CS520 Web Programming
Servlet and JSP Review

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Review Examples

1. Add two numbers
2. Guest Book
3. Login and logout
4. Email
5. Pizza Order

Example 1: Add Two Numbers

- Take two integer numbers as request parameters and display the sum

Topics Reviewed in Example 1

- Web project
- Servlet
  - `@WebServlet`
- Request parameter
- HTML form
  - `GET` and `POST`
- Deployment

Create a Web Project

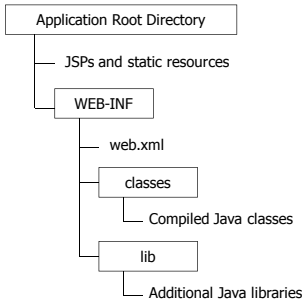
- Eclipse
  - http://csns.calstatela.edu/wiki/content/cysun/course_materials/cs520/development
  - Dynamic Web Project
  - `web.xml`

Versions, Versions

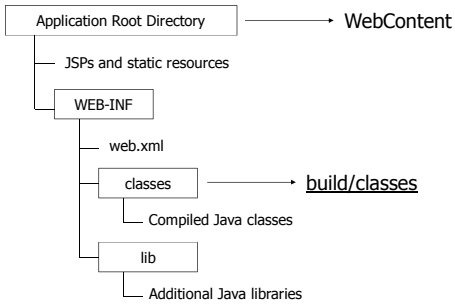
Servlet/JSP Spec	Tomcat	Java
3.0/2.2	7.0.x	1.6
2.5/2.1	6.0.x	1.5
2.4/2.0	5.5.x	1.4

The `version` attribute of `<web-app>` in web.xml

Directory Structure of a Java Web Application



Directory Structure of an Eclipse Dynamic Web Project



@WebServlet

- http://download.oracle.com/javaee/6/api/javax/servlet/annotation/WebServlet.html

@WebServlet Elements for URL Patterns

- `value`
  - URL pattern(s) of the servlet
  - The default element
- `urlPatterns`
  - Same purpose as `value`
  - Usually used when more than one element is specified
  - Only one of `value` and `urlPatterns` can be specified

@WebServlet Examples

```
@WebServlet( "/HelloServlet" )

@WebServlet( {"/HelloServlet", "/member/*"} )

@WebServlet( name="Hello", urlPatterns={"/HelloServlet", "/*.html"} )

@WebServlet(
        urlPatterns="/MyPattern",
        initParams={@WebInitParam(name="ccc", value="333")}
)
```

Wildcard in Servlet Mapping

- A string beginning with a **/** and ending with a **/***
  - E.g. `/*`, `/content/*`
- A string beginning with a ***.**
  - E.g. `*.html`, `*.do`

See Servlet Specification 3.0, Section 12

HTTP Request Example

http://cs3.calstatela.edu:8080/whatever

GET /whatever HTTP/1.1
Host: cs3.calstatela.edu:4040
User-Agent: Mozilla/5.0 (Windows; U; Windows NT 5.0; en-US; rv:1.7.3) ...
Accept: text/xml,application/xml,application/xhtml+xml,text/html;q=0.9,...
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
Cookie: nxt/gateway.dll/uid=4B4CF072; SITESERVER=ID=f1675...

HTTP Request

- Request line
  - Method
  - Request URI
  - Protocol
- Header
- [Message body]

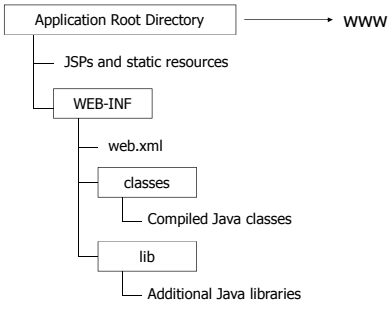
Request Methods

- Actions to be performed regarding the resource identified by the *Request URI*
- Browser
  - GET
  - POST
- Editor
  - PUT
  - DELETE
- Diagnosis
  - HEAD
  - OPTIONS
  - TRACE

Deploy a Web Project on CS3

- Understand directory structure
- "touch" or re-upload `web.xml` to force Tomcat to reload your application

Directory Structure on CS3



Example 2: Guest Book

My Guest Book

John says:	Hello!	Edit | Delete
Jane says:	Your website looks nice.	Edit | Delete
Joe says:	Nice to meet you. I'm from China.	Edit | Delete

Add Comment

My Guest Book – Add Comment

Your name:

Submit

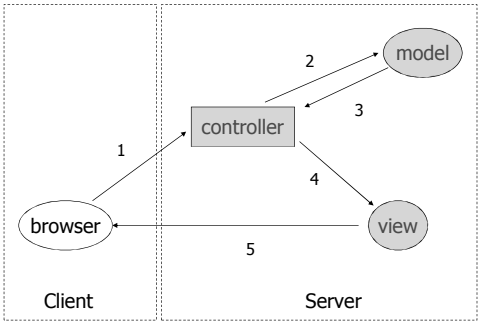
Topics Reviewed in Example 2

- MVC
- Scopes
- Expression Language
- JSTL

Web Application

- Web application = Data + Operations
- Data
  - Guestbook entries, blog entries, forum posts, wiki pages, twitter message …
- Operations
  - Add/create, search, display, edit, delete …

MVC Architecture



About MVC

- Models represent data in the application
- Controllers implement the actions
  - Handle user input
  - Access and process data
  - Implement business logic
  - Pass data to views for display
- Views render the display to the users

MVC Using Servlet and JSP

- Model: Bean (a.k.a. POJO)
- Controller: Servlet
- View: JSP
  - HTML, CSS, JavaScript
  - Expression Language (EL)
  - Custom tags (e.g. JSTL)
  - *No scripting elements*
    - <%! %>
    - <%= %>
    - <% %>

Understand Bean Properties

- Bean properties are defined by getters and/or setters
  - E.g. `getFoo()` ➔ `foo`
  - Read-only: only getter
  - Write-only: only setter
  - Read-write: both getter and setter
- For a boolean property, the getter starts with `is` instead of `get`
  - E.g. `isFoo()` instead of `getFoo()`

Scopes and Data Sharing

- Application scope – data is valid throughout the life cycle of the web application
- Session scope – data is valid throughout the session
  - redirect, multiple separate requests
- Request scope – data is valid throughout the processing of the request
  - forward
- Page scope – data is valid within current page

Common Usage of Scopes

- Application scope
  - Store data shared by all users
- Session scope
  - Store data associated with a session, e.g. login credentials, shopping cart
- Request scope
  - Pass data from controller to view
- Page scope
  - Local variables in a JSP

Access Scoped Variables in Servlet

- Application scope
  - `ServletContext`
- Session scope
  - `HttpSession`
- Request scope
  - `HttpServletRequest`
- Page scope (in JSP scriptlet)
  - `pageContext`

Expression Language

- Expression Language (EL)
  - A JSP 2.0 standard feature
  - A more concise way to write JSP expressions
    - vs. <%= expression %>
  - Java's answer to scripting languages
- EL Syntax

${ *expression* **}**

Expression

- Literals
- Operators
- Variables
- Functions
  - see Custom Tag Libraries

EL Operators

- Arithmetic
  - +, -, *, /, %
  - div, mod
- Logical
  - &&, ||, !
  - and, or, not
- Relational
  - ==, !=, <, >, <=, >=
  - eq, ne, lt, gt, le, ge
- Conditional
  - ? :
- empty
  - check whether a value is null or empty
- Other
  - [], ., ()

Implicit Objects

- pageContext
  - servletContext
  - session
  - request
  - response
- param, paramValues
- header,headerValues
- cookie
- initParam
- pageScope
- requestScope
- sessionScope
- applicationScope

Common Usage of EL

- Access scoped variables
  - `${applicationScope.foo}`
  - `${sessionScope.foo}` `${requestScope.foo}`
  - `${pageScope.foo}`
  - `${foo}`
- Access object properties, e.g. `${foo.bar}`
- Simple operations, e.g. `${not empty param.foo}`

JSP Standard Tag Library (JSTL)

Library	URI	Prefix
Core	http://java.sun.com/jsp/jstl/core	c
XML Processing	http://java.sun.com/jsp/jstl/xml	x
I18N Formatting	http://java.sun.com/jsp/jstl/fmt	fmt
Database Access	http://java.sun.com/jsp/jstl/sql	sql
Functions	http://java.sun.com/jsp/jstl/functions	fn

http://csns.calstatela.edu/file/view?id=4514026

JSTL Core

- Flow control
  - <c:if>
  - <c:choose>
    - <c:when>
    - <c:otherwise>
  - <c:forEach>
  - <c:forToken>
- Variable support
  - <c:set>
  - <c:remove>
- URL
  - <c:param>
  - <c:redirect>
  - <c:import>
  - <c:url>
- Output
  - <c:out>
- Exception handling
  - <c:catch>

Format Date and Time

```
<fmt:formatDate value="${date}" type="date" />

<fmt:formatDate value="${date}" type="time" />

<fmt:formatDate value="${date}" type="both" />

<fmt:formatDate value="${date}"
        pattern="yyyy-MM-dd hh:mm:ss a" />
```

See http://download.oracle.com/javase/6/docs/api/java/text/SimpleDateFormat.html for the date formatting patterns.

JSTL Functions

- fn:length()
- fn:contains()
- fn:containsIgnoreCase()
- fn:startWith()
- fn:endsWith()
- fn:indexOf()
- fn:replace()
- fn:trim()
- fn:toUpperCase()
- fn:toLowerCase()
- fn:substring()
- fn:substringAfter()
- fn:substringBefore()
- fn:split()
- fn:join()
- fn:escapeXML()

Example 3: Login and Logout

- A user must login before he or she can add comments to the guest book.

My Guest Book

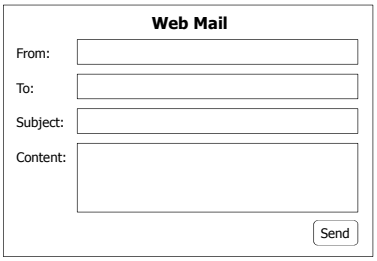
John says:	Hello!	Edit
Jane says:	Your website looks nice.	Edit
Joe says:	Nice to meet you. I'm from China.	Edit

Add Comment Logout

Topics Reviewed in Example 3

- Session tracking
- Basic login/logout mechanism

Example 4: Email

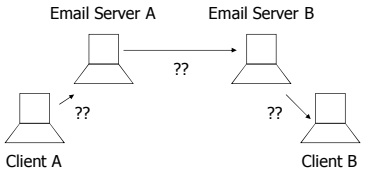


Topics Reviewed in Example 4

- Email basics
- Use of `JavaMail`

How Email Works

- SMTP, IMAP, POP



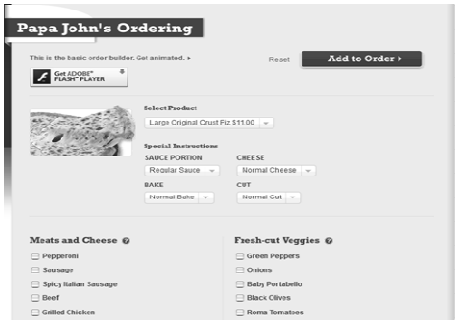
JavaMail

- http://java.sun.com/products/javamail/

```
Properties props = System.getProperties();
props.put("mail.smtp.host", mailhost);
Session session = Session.getInstance( props );

Message msg = new MimeMessage(session);
...
Transport.send( msg );
```

Example 5: Pizza Order



Create Your Own Pizza

- Crusts
  - Large Original, $11
  - Medium Original, $9
  - Large Thin, $11
- Cheese
  - Normal cheese, no cheese (-$1)
- Toppings ($1 each)
  - Pepperoni, sausage, bacon, pineapple

UI – Customize Pizza

Crust: Large Original $11

Cheese: Normal ● No cheese ○

Toppings: Pepperoni ☐

Sausage ☐

Bacon ☐

Pineapple ☐

Add to Order

UI – Review Order

Pizza	Quantity	Price
Large Original Crust, Normal Cheese, with Pepperoni, Bacon	1	$13
Large Thin Crust, No Cheese, with Pineapple	2	$22
	Total	$35

Add Another Pizza | Update Order | Place Order

Summary