Server Side Development

Java Server Pages

Topics

- JSP Fundamentals
- JSP Scripting Elements
- JSP Implicit Objects
- JSP Directives
- JSP Actions
- JSP Example (Loan Calculator)
- Servlets & JSPs together
- Tag Libraries
- Deploying and Running a JSP Application

Java Server Pages (JSP)

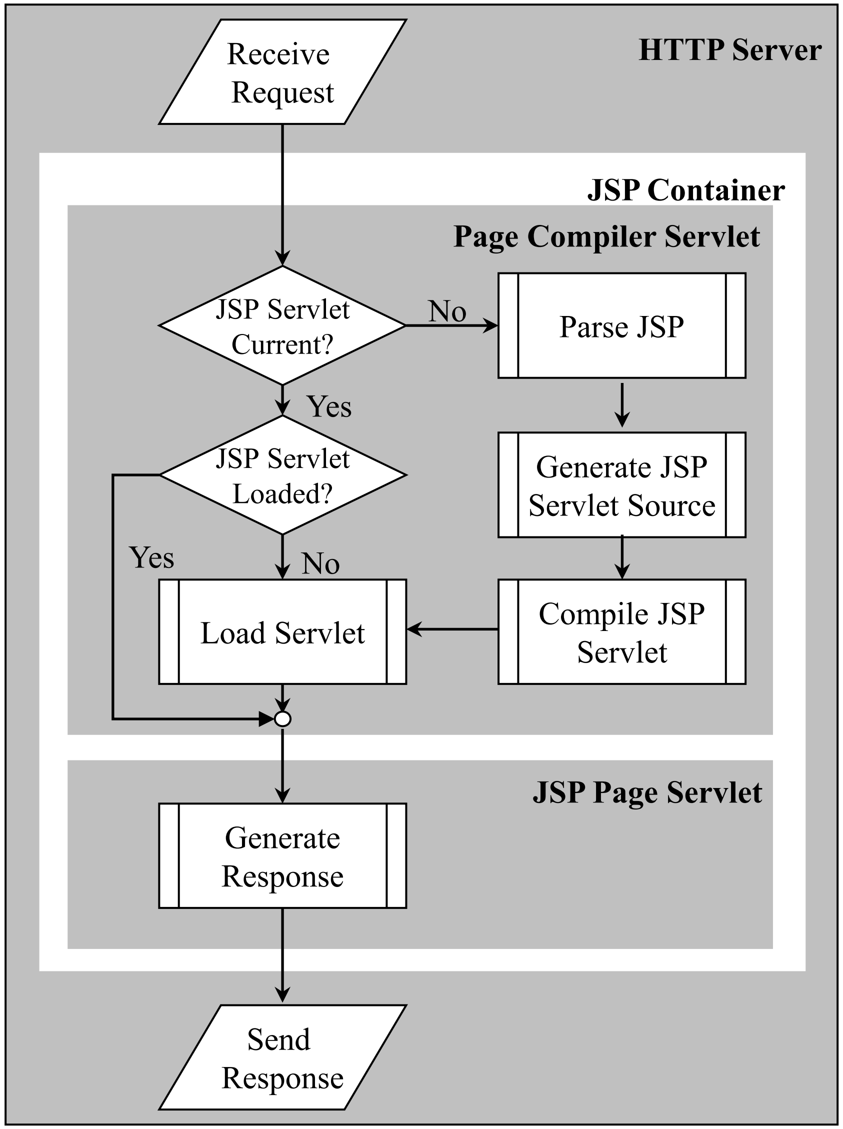
Fundamentals

- Java Server Pages are HTML pages embedded with snippets of Java code.
  - It is an inverse of a Java Servlet
- Four different elements are used in constructing JSPs
  - Scripting Elements
  - Implicit Objects
  - Directives
  - Actions

Java Server Pages (JSP)

Architecture

- JSPs run in two phases
  - Translation Phase
  - Execution Phase
- In translation phase JSP page is compiled into a servlet
  - called JSP Page Implementation class
- In execution phase the compliled JSP is processed



Scripting Elements

Types

- There are three kinds of scripting elements
  - Declarations
  - Scriptlets
  - Expressions

Declarations

Basics

- Declarations are used to define methods & instance variables
  - Do not produce any output that is sent to client
  - Embedded in <%! and %> delimiters

  Example:

```
<%!
    Public void jspDestroy() {
        System.out.println("JSP Destroyed");
    }
    Public void jspInit() {
        System.out.println("JSP Loaded");
    }
    int myVar = 123;
%>
```

  - The functions and variables defined are available to the JSP Page as well as to the servlet in which it is compiled

Scriptlets
Basics

- Used to embed java code in JSP pages.
  - Contents of JSP go into _JSPpageservice() method
  - Code should comply with syntactical and semantic constuct of java
  - Embedded in <% and %> delimiters

Example:

```
<%
     int x = 5;
     int y = 7;
     int z = x + y;
%>
```

Expressions

Basics

- Used to write dynamic content back to the browser.
  - If the output of expression is Java primitive the value is printed back to the browser
  - If the output is an object then the result of calling toString on the object is output to the browser
  - Embedded in <%= and %> delimiters

Example:

- <%="Fred"+ " " + "Flintstone %>

  prints "Fred Flintstone" to the browser
- <%=Math.sqrt(100)%>

  prints 10 to the browser

Java Implicit Objects

Scope

- Implicit objects provide access to server side objects
  - e.g. request, response, session etc.
- There are four scopes of the objects
  - Page: Objects can only be accessed in the page where they are referenced
  - Request: Objects can be accessed within all pages that serve the current request.

    (Including the pages that are forwarded to and included in the original jsp page)
  - Session: Objects can be accessed within the JSP pages for which the objects are defined
  - Application: Objects can be accessed by all JSP pages in a given context

Java Implicit Objects

List

- request: Reference to the current request
- response: Response to the request
- session: session associated woth current request
- application: Servlet context to which a page belongs
- pageContext: Object to access request, response, session and application associated with a page
- config: Servlet configuration for the page
- out: Object that writes to the response output stream
- page: instance of the page implementation class (this)
- exception: Available with JSP pages which are error pages

Java Implicit Objects

Example

```
<html>
  <head>
    <title>Implicit Objects</title>
  </head>
  <body style="font-family:verdana;font-size:10pt">
    <p>
      Using Request parameters...<br>
      <b>Name:</b> <%= request.getParameter("name") %>
    </p>
    <p>
      <% out.println("This is printed using the out implicit
              variable"); %>
    </p>
    <p>
      Storing a string to the session...<br>
      <% session.setAttribute("name", "Meeraj"); %>
      Retrieving the string from session...<br>
      <b>Name:</b> <%= session.getAttribute("name") %>
    </p>
    <p>
      Storing a string to the application...<br>
      <% application.setAttribute("name", "Meeraj"); %>
      Retrieving the string from application...<br>
      <b>Name:</b>
      <%= application.getAttribute("name") %>
    </p>
    <p>
      Storing a string to the page context...<br>
      <% pageContext.setAttribute("name", "Meeraj"); %>
      Retrieving the string from page context...</br>
      <b>Name:</b>
      <%= pageContext.getAttribute("name") %>
    </p>
  </body>
</html>
```

Example Implicit Objects

Deploy & Run

- Save file:
  - $TOMCAT_HOME/webapps/jsp/Implicit.jsp
- Access file
  - http://localhost:8080/jsp/Implicit.jsp?name=Sanjay
- Results of the execution

```
Using Request parameters...
        Name: sanjay
This is printed using the out implicit variable
Storing a string to the session...
        Retrieving the string from session...
        Name: Meeraj
Storing a string to the application...
        Retrieving the string from application...
        Name: Meeraj
Storing a string to the page context...
        Retrieving the string from page context...
        Name: Meeraj
```

Directives

Basics & Types

- Messages sent to the JSP container
  - Aids the container in page translation
- Used for
  - Importing tag libraries
  - Import required classes
  - Set output buffering options
  - Include content from external files
- The jsp specification defines three directives
  - Page: provder information about page, such as scripting language that is used, content type, or buffer size
  - Include – used to include the content of external files
  - Taglib – used to import custom actions defined in tag libraries

Page Directives

Basics & Types

- Page directive sets page properties used during translation
  - JSP Page can have any number of directives
  - Import directive can only occur once
  - Embedded in <%@ and %> delimiters
- Different directives are
  - Language: (Default Java) Defines server side scripting language (e.g. java)
  - Extends: Declares the class which the servlet compiled from JSP needs to extend
  - Import: Declares the packages and classes that need to be imported for using in the java code (comma separated list)
  - Session: (Default true) Boolean which says if the session implicit variable is allowed or not
  - Buffer: defines buffer size of the jsp in kilobytes (if set to none no buffering is done)

Page Directives

Types con't.

- Different directives are (cont'd.)
  - autoFlush:When true the buffer is flushed when max buffer size is reached (if set to false an exception is thrown when buffer exceeds the limit)
  - isThreadSafe: (default true) If false the compiled servlet implements SingleThreadModel interface
  - Info: String returned by the getServletInfo() of the compiled servlet
  - errorPage: Defines the relative URI of web resource to which the response should be forwarded in case of an exception
  - contentType: (Default text/html) Defines MIME type for the output response
  - isErrorPage: True for JSP pages that are defined as error pages
  - pageEncoding: Defines the character encoding for the jsp page

Page Directives

Example

```
<%@
        page language="java"
        buffer="10kb"
        autoflush="true"
        errorPage="/error.jsp"
        import="java.util.*, javax.sql.RowSet"
%>
```

Include Directive

Basics

- Used to insert template text and JSP code during the translation phase.
  - The content of the included file specified by the directive is included in the including JSP page
- Example
  - <%@ include file="included.jsp" %>

JSP Actions

Basics & Types

- Processed during the request processing phase.
  - As opposed to JSP directives which are processed during translation
- Standard actions should be supported by J2EE compliant web servers
- Custom actions can be created using tag libraries
- The different actions are
  - Include action
  - Forward action
  - Param action
  - useBean action
  - getProperty action
  - setProperty action
  - plugIn action

JSP Actions

Include

- Include action used for including resources in a JSP page
  - Include directive includes resources in a JSP page at translation time
  - Include action includes response of a resource into the response of the JSP page
  - Same as including resources using RequestDispatcher interface
  - Changes in the included resource reflected while accessing the page.
  - Normally used for including dynamic resources
- Example
  - <jsp:include page=“inlcudedPage.jsp”>
  - Includes the the output of includedPage.jsp into the page where this is included.

JSP Actions

Forward

- Forwards the response to other web specification resources
  - Same as forwarding to resources using RequestDispatcher interface
- Forwarded only when content is not committed to other web application resources
  - Otherwise an IllegalStateException is thrown
  - Can be avoided by setting a high buffer size for the forwarding jsp page
- Example
  - <jsp:forward page="Forwarded.html">
  - Forwards the request to Forwarded.html

JSP Actions - Include Action v/s Include Directive

Include Directive	Include Action
Translation time	Run time
Copies the included file	References to the included file
For static content	For dynamic content
Cannot pass parameters	Can pass parameters

JSP Actions

Param

- Used in conjunction with Include & Forward actions to include additional request parameters to the included or forwarded resource

- Example

```
<jsp:forward page="Param2.jsp">
    <jsp:param name="FirstName" value="Sanjay">
</jsp:forward>
```

  - This will result in the forwarded resource having an additional parameter FirstName with a value of Sanjay

JSP Actions

useBean

- Creates or finds a Java object with the defined scope.
  - Object is also available in the current JSP as a scripting variable
- Syntax:

```
<jsp:useBean id="name"
scope="page | request | session | application"
class="className" type="typeName" |
bean="beanName" type="typeName" |
type="typeName" />
```

  - At least one of the type and class attributes must be present
  - We can't specify values for bith the class and bean name.
- Example

```
<jsp:useBean id="myName" scope="request" class="java.lang.String">
        <% firstName="Sanjay"; %>
</jsp:useBean>
```

JSP Actions

get/setProperty

- getProperty is used in conjunction with useBean to get property values of the bean defined by the useBean action
- Example (getProperty)
  - <jsp:getProperty name=“myBean” property=“firstName” />
  - Name corresponds to the id value in the useBean
  - Property refers to the name of the bean property
- setProperty is used to set bean properties
- Example (setProperty)
  - <jsp:setProperty name=“myBean” property=“firstName” value=“Sanjay”/>
  - Sets the name property of myBean to SanjayExample (setProperty)
  - <jsp:setProperty name=“myBean” property=“firstName” param=“fname”/>
  - Sets the name property of myBean to the request parameter fname
  - <jsp:setProperty name=“myBean” property=“*”>
  - Sets property to the corresponding value in request

JSP Actions

plugIn

- Enables the JSP container to render appropriate HTML (based on the browser type) to:
  - Initiate the download of the Java plugin
  - Execution of the specified applet or bean
- plugIn standard action allows the applet to be embedded in a browser neutral fashion
- Example

```
<jsp: plugin type="applet" code="MyApplet.class" codebase="/">
        <jsp:params>
                <jsp:param name="myParam" value="122"/>
        </jsp:params>
        <jsp:fallback><b>Unable to load applet</b></jsp:fallback>
</jsp:plugin>
```