Java Server Pages

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Abstract

- Java Server Pages allow special tags and java code to be embedded in HTML files. These tags and code are processed by the web server to obtain a dynamically-produced HTML page to the browser.

  - another architecture in the web-based distributed application arsenal.

  - produce dynamic web pages on the server side (as do servlets), but separate application logic from the appearance of the page.

  - the tags allow previously compiled java code, in the form of JavaBeans, to be used

  - allows fast development and testing.

  - may also produce XML documents, instead of HTML.

Development of JSP

- Java Server Pages were developed as a response to Microsoft's Active Server Pages (ASP). The main differences are that ASP only runs on Microsoft IIS and Personal Web Servers, and JSP has user-defined tags.

- Development dates: (Note that JSP is built on top of servlets)
  - Servlet 2.1 Jan. 99
  - JSP 1.0 June 99
  - Source code released to Apache to develop Tomcat server November 99
  - Servlet 2.2 and JSP 1.1 (J2EE1.2) December 99
  - Look for further development of tag library in 00.

JSP elements

- A JSP page looks like a standard HTML or XML page with additional elements processed by the JSP engine. Typically, these elements create text that is inserted into the resulting document.

- JSP elements

  - JSP directive passes information to the JSP engine, enclosed in <%@ and %> markers.

  - JSP actions or tags are a set of customized XML-style tags for particular actions, e.g. jsp:useBean instantiates the JavaBean class on the server.

  - Expression: anything between <%= and %> markers is evaluated by the JSP engine as a Java expression in the server environment.

  - Scriptlet: a small script in Java to perform other functions

  - Implicit Objects: servlet abstractions

Example JSP page

- This page prints the day of the month and year, and either "Good Morning" or Good Afternoon", depending on the time.
```
<HTML>
<%@ page language="java" imports="com.wombat.JSP.*" %>
<H1>Welcome</H1>
<P>Today is </P>
<jsp:useBean id="clock" class="calendar.jspCalendar" />
<UL> <LI>Day:  <%= clock.getDayOfMonth( ) %>
     <LI>Month: <%= clock.getYear( ) %>
</UL>
<% if (Calendar.getInstance( ).get(Calendar.AM_PM) == Calendar.AM)
   {  %>  Good Morning
      <%  } else
            {  %>  Good Afternoon
            <%  } %>
<%@ include file = "copyright.html"  %>
</HTML>
```

Architecture

URL

jsp page

request

properties,
call methods

http request

JSP engine
compiles to
a servlet

JavaBean
Library

http response

response

http page

DB

browser

web server
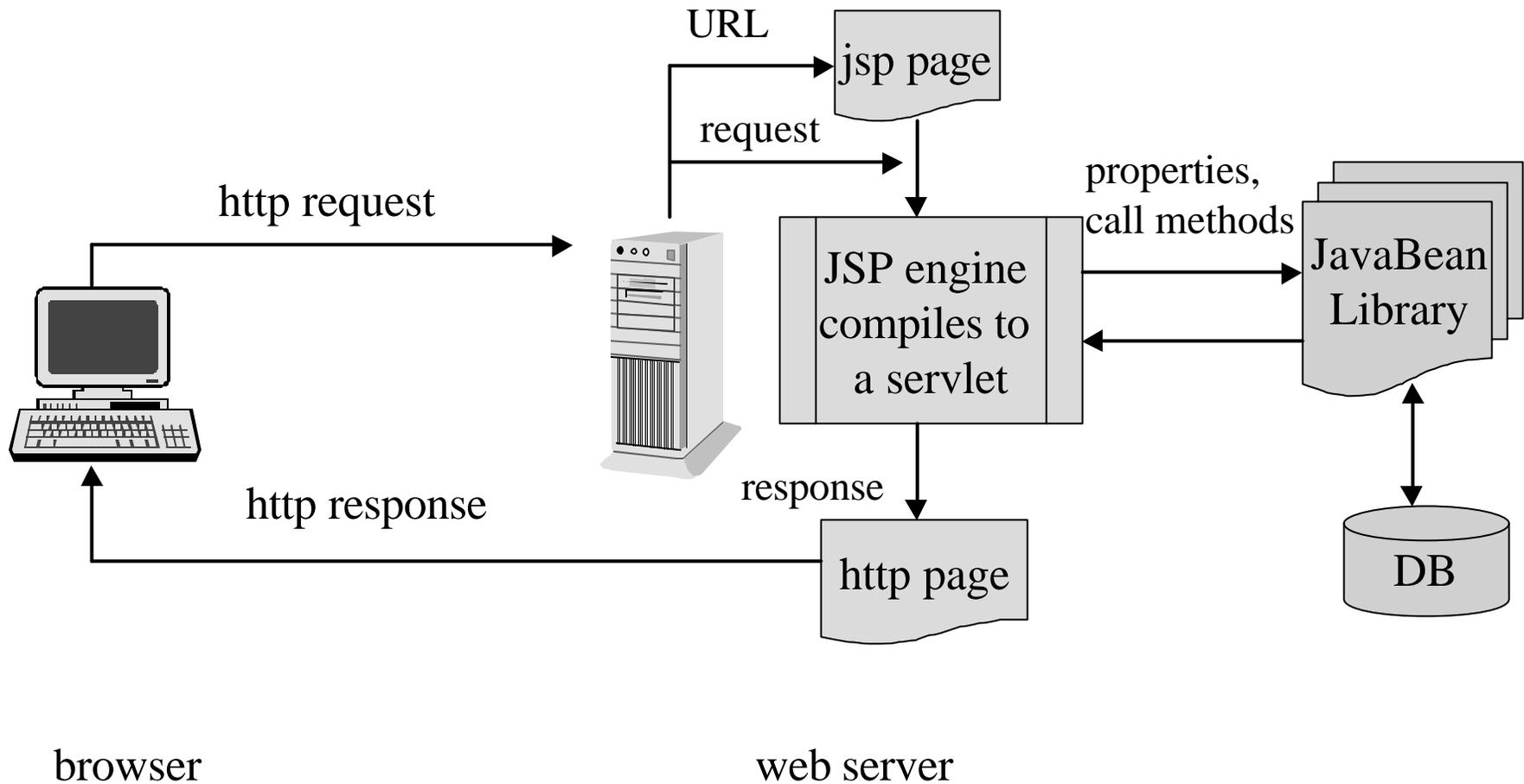
JSP Directives

- page directives communicate page-specific information to the JSP engine, such as buffer or thread information or specify an error page.

- language directives specify script language + possible extensions

- include directive includes an external document in the page. These are often company information files or copyright files, but can also be jsp files.

- taglib directive indicates a library of custom tags that the page can invoke.

- (see helloworld.jsp example.)

JSP Tags

- There are a set of core JSP1.0 tags that implement JSP-technology specific operations. Additional standard tags are planned, and the user can design their own custom tags.

    - jsp:useBean - declares the usage of an instance of a JavaBeans component. If it does not already exist, then the instance is created and registered in the servlet environment. Several properties can be set; notably that the state of the bean is saved for the session or just the page..

    - jsp:setProperty - this tag can be used to set all the properties of a Bean from the request parameter stream with parameters of the same name, or can be used to set individual properties.

    - jsp:getProperty - gets the property of the Bean, converts it to a String, and puts it into the implicit object "out".

    - jsp:forward - forwards the request to another jsp page or servlet.

    - jsp:include - include another jsp page

    - jsp:plugin - load into the specified plug-in of the browser

Scriptlets

- JSP pages can include small scripts in a page. These are code fragments that are executed at request time processing.

- May be combined with static elements on the page or other objects in the Java servlet environment.

- Anything contained with <% and %> or <%! and %> is evaluated by the script language engine, normally the Java virtual machine on the host.

- Declarations: the scope is the JSP file, including the include files. Declare variables or methods.

  - <%! int a, b; double c = 0.0; %>

  - <%! Color c = new Color (0, 128, 255); %>

- Expressions: any language expression, casts result to a String

  - <%= Math.sqrt(2) %>

More on Scriptlets

- Note that expressions never have semicolons.
- Scriplets within <% and %> can have declarations, expressions, or any other kind of code fragment.
  - <% String name = null;
    if (request.getParameter("name") == null)
    {
    %>
  - you can use any of the JSP implicit objects or classes imported by the page directive, declared in a declaration, or named in a <jsp:useBean> tag.

Processing HTML Forms by Servlets

- In the form tag on the HTML page, you can put the action field to be a JSP page.

- This is compiled to be a servlet and the request and response parameters can be explicitly used in a scriptlet on the page.
    request.getParameter ("username");
  where username is the name of a field on the form.

- The request object implements javax.servlet.HttpServletRequest and has the following methods, among others:
    - getRequest
    - getParameterNames
    - getParameterValues
    - getParameter

Processing HTML Forms by JavaBeans

- If using a Bean to process the form data, no action tag is necessary on the form.

- Give form element names that correspond to properties in the bean (exactly, respecting upper and lower case).

- First give the useBean tag to instantiate the Bean.

- Then give the setProperty tag either to set all properties, if all form elements names are included in the bean's properties, or to set individual ones.

      ```
      <jsp:useBean id="numguess" class="num.NumberGuessBean"
                                            scope="session"/>
      <jsp:setProperty name="numguess" property="*"/>
      ```

- Similarly, you can retrieve data from a bean property and use it in the resulting html page:

  ```
  <H1> Hello <jsp:getProperty name="mybean" property="username"/>!
  </H1>
  ```

Using with XML

- JSP pages can be used to generate XML pages.
- The JSP specification provides a way for XML tools to author and manipulate JSP pages, by converting JSP tags to their XML equivalents.
  - add a JSP root element to the document
  - convert elements and directives to their XML equivalent, e.g. instead of <% and %> scriptlet markers, use <jsp:scriptlet> and </jsp:scriptlet> XML tags.
  - create CDATA elements for all other (typically non-JSP) elements on the page

Industry Support

- Servers: Apache, iPlanet Web, IBM WebSphere, BEA WEbLogic, Inprise Application Server, ATG DYnamo, Acme, Bluestone, Gemstone, Oracle

- Tools: Forte SynerJ, Oracle Jdeveloper, Inprise Jbuilder, Macromedia Drumbeat 2000, NetObjects Fusion, Symantic Visual Café, . . .

- Engines:
  - ServletExec for IIS, Netscape, all MacOS servers
  - JRun for IIS, Netscape, Apache, WebSite Pro, WebSTAR
  - WAICoolRunner for Netscape
  - Caucho Resin for Apache, IIS

Community Process

- Java Community has put out Java Specification Request (JSR) for next version "Dot.next" JSP and Servlets, Standard Tag Library.

- Drafts will be posted for review at all levels: expert, participant, public

- Goals include support for
  - application events
  - improved debugging and tool support
  - improved XML support
  - improved JSP authoring support
  - better composition of components
  - . . .

JSP Resources

- Sun: java.sun.com/products/jsp
  - links for downloads, tutorials, white paper, etc.
  - join community process
  - JSP syntax card
- Apache:
  - download apache web server: www.apache.org
  - Jakarta project for Java-based web servers, including an apache module for JSP and servlets: jakarta.apache.org