

Apache Struts: An MVC Framework Overview, Installation, and Setup

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Agenda

- **Understanding Struts**
 - Different views of Struts
 - Advantages of Struts
 - Disadvantages of Struts
- **Setting Up Struts**
 - Downloading and configuring Struts
 - Testing Struts
 - Setting up Struts applications
 - Accessing Struts documentation
 - Adding Struts to an existing Web application

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What is Apache Struts?

- **An MVC Framework?**
 - Struts provides a unified framework for deploying servlet and JSP applications that use the MVC architecture.
- **A Collection of Utilities?**
 - Struts provides utility classes to handle many of the most common tasks in Web application development
- **A Set of JSP Custom Tag Libraries?**
 - Struts provides custom tag libraries for outputting bean properties, generating HTML forms, iterating over various types of data structures, and conditionally outputting HTML.
- **But which is the proper way to view Struts?**
 - The answer depends on what you are going to use it for, but the MVC framework is the most common way of looking at Struts.

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Advantages of Struts (vs. MVC Using RequestDispatcher)

- **Centralized file-based configuration**
 - Rather than hard-coding information into Java programs, many Struts values are represented in XML or property files. This loose coupling means that many changes can be made without modifying or recompiling Java code, and that wholesale changes can be made by editing a single file. This approach also lets Java and Web developers focus on their specific tasks (implementing business logic, presenting certain values to clients, etc.) without needing to know about the overall system layout.
- **Form beans**
 - In JSP, you can use `property="**"` with `jsp:setProperty` to automatically populate a JavaBean component based on incoming request parameters. Apache Struts extends this capability to Java code and adds in several useful utilities, all of which serve to greatly simplify the processing of request parameters.
- **Bean tags**
 - Apache Struts provides a set of custom JSP tags (bean:write, in particular) that let you easily output the properties of JavaBeans components. Basically, these are concise and powerful variations of the standard `jsp:useBean` and `jsp:getProperty` tags. www.coreservlets.com

Advantages of Struts (vs. Standard MVC), Continued

- **HTML tags**
 - Apache Struts provides a set of custom JSP tags to create HTML forms that are associated with JavaBeans components. This bean/form association serves two useful purposes:
 - It lets you get initial form-field values from Java objects.
 - It lets you redisplay forms with some or all previously entered values intact.
- **Form field validation**
 - Apache Struts has builtin capabilities for checking that form values are in the required format. If values are missing or in an improper format, the form can be automatically redisplayed with error messages and with the previously entered values maintained.
 - This validation can be performed on the server (in Java), or both on the server and on the client (in JavaScript).
- **Consistent approach**
 - Struts encourages consistent use of MVC throughout your application. www.coreservlets.com

Disadvantages of Struts (vs. MVC with RequestDispatcher)

- **Bigger learning curve**
 - To use MVC with the standard RequestDispatcher, you need to be comfortable with the standard JSP and servlet APIs. To use MVC with Struts, you have to be comfortable with the standard JSP and servlet APIs and a large and elaborate framework that is almost equal in size to the core system. This drawback is especially significant with smaller projects, near-term deadlines, and less experienced developers; you could spend as much time learning Struts as building your actual system.
- **Worse documentation**
 - Compared to the standard servlet and JSP APIs, Struts has fewer online resources, and many first-time users find the online Apache documentation confusing and poorly organized. There are also fewer books on Apache Struts than on standard servlets and JSP. www.coreservlets.com

Disadvantages of Struts (vs. Standard MVC), Continued

- **Less transparent**
 - With Struts applications, there is a lot more going on behind the scenes than with normal Java-based Web applications. As a result, Struts applications are:
 - Harder to understand
 - Harder to benchmark and optimize
- **Rigid approach**
 - The flip side of the benefit that Struts encourages a consistent approach to MVC is that Struts makes it difficult (but by no means impossible) to use other approaches.

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Downloading and Configuring Struts

- **Download the Struts zip file**
 - Start at <http://jakarta.apache.org/site/binindex.cgi>, or follow the link from <http://jakarta.apache.org/struts/>.
- **Unzip into a directory of your choice**
 - For example, unzip into C:\jakarta-struts-1.1. I'll refer to this location as *struts_install_dir*.
- **Update your CLASSPATH**
 - Add *struts_install_dir/lib/struts.jar* to the CLASSPATH used by your compiler or IDE (not your server).
- **Install an XML parser**
 - *If you have JDK 1.4 or Apache Tomcat, this step is not necessary*, since they already come with an XML parser. But, if you use JDK 1.2 or 1.3 with another server, you might need to obtain the XML parsing libraries. Here are two good sources:
 - <http://xml.apache.org/>
 - <http://java.sun.com/xml/>

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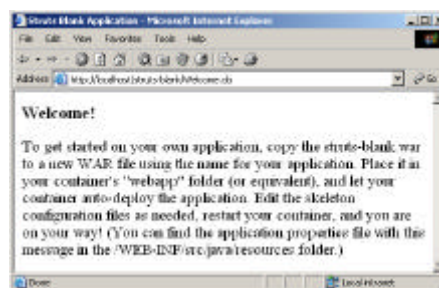
Testing Struts

- **Install struts-blank.war.**
 - Install the Web application from *struts_install_dir/webapps/struts-blank.war* on your server. For example, with Apache Tomcat, copy *struts_install_dir/webapps/struts-blank.war* to *tomcat_install_dir/webapps/*.
- **Start or restart the server.**
 - Most servers only recognize new Web apps when the server is started.
- **Access <http://localhost/struts-blank/>.**
 - This URL assumes you are running the server on your desktop and are using port 80. In general, access <http://hostname:port/struts-blank/>.

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Testing Struts (Results)



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Setting Up Struts Applications

- **Option 1 (Good): Copy/rename the struts-blank directory to your development directory.**
 - When you tested your Struts installation, you ran the struts-blank Web app. When you did so, Tomcat and most other servers unpacked the struts-blank.war file into the struts-blank directory. So, copy that directory to whatever location you use for developing custom Web apps, and rename it to whatever app name you choose.
 - For example, if you are using Tomcat and C:\Servlets+JSP is the location you use for development, copy the *tomcat_install_dir/webapps/struts-blank* directory to C:\Servlets+JSP, rename it to struts-test, resulting in C:\Servlets+JSP\struts-test.
 - **Note:** the index.jsp in struts-blank should be replaced with your own version.

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Setting Up Struts Applications

- **Option 2 (Good): Unjar struts-blank.war into your development directory.**
 - If your server doesn't automatically unpack WAR files, then even if you ran the struts-blank test described above, you have no regular directory to work with. Besides, some people prefer to unpack the WAR file themselves anyhow. To do so:
 - Copy *struts_install_dir/webapps/struts-blank.war* to your development directory.
 - Make a new directory (e.g., called struts-test).
 - Unjar struts-blank.war into that directory. You can use `jar -xvf` or a standard zip tool like WinZip or the Windows XP explorer.
 - Whenever you want to test your application, copy struts-test to the server's Web application autodeploy directory (e.g., onto the shortcut to *tomcat_install_dir/webapps/*).
 - Again, remember to replace the index.jsp page in struts-blank

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Setting Up Struts Applications

- **Option 3 (Bad): Rename struts-blank and leave it in the server's deployment directory.**
 - It is quite common to work directly in server's deployment directory (e.g., to work directly in `tomcat_install_dir/webapps/struts-test`). However, this approach scales poorly to real applications, makes it harder to test changes (you have no stable working version), and doesn't support your "real" deployment server anyhow (which is almost certainly not your desktop machine). If you don't have a good deployment system using your IDE or ant scripts, you can easily make a shortcut (Windows) or symbolic link (Unix/Linux) to the server's autodeploy directory, and just copy the Web app onto the shortcut each time. For example:
 - Grab `tomcat_install_dir/webapps` with your right mouse, drag it into `devel_dir`, release, and choose "Create Shortcut Here".
 - Create `struts-test` or other applications as subdirectories within `devel_dir`, as described above.
 - Deploy by using the right mouse to drag `struts-test` onto the shortcut from step 1, releasing, and choosing "Copy".

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Accessing Struts Documentation

- **Read a local copy**
 - This is fastest, but the documentation can get a bit out of date. To read a local copy, install the `struts-documentation.war` Web app. Copy `struts_install_dir/webapps/struts-documentation.war` to `tomcat_install_dir/webapps`, restart server, and use the URL <http://localhost/struts-documentation/>.
- **Read it from the Apache site**
 - This option is slower, but guarantees that you get the latest versions of the documentation. Use <http://jakarta.apache.org/struts/learning.html>.
 - The documentation includes FAQs, user guides, tutorials, and the API in Javadoc format.

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Adding Struts to an Existing Web Application

- Copy JAR files from `struts-blank/WEB-INF/lib` to your `_web_app/WEB-INF/lib`.
- Copy TLD files from `struts-blank/WEB-INF` to your `_web_app/WEB-INF`.
- Copy `struts-config.xml` from `struts-blank/WEB-INF` to your `_web_app/WEB-INF`.
- Copy the application properties file from `struts-blank/WEB-INF/classes/resources` to your `_web_app/WEB-INF/classes/resources`.
- If you plan on using the automatic validator, copy `validation.xml` and `validator-rules.xml` from `struts-blank/WEB-INF` to your `_web_app/WEB-INF`.
- If you plan on using Tiles, copy `struts-tiles.xml` from `struts-blank/WEB-INF` to your `_web_app/WEB-INF`.
- Copy declarations out of `struts-blank/WEB-INF/web.xml` into your `_web_app/WEB-INF/web.xml`. Most importantly, copy the servlet and servlet-mapping entries that map `*` to do

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Summary

- **Struts is an MVC framework**
 - Also a collection of utilities and custom tag libraries
- **Struts has significant advantages, but adds significant complexity**
 - Compare the use of Struts to the use of normal MVC (especially with the JSP 2.0 expression language)
- **Test by deploying `struts-blank.war`**
- **Develop by copying the `struts-blank` directory**
 - Don't start from scratch; too many changes needed in your Web app

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