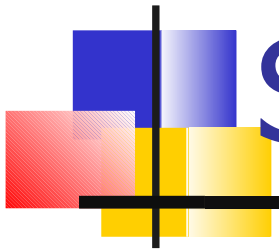
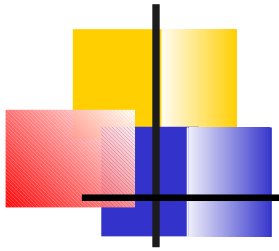


Struts Controller in Action

Gary D. Ashley Jr.

3rd Millennium Visions, Inc.

Garyashley at toughguy dot net

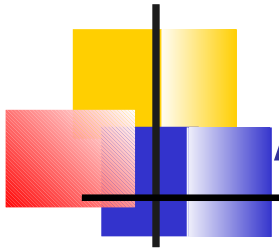


Real Agenda

- What are the various configuration elements?
- How is all this configuration loaded?
- How is it used?

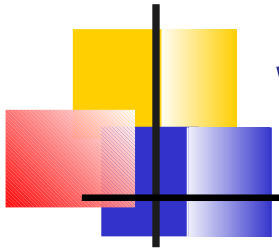
Reasons:

- To show how you can extend the Struts framework to better suit your needs.



Agenda (along the way)

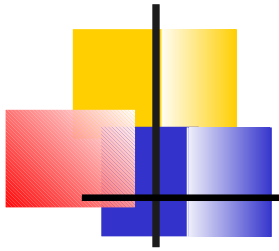
- What are common features of Struts?
- What are some new features in 1.1?
- How is Struts configured?
- What is Digester?
- What is Struts made of?
- What are some pros and cons?
- What's next for Struts?



What Is Struts?

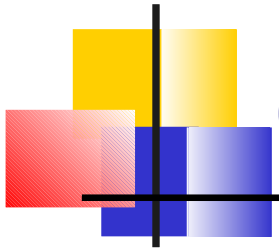
Struts – open source implementation of MVC design pattern for building web applications based on Servlet, JSP, XML, and Java.

- Controller – primary component is a servlet, ActionServlet.
- View – one of the primary benefits of 1.0, and even 1.1 is custom tag library.
- Model – only general guidelines are provided by Struts.



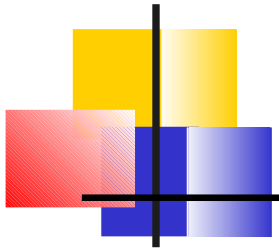
Struts Facts

- Originally created by Craig McClanahan, and donated to Apache in May 2000. (also Tomcat and JSF)
- 27 packages (12 top level), and several hundred classes/interfaces.
- Built upon several Jakarta projects (most in Commons):
  - BeanUtils, Collections, Digester, Lang, Logging, Validator, FileUpload, and ORO.



Common Features

- I18N Support (Internationalization)
- Powerful custom tag library
- Form Validation
- Supports various presentation layers (JSP, XML/XSLT, JSF, Velocity, …)
- Supports various model layers (JavaBeans, EJB, *etc*.)



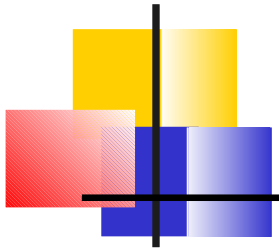
New Features to 1.1

Main features:

- Module support
- Plugin Support
- Tiles Integration

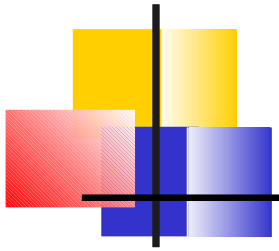
Other important notes:

- JSTL and EL are supported.
- Early Access version of JSF is included.
- Scaffold
  http://jakarta.apache.org/struts/userGuide/release-notes.html#Introduction



New Features to 1.2.x

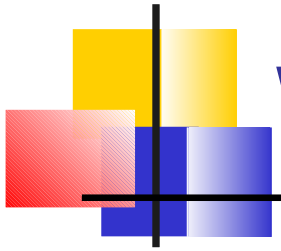
- At the writing of this presentation, 1.2 has not yet been released, but it is anticipated that one or more releases will be made prior to the Summit in October.
- Some expected items will include removal of all deprecations since 1.0, and the integration of 1 or more new Jakarta Commons Projects.



Struts Configuration

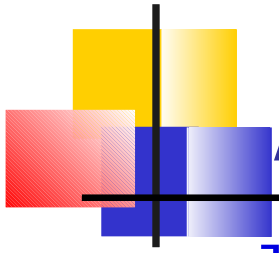
- There are various elements to configuring Struts:
  - web.xml
  - struts-config.xml
  - tiles-config.xml
  - validation-config.xml
  - messages-text.properties

http://jakarta.apache.org/struts/userGuide/configuration.html#dd_config



Web.xml

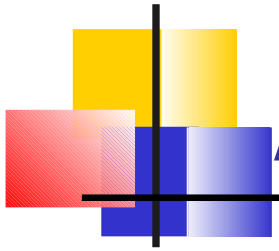
- ActionServlet instance
  - Init params (one for each module, plus default)
- ActionServlet mappings
- Struts Tag Libraries
- Note: the welcome file list can't be a Struts mapping, but you can use redirect:



Action Servlet Instance

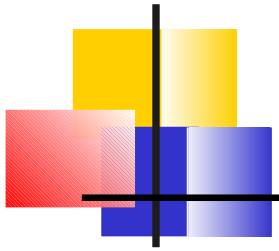
```
<servlet>
  <servlet-name>action</servlet-name>
  <servlet-class>
  org.apache.struts.action.ActionServlet
  </servlet-class>
  …
```

WARNING – Struts **MUST** be a web application wide singleton, do not define more than one <servlet> element for an instance of ActionServlet (or a subclass).



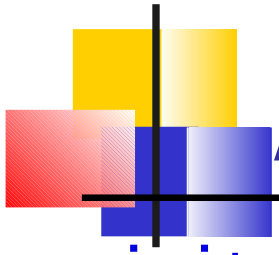
Action Servlet init params

- **config** – Context-relative path for the default module. [/WEB-INF/struts-config.xml].
  - This may also be a comma-delimited list of configuration files.
- **config/${module}** – Context-relative path for the application module that will use the specified prefix (/${module}).
  - This can be repeated as many times as required for multiple application modules. (Since Struts 1.1)



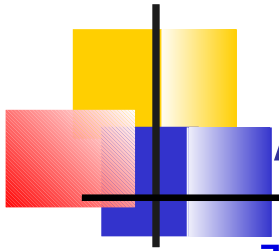
Init Params *(Continued)*

- **convertNull** – Force simulation of the Struts 1.0 behavior when populating forms. [false]
- **rulesets** – Comma-delimited list of additional org.apache.commons.digester.RuleSet instances that should be added to the Digester that will be processing struts-config.xml files.
- **validating** – Should we use a validating XML parser to process the configuration file
  - (strongly recommended by Struts doc). [true]



Action Servlet Instance *(Continued)*

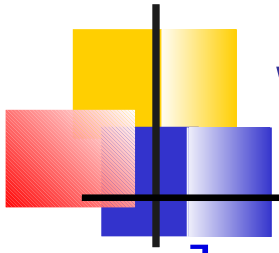
```
<init-param>
  <param-name>config</param-name>
  <param-value>/WEB-INF/struts-default.xml</param-
  value>
</init-param>
<init-param>
  <param-name>config/module</param-name>
  <param-value>/WEB-INF/struts-complaint.xml</param-
  value>
</init-param>
```



Action Servlet Mapping

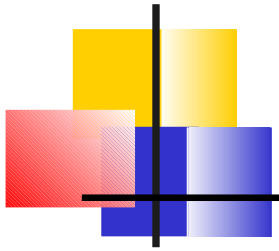
```
<servlet-mapping>

   <servlet-name>action</servlet-name>

   <url-pattern>*.3mv</url-pattern>

</servlet-mapping>
```

NOTE: Commonly used is *.do



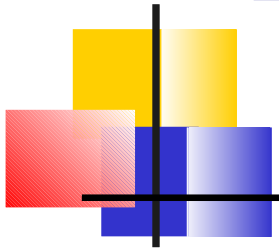
Welcome-File redirect

```
<welcome-file>index.jsp</welcome-file>

In jsp:

<%@taglib uri="/tags/struts-logic.tld" prefix="logic" %
   >
<logic:redirect forward="index"/>

In struts-config:
   <action path="/index"  …> … </action>
```



Struts Tag Libraries

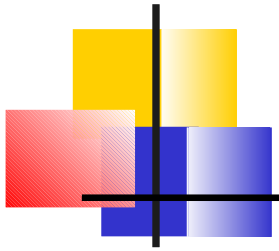
- Be sure to setup each Struts tag library you plan to use in web.xml
  - `struts-bean.tld`
  - `struts-html.tld`
  - `struts-logic.tld`
  - `struts-template.tld`
  - `struts-nested.tld`
  - `struts-tiles.tld`



Tag Library Setup

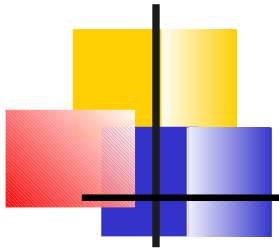
- Setup tag library in web.xml

```
<taglib>
   <taglib-uri>
        /tags/struts-html.tld
   </taglib-uri>
  <taglib-location>
        /WEB-INF/struts-html.tld
   </taglib-location>
</taglib>
```



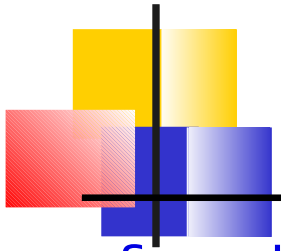
Struts-config.xml

- This is the central configuration file(s) to Struts, and any modules.
- Each defines various elements for:
  - Controller – flow & control
  - Message Resources – i18n files (key=value pairs)
  - Plugins – extension points
  - Data Sources – basic db config support
  - Form Beans – html form data/query string transport
  - Global Forwards – points to jsps/tile definitions, go here.
  - Global Exceptions – points to forward by exception type
  - Action Mappings – what code should run, based on url mapping.



Struts-config.xml layout

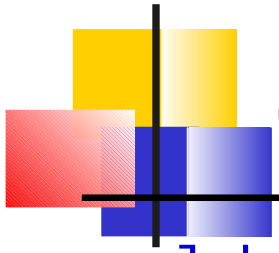
```
<struts-config>
  <data-sources          />
  <form-beans            />
  <global-exceptions     />
  <global-forwards       />
  <action-mappings       />
  <controller            />
  <message-resources     />
  <plug-in               />
</struts-config>
```



Form Beans

```
<form-beans>

<form-bean name="myForm"
        type="org.apache.struts.validator.DynaValidatorForm">

    <form-property name="oid" type="long" initial="-1"/>
    <form-property name="name" type="java.lang.String"/>
    <form-property name="values" type="java.lang.String[]"/>

</form-bean>
…
</form-beans>
```

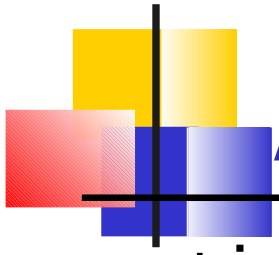
NOTE: this form is a DynaBean class. See Jakarta Commons BeanUtils for more info.



Global Exception

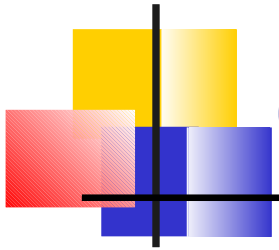
```
<global-exceptions>

  <exception path="failure"
   key="pageAlert.failure.validation"
   type="biz.threemv.struts.action.ValidationException" />

</global-exceptions>
```

NOTE: I utilize the path as a mapping to forward and the key as message-text entry.



Action Mapping

```
<action-mappings>
   <action path="/logon"
   type="org.apache.struts.x.LogonAction"
   name="logonForm"
        scope="request"
        input="/logon.jsp"
        unknown="false"
        validate="true" />
</action-mappings>
```

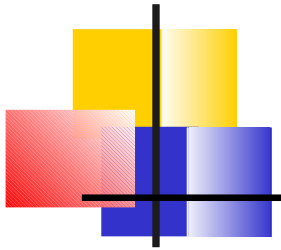


Controller

```
<controller
  processorClass="o.a.s.action.RequestProcessor"
  debug="0"
  contentType="text/html"/>
```

- This defines which RequestProcessor will be utilized by this module. The RequestProcessor is the key object in 'controlling' a Struts application.
- NOTE: There are several other configurable attributes.

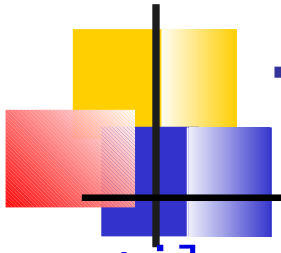
http://jakarta.apache.org/struts/userGuide/configuration.html



Message Resources

```
<message-resources
   parameter="biz.threemv.config.messages-common"
   key="commonBundle"
   null="false"/>
```

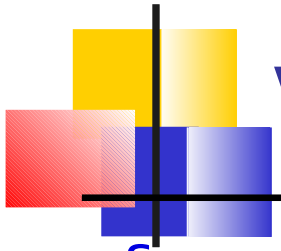
- This loads a text file of key=value pairs for internationalizing messages, or just managing text messages in general.
- NOTE: set null="false" to suppress throwing error messages when not found. It will display ???key??? instead to avoid nagging errors during development.
- WARNING: key="xxx" will save a bean in Application scope under that name.



Tiles-config.xml

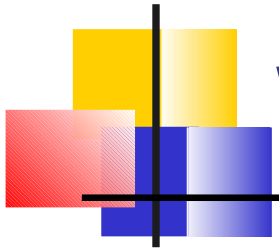
```
<tiles-definitions>
   <definition>
        <put />
        <putList>
              <add />
              <item />
        </putList>
   </definition>
</tiles-definitions>
```

NOTE: check out 'tiles-documentation' example that comes with Struts for many examples of what you can do here.



Validation-config.xml

```
<form-validation>
   <global>
      <constant />
   </global>
   <formset>
      <constant />
      <form name="myForm">
        <field  property="firstName"
      depends="required,mask,minlength">
              <arg0 />
         </field>
      </form>
   </formset>
</form-validation>
```

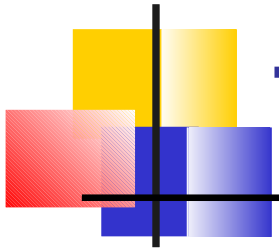


What Points to What?

- For those new to Struts, one of the difficult things is the complexity of parts.

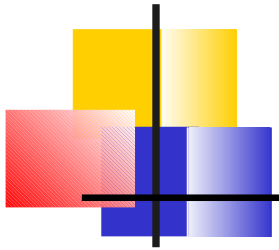
- <action name="xx" /> points to <form-bean name="xx"/>

This maps any HTML form data or query strings into the ActionForm instance defined by the form bean and passes that form into the Action associated to the path.



This Points to That…

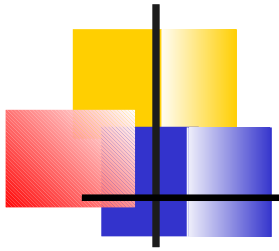
- <forward name="" /> is used inside Action class to determine where to forward the request to.
- <forward path="/xxx.jsp" /> points to a jsp.
- <forward path="xxx" /> points to (tiles) <definition name="xxx" />



… and That to That

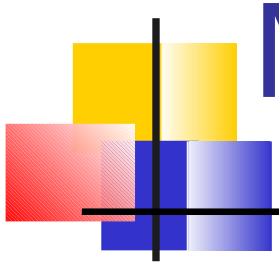
- `<action name= "myForm" />`
  points to `<form name= "myForm" />` (in validation-xxx.xml)
  IF `<form-bean name= "myForm"`
  `type=" DynaValidatorForm or ValidatorForm "`

- `<action name= "myForm" path= "/fooPath" />`
  points to `<form name= "/fooPath" />` (in validation-xxx.xml)
  IF `<form-bean name= "myForm"`
  `type=" DynaValidatorActionForm or ValidatorActionForm "`



Modules

- Modules allow the application to be divided up. This is important for a team environment.

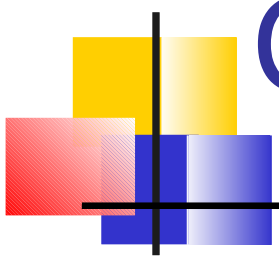


Module Configuration

Inside web.xml file.

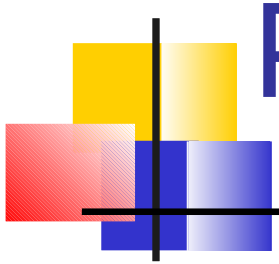
```
<init-param>
   <param-name>config</param-name>
   <param-value>/WEB-INF/struts-default.xml</param-value>
</init-param>

<init-param>
   <param-name>config/module1</param-name>
   <param-value>/WEB-INF/struts-module1.xml</param-value>
</init-param>
```

http://jakarta.apache.org/struts/userGuide/configuration.html#d



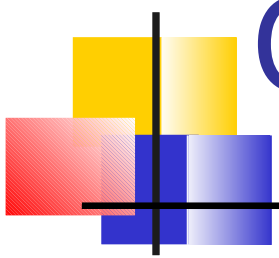
Caveats to Modules

- At the time of this writing, there are still several 'un' implemented aspects to modules.
  - For instance: can't have 2 form beans named same in 2 different modules because form bean names are NOT module aware yet.



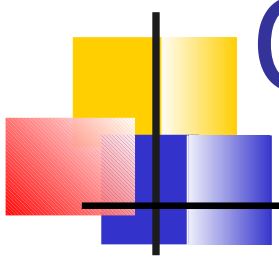
Plugins

- PlugIns – provides an extension point to add or enhance functionality.
- Several exist in Struts release:
  - TilesPlugin – Tiles Framework Extension
  - ValidatorPlugin – Validation Framework
  - ModuleConfigVerifier – set of verification tests to ensure module is configured properly.



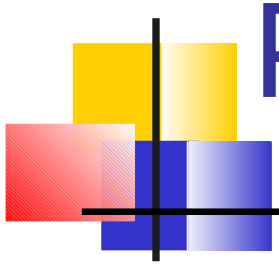
Other Plugin Ideas

- Business Model Hooks
  - Allow to initialize model components
  - Hooks to JMX, JNDI, JAAS, EJB Sessions, *etc.*
- Custom Tag Libraries
  - Allow for startup configurations
- Others:
  - Encryption/Decryption support (*i.e.*, passwords, credit cards, SSNs)



Other Plugin Examples

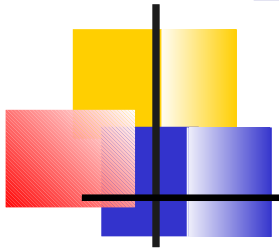
- Some of my own include:
  - CaseManagementPlugin – business domain specific.
  - WorkflowEnginePlugin – implementation of WfMC business process workflow engine
  - PluginTagsPlugin – custom tag library that leverages external XML configurations (and digester). Used for things like TabMenus, DropDownMenus, Tables, *etc*. that can leverage custom XML configurations.



Plugin Configuration

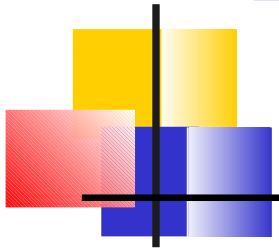
Inside struts-xxx.xml file.

```
<plug-in
    className="org.apache.struts.tiles.TilesPlugin">

  <set-property
      property="definitions-config"
      value="/WEB-INF/tiles-xxx.xml"/>

</plug-in>
```



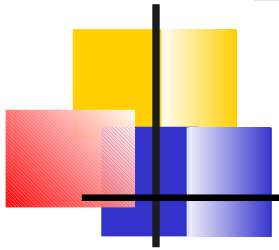
Tiles

- Tiles is a very powerful templating engine that allows you to assemble presentation pages from component, called "Tiles".



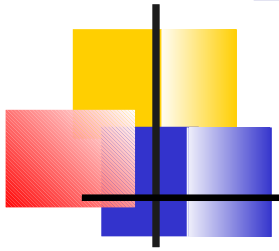
Tiles Features

- Screen Definitions
- Layouts
- Dynamic Page Building
- Reuse of Tiles (components)
- Internationalization
- Multi-Channels



Tile Screen Definitions

- Allow you to create a page of parts:
  - Header, Footer, TopNav, SideNav, and Body
- Definitions can be in:
  - One or more tiles-xxx.xml files
  - Directly in JSP pages
  - In Struts Actions
- Definitions have inheritance mechanism.

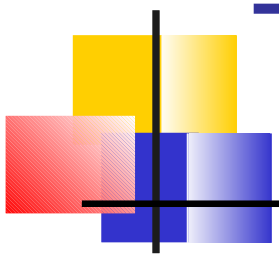


Tiles Definition Examples

In tiles-default.xml file

A master template for use throughout the site.

```
<definition name="master" path="/main.jsp" >

  <put name="title"        value="Default Title" />
  <put name="banner"       value="/banner.jsp"  />
  <put name="topnav"       value="/topNav.jsp"  />
  <put name="body"         value=""                    />
  <put name="formAction"   value="/nothing.do"         />
  <put name="footer"       value="/footer.jsp"  />

</definition>
```

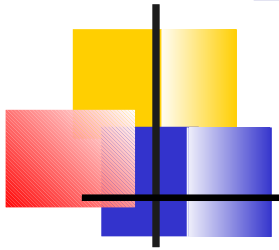


Tiles Definition Examples *(Continued)*

In tiles-xxx.xml file

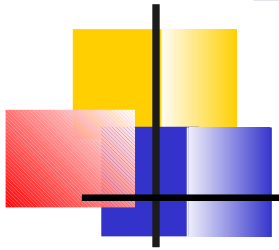
Extend the master definition to provide page specific details.

```
<definition name="myPage" extends="master">

  <put name="title"          value="New page title"
  />
  <put name="body"           value="/myPage.jsp"
  />
  <put name="formAction"  value="/myAction.do"  />

</definition>
```



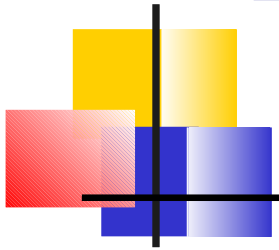
Tiles – One Approach

- One approach is to use a 3 deep pattern. This is useful to manage complexity of Tiles.
  - Master Definition – defines elements common to entire application. (no path defined)
  - Style / Format Definitions – extends Master Definition to provide different styles utilized. *i.e.* InfoPage, EditorPage, HelpPage (path="xxxLayout.jsp")
  - Page Definitions – extends a specific Style Definition and provides specific items (various body jsps, menu, title, actionMapping to submit forms to, *etc.*)
    - addressSummaryView, addAddressForm, editAddressForm



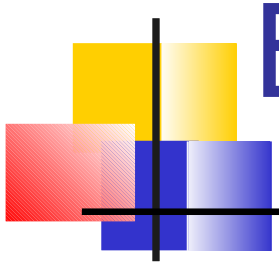
Tiles Layouts

- Define common layouts across application.
- Define menu layouts
  - I found using Tiles XML to define menus to be difficult and confusing, especially with junior developers on team. I use XML'ized custom tag plus Struts plugin mechanism instead. More recent work in this area may be better.
- Use existing layouts



Tiles *(Continued)*

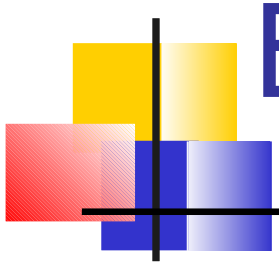
- Tiles are dynamic for each page reload, and can be be changed,
  - *i.e.,* From inside Action
- Can reuse tiles in different locations.
  - *i.e.,* address.jsp
- Internationalization – can load different tiles according to Locale



Enabling Tiles

- Setup tag library in web.xml

```
<taglib>
   <taglib-uri>
        /WEB-INF/struts-tiles.tld
   </taglib-uri>
  <taglib-location>
        /WEB-INF/struts-tiles.tld
   </taglib-location>
</taglib>
```



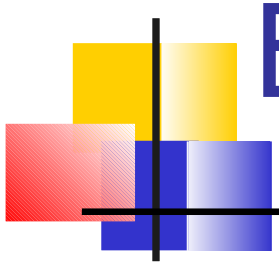
Enabling Tiles *(Continued)*

- In any jsps using Tiles:

```
<%@ taglib uri="/WEB-INF/struts-tiles.tld"
  prefix="tiles" %>
```

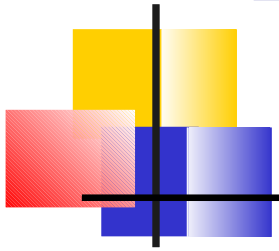
Or if servlet 2.3 (doesn't need web.xml entry):

```
<%@ taglib uri="http://jakarta.apache.org/struts/tags-
  tiles" prefix="tiles" %>
```



Enabling Tiles

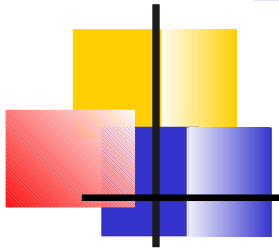
- Tiles Plugin entry required in Struts config (see plugin slide for example)
  - Note for Modules – I recommend using a tiles-default.xml that is configured in struts-default.xml for any definitions that are common throughout application, *i.e.* Master and Style definitions. Then each module can have a comma delimited list of tiles-xxx.xml files that inherit from various layout definitions.



Tiles, editorLayout.jsp

setup

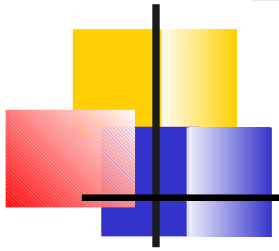
```
<%@ page language="java"%>

<%@ taglib uri="/tags/struts-tiles.tld"
           prefix="tiles" %>

<tiles:useAttribute
       name="formAction"
       classname="java.lang.String" />
```



Tiles, editorLayout.jsp

Head section

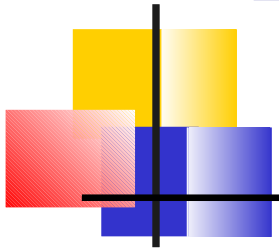
```
<html:html locale="true">
   <head>
   <title>

       <tiles:getAsString name="title" />

   </title>
…
</head>
```



Tiles, editorLayout.jsp

Start body

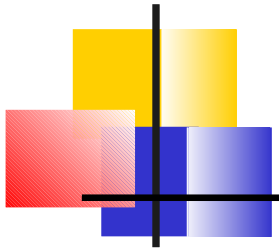
```
<body>
   <table>

      <tiles:insert attribute="banner" />

      <tiles:insert attribute="topnav" />
   …
```



Tiles, editorLayout.jsp

Body cont.

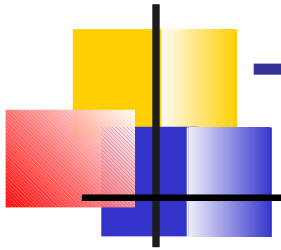
```
<html:form  action="<%=formAction%>">

  <tiles:insert attribute="body" flush="true"/>

</html:form>
```



Tiles, editorLayout.jsp

Finish body

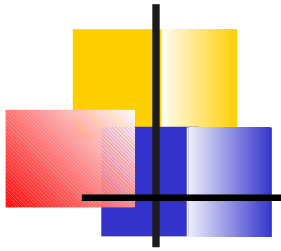
```
    <tiles:insert attribute="footer" />

</body>

</html:html>
```



Tiles *(Continued)*

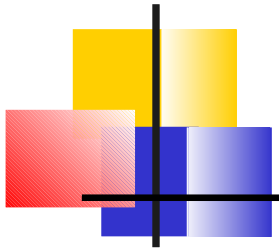
- Logging
  - Tiles uses Jakarta commons logging framework (which can hook to JDK1.4, Avalon, Log4J, *etc.*)

- There are a host of references on how to utilize all the capabilities of Tiles.
  - Book – *Developing Applications with Tiles*
    (by lead developers, Cedric Dumoulin and Ted Husted)



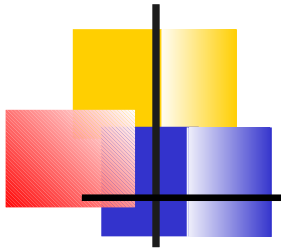
How Is All This config Loaded?

- As you can see, there is quite a large collection of configuration information in mutliple files.
- One of the nice things about Struts is that you can extend the configuration to suit your own needs by adding new elements and attributes.
- This is done using Jakarta Commons Digester.



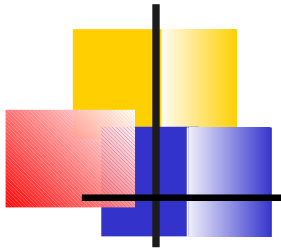
Digester

- A common component in Jakarta used to configure XML to Java object mappings.
  - *i.e.*, used in Tomcat and Jasper Reports
- Triggers Rules when XML pattern is recognized.
- A very rich set of predefined rules is built in.



Digester Advanced Uses

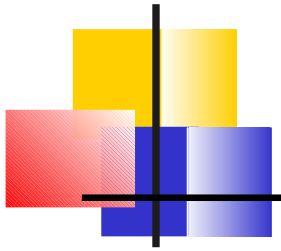
- Plugin in custom pattern matching engine.
- Optional namespace-aware processing
- Encapsulate Rules into RuleSets



Example of How to Use Digester

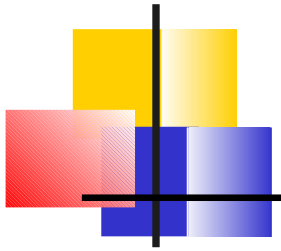
- Create an XML document.

```
<tabMenus>
   <tabMenu name="mainMenu">
        <images  selected="tab_h.gif" default="tab.gif"/>
        <tabs>
              <tab name="books"
                   displayKey="tab.books"
                   action="/booksHome.3mv"
                   module="/book" />
        </tabs>
   </tabMenu>
</tabMenus>
```



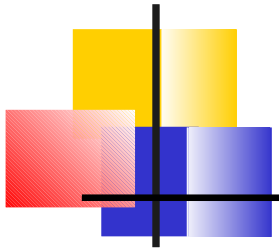
Digester Example *(Continued)*

- Create Java Objects to map into.
  - TabMenusConfig
  - TabMenuConfig
  - ImagesConfig
  - TabConfig



Digester Example *(Continued)*

- Let's look at Objects
  - TabMenusConfig
    - ✓ void addTabMenu(TabMenuConfig tabMenuConfig);
  - TabMenuConfig
    - ✓ private String name;
    - ✓ void addTab(TabConfig tabConfig);
    - ✓ void setImages(ImageConfig imageConfig);
  - TabConifg (fields all have basic getters/setters)
    - ✓ private String name;
    - ✓ private String displayKey;
    - ✓ private String action;
    - ✓ private String module;



Digester Example *(Continued)*

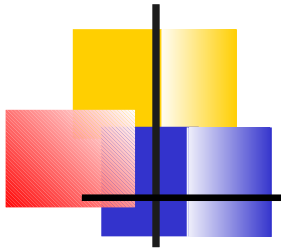
- Let's look at mappings
  - If this mapping is found:

    /tabMenus/tabMenu

    then create a new TabMenuConfig object add it to stack.
  - If this mapping is found:

    /tabMenus/tabMenu/tabs/tab

    then create a new TabConfig objects add it to parent TabMenu.



Digester Example *(Continued)*

- So, first create a rule set:

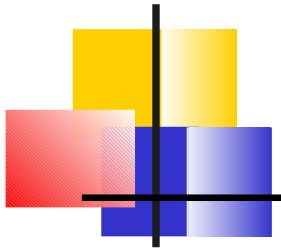
```
public class ConfigRuleSet extends RuleSetBase {
```

- Then, implement method:

```
public void addRuleInstances(Digester digester) {
```

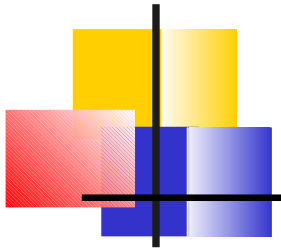
- Then add 3 lines (basic stuff) for each object to map:

```
digester.addObjectCreate(pattern, clazz);
digester.addSetProperties(pattern);
digester.addSetNext(pattern, methodName, paramType);
```



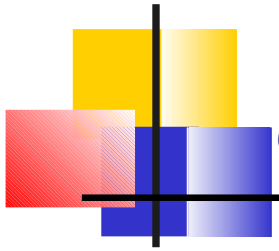
Digester Example *(Continued)*

- Important Notes:
  - When processing Rules, Digester uses a basic Stack. (can peek, pop, *etc.*)
  - addXxx adds a rule to Digester object, it is NOT parsing XML until .parse() is called.
- digester.addObjectCreate(pattern, clazz)
  - Adds a rule so will create a new instance of clazz when the pattern is found and place on top of stack.



Digester Example *(Continued)*

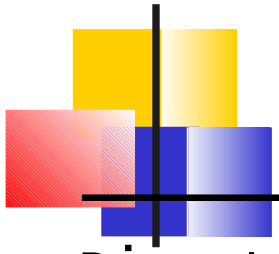
- digester.addSetProperties(pattern)
  - Adds a rule that sets all properties on the object on top of the stack using attributes with corresponding names.
- digester.addSetNext(pattern, methodName, paramType)
  - Adds a rule that calls method on top-1 object (2nd from top), and passes the object at top of stack as argument)
  - Used to establish parent child relationship as conveyed in XML layout.



addRuleInstances(digester)

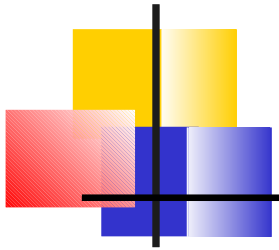
```
//TabMenuConfig settings

digester.addObjectCreate(
   "/tabMenus/tabMenu",
   TabMenuConfig.class);

digester.addSetProperties(
   "/tabMenus/tabMenu");

digester.addSetNext(
   "/tabMenus/tabMenu",
   "addTabMenu",

   "biz.threemv.TabMenuConfig"
   );
```

```
//TabConfig settings

digester.addObjectCreate(
   "/tabMenus/tabMenu/tabs/tab",
   TabConfig.class);

digester.addSetProperties(

   "/tabMenus/tabMenu/tabs/tab")
   ;

digester.addSetNext(
   "/tabMenus/tabMenu/tabs/tab",
   "addTab",
   "biz.threemv.TabConfig");
```



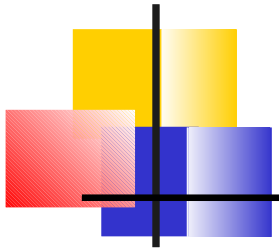
Use Digester

```
Digester digester = new Digester();
digester.setUseContextClassLoader(true);
digester.addRuleSet(new ConfigRuleSet());

InputStream xmlFile = getResourceAsStream(xmlPathName);
TabMenusConfig config = new TabMenusConfig();

digester.push(config);
digester.parse(xmlFile);

//that's it. Config is now loaded with TabMenuConfigs mapped
   from your XML file.
```



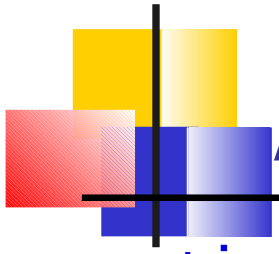
Struts and Digester

- Uses Init-Params to find XML documents.
- ActionServlet creates an instance of Digester during init() and uses o.a.s.config.ConfigRuleSet
- all struts-xxx.xml files, tiles, validation, *etc*. are 'digested' at init. (hint. you can use plugin to do same thing for your app specific stuff.)
- Stores a ModuleConfig instance for each module configured in web.xml in ServletContext (uses a Constant + prefix as key)



Struts and Digester

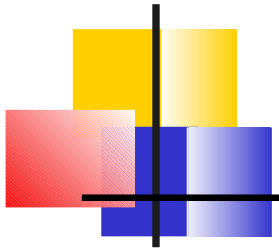
- You can add more rule sets and provide your own ModuleConfig implementation to completely customize your apps configuration.
- To try and minimize getting 'out of sync' with Struts I follow few guidelines.
  - Extend existing config objects where possible, and provide additional properties.
  - Use Plugin classes to load new config constructs that are outside scope of base Struts implementation. *i.e.*, for building navigation menus.



Action Mapping Example

```
<action-mappings
   type="biz.threemv.struts.action.HelperMapping">
 <action
   path="/basicInfoPage"
   type="biz.threemv.struts.action.HelperAction"
   name="myForm"
   helper="biz.threemv.actions.MyActionHelper"
   beans="makeXxxBean, makeYyyBean"
   defaultForward="success"
   roles="myRole"
  <forward name="success" path="displayMyPage" />
 </action>
```

- Key is providing a type="" in action-mappings (global) or a className in <action> element

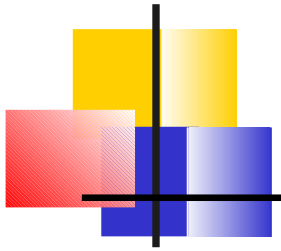


Let's Look "under the hood"

- Once Struts gets 'started' *via* ActionServlet.init(), and 'digests' all the XML configurations as ModuleConfig instance, it uses:

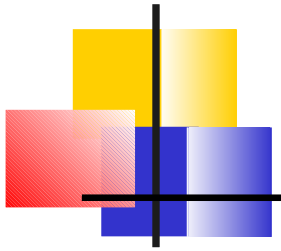
  org.apache.struts.action.RequestProcessor

- doGet() and doPost() both call process(), which in turn finds the ModuleConfig mapped to the URI, and gets the RequestProcessor from it. In turn, calls a process() method there.



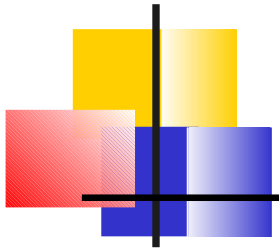
Recap - Struts-config.xml

- This is the central configuration file(s) to Struts, and any modules.
- Each defines various elements for:
  - Controller – flow & control
  - Message Resources – i18n files (key=value pairs)
  - Plugins – extension points
  - Data Sources – basic db config support
  - Form Beans – html form data/query string transport
  - Global Forwards – points to jsps/tile definitions, go here.
  - Global Exceptions – points to forward by exception type
  - Action Mappings – what code should run, based on url mapping.



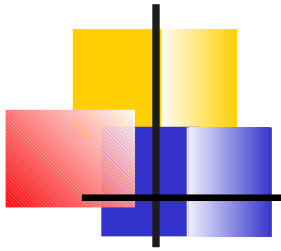
RequestProcessor

- The o.a.s.a.RequestProcessor handles most of the core processing for the servlet.
  - NOTE: A current design issue is the number of subclasses for popular extensions, and the incompatibilities between them.
- Has a set (currently) of 15 helper methods.



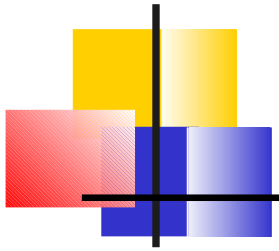
RequestProcessor

- processPath
- processLocale
- processContent
- processNoCache
- processPreprocess
- processMapping
- processRoles
- processActionForm
- processPopulate
- processValidate
- processForward
- processInclude
- processActionCreate
- processActionPerform
- processForwardConfig



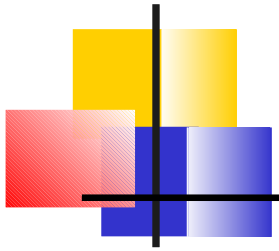
Request Process methods

- processPath
  - Determine the path that invoked us. This will be used later to retrieve an ActionMapping.
- processLocale
  - Select a locale for this request, if one hasn't already been selected, and place it in the request.
- processContent
  - Set the default content type (with optional character encoding) for all responses if requested.



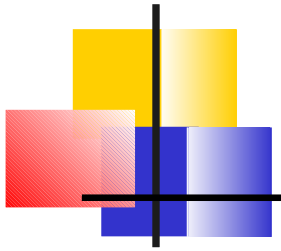
Request Process methods

- processNoCache
  - If appropriate, set the following response headers: "Pragma", "Cache-Control", and "Expires".
- processPreprocess
  - This is one of the "hooks" the RequestProcessor makes available for subclasses to override.
- processMapping
  - Determine the ActionMapping associated with this path.



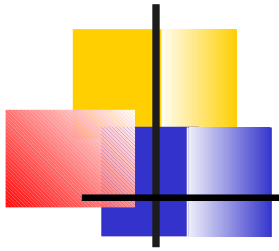
Request Process methods

- processRoles
  - If the mapping has a role associated with it, ensure the user has the specified role. If they do not, raise an error and stop processing of the request.
- processActionForm
  - Instantiate (if necessary) the ActionForm associated with this mapping (if any) and place it into the appropriate scope.
- processPopulate
  - Populate the ActionForm associated with this request, if any.



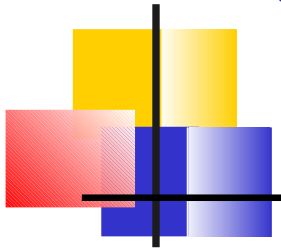
Request Process methods

- processValidate
  - Perform validation (if requested) on the ActionForm associated with this request (if any).
- processForward
  - If this mapping represents a forward, forward to the path specified by the mapping.
- processInclude
  - If this mapping represents an include, include the result of invoking the path in this request.



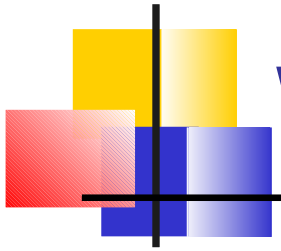
Request Process methods

- processActionCreate
  - Instantiate an instance of the class specified by the current ActionMapping (if necessary).
- processActionPerform ***
  - This is the point at which your action's execute method will be called.
- processForwardConfig
  - Finally, the process method of the RequestProcessor takes the ActionForward returned by your Action class, and uses to select the next resource (if any).



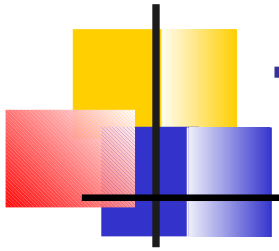
Soccer Club Registration Demo

- Goals:
  - Create a plugin that uses digester to help build tabMenu
  - Create new ActionMapping used to run jasper report.
- Demo:
  - Basic welcome, login, register pages.
  - Provide tabMenu over registration process.
  - Provide PDF 'receipt' of my registration.
  - Running on Jboss 3.0/Tomcat 4.1.24
  - Using Eclipse 2.1.1 as IDE



What's Next?

- Composeable Request Processors
- Pattern matching for Action Mapping paths.
- JSF
- DB support for MessageText
- Better tools to manage complexity (but hopefully still leverage power of flexibility).



The End.

Thank you for coming.

Gary D. Ashley Jr.

3rd Millennium Visions, Inc.

garyashley at toughguy dot net