Struts and JavaServer Faces

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(Slides by Craig McClanahan)

Agenda

- Brief description of JavaServer Faces
- Struts or JavaServer Faces?
- Future directions
- Summary
- Creator Demo

JavaServer Faces Is ...

A server side user interface component framework for Java-based web applications

Background

- Web applications a popular entry point for developers new to Java
- Powerful foundational technologies:
  - Servlet API
  - JavaServer Pages (JSP)
  - JSP Standard Tag Library (JSTL)
  - Portlet API
- But no common component standard

Background

- Web applications also represent a key opportunity to attract a new developer market segment to Java
  - Corporate developers
- Attracting this population required something different
  - Ease of use is the #1 criteria

Fundamental Requirements

- Accessible to corporate developers
- Accessible to tools
- Client device neutral
- Usable with or without JSP
- Usable with or without HTML
- Scalable to enterprise applications

Basic Capabilities

- Extensible user interface (UI) component model
- Flexible rendering model
- Event and listener handling model
- Per-component validation framework
- Basic page navigation support
- Internationalization and accessibility

Architecture Overview

- UIComponent – Basic component API
  - JavaBean class with default base implementation class (UIComponentBase)
  - Contains render-independent properties
- Standard generic components:
  - Examples: UICommand, UIInput, UIOutput
- Concrete component subclasses with HTML-specific properties and behaviors

Value Binding Expressions

- Components may have a local value
  - Rendered at output time
  - Updated on subsequent form submit
- Components may be bound to a model tier value
  - #{customer.address.city}
  - Syntax based on JSTL/JSP 2.0 EL
  - Semantics identical when rendering
- Nearly all properties may be bound

Method Binding Expressions

- Specialized version of value binding expression
- Last element of the expression points at a method instead of a property
- Used to bind command components to the corresponding action method that should be called when component is activated

Events and Listeners

- Standard JavaBeans event pattern
- Strongly typed events and listeners
- Two standard events:
  - ActionEvent – broadcast when a UICommand component is activated by the user
  - ValueChangeEvent – broadcast when a UIInput component has been validated, and the new value differs from the old value

Converters and Validators

- Converters – Plugins for String-Object conversion
  - Render time – Object to String
  - Update time – String to Object
- Validators – Plugins for correctness checking
- Default implementations for common use cases

Application Interface

- JavaServer Faces provides a default ActionListener for every UICommand
  - UICommand may contain a method binding to an action method to be executed
  - Each UICommand may have its own method, or they may share
  - Action method invoked “immediately” or after validation
  - Return logical outcome used for navigation

Page Navigation Model

- Pluggable NavigationHandler called to perform navigation duties
- Default implementation uses configured navigation rules based on:
  - What page submitted this form?
  - Which action method was invoked?
  - What logical outcome was returned?
- Result: navigate to new page or redisplay old page

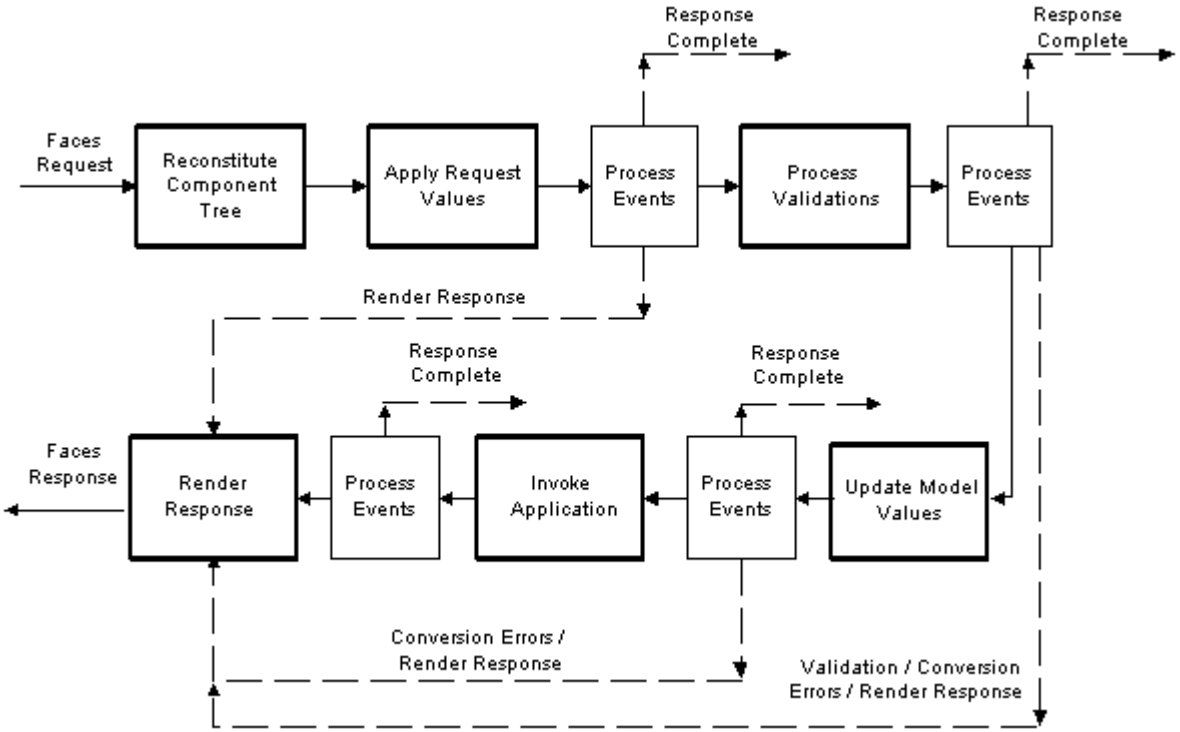
Managed Bean Creation Facility

- In a value binding or method binding expression, the first element is special
  - "Magic" values – provide access to request or application data
  - "Non-magic" values – search request, session, and application scope (like <jsp:useBean>)
  - If not present, automatically instantiate a bean, put it in scope, and populate properties
- Generalized verison of Struts form beans

Business Logic In Backing Beans

- Most JavaServer Faces applications will organize event handling code for a particular form into a corresponding JavaBean class (“backing bean”)
- Typical backing bean is also a managed bean, put in request scope
- Similar in concept to ASP.Net “code behind files”

Request Processing Lifecycle



JSF In Action

- The JSF RI ships with several samples
  - samples/jsf-cardemo.war
- Can be dropped into any Servlet 2.3 / JSP 1.2 (i.e. J2EE 1.3 or later) container
- We will see a demo using Creator

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Struts or JavaServer Faces?

- Long answer on Craig's blog:
  - http://blogs.sun.com/roller/page/craigmcc
  - /20040927#struts_or_jsf_struts_and
- Strusts and JSF provide 2 architectures for building Model 2 based webapps
- But is it an either-or choice?
- No – You can use them together

Struts+Faces Integration Library

- Design goals:
  - Take an existing Struts-based application ...
  - Convert one JSP page at a time to use JSF components instead of Struts HTML tags ...
  - Tweak the mapping information as needed in struts-config.xml ...
  - And make no changes in your form beans or actions
- Must work with Validator and Tiles

Struts+Faces Integration Library

- The design goals were achieved
- Struts+Faces Integration Library available at Apache:
  - http://svn.apache.org/builds/struts/nightly/struts-faces
- Converted application will use JSF components, but not JSF lifecycle
- Can convert actions later if desired

Demo – Integration Library

- The integration library ships with two samples (one with Tiles, one without)
- Can be dropped into any Servlet 2.3 / JSP 1.2 (i.e. J2EE 1.3 or later) container
- Let's look at these applications in action
- And browse the source code

Choosing What To Use

- Three choices here:
  - Pure Struts-based architecture
  - Pure JavaServer Faces-based architecture
  - Hybrid Struts+Faces with Integration Library
- More than one right answer
  - Not a one size fits all environment
- Different criteria will have different weights for different users

My Recommendations

- Existing Struts-based application?
  - Consider migration to JSF via integration library, when more sophisticated UI components are needed
  - Migrating form beans and actions is optional
- New application to be developed?
  - Sufficient JSF expertise and functionality? Use JSF (with tools if desired)
  - Else feel free to (continue) adopting Struts
  - Hybrid solution possible, but not recommended

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Future Directions

- Struts 1.x is a robust, mature framework:
  - 1.0 released in 2001
  - Subsequent versions backwards compatible
- Struts 1.x was (and is) a defacto standard
- Several other frameworks have emerged over the last four years
- And JavaServer Faces was standardized

Future Directions

- I believe it is time for Struts to harvest what we've learned over the years:
  - Good ideas from other frameworks
  - Embrace JavaServer Faces standard APIs
- If we knew then what we know now, what would Struts look like?
- A new approach to Struts 2.x will let us find out
  - While 1.x development continues

Future Directions

- Craig has proposed a new architecture for Struts 2.x, called “Shale”:
  - http://wiki.apache.org/struts/StrutsShale
- Fundamentally based on JSF and the plug in architecture it supports
- Decomposes the “monolithic” Struts request processor

Future Directions

- Focused functionality at different levels:
  - ViewController – Backing bean per page with very simple lifecycle callbacks (“View Helper” design pattern)
  - DialogController – Framework for managing user interaction requiring more than one HTTP request to complete
  - ApplicationFilter – Location for centralized functionality (like access control checks)

Future Directions

- Shale has not (yet) been accepted by the Struts developers as the formal choice for the next generation
  - Discussions continue on developer list
  - Likely to become an accepted subproject
- Shale needs to gather a community to become accepted
  - Subscribe to developer list to participate
    - Send an emtpy message to dev-subscribe@struts.apache.org

Future Directions

- In the mean time, Struts 1.3 is actively being developed
  - Refactor request processor based on Chain of Responsibility design pattern
  - Reorganize artifacts into core library and separate additional modules
  - Focus remains on being fundamentally backwards compatible

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Summary

- Struts is a mature, robust, framework for building web applications based on the MVC design pattern
- JavaServer Faces is the standard Java API for building user interface components for web applications
- The two can be used together as needed

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Struts and JavaServer Faces

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A Very Common Question

Now that JavaServer Faces is out, does that mean Struts is obsolete?

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- Introduction
- Brief description of JavaServer Faces
- Comparison of implementation techniques
- Decision criteria for choosing
- Summary
- Brief description of Struts

The Origin of Struts

- The JavaServer Pages (JSP) Specification (version 0.91) described two fundamental approaches:
  - Model 1 – A resource is responsible for both creating a page's markup and processing the subsequent form submit
  - Model 2 – Separate resources are responsible for creating a page's markup and processing the subsequent form submit

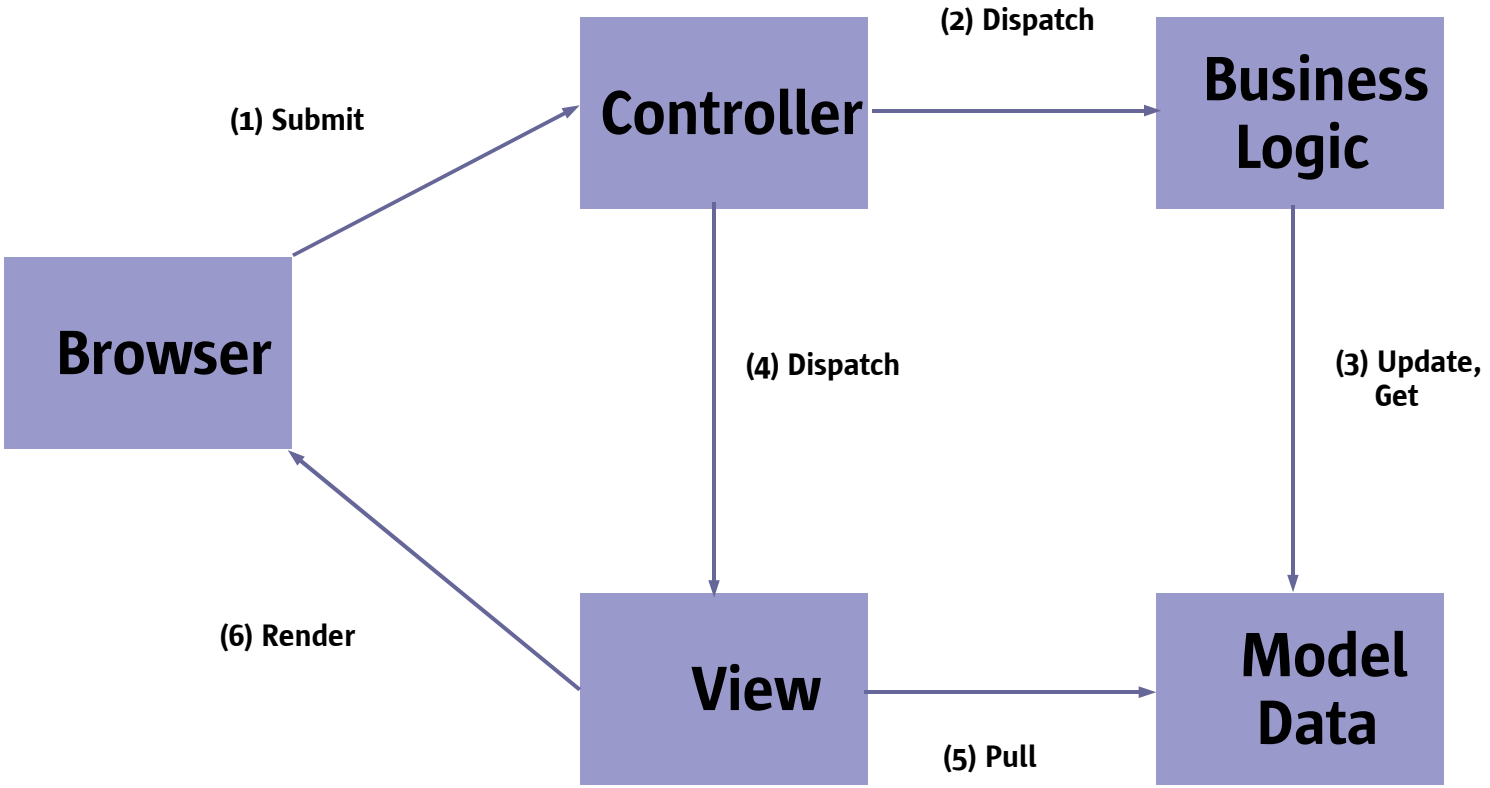
The Origin of Struts

- The second approach sounded better
  - Resources for creating markup and accessing databases are separated …
  - So they can be built by different people …
  - Perhaps using different tools
- So, I built a “home grown” architecture based on the Model-View-Controller (MVC) design pattern

Model-View-Controller (MVC)

- Model – Persistent data and the business logic that processes it
  - In large applications, often subdivided
- View – The interface with which the user directly interacts
- Controller – Management software to enforce flow control and dispatch logical functions to physical resources

MVC as Implemented in Struts



Struts Features – Model Tier

- Struts includes only minimal features
- But you can integrate any desired approach

Struts Features – View Tier

- Form Beans
  - Server-side state of input fields on a form
  - Classic (JavaBean) or DynaBean (configured properties, no separate class) style
- Validation Framework
  - Abstract validation rules into separate resource
  - Always enforced on the server side
  - Optionally generates JavaScript for client side checking as well

Struts Features – View Tier

- JSP Custom Tag Libraries
  - Bean and Logic – General support (superceded by JSTL)
  - Html – Render HTML markup
  - Nested – Navigate bean hierarchies
  - Tiles – Layout management (see next page)
- Extended Versions (struts-el)
  - Integrate expression language support
  - Not required in JSP 2.0 or later

Struts Features – View Tier

- Tiles Framework:
  - Templating for common look and feel
  - Definitions created in JSP page or separate XML resource
  - Definitions can inherit from other definitions
  - Advanced techniques for sharing information between tiles
  - Fully integrated into Struts navigation support

Struts Features – Controller Tier

- Standard configuration resource for defining desired behavior
  - Mapping URLs to Action classes
  - Mapping logical Forwards to physical pages
  - Defining form beans and properties
  - Configuring Action behavior
    - Form bean creation, validation, input page
  - Generalized exception handling
  - Localization resources

Struts Features – Controller Tier

- Standard request processing lifecycle
  - Extract action mapping path
  - Select locale (if necessary)
  - Select action mapping to utilize
  - Role-based authorization checks
  - Instantiate and populate form bean
  - Server side validation
  - Invoke application action
  - Forward to requested view tier resource

Struts Features – Controller Tier

- Sub-application modules
  - Logically divide a single web application into several “mini-applications”
  - Session state is shared across modules
- Standard Action implementations
  - Forward to or include other URLs
  - Dispatch to method based on parameter
  - Switch to different module