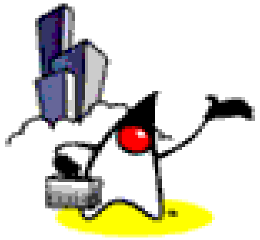
Servlet Basics II

Sang Shin
Michèle Garoche
www.JPassion.com
"Learn with JPassion"

Topics

- Servlet response: Status, Header, Body
- Servlet response status code
- Servlet scope objects
- Init parameters
- Error Handling
- Dispatcher include
- Logging

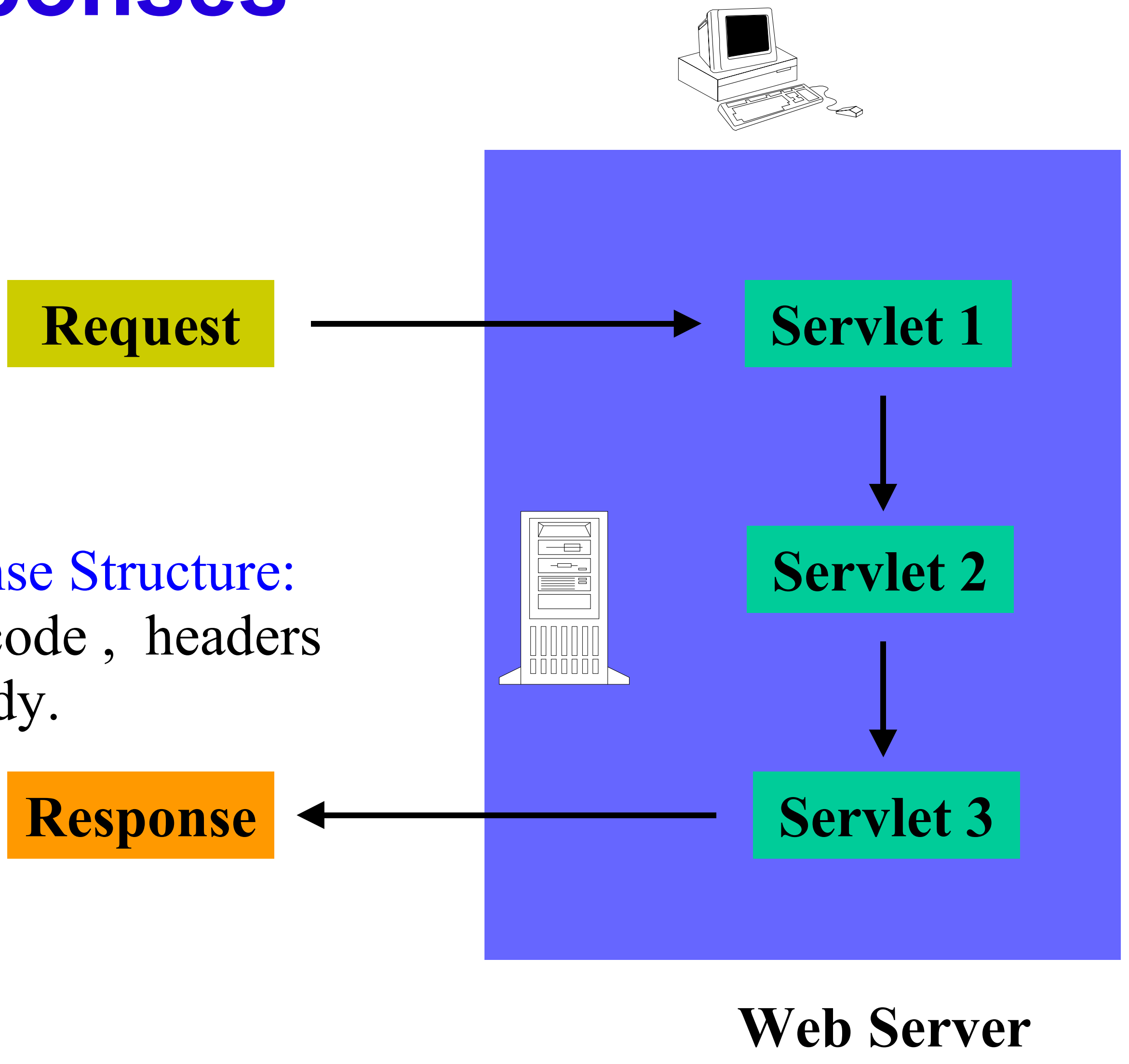
Servlet Response (HttpServletResponse)



What is Servlet Response?

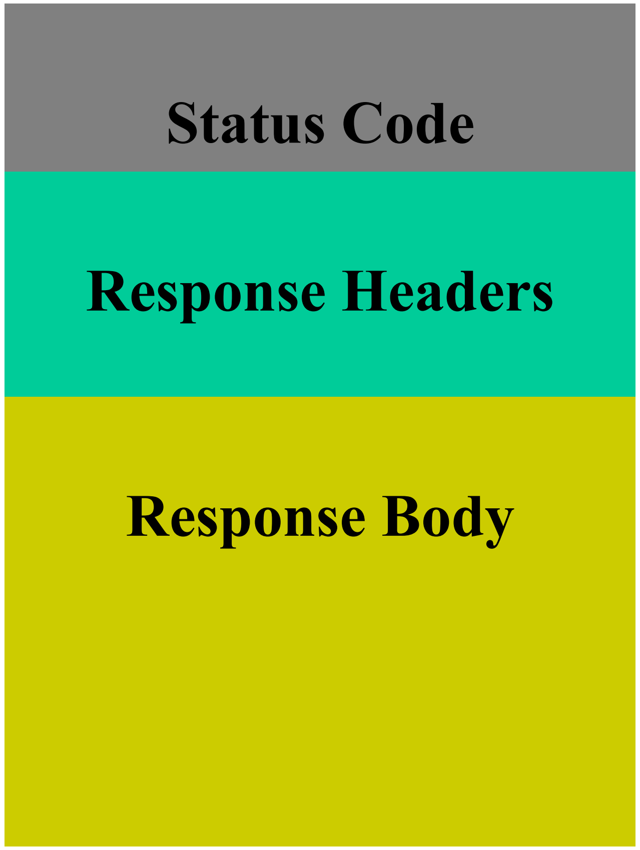
- Contains data passed from servlet to client
- All servlet responses implement ServletResponse interface
  - Retrieve an output stream
  - Indicate content type
  - Indicate whether to buffer output
  - Set localization information
- HttpServletResponse extends ServletResponse
  - HTTP response status code
  - Cookies

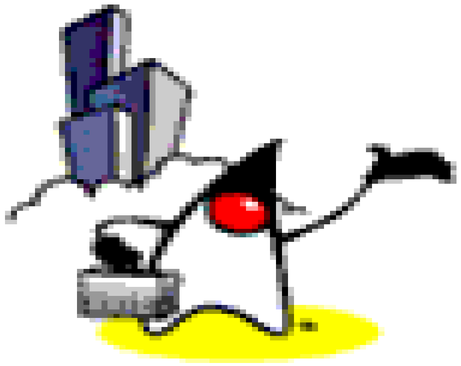
Responses



Response Structure:
status code , headers and body.

Response Structure





Status Code in Http Response

HTTP Response Status Codes

- Why do we need HTTP response status code?
  - Forward client to another page
  - Indicates resource is missing
  - Instruct browser to use cached copy

Methods for Setting HTTP Response Status Codes

- public void setStatus(int statusCode)
  - Status codes are defined in HttpServletResponse
  - Status codes are numeric fall into five general categories:
    - 100-199 Informational
    - 200-299 Successful
    - 300-399 Redirection
    - 400-499 Incomplete
    - 500-599 Server Error
  - Default status code is 200 (OK)

Example of HTTP Response Status

```
HTTP/ 1.1 200 OK
Content-Type: text/ html
<! DOCTYPE ...>
<HTML
...
</ HTML>
```

Common Status Codes

- 200 (SC_OK)
  - Success and document follows
  - Default for servlets
- 204 (SC_No_CONTENT)
  - Success but no response body
  - Browser should keep displaying previous document
- 301 (SC_MOVED_PERMANENTLY)
  - The document moved permanently (indicated in Location header)
  - Browsers go to new location automatically

Common Status Codes

- 302 (SC_MOVED_TEMPORARILY)
  - Note the message is "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
- 401 (SC_UNAUTHORIZED)
  - Browser tried to access password- protected page without proper Authorization header
- 404 (SC_NOT_FOUND)
  - No such page

Methods for Sending Error

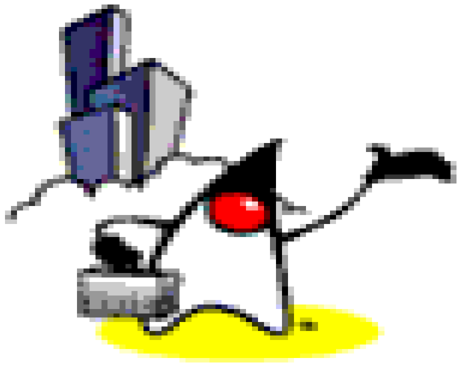
- Error status codes (400-599) can be used in sendError methods.
- public void sendError(int sc)
  - The server may give the error special treatment
- public void sendError(int code, String message)
  - Wraps message inside small HTML document

setStatus() & sendError()

```
try {
   returnAFile(fileName, out)
}
catch (FileNotFoundException e)
  {  response.setStatus(response.SC_NOT_FOUND);
 out.println("Response body");
}

   has same effect as

try {
   returnAFile(fileName, out)
}
catch (FileNotFoundException e)
  {   response.sendError(response.SC_NOT_FOUND);
}
```

Demo:

hello_response_sendError
4007_servlet_basics2.zip



Header in Http Response

Why HTTP Response Headers?

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

Methods for 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.

Methods for setting Common Response Headers

- setContentType
  - Sets the Content- Type header. Servlets almost always use this.
- setContentLength
  - Sets the Content- Length header. Used for persistent HTTP connections.
- addCookie
  - Adds a value to the Set- Cookie header.
- sendRedirect
  - Sets the Location header and changes status code.

Common HTTP 1.1 Response Headers

- Location
  - Specifies a document's new location.
  - Use sendRedirect instead of setting this directly.
- Refresh
  - Specifies a delay before the browser automatically reloads a page.
- Set-Cookie
  - The cookies that browser should remember. Don’t set this header directly.
  - use addCookie instead.

Common HTTP 1.1 Response Headers (cont.)

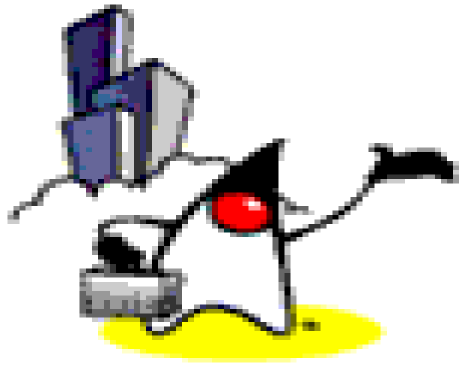
- Cache-Control (1.1) and Pragma (1.0)
  - A no-cache value prevents browsers from caching page. Send both headers or check HTTP version.
- Content- Encoding
  - The way document is encoded. Browser reverses this encoding before handling document.
- Content- Length
  - The number of bytes in the response. Used for persistent HTTP connections.

Common HTTP 1.1 Response Headers (cont.)

- Content- Type
  - The MIME type of the document being returned.
  - Use setContentType to set this header.
- Last- Modified
  - The time document was last changed
  - Don’t set this header explicitly.
  - provide a getLastModified method instead.

Refresh Sample Code

```
public class DateRefresh extends HttpServlet {
  public void doGet(HttpServletRequest req,
                    HttpServletResponse res)
       throws ServletException, IOException {
    res.setContentType("text/plain");
    PrintWriter out = res.getWriter();
    res.setHeader("Refresh", "5");
    out.println(new Date().toString());
  }
}
```



Body in Http Response

Writing a Response Body

- A servlet almost always returns a response body
- Response body could either be a PrintWriter or a ServletOutputStream
- PrintWriter
  - Using response.getWriter()
  - For character-based output
- ServletOutputStream
  - Using response.getOutputStream()
  - For binary (image) data

Scope Objects

Scope Objects

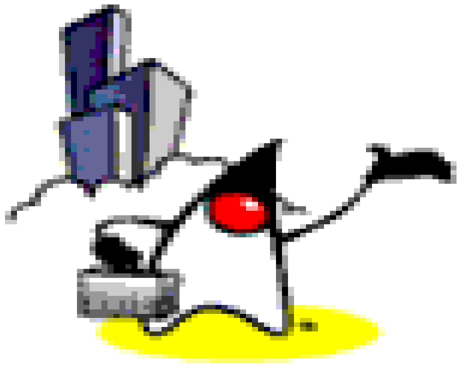
- Enables sharing information among collaborating web components via attributes maintained in Scope objects
  - Attributes are name/object pairs
- Attributes maintained in the Scope objects are accessed with
  - getAttribute() & setAttribute()
- 4 Scope objects are defined
  - Web context, session, request, page

Four Scope Objects: Accessibility

- Web context (ServletConext)
  - Accessible from Web components within a Web context
- Session
  - Accessible from Web components handling a request that belongs to the session
- Request
  - Accessible from Web components handling the request
- Page
  - Accessible from JSP page that creates the object

Four Scope Objects: Class

- Web context
  - javax.servlet.ServletContext
- Session
  - javax.servlet.http.HttpSession
- Request
  - subtype of javax.servlet.ServletRequest: javax.servlet.http.HttpServletRequest
- Page
  - javax.servlet.jsp.PageContext



Web Context (ServletContext)

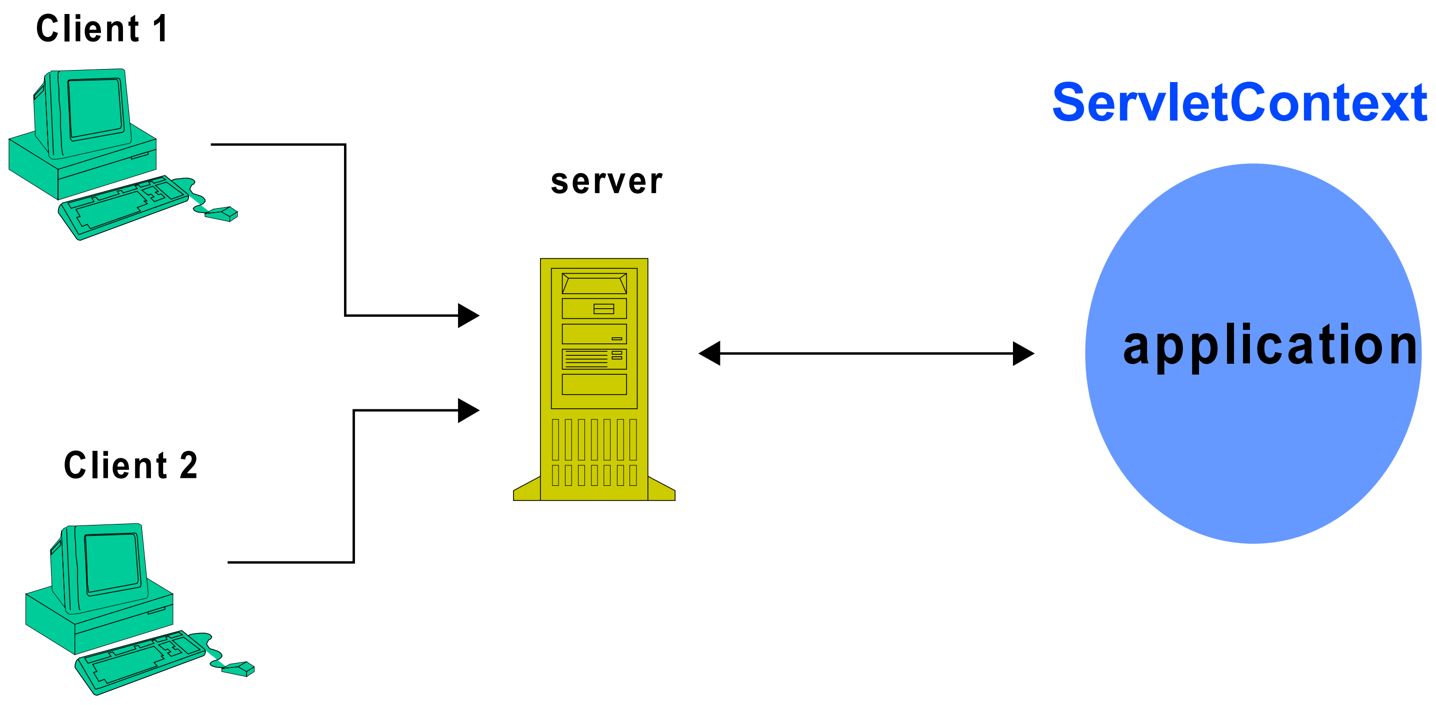
What is ServletContext For?

- Used by servets to
  - Set and get context-wide (application-wide) object-valued attributes
  - Get request dispatcher
    - To forward to or include web component
  - Access Web context-wide initialization parameters set in the web.xml file
  - Access Web resources associated with the Web context
  - Log
  - Access other misc. information

Scope of ServletContext

- Context-wide scope
  - Shared by all servlets and JSP pages within a "web application"
    - Why it is called “web application scope”
  - A "web application" is a collection of servlets and content installed under a specific subset of the server's URL namespace and possibly installed via a *.war file
    - All servlets in BookStore web application share same ServletContext object
  - There is one ServletContext object per "web application" per Java Virtual Machine

ServletContext: Web Application Scope

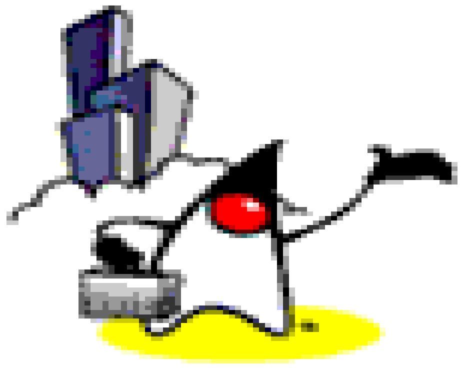


How to Access ServletContext Object?

- Within your servlet code, call getServletContext()
- Within your servlet filter code, call getServletContext()
- The ServletContext is contained in ServletConfig object, which the Web server provides to a servlet when the servlet is initialized
  - init (ServletConfig servletConfig) in Servlet interface

Example: Getting Attribute Value from ServletContext

```
public class CatalogServlet extends HttpServlet {
  private BookDB bookDB;
  public void init() throws ServletException {
    // Get context-wide attribute value from
    // ServletContext object
    bookDB = (BookDB)getServletContext().
                     getAttribute("bookDB");
    if (bookDB == null) throw new
      UnavailableException("Couldn't get database.");
  }
}
```



Session (HttpSession)

We will talk more on HTTPSession later in “Session Tracking”

Why HttpSession?

- Need a mechanism to maintain client state across a series of requests from a same user (or originating from the same browser) over some period of time
  - Example: Online shopping cart
- Yet, HTTP is stateless
- HttpSession maintains client state
  - Used by Servlets to set and get the values of session scope attributes

How to Get HttpSession?

- via getSession() method of a Request object (HttpServletRequest)

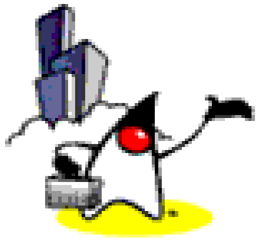
Example: HttpSession

```
public class CashierServlet extends HttpServlet {
  public void doGet (HttpServletRequest request,
                     HttpServletResponse response)
              throws ServletException, IOException {

      // Get the user's session and shopping cart
      HttpSession session = request.getSession();
      ShoppingCart cart =
        (ShoppingCart)session.getAttribute("cart");
      ...
      // Determine the total price of the user's books
      double total = cart.getTotal();
```

Demo:

hello_scope_context, hello_scope_session, hello_scope_request 4007_servlet_basics2.zip

Init Parameters



Setting Context Init Parameters

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app version="2.4" ...>
    <context-param>
        <param-name>city</param-name>
        <param-value>Seoul</param-value>
    </context-param>
    <context-param>
        <param-name>age</param-name>
        <param-value>22</param-value>
    </context-param>
    <servlet>
        <display-name>GreetingServlet</display-name>
        <servlet-name>GreetingServlet</servlet-name>
        <servlet-class>servlets.GreetingServlet</servlet-
  class>
    </servlet>
```

Reading Context Init Parameters

```
public void doGet(HttpServletRequest request,
   HttpServletResponse response)
          throws ServletException, IOException {
     PrintWriter out = response.getWriter();

     // then write the data of the response
     String username = request.getParameter("username");

     if ((username != null) && (username.length() > 0)) {
          out.println("<h2>Hello, " + username + "!</h2>");
          out.println("<h2>You live in " +
  getServletContext().getInitParameter("city") + "!</h2>");
          out.println("<h2>Your age is  " +
  getServletContext().getInitParameter("age") + "!</h2>");
     }

}
```

Setting Servlet Init Parameters

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app version="2.4" ...>
    <servlet>
        <display-name>GreetingServlet</display-name>
        <servlet-name>GreetingServlet</servlet-name>
        <servlet-class>servlets.GreetingServlet</servlet-class>
        <init-param>
            <param-name>greeting1</param-name>
            <param-value>hello</param-value>
        </init-param>
    </servlet>
    <servlet>
        <display-name>GreetingServlet2</display-name>
        <servlet-name>GreetingServlet2</servlet-name>
        <servlet-class>servlets.GreetingServlet2</servlet-class>
        <init-param>
            <param-name>greeting2</param-name>
            <param-value>goodbye</param-value>
        </init-param>
    </servlet>
```

Reading Servlet Init Parameters

```
public void doGet(HttpServletRequest request,
  HttpServletResponse response)
       throws ServletException, IOException {
    PrintWriter out = response.getWriter();

    // then write the data of the response
    String username = request.getParameter("username");

    if ((username != null) && (username.length() > 0)) {
        out.println("<h2>Hello, " + username + "!</h2>");
        out.println("<h2>You live in " +
  getServletContext().getInitParameter("city") + "!</h2>");
        out.println("<h2>Your age is  " +
  getServletContext().getInitParameter("age") + "!</h2>");
        out.println("<h2>Your greeting message is  " +
  getInitParameter("greeting3") + "!</h2>");

    }
}
```

Demo:

hello_initparam_context
hello_initparam_servlet
4007_servlet_basics2.zip

Handling Errors

Handling Errors

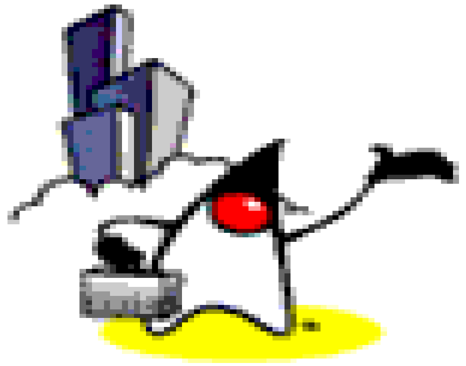
- Web container generates default error page
- You can specify custom default page to be displayed instead
- Steps to handle errors
  - Create appropriate error html pages for error conditions
  - Modify the web.xml accordingly

Example: Setting Error Pages in web.xml

```
<error-page>
  <exception-type>
    exception.BookNotFoundException
  </exception-type>
  <location>/errorpage1.html</location>
</error-page>
<error-page>
  <exception-type>
    exception.BooksNotFoundException
  </exception-type>
  <location>/errorpage2.html</location>
</error-page>
<error-page>
  <exception-type>exception.OrderException</exception-type>
  <location>/errorpage3.html</location>
</error-page>
```

Demo:

hello_servlet_errorhandling
4007_servlet_basics2.zip



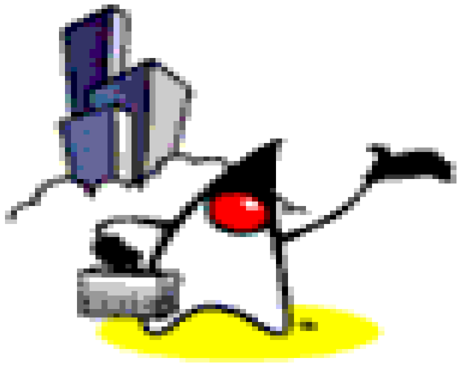
RequestDispatcher

Example: Getting and Using RequestDispatcher Object

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

        HttpSession session = request.getSession(true);
            ResourceBundle messages = (ResourceBundle)session.getAttribute("messages");

        // set headers and buffer size before accessing the Writer
        response.setContentType("text/html");
            response.setBufferSize(8192);
            PrintWriter out = response.getWriter();

        // then write the response
        out.println("<html>" +
                    "<head><title>" + messages.getString("TitleBookDescription") +
                    "</title></head>");

        // Get the dispatcher; it gets the banner to the user
        RequestDispatcher dispatcher =
               session.getServletContext().getRequestDispatcher("/banner");

        if (dispatcher != null)
               dispatcher.include(request, response);
        ...
```

Demo:

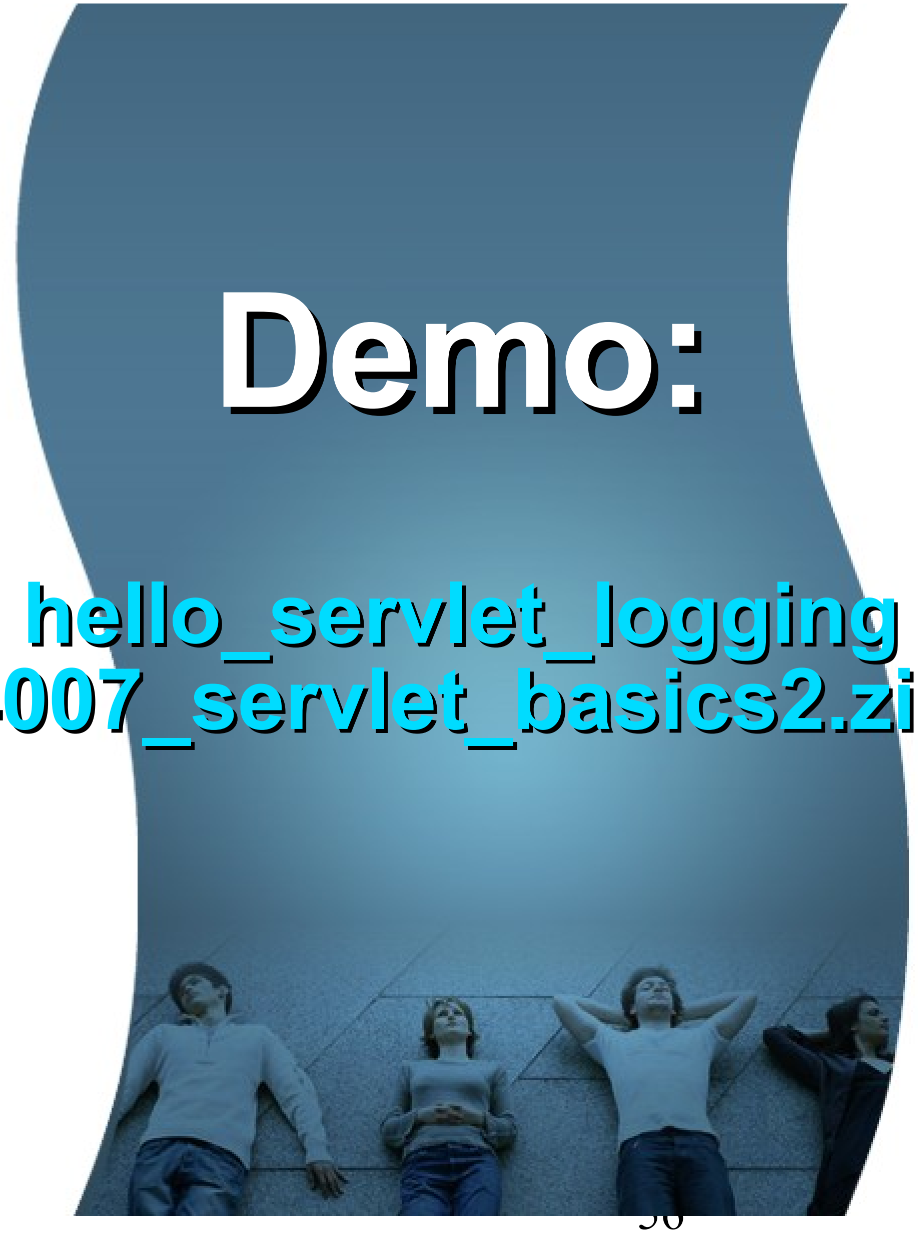
hello_servlet_dispatcher_include
4007_servlet_basics2.zip



Logging

Example: Logging

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

       ...
       getServletContext().log(“Life is good!”);
       ...
       getServletContext().log(“Life is bad!”, someException);
```



Demo:

hello_servlet_logging
4007_servlet_basics2.zip

Thank you!

Sang Shin
http://www.JPassion.com
“Learn with JPassion!”