

CNT 4714: Enterprise Computing Fall 2011

Introduction to JavaServer Pages (JSP) – Part 2

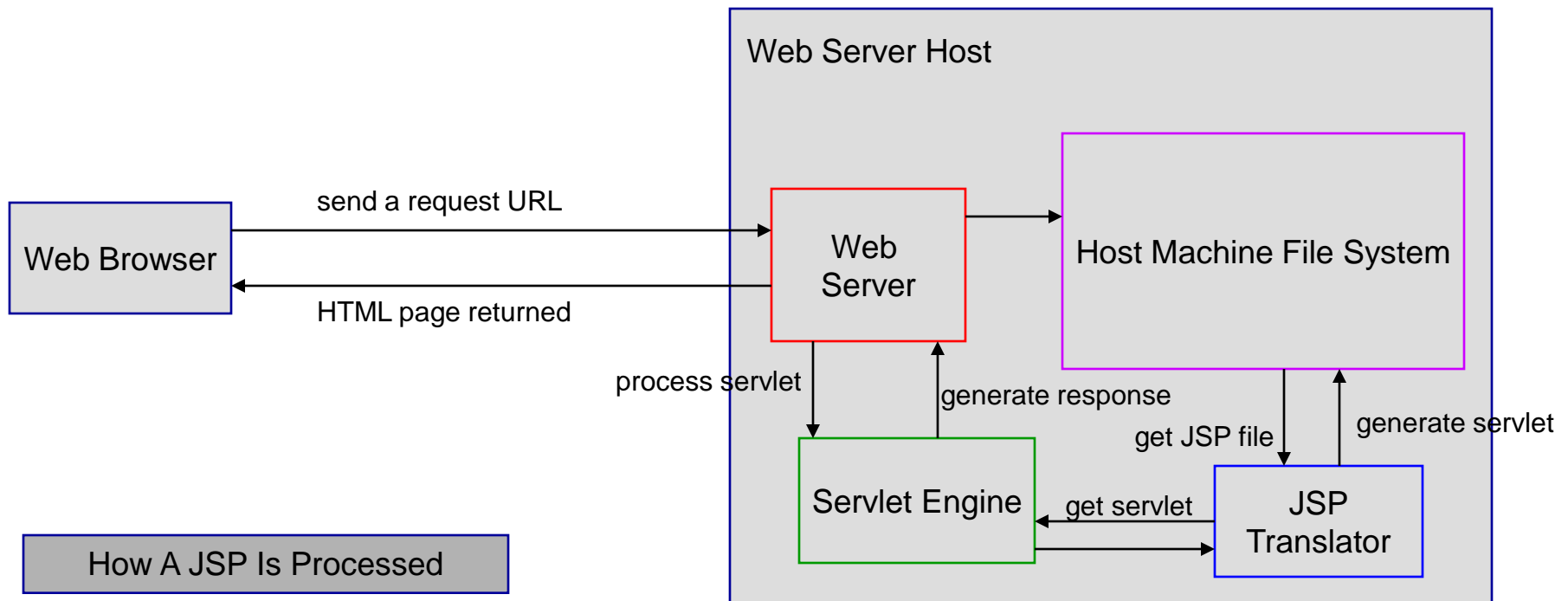
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How A JSP Is Processed

- Much like a servlet, a JSP must first be processed by a web server before it can be displayed in a web browser. The web server must support JSPs and the JSP page must be stored in a file with a `.jsp` extension. The web server translates the JSP into a Java servlet, compiles the servlet, and executes it. The result of the execution is sent to the browser for display.



More On JSP Scripting Constructs

- There are three main types of JSP constructs: **scripting constructs**, **directives**, and **actions**.
- **Scripting elements** allow you to specify Java code that will become part of the resultant servlet.
- **Directives** enable you to control the overall structure of the resultant servlet.
- **Actions** enable you to control the behavior of the JSP engine.
- We'll look in more detail at all of these, starting with the scripting constructs.



Scripting Constructs

- There are three main types of JSP scripting constructs that can be used to insert Java code into a resultant servlet: **expressions**, **scriptlets** and **declarations**. Recall that there are also **comments** and **escape sequences**.
- A **JSP expression** is used to insert a Java expression directly into the output. It has the following form:

```
<%= java expression %>
```
- The expression is evaluated, converted into a string, and set to the output stream of the servlet.



Scripting Constructs

- A **JSP scriptlet** enables you to insert a Java statement into the servlet's `jspService` method which is invoked by the service method. A JSP scriptlet has the following form:

```
<% java statement %>
```

- A **JSP declaration** is for declaring methods or fields into the servlet. It has the following form:

```
<%! java declaration %>
```

- HTML comments have the form:

```
<!-- HTML comment -->
```

- If you don't want the comment to appear in the resultant HTML file, use a **JSP comment** which has the form:

```
<%-- JSP comment -->
```



*C:\Program Files\Apache Software Foundation\Tomcat 7.0_Tomcat7.0.22\webapps\CNT4714\jsp\ComputeLoan.html - No...

File Edit Search View Encoding Language Settings Macro Run Plugins Window ?



toc.html banner.html ComputeLoan.html

ComputeLoan.html

```

1  <!-- ComputeLoan.html -->
2  <html>
3  <head>
4      <title>ComputeLoan</title>
5  </head>
6  <body bgcolor=white background=images/background.jpg lang=EN-US link=blue vlink=blue
7      style='tab-interval:.5in'>
8  <font size = 5><b>Compute Loan Payment</b></font>
9  <form method="get" action="/CNT4714/jsp/ComputeLoan.jsp"><p><p><br>
10     Loan Amount   <input type="text" name="loanAmount"><br><br>
11     Annual Interest Rate <input type="text" name="annualInterestRate"><br><br>
12     Number of Years <input type="text" name="numberOfYears" size="3"><br></p><p>
13     <input type="submit" name="Submit" value="Compute Loan Payment">
14     <input type="reset" value="Reset">
15     </p>
16 </form>
17 </body>
18 </html>
    
```

Hyper Text M length : 710 lines : 18 Ln : 18 Col : 1 Sel : 0 Macintosh ANSI INS

Start Processing a forward... jsp *C:\Program Files... 4:12 PM

To direct input to this virtual machine, press Ctrl+G.





ComputeLoan.jsp

```

2 <html>
3 <head>
4     <title>ComputeLoan</title>
5 </head><body bgcolor=white background=images/background.jpg lang=EN-US link=blue vlink=blue
6 style='tab-interval:.5in'>
7 <% double loanAmount = Double.parseDouble( request.getParameter("loanAmount"));
8     double annualInterestRate = Double.parseDouble(request.getParameter("annualInterestRate"));
9     double numberOfYears = Integer.parseInt(request.getParameter("numberOfYears"));
10    double monthlyInterestRate = annualInterestRate / 1200;
11    double monthlyPayment = loanAmount * monthlyInterestRate /
12        (1 - 1 / Math.pow(1 + monthlyInterestRate, numberOfYears * 12));
13    double totalPayment = monthlyPayment * numberOfYears * 12;
14 <%>
15 <b><font size = 7> Loan Details </font></b><br><br>
16 <font size = 5>
17 Loan Amount:
18     <%= loanAmount %> <br><br>
19 Annual Interest Rate:
20     <%= annualInterestRate %> <br><br>
21 Number of Years:
22     <%= numberOfYears %> <br><br>
23 <b>
24 Monthly Payment:
25 <%= "$" + monthlyPayment %> <br><br>
26 Total Payment:
27 <%= "$" + totalPayment %> <br><br>
28 </b>
29 </body>

```



Opera
 ComputeLoan x +
 localhost:8080/CNT4714/jsp/ComputeLoan.html Search with Google

Compute Loan Payment

Loan Amount

Annual Interest Rate

Number of Years



Opera ComputeLoan

localhost:8080/CNT4714/jsp/ComputeLoan.jsp

Loan Details

Loan Amount: 180000.0

Annual Interest Rate: 6.0

Number of Years: 15.0

Monthly Payment: \$1518.9422904872322

Total Payment: \$273409.6122877018

View (120%)

JavaServer length : 1089 lines : 30 Ln : 23 Col : 4 Sel : 0 Dos\Windows ANSI INS

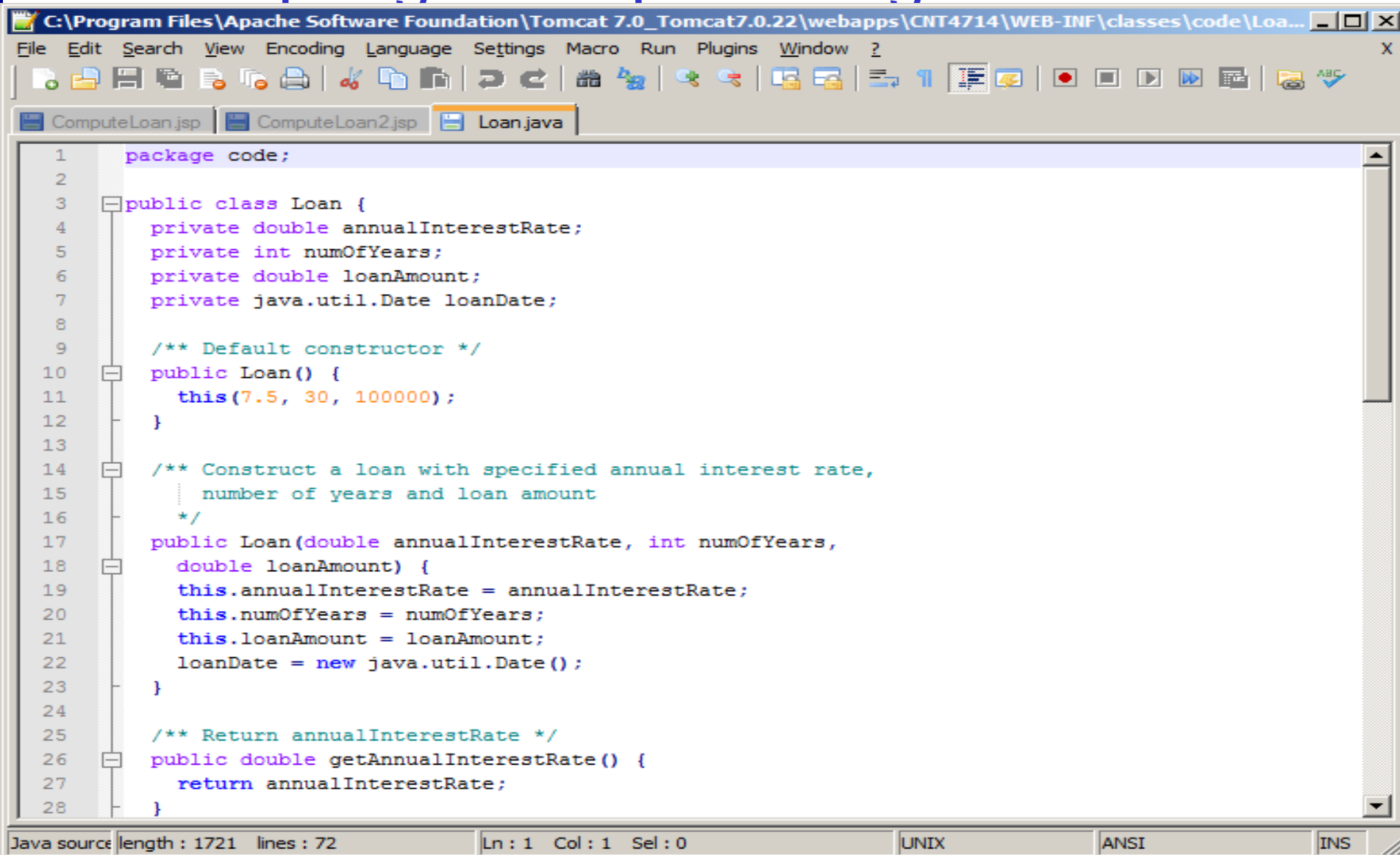
Start ComputeLoan - 0... jsp C:\Program Files\Ap... 4:20 PM

To direct input to this virtual machine, press Ctrl+G.

vmware



Scripting Example Using Directives



The screenshot shows an IDE window titled "C:\Program Files\Apache Software Foundation\Tomcat 7.0_Tomcat7.0.22\webapps\CNT4714\WEB-INF\classes\code\Loa...". The menu bar includes File, Edit, Search, View, Encoding, Language, Settings, Macro, Run, Plugins, and Window. The toolbar contains various icons for file operations and development tools. The active tab is "Loan.java". The code in the editor is as follows:

```
1 package code;
2
3 public class Loan {
4     private double annualInterestRate;
5     private int numOfYears;
6     private double loanAmount;
7     private java.util.Date loanDate;
8
9     /** Default constructor */
10    public Loan() {
11        this(7.5, 30, 100000);
12    }
13
14    /** Construct a loan with specified annual interest rate,
15     * number of years and loan amount
16     */
17    public Loan(double annualInterestRate, int numOfYears,
18               double loanAmount) {
19        this.annualInterestRate = annualInterestRate;
20        this.numOfYears = numOfYears;
21        this.loanAmount = loanAmount;
22        loanDate = new java.util.Date();
23    }
24
25    /** Return annualInterestRate */
26    public double getAnnualInterestRate() {
27        return annualInterestRate;
28    }

```

At the bottom of the IDE, the status bar shows "Java source length : 1721 lines : 72", "Ln : 1 Col : 1 Sel : 0", "UNIX", "ANSI", and "INS".



```
C:\Program Files\Apache Software Foundation\Tomcat 7.0_Tomcat7.0.22\webapps\CNT4714\WEB-INF\classes\code\Loa...
File Edit Search View Encoding Language Settings Macro Run Plugins Window ?
ComputeLoan.jsp ComputeLoan2.jsp Loan.java
29
30  /** Set a new annualInterestRate */
31  public void setAnnualInterestRate(double annualInterestRate) {
32      this.annualInterestRate = annualInterestRate;
33  }
34
35  /** Return numOfYears */
36  public int getNumOfYears() {
37      return numOfYears;
38  }
39
40  /** Set a new numOfYears */
41  public void setNumOfYears(int numOfYears) {
42      this.numOfYears = numOfYears;
43  }
44
45  /** Return loanAmount */
46  public double getLoanAmount() {
47      return loanAmount;
48  }
49
50  /** Set a newloanAmount */
51  public void setLoanAmount(double loanAmount) {
52      this.loanAmount = loanAmount;
53  }
54
55  /** Find monthly payment */
56  public double monthlyPayment() {
```

Java source length : 1721 lines : 72 Ln : 1 Col : 1 Sel : 0 UNIX ANSI INS





ComputeLoan.jsp ComputeLoan2.jsp Loan.java

```
54
55  /** Find monthly payment */
56  public double monthlyPayment() {
57      double monthlyInterestRate = annualInterestRate / 1200;
58      return loanAmount * monthlyInterestRate / (1 -
59          (Math.pow(1 / (1 + monthlyInterestRate), numOfYear * 12)));
60  }
61
62  /** Find total payment */
63  public double totalPayment() {
64      return monthlyPayment() * numOfYear * 12;
65  }
66
67  /** Return loan date */
68  public java.util.Date getLoanDate() {
69      return loanDate;
70  }
71  }
72
```

Java source length : 1721 lines : 72

Ln : 1 Col : 1 Sel : 0

UNIX

ANSI

INS

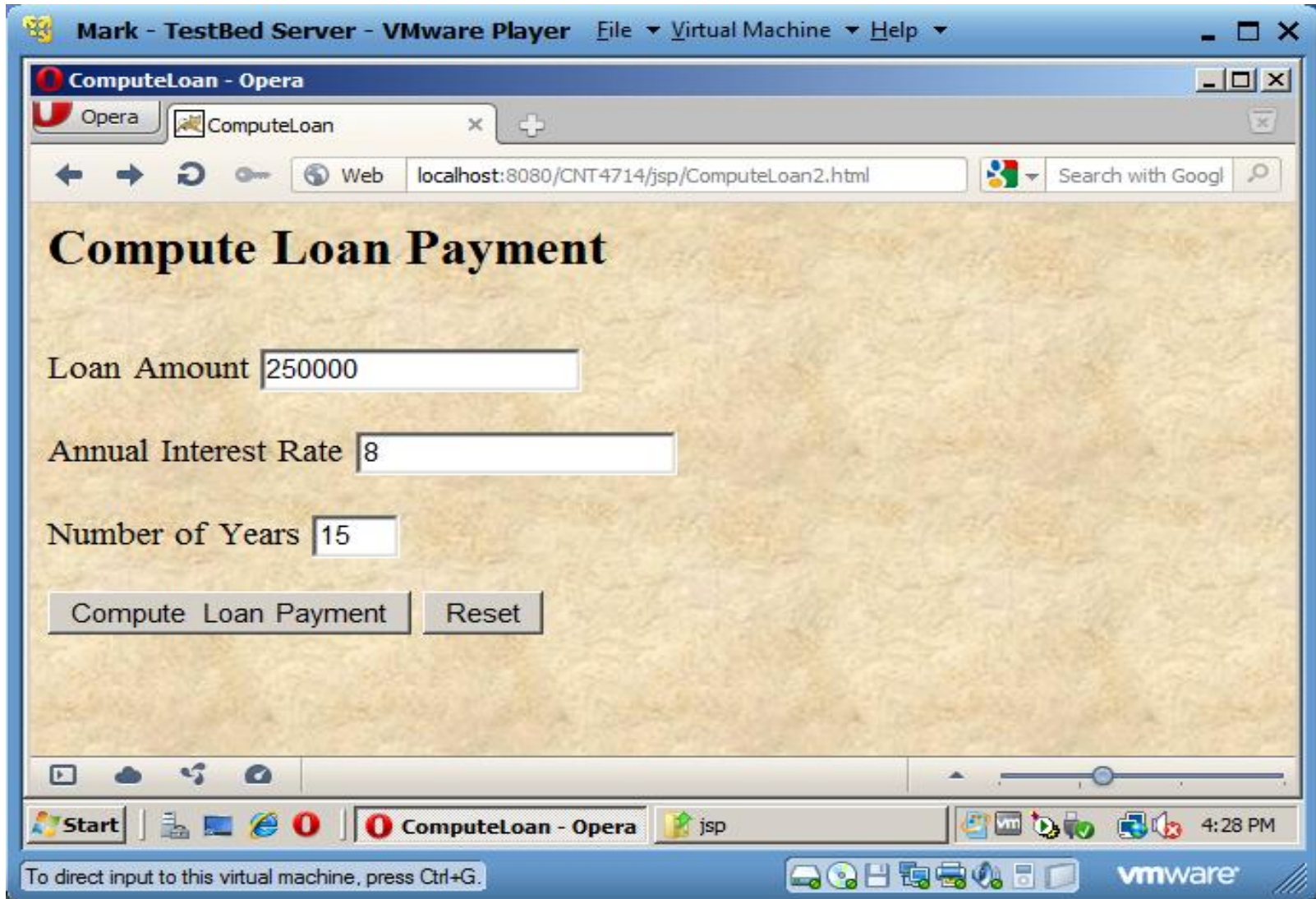


```
C:\Program Files\Apache Software Foundation\Tomcat 7.0_Tomcat7.0.22\webapps\CNT4714\jsp\ComputeLoan2.jsp - No... X
File Edit Search View Encoding Language Settings Macro Run Plugins Window ?
ComputeLoan.jsp ComputeLoan2.jsp
1 <!-- ComputeLoan2.jsp -->
2 <html>
3 <head>
4 <title>ComputeLoan</title>
5 </head><body bgcolor=white background=images/background.jpg lang=EN-US link=blue vlink=blue
6 style='tab-interval:.5in'>
7 <%@ page import = "code.Loan" %>
8
9 <% double loanAmount = Double.parseDouble( request.getParameter("loanAmount"));
10 double annualInterestRate = Double.parseDouble(request.getParameter("annualInterestRate"));
11 int numberOfYears = Integer.parseInt(request.getParameter("numberOfYears"));
12
13 Loan loan = new Loan (annualInterestRate, numberOfYears, loanAmount);
14 %>
15
16 <b><font size = 7> Loan Details </font></b><br><br>
17 <font size = 5>
18 Loan Amount:
19 <%= loanAmount %> <br><br>
20 Annual Interest Rate:
21 <%= annualInterestRate %> <br><br>
22 Number of Years:
23 <%= numberOfYears %> <br><br>
24 <b>
25 Monthly Payment:
26 <%= "$" + loan.monthlyPayment() %> <br><br>
27 Total Payment:
28 <%= "$" + loan.totalPayment() %> <br><br>
29 </b>
```

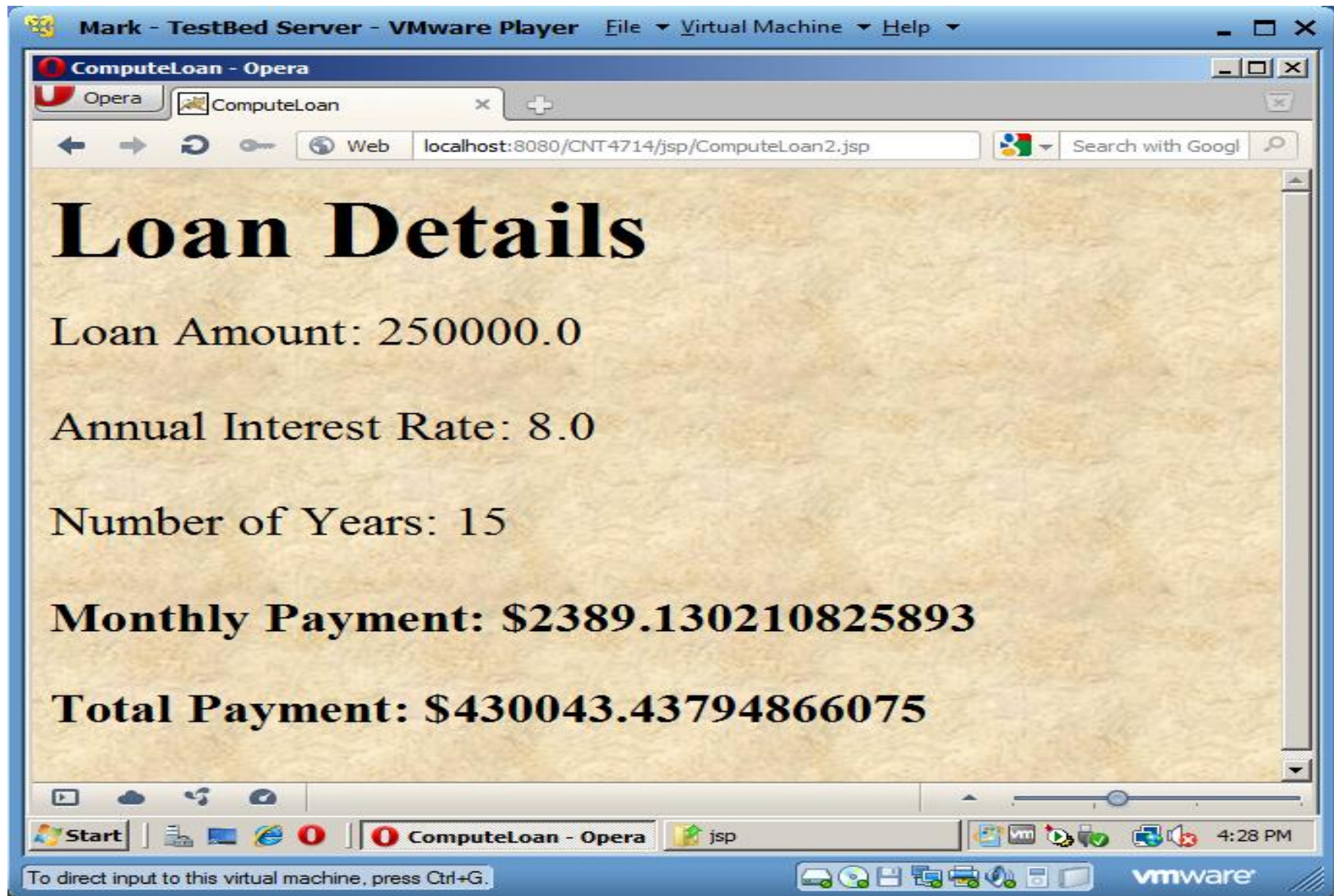
JSP directive to include a Java class.



Scripting Example Using Directives



Scripting Example Using Directives



The screenshot shows a VMware Player window titled "Mark - TestBed Server - VMware Player". Inside the player, an Opera browser window titled "ComputeLoan - Opera" is open. The browser's address bar shows "localhost:8080/CNT4714/jsp/ComputeLoan2.jsp". The main content of the page is displayed on a light brown, textured background and includes the following text:

Loan Details

Loan Amount: 250000.0

Annual Interest Rate: 8.0

Number of Years: 15

Monthly Payment: \$2389.130210825893

Total Payment: \$430043.43794866075

The VMware Player interface includes a menu bar (File, Virtual Machine, Help), a taskbar with a Start button and several application icons, and a system tray showing the time as 4:28 PM. A VMware logo is visible in the bottom right corner of the player window.



JSP Standard Actions

- JSP standard actions provide programmers with access to several of the most common tasks performed in a JSP, such as including content from other resources, forwarding requests to other resources and interacting with JavaBean software components.
- JSP containers process actions at request time.
- Actions are delimited by `<jsp: action>` and `</jsp: action>`, where *action* is the standard action name.
 - In cases where nothing appears between the starting and ending tags, the XML empty element syntax `<jsp: action />` can be used.



JSP Standard Actions

<code><jsp: include></code>	Dynamically includes another resource in a JSP. As the JSP executes, the referenced resource is included and processed.
<code><jsp: forward></code>	Forwards request processing to another JSP, servlet or static page. This action terminates the current JSP's execution.
<code><jsp: plugin></code>	Allows a plug-in component to be added to a page in the form of a browser-specific object or embed HTML element. In the case of a Java applet, this action enables the browser to download and install the Java Plug-in, if it is not already installed on the client computer.
<code><jsp: param></code>	Used with the include, forward and plug-in actions to specify additional name-value pairs of information for use by these actions.



JSP Standard Actions

JavaBean Manipulation	
<code><jsp: useBean></code>	Specifies that the JSP uses a JavaBean instance (i.e., an object of the class that declares the JavaBean). This action specifies the scope of the object and assigns it an ID (i.e., a variable name) that scripting components can use to manipulate the bean.
<code><jsp:setProperty></code>	Sets a property in the specified JavaBean instance. A special feature of this action is automatic matching of request parameters to bean properties of the same name.
<code><jsp:getProperty></code>	Gets a property in the specified JavaBean instance and converts the result to a string for output in the response.



<jsp: include> Action

- JSPs support two include mechanisms – the `<jsp: include>` action and the `include` directive.
- Action `<jsp: include>` enables dynamic content to be included in a JSP at request time. If the included resource changes between requests, the next request to the JSP containing the `<jsp: include>` action includes the resource's new content.
- The `include` directive copies the content into the JSP once, at JSP translation time. If the included resource changes, the new content will not be reflected in the JSP that uses the `include` directive, unless the JSP is recompiled, which would normally occur only if a new version of the JSP were installed.



A JSP Using the `<jsp: include>` Action

```
<?xml version = "1.0"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
    "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">

<!-- include.jsp -->

<html xmlns = "http://www.w3.org/1999/xhtml">
  <head>
    <title>Using jsp:include</title>
    <style type = "text/css">
      body {
        font-family: tahoma, helvetica, arial, sans-serif;
      }
      table, tr, td {
        font-size: 1.1em;
        border: 3px groove;
        padding: 5px;
        background-color: #dddddd;
      }
    </style>
  </head>
```



```
<body>
  <table>
    <tr>
      <td style = "width: 250px; text-align: center">
        <img src = "smallucf.gif"
          width = "140" height = "93"
          alt = "pegasus logo" />
      </td>
      <td>
        <!-- include banner.html in this JSP -->
        <jsp:include page = "banner.html"
          flush = "true" />
      </td>
    </tr>
    <tr>
      <td style = "width: 250px">
        <!-- include toc.html in this JSP -->
        <jsp:include page = "toc.html" flush = "true" />
      </td>
      <td style = "vertical-align: top">
        <!-- include clock2.jsp in this JSP -->
        <jsp:include page = "clock2.jsp"
          flush = "true" />
      </td>
    </tr>
  </table>
</body>
</html>
```



Banner.html

```
<!-- banner.html          -->
<!-- banner to include in another document -->
<div style = "width: 800px">
  <p>
    CNT 4714 - Enterprise Computing
    <br />
    Fall 2011 Semester - University of Central Florida
  </p>
  <p>
    <a href = "mailto:markl@cs.ucf.edu">markl@cs.ucf.edu</a>
  </p>
</div>
```



Table of Contents (toc.html)

```
<!-- toc.html -->
<!-- contents to include in another document -->
<p><a href = "http://www.cs.ucf.edu/courses/cnt4714/fall2011">
    CNT 4714 Course Webpage
</a></p>
<p><a href = "http://www.cs.ucf.edu/faculty/markl.html">
    Instructor's Webpage
</a></p>
<p><a href =
"http://www.cs.ucf.edu/courses/cnt4714/fall2011/code.html">
    Code Download Page
</a></p>
<p><a href =
"http://www.cs.ucf.edu/courses/cnt4714/fall2011/homework.html">
    Programming Assignments Page
</a></p>
<p>Send questions or comments about this site to
    <a href = "mailto:markl@cs.ucf.edu">
        markl@cs.ucf.edu
    </a><br />
</p>
```



Clock2.jsp

```
<!-- clock2.jsp -->
<!-- date and time to include in another document via redirection -->
<table>
  <tr>
    <td style = "background-color: black;">
      <p class = "big" style = "color: cyan; font-size: 3em;
        font-weight: bold;">
        <%-- script to determine client local and --%>
        <%-- format date accordingly --%>
        <%
          // get client locale
          java.util.Locale locale = request.getLocale();


          // get DateFormat for client's Locale
          java.text.DateFormat dateFormat =
            java.text.DateFormat.getDateTimeInstance(
              java.text.DateFormat.LONG,
              java.text.DateFormat.LONG, locale );
        %> <%-- end script --%>
        <%-- output date --%>
        <%= dateFormat.format( new java.util.Date() ) %>
      </p>
    </td>
  </tr>
</table>
```



Using jsp:include - Opera

Opera Using jsp:ir Reload (Ctrl+R)

Web localhost:8080/CNT4714/jsp/include.jsp Search with Google

	<p>CNT 4714 - Enterprise Computing Fall 2011 Semester - University of Central Florida markl@cs.ucf.edu</p>
<p>CNT 4714 Course Webpage</p> <p>Instructor's Webpage</p> <p>Code Download Page</p> <p>Programming Assignments Page</p> <p>Send questions or comments about this site to markl@cs.ucf.edu</p>	<div data-bbox="425 485 1381 671" style="border: 2px solid black; padding: 10px; text-align: center;"> <p>October 18, 2011 4:06:50 PM EDT</p> </div> <div data-bbox="994 963 1767 1092" style="border: 1px solid blue; padding: 5px; margin-top: 20px;"> <p>Execution of include.jsp</p> </div>

Reload (Ctrl+R)

Start Using jsp:include -... jsp C:\Program Files\Ap... vm 4:07 PM

To direct input to this virtual machine, press Ctrl+G.

vmware



<jsp: forward> Action

- JSP action <jsp: forward> enables a JSP to forward request processing to a different resource, such as an error page.
- Request processing by the original JSP terminates as soon as the JSP forwards the request.
- In the next example, this action is illustrated by forwarding a welcome request to another welcome page. JSP forward1.jsp forwards the request to JSP forward2.jsp. The forwarding action requests a date and time at which the original request was received that is forwarded.



Initial Forward JSP (forward1.jsp)

```
<?xml version = "1.0"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
    "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<!-- forward1.jsp -->
<html xmlns = "http://www.w3.org/1999/xhtml">
<head>
    <title>Forward request to another JSP</title>
</head>
<body>
    <% // begin scriptlet
        String name = request.getParameter( "firstName" );
        if ( name != null )
        {
    %> <%-- end scriptlet to insert fixed template data --%>

        <jsp:forward page = "forward2.jsp">
            <jsp:param name = "date"
                value = "<%= new java.util.Date() %>" />
        </jsp:forward>

    <% // continue scriptlet
        } // end if
```



Initial Forward JSP (forward1.jsp) (cont.)

```
else
    {
    %> <%-- end scriptlet to insert fixed template data --%>

        <form action = "forward1.jsp" method = "get">
            <p>Type your first name and press Submit</p>

            <p><input type = "text" name = "firstName" />
                <input type = "submit" value = "Submit" />
            </p>
        </form>

        <% // continue scriptlet

            } // end else

        %> <%-- end scriptlet --%>
    </body>
</html> <!-- end XHTML document -->
```



Forward2 JSP (forward2.jsp)

```
<?xml version = "1.0"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
    "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<!-- forward2.jsp -->
<html xmlns = "http://www.w3.org/1999/xhtml">
<head>
    <title>Processing a forwarded request</title>
    <style type = "text/css">
        .big
        {
            font-family: tahoma, helvetica, arial, sans-serif;
            font-weight: bold;
            font-size: 2em;
        }
    </style>
</head>
<body>
    <p class = "big">
        Hello <%= request.getParameter( "firstName" ) %>, <br />
        Your redirection request was received <br /> and
        forwarded at
```



Forward2 JSP (forward2.jsp) (cont.)

```
</p>
  <table style = "border: 6px outset;">
    <tr>
      <td style = "background-color: black;">
        <p class = "big" style = "color: cyan;">
          <%= request.getParameter( "date" ) %>
        </p>
      </td>
    </tr>
  </table>
</body>
</html>
```



Forward request to another JSP - Opera

Opera Forward request to anot... x

localhost:8080/CNT4714/jsp/forward1.jsp

Type your first name and press Submit

Mark Submit

View (120%)

Start Forward request t... jsp C:\Program Files\Ap... 4:08 PM

To direct input to this virtual machine, press Ctrl+G.

vmware

Original request is invoked by forward1.jsp



Forward2.jsp receives forwarded request for service with firstName passed as a parameter

**Hello Mark,
Your redirection request was received
and forwarded at**

Tue Oct 18 16:08:49 EDT 2011

