CS520 Web Programming
Bits and Pieces of Web Programming

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Overview

- Logging
- Testing
- File upload
- Email
- Message bundles
- Input validation

Logging

- Use print statements to assist debugging
  - Why do we want to do that when we have GUI debugger??

```
public void foo()
{
    System.out.println( "loop started" );
    // some code that might get into infinite loop
    …
    System.out.println( "loop finished" );
}
```

Requirements of Good Logging Tools

- Minimize performance penalty
- Support different log output
  - Console, file, database, …
- Support different message levels
  - Fatal, error, warn, info, debug, trace
- Easy configuration

Java Logging Libraries

- Logging implementations
  - Log4j - http://logging.apache.org/log4j/
  - java.util.logging in JDK
- Logging API
  - Apache Commons Logging (JCL) - http://commons.apache.org/logging/
  - Simple Logging Façade for Java (SLF4J) - http://www.slf4j.org/

Choose Your Logging Libraries

- Log4j
  - Widely used
  - Good performance
  - Easy configuration
- java.util.logging
  - Part of JDK, i.e. no extra library dependency
- Commons Logging
  - Determines logging implementation at runtime
- SLF4j
  - Statically linked to a logging implementation
    - Cleaner design
    - Better performance
    - Less problem

Log4j Example

- Library dependency
- Logger creation
- Configuration
  - Message levels
  - Output format

Log4j Configuration File

- `log4j.xml` or `log4j.properties`
- Appender
  - Output type
  - Output format
- Logger
  - Package or class selection
  - Message level

Log4j PatternLayout

- http://logging.apache.org/log4j/1.2/apidocs/org/apache/log4j/PatternLayout.html

Testing Basics

- Unit Testing
- System Testing
- Integration Testing
- User Acceptance Testing (Beta Testing)

Java Testing Frameworks

- JUnit
  - http://www.junit.org/
  - Widely used and supported
- TestNG
  - http://testng.org/
  - Technical superior to JUnit but not as widely used or supported
  - Example: testing BubbleSort

Maven Support for JUnit/TestNG

- Library dependency
- Directory structure
  - `src/test/java`
  - `src/test/resources`
- The *surefire* plugin

Basic TestNG Annotations

- `@Test` for test method
- Annotations for various before/after methods
  - Method
  - Class
  - Group and Test
  - Suite

Ordering Tests

- @Test
  - `dependsOnMethods`
  - `dependsOnGroups`

Test Suite

testng.xml

```
<suite name="cs520">
   <test name="all">
      <packages>
         <package name="cs520.testing" />
      </packages>
   </test>
</suite>
```

TestNG and Spring

- Test classes inherit from Spring TestNG support classes
- Specify Spring configuration file using `@ContextConfiguration`
- Examples: CSNS2

More About TestNG

- TestNG Documenation – http://testng.org/doc/documentation-main.html
- *Next Generation Java Testing* by Cédric Beust and Hani Suleiman

File Upload – The Form

```
<form action="FileUploadHandler"
      method="post"
      enctype="multipart/form-data">

   First file: <input type="file" name="file1" /> <br />
   Second file: <input type="file" name="file2" /> <br />

   <input type="submit" name="upload" value="Upload" />

</form>
```

File Upload – The Request

```
POST / HTTP/1.1
Host: cs.calstatela.edu:4040
[...]
Cookie: SITESERVER=ID=289f7e73912343a2d7d1e6e44f931195
Content-Type: multipart/form-data; boundary=---------------------------146043902153
Content-Length: 509

-----------------------------146043902153
Content-Disposition: form-data; name="file1"; filename="test.txt"
Content-Type: text/plain

this is a test file.

-----------------------------146043902153
Content-Disposition: form-data; name="file2"; filename="test2.txt.gz"
Content-Type: application/x-gzip

???□??????UC
```

Apache commons-fileupload

- http://jakarta.apache.org/commons/fileupload/using.html

```
FileItemFactory fileItemFactory = DiskFileItemFactory();
ServletFileUpload fileUpload = new ServletFileUpload( fileItemFactory );

List items = fileUpload.parseRequest( request );
for( Object o : items )
{
   FileItem item = (FileItem) items;
   if( ! item.isFormFiled() ) {...}
}
```

Spring File Upload Support

- `multipartResolver` bean
  - Support multiple request parser libraries
- Handle uploaded files
  - Add an `MultipartFile` argument to the controller method
  - Example: student/UploadFileController in CSNS2

Store Uploaded Files

- In database
  - BLOB, CLOB
  - BINARY VARCAR, VARCHAR
- On disk

- *Pros and Cons??*

Store Uploaded Files

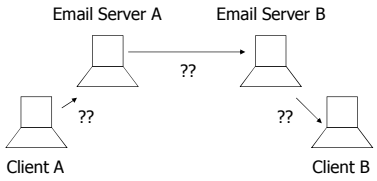
- In database
  - ACID
  - BLOB/CLOB types are not very portable
  - Bad performance
- On disk
  - Not ACID
  - Do not need BLOB/CLOB types
  - Good performance

Exercise: Upload Course Syllabus

- Modify the add/edit course function to allow users to upload course syllabi

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 );
```

Spring Email Support

- Declare a `mailSender` bean
- Mail message classes
  - `SimpleMailMessage`
    - http://static.springsource.org/spring/docs/current/spring-framework-reference/html/mail.html#mail-usage
    - No attachment, no special character encoding
  - `MimeMailMessage`
- Example: ResetPasswordController in CSNS2

Message Bundles

- Separate text messages from application code and put them into their own files
  - E.g. `messages.properties`

```
error.username.required=A username is required.
error.password.short=The password is too short.
error.username.taken=The username {0} is already taken.
```

Advantages of Using Message Bundles

- Change text messages without modifying the source code
- Internationalization (I18N)
  - `messages.properties`
  - `messages_en_US.properties`
  - `messages_zh_CN.properties`
  - …

Using Message Bundles with JSTL

```
<fmt:setBundle basename="messages" />

<fmt:message key="msg1">
    <fmt:param value="Chengyu" />
</fmt:message>

<fmt:message key="msg2" />
```

Using Message Bundles with Spring

- Declare a `messageSource` bean
- `<spring:message>` tag

```
<spring:message code="msg1"
    arguments="Chengyu" />

<spring:message code="msg2" />
```

Input Validation in Spring

- Implement a `Validator`
- Add a `BindingResult` parameter to the controller method
- Return the form view if validation fails
- Display errors using `<form:errors>`

Example: Validate Add/Edit Course

- Add error messages to the message bundle
- Implement a validator and wire it to the controller
- Validate
- Display error messages

Other Validation Options

- JavaScript validation
- Commons-validator
  - http://commons.apache.org/validator/
  - Provide both *declarative* and *programmatic* validation

Commons-Validator Declarative Validation Example

```
<form name="fooForm">

    <field property="name" depends="required">
        <arg0 key="fooForm.definition"/>
    </field>

    <field property="difficultyLevel"
           depends="required, integer">
        <arg0 key="fooForm.difficultyLevel"/>
    </field>

</form>
```

Commons-Validator Routines

- http://commons.apache.org/validator/api-1.3.1/org/apache/commons/validator/routines/package-summary.html
- Independent of the declarative validation framework
- A set of methods to validate
  - Date and time
  - Numeric values
  - Currency
  - ...