



# Apache Struts: Laying Out Pages with Tiles

## Struts 1.2 Version

Core Servlets & JSP book: [www.coreservlets.com](http://www.coreservlets.com)  
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Taught by the author of *Core Servlets and JSP*, *More Servlets and JSP*, and this tutorial. Available at public venues, or customized versions can be held on-site at your organization.

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# Agenda

- **Tiles motivations**
- **Tiles basics**
  - Sketch out desired layout
  - Make template file that represents layout
  - Create JSP pages that define layout pieces
  - Create JSP pages that populate layout
- **Handling relative URLs in Tiles**
  - Use `html:rewrite`
- **Using Tiles definitions file**

# Tiles Motivations

- **Reuse (not rewrite) repeated sections of pages**
- **Simplify the creation of similar pages**
- **Increase flexibility and ease of maintenance compared to `<jsp:include .../>`.**



# Tiles Basics

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## Prerequisites

- **Two entries needed in struts-config.xml**

```
<controller processorClass=  
    "org.apache.struts.tiles.TilesRequestProcessor"/>  
...  
<plug-in className="org.apache.struts.tiles.TilesPlugin" >  
    <!-- Path to XML definition file -->  
    <set-property property="definitions-config"  
        value="/WEB-INF/tiles-defs.xml" />  
    <!-- Set Module-awareness to true -->  
    <set-property property="moduleAware" value="true" />  
</plug-in>
```
- **These entries already exist in the struts-config.xml bundled with struts-blank**
  - No changes or additions required

# Tiles Basics

## 1. Sketch out desired layout

- Do this on paper

## 2. Make template file that represents layout

- Use `tiles:insert` wherever layout piece goes
- Use `tiles:getAsString` wherever changeable text goes
- To prevent direct access, put template in WEB-INF

## 3. Create JSP pages that define layout pieces

- JSP pages containing HTML snippets
- To prevent direct access, put JSP pages in WEB-INF

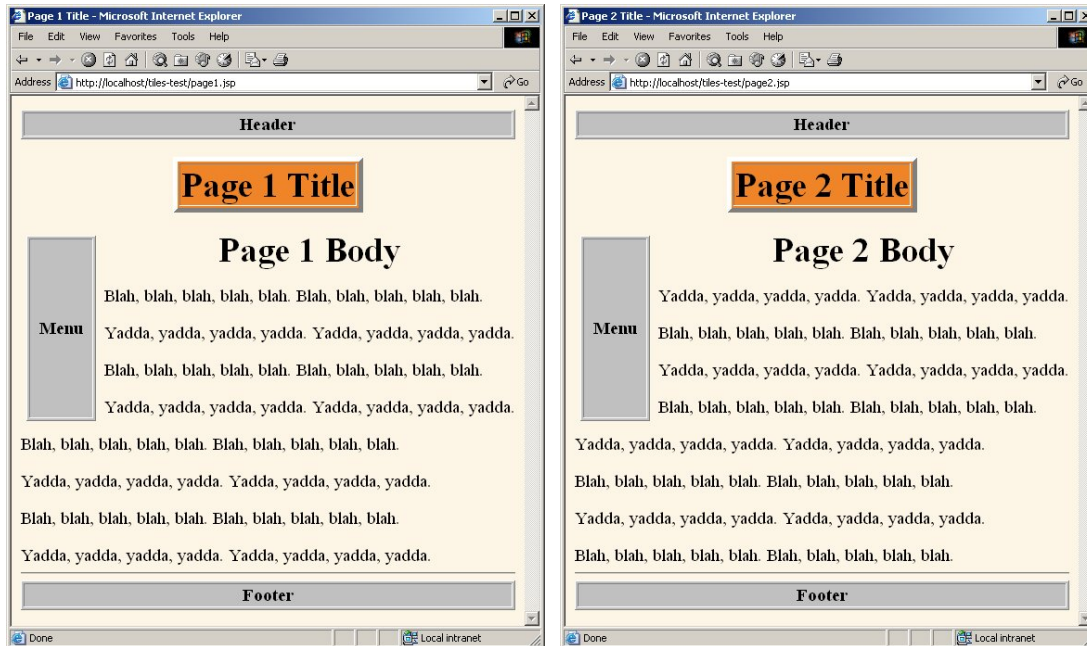
## 4. Create JSP pages that populate layout

- Use `tiles:insert` to refer to the layout from #1 above
- Use `tiles:put` to specify layout pieces
- Unless forwarded to, JSP *not* in WEB-INF

# Step 1: Sketch Out Desired Layout

- **Many sites have groups of pages that have a consistent general layout**
  - E.g., our example pages will contain five elements
    - Header
    - Title
    - Menu
    - Body
    - Footer
- **Often only one or two parts (e.g., the body) changes from page to page**
- **Helpful to sketch layout on paper**

# Step 1: Sketch Out Desired Layout



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# Step 2: Make Template File That Represents Layout

- Use regular HTML for parts that never change
- Declare the Struts tiles tag library
  - `<%@ taglib uri="http://struts.apache.org/tags-tiles" prefix="tiles" %>`
- Use `tiles:insert` to stub out sections that will be filled in by template pieces
  - `<tiles:insert attribute="header"/>`
  - The eventual JSP page will associate a real file with the header attribute
- Use `tiles:getAsString` to stub out locations that will be replaced by simple text
  - `<tiles:getAsString name="title"/>`
- Template file should never be accessed directly
  - So, put it in WEB-INF to avoid accidental access

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## Step 2: Make Template File That Represents Layout

- **WEB-INF/tiles/layout.jsp**

```
<%@ taglib uri="http://struts.apache.org/tags-tiles"
      prefix="tiles" %>
<!DOCTYPE ...>
<HTML>
<HEAD><TITLE><tiles:getAsString name="title"/></TITLE></HEAD>
<BODY BGCOLOR="#FDF5E6">
<tiles:insert attribute="header"/>
<P>
<TABLE BORDER=5 ALIGN="CENTER" BGCOLOR="#EF8429">
  <TR><TH><FONT SIZE="+3">
    <tiles:getAsString name="title"/>
  </FONT></TH></TR></TABLE>
<P>
<TABLE WIDTH=75 ALIGN="LEFT" CELLSPACING="5">
<TR><TD><tiles:insert attribute="menu"/></TD></TR>
</TABLE>
<tiles:insert attribute="body"/>
<BR CLEAR="ALL"><HR>
<tiles:insert attribute="footer"/>
</BODY></HTML>
```

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## Step 3: Create JSP Pages That Define Layout Pieces

- **These are regular JSP pages that define portions of an HTML page**
  - Be sure not to repeat tags such as DOCTYPE, HEAD, BODY, etc., that are defined in template file from Step 2
- **These pages can themselves be tiles**
- **Pages can use the bean: and html: Struts tags**
  - Layout pieces can access beans that are in request scope
- **Layout pieces should never be accessed directly**
  - So, put them in WEB-INF to avoid accidental access

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## Step 3: Create JSP Pages That Define Layout Pieces

- **WEB-INF/tiles/header.jsp**

```
<TABLE BORDER=1 WIDTH="100%" BGCOLOR="#C0C0C0">  
  <TR><TH>Header</TH></TR>  
</TABLE>
```

- **WEB-INF/tiles/body1.jsp**

```
<H1 ALIGN="CENTER">Page 1 Body</H1>  
Blah, blah, blah, blah, blah.  
Blah, blah, blah, blah, blah.  
<P>  
Yadda, yadda, yadda, yadda.  
Yadda, yadda, yadda, yadda.
```

- **WEB-INF/tiles/footer.jsp**

```
<TABLE BORDER=1 WIDTH="100%" BGCOLOR="#C0C0C0">  
  <TR><TH>Footer</TH></TR>  
</TABLE>
```

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## Step 4: Create JSP Pages That Populate Layout

- **Declare the Struts tiles tag library**

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

- **Use tiles:insert to refer to the layout defined in Step 2**

```
<tiles:insert page="/WEB-INF/tiles/layout.jsp">
```

...

```
</tiles:insert>
```

- **Use tiles:put to specify the layout pieces that apply to this specific page**

```
<tiles:insert ...>
```

```
  <tiles:put name="title" value="Page 1 Title"/>
```

```
  <tiles:put name="header"  
    value="/WEB-INF/tiles/header.jsp"/>
```

```
</tiles:insert>
```

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# Step 4: Create JSP Pages That Populate Layout

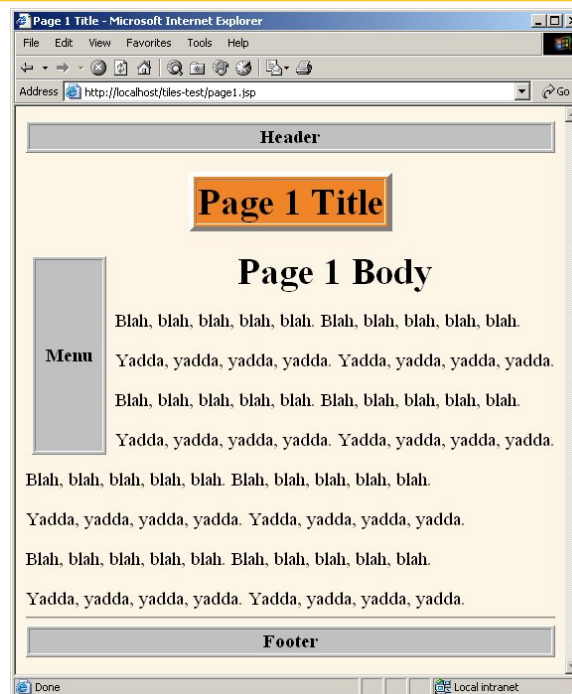
- **page1.jsp (not in WEB-INF)**

```
<%@ taglib uri="http://struts.apache.org/tags-tiles"
    prefix="tiles" %>
<tiles:insert page="/WEB-INF/tiles/layout.jsp">
    <tiles:put name="title" value="Page 1 Title"/>
    <tiles:put name="header" value="/WEB-INF/tiles/header.jsp"/>
    <tiles:put name="menu" value="/WEB-INF/tiles/menu.jsp"/>
    <tiles:put name="body" value="/WEB-INF/tiles/body1.jsp"/>
    <tiles:put name="footer" value="/WEB-INF/tiles/footer.jsp"/>
</tiles:insert>
```

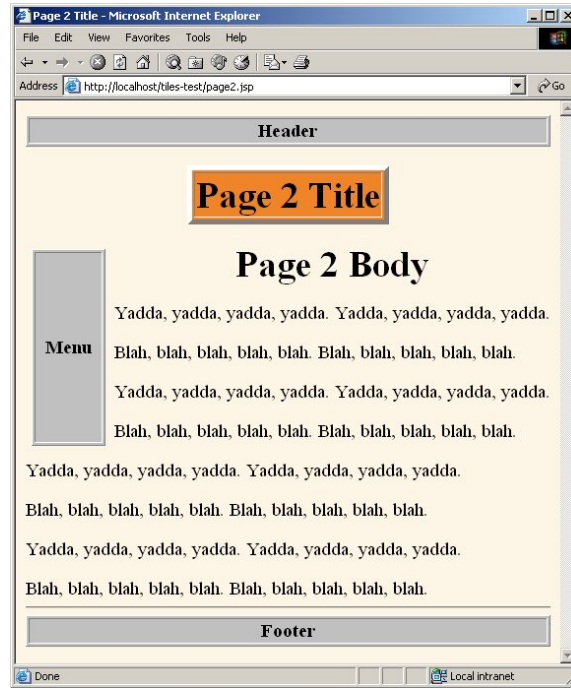
- **page2.jsp (not in WEB-INF)**

```
<%@ taglib uri="http://struts.apache.org/tags-tiles"
    prefix="tiles" %>
<tiles:insert page="/WEB-INF/tiles/layout.jsp">
    <tiles:put name="title" value="Page 2 Title"/>
    <tiles:put name="header" value="/WEB-INF/tiles/header.jsp"/>
    <tiles:put name="menu" value="/WEB-INF/tiles/menu.jsp"/>
    <tiles:put name="body" value="/WEB-INF/tiles/body2.jsp"/>
    <tiles:put name="footer" value="/WEB-INF/tiles/footer.jsp"/>
</tiles:insert>
```

# Results: page1.jsp



# Results: page2.jsp



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# Handling Relative URLs

## Relative URLs in Page Snippets

- **Many page elements are referred to with relative URLs**
  - Images
  - Style sheets
  - Simple hypertext links
- **Page elements cannot be referred to with URLs that are relative to location of layout pieces**
  - Pieces are in WEB-INF, so not directly accessible
  - Even if not in WEB-INF, client does not see the URL
- **Could use URL beginning with a slash**
  - But then you would have to list the Web app prefix
- **Could use `getContextPath`**
  - But then you need scriptlet

## Using `html:rewrite`

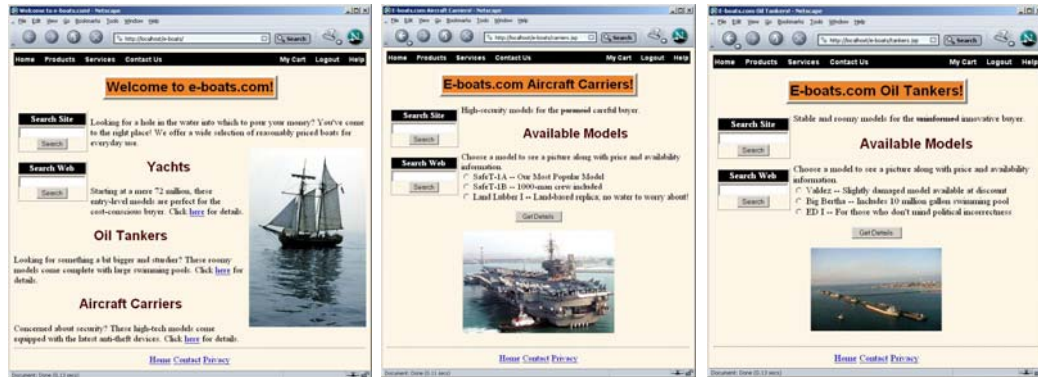
- **Lets you use URLs beginning with slashes**
  - You list path relative to Web application home
  - System adds Web application prefix (i.e., context path) to the front
- **You must import the Struts `html:` library first**
  - Same tag library as used in the section on form handling
- **Examples**
  - From layout page:

```
<LINK REL="STYLESHEET"
      HREF="<html:rewrite page='/css/styles.css' />"
      TYPE="text/css">
```
  - From snippet or layout page:

```
<IMG SRC="<html:rewrite page='/images/pic.jpg' />"...>
```

# The e-boats Application

- Online store to sell boats
- Uses tiles for pages that have similar layouts
  - Only title and body changes from page to page
- Uses style sheet to control look and feel
- Uses images on multiple pages



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# Step 1: Sketch Out Desired Layout

- Header
- Title
- Search menu
- Body (No outline)
- Footer



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## Step 2: Make Template File That Represents Layout

- WEB-INF/tiles/main-layout.jsp

```
<%@ taglib uri="http://struts.apache.org/tags-tiles"
    prefix="tiles" %>
<%@ taglib uri="http://struts.apache.org/tags-html"
    prefix="html" %>
<!DOCTYPE ...>
<HTML>
<HEAD><TITLE><tiles:getAsString name="title"/></TITLE></HEAD>
<LINK REL="STYLESHEET"
    HREF="<html:rewrite page='/css/styles.css'/>"
    TYPE="text/css">
```

## Step 2: Make Template File That Represents Layout

- WEB-INF/tiles/main-layout.jsp (Continued)

```
<BODY>
<tiles:insert attribute="header"/>
<P>
<TABLE BORDER=5 ALIGN="CENTER">
  <TR><TH CLASS="TITLE"><tiles:getAsString name="title"/>
</TH></TR></TABLE>
<P>
<TABLE WIDTH=75 ALIGN="LEFT" CELSPACING="5">
<TR><TD><tiles:insert attribute="search-menu"/></TD></TR>
</TABLE>
<tiles:insert attribute="body"/>
<BR CLEAR="ALL">
<HR>
<tiles:insert attribute="footer"/>
</BODY></HTML>
```



## Step 3: Create JSP Pages That Define Layout Pieces

- **WEB-INF/tiles/footer.jsp**

```
<%@ taglib uri="http://struts.apache.org/tags-html"
    prefix="html" %>
<CENTER>
<A HREF="<html:rewrite page='/index.html'/>">Home</A>
<A HREF="<html:rewrite page='/contact.html'/>">Contact</A>
<A HREF="<html:rewrite page='/privacy.html'/>">Privacy</A>
</CENTER>
```

## Step 3: Create JSP Pages That Define Layout Pieces

- **WEB-INF/tiles/body-index.jsp**

```
<%@ taglib uri="http://struts.apache.org/tags-html"
    prefix="html" %>
<P>
Looking for a hole in the water into which to pour your money?
You've come to the right place! We offer a wide selection of
reasonably priced boats for everyday use.
<IMG SRC="<html:rewrite page='/images/yacht.jpg'/>"
    WIDTH=240 HEIGHT=367
    ALIGN="RIGHT" ALT="Base-model yacht">
<H2>Yachts</H2>
Starting at a mere 72 million, these entry-level models are
perfect for the cost-conscious buyer.
Click <A HREF="<html:rewrite page='/yachts.jsp'/>">
here</A> for details.
<H2>Oil Tankers</H2>
...
<H2>Aircraft Carriers</H2>
...
```

## Step 3: Create JSP Pages That Define Layout Pieces

- WEB-INF/tiles/body-yachts.jsp
- WEB-INF/tiles/body-tankers.jsp
- WEB-INF/tiles/body-carriers.jsp

## Step 4: Create JSP Pages That Populate Layout

- **index.jsp (not in WEB-INF)**

```
<%@ taglib uri="http://struts.apache.org/tags-tiles"
    prefix="tiles" %>
<tiles:insert page="/WEB-INF/tiles/main-layout.jsp">
  <tiles:put name="title"
    value="Welcome to e-boats.com!"/>
  <tiles:put name="header"
    value="/WEB-INF/tiles/header.jsp"/>
  <tiles:put name="search-menu"
    value="/WEB-INF/tiles/search-menu.jsp"/>
  <tiles:put name="body"
    value="/WEB-INF/tiles/body-index.jsp"/>
  <tiles:put name="footer"
    value="/WEB-INF/tiles/footer.jsp"/>
</tiles:insert>
```

# Result: index.jsp



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## Step 4: Create JSP Pages That Populate Layout

- **yachts.jsp** (not in WEB-INF)

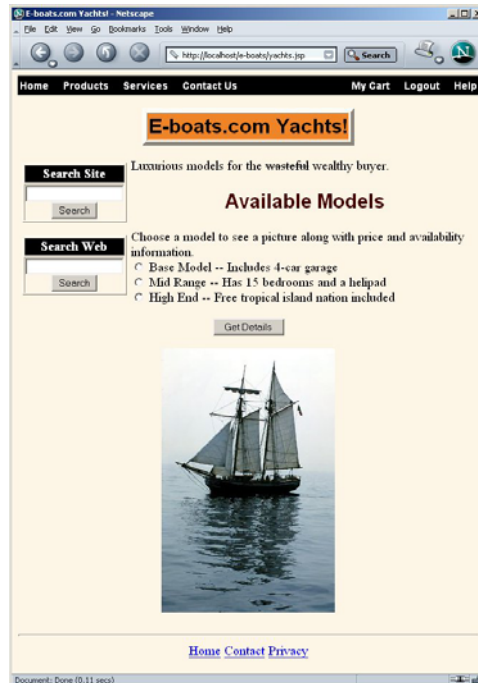
```
<%@ taglib uri="http://struts.apache.org/tags-tiles"
    prefix="tiles" %>
<tiles:insert page="/WEB-INF/tiles/main-layout.jsp">
  <tiles:put name="title"
    value="E-boats.com Yachts!"/>
  <tiles:put name="header"
    value="/WEB-INF/tiles/header.jsp"/>
  <tiles:put name="search-menu"
    value="/WEB-INF/tiles/search-menu.jsp"/>
  <tiles:put name="body"
    value="/WEB-INF/tiles/body-yachts.jsp"/>
  <tiles:put name="footer"
    value="/WEB-INF/tiles/footer.jsp"/>
</tiles:insert>
```

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# Result: yachts.jsp



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## Step 4: Create JSP Pages That Populate Layout

- **tankers.jsp (not in WEB-INF)**

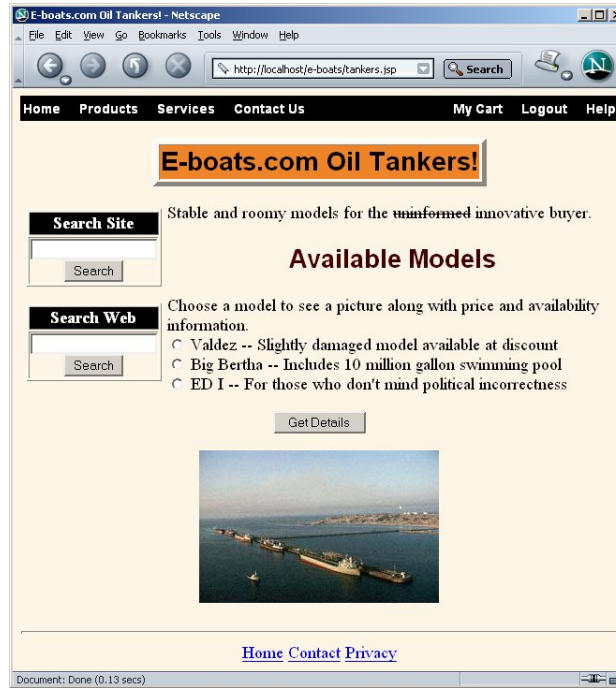
```
<%@ taglib uri="http://struts.apache.org/tags-tiles"
    prefix="tiles" %>
<tiles:insert page="/WEB-INF/tiles/main-layout.jsp">
  <tiles:put name="title"
    value="E-boats.com Oil Tankers!"/>
  <tiles:put name="header"
    value="/WEB-INF/tiles/header.jsp"/>
  <tiles:put name="search-menu"
    value="/WEB-INF/tiles/search-menu.jsp"/>
  <tiles:put name="body"
    value="/WEB-INF/tiles/body-tankers.jsp"/>
  <tiles:put name="footer"
    value="/WEB-INF/tiles/footer.jsp"/>
</tiles:insert>
```

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# Result: tankers.jsp



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## Step 4: Create JSP Pages That Populate Layout

- **carriers.jsp (not in WEB-INF)**

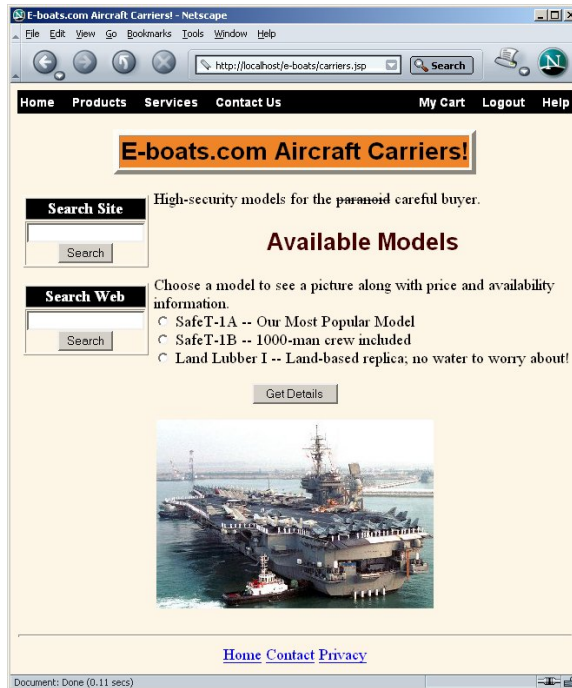
```
<%@ taglib uri="http://struts.apache.org/tags-tiles"
    prefix="tiles" %>
<tiles:insert page="/WEB-INF/tiles/main-layout.jsp">
  <tiles:put name="title"
    value="E-boats.com Aircraft Carriers!"/>
  <tiles:put name="header"
    value="/WEB-INF/tiles/header.jsp"/>
  <tiles:put name="search-menu"
    value="/WEB-INF/tiles/search-menu.jsp"/>
  <tiles:put name="body"
    value="/WEB-INF/tiles/body-carriers.jsp"/>
  <tiles:put name="footer"
    value="/WEB-INF/tiles/footer.jsp"/>
</tiles:insert>
```

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# Result: carriers.jsp



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## Using Tiles Definitions

# Motivation

- **Avoiding repetition**
  - In the previous examples, each final JSP page repeated the definition of all elements
    - Even though only the title and body changed, each final JSP page still had to do tiles:put on the header, search-menu, and footer
- **Centralized changes**
  - The locations of the various template pieces are scattered around multiple JSP pages
    - So, if locations change, multiple files need to be edited
- **Usage of config files**
  - Struts philosophy is to put as much as possible in config files and as little as possible in JSP/Java code

# Using Definitions: Steps

- 1. Sketch out desired layout**
  - Same as before
- 2. Make template file that represents layout**
  - Same as before
- 3. Create JSP pages that define layout pieces**
  - Same as before
- 4. Define layouts in WEB-INF/tiles-defs.xml**
- 5. Create JSP pages that use layouts**
  - Two line JSP pages
    - Imports tiles tag library
    - Uses tiles:insert with definition name

# Using Definitions: Key Differences

- **Define layouts in WEB-INF/tiles-defs.xml**
  - Top-level layouts
    - `<definition name="..." path="/WEB-INF/.../some-layout.jsp">`
  - Derived layouts
    - `<definition name="..." extends="top-level-layout-name">`
- **In final JSP page, use definition instead of page for tiles:insert**
  - `<tiles:insert definition="layout-name"/>`
- **Advantages**
  - Derived layouts need only specify parts that differ from parent layout
  - Can make changes in a single file
  - Definitions are in config files, not JSP pages

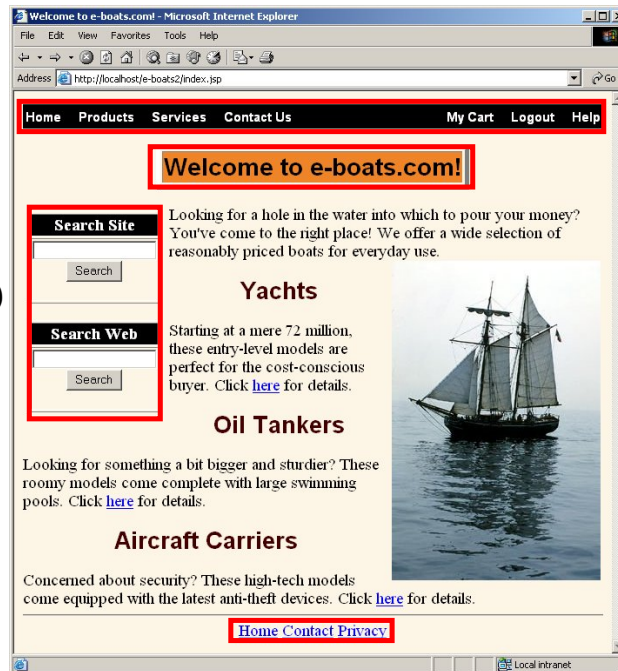
# Redoing e-boats with Tiles Definitions

- **Same page names**
- **Same look**



# Step 1: Sketch Out Desired Layout

- Header
- Title
- Search menu
- Body  
(No outline)
- Footer



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# Step 2: Make Template File That Represents Layout

- **WEB-INF/tiles/main-layout.jsp**
  - No change from previous example

```
<%@ taglib uri="http://struts.apache.org/tags-tiles"
    prefix="tiles" %>
<%@ taglib uri="http://struts.apache.org/tags-html"
    prefix="html" %>
<!DOCTYPE ...>
<HTML>
<HEAD><TITLE><tiles:getAsString name="title"/></TITLE></HEAD>
<LINK REL="STYLESHEET"
    HREF="<html:rewrite page='/css/styles.css'/"
    TYPE="text/css">
<BODY>
<tiles:insert attribute="header"/>
<P>
<TABLE BORDER=5 ALIGN="CENTER">
  <TR><TH CLASS="TITLE"><tiles:getAsString name="title"/>
</TH></TR></TABLE>
...

```

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## Step 3: Create JSP Pages That Define Layout Pieces

- **No changes from previous example**
  - WEB-INF/tiles/header.jsp
  - WEB-INF/tiles/search-menu.jsp
  - WEB-INF/tiles/footer.jsp
  - WEB-INF/tiles/body-index.jsp
  - WEB-INF/tiles/body-yachts.jsp
  - WEB-INF/tiles/body-tankers.jsp
  - WEB-INF/tiles/body-carriers.jsp

## Step 4: Define Layouts in WEB-INF/tiles-defs.xml

- **General format**

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<!DOCTYPE tiles-definitions PUBLIC ...>

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

## Step 4: Define Layouts in WEB-INF/tiles-defs.xml

- Top-Level Definition

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<!DOCTYPE tiles-definitions PUBLIC ...>

<tiles-definitions>
  <definition name=".mainLayout"
    path="/WEB-INF/tiles/main-layout.jsp">
    <put name="title" value=""/>
    <put name="header"
      value="/WEB-INF/tiles/header.jsp"/>
    <put name="search-menu"
      value="/WEB-INF/tiles/search-menu.jsp"/>
    <put name="body" value=""/>
    <put name="footer"
      value="/WEB-INF/tiles/footer.jsp"/>
  </definition>
  ...
</tiles-definitions>
```

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## Step 4: Define Layouts in WEB-INF/tiles-defs.xml

- Derived Definitions

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<!DOCTYPE tiles-definitions PUBLIC ...>

<tiles-definitions>
  ...
  <definition name="index.page" extends=".mainLayout">
    <put name="title" value="Welcome to e-boats.com!"/>
    <put name="body"
      value="/WEB-INF/tiles/body-index.jsp"/>
  </definition>
  <definition name="yachts.page" extends=".mainLayout">
    <put name="title" value="E-boats.com Yachts!"/>
    <put name="body"
      value="/WEB-INF/tiles/body-yachts.jsp"/>
  </definition>
  ...
</tiles-definitions>
```

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# Step 5: Create JSP Pages That Use Layouts

- **index.jsp**

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

```
<tiles:insert definition="index.page" />
```

- **yachts.jsp**

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

```
<tiles:insert definition="yachts.page" />
```

- **tankers.jsp**

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

```
<tiles:insert definition="tankers.page" />
```

- **carriers.jsp**

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

```
<tiles:insert definition="carriers.page" />
```

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## Result: index.jsp



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# Result: yachts.jsp

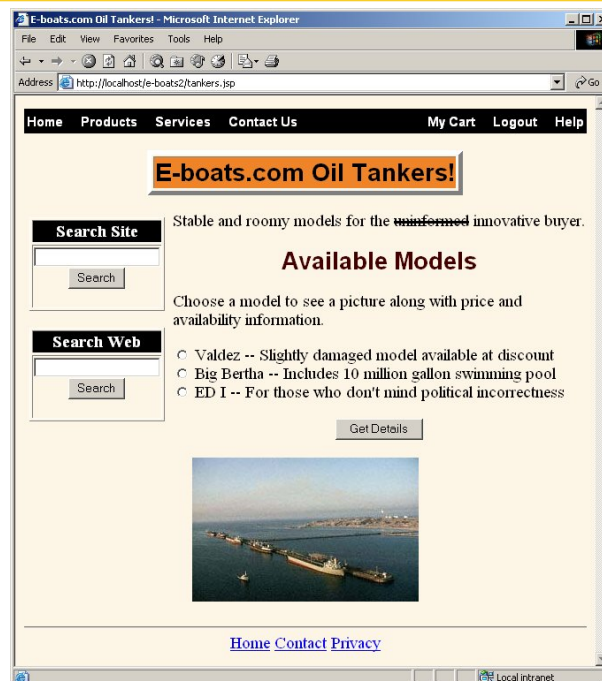


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# Result: tankers.jsp

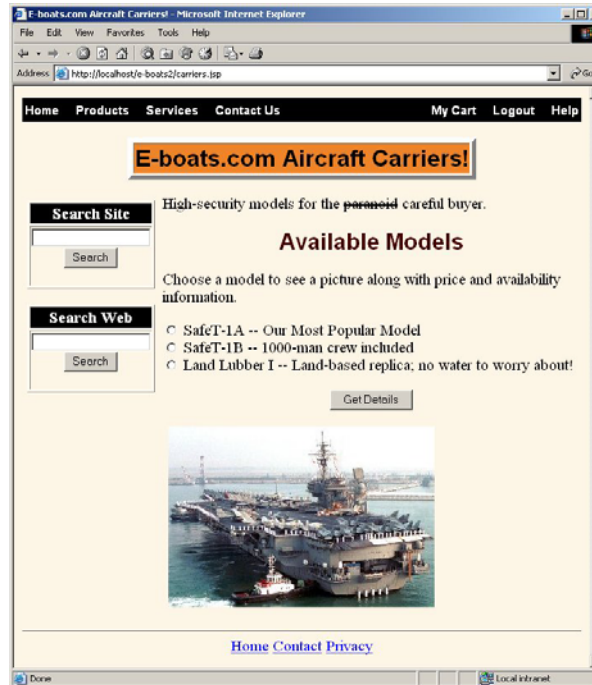


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# Result: carriers.jsp



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## Using Definition Names as forward Targets

- You can list definition names instead of JSP page locations in forward declarations
  - Change:

```
<action path="..." type="...">
  <forward name="..."
           path="/yachts.jsp"/>
</action>
```
  - To:

```
<action path="..." type="...">
  <forward name="..."
           path="yachts.page"/>
</action>
```
- If JSP pages are only used as forward targets, you can omit the 2-line JSP pages altogether

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# Summary

- **Basic Usage**

- Sketch out desired layout
- Make template file that represents layout
- Create JSP pages that define layout pieces
  - Use `html:rewrite` to handle relative URLs
- Create JSP pages that populate layout

- **Usage with Definition File**

- Sketch out desired layout
- Make template file that represents layout
- Create JSP pages that define layout pieces
- Define layouts in `WEB-INF/tiles-defs.xml`
- Create JSP pages that use layouts
  - Can omit this step and refer to definition names in forward declarations

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## Questions?

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