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Generating the Server Response: HTTP Response Headers

JSP and Servlet Training Courses: <http://courses.coreservlets.com>
JSP and Servlet Books from Sun Press: <http://www.coreservlets.com>

Agenda

- Format of the HTTP response
- Setting response headers
- Understanding what response headers are good for
- Building Excel spread sheets
- Generating JPEG images dynamically
- Sending incremental updates to the browser

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HTTP Request/Response

<ul style="list-style-type: none"> • Request <pre>GET /servlet/SomeName HTTP/1.1 Host: ... Header2: HeaderN: (Blank Line)</pre>	<ul style="list-style-type: none"> • Response <pre>HTTP/1.1 200 OK Content-Type: text/html Header2: HeaderN: ... (Blank Line) <!DOCTYPE ...> <HTML> <HEAD>...</HEAD> <BODY> ... </BODY></HTML></pre>
--	---

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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

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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-vn	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/tif	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.
- **Content-Disposition**
 - Lets you request that the browser ask the user to save the response to disk in a file of the given name
`Content-Disposition: attachment; filename=file-name`
- **Content-Encoding**
 - The way document is encoded. See earlier compression example
- **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

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Common HTTP 1.1 Response Headers (Continued)

- **Content-Type**
 - The MIME type of the document being returned.
 - Use `setContentType` 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 lottery number example in book (Chapter 3).

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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 security chapters in *More Servlets & JSP*.

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Building Excel Spreadsheets

```
public class ApplesAndOranges extends HttpServlet {
    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, IOException {
        response.setContentType(
            "application/vnd.ms-excel");
        PrintWriter out = response.getWriter();
        out.println("\tQ1\tQ2\tQ3\tQ4\tTotal");
        out.println(
            "Apples\t78\t87\t92\t29\tSUM(B2:E2)");
        out.println(
            "Oranges\t77\t86\t93\t30\tSUM(B3:E3)");
    }
}
```

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Building Excel Spreadsheets

	Q1	Q2	Q3	Q4	Total
Apples	78	87	92	29	=SUM(B2:E2) 286
Oranges	77	86	93	30	=SUM(B3:E3) 286

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Requirements for Handling Long-Running Servlets

- **A way to store data between requests.**
 - For data that is not specific to any one client, store it in a field (instance variable) of the servlet.
 - For data that is specific to a user, store it in the `HttpSession` object
 - See upcoming lecture on session tracking
 - For data that needs to be available to other servlets or JSP pages (regardless of user), store it in the `ServletContext`
- **A way to keep computations running after the response is sent to the user.**
 - This task is simple: start a `Thread`. The only subtlety: set the thread priority to a low value so that you do not slow down the server.
- **A way to get the updated results to the browser when they are ready.**
 - Use `Refresh` header to tell browser to ask for updates

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Persistent Servlet State and Auto-Reloading Pages: Example

- **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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Finding Prime Numbers for Use with Public Key Cryptography

```
public class PrimeNumbersServlet extends HttpServlet {
    private ArrayList primeListCollection = new ArrayList();
    private int maxPrimeLists = 30;

    public void doGet(HttpServletRequest request,
        HttpServletResponse response)
        throws ServletException, IOException {
        int numPrimes =
            ServletUtilities.getIntParameter(request,
                "numPrimes", 50);
        int numDigits =
            ServletUtilities.getIntParameter(request,
                "numDigits", 120);

        PrimeList primeList =
            findPrimeList(primeListCollection,
                numPrimes, numDigits);
    }
}
```

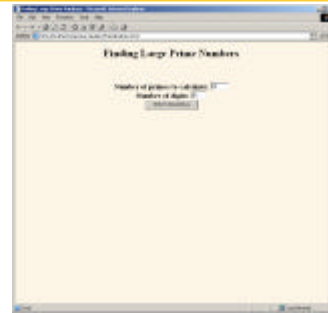
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Finding Prime Numbers for Use with Public Key Cryptography

```
if (primeList == null) {
    primeList = new PrimeList(numPrimes, numDigits, true);
    // Multiple servlet request threads share the instance
    // variables (fields) of PrimeNumbers. So
    // synchronize all access to servlet fields.
    synchronized(primeListCollection) {
        if (primeListCollection.size() >= maxPrimeLists)
            primeListCollection.remove(0);
        primeListCollection.add(primeList);
    }
}
ArrayList currentPrimes = primeList.getPrimes();
int numCurrentPrimes = currentPrimes.size();
int numPrimesRemaining = (numPrimes - numCurrentPrimes);
boolean isLastResult = (numPrimesRemaining == 0);
if (!isLastResult) {
    response.setIntHeader("Refresh", 5);
}
...
```

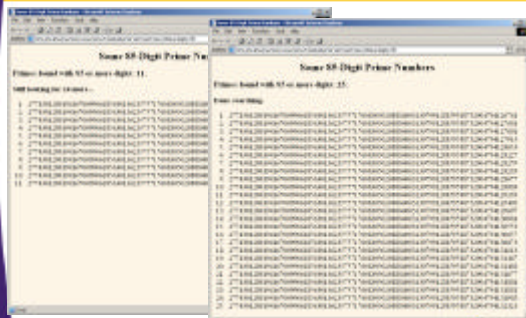
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Finding Prime Numbers for Use with Public Key Cryptography



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Finding Prime Numbers for Use with Public Key Cryptography



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Using Servlets to Generate JPEG Images

- **Create a BufferedImage**
- **Draw into the BufferedImage**
- **Set the Content-Type response header**

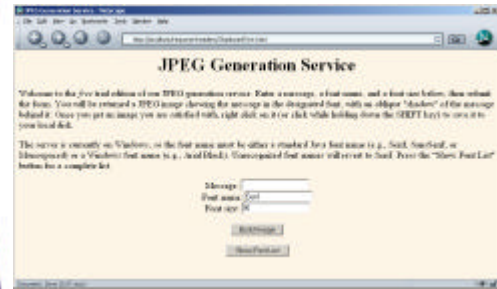
```
response.setContentType("image/jpeg");
```
- **Get an output stream**

```
OutputStream out = response.getOutputStream
```
- **Send the BufferedImage in JPEG format to the output stream**

```
try {
    ImageIO.write(image, "jpg", out);
} catch (IOException ioe) {
    System.err.println("Error writing JPEG file: "
        + ioe);
}
```

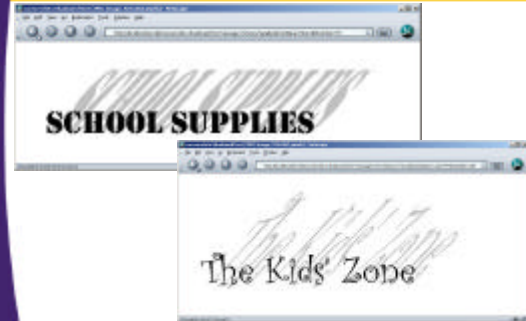
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Using Servlets to Generate JPEG Images



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Using Servlets to Generate JPEG Images



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Summary

- Many servlet tasks can *only* be accomplished through use of HTTP response headers
- **Setting response headers:**
 - In general, set with `response.setHeader()`
 - In special cases, set with `response.setContentType()`, `response.setContentLength()`, `response.addCookie()`, and `response.sendRedirect()`
- **Most important response headers you set directly:**
 - Cache-Control and Pragma
 - Content-Disposition
 - Content-Encoding
 - Content-Length
 - Expires
 - Refresh
 - WWW-Authenticate

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