JSF: Validating User Input

Originals of Slides and Source Code for Examples:
http://www.coreservlets.com/JSF-Tutorial/

This somewhat old tutorial covers JSF 1, and is left online for those maintaining existing projects. All new projects should use JSF 2, which is both simpler and more powerful. See http://www.coreservlets.com/JSF-Tutorial/jsf2/.

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- Courses developed and taught by Marty Hall
  - JSF 2, PrimeFaces, servlets/JSP, Ajax, jQuery, Android development, Java 6 or 7 programming, custom mix of topics
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Topics in This Section

- Manual validation
- Implicit automatic validation
- Explicit validation
- Defining your own validation methods
- Creating custom validators

The Need for Validation

- Two tasks that almost every Web application needs to perform:
  - Checking that all required form fields are present and in the proper format
  - Redisplaying the form when values are missing or malformed
    - With error messages showing what the problem was
    - With OK values maintained
- This is extremely cumbersome with standard servlet/JSP technology
  - Even with the JSP 2.0 expression language
  - This is a (the?) major weakness in servlet/JSP technology
Validation Approaches

• **Manual validation**
  – Use string properties for bean
  – Do validation in setter methods and/or action controller
  – Return null to redisplay form
  – Create custom error messages

• **Implicit automatic validation**
  – Use int, double, etc. bean properties. Or add `required`.
  – System redisplay form if there is conversion error
  – Use `h:message` to display field-specific error message

• **Explicit automatic validation**
  – Use `f:convertNumber`, `f:convertDateTime`, `f:validateLength`, `f:validateDoubleRange`, or `f:validateLongRange`
  – System redisplay form if failure; use `h:message` again

• **Custom validation methods**
  – Create `FacesMessage`, wrap in `ValidatorException`

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Validation in the Action Controller

For when validation is closely tied to your business logic, or when you need to check complex interactions among fields
Manual Validation

• Setter methods convert from strings
  – Use try/catch blocks
  – Use application-specific logic

• Action controller checks values
  – If values are OK
    • Returns normal outcomes
  – If values are missing or illegal
    • Stores error messages in bean
    • Returns null

• Input Form
  – Displays error messages
    • Error message should be empty string by default
    • In h:outputText, use escape="false" if error messages contain HTML tags

Manual Validation: Example

• Idea
  – Collect bids for keywords at search engine site

• Attributes
  – UserID
    • Cannot be missing
  – Keyword
    • Cannot be missing
  – Bid amount
    • Must be legal double
    • Must be at least 0.10
  – Bid duration
    • Must be legal int
    • Must be at least 15
package coreservlets;
import java.util.*;

public class BidBean1 {
    private String userID = "";
    private String keyword = "";
    private String bidAmount;
    private double numericBidAmount = 0;
    private String bidDuration;
    private int numericBidDuration = 0;
    private List<String> errorMessages;

    public String getUserID() { return(userID); }
    public void setUserID(String userID) {
        this.userID = userID.trim();
    }
    public String getKeyword() { return(keyword); }
    public void setKeyword(String keyword) {
        this.keyword = keyword.trim();
    }

    public String getBidAmount() { return(bidAmount); }
    public void setBidAmount(String bidAmount) {
        this.bidAmount = bidAmount;
        try {
            numericBidAmount = Double.parseDouble(bidAmount);
        } catch(NumberFormatException nfe) {} 
    }
    public double getNumericBidAmount() {
        return(numericBidAmount);
    }

    public String getBidDuration() { return(bidDuration); }
    public void setBidDuration(String bidDuration) {
        this.bidDuration = bidDuration;
        try {
            numericBidDuration = Integer.parseInt(bidDuration);
        } catch(NumberFormatException nfe) {} 
    }
    public int getNumericBidDuration() {
        return(numericBidDuration);
    }
}
Bean Code: Action Controller

```java
public String doBid() {
    errorMessages = new ArrayList<String>();
    if (getUserID().equals("")) {
        errorMessages.add("UserID required");
    }
    if (getKeyword().equals("")) {
        errorMessages.add("Keyword required");
    }
    if (getNumericBidAmount() <= 0.10) {
        errorMessages.add("Bid amount must be at least $0.10.");
    }
    if (getNumericBidDuration() < 15) {
        errorMessages.add("Duration must be at least 15 days.");
    }
    if (errorMessages.size() > 0) {
        return(null);
    } else {
        return("success");
    }
}
```

Bean Code: Error Messages Property

```java
public String getErrorMessages() {
    String messageList;
    if ((errorMessages == null) ||
        (errorMessages.size() == 0)) {
        messageList = "";
    } else {
        messageList = "<FONT COLOR=RED><B><UL>
        for(String message: errorMessages) {
            messageList = messageList + "<LI>" + message + "\n";
        }
        messageList = messageList + "</UL></B></FONT>\n";
    }
    return(messageList);
}
```
Input Form: Outputting Error Messages (bid1.jsp)

```html
<h:form>
  <h:outputText value="#{bidBean1.errorMessages}" escape="false"/>
  <TABLE>
    <TR>
      <TD>User ID:
        <h:inputText value="#{bidBean1.userID}"/>
    </TD></TR>
    <TR>
      <TD>Keyword:
        <h:inputText value="#{bidBean1.keyword}"/>
    </TD></TR>
    <TR>
      <TD>Bid Amount:
        $<h:inputText value="#{bidBean1.bidAmount}"/>
    </TD></TR>
    <TR>
      <TD>Duration:
        <h:inputText value="#{bidBean1.bidDuration}"/>
    </TD></TR>
    <TR><TH>
      <h:commandButton value="Send Bid!"
        action="#{bidBean1.doBid}"/>
    </TH></TR>
  </TABLE>
</h:form>
```

Manual Validation: Results

- Bid amount must be at least $0.10.

User ID: 123
Keyword: sdf
Bid Amount: $0.05
Duration: 30
Send Bid!
Manual Validation: Results

Enter Bid

- Keyword required
- Duration must be at least 15 days.

User ID: a-123
Keyword: 
Bid Amount: $0.20
Duration: 5

Send Bid!

Manual Validation: Results

Bid Accepted

You have bid successfully.

- User ID: a-123
- Keyword: jsf
- Bid Amount: $0.20
- Duration: 90

(Version 1)
Alternative to Building Own Error Messages (See Later Section)

1. Create a FacesMessage
2. Store it in global list of messages via facesContext.addMessage
3. Still return null to redisplay input form
4. Output error messages in input form with h:messages or h:message

• Advantages:
  – Don't have to store messages yourself
  – Don't have to build HTML or use escape="false"
  – Fits with standard JSF validation

• Disadvantages
  – Less control over format of error messages

Validation via Type Conversion
For simple validation that just checks the types of the various input fields
Implicit Automatic Validation

- Define bean properties to be simple standard types
  - int/Integer, long/Long, double/Double, boolean/Boolean, etc.
  - Note that wrapper types let you have initially blank textfields
- **System attempts to convert automatically in same manner as with jsp:setProperty**
  - I.e., Integer.parseInt, Double.parseDouble, etc.
  - If there is conversion error, form redisplayed
  - And error message stored
- **Required fields**
  - You can also add `required` attribute to any input element to indicate that empty values are errors
- **Use h:message to display error messages**
  - h:message returns empty string if there is no message
  - h:message accepts `styleClass` for CSS style name
- **Add `immediate` attribute to bypass validation**
  - E.g., for h:commandButton with logout or cancel operation
Implicit Validation: Example

- **Change BidBean properties**
  - bidAmount is a double
  - bidDuration is an int

- **Change BidBean action controller**
  - Remove all validation logic.
    - However, note that *specific* values for bid amount and bid duration are no longer checked

- **Change input form**
  - Add `required` attributes to userID and keyword fields
  - Add `id` attributes to every field
  - Add h:message (with appropriate id) to the right of each input field

Bean Code: String and Numeric Properties

```java
package coreservlets;

public class BidBean2 {
    private String userID;
    private String keyword;
    private double bidAmount;
    private int bidDuration;
    ...

    public double getBidAmount() { return(bidAmount); }
    public void setBidAmount(double bidAmount) {
        this.bidAmount = bidAmount;
    }
    public int getBidDuration() { return(bidDuration); }
    public void setBidDuration(int bidDuration) {
        this.bidDuration = bidDuration;
    }
```
Bean Code: Action Controller

```java
public String doBid() {
    return("success");
}
```

Input Form: Outputting Error Messages (bid2.jsp)

```html
<h:form>
  <TABLE>
  <TR>
    <TD>User ID: <h:inputText value="#{bidBean2.userID}" required="true" id="userID"></TD>
    <TD><h:message for="userID" styleClass="RED"></TD></TR>
  <TR>
    <TD>Keyword: <h:inputText value="#{bidBean2.keyword}" required="true" id="keyword"></TD>
    <TD><h:message for="keyword" styleClass="RED"></TD></TR>
  <TR>
    <TD>Bid Amount: $<h:inputText value="#{bidBean2.bidAmount}" id="amount"></TD>
    <TD><h:message for="amount" styleClass="RED"></TD></TR>
  <TR>
    <TD>Duration: <h:inputText value="#{bidBean2.bidDuration}" id="duration"></TD>
    <TD><h:message for="duration" styleClass="RED"></TD></TR>
  </TABLE>
</h:form>
```
Implicit Validation: Results

Enter Bid

User ID: ____________________________
Keyword: ____________________________
Bid Amount: $0.00 ____________________
Duration: ____________________________

Send Bid

Validation Error: "userID": Value is required.
Implicit Validation: Results

Enter Bid

User ID: a-123
Keyword:
Bid Amount: $1.25
Duration: one month

Validation Error: "keyword": Value is required.
"duration": Conversion error occurred.

Send Bid

Bid Accepted

You have bid successfully.

- User ID: a-123
- Keyword: jsf
- Bid Amount: $1.25
- Duration: 30

(Version 2)
Validation using the JSF Validator Tags

For when validation that is not tied to your business logic where you want to check that values are in certain ranges or of certain lengths

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Explicit Automatic Validation

- Define bean properties to be simple types
  - int, long, double, boolean, char, etc.
- Add `f:validateBlah` or `f:convertBlah` elements
- System checks that fields follow restrictions
  - `f:validateBlah` attributes let you control format
- If there is validation error, form redisplayed
  - And error message stored
- Other approaches stay the same
  - You can still add `required` attribute to any input element to indicate that empty values are errors
  - Still use `h:message` to display error messages
    - `h:message` returns empty string if there is no message
  - Still add `immediate` attribute to bypass validation
    - E.g., for `h:commandButton` when implementing logout or cancel operation

Explicit Validation: Example

- Leave `BidBean` unchanged from last example
- Change input form
  - Enforce that `userID` is 5 or 6 characters long
  - Enforce that `keyword` is 3 or more characters long
  - Enforce that `bid amount` is at least 10 cents
  - Enforce that `bid duration` is at least 15 days
<h:form>
  <TABLE>
    <TR>
      <TD>User ID:
        <h:inputText value="#{bidBean2.userID}" id="userID">
          <f:validateLength minimum="5" maximum="6"/>
        </h:inputText></TD>
      <TD><h:message for="userID" styleClass="RED"/></TD></TR>
    <TR>
      <TD>Keyword:
        <h:inputText value="#{bidBean2.keyword}" id="keyword">
          <f:validateLength minimum="3"/>
        </h:inputText></TD>
      <TD><h:message for="keyword" styleClass="RED"/></TD></TR>
    <TR>
      <TD>Bid Amount:
        $<h:inputText value="#{bidBean2.bidAmount}" id="amount">
          <f:validateDoubleRange minimum="0.10"/>
        </h:inputText></TD>
      <TD><h:message for="amount" styleClass="RED"/></TD></TR>
    <TR>
      <TD>Duration:
        <h:inputText value="#{bidBean2.bidDuration}" id="duration">
          <f:validateLongRange minimum="15"/>
        </h:inputText></TD>
      <TD><h:message for="duration" styleClass="RED"/></TD>
      <TR>TH COLSPAN=2>
        <h:commandButton value="Send Bid!"
          action="#{bidBean2.doBid}"/></TH></TR>
  </TABLE>
</h:form>
<h:form>
  <h:table>
    <h:tr>
      <h:td>User ID:
        <h:inputText value="#{bidBean2.userID}" id="userID">
          <f:validateLength minimum="5" maximum="6"/>
        </h:inputText>
      </h:td>
      <h:td><h:message for="userID" styleClass="RED"/></h:td>
    </h:tr>
  </h:table>
</h:form>
Explicit Validation: Results

Validation Error: "userID": Value is less than allowable minimum of '5'
Explicit Validation: Results

Enter Bid

User ID: 123
Keyword: juf
Bid Amount: $0.00
Duration: 90

Send Bid

Validation Error: "keyword": Value is less than allowable minimum of '3'
Validation Error: "amount": Value is less than allowable minimum of '0.1'

Bid Accepted

You have bid successfully.

- User ID: 123
- Keyword: juf
- Bid Amount: $1.25
- Duration: 90

(Version 3)
Conversion vs. Validation

- Both f:convertBlah and f:validateBlah check format and redisplay form if field is invalid
  - But f:convertBlah also changes the format in which the field is displayed
  - f:validateBlah makes sense only with h:inputText
  - f:convertBlah makes sense with both h:inputText and h:outputText

- Example
  `<h:inputText value="#{orderBean.discountCode}">
    <f:convertNumber maxFractionDigits="2"/>
  </h:inputText>`
  - Displays 0.75 or something similar (not 0.749)

Converter and Validator Attributes

- f:convertNumber
  - currencyCode, currencySymbol
  - groupingUsed
  - integerOnly
  - locale
  - max(min)FractionDigits
  - max(min)IntegerDigits
  - pattern (ala DecimalFormat)
  - type
    - number, currency, percentage
- f:convertDateTime
  - type
    - date, time, both
dateStyle, timeStyle
    - default, short, medium, long, full
  - pattern (ala SimpleDateFormat)
  - locale
  - timeZone
- f:validateLength
  - minimum
  - maximum
- f:validateLongRange
  - minimum
  - maximum
- f:validateDoubleRange
  - minimum
  - maximum
Custom Converters and Validators

• Converters
  – Implement Converter interface
  – getAsObject
    • Takes String; returns Object
  – getAsString
    • Takes Object; returns String
  – Conversion errors
    • Throw ConverterException with FacesMessage
  – Register in faces-config.xml
    • converter, converter-id, converter-class
  – Use converter attribute
    `<h:inputText value="#{…}"
        converter="someID"/>

• Validators
  – Implement Validator interface
  – Override validate method
  – Conversion errors
    • Throw ValidationException with FacesMessage
  – Register in faces-config.xml
    • validator, validator-id, validator-class
  – Use f:validator tag
    `<h:inputText value="#{…}"
      <f:validator
        validatorId="someID"/>
    </h:inputText>`

Customizing Error Messages

• Create and load global properties file
  – `<application>
      <message-bundle>MyMessages</message-bundle>
    </application>
    • Assumes WEB-INF/classes/MyMessages.properties
  – Use explicit property names as given in Messages.properties
    – javax.faces.component.UIInput.CONVERSION
    – javax.faces.component.UIInput.REQUIRED
  – Example
    `javax.faces.component.UIInput.CONVERSION=Illegal format!
    javax.faces.component.UIInput.REQUIRED=Missing value!`
    – Changes "Conversion error occurred" to "Illegal format!"
    – Changes "Value is required" to "Missing value!"
**Messages.properties**
(from jsf-impl.jar)

`javax.faces.component.UIInput.CONVERSION=`
{0}Conversion error occurred.

`javax.faces.component.UIInput.REQUIRED=`
Validation Error: {0}Value is required.

`javax.faces.validator.NOT_IN_RANGE=`
Validation Error: {2}Specified attribute is not between the expected values of {0} and {1}.

`javax.faces.validator.DoubleRangeValidator.MAXIMUM=`
Validation Error: {1}Value is greater than allowable maximum of 
"{0}"  

`javax.faces.validator.DoubleRangeValidator.MINIMUM=`
Validation Error: {1}Value is less than allowable minimum of 
"{0}"  

`javax.faces.validator.DoubleRangeValidator.TYPE=`
Validation Error: {0}Value is not of the correct type

---

**Validation using Custom Validator Methods**

For when validation that is not tied to your business logic, but when there is no built-in JSF validator.
Writing Your Own Validator Methods

**JSP**
- For input component specify method name explicitly
  - `<h:inputText id="someID" validator="#{someBean.someMethod}"/>
- Use `<h:message for="someID"/>

**Java**
- Throw ValidatorException with a FacesMessage if validation fails. Do nothing if validation succeeds.
- Method arguments:
  - FacesContext
    - The context
  - UIComponent
    - The component being validated
  - Object
    - The submitted value (primitives use wrappers)
Custom Validator Methods: Example (JSP)

...  
<TR>  
<TD>Bid Amount:  
$<h:inputText value="#{bidBean2.bidAmount}"  
id="amount" required="true"  
validator="#{bidBean2.validateBidAmount}"/>  
</TD>  
<TD><h:message for="amount" styleClass="RED"/></TD></TR>  
...  

Custom Validator Methods: Example (Java)

```java
public void validateBidAmount(FacesContext context,  
UIComponent componentToValidate,  
Object value)  
throws ValidatorException {
  double bidAmount = ((Double)value).doubleValue();
  double previousHighestBid = currentHighestBid();
  if (bidAmount <= previousHighestBid) {  
    FacesMessage message =  
      new FacesMessage("Bid must be higher than current " +  
                       "highest bid ($" +  
                       previousHighestBid + ").");
    throw new ValidatorException(message);
  }
}

currentHighestBid() {
  return(0.23); // Get from database in real life
}  
```
Custom Validator Methods: Results

Summary

- **Manual validation**
  - Most flexible
  - Most work
- **Implicit automatic validation**
  - Moderately flexible
  - Very little work
- **Explicit automatic validation**
  - Very flexible
  - Little to moderate work
- **Making your own validator methods**
  - Moderately flexible
  - Moderately little work
Questions?

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