Java Server Faces (JSF)

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We appreciate

Overview

- One-tier solution, presentation, business logic, and data are all integrated in one monolithic application.
- The multi-tier architecture breaks this type of application into three layers
  model (data access),
  view (presentation),
  controller (logic).
- This programming paradigm, representing the split between these layers, is known as the **Model-View-Controller (MVC)** architecture

Overview

- A typical multi tier software solution—serving a retail company, for example—it might include support for multiple agents such as

  - Web browsers,
  - mobile devices etc..

- Application developer forced to provide one application that should support all 3 agents - will be a maintenance nightmare, and may cause issues with security and scalability.

Overview

"How many technologies do I
have to learn in order to successfully
build a complete solution for my project?"

Framework

open source communities

Struts (an open source controller framework);

TopLink and Hibernate (model frameworks);

Tiles, Tapestry, XUL, and ADF UIX (view frameworks).

Benefits of application frameworks – modularity, reusability, and inversion of control (IoC)

Restrictions: Frameworks are also incompatible

with each other, which makes integration hard to handle.

JSF Overview

- Why you need yet another framework ?
- The differentiator that JSF brings, which other similar frameworks do not have, is the backing of a standard specification (JSR-127).
- Because JSF is part of the J2EE standard specification, it is a top priority for every major J2EE tools vendor in the market (including Oracle, IBM, Borland, and Sun) to support it, which in turn will guarantee a wide adoption and good tools support.

What is JSF?

- A set of Web-based GUI controls and associated handlers
- A Component-based model - similar to the model that's been used in standalone GUI applications for years
- A device-independent GUI control framework
- JSF uses UI components that hide most of the grunt work of integrating richer functionality into Web applications.
- Provides an easy way to construct UIs from a set of reusable UI components.

JSF - Component Model

- JSF component model is similar to the AWT GUI component model.
- Events and Properties
- Component functionality typically centers around two actions: decoding and encoding data.
- **DIRECT IMPLEMENTATION** approach and **DELEGATED IMPLEMENTATION** approach
- JSF components consist of two parts: the **COMPONENT** and the **RENDERER**

JSF - Navigation Model

- JSF provides a declarative navigation model
- JSF provides a set of navigation rules to define the navigation from one view to another
- Navigation rules in JSF are defined inside the JSF configuration file, faces-config.xml, and are **page-based**

```
<navigation-rule>
    <from-view-id>/login.jsp</from-view-id>
    <navigation-case>
        <from-outcome>success</from-outcome>
        <to-view-id>/result.jsp</to-view-id>
    </navigation-case>
</navigation-rule>
```

JSF - Application Lifecycle

- JSF framework helps manage **UI STATE** across server requests. Instead of having to take care of user elections and passing these selections from page to page, the framework will handle this
- JSF framework also has built-in processes in the Lifecycle to assist with **VALIDATION**, **CONVERSION**, and **MODEL UPDATES**.
- JSF provides a simple model for delivering client-generated **EVENTS** to server-side application code.

Example

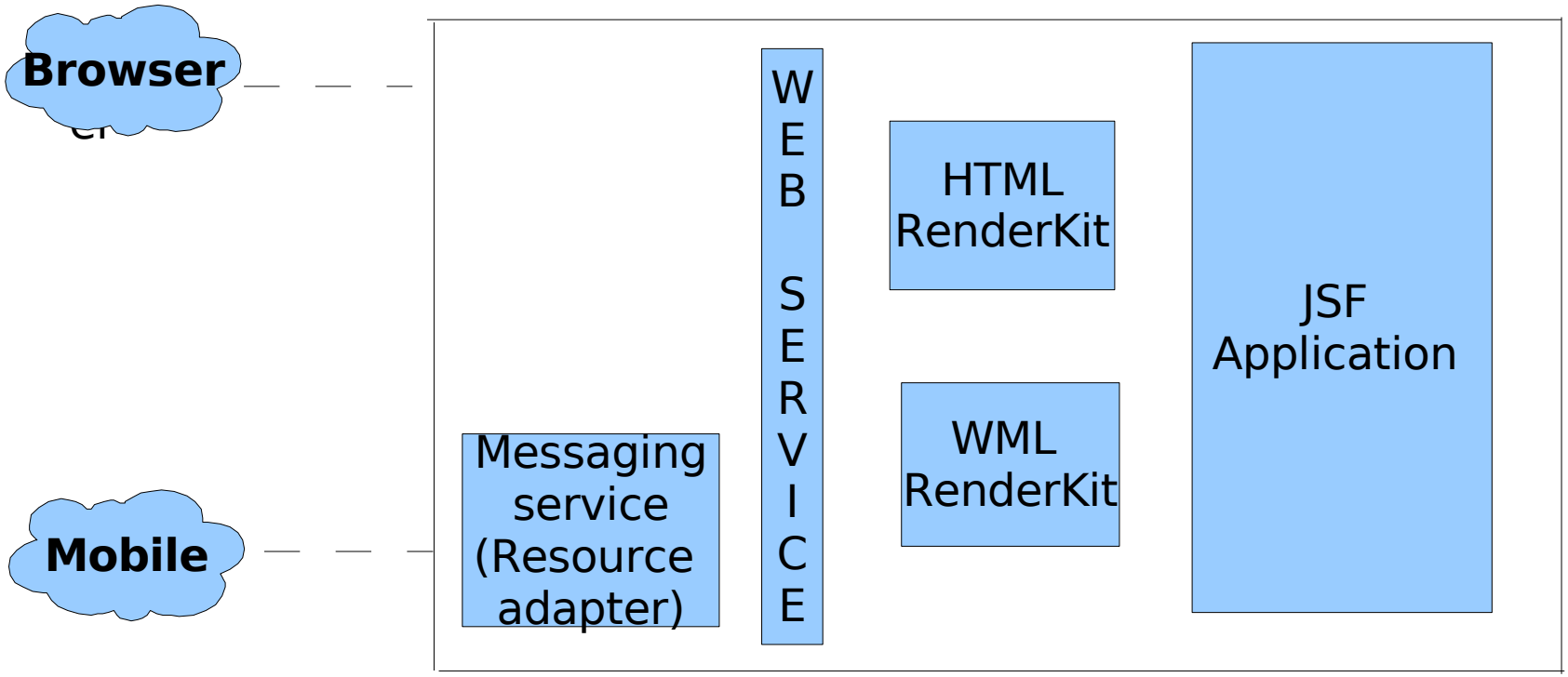
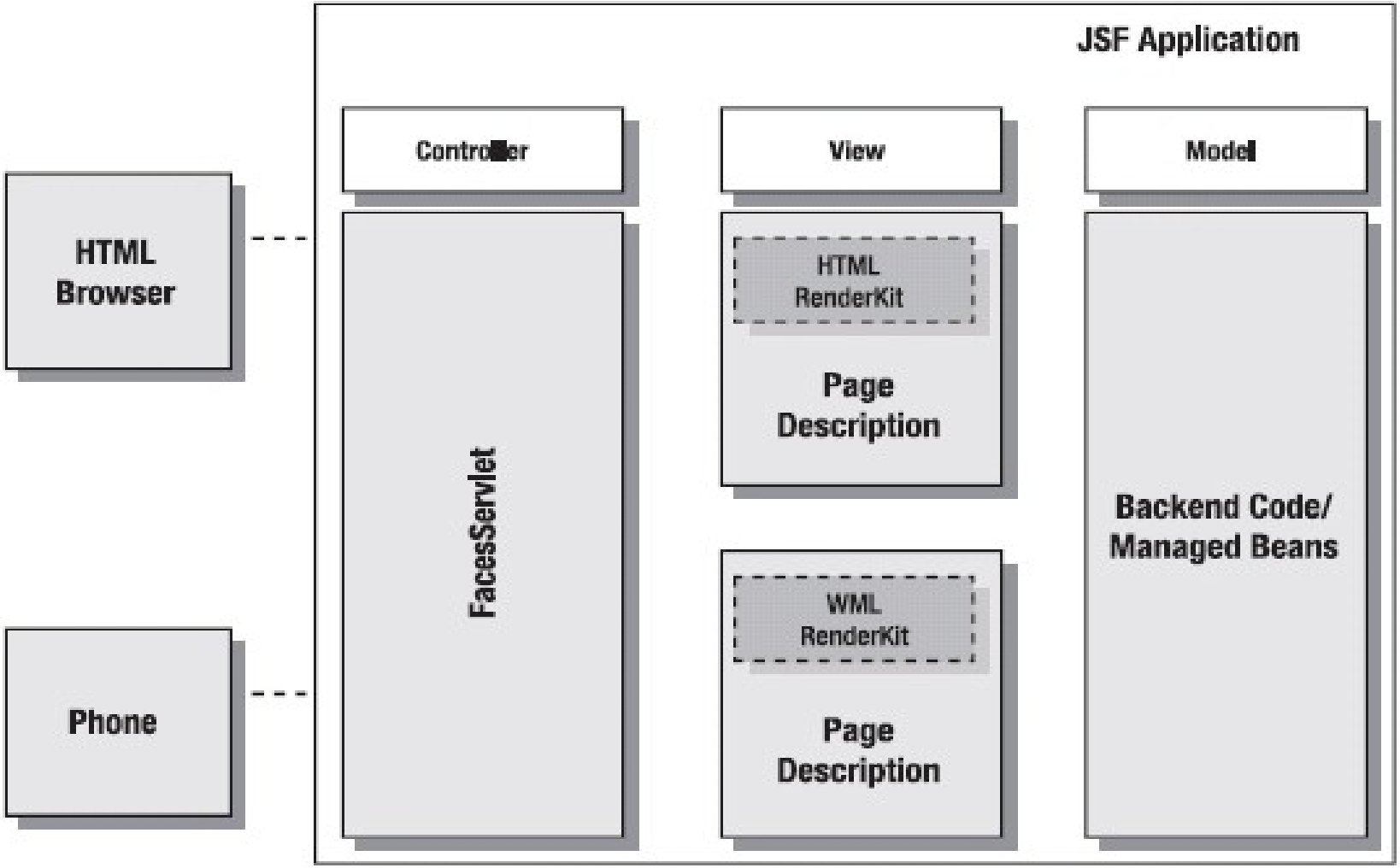


Figure J2EE architecture using JSF for a typical multi-tier software solution

JSF Architecture

- JSF implements - Model 2 pattern, which is based on the MVC architecture.
- Consists of three elements—the view, the navigation model, and the application logic



Model

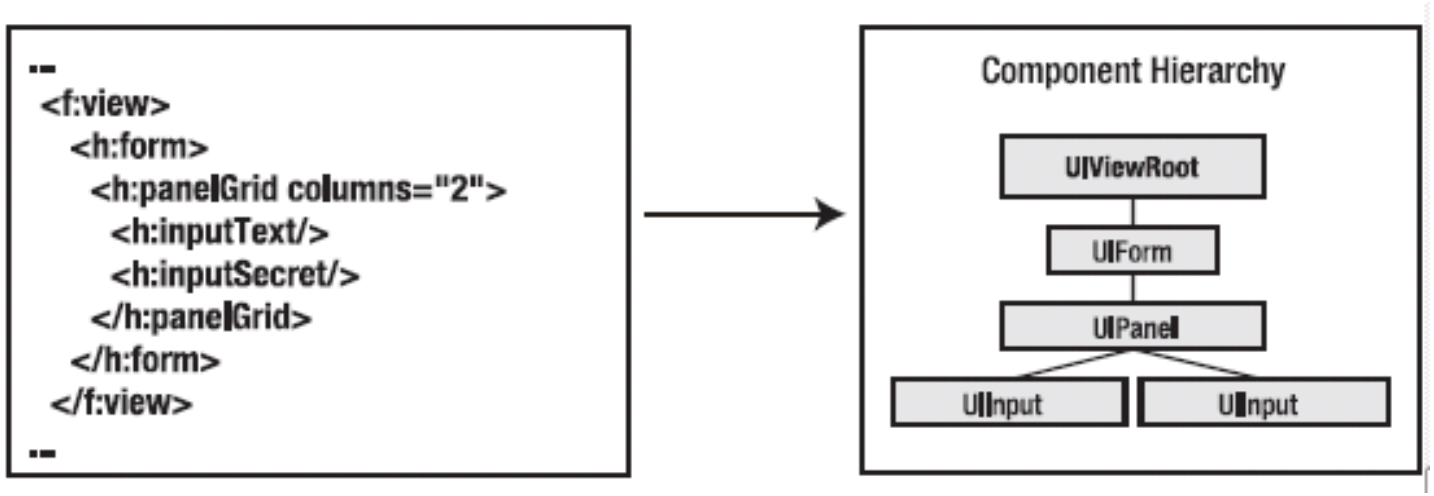
- Managed bean is the glue to the application logic—backing code or backing bean.
- In JSF it is the component that is aware of which action, or method, to call on a particular user event.
- The managed bean facility is responsible for creating the backing beans

```
<managed-bean>
    <managed-bean-name>sample</managed-bean-name>
    <managed-bean-class>com.application.SampleBean</managed-bean-class>
    <managed-bean-scope>session</managed-bean-scope>

</managed-bean>
```

View

- JSF view layer describes the intended layout, behavior, and rendering of the application.



- UIComponents nested structure will at runtime be represented as a component hierarchy

Controller

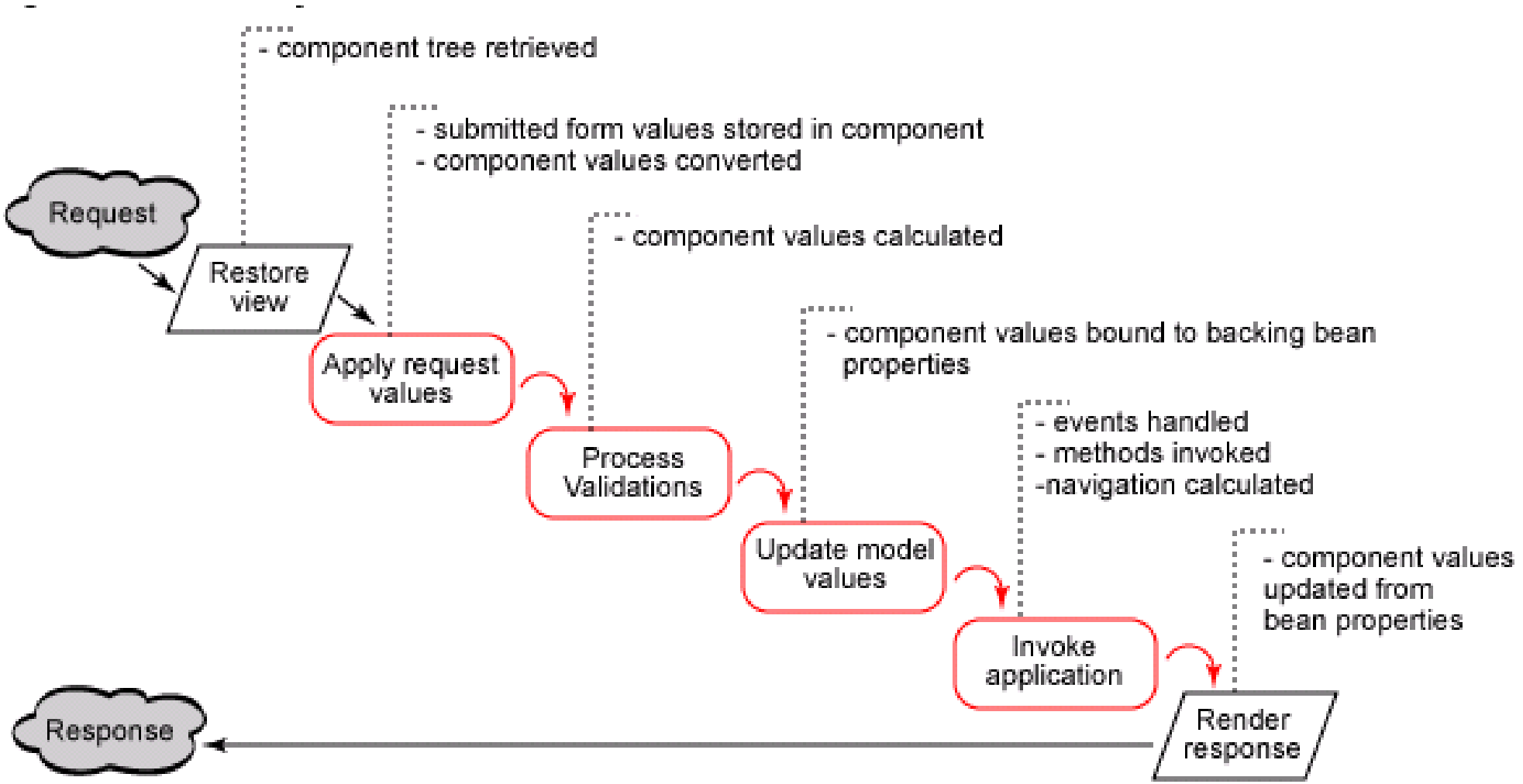
- JSF comes with a simple controller—the FacesServlet.
- Controlls Navigation Flow
- Dispatch Requests to appropirate page

A Simple JSF Application

Developing a simple JavaServer Faces application usually requires these tasks:

- Create the pages using the UI component and core tags.
- Define page navigation in the application configuration resource file. (faces-config.xml)
- Develop the backing beans. (backingbean/ managedbean)
- Add managed bean declarations to the application configuration resource file (faces-config.xml)
  - Refer example here....

The JSF lifecycle



Things to keep in mind.....

- FacesContext
  - The FacesContext object contains all the state information JSF needs to manage the GUI component's state for the current request in the current session.
  - The FacesContext stores the view in its viewRoot property
  - viewRoot contains all the JSF components for the current view ID.

Phase 1: Restore view

- In the first phase of the JSF lifecycle -- restore view -- a request comes through the FacesServlet controller.
- The controller examines the request and extracts the view ID, which is determined by the name of the JSP page.
- The JSF framework controller uses the view ID to look up the components for the current view.
- If the view doesn't already exist, the JSF controller creates it. If the view already exists, the JSF controller uses it. The view contains all the GUI components.

Phase 1: Restore view

- This phase - three view instances:

  new view,

  initial view, and

  postback, with each one being handled differently.

- New view - JSF builds the view of the Faces page and wires the event handlers and validators to the components. The view is saved in a FacesContext object.
- In the case of an initial view (the first time a page is loaded), JSF creates an empty view.

Phase 1: Restore view

- In the case of a postback (the user returns to a page that has been accessed previously), the view corresponding to the page already exists, so it needs only to be restored.
- In this case, JSF uses the existing view's state information to reconstruct its state.

Phase 2: Apply request values

- The purpose of the apply request values phase is for each component to retrieve its current state.
- The components must first be retrieved or created from the FacesContext object, followed by their values.
- Component values are typically retrieved from the request parameters, although they can also be retrieved from cookies or headers.

Phase 3: Process validation

- The first event handling of the lifecycle takes place after the apply request values phase.
- Values entered by the user are compared to the validation rules.
- If an entered value is invalid, an error message is added to FacesContext
- If there are no validation errors, JSF advances to the update model values phase
- If validation fails, JSF calls render response phase, which will display the current view with the validation error messages.

Phase 4: Update model values

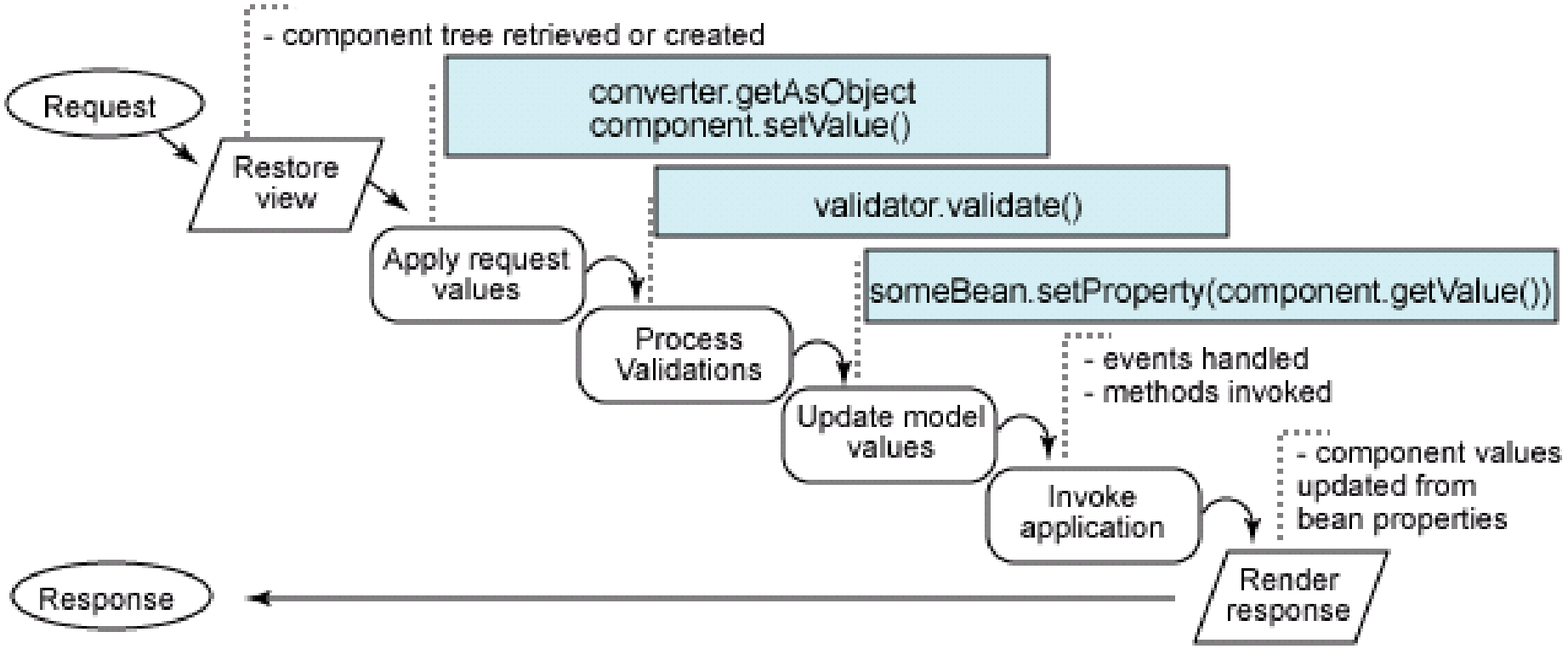
- Updates the actual values of the server-side model
- This is done by updating the properties of backing beans (managed beans).

Phase 5: Invoke application

- JSF controller invokes the application to handle Form submissions.
- At this phase, you also get to specify the next logical view for a given
- Define a specific outcome for a successful form submission and return that outcome

Phase 6: Render response

- In the sixth phase of the lifecycle -- render response -- you display the view with all of its components in their current state.



User Interface Component Model

JSF provides a rich, flexible component architecture that includes:

- A set of UICOMPONENT classes for specifying the state and behavior of UI components
- A RENDERING MODEL that defines how to render the components in various ways
- An EVENT and LISTENER MODEL that defines how to handle component events
- A conversion model that defines how to register data CONVERTERS onto a component
- A VALIDATION MODEL that defines how to register validators onto a component

UI Component class

JSF provides a set of

- UI COMPONENT CLASSES
- ASSOCIATED BEHAVIORAL INTERFACES

that specify all the UI component functionality like

- HOLDING COMPONENT STATE,
- MAINTAINING A REFERENCE TO OBJECTS
- EVENT HANDLING
- RENDERING

UI Component class

All JSF UI component classes extend *UIComponentBase*

refer block diagram in "JSF Custom Components"

UI component classes is includes: UIColumn, UICommand, UIData, UIForm, UIGraphic, UIInput, UIMessage, UIMessages, UIOutput, UIPanel, UIParameter, UISelectBoolean, UISelectMany, UISelectOne, UIViewRoot

Behavioral Interfaces include: ActionSource, EditableValueHolder, NamingContainer, StateHolder, ValueHolder

UI Component class

ex:

UICommand implements ActionSource and StateHolder.

UIOutput implement StateHolder and ValueHolder.

UIInput implement EditableValueHolder, StateHolder, and ValueHolder.

UIComponentBase implements StateHolder

Component Rendering Model

Renderer class defines a different way to render the particular component to the output defined by the render kit.

For example,

a UISelectOne component has three different renderers.

- One of them renders the component as a set of radio buttons.
- Another renders the component as a combo box.
- The third one renders the component as a list box.

refer table

UISelectOne

selectOneRadio

```
<h:selectOneRadio
 value="#|carBean.currentCar]">
  <f:selectItems
   value="#|carBean.carList]" />
</h:selectOneRadio>
```

selectOneMenu

```
<h:selectOneMenu id="selectCar"
 value="#|carBean.currentCar]">
  <f:selectItems
   value="#|carBean.carList]" />
</h:selectOneMenu>
```

selectOneListbox

```
<h:selectOneListbox id="pickCar"
 value="#|carBean.currentCar]">
  <f:selectItems
   value="#|carBean.carList]" />
</h:selectOneListbox>
```

Conversion Model

- JSF implementation automatically converts component data between these model view and presentation view

For example,

```
<h:inputText value="#{sample.date}" >
   <f:convertDateTime pattern="yyyy-MMM-dd" />
   </h:inputText>
```

java.util.Date - represented as a text string in the format mm/dd/yy etc..

UISelectBoolean component is associated with a bean property of type java.lang.Boolean,
JSF implementation will automatically convert the component's data from String to Boolean.

Event and Listener Model

JSF supports three kinds of events: value-change events, action events, and data-model events.

- An action event occurs when the user activates a component that implements ActionSource. ex: buttons and hyperlinks.
- A value-change event occurs when the user changes the value of a component represented by UIInput or one of its subclasses ex: checkbox.
- A data-model event occurs when a new row of a UIData component is selected

```
<h:commandButton
        styleClass="text"
        id="start"
        action="#{MyNewAction.startAction}"
        value="#{msgs['deploy.start']}"
        rendered="#{MyNewAction.startRender}"
/>
```

```
<h:selectOneListbox
    styleClass="selectListBoxStyle" size="10"
      value="#{MyNewAction.selectedCategoryId}"
      valueChangeListener="#{MyNewAction.onSelectCategoryValueChange}"
      id="categoryId1"
      onchange="form.submit();" required="true"

       <f:selectItems value="#{MyNewAction.categorySelectItems}"
      id="categorySelectItem1"/>
</h:selectOneListbox>
```

Mixing JSTL and JSF

- If you're using JSP or JSTL expressions with managed beans, you need to ensure that the beans have been created first,
  - either by a JSF expression,
  - Java code, or
  - custom tag
- older expression languages don't know about JSF's Managed Bean Creation facility

Mixing JSTL and JSF

```
...
<f:view>
  <jsp:useBean class="org.jia.examples.TestForm" id="exampleBean" scope="session"/>
  <h:form>
    <h:inputText id="inputInt" value="#{sessionScope.exampleBean.number}"/>
    <h:commandButton value="Go!"/>
      <c:if test="${sessionScope.exampleBean.number > 0}">
        <c:forEach begin="0" end="${sessionScope.exampleBean.number - 1}" var="count">
          Queen Tracey will achieve world domination.<br>
        </c:forEach>
      </c:if>
  </h:form>
</f:view>
```

Resources

- Javaserver Faces in Action – Kito D.mann
- Mastering Java Server Faces – Bill Dudney
- JSF - OReilly
- Pro JSF and AJAX – Jonas and John - APress
- http://www-128.ibm.com/developerworks/java

Special thanks

CommVault Systems (India) Pvt. Ltd.

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CommVault is a Storage Management, Backup and Disaster Recovery company incorporated in USA with its Global Development Centre in Hyderabad, AP.

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