

Visual Struts: Modeling Struts-Based Applications using UML and Advanced Tool Support

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Forecast

- Will present tools and techniques that aid in both the development and documentation of Struts-based applications.
- Will not discuss tools that “hide” the struts framework (Compuware OptimalJ).

Outline

- Background on Struts
- Motivation
- Page Flow Diagrams using UML
- Tool Support for Visual Struts Development

Why Struts?

- De facto standard framework for web applications development.
 - TheServerSide Java Symposium 2005 revealed that **47%** of responded indicated that they **used Struts** as the web framework, compared to **20%** for the next runner-up, **Spring**.
 - **16 books** dedicated to Struts-based development.

Background: Struts

- A mostly black-box framework.
- Fills the J2EE gap in the interaction between JSPs and Servlets.
- A web variant of the model-view-controller (MVC) pattern.

What makes struts-development difficult?

- Relationships are defined in a declarative manner.
- Most inconsistencies/problems only show-up at runtime.
- Poor (default) IDE support (e.g. refactoring, dependencies).
- Debugging such applications can be very difficult.

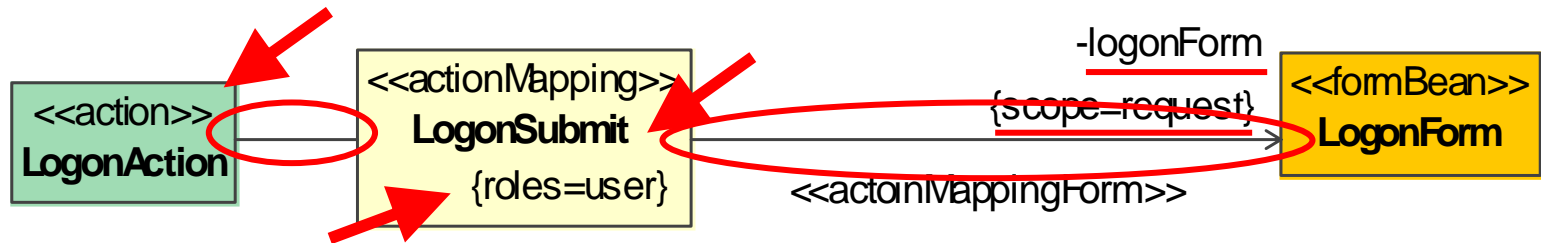
Tool Support

- Page Flow Diagrams
 - Visualize JSP pages and Struts elements (e.g. action mappings).
- Tool Support
 - Don't wait until runtime to spot problems.

Example Application



PFD: Action Mapping – General



```
<action-mappings>
```

```
<action
```

```
  path="/LogonSubmit"
```

```
  type="app.LogonAction"
```

```
  name="logonForm"
```

```
  scope="request"
```

```
    validate="true"
```

```
    input="/pages/Logon.jsp"
```

```
    roles="user">
```

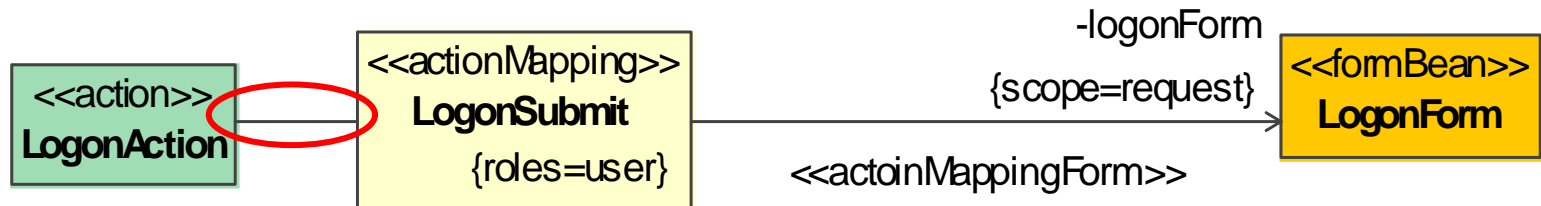
```
    <forward
```

```
      name="error"
```

```
      path="Logon.jsp"/>
```

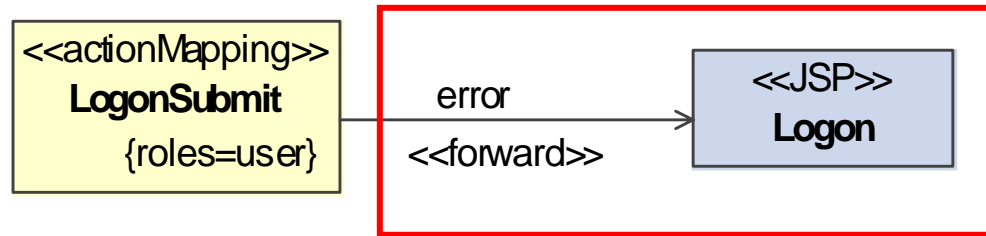
```
</action>
```

PFD: Action Mapping – General



```
public final class LogonAction extends Action {  
    public ActionForward execute(ActionMapping mapping, ...) {  
        ...  
    }  
}
```

PFD: Action Mapping – Local Forward



```
<action-mappings>
```

```
<action
```

```
  path="/LogonSubmit"
```

```
  type="app.LogonAction"
```

```
  name="logonForm"
```

```
  scope="request"
```

```
  validate="true"
```

```
  input="/pages/Logon.jsp"
```

```
  roles="user">
```

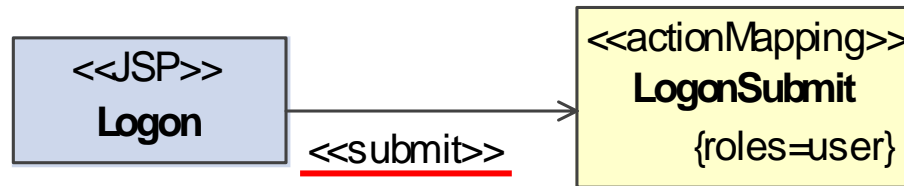
```
    <forward
```

```
      name="error"
```

```
      path="Logon.jsp"/>
```

```
</action>
```

PFD: Action Mapping – Submit



In Logon.jsp:

```
<html:form action="/LogonSubmit" focus="username">
```

...

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

PFD: Global Forward – JSP to JSP



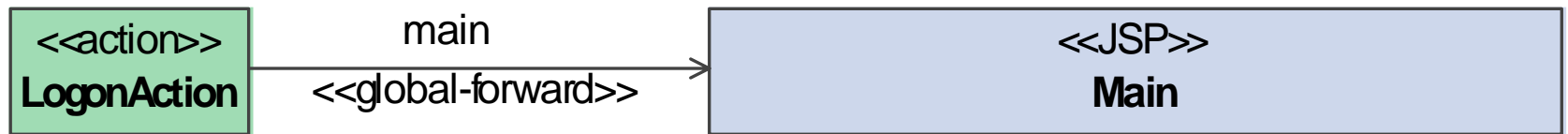
→ **Welcome.jsp**

```
<logic:forward  
  name="logon"/>
```

struts-config.xml

```
<global-forwards>  
  <forward name="logon"  
    path="Logon.jsp"/>
```

PFD: Global Forward – Action to JSP



```
public final class LogonAction extends Action {  
    public ActionForward execute(ActionMapping mapping, ...) {  
  
        ...  
  
        return (mapping.findForward("main"));  
    }  
}
```

PFD: Object Usage

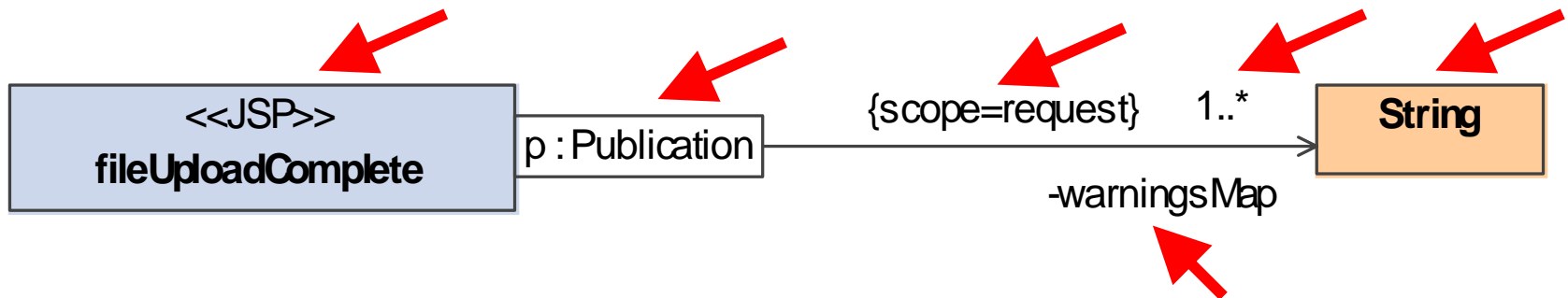


In Main.jsp:

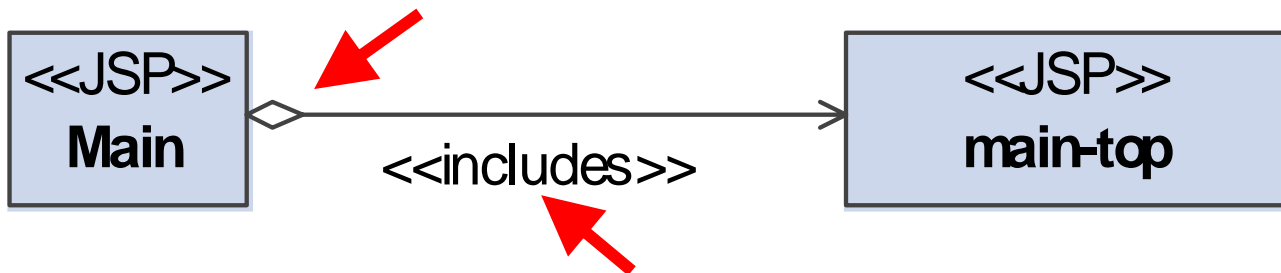
Welcome <bean:write name="user" property="username"/>!

PFD: Map Usage in JSPs

```
<c:forEach items='${warningsMap}' var='w'>
  <p> Title: ${w.key.title} </p>
  <ul> <c:forEach items='${w.value}' var='warning'>
    <li>${warning}</li>
  </ul> </c:forEach>
</c:forEach>
```



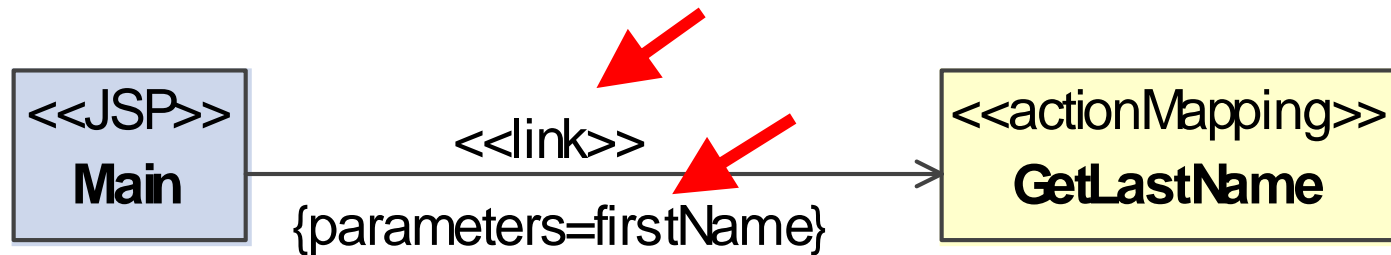
PFD: JSP Include Relationship



In Main.jsp:

```
<%@include file="main-top.jsp"%>
```

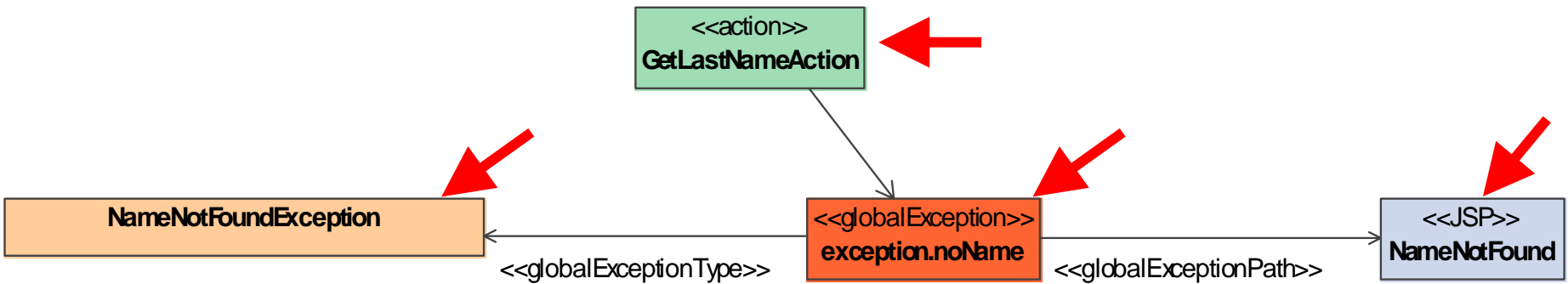
PFD: Link



In Main.jsp:

```
<html:link action="GetLastName" paramId="firstName" paramName="user"  
  paramProperty="username">Get last name</html:link>
```

PFP: Global Exception



```
<global-exceptions>
```

```
<exception
```

```
  key="exception.noName"
```

```
  type="app.NameNotFoundException"
```

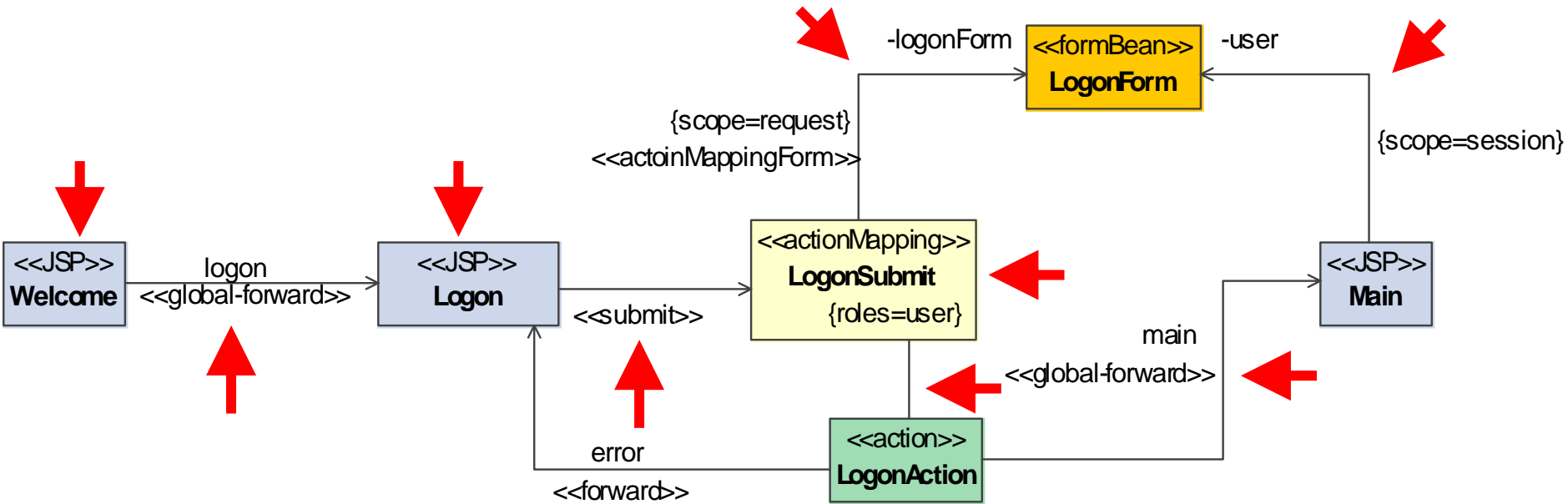
```
  path="/pages/NameNotFound.jsp"/>
```

```
</global-exceptions>
```

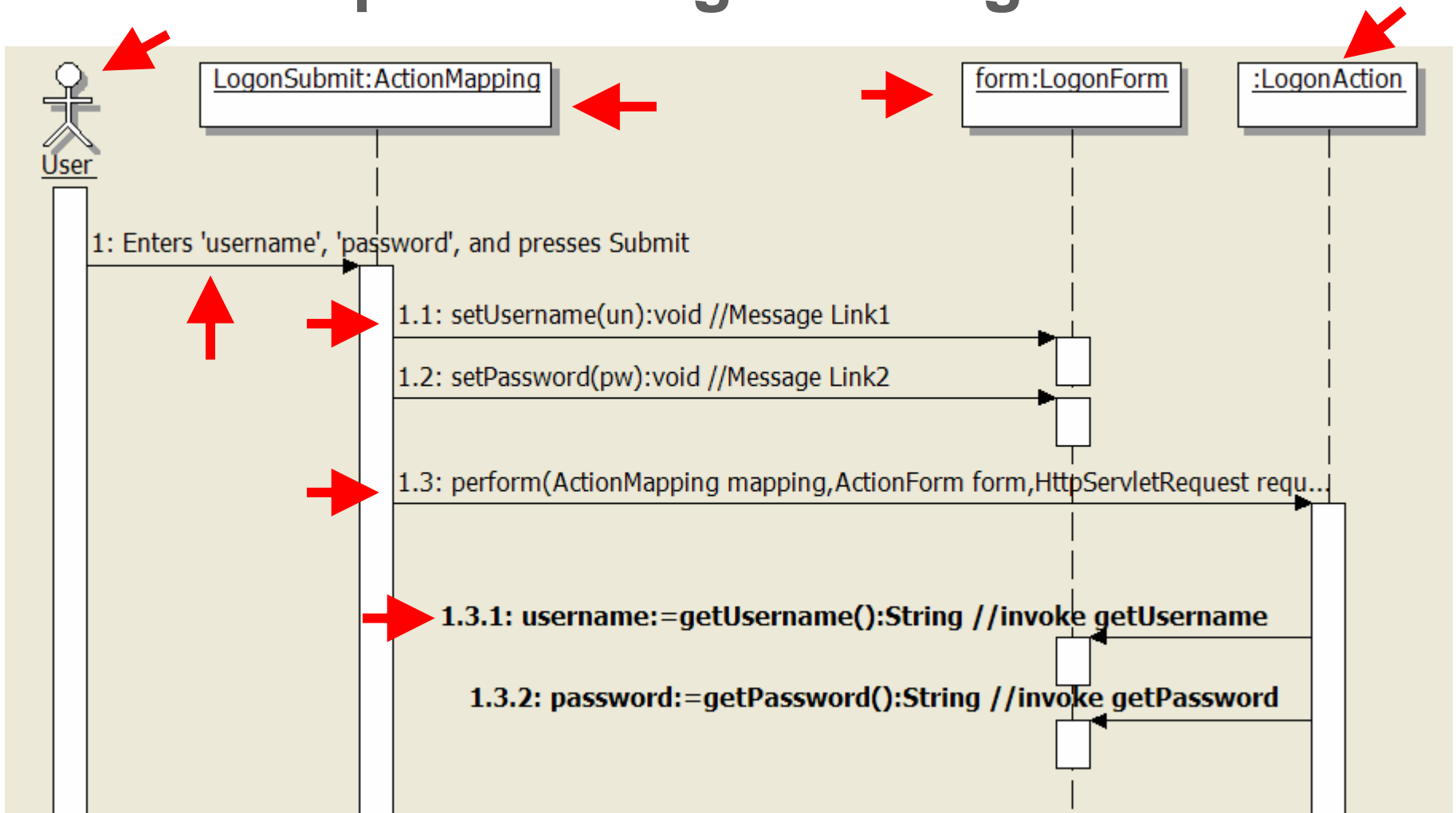
PFD Uses

- Static view (based on the class diagram).
- Document functionality (defined in a use case).
- Document patterns used in the application.
- Helps in performing an impact analysis.

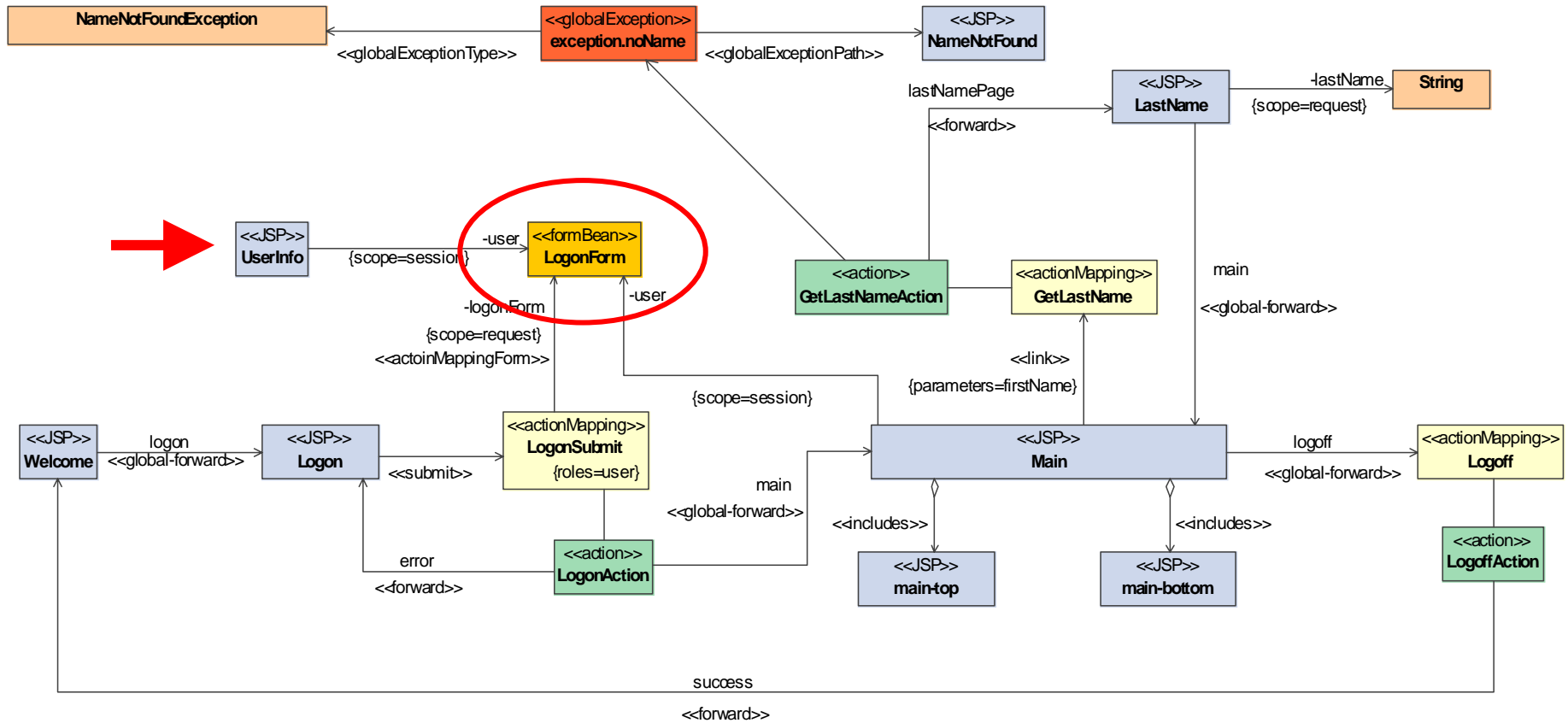
Use Case View: Logon



Sequence Diagram: Logon



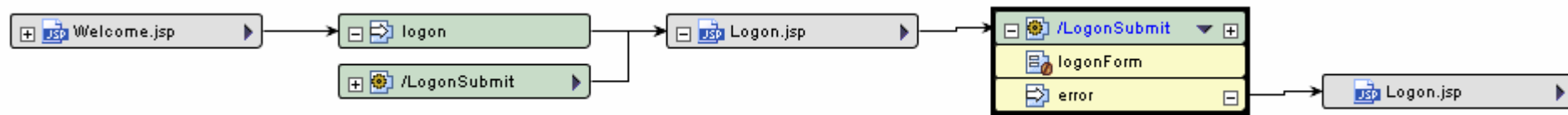
Package View



Tool Support

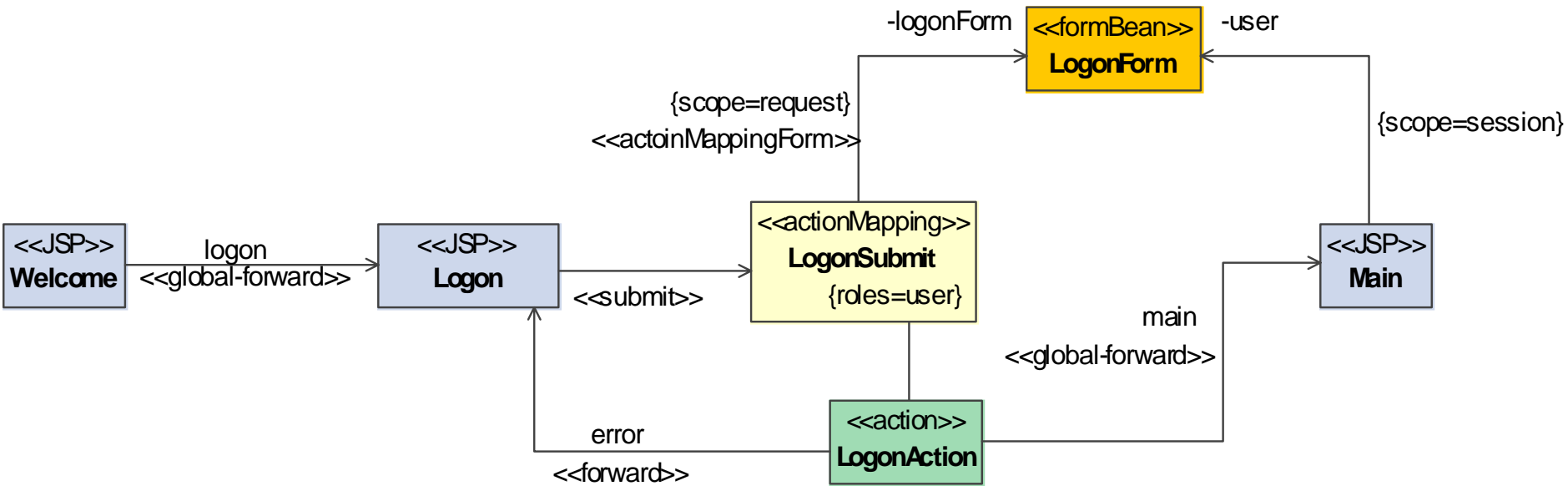
- Struts UML Profile
 - MagicDraw Community Edition (Free)
 - Disconnected from the code.
- Alternatives:
 - Oracle JDeveloper (Free)
 - Exadel Studio (Free)
 - M7 NitroX (\$500)

M7 NitroX: struts-config.xml visualization

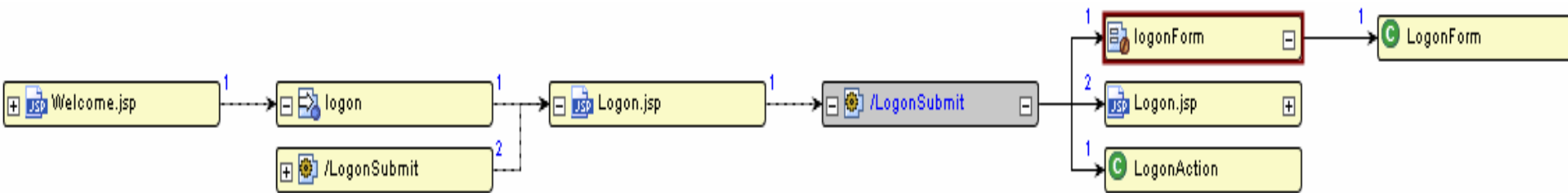


- LogonAction is not shown.
 - Flow to Main.jsp is not shown.
- LogonForm is only implicitly visible.

Use Case View (repeated)

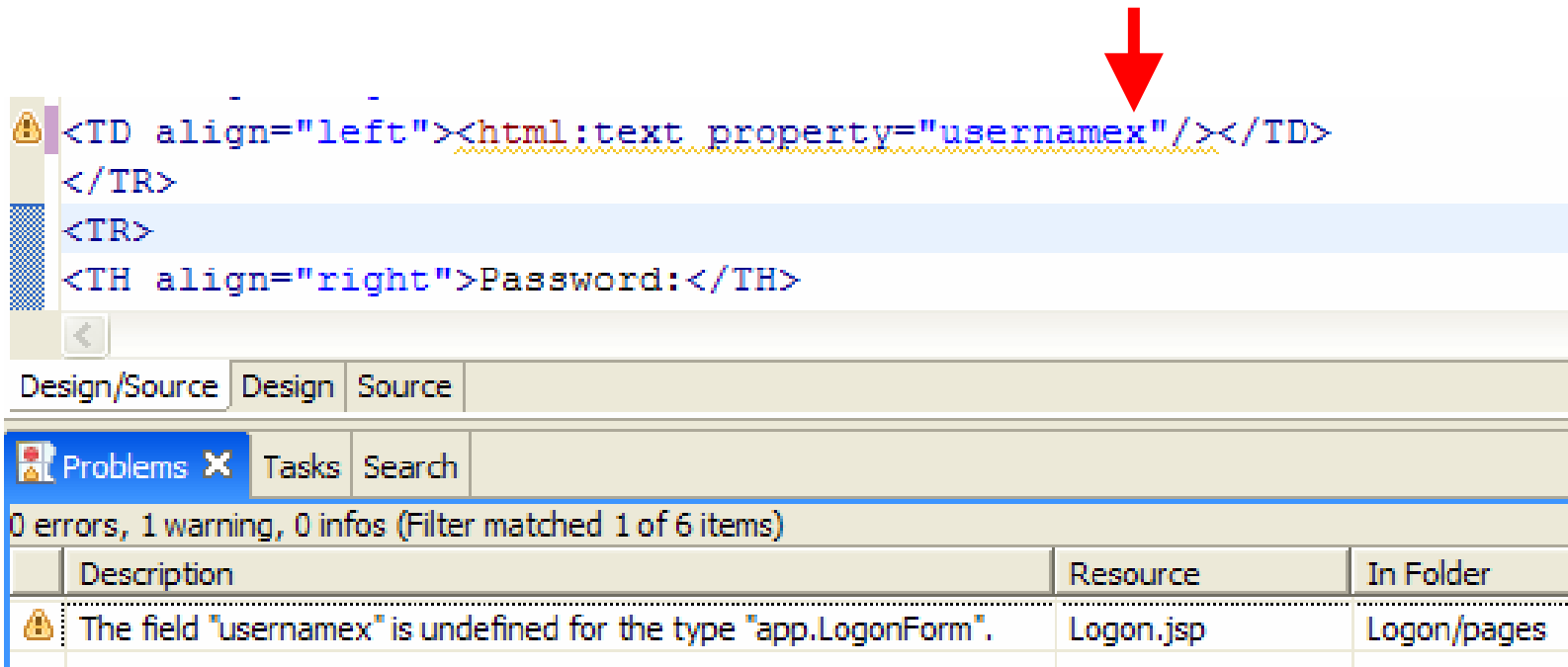


M7 NitroX: Dependency visualization



- Does not show LogonAction's dependence on Main.jsp.
- Dependencies on non-struts objects are not shown.

M7 NitroX: Thorough Support




The screenshot shows an IDE interface. The top part is a code editor with the following HTML code:

```
<TD align="left"><html:text property="username"/></TD>
</TR>
<TR>
<TH align="right">Password:</TH>
```

A red arrow points to the `<html:text property="username"/>` tag in the code editor.

Below the code editor is a toolbar with tabs for "Design/Source", "Design", and "Source". Below that is a "Problems" window with tabs for "Problems", "Tasks", and "Search". The "Problems" window shows a warning message:

0 errors, 1 warning, 0 infos (Filter matched 1 of 6 items)

Description	Resource	In Folder
 The field "username" is undefined for the type "app.LogonForm".	Logon.jsp	Logon/pages

A red arrow points to the warning message in the Problems window.

M7 NitroX: Advanced Code Completion



```
<html:form action="/LogonSubmit" focus="username">
<TABLE border="0" width="100%">
<TR>
<TH align="right">Username:</TH>
<TD align="left"><html:text property="" /></TD>
</TR>
<TR>
<TH align="right">Password:</TH>
<TD align="left"><html:password proper
</TR>
<TR>
```

A code completion popup menu is shown on the right side of the code editor. It contains two entries: "password" and "username". The "password" entry is currently selected and highlighted in a light green color. The popup has a light pink background and a thin border.



Design/Source Design Source

Problems Tasks Search

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BESTweb

Publications List Display Settings

<input type="checkbox"/> Publication Type	<input type="checkbox"/> Place Published
<input checked="" type="checkbox"/> First Author	<input type="checkbox"/> URL
<input type="checkbox"/> All Authors	<input type="checkbox"/> ID
<input checked="" type="checkbox"/> Year	<input type="checkbox"/> Publisher
<input checked="" type="checkbox"/> Title	<input type="checkbox"/> ISBN
<input type="checkbox"/> Source	<input type="checkbox"/> BEST codes
<input type="checkbox"/> Editors	<input type="checkbox"/> Number Of Volumes
<input type="checkbox"/> Volume	<input type="checkbox"/> Section
<input type="checkbox"/> Issue	<input type="checkbox"/> Edition
<input type="checkbox"/> Pages	<input type="checkbox"/> Date
<input type="checkbox"/> Alternate Title	<input type="checkbox"/> Type Of Work
<input type="checkbox"/> Notes	<input type="checkbox"/> Accession Number
<input type="checkbox"/> Abstract	

Cancel

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Publications List Display Settings

<input type="checkbox"/>	<input type="checkbox"/>
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<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

Cancel

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jsp:directive-include (./include-top.jsp)

<%= context %>/img/logo-part1.png <%= context %>/img/logo-part2.png

jsp:directive-include (isInitialized.jsp)

logic:notPresent (displaySettings)

logic:forward (showMain)

Publications List Display Settings

html:form (/DisplaySubmit)

<input checked="" type="checkbox"/> showPubType	<input checked="" type="checkbox"/> showPlacePublished
<input checked="" type="checkbox"/> showAuthor	<input checked="" type="checkbox"/> showUrl
<input checked="" type="checkbox"/> showAllAuthors	<input checked="" type="checkbox"/> showId
<input checked="" type="checkbox"/> showYear	<input checked="" type="checkbox"/> showPublisher
<input checked="" type="checkbox"/> showTitle	<input checked="" type="checkbox"/> showIsbn
<input checked="" type="checkbox"/> showSource	<input checked="" type="checkbox"/> showCodes
<input checked="" type="checkbox"/> showEditors	<input checked="" type="checkbox"/> showNumberOfVolumes
<input checked="" type="checkbox"/> showVolume	<input checked="" type="checkbox"/> showSection
<input checked="" type="checkbox"/> showIssue	<input checked="" type="checkbox"/> showEdition
<input checked="" type="checkbox"/> showPages	<input checked="" type="checkbox"/> showDate
<input checked="" type="checkbox"/> showNotes	<input checked="" type="checkbox"/> showTypeOfWork
<input checked="" type="checkbox"/> showAbstract	<input checked="" type="checkbox"/> showAccessionNumber

OK Cancel

jsp:directive-include (./include-bottom.jsp)

M7 NitroX: Summary

- Advanced tool for struts-based web-app development.
- Wizards automate redundant tasks.
- The tool is not perfect (e.g. Java refactoring is not extended to Struts elements).
- Good tools are worth the money.

Summary

- Struts-based application development can be complex.
- Tools & visual aids help.
- The tools are most beneficial to people who are not familiar with Struts/JSP or the system.
- Struts UML profile: flexible and powerful.
- Struts tools: all about automation.

Reference: Struts Tools

- M7 NitroX
- Oracle JDeveloper
- MyEclipse J2EE IDE
- Exadel Studio
- Borland JBuilder
- IBM WebSphere Studio Site Developer