CS320 Web and Internet Programming

Java Beans and Expression Language (EL)

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Problems with Scripting Elements

- Mixing presentation and processing
  - hard to debug
  - hard to maintain
- No clean and easy way to reuse code
- Solution – separate out Java code
  - Servlets
  - Java Beans
  - Custom tag libraries

Java Beans

- A regular Java object, typically used for modeling data, e.g. `GuestBookEntry`
- A.K.A. POJO (Plain Old Java Object)

Bean Properties

- The properties of a bean are defined by getters and setters
- Properties != Class variables

```
public class User {

    String firstname;
    String lastname;

    public getFirstname() { return firstname; }
    public getLastname() { return lastname; }
    public getName() { return firstname + " " + lastname; }
}
```

Properties

- firstname
- lastname
- name

About Bean Properties

- Property naming conventions
  - 1st letter is always in lower case
  - 1st letter must be capitalized in *getter* (*accessor*) and/or *setter* (*mutator*)
- Property types
  - read-only property: only *getter*
  - write-only property: only *setter*
  - read/write property: both

Bean Property Example

- What properties does `Foobar` have?
  - Read-only: ??
  - Write-only: ??
  - Read/write: ??

```
public class Foobar {

    private int a, b, c, d;
    private boolean e;

    public Foobar() { a = b = c = d = 0; }

    public int getA() { return a; }
    public void setA( int a ) { this.a = a; }

    public int getB() { return b; }

    public void setC( int c ) { this.c = c; }

    public int getAB() { return a+b; }

    public boolean isE() { return e; }
    public void setE( boolean e ) { this.e = e; }
}
```

Common Problems with Bean Property …

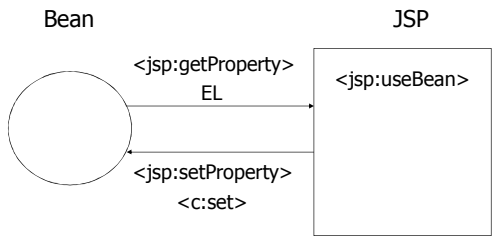
```
public class Foobar {

   private int a, b, c, d;

   public Foobar() { a = b = c = d = 0; }

   public int getA() { return a; }
   public void setA( String s ) { this.a = Integer.parseInt(s); }

   public int getB( int x ) { return b+x; }

   public void setC( int c, int x ) { this.c = c+x; }

   public void setD( String s ) { this.d = Integer.parseInt(d); }

}
```

How many properties does Foobar have??

… Common Problems with Bean Property

- A getter must have no argument
- A setter must have exactly one argument
- The *type* of a property must be consistent in both the getter and the setter

Bean and JSP



Bean Tags and Attributes

- jsp:useBean
  - class
  - id
  - scope
    - `page` (default)
    - `request`
    - `session`
    - `application`
- jsp:getProperty
  - name
  - property
- jsp:setProperty
  - name
  - property
  - value
  - param

Example: BGColor.jsp

- Use a bean `BGBean` to control the background color of a JSP page

```
<jsp:useBean id="bg" class="cs320.bean.BGBean" />

<jsp:getProperty name="bg" property="r" />
```

Understand <jsp:useBean> and <jsp:getProperty>

```
<jsp:useBean id="bg" class="cs320.bean.BGBean" />
<jsp:getProperty name="bg" property="r" />
```

⇩

```
cs320.bean.BGBean bg = new cs320.bean.BGBean();
bg.getR();
```

↑

The bean class used in <jsp:useBean> must have a Constructor that takes no argument.

Set Bean Properties

```
<jsp:setProperty name="bg" property="r" value="255" />
<jsp:setProperty name="bg" property="r" param="r" />
<jsp:setProperty name="bg" property="r" />
<jsp:setProperty name="bg" property="*" />
```

Understand Scopes

- 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

Scopes in Servlet

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

Need for EL

- Using <jsp:getProperty> to access bean properties

EL

What is EL?

- Expression Language (EL)
  - Since the JSP 2.0 Specification
  - A more concise way to access bean properties and write JSP expressions
    - vs. <jsp:getProperty>
    - vs. <%= expression %>
  - Java's answer to scripting languages
- Syntax: ${ expression }

Example: BGColor.jsp Revisited

- Use EL to access the bean properties

${ bean_name**.**property_name **}**

Expression

- Literals
- Operators
- Variables

EL Literals

- `true`, `false`
- `23`, `0x10`, ...
- `7.5`, `1.1e13`, ...
- `"double-quoted"`, `'single-quoted'`
- `null`

- No char type

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
  - [], ., ()

EL Evaluation and Auto Type Conversion

${2+4/2}	
${2+3/2}	
${"2"+3/2}	
${"2"+3 div 2}	
${"a" + 3 div 2}	
${null == 'test'}	
${null eq 'null'}	

${empty ""}	
${empty param.a}	
${empty null}	
${empty "null"}	
${"abc" lt 'b'}	
${"cs320" > "cs203"}	

EL Variables

- You cannot declare new variables using EL (after all, it's called *"expression"* language).
- However, you can access beans, implicit objects, and previously defined scoped variables.

Implicit Objects in EL

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

Example: RequestInfo.jsp

- Display some information about the request
  - Client address …
  - Cookies and parameters
- Use of implicit objects
  - Find the Java class type for the object
  - Look for *getters* in the API
    - E.g. `${pageContext.request.remoteAddr}`
  - Access elements in a collection
    - `cookie` and `param`

Limitation of EL

- Only expressions, no statements, especially *no control-flow statements*

JSTL