Struts Development

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Agenda

- Overview
- Struts elements
- JDeveloper implementation of Struts
- Creating Struts-based applications
What is Struts?

- Framework of reusable components and tag libraries for building and managing web applications
- Model-View-Controller architecture
  - Struts acts as the Controller
  - Action control
  - Page building
Models 1 and 2 Architecture

◆ Model 1 Architecture (Traditional)
  - UI controls all application logic.
  - No separation between application components and how they interact.
  - Java code is embedded in HTML code and JSP page.
  - Difficult to develop, debug and maintain.

◆ Model 2 Architecture
  - Separates logic from UI development.
  - Display code is separate from page flow control code.
  - Servlets control page flow.
Struts Architecture

- Provides a structured approach to application development
- Uses a state transition engine (STE) metaphor for page control.
- Uses JSP or HTML pages
Struts Elements (1)

- **Action Tag**
  - Used to change control in an application
  - May have other tags nested inside it
  - May have many Forward tags defined within it
  - May point to a Java file (action class) for complex control

- **Forward Tag**
  - Changes control based on parameter passed from the application
    - `name` – expected value of passed parameter (e.g. "success")
    - `path` – indicates where control will be passed
Struts Elements (2)

- **Action Class**
  - Custom Java class extending Struts class `org.apache.struts.Action`
  - Supports complex flow logic
  - Includes "execute" method

- **ActionForm Class (FormBean)**
  - Java class
  - Caches data from page to page movement
  - Handles persistence requirements
  - Not often used in JDeveloper 10g
Struts Elements

- **Action** (/browseDept.do)
  - Tag used to change control in the application
    
    ```
    <forward name="success" path="/xxy.do">
    <forward name="fail" path="/error.jsp">
    ```

- **Action Class** (actionlogicDept.java)
  - Java class for an action (add complex logic)
    - Minor Validation
    - Page Navigation
      - Logic to select forward: “success” or “fail”
Struts Element Interaction

1. Request data
2. Return data
3. Code data
4. Pass for display/edit
5. Return edited data
6. Return data
7. Pass control
8. Return updated data

JSP Page

Data Form

Another Page

Another Action

Database
ApplicationResources.properties files

- Element/Value pairs (multi-lingual support)
- Files store string values and global variables and/or initialization parameters
- Easy to change properties referenced in many places in the page
- Can have multiple files for different languages
Sample .properties files

#Fri Mar 12 16:59:39 GMT-05:00 2004
errorpage.title=Error Page
errorpage.apperror=Application Error
error.Validate3=&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;
error.Validate2=&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;(0)
error.Validate1=&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;(0)
error.Validate0=(0)
errors.header=<h3><font color="red">Validation Error</font></h3>
errors.prefix=<li>
globalerror.jboException=Application Error
errorpage.message=Error Message:
errors.footer=</ul><hr>
errors.suffix=</li>
<xml version='1.0' encoding='windows-1252'>
<!DOCTYPE struts-config PUBLIC "-//Apache Software Foundation//DTD Struts Configuration 1.1//EN" "http://
<struts-config>
  <form-beans>
    <form-bean name="DataForm" type="oracle.adf.controller.struts.forms.BindingContainerActionForm"/>
  </form-beans>
  <action-mappings>
    <action path="/browseDeptDP" className="oracle.adf.controller.struts.actions.DataActionMapping" type="c
      <set-property property="modelReference" value="browseDeptDPUIModel"/>
    </action>
    <action path="/editDeptDP" className="oracle.adf.controller.struts.actions.DataActionMapping" type="c
      <set-property property="modelReference" value="editDeptDPUIModel"/>
      <set-property property="methodName" value="editDeptDPUIModel.setCurrentRowWithKey"/>
      <set-property property="resultLocation" value="${requestScope.methodResult}"/>
      <set-property property="numParams" value="1"/>
      <set-property property="paramNames[0]" value="${param.rowKeyStr}"/>
      <forward name="deptUpdate" path="/browseDeptDP.do"/>
    </action>
    <action path="/createDeptDA" className="oracle.adf.controller.struts.actions.DataActionMapping" type="c
      <set-property property="modelReference" value="createDeptDAUIModel"/>
      <set-property property="methodName" value="createDeptDAUIModel.Create"/>
      <set-property property="resultLocation" value="${requestScope.methodResult}"/>
      <set-property property="numParams" value="0"/>
      <forward name="success" path="/editDeptDP.do"/>
    </action>
    <action path="/setCurrentDeptDA" className="oracle.adf.controller.struts.actions.DataActionMapping" t
      <set-property property="modelReference" value="setCurrentDeptDAUIModel"/>
      <set-property property="methodName" value="setCurrentDeptDAUIModel.setCurrentRowWithKey"/>
      <set-property property="resultLocation" value="${requestScope.methodResult}"/>
      <set-property property="numParams" value="1"/>
      <set-property property="paramNames[0]" value="${param.rowKeyStr}"/>
      <forward name="success" path="/deleteDeptDA.do"/>
    </action>
  </action-mappings>
</struts-config>
struts-config.xml File

- struts-config.xml
  - Core of Struts !!!
  - XML file
  - Ties all the components of your struts application together
Sample JDeveloper10g Struts Flow
### Departments Application

<table>
<thead>
<tr>
<th>First</th>
<th>Previous</th>
<th>Next</th>
<th>Last</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DepartmentId</th>
<th>DepartmentName</th>
<th>ManagerId</th>
<th>LocationId</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Administration</td>
<td>201</td>
<td>1700</td>
</tr>
<tr>
<td>20</td>
<td>Marketing</td>
<td>201</td>
<td>1800</td>
</tr>
<tr>
<td>30</td>
<td>Purchasing</td>
<td>114</td>
<td>1700</td>
</tr>
<tr>
<td>40</td>
<td>Human Resources</td>
<td>203</td>
<td>2400</td>
</tr>
<tr>
<td>50</td>
<td>Shipping</td>
<td>121</td>
<td>1500</td>
</tr>
<tr>
<td>60</td>
<td>IT</td>
<td>103</td>
<td>1400</td>
</tr>
<tr>
<td>70</td>
<td>Public Relations</td>
<td>204</td>
<td>2700</td>
</tr>
<tr>
<td>80</td>
<td>Sales</td>
<td>145</td>
<td>2500</td>
</tr>
<tr>
<td>90</td>
<td>Executive</td>
<td>100</td>
<td>1700</td>
</tr>
<tr>
<td>100</td>
<td>Finance</td>
<td>108</td>
<td>1700</td>
</tr>
</tbody>
</table>

- **Commit**
- **Rollback**

**Create a department**
# Edit Departments

<table>
<thead>
<tr>
<th>DepartmentId</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>DepartmentName</td>
<td>Human Resources</td>
</tr>
<tr>
<td>ManagerId</td>
<td>203</td>
</tr>
<tr>
<td>LocationId</td>
<td>2400</td>
</tr>
</tbody>
</table>

**Update**
XML file – <tags> for all components in the application and how they interact

Two main parts:

- Form bean area
  - ActionForm/DynaActionForm classes
- Action mappings area
  - Actions and re-directions
Inside Struts-config.xml

◆ Form bean
◆ Just **one reference** in Jdev10g!
  ➢ Complete connection to all ADF BC’s

```xml
<struts-config>
  <form-beans>

    <form-bean name="DataForm"
      type="oracle.adf.controller.struts.forms.BindingContainerActionForm"/>

  </form-beans>

...</struts-config>
```
Inside Struts-config.xml

◆ Action mappings

```xml
<action path="/browseDeptDA"
   className="oracle.adf.controller.struts.actions.DataActionMapping"
   type="view.BrowseDeptAction" name="DataForm">
   <set-property property="modelReference" value="browseDeptPGUIModel"/>
   <forward name="success" path="/browseDeptPG.do"/>
</action>

<action path="/browseDeptPG"
   className="oracle.adf.controller.struts.actions.DataActionMapping"
   type="oracle.adf.controller.struts.actions.DataForwardAction"
   name="DataForm" parameter="/browseDeptPG.jsp">
   <set-property property="modelReference" value="browseDeptPGUIModel"/>
</action>
```
View-level Struts (tag libs)

- **Html**
  - This library is used to generate standard HTML elements.

- **Bean**
  - Beans are used to provide a number of utility-like operations such as access data in a cookie.

- **Logic**
  - These libraries provide conditional logic support.

- **Nested**
  - These libraries are used to support nested elements such as an address embedded in an Edit Person page.

- **Template**
  - These libraries help create pages based on a template.

- **Tiles**
  - Tiles partition your pages into areas that are static and dynamic to improve update performance and ease development.
Struts Development

**Traditional Struts**
- **Code:**
  - Pages
  - Actions
  - ActionClasses
    - Navigation
  - ActionForms
    - Validation
    - Data Storage
  - Struts-config.xml

**JDeveloper Struts**
- **Draw:**
  - Page flow
- **Drag & Drop**
  - ADF data objects
Sample JDeveloper10g Struts Flow
◆ Main JDev10g interface for Struts

◆ **Drag-and-drop** functionality makes development easy!

◆ Elements added from the Component Palette or **Data Control** Palette are automatically added to the code and vice versa.
Sample JDeveloper Page
Flow Diagrams

Simplified flow taking advantage of ADF

Extra data actions to support complex logic
JDeveloper Data Controls

- Easy drag-and-drop functionality from the Data Control Palette
- Select the type of component (JSP, HTML, etc.)
  - Filtered lists of components appropriate for file type
- “Operations” can be dropped onto elements in the Page Flow Diagram.
  - Create, Find, Execute, First, Previous, Previous Set, Next Set, Last, Delete
View-Level Struts

◆ Custom Oracle Struts tags
  ➢ Used in the view layer
  ➢ Simplify page construction
  ➢ Tie view elements to framework
  ➢ Drag & Drop to add:
    ▪ Tables
    ▪ Forms
    ▪ Buttons
    ▪ Etc.
Components

- Page
- Data Page
- Action
- Data Action
- Forward
- Page Link
- Page Forward

- Notes & Attachments can be added to any Page Flow Diagram
Page (basic – but not useful)

- Allows you to create a JavaServer Page
- No effect on the struts-config.xml file
- Not needed - if developing ADF applications in JDev10g
Data Page (basic ADF element)

- Extension of the Struts idea of a page
- The framework will take care of binding them to the ADF BC view components.

```xml
<action path="/dataPage1"
   className="oracle.adf.controller.struts.actions.DataActionMapping"
   type="oracle.adf.controller.struts.actions.DataForwardAction" name="DataForm"
   parameter="unknown"/>
```
Action (basic – not used in ADF)

- Adapts incoming HTTP request to business logic to be executed
  - Model interaction
  - Page navigation
Data Action
(basic ADF element)

- Frequently used to simply query data and pass it on to the next element.
- It can also do non-trivial things such as navigation to one element or another based upon some condition.

```xml
?action path="/dataAction1"
className="oracle.adf.controller.struts.actions.DataActionMapping"
type="oracle.adf.controller.struts.actions.DataAction"
name="DataForm"/>
```
Forward

- Standard Struts element
- Links any two data actions, data pages, forwards, etc…
- Name/destination pair
- It is the Struts equivalent of a “GoTo”.
- If you create a forward (“success”) from a component to one called “B”, it adds the code

```xml
<forward name="success" path="/B.do"/>
```
Page Link

- Corresponds to the standard HTML anchor tag
  - Page tag: Sends you to another page or action.

- If you create link in a JSP to take you to page “B”:, it will add the following code
  
  `<html:link page="/B.do">
      <bean:message key="link.B"/>
  </html:link>`

- The link page tag tells the page where to go and the message key tag indicates the location of the label text for the link in the .properties file.

  `link.B=Please take me to page “B”`
Page Forward

◆ Simple link to a page
  ➢ When you drag in a page forward it makes the following code:

  `<action path="/page1" forward="unknown"/>

◆ When you double click on the component and create a UI file (e.g. .jsp file) it will use the name of the file as the forward destination.
◆ Can be used for "child" data pages such as new or edit record pages.
Many ways of building an application
Different combinations may be used
Most use data actions and data pages
Standard pages can be used when there is no data interaction.
JDeveloper 10g
Struts Development

◆ Extended and simplified
  - Visual – page flow diagramming tool
  - Drag & Drop integration with ADF Services
  - Struts-Tags custom tag libraries

◆ JDev10g provides easiest way to use Struts
  - MUCH better than 9i
  - MUCH better than anything else
  - Still not trivial
Tips

◆ Cut and paste code with caution
  ➢ Use wizards
  ➢ Most data operations are in two places
    ▪ XML, Code (Java, HTML)

◆ Don’t rename
  ➢ Even remove is not safe if you have used it
  ➢ Drag and drop adds, it never leaves
    ▪ In JSP delete from screen AND Structure pane
  ➢ Bindings area does not clean up.

◆ Save often (certainly prior to each running)
  ➢ Make backups of whole directory
More Tips

- `event_...`
  - In forward tag in `struts_config.xml`
  - `event_Submit` default
  - `event_ErrorHandler` custom
  - Saves coding, ADF auto looks for events named this way (uses “line” name)

- `&nbsp;` - one blank space in HTML

- Don’t use “HTML” components when doing struts – won’t bind
  - Component Pallette “Struts HTML”
Development Method Tips

1. Ultra-thin client
2. Put everything possible into the database.
3. Make a view for each screen display and each screen update
4. Applications should never access anything other than views.
   - Views wrap functions and procedures.
Required Hardware

- Dual 20 inch monitors
- $\geq 1$ GB memory (even if you are not running the DB) 2 GB nice, 4 GB cool
- $> 2$ GHz processor
Resources

- OTN white papers
- Google for help (it will even find the OTN papers)
- Post questions on ODTUG, OTN.
- Get a mentor.
  - Without one, you will fail one or more projects
- Basic Struts book may not help much.
References

- **The Java Class Libraries – Volumes 1, 2, 3**, Chan & Lee, (Addison-Wesley)
- **The Java Tutorial (series)**, Campione, et. al (Addison-Wesley)
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