

Generating the HTTP Response

Lecture 4 – Chapters 6 & 7

Core Servlets & JSP book: www.coreservlets.com
 More Servlets & JSP book: www.moreservlets.com
 Servlet and JSP Training Courses: courses.coreservlets.com

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Agenda

- Idea of HTTP status codes
- Setting status codes from servlets
- Common HTTP 1.1 status codes
- A common front end to various Web search engines
- Idea of HTTP response headers
- Setting response headers from servlets
- Common HTTP 1.1 response headers
- Persistent servlet state and auto-reloading pages

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Generating the Server Response: HTTP Status Codes

- **Example HTTP 1.1 Response**

```
HTTP/1.1 200 OK
Content-Type: text/html

<!DOCTYPE ...>
<HTML>
...
</HTML>
```
- **Changing the status code lets you perform a number of tasks not otherwise possible**
 - Forward client to another page
 - Indicate a missing resource
 - Instruct browser to use cached copy
- **Set status *before* sending document**

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Setting Status Codes

- **public void setStatus(int statusCode)**
 - Use a constant for the code, not an explicit int. Constants are in HttpServletResponse
 - Names derived from standard message. E.g., SC_OK, SC_NOT_FOUND, etc.
- **public void sendError(int code, String message)**
 - Wraps message inside small HTML document
- **public void sendRedirect(String url)**
 - Relative URLs permitted in 2.2 and later
 - Sets Location header also

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Common HTTP 1.1 Status Codes

- **200 (OK)**
 - Everything is fine; document follows.
 - Default for servlets.
- **204 (No Content)**
 - Browser should keep displaying previous document.
- **301 (Moved Permanently)**
 - Requested document permanently moved elsewhere (indicated in Location header).
 - Browsers go to new location automatically.

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Common HTTP 1.1 Status Codes (Continued)

- **302 (Found)**
 - Requested document temporarily moved elsewhere (indicated in Location header).
 - Browsers go to new location automatically.
 - Servlets should use `sendRedirect`, not `setStatus`, when setting this header. See example.
- **401 (Unauthorized)**
 - Browser tried to access password-protected page without proper Authorization header. See example in book.
- **404 (Not Found)**
 - No such page. Servlets should use `sendError` to set this.
 - Problem: Internet Explorer 5.0.
 - Fun and games: <http://www.plinko.net/404/>

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A Front End to Various Search Engines: Code

```
public void doGet(HttpServletRequest request,
                  HttpServletResponse response)
    throws ServletException, IOException {
    String searchString =
        request.getParameter("searchString");
    if ((searchString == null) ||
        (searchString.length() == 0)) {
        reportProblem(response, "Missing search string.");
        return;
    }
    searchString = URLEncoder.encode(searchString);
    String numResults =
        request.getParameter("numResults");
    ...
    String searchEngine =
        request.getParameter("searchEngine");
```

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A Front End to Various Search Engines: Code (Continued)

```
SearchSpec[] commonSpecs =
    SearchSpec.getCommonSpecs();
for(int i=0; i<commonSpecs.length; i++) {
    SearchSpec searchSpec = commonSpecs[i];
    if (searchSpec.getName().equals(searchEngine)) {
        String url =
            searchSpec.makeURL(searchString, numResults);
        response.sendRedirect(url);
        return;
    }
}
reportProblem(response,
    "Unrecognized search engine.");
```

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A Front End to Various Search Engines: Code (Continued)

```
private void reportProblem(HttpServletResponse response,
                          String message)
    throws IOException {
    response.sendError(response.SC_NOT_FOUND,
        "<H2>" + message + "</H2>");
}
```

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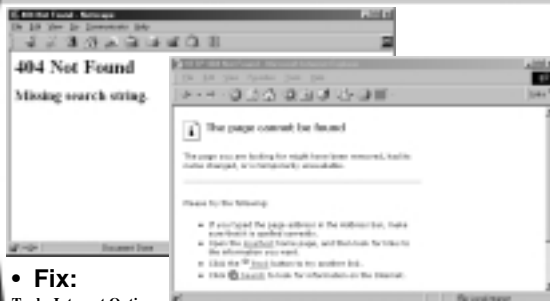
Front End to Search Engines: Result of Legal Request



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Front End to Search Engines: Result of Illegal Request



• Fix:

Tools, Internet Options,
deselect "Show 'friendly' HTTP error messages"

Not a real fix -- doesn't help unsuspecting users of your pages

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Generating the Server Response: HTTP Response Headers

• Purposes

- Give forwarding location
- Specify cookies
- Supply the page modification date
- Instruct the browser to reload the page after a designated interval
- Give the document size so that persistent HTTP connections can be used
- Designate the type of document being generated
- Etc.

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Setting Arbitrary Response Headers

- **public void setHeader(String headerName, String headerValue)**
 - Sets an arbitrary header.
- **public void setDateHeader(String name, long millisecs)**
 - Converts milliseconds since 1970 to a date string in GMT format.
- **public void setIntHeader(String name, int headerValue)**
 - Prevents need to convert int to String before calling setHeader.
- **addHeader, addDateHeader, addIntHeader**
 - Adds new occurrence of header instead of replacing. Servlets 2.2/2.3 only.

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Setting Common Response Headers

- **setContentLength**
 - Sets the Content-Type header. Servlets almost always use this. See table of common MIME types.
- **setContentLength**
 - Sets the Content-Length header. Used for persistent HTTP connections. See Connection request header.
- **addCookie**
 - Adds a value to the Set-Cookie header. See separate section on cookies.
- **sendRedirect**
 - Sets the Location header (plus changes status code).

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Common MIME Types

Type	Meaning
application/msword	Microsoft Word document
application/octet-stream	Unrecognized or binary data
application/pdf	Acrobat (.pdf) file
application/postscript	PostScript file
application/vnd.ms-excel	Excel spreadsheet
application/vnd.ms-powerpoint	Powerpoint presentation
application/x-gzip	Gzip archive
application/x-java-archive	JAR file
application/x-java-vm	Java bytecode (.class) file
application/zip	Zip archive
audio/basic	Sound file in .au or .snd format
audio/x-aiff	AIFF sound file
audio/x-wav	Microsoft Windows sound file
audio/midi	MIDI sound file
text/css	HTML cascading style sheet
text/html	HTML document
text/plain	Plain text
text/xml	XML document
image/gif	GIF image
image/jpeg	JPEG image
image/png	PNG image
image/tiff	TIFF image
video/mpeg	MPEG video clip
video/quicktime	QuickTime video clip

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Common HTTP 1.1 Response Headers

- **Cache-Control (1.1) and Pragma (1.0)**
 - A no-cache value prevents browsers from caching page. Send both headers or check HTTP version.
- **Content-Encoding**
 - The way document is encoded. Browser reverses this encoding before handling document. See compression example earlier.
- **Content-Length**
 - The number of bytes in the response.
 - See **setContentLength** on previous slide.
 - Use **ByteArrayOutputStream** to buffer document before sending it, so that you can determine size. See discussion of the Connection request header and detailed example in book.

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Common HTTP 1.1 Response Headers (Continued)

- **Content-Type**
 - The MIME type of the document being returned.
 - Use **setContentLength** to set this header.
- **Expires**
 - The time at which document should be considered out-of-date and thus should no longer be cached.
 - Use **setDateHeader** to set this header.
- **Last-Modified**
 - The time document was last changed.
 - Don't set this header explicitly; provide a **getLastModified** method instead. See example in CSAJSP Chapter 2.

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Common HTTP 1.1 Response Headers (Continued)

- **Location**
 - The URL to which browser should reconnect.
 - Use **sendRedirect** instead of setting this directly.
- **Refresh**
 - The number of seconds until browser should reload page. Can also include URL to connect to. See following example.
- **Set-Cookie**
 - The cookies that browser should remember. Don't set this header directly; use **addCookie** instead. See next section.
- **WWW-Authenticate**
 - The authorization type and realm needed in Authorization header. See example in CSAJSP Section 4.5.

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Persistent Servlet State and Auto-Reloading Pages

- **Idea: generate list of large (e.g., 150-digit) prime numbers**
 - Show partial results until completed
 - Let new clients make use of results from others
- **Demonstrates use of the Refresh header.**
- **Shows how easy it is for servlets to maintain state between requests.**
 - Very difficult in traditional CGI.
- **Also illustrates that servlets can handle multiple simultaneous connections**
 - Each request is in a separate thread.

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Generating Prime Numbers: Source Code

```
public void doGet(HttpServletRequest request,
    HttpServletResponse response)
    throws ServletException, IOException {
    int numPrimes =
        ServletUtilities.getIntParameter(request,
            "numPrimes", 50);

    int numDigits =
        ServletUtilities.getIntParameter(request,
            "numDigits", 120);

    // findPrimeList is synchronized
    PrimeList primeList =
        findPrimeList(primeListVector, numPrimes, numDigits);
    if (primeList == null) {
        primeList = new PrimeList(numPrimes, numDigits, true);
    }
}
```

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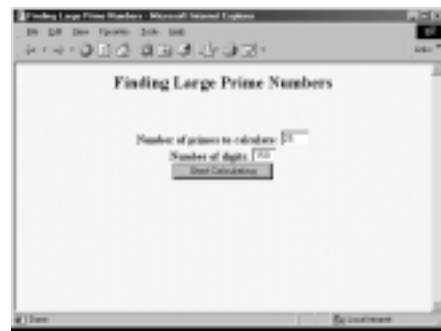
Generating Prime Numbers: Source Code (Continued)

```
synchronized(primeListVector) {
    if (primeListVector.size() >= maxPrimeLists)
        primeListVector.removeElementAt(0);
    primeListVector.addElement(primeList);
}
}
Vector currentPrimes = primeList.getPrimes();
int numCurrentPrimes = currentPrimes.size();
int numPrimesRemaining = (numPrimes - numCurrentPrimes);
boolean isLastResult = (numPrimesRemaining == 0);
if (!isLastResult) {
    response.setHeader("Refresh", "5");
}
response.setContentType("text/html");
PrintWriter out = response.getWriter();
// Show List of Primes found ...
```

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Prime Number Servlet: Front End



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Prime Number Servlet: Initial Result



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Prime Number Servlet: Final Result



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Summary

- Many servlet tasks can *only* be accomplished through use of HTTP status codes and headers sent to the browser
- Two parts of the response
 - Status line
 - In general, set via `response.setStatus`
 - In special cases, set via `response.sendRedirect` and `response.sendError`
 - Response headers
 - In general, set via `response.setHeader`
 - In special cases, set via `response.setContentType`, `response.setContentLength`, `response.addCookie`, and `response.sendRedirect`

HTTP Response

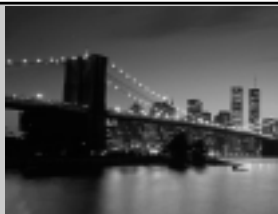
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Summary (Continued)

- Most important status codes
 - 200 (default)
 - 302 (forwarding; set via `sendRedirect`)
 - 401 (password needed)
 - 404 (not found; set via `sendError`)
- Most important headers you set directly
 - Cache-Control and Pragma
 - Content-Encoding
 - Content-Length
 - Expires
 - Refresh
 - WWW-Authenticate

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