

Jakarta Struts 1.1

Ready for Prime Time



Atlanta Java Users Group (AJUG)

August 20 2002

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Speaker Introductions

- Senior Technologist (S1 Corporation)
- Co-Author of Special Edition EJB 2.0
- Co-Author of Special Edition Java 2
- Technical Editor on Various J2EE Books including Special Edition JSP and Servlets, Special Edition J2EE, WebServices and WebLogic 7.0
- Articles for JavaWorld, InformIT, etc.
- Struts developer and user since the beginning
- Built several large J2EE Struts-based apps
- **Author of Jakarta Struts from O'Reilly**



Presentation Goals

- Introduce Struts from 5,280 ft
- Introduce the Struts 1.1 features
- Highlight the steps for developing a Struts application
- Subliminally emphasize the importance and benefit of using a framework like Struts

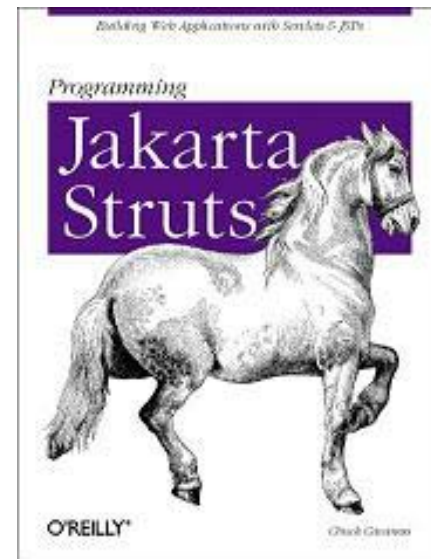
Presentation Goals (continued)

- No software to push
- No financial ties to the framework
- Purely Altruistic purpose

Buy Jakarta Struts from O'Reilly

Buy my book

Buy my book



Buy my book!

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!**



What is Struts?

- An open source development **framework** for building web applications
- Based on Model-View-Controller (MVC) design paradigm
- Implementation of JSP Model 2 Architecture
- Created by Craig McClanahan and donated to Apache Software Foundation (ASF) in 2000
- 2nd release candidate of version 1.1 released



What is Struts? (continued)

- Consists of 8 Top-Level Packages
- Approx 250 Classes and Interfaces



Case Study

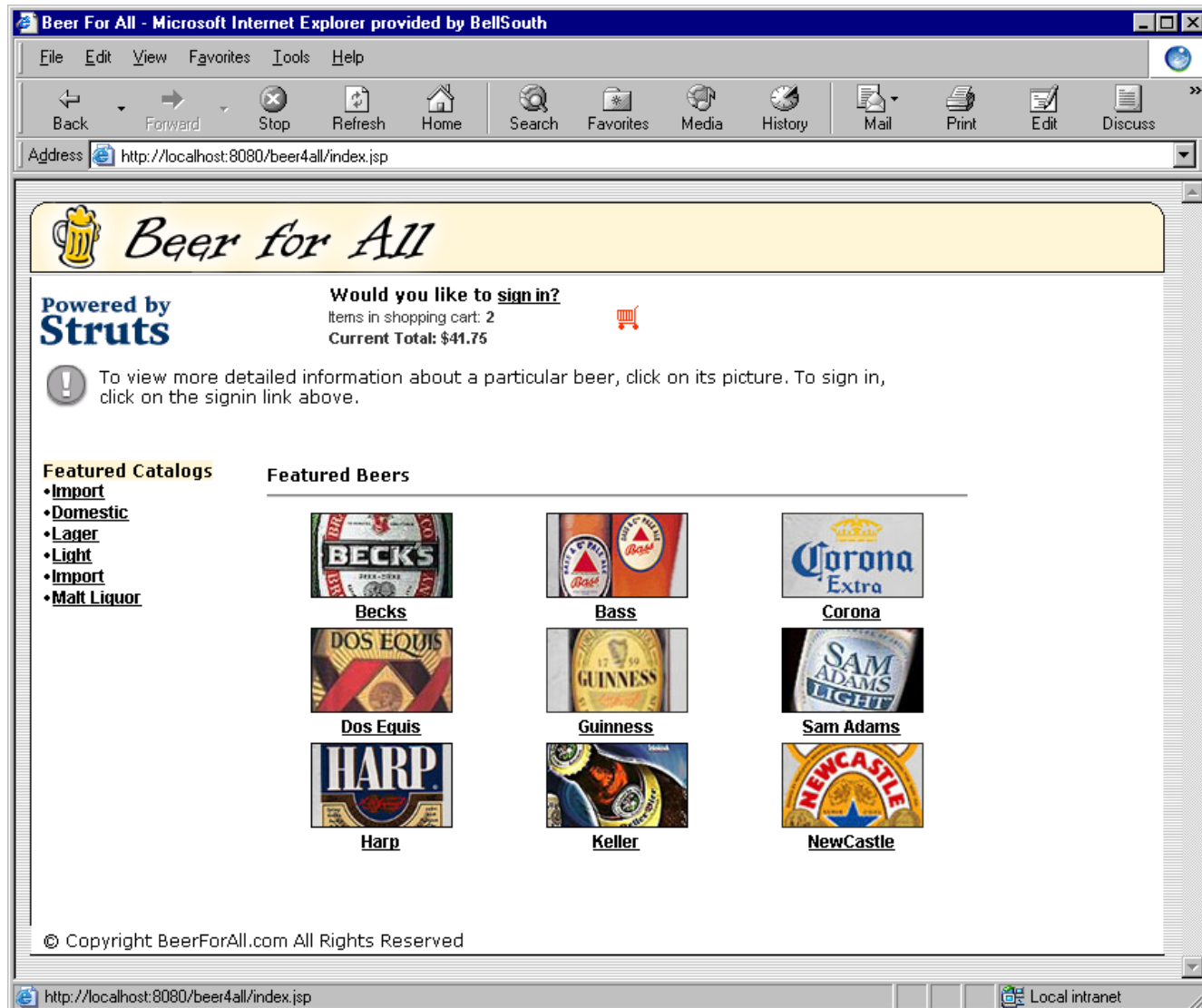
- Let's create a dot com company
- Need a solid business model
- Something that many consumers are interested in
- Strong sells regardless of the economy or market

Beer 4 All (www.beer4all.com)

Beer !



Beer4All Web Application




Beer4All Application (continued)

Beer For All - Microsoft Internet Explorer provided by BellSouth

File Edit View Favorites Tools Help


Back Forward Stop Refresh Home Search Favorites Media History Mail Print Edit Discuss

Address <http://localhost:8080/beer4all/cart.jsp>


 *Beer for All*

Powered by Struts

Would you like to [sign in?](#)

Items in shopping cart: 2 

Current Total: \$41.75

 To remove an item from your cart, click on the checkbox and then select the "Delete Checked Items" button. You can also change the quantity of an item and select the "Update Qty" button.

Remove	Name	Description	Quantity	Price
<input type="checkbox"/>	Corona In Stock - Usually ships in 2-3 business days Available for pickup at most stores	<input type="text" value="3"/>	\$5.25	\$15.75
<input type="checkbox"/>	Dos Equis In Stock - Usually ships in 2-3 business days Available for pickup at most stores	<input type="text" value="4"/>	\$6.50	\$26.00

[DELETE CHECKED ITEM\(S\)](#) [UPDATE QTY](#) **SubTotal* \$41.75**

[CONTINUE SHOPPING](#) [BEGIN CHECKOUT](#)

*SubTotal does not include tax or shipping/handling charge.

Done Local intranet



Purpose of Case Study

- A context for our Struts discussion
- We'll use this case study off and on throughout the presentation
- Promote better beer drinking through technology
- And yes I do own www.Beer4All.com!

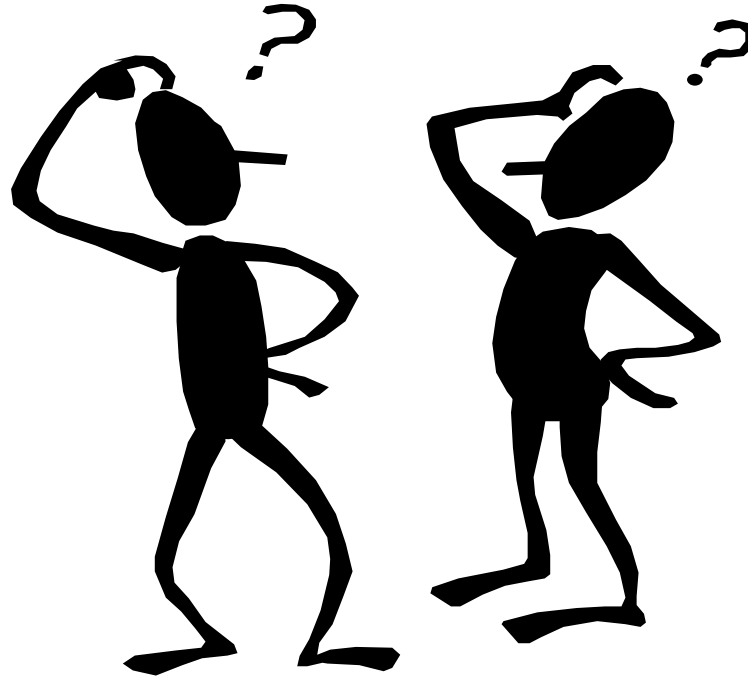
Selecting a UI Framework for Beer4All

- No framework
(use straight JSP)
- Build our own framework
- Webwork
- Espresso
- Barracuda
- Cocoon
- SiteMesh
- Freemarker, Velocity and WebMacro
- XML/XSLT
- ???



Highly Paid Beer4All Architects Meet!

Why not use Struts?



Smart, but extremely underpaid developers who attended the AJUG Struts presentation ask...



Why consider Struts?

(Manager Version)

- Developed by Industry Experts
- Stable & Mature
- Manageable learning Curve
- Open Source
- 1700 member User Community (50-100 new members each month)
- It's probably similar to what you would build if not using Struts
- Good documentation – 5 books available soon!



Why consider Struts?

(Developer Version)

- Feature-rich
- Free to develop & deploy
- Many supported third-party tools
- Flexible & Extendable
- J2EE Technologies
- Expert Developers and Committers
- Large User Community
- Performant



Struts Framework Features

- Model 2 - MVC Implementation
- Internationalization(I18N) Support
- Rich JSP Tag Libraries
- Based on JSP, Servlet, XML, and Java
- Supports Java's Write Once, Run Anywhere Philosophy
- Supports different model implementations (JavaBeans, EJB, etc.)
- Supports different presentation implementations(JSP, XML/XSLT, etc)



Struts Dependencies

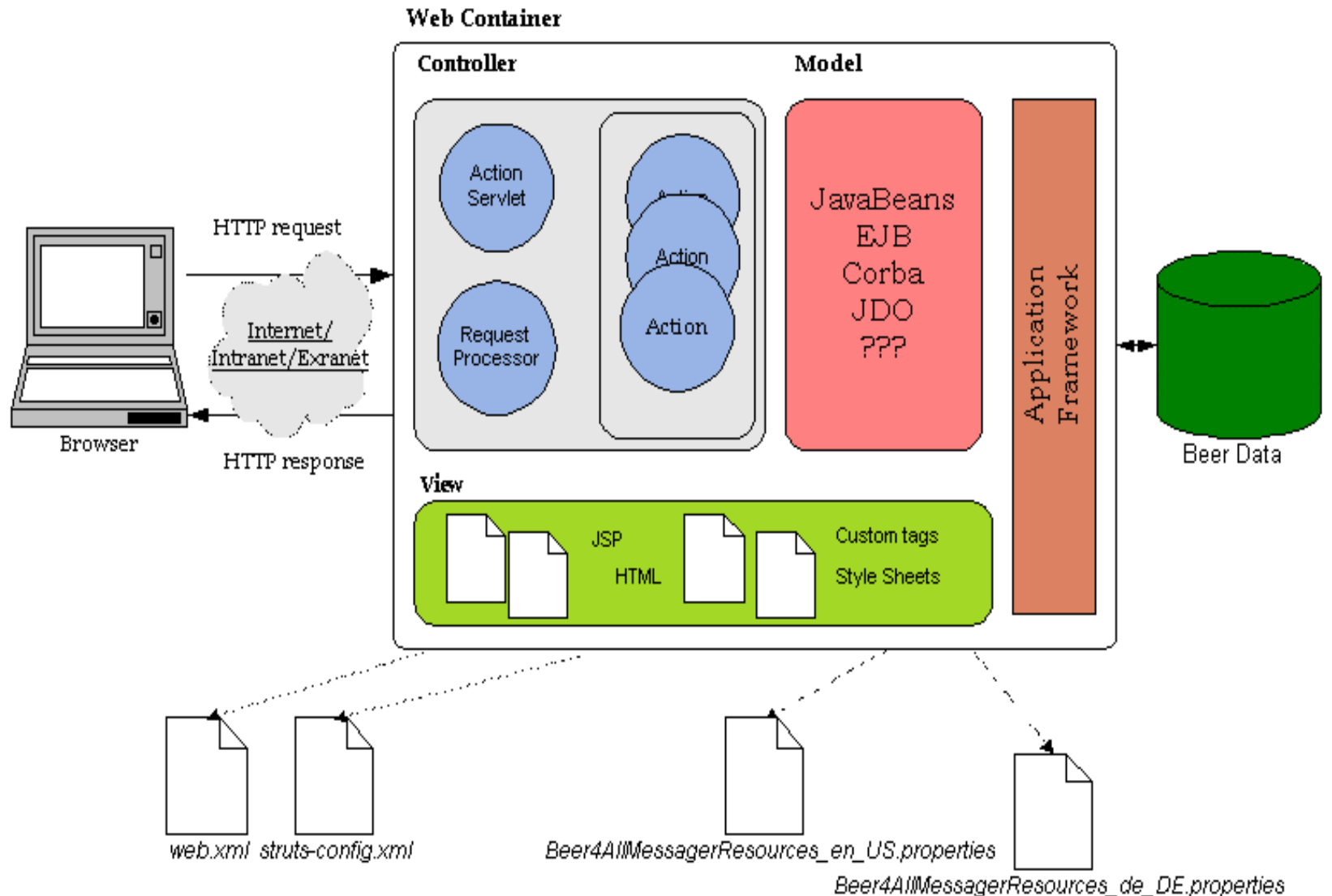
- Java 1.2 or newer
- Servlet 2.2 and JSP 1.1 container
- XML parser compliant with JAXP 1.1 or newer (e.g. Xerces)
- Jakarta Commons packages
- JDBC 2.0 optional package

Decision: Let's go with Struts!



Beer4All Chief Architect proclaims!

Beer4All Logical Architecture

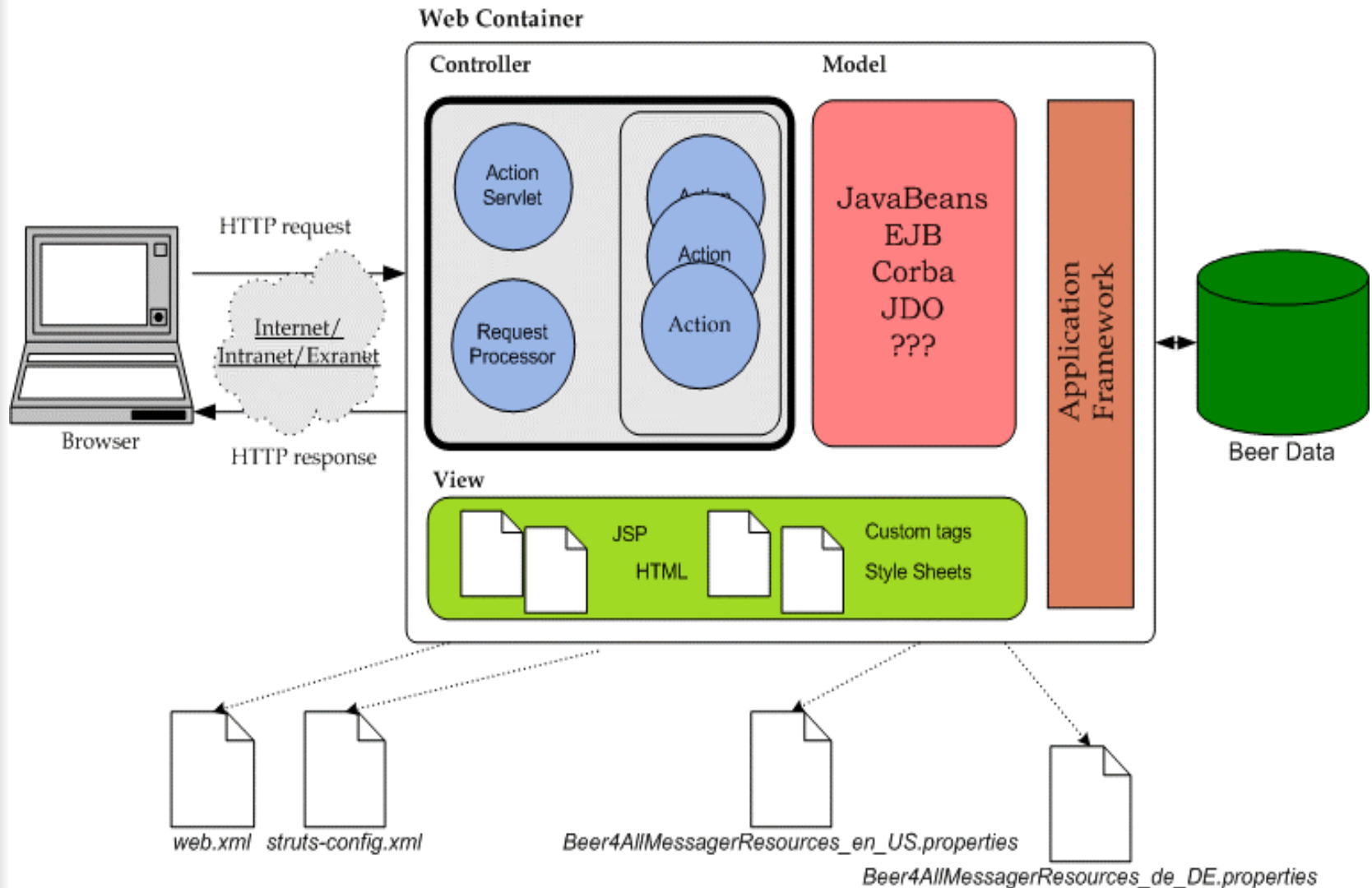


Let's Talk about the Framework

- Controller
- Model
- View
- Configuration
- 1.1 Features



The Controller Components





Controller Components

- `ActionServlet` — (Framework provided)
- `RequestProcessor` — (Framework provided)
- **Action Classes** — (You have to build these)



ActionServlet and RequestProcessor (What Do They Really Do?)

- Receive the *HttpServletRequest*
- Automatically populate a JavaBean from the request parameters
- Handle *Locale* and Content Type Issues
- Determine which *Action* to invoke based on URI
- Provide extension points



ActionServlet Facts

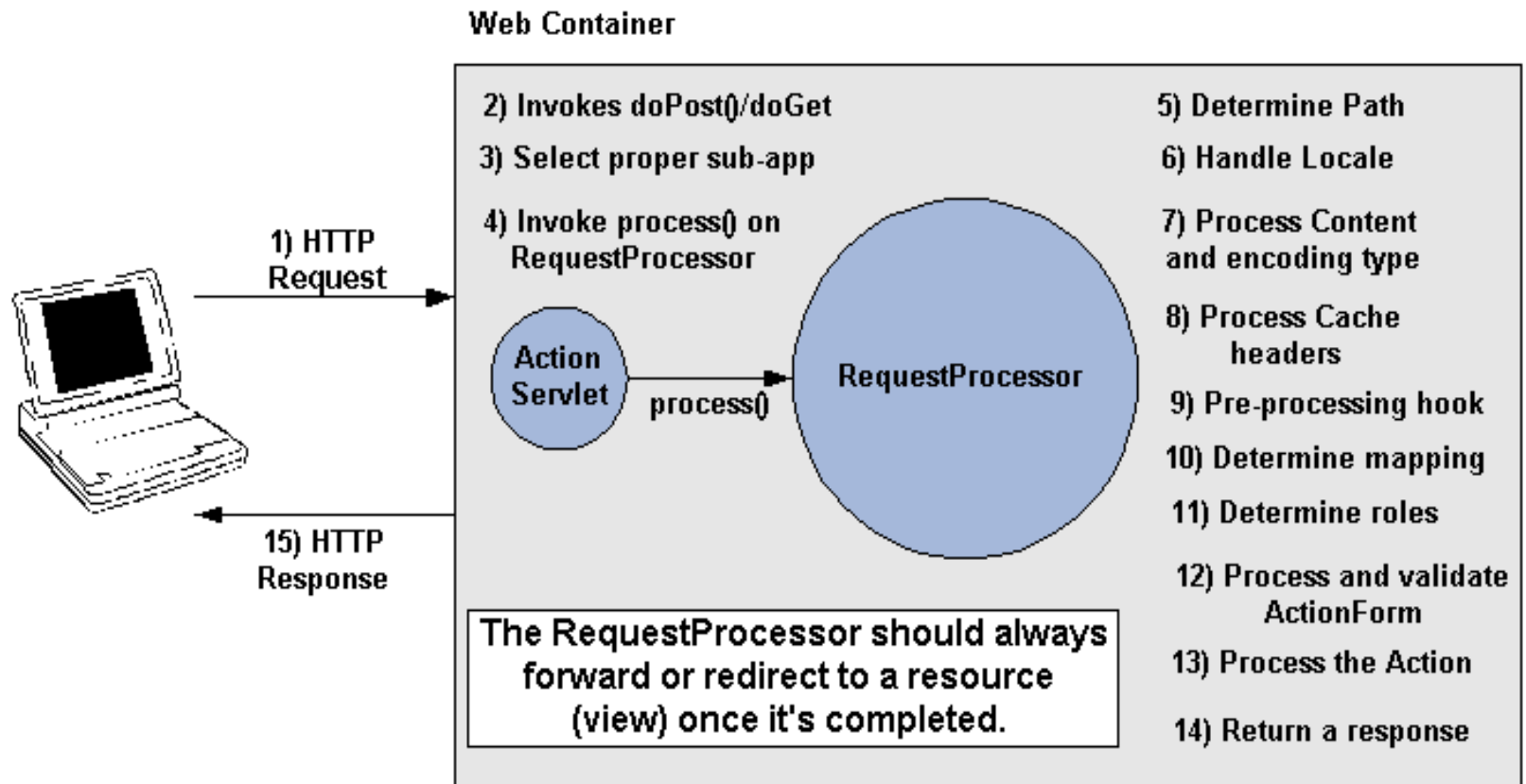
- Extends `javax.servlet.http.HttpServlet`
- Receives all framework requests
- Selects proper application module
- Delegates request handling to the `RequestProcessor` instance
- One `ActionServlet` instance per web application
- Default implementation provided by framework (can extend if necessary)
- May go away in future versions



The RequestProcessor Class

- One instance per application module
- Processes all requests for module
- Invokes proper Action instance
- Default implementation provided by framework (can extend if necessary)

ActionServlet and RequestProcessor Diagram

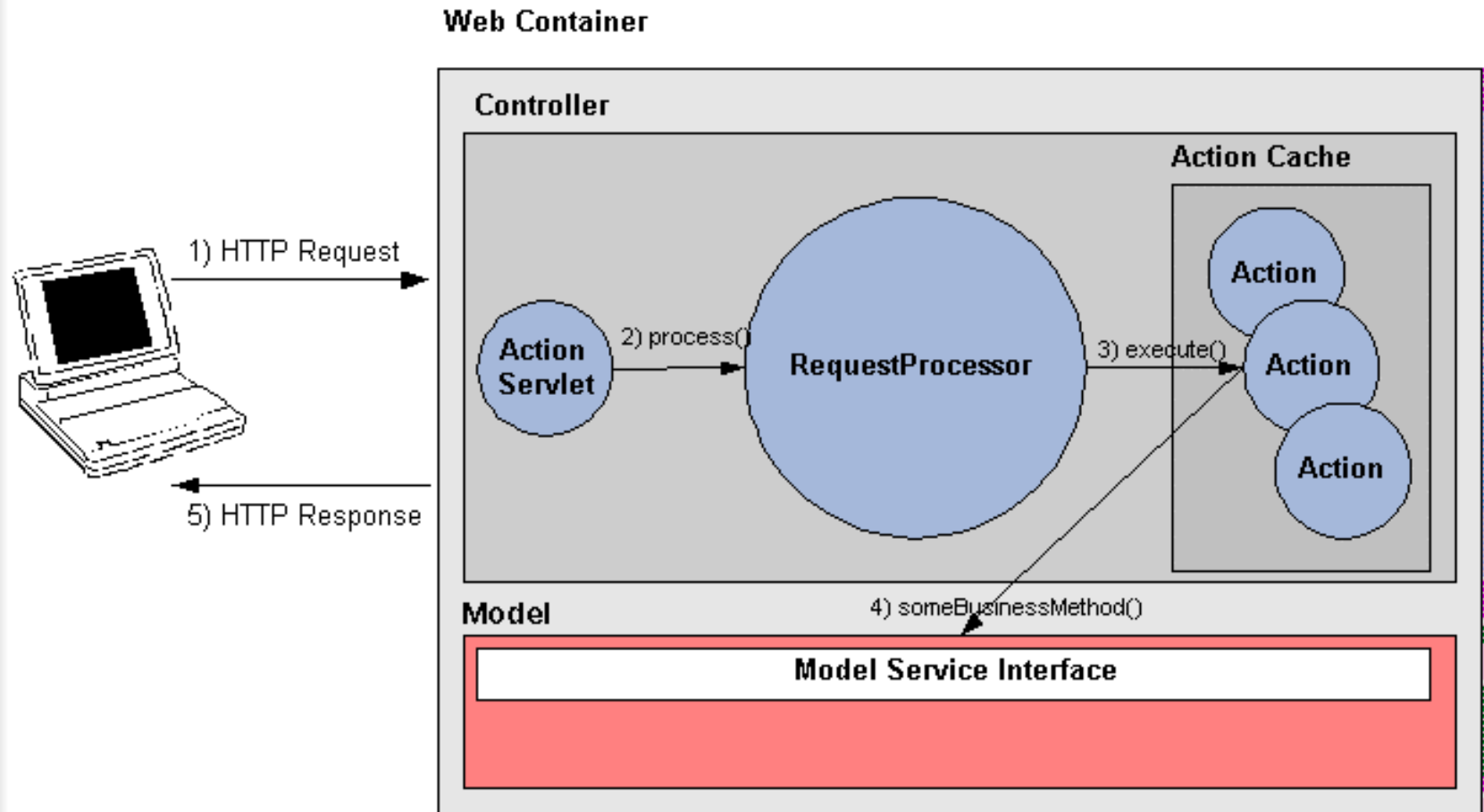




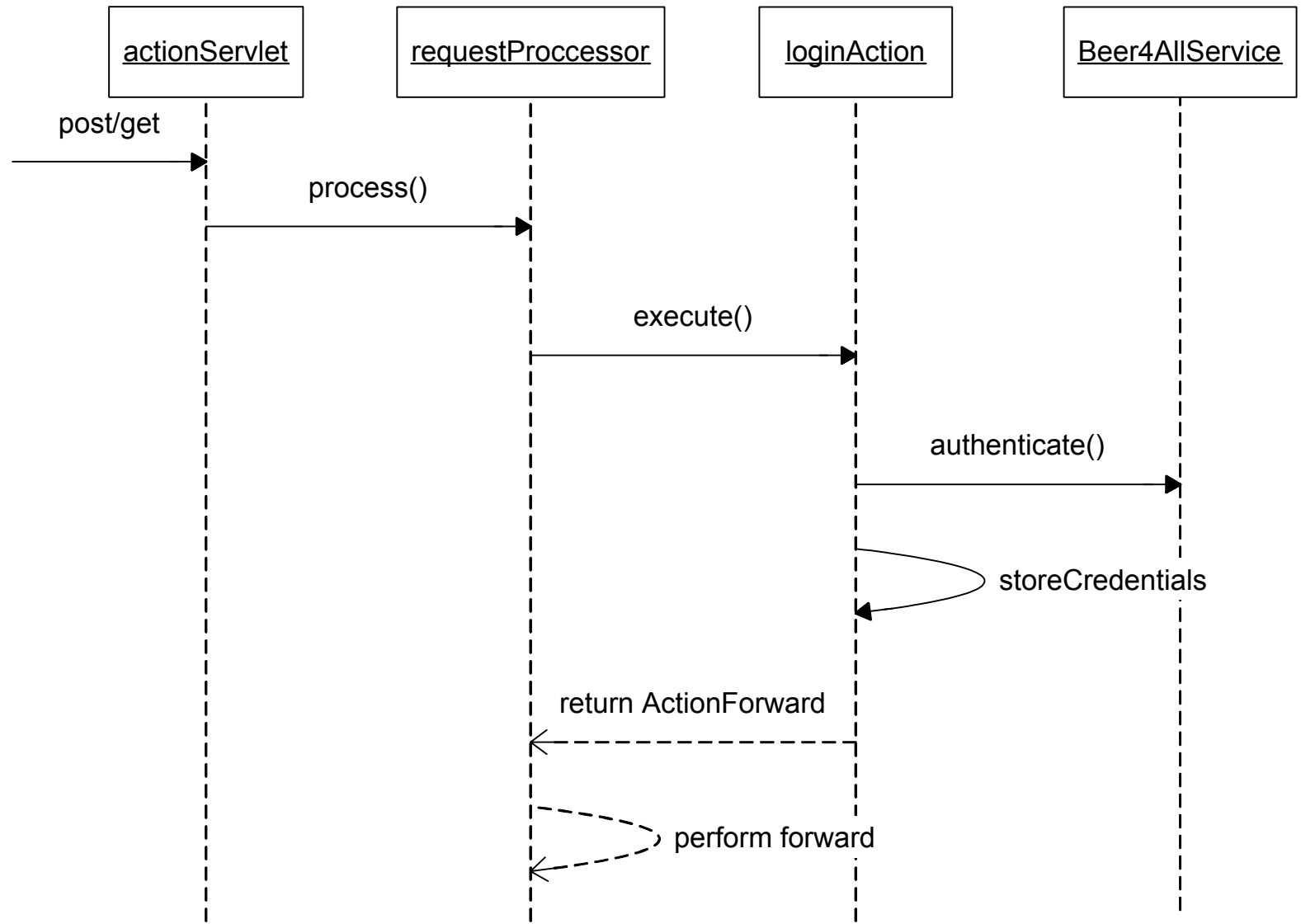
What's an *Action* Class?

- Extends *org.apache.struts.action.Action*
- Overrides the *execute()* method
- Acts as a bridge between user-invoked URI and a business method (Command pattern)
- Returns information about which view should be rendered next
- Part of the Controller, not the Model

Action Class Diagram



Action Sequence Diagram



Example Action execute() Method

```
public ActionForward execute( ActionMapping mapping, ActionForm form, HttpServletRequest request, HttpServletResponse response )
```

```
throws Exception{
```

```
    String username = ((LoginForm)form).getUsername();
```

```
    String password = ((LoginForm)form).getPassword();
```

```
    // Obtain the service
```

```
    Beer4AllService serviceImpl = getBeer4AllService();
```

```
    // Authenticate the user
```

```
    UserView userView = serviceImpl.authenticate(username, password);
```

```
    // Store the user's credentials
```

```
    UserContainer existingContainer = getUserContainer(request);
```

```
    existingContainer.setUserView( userView );
```

```
    // Return an ActionForward for the next page
```

```
    return mapping.findForward(Constants.SUCCESS_KEY);
```

```
}
```



Beer4AllBaseAction Class

```
package com.cavaness.beer4all.framework;

import org.apache.struts.action.*;
import javax.servlet.http.*;
import javax.servlet.ServletContext;
import com.cavaness.beer4all.service.*;
import com.cavaness.beer4all.util.Constants;

abstract public class Beer4AllBaseAction extends Action {

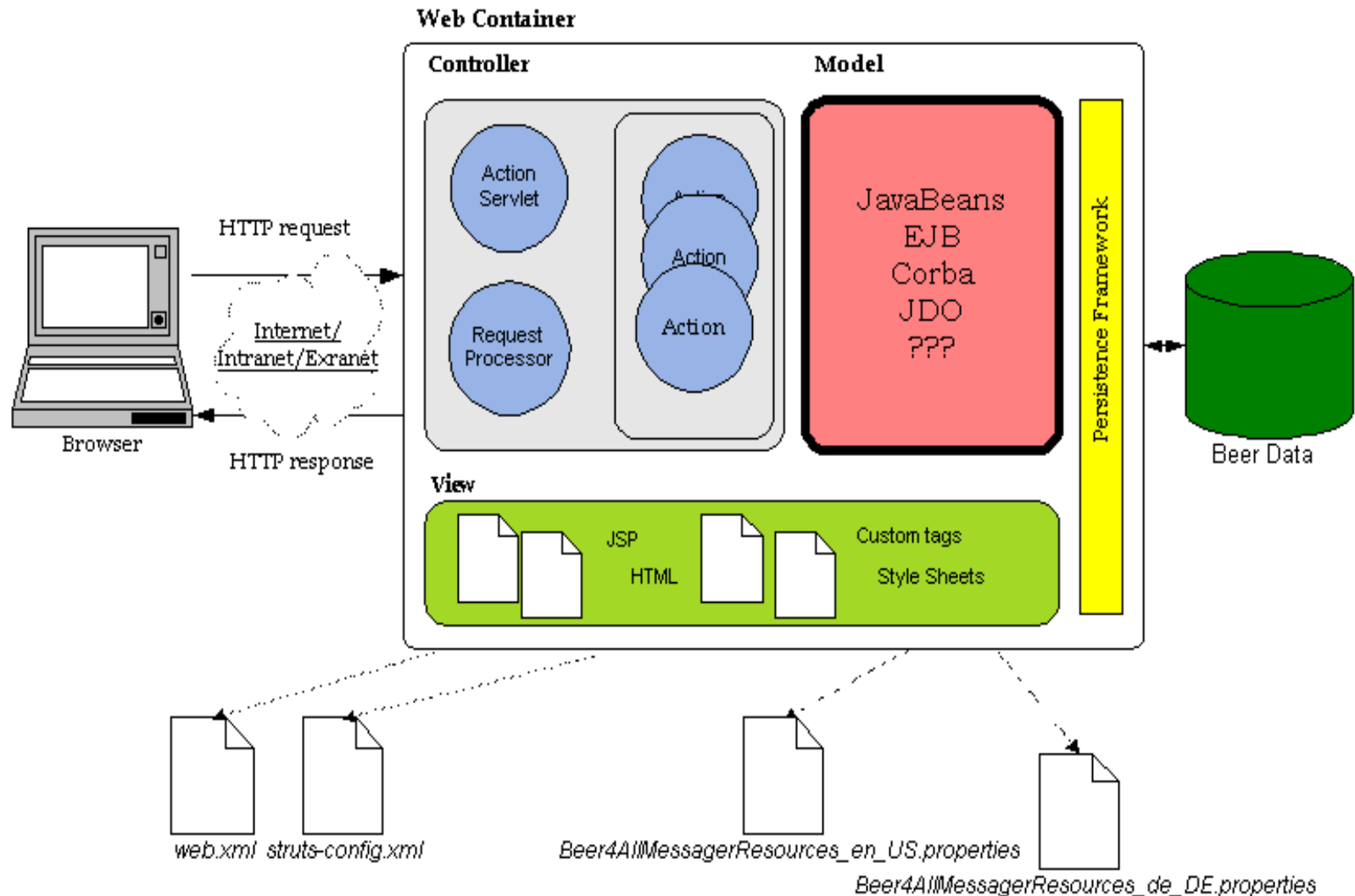
    public Beer4AllService getBeer4AllService(){
        ServletContext ctx = getServlet().getServletContext();
        ServiceFactory factory =
            (ServiceFactory)ctx.getAttribute(Constants.SERVICE_FACTORY_KEY);
        return (Beer4AllService)factory.createService();
    }
}
```



Struts Includes Pre-built Action Classes

- ForwardAction
- DispatchAction
- LookupDispatchAction
- IncludeAction
- SwitchAction

The Model Components





Struts Model Components

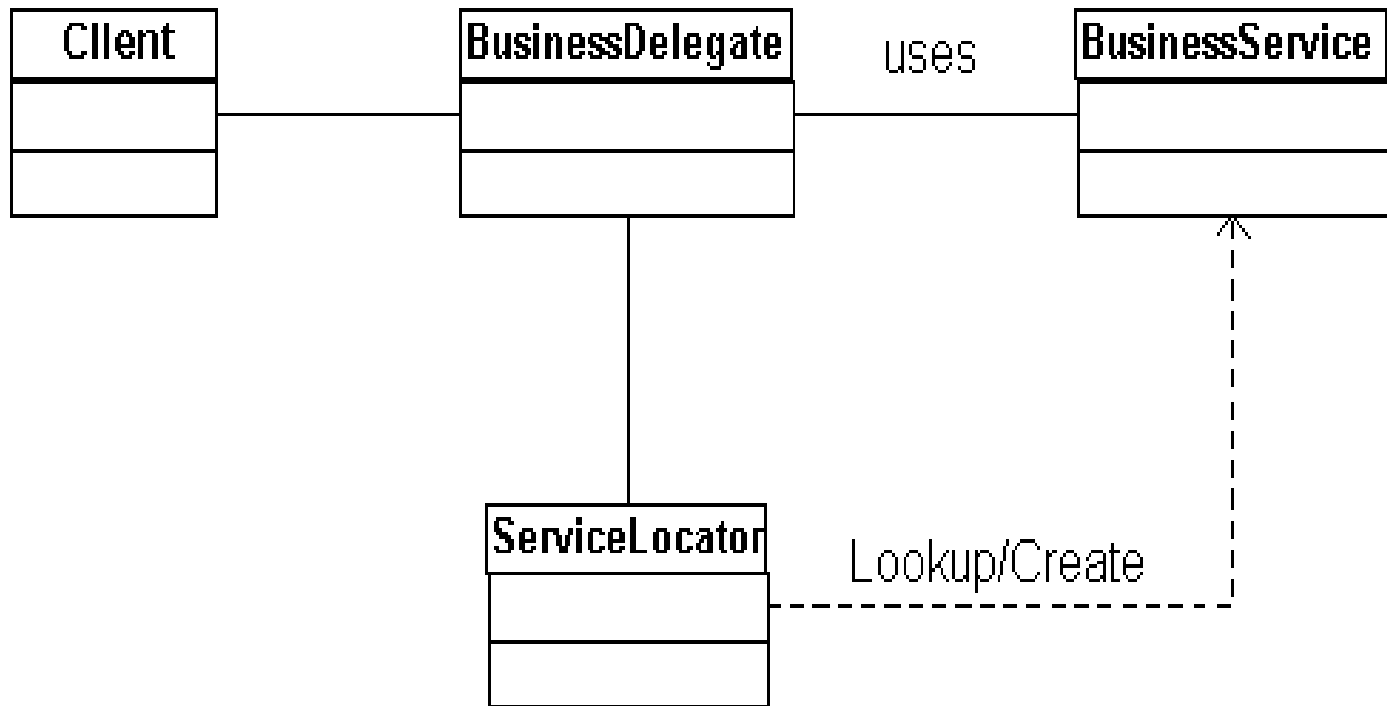
- No built-in support for the model
- No model components provided
- Framework supports any component model (JavaBeans, EJB, Corba, JDO, etc.)
- Should always decouple the application from a specific model implementation.



Patterns De Jour

- Model-View-Controller
- Front Controller
- Session Façade
- Service Locator
- Data Transfer Object (a.k.a ValueObject)
- Command
- Business Delegate
- Factory
- Data Access Object
- Service to Worker

Business Delegate Pattern





Benefits of the Business Delegate Pattern

- Reduces coupling, increases manageability
- Hides complexity of remote services
- Exposes a simple uniform interface of the business tier to the client
- More complex features such as failure recovery are made easier



Beer4All Business Interface

```
package com.cavaness.beer4all.service;

import java.util.List;

import com.cavaness.beer4all.catalog.view.CatalogView;
import com.cavaness.beer4all.catalog.view.ItemView;
import com.cavaness.beer4all.common.view.UserView;
import com.cavaness.beer4all.common.exceptions.InvalidLoginException;
import com.cavaness.beer4all.common.exceptions.DatabaseException;

public interface Beer4AllService {

    public List getFeaturedItems() throws DatabaseException;

    public List getFeaturedCatalogs() throws DatabaseException;

    public ItemView getItemById( String itemId ) throws DatabaseException;

    public List.getItemsInCatalog( String catalogId ) throws DatabaseException;

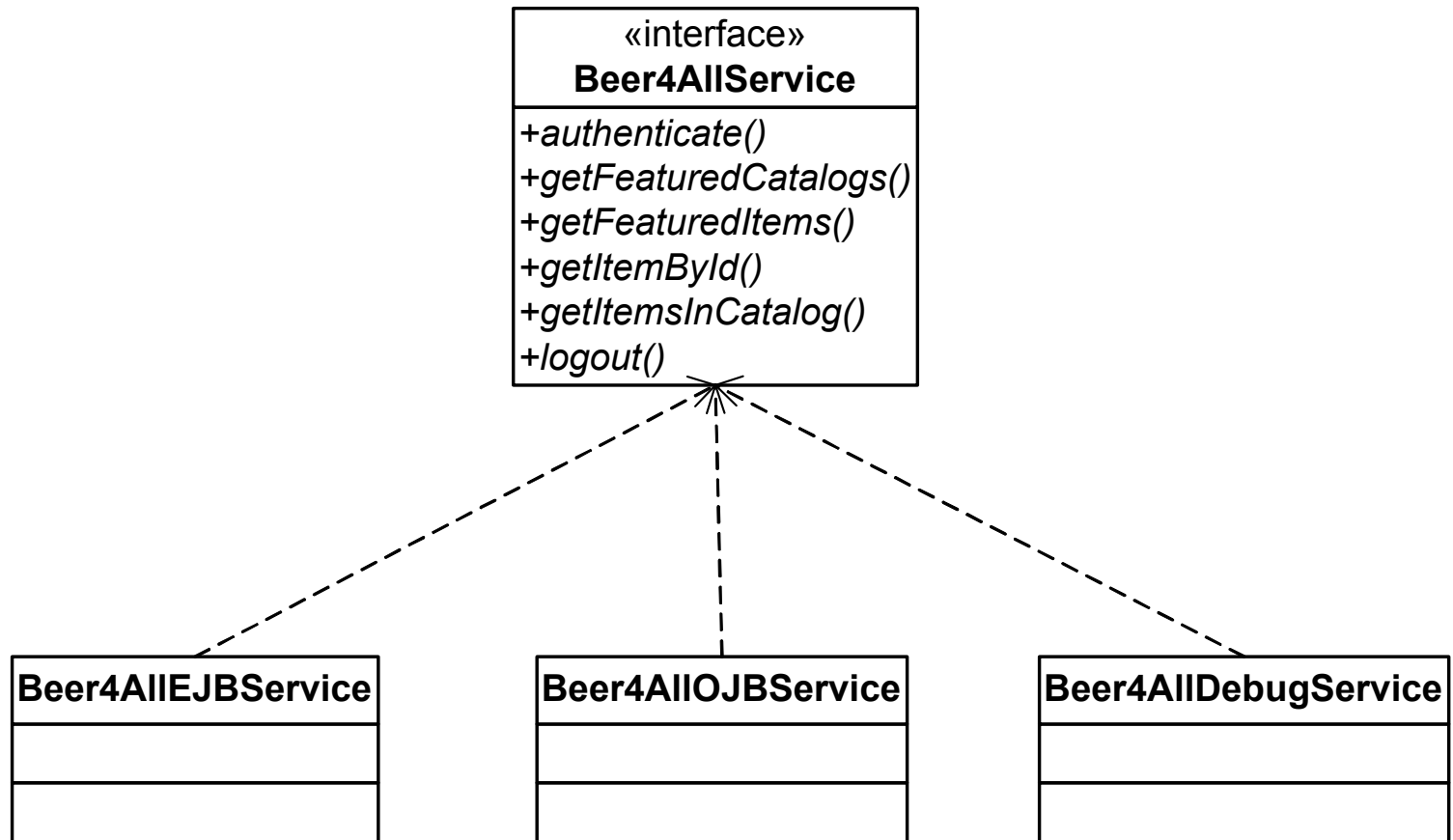
    public void logout(String email) throws DatabaseException;

    public UserView authenticate(String username, String password)

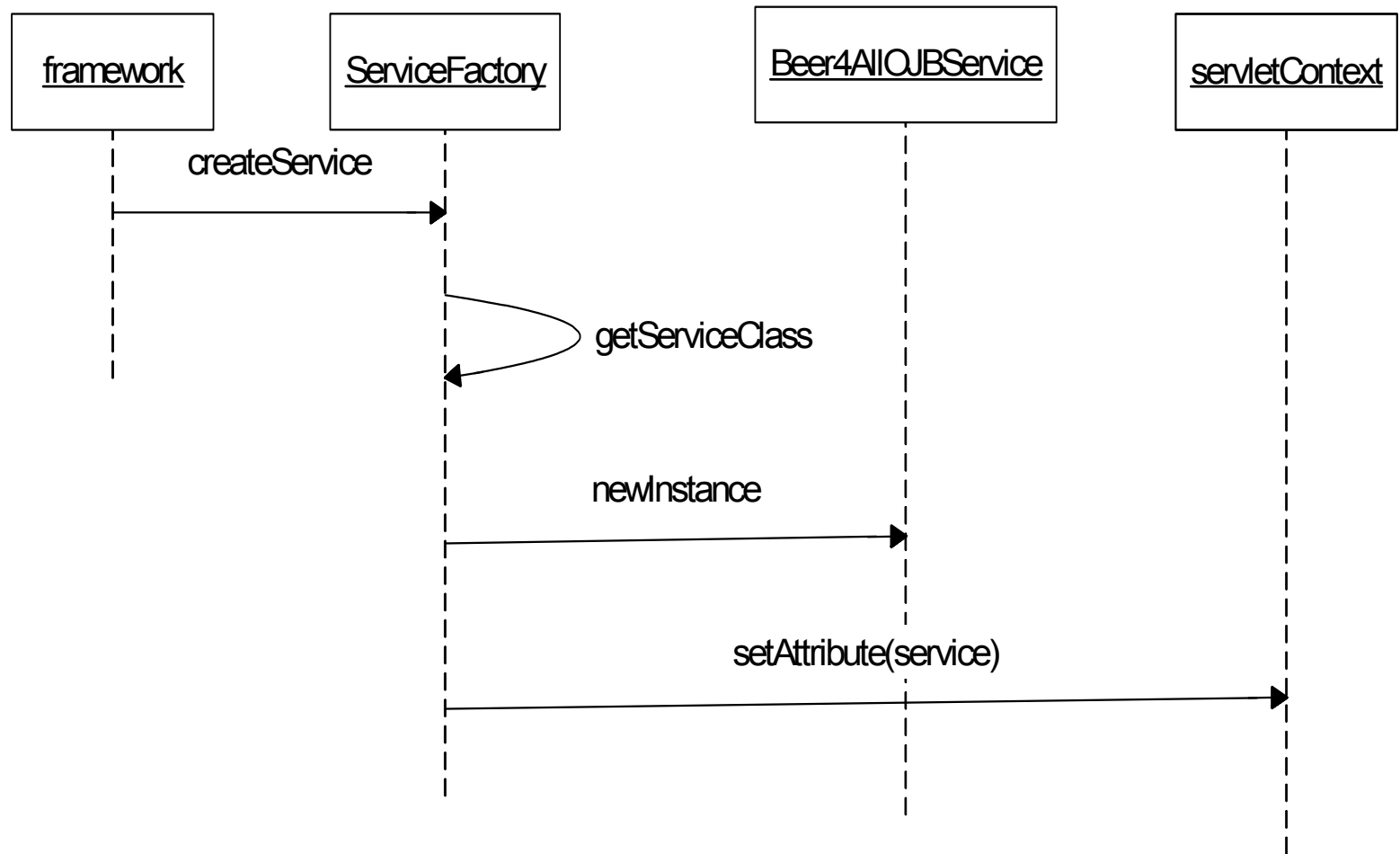
        throws DatabaseException, InvalidLoginException;

}
```

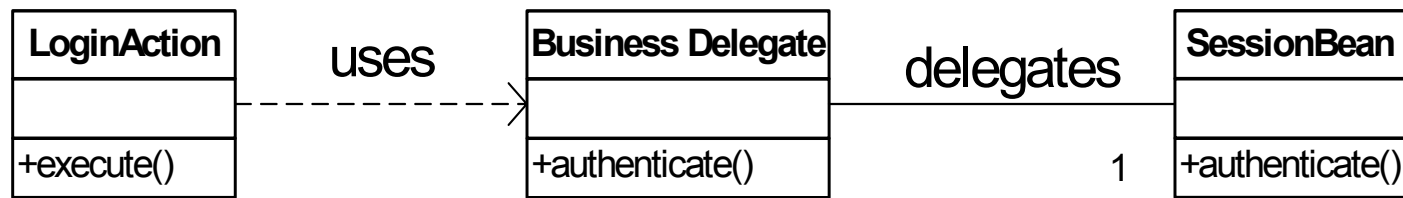
Beer4All Service Implementations



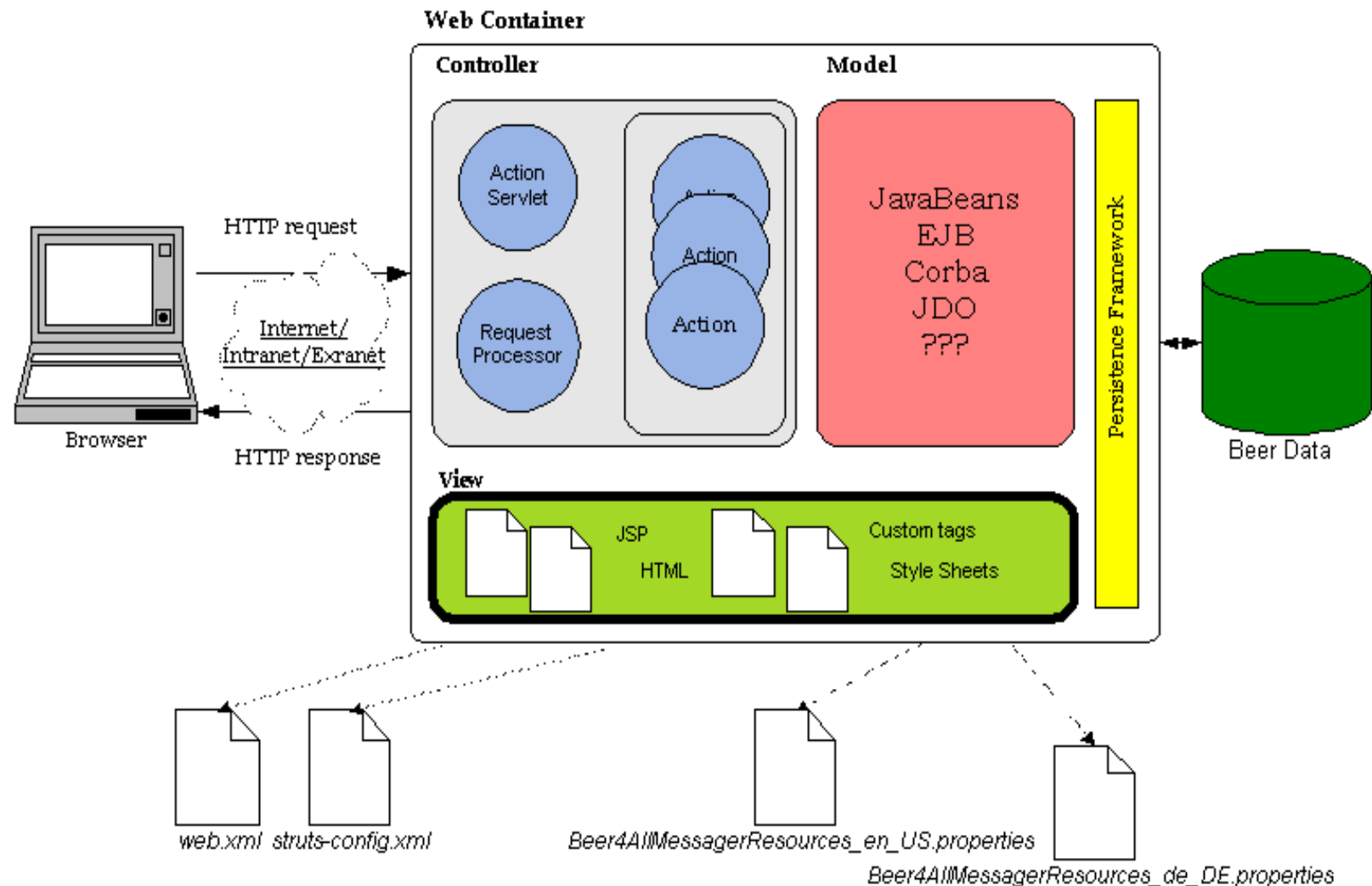
Beer4All Service Factory



Struts with Enterprise JavaBeans



The View Components





View Components

- JavaServer Pages
- HTML
- JavaScript and Stylesheets
- Multimedia Files
- Resource Bundles
- JavaBeans (Part of model used by views)
- JSP Custom Tags
- ActionForms



Struts JSP Tag Libraries

- HTML
- Bean
- Logic
- Nested
- Tiles
- Template



The HTML Tag Library

- Tags used to create Struts input forms
- Examples include (checkbox, image, link, submit, text, textarea)

HTML Tag Example

<table>

<tr>Shipping Address</tr>

<tr><td>Address:</td>

<td><bhtml:text name="checkoutForm" property="shippingAddress"/>

</td></tr>

<tr><td>City:</td>

<td><bhtml:text name="checkoutForm" property="shippingCity"/>

</td></tr>

<tr><td>State:</td>

<td><bhtml:text name="checkoutForm" property="shippingState"/>

</td></tr>

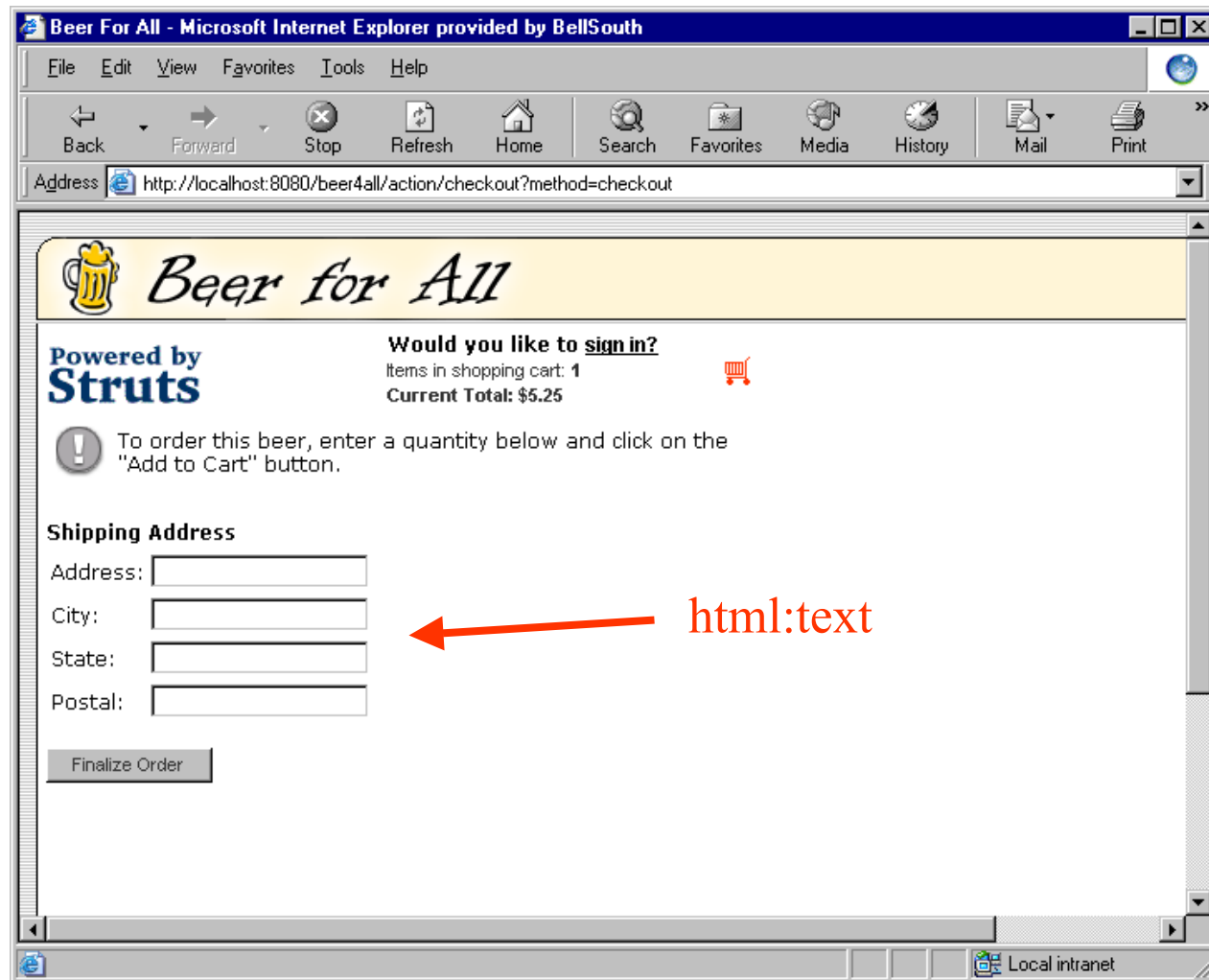
<tr><td>Postal:</td>

<td><bhtml:text name="checkoutForm" property="shippingPostal"/>

</td></tr>

</table>

HTML Tag Example (continued)




The screenshot shows a Microsoft Internet Explorer window titled "Beer For All - Microsoft Internet Explorer provided by BellSouth". The address bar displays "http://localhost:8080/beer4all/action/checkout?method=checkout". The page features a yellow header with a beer mug icon and the text "Beer for All". Below the header, there is a "Powered by Struts" logo on the left and a sign-in prompt on the right. The sign-in prompt includes the text "Would you like to sign in?", "Items in shopping cart: 1", and "Current Total: \$5.25". A red arrow points from the text "html:text" to the "Address:" label of the shipping address form. The form includes input fields for "Address:", "City:", "State:", and "Postal:", and a "Finalize Order" button.

Beer For All - Microsoft Internet Explorer provided by BellSouth

File Edit View Favorites Tools Help


Back Forward Stop Refresh Home Search Favorites Media History Mail Print


Address http://localhost:8080/beer4all/action/checkout?method=checkout

 *Beer for All*

Powered by **Struts**

Would you like to sign in?
Items in shopping cart: 1
Current Total: \$5.25



 To order this beer, enter a quantity below and click on the "Add to Cart" button.

Shipping Address

Address:

City:

State:

Postal:

html:text

Local intranet



The Bean Tag Library

- Tags used for accessing JavaBeans and their properties
- Examples include (define, message, write)



Bean Tag Library Example

<bean:write name="UserContainer" property="cart.size" scope="session"/>

**
**Current Total:

\$<bean:write name="UserContainer" format="#,##0.00" property="cart.totalPrice" scope="session"/>


Bean Tag Example (continued)

Beer For All - Microsoft Internet Explorer provided by BellSouth

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites Media History Mail Print


Address http://localhost:8080/beer4all/cart.jsp




Beer for All

Powered by
Struts

Would you like to sign in?

Items in shopping cart: 1 

Current Total: \$5.25

 To remove an item from your cart, click on the checkbox and then select the "Delete Checked Items" button. You can also change the quantity of an item and select the "Update Qty" button.

Remove **Name** **Description** **Quantity** **Price**

<input type="checkbox"/>	Corona		1	\$5.25
	In Stock - Usually ships in 2-3 business days Available for pickup at most stores			

DELETE CHECKED ITEM(S) UPDATE QTY SubTotal* \$5.25

CONTINUE SHOPPING BEGIN CHECKOUT

*SubTotal does not include tax or shipping/handling charge.

Local intranet

Annotations:

- Red arrow from `bean:message` points to the warning icon and text.
- Red arrow from `bean:write` points to the "Current Total: \$5.25" text.



The Logic Tag Library

- Managing conditional generation of output text
- Looping over object collections for repetitive generation of output text
- Application flow management.
- Examples include (empty, lessThan, greaterThan, redirect, iterate)



Logic Tag Library Example

```
<logic:iterate id="cartItem" scope="session" name="UserContainer" property="cart.items">
```

```
...
```

```
<html:link
```

```
  page="/action/viewitemdetail?method=viewItem"
```

```
  paramName="cartItem"
```

```
  paramId="id"
```

```
  paramProperty="id">
```

```
    <bean:write name="cartItem" property="name"/>
```

```
</html:link>
```

```
...
```

```
</logic:iterate>
```


Logic Tag Library Example (continued)

Bier für alle - Microsoft Internet Explorer provided by BellSouth

File Edit View Favorites Tools Help


Back Forward Stop Refresh Home Search Favorites Media History Mail


Address <http://localhost:8080/beer4all/cart.jsp>

 *Beer for All*

Powered by Struts

Hello Chuck [sign off?](#)
Items in shopping cart: 2
Current Total: \$28,75



 To remove an item from your cart, click on the checkbox and then select the "Delete Checked Items" button. You can also change the quantity of an item and select the "Update Qty" button.

Remove	Name	Description	Quantity	Price
<input type="checkbox"/>	<u>Dos Equis</u> In Stock - Usually ships in 2-3 business days Available for pickup at most stores	<input type="text" value="2"/>	\$6,50	\$13,00
<input type="checkbox"/>	<u>Corona</u> In Stock - Usually ships in 2-3 business days Available for pickup at most stores	<input type="text" value="3"/>	\$5,25	\$15,75

DELETE CHECKED ITEM(S)

UPDATE QTY

SubTotal* \$28,75

CONTINUE SHOPPING

BEGIN CHECKOUT

*SubTotal does not include tax or shipping/handling charge.

Done

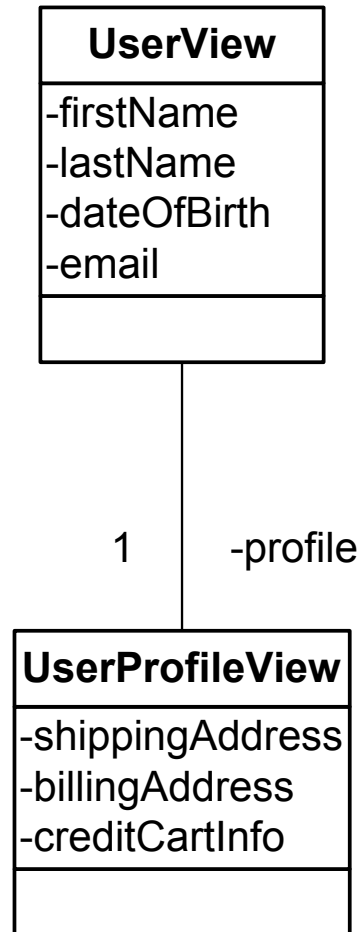
Local intranet



The Nested Tag Library

- Extend the base struts tags to allow them to relate to each other in a nested nature
- Created by Arron Bates
- Added to core beginning of 2002

Nested Tag Example



Nested Tag Example (continued)

<html:form action="/some-action.do" >

User View...

First: <html:text name="user" property="firstName" />

Last: <html:text name="user" property="lastName" />

DOB: <html:text name="user" property="dateOfBirth" />

<hr> User Profile...

Shipping Address: <html:text name="user" property="profile.shippingAddress" />

Billing Address: <html:text name="user" property="profile.billingAddress" />

<hr> </html:form>

Nested Tag Example (continued)

<html:form action="/some-action.do" >

User View...

First: <nested:text property="firstName" />

Last: <nested:text property="lastName" />

DOB: <nested:text property="dateOfBirth" />

<nested:nest property="profile">

User Profile...

Shipping Address: <nested:text property="shippingAddress" />

Billing Address: <nested:text property="billingAddress" />

</nested:nest>

 </html:form>



Nested Tag Benefits

- Tags can have a relationship
- Fewer attributes must be defined
- Can work against a single level
- Change is more manageable



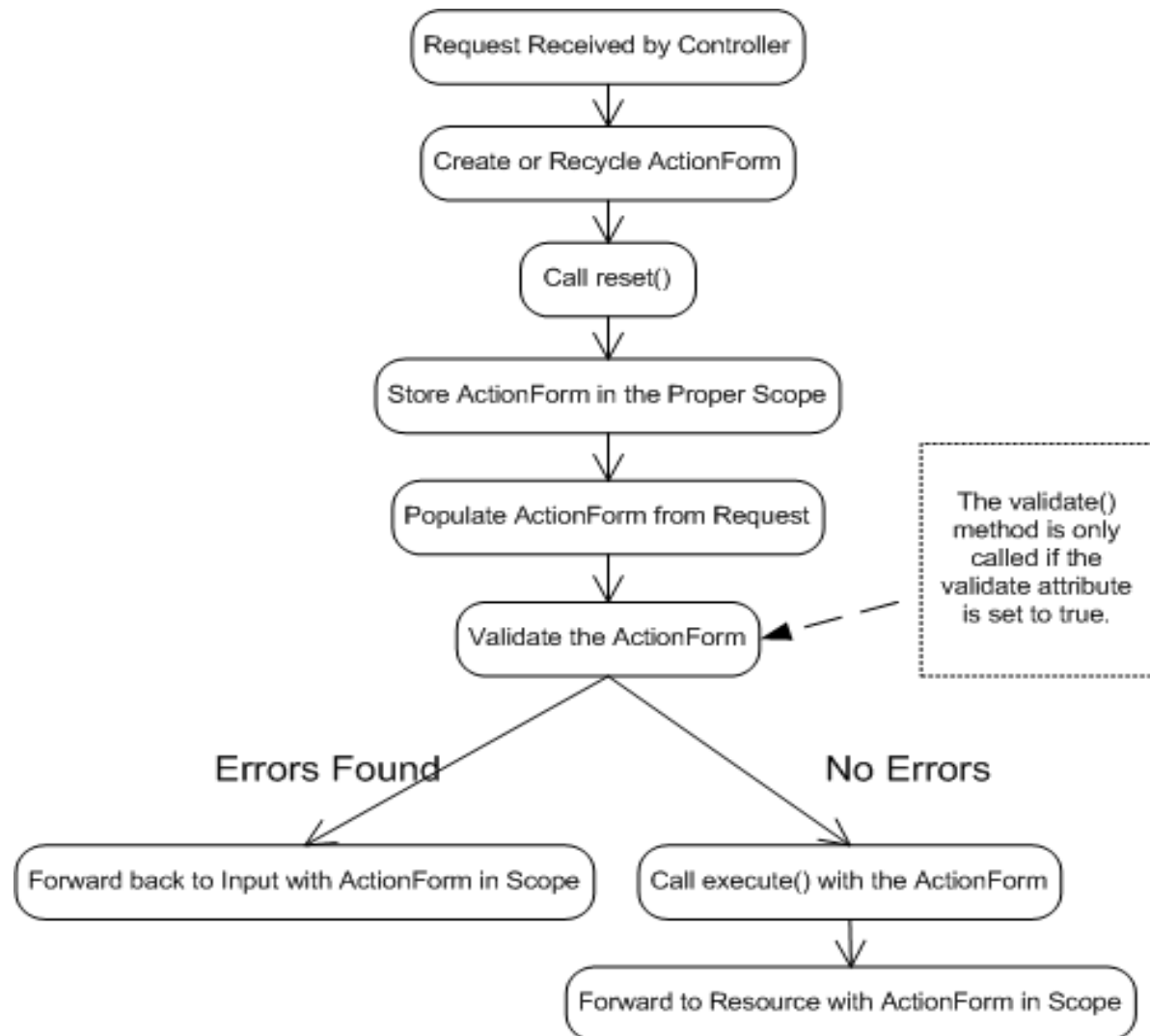
What is an ActionForm?

- Java class that extends the `org.apache.struts.action.ActionForm`
- Captures user data from the Http request
- Stores the data temporarily
- Acts as a “firewall” between the presentation tier and the application
- Provides the ability to validate the user input

Beer4All LoginForm Example

```
public class LoginForm extends ActionForm {  
    private String password = null;  
    private String username = null;  
    // ... some code not shown  
  
    public ActionErrors validate(ActionMapping mapping, HttpServletRequest request) {  
        ActionErrors errors = new ActionErrors();  
        // Get access to the message resources for this application  
        MessageResources resources =  
            (MessageResources)request.getAttribute( Action.MESSAGES_KEY );  
        if(getUsername() == null || getUsername().length() < 1) {  
            String usernameLabel = resources.getMessage( "label.username" );  
            errors.add( ActionErrors.GLOBAL_ERROR, new ActionError("errors.required", usernameLabel ));  
        }  
        if(getPassword() == null || getPassword().length() < 1) {  
            String passwordLabel = resources.getMessage( "label.password" );  
            errors.add( ActionErrors.GLOBAL_ERROR, new ActionError("errors.required", passwordLabel ));  
        }  
        return errors;  
    }  
}
```

ActionForm Sequence Diagram

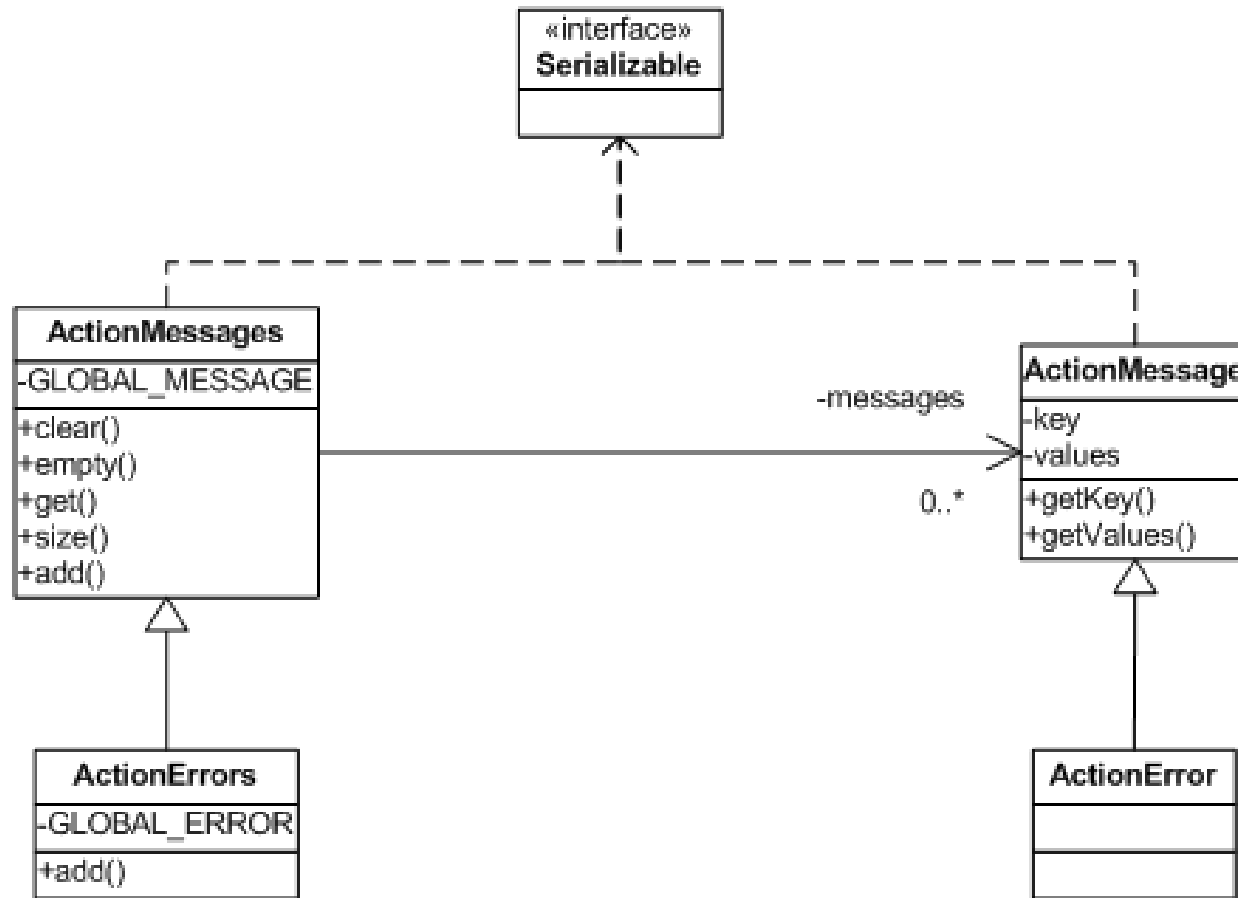




ActionMessage and ActionError

- Used to signify general purpose informational and error messages
- Rely on the Resource Bundles
- JSP Tags can access them

ActionMessage Class Hierarchy



Beer4All Signin Error Messages

```
<tr class="RED">
  <td></td>
  <td>
    <html:messages id="error">
      <li><bean:write name="error"/></li>
    </html:messages>
  </td>
</tr>
```



Beer4All Signin Error Messages (continued)

Bier fÄr alle - Microsoft Internet Explorer provided by BellSouth

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites Media History Mail

Address <http://localhost:8080/beer4all/action/signin>

 *Beer for All*

- Username is required.
- Password is required.

[html:messages](#)

Please sign in to access your account. If you do not have an account, it only takes a few moments to create one.

- 1. Username:**
- 2. Password:**
☐ New customer, create an account.
☒ Returning customer, enter your password and sign in securely.

Forgot your password?
Enter your E-mail address in step one and we'll send it to you.
- 3. CONTINUE ►**

© Copyright BeerForAll.com All Rights Reserved

Done Local intranet

Putting it together





Configuring a Struts Application

- Create and edit the web app deployment descriptor (*web.xml*)
- Create and edit the *struts-config.xml* file
- Other configuration files might be necessary for Validator and tiles



Configuring *web.xml* for Struts

- Add servlet element
- Configure servlet-mapping element
- Add taglib elements



Beer4All web app Descriptor

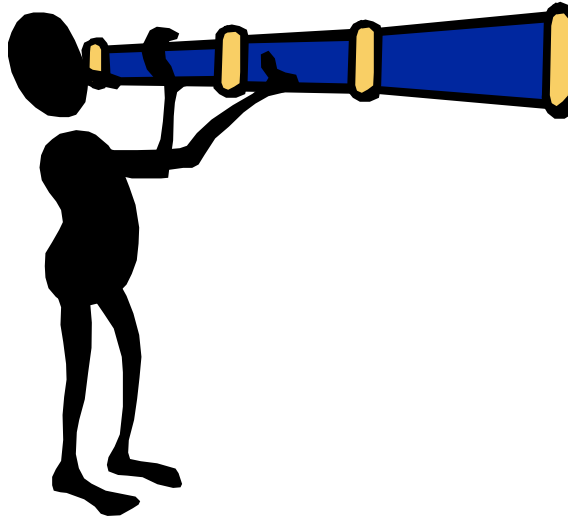
```
<web-app>
  <servlet>
    <servlet-name>beer4all</servlet-name>
    <servlet-class>org.apache.struts.action.ActionServlet</servlet-class>
    <init-param>
      <param-name>config</param-name>
      <param-value>/WEB-INF/struts-config.xml</param-value>
    </init-param>
    <load-on-startup>1</load-on-startup>
  </servlet>
  <servlet-mapping>
    <servlet-name>beer4all</servlet-name>
    <url-pattern>/action/*</url-pattern>
  </servlet-mapping>
  <taglib>
    <taglib-uri>/WEB-INF/struts-html.tld</taglib-uri>
    <taglib-location>/WEB-INF/struts-html.tld</taglib-location>
  </taglib>
  ... other tag library descriptors here
<</web-app>
```



Struts Configuration File

- Uses XML
- Defines the set of “rules” for a Struts application
- Starting with 1.1, can define multiple
- Gets parsed and loaded into memory at startup

Beer 4 All Struts Config File



Let's look at some source!



Internationalization Support

- Much of the framework's functionality based on `java.util.Locale`
- Struts Uses Java Resource Bundles



Using Java Resource Bundles

`global.title=Beer For All`

`label.featuredcatalogs=Featured Catalogs`

`label.featuredbeers=Featured Beers`

`label.username=Username`

`label.password=Password`

`errors.required={0} is required.`

`errors.minlength={0} can not be less than {1} characters.`

`errors.maxlength={0} can not be greater than {1} characters.`

`errors.invalid={0} is invalid.`

`errors.byte={0} must be an byte.`

`errors.short={0} must be an short.`

`errors.integer={0} must be an integer.`

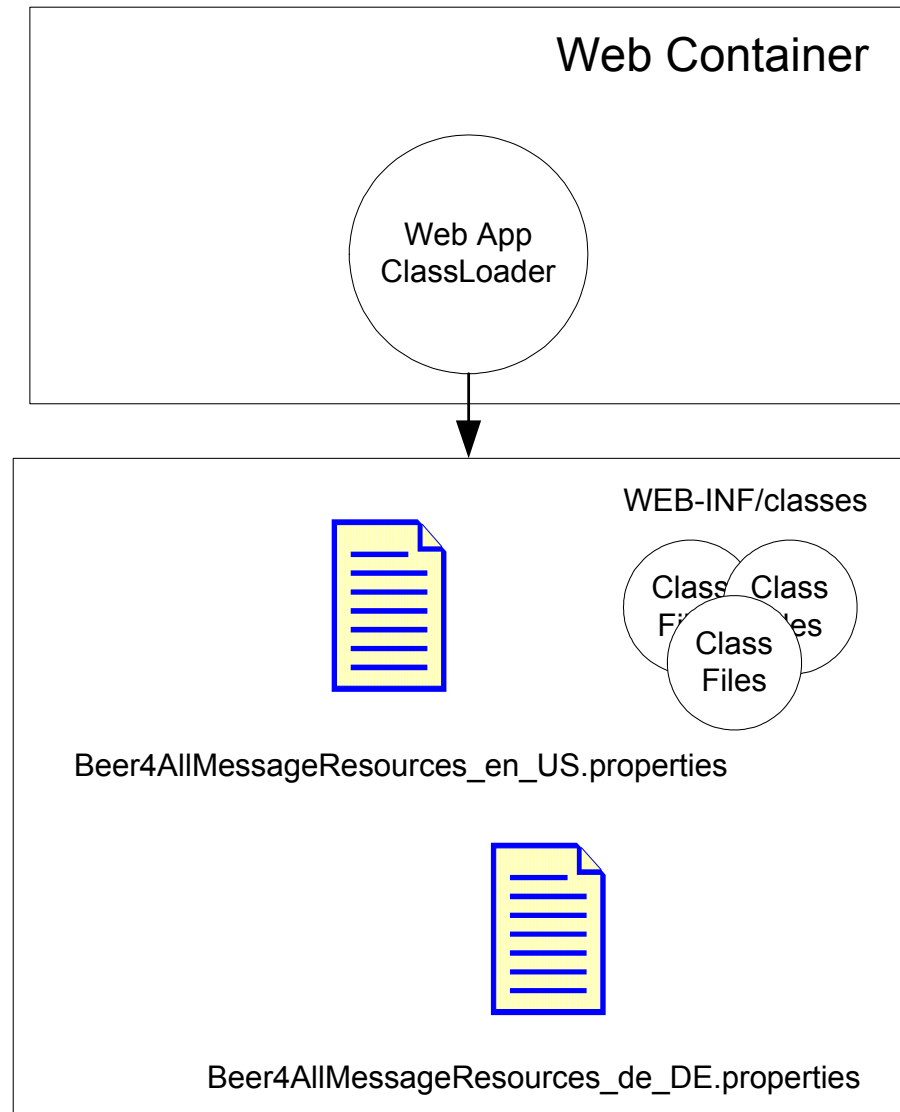
`errors.long={0} must be an long.`

`errors.float={0} must be an float.`

`errors.double={0} must be an double.`

`errors.date={0} is not a date.`

Locale-based Message Bundles



Accessing messages from JSP Tags

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

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

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

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

```
<html:form action="main">
```

```
<head>
```

```
<html:base/>
```

```
<link rel="stylesheet" href="stylesheets/format_win_nav_main.css" type="text/css">
```

```
<title><bean:message key="global.title"/></title>
```

```
</head>
```



I18N is more than Resource Bundles

- Date and Time Formatting
- Currency Formatting
- Currency Conversion
- Text direction
- Proper Input Controllers
- Color Conventions
- etc...



Overview of Struts 1.1 Features

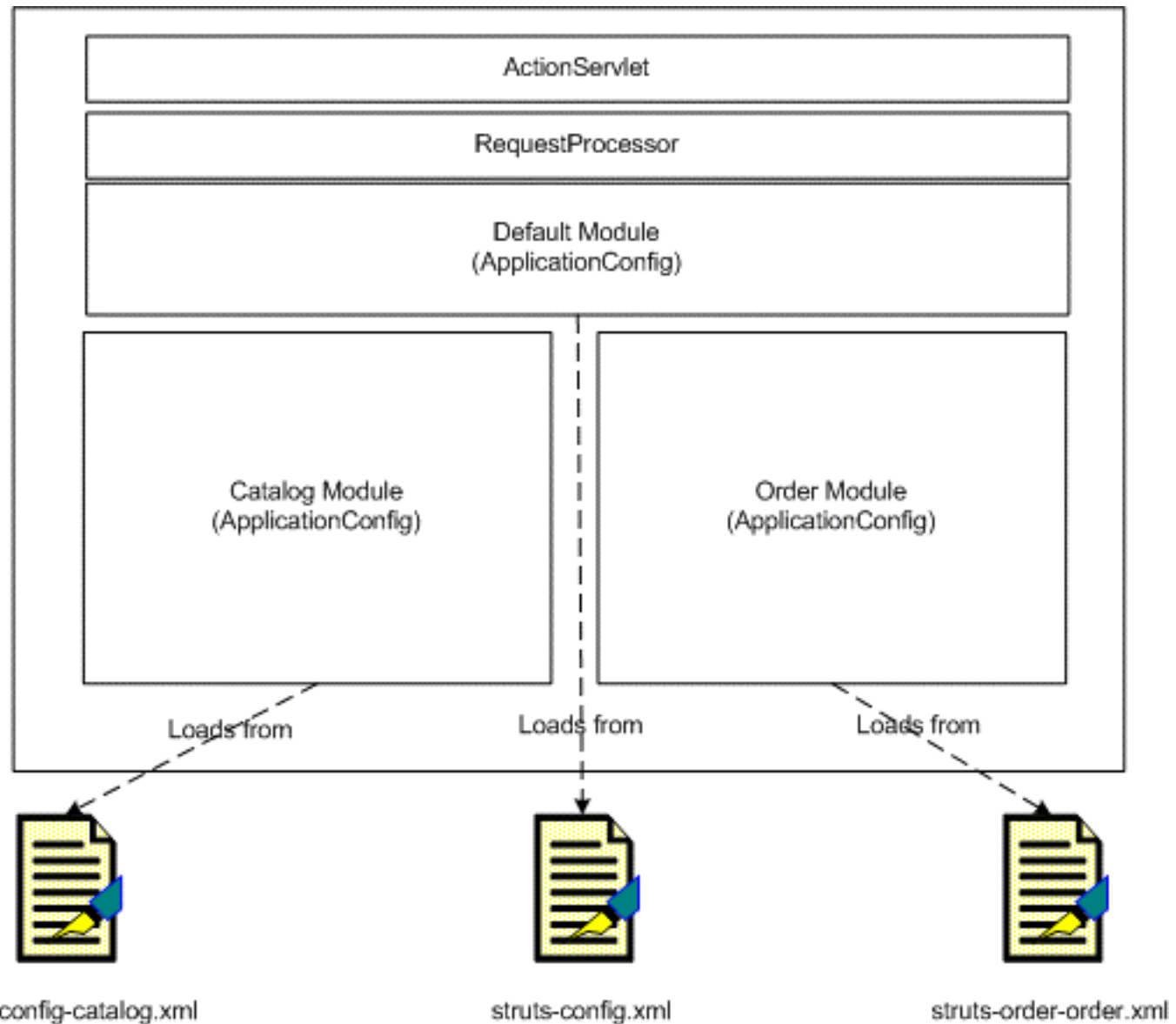
- Multi-Module Support
- Declarative Exception-Handling
- Dynamic ActionForms
- Nested Tag Library
- New Config Package
- More Extension Points
- Validator integrated with Core
- Tiles integrated with Core
- Plugins
- Uses Commons Components



Multi-Module Support

- Separate, independent application modules (sub-applications)
- Supports parallel development
- Separate Struts configuration files
- Use the SwitchAction to move between application modules

Multi-Application Support





Exception Handling Capabilities

- Declarative or/and Programmatic Support
- Declarative added to 1.1
- Define which exceptions can be thrown for which actions
- Create your own custom *ExceptionHandler*, per action if necessary

How Declarative Exception Handling works

```
public ActionForward execute( ActionMapping mapping, ActionForm form, HttpServletRequest request, HttpServletResponse response ) throws Exception {
```

```
    String username = ((LoginForm)form).getUsername();
```

```
    String password = ((LoginForm)form).getPassword();
```

```
    ServletContext context = getServlet().getServletContext();
```

```
    // Login through the security service
```

```
    Beer4AllService serviceImpl = this.getBeer4AllService();
```

```
    // Authenticate the user
```

```
    UIView userView = serviceImpl.authenticate(username, password);
```

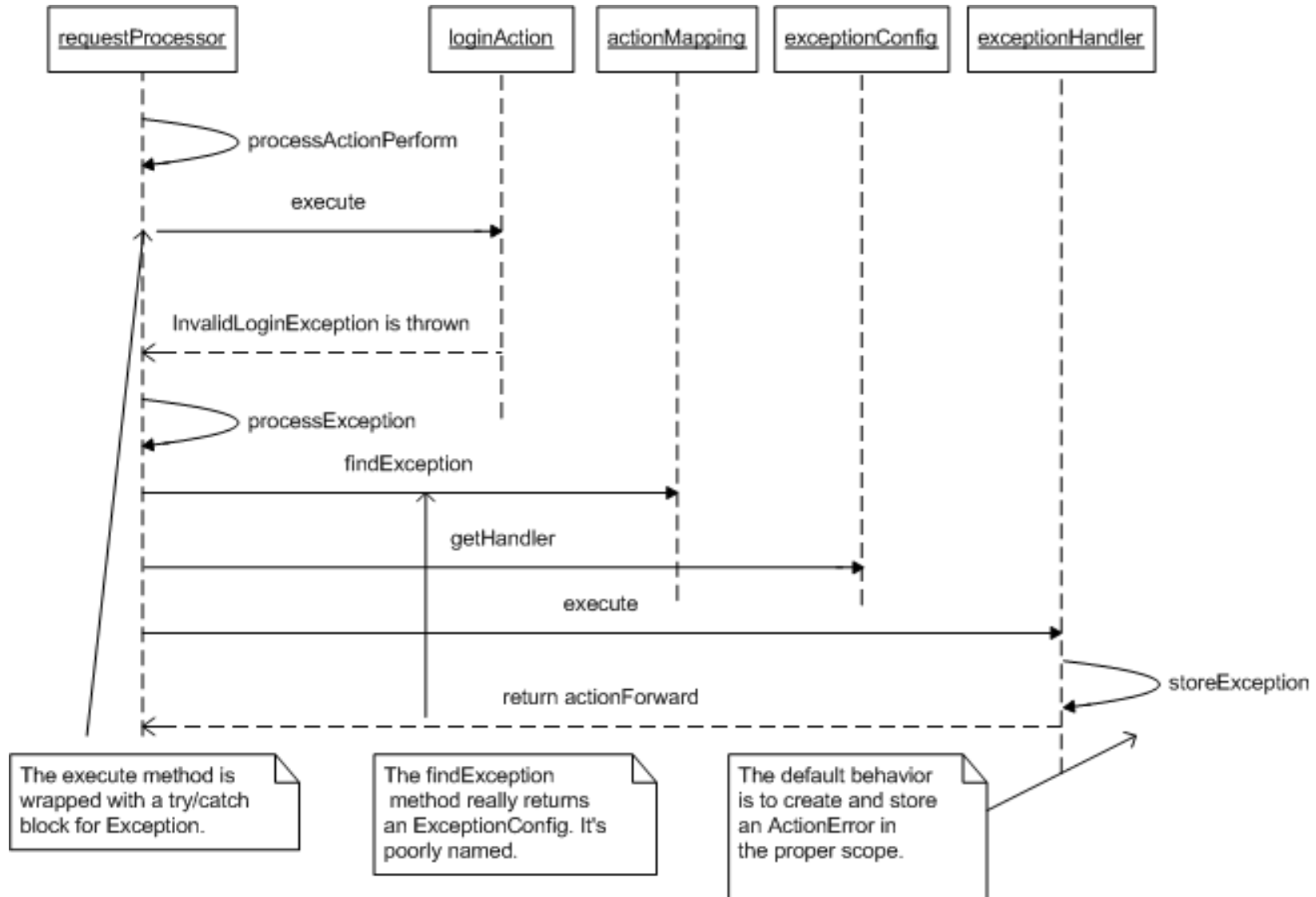
```
    UserContainer existingContainer = getUserContainer(request);
```

```
    existingContainer.setUserView( userView );
```

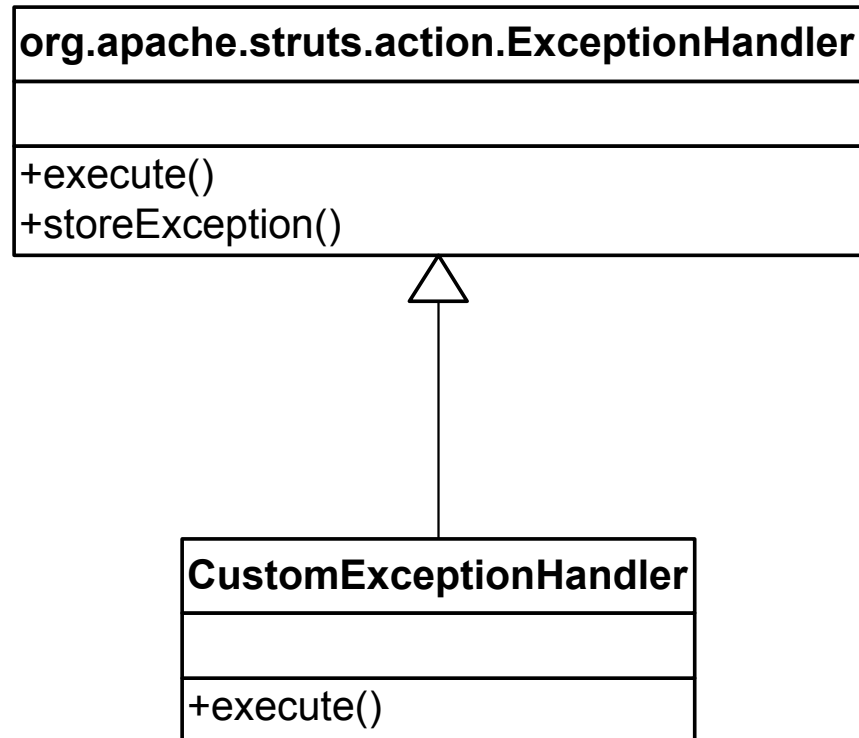
```
    return mapping.findForward(Constants.SUCCESS_KEY);
```

```
}
```

Declarative Exception Handling



Override the ExceptionHandler



Programmatic Exception Handling

```
public ActionForward execute( ActionMapping mapping, ActionForm form,
    HttpServletRequest request,
    HttpServletResponse response ) throws Exception{
    UserView userView = null;
    String username = ((LoginForm)form).getUsername();
    String password = ((LoginForm)form).getPassword();
    Beer4AllService serviceImpl = this.getBeer4AllService();
    try{
        // Attempt to authenticate the user
        userView = serviceImpl.authenticate(username, password);
    }catch( InvalidLoginException ex ){
        ActionErrors errors = new ActionErrors();
        ActionError newError = new ActionError( "" );
        errors.add( ActionErrors.GLOBAL_ERROR, newError );
        saveErrors( request errors);
        return mapping.findForward( Constants.FAILURE_KEY );
    }
    UserContainer existingContainer = getUserContainer(request);
    existingContainer.setUserView( userView );
    return mapping.findForward(Constants.SUCCESS_KEY);
}
```



Programmatic or Declarative?

- Use Declarative Exception Handling if possible.
- Customize the `ExceptionHandler` for customized behavior
- Use programmatic only when necessary



Dynamic ActionForms

- Define ActionForms declaratively
- Behave like regular ActionForms throughout the application
- No need to define ActionForm classes



DynaActionForm Example

```
<form-bean
```

```
  name="checkoutForm"
```

```
  type="org.apache.struts.validator.DynaValidatorForm">
```

```
    <form-property name="shippingAddress" type="java.lang.String"/>
```

```
    <form-property name="shippingCity" type="java.lang.String"/>
```

```
    <form-property name="shippingState" type="java.lang.String"/>
```

```
    <form-property name="shippingPostal" type="java.lang.String"/>
```

```
</form-bean>
```

DynaActionForm Example (continued)

```
<table>
```

```
<tr><b>Shipping Address</b></tr>
```

```
<tr> <td>Address:</td>
```

```
  <td><html:text name="checkoutForm" property="shippingAddress"/></td></tr>
```

```
<tr><td>City:</td>
```

```
  <td><html:text name="checkoutForm" property="shippingCity"/></td></tr>
```

```
<tr><td>State:</td>
```

```
  <td><html:text name="checkoutForm" property="shippingState"/></td></tr>
```

```
<tr><td>Postal:</td>
```

```
  <td><html:text name="checkoutForm" property="shippingPostal"/></td></tr>
```

```
</table>
```




The Struts Validator

- Open source Validation framework
- Developed by David Winterfeldt
- Integrated into Struts core during 1.1
- Extendable and Flexible
- Can be used outside of Struts
- Utilizes Regular Expressions
- Uses the Jakarta ORO Package



Validator Features

- Allows for regular expressions to be used
- Comes with many pre-built validation routines
- Supports Client-Side (JavaScript) and Server-Side (Java)



Adding Validator to a Struts Application

```
<plug-in className="org.apache.struts.validator.ValidatorPlugIn">  
  <set-property  
    property="pathnames"  
    value="/WEB-INF/validator-rules.xml,/WEB-INF/validation.xml"/>  
</plug-in>
```



Validator configuration Files

- `validator-rules.xml`
- `validation.xml`



Validator-rules.xml File

```
<validator name="required"
  classname="org.apache.struts.util.StrutsValidator"
  method="validateRequired"
  methodParams="java.lang.Object,
    org.apache.commons.validator.ValidatorAction,
    org.apache.commons.validator.Field,
    org.apache.struts.action.ActionErrors,
    javax.servlet.http.HttpServletRequest"
  msg="errors.required">
//...some text deleted
```

Validator-rules.xml (continued)

```
<javascript><![CDATA[
function validateRequired(form) {
    var bValid = true;
    var focusField = null;
    var i = 0;
    var fields = new Array();
    oRequired = new required();
    for (x in oRequired) {
        if ((form[oRequired[x][0]].type == 'text' || form[oRequired[x][0]].type == 'textarea' ||
            form[oRequired[x][0]].type == 'select-one' || form[oRequired[x][0]].type == 'radio' ||
            form[oRequired[x][0]].type == 'password') && (form[oRequired[x][0]].value == "")) {
            if (i == 0) { focusField = form[oRequired[x][0]]; }
            fields[i++] = oRequired[x][1];
            bValid = false;
        }
    }
}
</javascript>
```



Validator.xml File

```
<form name="checkoutForm">
  <field
    property="shippingAddress"
    depends="required,mask">
    <arg0 key="label.address"/>
    <var>
      <var-name>mask</var-name>
      <var-value>^\w+$</var-value>
    </var>
  </field>
  ...

```



Message Bundle

...

errors.required={0} is required.

errors.minlength={0} can not be less than {1} characters.

errors.maxlength={0} can not be greater than {1} characters.

errors.invalid={0} is invalid.

errors.byte={0} must be an byte.

errors.short={0} must be an short.

errors.integer={0} must be an integer.

errors.long={0} must be an long.

errors.float={0} must be an float.

errors.double={0} must be an double.

errors.date={0} is not a date.

...


Validator Failures

Beer For All - Microsoft Internet Explorer provided by BellSouth

File Edit View Favorites Tools Help


Back Forward Stop Refresh Home Search Favorites Media History Mail Print Edit


Address http://localhost:8080/beer4all/action/finalizeOrder

*Beer for All*

Powered by Struts

Would you like to sign in?
Items in shopping cart: 1
Current Total: \$5.25



 To order this beer, enter a quantity below and click on the "Add to Cart" button.

- Address is required.
- City is required.
- State is required.
- Postal Code is required.

Shipping Address

Address:

City:

State:

Postal:

Validation failures

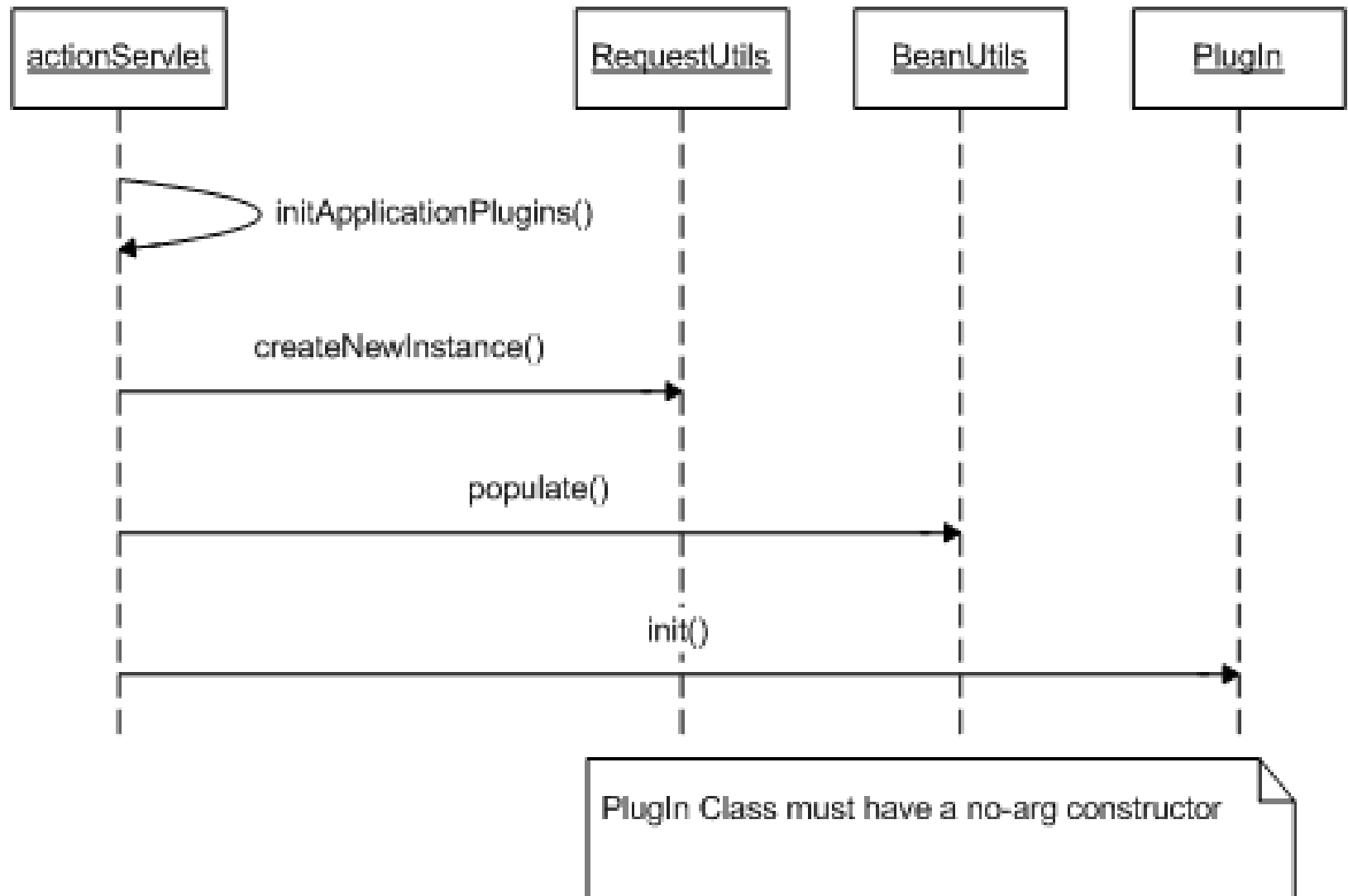
Local intranet



Struts Plug-in Capabilities

- Declarative means for “Startup Classes”
- Can declare multiple Plug-ins per sub-application
- Just need to implement the PlugIn interface
- Framework will call `init()` on startup and `destroy()` on shutdown

Using the Plug-in Functionality





Plug-in Example

```
<plug-in className="com.cavaness.beer4all.service.ServiceFactory">  
  <set-property  
    property="serviceName"  
    value="com.cavaness.beer4all.service.Beer4AllOBJService"/>  
</plug-in>
```



Beer4All ServiceFactory Plug-in

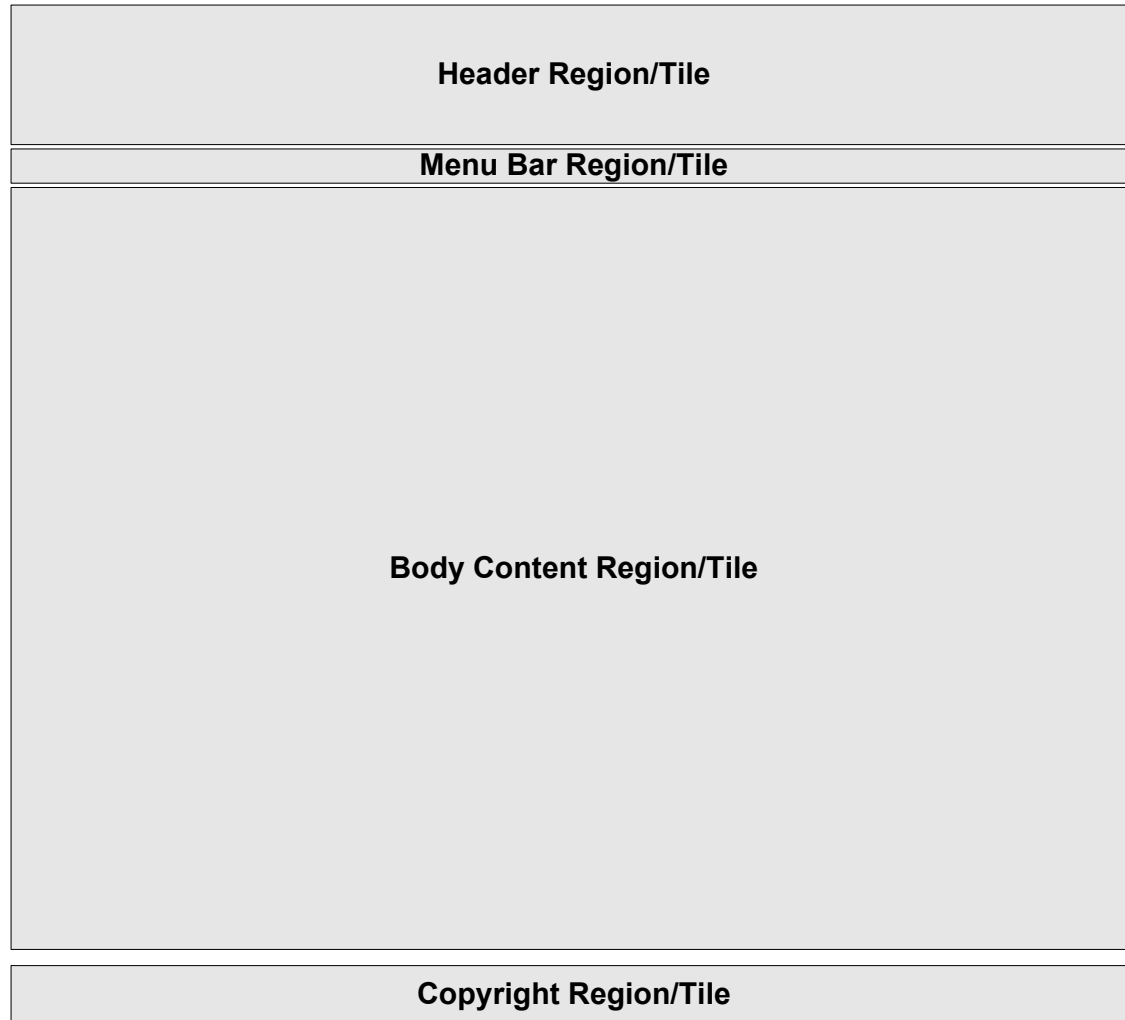
```
public class ServiceFactory implements PlugIn {  
    private String serviceName = null;  
    public String getServiceClassName(){  
        return serviceName;  
    }  
    public void setServiceClassName( String className ){  
        this.serviceName = className;  
    }  
    public void init(ActionServlet servlet, ApplicationConfig config){  
        // Perform initialization functionality here  
    }  
    public void destroy(){  
        // Perform shutdown functionality here  
    }  
}
```



Tiles Library Features

- Advanced templating mechanism
- Set of JSP Tags
- Supports the idea of Layouts (known as Tiles)
- Layouts based on Locale/Channel
- Tiles can be reused
- Created by Cedric Dumoulin (while working at S1 coincidentally)
- Added to core in Struts 1.1

Beer4All Layout





Beer4All Layout Tile

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

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

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

```
<html:html>
```

```
  <head><title><bean:message key="global.title"/></title> </head>
```

```
  <body topmargin="0" leftmargin="0" bgcolor="#FFFFFF">
```

```
    <b>tiles:insert attribute="header" />
```

```
    <b>tiles:insert attribute="banner"/>
```

```
    <b>tiles:insert attribute="body-content"/>
```

```
    <b>tiles:insert attribute="copyright"/>
```

```
  </body>
```

```
</html:html>
```




Beer4All JSPs Using Tiles

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

```
<tiles:insert page="/layouts/beer4AllDefaultLayout.jsp" flush="true">  
  <tiles:put name="header" value="/common/header.jsp" />  
  <tiles:put name="banner" value="/common/banner.jsp" />  
  <tiles:put name="body-content" value="/main.jsp" />  
  <tiles:put name="copyright" value="/common/copyright.jsp" />  
</tiles:insert>
```

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

```
<tiles:insert page="/layouts/beer4AllDefaultLayout.jsp" flush="true">  
  <tiles:put name="header" value="/common/header.jsp" />  
  <tiles:put name="banner" value="/common/banner.jsp" />  
  <tiles:put name="body-content" value="/beer.jsp" />  
  <tiles:put name="copyright" value="/common/copyright.jsp" />  
</tiles:insert>
```



Tiles XML Definition

```
<!DOCTYPE tiles-definitions PUBLIC "-//Apache Software Foundation//DTD Tiles Configuration//EN" "http://jakarta.apache.org/struts/dtds/tiles-config.dtd">
```

```
<tiles-definitions>
```

```
  <definition name="beer4All.default" path="/layouts/beer4allDefaultLayout.jsp">
```

```
    <put name="header" value="/common/header.jsp" />
```

```
    <put name="banner" value="/common/banner.jsp" />
```

```
    <put name="copyright" value="/common/copyright.jsp" />
```

```
  </definition>
```

```
</tiles-definitions>
```



Extending Tiles Definitions

```
<tiles-definitions>  
  <definition name="beer4All.custom" extends="beer4All.default">  
    <put name="copyright" value="/common/new-copyright.jsp" />  
  </definition>  
</tiles-definitions>
```



Other Tiles Resources

- Cedric's Site

(<http://www.lifl.fr/~dumoulin/tiles/>)

- My Chapter on Tiles

(<http://www.theserverside.com/resources/strutsreview.jsp>)



Jakarta Commons Packages

- BeanUtils
- Collections
- Digester
- DBCP
- Logging
- Lang
- Resources



Logging in a Struts Application

- Struts utilizes Commons Logging (jakarta.apache.org/Commons)
- Various logging implementations supported (JDK1.4, log4J, Console, etc.)



Logging Example

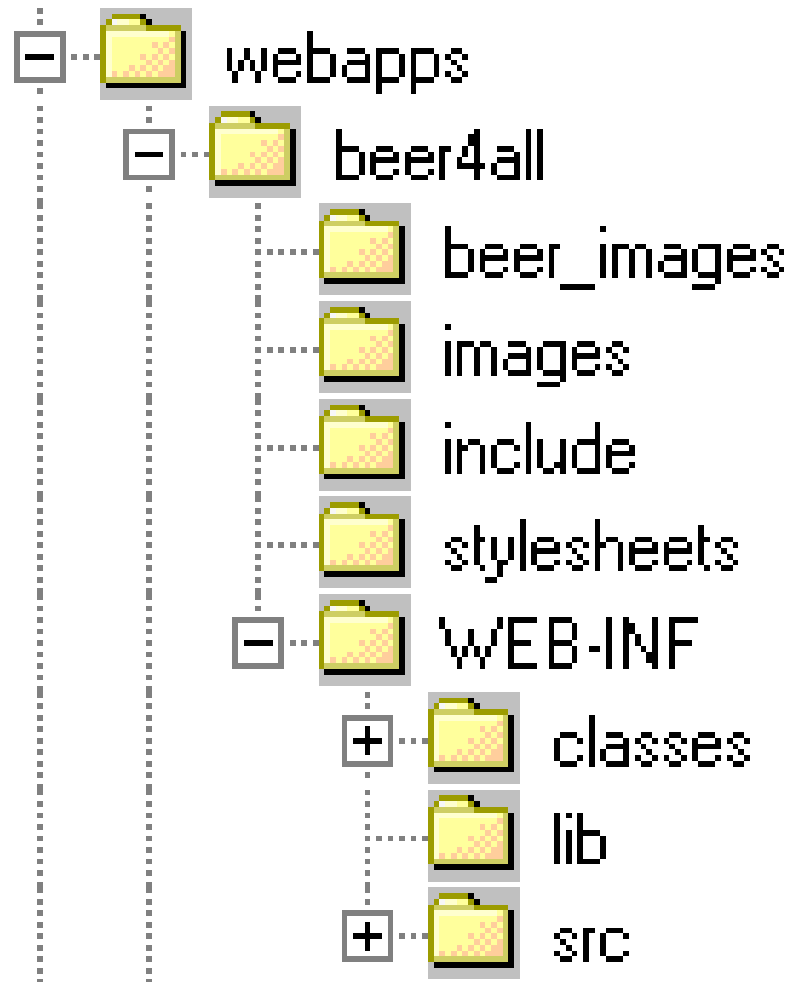
```
Log logger = LoggerFactory.getLog( getClass() );  
logger.debug( "LoginAction entered" );  
try{  
    // Attempt to authenticate the user  
    userView = serviceImpl.authenticate(username, password);  
}catch( InvalidLoginException ex ){  
    logger.error( "Exception in the LoginAction class", ex );  
    //...
```



Packaging and Deployment

- Package as a Web ARchive File (WAR)
- Deploys into any Servlet 2.2, JSP 1.1 compliant web container
- You can also leave it exploded
- Use Ant to build and deploy

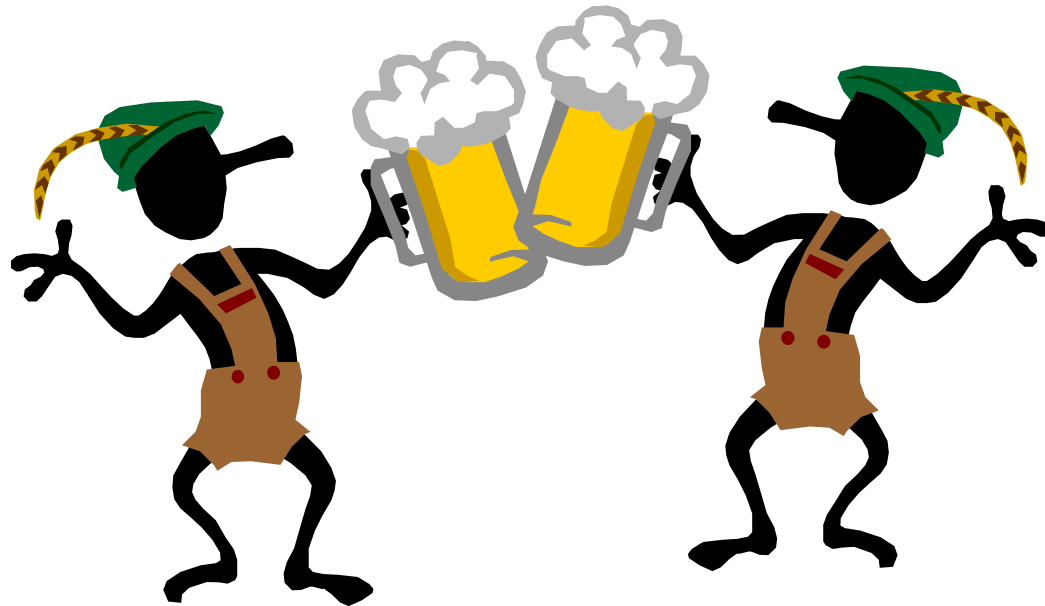
Beer4All Directory Structure



Beer4All Is a Success!



Beer Drinkers Everywhere Rejoice



The world unites by using Beer4All.com



Resources

- Jakarta Struts Home Site
(jakarta.apache.org/struts)
- Ted Husted's Site (<http://www.husted.com/struts>)
- TheServerSide Struts Book Review
(<http://www.theserverside.com/resources/strutsreview.jsp>)
- Jakarta Struts from O'Reilly
(Available for order on Amazon right now!)
- Struts user and dev mailing lists
- Atlanta Struts user group
(<http://www.open-tools.org/struts-atlanta/index.jsp>)

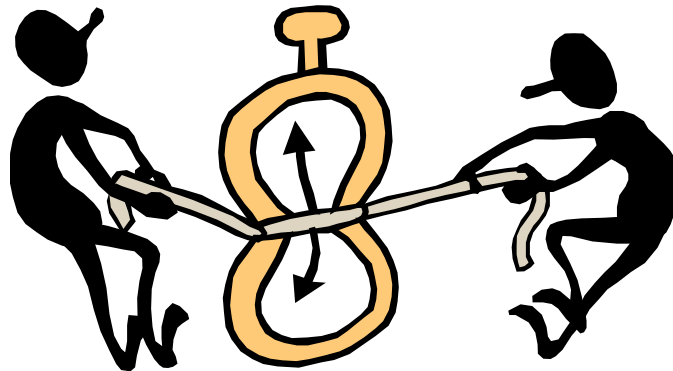
Third-Party Tools for Struts

- **Struts Console**
(<http://www.jamesholmes.com/struts>)
- **Easy Struts Project**
(<http://easystruts.sourceforge.net>)
- **Adalon** (<http://www.synthis.com>)
- **More**
(jakarta.apache.org/struts/resources)



When is 1.1 GA?

I Don't Know!



Q & A

What did I miss?