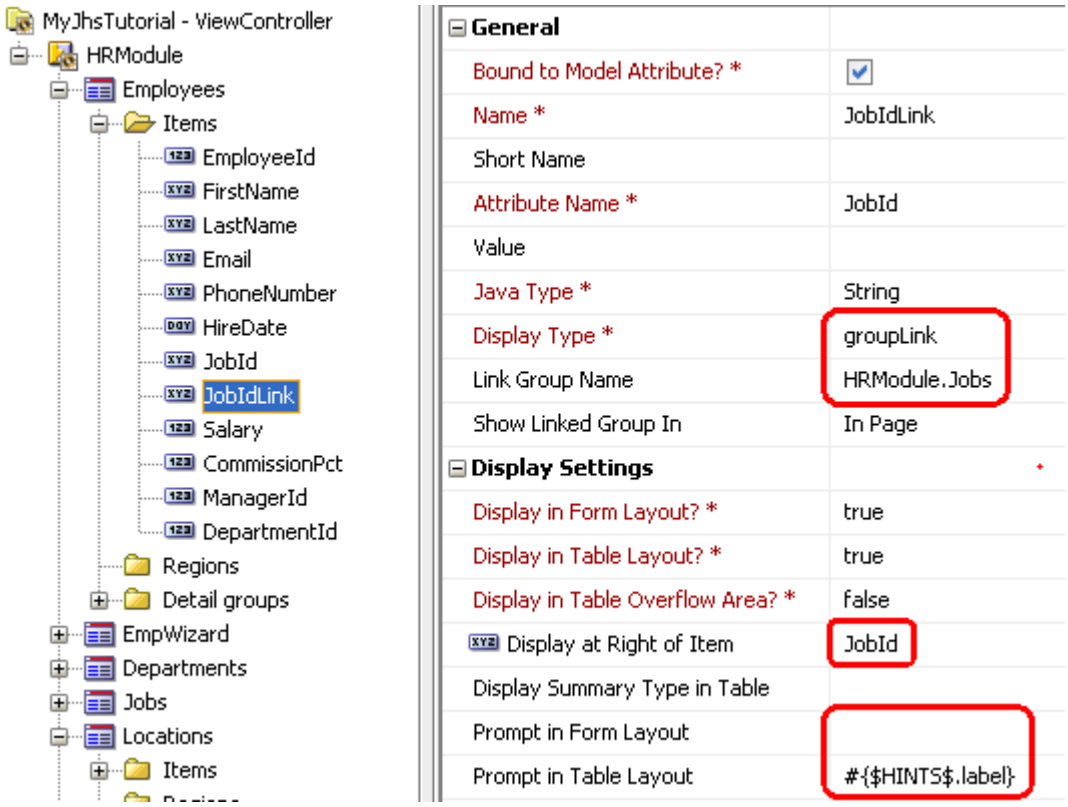
In this step, we will use JHeadstart's so-called “deep linking” support to generate the `JobId` in the Employees group table as a hyperlink that navigates to the "Job Edit" page querying the proper Job row in the process.

To accomplish this task, follow the steps in the sections below.

Create New Item for Deep Linking to Jobs Group

The `JobId` item in the `Employees` group is used both in the read-only table page and in the editable form page. Since we still want to display a dropdown list to edit the Job in the form page, we will create a new item to create the hyperlink in the table page.
Right-mouse-click on the `JobId` Item and choose **Duplicate Item** from the popup window.
A new item also named `JobId` is added to the group. Rename the new item to `JobIdLink` and move this new item using drag and drop to display right below the `JobId` item. Hide the `JobId` item in the table by setting **Display in Table?** to false. Make the settings for the new `JobIdLink` item as shown below:

Property Category	Property Name	Set to Value
General	Display Type	groupLink
General	Link Group Name	HRModule.Jobs
Display Settings	Display at Right of Item	JobId
Display Settings	Prompt in Form Layout	(null)
Display Settings	Prompt in Table Layout	#{$HINTS$.label}

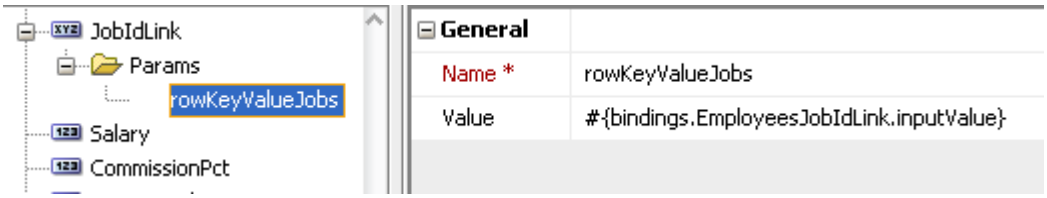


Set Up Parameter to Pass Employee JobId

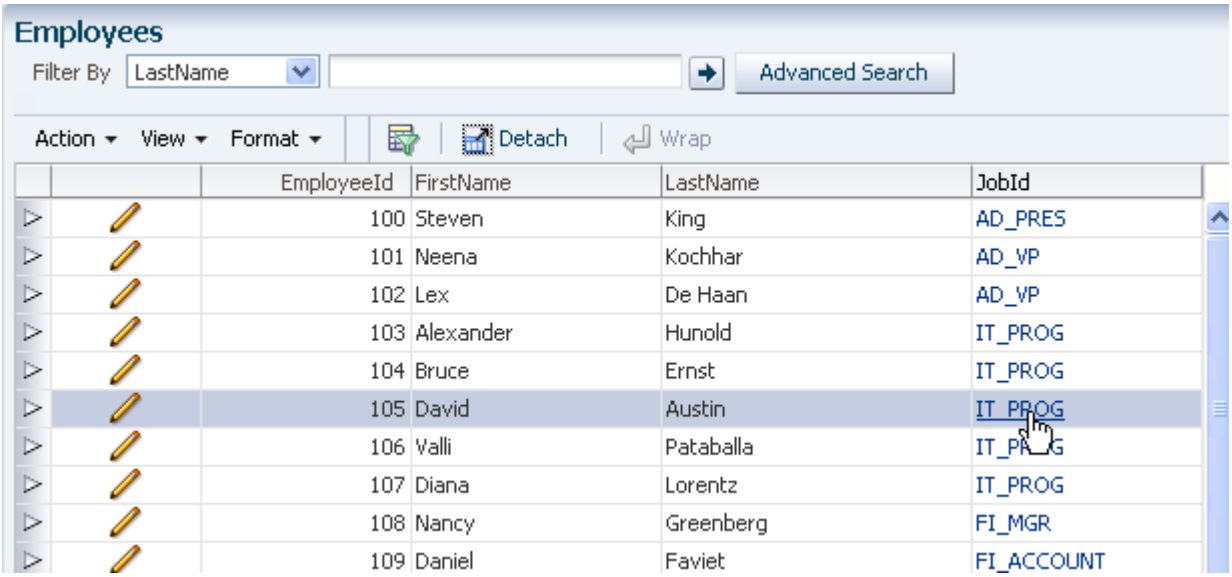
When clicking on the link, the user will navigate to the generated `Jobs` taskflow. Each taskflow generated by JHeadstart is pre-configured with taskflow parameters for deep linking. If you specify a parameter named `rowKeyValueJobs`, the taskflow control flow will route to a so-called `SetCurrentRow` activity that sets the current job before navigating to the Edit Jobs page.

To specify the parameter, right-mouse-click on `JobIdLink` and choose **New > Parameter**.

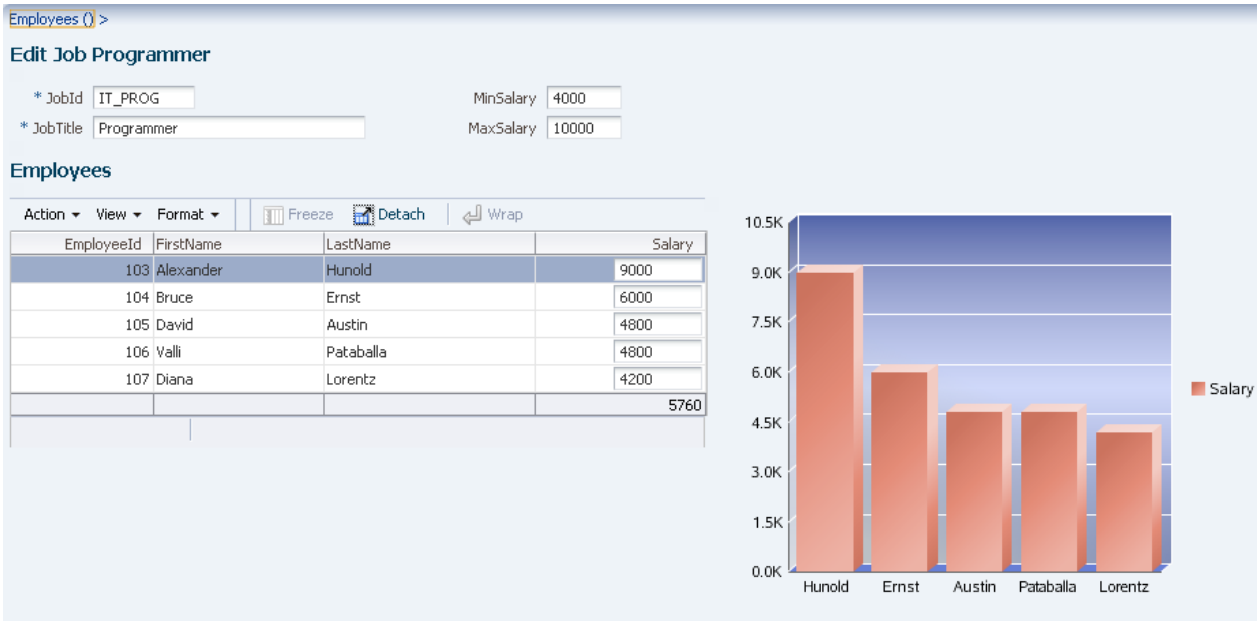
Set the **Name** of the parameter to `rowKeyValueJobs` and the **Value** to `#{bindings.EmployeesJobIdLink.inputValue}`



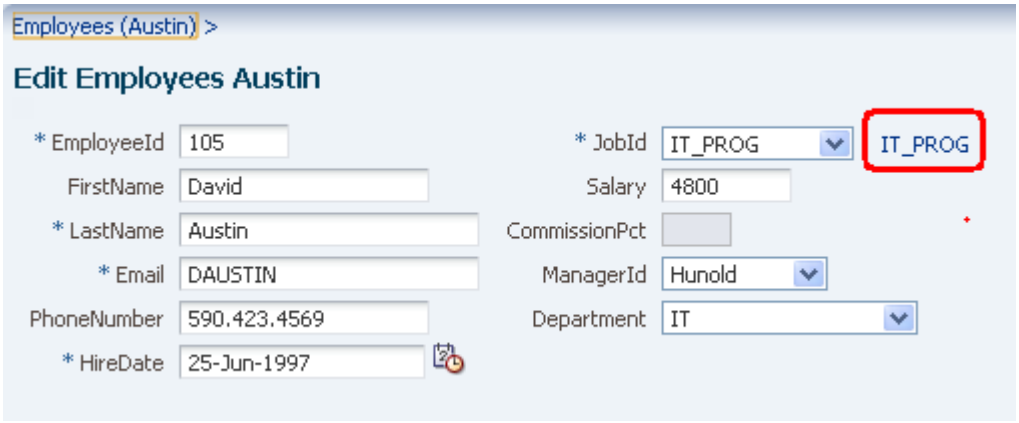
Renenerate and Run the Application.
Regenerate and run the application. Go to the `Employees` tab, the `JobId` column now displays as a hyperlink.



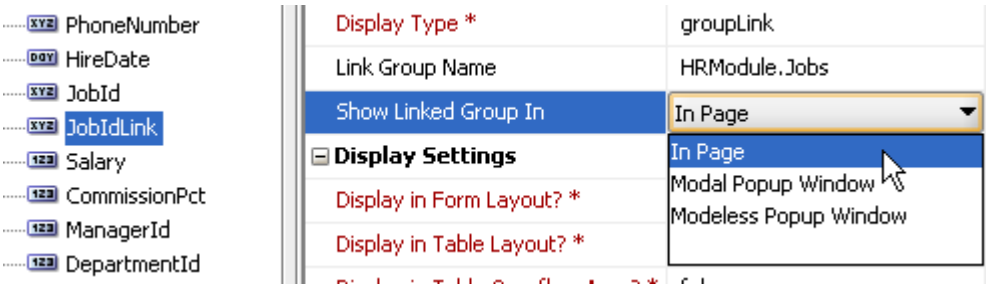
Clicking on a the hyperlink for `IT_PROG` for employee David Austin jumps straight to the `Edit Job` page with that specific job selected for editing as shown below. Also note the *dynamic breadcrumb* at the top of the page allowing you to return to the `Employees` page



If you go to the `Employee` edit page, you will see that the `JobId` link is displayed at the right of the `JobId` drop-down list, as we configured using the **Display at Right of Item** property.



Note that in this example, we left the item property **Show Linked Group In** to its default of `In Page`. We can also choose to display the linked group in a modal or modeless popup window.



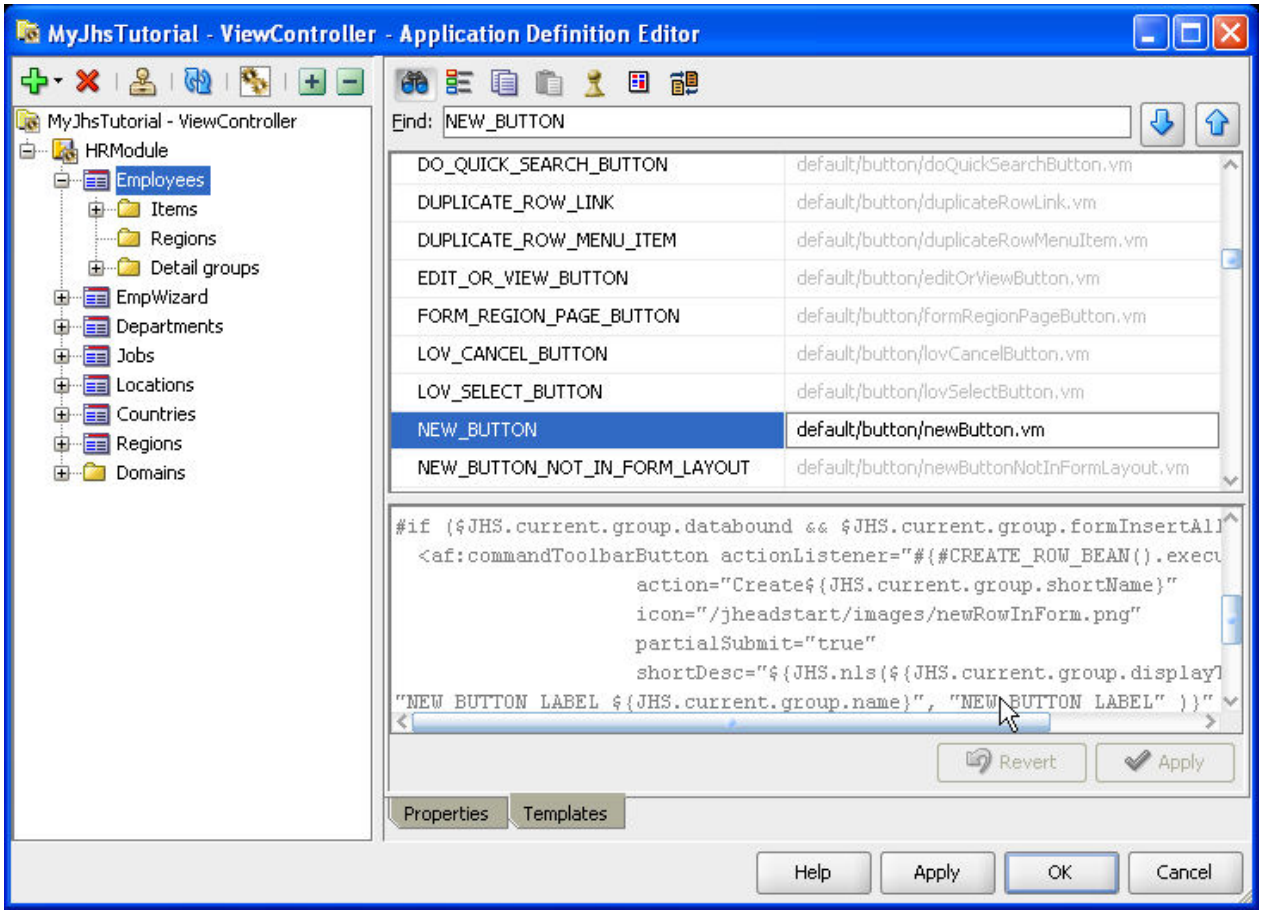
Using an additional parameter, we could even display the `Jobs` page in read-only mode in a popup, supporting the “employee job details look up” use case rather than the “edit current job” use case. See the JHeadstart Developer’s Guide [4], section 6.14 “Navigating Context-Sensitive to Another Group Taskflow (Deep Linking)” for more information.

10. Launching the Employee Wizard in a Popup Window

The employee wizard created in step 6 is now displayed under its own tab. From an end user usability perspective it makes more sense to have only one tab related to employees, and launch the employee wizard when clicking the (**New**) button in the `Employees` group.
We can accomplish this using a custom template for the (**New**) button in the `Employees` group. Follow these steps to do this:

Create Custom Template for New Employee Button

By default, the (**New**) button in both the employee table page and employee form page navigates to the employee form page, showing this page in create mode. We will create a custom template to change this behavior and invoke the employee wizard in a popup window instead.
In the JHeadstart Application Definition Editor, select the `Employees` group and click on the **Templates** tab. In the toolbar at the top of the Templates tab, click the Find icon, and enter `NEW_BUTTON` in the `Find` item and click (**Enter**). Click on the path name of the NEW_BUTTON line. The editor should now look the figure below.



Now change the template path to `custom/button/newEmployeeButton.vm` and click OK in the dialog that appears to confirm you want to copy the content from the default template.
Make the following changes to the content of the template:

- Remove the actionListener property within the `<af:commandToolButton>` element
- Change the action property as follows

```
action="${JHS.facesConfigGenerator.addGroupTaskFlowCall(${JHS.current.group},"EmpWizard",true,null)}"
```

This velocity statement will generate the task flow call that is needed to launch the EmpWizard taskflow. The boolean argument indicates to launch the taskflow in a popup window.

- Add the following properties to the `<af:commandToolButton>` element:

```
windowModalityType="applicationModal" useWindow="true" windowWidth="500"
```

These properties define that when clicking the button, a new model window with a width of 500 pixels should be opened to show the called taskflow

- Finally, add the following child element to the `<af:commandToolButton>` element

```
<af:setActionListener from="#{true}"
            to="#{EmpWizardDeepLinkParameters.createEmpWizard}"/>
```

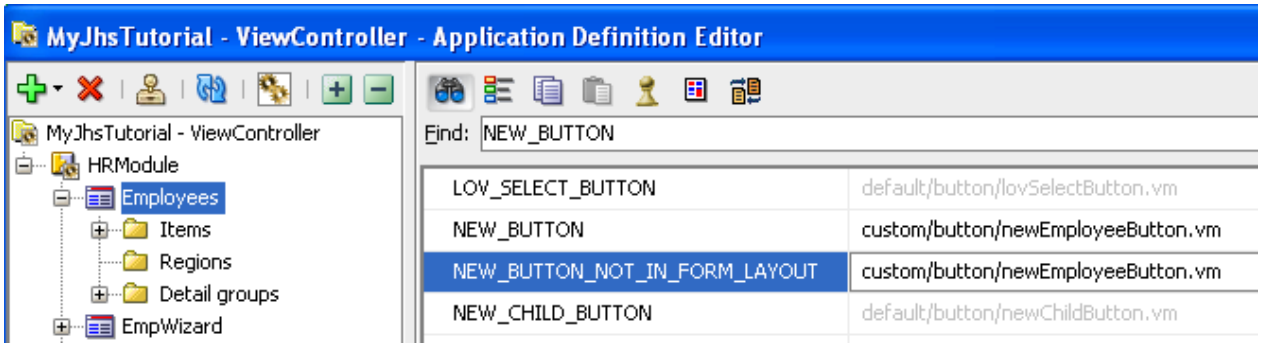
This element ensures that the Employee Wizard taskflow willl be called with the createEmpWizard parameter set to true, ensuring the first taskflow page will open in create mode

The complete custom template (without revision history and shortDesc and rendered properties truncated) should now look like this:

```
#if ($JHS.current.group.databound && $JHS.current.group.formInsertAllowed)
  <af:commandToolbarButton
      action="${JHS.facesConfigGenerator.addGroupTaskFlowCall(${JHS.current.group},"EmpWizard",true,null)}"
      windowModalityType="applicationModal" useWindow="true" windowWidth="500"
      icon="/jheadstart/images/newRowInForm.png"
      partialSubmit="true"
      shortDesc="${JHS.nls(${JHS.current.group.displayTitleSingular}, "NEW_BUTTON_LABEL_${JHS.current.group
      rendered="#{#GROUP_NOT_IN_CREATE_MODE() and #PARENT_GROUP_HAS_ROW() ${JHS.addELExpression(${JHS.curre
      id="${JHS.current.group.shortName}NewButton">
      <af:setActionListener from="#{true}" to="#{EmpWizardDeepLinkParameters.createEmpWizard}"/>
  </af:commandToolbarButton>
  #ADD_CUR_GROUP_PARTIAL_TRIGGER("${JHS.current.group.shortName}NewButton")
#end
```

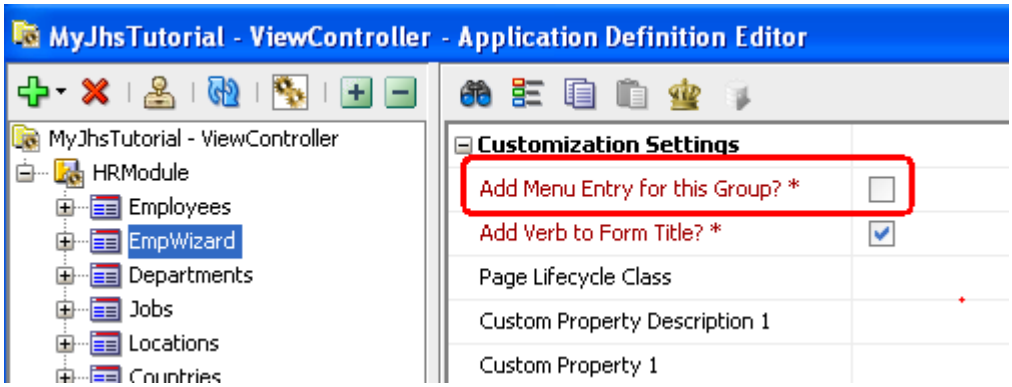
Click (**V Apply**) to save your changes to the custom template.

There are separate templates for the new button displayed in the employee table page (NEW_BUTTON_NOT_IN_FORM_LAYOUT) and employee form page (NEW_BUTTON). We can reuse the custom template just created in the table page, so change the path of NEW_BUTTON_NOT_IN_FORM_LAYOUT to `custom/button/newEmployeeButton.vm` as well.



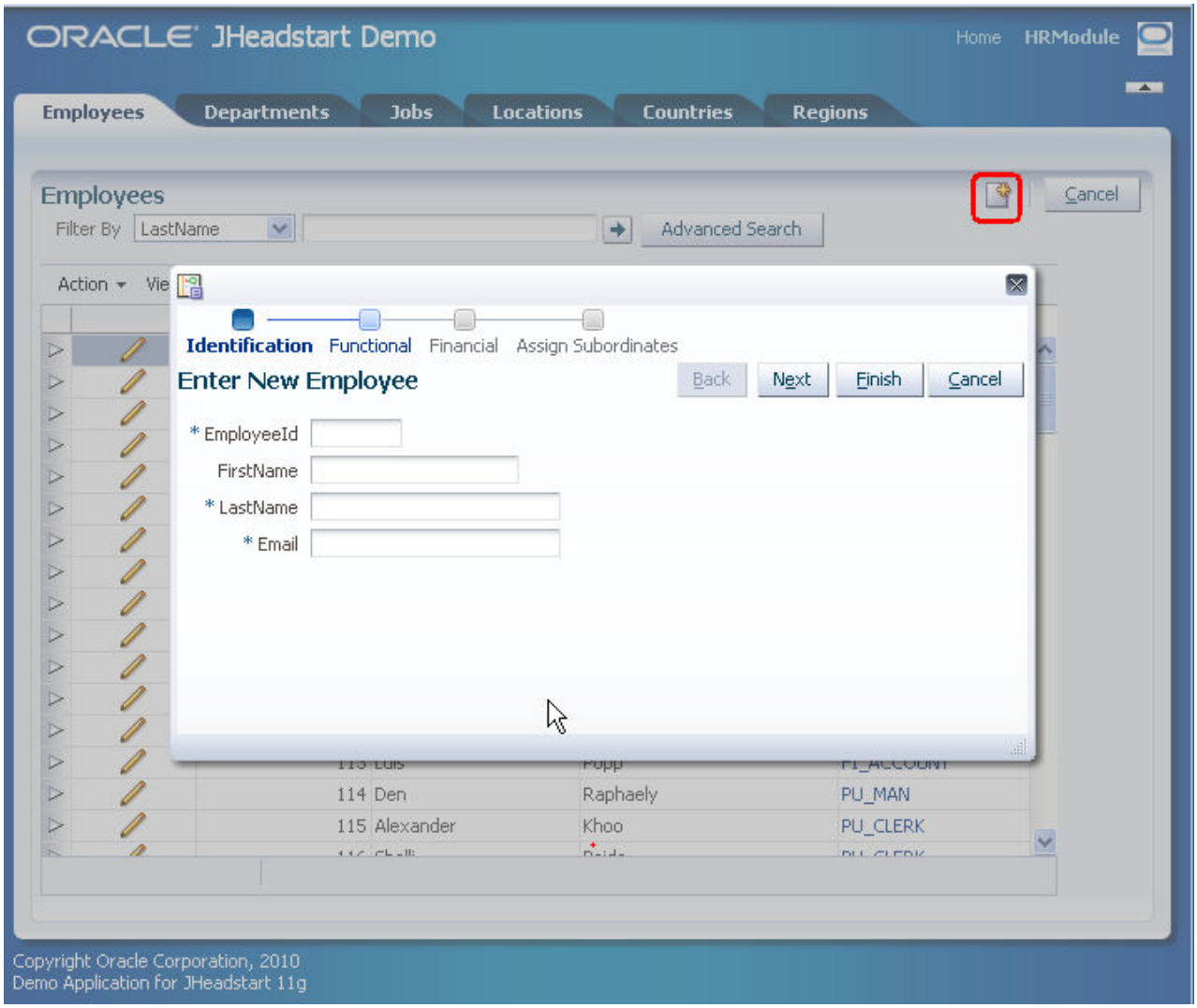
Hide Employee Wizard Tab in the Menu

We no longer want to access the employee wizard directly from the menu. To hide this menu tab, select the `Employee Wizard` group, click on the **Properties** tab, click on the toolbar chess icon "Switch to Expert mode", and uncheck the property **Add Menu Entry for this Group?** under category **Customization Settings**.



Renenerate and Run the Application.

Regenerate and run the application. Go to the `Employees` tab and click on the New Employee button. The employee wizard will appear in a popup window. Also notice the menu, the Employee Wizard tab is no longer there.



11. Reusing the Employees Group

You might have noticed that employee data are displayed in various pages. We have the Employees group that we configured to generate a read-only table page with overflow inline, and a form page with subordinate and managed department information shown below. We also configured the new button to launch a separate new employee wizard in a popup window.
As a child of the departments group, we have the Employees3 group that displays employee data in table format below the departments table. And we have the Employees5 group that displays employee data in table format below the department selected through the tree control that we set up in step 4.
Now, assume we want to have a consistent way of presenting and editing employee data across the application. We could configure the metadata in the Employees3 and Employees5 group to be the same as the Employees group to generate similar page (fragments). But this would result in redundant work to keep the metadata and generated pages in synch.

Fortunately, there is a much easier way to get this consistency: by reusing a group definition elsewhere in the JHeadstart metadata using a **Group Region**. In this step, we will reuse the Employees group as a child group under the Departments group. We will remove the existing Employees3 group, and will replace it with a reference to the top-level Employees group. We will use task flow parameters of the Employees group to configure the behavior and appearance of the employees group when used as a child of the

departments group. The taskflow parameters are passed as query bind variables to the `EmployeesView` query to restrict the query results to a specific department if needed.

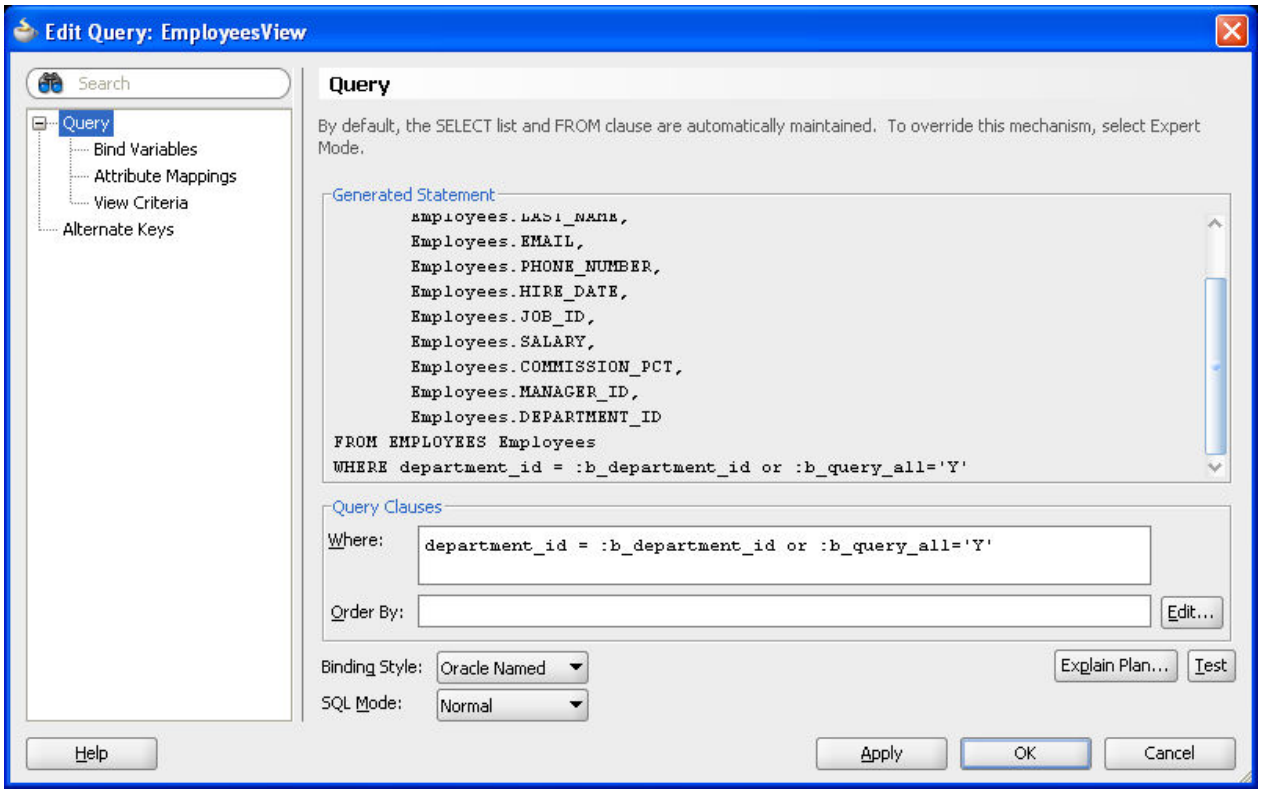
Follow the steps below to accomplish this.

11.1. Make the EmployeesView Query Conditionally Restricted to one Department

Change EmployeesView Query

Select the `oracle.hr.model.queries.EmployeesView` view object in the application navigator, and double-click it to launch the **View Object Editor**. On the **Query** panel of the editor, click the **Edit** icon and add the following where clause to the query:

```
department_id = :b_department_id or :b_query_all='Y'
```

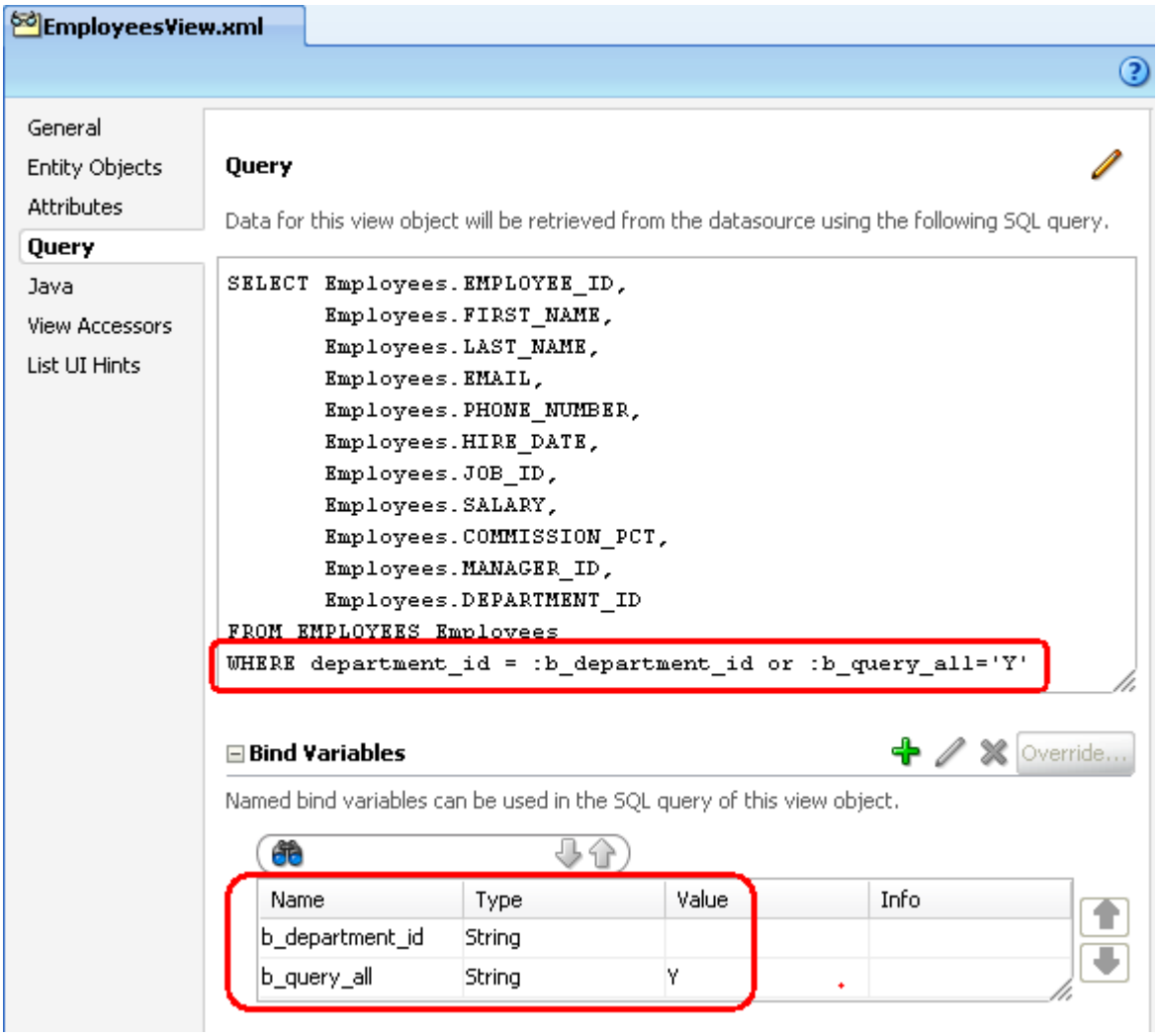


Add Bind Parameters to EmployeesView

Still in the **Edit Query** dialog, click on the **Bind Variables** node in the tree at the left side. Enter the two bind variables that you defined in the query:

- Click on the **New** button and enter `b_department_id` in the **Variable Name** field.
- Click on the **Control Hints** tab, and set the **Display Hint** field to `Hide`. This prevents the bind variable to show up in the search region.
- Click again on the **New** button and enter `b_query_all` in the **Variable Name** field. Enter 'Y' in the **Value** field. This is the default value that will be used if the bind variable is not set.
- Click on the **Control Hints** tab, and set the **Display Hint** field to `Hide`.
- Click **OK** to close the **Edit Query** dialog.

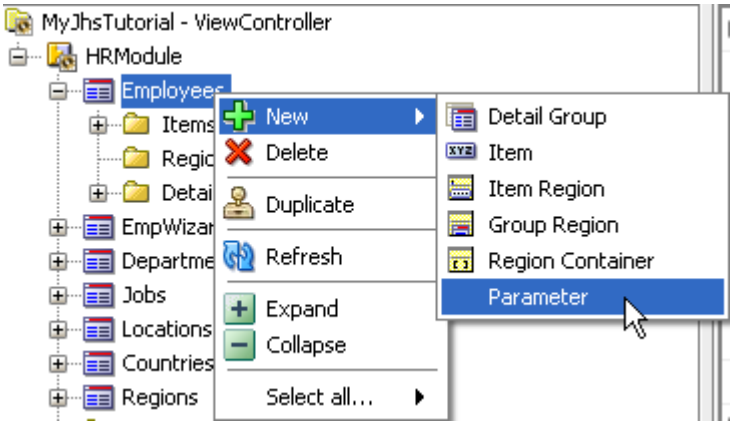
The query pane should look like this:



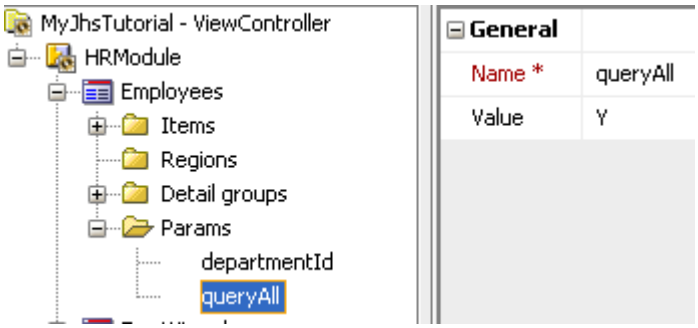
11.2. Configure Employees Group for Reuse

Set Up Taskflow Parameters in Employees Group

Back in the Application Definition Editor, right-mouse-click on the `Employees` group node and in the popup menu choose **New -> Parameter**.



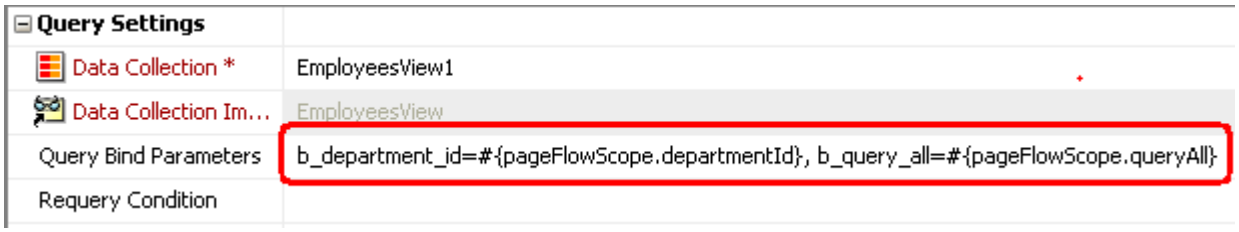
Set the **Name** of the parameter to `departmentId`. Add another parameter with name `queryAll` and value `Y`, as show below.



Pass Taskflow Parameters as Query Bind Variables

To pass the taskflow parameters we just defined as query bind variables to the `EmployeesView` query, we use the group-level property **Query Bind Parameters** which can be found under the **Query Settings** category**.** In this property we can specify a comma-delimited list of query bind variables. Each bind variable is a name-value pair, separated by the '=' character. To pass the values of the taskflow parameters, set the **Query Bind Parameters** property as follows:

```
b_department_id=#{pageFlowScope.departmentId}
,b_query_all=#{pageFlowScope.queryAll}
```



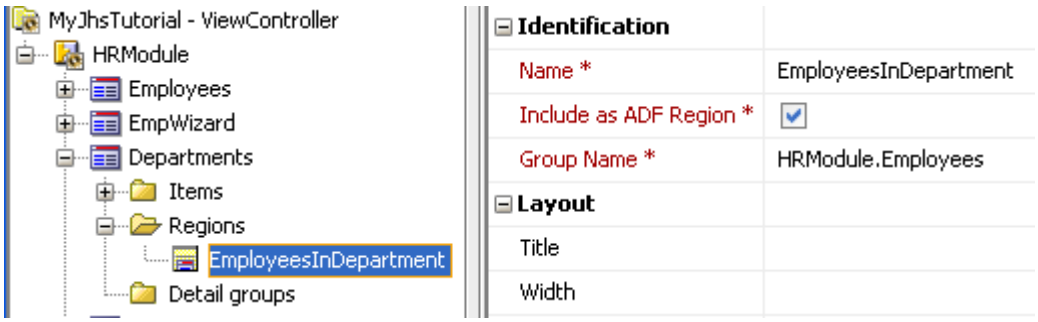
11.3. Reuse Employees Group as Child of Departments Group

Remove Employees3 Group

We no longer need the `Employees3` group. Select this group in the navigator and click the delete icon, and click **Apply**.

Add Employees Group Region

Right-mouse-click on the **Regions** folder of the Departments group and choose **New -> Group Region**. Set the **Name** property to `EmployeesInDepartment`, and check the **Include as ADF Region** checkbox. This checkbox allows you to select other top-level groups in the **Group Name** property. Set this property to `HRModule.Employees`.



Note that if you leave the **Include as ADF Region** checkbox unchecked, you can only select detail groups of the current group that have the **Same Page?** checkbox checkedin the **Group Name** property. This is useful if you want to generate complex layouts where the placement of detail groups should be relative to other detail groups and or item groups of the parent group.

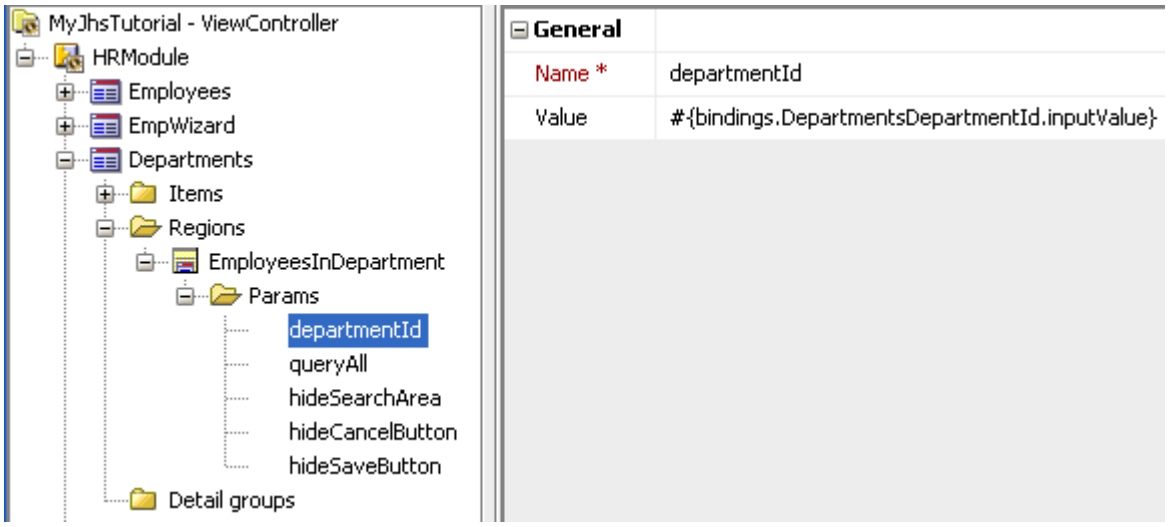
Set Up Employees Taskflow Parameter Values

Now that we defined the group region to reuse the `Employees` group, we must specify the taskflow parameter values that should be passed to the `Employees` taskflow when reused in this specific group region. To add such a parameter, right-mouse-click on the `EmployeesInDepartment` group region and choose **New -> Parameter**. Add the following parameters to the group region:

Parameter Name	Parameter Value
departmentId	#{bindings.DepartmentsDepartmentId.inputValue}
queryAll	N
hideSearchArea	true
hideCancelButton	true
hideSaveButton	true

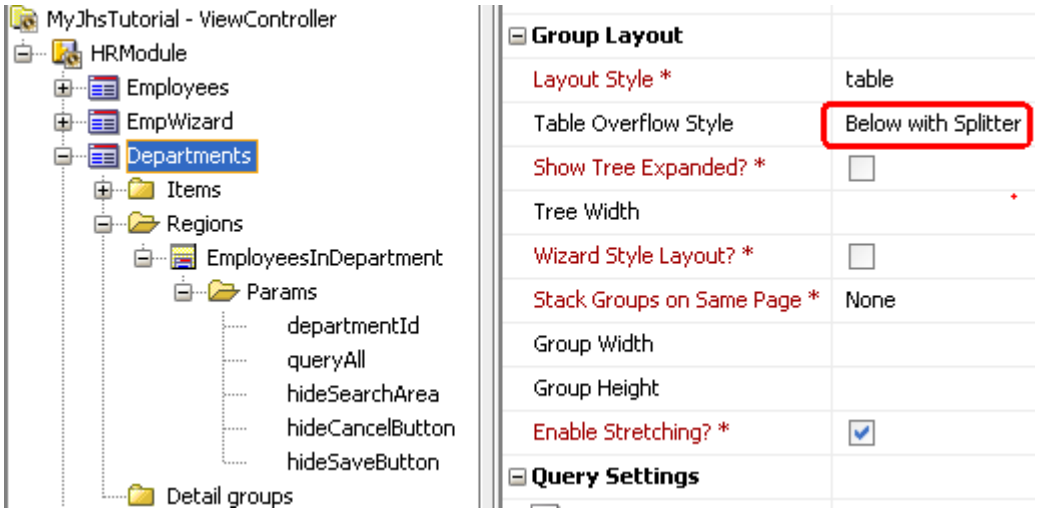
These parameter settings might require some explanation: the first two parameters ensure that the `EmployeesView` query will only query the employees for the currently selected department in the departments table. The last three parameters are standard taskflow parameters generated by JHeadstart to ease reuse. The generated pages evaluate these parameters and will dynamically show the quick and/or advanced search area, and the Save and Cancel buttons. Since we just want to see all employees within a department, we don't need a search area to be displayed. Furthermore, the departments table toolbar already contains save and cancel buttons, so we don't need them anymore in the employees toolbar. That's why we set these parameters to `true`.

When you are done, the `Departments` group should look like this:



Show EmployeesInDepartment Group Region Below Departments Table

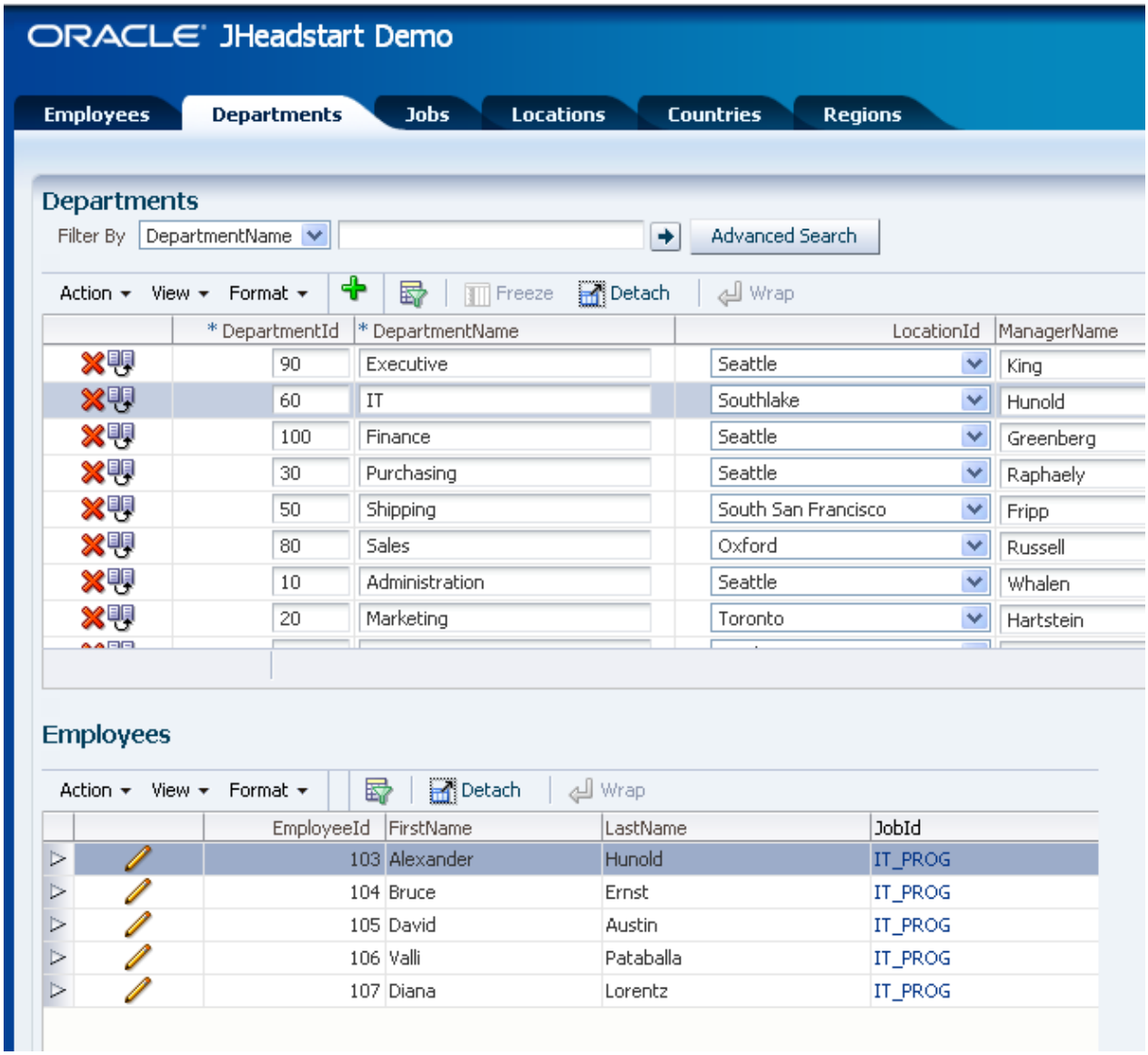
The `Departments` group has **Layout Style** `table`, this means that by default any group regions will not be displayed. We need to configure where the group region should appear relative to the table. We want the group region to be displayed below the departments table, separated by a splitter. To achieve this, we need to set the **Table Overflow Style** to `Below With Splitter`.



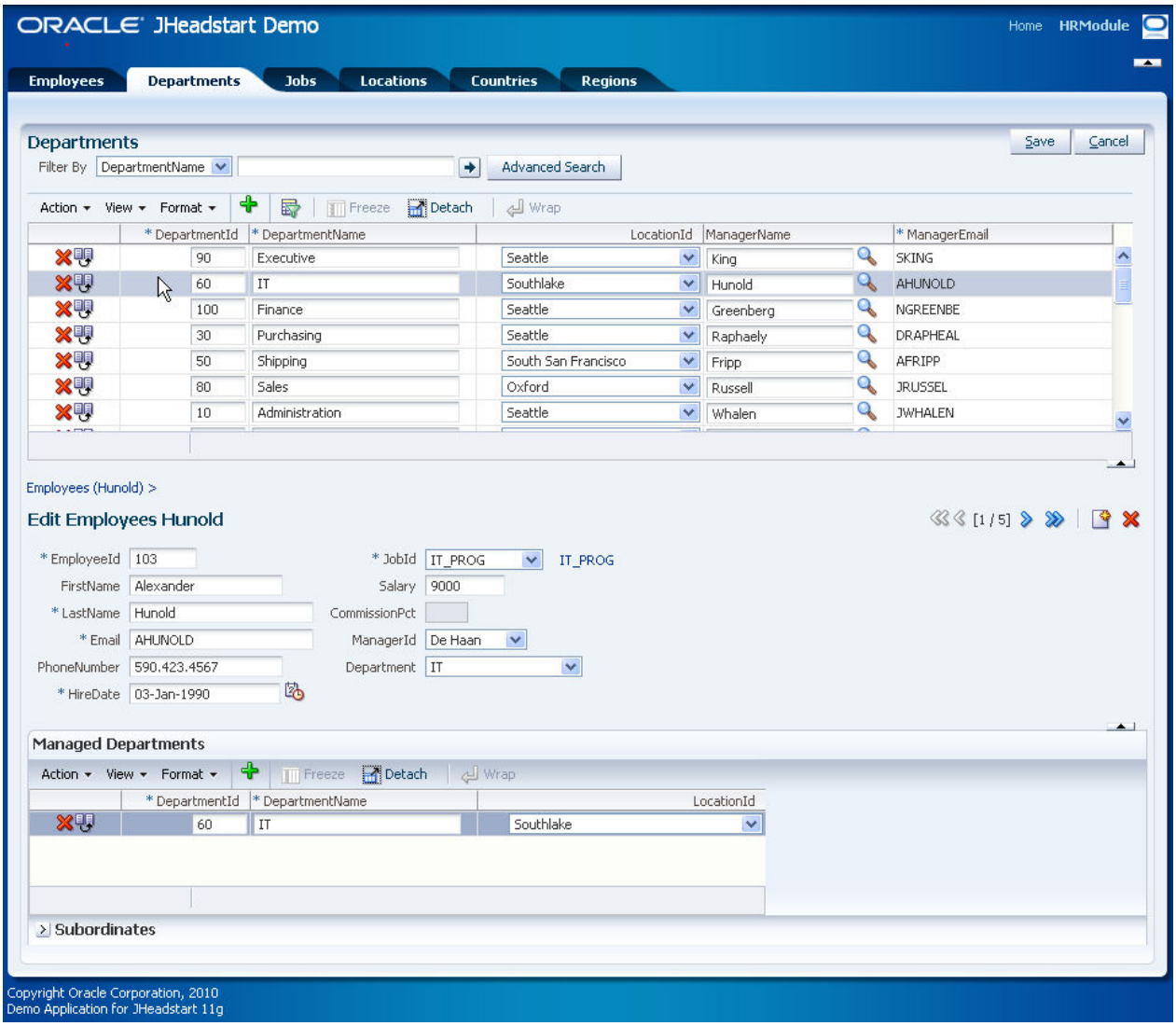
To make the group region stretch vertically to consume the available space based on the splitter position, we also need to check the **Enable Stretching?** checkbox on the **Regions** node.

11.4. Regenerate and Run the Application

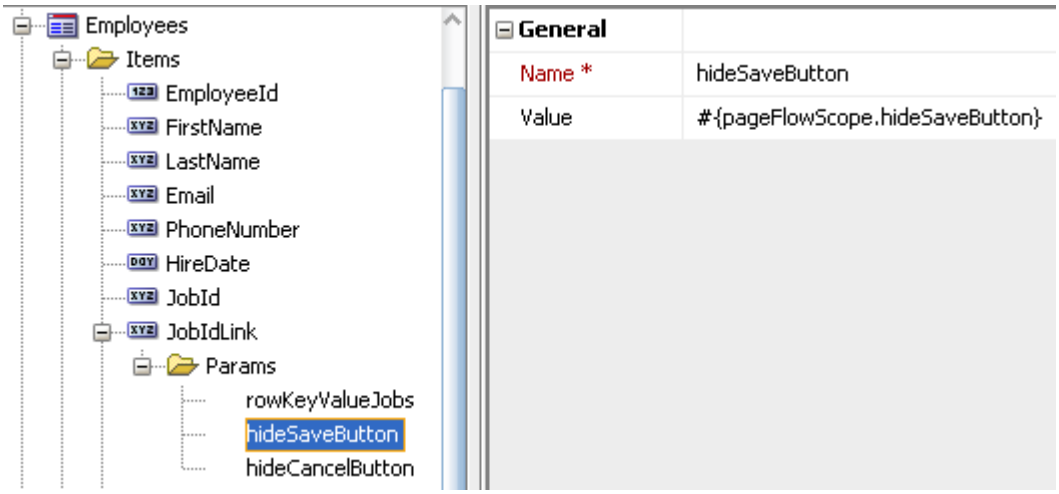
We're done setting up the reuse of the `Employees` group, so let's regenerate the application and run it. When generation finishes, run the application again by clicking on the `ViewController` project in the application navigator and press F11.
When you visit the `Employees` tab, the employees table page will appear the same as before, showing all employees. Now, visit the `Departments` tab, and you will see the same employees table as child of the departments table, separated by a splitter. Note the absence of the employees search region, and the absence of the cancel and the save buttons in the employees toolbar.



If you click on the Employees New button, the employee wizard will launch in a popup window. If you click the edit icon, you will navigate to the employee form page *within the employees region*, the departments table is still visible at the top.



You can even click the `JobId` hyperlink to navigate context-sensitive to the `Jobs` group. If you do this, you notice that the `Jobs` group still displays the **Save** and **Cancel** buttons. This could easily be accomplished by adding additional parameters to the `JobIdLink` item in the `Employees` group where we pass the values of the `Employees` taskflow parameters `hideSaveButton` and `hideCancelButton` to the same parameters of the `Jobs` taskflow, as shown below.



Don't forget to regenerate your application if you want to make this "finishing touch" to this exercise!

Tip: The ability to reuse a bounded taskflow with page fragments as a region in another page fragment, greatly facilitated by JHeadstart, can have a big impact on the overall design of your application. In this simple tutorial, we no longer need the nested `EmployeesView3` view object usage in the `HRModule` application module, and the `Employees3` group derived from it. In a real application, it can save a lot of time to carefully plan the user interface parts you want to reuse upfront, and assess the impact it might have on the underlying view objects and view links.

12. Changing the Look and Feel

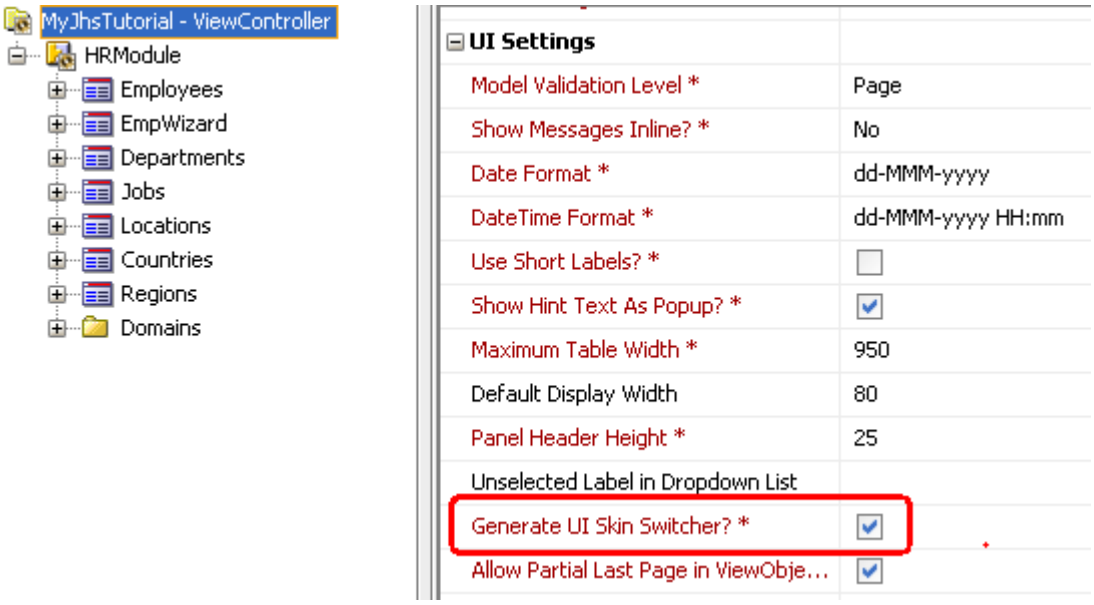
You have undoubtedly noticed that the ADF web application we've built in this tutorial has a consistent look and feel on all the pages. This consistency is an important ingredient in delivering the attractive and easy-to-use experience that all application developers want for their end users. You might have also noticed that the pages we've built resemble those in Oracle's own fusion web applications. By default, ADF Faces pages are configured to have this Fusion Look and Feel ...and with good reason. Over 8000 developers inside Oracle who implement and enhance the Fusion Applications use Oracle ADF to build these web applications, the same key technologies we're using in this tutorial.

But if it's not your style to have your application look like the Oracle Fusion Applications, no worries. The ADF Faces technology supports changing the look and feel of all your pages in a consistent way by using your own page templates and applying a skin [11]. Applying a skin does not require any changes to the application pages that you've built. It's just a configuration setting in the `trinidad-config.xml` located in the WEB-INF folder.

However, rather than changing this file directly, we will use neat JHeadstart features that make it very easy to prototype various look and feels.

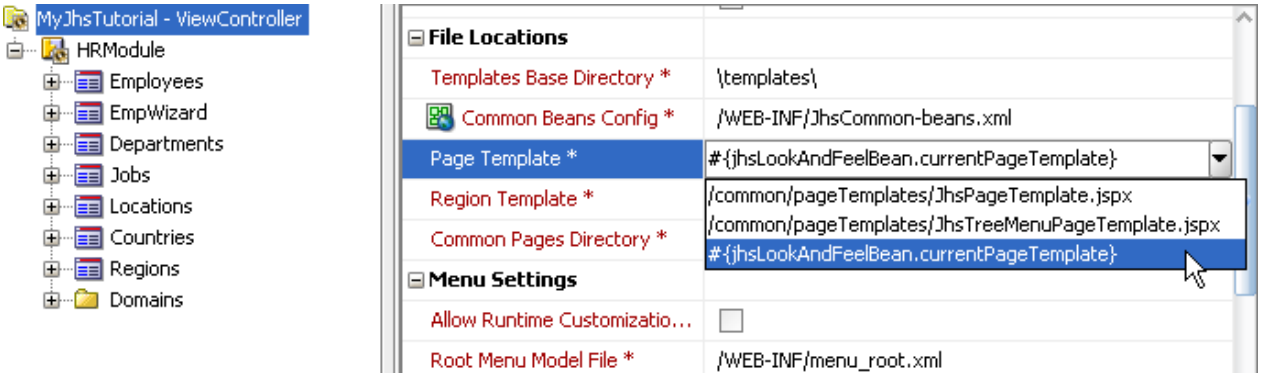
Configure a Skin Switcher

In the JHeadstart Application Definition Editor, select the top-level node named `MyJhsTutorial - ViewController`. In this node, you can make settings that apply to the application as a whole. Under the **UI Settings** category, check the checkbox **Generate UI Skin Switcher?**.



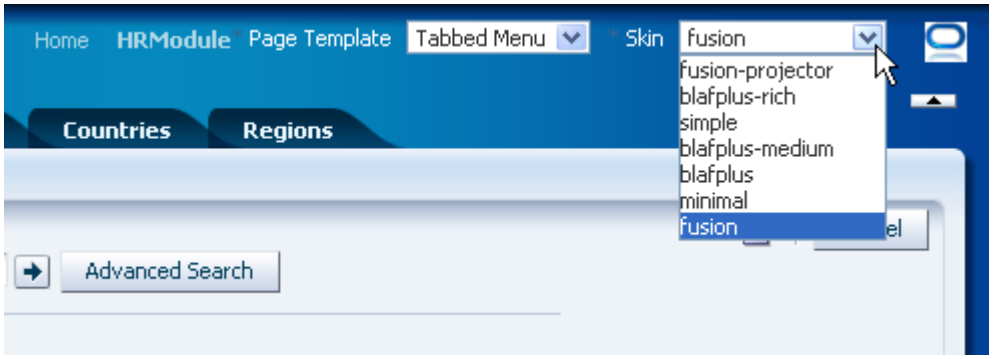
Configure a Page Template Switcher

With the top-level application node still selected, go to the **File Locations** category, and set the **Page Template** property to the EL expression that reads the current page template from the JHeadstart LookAndFeel managed bean, as shown below.

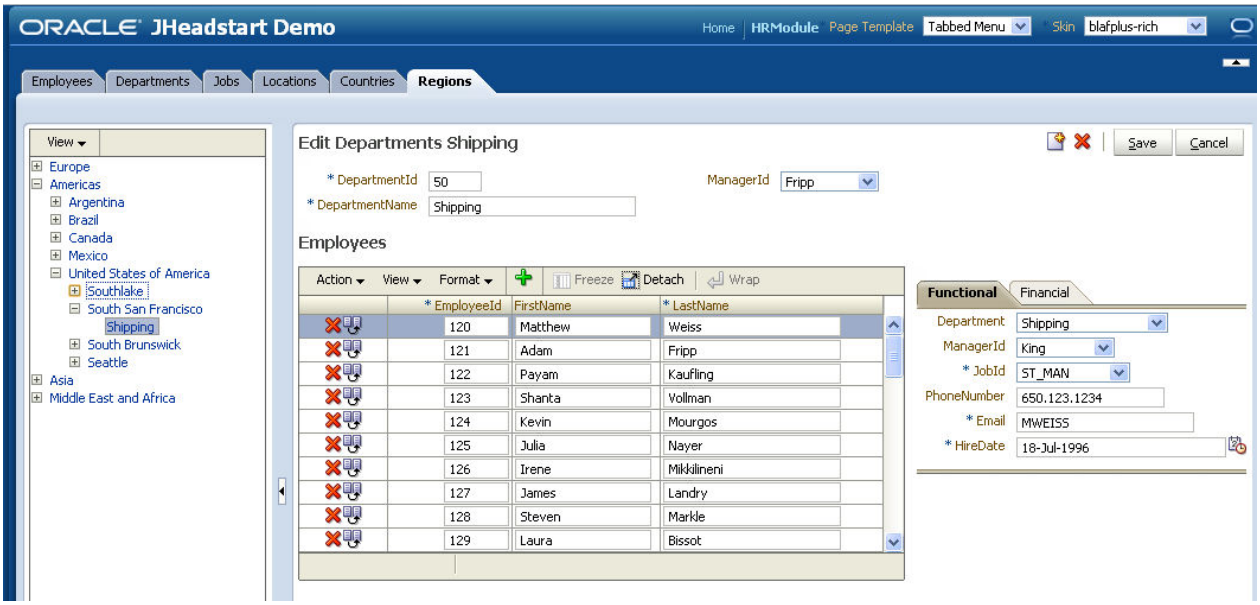


Regenerate and Run the Application

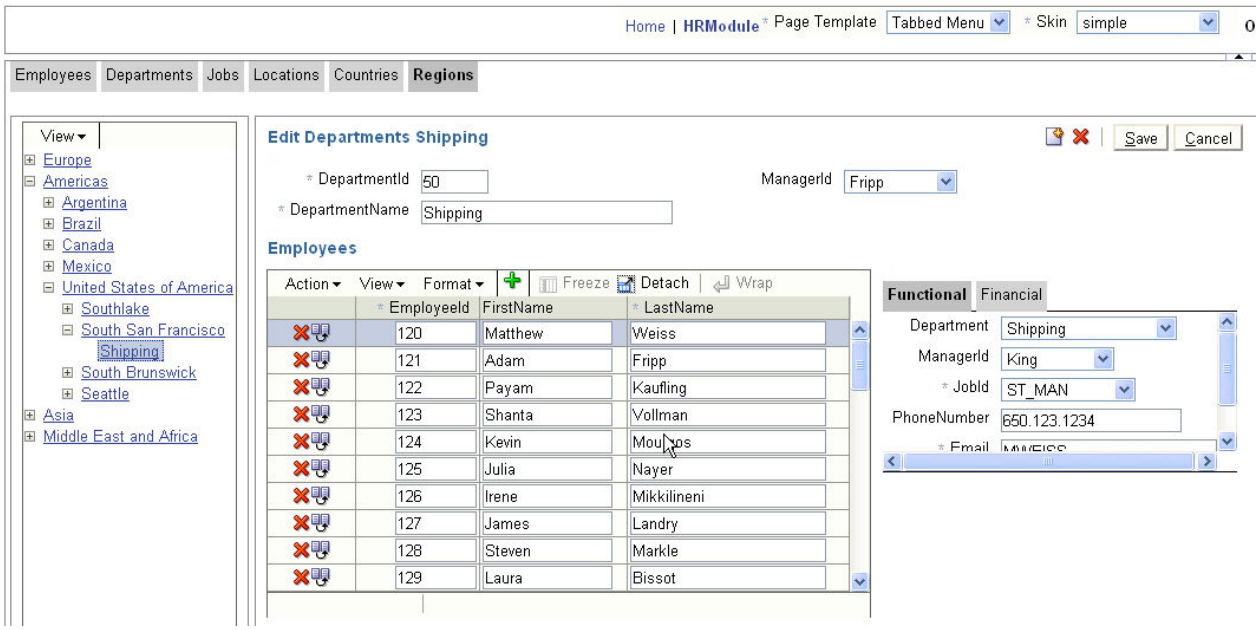
If you regenerate the application and run it, you will notice two additional dropdown lists in the upper-right corner, as shown below.



The skin dropdown list shows all the skins that are shipped with ADF Faces. The default skin is the fusion skin that is, as the name implies, used by Oracle's own Fusion Applications. If you change the skin to "blafplus-rich" the regions tree page will look like below.



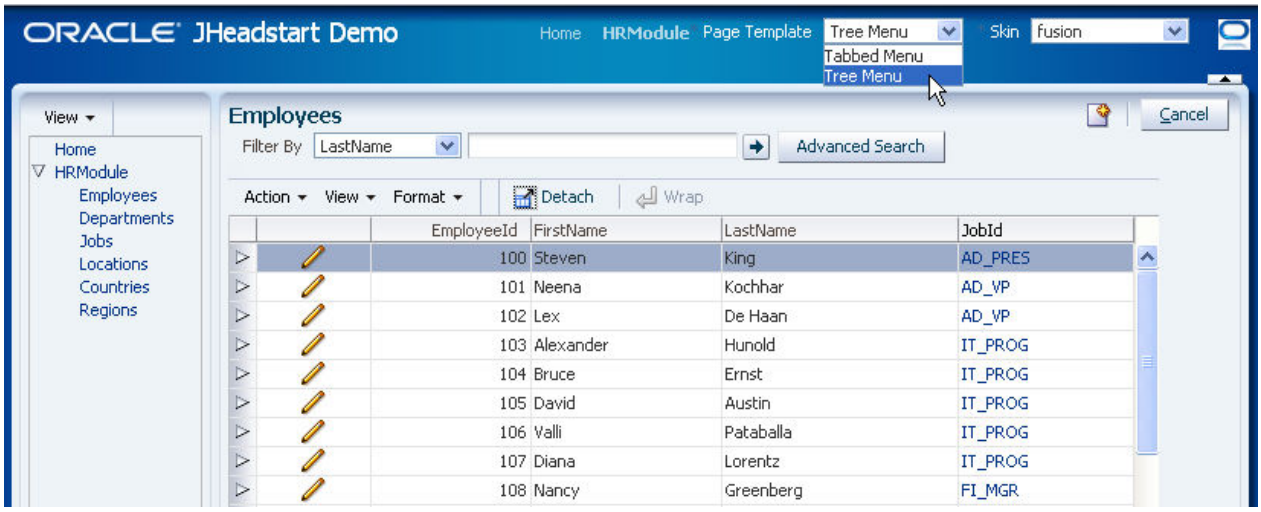
Changing the skin to "simple"has a more dramatic visual effect, as shown below.



All of our application's functionality works the same as it did before, but the look and feel has been consistently modified using the skin switcher.
Note that if you define additional custom skins, they will automatically appear in the skin switcher.

Using the page template dropdown list, you can change at runtime the ADF Faces page template that is used to display the applications pages. JHeadstart ships with two sample page templates, the default uses

a tabbed menu at the top, which we have used so far. The other page template displays the menu using a tree control at the left side of the page, as shown below.



You can easily add your own custom page templates to this dropdown list, or configure JHeadstart to use a custom page template without showing this runtime page template switcher. You can also link a specific page template to a specific skin, forcing the page template to automatically change when the user changes the skin. See the JHeadstart Developer's Guide [4], section 5.10 "Changing the Overall page Look and feel" for more information.

To more radically change the look and feel of your application, for example to seamlessly match the look and feel of an existing site, you will typically use ADF Faces skinning and ADF Faces page templates in combination with a set of custom JHeadstart generator templates.

13. Adding Validation Rules

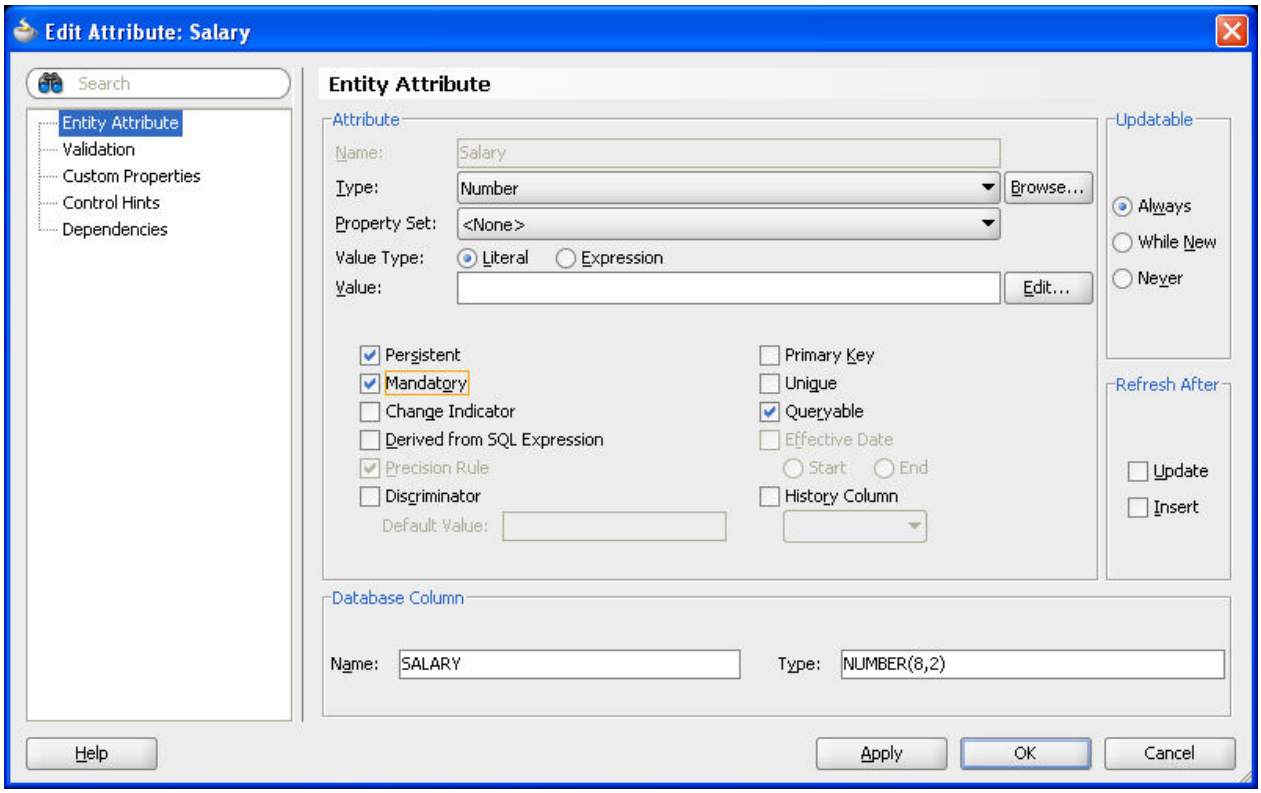
In this section of the tutorial, we'll add some declarative validation logic to one of our business domain objects. This will illustrate how business logic and user interface are cleanly separated in an Oracle ADF application, as well as show how the errors are displayed to the end-user.

13.1. Defining Some Declarative Validation Rules

Using Oracle ADF our business validation logic is nicely encapsulated inside the entity objects that represent our business domain objects. You can capture a number of aspects of business domain validation declaratively. Here we'll illustrate two examples of enforcing that an attribute is mandatory, and that its value lie within a certain numerical range.

Make an Employee's Salary Mandatory

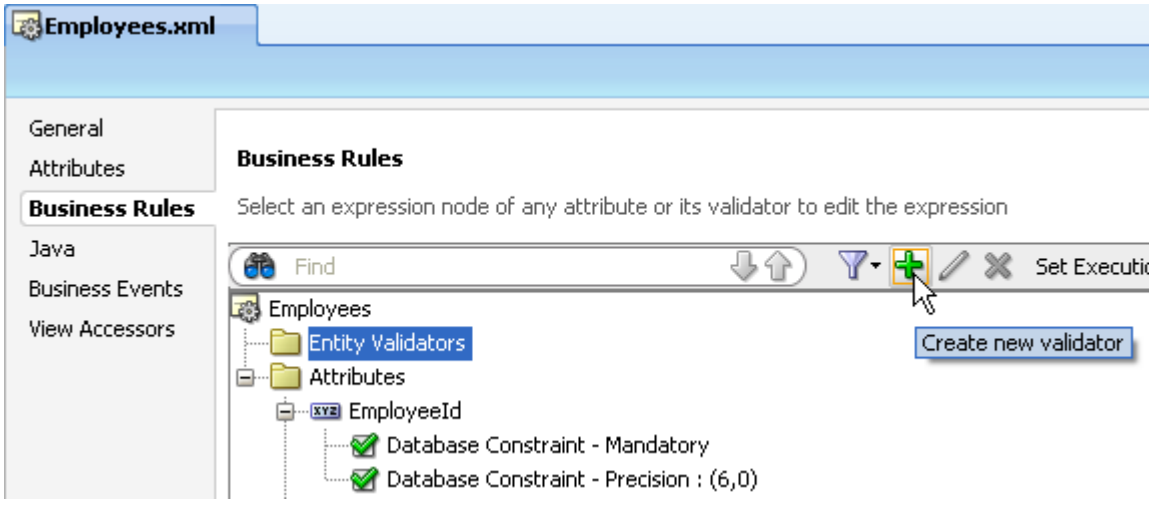
In your `Model` project, find the `Employees` entity object in the `oracle.hr.model.entities` package and double-click it to edit it. In the **Overview** tab, click on the **Attributes** tab, and double-click on the Salary attribute. In the **Edit Attribute** dialog that appears check the **Mandatory** checkbox.



Click **OK** to close the dialog.

Validate that Salary is Between Minimum and Maximum Salary of Employee Job

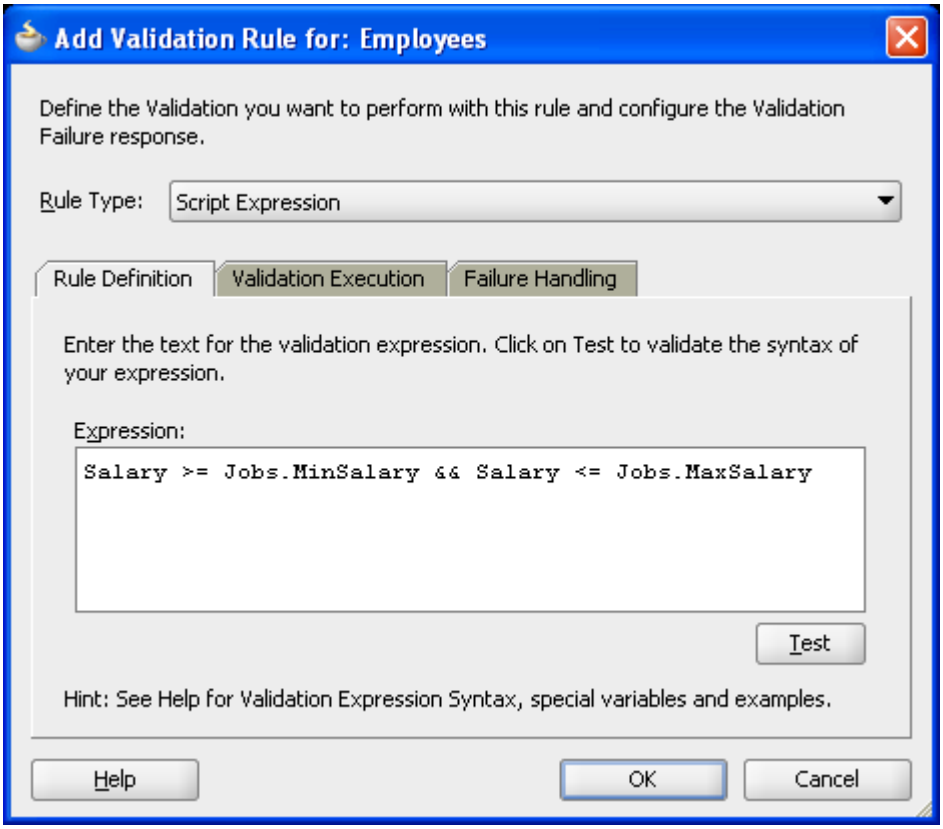
Click on the **Business Rules** tab, select the **Entity Validators** node, and click the plus icon to create a new entity-level validation rule.



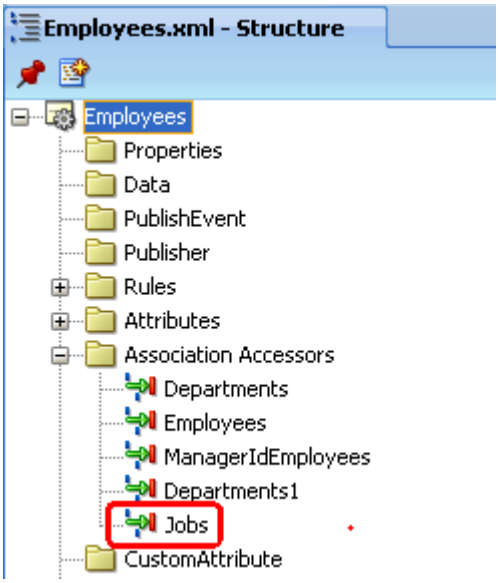
In the **Add Validation Rule for: Employees** dialog, select `Script Expression` from the **Rule Type** dropdown list. Enter the following expression:

```
Salary >= Jobs.MinSalary && Salary <= Jobs.MaxSalary
```

This is a Groovy script expression. Groovy is a scripting language that nicely integrates with Java, and is supported by ADF Business Components to specify validation rules.

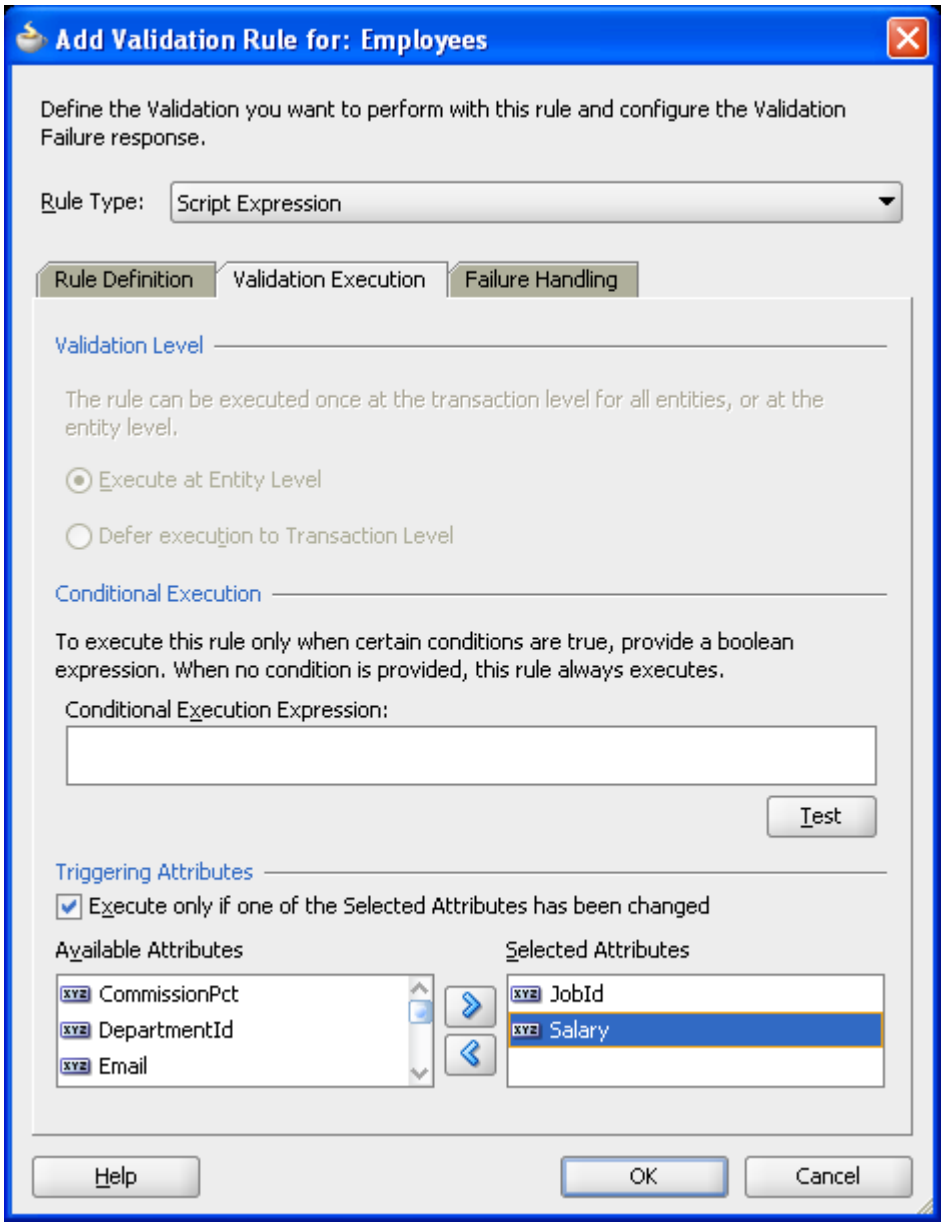


Using Groovy, we can easily traverse the object model created by ADF Business Components. In this example, we use the expression `Jobs` to access the Jobs entity object instance for this employee. This expression references a so-called **Association Accessor** attribute. If you want to know which assoications you can traverse using a Groovy expression, you can use the **Structure** pane and expand the **Association Accessors** node, as shown below.



Using the dot notation (like `Jobs.MinSalary`) we can then access all attributes in the `Jobs` entity object.

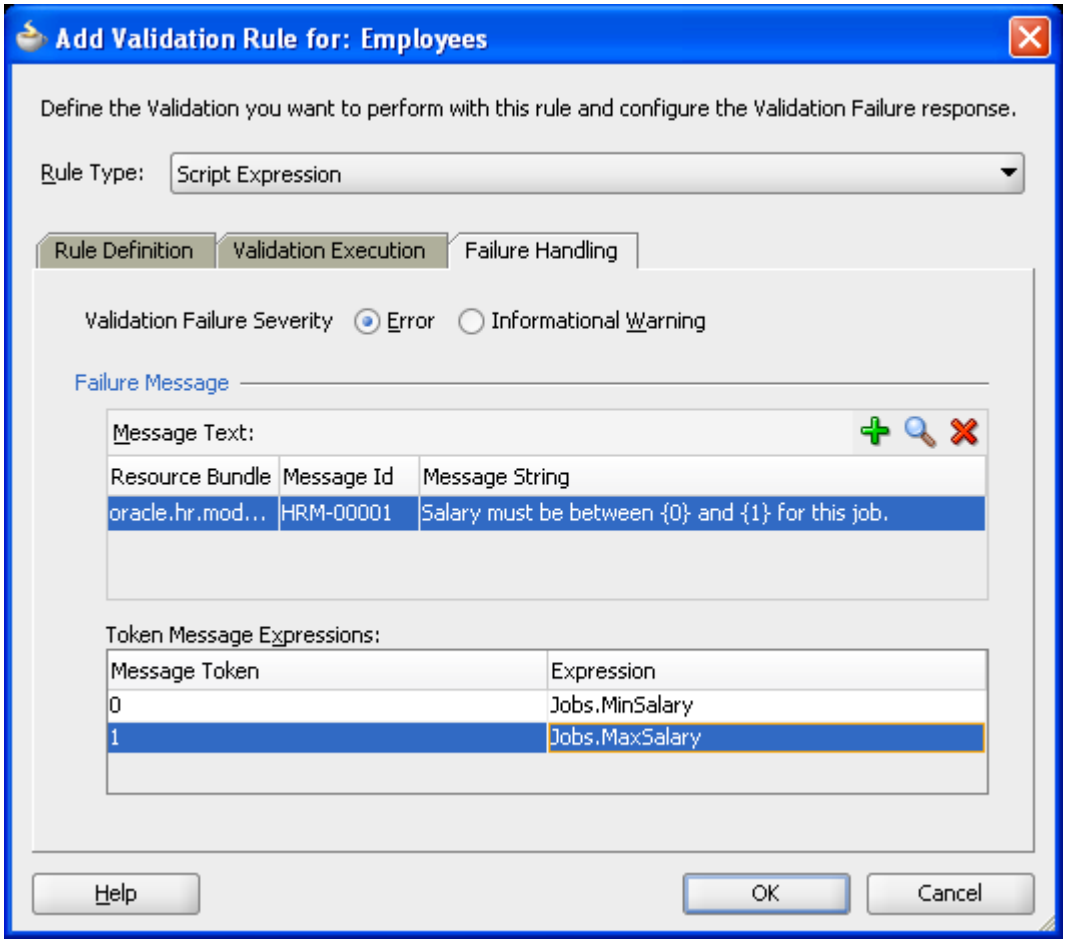
Now click on the **Validation Execution** tab and select the attributes that when modified should trigger this rule: `Salary` and `JobId`. Also check the checkbox **Execute only if one of the Selected Attributes has been changed**.



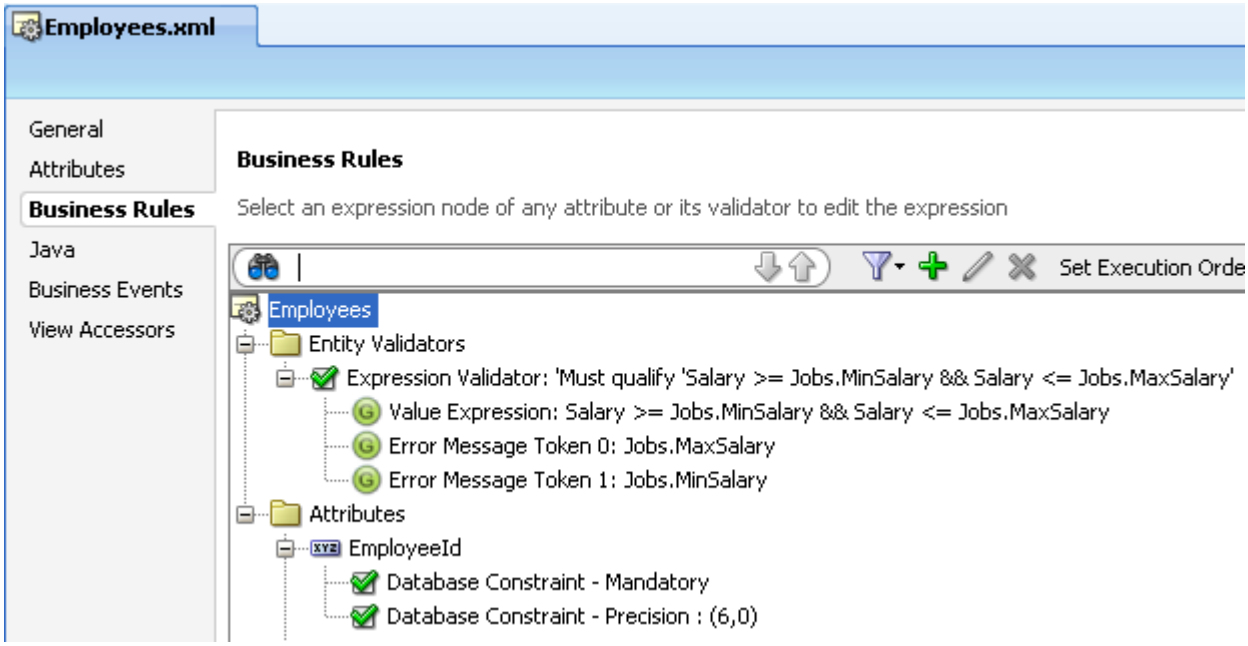
Click on the **Failure Handling** tab, lcik the green plus icon to add a new message. Set the **Message Id** to `HRM-00001` and the **Message Text** to

```
Salary must be between {0} and {1} for this job.
```

When you tab out the **Message Text** field, two message tokens appear automatically at the bottom of the dialog. Enter `Jobs.MinSalary` for the first token, and enter `Jobs.MaxSalary` for the second token. When you are done, the dialog window should look like this:



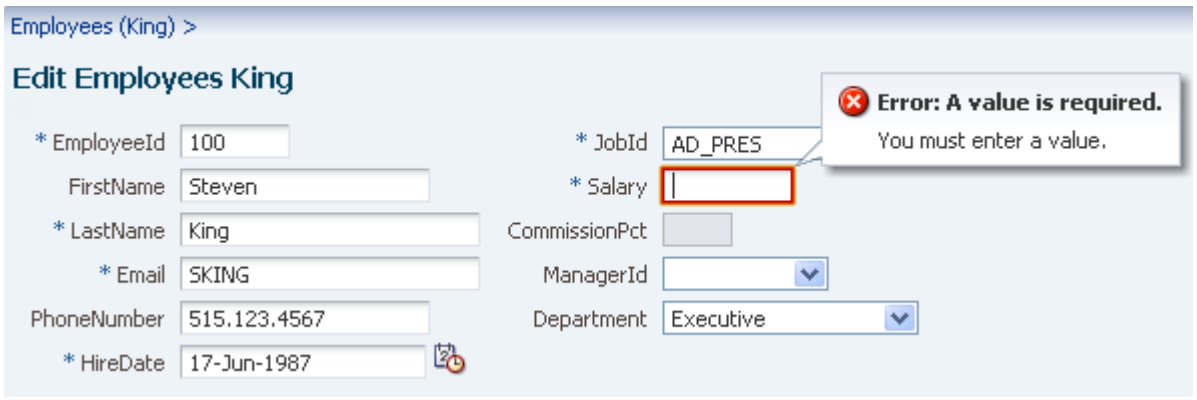
Click **OK** to close the dialog, and click the **Save All** button in JDeveloper to save your changes.
As shown below, any validation rules you've added to attributes or at the entity object level appear in the tree display on the **Business Rules** panel. Also note the business rules that were created based on database constraints. This rules are automatically created when running the ADF Business Components wizard in step 3 of this tutorial.



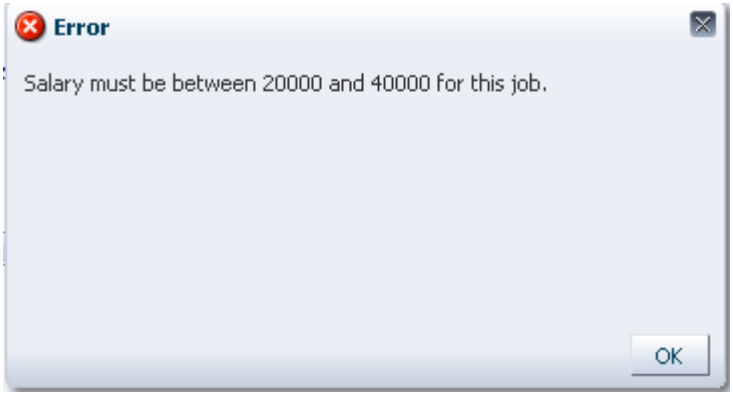
13.2. Rerunning the Application to See Business Rules in Action

At this point, let's re-run the application to see the effect of having added two simple validation rules. Note that there is NO need to regenerate the application using JHeadstart. As we've done before, select the ViewController project in the Application Navigator and press F11 to run.

When the initial Employees tab appears, click the edit icon for employee “Steven King” to edit the data. First try blanking out the existing value of `Salary` and pressing the **Save** button. You'll see an error as shown below.



Next, try to enter a Salary value of 44000 and click **Save** again. Since this value is outside of the valid range of `JobId AD_PRES`, we see that the end-user is shown the custom error message we provided when we added the Groovy validation rule on the Employee entity object.

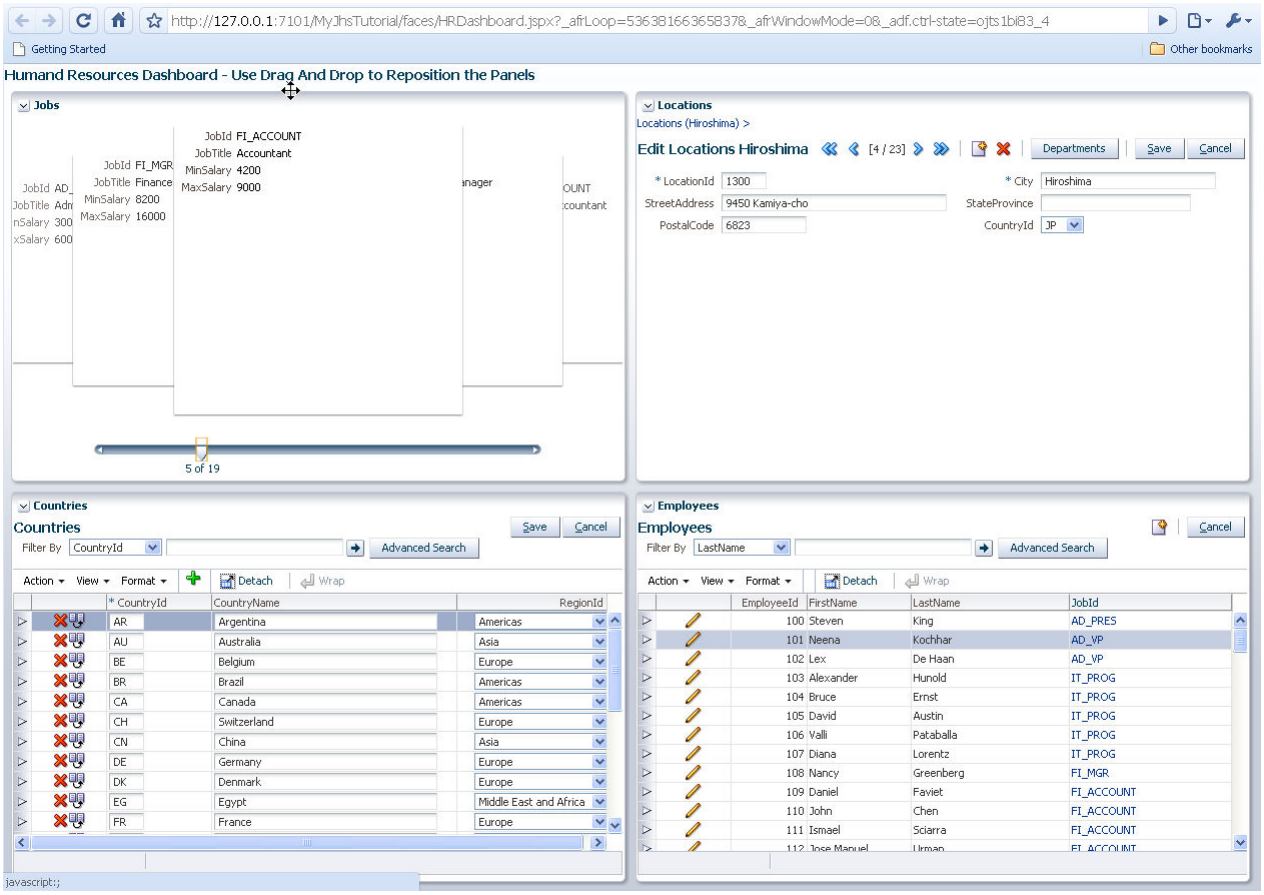


Next, change the `Salary` to 34000 and click **Save** again. The transaction is completed succesfully. Now, change the `JobId` to `AD_VP` and click **Save** again. You will get an error message that the salary must be between 15000 and 30000, which is the salary range for his new job `AD_VP`.

Under the covers, what makes this work is the automatic coordination that's occurring between the front-end ADF Faces components and the view objects in the back-end ADF application module. Those view objects, in turn, coordinate with your underlying busing domain layer — realized as a set of ADF entity objects — which encapsulate the business validation. Any errors raised by the business layer automatically "bubble up" back to the user interface and are presented to the user. Again — as we've seen throughout this tutorial — all of this infrastructure is provided for you by the Oracle ADF framework so you don't have to write the "application plumbing" code.

14. Conclusion

In this end-to-end tutorial we've experienced first-hand how Oracle JHeadstart 11g turbo-charges developer productivity for Oracle ADF-based web applications. Using a JDeveloper wizard to generate the back-end ADF Business Components that handle database interaction, and using the declarative JHeadstart Application Generator to iteratively generate the entire web front end, we built an attractive, consistent, interactive, and skinnable web application with advanced transactional functionalities against six related database tables from the Oracle HR sample schema.
We have seen how the generated ADF best-practice architecture optimizes reuse of generated artefacts. While not included as a step in this tutorial, the finished tutorial application [3] includes a bonus example of the reuse options: a handbuilt `HRDashboard` page with a handbuilt carrousel component to view job information, and three JHeadstart-generated taskflows that were simply added to the `HRDashboard` page by dragging and dropping the taskflow as a region on the page.



To run the `HRDashboard` page shown above, open the finished tutorial application in JDeveloper, right-mouse-click on the `HRDashboard` page in the JDeveloper **Application Navigator** pane, and choose **Run**.

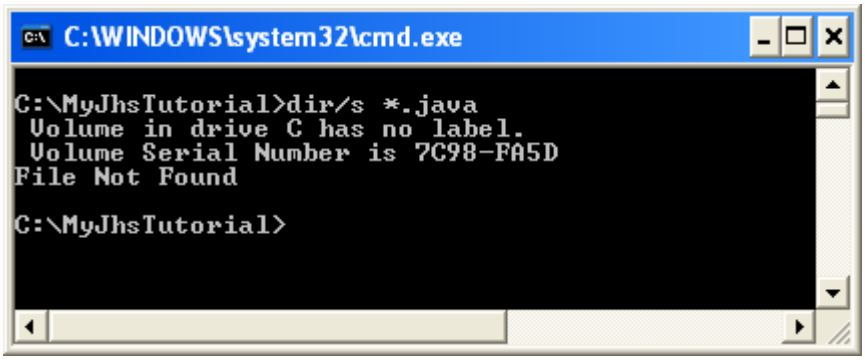
Finally, we saw an example of how the JHeadstart Application Generator can be customized using a powerful templating mechanism to locally (or globally) change the basic structure of the pages it generates. We also saw that since JHeadstart is generating standard ADF artifacts and metadata, we can use the standard tools that JDeveloper provides to customize the generated pages where needed.

Tip: For customers working today with Oracle Forms — accustomed to the productivity they gain from 4GL RAD tools — JHeadstart offers the one-two productivity "punch" that combines an enhanced generation of ADF Business Components from an Oracle Forms .fmb file, as well as a fully-working ADF Faces web application generated on top of them. This means that you can reuse the definitions in your Oracle Forms source files to generate both the back-end and the front-end of your web application using JHeadstart. For more information, see the JHeadstart Developer's Guide [4].

14.1. No Generated Java Code For Any Functionality in the Entire Tutorial!

We claimed at the outset that no Java code was required to build the demo, and in fact none of the steps we followed above required our writing any Java code. But you must be thinking, "Surely JHeadstart or JDeveloper itself must have generated some Java code to make all of that functionality work, right?" You might be surprised.

We can simply go to a command shell and try to count the number of Java source code files that were generated during the course of this tutorial.



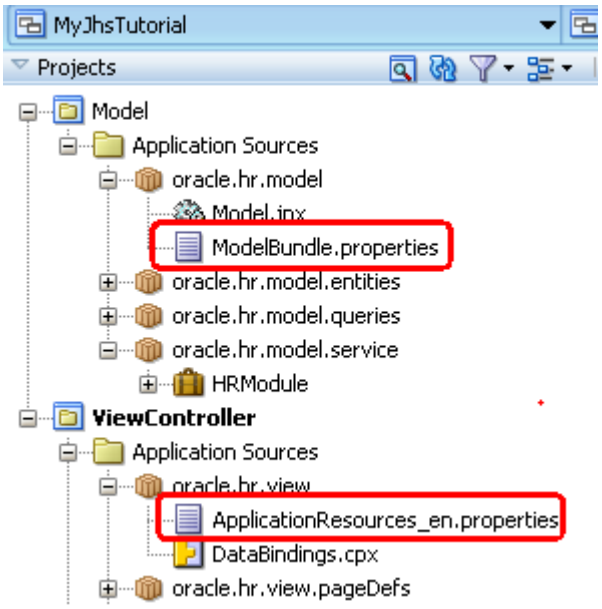
The figure above shows the result of opening a command shell, changing directories to the `C:\MyJhsTutorial` root directory where we've been working on the tutorial, and doing a recursive directory search for any *.java files. The executive summary: `File Not Found`.

While a search for `*.jspx` files, `*.jsff`, `*.properties`, or `*.xml` files will produce a number of hits no Java code was needed to build this demo. All of the base functionality to support the features we have employed lives in the base ADF framework library components and some standard framework extension libraries that JHeadstart provides to complement its declarative application generation.

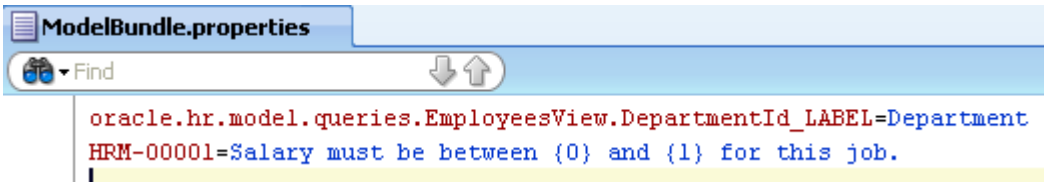
This does not imply that building your own business applications with Oracle ADF and JHeadstart 11g Application Generator won't require any Java code. They undoubtedly will. However, what we're illustrating here in the tutorial is that Java code is not required for a huge amount of the basic functionality every business application needs. The code you'll end up writing will be code that is specific to your business application functionality, and not to making the basics of screen management, data management, or business rules enforcement work correctly.

14.2. Simplified Multi-Lingual Applications with Message Files

A Java message properties file is the standard way a Java component — like the Employees entity object in your Model project — can save its translatable string resources. Oracle ADF and JHeadstart 11g use such `*.properties` files to save translatable string resources for your web tier in the ViewController project and business service tier in your Model project.



If we look a little more closely at the `ModelBundle.properties` file, you'l see the modified label for `DepartmentId` and the error message for the `Employees` entity object's range validation rule that we added above:



Liekwise, the `ApplicationResources_en.properties` file in the `ViewController` project contains all the translatable strings generated into the various pages.

Using a combination of *.properties files and Java message bundles like this, the applications you build with Oracle ADF and Oracle JHeadstart 11g for ADF are setup out of the box to use the best-practice techniques to make building even multi-lingual applications easy!

14.3. Now You Can Try On Your Own Schema

At this point you are ready to try Oracle JHeadstart Evaluation Version on your own database schema. Keep in mind that the evaluation version of JHeadstart is fully-functional and has no time-limit, however it does limit you to working with a maximum of only ten (10) different view objects in your workspace. If you try to run the JHeadstart application generator in a workspace with more than ten view objects, you'll see the JAG error:

```
JAG-00130 [ JHeadstart ] You can have only 10 ViewObjects in your workspace
when using the JHeadstart Evaluation Version.
```

This lets you experiment with every feature of the powerful JHeadstart product on a selected group of your real-world application tables to demonstrate to yourself, your colleagues, and your management the boost in development productivity it can provide you. In addition to the features showcased in this tutorial, you can add other powerful JHeadstart features like fine-grained security, and the ability to define so-called flex fields at runtime. You can find more information on these additional features in the JHeadstart Developer's Guide [4]. If you like what you see, you can find information on getting the full JHeadstart product on the JHeadstart Product Center on OTN [5].

15. Useful Links

1. Building Rich Enterprise Applications with Oracle JHeadstart for ADF (11.1.1) [PDF][http://download.oracle.com/consulting/jhstutorial1111.pdf]
2. Tutorial Files for Offline Viewing and Database Setup [http://download.oracle.com/consulting/JhsTutorialFiles.zip]
3. Completed Version of the Tutorial [http://download.oracle.com/consulting/MyJhsTutorial.zip]
4. JHeadstart Developer's Guide [http://download.oracle.com/consulting/jhsdevguide1111.pdf]
5. JHeadstart Product Center [http://www.oracle.com/technology/products/jheadstart/index.html]
6. JDeveloper Downloads [http://www.oracle.com/technology/software/products/jdev/index.html]
7. Fusion Developer's Guide for Oracle ADF [http://download.oracle.com/docs/cd/E15523_01/web.1111/b31974/toc.htm]
8. Oracle Magazine DEVELOPER: Frameworks [http://www.oracle.com/technology/products/jdev/tips/muench/oramag/index.html]
9. Asynchronous JavaScript and XML (AJAX) [http://en.wikipedia.org/wiki/AJAX]
10. Velocity [http://jakarta.apache.org/velocity/]
11. Wikipedia Definition of 'Skin' [http://en.wikipedia.org/wiki/Skin_(computing)]
12. OTN JHeadstart Discussion Forum [http://forums.oracle.com/forums/forum.jsp?forum=38]
13. JHeadstart Blog [http://blogs.oracle.com/jheadstart/]
14. JDeveloper Product Center on OTN [http://www.oracle.com/technology/products/jdev/index.html]
15. ADF Learning Center on OTN [http://www.oracle.com/technology/products/adf/learnadf.html]
16. ADF and J2EE for Forms and Designer Developers [http://otn.oracle.com/formsdesignerj2ee]
17. Dive into ADF Blog [http://blogs.oracle.com/smuenchadf/]
18. Oracle Technology Network [http://otn.oracle.com]
19. Oracle Community Weblogs (Oracle Blogs) [http://blogs.oracle.com]
20. OTN JDeveloper Discussion Forum [http://forums.oracle.com/forums/forum.jsp?forum=83]
21. Oracle Fusion Middleware Guide for Oracle JDeveloper [http://download.oracle.com/docs/cd/E12839_01/install.1111/e13666/ojdig.htm#BDCJDDFE]