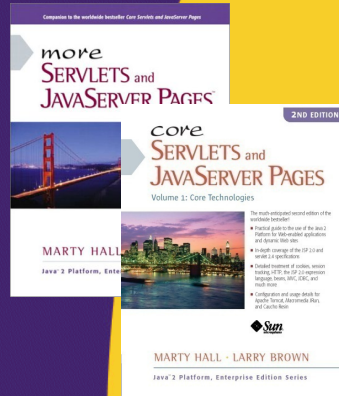




Handling the Client Request: Form Data

Originals of Slides and Source Code for Examples:
<http://courses.coreservlets.com/Course-Materials/csajsp2.html>

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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. Contact hall@coreservlets.com for details.

Agenda

- The role of form data
- Creating and submitting HTML forms
- Reading individual request parameters
- Reading the entire set of request parameters
- Handling missing and malformed data
- Dealing with incomplete form submissions
- Filtering special characters out of the request parameters

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Form Basics

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The Role of Form Data

- **Example URL at online travel agent**
 - `http://host/path?user=Marty+Hall&origin=bwi&dest=lax`
 - Names come from HTML author; values from end user
- **Parsing form (query) data in traditional CGI**
 - Read the data one way (QUERY_STRING) for GET requests, another way (standard input) for POST requests
 - Chop pairs at ampersands, then separate parameter names (left of the =) from parameter values (right of the =)
 - URL decode values (e.g., "%7E" becomes "~")
- **Greatly simplified in servlets**
 - Use `request.getParameter` in all cases.
 - Gives URL-decoded result

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Creating Form Data: HTML Forms

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD><TITLE>A Sample Form Using GET</TITLE></HEAD>
<BODY BGCOLOR="#FDF5E6">
<H2 ALIGN="CENTER">A Sample Form Using GET</H2>

<FORM ACTION="http://localhost:8088/SomeProgram">
  <CENTER>
    First name:
    <INPUT TYPE="TEXT" NAME="firstName" VALUE="J. Random"><BR>
    Last name:
    <INPUT TYPE="TEXT" NAME="lastName" VALUE="Hacker"><P>
    <INPUT TYPE="SUBMIT"> <!-- Press this to submit form -->
  </CENTER>
</FORM>
</BODY></HTML>
```

You normally use a relative URL for the ACTION. This URL is just for testing because I am running a test server on port 8088 that echoes the data it receives.

- See *CSAJSP/2* Ch. 19 for details on forms

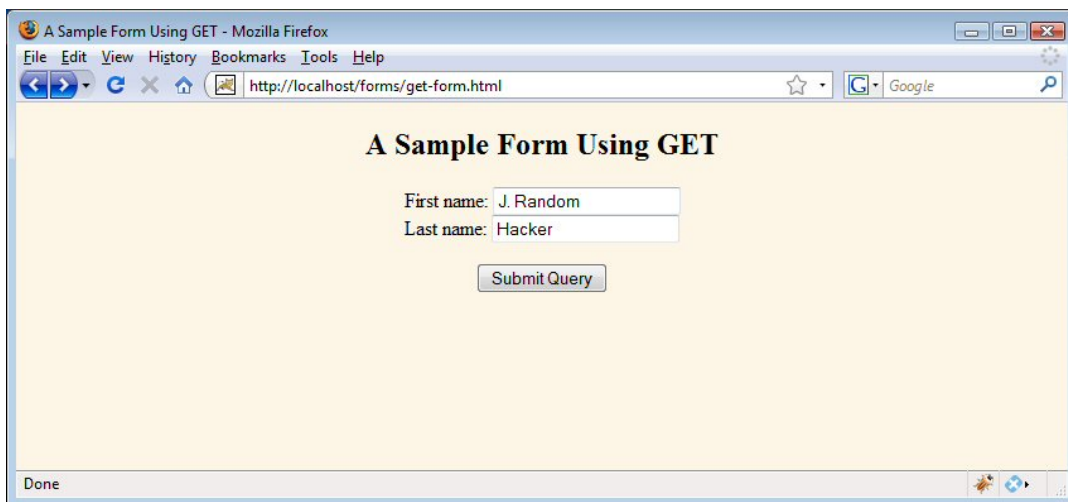
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Aside: Installing HTML Files

- **HTML files do not go in src**
 - They go in WebContent
 - When deployed, that becomes the top-level Web application directory
 - In contrast, code under src gets deployed to the WEB-INF/classes folder of the Web app directory
- **Example**
 - Eclipse project name: forms
 - Files
 - WebContent/test1.html
 - WebContent/someDir/test2.html
 - URLs
 - <http://localhost/forms/test1.html>
 - <http://localhost/forms/someDir/test2.html>

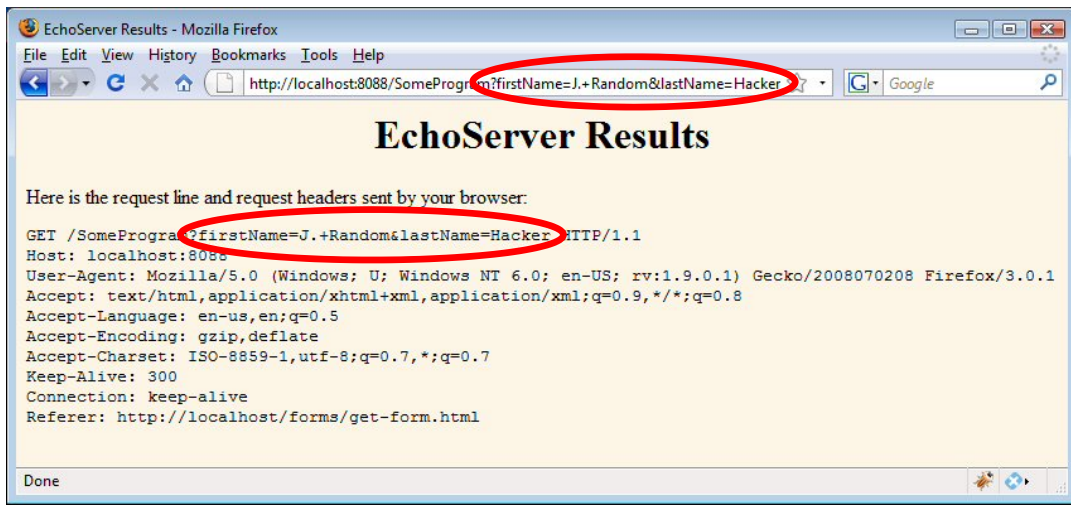
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GET Form: Initial Result



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GET Form: Submission Result (Data Sent to EchoServer)



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Sending POST Data

```
<!DOCTYPE ... >
<HTML>
<HEAD><TITLE>A Sample Form Using POST</TITLE></HEAD>
<BODY BGCOLOR="#FDF5E6">
<H2 ALIGN="CENTER">A Sample Form Using POST</H2>

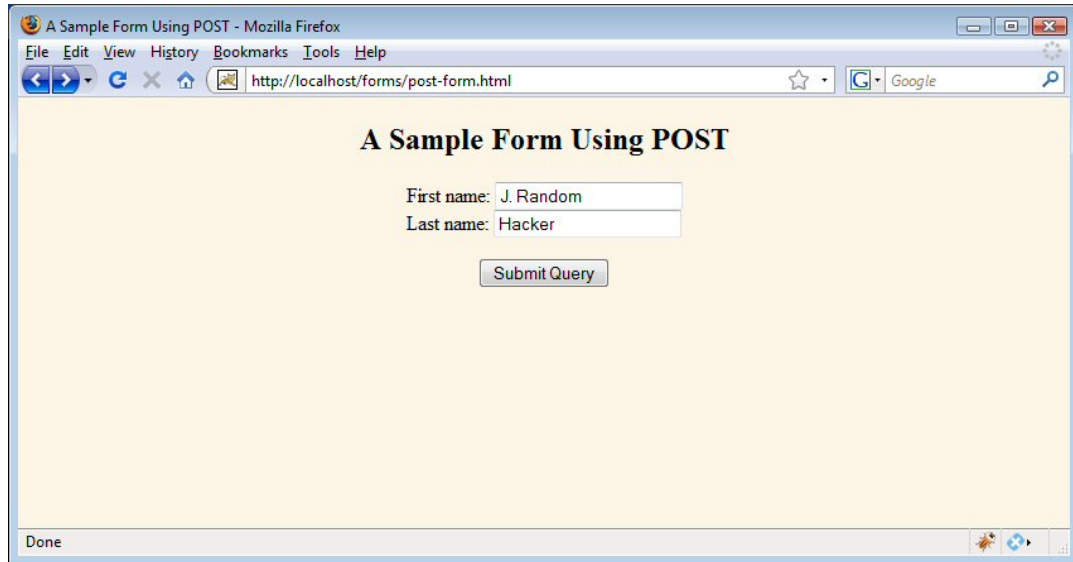
<FORM ACTION="http://localhost:8088/SomeProgram"
  METHOD="POST">
  <CENTER>
  First name:
  <INPUT TYPE="TEXT" NAME="firstName" VALUE="J. Random"><BR>
  Last name:
  <INPUT TYPE="TEXT" NAME="lastName" VALUE="Hacker"><P>
  <INPUT TYPE="SUBMIT">
  </CENTER>
</FORM>

</BODY></HTML>
```

The default method is GET. So, if a form says METHOD="GET" or it has no METHOD at all, GET is used.

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POST Form: Initial Result



A Sample Form Using POST

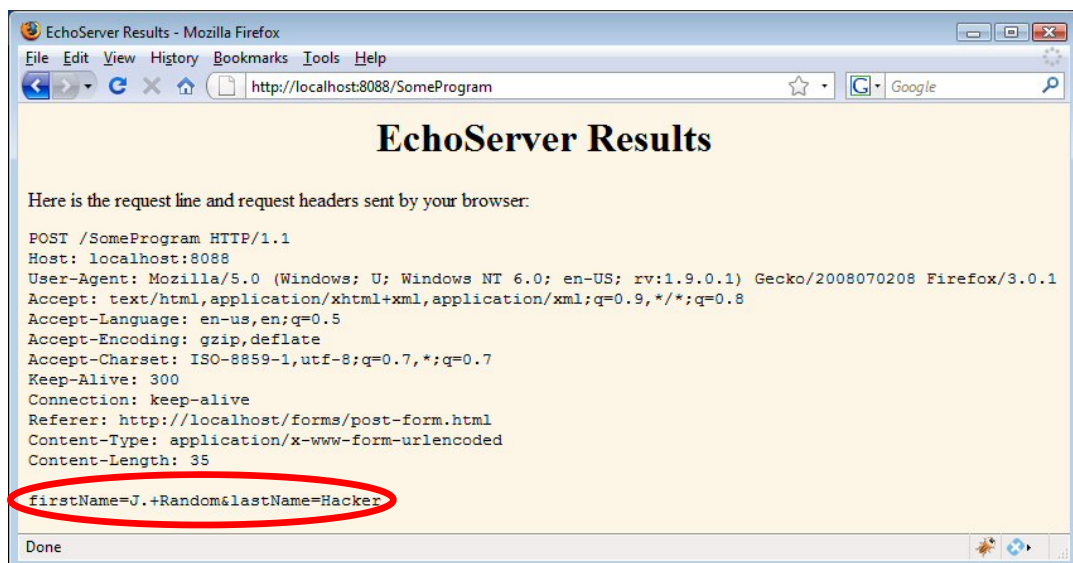
First name:

Last name:

Done

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POST Form: Submission Result (Data Sent to EchoServer)



EchoServer Results

Here is the request line and request headers sent by your browser:

```
POST /SomeProgram HTTP/1.1
Host: localhost:8088
User-Agent: Mozilla/5.0 (Windows; U; Windows NT 6.0; en-US; rv:1.9.0.1) Gecko/2008070208 Firefox/3.0.1
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-us,en;q=0.5
Accept-Encoding: gzip,deflate
Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7
Keep-Alive: 300
Connection: keep-alive
Referer: http://localhost/forms/post-form.html
Content-Type: application/x-www-form-urlencoded
Content-Length: 35
firstName=J.+Random&lastName=Hacker
```

Done

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GET vs. POST

- **Advantages of POST**

- URL is simpler
- Data is hidden from people looking over your shoulder
- Larger amounts of data can be sent
- Can send special characters (e.g., in uploaded files)
- Browsers will not cache results
- Should always be used if the requests changes data on server (REST)

- **Advantages of GET**

- Can bookmark results page
- Browsers can cache results
- Easier to test interactively

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HTML 4 vs. XHTML Syntax

- **HTML 4**

- Some end tags optional
- Tag names and attribute names are case insensitive

- **XHTML**

- End tags always required
 - If no body content, can use collapsed form like `
`
- Tag names and attribute names must be in lower case

- **HTML 5 DOCTYPE**

- Most people who use the HTML 5 DOCTYPE do so as a convenience, and follow XHTML syntax in their pages.

- **Examples**

- HTML 4
 - `<INPUT TYPE="TEXT" NAME="Blah">
`
- XHTML
 - `<input type="text" name="Blah"/>
`

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Reading Form Data

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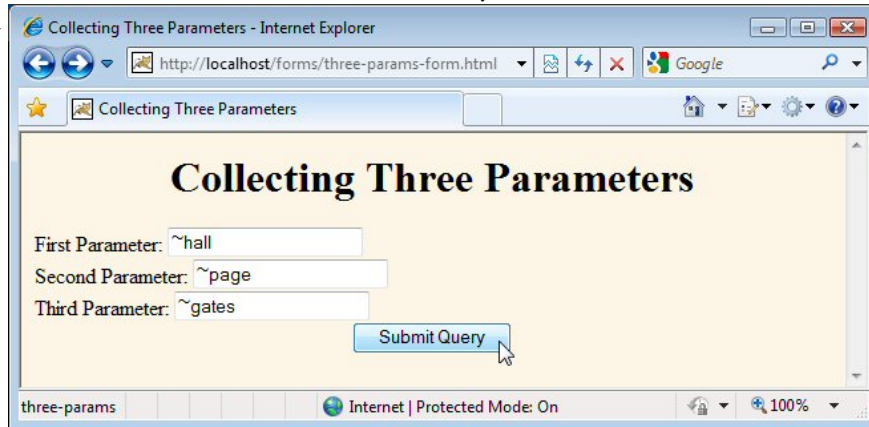
Reading Form Data In Servlets

- **`request.getParameter("name")`**
 - Returns URL-decoded value of first occurrence of name in query string
 - Works identically for GET and POST requests
 - Returns null if no such parameter is in query data
- **`request.getParameterValues("name")`**
 - Returns an array of the URL-decoded values of *all* occurrences of name in query string
 - Returns a one-element array if param not repeated
 - Returns null if no such parameter is in query
- **`request.getParameterNames()` or `request.getParameterMap()`**
 - Returns Enumeration or Map of request params
 - Usually reserved for debugging

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An HTML Form With Three Parameters

```
<FORM ACTION="three-params">  
  First Parameter: <INPUT TYPE="TEXT" NAME="param1"><BR>  
  Second Parameter: <INPUT TYPE="TEXT" NAME="param2"><BR>  
  Third Parameter: <INPUT TYPE="TEXT" NAME="param3"><BR>  
  <CENTER><INPUT TYPE="SUBMIT"></CENTER>  
</FORM>
```



- Project name is "forms"
- Form installed in WebContent/three-params-form.html

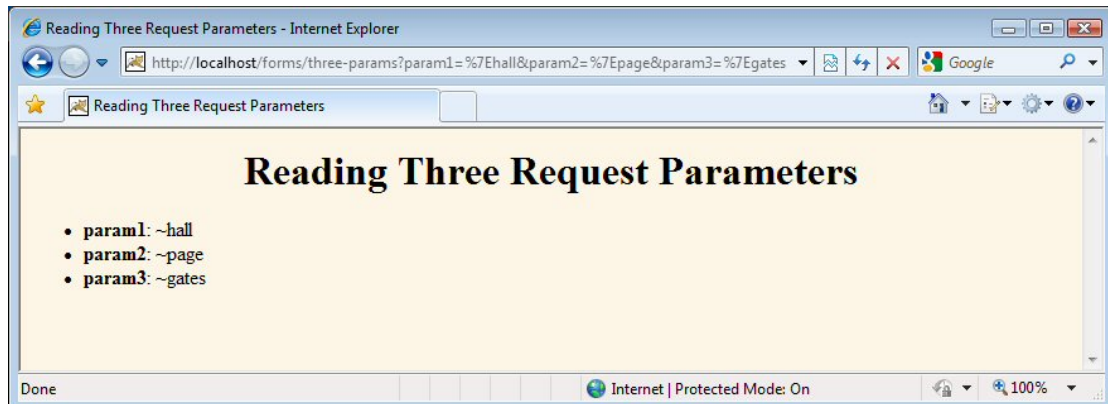
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Reading the Three Parameters

```
@WebServlet("/three-params")  
public class ThreeParams extends HttpServlet {  
    public void doGet(HttpServletRequest request,  
        HttpServletResponse response)  
        throws ServletException, IOException {  
        ...  
        out.println(docType +  
            "<HTML>\n" +  
            "<HEAD><TITLE>"+title + "</TITLE></HEAD>\n" +  
            "<BODY BGCOLOR=\"#FDF5E6\"\n" +  
            "<H1 ALIGN=\"CENTER\"\n" + title + "</H1>\n" +  
            "<UL>\n" +  
            "  <LI><B>param1</B>: "  
            + request.getParameter("param1") + "\n" +  
            "  <LI><B>param2</B>: "  
            + request.getParameter("param2") + "\n" +  
            "  <LI><B>param3</B>: "  
            + request.getParameter("param3") + "\n" +  
            "</UL>\n" +  
            "</BODY></HTML>");  
    }  
}
```

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Reading Three Parameters: Result



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Reading All Parameters

```
@WebServlet("/show-params")
public class ShowParameters extends HttpServlet {
    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, IOException {
        response.setContentType("text/html");
        PrintWriter out = response.getWriter();
        String docType =
            "<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 " +
            "Transitional//EN">\n";
        String title = "Reading All Request Parameters";
        out.println(docType +
            "<HTML>\n" +
            "<HEAD><TITLE>" + title + "</TITLE></HEAD>\n" +
            "<BODY BGCOLOR=\"#FDF5E6\"\>\n" +
            "<H1 ALIGN=CENTER>" + title + "</H1>\n" +
            "<TABLE BORDER=1 ALIGN=CENTER>\n" +
            "<TR BGCOLOR=\"#FFAD00\"\>\n" +
            "<TH>Parameter Name<TH>Parameter Value(s)");
```

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Reading All Parameters (Continued)

```
Enumeration<String> paramNames =
    request.getParameterNames();
while (paramNames.hasMoreElements()) {
    String paramName = (String)paramNames.nextElement();
    out.print("<TR><TD>" + paramName + "\n<TD>");
    String[] paramValues =
        request.getParameterValues(paramName);
    if (paramValues.length == 1) {
        String paramValue = paramValues[0];
        if (paramValue.length() == 0)
            out.println("<I>No Value</I>");
        else
            out.println(paramValue);
    } else {
        out.println("<UL>");
        for (int i=0; i<paramValues.length; i++) {
            out.println("<LI>" + paramValues[i]);
        }
        out.println("</UL>");
    }
}
out.println("</TABLE>\n</BODY></HTML>");
}
```

23

Reading All Parameters (Continued)

```
public void doPost(HttpServletRequest request,
                  HttpServletResponse response)
    throws ServletException, IOException {
    doGet(request, response);
}
}
```

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Reading All Parameters (Sample Form)

A Sample Form using POST

Item Number: 123-A
Description: Wonder Widget
Price Each: \$456.78

First Name: Sam
Last Name: Palmisano
Middle Initial:

Shipping Address: One Microsoft Way
Redmond WA 98052

Credit Card:
 Visa
 MasterCard
 American Express
 Discover
 Java SmartCard

Credit Card Number:
Repeat Credit Card Number:

Submit Order

Done

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Reading All Parameters (Result)

Reading All Request Parameters

Parameter Name	Parameter Value(s)
cardNum	<ul style="list-style-type: none">12345678901234567890
cardType	Java SmartCard
price	\$456.78
initial	No Value
itemNum	123-A
address	One Microsoft Way Redmond WA 98052
description	Wonder Widget
firstName	Sam
lastName	Palmisano

Done

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Handling Missing and Malformed Data

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Checking for Missing and Malformed Data

- **Missing**

- Field missing in form
 - `getParameter` returns null
- Field blank when form submitted
 - `getParameter` returns an empty string (or possibly a string with whitespace in it)
- Must check for null before checking for empty string

```
String param = request.getParameter("someName");
if ((param == null) || (param.trim().equals("")) ) {
    doSomethingForMissingValues (...);
} else {
    doSomethingWithParameter (param);
}
```

- **Malformed**

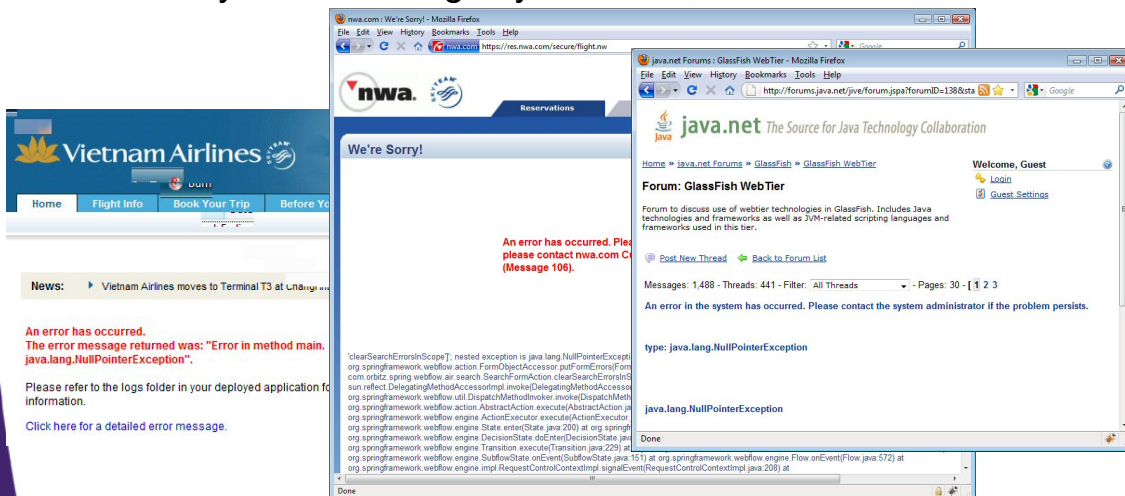
- Value is a nonempty string in the wrong format

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Checking for Missing and Malformed Data

• Principles

- Assume user data could be missing or in wrong format
- Users should *never* see Java error messages
 - Only error messages you create, aimed at end users



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Handling Missing and Malformed Data

• Use default values

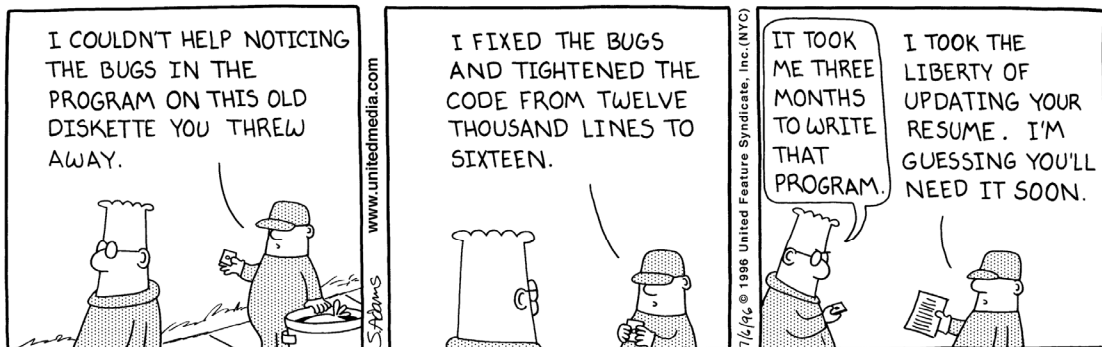
- Replace missing values with application-specific standard values
- See following example

• Redisplay the form

- Show the form again, with missing values flagged
- Previously-entered values should be preserved
- Best option for implementing this: use framework like JSF or Struts
 - Covered in later tutorials
- Four options to implement this directly
 - Have the same servlet present the form, process the data, and present the results.
 - See book for example
 - Have one servlet present the form; have a second servlet process the data and present the results.
 - Have a JSP page “manually” present the form; have a servlet or JSP page process the data and present the results.
 - Have a JSP page present the form, automatically filling in the fields with values obtained from a data object. Have a servlet or JSP page process the data and present the results.

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Example of Using Default Values: A Résumé-Posting Site



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Résumé-Posting Site: Input Form and Good Data Results

The screenshot shows a web browser window titled "Free Resume Posting - Mozilla Firefox" with the URL "http://localhost/forms/submit-resume.html". The page header is "hot-computer-jobs.com". The main text reads: "To use our *free* resume-posting service, simply fill out the brief summary of your skills below. Use "Preview" to check the results, then press "Submit" once it is ready. Your mini-resume will appear online within 24 hours."

The form is divided into three sections:

- First, give some general information about the look of your resume:**
 - Heading font: Arial Black
 - Heading text size: 36
 - Body font: default
 - Body text size: 22
 - Foreground color: BLACK
 - Background color: #C0C0C0
- Next, give some general information about yourself:**
 - Name: Al Gore lthm
 - Current or most recent title: CTO
 - Email address: lthm@acm.org
 - Programming Languages: Java, Ruby, Lisp, Scala
- Finally, enter a brief summary of your skills and experience:** (use <P> to separate paragraphs. Other HTML markup is also permitted.)
 - Expert in data structures and computational methods.
 - <P>Well known for finding efficient solutions to intractable problems, then rigorously proving time and space complexity for best-, worst-, and average-case performance.
 - <P>Can prove that P is not equal to NP. Does not want to work for a company that does not know what this means.
 - <P>Not related to the American politician.

Buttons for "Preview" and "Submit" are at the bottom. A "See our privacy policy" link is also present.

The screenshot shows a web browser window titled "Resume for Al Gore lthm - Mozilla Firefox" with the URL "http://localhost/forms/show-resume-preview". The page header is "AI Gore lthm CTO" with the email "lthm@acm.org".

The resume content is as follows:

- Programming Languages**
 - Java
 - Ruby
 - Lisp
 - Scala
- Skills and Experience**
 - Expert in data structures and computational methods.
 - Well known for finding efficient solutions to intractable problems, then rigorously proving time and space complexity for best-, worst-, and average-case performance.
 - Can prove that P is not equal to NP. Does not want to work for a company that does not know what this means.
 - Not related to the American politician.

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Résumé-Posting Site: Servlet Code

```
headingFont =
    replaceIfMissingOrDefault(headingFont, "");
int headingSize =
    getSize(request.getParameter("headingSize"),
            32);
String bodyFont =
    request.getParameter("bodyFont");
bodyFont =
    replaceIfMissingOrDefault(bodyFont, "");
int bodySize =
    getSize(request.getParameter("bodySize"), 18);
String fgColor = request.getParameter("fgColor");
fgColor =
    replaceIfMissing(fgColor, "BLACK");
String bgColor = request.getParameter("bgColor");
```

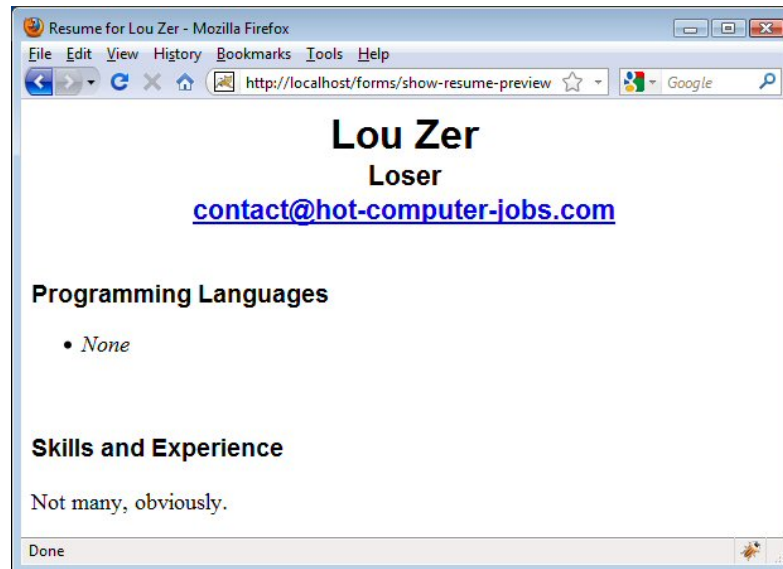
33

Résumé-Posting Site: Servlet Code (Continued)

```
private String replaceIfMissing(String orig,
                                String replacement) {
    if ((orig == null) || (orig.trim().equals(""))) {
        return(replacement);
    } else {
        return(orig);
    }
}
```

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Résumé-Posting Site: Result for Incomplete Data



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Filtering Strings for HTML- Specific Characters (Code)

```
public class ServletUtilities {
    public static String filter(String input) {
        if (!hasSpecialChars(input)) {
            return(input);
        }
        StringBuilder filtered =
            new StringBuilder(input.length());
        char c;
        for(int i=0; i<input.length(); i++) {
            c = input.charAt(i);
            switch(c) {
                case '<': filtered.append("&lt;"); break;
                case '>': filtered.append("&gt;"); break;
                case '"': filtered.append("&quot;"); break;
                case '&': filtered.append("&amp;"); break;
                default: filtered.append(c);
            }
        }
        return(filtered.toString());
    }
}
```

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A Servlet that Displays Code Samples: No Filtering

```
@WebServlet("/code-preview-bad")
public class CodePreviewBad extends HttpServlet {
    public void doPost(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, IOException {
        ...
        out.println(docType +
            "<HTML>\n" +
            "<HEAD><TITLE>"+title+"</TITLE></HEAD>\n" +
            "<BODY BGCOLOR=\"#FDF5E6\">\n" +
            "<H1 ALIGN=\"CENTER\">" + title + "</H1>\n"+
            "<PRE>\n" +
            getCode(request) +
            "</PRE>\n" +
            "Now, wasn't that an interesting sample\n" +
            "of code?\n" +
            "</BODY></HTML>");
    }
    protected String getCode(HttpServletRequest request) {
        return(request.getParameter("code"));
    }
}
```

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A Servlet that Displays Code Samples: No Special Chars

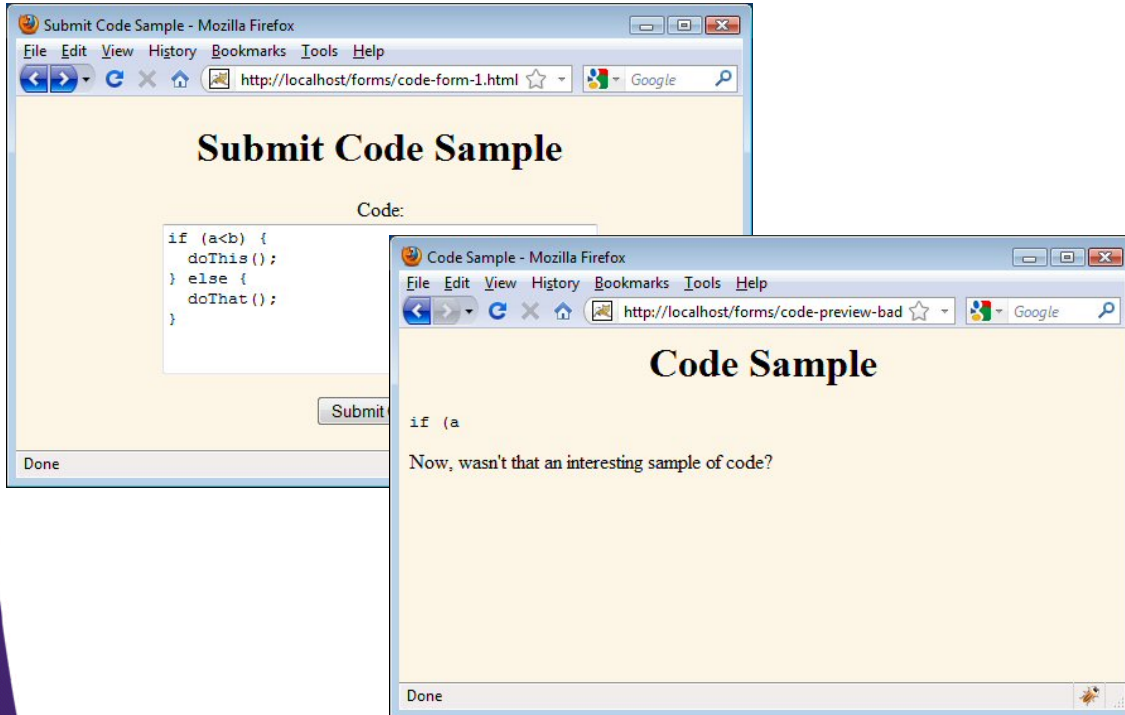
The image shows two overlapping browser windows. The background window is titled 'Submit Code Sample - Mozilla Firefox' and shows a form with the title 'Submit Code Sample'. The form has a text area labeled 'Code:' containing the following code snippet:

```
if (a==b) {
doThis();
} else {
doThat();
}
```

Below the text area is a 'Submit' button. The foreground window is titled 'Code Sample - Mozilla Firefox' and shows the output of the servlet. The output has the title 'Code Sample' and displays the code snippet from the form, followed by the text: 'Now, wasn't that an interesting sample of code?'

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A Servlet that Displays Code Samples: Special Chars



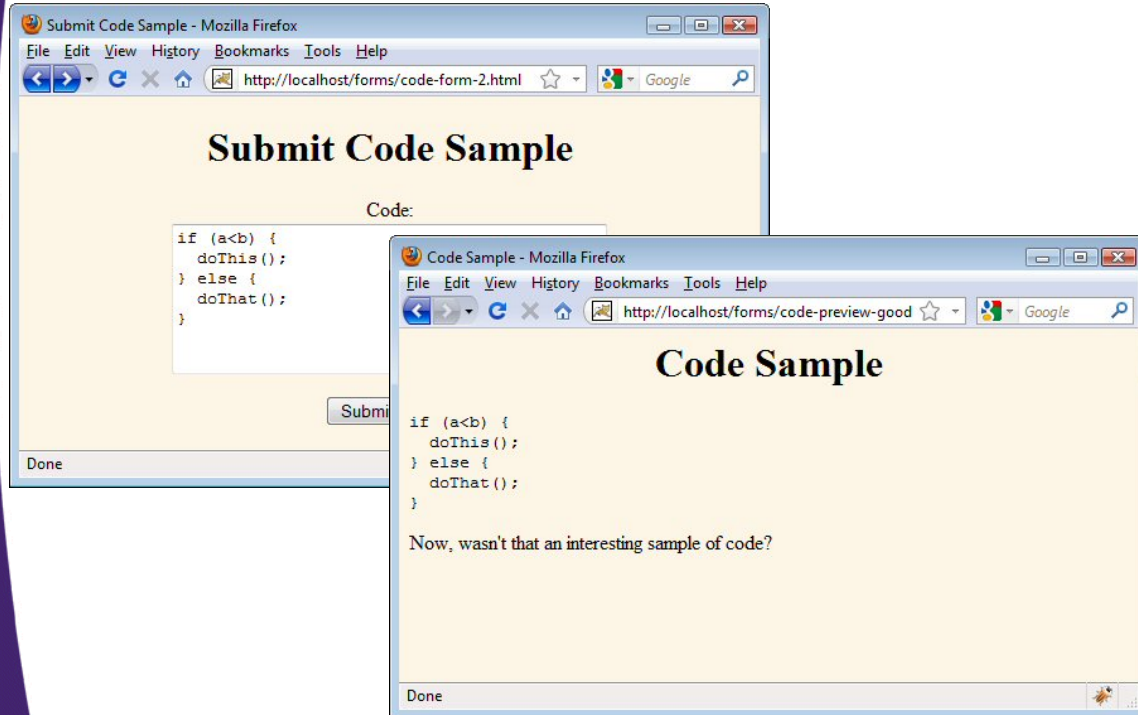
39

A Servlet that Displays Code Samples: Filtering

```
@WebServlet("/code-preview-good")
public class CodePreviewGood extends CodePreviewBad {
    protected String getCode(HttpServletRequest request) {
        return
            (ServletUtilities.filter(super.getCode(request)));
    }
}
```

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Fixed Servlet that Displays Code Samples: Special Chars



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Advanced Topics

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Tags for Form Aesthetics

- **label**

- If you use the label tag for prompts associated with fields, clicking on the label transfers focus to the input field
- You can either use the "for" attribute or enclose the field within the label

- `<label for="fname">First name:</label>`
`<input type="text" name="userFirstName" id="fname"/>`
- `<label>First name:`
`<input type="text" name="userFirstName"`
`</label>`

- **fieldset and legend**

- Grouping all or part of a form inside fieldset draws attention to it and separates it from the rest of the page
- Using style sheets for the legend is particularly useful

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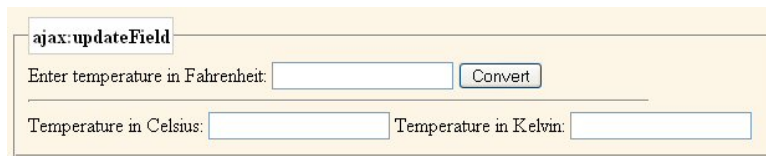
Tags for Form Aesthetics: Example

- **HTML**

```
<fieldset>
  <legend>ajax:updateField</legend>
  <form ...>
    <label for="f">Enter temperature in Fahrenheit:</label>
    <input type="text" id="f"/>
    <input type="button" id="convertButton" value="Convert"/>
    <hr width="500" align="left"/>
    <label for="c">Temperature in Celsius:</label>
    <input type="text" id="c"/>
    <label for="k">Temperature in Kelvin:</label>
    <input type="text" id="k"/>
  </form>
</fieldset>
```

- **CSS**

```
legend {
  font-weight: bold;
  color: black;
  background-color: white;
  border: 1px solid #cccccc;
  padding: 4px 2px;
}
```

A screenshot of the rendered HTML form. It features a legend at the top with the text "ajax:updateField". Below the legend, there are three input fields. The first is a text input with the label "Enter temperature in Fahrenheit:" and a "Convert" button next to it. Below this is a horizontal line. The second and third are text inputs with labels "Temperature in Celsius:" and "Temperature in Kelvin:" respectively.

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Handling Input in Multiple Languages

- **Use server's default character set**

```
String firstName =  
    request.getParameter("firstName");
```

- **Convert from English (Latin-1) to Japanese**

```
String firstNameWrongEncoding =  
    request.getParameter("firstName");  
String firstName =  
    new String(firstNameWrongEncoding.getBytes(),  
        "Shift_JIS");
```

- **Accept either English or Japanese**

```
request.setCharacterEncoding("JISAutoDetect");  
String firstName =  
    request.getParameter("firstName");
```

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Reading Raw Form Data and Parsing Uploaded Files

- **Raw data**

- request.getReader
- request.getInputStream
 - Data no longer available via getParameter after this

- **Parsing uploaded files**

- HTML has a way of submitting entire files
 - `<INPUT TYPE="FILE"...>`
 - See Section 19.7 of 2nd Edition of *Core Servlets and JSP*.
- Only became part of the servlet/JSP API in Servlet version 3.0 (e.g., Tomcat 7)
- For older servers, popular third-party library available from the Apache/Jakarta “Commons” library
 - <http://jakarta.apache.org/commons/fileupload/>

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More Advanced Topics (See book for details/examples)

- **Automatically filling in a data object with request parameter values**
 - Use a JavaBean (Java object with methods named getBlah and setBlah) to store incoming data
 - Request param named blah passed to appropriate setBlah method. Automatic type conversion. Default values used for errors.
- **Redisplaying the input form when parameters are missing or malformed**
 - The same servlet presents the form, processes the data, and presents the results. JSF provides better solution – see later tutorials!
 - The servlet first looks for incoming request data: if it finds none, it presents a blank form. If the servlet finds partial request data, it extracts the partial data, puts it back into the form, and marks the other fields as missing. If the servlet finds the full complement of required data, it processes the request and displays the results.

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Summary

- **Make a form: `<form ...> ... </form>`**
 - Relative URL for “action”. Textfields need “name”. Should always have submit button.
- **Read data: `request.getParameter("name")`**
 - Results in value as entered into form, not necessarily as sent over network. I.e., *not* URL-encoded.
- **Check for missing or malformed data**
 - Missing: null or empty string
 - Special case: query data that contains special HTML characters
 - Need to be filtered if query data will be placed into resultant HTML page

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Questions?

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