The Tie That Binds: An Introduction to ADF Bindings

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quovera

utoug utah oracle users group

Bindings Are Like This

Survey

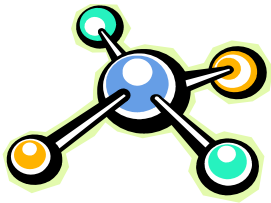
- "Traditional" Oracle development (Forms, Reports, Designer, PL/SQL)
  - 1-2 years?
  - More than 2 years?
- Java development
  - 1-3 years?
  - 4-17 years?
  - 17+ years?
- JDeveloper
  - 1-2 years?
  - 2+ years?

Agenda

- Overview
- Working with Bindings
- Binding Examples

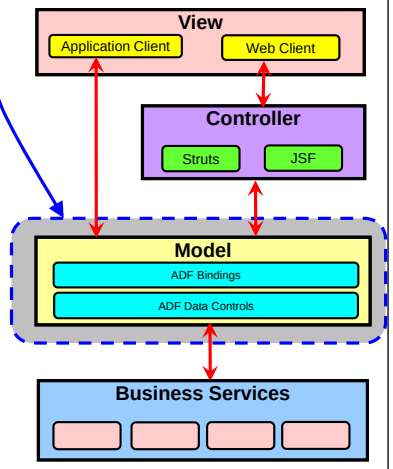
Slides will be available on the Quovera and UTOUG websites.

Additional information in the appendixes.



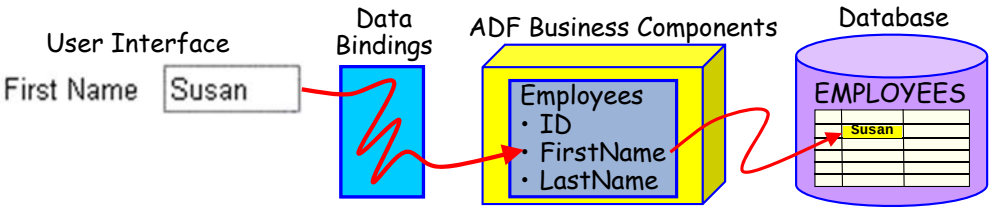
Review: ADF Model (ADFm)

- A layer of ADF
  - ADF Bindings
    - Bindings provide objects to link to components
  - ADF Data Controls
    - Automatically bound sets of components
- Communication from Business Services to View and Controller layers
  - One common layer for all types of business services
    - E.g., EJB, ADF BC, web services
  - Code to access any business service works the same way



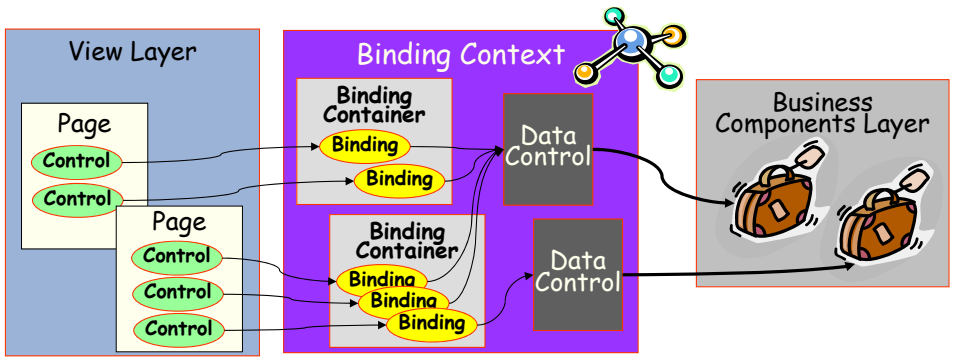
ADF Bindings

- Association of a business service data element or action with a UI control
  - Not automatic in native Java EE
  - Relatively automatic in Oracle Forms
- Binding normally takes a lot of coding
  - One-off solution is not the answer
  - Need a framework to assist



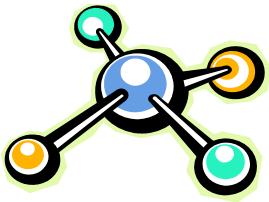
ADF Model Components

- Each control on the page can use bindings
- Bindings expose actions to buttons and links
  - Commit, Rollback, First, Last
- Bindings expose data to input items
  - FirstName, LastName, Email, HireDate



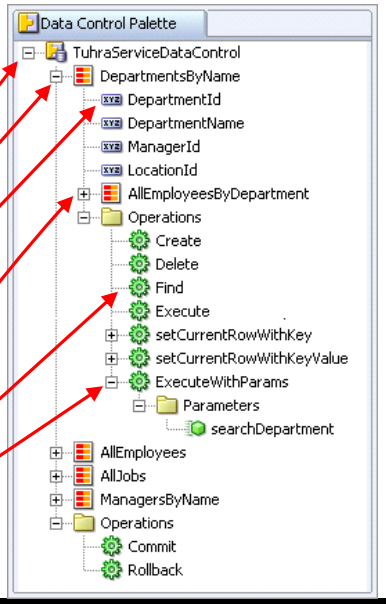
Agenda

- Overview
- Working with Bindings
  - Creating/Accessing
  - PageDef file
  - DataBindings.cpx
- Binding Examples



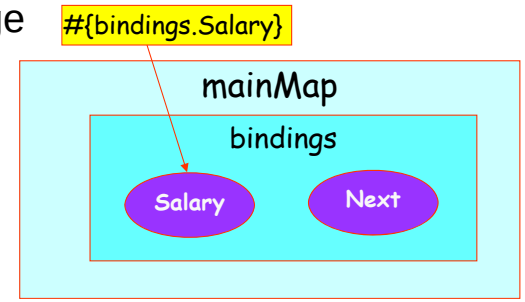
Creating Bindings Automatically

- Drag and drop control from the Data Control panel
  - Automatically appears when editing a JSF JSP
  - OR Ctrl-Shift-D
  - This creates and binds UI items
- Nodes for
  - Data control
  - Data collection
  - Attribute
  - Nested data collection
  - Operation
  - Method



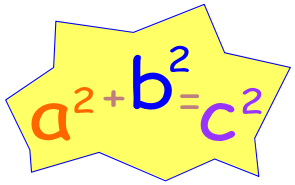
Accessing Bindings Manually

- Progammatically, you use **`java.util.Map`**
  - An interface for organizing data
  - Stores *elements* – data of any Object type
- The **`bindings`** map contains all the bindings in the current page's binding container
- You can access these bindings using Expression Language



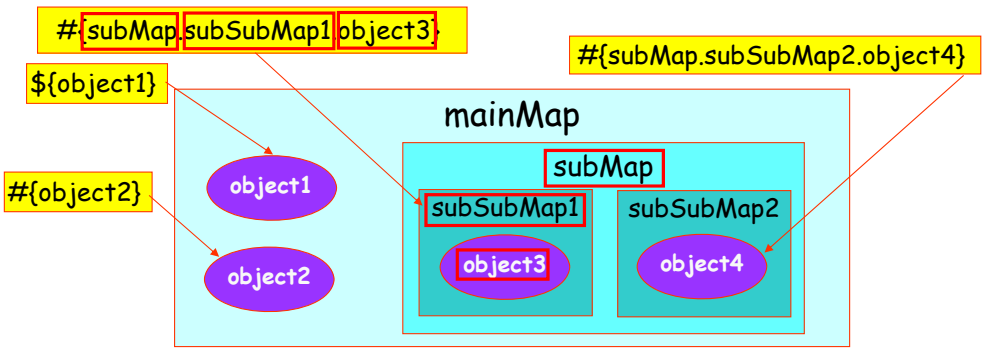
Expression Language

- A.k.a.:
  - "JSP Expression Language"
  - "EL"
- Part of JavaServer Pages Standard Tag Language (JSTL)
  - Procedural language within tags
    - **`forEach; if; choose; set; when`**
- Many other technologies can use it
  - JSF, UIX, Struts, Swing
- Can be used to refer to elements stored in maps
  - Collections of objects



EL Syntax

- All EL expressions have the form **`${…}`** or **`#{…}`**
  - JSF uses the # variation for component properties
- Refer to map elements by specifying the path to the element within the map, separated by "."
- The main map is determined by context



EL for ADF

- ADF's submap is "bindings"
- You can use EL expressions that refer to this map in attribute values, e.g.

ID 203

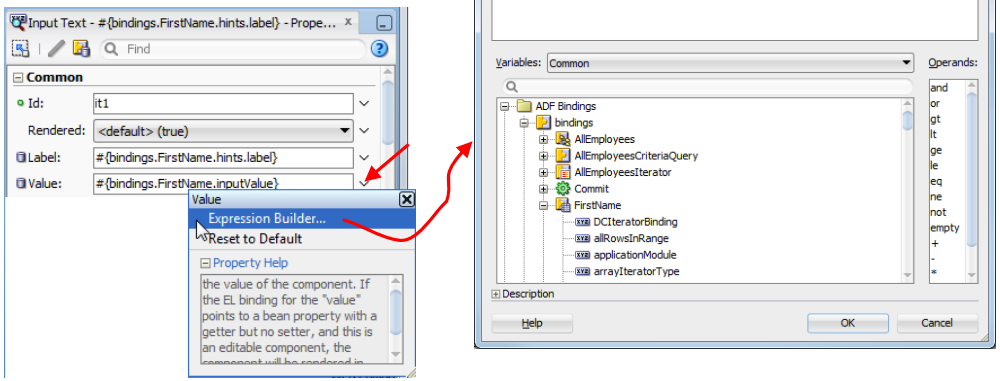
```
<af:inputText
  value="#{bindings.EmployeeId.inputValue}"
  label="#{bindings.EmployeeId.label}"/>
```

- The af:inputText label and value are derived from the bindings context
  - EmployeeId – a submap referring to the ADF BC view object instance
  - In Forms, those EL expressions are like this:

```
GET_ITEM_PROPERTY('EMP.EMPLOYEE_ID',DATABASE_VALUE);
GET_ITEM_PROPERTY('EMP.EMPLOYEE_ID',PROMPT_TEXT);
```


Creating the Expression

- JSF expressions use the "#" prefix
  - Distinguishes them from JSTL expressions
- Use the Expression Builder



Programmatic Access to Bindings

- Double click a bound button to generate the backing bean binding code, like this:

```
public String saveAction()
 {
   BindingContainer bindings = getBindings();
   OperationBinding operationBinding =
       bindings.getOperationBinding("Commit");
   Object result = operationBinding.execute();
   if (!operationBinding.getErrors().isEmpty())
   {
     return null;
   }
   return null;
 }
```


Agenda

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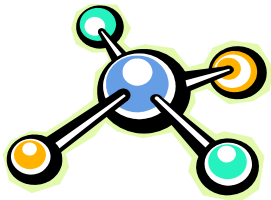
- Working with Bindings
  - Creating/Accessing
  - PageDef file
  - DataBindings.cpx
- Binding Examples

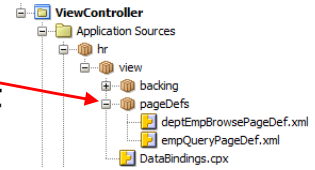


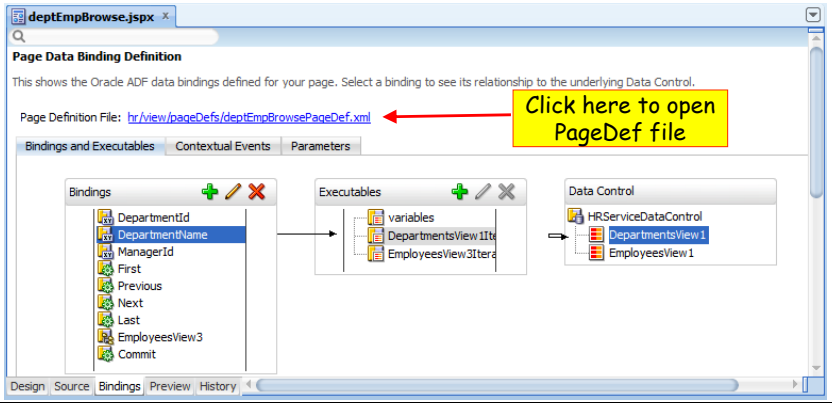
The Bindings File

- The *page definition (*or *PageDef) XML* file stores binding definitions for the page
  - One PageDef file for each JSP
  - Called *filename*PageDef
  - For example; editEmployeePageDef.xml
- Created when you drag a data control to the page the first time
  - You can create the file manually
- Maintained as you drag or delete components
  - You can edit manually

Viewing/Editing the PageDef

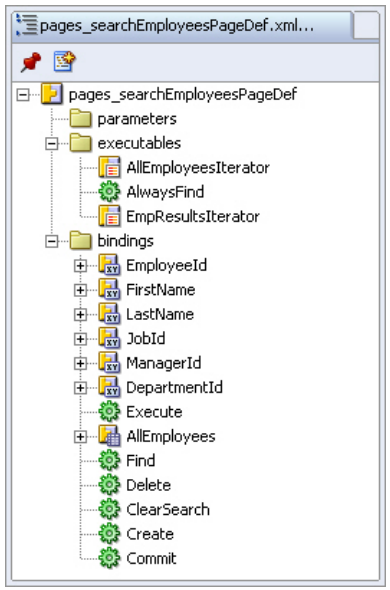
- Navigator
- **OR** Bindings tab on the JSF page





Contents of the PageDef File

- Executables
  - Definitions of actions that will be run when the PageDef file is loaded
    - Like trigger code in Forms
- Bindings
  - Values and operations required on the page

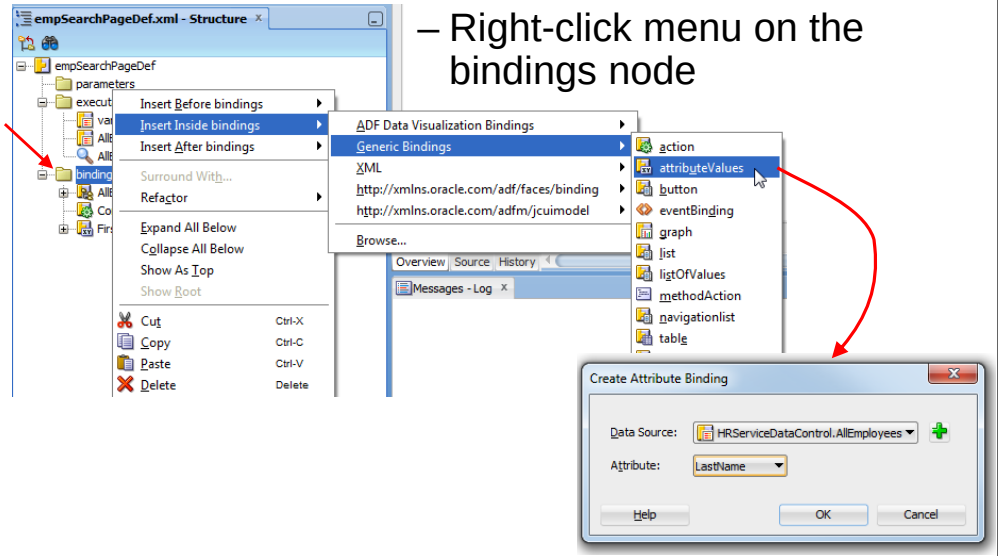


PageDef Snippet: Bindings

```
<pageDefinition xmlns=http://xmlns.oracle.com/adfm/uimodel ...
  <bindings>
    <attributeValues id="EmployeeId" IterBinding="AllEmployeesIterator">
      <AttrNames>
        <Item Value="EmployeeId"/>
      </AttrNames>
    </attributeValues>
    <action id="Commit" InstanceName="TuhraServiceDataControl"
            DataControl="TuhraServiceDataControl"
            RequiresUpdateModel="true" Action="100"/>
    <list id="AllEmployeesJobId" IterBinding="AllEmployeesIterator"
          StaticList="false" ListOperMode="0" ListIter="AllJobsIterator"
          NullValueFlag="1" NullValueId="AllEmployeesJobId_null">
      <AttrNames>
        <Item Value="JobId"/>
      </AttrNames>
      <ListAttrNames>
        <Item Value="JobId"/>
      </ListAttrNames>
      <ListDisplayAttrNames>
        <Item Value="JobTitle"/>
      </ListDisplayAttrNames>
    </list>
  </bindings>
```

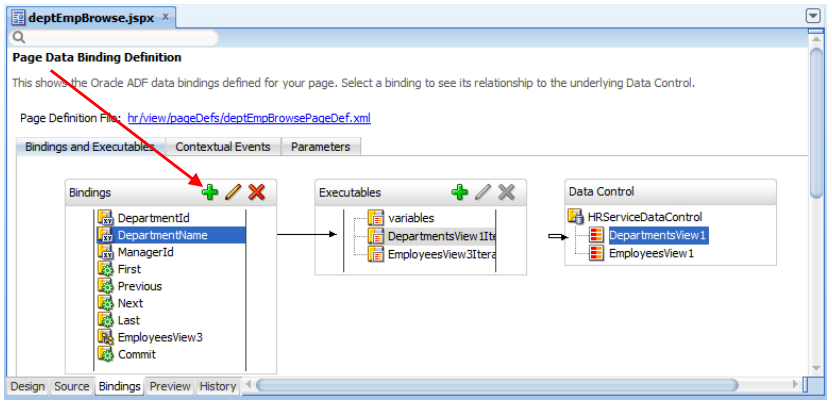
Creating Bindings–Alternative 1

- Use the Structure window for the PageDef file
  - Right-click menu on the bindings node



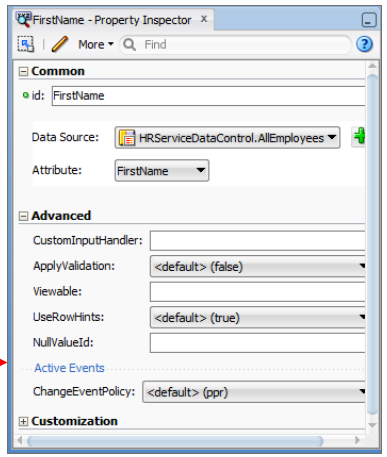
Creating Bindings–Alternative 2

- Bindings tab on the JSPX page
  - Or Overview tab in the PageDef file



Editing Bindings–the Alternatives

- PageDef (Overview tab) or page (Bindings tab)
- Code Editor for the PageDef file
- Or select **Go to Binding** from a UI component
- Or select **Go to Properties** from the right-click menu on a binding in the Structure window
- Or select the binding in the Structure window and use the Property Inspector



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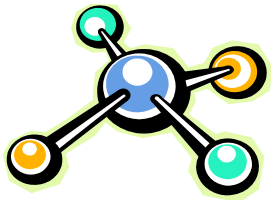
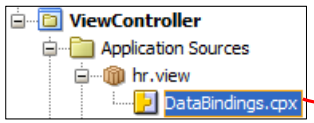
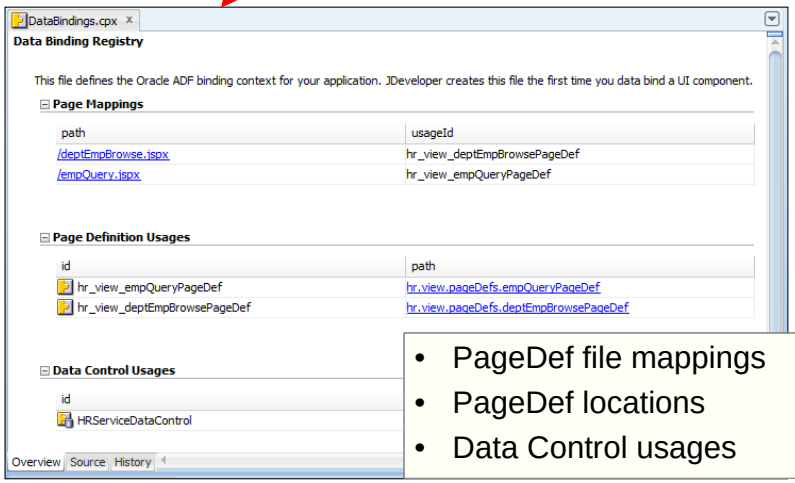


DataBindings.cpx





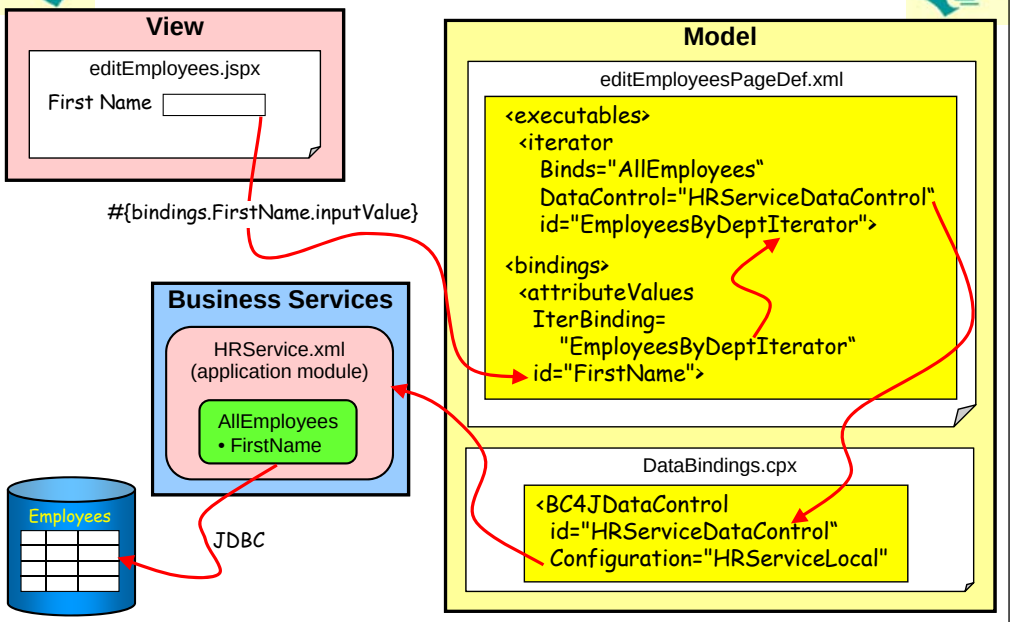
- PageDef file mappings
- PageDef locations
- Data Control usages

DataBindings.cpx DC Usages

```
<dataControlUsages>
  <BC4JDataControl id="HRServiceDataControl"
    Package="hr.model"
    FactoryClass="oracle.adf.model.bc4j.DataControlFactoryImpl"
    SupportsTransactions="true"
    SupportsFindMode="true"
    SupportsRangesize="true"
    SupportsResetState="true"
    SupportsSortCollection="true"
    Configuration="HRServiceLocal"
    syncMode="Immediate“
    xmlns="http://xmlns.oracle.com/adfm/datacontrol"/>
</dataControlUsages>
```

- Last section in overview editor
- ADF BC data control (BC4J)
- ID for data control used

Inside the Walls



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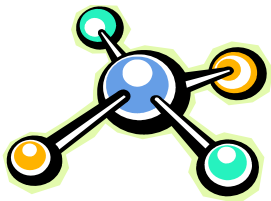
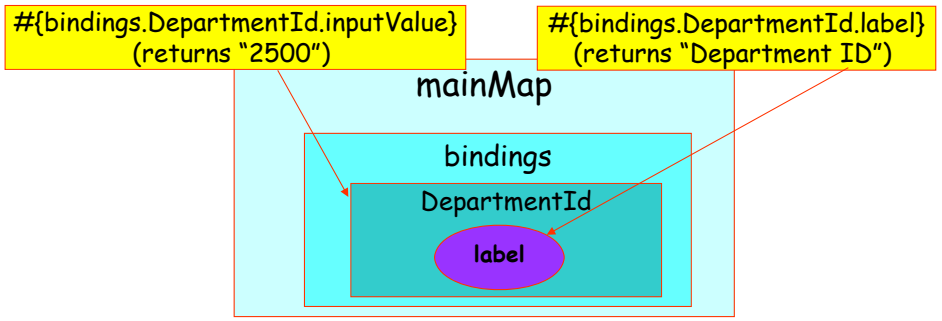


Common Binding Types

- Attribute
  - For single attribute in a collection
- List
  - For data-bound list elements
- List of Values
  - For view object lists of values
- Tree
  - hierarchical controls (master detail) and tables
- Table (or range)
  - For table components bound to collections (not used much now)
- Boolean
  - For checkboxes
- Action
  - For standard operations like Commit
- Method
  - For custom methods

Attribute Bindings

- A single view attribute value on the iterator binding's current view row
- Example: DepartmentId



Attribute Bindings and JSF

- You can access attribute bindings from any component attribute

```
<af:outputText
   value="#{bindings.DepartmentId.inputValue}" />
```

- Other component attributes access properties on the Model level object
  - Control hints or attribute properties (for example, label and width):

```
<af:inputText
  value="#{bindings.PhoneNumber.inputValue}"
  label="#{bindings.PhoneNumber.label}"
  columns="#{bindings.PhoneNumber.displayWidth}"/>
```


Code Snippets

JSF

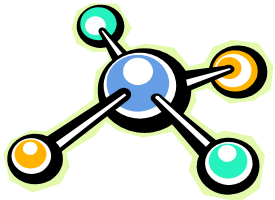
```
<af:inputText value="#{bindings.DepartmentId.inputValue}"
              label="#{bindings.DepartmentId.hints.label}"
    required="#{bindings.DepartmentId.hints.mandatory}"
    columns="#{bindings.DepartmentId.hints.displayWidth}"
    maximumLength="#{bindings.DepartmentId.hints.precision}"
    shortDesc="#{bindings.DepartmentId.hints.tooltip}"
              id="it1">
</af:inputText>
```

PageDef

```
<bindings>
  <attributeValues IterBinding="DepartmentsView1Iterator"
      id="DepartmentId">
    <AttrNames>
      <Item Value="DepartmentId"/>
    </AttrNames>
  </attributeValues>
```

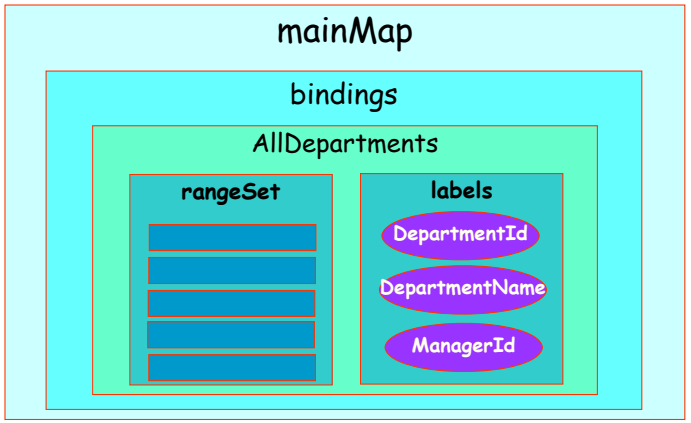
Tree Bindings

- Used for tables, tree-tables and trees
- Expose data from all rows in the iterator binding's current range
- Can also be used for master-detail
- Expose some or all columns
- Iterator's *collectionModel* property is used as the table's value
- A variable is assigned to the table binding's data
  - Usually "row"



Tree Binding Map

- Example: AllDepartments
  - Contains rangeSet and labels



PageDef Snippets

```
<bindings>
 <table
   id="AllEmployees"
   IterBinding=
     "EmpResultsIterator">
  <AttrNames>
    <Item Value="EmployeeId"/>
    <Item Value="FirstName"/>
    <Item Value="LastName"/>
    <Item Value="Email"/>
    <Item Value="PhoneNumber"/>
    <Item Value="HireDate"/>
    <Item Value="JobId"/>
    <Item Value="Salary"/>
    <Item Value="ManagerId"/>
  </AttrNames>
</table>
```

Table Binding

```
<executables>
 <iterator
   id="EmpResultsIterator"
   RangeSize="10"
   Binds="AllEmployees"
   DataControl=
   "TuhraServiceDataControl"/>
 <iterator
   id="AllJobsIterator"
   RangeSize="-1"
   Binds="AllJobs"
   DataControl=
   "TuhraServiceDataControl"/>
</executables>
```

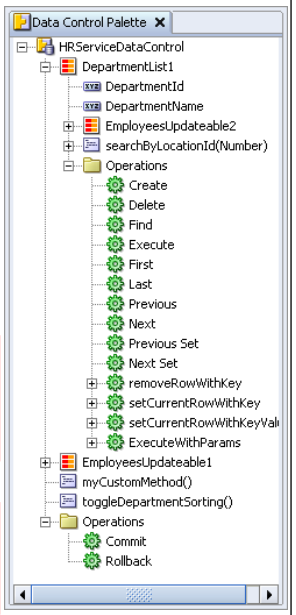
Iterator

JSF Snippet: af:table

```
<af:table
  value="#{bindings.AllEmployees.collectionModel}" var="row"
  rows="#{bindings.AllEmployees.rangeSize}"
  first="#{bindings.AllEmployees.rangeStart}"
  selectionState=
      "#{bindings.AllEmployees.collectionModel.selectedRow}"
  selectionListener=
      "#{bindings.AllEmployees.collectionModel.makeCurrent}"
  width="100%">
  <af:column
    headerText="#{bindings.AllEmployees.labels.EmployeeId}"
    sortProperty="EmployeeId" sortable="true">
    <af:outputText value="#{row.EmployeeId}"/>
  </af:column>
  <af:column
    headerText="#{bindings.AllEmployees.labels.FirstName}"
    sortProperty="FirstName" sortable="true">
    <af:outputText value="#{row.FirstName}"/>
  </af:column>
```

Action Bindings

- Added when buttons or links are dropped into the UI
- Run *operations*
  - Collection operations
    - Create, Delete, Find, First, Last, etc.
  - Data control operations
    - Commit, Rollback



Save

JSF

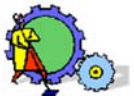
```
<af:commandButton
  text="Save"
  actionListener="#{bindings.Commit.execute}"
  disabled="#{!bindings.Commit.enabled}"/>
```

PageDef

```
<action id="Commit" RequiresUpdateModel="true"
    Action="commitTransaction"
    DataControl="HRServiceDataControl"/>
```

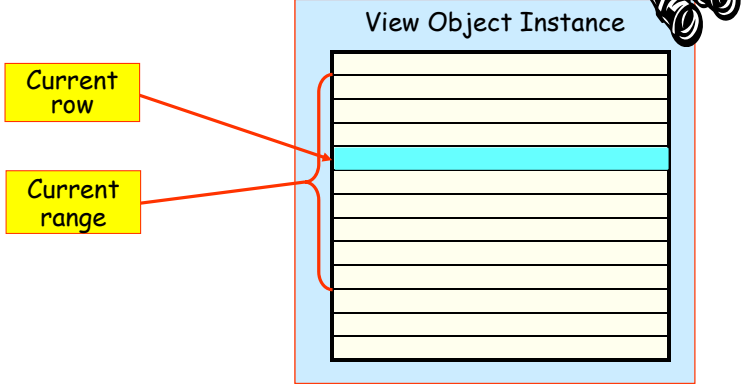

What is an Iterator?

- A pointer to a row in a collection
  - Allows manipulation of attribute values in a row
- Used to navigate a set of rows
  - Much like a cursor navigating a query in PL/SQL
- You implicitly refer to these in binding expressions:
  - **`#{bindings.EmployeeId.inputValue}`**
  - "The employee ID of whatever row is currently pointed to by the iterator"
- Can define more than one iterator per collection
  - To have different pointers to the same collection
  - E.g., if the same collection were used for two purposes like a search form and a read-only results table



Iterator – An Executable

- These keep track of the current view row in a view object instance's query result
- Keeps track of a "range" of data around the view row



I'd Hammer in the Morning

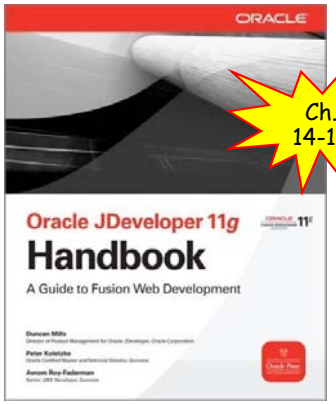
All parts should go together
without forcing...
By all means,
do not use a hammer.

—*1925 IBM Maintenance Manual*

Raffle

Summary

- ADF Model layer connects the ADF Controller or View and Business Services layers
- ADF Data Bindings provide association of UI components and business services
- Simple coding in EL (and XML) tap into the ADF Model framework code
- XML code in the PageDef file defines the bindings
- EL in the UI properties access the binding by name
- Different types of bindings accomplish different tasks



- **Books co-authored with Dr. Paul Dorsey, Avrom Roy-Faderman, & Duncan Mills**

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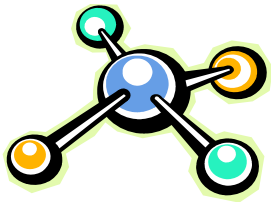
- **Founded in 1995 as Millennia Vision Corp.**
- **Profitable without outside funding**
- **Consultants each have 10+ years industry experience**
- **Strong High-Tech industry background**
- **200+ clients/300+ projects**
- **JDeveloper Partner**
- **More technical white papers and presentations on the web site**

Appendixes

- A: More Binding Examples
- B: More About Iterators and Executables

Table Bindings

- A.k.a., *range bindings*
- Expose data from all rows in the iterator binding's current range
- Expose some or all columns
- Iterator's *collectionModel* property is used as the table's value
- A variable in the table UI component is assigned to the table binding's data
  - Usually "row"



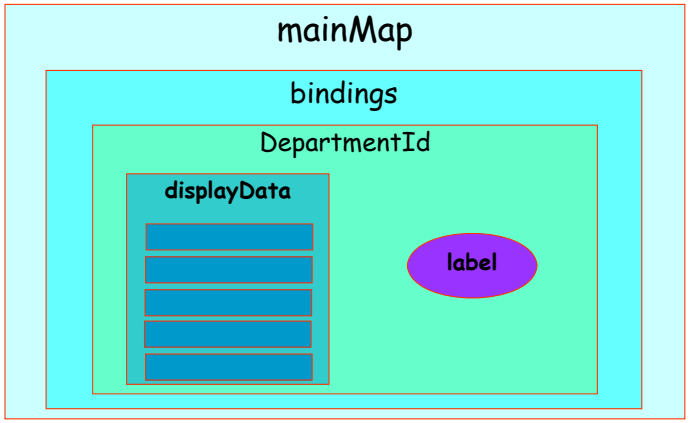
List Bindings

- Populate a single attribute in the current row, or navigate between rows
  - Dynamic or static
- Generally used as the **`value`** attribute for a pulldown list or similar element

```
<af:selectOneChoice
  value="#{bindings.AllEmployeesJobId.inputValue}"
/>
```

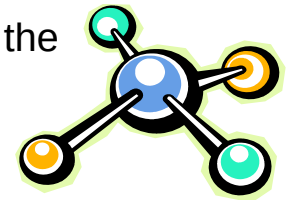
List Bindings and Maps

- Example: a list for DepartmentId



List Binding Modes

- For populating an attribute, a list binding can be in static or dynamic list
  - Static allows you to hard code the list
  - Dynamic lets you specify a collection as the source
- For navigating, a list binding uses Navigation mode
  - The iterator binding will jump to the row selected in the list



Navigation List Bindings

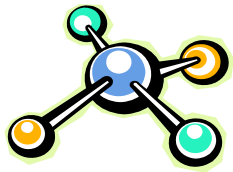
- Changes the current row in the iterator
- Selecting a value from a navigation list sets that row as current
- This List Binding Editor appears when you drop a collection as a navigation list

List of Values Bindings

- Used for ADF LOV input list or ADF LOV choice list
  - Popup LOV dialog
- List elements are displayed from the view object
  - Any number of columns
- Provides search capabilities
  - More functionality than a standard list binding
  - Can also display a *quick selection list*
    - Values displayed in a pulldown not popup

Method Bindings

- Used for custom code
  - Otherwise, identical in results to action bindings
- Drop the method from the Data Controls panel as a parameter form or button or link
  - Creates a methodAction binding type
- Can also create the binding manually

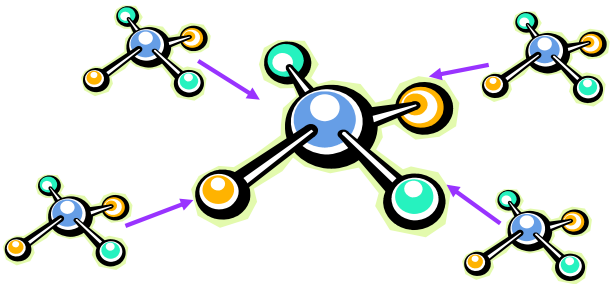


Appendixes

- A: More Binding Examples
- B: More About Iterators and Executables

Iterators Are Necessary

- Almost all other kinds of bindings must be associated with an iterator
- Exceptions: are bindings to actions
  - E.g., “Commit” and “Rollback”,
  - Do not apply to a particular query result



Iterator Details

- Consider this binding: **`#{bindings.EmployeeId.inputValue}`**
  - The employee ID of whatever record is currently pointed to by the iterator
- Iterators are defined in the PageDef file executables section
  - The query associated with the iterator's view object is run when the page loads
    - If more than one iterator per collection, the query executes once
- Important property: *rangeSize*
  - Number of rows fetched (-1 is all)

InvokeAction - Another Executable

- Calls an existing action or method binding defined in action bindings
- Example: Create binding will add a row to the collection
  - invokeAction on the binding will execute this operation
- Important property: *Refresh*
  - Specifies when this invokeAction occurs
    - ifNeeded – framework decides
    - always – every time the page is invoked

Action and ActionListener Properties

- Used on action components
  - af:commandButton, af:commandLink
- An actionListener executes before the main action of the component, e.g.,

```
<af:commandButton
  actionListener="#{bindings.Rollback.execute}"
  text="Cancel"
  action="cancelEditEmp">
```

- The main action returns "cancelEditEmp" to the framework to cause page navigation
- The actionListener executes a Rollback operation before the main action
  - Two actions, one component
  - No Java!