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Struts 2- The modern web application framework

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ABSTRACT: *Information systems are widely used today in every possible field. Traditional web applications respond slowly to the user interface, thus, wasting bandwidth and causing inconvenience to the users. Interactive web applications that present a lot of functionality are increasingly substituting their desktop counterparts. However, the browser and the web itself were originally designed for viewing and exchanging documents and data and not for running applications. Over the years, web pages have slowly been transformed into web applications and as a result, they have been forcefully fit into an unnatural mold for them.Many patterns and frameworks have been used to build web application, yet their efficiency does not match to that of the Struts2 framework. The struts 2 framework is a brand new framework that introduces many architectural refinements over the existing ones to make the web based systems more efficient to use. In this paper we describe and analyze the modern framework-Struts2 for implementing web applications in a way that completes this transition and creates a more natural environment for web applications to live in.*

Keywords: *actions, interceptors, internationalization, struts2 framework, web applications*

I. INTRODUCTION

A web application is simply, or not so simply, an application that runs over the Web. With rapid improvements in Internet speed, connectivity, and client/server technologies, the Web has become an increasingly powerful platform for building all classes of applications, from standard business-oriented enterprise solutions to personal software. The latest iterations of web applications must be as full featured and easy to use as traditional desktop applications. Yet, in spite of the increasing variety in applications built on the web platform, the core workflow of these applications remains markedly consistent, a perfect opportunity for reuse. Frameworks such as Struts 2 strive to release the developer from the mundane concerns of the domain by providing a reusable architectural solution to the core web application workflows. Struts 2 is build from the ground up on best practices and proven community-accepted design patterns.

This paper focuses on emphasizing all the salient features provided by the Struts 2 framework that makes web application development convenient to the developers.

II. SUMMARY OF STRUTS2 FRAMEWORK

A *web application framework* is a piece of structural software that provides automation of common tasks of the domain as well as a built-in architectural solution that can be easily inherited by applications implemented on the framework. Struts2 is popular and mature web application framework based on the MVC[1] design pattern. Struts2 is not just the next version of Struts 1, but it is a complete rewrite of the Struts architecture. The WebWork framework started off with Struts framework as the basis and its goal was to offer an enhanced and improved framework built on Struts to make web development easier for the developers. After some time, the Webwork framework and the Struts community joined hands to create the famous Struts2 framework. The framework is designed to streamline the full development cycle, from building, to deploying, to maintaining applications over time. The figure provides a simple depiction of the context in which Struts 2 is used. As depicted in figure 1, Struts 2 sits on top of two important technologies. At the heart of all Struts 2 applications lie the client/server exchanges of the HTTP protocol. The Java Servlet API exposes these low-level HTTP communications to the Java language.

Figure 1. The technology stack

Struts 2 provides certain strong features that makes it a favourite of the web application developers. Struts2 has improved the form tags and the new tags allow the developers to write less code. Also, Struts2 has recognised the takeover by Web2.0 technologies, and has integrated AJAX[1][2] support into the product by creating AJAX tags, that function very similar to the standard Struts2 tags. Moreover, integration with other frameworks like Spring, Tiles and SiteMesh is now easier with a variety of integration available with Struts2. Tag markups in Struts2 can be tweaked using Freemarker templates. This does not require JSP or java knowledge. Basic HTML, XML and CSS knowledge is enough to modify the tags. Thus, web applications can be easily designed using Struts 2 in a robust way.

III. HOW STRUTS 2 FRAMEWORK WORKS

Struts 2 is a second-generation web application framework that implements the Model-View-Controller (MVC) design pattern. Struts 2 framework can be also called 'MVC from 30,000 feet' or 'pull-MVC' as it provides a cleaner implementation of MVC.. The Model-View-Controller pattern in Struts2 is realized with following five core components: **Actions, Interceptors, Value Stack / OGNL, Results / Result types, View technologies.**

Struts 2 is slightly different from a traditional MVC framework in that the action takes the role of the model rather than the controller, although there is some overlap. The fig. 2 depicts the Model, View and Controller to the Struts2 high level architecture. The controller is implemented with a Struts2 dispatch servlet filter as well as interceptors, the model is implemented with actions, and the view as a combination of result types and results. The value stack and OGNL provide common thread, linking and enabling integration between the other components. The fig 2 describes the Struts 2 request lifecycle.

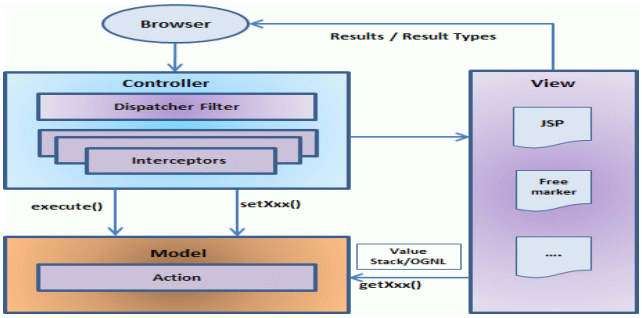

Figure 2. Struts2 request lifecycle

Based on the above diagram, user's request life cycle in Struts 2 as follows:

1. Firstly the user sends a request to the server for requesting for some resource (ex. A web page) through the browser.
2. The FilterDispatcher looks at the request and then determines the appropriate Action.
3. Configured interceptors functionalities are applied such as validation, file upload etc.
4. Selected action is executed to perform the requested operation.
5. Again, configured interceptors are applied to do any post-processing if required.
6. Finally the result is prepared by the view and returns the result to the user.

IV. STRUTS2 CORE COMPONENTS

IV.1 ACTION: Actions are the core of the Struts2 framework, as they are for any MVC (Model View Controller) framework. Each URL is mapped to a specific action, which provides the processing logic necessary to service the request from the user. But the action also serves in two other important capacities. First, the action plays an important role in the transfer of data from the request through to the view, whether it's a JSP or other type of result. Second, the action must assist the framework in determining which result should render the view that will be returned in the response to the request. An example of Struts 2 action mapping is:

```
<action name="locale" class="Locale" method="execute">
<result name="success">/index.jsp</result>
<result name="error">/errorpage.jsp</result>
</action>
```

Here, depending upon the result, the struts2 actions determine the page to be displayed.

IV.2 INTERCEPTORS: Interceptors allow for crosscutting functionality to be implemented separately from the action as well as the framework. Web application developers can achieve the following using interceptors: Providing preprocessing logic before the action is called, providing post processing logic after the action is called and catching exceptions so that alternate processing can be performed. Many of the features provided in the Struts2 framework are implemented using interceptors; examples include exception handling, file uploading, lifecycle callbacks and validation etc.

IV.3 VALUESTACK/OGNL: The ValueStack is a Struts 2 construct that presents an aggregation of the properties of a stack of objects as properties of a single virtual object. If duplicate properties exist—two objects in the stack both have a name property—then the property of the highest object in the stack will be the one exposed on the virtual object represented by the ValueStack. The ValueStack represents the data model exposed to the current request and is the default object against which all OGNL expressions are resolved.

OGNL(*Object-Graph Navigation Language*) is a powerful expression language (and more) that is used to reference and manipulate properties on the ValueStack. The Object-Graph Navigation Language (OGNL) is tightly integrated into Struts 2 to provide support for data transfer and type conversion. OGNL provides an expression language that allows developers to map form fields to Java-side properties, and it also provides type converters that automatically convert from the strings of the request parameters to the Java types of your properties.

V. LOCALISATION USING STRUTS2

Internationalization (i18n) is the process of planning and implementing products and services so that they can easily be adapted to specific local languages and cultures, a process called localization. The internationalization process is sometimes called translation or localization enablement. Internationalization is abbreviated i18n because the word starts with an i and ends with an n, and there are 18 characters between the first i and the last n. Struts2 provides localization i.e. internationalization (i18n) support through resource bundles, interceptors and tag libraries in the following places: The UI tags, messages and errors and within action classes. Struts2 uses resource bundles to provide multiple language and locale options to the users of the web application. The simplest naming format for a resource file is: **bundlename_language_country.properties** (example. es_ES for Spanish locale).

An illustration of localization is as follows:

```
<body>
   <s:property value="getText('global.success')" />
</body>
```

In the code above, the property value will automatically be identified by Struts2 using the locale from the properties file. The English and French locale properties file will be:

global_en.properties:

```
global.success = Successfully authenticated
```

global_fr.properties:

```
global.success = Authentifi é avec success
```

Thus, by using Struts2 framework, localization is easily achieved in the web applications to design multi-lingual applications that can be launched globally.

VI. CONCLUSION

Struts2 framework has proved to be a break through over the traditional frameworks and patterns. Moreover, several refinements introduced by Struts 2 framework makes it more feasible option to be considered when choosing the right framework for a web application. While it is yet to be widely adapted in the WWW arena, this framework will surely go miles ahead to produce simple yet robust web applications.

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