

ZK Developer's Guide

Developing responsive user interfaces for web applications using AJAX, XUL, and the open-source ZK rich web client development framework

##### Markus Stäuble

**Hans-Jürgen Schumacher**



BIRMINGHAM - MUMBAI

ZK Developer's Guide

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There are several people who have supported the writing of my first book. But there is especially one person to whom I want to say thank you, my wife Maria Elena. She supported the writing very much and gave me the power and energy to finish that work.

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I would like to thank my son Samuel, who was just born at the right time and gave me the power to finish this book.

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I would like to thank my wife Mihaela for her support while reviewing this book, and my parents.

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For my mum, S. Resmiana Limbong. Thanks for your struggle.

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# Preface

ZK is an open-source web development framework that enables web applications to have the rich user experiences and low development costs that desktop applications have had for years. ZK includes an AJAX-based event-driven engine, rich sets of XML User Interface Language (XUL), and XHTML components, and

a markup language (ZUML).The ZK rich client framework takes the so-called server-centric approach: the content synchronization of components and the event pipelining between clients and servers are automatically done by the engine and AJAX plumbing codes are completely transparent to web application developers. Therefore, the end users get rich user interfaces with similar engaged interactivity and responsiveness to that of desktop applications, while for programmers, development remains similar in simplicity to that of desktop applications

**What This Book Covers**

In *Chapter 1* we give an introduction to, and take a look behind the ZK framework. In the last section of this chapter, we show some important issues from the ZK User Interface Language (ZUML).

In *Chapter 2* we will implement a CRUD (Create—Read—Update—Delete) application. We will also design and implement the pages with the ZK framework.

At the beginning of *Chapter 3*, we start with a simple CRUD application. The first thing we do here is to add some AJAX features to the application (live data). Here, we will learn many cornerstones provided by the ZK framework, and that we only have to implement some interfaces to use these features. We will move the application from a mixed code approach to a Model-View-Controller Architecture.

*Chapter 4* deals with the end of the third phase in the development of a CRUD application with the AJAX ZK framework. We start with a simple application, and extend it step by step. The application now has many features that you will need in other applications as well.

*Chapter 5* introduces the advantages and disadvantages of ZK. Then we will see how to integrate ZK with the Spring Framework and also why it is useful to do so. We will then move on to Hibernate and JasperReport.

In *Chapter 6* we will learn how to customize existing components. We have the ability to use styles that we know from HTML to change the layout of the components.

Additionally we will see that it is possibile to build new components (macro components) on the basis of existing components. And, last but not least, in the last section of this chapter we will learn how to create a complete custom component that is based on a .dsp file.

*Chapter 7* introduces zk-bench. Zk-bench is a very useful tool and it supports much more than just designing ZUL pages. It simplifies the development of web applications a lot and it's build around the ZK framework.

The *Appendix A* contains information about the configuration files, which are important in the context of a ZK application. You should use this appendix in conjunction with Chapter 1 to get a better understanding of how to configure your ZK application.

**What You Need for This Book**

The following is the list of software that you need to install and configure in order to start working with ZK:

 ZK 2.3.0

* Tomcat version 5.5.x (apache.tomcat.org)
* The demo application from ZK 2.3.0 is a simple WAR file. Just copy the WAR file into the webapps directory of the tomcat installation.
* Eclipse version 3.3

**Who is This Book For?**

This book is a Developer's Guide that steps you through the ZK framework with examples. It starts with installing and configuring ZK and takes you on to integrate it with other frameworks. By the time you are through the book you will be able to build an application on your own*.*

**Conventions**

In this book, you will find a number of styles of text that distinguish between different kinds of information. Here are some examples of these styles, and an explanation of their meaning.

There are three styles for code. Code words in text are shown as follows: "In the sample there is a class InitSample in a package sample used."

A block of code will be set as follows:

<zscript><![CDATA[

import sample.InitSample;

]]>

</zscript>

When we wish to draw your attention to a particular part of a code block, the relevant lines or items will be made bold:

if (event.getValue().length() > 0 && event.getValue().trim()

.length() > 0)

{

**buttonToSayHello.setVisible(true);**

}

else

{

buttonToSayHello.setVisible(false);

}

**New terms** and **important words** are introduced in a bold-type font. Words that you see on the screen, in menus or dialog boxes for example, appear in our text like this: "When the user clicks on the button **Start the thread,** the thread starts doing the work asynchronously".

Important notes appear in a box like this.



Tips and tricks appear like this.



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Getting Started with ZK

The world of web application development grows and grows. We can read many articles and books that explain how to develop a web application. Nearly every week a new framework emerges in the sphere of development. However, each new technology and framework means that we have to learn it. Without learning, it's not possible to leverage the complete power of the chosen technique. There are some reasons for the emergence of such a wide range of possibilities for developing a web application. The evolution of technology is one reason, and another is the demand for a faster and more efficient way to develop a web application. Each developer has his or her own preference for the way of development. However, not only issues in development demand new ways of building a web application. The big picture is about Web 2.0 and the underlying techniques **AJAX (Asynchronous JavaScript and XML)** also need new ways.

With ZK the developer gets a new alternative for solving the daily problems that occur in web projects and for building Web 2.0 applications. Through the chapters of this book, we show how to develop applications with ZK. After reading it and trying the framework there should be no need for more convincing.

Before we dive into the ZK framework it's important to clarify that this introductory chapter is not a replacement for the developers' guide from ZK (see [http://www.](http://www/) zkoss.org/doc/ZK-devguide.pdf). The aim of this chapter is to give you an understanding of the basics and some important aspects of ZK, which are essential for daily development with the framework.

The following browsers are supported by ZK:

* Internet Explorer 6+/7
* Firefox 1+
* Safari 2+
* Mozilla 1+
* Opera 9+
* Camino 1+

Browsers without decent support for DOM and JavaScript are not supported. ZK is offered with a dual licensing model. On one side there is the GPL license, and on the other there is a commercial license with commercial support, which is offered

from ZK (see [http://www.zkoss.org/license/).](http://www.zkoss.org/license/)) Actually there are some IDEs that support the ZK framework. For example, there is ZeroKoder and the commercial

zk-bench. These tools are presented in Chapter 7 of this book. To start programming with ZK you only need a basic knowledge of Java and XUL (XML User Interface Language). It's very easy to develop a front-end to a database. There are existing integrations of some OR-Mappers to ZK (e.g. for Hibernate). At present there are no external providers for controls. However, there is a defined interface (zk-forge) for creating controls.

The benefits of ZK are:

* AJAX-based Rich User Interfaces
* Event-driven Model
* ZK User-interface Markup Language
* Server-Centric Processing
* Script in Java and EL Expressions
* Modal Dialogs
* Simple Thread Model
* Live Data
* GPL

The disadvantage of frameworks like JSF, or the Echo framework is lack of a good IDE support.

## What is ZK?

If somebody asks about ZK, a good answer is: *ZK is AJAX without JavaScript*. That's an answer for some merchandising prospects. The technical answer to the question is that ZK is a component-based framework, which is driven through events.

There are three cornerstones:

1. An AJAX-based event-driven engine
2. A rich set of XUL and XHTML components
3. ZUML (ZK User Interface Markup Language)

Before we go on, we should get familiar with a few buzzwords, which we mentioned before.

### XHTML

XHTML is the abbreviation of *Extensible HyperText Markup Language*. XHTML is very similar to HTML. Briefly, XHTML is HTML written in XML syntax. The following points are the most important differences:

* The notation (uppercase/lowercase) of an element/attribute is important in XHTML (unlike of HTML).
* Elements without content (e.g. <br>) must be closed in XHTML (e.g. <br />).

Example:

<?xml version="1.0" encoding="iso-8859-1" ?>

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" ["http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">](http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd)

<html [xmlns="http://www.w3.org/1999/xhtml"](http://www.w3.org/1999/xhtml) lang="de" xml:lang="de">

<head>

<title>A XHTML example</title>

</head>

<body>

<h1>Testpage</h1>

<p>A paragraph</p>

<p>another<br />paragraph

</p>

</body>

</html>

### XUL

XUL is the abbreviation for *XML User Interface Markup Language*. This "language" is not a new invention from the ZK team. It was originally defined by the Mozilla team. The project page of XUL is [http://www.mozilla.org/projects/xul/.](http://www.mozilla.org/projects/xul/) The intention of Mozilla is to have a platform-independent language to define user interfaces. And therefore, a ZK developer can benefit from the big community around XUL, and can use XUL widgets.

Example:

<?xml version="1.0"?>

<?xml-stylesheet href="chrome://global/skin/" type="text/css"?>

<window

id="findfile-window" title="Find Files" orient="horizontal"

[xmlns="http://www.mozilla.org/keymaster/gatekeeper](http://www.mozilla.org/keymaster/gatekeeper)

/there.is.only.xul">

<button id="find-button" label="Find"/>

<button id="cancel-button" label="Cancel"/>

</window>

### ZUML

ZUML is the abbreviation for *ZK User Interface Markup Language*. ZUML is based on XUL. There are some extensions to the XUL standard like the possibility of embedding program code.

<window title="Hello" border="normal"> Hello World!

</window>

For the user, the application feels like a desktop application. For the developer, the programming is like a standalone application. ZK uses an event-driven paradigm, which encapsulates the request-response paradigm from a web application. These technical infrastructure things are done through the framework. Therefore, no JavaScript usually needs to be written for the browser side. Here, it's important

to say that the framework automatically includes some JavaScript libraries, and generates the JavaScript code for the user. Therefore, the developer has nothing to do with JavaScript.

It's important to know that ZK does only things that should be done from a UI Framework. This means that we do not have a new framework that solves all development problems in the world. Only the UI layer is addressed. Therefore, things like persistence must be done with other frameworks. However, there are many possibilities for integrating other frameworks (e.g. Hibernate, http://www.hibernate.org) into ZK.



## First Step: Say Hello to ZK

To get a feel of working with ZK, it's wise to do a small example. To follow the long tradition of many programming technologies, we will start with the traditional "Hello World" example.

For the examples, we are using version 2.3.0 of the ZK framework.



The best way to start with ZK is to download the zkdemo application from the ZK team. The application can be downloaded from: <http://www.zkoss.org/>

download/. The application comes in a ZIP archive. This archive contains four files:

1. zkdemo-all.war
2. zkdemo.war
3. zkdemos-all.ear
4. zkdemos.ear

The WAR files are for deploying inside a J2EE web container. The EAR files are for deploying inside a J2EE application server. To start, just throw the zkdemo. war inside the webapps directory of Tomcat. After this the application is available

with the URL http://localhost:8080/zkdemo (if Tomcat runs at port 8080). Now create a new file with the name hello.zul, and copy this page to the decompressed application zkdemo. The page can be accessed with http://localhost:8080/ zkdemo/hello.zul.

<window title="Hello" border="normal"> Hello World!

</window>

The downloaded archive of the demo contains zkdemo.war, zkdemo-all.war, zkdemos-all.ear, and zkdemos.ear. The files without the suffix -all does not contain a complete application. The libraries from ZK are missing. For a first start you can copy the zkdemo-all.war to your Tomcat webapps directory. If you want to use the zkdemo.war please copy all libraries from your zk-2.3.0



(directory zk-2.3.0/dist/lib) into the expanded directory of the web application. Without a copy of the libraries you get an error while executing your application.

After this small example, we will make a second example with an input element inside. This application consists of one main screen. This screen has a label (**Insert your name**), an input field, and a hidden button (**Say Hello**). The following screenshot shows the screen.



The definition of this screen is done in a single file. Its name is helloworld.zul. Both the layout and logic is done in that page. The page is realized with the previously mentioned ZK User Interface Markup Language.

Now it's time to draw the curtain and show the implementation of this simple application as follows:

<?xml version="1.0" encoding="UTF-8"?>

<zk [xmlns="http://www.zkoss.org/2005/zul">](http://www.zkoss.org/2005/zul)

<window title="My First window" border="normal" width="400px">

<label value="Insert your name:" />

<textbox width="60%" id="username">

<!-- implement an event listener for the even onChanging -->

<attribute name="onChanging"><![CDATA[

//The eventcode is pure Java and therefore we can use the standard comment signs

//Caution: We can not use the ampersand for the if-clause because we have to produce valid XML and

//the ampersand is the indicator of an entity in XML

/\*\* Comments spanning more than one line are possible, too \*\*/

if (event.getValue().length() > 0 && event.getValue().trim()

.length() > 0)

{

buttonToSayHello.setVisible(true);

}

else

{

buttonToSayHello.setVisible(false);

}

]]>

</attribute>

</textbox>

<!-- The alert is not a javascript alert, it’s

a global function -->

<button id="buttonToSayHello" label="Say Hello" visible="false">

<attribute name="onClick"><![CDATA[

alert('Hello '+username.value);

]]>

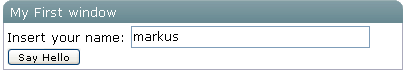
</attribute>

</button>

</window>

</zk>

It was mentioned before that the page contains one hidden button (**Say Hello**). This button has the buttonToSayHello id. The idea behind this is that the button is only shown if there is some input in the textbox with the username id. After the input of some content (at least one character that is not a white space character) the output looks like the following screenshot.

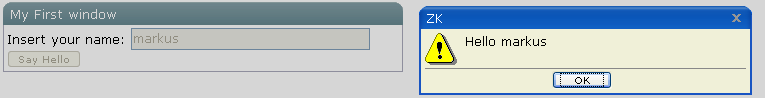


One way to define this "event listener" is to define the onChanging attribute for the textbox username. The implementation of the event is done in Java.

Each main element should have an id attribute. With the id of an element it's easy to access such an element. In the example, we set the button visible with buttonToSayHello.setVisible(true).



If we click on the **Say Hello** button a window with a message is opened (see the following screenshot).



To show this messagebox the onClick attribute of the button is defined as alert(&quot;Hello &quot;+username.value). We used the globally defined method alert to show the message. The parameter for the method is a text string. We first have a constant **Hello** text, and then the value of the username (username. value) textbox.

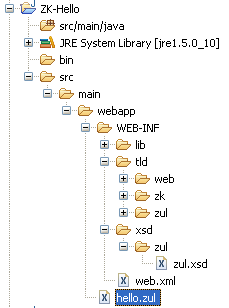
Always in development, it's important to remember that a ZUL file is just an XML file. Also if we want to use Java in that file, we have to keep in mind that some characters could conflict with XML. Therefore, we have to use the XML entities for special characters. In the example, we used &quot; for ' and &amp; for the & sign.



It's notable that the alert method is not JavaScript, it's Java. The code within a ZUL page is interpreted inside the BeanShell interpreter (http://www.beanshell.org). To use JavaScript for the onClick event handler we have to explicitly prefix the command with javascript:. The difference between a JSP and ZUL page is that the code inside a ZK page is run inside the BeanShell, whereas a JSP is compiled to

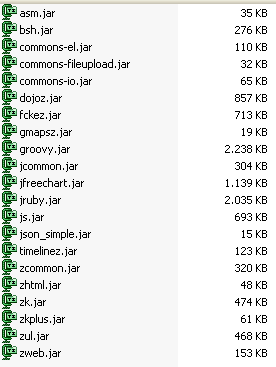
a Java class.

The ZK framework itself runs in a JEE (Java Enterprise Edition) Web container. And to fulfill the requirements to run into such a container, we have to do (unfortunately) more than just creating such a page. The succeeding screenshot shows the project layout for the sample project.



One part of the project is the ZK framework itself (which can be downloaded under http://www.zkoss.org). Here, we have to copy the libraries, **tld** and **xsd** files to our project. The following libraries (inside the lib directory) are necessary to run

the application:



The last artifact that we have to create is the deployment descriptor for the web application, web.xml. The descriptor for the demo application is depicted below. The

.zul files are interpreted by a servlet defined inside the zk.jar. The ZK framework also provides session management. Therefore, a predefined web.xml file is provided.

<?xml version="1.0" encoding="UTF-8"?>

<web-app version="2.4" [xmlns="http://java.sun.com/xml/ns/j2ee"](http://java.sun.com/xml/ns/j2ee) [xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"](http://www.w3.org/2001/XMLSchema-instance) [xsi:schemaLocation="http://java.sun.com/xml/ns/j2ee](http://java.sun.com/xml/ns/j2ee) [http://java.sun.com/xml/ns/j2ee/web-app\_2\_4.xsd">](http://java.sun.com/xml/ns/j2ee/web-app_2_4.xsd)

<description><![CDATA[ZK Demo]]></description>

<display-name>zk-hello</display-name>

<!--

<icon>

<small-icon></small-icon>

<large-icon></large-icon>

</icon>

-->

<!-- //// -->

<!-- ZK -->

<listener>

<description>

Used to cleanup when a session is destroyed

</description>

<display-name>ZK Session Cleaner</display-name>

<listener-class> org.zkoss.zk.ui.http.HttpSessionListener

</listener-class>

</listener>

<servlet>

<description>ZK loader for ZUML pages</description>

<servlet-name>zkLoader</servlet-name>

<servlet-class> org.zkoss.zk.ui.http.DHtmlLayoutServlet

</servlet-class>

<!-- Required. Specifies URI of the update engine (DHtmlUpdateServlet).It must be the same as <url-pattern> for the update engine.-->

<init-param>

<param-name>update-uri</param-name>

<param-value>/zkau</param-value>

</init-param>

<load-on-startup>1</load-on-startup>

</servlet>

<servlet-mapping>

<servlet-name>zkLoader</servlet-name>

<url-pattern>\*.zul</url-pattern>

</servlet-mapping>

<servlet-mapping>

<servlet-name>zkLoader</servlet-name>

<url-pattern>\*.zhtml</url-pattern>

</servlet-mapping>

<!-- Optional. Uncomment it if you want to use richlets.-->

<servlet-mapping>

<servlet-name>zkLoader</servlet-name>

<url-pattern>/zk/\*</url-pattern>

</servlet-mapping>

<servlet>

<description>The asynchronous update engine for ZK</description>

<servlet-name>auEngine</servlet-name>

<servlet-class> org.zkoss.zk.au.http.DHtmlUpdateServlet

</servlet-class>

</servlet>

<servlet-mapping>

<servlet-name>auEngine</servlet-name>

<url-pattern>/zkau/\*</url-pattern>

</servlet-mapping>

<!-- /////////// -->

<!-- Miscellaneous -->

<session-config>

<session-timeout>120</session-timeout>

</session-config>

<welcome-file-list>

<welcome-file>index.zul</welcome-file>

<welcome-file>index.zhtml</welcome-file>

<welcome-file>index.html</welcome-file>

<welcome-file>index.htm</welcome-file>

</welcome-file-list>

</web-app>

Now the application is ready to run in a JEE Web container, such as Apache Tomcat (http://tomcat.apache.org).

## Inside ZK—How ZK Works

Before we start building a sample application, it's time to explain the internals of ZK. When building a simple application, or using a good tool, it is not important to understand its architecture. However, in case of an exception (Bad news: There are exceptions in programming with ZK, too.) it's better to know where you can look for the error.There are three components in the ZK architecture that can be identified as the main elements of the framework.

|  |  |
| --- | --- |
| ZK Loader | This component is responsible for the loading and interpretation of a ZK page. The selection of the page is done based on the incoming URL Request from the client browser.  The result is rendered as an HTML page and send back to the browser. |
| ZK Client Engine | This component sends "ZK Requests" to the server, and gets "ZK Responses" from the server. With these responses the DOM (Document Object Model) tree on the client side is updated. Therefore, we could call that the client part of the AJAX. |
| ZK AU (Asynchronous Update) Engine | The ZK AU Engine is the server part of the AJAX. |

The following Insert figure gives a short overview to the architecture of ZK.



The sending of **ZK Requests** and **ZK Responses**, and the resulting updates constitute the mentioned event-driven programming model.

One of the first things every Java programmer gets to know from his or her new programming heaven is that there is no need to care about memory, because the JVM (Java Virtual Machine) does the job for the developer. However, after that good message the next thing a Java



programmer has to learn about is Garbage Collection. The ZK framework has no method for destroying a component. Since a page is detached from a page, the framework doesn't have any control over that component.

After the detachment, the JVM takes care of the memory that was occupied by the component.

### The Three Relatives—Desktop, Page, and Component

On the user side there are only HTML pages. In ZK these pages are build on desktops, pages, and components.

|  |  |
| --- | --- |
| **Component** | Framework representation: org.zkoss.zk.ui.Component  A component is a UI object (for example: button, textbox, or label).  The component besides being a Java object on the server has a visual representation in the browser. This is created at the moment of attachment to a page. At the moment of detachment the visual part is removed.  A component could have children. A component without any parent is called a **root component**. |
| **Page** | Framework representation: org.zkoss.zk.ui.Page  A page contains components. Therefore, a page is a container for components. If the ZK loader is interpreting a ZUML page, a org. zkoss.zk.ui.Page is created.  **Note:** A page can have multiple root components. |
| **Desktop** | Framework representation: org.zkoss.zk.ui.Desktop  It's possible for a ZUML page to include another ZUML page. This is because these pages are available under the same URL and they are grouped to a desktop. Therefore, a desktop is a container for the pages. |

The following figure gives a small overview of how the three "relatives" belong together.



### Identification in ZK

If we talk about identification in ZK, we have to handle three paradigms:

* Identifiers
* UUID
* ID Space

At the moment of creation of a component the **Identifier** for the component is created (each one has an identifier). It's possible to change the identifier at any time. To set the identifier for a component you can use the id attribute.

<button label="test" id="theIdOfTheButton" />

It's not really necessary to set an id for the component. If no id is set from the developer, the framework generates a unique ID.

In addition to the mentioned identifier the, id of a component, each component has another identifier, the **Universal Unique ID** (**UUID**). This identifier is created automatically at the creation phase of a component.

In most cases, an application developer has no contact with the UUID.



The identifier is used from the Client Engine to manipulate the Document Object Model at the client. For HTML components the id, and the UUID are the same. Therefore, if you change the id you change the UUID.

One attribute of an identifier should be that it is unique. If the project grows it's difficult to guarantee that an identifier is unique within the whole application. Therefore, in ZK we have the feature of **ID Spaces**. For example, an org.zkoss.zul. Window is an ID space. All identifiers in an ID Space must be unique instead of all identifiers in the whole application. Each component that implements the interface org.zkoss.zk.ui.IdSpace has its own ID Space. You could compare an ID Space with an XML Namespace.

For programmatic navigation inside and outside of the ID Spaces there is the helper class org.zkoss.zk.ui.Path.

A simple page hierarchy is shown in the figure below.



The class org.zkoss.zk.ui.Path offers two general possibilities to access a component. One is a static way, and the other is with an org.zkoss.zk.ui.Path instance.

The static way:

Path.getComponent("/5")

The way with an ork.zkoss.ui.Path instance:

new Path().getComponent("/1/2", "4")

### Loading and Updating a ZK Page

The lifecycle of loading a ZK page consists of four phases. These phases are illustrated in the figure below.



#### Phase: Page Initial

In this phase, the page is initialized. To control this phase, it is possible to define a class or zscript for that phase.

Following is an example of defining a class for the init sequence:

<?init class="sample.InitSample" ?>

In the above example, the InitSample class from sample package is used. This class has to implement the org.zkoss.zk.util.util.Initiator interface.

The second way is to define a zscript for the init sequence:

<?init zscript="/init/init-sample.zs" ?>

Note: It's not necessary to define an init sequence.



**Why to use an absolute class name in init?**

In the description of the "Page Initial" phase the possibilities for the definition of the init sequence are shown. The use of org.zkoss. zk.util.util.Initiator interface to implement it is a good way. In most cases, the implementation class is placed in some package. To use the class you have to use the absolute name of the class.

<?init class="sample.InitSample" ?>

The reason for this is explained through the lifecycle. If you don't want to use an absolute class name in a Java program you have to import the class. In a ZUL file, you can do that with a zscript.

 <zscript><![CDATA[

import sample.InitSample;

]]>

</zscript>

However, if you now just use the name InitSample for the init sequence you will get a java.lang.ClassNotFoundException. To understand this, just add an output to the zscript.

<zscript><![CDATA[

import sample.InitSample; System.out.println(InitSample.class);

]]>

</zscript>

Now we will implement doInit() and doAfterCompose().

package sample;

import org.zkoss.zk.ui.Page;

import org.zkoss.zk.ui.util.Initiator;

public class InitSample implements Initiator

{

public void doAfterCompose(Page page) throws Exception

{

System.out.println("doAfterCompose");

}

public void doInit(Page page, Object[] args) throws Exception

{

System.out.println("doInit");

}

public void doCatch(Throwable throwable)

{

}

public void doFinally()

{

}

}

The result is the following output:

**doInit**

**class sample.InitSample doAfterCompose**

The init sequence is called before the zscript, and therefore, your import has no consequence for that sequence. Instead of writing an init class you can do the necessary actions in a ZUL file (init.zs).

#### Phase: Component Creation

In this phase, the ZK loader is responsible for the interpretation of the pages. The components of each page are created and initialized.

The following steps are performed in this phase:

**Composing Phase**

**Step 1:** Before the creation and initialization is started, the optional values of if and unless attributes are evaluated (<window if="expression" /> or <window unless="expression" />). With these attributes it's possible to control the layout depending on some conditions.

**Step 2:** The component is created. In the case of specification of the use attribute (<window use="MyClass" />) the specified class is used to create the component. Otherwise the component is created based on the name. After that the members are initialized.

**Step 3**: The nested elements are interpreted.

**After the Composing Phase**

**Step 4**: If the component implements the org.zkoss.zk.ui.ext.AfterCompose

interface, afterCompose() is called.

**Step 5**: After the creation of all children the event onCreate is send to the created component.

If we use the forEach attribute the steps are done for each element in the collection.

<zscript><![CDATA[

elements = new String[] {"ZK", "AJAX",

"FRAMEWORK"};



]]>

</zscript>

<listbox width="200px">

<listitem label="${each}" forEach="${elements}"/>

</listbox>

#### Phase: Event Processing

For each event that is queued, the event listeners are called in a thread. The processing of other events is not affected by the processing of code of a single event listener.

#### Phase: Rendering

The last stage is to compose from all components one single HTML page. For the rendering of a component redraw() is called.

The lifecycle of updating a ZK page consists of three phases. These phases are illustrated in the diagram below:



It's worth mentioning that requests to the same desktop are processed sequentially, and requests to different desktops are processed in parallel. That's important if you are using frames, and each frame is a desktop.



#### Phase: Request Processing

The ZK Asynchronous Update Engine updates the appropriate components.

#### Phase: Event Processing

This is the same as the event processing on creation of a page.

#### Phase: Rendering

ZK renders the affected components. The Client Engine updates the DOM tree on the browser on the basis of the ZK responses.

### Events in ZK—Listening and Processing

In the introduction to ZK with the "Hello World" example, we actually used a way to register an event listener. We directly defined it as an attribute of a component in the page:

<button id="buttonToSayHello" label="Say Hello" onClick="alert(&quot;Hello &quot;+username.value)" visible="false"/>.

The next way to define an event listener is in the component class. Here, we have the first use of the use attribute of an element. When using the use attribute, the given class should implement the base class of the control.

<window use="sample.ExampleComponent" />

Now we can implement the event. In the example below, we implement the event onOK. If the event contains necessary information for the processing it's possible to give the method an argument org.zkoss.zk.ui.event.KeyEvent. However, the implementation of the method is correct without the argument, too.

package sample;

import org.zkoss.zk.ui.event.KeyEvent; import org.zkoss.zul.Window;

public class ExampleComponent extends Window

{

//It is possible to implement the method with an argument public void onOK(final KeyEvent event)

{

}

}

The org.zkoss.zk.ui.Component interface offers two methods: addEventListener() and removeEventListener(). With these methods it's possible to add and remove event listeners dynamically. The event listener must be from type org.zkoss.zk.ui.event.EventListener.

package sample;

import org.zkoss.zk.ui.event.Event;

import org.zkoss.zk.ui.event.EventListener;

public class SampleEventListener implements EventListener

{

public boolean isAsap()

{

return true;

}

public void onEvent(final Event event)

{

//here we process the necessary instructions

}

}

Now we can add this event listener in some initialization method.

public void init(final Component component)

{

component.addEventListener("onClick", new SampleEventListener());

}

When should it be done?—ASAP

The interface org.zkoss.zk.ui.event.EventListener has a method isAsap with the return value boolean.

 If the method returns true, the event will be sent to the server the moment the events occurs. However, if the method returns false, the

event won't be sent to the server directly. It will be sent if another event occurs that has a positive isAsap. In case of performance problems there is a possibility to directly affect that point.

Another way to handle events is to add an event listener to org.zkoss.zk.ui.Page. The consequence is that all events that belong to component from the page are send to that registered listener, too.

#### What is the Priority?—The Order of Event Processing

An interesting point in the processing of events is the sequence in which the events are processed. For the explanation, we assume that the onSelect event is sent

and received.

**First Step**: All event listeners for the onSelect event for the targeting component are invoked that implement the marker interface org.zkoss.zk.ui.event.Express.

**Second Step**: Now the script for the onSelect attribute for the target component is executed. It's notable that if we don't have an event listener that implements org. zkoss.zk.ui.event.Express then the event listener in the first attribute is executed.

**Third Step**: Now all event listeners of the targeting component that do not implement the mentioned org.zkoss.ui.event.Express interface are executed.

**Fourth Step**: If the targeting component has an onSelect method it will be executed.

**Fifth Step**: All event listeners for the onSelect event that are registered to the parent page of the target component are executed.

The only way to change the order of execution is with the help of the org.zkoss.ui.event.Express interface. If we have to register multiple event listeners for the same event on the same component that implements that interface then the event listener that is added first is the first to execute its event code. This interface only has a consequence if the event listener is registered on a component not on a page.



**Mark up your classes**

The org.zkoss.zk.ui.event.Express interface is a marker interface. The characteristic of such an interface is that it has an empty body. Such an interface is used only as a marker. It's useful to have such interfaces to emphasize that a class can have a special attribute.

The best known marker interface in the Java world is

java.io.Serializable.

**How to send an event—Asynchronous or Synchronous ?**

It's possible to send events with the help of the org.zkoss.zk.ui. event.Events class. There are two methods: postEvent (the

 asynchronous way) and sendEvent (the synchronous way). With the

postEvent method the event is placed at the end of the event queue. The

method returns immediately. With the usage of the sendEvent method it can be specified that the event should be executed immediately. The method returns after the specified event is executed.

#### How Can We Parallelize Event Listeners?

We mentioned before that requests to one desktop are done in a sequence. Therefore, if one event listener is processing its instructions then all other event listeners for that desktop are blocked. There is no problem if we only have short instructions, but in the case of long instructions we come across the problem that it's not acceptable to wait.

* To suspend working threads we have to use the wait method in ork.zkoss. zk.ui.Executions.
* We have to provide all necessary information to the working thread. This is because the working thread is not an event listener, and therefore, we have no direct access to the desktop.
* To proceed with the working we have to use the notify or notifyAll

method of org.zkoss.zk.ui.Executions.

* To resume the event listener we use org.zkoss.zul.Timer.

For better illustration, we will provide a small example. First we have to implement a thread, which will do the work asynchronously. This thread is an implementation of the java.lang.Thread.

package sample.thread;

public class SampleWorkingThread extends Thread

{

private static int counter; private Desktop desktop; private Label label;

//Mutex variable for synchronization

private final Object mutex = new Integer(0);

/\*\* Called by thread.zul to create a label asynchronously.

\* To create a label, it starts a thread, and waits for its completion.

\*/

public static final Label asyncCreate(final Desktop desktop) throws InterruptedException

{

//Create a new instance of the working thread final SampleWorkingThread worker = new

SampleWorkingThread(desktop); synchronized (worker.mutex)

{

worker.start();

//Suspend the thread Executions.wait(worker.mutex); return worker.label;

}

}

/\*\*

\* Implementation of the standard run method from java.lang.Thread.

\*/

public void run()

{

++this.counter;

this.label = new Label("Execute, counter : " + counter); synchronized (this.mutex)

{

//Proceed working of threads which are suspend with mutex Executions.notify(this.desktop, this.mutex);

}

}

/\*\*

* Constructor.

\*

* @param desktop The reference to the acutal desktop instance.

\*/

public WorkingThread(final Desktop desktop)

{

this.desktop = desktop;

}

}

Now we have to provide a ZUL page that starts the thread.

<window id="main" title="A Sample for a working Thread">

<button label="Start the thread">

<attribute name="onClick"> timer.start();

Label label = sample.thread.SampleWorkingThread

.asyncCreate(desktop); main.appendChild(label);

timer.stop()

</attribute>

</button>

<timer id="timer" running="false" delay="1000" repeats="true"/>

</window>

When the user clicks on the button **Start the thread,** the thread starts doing the work asynchronously.

#### Event Processing Thread—Initialize and Cleanup

One important thread in a ZK application is the event processing thread. In this thread an event listener is processed.

Sometimes there is a demand to initialize or clean up the thread. For this we have the org.zkoss.zk.ui.event.EventThreadInit-interface. This interface has the method init(Component, Event) which must be implemented (and the prepare method). To register the listener it's necessary to make an entry in WEB-INF/zk.xml.

<zk>

<listener>

<listener-class>sample.SampleEventThreadInit</listener-class>

</listener>

</zk>

For cleanup there is the org.zkoss.zk.ui.event.EventThreadCleanup interface. Here, we have to implement the cleanup(Component, Event, List)method; additionally we also have to implement the complete method. The last parameter for the method cleanup is a list of exceptions that occur before the method is executed.

To register the listener it's necessary to make an entry in WEB-INF/zk.xml.

<zk>

<listener>

<listener-class>sample.SampleEventThreadCleanup</listener-class>

</listener>

</zk>

An example implementation of such a listener is shown in *Appendix A*.

Until now we have used ZUML, but we haven't really explained what ZUML is and how to use it. The next section should you give some idea about working with ZUML. Before we start, it's important to note that the next section is not a reference for ZUML, it's just a guide to help in the development of a ZUML page.

#### Event Types

The following event types exist in ZK:

* Mouse Events (e.g. onClick)
* Keystroke Events (e.g. onOK)
* Input Events (e.g. onChange)
* List and Tree Events (e.g. onSelect)
* Slider and Scroll Events (e.g. onScroll)
* Other Events (e.g. onZIndex)

It depends on the component whether an event is supported or not. It's noteworthy to say that an event is sent after the content of the component is updated.

### ZUML – ZK User Interface Markup Language

The first thing a new ZK developer is confronted with is the ZUML (ZK User Interface Markup Language). It's noteworthy to say that this is not a new proprietary language; it's just an XML with namespace.

There are at least three namespaces that are important for working with ZK:

|  |  |
| --- | --- |
| <http://www.zkoss.org/2005/zul> | The XUL component set |
| <http://www.w3.org/1999/xhtml> | The XHTML component set |
| <http://www.zkoss.org/2005/zk> | ZK-specific attributes |

Inside a ZUML page, we can use for example: EL expressions, Java, JavaScript, Ruby, and Groovy.

Where is the session?

In some situations it could be faster to place some zscripts into the page, and for that we may want to access the session or some other object (for example the page itself).

In such situations there are some implicit objects that can be  accessed in the pages. The objects are: self, spaceOwner,

page, desktop, session, componentScope, spaceScope, pageScope, desktopScope, sessionScope, applicationScope, requestScope, arg, each, forEachStatus, and event.

You can use these objects in a zscript block, or in an element (<button label="simple test" onClick="alert(self.label)" />).

If you need information about the current execution you could use the org. zkoss.zk.ui.Execution interface. If you are in a component use getDesktop(). getExecution(). When you don't have any component reference use the static method, getCurrent() from the class org.zkoss.zk.ui.Executions. After this introduction to ZUML, we present some important points in ZUML.

Are there some predefined Dialogs?

Each UI framework offers some predefined Dialogs, and ZK is no exception. We used the org.zkoss.zul.Messagebox in the "Hello

 World" example through the globally defined alert method.

Beyond the mentioned Messagebox, the next important predefined dialog is the org.zkoss.zul.Fileupload. With this dialog, it's possible to do an HTTP Upload.

Beyond the usage of the standard components such as window, textbox, and button it's possible to create components for a particular page. For that purpose there exists the component element.

With the style attribute of a component, it is possible to change the visual appearance of a component. You have the possibility to define the style each time.

For example:

<button label="Say Hello" style="border:2px red" />

However, if you want to use that button more than once, you can define a component.

For example:

<?component name="mybutton" extends="button" style="border:2px red" label="Say Hello" ?>

Now you can use this component as follows:

<mybutton />

<mybutton label="My label" />

It's possible to override the definitions of the predefined components:

<?component name="button" extends="button" style="border:2px red" label="Say Hello" ?>

<mybutton />

<mybutton label="My label" />

#### Molds

A mold is an attribute that is used to customize pages in ZK. The org.zkoss.zk.ui. Component interface has the setMold method. If there isn't a mold defined; the mold with the name default is used.

Some components come with more than the default mold. For example, groupbox

(represented by the class org.zkoss.zul.Groupbox) has the default and 3d molds.

To use the default mold nothing special is necessary.

<groupbox open="true" width="250px">

<caption label="Title of the group box"></caption>

</groupbox>



To use the 3d mold we have to specify the mold attribute.

<groupbox mold="3d" open="true" width="250px">

<caption label="Title of the group box"></caption>

</groupbox>



#### ZK Attributes

Beyond the normal attributes of elements (for example: width) there are some special attributes, which are called ZK Attributes.

|  |  |
| --- | --- |
| use | With this attribute you can specify another class for the rendering of a concrete element instead of the default element.  Example:  <window use="sample.SampleWindow" /> |
| if | The element is rendered only if the condition is true. Example:  <textbox if="${b==1}" /> |
| unless | The element is rendered only if the condition is false. Example:  <textbox unless="${c==1}" /> |
| forEach | This attribute is used in conjunction with collections. For each element in the collection, the element is rendered with the concrete value.  Example:  <listitem label="${each}" forEach="${elements}" /> |

|  |  |
| --- | --- |
| forEachBegin | This is used in conjunction with the forEach attribute. Here, you could specify the index of the first element of the collection that should be used for forEach.  Example:  <listitem label="${each}" forEach="${elements}" forEachBegin="1"/> |
| forEachEnd | This is used in conjunction with the forEach attribute. Here, you could specify the index of the last element of the collection that should be used for forEach.  Example:  <listitem label="${each}" forEach="${elements}" forEachEnd="1"/> |

#### ZK Elements

There are special elements that aren't responsible for creating components, the so called ZK Elements. The task of these elements is to control a ZUML page.

The following is a list of ZK Elements:

* **Element:** zk, <zk>…</zk>
* **Element:** zscript, <zscript>…</zscript>
* **Element:** attribute, <attribute />
* **Element:** custom-attributes, <custom-attributes />

The **zk element** is an element for grouping other components. Important at this juncture is that the zk element gets no member in the component tree.

Sample:

<window>

<zk>

<button id="buttonToSayHello" label="Say Hello" />

<button id="buttonToSayHelloAgain" label="Say Hello Again" />

</zk>

</window>

For layout and component tree, it's same as having no zk element.

A good question could be why to use the zk element. One important reason is that in a XML document there can be only one root element. And therefore, if we want to have more root elements (for example, more than one window) then we can use a zk element as root.

Another area of application is the possibility of iterating over components, or conditional evaluation. For that zk elements supports the following attributes:

* forEach
* if
* unless

A small example of usage is as follows:

<window>

<zk forEach="${element}">

<label value="${element.name}" />

<button id="buttonToSayHello" label="Say Hello" if="${element.showSayHello}" />

<button id="buttonNotToSayHello" label="Say not Hello" unless="${element.showSayHello}" />

</zk>

</window>

The **zscript element** is used for embedding Java code into ZUML pages. At the time of page evaluation the code will be interpreted by the BeanShell ([http://www.](http://www/) beanshell.org). It's possible to embed Java code directly between the opening and closing zscript tags. Another way is to use the src attribute of the zscript element. In this attribute, you could specify a URI to a file, which contains the Java code. The zscript element supports conditional evaluation with the help of the if and unless attributes.

Beyond zscript you could use **EL** (Expression Language) Expressions in your ZK pages.



The **attribute element** defines an attribute of the enclosing element. We have used this ZK Element in the "Hello World" example.

<textbox width="60%" id="username">

<attribute name="onChanging">

...

</attribute>

</textbox>

One area of application is event listeners. The attribute element supports conditional evaluation with if and unless, too.

The **custom-attributes element** is used to define an object in a special scope (for example, page scope).

An example for defining a custom-attributes element is as follows:

<window>

<custom-attributes test="simple" />

</window>

This is the same as:

<window>

<zscript>

self.setAttribute("test", "simple");

</zscript>

</window>

It's possible to use the scope attribute:

<window>

<custom-attributes test="simple" scope="desktop" />

</window>

This is the same as:

<window>

<zscript>

desktop.setAttribute("test", "simple");

</zscript>

</window>

The custom-attributes element supports conditional evaluation with if and

unless, too.

#### Layout Techniques

If we talk about UI, we have to talk about the layout of the pages. There are some elements that help you in the layout of a ZK page.

Some important elements are:

* vbox
* hbox
* box
* grid (in conjunction with: columns, column, rows, and row)

An example for using div and vbox elements is as follows:

<div align="center" style="vertical-align:center">

<vbox>

<groupbox mold="3d" open="true" width="250px">

<caption label="testbox"></caption>

<radiogroup id="master">

<radio label="Apple"/>

<radio label="Orange"/>

<radio label="Banana"/>

</radiogroup>

</groupbox>

<groupbox mold="3d" open="true" width="250px">

<caption label="another testbox"></caption>

<radiogroup id="client">

<radio label="Apple"/>

<radio label="Orange"/>

<radio label="Banana"/>

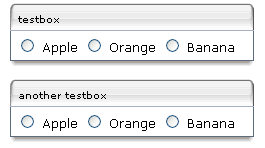
</radiogroup>

</groupbox>

</vbox>

</div>

The following screenshot shows the layout.



Prevent XHTML, where it is possible

There are some disadvantages in the usage of XHTML in ZK. We have only one identifier and not two (see the section *Identification in ZK* ).

 Therefore, the id attribute has to be unique for the same desktop. There is no invalid XML element because ZK uses org.zkoss.zhtml.Raw

for constructing any unrecognized XML element. The elements are case insensitive, and have no mold support (the attribute is ignored).

Therefore, in most cases it's better to port an XHTML page to a ZK page.

Instead of using the layout control it's possible to do the layout with a XHTML, and using Cascading Stylesheets (see Chapter 6*: Creating Custom Components*).

#### Separation of Concerns

One important paradigm in object-oriented programming is **Separation of Concerns (SoC)**. This paradigm says that an application should be broken into distinct features that overlap in functionality as little as possible (see <http://en.wikipedia.org/> wiki/Separation\_of\_concerns).

For large applications, it's not advisable to do the layout, and the logic together in one page. For such applications, you should follow the programming principle of separation of concerns. This separation is not only for architecture, but also for better maintenance of your application. This is because if you have your logic directly in Java classes, you can leverage the full power of your IDE, e.g. you can have a good debugger, and you can easily write unit tests.

## Configuration and Deployment

The configuration for the ZK framework is separated in two files: web.xml for servlet and mapping definition, and zk.xml, which gives the possibility of overriding

the default ZK system settings. The following figure shows that there are some mandatory settings, and some optional additional settings. The configuration in web.xml is mandatory for correct working of the ZK framework.



### Configuration of web.xml

The most important place to configure a web application is the web.xml file. Without correct settings nothing will work. In the next paragraphs, we will have a detailed look at the settings that are necessary for the ZK framework.

First we need the zkLoader servlet, which loads the ZUML pages when the web container receives a request for a page.

This servlet is named org.zkoss.zk.ui.http.DHtmlLayoutServlet. Since this is the first entry for the ZK framework it is really necessary to load this first. Use the parameter:

<load-on-startup>1</load-on-startup>

The servlet has two init parameters:

* **Update-uri**

This is a mandatory parameter. It specifies the URI the ZK AU engine is mapped to. The browser needs that URI to send the correct pattern of AJAX URL requests to the DHtmlLayoutServlet. For default, we use /zkau.

* **Log\_level**

This is an optional parameter. It specifies the default log level for the org. zkoss package. Possible values are OFF, ERROR, DEBUG, INFO, and WARNING.

This servlet supports static XHTML pages natively. The complete settings are as follows:

<servlet>

<description>ZK loader for ZUML pages</description>

<servlet-name>zkLoader</servlet-name>

<servlet-class> org.zkoss.zk.ui.http.DHtmlLayoutServlet

</servlet-class>

<init-param>

<param-name>update-uri</param-name>

<param-value>/zkau</param-value>

</init-param>

<load-on-startup>1</load-on-startup>

</servlet>

The second important and mandatory servlet is org.zkoss.zk.au.http. DHtmlUpdateServlet. It handles AJAX requests asynchronously. The mapped URL pattern must be the same as for the update-uri parameter in the DHtmlLayoutServlet.

The last mandatory servlet is the ZK Session Cleaner. It is a listener and it cleans up the memory when a session is closed. The class is org.zkoss.zk.ui.http. HttpSessionListener.

The question is now what to do if any other technique like JSP or JSF should be integrated as well. ZK has a filter servlet, which post-process the output from other servlets processors.

The servlet class is org.zkoss.zk.ui.http.DHtmlLayoutFilter and has two optional parameters:

* **Extension**

This describes how to process the output. The default is html.

* **Charset**

This specifies the charset of the output. The default is UTF-8.

A sample part of web.xml looks as follows:

<listener>

<description>

Used to cleanup when a session is destroyed

</description>

<display-name>ZK Session Cleaner</display-name>

<listener-class> org.zkoss.zk.ui.http.HttpSessionListener

</listener-class>

</listener>

<servlet>

<description>ZK loader for ZUML pages</description>

<servlet-name>zkLoader</servlet-name>

<servlet-class> org.zkoss.zk.ui.http.DHtmlLayoutServlet

</servlet-class>

<init-param>

<param-name>update-uri</param-name>

<param-value>/zkau</param-value>

</init-param>

<load-on-startup>1</load-on-startup>

</servlet>

<servlet-mapping>

<servlet-name>zkLoader</servlet-name>

<url-pattern>\*.zul</url-pattern>

</servlet-mapping>

<servlet-mapping>

<servlet-name>zkLoader</servlet-name>

<url-pattern>\*.zhtml</url-pattern>

</servlet-mapping>

<servlet>

<description>The asynchronous update engine for ZK</description>

<servlet-name>auEngine</servlet-name>

<servlet-class> org.zkoss.zk.au.http.DHtmlUpdateServlet

</servlet-class>

</servlet>

<servlet-mapping>

<servlet-name>auEngine</servlet-name>

<url-pattern>/zkau/\*</url-pattern>

</servlet-mapping>

### Configuration of zk.xml

The zk.xml file is an optional file, and stays in the WEB-INF/ folder on the same level as web.xml. As the above overview has shown, there are many settings, which

already have default values. The purpose of the zk.xml file is to extend, or overwrite existing settings for ZK application. A list of these settings is given in the *Appendix A*.

### Deployment

The deployment via Ant or any other IDE integrated tools is rather simple. Just copy the ZK distribution under WEB-INF/lib and that's it. If you wish to optimize the distribution you may omit the libraries you didn't use like dojoz or timeline.

#### Deployment of ZK Applications with Maven

If you like to work with Maven (http://maven.apache.org) it takes a little bit more effort. This is because of the rapid rate of releases in ZK; sometimes the Maven repositories have a bit of a delay in publishing. The most famous Maven repositories include the ZK framework, i.e. [http://repo1.maven.org/maven2.](http://repo1.maven.org/maven2) The structure of the ZK framework in a Maven repository looks like:

As the illustration shows the ZK framework within the Maven repository has three different groupIDs:

* org.zkoss.common
* org.zkoss.zk
* org.zkoss.zkforge

The artifacts zcommon and zweb are common. The second group contains the artifacts of the ZK framework itself, and the last contains the additional tools like FCKEZ. See the complete part of the POM.XML for the deployment of ZK in a Maven project:

<dependency>

<groupId>org.zkoss.common</groupId>

<artifactId>zcommon</artifactId>

<version>2.3.0</version>

</dependency>

<dependency>

<groupId>org.zkoss.common</groupId>

<artifactId>zweb</artifactId>

<version>2.3.0</version>

</dependency>

<dependency>

<groupId>org.zkoss.zk</groupId>

<artifactId>zk</artifactId>

<version>2.3.0</version>

</dependency>

<dependency>

<groupId>org.zkoss.zk</groupId>

<artifactId>zul</artifactId>

<version>2.3.0</version>

</dependency>

<dependency>

<groupId>org.zkoss.zk</groupId>

<artifactId>zhtml</artifactId>

<version>2.3.0</version>

</dependency>

<dependency>

<groupId>org.zkoss.zk</groupId>

<artifactId>zkplus</artifactId>

<version>2.3.0</version>

</dependency>

<dependency>

<groupId>org.zkoss.zkforge</groupId>

<artifactId>gmapsz</artifactId>

<version>2.0-2</version>

</dependency>

<dependency>

<groupId>org.zkoss.zkforge</groupId>

<artifactId>fckez</artifactId>

<version>2.3-2</version>

</dependency>

<dependency>

<groupId>org.zkoss.zkforge</groupId>

<artifactId>dojoz</artifactId>

<version>0.2.2-2</version>

</dependency>

## Summary

In this chapter, we give an introduction into, and behind the ZK framework. The example illustrated in the section *First Step – Say Hello to ZK* gave us a feeling of

how a simple ZK application is ccrr aatteedd.. It's a good point to start your own small ZK

projects or do some rapid prototyping with ZK.

The section "*Inside ZK – How ZK works*" is not really necessary if you just want to do small projects with ZK. However, if you think about major projects it's wise to know a little bit about what is inside ZK, and how ZK works.

The last section of this chapter, we show some important issues from the ZK User

Interface Language (ZUML). Here, it's not possible to show you the ccoommpp

llee

ttee ZUML.

We just want to pick some points to show you how these important cornerstones are working.

However, now we have talked enough about inside ZK. In the following chapter, the main focus will be on using the ZK framework, and get "infected" by the

ZK framework.

Online Media Library

The first chapter shows the theory and deployment of the ZK framework. Now it's time to do the things that we are here for: implementing applications with ZK.

The next three chapters will show the detailed implementation of a small, but rich application. It's not really possible to use all components in this application, but the application at the end of Chapter 4 has many things that you will need in your first project with the ZK framework.

With the help of this chapter, you should be able to build your own applications based on the ZK framework. In this chapter, we only build the cornerstone of the Online Media library, and improve it step by step in the next chapters.

## An Online Media Library

There are some traditional applications that could be used to introduce a framework. One condition for the selection is that the application should be a **CRUD (Create**

**—Read—Update—Delete)** application. Therefore, an 'Online Media Library', which has all four operations, would be appropriate. We start with the description of requirements, which is the beginning of most IT projects.

The application will have the following features:

* Add new media
* Update existing media
* Delete media
* Search for the media (and show the results)
* User roles (administrator for maintaining the media and user accounts for browsing the media)

In the first implementation round the application should only have some basic functionality that will be extended step by step.



**ZK-Medialib**

Add media

Update media

Delete media

Show the media

Search

A media item should have the following attributes:

* A title
* A type (Song or Movie)
* An ID which could be defined by the user
* A description
* An image

The most important thing at the start of a project is to name it. We will call our project **ZK-Medialib**.

## Setting up Eclipse to Develop with ZK

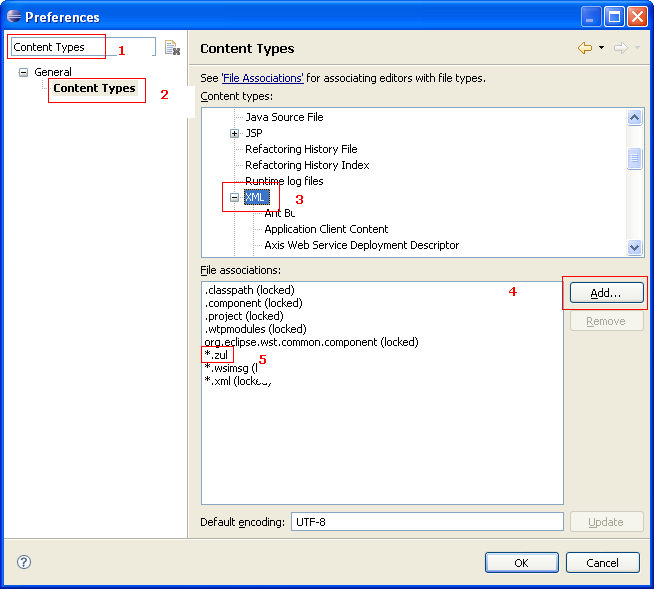
We use version 3.3 of Eclipse, which is also known as *Europa* release. You can download the IDE from [http://www.eclipse.org/downloads/.](http://www.eclipse.org/downloads/) We recommend using the version "Eclipse IDE for Java EE Developers".

First we have to make a file association for the .zul files. For that open the

**Preferences** dialog with **Window**|**Preferences**. After that do the following steps:

1. Type **Content Types** into the search dialog.
2. Select **Content Types** in the tree.
3. Select **XML** in the tree.
4. Click **Add** and type **\*.zul**.
5. See the result.

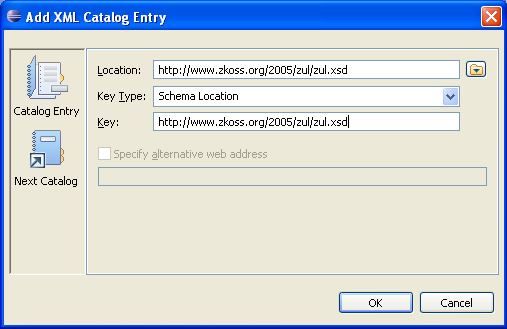
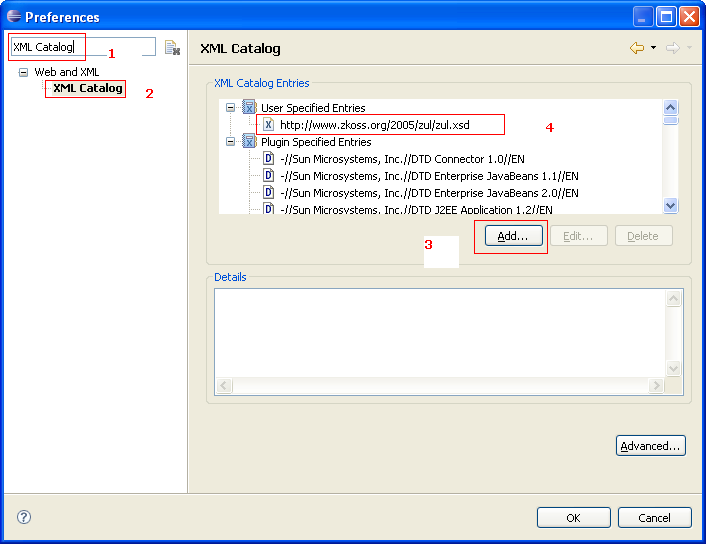
The steps are illustrated in the picture below:



With these steps, we have syntax highlighting of our files. However, to have content assist, we have to take care about the creation of new files. The easiest way is to set up Eclipse to work with zul.xsd.

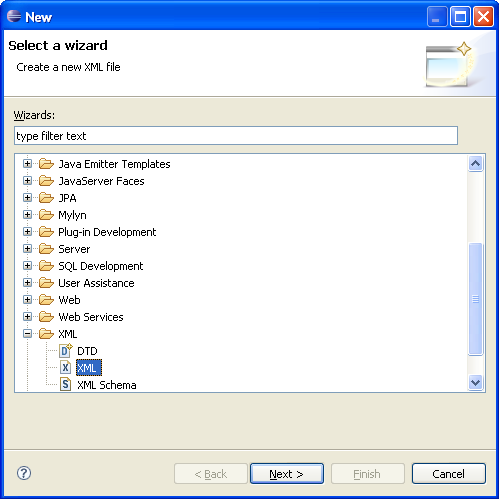
For that open the **Preferences** dialog with **Window**|**Preferences**. After that do the following steps:

1. Type **XML Catalog** into the search dialog.
2. Select **XML Catalog** in the tree.
3. Press **Add** and fill out the dialog (see the second dialog below).
4. See the result.

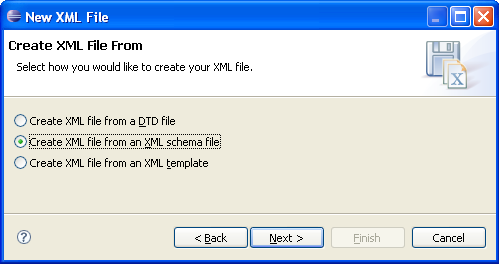


Now we can easily create new ZUL files with the following steps:

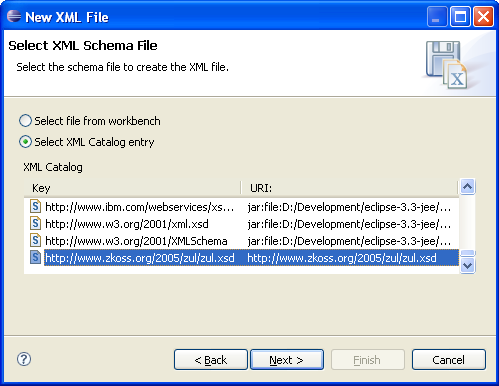
1. **File**|**New**|**Other**, and select **XML**:



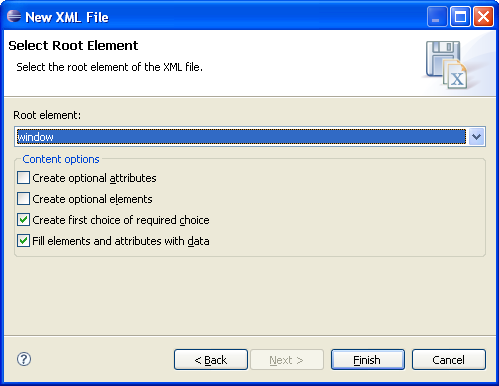
1. Type in the name of the file (for example hello.zul).
2. Press **Next**.
3. Choose **Create XML file from an XML schema file**:



1. Press **Next**.
2. Select **Select XML Catalog entry**.
3. Now select **zul.xsd**:

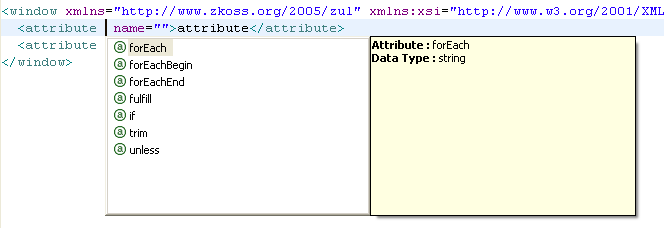


1. Now select the **Root Element** of the page (e.g. window).



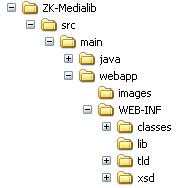
1. Select **Finish**.

Now you have a new ZUL file with content assist. Go into the generated attribute element and press *Alt+Space.*

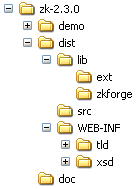


## Setting up a New Project

The first thing we will need for the project is the framework itself. You can download the ZK framework from [http://www.zkoss.org.](http://www.zkoss.org/) At the time of writing, the latest version of ZK is 2.3.0. Therefore it's recommended to use that version for the examples that are provided in this book. After downloading and unzipping the ZK framework we should define a project structure. A good structure for the project is the directory layout from the **Maven project** ([http://maven.apache.org/).](http://maven.apache.org/)) The structure is shown in the figure below.



The directory **lib** contains the libraries of the ZK framework. For the first time it's wise to copy all JAR files from the ZK framework distribution. If you unzip the distribution of the version 2.3.0 the structure should look like the figure below. The structure below shows the structure of the ZK distribution. Here you can get the files you need for your own application.



For our example, you should copy all JAR files from **lib**, **ext**, and **zkforge** to the **WEB-INF/lib** directory of your application. It's important that the libraries from **ext** and **zkforge** are copied direct to **WEB-INF/lib**. Additionally copy the directories **tld** and **xsd** to the **WEB-INF** directory of your application.

Now after the copy process, we have to create the deployment descriptor (web.xml) for the web application. Here you can use web.xml from the demo application, which is provided from the ZK framework. For our first steps, we need no zk.xml (that configuration file is optional in a ZK application).

The application itself must be run inside a **JEE** (Java Enterprise Edition) **Webcontainer**. For our example, we used the Tomcat container from the Apache project (http://tomcat.apache.org). However, you can run the application in each JEE container that follows the Java Servlet Specification 2.4 (or higher) and runs under a Java Virtual Machine 1.4 (or higher). We create the zk-media.xml file for Tomcat, which is placed in conf/Catalina/localhost of the Tomcat directory.

<Context path="/zk-media" docBase="D:/Development/workspaces/ workspace-zk-medialib/ZK-Medialib/src/main/webapp" debug="0" privileged="true" reloadable="true" crossContext="false">

<Logger className="org.apache.catalina.logger.FileLogger" directory="D:/Development/workspaces/workspace-zk-medialib/logs/ ZK-Medialib" prefix="zkmedia-" suffix=".txt" timestamp="true"/>

</Context>

With the help of this context file, we can directly see the changes of our development, since, we set the root of the web application to the development directory.

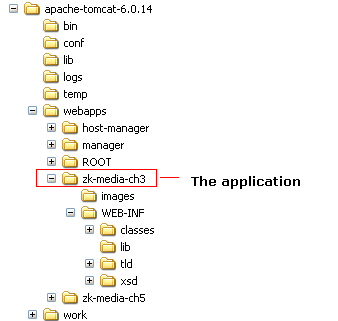
Deployment of the demo application

The folder structure of the demo application is the Maven structure ([http://maven.apache.org/).](http://maven.apache.org/)) To deploy the application, create

a new subdirectory (e.g. zk-media-lib) in the **webapps** directory of Tomcat and copy everything from the webapp directory of the application to this new subdirectory. Don't forget to copy the libraries, too. After

that, you can start your Tomcat and run the application with http://localhost:8080/zk-media-lib (if your Tomcat is running on port 8080).





## Creating the Pages

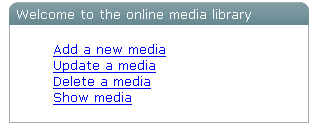
After the implementation of the model classes (which is not in the scope of this book) it's time to start with implementing the ZUL pages. The first page is index.zul which should be a simple navigation page for the individual pages. A simple way to execute the individual pages is to offer links for each page on the starting page. In a simple HTML page, we would use a href tag. In a ZUL page the preferred way is to use toolbarbutton. With the following line we add a link to add-media.zul:

<toolbarbutton label="Add a new media" href="add-media.zul"/>

We need four navigation points, and therefore, four pages to fulfill the requirements of the CRUD feature. These four pages are:

* Add a new media item: add-media.zul
* Update an existing media item: update-media.zul
* Delete an existing media item: delete-media.zul
* Show media: show-media.zul

The navigation page is depicted in the following figure:



To have a border with a title, the window component of ZK is used. With the help of the div component, the window component is centered. The next problem we have to solve is that each link should appear on a new line. This is achieved by using the br tag from HMTL. Hence, we have to define the XHTML namespace.

The complete implementation of the page is shown below:

<?xml version="1.0" encoding="UTF-8"?>

<zk [xmlns:html="http://www.w3.org/1999/xhtml">](http://www.w3.org/1999/xhtml)

<div align="center">

<window title="Welcome to the online media library" border=

"normal" width="300px">

<div align="left" style="margin-left:30pt;margin-top:10pt;

margin-bottom:10pt">

<toolbarbutton label="Add a new media" href="add-media.zul"/>

<html:br />

<toolbarbutton label="Update a media" href="update-media.zul"/>

<html:br />

<toolbarbutton label="Delete a media" href="delete-media.zul"/>

<html:br />

<toolbarbutton label="Show media" href="show-media.zul"/>

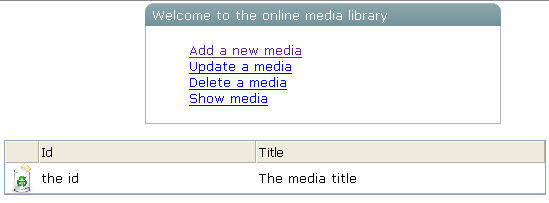
</div>

</window>

</div>

</zk>

A better solution for the scenario is to combine the result page and the menu on one page. Therefore, we need no extra page for showing the media. The redesigned first page (index.zul) is shown in the figure below:



For displaying the result in the first step, we use the listbox component. The first column is an image with a link to remove a media item. Here, we can use the toolbarbutton component with the image attribute.

<toolbarbutton image="images/trashcan.gif" />

To define the header of the grid, we can use the listhead component in combination with the listheader component.

<listhead>

<listheader label="" />

<listheader label="Id" />

<listheader label="Title" />

</listhead>

To represent a list of data you can use the listbox component or the grid component. To decide whether to use the grid component or the listbox component you have to define what you want to do with the data. A grid component is designed for showing data. The main use of listbox is to show data that should be selected by the user.



The data for the listbox component is provided from the underlying model classes. The model classes are simple **POJO** (Plain Ordinary/Old Java Objects).

**How to use the ${each} variable inside a zscript block**

The ${each} is an Expression Language variable, and therefore, it cannot be used directly inside a zscript block. But in some cases (especially

in event handlers) it's very useful to use ${each}. It's possible to define  a custom attribute, and place the variable in the custom-attributes map

for the component. With <custom-attributes thename="${each}"

/> the ${each} is stored with key thename in the mentioned map. In the zscript block, it's now possible to access this object with componentScope.get("thename").

The data in the listbox component is shown with the help for the forEach attribute in combination with the ${each} EL (Expression Language) variable.

<listitem forEach="${list}">

<listcell style="width:30px">

<toolbarbutton image="images/trashcan.gif"

tooltip="tooltip.remove">

<custom-attributes myMedia="${each}"/>

<attribute name="onClick"><![CDATA[ dao.removeMedia(componentScope.get("myMedia")); Executions.sendRedirect("index.zul");

]]>

</attribute>

</toolbarbutton>

</listcell>

<listcell label="${each.id}"/>

<listcell label="${each.title}"/>

</listitem>

The full implementation of the redesigned page is given below. Here, we want to mix elements from XHTML with elements from ZUL. For that we need a clear

separation of the two worlds. In an XML file, there is an element that helps us to do this separation, the namespace. If we use a namespace we have to add a prefix to each tag from that namespace (e.g. <html:br />). For further information about namespaces visit [http://www.w3.org/TR/REC-xml-names/.](http://www.w3.org/TR/REC-xml-names/)

<?xml version="1.0" encoding="UTF-8"?>

<zk [xmlns:html="http://www.w3.org/1999/xhtml">](http://www.w3.org/1999/xhtml)

<div align="center">

<window title="Welcome to the online media library" border="normal" width="300px">

<div align="left" style="margin-left:30pt;margin-top:10pt; margin-bottom:10pt">

<toolbarbutton label="Add a new media"

href="add-media.zul"/>

<html:br />

<toolbarbutton label="Update a media" href="update-media.zul"/>

</div>

</window>

</div>

<zscript><![CDATA[

import java.util.Collection;

import com.packtpub.zk.media.dao.\*;

]]>

</zscript>

<html:br/>

<listbox mold="paging">

<zscript>

MediaDAO dao = MediaDAOFactory.getDAO(); Collection list = dao.getMedia();

</zscript>

<listhead>

<listheader label="" />

<listheader label="Id" />

<listheader label="Title" />

</listhead>

<listitem forEach="${list}">

<listcell style="width:30px">

<toolbarbutton image="images/trashcan.gif" tooltip="tooltip.remove">

<custom-attributes myMedia="${each}"/>

<attribute name="onClick"><![CDATA[ dao.removeMedia(componentScope.get("myMedia")); Executions.sendRedirect("index.zul");

]]>

</attribute>

</toolbarbutton>

</listcell>

<listcell label="${each.id}"/>

<listcell label="${each.title}"/>

</listitem>

</listbox>

<popup id="tooltip.remove"> Remove the media.

</popup>

</zk>

How to implement a tooltip

One aim in the design of user interfaces should be 'as easy as possible'. However, the user should also be guided with some help by the application itself on his or her first touch. One help could be a tooltip

 for the elements. For this, most of the ZK elements have the tooltip

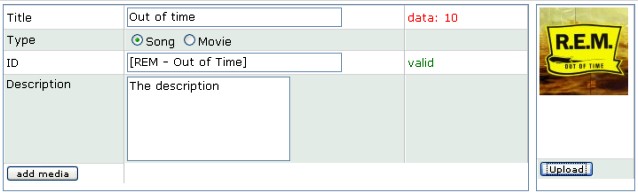
attribute (e.g: <button label="Upload" tooltip="tooltip.

upload">). The tooltip itself is realized with the help of the popup component. That means, beyond the tooltip attribute, you have to provide a popup implementation for the tooltip (e.g. <popup id="tooltip. upload">Upload a image for the media.</popup>).

Sometimes we may want to provide some error handling for the page, especially, if we have to add a warning dialog before we really remove a media item from the underlying persistent storage.

The last screen that we want to implement in the first round is the page for adding new media.

The following figure shows the page:



**How to store data in the model classes**

On one side, we have the ZUL page, and on the other side the model classes. In the case of entering data, the programmer would want to use the model class directly to store the data. For this, we need some "glue" code. The ZK framework solves that by binding of data with annotations in the ZUL pages. To use such annotations we have to define a namespace

 for them: [xmlns:a=http://www.zkoss.org/2005/zk/annotati](http://www.zkoss.org/2005/zk/annotation)on.

Additionally, we also have to initiate the mechanism of annotation in

the page. This is done with a special init class (org.zkoss.zkplus. databind.AnnotateDataBinderInit). Now the page is ready to bind the input directly to the model classes. To bind data, we have to place

an annotation over a normal element (e.g. <a:bind value="object. name" /> binds the following input to the name property to object; note: we have to create an instance object in the zscript block).

The uploading of an image is done with the Fileupload dialog from the ZK framework.

If you want to upload more than one file within one dialog you should use the Fileupload.get(int) method. For example Fileupload. get(5) presents a dialog with five fields for five uploads.



First we have to define a button component where we connect the onClick event (<attribute name="onClick">) with the opening of the dialog.

<button label="Upload" tooltip="tooltip.upload">

<attribute name="onClick">

{

Object media = Fileupload.get();

if (media instanceof org.zkoss.image.Image)

{

org.zkoss.image.Image img = (org.zkoss.image.Image) media; image.setContent(img); imagegrid.setWidth(""+(img.getWidth()+10)+"px");

}

else if (media != null)

Messagebox.show("Not an image: "+media, "Error",

Messagebox.OK, Messagebox.ERROR);

}</attribute>

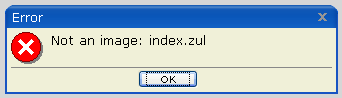
</button>

If the uploaded file is an unacceptable media we would like to provide an error message to the user. For that, we use Messagebox from the ZK framework.

Messagebox.show("Not an image: "+media, "Error",

Messagebox.OK, Messagebox.ERROR);

The mentioned Messagebox is shown as a modal dialog. An example of the appearance in the case of an error is shown in the following figure.



The gray background comes from the ZK framework. You have to acknowledge the message by clicking the **OK** button.

After the upload of a correct image it is shown directly, and without reloading the page. To set the image on the correct component, we address the component with id. For that we defined an image component with id="image".

<image id="image" />

The field id is extended with two validations. The first validation is done while the user inserts some input into the field. For that we provided some code for the onChanging handler. If the user types only white spaces there is the warning **not valid** on the right side. Otherwise the green note **valid** is presented.

<attribute name="onChanging">

if (event.getValue().trim().length() > 0)

{

idstatus.setValue("valid"); idstatus.setStyle("color:green");

}

else

{

idstatus.setValue("not valid"); idstatus.setStyle("color:red");

}

</attribute>

The next validation is done in the onChange handler.

<attribute name="onChange">

if (self.value != null &amp;&amp; self.value.trim().length() == 0)

{

self.value = "";

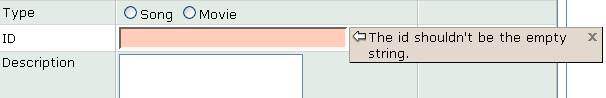
throw new WrongValueException(self, "The id shouldn't be the

empty string.");

}

</attribute>

We use the possibility to throw a org.zkoss.zk.ui.WrongValueException. If this exception occurs the framework shows an error message linked to the concerned field. The following figure shows such an error message.



It's important to say that the code in an event handler or a zscript must be valid XML, because a ZUL page is an XML page. Here, we are confronted with the problem of using some special characters (e.g. & or <). We have two possibilities to use such characters. The first is to use valid XML entities (e.g. &amp;&amp; for &&) or we can embed the code in a CDATA block (<![CDATA[ … ]]>). For more readable code it's recommended to use the CDATA block variant.



The complete implementation of add-media.zul is presented below:

<?xml version="1.0" encoding="UTF-8"?>

<?init class="org.zkoss.zkplus.databind.AnnotateDataBinderInit" ?>

<window id="mainwin" [xmlns:a="http://www.zkoss.org/2005/zk/annotation">](http://www.zkoss.org/2005/zk/annotation)

<zscript>

import com.packtpub.zk.media.model.MediaType; import com.packtpub.zk.media.dao.\*;

</zscript>

<!-- Component to describe the media -->

<hbox>

<grid width="700px" height="320px">

<rows>

<row>

<label value="Title"/>

<a:bind value="media.title"/>

<textbox width="80%" id="titlecontent" tooltip="tooltip.title">

<attribute name="onChanging">

if (event.getValue().length() == 0)

{

titlecount.setValue("");

}

else

{

//titlecount.setValue(""+event.getValue().length()); titlecount.setValue(com.packtpub.zk.media.

MyDataProvider.next());

}

</attribute>

</textbox>

<label id="titlecount" style="color:red" />

</row>

<row>

<label value="Type" />

<radiogroup>

<zscript>

MediaType[] types ={MediaType.Song,MediaType.Movie};

</zscript>

<a:bind value="media.type" />

<radio label="${each.screenText}" tooltip="tooltip.media.${each.screenText}" forEach="${types}" value="${each}"/>

</radiogroup>

<label />

</row>

<row>

<label value="ID" />

<a:bind value="media.id"/>

<textbox width="80%" tooltip="tooltip.id">

<attribute name="onChanging">

if (event.getValue().trim().length() > 0)

{

idstatus.setValue("valid"); idstatus.setStyle("color:green");

}

else

{

idstatus.setValue("not valid"); idstatus.setStyle("color:red");

}

</attribute>

<attribute name="onChange">

if (self.value != null &amp;&amp; self.value.trim().length() == 0)

{

self.value = "";

throw new WrongValueException(self, "The id shouldn't

be the empty string.");

}

</attribute>

</textbox>

<label id="idstatus" style="color:red" value="not valid"/>

</row>

<row valign="top">

<label value="Description"/>

<textbox height="200px" width="50%" tooltip="tooltip.description"/>

<label />

</row>

<row valign="top">

<button label="add media">

<attribute name="onClick"><![CDATA[

dao.addMedia(media); Executions.sendRedirect("index.zul");

]]>

</attribute>

</button>

</row>

</rows>

</grid>

<grid height="320px" id="imagegrid">

<rows>

<row height="284px" valign="top">

<image id="image"/>

</row>

<row>

<button label="Upload" tooltip="tooltip.upload">

<attribute name="onClick">

{

Object media = Fileupload.get();

if (media instanceof org.zkoss.image.Image)

{

org.zkoss.image.Image img = (org.zkoss.image.Image) media;

image.setContent(img); imagegrid.setWidth(""+(img.getWidth()+10)+"px");

}

else if (media != null)

Messagebox.show("Not an image: "+media, "Error", Messagebox.OK, Messagebox.ERROR);

}

</attribute>

</button>

</row>

</rows>

</grid>

</hbox>

<!-- Initialize the model objects for using with anotations -->

<zscript>

//prepare the media instance com.packtpub.zk.media.model.Media media =

com.packtpub.zk.media.model.MediaFactory.create(); MediaDAO dao = MediaDAOFactory.getDAO();

</zscript>

<!-- tooltip definition -->

<popup id="tooltip.title"> The title of the media.

</popup>

<popup id="tooltip.media.Song"> A Song.

</popup>

<popup id="tooltip.media.Movie"> A Movie.

</popup>

<popup id="tooltip.id">

The id for the media. That is a user defined id. The id

must be unique.

</popup>

<popup id="tooltip.description"> The description for the media.

</popup>

<popup id="tooltip.upload"> Upload a image for the media.

</popup>

</window>

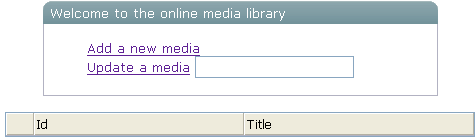
**How to redirect to other pages**

It is often necessary to redirect to another page after an action is executed. In that case, the ZK framework offers the general utility class org.zkoss.zk.ui.Executions. This method offers the sendRedirect method. In a ZUL page, you could directly access the

 Executions instance and redirect to another page (e.g. Exectutions.

sendRedirect('index.zul')). A redirect sends a response to the client giving it a new URL. The client then requests the new URL. A forward happens internally in the servlet container. The target is given the chance to respond to the original request. If you use the browser's back button the same request is sent again.

For the first version of the update, we extend index.zul with a textbox component beside a toolbarbutton of **Update a media**.



The extended index.zul is shown below:

<?xml version="1.0" encoding="UTF-8"?>

<zk [xmlns:html="http://www.w3.org/1999/xhtml">](http://www.w3.org/1999/xhtml)

<div align="center">

<window title="Welcome to the online media library" border="normal" width="500px">

<div align="left" style="margin-left:30pt;margin-top:10pt; margin-bottom:10pt">

<toolbarbutton label="Add a new media" href="add-media.zul"/>

<html:br />

<toolbarbutton label="Update a media">

<attribute name="onClick"><![CDATA[ sessionScope.put("id", mediaid.getValue()); Executions.sendRedirect("update-media.zul");

]]>

</attribute>

</toolbarbutton>

<textbox id="mediaid"></textbox>

</div>

</window>

</div>

<zscript><![CDATA[

import java.util.Collection;

import com.packtpub.zk.media.dao.\*;

]]>

</zscript>

<html:br/>

<listbox mold="paging">

<zscript>

MediaDAO dao = MediaDAOFactory.getDAO(); Collection list = dao.getMedia();

</zscript>

<listhead>

<listheader label="" />

<listheader label="Id" />

<listheader label="Title" />

</listhead>

<listitem forEach="${list}">

<listcell style="width:30px">

<toolbarbutton image="images/trashcan.gif"

tooltip="tooltip.remove">

<custom-attributes myMedia="${each}"/>

<attribute name="onClick"><![CDATA[ dao.removeMedia(componentScope.get("myMedia")); Executions.sendRedirect("index.zul");

]]>

</attribute>

</toolbarbutton>

</listcell>

<listcell label="${each.id}"/>

<listcell label="${each.title}"/>

</listitem>

</listbox>

<popup id="tooltip.remove"> Remove the media.

</popup>

</zk>

The interesting point is the extended toolbarbutton component. The data is transferred with the sessionScope instance.

<toolbarbutton label="Update a media">

<attribute name="onClick"><![CDATA[ sessionScope.put("id", mediaid.getValue()); Executions.sendRedirect("update-media.zul");

]]>

</attribute>

</toolbarbutton>

The page update-media.zul is similar to add-media.zul except that the creation of a media instance is replaced with retrieving of the media from sessionScope.

For completeness the full implementation of update-media.zul is shown next.

<?xml version="1.0" encoding="UTF-8"?>

<?init class="org.zkoss.zkplus.databind.AnnotateDataBinderInit" ?>

<window id="mainwin" [xmlns:a="http://www.zkoss.org/2005/zk/](http://www.zkoss.org/2005/zk/) annotation">

<zscript>

import com.packtpub.zk.media.model.MediaType; import com.packtpub.zk.media.dao.\*;

</zscript>

<!-- Component to describe the media -->

<hbox>

<grid width="700px" height="320px">

<rows>

<row>

<label value="Title"/>

<a:bind value="media.title"/>

<textbox width="80%" id="titlecontent" tooltip="tooltip.title">

<attribute name="onChanging">

if (event.getValue().length() == 0)

{

titlecount.setValue("");

}

else

{

//titlecount.setValue(""+event.getValue().length()); titlecount.setValue(com.packtpub.zk.media.

MyDataProvider.next());

}

</attribute>

</textbox>

<label id="titlecount" style="color:red" />

</row>

<row>

<label value="Type" />

<radiogroup>

<zscript>

MediaType[] types = {MediaType.Song,MediaType.Movie};

</zscript>

<a:bind value="media.type" />

<radio label="${each.screenText}" tooltip="tooltip.media.${each.screenText}" forEach="${types}" value="${each}"/>

</radiogroup>

<label />

</row>

<row>

<label value="ID" />

<a:bind value="media.id"/>

<textbox width="80%" tooltip="tooltip.id">

<attribute name="onChanging">

if (event.getValue().trim().length() > 0)

{

idstatus.setValue("valid"); idstatus.setStyle("color:green");

}

else

{

idstatus.setValue("not valid"); idstatus.setStyle("color:red");

}

</attribute>

<attribute name="onChange">

if (self.value != null &amp;&amp; self.value.trim().length() == 0)

{

self.value = "";

throw new WrongValueException(self, "The id shouldn't be the empty string.");

}

</attribute>

</textbox>

<label id="idstatus" style="color:red" value="not valid"/>

</row>

<row valign="top">

<label value="Description"/>

<textbox height="200px" width="50%" tooltip="tooltip.description"/>

<label />

</row>

<row valign="top">

<button label="add media">

<attribute name="onClick"><![CDATA[ dao.addMedia(media); Executions.sendRedirect("index.zul");

]]>

</attribute>

</button>

</row>

</rows>

</grid>

<grid height="320px" id="imagegrid">

<rows>

<row height="284px" valign="top">

<image id="image"/>

</row>

<row>

<button label="Upload" tooltip="tooltip.upload">

<attribute name="onClick">

{

Object media = Fileupload.get();

if (media instanceof org.zkoss.image.Image)

{

org.zkoss.image.Image img = (org.zkoss.image.Image) media;

image.setContent(img); imagegrid.setWidth(""+(img.getWidth()+10)+"px");

}

else if (media != null)

Messagebox.show("Not an image: "+media, "Error", Messagebox.OK, Messagebox.ERROR);

}

</attribute>

</button>

</row>

</rows>

</grid>

</hbox>

<!-- Initialize the model objects for using with anotations -->

<zscript><![CDATA[

//prepare the media instance

MediaDAO dao = MediaDAOFactory.getDAO(); com.packtpub.zk.media.model.Media media =

dao.getMediaById(sessionScope.get("id"));

]]>

</zscript>

<!-- tooltip definition -->

<popup id="tooltip.title"> The title of the media.

</popup>

<popup id="tooltip.media.Song"> A Song.

</popup>

<popup id="tooltip.media.Movie"> A Movie.

</popup>

<popup id="tooltip.id">

The id for the media. That is a user defined id. The id must not be unique.

</popup>

<popup id="tooltip.description"> The description for the media.

</popup>

<popup id="tooltip.upload"> Upload a image for the media.

</popup>

</window>

Now we have a small, but running CRUD application with the ZK framework. In the coming chapters, we will improve this application step by step.

## Summary

In this chapter, we started implementing a CRUD (Create—Read—Update—Delete) application. Before starting the implementation of the application, we created the setup of the ZK application in the web container. After the preparation of the project, we defined some model classes to store data.

After these cornerstones, we designed and implemented the pages with the ZK framework. We have not used the full functionality of the framework here, but showed some solutions for daily work with it.

The application has not finished with this chapter, but we have some base functionality, which we will further expand in the coming chapters.

Extending the Online

Media Library

In the last chapter, we started the implementation of a CRUD application. We implemented the application with some basics of ZK application. Now it's time to extend and optimize the application from the last chapter.

## AJAX—Live Data

There are many discussions around AJAX. Everybody understands different things if we are talking about richness and responsiveness of an application. However, one thing everybody would agree is that one feature of a user interface should be to show actual data. In the start page (index.zul) in Chapter 2, we implemented a listbox, which shows the media instances from the underlying persistent storage. The listbox component has a header (realized with the listheader component) and the content. In addition to the attributes of a media class there is one column (symbolized with the recycling bin image) to delete a media item. If we click on the image the media is removed, and with Executions.sendRedirect("index.zul") the page is reloaded. The following code recapitulates the implementation of

this section.

<listbox mold="paging">

<zscript>

MediaDAO dao = MediaDAOFactory.getDAO(); Collection list = dao.getMedia();

</zscript>

<listhead>

<listheader label="" />

<listheader label="Id" />

<listheader label="Title" />

</listhead>

<listitem forEach="${list}">

<listcell style="width:30px">

<toolbarbutton image="images/trashcan.gif"

tooltip="tooltip.remove">

<custom-attributes myMedia="${each}"/>

<attribute name="onClick"><![CDATA[ dao.removeMedia(componentScope.get("myMedia")); Executions.sendRedirect("index.zul");

]]>

</attribute>

</toolbarbutton>

</listcell>

<listcell label="${each.id}"/>

<listcell label="${each.title}"/>

</listitem>

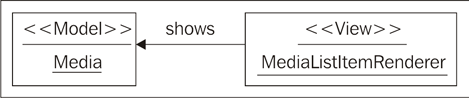
</listbox>

This implementation works, but it's not really AJAX. This is because with Executions.sendRedirect("index.zul") we reload the page. However, one feature of ZK is to do such things without loading the whole page again. Therefore, it's now time to use the feature of the ZK framework that will load data behind the scenes. Instead of providing data for the listbox with the help of forEach attribute, we have to provide the data with the help of the org.zkoss.zul.ListModel interface. ZK offers an implementation of the interface, which is called org.zkoss. zul.SimpleListModel. With this class, it's possible to provide data for one column, but in our case, we have more than one column. Therefore, we have to implement our own ListModel. Additionally we have to implement the interface, org.zkoss. zul.ListItemRenderer. Without such an implementation, listbox cannot render the cells. The default renderer supports a string array model, and a single column list. The mentioned interface has only one method (render(Listitem, Object)), which must be implemented. In this method, instances of type org.zkoss.zul.

Listcell are created. It's important to set the parent to a newly created instance. The following code demonstrates the implementation of the renderer class in

our example.

The model-view-controller pattern is used, but without a controller.



public class MediaListItemRenderer implements ListitemRenderer

{

public void render(Listitem item, Object data) throws Exception

{

if (data instanceof Media)

{

Media media = (Media) data; Listcell cell = null;

cell = new Listcell(); cell.setParent(item);

cell.appendChild(this.createRemoveButton(media, cell));

// The id of the media cell = new Listcell(); cell.setParent(item);

cell.setLabel(media.getId());

// The title of the Media cell = new Listcell(); cell.setParent(item);

cell.setLabel(media.getTitle());

}

}

private Toolbarbutton createRemoveButton(final Media media,

final Component parent)

{

Toolbarbutton button = new Toolbarbutton(); button.addEventListener("onClick", new EventListener()

{

public boolean isAsap()

{

return false;

}

public void onEvent(Event event)

{

MediaDAOFactory.getDAO().removeMedia(media);

}

});

button.setSrc("images/trashcan.gif"); button.setTooltip("tooltip.remove"); button.setParent(parent);

return button;

}

}

In the next piece, we will need an implementation of org.zkoss.zul.ListModel. The framework provides an abstract implementation (org.zkoss.zul.

AbstractListModel) of that interface.

public class MediaListModel extends AbstractListModel

{

/\*\*

\* @see org.zkoss.zul.ListModel#getElementAt(int)

\*/

public Object getElementAt(final int index)

{

return MediaDAOFactory.getDAO().getMedia().toArray()[index];

}

/\*\*

\* @see org.zkoss.zul.ListModel#getSize()

\*/

public int getSize()

{

return MediaDAOFactory.getDAO().getMedia().toArray().length;

}

/\*\*

* Remove a media item.
* For the removal a ListDataEvent is fired.
* @param media The media which should be removed.

\*/

public void removeMedia(final Media media)

{

this.fireEvent(ListDataEvent.CONTENTS\_CHANGED, 0,

this.getSize()-1);

}

}

One remarkable thing in the implementation above is the method removeMedia(Media). In the case that a media item is removed, an event of type org.zkoss.zul.event.ListDataEvent is fired. With this event, the listbox is actualized. To have more control about registering listeners, we provide a custom implementation of org.zkoss.zul.Listbox. The implementation is as follows:

public class MyListbox extends Listbox implements MediaDAOListener

{

/\*\*

\* Constructor.

\*

\*/

public MyListbox()

{

}

public void removeMedia(final Media media)

{

((MediaListModel)this.getModel()).removeMedia(media);

}

/\*\*

\* Setting the id and register the Listbox as listener for the MediaDAOFactory.

\*/

@Override

public void setId(final String id)

{

super.setId(id); MediaDAOFactory.registerListener(this);

}

}

This implementation is used through the use attribute of the listbox component.

<listbox id="myList" use="com.packtpub.zk.media.view.MyListbox" itemRenderer="com.packtpub.zk.media.view.

MediaListItemRenderer" model="${model}">

To complete the description, the complete implementation of the changed index. zul page is shown next:

<?xml version="1.0" encoding="UTF-8"?>

<zk [xmlns:html="http://www.w3.org/1999/xhtml">](http://www.w3.org/1999/xhtml)

<window>

<div align="center">

<window title="Welcome to the online media library" border="normal" width="500px">

<div align="left" style="margin-left:30pt;margin-top:10pt; margin-bottom:10pt">

<toolbarbutton label="Add a new media"

href="add-media.zul"/>

<html:br />

<toolbarbutton label="Update a media">

<attribute name="onClick"><![CDATA[ sessionScope.put("id", mediaid.getValue());

Executions.sendRedirect("update-media.zul");

]]>

</attribute>

</toolbarbutton>

<textbox id="mediaid"></textbox>

</div>

</window>

</div>

<zscript><![CDATA[

import java.util.Collection;

import com.packtpub.zk.media.dao.\*; import com.packtpub.zk.media.model.\*; import com.packtpub.zk.media.view.\*;

]]>

</zscript>

<html:br/>

<zscript><![CDATA[

ListModel model = new MediaListModel();

]]>

</zscript>

<listbox id="myList" use="com.packtpub.zk.media.view.MyListbox" itemRenderer="com.packtpub.zk.media.view.

MediaListItemRenderer" model="${model}">

<listhead>

<listheader label="" />

<listheader label="Id" />

<listheader label="Title" />

</listhead>

</listbox>

<popup id="tooltip.remove"> Remove the media.

</popup>

</window>

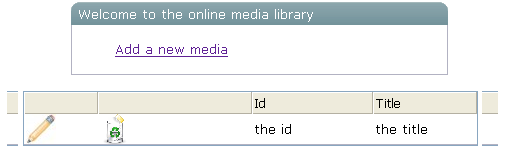
</zk>

The grid component supports live data, too. However, to implement the ListItemRenderer it's necessary to implement org.zkoss.zul. RowRenderer. For providing data, a ListModel is used.



## Updating at the Right Place

In the last chapter, we implemented a minimal update. However, the functionality is not really the normal way an update should work. Therefore, it's better to move the update to the result table. The following screenshot depicts the way an update should appear in the table.



If the user clicks on the pencil, the selected media should be opened in the update mask. For that case, we have to update the com.packtpub.zk.media.view.

MediaListItemRenderer class. We append an additional column for the update.

How to access the sessionScope in a Java class

In a ZUL page, we can access a session directly with the variable

sessionScope. However, in a Java class we haven't used that variable,  because there are no global variables in Java. To work with the current

session in a class, we can use the utility class org.zkoss.zk.ui.

Sessions. With the getCurrent() method, we get access to the current session. Now it's possible to set (method: setAttribute) and get (method: getAttribute) attributes from the session.

The class is extended with the createEditButton method for creating a

toolbarbutton for the update.

public class MediaListItemRenderer implements ListitemRenderer

{

public void render(Listitem item, Object data) throws Exception

{

if (data instanceof Media)

{

Media media = (Media) data; Listcell cell = null;

//The update button cell = new Listcell(); cell.setParent(item);

cell.appendChild(this.createEditButton(media, cell));

//The remove button cell = new Listcell();

cell.setParent(item); cell.appendChild(this.createRemoveButton(media, cell));

//The id of the media cell = new Listcell(); cell.setParent(item);

cell.setLabel(media.getId());

//The title of the Media cell = new Listcell(); cell.setParent(item);

cell.setLabel(media.getTitle());

}

}

private Toolbarbutton createEditButton(final Media media,

final Component parent)

{

Toolbarbutton button = new Toolbarbutton(); button.addEventListener("onClick", new EventListener()

{

public boolean isAsap()

{

return false;

}

public void onEvent(Event event)

{

}

});

Sessions.getCurrent().setAttribute("id", media.getId()); Executions.sendRedirect("update-media.zul");

button.setSrc("images/pencil.jpg"); button.setTooltip("tooltip.update"); button.setParent(parent);

return button;

}

private Toolbarbutton createRemoveButton(final Media media,

final Component parent)

{

Toolbarbutton button = new Toolbarbutton(); button.addEventListener("onClick", new EventListener()

{

public boolean isAsap()

{

return false;

}

public void onEvent(Event event)

{

MediaDAOFactory.getDAO().removeMedia(media);

}

});

button.setSrc("images/trashcan.gif"); button.setTooltip("tooltip.remove");

button.setParent(parent); return button;

}

}

On the index.zul page, we have to extend the listbox component with listheader.

<listbox id="myList" use="com.packtpub.zk.media.view.MyListbox" itemRenderer="com.packtpub.zk.media.view.

MediaListItemRenderer" model="${model}">

<listhead>

<listheader label="" />

<listheader label="" />

<listheader label="Id" />

<listheader label="Title" />

</listhead>

</listbox>

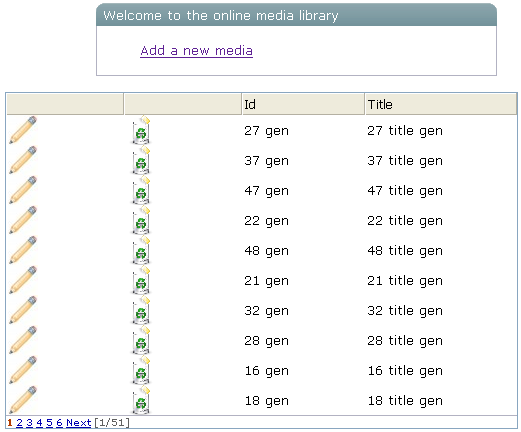
Additionally, we have to add a popup with the tooltip.update id to provide the tooltip for the pencil symbol.

<popup id="tooltip.update"> Update the media.

</popup>

## Optimize the Result Presentation

If we have many results in the list, we need paging. This feature is provided through a mold. In practice, even with a mold, the lists in ZK have proven to be too slow when getting bigger (10K elements). We just have to change the listbox component on index.zul, and the following presentation of the result.



The changed listbox is shown in the following code:

<listbox mold="paging" pageSize="10" id="myList" use="com.packtpub.zk.media.view.MyListbox" itemRenderer="com.packtpub.zk.media.view. MediaListItemRenderer" model="${model}">

<listhead>

<listheader label="" />

<listheader label="" />

<listheader label="Id" />

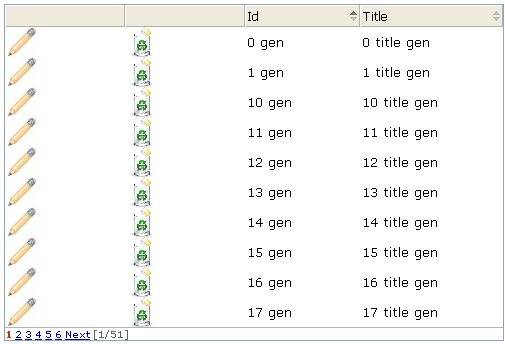
<listheader label="Title" />

</listhead>

</listbox>

For lists with many entries, it makes sense to have a sorting facility. This feature is supported directly, too. If we enable the feature, the result looks like the figure that follows. The columns that are now extended with sorting capability have

two arrows.



The simplest way to extend a column with the sort feature is to set the sort attribute with a value auto.

<listbox mold="paging" pageSize="10" id="myList" use="com.packtpub.zk.media.view.MyListbox" itemRenderer="com.packtpub.zk.media.view. MediaListItemRenderer" model="${model}">

<listhead>

<listheader label="" />

<listheader label="" />

<listheader label="Id" sort="auto"/>

<listheader label="Title" sort="auto"/>

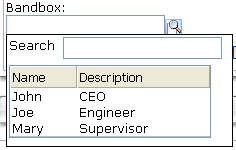
</listhead>

</listbox>

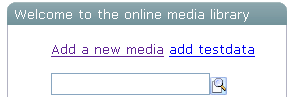
If some special sort order is necessary, it's possible to provide our own implementation of java.util.Comparator. To provide such a comparator to your listheader, you could specify the sortAscending and sortDescending attributes. This means you could provide different orders for ascending and descending sorts.

## Improve Navigation Inside the Data

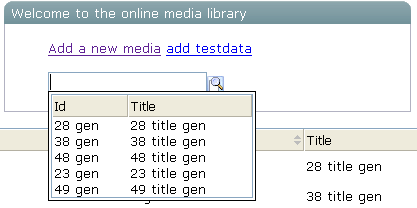
Actually, we only have the possibility of seeing all data in the result list, and navigating with the help of paging. It's not really satisfying. To improve the application, we should add a search facility. Here, we don't just provide a simple input field; we want to offer some exciting functionality. The idea is to use the bandbox component. A bandbox suggests possible choices for the input field. An example **Bandbox** is shown in the figure below.



The special property of a bandbox component is that the popup is customizable. Now we will try to implement such a bandbox with a live data result grid.



Additionally for large data, it's not wise to present the user with a complete list of data. We present them only the first five records. Additionally, if we select a record from the pop-up list, the title of that record should appear in the input field, and the popup should close. The result should look like the following figure. For faster generation of test data, we have added a small functionality to generate such data. This feature is available with the link **add testdata**.



Inside a bandbox, we can use the same components that are used outside a bandbox. Therefore, we use the listbox component for the result list. To fill the listbox with live data, we have to provide the data in ListModel (an instance of org.zkoss. zul.ListModel). Since we have more than one column, we have to implement

an instance of org.zkoss.zul.ListitemRenderer. The implementation of this renderer is shown in the following listing.

public class MediaListItemRenderer implements ListitemRenderer

{

public void render(Listitem item, Object data) throws Exception

{

if (data instanceof Media)

{

Media media = (Media) data; Listcell cell = null;

// The id of the media cell = new Listcell(); cell.setParent(item);

cell.setLabel(media.getId());

// The title of the Media cell = new Listcell(); cell.setParent(item);

cell.setLabel(media.getTitle());

//Set the value of the item for the selection

item.setValue(media.getTitle());

}

}

}

We manually set the value of listitem with item.setValue(media.getTitle()) to have the possibility of accessing that value in the onSelect listener of the listbox. Most of the ZK controls implement the setValue and getValue methods, as a way of exchanging data over the application.

After seeing the implementation of the ListItemRenderer, we should look at the implementation of the ListModel.

public class SearchMediaListModel extends AbstractListModel

{

/\*\*

\* @see org.zkoss.zul.ListModel#getElementAt(int)

\*/

public Object getElementAt(final int index)

{

String searchattribute = (String)

Sessions.getCurrent().getAttribute(„searchattribute"); if (searchattribute == null)

{

searchattribute = „";

}

return MediaDAOFactory.getDAO().searchByTitle(searchattribute, 5)

.toArray()[index];

}

/\*\*

\* @see org.zkoss.zul.ListModel#getSize()

\*/

public int getSize()

{

String searchattribute = (String)

Sessions.getCurrent().getAttribute(„searchattribute"); if (searchattribute == null)

{

searchattribute = „";

}

return MediaDAOFactory.getDAO().searchByTitle(searchattribute, 5) size();

}

public void update()

{

this.fireEvent(ListDataEvent.CONTENTS\_CHANGED, 0,

this.getSize() - 1);

}

}

The update method is used to update the data in the listbox with the help of firing events from the type ListDataEvent. We want to have the feature that on each character the user types into the input field of the bandbox, the data of the result list is actualized. To transfer the data from the input field to the model, we use

the session.

To finish the implementation, we have to add the bandbox to index.zul.

<?xml version="1.0" encoding="UTF-8"?>

<zk [xmlns:html="http://www.w3.org/1999/xhtml">](http://www.w3.org/1999/xhtml)

<zscript><![CDATA[

import java.util.Collection;

import com.packtpub.zk.media.dao.\*; import com.packtpub.zk.media.model.\*; import com.packtpub.zk.media.view.\*;

import com.packtpub.zk.media.view.search.\*; MediaDAO dao = MediaDAOFactory.getDAO();

ListModel searchmodel = new SearchMediaListModel();

]]>

</zscript>

<window>

<div align="center">

<window title="Welcome to the online media library" border="normal" width="500px">

<div align="left" style="margin-left:30pt; margin-top:10pt; margin-bottom:10pt">

<toolbarbutton label="Add a new media"

href="add-media.zul"/>

<toolbarbutton label="add testdata">

<attribute name="onClick"> MediaDAOFactory.create(50); Executions.sendRedirect("index.zul");

</attribute>

</toolbarbutton>

<html:br />

<html:br />

<bandbox id="bd" autodrop="true">

<attribute name="onChanging"> sessionScope.put("searchattribute", event.getValue()); searchlistbox.getModel().update();

</attribute>

<attribute name="onOpen"> searchlistbox.getModel().update();

</attribute>

<bandpopup>

<listbox id="searchlistbox" width="200px" itemRenderer="com.packtpub.zk.media.view. search.MediaListItemRenderer" model="${searchmodel}">

<attribute name="onSelect"> bd.value=self.selectedItem.value; bd.closeDropdown();

</attribute>

<listhead>

<listheader label="Id"/>

<listheader label="Title"/>

</listhead>

</listbox>

</bandpopup>

</bandbox>

</div>

</window>

</div>

<html:br/>

<zscript><![CDATA[

ListModel model = new MediaListModel();

]]>

</zscript>

<listbox mold="paging" pageSize="10" id="myList" use="com.packtpub.zk.media.view.MyListbox" itemRenderer="com.packtpub.zk.media.view. MediaListItemRenderer" model="${model}">

<listhead>

<listheader label="" />

<listheader label="" />

<listheader label="Id" sort="auto"/>

<listheader label="Title" sort="auto"/>

</listhead>

</listbox>

<popup id="tooltip.remove"> Remove the media.

</popup>

<popup id="tooltip.update"> Update the media.

</popup>

</window>

</zk>

If the user selects a line of the list, the title of the media is shown in the input field, and the bandbox is shown.

<attribute name="onSelect"> bd.value=self.selectedItem.value; bd.closeDropdown();

</attribute>

The title of the media is the value of the selected item. We have set that value in our implementation of the ListItemRenderer.

## Some Candies for the User

Now that we have added some really necessary functionalities, it's time to add some features from the category "nice to have". The first one that each application should have is version information. For that, we add a query symbol (realized in a toolbarbutton component), which opens a window component as a popup. The following figure shows the result.



The implementation of this feature is not really difficult, and is shown next:

<zk>

<window id="version" border="normal" width="200px" visible="false">

<zscript>

String appVersion = com.packtpub.zk.media.

ZKMediaLibVersion.VERSION; String appName = com.packtpub.zk.media.

ZKMediaLibVersion.NAME;

</zscript>

<caption label="${appName}"/>

<label value="${appVersion}" />

</window>

</zk>

<div align="right">

<toolbarbutton image="/images/query-symbol.jpg">

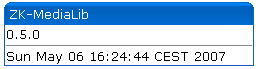
<attribute name="onClick"> version.doPopup();

</attribute>

</toolbarbutton>

</div>

Now the version information should be extended with the timer component from ZK. This component sends an onTimer event at regular intervals. The intervals could be controlled with the help of the delay attribute of the component. The appearance of the changed version information is shown in the following figure:



Additionally, with the timer, we use the separator component for a visual separation of the version information and the running watch. The implementation of the improved version information is as follows:

<zk>

<window id="version" border="normal" width="250px" visible="false">

<zscript>

String appVersion = com.packtpub.zk.media.

ZKMediaLibVersion.VERSION; String appName = com.packtpub.zk.media.

ZKMediaLibVersion.NAME;

</zscript>

<caption label="${appName}"/>

<label value="${appVersion}" />

<separator bar="true" />

<label id="time"/>

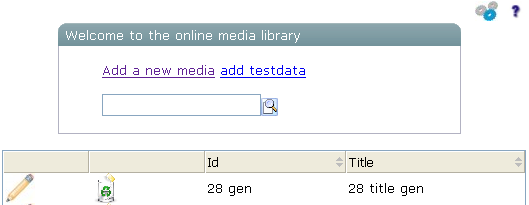
<timer id="timer" delay="1000" repeats="true" onTimer="time.setValue(new Date().toString())"/>

</window>

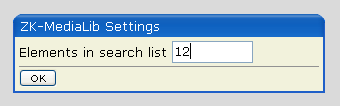
</zk>

One feature that should also be available is the feature of configuration. For the first step, we add a feature to configure the number of elements that are displayed in the search preview list that is presented with the help of the bandbox component.

To access the configuration window, we add a toolbarbutton component with a cogwheel image.



When the toolbarbutton is clicked, a modal dialog with an input field for the number of elements should appear. The appearance of the dialog is shown in the following figure:



The default value of the number of elements should be initialized at the start of the page. For that, we have to provide an implementation of the org.zkoss.zk.ui. util.Initiator. interface.

public class SettingsInitializer implements Initiator

{

public void doAfterCompose(final Page page) throws Exception

{

}

public void doCatch(final Throwable ex)

{

}

public void doFinally()

{

}

public void doInit(final Page page, final Object[] args) throws Exception

{

InputStream in = SettingsInitializer.class.getClassLoader(). getResourceAsStream("settings.properties");

Properties properties = new Properties(); properties.load(in);

SettingsFactory.get().setNoOfElementsInResult(Integer.parseInt (properties.getProperty("noOfElementsInResult")));

}

}

To use this implementation, we have to define the init class at the beginning of the page.

<?init class="com.packtpub.zk.media.bootstrap.SettingsInitializer" ?>

The implementation of the modal dialog is the same as the implementation of a normal dialog. We lay out the components in a normal window component. The implementation is as follows:.

<zk>

<window id="settingsWindow" border="normal" width="450px" visible="false">

<caption label="${appName} Settings"/>

<label value="Elements in search list" />

<zscript>

Settings settingsStorage = SettingsFactory.get();

</zscript>

<a:bind value="settingsStorage.noOfElementsInResult"/>

<textbox id="noOfElementsInResult"/>

<separator bar="true" />

<button label="OK">

<attribute name="onClick"> settingsWindow.doModal();

</attribute>

</button>

</window>

</zk>

The value is set with the help of an annotation. To use this annotation, we have to add an init sequence for the org.zkoss.zkplus.databind. AnnotateDataBinderInit class.

It's important to know that a page can have more than one class for the



init sequence.

To use that implementation we have to define that init class at the beginning of the page.

<?init class="org.zkoss.zkplus.databind.AnnotateDataBinderInit" ?>

To complete the picture the complete implementation of the new index.zul is shown below.

<?xml version="1.0" encoding="UTF-8"?>

<zk [xmlns:html="http://www.w3.org/1999/xhtml"](http://www.w3.org/1999/xhtml) [xmlns:a="http://www.zkoss.org/2005/zk/annotation">](http://www.zkoss.org/2005/zk/annotation)

<?init class="org.zkoss.zkplus.databind.AnnotateDataBinderInit" ?>

<?init class="com.packtpub.zk.media.bootstrap.SettingsInitializer"

?>

<zscript><![CDATA[

import java.util.Collection;

import com.packtpub.zk.media.dao.\*; import com.packtpub.zk.media.model.\*; import com.packtpub.zk.media.view.\*;

import com.packtpub.zk.media.view.search.\*; import com.packtpub.zk.media.bootstrap.\*; import com.packtpub.zk.media.\*;

MediaDAO dao = MediaDAOFactory.getDAO();

ListModel searchmodel = new SearchMediaListModel();

]]>

</zscript>

<!-- the version information -->

<zk>

<window id="version" border="normal" width="250px" visible="false">

<zscript>

String appVersion = com.packtpub.zk.media.

ZKMediaLibVersion.VERSION; String appName = com.packtpub.zk.media.

ZKMediaLibVersion.NAME;

</zscript>

<caption label="${appName}"/>

<label value="${appVersion}" />

<separator bar="true" />

<label id="time"/>

<timer id="timer" delay="1000" repeats="true" onTimer="time.setValue(new Date().toString())"/>

</window>

</zk>

<div align="right">

<toolbarbutton image="/images/cogwheel.jpg">

<attribute name="onClick"> settingsWindow.doModal();

</attribute>

</toolbarbutton>

<toolbarbutton image="/images/query-symbol.jpg">

<attribute name="onClick"> version.doPopup();

</attribute>

</toolbarbutton>

</div>

<!-- settings -->

<zk>

<window id="settingsWindow" border="normal" width="450px" visible="false">

<caption label="${appName} Settings"/>

<label value="Elements in search list" />

<zscript>

Settings settingsStorage = SettingsFactory.get();

</zscript>

<a:bind value="settingsStorage.noOfElementsInResult"/>

<textbox id="noOfElementsInResult"/>

<separator bar="true" />

<button label="OK">

<attribute name="onClick"> settingsWindow.doPopup();

</attribute>

</button>

</window>

</zk>

<window>

<div align="center">

<window title="Welcome to the online media library" border="normal" width="500px">

<div align="left" style="margin-left:30pt;margin-top:10pt; margin-bottom:10pt">

<toolbarbutton label="Add a new media"

href="add-media.zul"/>

<toolbarbutton label="add testdata">

<attribute name="onClick"> MediaDAOFactory.create(50); Executions.sendRedirect("index.zul");

</attribute>

</toolbarbutton>

<html:br />

<html:br />

<bandbox id="bd" autodrop="true">

<attribute name="onChanging"> sessionScope.put("searchattribute", event.getValue()); searchlistbox.getModel().update();

</attribute>

<attribute name="onOpen"> searchlistbox.getModel().update();

</attribute>

<bandpopup>

<listbox id="searchlistbox" width="200px" itemRenderer="com.packtpub.zk.media. view.search.MediaListItemRenderer" model="${searchmodel}">

<attribute name="onSelect"> System.out.println(self.selectedItem); bd.value=self.selectedItem.value;

bd.closeDropdown();

</attribute>

<listhead>

<listheader label="Id"/>

<listheader label="Title"/>

</listhead>

</listbox>

</bandpopup>

</bandbox>

</div>

</window>

</div>

<html:br/>

<zscript><![CDATA[

ListModel model = new MediaListModel();

]]>

</zscript>

<listbox mold="paging" pageSize="10" id="myList" use="com.packtpub.zk.media.view.MyListbox" itemRenderer="com.packtpub.zk.media.view. MediaListItemRenderer" model="${model}">

<listhead>

<listheader label="" />

<listheader label="" />

<listheader label="Id" sort="auto"/>

<listheader label="Title" sort="auto"/>

</listhead>

</listbox>

<popup id="tooltip.remove"> Remove the media.

</popup>

<popup id="tooltip.update"> Update the media.

</popup>

<popup id="tooltip.query"> About the ZK-Medialib

</popup>

</window>

</zk>

## Summary

Our second iteration of the application is now complete. Before we proceed with the last iteration, and give finishing touches in the next chapter, we should look back at what we have done, and learned in this chapter.

At the beginning of this chapter, we started with a simple CRUD application. The first thing we have done is to add some AJAX features to the application (live data). Here, we learned that many cornerstones are provided from the ZK framework, and that we only have to implement some interfaces to use these features. We moved the application from a mixed code approach to a Model-View-Controller Architecture. The use of the "Live Data" concept is the only way in ZK to use this design pattern. It's advantages, against the flat approach, are code reusability (model and controller could be inherited from other projects addressing the same business logic; the view is the only part dependent on ZK.

With the help of the live data it's possible to give the user the feeling of a desktop application, and that's one of the reasons why we are using ZK.

The next steps in this chapter extended the application, in particular the index.zul

page. In the last steps, we added version information, and a settings dialog.

Where to get more help

In some situations it's not really clear how to choose the right user

 interface controls with the ZK framework. In such cases, it's wise to look into the provided zkdemo application from the ZK framework. In this

application each component is used and you could get a feeling of how to use that component.

Is it on the Desktop or

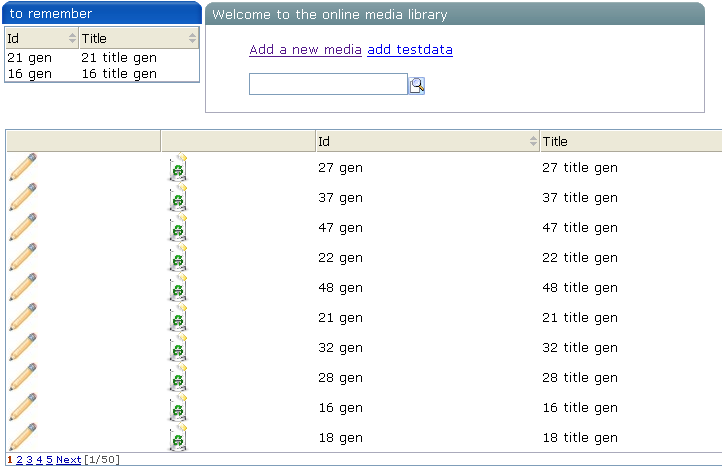
on the Web?

In the last two chapters, we implemented the basic functionality of an online media library. There we started with a simple page (index.zul), which we extended

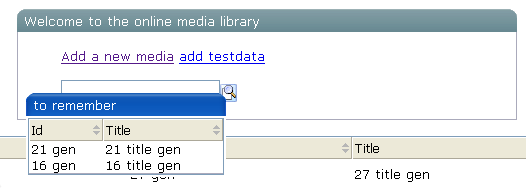
with some additional features. Now in this chapter, we run the last cycle of our implementation. The goal of the chapter is to have an application that will give the user a feeling of a desktop application.

## Adding Drag-and-Drop

One feature of many desktop applications is drag-and-drop. Therefore, we should implement such a feature, too. We want to have the ability to drag a list item from the result list of media to a separate list to remember the items later. The modified application screen is as shown in the figure:



We added a window component with the title **to remember** to our application. This component should be moveable around the browser, and should also be able to overlap other components. The following screenshot shows the overlapping feature:



To activate the overlap feature for a window, you simply have to call one method,

doOverlapped().

<zscript> rememberWindow.doOverlapped();

</zscript>

This additional window should have a listbox component with live data. For that we have to provide the data from a list model.

<window title="to remember" width="200px" firstLeft="10px" firstTop="10px"

id="rememberWindow" use="com.packtpub.zk.media.view.remember. RememberWindow">

<listbox mold="paging" pageSize="10" itemRenderer="com.packtpub. zk.media.view.

remember.DropableMediaListItemRenderer" model="${testmodel}">

<listhead>

<listheader label="Id" sort="auto"/>

<listheader label="Title" sort="auto"/>

</listhead>

</listbox>

<zscript> rememberWindow.doOverlapped();

</zscript>

</window>

With the doOverlapped method, we get the ability to move the window around. However, when we click on **add testdata** to add some data to the main listbox, we enforce a reload of the page because of Executions.sendRedirect("index.zul") at the end of the action of **add testdata**. After reload, the position of rememberWindow is lost. To solve this problem, we have to store the position of the window component in the session, and restore that position in the construction phase of the window. To implement this feature, we have to extend org.zkoss.zul.Window.

public class RememberWindow extends Window implements EventListener

{

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*\*\*\*\*\*\*\*

\* Internal Constants

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*\*\*\*\*\*\*/

private final static String LEFT = "LEFT"; private final static String TOP = "TOP";

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*\*\*\*\*\*\*\*

\* Instance variables

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*\*\*\*\*\*\*/

private boolean setBySession = false; private String firstTop;

private String firstLeft;

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*\*\*\*\*\*\*\*/

/\*\*

* Constructor.
* A event listener for the event <code>onMove</code> is registered.

\*/

public RememberWindow()

{

this.addEventListener("onMove", this);

// Restore the left position from the session if avaiable if (Sessions.getCurrent().getAttribute(LEFT) != null)

{

this.setLeft((String) Sessions.getCurrent().getAttribute(LEFT)); this.setBySession = true;

}

// Restore the top position from the session if avaiable if (Sessions.getCurrent().getAttribute(TOP) != null)

{

this.setTop((String) Sessions.getCurrent().getAttribute(TOP));

}

}

/\*\*

* Set the top position which is used on the first time. First time means at
* initialization. The position is only evaluated if the position is not set
* in the constructor from a session variable.

\*

* @param firstTop The top position.

\*/

public void setFirstTop(final String firstTop)

{

this.firstTop = firstTop; if (!this.setBySession)

{

this.setTop(this.firstTop);

}

}

/\*\*

* Set the left position which is used on the first time. First time means at
* initialization. The position is only evaluated if the position is not set
* in the constructor from a session variable.

\*

* @param firstLeft The left position.

\*/

public void setFirstLeft(final String firstLeft)

{

this.firstLeft = firstLeft; if (!this.setBySession)

{

this.setLeft(this.firstLeft);

}

}

/\*\*

\* @see EventListener#isAsap()

\*/

public boolean isAsap()

{

return false;

}

/\*\*

\* Eventlistener method.

\*/

public void onEvent(final Event event)

{

// store the left position Sessions.getCurrent().setAttribute(RememberWindow.LEFT,

((MoveEvent) event).getLeft());

// store the right position Sessions.getCurrent().setAttribute(RememberWindow.TOP,

((MoveEvent) event).getTop()); System.out.println(((MoveEvent) event).getTop());

}

}

For storing the actual position of the window, we implement an event listener for the onMove event. In this method, we store the top and the left position of the window into the session of the user. For the first time, we want to set a position for the window, too. Here, we have to add two new attributes firstTop and firstLeft.

To extend a component with some attributes, we just have to implement simple setter methods. The small window for the remembered media instances should not display the same list as the result list, therefore, we have to implement our own ListitemRenderer.

public class DropableMediaListItemRenderer implements ListitemRenderer

{

public void render(final Listitem item, Object data) throws Exception

{

if (data instanceof Media)

{

final Media media = (Media) data; Listcell cell = null;

// The id of the media cell = new Listcell(); cell.setParent(item);

cell.setLabel(media.getId());

// The title of the Media cell = new Listcell(); cell.setParent(item);

cell.setLabel(media.getTitle()); item.setDroppable("true"); item.addEventListener("onDrop", new EventListener()

{

public boolean isAsap()

{

return false;

}

@SuppressWarnings("unchecked") public void onEvent(Event event)

{

}

});

}

}

}

Listitem it = (Listitem) ((DropEvent)event).getDragged(); Object[] childs = it.getChildren().toArray();

RememberList remember = (RememberList) Sessions.getCurrent()

.getAttribute(RememberListInitializer.REMEMBER\_LIST); Media media = MediaFactory.create(((Listcell)

childs[4]).getLabel());

media.setTitle(((Listcell)childs[3]).getLabel()); media.setId(((Listcell)childs[2]).getLabel()); remember.add(media); ((RememberMediaListModel)((Listbox)item.getParent())

.getModel()).update();

One notable line in the code is item.setDroppable("true"). With this line, we activate the listbox as a possible destination of the drag-and-drop process. To activate the main listbox as possible source of a drag-and-drop process, we have to add the line item.setDraggable("true") to com.packtpub.zk.media.view. MediaListItemRenderer. Additionally we implement our own ListModel for that window.

public class RememberMediaListModel extends AbstractListModel implements ListModel

{

/\*\*

\* @see org.zkoss.zul.ListModel#getElementAt(int)

\*/

public Object getElementAt(final int index)

{

return this.getMedia().toArray()[index];

}

/\*\*

\* @see org.zkoss.zul.ListModel#getSize()

\*/

public int getSize()

{

return this.getMedia().size();

}

@SuppressWarnings("unchecked") private RememberList getMedia()

{

return (RememberList) Sessions.getCurrent().getAttribute( RememberListInitializer.REMEMBER\_LIST);

}

public void update()

{

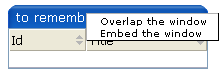
this.fireEvent(ListDataEvent.CONTENTS\_CHANGED, 0,

this.getSize() - 1);

}

}

With these pieces, we have a working drag-and-drop, as well as a window that we can move around. Now we want to have the option to embed the window. To choose this option, we add a context menu to the remember window. The result should appear like the following figure:



The context menu is realized as menupopup component. The elements in that menu are menuitem components. With the help of the autocheck attribute, the check symbol for the element in the menu is changed every time an entry is selected.

<menupopup id="rememberOptions">

<menuitem label="Overlap the window" autocheck="true" id="rememberOverlap">

<attribute name="onClick"> rememberWindow.doOverlapped(); rememberEmbed.setChecked(false);

</attribute>

</menuitem>

<menuitem label="Embed the window" autocheck="true" id="rememberEmbed">

<attribute name="onClick"> rememberWindow.doEmbedded(); rememberOverlap.setChecked(false);

</attribute>

</menuitem>

</menupopup>

If we click on **Embed the window** the window is embedded by calling doEmbedded(). To mark the menu as context menu to the rememberWindow we use the context attribute of the window component.

<window title="to remember" width="200px" firstLeft="10px" firstTop="10px"

id="rememberWindow" use="com.packtpub.zk.media.view.remember. RememberWindow" context="rememberOptions" border="true">

<listbox mold="paging" pageSize="10" itemRenderer= "com.packtpub.zk.media.view.remember

.DropableMediaListItemRenderer" model="${testmodel}">

<listhead>

<listheader label="Id" sort="auto"/>

<listheader label="Title" sort="auto"/>

</listhead>

</listbox>

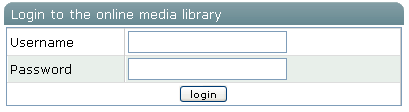
<zscript> rememberWindow.doOverlapped();

</zscript>

</window>

## Adding a Login Page

Now it's time to add a login page to our application. The screen itself is very simple, and appears like the following figure:



The two fields **Username** and **Password** should have validation. The validation is enabled with the help of the constraint attribute. This attribute can contain a combination of the following options:

* no positive
* no negative
* no zero
* no empty
* no future
* no past
* no today
* a regular expression

In our example, we use no empty.

How to validate a form

In the earlier chapters, we used WrongValueException to validate a single input field. However, when we click on the button and submit the

 data of form, validation doesn't happen automatically. To validate we

have to call getValue() on an input field. If the validation is broken a popup occurs on the concerned field. If we want to prevent such popup, we can call the isValid() function and create our own error message.

The complete login page (login.zul) is shown as follows:

<?xml version="1.0" encoding="UTF-8"?>

<zk [xmlns:html="http://www.w3.org/1999/xhtml"](http://www.w3.org/1999/xhtml) [xmlns:a="http://www.zkoss.org/2005/zk/annotation">](http://www.zkoss.org/2005/zk/annotation)

<?init class="org.zkoss.zkplus.databind.AnnotateDataBinderInit" ?>

<zscript>

import com.packtpub.zk.media.model.\*;

</zscript>

<div align="center">

<window width="400px" title="Login to the online media library">

<grid>

<rows>

<row>

<label value="Username" />

<a:bind value="user.name"/>

<textbox id="username"/>

</row>

<row>

<label value="Password" />

<a:bind value="user.password" />

<textbox type="password" id="password" constraint="no

empty"/>

</row>

<row spans="2" align="center">

<button label="login">

<attribute name="onClick">

//validate the username

username.getValue();

//validate the password password.getValue(); UserFactory.login(user); Executions.sendRedirect("index.zul");

</attribute>

</button>

</row>

</rows>

</grid>

</window>

</div>

<!-- Initialize the model objects for using with anotations -->

<zscript>

com.packtpub.zk.media.model.User user = com.packtpub.zk.media. model.UserFactory.create();

</zscript>

</zk>

The user instance is stored into the session. For minimal security, which isn't enough for production environments, we use an implementation of javax.servlet.Filter and register it in web.xml.

<filter>

<filter-name>SecurityFilter</filter-name>

<filter-class>com.packtpub.zk.media.controller.SecurityFilter</ filter-class>

<init-param>

<param-name>loginPage</param-name>

<param-value>login.zul</param-value>

</init-param>

</filter>

<filter-mapping>

<filter-name>SecurityFilter</filter-name>

<url-pattern>\*.zul</url-pattern>

</filter-mapping>

To complete the example, implementation of the filter method doFilter is as follows:

public void doFilter(ServletRequest request, ServletResponse response, FilterChain chain) throws IOException, ServletException

{

HttpSession session = ((HttpServletRequest) request).getSession();

if (session != null && session.getAttribute

(SESSIONKEY\_USER) != null)

{

User user = (User) session.getAttribute(SESSIONKEY\_USER); if (user.isLoggedIn())

{

chain.doFilter(request, response);

}

}

if (loginPage != null)

{

// forward to the loginpage request.getRequestDispatcher(loginPage).forward

(request, response);

}

else

{

chain.doFilter(request, response);

}

}

For a production environment it's recommended to embed the Acegi framework (http://www.acegisecurity.org) for security. An example for integration is shown in the next chapter.



One minimal problem of the login mask is that the user has to press the **login** button and the enter key is not recognized. If the user presses the enter key the onOK event is sent. Therefore, we adapt the window component in login.zul.

<window width="400px" title="Login to the online media library" onOK="login()">

The method login is the extracted login method of the button. For completeness, the new login.zul is as shown:

<?xml version="1.0" encoding="UTF-8"?>

<zk [xmlns:html="http://www.w3.org/1999/xhtml"](http://www.w3.org/1999/xhtml) [xmlns:a="http://www.zkoss.org/2005/zk/annotation">](http://www.zkoss.org/2005/zk/annotation)

<?init class="org.zkoss.zkplus.databind.AnnotateDataBinderInit" ?>

<zscript>

import com.packtpub.zk.media.model.\*;

</zscript>

<div align="center">

<window width="400px" title="Login to the online media library"

onOK="login()">

<grid>

<rows>

<row>

<label value="Username" />

<a:bind value="user.name"/>

<textbox id="username" constraint="no empty"/>

</row>

<row>

<label value="Password" />

<a:bind value="user.password" />

<textbox type="password" id="password"

constraint="no empty"/>

</row>

<row spans="2" align="center">

<button label="login">

<attribute name="onClick"> login();

</attribute>

</button>

</row>

</rows>

</grid>

</window>

</div>

<zscript>

void login()

{

//validate the username username.getValue();

//validate the password password.getValue(); UserFactory.login(user); Executions.sendRedirect("index.zul");

}

</zscript>

<!-- Initialize the model objects for using with anotations -->

<zscript> com.packtpub.zk.media.model.User user =

com.packtpub.zk.media.model.UserFactory.create();

</zscript>

</zk>

Before we proceed, it's time to show the complete index.zul page.

<?xml version="1.0" encoding="UTF-8"?>

<zk [xmlns:html="http://www.w3.org/1999/xhtml"](http://www.w3.org/1999/xhtml) [xmlns:a="http://www.zkoss.org/2005/zk/annotation">](http://www.zkoss.org/2005/zk/annotation)

<?init class="org.zkoss.zkplus.databind.AnnotateDataBinderInit" ?>

<?init class="com.packtpub.zk.media.bootstrap.SettingsInitializer"

?>

<?init class="com.packtpub.zk.media.bootstrap.

RememberListInitializer" ?>

<zscript><![CDATA[

import java.util.Collection;

import com.packtpub.zk.media.dao.\*; import com.packtpub.zk.media.model.\*; import com.packtpub.zk.media.view.\*;

import com.packtpub.zk.media.view.search.\*; import com.packtpub.zk.media.view.remember.\*; import com.packtpub.zk.media.bootstrap.\*; import com.packtpub.zk.media.\*;

MediaDAO dao = MediaDAOFactory.getDAO();

ListModel searchmodel = new SearchMediaListModel();

User user = Sessions.getCurrent().getAttribute(com.packtpub. zk.media.controller.SecurityFilter.SESSIONKEY\_USER);

]]>

</zscript>

<!-- the version information -->

<zk>

<window id="version" border="normal" width="250px" visible="false">

<zscript>

String appVersion = com.packtpub.zk.media.

ZKMediaLibVersion.VERSION; String appName = com.packtpub.zk.media.ZKMediaLibVersion.NAME;

</zscript>

<caption label="${appName}"/>

<label value="${appVersion}" />

<separator bar="true" />

<label id="time"/>

<timer id="timer" delay="1000" repeats="true" onTimer="time.setValue(new Date().toString())"/>

</window>

</zk>

<div align="right">

<toolbarbutton image="/images/cogwheel.jpg">

<attribute name="onClick">

settingsWindow.doModal();

</attribute>

</toolbarbutton>

<toolbarbutton image="/images/query-symbol.jpg">

<attribute name="onClick"> version.doPopup();

</attribute>

</toolbarbutton>

<toolbarbutton label="logout">

<attribute name="onClick"> UserFactory.logout(); Executions.sendRedirect("index.zul");

</attribute>

</toolbarbutton>

</div>

<!-- settings -->

<zk>

<window id="settingsWindow" border="normal" width="450px" visible="false">

<caption label="${appName} Settings"/>

<label value="Elements in search list" />

<zscript>

Settings settingsStorage = SettingsFactory.get();

</zscript>

<a:bind value="settingsStorage.noOfElementsInResult"/>

<textbox id="noOfElementsInResult"/>

<separator bar="true" />

<button label="OK">

<attribute name="onClick"> settingsWindow.doPopup();

</attribute>

</button>

</window>

</zk>

<window>

<div align="center">

<window title="Hello ${user.name}, Welcome to the

online media library"

border="normal" width="500px">

<div align="left" style="margin-left:30pt;margin-top:10pt; margin-bottom:10pt">

<toolbarbutton label="Add a new media">

<attribute name="onClick"> Sessions.getCurrent().setAttribute("media.mode", "add");

Executions.sendRedirect("add-update-media.zul");

</attribute>

</toolbarbutton>

<toolbarbutton label="add testdata">

<attribute name="onClick"> MediaDAOFactory.create(50); Executions.sendRedirect("index.zul");

</attribute>

</toolbarbutton>

<html:br />

<html:br />

<bandbox id="bd" autodrop="true">

<attribute name="onChanging"> sessionScope.put("searchattribute", event.getValue()); searchlistbox.getModel().update();

</attribute>

<attribute name="onOpen"> searchlistbox.getModel().update();

</attribute>

<bandpopup>

<listbox id="searchlistbox" width="200px"

itemRenderer="com.packtpub. zk.media.view.search.MediaListItemRenderer" model="${searchmodel}">

<attribute name="onSelect"> bd.value=self.selectedItem.value; bd.closeDropdown();

</attribute>

<listhead>

<listheader label="Id"/>

<listheader label="Title"/>

</listhead>

</listbox>

</bandpopup>

</bandbox>

</div>

</window>

</div>

<html:br/>

<zscript><![CDATA[

ListModel model = new MediaListModel();

ListModel testmodel = new RememberMediaListModel();

]]>

</zscript>

<listbox mold="paging" pageSize="10" id="myList"

use="com.packtpub.zk. media.view.MyListbox" itemRenderer="com.packtpub

.zk.media.view.

MediaListItemRenderer" model="${model}">

<listhead>

<listheader label="" />

<listheader label="" />

<listheader label="Id" sort="auto"/>

<listheader label="Title" sort="auto"/>

</listhead>

</listbox>

<popup id="tooltip.remove"> Remove the media.

</popup>

<popup id="tooltip.update"> Update the media.

</popup>

<popup id="tooltip.query"> About the ZK-Medialib

</popup>

</window>

<html:br/>

<window title="to remember" width="200px"

firstLeft="10px" firstTop="10px" id="rememberWindow" use="com.packtpub.zk.media.view

.remember.RememberWindow" context=

"rememberOptions" border="true">

<listbox mold="paging" pageSize="10" itemRenderer="com.packtpub

.zk.media.view.remember.DropableMediaListItemRenderer "model="${testmodel}">

<listhead>

<listheader label="Id" sort="auto"/>

<listheader label="Title" sort="auto"/>

</listhead>

</listbox>

<zscript> rememberWindow.doOverlapped();

</zscript>

</window>

<menupopup id="rememberOptions">

<menuitem label="Overlap the window" autocheck="true" id="rememberOverlap">

<attribute name="onClick"> rememberWindow.doOverlapped(); rememberEmbed.setChecked(false);

</attribute>

</menuitem>

<menuitem label="Embed the window" autocheck="true" id="rememberEmbed">

<attribute name="onClick"> rememberWindow.doEmbedded(); rememberOverlap.setChecked(false);

</attribute>

</menuitem>

</menupopup>

</zk>

## Extending Add and Update

The add media (add-media.zul) and update media (update-media,zul) features have so far been implemented as two different pages. These pages are very similar, and therefore, we can merge them. The only difference is that in the case of an update we load the data, and for adding we create a new instance. The simplest way is to extend the page with a mode parameter. The new page can have the name

add-update-media.zul.

The first change is in the index.zul page:

<toolbarbutton label="Add a new media">

<attribute name="onClick"> Sessions.getCurrent().setAttribute("media.mode", "add"); Executions.sendRedirect("add-update-media.zul");

</attribute>

</toolbarbutton>

Additionally we have to extend com.packtpub.zk.media.view. MediaListItemRenderer.

public void onEvent(Event event)

{

Sessions.getCurrent().setAttribute("id", media.getId()); Sessions.getCurrent().setAttribute("media.mode", "update"); Executions.sendRedirect("add-media.zul");

}

In the new page add-update-media.zul, we now have to evaluate the session parameter media.mode.

<zscript>

MediaDAO dao = MediaDAOFactory.getDAO();

//prepare the media instance

com.packtpub.zk.media.model.Media media = null; String mode = sessionScope.get("media.mode"); if ("update".equals(mode))

{

media = dao.getMediaById(sessionScope.get("id"));

}

else

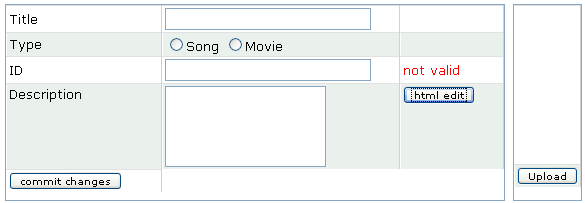
{

media = com.packtpub.zk.media.model.MediaFactory.create();

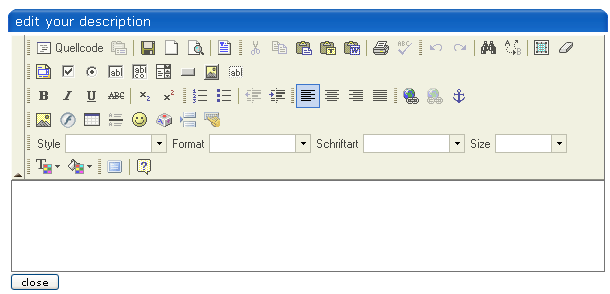
}

</zscript>

Now we have a single page, and we can proceed with improvements for that page. The first extension should be an HTML editor for the description. For that we can use the FCKeditor (http://www.fckeditor.net). This editor can be embedded into the ZK framework. For integration, we extend the add/update screen with a button (**html edit**) for opening a new window with that editor component. The following screenshot shows the adapted page.



When we click on the **html edit** button, a window with the editor appears (see the following screenshot).



The integration of the editor is very simple, because FCKeditor comes along with the normal distribution of the ZK framework. The window with the editor has the following source code:

<window title="edit your description" width="600px" id="htmlEdit" visible="false">

<fckeditor height="600px"/>

<button label="close">

<attribute name="onClick"> htmlEdit.setVisible(false);

</attribute>

</button>

</window>

The window is opened in the embedded mode:

<button label="html edit">

<attribute name="onClick"> htmlEdit.doOverlapped();

</attribute>

</button>

With the shown implementation, we only have a window with an FCKeditor, but we haven't implemented the ability to show the edited text. For that we want to extend the add/update screen. The first extension is for the edit window itself. We add a button for discarding changes (**discard changes**) and rename the other button to **save changes**.

<window title="edit your description" width="600px" id="htmlEdit" visible="false">

<fckeditor id="fck" height="600px" />

<button label="save changes">

<attribute name="onClick"> descriptionFrame.setContent(fck.value); htmlEdit.setVisible(false);

</attribute>

</button>

<button label="discard changes">

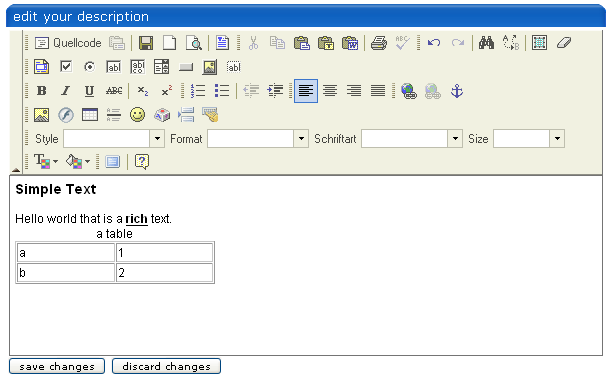
<attribute name="onClick">

fck.value = descriptionFrame.getContent(); htmlEdit.setVisible(false);

</attribute>

</button>

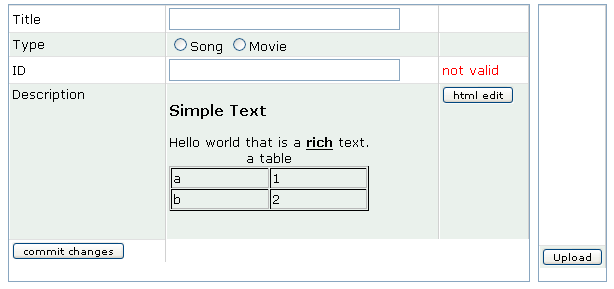
</window>



To show the content, we use the html component of the ZK framework.

<html id="descriptionFrame" width="100%"/>

With the help of this component it's possible to show formatted HTML text.



The next thing we can change is the selection of media type. We can remove the radio button group, and insert a popup with a tree with media types. The popup is opened with a **select type** button.

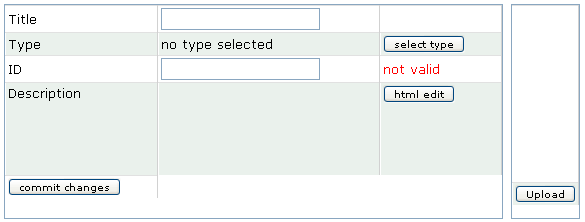
<button label="select type">

<attribute name="onClick"> mediaType.doOverlapped();

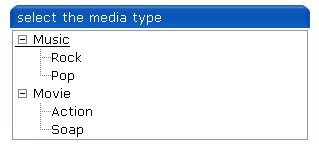
</attribute>

</button>

The adapted screen looks as follows:



The figure below shows the window that is opened on a click on **select type**.



The tree is build with the tree component. The selection of a media type should work with drag-and-drop. Therefore, we add the draggable attribute to the treecell components.

<window title="select the media type" id="mediaType" width="300px" visible="false">

<tree id="tree">

<treechildren>

<treeitem>

<treerow>

<treecell label="Music"/>

</treerow>

<treechildren>

<treeitem>

<treerow>

<treecell label="Rock" draggable="true"/>

</treerow>

</treeitem>

<treeitem>

<treerow>

<treecell label="Pop" draggable="true"/>

</treerow>

</treeitem>

</treechildren>

</treeitem>

<treeitem>

<treerow>

<treecell label="Movie"/>

</treerow>

<treechildren>

<treeitem>

<treerow>

<treecell label="Action" draggable="true"/>

</treerow>

</treeitem>

<treeitem>

<treerow>

<treecell label="Soap" draggable="true"/>

</treerow>

</treeitem>

</treechildren>

</treeitem>

</treechildren>

</tree>

</window>

A tree could have a header. The header of a tree has the same appearance as the header of listbox component. A header is implemented with treecols and treecol.



Now we have to implement a destination for the drag-and-drop. Here, we use a simple label.

<row>

<label value="Type" />

<label droppable="true" value="no type selected">

<attribute name="onDrop"><![CDATA[

self.value = ((Treecell)((DropEvent)event).getDragged())

.getTreeitem().getLabel(); mediaType.setVisible(false);

]]>

</attribute>

</label>

<button label="select type">

<attribute name="onClick"> mediaType.doOverlapped();

</attribute>

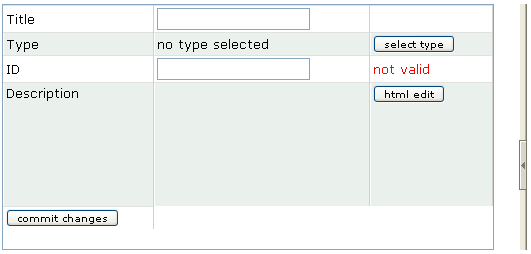
</button>

</row>

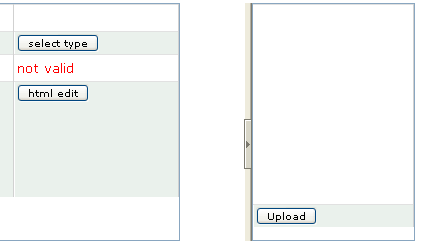
One interesting layout element is the splitter component. With one simple statement it's possible to add a splitter in ZK. Therefore, we just try adding a splitter between the input box, and the image upload box.

<splitter collapse="after" open="false"/>

The screen with the closed splitter (attribute open="false") is as shown :



When we click on the arrow, the image upload box is shown.



Now, we have a rich add/update page. To complete the example we show add- update-media.zul.

<?xml version="1.0" encoding="UTF-8"?>

<?init class="org.zkoss.zkplus.databind.AnnotateDataBinderInit" ?>

<window id="mainwin"

[xmlns:a="http://www.zkoss.org/2005/zk/annotation">](http://www.zkoss.org/2005/zk/annotation)

<zscript>

import com.packtpub.zk.media.model.MediaType; import com.packtpub.zk.media.dao.\*;

String tmpvalue = null;

</zscript>

<!-- htmledit for the description of a media -->

<window title="edit your description" width="600px" id="htmlEdit" visible="false">

<fckeditor id="fck" height="600px" />

<button label="save changes">

<attribute name="onClick"> descriptionFrame.setContent(fck.value); htmlEdit.setVisible(false);

</attribute>

</button>

<button label="discard changes">

<attribute name="onClick">

fck.value = descriptionFrame.getContent(); htmlEdit.setVisible(false);

</attribute>

</button>

</window>

<!-- Component to describe the media -->

<hbox>

<grid width="700px" height="320px">

<rows>

<row>

<label value="Title"/>

<a:bind value="media.title"/>

<textbox width="80%" id="titlecontent"

tooltip="tooltip.title">

<attribute name="onChanging">

if (event.getValue().length() == 0)

{

titlecount.setValue("");

}

else

{

//titlecount.setValue(""+event.getValue().length()); titlecount.setValue(com.packtpub.zk.media.

MyDataProvider.next());

}

</attribute>

</textbox>

<label id="titlecount" style="color:red" />

</row>

<row>

<label value="Type" />

<label droppable="true" value="no type selected">

<attribute name="onDrop"><![CDATA[

self.value = ((Treecell)((DropEvent)event).getDragged())

.getTreeitem().getLabel(); mediaType.setVisible(false);

]]>

</attribute>

</label>

<button label="select type">

<attribute name="onClick"> mediaType.doOverlapped();

</attribute>

</button>

</row>

<row>

<label value="ID" />

<a:bind value="media.id"/>

<textbox width="80%" tooltip="tooltip.id">

<attribute name="onChanging">

if (event.getValue().trim().length() > 0)

{

idstatus.setValue("valid"); idstatus.setStyle("color:green");

}

else

{

idstatus.setValue("not valid"); idstatus.setStyle("color:red");

}

</attribute>

<attribute name="onChange">

if (self.value != null &amp;&amp; self.value.trim(). length() == 0)

{

self.value = "";

throw new WrongValueException(self, "The id shouldn't be the empty string.");

}

</attribute>

</textbox>

<label id="idstatus" style="color:red" value="not valid"/>

</row>

<row valign="top" height="200px">

<label value="Description" />

<html id="descriptionFrame" width="100%"/>

<button label="html edit">

<attribute name="onClick"> htmlEdit.doOverlapped();

</attribute>

</button>

</row>

<row valign="bottom">

<button label="commit changes">

<attribute name="onClick"><![CDATA[ dao.addMedia(media); Executions.sendRedirect("index.zul");

]]>

</attribute>

</button>

</row>

</rows>

</grid>

<splitter collapse="after" open="false"/>

<grid height="320px" id="imagegrid" width="300px">

<rows>

<row height="284px" valign="top">

<image id="image"/>

</row>

<row>

<button label="Upload" tooltip="tooltip.upload">

<attribute name="onClick">

{

Object media = Fileupload.get();

if (media instanceof org.zkoss.image.Image)

{

org.zkoss.image.Image img =

(org.zkoss.image.Image) media; image.setContent(img); imagegrid.setWidth(""+(img.getWidth()+10)+"px");

}

else if (media != null)

Messagebox.show("Not an image: "+media, "Error",

Messagebox.OK, Messagebox.ERROR);

}

</attribute>

</button>

</row>

</rows>

</grid>

</hbox>

<!-- media type -->

<window title="select the media type" id="mediaType" width="300px" visible="false">

<tree id="tree">

<treechildren>

<treeitem>

<treerow>

<treecell label="Music"/>

</treerow>

<treechildren>

<treeitem>

<treerow>

<treecell label="Rock" draggable="true"/>

</treerow>

</treeitem>

<treeitem>

<treerow>

<treecell label="Pop" draggable="true"/>

</treerow>

</treeitem>

</treechildren>

</treeitem>

<treeitem>

<treerow>

<treecell label="Movie"/>

</treerow>

<treechildren>

<treeitem>

<treerow>

<treecell label="Action" draggable="true"/>

</treerow>

</treeitem>

<treeitem>

<treerow>

<treecell label="Soap" draggable="true"/>

</treerow>

</treeitem>

</treechildren>

</treeitem>

</treechildren>

</tree>

</window>

<!-- Initialize the model objects for using with anotations -->

<zscript>

MediaDAO dao = MediaDAOFactory.getDAO();

//prepare the media instance com.packtpub.zk.media.model.Media media = null; String mode = sessionScope.get("media.mode"); if ("update".equals(mode))

{

media = dao.getMediaById(sessionScope.get("id"));

}

else

{

media = com.packtpub.zk.media.model.MediaFactory.create();

}

</zscript>

<!-- tooltip definition -->

<popup id="tooltip.title"> The title of the media.

</popup>

<popup id="tooltip.media.Song"> A Song.

</popup>

<popup id="tooltip.media.Movie"> A Movie.

</popup>

<popup id="tooltip.id">

The id for the media. That is a user defined id.

The id must be unique.

</popup>

<popup id="tooltip.description"> The description for the media.

</popup>

<popup id="tooltip.upload"> Upload a image for the media.

</popup>

</window>

## Internationalization with the ZK Framework

Before we end the chapter, and the tutorial part of this book, we should look at how internationalization is done with ZK. For that we will use login.zul page from the previous chapter.

The ZK framework comes with a built-in functionality to separate the name of the labels in a property file. The name of the property file is i3-label\_lang\_CNTY. properties. lang is the language (for example: en) and CNTY is the country

(for example US). The file must be located in the WEB-INF directory of the web application. If the file is not found, the file i3-label\_lang.properties is loaded, and if that fails the framework tries to load i3-label.properties. To access the properties, you can use org.zkoss.util.resource.Labels.

For completeness, the new implementation of login.zul is as shown:

<?xml version="1.0" encoding="UTF-8"?>

<zk [xmlns:html="http://www.w3.org/1999/xhtml"](http://www.w3.org/1999/xhtml) [xmlns:a="http://www.zkoss.org/2005/zk/annotation">](http://www.zkoss.org/2005/zk/annotation)

<?init class="org.zkoss.zkplus.databind.AnnotateDataBinderInit" ?>

<zscript>

import com.packtpub.zk.media.model.\*;

</zscript>

<div align="center">

<window width="400px" title="Login to the online media library" onOK="login()">

<grid>

<rows>

<zscript>

String username = org.zkoss.util.resource.Labels

.getLabel("login.username"); String password = org.zkoss.util.resource.Labels

.getLabel("login.password"); String login = org.zkoss.util.resource.Labels

.getLabel("login.button");

</zscript>

<row>

<label value="${username}" />

<a:bind value="user.name"/>

<textbox id="username" constraint="no empty"/>

</row>

<row>

<label value="${password}" />

<a:bind value="user.password" />

<textbox type="password" id="password"

constraint="no empty"/>

</row>

<row spans="2" align="center">

<button label="${login}">

<attribute name="onClick"> login();

</attribute>

</button>

</row>

</rows>

</grid>

</window>

</div>

<zscript>

void login()

{

//validate the username username.getValue();

//validate the password password.getValue(); UserFactory.login(user); Executions.sendRedirect("index.zul");

}

</zscript>

<!-- Initialize the model objects for using with anotations -->

<zscript> com.packtpub.zk.media.model.User user =

com.packtpub.zk.media.model.UserFactory.create();

</zscript>

</zk>

Internationalization

Besides using the org.zkoss.utiil.resource.Labels class, in the ZUL file you can use the supplied taglib from the ZK framework:

<%@ taglib uri="/WEB-INF/tld/web/core.dsp.tld" prefix="c" %>

 ...

<label value="${c:l('login.password')}">

...

</window>

In a Java class, the only possibility is to use the Label class. For the ZUL file, it's easier to use the taglib as shown.

## Summary

Now we are at the end of our third phase in the development of a CRUD application with the AJAX ZK framework. We started with a simple application, and extended it step by step. The application now has many features, which you will need in other applications as well. Besides the components used there are many other interesting components, which can be used to enrich your application and give user the feeling of a desktop application.

Integration with Other Frameworks

ZK's biggest strength is its productivity. But it does have other advantages:

* ZK decouples the rendering logic from the presentation logic. That means with ZK, applications can be retargetted to devices other than the browser, such as the desktop or Swing or even a mobile device.
* Async update has always been an issue. With ZK the whole async update business can be abstracted into a timer component and it is very easy to do. However, you still have to pay attention to your server-side logic.
* ZK's ZUML makes it easy to build complex UI component trees. It also shortens the edit—compile—test cycle for developers.
* ZK allows developers to keep their business logic on the server side.

ZK is a great framework but the focus is on the GUI so other frameworks may be needed. This chapter discusses the integration of ZK with other frameworks so as to overcome these weaknesses. One of the most important frameworks is **Spring**. This is very often used together with **Hibernate**. As we will see, it is very easy to integrate ZK with other frameworks. Once it was difficult to use captchas but in the latest ZK versions, ZK supports captchas natively.

## Integration with the Spring Framework

Spring is one of the most complete lightweight containers, which provides centralized, automated configuration, and wiring of your application objects. It improves your application's testability and scalability by allowing software components to be first developed and tested in isolation, then scaled up for

deployment in any environment. This approach is called the POJO (Plain Old Java Object) approach and is gaining popularity because of its flexibility.

So, with all these advantages, it's no wonder that Spring is one of the most used frameworks. Spring provides many nice features: however, it works mainly in the back end. Here ZK may provide support in the view layer. The benefit from this pairing is the flexible and maturity of Spring together with the easy and speed of ZK. Specify a Java class in the use attribute of a window ZUL page and the world of Spring will be yours. Remember as discussed in previous chapters what a sample ZUL looks I like:

<?xml version="1.0" encoding="UTF-8"?>

<p:window [xmlns:p="http://www.zkoss.org/2005/zul"](http://www.zkoss.org/2005/zul) [xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"](http://www.w3.org/2001/XMLSchema-instance) [xsi:schemaLocation="http://www.zkoss.org/2005/zul](http://www.zkoss.org/2005/zul)

<http://www.zkoss.org/2005/zul> "

border="normal" title="Hello!" use="com.myfoo.myapp.HelloController">

Thank you for using our Hello World Application.

</p:window>

The HelloController points directly to a Java class where you can use Spring features easily.

Normally, if a Java Controller is used for a ZUL page it becomes necessary sooner or later to call a Spring bean. Usually in Spring you would use the applicationContext like:

ctx = new ClassPathXmlApplicationContext("applicationContext.xml"); UserDAO userDAO = (UserDAO) ctx.getBean("userDAO");

Then the userDAO is usable for any further access. In ZK there is a helper class

SpringUtil. It wrapps the applicationContext and simplifies the code to:

UserDAO userDAO = (UserDAO) SpringUtil.getBean("userDAO");

Pretty easy, isn't it? Let us examine an example.

Assume we have a small web application that gets flight data from a flight table. The

web.xml file looks like:

<?xml version="1.0" encoding="UTF-8"?>

<web-app version="2.4"

[xmlns="http://java.sun.com/xml/ns/j2ee"](http://java.sun.com/xml/ns/j2ee) [xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"](http://www.w3.org/2001/XMLSchema-instance) [xsi:schemaLocation="http://java.sun.com/xml/ns/j2ee](http://java.sun.com/xml/ns/j2ee)

[http://java.sun.com/xml/ns/j2ee/web-app\_2\_4.xsd">](http://java.sun.com/xml/ns/j2ee/web-app_2_4.xsd)

<display-name>IRT-FLIGHTSAMPLE</display-name>

<filter>

<filter-name>hibernateFilter</filter-name>

<filter-class>org.springframework.orm.hibernate3.support.

OpenSessionInViewFilter</filter-class>

</filter>

<filter-mapping>

<filter-name>hibernateFilter</filter-name>

<url-pattern>/\*</url-pattern>

</filter-mapping>

<context-param>

<param-name>contextConfigLocation</param-name>

<param-value>classpath:applicationContext-jdbc.xml

,classpath:applicationContext-dao.xml

,classpath:applicationContext-service.xml

,classpath:applicationContext.xml

</param-value>

</context-param>

<listener>

<listener-class>org.springframework.web.context.

ContextLoaderListener</listener-class>

</listener>

<session-config>

<!-- Default to 30 minute session timeouts -->

<session-timeout>30</session-timeout>

</session-config>

<mime-mapping>

<extension>xsd</extension>

<mime-type>text/xml</mime-type>

</mime-mapping>

<servlet>

<description>

<![CDATA[

The servlet loads the DSP pages.

]]>

</description>

<servlet-name>dspLoader</servlet-name>

<servlet-class> org.zkoss.web.servlet.dsp.InterpreterServlet

</servlet-class>

</servlet>

<servlet-mapping>

<servlet-name>dspLoader</servlet-name>

<url-pattern>\*.dsp</url-pattern>

</servlet-mapping>

<!-- ZK -->

<listener>

<description>

Used to cleanup when a session is destroyed

</description>

<display-name>ZK Session Cleaner</display-name>

<listener-class> org.zkoss.zk.ui.http.HttpSessionListener

</listener-class>

</listener>

<servlet>

<description>ZK loader for ZUML pages</description>

<servlet-name>zkLoader</servlet-name>

<servlet-class> org.zkoss.zk.ui.http.DHtmlLayoutServlet

</servlet-class>

<!-- Must. Specifies URI of the update engine (DHtmlUpdateServlet).

It must be the same as <url-pattern> for the update engine.

-->

<init-param>

<param-name>update-uri</param-name>

<param-value>/zkau</param-value>

</init-param>

<load-on-startup>1</load-on-startup>

</servlet>

<servlet-mapping>

<servlet-name>zkLoader</servlet-name>

<url-pattern>\*.zul</url-pattern>

</servlet-mapping>

<servlet-mapping>

<servlet-name>zkLoader</servlet-name>

<url-pattern>\*.zhtml</url-pattern>

</servlet-mapping>

<servlet>

<description>The asynchronous update engine for ZK</description>

<servlet-name>auEngine</servlet-name>

<servlet-class> org.zkoss.zk.au.http.DHtmlUpdateServlet

</servlet-class>

</servlet>

<servlet-mapping>

<servlet-name>auEngine</servlet-name>

<url-pattern>/zkau/\*</url-pattern>

</servlet-mapping>

<welcome-file-list id="WelcomeFileList">

<welcome-file>index.zul</welcome-file>

</welcome-file-list>

</web-app>

Furthermore let's have a small ZUL page that has the interface to retrieve and show flight data:

<?xml version="1.0" encoding="UTF-8"?>

<p:window [xmlns:p="http://www.zkoss.org/2005/zul"](http://www.zkoss.org/2005/zul) [xmlns:h="http://www.w3.org/1999/xhtml"](http://www.w3.org/1999/xhtml) [xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"](http://www.w3.org/2001/XMLSchema-instance) [xsi:schemaLocation="http://www.zkoss.org/2005/zul](http://www.zkoss.org/2005/zul)

<http://www.zkoss.org/2005/zul> "

id="query" **use="com.myfoo.controller.SampleController"**>

<p:grid>

<p:rows>

<p:row>

Airline Code:

<p:textbox id="airlinecode"/>

</p:row>

<p:row>

Flightnumber:

<p:textbox id="flightnumber"/>

</p:row>

<p:row>

Flightdate:

<p:datebox id="flightdate"/>

</p:row>

<p:row>

<p:button label="Search" id="search"/>

<p:separator width="5px"/>

</p:row>

</p:rows>

</p:grid>

<p:listbox width="100%" id="resultlist" mold="paging" rows="21" style="font-size: x-small;">

<p:listhead sizable="true">

<p:listheader label="Airline Code" sort="auto"

style="font-size: x-small;"/>

<p:listheader label="Flightnumber" sort="auto"

style="font-size: x-small;"/>

<p:listheader label="Flightdate" sort="auto"

style="font-size: x-small;"/>

<p:listheader label="Destination" sort="auto"

style="font-size: x-small;"/>

</p:listhead>

</p:listbox>

</p:window>

As you can see, the use attribute of the ZUL page is the link to the SampleController. The SampleController handles and controls the objects. Let's have a short look at the SampleController sample code:

public class SampleController extends Window {

private Listbox resultlist; private Textbox airlinecode; private Textbox flightnumber; private Datebox flightdate; private Button search;

/\*\*

\* Initialize the page

\*/

public void onCreate() {

// Components resultlist = (Listbox)

this.getPage().getFellow("query").getFellow("resultlist");

airlinecode = (Textbox) this.getPage().getFellow("query").getFellow("airlinecode");

flightnumber = (Textbox) this.getPage().getFellow("query").getFellow("flightnumber");

flightdate = (Datebox) this.getPage().getFellow("query").getFellow("flightdate");

search = (Button) this.getPage().getFellow("query").getFellow("search");

search.addEventListener("onClick", new EventListener() {

public void onEvent(Event event) throws Exception { performSearch();

}

});

}

/\*\*

\* Execute the search and fill the list

\*/

private void performSearch() {

//(1) List<Flight> flightlist = ((FlightService)

SpringUtil.getBean("flightService")). getFlightBySearch(airlinecode.getValue(), flightnumber.getValue(), flightdate.getValue(),"");

resultlist.getItems().clear();

for (Flight aFlightlist : flightlist) {

// add flights to list

}

}

}

/\* (1)-shows the integration of the Spring Bean\*/

Just for completion the context file for Spring is listed here with the bean that is called.

<?xml version="1.0" encoding="UTF-8"?>

<!DOCTYPE beans PUBLIC "-//SPRING//DTD BEAN//EN"

["http://www.springframework.org/dtd/spring-beans.dtd">](http://www.springframework.org/dtd/spring-beans.dtd)

<beans>

<bean id="txProxyTemplate" abstract="true" class="org.springframework.transaction.

interceptor.TransactionProxyFactoryBean">

<property name="transactionManager">

<ref bean="transactionManager"/>

</property>

<property name="transactionAttributes">

<props>

<prop key="save\*">PROPAGATION\_REQUIRED</prop>

<prop key="add\*">PROPAGATION\_REQUIRED</prop>

<prop key="remove\*">PROPAGATION\_REQUIRED</prop>

</props>

</property>

</bean>

<bean id="flightService" parent="txProxyTemplate">

<property name="target">

<bean class="com.myfoo.services.impl.FlightServiceImpl">

<property name="flightDAO">

<ref bean="flightDao"/>

</property>

</bean>

</property>

</bean>

</beans>

In short we have learned how to use Spring with ZK and about the configurations. We have seen that the integration is quite smooth and also powerful.

## Hibernate

Well, Hibernate has really nothing to do with a view layer so why are we talking here about this issue?

Normally, Hibernate is used along with Spring to take care of the database transactions. In the Spring sample the section above in we have also shown the integration of Hibernate to do the mapping and DAO handling. However,

unfortunately there is a downer. Hibernate has a different session management. Unlike the ZK multi-threaded environment, Hibernate handles all data accessing operations in one session. To solve this problem the creators of ZK developed their own ZK listener for Hibernate.

This listener has to be configured in the zk.xml:

<listener>

<description>Hibernate thread session context handler</description>

<listener-class>

org.zkoss.zkplus.hibernate.

HibernateSessionContextListener

</listener-class>

</listener>

The <listener> copies the sessionMap to the event thread's ThreadLocal variable whenever a new event thread is initiated. So whenever you call getCurrentSession() in Hibernate the same sessionMap is referenced.

Pay attention of this issue and then Hibernate can be used as described in the Hibernate documentation.



## JasperReport

JasperReport is an open-source reporting engine. It can generate print-quality output like PDF, HTML, and RTF. Because there is no communication between the ZK layer and the JasperReport module the integration is quite easy. Just generate the reports (or graphs or PDFs) with JasperReport and show them with ZK tools. A graphic may be loaded dynamically or a PDF can be shown by opening the link.

To use JasperReport use the Java Controller for a ZUL page and use statements like:

jasperReport = JasperCompileManager.compileReport( "reports/zkbook\_demo.jrxml");

jasperPrint = JasperFillManager.fillReport( jasperReport, new HashMap(), new

JREmptyDataSource());

JasperExportManager.exportReportToPdfFile( jasperPrint, "reports/zkbook.pdf");

There is nothing more to configure.

## ZK Mobile

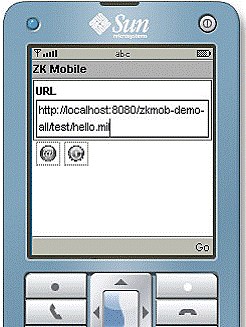
Mobile devices have become more and more popular. There are some tools in the market to create mobile websites. ZK also supports the mobile device market with a special ZK Mobile solution. This ZK Mobile client has to be installed into

the mobile device and should be made to run as a thin client to interact with a ZK server. However, the solution isn't perfect because the user has to install software on his or her device even if he or she wishes to access only a single website. But the installation process on mobile devices can be automated so it's not that big an issue.

ZK Mobile features 10 out-of-the-box components:

* listbox
* listitem
* textbox
* image
* label
* command
* datebox
* decimalbox
* intbox
* frame

Also, the way of developing ZK applications is similar in ZK Mobile. After the installation of the ZK Mobile client (easy with zkmob.jad) any URL pointing to a ZK application may be called. See the following sample picture:



Instead of using the extension \*.zul the extension \*.mil is used for pages. MIL stands for Mobile Interactive Language. In other chapters we have learned that we need a Loader to interpret the ZUL pages and one will also be needed for

MIL pages.

The web.xml modifications are:

<servlet-mapping>

<servlet-name>zkLoader</servlet-name>

<url-pattern>\*.mil</url-pattern>

</servlet-mapping>

<mime-mapping>

<extension>jad</extension>

<mime-type>text/vnd.sun.j2me.app-descriptor</mime-type>

</mime-mapping>

<welcome-file-list>

<welcome-file>index.mil</welcome-file>

</welcome-file-list>

To use ZK Mobile it is necessary to use at least version 3.0.0 of the ZK framework.

## ZK JSP Tags Library

ZK as an AJAX framework has its own interpreting and rendering technology. In some cases, however, the developer would like to use JSP pages and add some ZK features. Maybe there is a large application with hundreds of JSP pages that can't migrate so easily. For this purpose ZK provides the ZK JSP tags library.

Actually the ZK JSP tags library consists of two files:

* zuljsp.jar
* zuljsp.tld

Declare the namespace in the JSP files and start using ZK via tags. Check this

sample.jsp:

<%@ taglib [uri="http://www.zkoss.org/2005/zul/jsp"](http://www.zkoss.org/2005/zul/jsp) prefix="j" %>

<j:page zscriptLanguage="java">

<h3>JSP Tag Demo</h3>

<j:window title="jsp demo" border="normal" width="650px">

<j:button label="Click Me">

<j:attribute name="onClick">{

Messagebox.show("It works.", "Information", Messagebox.OK, Messagebox.INFORMATION);

}

</j:attribute>

</j:button>

<j:vbox id="demo"/>

</j:window>

</j:page>

## ZK JSF Components

To enable features from JSF like Validator and ValueBinding the ZK JSF Components wrap ZK components.

Similarly to with the JSP components, just declare the name space and start using the components, that is:

<%@ taglib [uri="http://www.zkoss.org/jsf/zul"](http://www.zkoss.org/jsf/zul) prefix="z"%>

The sample code from the JSP section will look like:

<HTML>

<HEAD>

<title>JSF Component Demo</title>

</HEAD>

<%@ taglib [uri="http://java.sun.com/jsf/html"](http://java.sun.com/jsf/html) prefix="h"%>

<%@ taglib [uri="http://java.sun.com/jsf/core"](http://java.sun.com/jsf/core) prefix="f"%>

<%@ taglib [uri="http://www.zkoss.org/jsf/zul"](http://www.zkoss.org/jsf/zul) prefix="z"%>

<f:view>

<z:page>

<z:window title="jsf demo" border="normal">

<z:button label="Click Me">

<z:attribute name="onClick">{

Messagebox.show("It works.", "Information", Messagebox.OK, Messagebox. INFORMATION);

}</z:attribute>

</z:button>

<z:vbox id="demo"/>

</z:window>

</z:page>

</f:view>

</body>

</HTML>

## Binding to a Backing Bean

With the EditableValueHolder implementation a component can bind values to and from a backing bean. The input ZK components implement the EditableValueHolder interface and the following table shows the list of components with the, class of binding target and the attribute of the ZK component that will be set in wrapping.

|  |  |  |
| --- | --- | --- |
| **ZK JSF Component** | **Class of Binding** | **Attribute of ZK Component** |
| Bandbox | String | value |
| Calendar | Date | value |
| Checkbox | Boolean | checked |
| Combobox | String | value |
| Datebox | Date | text |
| Decimalbox | BigDecimal | text |
| Doublebox | Double | text |
| Intbox | Integer | text |
| Listbox | String  String[] (multiple selection) | Binding on selection |
| Radiogroup | String | Binding on selection |
| Slider | Integer | curpos |
| Timebox | Date | text |
| Textbox | String | value |
| Tree | String  String[] (multiple selection) | Binding on selection |

#### ValueBinding of a component

The binding follows typical JSF style. See the following code snippet:

<z:window z:title="ValueBinding Demo" width="650px" >

<z:textbox id="demotextbox"

**f:value="#{ValueBindingBean.text}"** /><br/>

<z:intbox id="demointbox"

**f:value="#{ValueBindingBean.number}"** /><br/>

<z:datebox id="demodatebox" format="dd/MM/yyyy"

**f:value="#{ValueBindingBean.date}"** />

<br/>

<z:listbox id="demolistbox"

**f:value="#{ValueBindingBean.selection}"**>

<z:listitem value="1" label="Text 1" />

<z:listitem value="2" label="Text 2" />

<z:listitem value="3" label="Text 3" />

<z:listitem value="4" label="Text 4" />

<z:listitem value="5" llaabbeell==""TTTeexxxttt 55"" />

<z:listitem value="6" label="Text 6" />

</z:listbox>

<h:commandButton id="submit" action="#{ValueBindingBean.doSubmit}" value="Submit" />

</z:window>

## Summary

We started this chapter with advantages and disadvantages. Then we saw how to integrate ZK with the Spring Framework and also why it is useful to do so. We

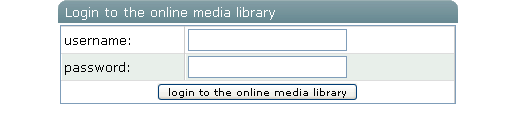
then moved on to Hibernate and JasperReport. Then we had a quick brush with ZK Mobile, ZK JSP tags library, and ZK JSF components.

Creating Custom Components

After the tutorial, and the integration of some interesting framework into the ZK framework, it's interesting to see how to customize existing components, and to create our own components for the framework, which you could spread around the community.

## Cascading Style Sheets (CSS)

One way to customize components is by the use of **Cascading Style Sheets**. This technique is familiar from HTML, and therefore, it's normal that Potix (the manufacturer of ZK framework) decided to offer that possibility as well.



A possible way to customize a component with a style is by using the style attribute of an element. We start by changing the layout of the login button.

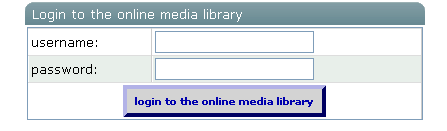
<button label="${login}" style="border: 4px outset;background-color: lightgray;padding:5px;color: #0000AF; font-weight:bold">

<attribute name="onClick"> login();

</attribute>

</button>

The result is shown as follows:.



Another solution for defining the layout of a control is to externalize the style definition (instead of using the style attribute). With this solution, we have the benefit of being able to reuse the style definition. The definitions from the external stylesheet could be used with the sclass attribute.

<label value="${labelPassword}" sclass="simplelabel" />

To provide the definition, we can either embed the style directly into the ZUL page, or include an external CSS file.

External variant:

<style src="/css/sample-styles.css"/>

.simplelabel

{

padding:2px; color: black; font-weight:bold;

}

The mentioned path (/css/sample-styles.css) is relative to the web application. Embedded variant:

<style> mylabel

{

padding:2px; color: black; font-weight:bold;

}

</style>

The changed mask is shown as follows:



It's good to externalize the stylesheets into a file. With this mechanism it's possible to reuse the styles across pages. The disadvantage is that we have to specify the sclass attribute every time we want to use it. A more comfortable way is to define our own component, and use it.

<?component name="loginLabel" extends="label" sclass="mylabel"?>

<loginLabel value="${labelUsername}" />

To use an extended component in the whole application, we have to define a language-addon. A language-addon allows the usage of a component in the whole application. Such an addon contains a set of components. First we have to provide a file that defines the addons. An example is as follows.

<?xml version="1.0" encoding="UTF-8"?>

<language-addon>

<addon-name>my-addon</addon-name>

<language-name>xul/html</language-name>

<component>

<component-name>specialLabel</component-name>

<extends>label</extends>

<property>

<property-name>sclass</property-name>

<property-value>simplelabel</property-value>

</property>

</component>

</language-addon>

|  |  |
| --- | --- |
| language- name | The language of the addon. The possible languages are defined in the lang.xml file which is provided from the ZK framework. |
| addon-name | The name of the addon. The addon name is the identifier for the addon. That name must be unique for one web application. |
| component- name | The name of the component. This name is used in the ZUL files to integrate the component. |
| extends | This is same as the extends in a Java class. Here, we define the base component. |
| property | Inside property, we define the predefined attributes for the component. |

To register a language-addon, we have two possibilities. The first one is to place the file into the metainfo/zk directory, and name it language-addon.xml. Another way is to register the file inside the optional configuration zk.xml file. This file has to be located inside the WEB-INF directory. The zk.xml file to register a language-addon is depicted.

<?xml version="1.0" encoding="UTF-8"?>

<zk>

<language-config>

<addon-uri>/WEB-INF/my-addon.xml</addon-uri>

</language-config>

</zk>

Now we can use the component inside the pages.

<specialLabel value="${labelPassword}" />

A language-addon can do many more things for you. For example, with the component-class attribute you can provide your own class for the component. Just look into lang.xml file of the zul.jar file of the ZK framework.



## Macro Components

Beyond the possibility of customizing existing components with the help of CSS files, it's also possible to create new components based on existing ones. In our sample login page, we used a label followed by a textbox component. Now we will replace that component with a component that has a label, and a textbox.

<specialLabel value="${labelPassword}" />

<a:bind value="user.password" />

<textbox type="password" id="password" constraint="no empty"/>

Now we start creating a macro component, and use that component in the page. The interesting thing about the macro component itself is the usage of annotation-based data binding in the macro component.

The first step is to create the macro ZUL file.

<zk xmlns=["http://www.zkoss.org/2005/zul"](http://www.zkoss.org/2005/zul) [xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"](http://www.w3.org/2001/XMLSchema-instance)

[xsi:schemaLocation="http://www.zkoss.org/2005/zul](http://www.zkoss.org/2005/zul) ../WEB- INF/xsd/zul/zul.xsd"

[xmlns:a="http://www.zkoss.org/2005/zk/annotation">](http://www.zkoss.org/2005/zk/annotation)

<?init class="org.zkoss.zkplus.databind.AnnotateDataBinderInit" ?>

<label value="${arg.labelvalue}" />

<a:bind value="user.password" />

<textbox type="password" id="password" constraint="no empty"/>

<zscript>

import com.packtpub.zk.media.model.\*;

User user = self.getDynamicProperty(„user");

</zscript>

</zk>

To use data binding based on annotation, we have to declare the org.zkoss. zkplus.databind.AnnotateDataBinderInit initialization class. In our example, the component we created is of type org.zkoss.zk.ui.HtmlMacroComponent.

To initialize the user for the databinding, we have to access the property with the

getDynamicProperty method.

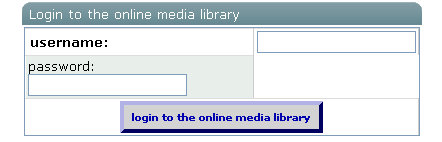
In the ZUL page, we have to define the new component as:

<?component name="passwordLine" macro-uri="/WEB-INF/macros/ passwordline.zul"?>

Now we can use this component as follows:

<passwordLine id="passwordMacro" user="${user}" labelvalue="${labelPa ssword}"/>

If we use the new component in the login page, the screen looks like the following screenshot.



The resulting screen is not as expected. This is because of the row component used. This component creates each component inside a cell (in HTML a <td> tag). For the row, our components appear like one component. To solve the problem, we can change the layout of the login page, or extend the row component. However, that's not within the scope of the chapter. Before we start with the implementation of our component, we should look at the actual login.zul. The sample-style.css is shown as follows.

<?xml version="1.0" encoding="UTF-8"?>

<zk [xmlns:html="http://www.w3.org/1999/xhtml"](http://www.w3.org/1999/xhtml) [xmlns:a="http://www.zkoss.org/2005/zk/annotation">](http://www.zkoss.org/2005/zk/annotation)

<?init class="org.zkoss.zkplus.databind.AnnotateDataBinderInit" ?>

<style src="/css/sample-styles.css"/>

<style>

.mylabel

{

padding:2px; color: black; font-weight:bold;

}

</style>

<zscript>

import com.packtpub.zk.media.model.\*;

</zscript>

<?component name="loginLabel" extends="label" sclass="mylabel"?>

<?component name="passwordLine" macro-uri="/WEB- INF/macros/passwordline.zul"?>

<div align="center">

<window width="400px" title="Login to the online media library"

onOK="login()">

<grid>

<rows>

<zscript>

String labelUsername = org.zkoss.util.resource.Labels

.getLabel("login.username");

String labelPassword = org.zkoss.util.resource.Labels

.getLabel("login.password"); String login = org.zkoss.util.resource.Labels

.getLabel("login.button");

</zscript>

<row>

<loginLabel value="${labelUsername}" />

<a:bind value="user.name"/>

<textbox id="username" constraint="no empty"/>

</row>

<row>

<passwordLine id="passwordMacro" user="${user}" labelvalue="${labelPassword}"/>

</row>

<row spans="2" align="center">

<button label="${login}" style="border: 4px outset; background-color:lightgray;padding:5px; color: #0000AF; font-weight:bold">

<attribute name="onClick"> login();

</attribute>

</button>

</row>

</rows>

</grid>

</window>

</div>

<zscript>

void login()

{

//validate the username username.getValue();

//validate the password

password.getValue(); UserFactory.login(user); Executions.sendRedirect("index.zul");

}

</zscript>

<!-- Initialize the model objects for using with anotations -->

<zscript>

com.packtpub.zk.media.model.User user = com.packtpub.zk.media

.model.UserFactory.create();

</zscript>

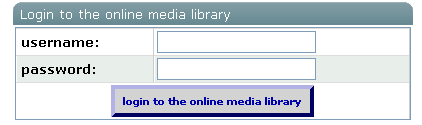
</zk>

## Creating Our Own Component

After we have customized the layout and the styles, and created our own components based on existing components it's time to create a custom component.

In application development, it should be rare to create a custom component, but to have a complete understanding of the framework it could be important to know how a component is created.

In the example login.zul, we use a window component with a title ('**Login to the online media library**').



Now, we try to create our own window component. The first step is to define a

language-addon.

<?xml version="1.0" encoding="UTF-8"?>

<language-addon>

<addon-name>my-window</addon-name>

<language-name>xul/html</language-name>

<component>

<component-name>mywindow</component-name>

<component-class>org.zkoss.zul.Window</component-class>

<mold>

<mold-name>default</mold-name>

<mold-uri>my-window.dsp</mold-uri>

</mold>

</component>

</language-addon>

In the language-addon, we use the original class org.zkoss.zul.Window. An exciting part of the language-addon definition is mold. Here, we define our own

.dsp file which is responsible for rendering the component as HTML.

This is the original window.dsp in the directory web/zul/html of the archive

zul.jar:

<%--

window.dsp

{

{

IS\_NOTE

Purpose: Description: z.autoz:

Automatically adjust z-index onmousedown (au.js) History:

Tue May 31 19:37:23 2005, Created by tomyeh

}

}

IS\_NOTE

Copyright (C) 2005 Potix Corporation. All Rights Reserved.

{

{

IS\_RIGHT

This program is distributed under GPL Version 2.0 in the hope that it will be useful, but WITHOUT ANY WARRANTY.

}

}

IS\_RIGHT

--%>

<%@ taglib uri="/WEB-INF/tld/web/core.dsp.tld" prefix="c" %>

<%@ taglib uri="/WEB-INF/tld/zk/core.dsp.tld" prefix="z" %>

<c:set var="self" value="${requestScope.arg.self}"/>

<c:set var="titlesc" value="${self.titleSclass}"/>

<div id="${self.uuid}" z.type="zul.wnd.Wnd" z.autoz="true"${self.outerAttrs}${self.innerAttrs}>

<div>

<%-- for animation effect --%>

<c:choose>

<c:when test="${empty self.caption and empty self.title}">

<c:if test="${c:isExplorer() and !c:isExplorer7()}">

<%-- Bug 1579515: to clickable, a child with 100% width is required for DIV --%>

<table width="100%" border="0" cellpadding="0"

cellspacing="0">

<tr height="1px"><td></td></tr>

</table>

</c:if>

</c:when>

<c:otherwise>

<table width="100%" border="0" cellpadding="0"

cellspacing="0">

<c:choose>

<c:when test="${empty self.caption}">

<tr id="${self.uuid}!caption" class="title">

<td class="l${titlesc}"></td>

<td class="m${titlesc}">

<c:out value="${self.title}"/>

</td>

<c:if test="${self.closable}">

<td width="16" class="m${titlesc}">

<img id="${self.uuid}!close" src="${c:encodeURL ('~./zul/img/close-off.gif')}"/>

</td>

</c:if>

<td class="r${titlesc}"></td>

</tr>

</c:when>

<c:otherwise>

<tr id="${self.uuid}!caption">

<%-- title and closable button are generated by

caption.dsp --%>

<td class="l${titlesc}"></td>

<td class="m${titlesc}">

${z:redraw(self.caption, null)}

</td>

<td class="r${titlesc}"></td>

</tr>

</c:otherwise>

</c:choose>

</table>

<c:set var="wcExtStyle" value="border-top:0;"/>

<%-- used below --%>

</c:otherwise>

</c:choose>

<c:set var="wcExtStyle" value="${c:cat(wcExtStyle, self.contentStyle)}"/>

<div id="${self.uuid}!cave" class="${self.contentSclass}"$

{c:attr('style',wcExtStyle)}>

<c:forEach var="child" items="${self.children}">

<c:if test="${self.caption != child}">

${z:redraw(child, null)}</c:if>

</c:forEach>

</div>

<%-- we don't generate shadow here since it looks odd when on

top of modal mask --%>

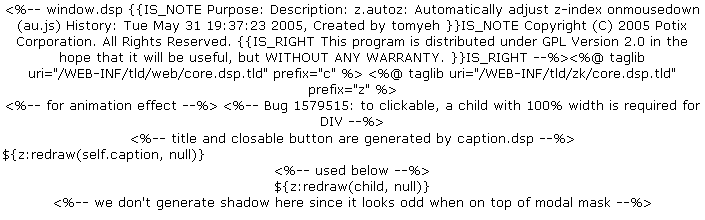
</div>

</div>

Now, we can use the new component in our login.zul.

<mywindow width="400px" title="Login to the online media library" onOK="login()">

Now, if we call the changed login.zul, we get the following output.



This isn't the expected result. The problem here is that the .dsp file should be parsed. To do that we have to register the org.zkoss.web.servlet.dsp. InterpreterServlet in the web.xml.

<servlet>

<servlet-name>dspLoader</servlet-name>

<servlet-class> org.zkoss.web.servlet.dsp.InterpreterServlet

</servlet-class>

</servlet>

<servlet-mapping>

<servlet-name>dspLoader</servlet-name>

<url-pattern>\*.dsp</url-pattern>

</servlet-mapping>

A .dsp file is not a JSP page. However, we can use JSP syntax and tags inside such a .dsp file. For completion, we show the complete web.xml of the application. A custom component renders its dynamic HTML code based on the XML attributes and the content of the control in a JSP fashion.

<?xml version="1.0" encoding="UTF-8"?>

<web-app version="2.4" [xmlns="http://java.sun.com/xml/ns/j2ee"](http://java.sun.com/xml/ns/j2ee) [xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"](http://www.w3.org/2001/XMLSchema-instance) [xsi:schemaLocation="http://java.sun.com/xml/ns/j2ee](http://java.sun.com/xml/ns/j2ee)

[http://java.sun.com/xml/ns/j2ee/web-app\_2\_4.xsd">](http://java.sun.com/xml/ns/j2ee/web-app_2_4.xsd)

<description><![CDATA[A online media library]]></description>

<display-name>zkmedialib</display-name>

<!-- ZK -->

<listener>

<description>

Used to cleanup when a session is destroyed</description>

<display-name>ZK Session Cleaner</display-name>

<listener-class> org.zkoss.zk.ui.http.HttpSessionListener

</listener-class>

</listener>

<filter>

<filter-name>SecurityFilter</filter-name>

<filter-class> com.packtpub.zk.media.controller.SecurityFilter

</filter-class>

<init-param>

<param-name>loginPage</param-name>

<param-value>login.zul</param-value>

</init-param>

</filter>

<filter-mapping>

<filter-name>SecurityFilter</filter-name>

<url-pattern>\*.zul</url-pattern>

</filter-mapping>

<servlet>

<description>ZK loader for ZUML pages</description>

<servlet-name>zkLoader</servlet-name>

<servlet-class> org.zkoss.zk.ui.http.DHtmlLayoutServlet

</servlet-class>

<!-- Required. Specifies URI of the update engine (DHtmlUpdateServlet).It must be the same as <url-pattern> for the update engine.-->

<init-param>

<param-name>update-uri</param-name>

<param-value>/zkau</param-value>

</init-param>

<load-on-startup>1</load-on-startup>

</servlet>

<servlet>

<description>

The asynchronous update engine for ZK

</description>

<servlet-name>auEngine</servlet-name>

<servlet-class> org.zkoss.zk.au.http.DHtmlUpdateServlet</servlet-class>

</servlet>

<servlet>

<servlet-name>dspLoader</servlet-name>

<servlet-class> org.zkoss.web.servlet.dsp.InterpreterServlet

</servlet-class>

</servlet>

<servlet-mapping>

<servlet-name>zkLoader</servlet-name>

<url-pattern>\*.zul</url-pattern>

</servlet-mapping>

<servlet-mapping>

<servlet-name>zkLoader</servlet-name>

<url-pattern>\*.zhtml</url-pattern>

</servlet-mapping>

<servlet-mapping>

<servlet-name>zkLoader</servlet-name>

<url-pattern>/zk/\*</url-pattern>

</servlet-mapping>

<servlet-mapping>

<servlet-name>auEngine</servlet-name>

<url-pattern>/zkau/\*</url-pattern>

</servlet-mapping>

<servlet-mapping>

<servlet-name>dspLoader</servlet-name>

<url-pattern>\*.dsp</url-pattern>

</servlet-mapping>

<!-- Miscellaneous -->

<session-config>

<session-timeout>120</session-timeout>

</session-config>

<!-- MIME mapping -->

<mime-mapping>

<extension>doc</extension>

<mime-type>application/vnd.ms-word</mime-type>

</mime-mapping>

<mime-mapping>

<extension>gif</extension>

<mime-type>image/gif</mime-type>

</mime-mapping>

<mime-mapping>

<extension>htm</extension>

<mime-type>text/html</mime-type>

</mime-mapping>

<mime-mapping>

<extension>html</extension>

<mime-type>text/html</mime-type>

</mime-mapping>

<mime-mapping>

<extension>jad</extension>

<mime-type>text/vnd.sun.j2me.app-descriptor</mime-type>

</mime-mapping>

<mime-mapping>

<extension>jnlp</extension>

<mime-type>application/x-java-jnlp-file</mime-type>

</mime-mapping>

<mime-mapping>

<extension>jpeg</extension>

<mime-type>image/jpeg</mime-type>

</mime-mapping>

<mime-mapping>

<extension>jpg</extension>

<mime-type>image/jpeg</mime-type>

</mime-mapping>

<mime-mapping>

<extension>js</extension>

<mime-type>application/x-javascript</mime-type>

</mime-mapping>

<mime-mapping>

<extension>pdf</extension>

<mime-type>application/pdf</mime-type>

</mime-mapping>

<mime-mapping>

<extension>png</extension>

<mime-type>image/png</mime-type>

</mime-mapping>

<mime-mapping>

<extension>txt</extension>

<mime-type>text/plain</mime-type>

</mime-mapping>

<mime-mapping>

<extension>xls</extension>

<mime-type>application/vnd.ms-excel</mime-type>

</mime-mapping>

<mime-mapping>

<extension>xml</extension>

<mime-type>text/xml</mime-type>

</mime-mapping>

<mime-mapping>

<extension>xul</extension>

<mime-type>application/vnd.mozilla.xul-xml</mime-type>

</mime-mapping>

<mime-mapping>

<extension>zhtml</extension>

<mime-type>text/html</mime-type>

</mime-mapping>

<mime-mapping>

<extension>zip</extension>

<mime-type>application/x-zip</mime-type>

</mime-mapping>

<mime-mapping>

<extension>zul</extension>

<mime-type>text/html</mime-type>

</mime-mapping>

<welcome-file-list>

<welcome-file>index.zul</welcome-file>

<welcome-file>index.zhtml</welcome-file>

<welcome-file>index.html</welcome-file>

<welcome-file>index.htm</welcome-file>

</welcome-file-list>

</web-app>

If we want to provide just a new mold to a component, it's possible to declare a mold-uri in the component tag. A new mold means a new



.dsp file.

## Summary

In this chapter, we have learned how to customize existing components. We have the ability to use styles which are known from HTML to change the layout of the components. Additionally we have seen that it is possible to build new components (macro components) on the basis of existing components. And last but not least, in the last section of this chapter we have learned how to create a complete custom component that is based on a .dsp file.

Our advice is first to try to build on an existing component, instead of creating a complete component of your own. Use object-oriented inheritance, not code

duplication, which would loose advantage of error corrections in newer versions.

Development Tools for the

ZK Framework

This chapter discusses some IDE tools for working with ZK. Definitely for effective development with a framework like ZK it is a must to have some IDE support. Right now there is a tool called 'ZeroKode' which recently became an open source project. With ZeroKode it is possible to design a ZUL page. Another tool is 'zk-bench', which is designed as an Eclipse plugin. In the next sections, we discuss the early beta version of zk-bench, which will be provided as a commercial product. Zk-bench is very promising because it gives the developer much more than just 'page designing'.

## ZK-Bench

Zk-bench is designed as an Eclipse plug-in and the installation is pretty easy. There is an update site available as well as an installer for download. Further details are available from [http://www.ir-team.com/index.php/zk-bench.](http://www.ir-team.com/index.php/zk-bench) The company behind zk-bench even offers a forum to discuss problems and features.

The installer asks a few options but it runs very smoothly. After the installation we find a new zk-bench project type available. Zk-bench provides a visual designer for ZUL pages, event handling, and property changes within the IDE, a structural pattern, and persistence support.

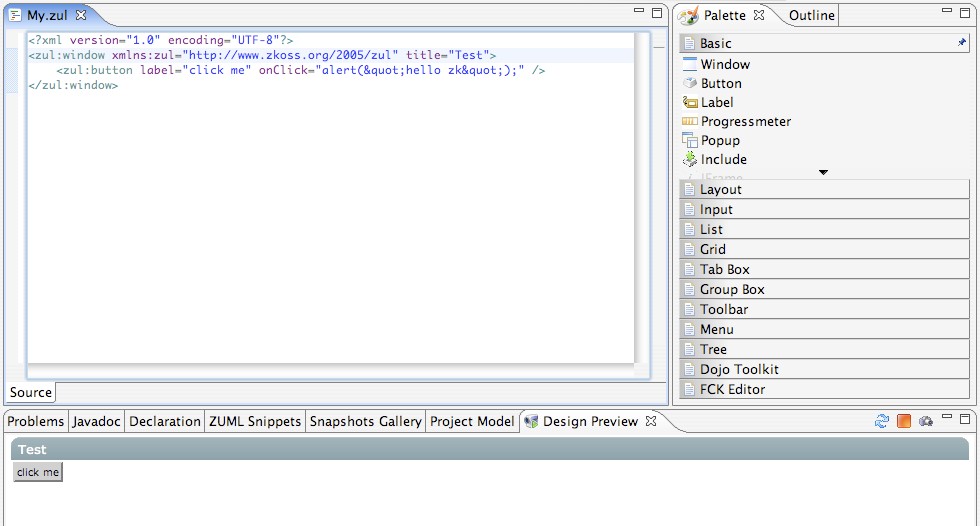
The zk-bench project follows the Maven 2.x directory structure, but that is not visible for the developer, at least not at the first step of work. Maven-specific items like artifactId and groupId are wrapped in more easily understood labels. The default view of the project is a kind of meta-view. So there are folders for images, pages,

Java classes, and the project structure looks very clean even for big projects. The zk-bench project opens a perspective with a graphical editor, the Meta-project explorer, Snippet views, snapshot gallery, and a palette for the ZK components.

With the palette and the visual designer it's just a breeze to design a web page. The selection of a component shows all the properties and it's even possible to manage the events very intuitively. With a click on the component the property menu appears and there is an entry for the action method. Developers who knows Swing Development will feel very comfortable with this kind of design. The result of the design work is a ZUL page and the related Java class.

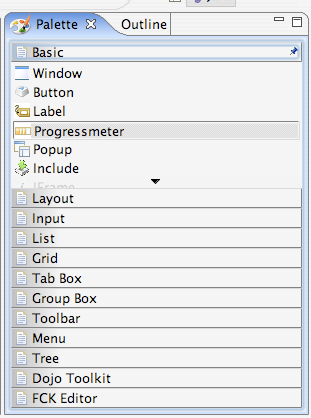
### Dynamic Preview of Pages

During the development of the visual ZUL page there is an option to show the preview of the page. The preview is done in real time so it's nice to see the result of the design process all the time.



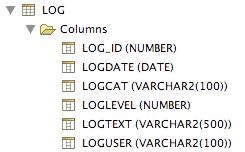
### The Palette

The visual designer provides a palette for all ZK components. The components can be moved from the palette into the designer frame with drag-and-drop. The related palette for a specific ZK version is dynamically loaded. The ZK version is managed in the preferences and zk-bench will dynamically recognize the components.



### Databinding

Zk-bench has its own database explorer and to create a link between a database column and a ZK component we can just drag-and-drop from the database column onto the component in the visual designer.

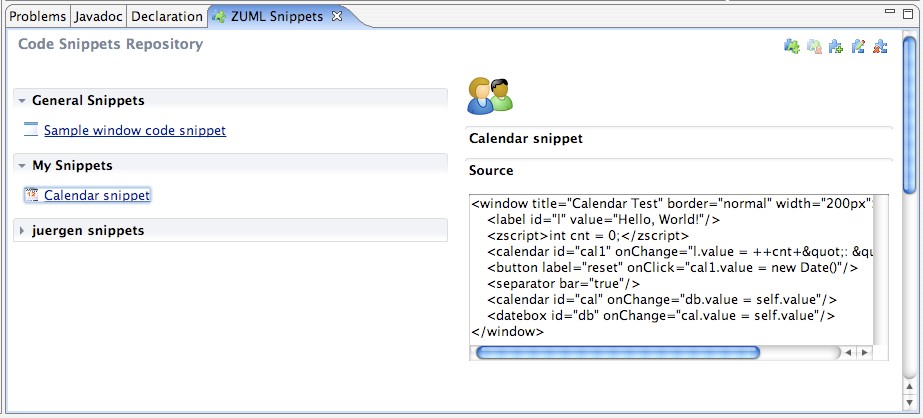


### Deployment

While creating the project the target package type will be specified. In the case of a WAR type, zk-bench will create the WAR package automatically. Internally Maven 2 is used along with IRT—the developers of the zk-bench plug-in plan to support and ANT as well.

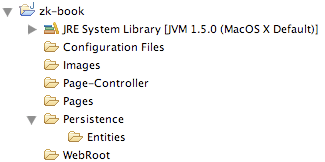
### Snippets

Zk-bench supports an personal snippet repository. It can be used for personal code fragments as well as to share snippets with other users.



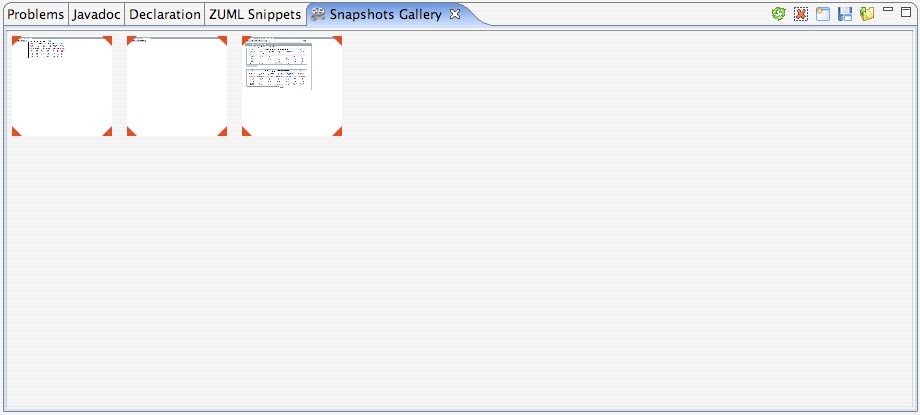
## Project Explorer

Zk-bench provides its own way to find project files. The following picture shows a separate folder for Page-Controller. Folders are automatically created by zk-bench during the design of ZUL pages.



## Snapshot Gallery

With a simple click on an icon a snapshot from the actual view in the preview pane will be created. That is a very useful feature especially in projects with a large number of pages.



## Summary

Zk-bench is a very useful tool and it supports much more than just designing ZUL pages. It simplifies the development of web application a lot and it is built around the ZK framework. By the time this book is written IRT plan—the EAP for the 16th, January 2008 and more features will be available. It will be a pleasure to use such a tool.

Configuration Files in ZK

The following tables contain information about the configuration files, which are important in the context of a ZK application. You should use this appendix in conjunction with Chapter 1 to get a better understanding of how to configure your ZK application.

## WEB.XML

|  |  |
| --- | --- |
| org.zkoss.zk.ui.http.DHtmlLayoutServlet | ZKLoader |
| org.zkoss.zk.au.http.DHtmlUpdateServlet | ZK AU Engine |
| org.zkoss.zk.ui.http.HttpSessionListener | Session Cleaner |
| org.zkoss.zk.ui.http.DHtmlLayoutFilter | Post process filter |

## zk.xml

|  |  |
| --- | --- |
| **Tag** | **Default** |
| <richlet> | - |
| <listener> | - |
| <log> | - |
| <desktop-config> | - |
| ... <desktop-timeout> | 3600 |
| ... <file-check-period> | 5 |
| ... <processing-prompt-delay> | 900 [in milliseconds] |
| ... <tooltip-delay> | 800 [in milliseconds] |

*Configuration Files in ZK*

|  |  |
| --- | --- |
| **Tag** | **Default** |
| ... <theme-uri> | - |
| ... <disable-default-theme> | - |
| ... <el-config> | - |
| ... ... <evaluator-class> | org.apache.commons.el.  ExpressionEvaluatorImpl |
| ... <language-config> | - |
| ... ... <addon-uri> | - |
| ... <session-config> | - |
| ... ... <timeout-uri> | - |
| ... ... <session-timeout> | [see Webserver] |
| ... ... <max-desktops-per- session> | 10 |
| ... <system-config> | - |
| ... ... <max-events-threads> | 100 |
| ... ... <max-upload-size> | 5120 [in KB] |
| ... ... <response-charset> | UTF-8 |
| ... ... <locale-provider-class> | - |
| ... ... <time-zone-provider- class> | - |
| ... ... <cache-provider-class> | org.zkoss.zk.ui.impl.  SessionDesktopCacheProvider |
| ... ... <ui-factory-class> | org.zkoss.zk.ui.http. SimpleUiFactory |
| ... ... <engine-class> | org.zkoss.zk.ui.impl.UiEngineImpl |
| ... ... <web-app-class> | org.zkoss.zk.ui.http.SimpleWebApp |
| ... <zscript-config> | - |
| ... ... <zscript-language> | - |
| ... ... ...<language-name> | - |
| ... ... ... <interpreter-class> | - |
| ... <error-page> | - |
| ... <preference> | - |
| ... ... <name> | - |
| ... ... <value> | - |

*Appendix A*

### Configuration of ZK.XML

#### <richlet> Tag

The richlet tag declares a richlet. It uses two parameters, <richlet-class> and the

<richlet-uri>. For example:

<richlet>

<richlet-class>com.irteam.TestRichlet</richlet-class>

<richlet-url>/test</richlet-url>

</richlet>

The richlet class must implement the org.zkoss.zk.ui.Richlet class. Be aware of the richlet-url because the "/" is necessary.

#### <listener> Tag

More than one listener may be specified in zk.xml. The listener may implement various interfaces. The possible interfaces are:

|  |
| --- |
| org.zkoss.zk.ui.event.EventThreadInit  Initialize an event processing thread before an event is dispatched. |
| org.zkoss.zk.ui.event.EventThreadCleanup  Clean up an event thread after execution. |
| org.zkoss.zk.ui.event.EventThreadSuspend  Called before an event is going to be suspended. |
| org.zkoss.zk.ui.event.EventThreadResume  Called when an event is resumed or aborted. |
| org.zkoss.zk.ui.util.WebAppInit  Called when a ZK application is initialized. |
| org.zkoss.zk.ui.util.WebAppCleanup  Clean up a ZK application, which is destroyed. |
| org.zkoss.zk.ui.util.SessionInit  Invoked when a new Session is initialized. |
| org.zkoss.zk.ui.util.SessionCleanup  Invoked to clean up a session that is destroyed. |
| org.zkoss.zk.ui.util.DesktopInit  Initialize when a new desktop is created. |
| org.zkoss.zk.ui.util.DesktopCleanup  To clean up a desktop that is destroyed. |
| org.zkoss.zk.ui.util.ExecutionInit  Called when a new execution is initialized. |

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|  |
| --- |
| org.zkoss.zk.ui.util.ExecutionCleanup  Clean up an execution which is destroyed. |
| org.zkoss.zk.ui.util.URIInterceptor  This is used to intercept the loading of ZUML pages with the URI. It may be |
| used to confirm if the current user should have access to the URI.  org.zkoss.zk.ui.util.Monitor  This is used to monitor the status of the ZK application. |

#### <log> Tag

Normally, the logging will be performed according to the settings in the web container. This log tag can overwrite the existing settings. If the whole package needs logging then use this tag.

<log>

<log-base></log-base>

</log>

Or use

<log>

<log-base>com.irteam.myapp</log-base>

</log>

if only the package's com.irteam.myapp.\* needs logging.

#### <desktop-config> Tag

This has the following possible child tags: theme-uri, disable-default-theme, desktop-timeout, file-check-period, tooltip-delay, and processing-prompt- delay. The following list describes these child tags.

1. **<desktop-timeout>**

This is the time between client requests, when the desktop will be timed out by the server. A negative value will never time out.

1. **<disable-default-theme>**

This defines the component set whose default theme will be disabled.

1. **<file-check-period>**

This is the waiting time before a file is checked for whether it is modified.

1. **<processing-prompt-delay>**

This is the waiting time before a prompt will be displayed.

*Appendix A*

###### <tooltip-delay>

This is the waiting time before a tool tip will be displayed.

1. **<theme-uri>**

This defines an additional URI for style sheets.

#### <el-config> Tag

This tag has one child, the <evaluator-class>, and it specifies the class used to evaluate the EL expressions.

#### <language-config> Tag

This tag has one child, the <addon-uri> element. It defines the URI of language add-ons. It is used to add new components. This is explained in some of the later chapters in more detail.

#### <session-config> Tag

This element has three child tags: <timeout-uri>, <session-timeout>, and <max- desktops-per-session>.

###### <timeout-uri>

This defines the URI the user will be redirected to, when a session is timed out.

1. **<session-timeout>**

This defines the time between client requests when the session will be timed out by the server.

1. **<max-desktops-per-session>**

This defines the maximum number of desktops within a session.

#### <system-config> Tag

This has nine child tags: <max-event-threads>, <max-upload-size>, <response- charset>, <locale-provider-class>, <time-zone-provider-class>, <cache- provider-class>, <ui-factory-class>, <engine-class>, and <web-app-class>.

###### <max-event-threads>

This specifies the maximum allowed event handling threads.

1. **<max-upload-size>**

This specifies the maximum size of a file that can be uploaded by a client.

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###### <response-charset>

This defines the charset that is used for rendering the ZUML pages.

1. **<locale-provider-class>**

This defines the class that is used to determine the locale. The class must im- plement the org.zkoss.zk.ui.sys.LocaleProvider interface.

###### <time-zone-provider-class>

This defines the class that is used to determine the time zone. The class must implement the org.zkoss.zk.ui.sys.TimeZoneProvider interface.

###### <cache-provider-class>

This defines the class that is used for the desktop cache. The class must implement the org.zkoss.zk.ui.sys.DesktopCacheProvider interface. Right now (zk 2.3.0) there are two implementations available:

* + org.zkoss.zk.ui.impl.SessionDesktopCacheProvider All desktops from a session are stored in a single cache so clustering is not possible.
  + org.zkoss.zk.ui.impl.GlobalDesktopCacheProvider

All desktops from a zk application are stored in a single cache.

1. **<ui-factory-class>**

This defines the class that creates desktops and pages. It also maps URLs to pages. The class must implement the org.zkoss.zk.ui.sys.UiFactory interface. Right now (zk 2.3.0) there are two implementations available:

* + org.zkoss.zk.ui.http.SimpleUiFactory

The generated sessions are not serializeable.

* + org.zkoss.zk.ui.http.SerializableUiFactory

Here the sessions are serializable.

The sessions can be restored after a restart of the web container.

1. **<engine-class>**

This defines the class that implements the UI engine. This class must imple- ment the org.zkoss.zk.ui.sys.UiEngine interface.

###### <webb-app-class>

This implements the web application. It can be extended by org.zkoss. zk.ui.impl.AbstractWebApp or org.zkoss.zk.ui.http.SimpleWebApp.

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#### <zscript-config> Tag

This defines the language and the implementation class.

<zscript-config>

<zscript-language>

<language-name>ZKJava</language-name>

<interpreter-class>com.irteam.ZKJavaInterpreter</interpreter- class>

</zscript-language>

</zscript-config>

#### <error-page> Tag

This defines a URI for a specific uncaught exception.

<error-page>

<exception-type>com.irteam.Special</exception-type>

<location>/error/special.zul</location>

</error-page>

#### <preference> Tag

Any pair of name / value may be defined.

<preference>

<name>com.irteam.preference.AdminAccount</name>

<value>Administrator</value>

</preference>

The values can be read by the getPreference method of the org.zkoss.zk.ui. util.Configuration class.

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