Web Application Framework Component Author's Guide

Sun Java™ Studio Enterprise 7 2004Q4

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Contents

Before You Begin

This *Web Application Framework Component Author's Guide* describes the component architecture of the Web Application Framework and the process whereby component authors can design, create, and distribute new components. This book is intended for prospective Web Application Framework component authors, and assumes that these component authors are already familiar with the Web Application Framework architecture and the Sun™ Java ™ Studio Enterprise 7 2004Q4 development environment (hereafter referred to as the IDE).

Before You Read This Book

Before starting, you should be familiar with concepts used in building web applications using existing J2EE web technologies, such as servlets and JavaServlet Pages™ (JSP™ pages). You should be also already familiar with the Web Application Framework architecture by reading the related Web Application Framework documentation listed later in this chapter.

The following resources can provide additional information:

- *Java 2 Platform, Enterprise Edition Specification*
  http://java.sun.com/j2ee/download.html#platformspec
- *The J2EE Tutorial*
  http://java.sun.com/j2ee/tutorial
- *Java Servlet Specification Version 2.3*
  http://java.sun.com/products/servlet/download.html#specs
- *JavaServer Pages Specification Version 1.2*
  http://java.sun.com/products/jsp/download.html#specs

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How This Book Is Organized

Chapter 1, Overview and Component Architecture provides an overview of Component-Based Development (CBD), Web Application Framework Component Library, the Component Class, and the ComponentInfo Class.

Chapter 2, Developing Components provides a description of the fundamental steps involved in creating, distributing, and using a Web Application Framework component.

Chapter 3, Developing View Components provides a description of the fundamental steps involved in developing view components.

Chapter 4, Developing Model Components provides a description of the fundamental steps involved in developing model components.

Chapter 5, Developing Command Components provides a description of the fundamental steps involved in developing command components.

Chapter 6, ConfigurableBeans (Non-Visual Components) introduces how the IDE toolset makes use of the ConfigurableBean, the role it plays, and the relationship between Web Application Framework and the ConfigurableBean types.

Chapter 7, Developing and Distributing Non-Extensible Model, Command and ContainerView Components introduces the steps to develop and distribute non-extensible Model, Command, and ContainerView components.

Chapter 8, Design Actions describes developing extensible components which have component design actions, defines a component design action, and shows how to expose design action in `ComponentInfo`.

Chapter A, Component Library Structure offers an overview of the component library and the component library structure, and details the component manifest, with a description of automated unpacking of component tag libraries (TLD) files, and automated unpacking of "Additional Files".

Typographic Conventions

Typeface	Meaning	Examples
`AaBbCc123`	The names of commands, files, and directories; on-screen computer output	Edit your `.cvspass` file. Use `DIR` to list all files. `Search is complete.`

`AaBbCc123`	What you type, when contrasted with on-screen computer output	`>` **`login`**
		`Password:`

AaBbCc123	Book titles, new words or terms, words to be emphasized	Read Chapter 6 in the *User's Guide*. These are called *class* options. You *must* save your changes.
AaBbCc123	Command-line variable; replace with a real name or value	To delete a file, type **`DEL`** *filename*.

Related Documentation

Java Studio Enterprise documentation includes books and tutorials delivered in Acrobat Reader (PDF) format, release notes, online help, and tutorials delivered in HTML format.

Documentation Available Online

The documents described in this section are available from the `docs.sun.com`SM web site and from the Documentation link from the Sun Java Studio Enterprise Developers Source portal (`http://developers.sun.com/jsenterprise)`.

The `docs.sun.com` web site (`http://docs.sun.com`) enables you to read, print, and buy Sun Microsystems manuals through the Internet.

- *Sun Java Studio Enterprise 7 Release Notes* - part no. 819-0905-10

  Describes last-minute release changes and technical notes.

- *Sun Java Studio Enterprise 7 Installation Guide* (PDF format) - part no. 817-7971-10

  Describes how to install the Sun Java Studio Enterprise 7 integrated development environment (IDE) on each supported platform and includes other pertinent information, such as system requirements, upgrade instructions, server information, command-line switches, installed subdirectories, database integration, and information on how to use the Update Center.

- *Building J2EE Applications* - part no. 819-0819-10

  Describes how to assemble EJB modules and web modules into a J2EE application and how to deploy and run a J2EE application.

- Web Application Framework documentation (PDF format)
  - *Web Application Framework Component Author's Guide* - part no. 819-0724-10

    Describes the Web Application Framework component architecture and the process to design, create, and distribute new components.

  - *Web Application Framework Component Reference Guide* - part no. 819-0725-10

    Describes the components available in the Web Application Framework Library.

  - *Web Application Framework Overview* - part no. 819-0726-10

    Introduces the Web Application Framework and what it is, how it works, and what sets it apart from other application frameworks.

  - *Web Application Framework Tutorial*- part no. 819-0727-10

    Introduces the mechanics and techniques to build a web application using the Web Application Framework tools.

  - *Web Application Framework Developer's Guide* - part no. 819-0728-10

    Provides the steps to create and use application components that can be assembled to develop an application using the Web Application Framework and explains how to deploy the application in most J2EE containers.

  - *Web Application Framework IDE Guide* - part no. 819-0729-10

    Describes the various parts of the Sun Java Studio Enterprise 7 2004Q4 IDE and emphasizes the use of the visual tools for developing a Web Application Framework application.

  - *Web Application Framework Tag Library Reference* - part no. 819-0730-10

    Gives a brief introduction to the Web Application Framework tag library, as well as a comprehensive reference to the tags available within the library.

Tutorials

Sun Java Studio Enterprise 7 tutorials help you understand the features of the IDE. Each tutorial provides techniques and code samples that you can use or modify in developing more substantial applications. All tutorials illustrate deployment with Sun Java System Application Server.

All tutorials are available from the Tutorials and Code Camps link off the Developers Source portal, which you can access from within the IDE by choosing Help > Examples and Tutorials.

- **QuickStart guides** provide an introduction to the Sun Java Studio IDE. Start with a QuickStart tutorial if you are either new to the Sun Java Studio IDE or want a quick introduction to a particular feature. These tutorials describe how to develop simple web and J2EE applications, generate web services, and how to get started with UML modeling and Refactoring. QuickStarts take minutes to complete.
- **Tutorials** focus on a single feature of the Sun Java Studio IDE. Try these if you are interested in the details of a particular feature. Some tutorials build an application from the ground up, while others build on provided source files, depending on the focus of the example. You can complete a tutorial in an hour or less.
- **Narrated Tutorials** use video to illustrate a feature or technique. Try a narrated tutorials for a visual overview of the IDE or an in-depth presentation of a particular feature. You can complete a narrated tutorial in a few minutes. You can also start and stop a narrated tutorial at any point you wish.

Online Help

Online help is available in the Sun Java Studio Enterprise 7 IDE. You can open help by pressing the help key (F1 in Microsoft Windows environments, Help key in the Solaris environment), or by choosing Help → Contents. Either action displays a list of help topics and a search facility.

Documentation in Accessible Formats

The documentation is provided in accessible formats that are readable by assistive technologies for users with disabilities. You can find accessible versions of documentation as described in the following table.

Type of Documentation	Format and Location of Accessible Version
Books and tutorials	HTML at `http://docs.sun.com`
Tutorials	HTML at the Examples and Code Camps link from the Developers Source portal at `http://developers.sun.com/jsenterprise`
Release notes	HTML at `http://docs.sun.com`

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Please include the book's title (*Web Application Framework Component Author's Guide*) and its part number (819-0724-10) in the subject line of your email.

CHAPTER 1

Overview and Component Architecture

Component-Based Development (CBD)

Component-Based Development (CBD) is a highly regarded engineering strategy whereby the production, distribution, and consumption of components contribute to more efficient and reliable application development. Mature CBD combines a robust component model with a component-aware IDE.

The producers of components (component authors) are responsible for developing components according to the specification of a particular component model (component architecture). A component model formalizes component structure and specifies a means of component distribution. A mature component model also allows each component to be self-describing, so that it can advertise its features to component consumers. Components are typically distributed as collections known as component libraries.

Components can come in a variety of flavors intended for use in different development scenarios. For example, components can be designed in a very generic, or horizontal fashion to cut across a range of specific development needs. These components tend to be the broadest components available, with their strength being flexibility and customizability. These types of components are usable by many different application developer populations, across projects and companies, and in the Web application space, and generally are not biased toward any particular look and feel. Alternatively, other components can be designed to satisfy a narrower, vertical set of development needs. These components are tailored to a particular usage scenario, allowing them to provide high-level features and high ease-of-use. These types of components are less broadly usable, but because their scope is more narrowly defined, they can keep parameterization to a minimum and use a particular look and feel.

The consumers of components are typically application developers. In CBD, application development consists primarily of aggregating or assembling a particular application from a collection of reusable components. The greater the coverage provided by the components, the smaller the amount of application-specific code.

A component-aware IDE is necessary to expose components to the component consumers. The IDE leverages the self-describing nature of components to dynamically present components for instantiation and configuration. The IDE is the final piece of the puzzle, but it is very significant. Without a component-aware IDE, the component model exists only on paper. Without a component-aware IDE, developers can only use a component as they would any other Java class, through its public API. A component-aware IDE, on the other hand, allows developers to browse through collections of components, visually assemble components into application entities, and configure components by declaratively filling in component-specific property sheets.

The rest of this document describes the Sun™ ONE Application Framework component model, and the manner in which component authors can leverage that component model to create powerful component libraries.

What is a Web Application Framework Component?

Since its inception, the Web Application Framework has supported a component model for certain types of objects. However, the prior component model relied on developers to learn each component's API and write code to use that component in their applications. Although this level of functionality was sufficient and provided a significant productivity advantage over contemporary competitors, the Web Application Framework has significantly extended its component model to encompass all types of primary Web Application Framework application objects (Views, Models, and Commands). Furthermore, the Web Application Framework module for the IDE now provides a full featured, component-aware IDE that creates a visual development environment for Web Application Framework applications.

In Web Application Framework terms, a component is one of the various types of supported component classes (Views, Models, and Commands) in conjunction with metadata information. This metadata is encapsulated in a Web Application Framework-specific class called a `ComponentInfo` class. At design-time, the Sun Java System can inspect the ComponentInfo and present the component in an easy-to-use visual fashion.

The metadata stored in `ComponentInfo` classes is intended to enable automated use of the component in a development environment, such as the Sun Java System. Developers can still manually create and use various types of components in their applications without defining a `ComponentInfo` class.

Web Application Framework Component Libraries

The Web Application Framework component model requires that components intended for discovery by the IDE toolset must be packaged into a specific component library format. A Web Application Framework component library consists of a standard JAR file containing the component classes, ComponentInfo metadata classes, and a single component library manifest file. The component library manifest file is described in detail later in this document.

Note – A component library JAR can contain any number of non-component related classes. It is just a standard JAR file with some component-model-specific additions.

Application developers make use of the Web Application Framework component libraries by placing them in their Web application's `WEB-INF/lib` directory. The IDE toolset automatically recognizes and mounts any component libraries placed in that directory. After the IDE toolset has discovered and inspected the libraries (it might take a minute or two due to background thread latency), the library components are available for use within the application. The components are then said to be registered with the IDE toolset.

Hint: The library manifest inspection and component registration process recurs every time a Web Application Framework application is remounted within the IDE toolset. This is natural and should be expected, because the component model is entirely dynamic. However, both component authors and application developers should be aware of this process and understand that the accidental or intentional removal of a component library from the application’s `WEB-INF/lib` directory results in the expected omission of those components the next time the application is mounted.

IDE troubleshooting hint: A common mistake of newcomers to the Sun Java System is to improperly mount a Web application. The IDE's Web application module (upon which the Web Application Framework toolset module is built) only recognizes a mounted file system as a Web application if the mount point corresponds with the root of the Web application structure. If you do not mount the Web application at its root directory, the IDE treats it as a conventional file system, and fails to provide the Web Application Framework application view that you expect. Keep this in mind as you build and test your first components. The easiest way to avoid any confusion in this regard is to use the Mount Web Application action of the IDE instead of the Mount File System action.

The Web Application Framework Component Library

The Web Application Framework Component Library contains the core interfaces, run-time classes, and many basic components that you use to create a Web Application Framework application. The standard Web Application Framework Component Library is packaged as a single JAR file, and should appear in your application's `WEB-INF/lib` directory.

When creating a Web Application Framework application using the IDE toolset, the current version of the standard Web Application Framework Component Library is automatically added to the application's `WEB-INF/lib` directory. If you open an application created in a previous version of the IDE toolset, you might be prompted to upgrade the application, including the Web Application Framework run-time library.

The Component Class

A Web Application Framework component class is the class which defines a Web Application Framework run-time type, a View, a Command, or a Model.

The author of the component class is only concerned with design-time considerations to the extent that a JavaBean developer would do so. That is to say, as a component author, you must anticipate the properties which you would like to expose to design time configuration and define appropriate `get` and `set` methods. However, unlike the JavaBean model, the Web Application Framework component model does not eagerly expose all `get` and `set` methods as properties. That is because the Web Application Framework recognizes that there are many `get` and `set` methods in the Web Application Framework core from which the components derive which are not appropriate for design time configuration. Therefore, the Web Application Framework component model limits the exposed properties to those which are explicitly specified in the companion `ComponentInfo` class.

The ComponentInfo Class

The `ComponentInfo` class is the heart and soul of the Web Application Framework component model. Logically speaking, a Web Application Framework component can be referred to as a tuple comprised of a component class and a `ComponentInfo` class. The `ComponentInfo` class provides the metadata that is introspected by the IDE toolset to provide the component's design-time presence. When you author a `ComponentInfo` class, you can focus exclusively on design-time considerations. The `ComponentInfo` class plays no run-time role in the Web Application Framework.

CHAPTER 2

Developing Components

Develop Your First Component

This chapter provides a description of the fundamental steps involved in creating, distributing, and using a Web Application Framework component.

Approach this as an exercise, and actually build and test drive the component. After completing this section, you should have a good understanding of the process. Do not worry about trying to understand every detail at this point. The rest of this document delves into details concerning the various types of components, the details of the metadata formats, and the extra optional features available to component authors.

This section assumes basic familiarity with the Web Application Framework application.

Decide the Type of the Component

An ultra-simple example is contrived to focus on technique. You will create a new DisplayField component called "MyTextField". The objective is to have this component expose a new property called "Foo" that will take a boolean value. Application developers will be able to visually select `MyTextField` and add it to their Web Application Framework pages. It is expected that the component will have all of the properties of the standard Web Application Framework `TextField` component, plus the new *Foo* property.

Create the Component Class

A new component class is not always needed in Web Application Framework. This subtlety is discussed later in this document. This example, however, does require a new component class, so you will begin with that.

1. **In any Java editor create the package** `mycomponents`**.**
2. **Create the** `mycomponents.MyTextField` **class.**
3. **Make** `MyTextField` extend `com.iplanet.jato.view.BasicDisplayField`**.**
4. **Implement the appropriate constructor for the component type.**

   All `DisplayField` components must implement a two-arg constructor that takes a View "parent" and a String "name". The IDE toolset assumes that all `DisplayField` components will implement this constructor.
5. **Add a** `get` **and** `set` **method for the new boolean property named "Foo".**

   After these steps, `mycomponents/MyTextField.java` should look as follows:

```
package mycomponents;

import com.iplanet.jato.view.*;

/**
 *
 * @author component author
 */
public class MyTextField extends BasicDisplayField {

     /** Creates a new instance of MyTextField */
     public MyTextField(View parent, String name) {
          super(parent, name);
     }

     public boolean getFoo() {
          return foo;
     }

     public void setFoo(boolean value) {
          foo = value;
     }

     boolean foo;
}
```

Although you are creating a new property on this component, how this property actually interacts with the component at run-time is not defined. That is up to you as the component author and is beyond the scope of this part of the document.

Create the ComponentInfo Class

The `ComponentInfo` class defines the design-time metadata that the IDE toolset requires to incorporate the component. In this example, you extend an existing `ComponentInfo` and, in true OO style, simply augment it. You could, of course, choose to implement the `ComponentInfo` interface from scratch, but that would be unproductive in this case.

1. **Create the class** `mycomponents.MyTextFieldComponentInfo`**.**
2. **Make** `MyTextFieldComponentInfo` **extend** `com.iplanet.jato.view.html2.TextFieldComponentInfo`**.**
3. **Implement the no-arg constructor.**
4. **Implement the** `getComponentDescriptor()` **method to provide the basic design-time description of the component.**
5. **Implement the** `getConfigPropertyDescriptors()` **method to identify which properties you want to expose in the IDE.**

   Utilize inheritance to add the new *Foo* property to those properties already defined in `TextFieldComponentInfo`.

   After these steps, `mycomponents/MyTextFieldComponentInfo.java` should look like the code that follows:

Note – In the following sample code, for demonstration purposes, String values have been embedded directly. Utilize resource bundles if you anticipate the need to localize your display strings.

```
package mycomponents;

import java.util.*;
import com.iplanet.jato.view.*;
import com.iplanet.jato.component.*;
import com.iplanet.jato.view.html2.*;


public class MyTextFieldComponentInfo extends TextFieldComponentInfo {

    public MyTextFieldComponentInfo()
    {
          super();
     }

     public ComponentDescriptor getComponentDescriptor() {

          // identify the component class
          ComponentDescriptor result=new ComponentDescriptor(
               "mycomponents.MyTextField");

          // The name will be used to determine a name for the component instance
          result.setName("MyTextField");

          // The display name will be used to show the component in a chooser
          result.setDisplayName("MyTextField Component");

          // The description will be the tool tip text for the component
          result.setShortDescription("A simple demonstration of a new component");

          return result;
     }

     public ConfigPropertyDescriptor[] getConfigPropertyDescriptors() {

          if (configPropertyDescriptors!=null)
               return configPropertyDescriptors;

          // Get any properties defined in the super class
          configPropertyDescriptors=super.getConfigPropertyDescriptors();
          List descriptors=new LinkedList(
               Arrays.asList(configPropertyDescriptors));

          ConfigPropertyDescriptor descriptor = null;

          // Add the "foo" property
          descriptor=new ConfigPropertyDescriptor("foo",Boolean.TYPE);
          descriptor.setDisplayName("Foo Property");
          descriptor.setHidden(false);
          descriptor.setExpert(false);
          descriptor.setDefaultValue(new Boolean(false));
          descriptors.add(descriptor);

          // Create/return the array
          configPropertyDescriptors = (ConfigPropertyDescriptor[])
               descriptors.toArray(
                    new ConfigPropertyDescriptor[descriptors.size()]);
          return configPropertyDescriptors;
     }

     private ConfigPropertyDescriptor[] configPropertyDescriptors;
}
```

Create the Component Library Manifest

Web Application Framework components are packaged and distributed in ordinary JAR files. Any classes (component, ComponentInfo, and any other ancillary files) should be placed in the JAR in accordance with standard Java convention.

Additionally, the Web Application Framework requires that a component library JAR contains a special Web Application Framework library manifest file. This is a simple XML document that describes the collection of components in the library. Library manifests might declare any number of components. In this case, just declare the one component that you have just authored.

The Web Application Framework library manifest must be named `complib.xml`. Within the JAR file, the Web Application Framework library manifest must be placed in the `/COMP-INF` directory.

1. **Create the file called `complib.xml`.**
2. **Add the minimum information to satisfy the Web Application Framework library manifest requirements.**
3. **Add a component declaration for the `MyTextField` component.**

After these steps, the `COMP-INF/complib.xml` file should look like the code that follows:

Note – If you use a tool to create the XML file, be sure that it looks like this. Some XML tools automatically insert a root element when you create the file. Make sure the root element is <*component-library*> as indicated next. An improper XML file will cause the IDE toolset to fail to discover your component library

---

```
<?xml version="1.0" encoding="UTF-8"?>
<component-library>
        <tool-info>
                <tool-version>2.1.0</tool-version>
        </tool-info>
        <library-name>mycomponents</library-name>
        <display-name>My First Component Library</display-name>
        <!-- Your icon here
        <icon>
                <small-icon>/com/iplanet/jato/resources/complib.gif</small-icon>
        </icon>
        -->
        <interface-version>1.0.0</interface-version>
        <implementation-version>20030221</implementation-version>

        <component>
                <component-class>mycomponents.MyTextField</component-class>
                <component-info-class>mycomponents.MyTextFieldComponentInfo</component-
        info-class>
        </component>

</component-library>
```

Create the Component Library JAR File

JAR up the component classes so they can be ready for distribution as a library.

The name of the JAR file is arbitrary.

1. **In this case, name the JAR file** `mycomponents.jar`**.**

   You can omit the Java source files from the JAR.

2. **Include in the JAR any necessary ancillary resources, such as icon images or resource bundles.**

   In this case there are none.

   The `mycomponents.jar` internal structure should look like the code that follows:

```
mycomponents/MyTextField.class
mycomponents/MyTextFieldComponentInfo.class
COMP-INF/complib.xml
```

Test the Component

Your library is now ready for testing and distribution. You should test it in a sample project. This stage requires the use of the IDE with the Web Application Framework module installed and enabled. If you have never built a Web Application Framework application in the IDE, before continuing, you should first complete the *Web Application Framework Tutorial* that is included with the Web Application Framework document set.

Caution – You can test your component(s) in any existing Web Application Framework application. However, you should create a new Web Application Framework application to serve as the test application for all of the example components that you will build in the course of completing the exercises within this guide. The instructions that follow generally assume that the names for your test objects were generated according to Web Application Framework defaults (for example, Page1, and so on) and you will have an easier time following the instructions if your test application's object names match those in the instructions.

---

1. **Create a new Web Application Framework application in the IDE.**

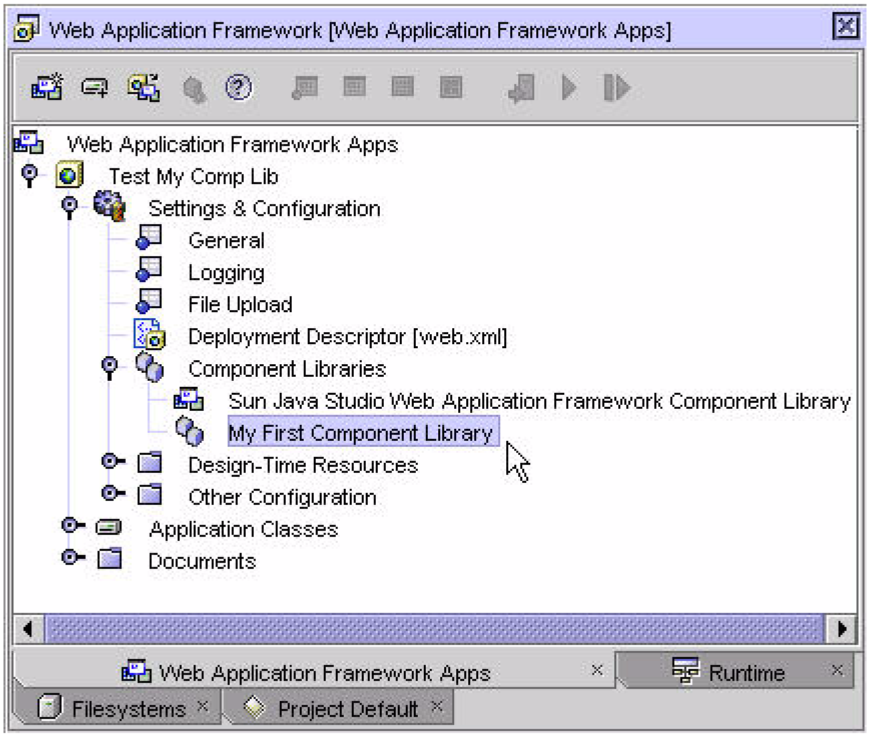
   The name of the application is up to you.

2. **From the filesystem, copy the new `mycomponents.jar` file into the `WEB-INF/lib` directory within your test application.**

3. **Wait for the IDE background thread to discover that a new JAR has been deployed in the application's `WEB-INF/lib` directory.**

   This takes several seconds, depending upon the value of the IDE's background thread Refresh Interval.

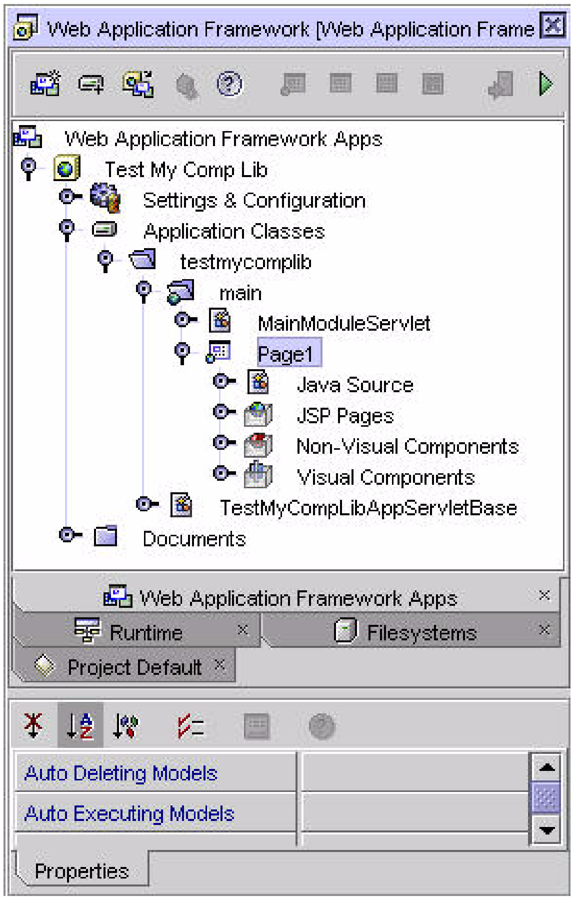
   The library is fully recognized and functional when a new library node appears under the Web Application Framework application's Settings and Configuration -> Component Libraries node, as shown next:


Web Application Framework [Web Application Framework Apps]
Web Application Framework Apps
Test My Comp Lib
Settings & Configuration
General
Logging
File Upload
Deployment Descriptor [web.xml]
Component Libraries
Sun Java Studio Web Application Framework Component Library
My First Component Library
Design-Time Resources
Other Configuration
Application Classes
Documents
Web Application Framework Apps
Runtime
Filesystems
Project Default

4. **Create a new Page (ViewBean) object.**

   Take the wizard defaults, and the IDE names it "Page1".

5. **Select and expand the newly created Page1 node.**



6. **Add an instance of "MyTextField Component" to Page1.**

   This can be accomplished in either of two equally valid user interface actions.

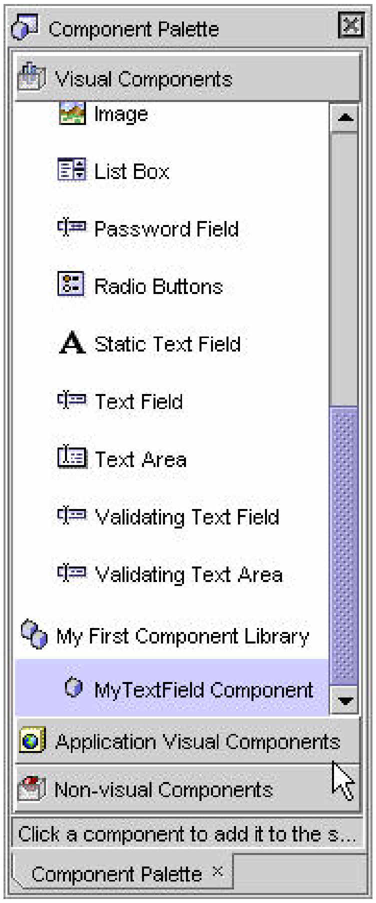
   - You can utilize the Component Palette (shown in the next figure).
     - Expand the "Visual Components" section.
     - Click the "MyTextField Component" item.

     This adds an instance to whatever page node has focus at that moment.

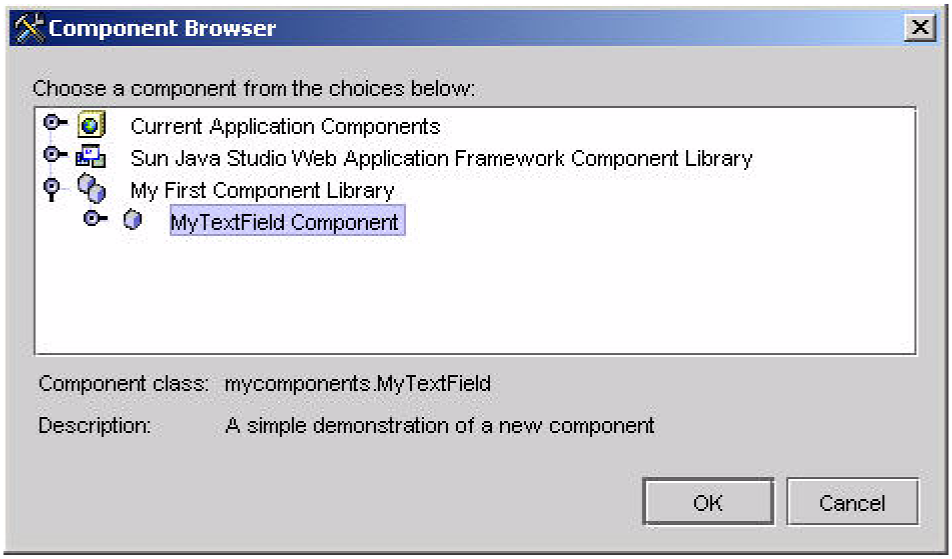
   - Alternatively, you can select Page1's Visual Components sub-node.

     Right-click, and select the *Add Visual Component* action from the pop-up menu.

     Note the generic icons for both the library "My First Component Library" and the component "MyTextField Component". This occurs because, in this example, you did not specify any specific icons. That is just one of the features that you will learn about in the rest of this document.



The Component Browser (shown next) is an alternative to the Component Palette (shown in the previous figure). In the rest of this document, any instruction that involves adding a visual component can be fulfilled by using either the Component Palette or the Component Browser. They are functionally interchangeable, and users can use either, or both, at all times.



Component Browser
Choose a component from the choices below:
Current Application Components
Sun Java Studio Web Application Framework Component Library
My First Component Library
MyTextField Component
OK
Cancel

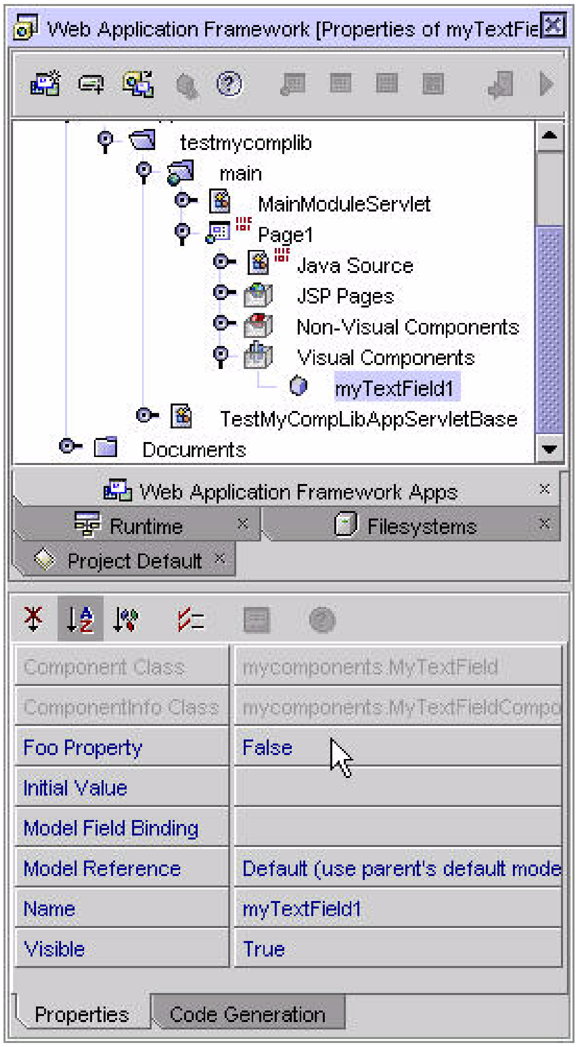
Component class: mycomponents.MyTextField

Description: A simple demonstration of a new component

After selecting the `MyTextField` Component from either the Component Palette or the Component Browser, observe how a child View named "myTextField1" is added to the page.

7. **Select the child node** `myTextField1`**.**

   Observe how the IDE's property sheet has added *Foo* Property, the new custom property, in addition to the inherited `TextField` component properties.



Component Class	mycomponents.MyTextField
ComponentInfo Class	mycomponents.MyTextFieldCompo
Foo Property	False
Initial Value	
Model Field Binding	
Model Reference	Default (use parent's default mode
Name	myTextField1
Visible	True

Test the behavior of the *Foo* Property to make sure it behaves the way you, as component author, expect it should.

You should be able to assign the *Foo* Property the value `True` or `False`.

8. **In this example, set the *Foo* Property to `True`.**

9. **Observe the code generation inside the `Page1` java file.**

   You should see a block of code inside the `createChildReserved` method that looks like the following code (the indenting in your code might differ from what you see the next code sample):

```
...
else if (name.equals(CHILD_MY_TEXT_FIELD1)) {
     mycomponents.MyTextField child =
          new mycomponents.MyTextField(this, CHILD_MY_TEXT_FIELD1);
     child.setFoo(true);
     return child;
}
...
```

Ship It!

When you are finished testing and refining your component, you can distribute the component library JAR file to your developer community. It is up to application developers to add the component JAR file to each application in which they want to utilize the components.

Web Application Framework Components in More Detail

Web Application Framework components are designed to enable application developers to more rapidly define Web Application Framework run-time types (Views, Commands, and Models). However, the manner in which Web Application Framework components are integrated into the application developer's design-time experience varies in accordance with the range of Java's object oriented opportunities (for example, class sub-typing vs. object instantiation).

As an experienced Java programmer, a Web Application Framework component author should easily anticipate the manner in which Web Application Framework application developers will integrate a new component into their development processes. The component author will know that the application developer expects to subclass one type of component, and instantiate another type of component. Component authors understand that in some circumstances they can distribute a component as a fully enabled, fully configured black box, while in other cases, they require the application developer to configure each usage of the component.

The Web Application Framework component model and the IDE toolset combine to empower component authors and application developers to exploit the full range of Java object orientation. This section details the specific terminology that the Web Application Framework component model uses to differentiate each component's role as an object oriented building block.

The discussion of components is often filled with highly overloaded terms. To provide the grounds for a more precise discussion of Web Application Framework components, some terminology has been developed to avoid reliance on confusingly overloaded terms.

Distributable vs. Application-Specific (Non-Distributable) Components

Technically speaking, every Web Application Framework object (Model, View or Command) is a component. However, not all Web Application Framework components are destined for distribution in a component library. Some components are simply built as part of the standard process of building the application within the IDE, in which every Model, View, and Command is, technically speaking, a component. This distinction is acknowledged by referring to components which are included in libraries as distributable components, and components which are simply built within applications, as application-specific components, or non-distributable components. This is purely a distinction of terminology, not a hard formal distinction. Distributable components and application-specific components do not differ by type. The distinction is merely a soft categorization, meant to help distinguish the component author's role from the application developer's role. Application developers develop application-specific components. Component authors develop distributable components.

The first term, application-specific components, or non-distributable components, refers to components which are only reusable within the application in which they are defined. They are not packaged into a component library. They generally do not have an explicit `ComponentInfo` associated with them. As an example, when application developers build a `ContainerView` or Model in their applications, they are implicitly building application-specific components. This is akin to a `javax.swing` application developer building an application specific panel or frame. Because the IDE toolset knows how to manipulate these application-specific components directly, they are usable within the same application without any additional work by the developer. For instance, after creating a new application specific Model, the application developer can visually connect that new Model to Views within the current application. Development of an application-specific component is transparent and implicit, and requires no component authoring knowledge per se.

Application-specific (non-distributable) components are:

- Implicitly developed by the casual application developer.
- Designed for use only within the current application.
- Not accompanied by any explicit `ComponentInfo`.

By contrast, distributable components refers to components which are reusable across many applications. Component authors package distributable components into component libraries. Component authors typically develop an explicit `ComponentInfo` class for each distributable component. Usually, the creation of a distributable component requires more foresight in design due to its greater ambition for reuse. To use the `javax.swing` analogy again, a distributable component would be a new sub-type of `javax.swing.JPanel` which is distributed for use in many new applications. In the Web Application Framework application, a distributable component might be a new type of `DisplayField`, or a specialized, but highly reusable type of `ContainerView`.

Distributable components are:

- Explicitly developed by someone with an understanding of the component model (a component author).
- Designed for reuse across applications.
- Accompanied by an explicit `ComponentInfo` class.
- Packaged into a library for distribution.

Of course, in accordance with common bottom-up design practices, it is not uncommon for an application-specific component to be explicitly "promoted" to distributable status. This happens when a development team identifies it as a valid candidate for reuse across applications. This is normal, expected, and encouraged. The promotion of an application-specific component to distributed status merely entails fulfilling the tasks that will be identified as standard for distributable components.

Therefore, in deference to the simplicity/transparency of creating application-specific components versus the relative complexity of authoring distributable components, the bulk of this document is dedicated to describing the process of authoring distributable components.

Extensible vs. Non-Extensible Components

In Web Application Framework component libraries, there is a formal distinction between extensible and non-extensible components. Component authors are responsible for designating a component as either extensible or non-extensible. This distinction allows component authors to control the manner in which the component-aware IDE toolset will expose a given component for usage by application developers. The IDE toolset will expose both extensible and non-extensible components in well-defined, but distinct fashions.

It is worth noting that while the distinction between extensible and non-extensible is important to a component author, practically speaking, component consumers are totally unaware of the distinction. That it to say, the IDE toolset will never present the application developer with either of these terms. Rather, the IDE toolset will automatically manage these subtleties so that application developers can just concentrate on building their applications. Application developers will generally never need to worry about whether a component is extensible or not, or even whether it has a `ComponentInfo` class.

Extensible Components

Extensible components are appropriate in those cases where the application assembly calls for the declaration of a new Web Application Framework sub-type (for example, a new type of Model, a new type of ContainerView, a new type of Command, and so on).

The IDE toolset presents extensible components for direct sub-classing by application developers. When an application developer selects an extensible component from the list of available components, the net result is that the IDE toolset creates a new Java class that extends the selected component's class. A component author should designate a component as an extensible component if it is envisioned that the proper usage of a given component is through application specific sub-typing. Effectively, the Web Application Framework dictates where extensible components fit in. Wherever the Web Application Framework framework designates that an application entity must be a sub-type of a framework entity, that is where extensible components come into play.

Extensible components are designated by an *<extensible-component>* element within the component library manifest, as shown in the following example:

```
<extensible-component>
     <component-class>com.iplanet.jato.view.BasicViewBean</component-class>
     <component-info-class>com.iplanet.jato.view.BasicBeanComponentInfo</component-info-
class>
</extensible-component>
```

Extensible components:

- Allow application developers to create new types which extend the extensible component.
- Might be abstract.
- Can specify a component-specific Java file to serve as the template for the new type.

Examples are: Extensible `ViewBean`, `ContainerViews`, `Model`, or `Command` components.

Non-Extensible Components

Non-extensible components are appropriate in cases where the application assembly calls for the simple declaration and configuration of instances.

The net result of an application developer selecting a non-extensible component is that a new instance of the non-extensible component is declared in the application-specific class. For example, whenever a developer adds a text field or a button to a `ContainerView`, the IDE toolset turns that design decision into a declaration of an instance of the text field or button in `ContainerView` class. In this manner, application developers populate the application-specific classes with instances of non-extensible components. This is the classic "assembly" model of component based development.

Again, the Web Application Framework dictates where this is appropriate. For instance, in developing an application-level Page (ViewBean) or Pagelet (ContainerView) component, the application developer expects to be able to add child view objects (such as DisplayFields) to that component. Consequently, the IDE toolset presents the application developer with a list of non-extensible components for direct addition to the page or pagelet.

Non-extensible components are designated by a <*component*> element within the component library manifest, as shown in the following example:

```
<component>
     <component-class>com.iplanet.jato.view.BasicChoiceDisplayField</component-class>
     <component-info-class>com.iplanet.jato.view.html2.ListBoxComponentInfo</component-
info-class>
</component>
```

Non-extensible components:

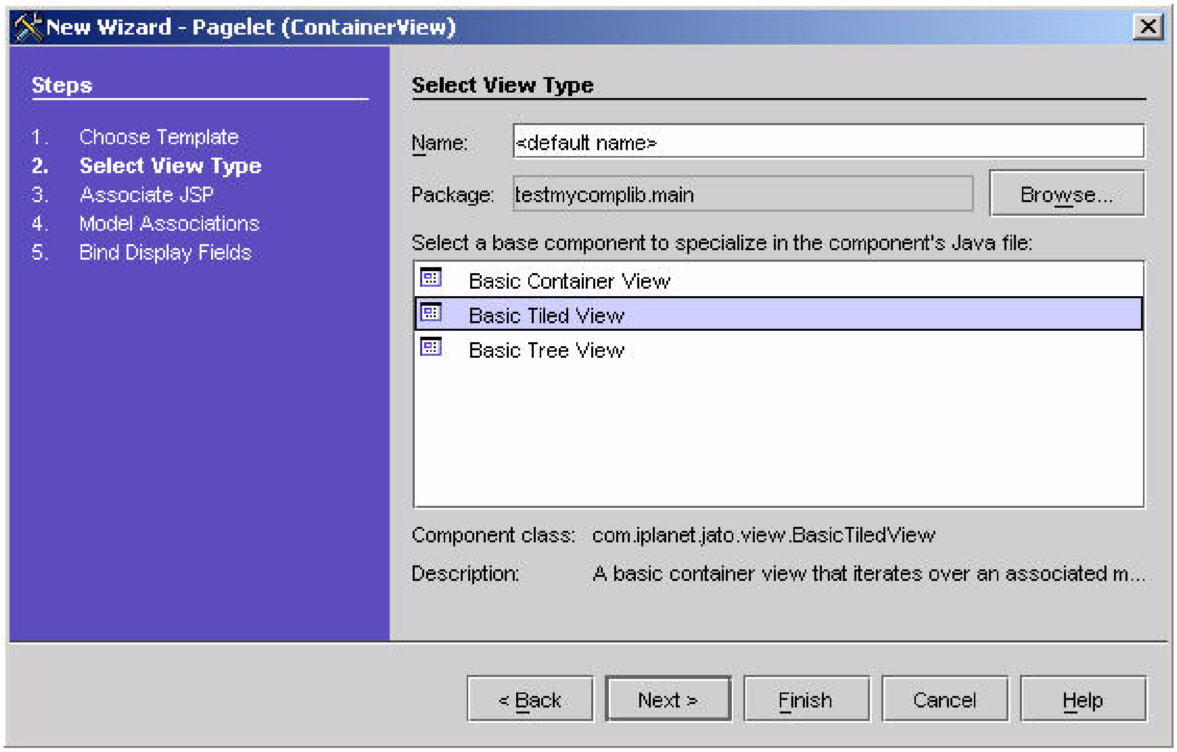
- Allow application developers to easily declare and configure new instances of the component.
- Cannot be abstract.
  - Fine grained component example: DisplayField components.
  - Coarse grained example: pre-packaged, fully configured non-extensible ContainerViews, Models and Commands.

Extensible and Non-Extensible Components in the IDE

If you still find it confusing to distinguish extensible and non-extensible components, it might help at this point to refer to the IDE to see how the IDE toolset transparently exposes extensible and non-extensible components.

1. **Open a Web Application Framework project and select a "module" folder.**
2. **Right-click, and choose Add->Model or Add->Page (ViewBean) or Add->Pagelet (ContainerView).**

   These actions invoke wizards which contain an embedded extensible component browser, as shown next:



New Wizard - Pagelet (ContainerView)

Steps

1. Choose Template
2. **Select View Type**
3. Associate JSP
4. Model Associations
5. Bind Display Fields

Select View Type

Name: <default name>

Package: testmycomplib.main

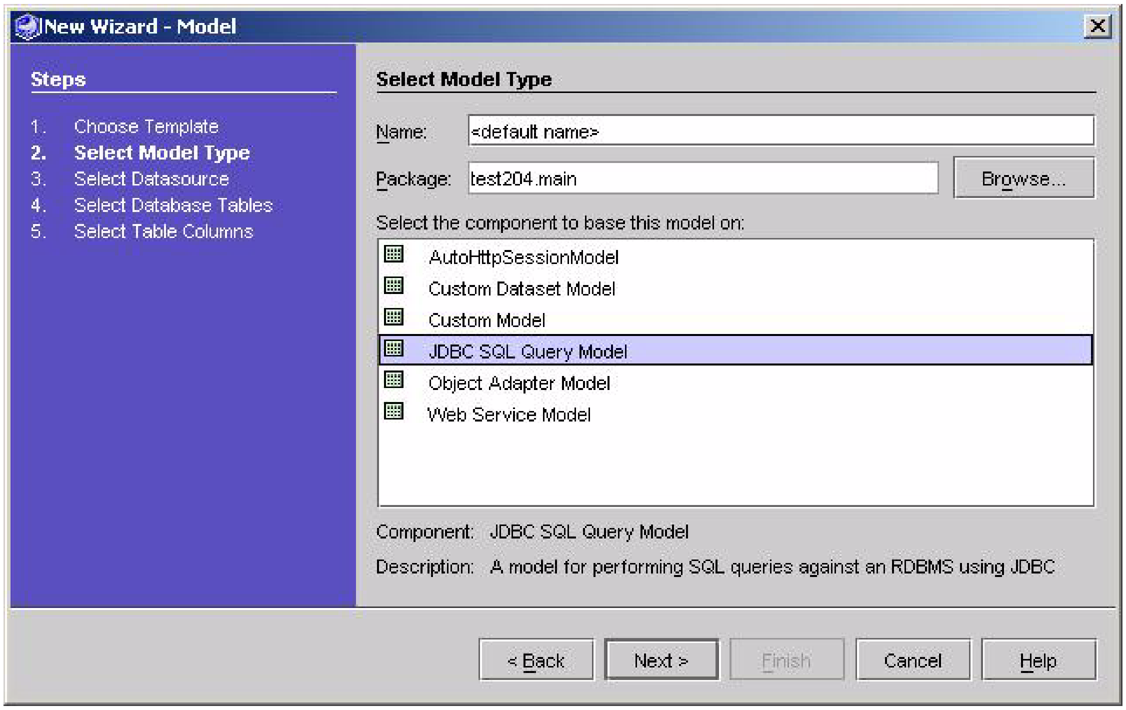
Select a base component to specialize in the component's Java file:

- Basic Container View
- Basic Tiled View
- Basic Tree View

Component class: com.iplanet.jato.view.BasicTiledView

Description: A basic container view that iterates over an associated m...

3. **Complete either of the wizards, and the IDE toolset creates a new class that extends the extensible component's class.**



Select Model Type

Name: <default name>

Package: test204.main

Select the component to base this model on:

- AutoHttpSessionModel
- Custom Dataset Model
- Custom Model
- JDBC SQL Query Model
- Object Adapter Model
- Web Service Model

Component: JDBC SQL Query Model

Description: A model for performing SQL queries against an RDBMS using JDBC

4. **Select an existing page or pagelet node.**

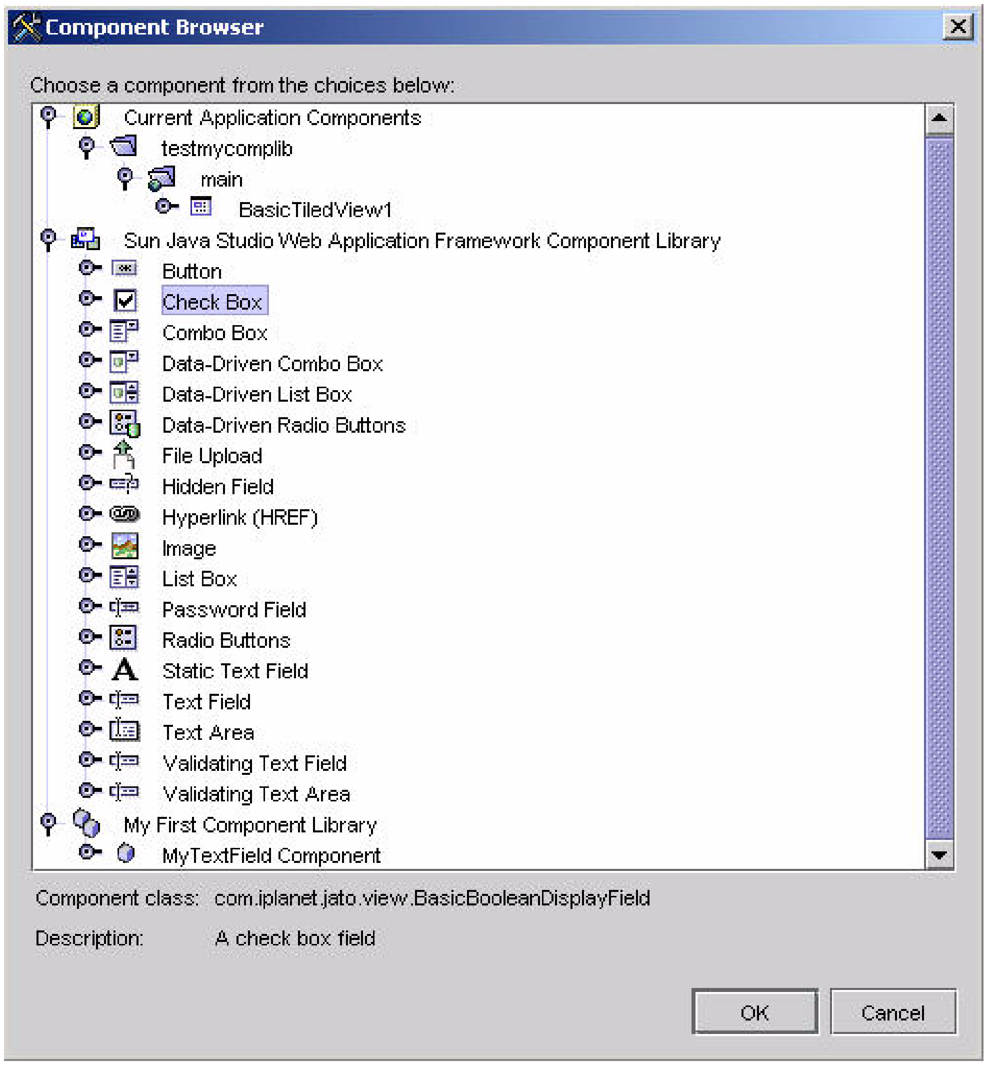
   Expand the top node so you can see its inner Visual Components node.

5. **Select the Visual Components sub-node, right-click, and select the Add Visual Component action.**

   This invokes the non-extensible component browser (shown next).

6. **Complete the selection of a child view.**

   This does not result in the creation of a new class, but rather adds a child element to the currently selected class.


Component Browser

Choose a component from the choices below:

- Current Application Components
  - testmycomplib
    - main
      - BasicTiledView1
- Sun Java Studio Web Application Framework Component Library
  - Button
  - Check Box
  - Combo Box
  - Data-Driven Combo Box
  - Data-Driven List Box
  - Data-Driven Radio Buttons
  - File Upload
  - Hidden Field
  - Hyperlink (HREF)
  - Image
  - List Box
  - Password Field
  - Radio Buttons
  - Static Text Field
  - Text Field
  - Text Area
  - Validating Text Field
  - Validating Text Area
- My First Component Library
  - MyTextField Component

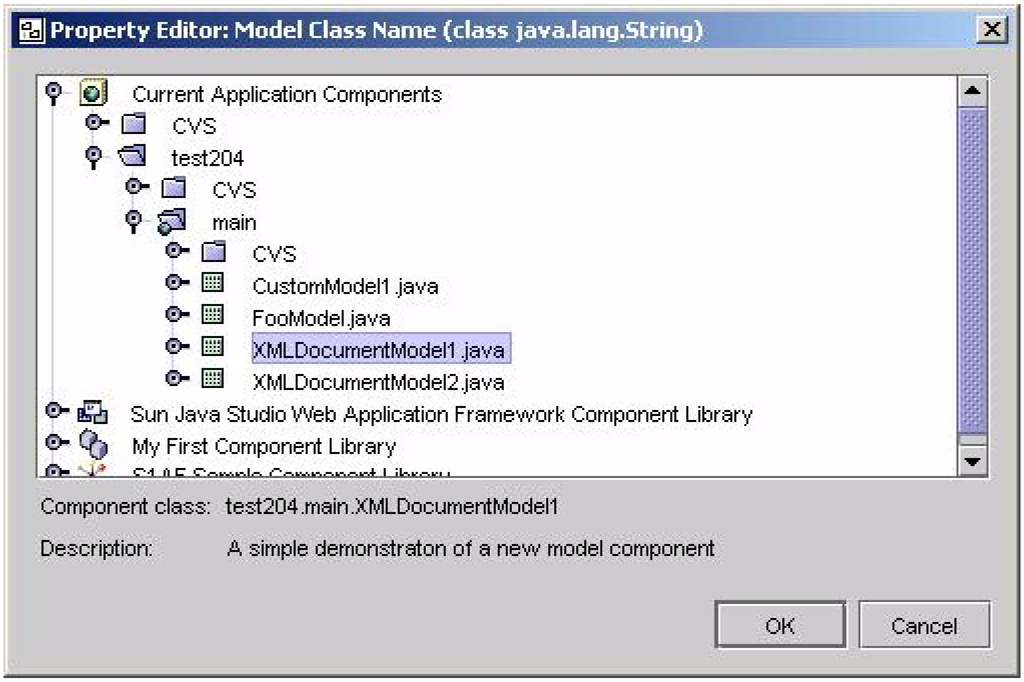
Component class: com.iplanet.jato.view.BasicBooleanDisplayField

Description: A check box field

The figure above shows the Non-Extensible component browser employed in the context of "Add Visual Component" action. This figure shows the browser fully expanded to show two libraries and the current application's non-extensible components.

In other areas of the IDE, the non-extensible component browser is used to select Page/Pagelets, or Models, or Commands for assignment to certain property values. For instance, wherever a Web Application Framework use relationship is expressed in a property (for example, a View uses a Model), the property editor can leverage the non-extensible component browser to enable the application developer to select a valid target object.

For instance, properties of type `Model Class Name` are edited using a non-extensible Component Browser which shows non-extensible Model components in the mounted component libraries (if any), and also any Models which have been added to the current application. Similar behavior applies to editing the "Command Class Name" property. However, in that case, Command components are selected instead of Models.


Property Editor: Model Class Name (class java.lang.String)

- Current Application Components
  - CVS
  - test204
    - CVS
    - main
      - CVS
      - CustomModel1.java
      - FooModel.java
      - XMLDocumentModel1.java
      - XMLDocumentModel2.java
- Sun Java Studio Web Application Framework Component Library
- My First Component Library

Component class: test204.main.XMLDocumentModel1

Description: A simple demonstraton of a new model component

The figure above shows the Non-Extensible component browser employed in context of a Model Class Name property editor. This figure shows the browser fully expanded to show two libraries and the current application's non-extensible Model components.

ComponentInfo in More Detail

The `ComponentInfo` class is the heart and soul of the Web Application Framework component model. Logically speaking, a Web Application Framework component can be defined as a tuple comprised of a component class and a `ComponentInfo` class. The `ComponentInfo` class provides the metadata that is introspected by the IDE toolset to provide the component's design-time presence. When you author a `ComponentInfo` class, you can focus exclusively on design-time considerations. The `ComponentInfo` class plays no run-time role in the Web Application Framework.

Specific `ComponentInfo` classes must implement the `com.iplanet.jato.component.ComponentInfo` interface, or one of its sub-interfaces. `ComponentInfo` class names must end with the "ComponentInfo" suffix. Whenever practical, the `ComponentInfo` class should share the same base name as the component class (for example, `Foo` and `FooComponentInfo`).

Here is an early glimpse into the Web Application Framework Component Library manifest. In the following snippet, you can see the simple declaration of a component as a component class and `ComponentInfo` tuple. Note in this example the extra designation of the <*extensible-component*> tag (for complete details of the Web Application Framework component manifest, see The Component Manifest, found in Chapter A, Component Library Structure.

```
<extensible-component>
     <component-class>com.iplanet.jato.view.BasicViewBean</component-class>
     <component-info-class>com.iplanet.jato.view.BasicViewBeanComponentInfo</component-
info-class>
</extensible-component>
```

However, the Web Application Framework allows `ComponentInfo` classes to differ in base name from their associated component class. In fact, the Web Application Framework allows more than one `ComponentInfo` class to be associated with the same component class. As stated earlier, logically speaking, a component is a tuple comprised of a component class and a `ComponentInfo`. The surprise is that the same component class might participate in more than one of these tuples.

This might not be immediately intuitive to most component authors, but it is a very effective and powerful feature of the Web Application Framework component model. For instance, in the `com.iplanet.jato.view.html2` package, there are several `ComponentInfo` classes which are actually associated with the same component class. For example, the `ListBoxComponentInfo`, `RadioButtonsComponentInfo` and `ComboBoxComponentInfo` classes all specify `com.iplanet.jato.view.BasicChoiceDisplayField` as their component class.

Following is another actual snippet from the Web Application Framework Component Library manifest where you can see the component tuples described above:

```
<component>
     <component-class>com.iplanet.jato.view.BasicChoiceDisplayField</component-class>
     <component-info-class>com.iplanet.jato.view.html2.ListBoxComponentInfo</component-
info-class>
</component>
<component>
     <component-class>com.iplanet.jato.view.BasicChoiceDisplayField</component-class>
     <component-info-
class>com.iplanet.jato.view.html2.RadioButtonsComponentInfo</component-info-class>
</component>
<component>
     <component-class>com.iplanet.jato.view.BasicChoiceDisplayField</component-class>
     <component-info-class>com.iplanet.jato.view.html2.ComboBoxComponentInfo</component-
info-class>
</component>
```

These pairs form three distinct tuples, and therefore, three distinct logical components. The value presented by this freedom is that new component variations can be created by simply defining new `ComponentInfo` classes.

Note – To be anything more than just equivalent to other components that use the same component class, the new components must either expose existing component properties not exposed by other components (for example, only `ListBoxComponentInfo` exposes the "Allow Multiple Choices" property), or change other meaningful component metadata. In the examples provided above, the components primarily differ in the JSP tags that they declare, thereby drastically changing the way these components look and feel when added to an HTML page. However, the component functionality itself is essentially the same among all of them. The ability to declare different tags, and thus different rendering mechanisms for a component, is the most compelling reason to define components that use the same component underlying component class.

Unlike declarative metadata, a `ComponentInfo` is specified as a Java class. Therefore, new `ComponentInfo` classes can derive from existing `ComponentInfo` classes and benefit from standard inheritance of superclass functionality. The `com.iplanet.jato.component.SimpleComponentInfo` class can serve as a reliable starting point for any new `ComponentInfo` class, if there is not a more specific and more appropriate subtype already available.

Specialized ComponentInfo Interfaces

The Web Application Framework provides several specialized sub-types of the `ComponentInfo` which allow component authors to specify additional metadata that is appropriate for certain components. The IDE toolset leverages the additional metadata to provide special visual development support congruent with the additional metadata.

ExtensibleComponentInfo

The `com.iplanet.jato.component.ExtensibleComponentInfo` interface allows developers to provide additional metadata that is specifically appropriate for extensible components. In the IDE toolset, extensible components serve as the base classes when developers create new Web Application Framework types (Models, Pages/Pagelets, and Commands). To this end, the extra metadata defined in the `ExtensibleComponentInfo` interface allows the component author to influence the construction of the new type. Specifically, component authors might specify a Java class template to serve as the starting point for every new type derived from the extensible component.

Other Types of Specialized ComponentInfo

There are several other specialized types of `ComponentInfo`:

- `com.iplanet.jato.component.ExtensibleComponentInfo`
- `com.iplanet.jato.view.ViewComponentInfo`
- `com.iplanet.jato.view.ContainerViewComponentInfo`
- `com.iplanet.jato.command.CommandComponentInfo`
- `com.iplanet.jato.model.ModelComponentInfo`
- `com.iplanet.jato.model.ExecutingModelComponentInfo`

Details of these interfaces are discussed later in sections describing the steps required to create components of the various types to which these specialized `ComponentInfo` interfaces pertain.

Standard Implementations of ComponentInfo

Since the Web Application Framework component model is based on well-defined interfaces, component authors can implement these interfaces from scratch for any new component. However, the Web Application Framework generally provides ready-made implementations of all of the various specialized `ComponentInfo` interfaces, and component authors are encouraged to extend one of the existing implementations when writing their own components. This saves you labor and speeds your authoring process.

CHAPTER 3

Developing View Components

This section assumes that you have already read "Develop Your First Component" on page 19.

View Components

For background on Web Application Framework Views, see the *Web Application Framework Developer's Guide*.

View components are also referred to as visual components. The View term comes from the Model-View-Controller design pattern. Most of the types in the `com.sun.iplanet` library use the term view for this reason. The IDE however, caters to corporate developer expectations by using the term visual component more frequently than view, and page more frequently than ViewBean.

For the purposes of this document:

- View component and visual component are synonymous.
- Child view component and child visual component are synonymous.
- Page component and ViewBean component are synonymous.
- Pagelet component and ContainerView component are synonymous.

Broadly speaking, there are two types of view components:

- Extensible view components.
- Non-extensible view components.

Extensible view components are custom implementations of Web Application Framework ContainerViews which are intended for further specialization by application developers. For instance, in the Web Application Framework Component Library, the Basic Container View, Basic Tiled View, and Basic ViewBean are all examples of extensible view components.

Do not read too much into the statement "specialization by application developers" above. Frequently, the only specialization an application developer will make is the addition of child view components (which is done via the IDE), and the logic associated with them.

The most recognizable and easily comprehended non-extensible view components are custom implementations of the DisplayField interface. The Web Application Framework Component Library contains over a dozen DisplayField components. These fall easily into the classic widget or visual control category, and component developers and application developer alike intuitively relate to these components. As you will see, the Web Application Framework goes well beyond this minimal component story and offers more potential in the component domain than many component authors and application developers might have seen before.

For instance, a less recognizable non-extensible view component would be ANY concrete ContainerView implementation created by the IDE toolset. Every ContainerView an application developer creates is a non-extensible component. This is a subtlety of the Web Application Framework approach where nearly everything is a component. Where these various types of components differ is in the way in which they are packaged for distribution and reuse.

ViewComponentInfo

The ViewComponentInfo interface allows component authors to specify additional metadata that is applicable to all view components. This interface is applicable to both extensible and non-extensible view components, and contains metadata, such as, which JSP tags should be associated with the view component.

As indicated above, it is possible, and expected, that multiple `ComponentInfo` classes can be paired with a single component class to produce a variety of components. For example, the `ListBoxComponentInfo`, `RadioButtonsComponentInfo`, and `ComboBoxComponentInfo` all specify `BasicChoiceDisplayField` classes as their component class. These form three distinct tuples, and therefore, three distinct logical components. One of the key ways in which these three components differ from each other is that they each implement the `ViewComponentInfo`'s `getJspTagDescriptors()` method to return a different `JspTagDescriptor`. In summary, these components are nearly identical to each other, except for the different JSP tags which the IDE toolset generates when an instance of the component is added to the application. The opportunity this presents to component authors is quite liberating. A component author could create a whole new library of JSP tags that generate different markup, and pair them with existing component classes simply by implementing additional `ComponentInfo` classes.

ContainerViewComponentInfo

The ContainerViewComponentInfo interface allows component authors to additional metadata that is applicable to all ContainerView components. This interface is only applicable to extensible view components.

Develop a Non-Extensible View Component

This section describes how to create a new `TextField` component that supports a rudimentary input validation feature. In the interest of simplicity, the validation design and implementation are kept to a minimum. This exercise is intended to focus on the mechanics of non-extensible view component design and as such, only scratches the surface of validation support possibilities.

Note – The Web Application Framework Component Library 2.1.1 already contains a fully productized ValidatingTextField component. This educational exercise results in your creating a validating text field component that approximates the Web Application Framework Component library's functionality. But the resulting component from this exercise is not equivalent to the one in Web Application Framework Component library, because this exercise does not attempt to implement all of the features of that productized component.

This example covers several additional Web Application Framework component model topics, leveraging ViewComponentInfo, developing a new JSP tag, and developing a ConfigurableBean.

The validating text component should support the following design-time functionality:

- Expose a property called "Validator". This property will take a reference to a Validator object. The DisplayField will delegate validation to the Validator object.
- Expose a property called "Validation Failure Message". This property will take a simple String.

The validating text component should support the following run-time functionality:

- Upon input, the component will delegate its input value for validation by the Validator object.
- If the value is invalid and the application redisplays the page, the validating component should display the invalid value followed by the application developer supplied validation failure message.

To meet these requirements, you will design and implement the following classes:

- Component class - `mycomponents.ValidatingDisplayField`
- `ComponentInfo` class - `mycomponents.ValidatingTextFieldComponentInfo`
- JSP `TagHandler` class - `mycomponents.ValidatingTextFieldTag`
- A Validator interface - `mycomponents.Validator`
- An implementation of the Validator interface - `mycomponents.TypeValidator`

A new JSP tag library will also be defined - mycomponents.tld

Finally, you will edit the mycomponents `complib.xml` to add the new component, taglibrary, and ConfigurableBean to the Web Application Framework component library.

Create the Validator Interface

1. **In any Java editor, create the class** `mycomponents.Validator`
2. **Define a very simple validation API.**

   Design principle hint: In designing the Validator as an interface the stage is being set to leverage the power of the Web Application Framework component model's ConfigurableBean story. Specifically, a ValidatingTextField property will subsequently be defined to be of type "Validator". And as you will see, the IDE toolset will allow the application developer to choose from a dynamically list of ConfigurableBean types which implement that interface. Furthermore, third party component authors can augment this component story by authoring and distributing additional ConfigurableBean implementations of the same interface.

   After these steps, `mycomponents/Validator.java` should look as follows:

```
package mycomponents;


/**
 *
 * @author component-author
 */
public interface Validator {


        /**
         *
         *
         */
        public abstract boolean validate(Object value);
}
```

Create at Least One Implementation of the Validator Interface

1. **In any Java editor create the class** `mycomponents.TypeValidator`**.**
2. **Add a String property called ValidationRule.**
3. **Implement the Validator interface.**

   After these steps, `mycomponents/Validator.java` should look as follows:

```
package mycomponents;
import com.iplanet.jato.model.*;
import com.iplanet.jato.util.*;


public class TypeValidator implements Validator
{

    public TypeValidator()
    {
        super();
    }

    public String getValidationRule()
    {
        return rule;
    }
    public void setValidationRule(String value)
    {
        rule=value;
    }

    public boolean validate(Object value)
    {
        if (getValidationRule()==null)
            throw new ValidationException("No validation rule has been set");

        try
        {
            value=TypeConverter.asType(getValidationRule(),value);
        }
        catch (Exception e)
        {
            return false;
        }

        return true;
    }
    ////////////////////////////////////////////////////////////////////////////////
    // Instance variables
    ////////////////////////////////////////////////////////////////////////////////

    private String rule;
}
```

Design hint: The rudimentary implementation of TypeValidator above exposes the ValidationRule as a simple String property. In the absence of any further work, the IDE toolset will expose this property for editing with the default String editor. This will require application developers to explicitly set the value of the property to "java.lang.String" or "java.lang.Integer" or "java.lang.Float". That is not a very user friendly user interface. Since this ValidationRule falls into the ConfigurableBean category, the component author can make use of the full JavaBean component model to improve the user experience. Ideally, a component author would also design and deploy a custom property editor for this property. In this case, a simple drop down list property editor would be a big improvement over the default String editor. Then the component author can create a TypeValidatorBeanInfo which would specify the custom property editor of his choice. For more on this topic, see Design Actions.

Create the Web Application Framework Component Class

1. **In any Java editor create the class** `mycomponents.ValidatingDisplayField`**.**

2. **Make ValidatingDisplayField extend** `com.iplanet.jato.view.BasicDisplayField`
3. **Implement the appropriate constructor for the component type.**

   All DisplayField components must implement a two-arg constructor that takes a View parent and a String name. The IDE toolset assumes that all DisplayField components will implement this constructor.
4. **Add a get and set method for the property Validator**
5. **Add a get and set method for the property ValidationFailureMessage**
6. **Implement the remaining methods that are required to fulfill our requirements.**
   - A flag to indicate the valid/invalid state.
   - A buffer to hold the invalid value(s) for redisplay.
   - Overridden implementations of setValue which will invoke the Validator.
   - Overridden implementations of getValue which will conditionally return the buffered invalid value.

   After these steps, `mycomponents/ValidatingDisplayField.java` should look as follows:

```
package mycomponents;
import com.iplanet.jato.view.*;
import com.iplanet.jato.model.*;
import com.iplanet.jato.util.*;


public class ValidatingDisplayField extends BasicDisplayField {


    public ValidatingDisplayField(View parent, String name) {
        super(parent, name);
    }

    public Validator getValidator()
    {
        return validator;
    }


    public void setValidator(Validator value)
    {
        validator=value;
    }

    public String getValidationFailureMessage()
    {
        return validationFailureMessage;
    }

    public void setValidationFailureMessage(String value)
    {
        validationFailureMessage=value;
    }

    public boolean isValid()
    {
            return isValid;
    }

    public void setValid(boolean value)
    {
            isValid = value;
    }

    ////////////////////////////////////////////////////////////////////////////
    // Value methods
    ////////////////////////////////////////////////////////////////////////////

    public Object getValue()
    {
        if (!isValid())
            return getInvalidValue();
        else
            return super.getValue();
    }

    public Object getInvalidValue()
    {
        if (invalidValue !=null)
            return invalidValue;
        else
            return null;
    }

    public void setValue(Object value)
    {
        if (value!=null && getValidator()!=null)
        {
            if (getValidator().validate(value))
            {
                try
                {
                    super.setValue(value);
                    setValid(true);
                }
                catch (ValidationException e)
                {
                        setValid(false);
                        invalidValue=value;
                        setValidationFailureMessage("Exception setting value \""+
                            "on model: "+ e.getMessage());
                    }
                }
                else
                {
                    setValid(false);
                    invalidValue=value;
                }
            }
            else
                super.setValue(value);
        }


        ////////////////////////////////////////////////////////////////////////////
        // Instance variables
        ////////////////////////////////////////////////////////////////////////////

        private Validator validator;
        private String validationFailureMessage;
        private boolean isValid = true;

        private Object invalidValue;
}
```

Create a Custom JSP TagHandler Class

Requirements call for the `ValidatingComponent` class to display its validation error message. One way to achieve this, and the approach pursued here, is to pair the new component with a custom JSP `TagHandler` class. This will allow you to fully control the rendering of the component.

1. **In any Java editor, create the class** `mycomponents.ValidatingTextFieldTag`**.**
2. **Extend this class from** `com.iplanet.jato.taglib.html.TextFieldTag`**.**
3. **Override the doEndTag method to conditionally append the validation error message whenever the component is not valid.**

After these steps, `mycomponents/ValidatingTextFieldTag.java` should look as follows:

```
package mycomponents;
import com.iplanet.jato.util.*;
import javax.servlet.jsp.*;
import com.iplanet.jato.taglib.html.*;
import com.iplanet.jato.util.*;
import com.iplanet.jato.view.*;
public class ValidatingTextFieldTag extends TextFieldTag
{

    public ValidatingTextFieldTag()
    {
        super();
    }


    public int doEndTag()
        throws JspException
    {
        int result=super.doEndTag();

        ContainerView parentContainer=getParentContainerView();
        View child=parentContainer.getChild(getName());
        checkChildType(child,ValidatingDisplayField.class);

        ValidatingDisplayField field=(ValidatingDisplayField)child;
        // If the field is valid, do nothing.
        if (field.isValid())
            return result;

        // Append the validation error message in Red
        NonSyncStringBuffer buffer=new NonSyncStringBuffer(
            " <font color=\"#FF0000\">");
        buffer.append(field.getValidationFailureMessage());
        buffer.append("</font>");
        writeOutput(buffer);
        return result;
    }
}
```

Note – The Web Application Framework component model allows component authors to specify multiple JSP TagHandlers for a given component. For more on that subject see the JspTagDescriptor API.

Create the ComponentInfo Class

The ComponentInfo class defines the design-time metadata that the IDE toolset requires to incorporate the component. In this example, you will extend an existing ComponentInfo class and in true OO style, simply augment it. You could, of course, implement the ComponentInfo interface from scratch, but that would be unproductive in this case.

This example takes you beyond the functionality revealed in the first component example. Next, you will take advantage of the key metadata opportunity provided by the ViewComponentInfo interface, the ability to describe JSP tag(s) for a given component.

1. **Create the class** mycomponents.ValidatingTextFieldComponentInfo**.**
2. **Make the** ValidatingTextFieldComponentInfo **class extend** com.iplanet.jato.view.html2.TextFieldComponentInfo**.**
3. **Implement the no-arg constructor.**
4. **Implement the** getComponentDescriptor() **method to provide the basic design-time description of the component.**
5. **Implement the** getConfigPropertyDescriptors() **method to identify which properties you wish to expose in the IDE.**
   - Add a ConfigPropertyDescriptor for the Validator property.
   - Add a ConfigPropertyDescriptor for the ValidationFailureMessage property.
6. **Implement the** getJspTagDescriptors() **method to specify the JSP tag which you want the IDE toolset to automatically add to associated JSP(s) whenever an instance of this component is added to a ViewBeans/ContainerViews.**

   After these steps, mycomponents/ValidatingTextFieldComponentInfo.java should look like the code that follows:

Note – In this sample code, String values have been embedded directly for ease of demonstration. Utilize resource bundles if you anticipate the need to localize your display strings.

```
package mycomponents;
import java.beans.*;
import java.util.*;
import com.iplanet.jato.component.*;
import com.iplanet.jato.taglib.*;
import com.iplanet.jato.view.*;
import com.iplanet.jato.view.html2.*;
```

```
public class ValidatingTextFieldComponentInfo extends TextFieldComponentInfo {

     public ValidatingTextFieldComponentInfo() {
          super();
     }

     public ComponentDescriptor getComponentDescriptor()
     {
          // identify the component class
          ComponentDescriptor result=new ComponentDescriptor(
               "mycomponents.ValidatingDisplayField");

          // The name will be used to determine a name for the component instance
          result.setName("ValidatingTextField");

          // The display name will be used to show the component in a chooser
          result.setDisplayName("ValidatingTextField Component");

          // The description will be the tool tip text for the component
          result.setShortDescription("A simple validating text field component");

          return result;
     }

     public ConfigPropertyDescriptor[] getConfigPropertyDescriptors()
     {
          if (configPropertyDescriptors!=null)
               return configPropertyDescriptors;

          // get any properties defined in the super class
          configPropertyDescriptors=super.getConfigPropertyDescriptors();
          List descriptors=new LinkedList(Arrays.asList(configPropertyDescriptors));

          ConfigPropertyDescriptor descriptor = null;

          descriptor=new ConfigPropertyDescriptor(
               "validator",Validator.class);
          descriptor.setDisplayName("Validator");
          descriptor.setHidden(false);
          descriptor.setExpert(false);
          descriptors.add(descriptor);

          descriptor=new ConfigPropertyDescriptor(
               "validationFailureMessage",String.class);
          descriptor.setDisplayName("Validation Failure Message");
          descriptor.setHidden(false);
          descriptor.setExpert(false);
          descriptors.add(descriptor);
          // Create/return the array
          configPropertyDescriptors = (ConfigPropertyDescriptor[])
               descriptors.toArray(
                    new ConfigPropertyDescriptor[descriptors.size()]);
          return configPropertyDescriptors;
     }

     public JspTagDescriptor[] getJspTagDescriptors()
     {
          JspTagAttributeDescriptor[] attrs=new JspTagAttributeDescriptor[1];
          attrs[0]=new JspTagAttributeDescriptor(
               TagBase.ATTR_NAME,JspTagDescriptor.ASSUMED_PROPERTY_NAME,null);

          JspTagDescriptor htmlTagDescriptor=new JspTagDescriptor(
               JspTagDescriptor.ENCODING_HTML,"validatingTextField",
               "/WEB-INF/mycomplib.tld",attrs);

          return new JspTagDescriptor[] {htmlTagDescriptor};
     }

     private ConfigPropertyDescriptor[] configPropertyDescriptors;
}
```

Create a New Tag Library TLD File

Since a new JSP TagHandler has been defined, a JSP library TLD file must be created for the component library.

There is a *soft* restriction on your custom JSP library. During IDE operations, a logical object model is created for the working JSP files. This JSP object model is used by the page and pagelet view component mechanisms to manage the placement of tags in the JSP while the views are mutated. While parsing the JSP file to create the JSP object model, tags for Web Application Framework component tag libraries have special treatment. If your custom JSP tag library has additional tags which are not related to a Web Application Framework view component, these tags might be categorized incorrectly in the JSP object model. You should isolate your Web Application Framework related tags in their own tag library. Internally in the JSP object model, tags from tag libraries specified in the component library manifest will be categorized as "JATO" tags, while all other tags in the JSP file are categorized as "OTHER" tags. The reason why this is a *soft* restriction is that there is only an edge case where a non Web Application Framework tag would interfere with view component tag management. If a non Web Application Framework tag remains in your component tag library, and if that tag has an attribute "name" who's value collides with a "name" attribute of a true Web Application Framework tag, the JSP object model might not operate properly. In other words, if you have non Web Application Framework tags which have a "name" attribute, you should try and isolate these tags in a separate tag library to avoid edge case problems.

The library TLD file name is arbitrary. Its location within the library is also arbitrary. In a later step, the new TLD file will be declared in your component manifest. A full discussion of JSP tld files is beyond the scope of this document. Suffice to say, for this example, only a new library (mycomlib) containing a single tag element (validatingTextField) needs to be declared. All of the tag attributes can be copied verbatim from the declaration of the TextField tag in the Web Application Framework Component Library's `jato.tld` file. You can find the `jato.tld` file located in the `WEB-INF\tld\com_iplanet_jato` directory of any Web Application Framework application created by the IDE.

1. **Create the file** `mycomponents/mycomplib.tld`**.**
2. **Add the basic tld information to declare a new tag library.**
3. **Add a tag element for the new tag validatingTextField and its corresponding tag-class** `mycomponents.ValidatingTextFieldTag`**.**
4. **Complete the tag element declaration by adding all desired tag attributes. Copy those already defined in** `jato.tld` **for the Web Application Framework Component Library's TextField tag.**

   After these steps, the `mycomponents/mycomplib.tld` file should look as follows

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

<!DOCTYPE taglib
        PUBLIC "-//Sun Microsystems, Inc.//DTD JSP Tag Library 1.2//EN"
        "http://java.sun.com/dtd/web-jsptaglibrary_1_2.dtd">
<!-- template test -->

<taglib>
    <tlib-version>1.0</tlib-version>
    <jsp-version>1.2</jsp-version>
    <short-name>mycomponents.mycomplib</short-name>
    <display-name>mycomponents.mycomplib</display-name>
    <tag>
        <name>validatingTextField</name>
        <tag-class>mycomponents.ValidatingTextFieldTag</tag-class>
        <body-content>empty</body-content>
        <display-name>Validating Text Field</display-name>
        <description></description>
        <attribute>
            <name>name</name>
            <required>true</required>
            <rtexprvalue>false</rtexprvalue>
                <type>String</type>
        </attribute>
...
        <!-- more attribute definitions follow -->
...

    </tag>
</taglib>
```

Augment the Component Library Manifest

The component manifest has already been created in the earlier example. Now you will add additional information.

Note that you will add additional types of information not seen in the prior example.

The Web Application Framework library manifest must be named `complib.xml`. Within the JAR file, the Web Application Framework library manifest must be placed in the `/COMP-INF` directory.

1. **Create/Open the file** `COMP-INF/complib.xml`**.**
2. **Add a component element to declare the ValidatingTextField component.**
3. **Add a ConfigurableBean element to declare the** `mycomponents.TypeValidator`**.**
4. **Add a taglib element to declare the** `mycomplib.tld`**.**

After these steps, the `COMP-INF/complib.xml` file should look like the following:

Note – Make sure that the tld is a well formed XML document. Even something as minor as inappropriate leading spaces before the first XML tag can create a malformed document. If your tld file is not well formed XML, certain servlet containers will fail to load your entire Web application. Such errors might be difficult to track down.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<component-library>
<tool-info>
<tool-version>2.1.0</tool-version>
</tool-info>
<library-name>mycomponents</library-name>
<display-name>My First Component Library</display-name>
<!-- Your icon here
<icon>
<small-icon>/com/iplanet/jato/resources/complib.gif</small-icon>
</icon>
-->
<interface-version>1.0.0</interface-version>
<implementation-version>20030221</implementation-version>

<component>
<component-class>mycomponents.MyTextField</component-class>
<component-info-class>mycomponents.MyTextFieldComponentInfo</component-info-class>
</component>
<component>
<component-class>mycomponents.ValidatingDisplayField</component-class>
<component-info-class>mycomponents.ValidatingTextFieldComponentInfo</component-info-class>
</component>

<configurable-bean>
<bean-class>mycomponents.TypeValidator</bean-class>
</configurable-bean>

<taglib>
<taglib-uri>/WEB-INF/mycomplib.tld</taglib-uri>
<taglib-resource>/mycomponents/mycomplib.tld</taglib-resource>
<taglib-default-prefix>mycomp</taglib-default-prefix>
</taglib>

</component-library>
```

Recreate the Component Library JAR File

Jar up the component classes as you did in the first example so that they can be ready for distribution as a library.

1. **The name of the JAR file is arbitrary.**

   In this case, name it "mycomponents.jar".

2. **You can omit the Java source files from the JAR.**

3. **You should include in the JAR any necessary ancillary resources, like icon images, or resource bundles.**

   In this case, there are none.

   In this case, you are now including several new classes and a new JSP tag library.

4. **The mycomponents.jar internal structure should look as follows:**

```
mycomponents/MyTextField.class
mycomponents/MyTextFieldComponentInfo.class
mycomponents/TypeValidator.class
mycomponents/ValidatingDisplayField.class
mycomponents/ValidatingTextFieldComponentInfo.class
mycomponents/ValidatingTextFieldTag.class
mycomponents/Validator.class
mycomponents/mycomplib.tld
COMP-INF/complib.xml
```

Test the New Component

Your library is now ready for testing and distribution. You should test it in a sample project. This stage requires the use of the IDE with the Web Application Framework module installed and enabled. If you have never built a Web Application Framework application in the IDE, before continuing, you should first complete the *Web Application Framework Tutorial* that is included with the Web Application Framework document set.

1. **Deploy the new version of the library into your previously created test application.**

   Important IDE note: The IDE will not let you delete or copy over a JAR file that is currently mounted. This presents a bit of a challenge when iteratively developing a component library and testing that library in a test application.

   For repeatedly testing new versions of the same library JAR file within a test application, perform the following steps:

   a. **Unmount the test application.**

   b. **After the unmount is complete, go to your operating system file system and copy the new library JAR file over the old library JAR file in the unmounted test application's `WEB-INF/lib` directory.**

   c. **Remount the test application.**

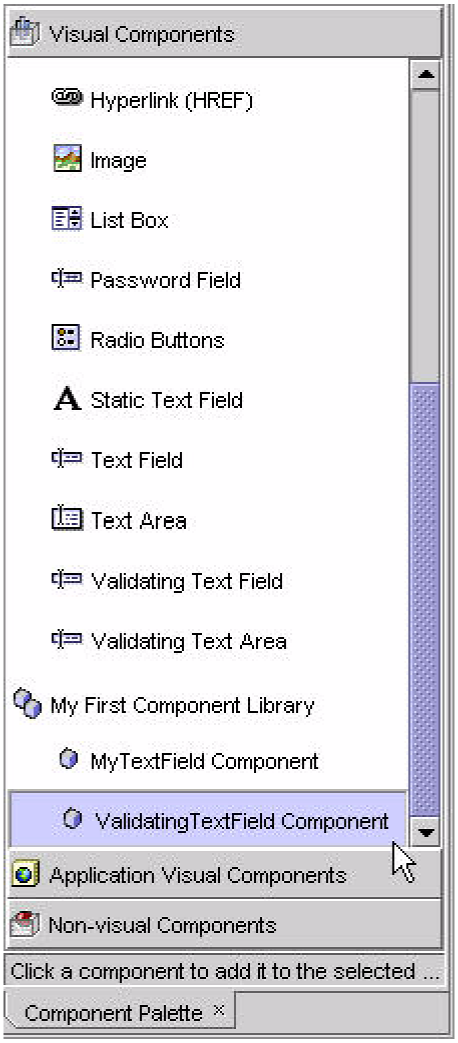
      The test application should now pick up the new library version.

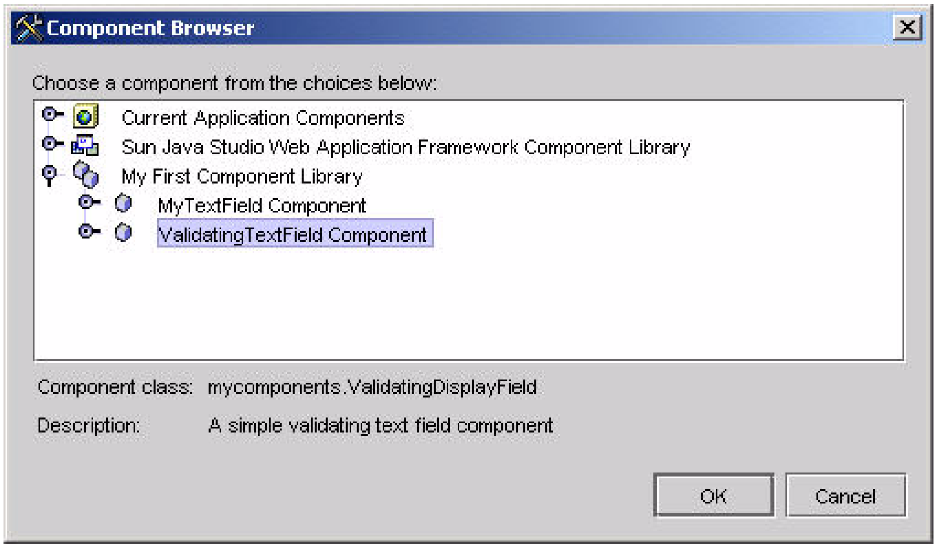
      Normally, those steps work fine. If you encounter a spurious failure that either prevents you from copying the new JAR over the old JAR, or failure to remount the test application properly, the fallback strategy is to restart the IDE.

2. **Select the previously created Page1 object.**

3. **Add an instance of the ValidatingTextFieldComponent to Page1.**

   You can either select the component from the Component Palette, or select the Page1's Visual Components sub-node, right-click, and select the Add Visual Component... action from the pop-up menu.


Visual Components
Hyperlink (HREF)
Image
List Box
Password Field
Radio Buttons
Static Text Field
Text Field
Text Area
Validating Text Field
Validating Text Area
My First Component Library
MyTextField Component
ValidatingTextField Component
Application Visual Components
Non-visual Components
Click a component to add it to the selected ...
Component Palette


Component Browser
Choose a component from the choices below:
Current Application Components
Sun Java Studio Web Application Framework Component Library
My First Component Library
MyTextField Component
ValidatingTextField Component
OK
Cancel

Component class: mycomponents.ValidatingDisplayField

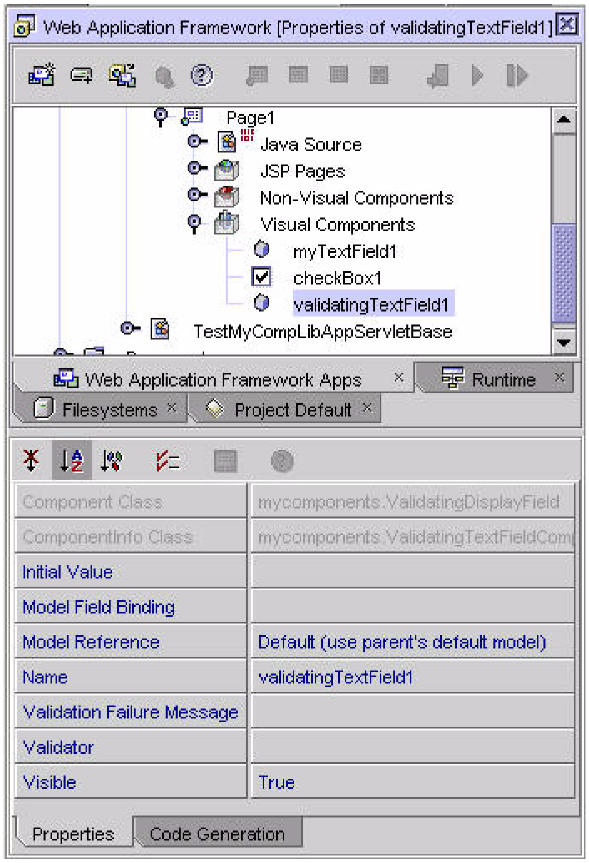
Description: A simple validating text field component

4. **Select the "ValidatingTextField Component" from the list.**

   Observe how a child view named "validatingTextField1" is added to the page.

5. **Select the validatingTextField1 visual component node.**

   Observe how the IDE's property sheet now displays the custom Validator and Validation Failure Message properties, in addition to the inherited TextField component properties.


Web Application Framework [Properties of validatingTextField1]

Component Class	mycomponents.ValidatingDisplayField
ComponentInfo Class	mycomponents.ValidatingTextFieldCom
Initial Value	
Model Field Binding	
Model Reference	Default (use parent's default model)
Name	validatingTextField1
Validation Failure Message	
Validator	
Visible	True

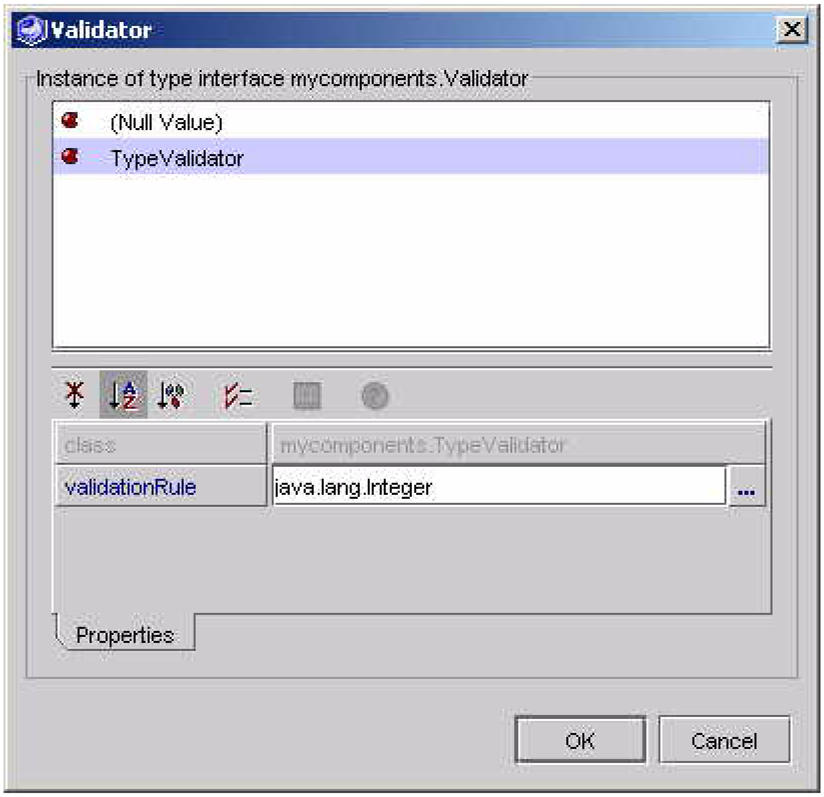
6. **Edit the Validation Failure Message property.**

   Set it to "This is a test failure message" (or anything you like).

7. **Edit the Validator property.**

   This should bring up the following dedicated ConfigurableBean editor. For test purposes, set the validationRule property to "java.lang.Integer".

   Make sure you specify the fully qualified class name for the validationRule property. Just "Integer" will not evaluate properly at run-time. It must be fully qualified, as in "java.lang.Integer".



Validator

Instance of type interface mycomponents.Validator

(Null Value)

TypeValidator

class	mycomponents.TypeValidator
validationRule	java.lang.Integer

8. **Observe the code generation inside the page's java file.**

   You should see a block of code inside the createChildReserved method that looks like the following (the indenting in your code might differ):

```
...
else if (name.equals(CHILD_VALIDATING_TEXT_FIELD1)) {
mycomponents.ValidatingDisplayField child =
new mycomponents.ValidatingDisplayField(this, CHILD_VALIDATING_TEXT_FIELD1);
mycomponents.TypeValidator validatorVar =
new mycomponents.TypeValidator();

{ // begin local variable scope
validatorVar.setValidationRule("java.lang.Integer");
} // end local variable scope
child.setValidator(validatorVar);
child.setValidationFailureMessage( "This is a test failure message");
return child;
}
...
```

9. **Open the associated JSP file to observe the inclusion of the validatingTextField tag.**

   Note also the automatic inclusion of a `mycomplib.tld` directive. (The overall look of your test application's JSP may differ from the one shown next, depending upon whether you have added other child views you to your test page in addition to validatingTextField1)

```
<%@page contentType="text/html; charset=ISO-8859-1" info="Page1" language="java"%>
<%@taglib uri="/WEB-INF/jato.tld" prefix="jato"%>
<%@taglib uri="/WEB-INF/mycomplib.tld" prefix="mycomp"%>

<jato:useViewBean className="testmycomplib.main.Page1">

<html>
<head>
<title>Page1</title>
</head>
<body>
<jato:form name="Page1" method="post">
<jato:textField name="myTextField1"/>
<mycomp:validatingTextField name="validatingTextField1"/>
</jato:form>
</body>
</html>

</jato:useViewBean>
```

10. **Before you can effectively test run Page1, you need to add a button and request handling code.**

    For your test purposes, you should take the following steps to add a button and some request handling code, which will redisplay the page following a submit. This allows you to see if the ValidatingTextComponent is behaving as designed. If you have not done so already, add a button and some request handling code, follow the steps shown next:

    Note – The following steps represent conventional Web Application Framework application development practice, the details of which are beyond the scope of this document. These steps, or similar ones, are required to create an effective test page.

    ---

    a. **Add an instance of the Web Application Framework Library's Basic Button to Page1.**

       You may either select the component from the Component Palette or select the Page1's Visual Components sub-node, right-click, and select the Add Visual Component... action from the pop-up menu.

       This adds a "button1" child to your test ViewBean.

b. **Select the button1 visual component node.**

c. **Right-click, and select the pop up menu's Events->handleRequest action.**

This adds an event handler method named `handleButton1Request` to your ViewBean's Java file.

For this test, you do not need to modify the body of `handleButton1Request` since it is auto-generated to redisplay the current page, which is precisely the test you are looking for.

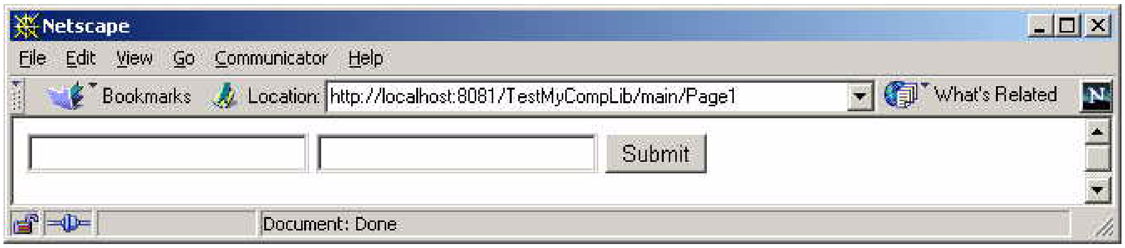
Make sure your request handler looks as follows:

```
public void handleButton1Request(RequestInvocationEvent event) throws Exception {
getParentViewBean().forwardTo(getRequestContext());
}
```

11. **Test run Page1.**

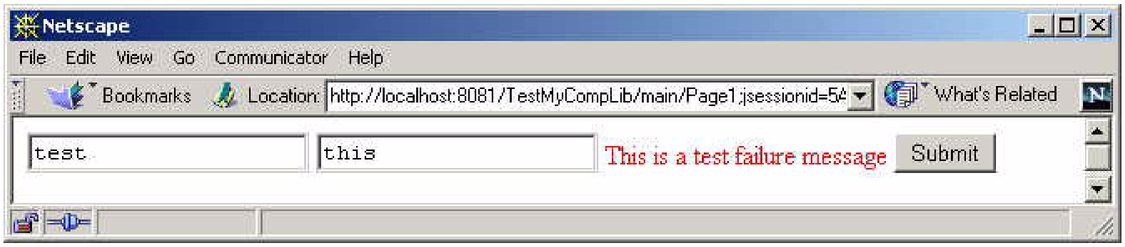
See the *Web Application Framework Tutorial* if you do not already know how to test run a Web Application Framework ViewBean.

The Page1 output should appear in a browser looking as follows (it now contains two text fields, one instance of MyTextField, and one instance of ValidatingTextField):


Netscape
File Edit View Go Communicator Help
Bookmarks
Location: http://localhost:8081/TestMyCompLib/main/Page1
What's Related
Submit
Document: Done

12. **Enter an invalid value (for example, any value other than an integer) in the ValidatingTextField's text input, and submit the page.**

The page should immediately be redisplayed with the text of the Validation Error Message property immediately following the ValidatingTextField.

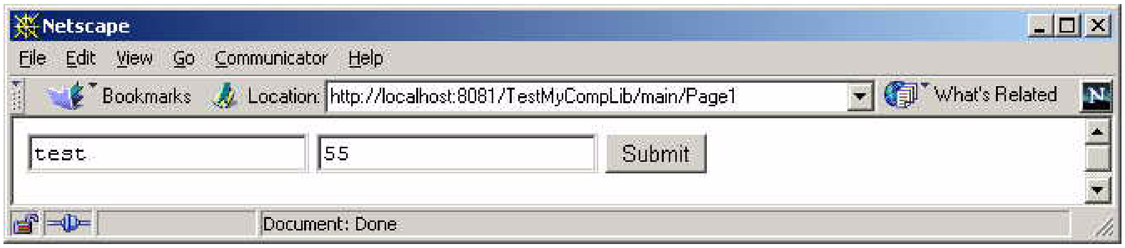

Netscape
File Edit View Go Communicator Help
Bookmarks Location: http://localhost:8081/TestMyCompLib/main/Page1;jsessionid=5
What's Related

test | this | This is a test failure message | Submit

13. **Enter a valid value (for example, 55, or any other valid integer) and submit the page.**

    The page should be redisplayed without the Validation Error Message text.

    If you continue to get the Validation Error Message, go back and verify that you set the value of validatingTextField1's Validator->ValidationRule property to "java.lang.Integer", and not just "Integer".


Netscape
File Edit View Go Communicator Help
Bookmarks Location: http://localhost:8081/TestMyCompLib/main/Page1
What's Related
Document: Done

test | 55 | Submit

Ship It!

Now that your component is functioning properly, you can ship it. However, you might also go back and enhance it. For instance, you might decide that requiring the end user to type "java.lang.Integer" into the Validator's ValidationRule property is unacceptably error prone. If so, you should spend a little time and develop a custom property editor. The details of that are beyond the scope of this document, but can be found in any basic JavaBean reference.

Develop an Extensible View Component

This section describes how to create a new ViewBean component that supports a rudimentary page level security feature. In the interest of simplicity, the security model and implementation will be kept to a minimum. This exercise is intended to focus on the mechanics of extensible View component design and, as such, only scratches the surface of security model possibilities. Upon completion of this section, you should have a good understanding of the role of extensible components within the Web Application Framework. Bear in mind that this example will implement several optional features, and goes beyond the bare minimum required to author an extensible View component.

This example introduces several additional Web Application Framework component model topics, as follows:

- ExtensibleComponentInfo
- Component supplied Java templates
- IndexedConfigPropertyDescriptor
- EventHandlerDescriptor

As a basic design principle, the Web Application Framework prefers to be enabling rather than prescriptive when it comes to application and page level security, since developer preferences in this domain vary widely. This example demonstrates that the Web Application Framework can easily enable an arbitrary page level security model. It is not meant to suggest that this example is the ultimate or recommended implementation.

Your secure ViewBean component should support the following design-time functionality:

- Each secure ViewBean will expose an indexed property called “RequiredTokens”. Application developers will configure this property to specify an arbitrary list of “required” String tokens (for example, the tokens that are required to gain access to the current page).
- Each secure ViewBean will expose an indexed property called "GrantTokens". Application developers will configure this property to specify an arbitrary list of "grant" String tokens (for example, the tokens that will be granted to the user after they successfully access the current page).
- Each secure ViewBean will expose the "handleMissingTokens" event handler for custom implementation. This means that IDE developers can select the "handleMissingTokens" from the "Events" pop up menu, and the IDE toolset will automatically insert the event handler into the current secure ViewBean's Java file. This is an advanced and optional feature of the Web Application Framework component model.

Your secure ViewBean component should support the following run-time functionality:

- Each secure ViewBean can "grant" tokens to users who successfully access the current secure ViewBean. Thus, application users will "accumulate" tokens as they proceed through the application.
- Each secure ViewBean will limit run-time access to itself through a simple comparison of required tokens to user accumulated tokens. If the application user has not accumulated all of the required tokens, a MissingTokensEvent will be fired. A specific event handler method called handleMissingTokens will be invoked. The secure ViewBean base class implementation of

handleMissingTokens will throw a SecurityCheckException. The Web Application Framework will automatically process an uncaught SecurityCheckException as it does any uncaught exception (for example, it will return the standard Web Application Framework error page to the user). Individual secure ViewBeans can override the implementation of the handleMissingTokens to perform arbitrary context specific behavior.

This run-time model assumes that both the grant tokens and the required tokens will be specified on a per secure ViewBean basis by the application developers.

The implementation of the secure ViewBean component is responsible for tracking the accumulated tokens at run-time, and enforcing the security model described above. The implementation shall store the accumulated tokens per user in a special HttpSession attribute.

The choice to implement the base class version of handleMissingTokens to throw a SecurityCheckException is purely arbitrary. Alternatively, you could implement that method to transfer control to a more user friendly error page, or anything else that the component author prefers. Strictly in the interest of brevity and simplicity, the choice is to throw a SecurityCheckException.

To meet these requirements, you will design and implement the following classes:

- Component class - *mycomponents.SecureViewBean*
- ComponentInfo class - `mycomponents.SecureViewBeanComponentInfo`
- A simple event class - `mycomponents.MissingTokensEvent`

Additionally, you will implement a custom Java template which the IDE toolset will use as the basis for application specific sub-types of your SecureViewBean.

Finally, you will edit the mycomponents `complib.xml` to add the new component to the Web Application Framework component library.

Create the MissingTokensEvent Class

1. **In any Java editor, create the class** `mycomponents.MissingTokensEvent`**.**

2. **Define a very simple event API that will allow the event handler to discover which tokens were missing.**

   After these steps, `mycomponents/MissingTokensEvent.java` should look as follows:

```
package mycomponents;
  import java.util.*;

  public class MissingTokensEvent extends Object {

    public MissingTokensEvent(List tokens) {
        missingTokens = new ArrayList(tokens);
    }

    public String toString() {
        Iterator iter = missingTokens.iterator();
        StringBuffer buff = new StringBuffer();
        buff.append("MissingToken count[" + missingTokens.size() + "] ");
        while(iter.hasNext()) {
            buff.append("Token[" + (String)iter.next() + "] ");
        }
        return buff.toString();
    }

    public ArrayList getMissingTokens() {
        return missingTokens;
    }

    private ArrayList missingTokens = null;

}
```

Create the Web Application Framework Component Class

1. **In any Java editor, create the class** `mycomponents.SecureViewBean`**.**
2. **Make SecureViewBean extend** `com.iplanet.jato.view.BasicViewBean`**.**
3. **Implement the appropriate constructor for the component type.**

   All ViewBean components must implement a no-arg constructor.
4. **Add a get and set method for the property named "RequiredTokens".**
5. **Add a get and set method for the property named "GrantTokens".**
6. **Implement the remaining methods that are required to fulfill your component specific requirements.**
   - Overridden implementation of the securityCheck method which will enforce the component's page security model.

- Default implementation of the component's handleMissingTokens method.

After these steps, `mycomponents/SecureViewBean.java` should look as follows:

```
package mycomponents;
import java.util.*;
import com.iplanet.jato.view.*;
import com.iplanet.jato.*;

public class SecureViewBean extends BasicViewBean {

     public SecureViewBean()
     {
          super();
     }

     public String[] getRequiredTokens()
     {
          return requiredTokens;
     }

     public void setRequiredTokens(String[] value)
     {
           requiredTokens = value;
     }

     public String[] getGrantTokens()
     {
          return grantTokens;
     }

     public void setGrantTokens(String[] value)
     {
           grantTokens = value;
     }

     public void securityCheck() throws SecurityCheckException
     {
          super.securityCheck();

          // Get the accumulated tokens from session.
          HashSet accumulated = (HashSet)
               getSession().getAttribute("AccumulatedTokens");
          // Defensively prepare the accumulated collection
          if(accumulated == null)
               accumulated = new HashSet();

          // Check to see if required tokens are present
          if(requiredTokens.length > 0) {
               // Check for presence of required tokens
               List missingTokens = new ArrayList();
```

```
            for(int i=0; i<requiredTokens.length; i++)
            {
                if(! accumulated.contains(requiredTokens[i]))
                    missingTokens.add(requiredTokens[i]);
            }

            if(missingTokens.size() > 0)
                handleMissingTokens(new MissingTokensEvent(missingTokens));
        }

        // Now add the current grant tokens to the accumulated.
        // Note, as expected, we will not reach this point if the
        // handleMissingTokens throws an Exception.
        for(int i=0; i<grantTokens.length; i++)
        {
                accumulated.add(grantTokens[i]);
        }
        getSession().setAttribute("AccumulatedTokens", accumulated);
    }

    public void handleMissingTokens(MissingTokensEvent e)
        throws SecurityCheckException
    {
        // This default implementation will just trigger conventional
        // Web Application Framework SecurityCheckException handling
        throw new SecurityCheckException(e.toString());
    }

    private String[] requiredTokens = new String[0];
    private String[] grantTokens = new String[0];

}
```

Create the Extensible Component's Java Template

Extensible components serve as base classes for application defined entities. Therefore, the Web Application Framework component model provides extensible component authors the opportunity to provide a custom Java template. The IDE toolset will, subsequently, use the component supplied template to create the application specific sub-type. Component authors can utilize the custom template to enhance the application developer's experience. Component authors might prepare the component specific Java template with a set of template tokens defined in `com.iplanet.jato.component.ExtensibleComponentInfo`. For token details, see ExtensibleComponent API.

Component authors might also utilize any arbitrary Java constructs within the Java template (for example, import statements, methods, variables, interface declarations, and so on). Minimally, the custom template will ensure that the new Java class extends from the extensible component class.

In this example, the template will be kept minimal.

1. **Create a new directory** `mycomponents.resources`**.**
2. **In any text editor, create the template** `mycomponents.resources.SecureViewBean_java.template`**.**

   The template contents should look as follows:

Note – The tokens follow a __TOKEN__ pattern.

```
package __PACKAGE__;

import java.io.*;
import java.util.*;
import javax.servlet.*;
import javax.servlet.http.*;
import com.iplanet.jato.*;
import com.iplanet.jato.view.*;
import com.iplanet.jato.view.event.*;
import com.iplanet.jato.model.*;
import mycomponents.*;


/**
 *
 *
 */
public class __CLASS_NAME__ extends SecureViewBean
{
    /**
     * Default constructor
     *
     */
    public __CLASS_NAME__()
    {
        super();
    }


}
```

Create the ComponentInfo Class

The ComponentInfo class defines the design-time metadata that the IDE toolset requires to incorporate the component. In this example, you will extend an existing ComponentInfo and in true OO style, simply augment it. You could, of course, choose to implement the `ComponentInfo` interface from scratch, but that would be unproductive in this case.

In this example, you are going beyond the functionality revealed in the earlier component examples. Next, you are going to take advantage of two new metadata opportunities provided by the ExtensibleComponentInfo interface, the opportunity to specify a Java template, and the opportunity to describe event handler methods for the extensible component.

1. **Create the class** `mycomponents.SecureViewBeanComponentInfo`**.**
2. **Make SecureViewBeanComponentInfo extend** `com.iplanet.jato.view.BasicViewBeanComponentInfo`**.**
3. **Implement the no-arg constructor.**
4. **Implement the** `getComponentDescriptor()` **method to provide the basic design-time description of the component.**
5. **Implement the** `getConfigPropertyDescriptors()` **method to identify which properties you want to expose in the IDE.**
   a. **Add an IndexedConfigPropertyDescriptor for the RequiredTokens property.**
   b. **Add an IndexedConfigPropertyDescriptor for the GrantTokens property.**
6. **Implement the** `getPrimaryTemplateAsStream()` **method to return a Java template file which you want the IDE toolset to use as the starting point for new classes derived from this extensible component.**
7. **Implement the** `getEventHandlerDescriptors()` **method to provide a design-time description of any event handler methods which you want the IDE toolset to expose for automated insertion into new classes derived from this extensible component.**

   After these steps, `mycomponents/SecureViewBeanComponentInfo.java` should look as follows:

   In this sample code, String values have been embedded directly for ease of demonstration. Utilize resource bundles if you anticipate the need to localize your display strings.

```
package mycomponents;
import java.util.*;
import java.io.*;
import com.iplanet.jato.*;
import com.iplanet.jato.component.*;
import com.iplanet.jato.view.*;


public class SecureViewBeanComponentInfo extends BasicViewBeanComponentInfo
{

     public SecureViewBeanComponentInfo()
     {
          super();
     }

     public ComponentDescriptor getComponentDescriptor()
     {
          final String CLASS_NAME="mycomponents.SecureViewBean";

          ComponentDescriptor descriptor=new ComponentDescriptor(
               CLASS_NAME);
          descriptor.setName("SecurePage");
          descriptor.setDisplayName("Secure ViewBean");
          descriptor.setShortDescription(
               "A Page with a token based security model");
          return descriptor;
     }

     public ConfigPropertyDescriptor[] getConfigPropertyDescriptors()
     {
          if (configPropertyDescriptors!=null)
               return configPropertyDescriptors;

          configPropertyDescriptors=super.getConfigPropertyDescriptors();
          List descriptors=new LinkedList(Arrays.asList(configPropertyDescriptors));

          ConfigPropertyDescriptor descriptor = null;

          descriptor=new IndexedConfigPropertyDescriptor(
               "grantTokens",String.class); // NOI18N
          descriptor.setDisplayName("Grant Tokens"); // NOI18N
          descriptor.setHidden(false);
          descriptor.setExpert(false);
          descriptors.add(descriptor);

          descriptor=new IndexedConfigPropertyDescriptor(
               "requiredTokens",String.class); // NOI18N
          descriptor.setDisplayName("Required Tokens"); // NOI18N
          descriptor.setHidden(false);
          descriptor.setExpert(false);
          descriptors.add(descriptor);

          // Create/return the array
```

```
         configPropertyDescriptors = (ConfigPropertyDescriptor[])
             descriptors.toArray(
                 new ConfigPropertyDescriptor[descriptors.size()]);
         return configPropertyDescriptors;
     }

 public String getPrimaryTemplateEncoding()
     {
/* Production version would be resource bundle driven, like this:
return getResourceString(getClass(),
"PROP_SecureViewBean_SOURCE_TEMPLATE_ENCODING", "ascii");
*/

         return "ascii";
     }

     public InputStream getPrimaryTemplateAsStream()
     {
/* Production version would be resource bundle driven, like this:

return SecureViewBeanComponentInfo.class.getClassLoader().
getResourceAsStream(
getResourceString(getClass(),
"RES_SecureViewBeanComponentInfo_SOURCE_TEMPLATE",""));
*/

         return SecureViewBeanComponentInfo.class.getResourceAsStream(
             "/mycomponents/resources/SecureViewBean_java.template");
     }


     public EventHandlerDescriptor[] getEventHandlerDescriptors()
     {
         if (eventHandlerDescriptors!=null)
             return eventHandlerDescriptors;

         eventHandlerDescriptors=super.getEventHandlerDescriptors();
         List descriptors=new LinkedList(
             Arrays.asList(eventHandlerDescriptors));

         EventHandlerDescriptor descriptor =new EventHandlerDescriptor(
             "handleMissingTokens",
             "handleMissingTokens",
             "public void handleMissingTokens(MissingTokensEvent e)" +
             "throws SecurityCheckException",
             "throw new SecurityCheckException(e.toString());",
             "");

         descriptors.add(descriptor);

         // Create/return the array
```

```
        eventHandlerDescriptors = (EventHandlerDescriptor[])
            descriptors.toArray(
                new EventHandlerDescriptor[descriptors.size()]);
        return eventHandlerDescriptors;
    }

    private ConfigPropertyDescriptor[] configPropertyDescriptors;
    private EventHandlerDescriptor[] eventHandlerDescriptors;
}
```

Augment the Component Library Manifest

The component manifest has already been created in the earlier example. Now you will add additional information.

Note that you will add additional types of information not seen in the prior example.

The Web Application Framework library manifest must be named `complib.xml`. Within the JAR file, the Web Application Framework library manifest must be placed in the `/COMP-INF` directory.

1. **Create/Open the file** `COMP-INF/complib.xml`**.**
2. **Add an extensible-component element to declare the SecureViewField component.**

   After these steps, the `COMP-INF/complib.xml` file should look as follows:

Note – For clarity, only the significant delta to the prior version of this file shown earlier is shown here.

```
<?xml version="1.0" encoding="UTF-8"?>
<component-library>
<tool-info>
<tool-version>2.1.0</tool-version>
</tool-info>
<library-name>mycomponents</library-name>
<display-name>My First Component Library</display-name>

 ...

     <extensible-component>
          <component-class>mycomponents.SecureViewBean</component-class>
          <component-info-class>mycomponents.SecureViewBeanComponentInfo</component-info-
class>
     </extensible-component>

...

</component-library>
```

Recreate the Component Library JAR File

Jar up the component classes as you did in the first example, so that they can be ready for distribution as a library.

1. **The name of the JAR file is arbitrary.**

   In this case, name it "mycomponents.jar".

   You can omit the Java source files from the JAR.

2. **Include in the JAR any necessary ancillary resources, like icon images, or resource bundles.**

   In this case you are including several new classes and a Java template file.

3. **The `mycomponents.jar` internal structure should look as follows:**

```
mycomponents/resources/SecureViewBean_java.template
mycomponents/MissingTokensEvent.class
mycomponents/MyTextField.class
mycomponents/MyTextFieldComponentInfo.class
mycomponents/SecureViewBean.class
mycomponents/SecureViewBeanComponentInfo.class
mycomponents/TypeValidator.class
mycomponents/ValidatingDisplayField.class
mycomponents/ValidatingTextFieldComponentInfo.class
mycomponents/ValidatingTextFieldTag.class
mycomponents/Validator.class
mycomponents/mycomplib.tld
COMP-INF/complib.xml
```

Test the New Component

1. **Deploy the new version of the library into your previously created test application.**

   Important IDE note: The IDE will not let you delete or copy over a JAR file that is currently mounted. This presents a bit of a challenge when iteratively developing a component library and testing that library in a test application. For repeatedly testing new versions of the same library JAR file within a test application, do the following:

   a. **Unmount the test application.**

   b. **After the unmount is complete, go to your operating system file system and copy the new library JAR file over the old library JAR file in the unmounted test application's `WEB-INF/lib` directory.**

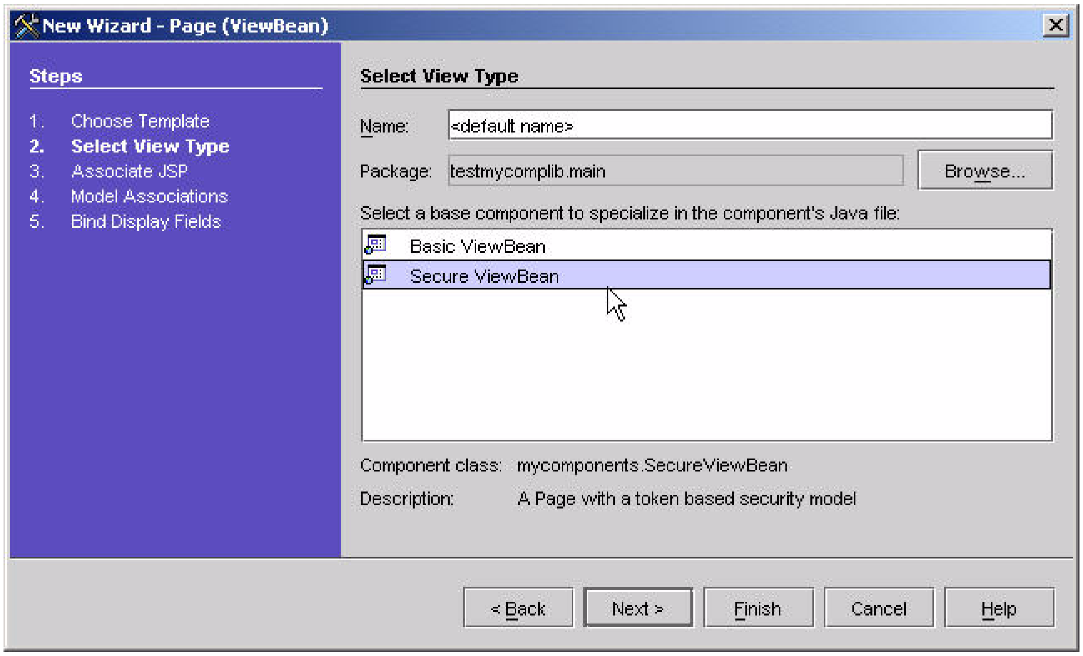
   c. **Remount the test application.**

      The test application should now pick up the new library version.

      Normally, those steps work fine. If you encounter a spurious failure that either prevents you from copying the new JAR over the old JAR, or failure to remount the test application properly, the fallback strategy is to restart the IDE.

2. **Create a new ViewBean object.**

   The new ViewBean wizard should now look as follows:


New Wizard - Page (ViewBean)

Steps

1. Choose Template
2. **Select View Type**
3. Associate JSP
4. Model Associations
5. Bind Display Fields

Select View Type

Name: <default name>

Package: testmycomplib.main

Select a base component to specialize in the component's Java file:

- Basic ViewBean
- Secure ViewBean

Component class: mycomponents.SecureViewBean

Description: A Page with a token based security model

3. **Select the "Secure ViewBean" from the component list and complete the wizard.**

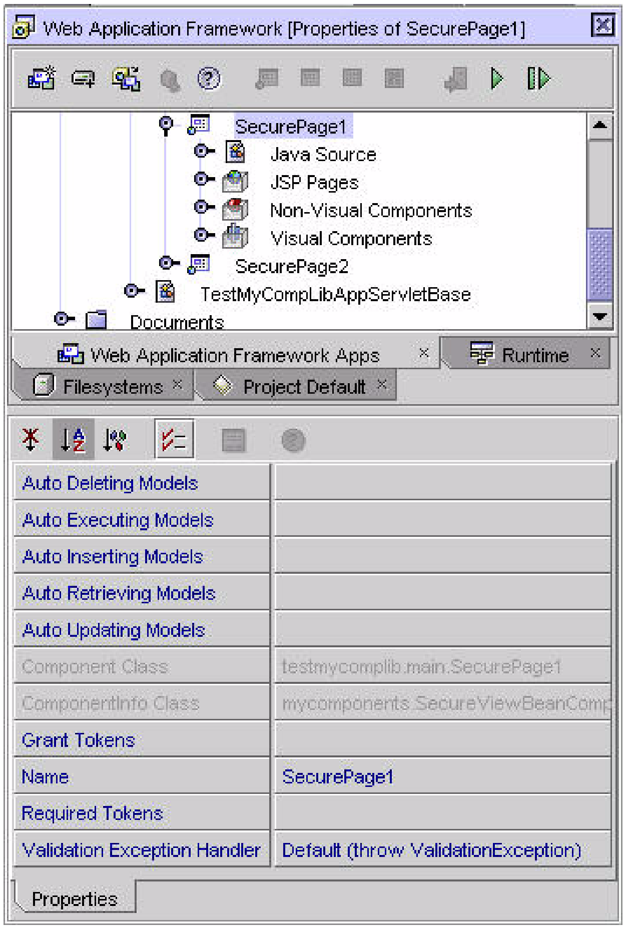
   Take the default settings and let the wizard create SecurePage1 for you. (You can select Finish in the wizard stage shown above.)

4. **After the wizard completes you can see that the IDE toolset has created a new class based on the component supplied template.**

5. **To test your security model, create a second SecureViewBean.**

   You application should now contain two SecureViewBeans (SecurePage1 and SecurePage2).

   The new SecureViewBeans contain the Grant Tokens and Required Tokens properties.



Auto Deleting Models	
Auto Executing Models	
Auto Inserting Models	
Auto Retrieving Models	
Auto Updating Models	
Component Class	testmycomplib.main.SecurePage1
ComponentInfo Class	mycomponents.SecureViewBeanComp
Grant Tokens	
Name	SecurePage1
Required Tokens	
Validation Exception Handler	Default (throw ValidationException)

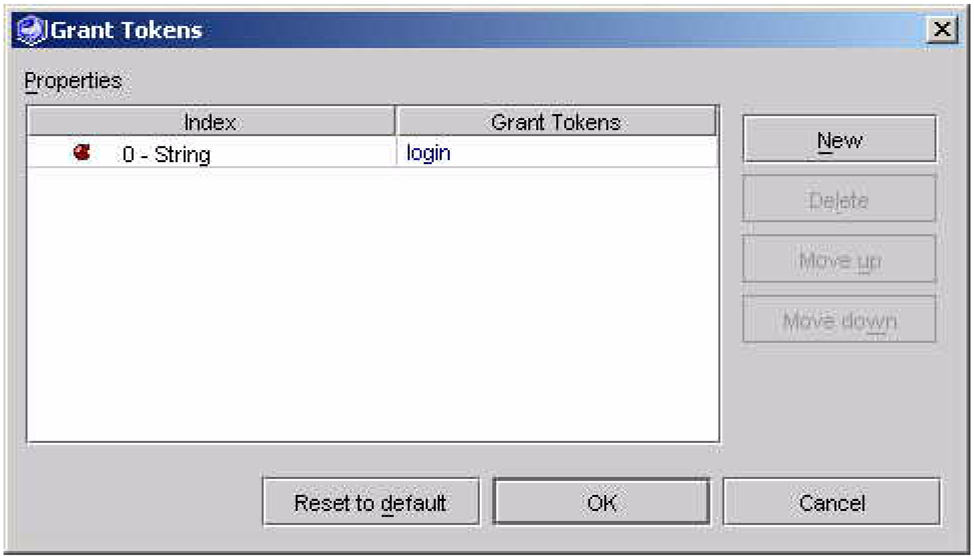
6. **Test the security model by introducing some values into the token properties.**

   Select SecurePage1's Grant Tokens property.

   If you select the ellipsis in the property sheet, it will bring up the indexed String property editor.

7. **Add the value "login" to that property.**

   You can add additional tokens.



Index	Grant Tokens
0 - String	login

8. **Select the other Secure ViewBean, SecurePage2.**

   Select its Required Tokens property, and add the value "login".

   You have now established a page security rule in your application.

   SecurePage2 requires the "login" token, and SecurePage1 grants the "login" token. Therefore, an end user who does not visit SecurePage1 BEFORE SecurePage2 should trigger a security exception.

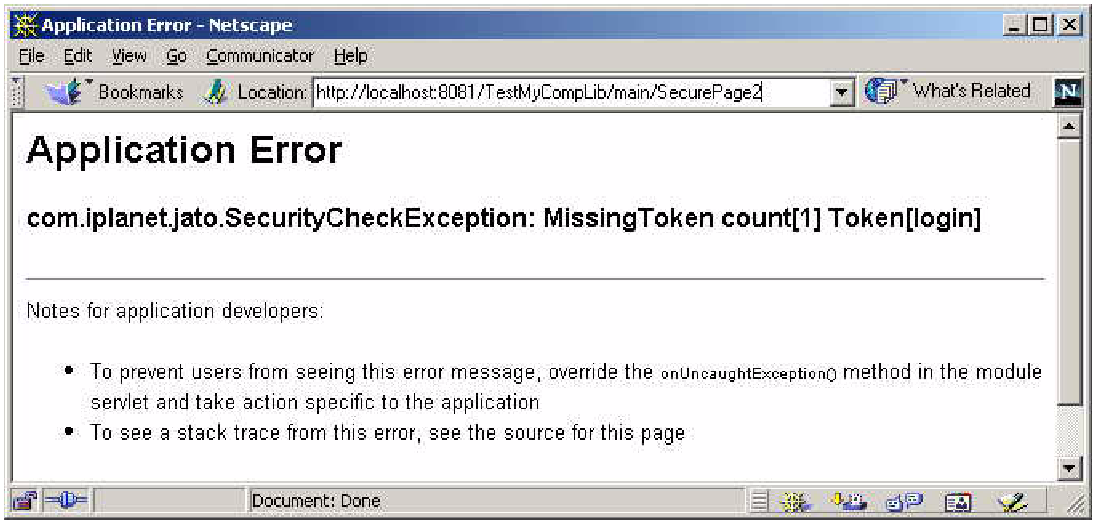
9. **Add some static content to the SecurePage2's associated JSP, SecurePage2.jsp, since this is currently a blank page.**

   For example, put the text "Welcome to Secure2" into SecurePage2.jsp so you will recognize it in the browser

10. **Test run SecurePage2.**

    Instead of seeing SecurePage2.jsp's content, you should see the following message in the browser:

Note – If you see this message, it means that the SecureViewBean security model has worked as intended. At least the access prevention has worked.


Application Error - Netscape
File Edit View Go Communicator Help
Bookmarks Location: http://localhost:8081/TestMyCompLib/main/SecurePage2
What's Related
Document: Done

Application Error

com.iplanet.jato.SecurityCheckException: MissingToken count[1] Token[login]

Notes for application developers:

- To prevent users from seeing this error message, override the onUncaughtException() method in the module servlet and take action specific to the application
- To see a stack trace from this error, see the source for this page

11. **Create a link between SecurePage1 and SecurePage2 so that you can test the positive path.**

    There are several ways to do this.

    You can implement your own link. The instructions that follow are just one approach.

    a. **Add an instance of the Web Application Framework Library's Basic Button to SecurePage1.**

       You can either select the component from the Component Palette, or select the SecurePage1's Visual Components sub-node, right-click, and select the Add Visual Component... action from the pop-up menu.

       This will add a "button1" child to your test ViewBean

    b. **Select the button1 visual component node.**

    c. **Right-click, and select the pop up menu's Events->handleRequest action.**

       This will add an event handler method named handleButton1Request to your SecurePage1's Java file.

    d. **Rework the body of the handleButton1Request to look as follows:**

```
public void handleButton1Request(RequestInvocationEvent event) throws Exception {
getViewBean(SecurePage2.class).forwardTo(getRequestContext());
}
```

12. **Test run the page flow from SecurePage1 to SecurePage2.**

    a. **Test run SecurePage1.**

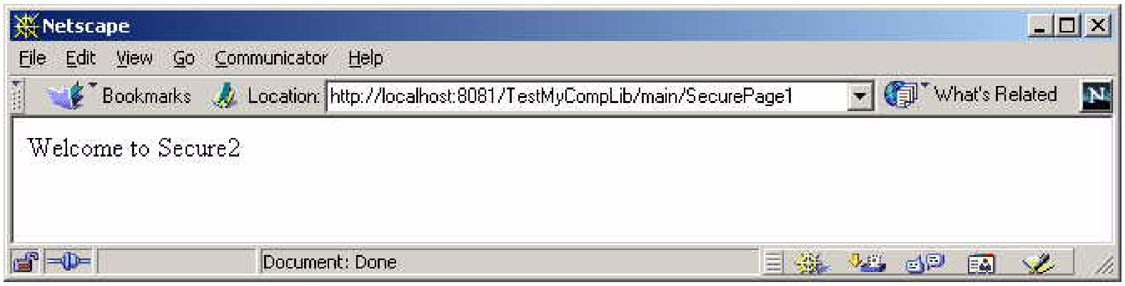
b. **Secure1 should appear in the browser as a blank page with a single button labeled "Submit".**

   The user should now have been granted the "login" token.

c. **Press the Submit button.**

   This will trigger the handleButton1Request logic which will forward the request to SecurePage2.

   The contents of SecurePage2.jsp should show up in the browser (because the user had accumulated the required tokens).


Netscape
File Edit View Go Communicator Help
Bookmarks Location: http://localhost:8081/TestMyCompLib/main/SecurePage1
What's Related

Welcome to Secure2

Document: Done

Ship It?

Not yet. First test the EventHandlerDescriptor feature (handleMissingTokens).

Recall that the SecureViewBeanComponentInfo declares an EventHandlerDescriptor which described an event handler called handleMissingTokens. Now you need to test this feature.

1. **Select the SecurePage2 node.**
2. **Right-click, and select the pop up menu's Events->handleMissingTokens option.**

   This should insert the handleMissingTokens method skeleton into SecurePage2.java and automatically position the Java editor at that method.

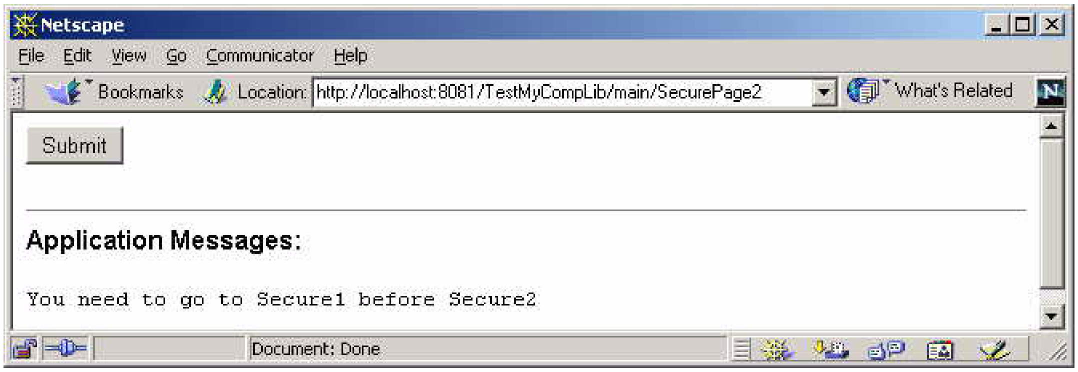
3. **Edit that method to automatically route users back to SecurePage1 when this event is triggered.**

   This is just an arbitrary means of testing the event handler. Application developers can implement this handler any way they want.

```
public void handleMissingTokens(MissingTokensEvent e)throws SecurityCheckException {
        // Route invalid access users to SecurePage1
        appMessage("You need to go to Secure1 before Secure2");
        getViewBean(SecurePage1.class).forwardTo(getRequestContext());
        // Stop further processing of the original request.
        throw new CompleteRequestException();
}
```

4. **Test run SecurePage2 again.**

   This time, the browser should return SecurePage1, because the event handler took control.


Netscape
File Edit View Go Communicator Help
Bookmarks
Location: http://localhost:8081/TestMyCompLib/main/SecurePage2
What's Related
Submit
Document: Done

Application Messages:

You need to go to Secure1 before Secure2

CHAPTER 4

Developing Model Components

This section assumes that you have already read "Develop Your First Component" on page 19.

Model Components

The obvious Model components are the extensible Model components. Extensible Model components are custom implementations of the Model class which are intended for specialization by application developers. The specialization by application developers will usually consist of application developers adding schema information to their application specific Models. The Web Application Framework Component Library contains a number of extensible Model components, such as `QueryModelBase`, `WebServiceModel`, `SessionModel`, `ObjectAdapterModel`, and `CustomModel`.

ModelComponentInfo

The `ModelComponentInfo` interface allows component authors to define additional metadata that is applicable to all Model components.

ExecutingModelComponentInfo

The `ExecutingModelComponentInfo` interface allows component authors to define additional metadata that is applicable to all Model components whose component class implements the `com.iplanet.jato.model.ExecutingModel` interface.

Is it possible to create a non-extensible Model component?

The answer is yes. In fact, whenever application developers create a new Model via the Model wizard, they are in fact extending an extensible Model component and creating an application-specific Model. This new application specific Model is by definition a non-extensible component. Whenever an application developer attempts to fill out a property of type ModelReference, the IDE toolset will invoke a component browser that allows the application developer to choose from a set of existing non-extensible Models. For instance when a application developers specify a DisplayField's Model Reference property, the IDE toolset presents them with a browser that allows them to select a Model.

Is it possible to create one of these non-extensible Models and add it to a library so that it can be distributed? Again, the answer is yes. See the section Developing and Distributing Non-Extensible Model, Command and ContainerView Components (next).

Developing a Non-Extensible Model Component

A non-extensible Model component is a concrete Model that has been created within the IDE from an extensible Model component. It is no different from an application specific Model, except that is distributed in a JAR file and can be incorporated into multiple applications. The distribution technique is common for non-extensible Models, ContainerViews, and Commands. See the section Developing and Distributing Non-Extensible Model, Command and ContainerView Components

Developing an Extensible Model Component

This section describes how to create a new extensible Model component that acts as an adapter to an arbitrary XML document. The adapter pattern is one of the patterns which Web Application Framework Models are well suited to implement. In this example, the Model component will allow Web Application Framework Views to access arbitrary XML document data in a Web Application Framework consistent way. View developers will not need to know anything about the XML internals, or any XML specific APIs. Instead, the View developers will interact with the XML document Model as they would any other Web Application Framework Model. This hightlights one of the key aspects of Web Application Framework Model design. Web Application Framework Models are intended primarily to serve as application resources which are used by Views. For more on the relationship between Web Application Framework Views and Models see the *Web Application Framework Developer's Guide*.

Designing a new extensible Model is generally a non-trivial undertaking. The following example is sophisticated, yet concise enough for this guide. As with any Model, alternative designs are possible. As with any example, further refinement is encouraged for a production quality version. The objective of this section is to familiarize yourself with the mechanics of Web Application Framework extensible Model implementation.

This example introduces several additional Web Application Framework component model topics, as follows:

- ExtensibleModelComponentInfo
- ModelFieldGroupDescriptor
- ModelFieldDescriptor

Key XML Document Model Design Points

This Model will not be a business delegate. Some models ARE both adapters and business delegates. For example, the Web Application Framework standard component library's JDBC SQL Query Model is both an adapter and a business delegate because it is responsible for communicating with the enterprise tier.

The XML Document Model will not be responsible for the lifecycle of the XML Document. It will assume that the application has managed to acquire the XML document. The Model does not care how the application acquires the XML document. The Model will rely on the application to place the XML document within a well defined location. The Model will access the XML document from that location, as needed.

There are several benefits to this design decision beyond just making the Model's job simpler. For one, this approach will allow > 1 XML Document Model access to the same XML Document. During the testing of the component you will see how this Document-Model cardinality will benefit application developers.

Another benefit is that it allows application developers to seamlessly leverage non-Web Application Framework infrastructure code that they might already have written to manage the document lifecycle.

This Model will limit its ambition to serving as a read-only Model. This means that the Model will support retrieval and display of XML document data, but it will not facilitate modification of document data. The implementation of full XML document update support is beyond the scope of this document. Furthermore, it is perfectly justifiable for a Model to limit its ambition to a well defined feature set, as long as the Model documentation makes it clear what is, and what is not supported. Application developers will then limit the use of the Model according to its documented usage.

Your XML Document Model component should support the following design-time functionality:

- Each XML Document Model will expose a property called "Document Scope". Application developers will configure this property to specify one of three standard servlet container scopes, request scope, session scope or application scope. By setting this property the application developer commits to placing the XML document in the specified scope at run-time. The Model will then fetch the document from the specified scope at run-time. The default value for this property will be request scope.
- Each XML Document Model will expose a property called "Document Scope Attribute Name". This is a companion property to "Document Scope". Application developers will configure this property to specify a scoped attribute name. By setting this property the application developer commits to placing the XML document in the specified scope and attribute name.
- Each XML Document Model will expose a property called "Base Dataset Name". Application developers will configure this property to specify an offset into the XML Document. The dataset name will be specified as an XPath expression. Within a given Model all ModelField specific XPath expressions will be relative to the "Base Dataset Name". This property may be left blank, in which case Model Field specific XPath expressions will be assumed to be absolute.
- Each XML Document Model will allow application developers to add an arbitrary number of Model Fields to the Model at design-time.
  - Application developers can configure each Model Field to have an arbitrary field name.
  - Application developers can configure each Model Field to access a value within the XML Document. This access must be configured as an XPath expression (either relative to the "Base Dataset Name", or absolute in the absence of any "Base Dataset Name").
  - View developers will be able to bind to the Model Fields in the Web Application Framework conventional manner.

Your XML Document Model component should support the following run-time functionality:

- The XML Document Model will defensively access the XML Document by retrieving it from the named attribute within the specified scope.
- The XML Document Model will implement the key `com.iplanet.jato.model.Model` method "getValue(String fieldName)" to resolve a field name to an XPath expression, and an XPath expression to a value within the document.

- The XML Document Model will implement the `com.iplanet.jato.model.DatasetModel` interface. All DatasetModels provide consistent access to multiple discreet sets of data. In this case, a dataset would be a section of the XML Document for which an XPath expression would return > 1 nodes. The implementation of the DatasetModel interface will allow application developers to use the DatasetModel API to iterate across the multiple values within the dataset. The conventional, but not only, means for achieving this is to associate a TiledView with a DatasetModel.

Note – The implementation shown next will take shortcuts in the interest of brevity. The sample code contains some comments which point out areas where run time optimizations are possible, but would require more complex code beyond the scope of this exercise.

To meet these requirements, you will design and implement the following classes:

- Component class - `mycomponents.XMLDocumentModel`
- ComponentInfo class - `mycomponents.XMLDocumentModelComponentInfo`
- A ModelFieldDescriptor class - `mycomponents.XMLDocumentModelFieldDescriptor`

Additionally, you will implement a custom Java template which the IDE toolset will use as the basis for application specific sub-types of our XMLDocumentModel.

Finally, you will edit the mycomponents `complib.xml` to add the new component to the Web Application Framework component library.

Create the ModelFieldDescriptor Class

The Web Application Framework component model provides extensible Model component authors with the opportunity to specify an arbitrary implementation of the `com.iplanet.jato.model.ModelFieldDescriptor` interface. This is a very minimal interface. Each implementation of ModelFieldDescriptor must also be a JavaBean. Model component authors should design a ModelFieldDescriptor as a bean that can be configured by application developers to define a model field at design-time. Component authors, therefore have tremendous freedom to design model fields which can expose all the design-time configuration opportunity they want, as long as it can be expressed as a JavaBean.

In the example, your model field design-time configuration needs are trivial. The application developer needs to be able to configure each model field with an XPath expression.

1. **In any Java editor, create the class** `mycomponents.XMLDocumentModelFieldDescriptor`**.**

2. **Implement the basic** `com.iplanet.jato.model.ModelFieldDescriptor` **interface.**
3. **Add a get and set method for the property XPath.**
4. **Add a get and set method for the property FieldClass.**

   This is an optional property. If populated, at run-time the Model will coerce the raw value retrieved with the XPath expression into the type specified by the FieldClass property.

   After these steps, `mycomponents/XMLDocumentModelFieldDescriptor.java` should look as follows:

```
package mycomponents;

import java.io.*;
import java.util.*;
import com.iplanet.jato.model.*;

/**
 *
 *
 *
 */
public class XMLDocumentModelFieldDescriptor extends Object
     implements ModelFieldDescriptor, Serializable
{

     public XMLDocumentModelFieldDescriptor()
     {
          super();
     }

     public String getName()
     {
          return name;
     }

     public void setName(String name)
     {
          this.name = name;
     }

     public String getXPath()
     {
          return xpath;
     }

     public void setXPath(String xpath)
     {
          this.xpath = xpath;
     }

     public Class getFieldClass()
     {
          return fieldClass;
     }

     public void setFieldClass(Class fieldClass)
     {
          this.fieldClass = fieldClass;
     }

     private String xpath;
     private String name;
     private Class fieldClass; // DO NOT change this init to a default value

}
```

Create the Web Application Framework Component Class

1. **In any Java editor, create the class** `mycomponents.XMLDocumentModel`**.**
2. **Make XMLDocumentModel extend** `com.iplanet.jato.view.DatasetModelBase`**.**
3. **Make XMLDocumentModel implement** `com.iplanet.jato.view.MultiDatasetModel`**.**
4. **Implement the appropriate constructor for the component type.**

   All Model components must implement a no-arg constructor.
5. **Add a get and set method for the property named "DocumentScope".**
6. **Add a get and set method for the property named "DocumentScopeAttributeName".**
7. **Add a get and set method for the property named "CurrentDatasetName".**

   This property will get a more user friendly display name "Base Dataset Path", but that work will be done in the XMLDocumentModelComponentInfo.
8. **Implement the remaining methods that are required to fulfill your component specific requirements.**
   - Implement the methods which `DatasetModelBase` left abstract.
   - Implement the methods required by `MultiDatasetModel` interface.

- Implement any helper methods which are needed to fulfill the XML Document adaptation.

After these steps, `mycomponents/XMLDocumentModel.java` should look as follows:

```
package mycomponents;
import java.util.*;
import com.iplanet.jato.*;
import com.iplanet.jato.model.*;
import com.iplanet.jato.model.custom.*;
import com.iplanet.jato.util.*;
import org.w3c.dom.*;
import org.w3c.dom.traversal.*;
import org.apache.xpath.XPathAPI;
import javax.xml.transform.*;
import javax.servlet.jsp.PageContext;


/**
 *
 * @author  component-author
 */
public class XMLDocumentModel extends DatasetModelBase implements MultiDatasetModel
{

    public XMLDocumentModel()
    {
        super();
    }


    ////////////////////////////////////////////////////////////////////////////
    // Properties
    ////////////////////////////////////////////////////////////////////////////

    public String getCurrentDatasetName()
    {
        // Add some defensive logic to ensure a valid currentDatasetName
        if(currentDatasetName == null || currentDatasetName.trim().equals(""))
            currentDatasetName = "/";
        return currentDatasetName;
    }

    public void setCurrentDatasetName(String datasetName)
    {
        this.currentDatasetName = datasetName;
    }

    public int getDocumentScope()
    {
        return documentScope;
    }


    public void setDocumentScope(int documentScope)
    {
        this.documentScope = documentScope;
    }

    public String getDocumentScopeAttributeName()
    {
        return documentScopeAttr;
    }


    public void setDocumentScopeAttributeName(String name)
    {
        this.documentScopeAttr = name;
    }

    public void setDocument(Document value)
    {
        doc = value;
    }

    public Document getDocument()
    {
        if(doc == null) {
            // Use the scope and attribute name to find the document
            // The assumption is that the application logic has placed doc
            // in the appropriate scope.
            RequestContext rc = RequestManager.getRequestContext();
            String attr = getDocumentScopeAttributeName();
            switch (getDocumentScope())
            {
                case PageContext.REQUEST_SCOPE:
                    doc = (Document)
                    rc.getRequest().getAttribute(attr);
                    break;
                case PageContext.APPLICATION_SCOPE:
                    doc = (Document)
                    rc.getServletContext().getAttribute(attr);
                    break;
                case PageContext.SESSION_SCOPE:
                    doc = (Document)
                    rc.getRequest().getSession().getAttribute(attr);
                    break;
                default:
                    throw new IllegalArgumentException(
                    "DocumentScope is set to an invalid value " +
                              getDocumentScope());
               }

               if(DEBUG)
                    System.out.println("XMLDocumentModel.getModel doc is " +
                    (doc==null?"null":"not null"));

          }
          return doc;
     }

     ////////////////////////////////////////////////////////////////////////////
     // Model Interface Methods
     ////////////////////////////////////////////////////////////////////////////

     public Object getValue(String name)
     {
          Node node=null;
          try
          {
               node=getNode(name);
          }
          catch (Exception e)
          {
               throw new ModelValueException("Exception getting value for "+
                    "field \""+name+"\"",e);
          }

          if (node==null)
               return null;

          Object result=null;
          if (isTextNode(node) || isAttributeNode(node))
          {
               result=node.getNodeValue();

               XMLDocumentModelFieldDescriptor descriptor=(XMLDocumentModelFieldDescriptor)
                    getFieldGroup().getFieldDescriptor(name);
               if (descriptor.getFieldClass()!=null)
                    result=TypeConverter.asType(descriptor.getFieldClass(),result);
          }
          else
          {
               // Return the node as is and let the caller figure out what to
               // do with it--this could've been what they actually wanted
               result=node;
          }

          return result;
     }
```

```
    public Object[] getValues(String name)
    {
        NodeList nodes=null;
        try
        {
            nodes=getNodes(name);
        }
        catch (Exception e)
        {
            throw new ModelValueException("Exception getting values for "+
                "field \""+name+"\"",e);
        }

        if (nodes==null)
            return new Object[0];

        Object[] result=null;
        try
        {
            List resultList=new LinkedList();
            for (int i=0; i<nodes.getLength(); i++)
            {
                Node node=nodes.item(i);
                if (isTextNode(node) || isAttributeNode(node))
                {
                    Object data=node.getNodeValue();

                    XMLDocumentModelFieldDescriptor descriptor=
(XMLDocumentModelFieldDescriptor)
                        getFieldGroup().getFieldDescriptor(name);
                    if (descriptor.getFieldClass()!=null)
                    {
                        data=TypeConverter.asType(descriptor.getFieldClass(),
                            data);
                    }

                    resultList.add(data);
                }
                else
                {
                    // Return the node as is and let the caller figure out what
                    // to do with it--this could've been what they actually
                    // wanted
                    resultList.add(node);
                }
            }

            result=resultList.toArray();
        }
        catch (Exception e)
```

```
          {
               throw new ModelValueException("Exception getting values "+
                    "for field \""+name+"\"",e);
          }

          return result;
     }



     public void setValue(String name, Object value)
     {
          // Ignore
     }

     public void setValues(String name, Object[] value)
     {
          // Ignore
     }

     ////////////////////////////////////////////////////////////////////////////
     // DatasetModel Interface Methods
     ////////////////////////////////////////////////////////////////////////////

     protected NodeList getCurrentDatasetNodeList()
          throws ModelControlException
     {
          if (nodeList!=null)
               return nodeList;

          if (getDocument()==null)
          {
               throw new ModelControlException(
                    "No XML document has been provided");
          }

          try
          {
               // Note: instead of XPathAPI, we can use CachedXPathAPI to improve
               // the efficiency of this call.  This requires some additional
               // complexity not useful in this example, however.
               // Also, we could potentially move away from use Apache-specific
               // code by using the org.w3c.dom.xpath package, as long as the
               // XML parser supported DOM Level 3.
               nodeList=XPathAPI.selectNodeList(getDocument(),
                    getCurrentDatasetName());
          }
          catch (TransformerException e)
          {
               throw new ModelControlException("Exception getting NodeList for "+
                    "dataset \""+getCurrentDatasetName()+"\"");
          }

          return nodeList;
     }


     public int getLocationOffset()
     {
          return 0;
     }


     public int getLocation()
          throws ModelControlException
     {
          Integer index=(Integer)datasetContexts.get(getCurrentDatasetName());
          if (index==null)
          {
               // Call just to check for NodeList validity
               getCurrentDatasetNodeList();
               return -1;
          }

          return index.intValue();
     }


     public void setLocation(int value)
          throws ModelControlException
     {
          int maxLength=getCurrentDatasetNodeList().getLength();
          if (value>=maxLength || value<-1)
          {
               throw new ModelControlException("Location index out of "+
                    "range (max value = "+(maxLength-1)+")");
          }

          datasetContexts.put(getCurrentDatasetName(),new Integer(value));
     }


     public int getSize()
          throws ModelControlException
     {
          return getCurrentDatasetNodeList().getLength();
     }


     public void setSize(int value)
          throws ModelControlException
     {
          throw new ModelControlException("Unsupported operation; "+
               "model size cannot be set");
     }

     protected boolean ensureValidDataPosition()
          throws ModelControlException
     {
          if (getSize()==0)
               return false; // No data to retrieve
          else
          if (getLocation()==-1)
          {
               // If we're currently before the first item, we need to move
               // to the first item to retrieve some data
               if (!first())
                    throw new ModelControlException("Could not move to first item");
          }

          return true;
     }

     ////////////////////////////////////////////////////////
     // XML Node methods
     ///////////////////////////////////////////////////////////////////////

     public Node getNode(String fieldName)
          throws ModelControlException, TransformerException
     {
          if (!ensureValidDataPosition())
               return null;

          Node contextNode=getCurrentDatasetNodeList().item(getLocation());

          // Note: instead of XPathAPI, we can use CachedXPathAPI to improve
          // the efficiency of this call.  This requires some additional
          // complexity not useful in this example, however.
          // Also, we could potentially move away from use Apache-specific
          // code by using the org.w3c.dom.xpath package, as long as the
          // XML parser supported DOM Level 3.
          Node n = XPathAPI.selectSingleNode(contextNode,getFieldXPath(fieldName));
          if(DEBUG) {
               if(n == null)
                    System.out.println("Warning: getNode found no node at[" +
                         getFieldXPath(fieldName) + "]");
          }
          return n;
     }

     public NodeList getNodes(String fieldName)
          throws ModelControlException, TransformerException
     {
          if (!ensureValidDataPosition())
               return null;

          Node contextNode=getCurrentDatasetNodeList().item(getLocation());

          // Note: instead of XPathAPI, we can use CachedXPathAPI to improve
          // the efficiency of this call.  This requires some additional
          // complexity not useful in this example, however.
          // Also, we could potentially move away from use Apache-specific
          // code by using the org.w3c.dom.xpath package, as long as the
          // XML parser supported DOM Level 3.
          NodeList nl = XPathAPI.selectNodeList(contextNode,getFieldXPath(fieldName));
          if(DEBUG) {
               if(nl == null)
                   System.out.println("Warning: getNodes found no nodes at[" +
                       getFieldXPath(fieldName) + "]");
          }
          return nl;
     }


     public static boolean isTextNode(Node node)
     {
          if (node==null)
               return false;
          return (node instanceof CharacterData);
     }

     public static boolean isAttributeNode(Node node)
     {
          if (node==null)
               return false;
          return node.getNodeType()==Node.ATTRIBUTE_NODE;
     }

     ////////////////////////////////////////////////////////////////////////////
     // Helper method
     ////////////////////////////////////////////////////////////////////////////
     public String getFieldXPath(String fieldName)
     {
          XMLDocumentModelFieldDescriptor descriptor=(XMLDocumentModelFieldDescriptor)
               getFieldGroup().getFieldDescriptor(fieldName);
          return descriptor.getXPath();
     }
     ////////////////////////////////////////////////////////////////////////////
     // Instance variables
     ////////////////////////////////////////////////////////////////////////////

     private int documentScope = PageContext.REQUEST_SCOPE; // request scope by default
     private String documentScopeAttr = "testDoc";
     private String currentDatasetName;
     private Document doc;

     private NodeList nodeList;
     private Map datasetContexts=new HashMap();
     private String datasetName;

     private static final boolean DEBUG = true;
}
```

Create the Extensible Component's Java Template

Extensible components serve as base classes for application defined entities. Therefore, the Web Application Framework component model provides extensible component authors the opportunity to provide a custom Java template. The IDE toolset will, subsequently, use the component supplied template to create the application specific sub-type. Component authors can utilize the custom template to enhance the application developer's experience. Component authors may prepare the component specific Java template with a set of template tokens defined in `com.iplanet.jato.component.ExtensibleComponentInfo`. For token details see ExtensibleComponent API.

Component authors may also utilize any arbitrary Java constructs within the Java template (for example, import statements, methods, variables, interface declarations, and so on). Minimally, the custom template will ensure that the new Java class extends from the extensible component class. Component authors may also use the template as a means of communicating to the developer documentation inline in the source so as to provide "recommended steps" or conditions or boundaries to keep in mind while specializing.

In this example, the template will be kept minimal.

In any text editor create the template `mycomponents.resources.XMLDocumentModel_java.template`.

The template contents should look as follows:

Note – The tokens follow a __TOKEN__ pattern.

```
package __PACKAGE__;

import java.io.*;

import java.util.*;
import javax.servlet.*;
import javax.servlet.http.*;
import com.iplanet.jato.*;
import com.iplanet.jato.model.*;
import com.iplanet.jato.util.*;
import mycomponents.*;


/**
 *
 *
 * @author
 */
public class __CLASS_NAME__ extends XMLDocumentModel
{
     /**
      * Default constructor
      *
      */
     public __CLASS_NAME__()
     {
          super();
     }

}
```

Create the ComponentInfo Class

The ComponentInfo class defines the design-time metadata that the IDE toolset requires to incorporate the component. In this example, you will extend an existing ComponentInfo and in true OO style, simply augment it. You could, of course, choose to implement the `ComponentInfo` interface from scratch, but that would be unproductive in this case.

In this example, you are going beyond the functionality revealed in the earlier component examples. Next, you are going to take advantage of a new metadata opportunity provided by the ExtensibleModelComponentInfo interface, the opportunity to describe an arbitrary Model Field type.

1. **Create the class** `mycomponents.XMLDocumentModelComponentInfo`**.**
2. **Make XMLDocumentModelComponentInfo extend** `com.iplanet.jato.model.ExtensibleModelComponentInfo`**.**
3. **Implement the no-arg constructor.**
4. **Implement the** `getComponentDescriptor()` **method to provide the basic design-time description of the component.**

5. **Implement the `getConfigPropertyDescriptors()` method to identify which properties you want to expose in the IDE.**

   Note the use of default values within the ConfigPropertyDescriptor declarations.

   - Add a ConfigPropertyDescriptor for the DocumentScope property.
   - Add a ConfigPropertyDescriptor for the DocumentScopeAttributeName property.
   - Add a ConfigPropertyDescriptor for the CurrentDatasetName property.

6. **Implement the `getPrimaryTemplateAsStream()` method to return a Java template file which you want the IDE toolset to use as the starting point for new classes derived from this extensible component.**

7. **Implement the `getModelFieldGroupDescriptors()` method to provide a design-time description of the model field type required by the Model.**

   Do not get confused by the extra level of indirectness suggested by ModelFieldGroupDescriptor on top of ModelFieldDescriptor. The ModelFieldDescriptor is the vital feature for you to focus on. The ModelFieldGroupDescriptor is an advanced optional feature. Suffice to say that most Web Application Framework Model components can simply make use of the standard `com.iplanet.jato.model.ModelFieldGroup`.

   After these steps, `mycomponents/XMLDocumentModelComponentInfo.java` should look as follows:

Note – In this sample code, String values have been embedded directly for ease of demonstration. Utilize resource bundles if you anticipate the need to localize your display strings.

```
package mycomponents;

import java.util.*;
import java.io.*;
import com.iplanet.jato.component.*;
import com.iplanet.jato.model.*;

/**
 *
 *
 */
public class XMLDocumentModelComponentInfo extends ExtensibleModelComponentInfo
{

     public XMLDocumentModelComponentInfo()
     {
          super();
     }
     public ComponentDescriptor getComponentDescriptor()
     {
          // identify the component class
          ComponentDescriptor result=new ComponentDescriptor(
               "mycomponents.XMLDocumentModel");

          // The name will be used to determine a name for the component instance
          result.setName("XMLDocumentModel");

          // The display name will be used to show the component in a chooser
          result.setDisplayName("XML Document Model");

          // The description will be the tool tip text for the component
          result.setShortDescription("A simple demonstration of a new model component");

          return result;

     }


     public String getPrimaryTemplateEncoding()
     {
/* Production version would be resource bundle driven, like this:
return getResourceString(getClass(),
"PROP_XMLDocumentModel_SOURCE_TEMPLATE_ENCODING", "ascii");
*/

          return "ascii";
     }

     public InputStream getPrimaryTemplateAsStream()
     {
/* Production version would be resource bundle driven, like this:
return XMLDocumentModelComponentInfo.class.getClassLoader().
getResourceAsStream(
getResourceString(getClass(),
"RES_XMLDocumentModelComponentInfo_SOURCE_TEMPLATE",""));
*/

          return XMLDocumentModelComponentInfo.class.getResourceAsStream(
               "/mycomponents/resources/XMLDocumentModel_java.template");
     }

     public ConfigPropertyDescriptor[] getConfigPropertyDescriptors()
     {
          if (configPropertyDescriptors!=null)
               return configPropertyDescriptors;

          configPropertyDescriptors=super.getConfigPropertyDescriptors();
          List descriptors=new LinkedList(Arrays.asList(configPropertyDescriptors));
```

```
        ConfigPropertyDescriptor descriptor = null;

        descriptor=new ConfigPropertyDescriptor(
            "documentScope",Integer.TYPE);
        descriptor.setDisplayName("Document Scope");
        descriptor.setHidden(false);
        descriptor.setExpert(false);
        descriptor.setDefaultValue(new Integer(
            javax.servlet.jsp.PageContext.REQUEST_SCOPE));
        descriptors.add(descriptor);

        descriptor=new ConfigPropertyDescriptor(
            "documentScopeAttributeName",String.class);
        descriptor.setDisplayName("Document Scope Attribute Name");
        descriptor.setHidden(false);
        descriptor.setExpert(false);
        descriptor.setDefaultValue("");
        descriptors.add(descriptor);

        descriptor=new ConfigPropertyDescriptor(
            "currentDatasetName",String.class);
        descriptor.setDisplayName("Base Dataset Path");
        descriptor.setHidden(false);
        descriptor.setExpert(false);
        descriptor.setDefaultValue("");
        descriptors.add(descriptor);

        // Create/return the array
        configPropertyDescriptors = (ConfigPropertyDescriptor[])
            descriptors.toArray(
                new ConfigPropertyDescriptor[descriptors.size()]);
        return configPropertyDescriptors;
    }

    public ModelFieldGroupDescriptor[] getModelFieldGroupDescriptors()
    {
        if(null != modelFieldGroupDescriptors)
            return modelFieldGroupDescriptors;

        List descriptors=new ArrayList();
        ModelFieldGroupDescriptor descriptor=null;

        descriptor = new ModelFieldGroupDescriptor(
            "Fields",
            ModelFieldGroup.class,
            new ConfigPropertyDescriptor[0],
            XMLDocumentModelFieldDescriptor.class,
            "addFieldDescriptor",
            "setFieldGroup");

        descriptor.setFieldBaseName("field");
        descriptor.setFieldTypeDisplayName("Field");
        descriptor.setGroupDisplayName("Fields");
        descriptor.setFieldPropertyEditorClass(null);
        descriptors.add(descriptor);

        modelFieldGroupDescriptors = (ModelFieldGroupDescriptor[])
            descriptors.toArray(
                new ModelFieldGroupDescriptor[descriptors.size()]);
        return modelFieldGroupDescriptors;
    }

    private ModelFieldGroupDescriptor[] modelFieldGroupDescriptors;
    private ConfigPropertyDescriptor[] configPropertyDescriptors;

}
```

Augment the Component Library Manifest

The component manifest has already been created in the earlier example. Now you will add additional information.

Note that you will add additional types of information not seen in the prior example.

The Web Application Framework library manifest must be named `complib.xml`. Within the JAR file, the Web Application Framework library manifest must be placed in the `/COMP-INF` directory.

1. **Create/Open the file** `COMP-INF/complib.xml`**.**
2. **Add an extensible component element to declare the XMLDocumentModel component.**

   After these steps, the `COMP-INF/complib.xml` file should look as follows:

Note – For clarity, only the significant delta to the prior version of this file shown earlier is shown here.

```
<?xml version="1.0" encoding="UTF-8"?>
<component-library>
<tool-info>
<tool-version>2.1.0</tool-version>
</tool-info>
<library-name>mycomponents</library-name>
<display-name>My First Component Library</display-name>

 ...

     <extensible-component>
          <component-class>mycomponents.XMLDocumentModel</component-class>
         <component-info-class>mycomponents.XMLDocumentModelComponentInfo</component-info-
class>
     </extensible-component>

...

</component-library>
```

Recreate the Component Library JAR File

Jar up the component classes as you did in the first example, so that they can be ready for distribution as a library.

1. **The name of the JAR file is arbitrary.**

   In this case, name it "mycomponents.jar".

2. **You can omit the Java source files from the JAR.**

3. **You should include in the JAR any necessary ancillary resources, like icon images, or resource bundles.**

   In this case, there are none.

   In this case, you are now including several new classes and a Java template file.

4. **The `mycomponents.jar` internal structure should look as follows:**

```
mycomponents/resources/SecureViewBean_java.template
mycomponents/resources/XMLDocumentModel_java.template
mycomponents/MissingTokensEvent.class
mycomponents/MyTextField.class
mycomponents/MyTextFieldComponentInfo.class
mycomponents/SecureViewBean.class
mycomponents/SecureViewBeanComponentInfo.class
mycomponents/TypeValidator.class
mycomponents/ValidatingDisplayField.class
mycomponents/ValidatingTextFieldComponentInfo.class
mycomponents/ValidatingTextFieldTag.class
mycomponents/Validator.class
mycomponents/XMLDocumentModel.class
mycomponents/XMLDocumentModelComponentInfo.class
mycomponents/XMLDocumentModelFieldDescriptor.class
mycomponents/mycomplib.tld
COMP-INF/complib.xml
```

Test the New Component

1. **Deploy the new version of the library into your previously created test application.**

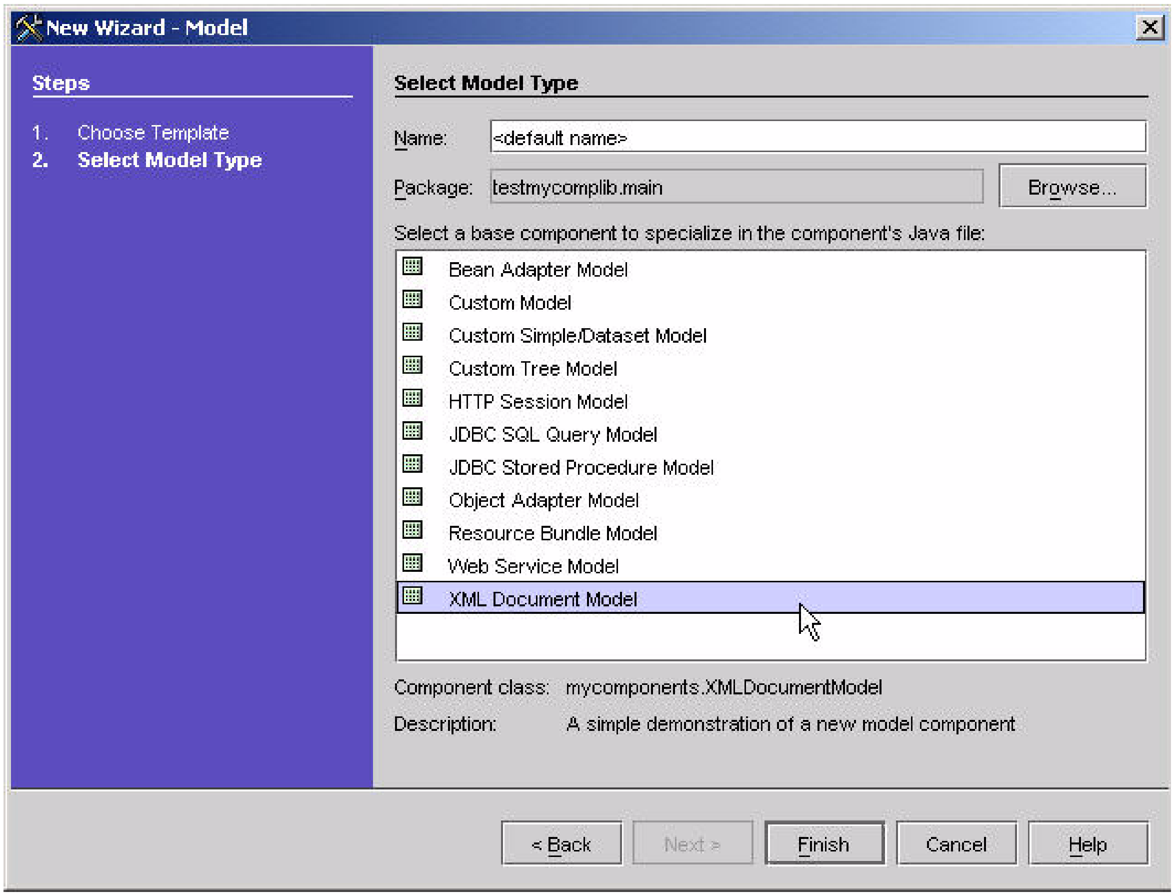
   Important IDE note: The IDE will not let you delete or copy over a JAR file that is currently mounted unless this is done via the IDE using ANT tasks which share the same VM as the IDE and share the file locks. You should shutting down the IDE whenever you need to replace one of the JAR files that is currently mounted. If you are trying to test the new version of component library in a project that is already opened inside the IDE, first shut down the IDE. Once the IDE has released its hold on the old copy of the library JAR file, you can copy the new version of the JAR file over the old version. After successfully deploying the new version of the library, you can re-open the application in IDE.

2. **Create a new Model object.**

   If you have not done this before, complete the *Web Application Framework Tutorial*.

   The new Model wizard should now look as follows:

   Note – Depending upon the version of Web Application Framework, you might not see all of the models that are shown next. The important point is that you see the entry for "XML Document Model".



Select Model Type

Name: <default name>

Package: testmycomplib.main

Select a base component to specialize in the component's Java file:

- Bean Adapter Model
- Custom Model
- Custom Simple/Dataset Model
- Custom Tree Model
- HTTP Session Model
- JDBC SQL Query Model
- JDBC Stored Procedure Model
- Object Adapter Model
- Resource Bundle Model
- Web Service Model
- XML Document Model

Component class: mycomponents.XMLDocumentModel

Description: A simple demonstration of a new model component

3. **Select the "XML Document Model" from the component list and complete the wizard.**

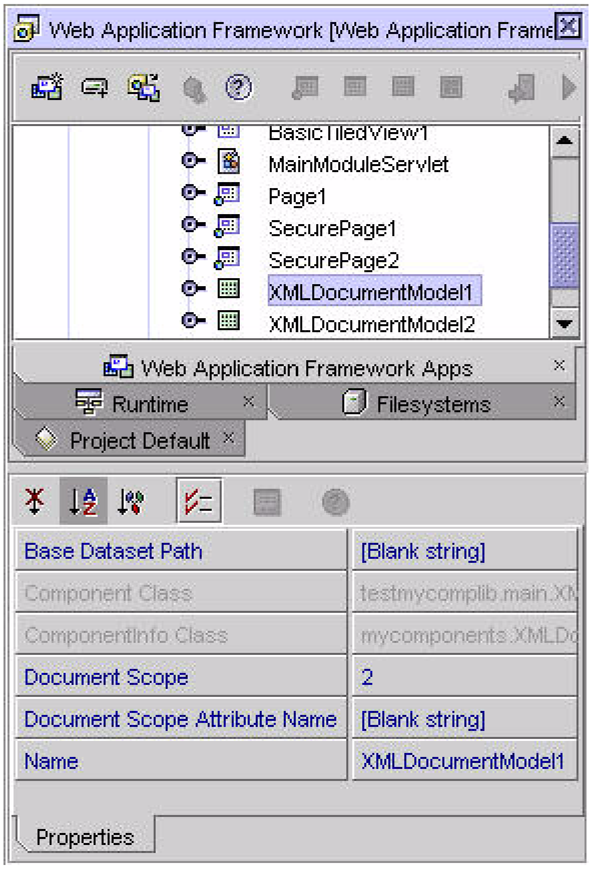
   Take the default settings and let the wizard create "XMLDocumentModel1" for you.

   After the wizard completes, you can see that the IDE toolset has created a new class based on the component supplied template.

4. **To test your mode fully, create a second XML Document Model.**

   Your application should now contain two XML Document Models (XMLDocumentModel1 and XMLDocumentModel2).

   Note the Base Dataset Name, Document Scope, and Document Scope Attribute Name properties.



Base Dataset Path	[Blank string]
Component Class	testmycomplib.main.XN
ComponentInfo Class	mycomponents.XMLDo
Document Scope	2
Document Scope Attribute Name	[Blank string]
Name	XMLDocumentModel1

Note above that the Document Scope property value is the raw integer 2. This is because XMLDocumentModelComponentInfo declared the DocumentScope property thus. The type is Integer.Type, and the default value is `javax.servlet.jsp.PageContext.REQUEST_SCOPE`. The net effect in the IDE will use the default Integer property editor which will express the raw integer value, in this case 2.

```
descriptor=new ConfigPropertyDescriptor(
     "documentScope",Integer.TYPE);
descriptor.setDisplayName("Document Scope");
descriptor.setHidden(false);
descriptor.setExpert(false);
descriptor.setDefaultValue(new Integer(
     javax.servlet.jsp.PageContext.REQUEST_SCOPE));
descriptors.add(descriptor);
```

You would be correct in thinking that this is a poor user interface since most developers will not know that 2 corresponds to request scope. Therefore, as a follow up exercise, you will see later how to substitute a more user friendly property editor in place of the default Integer property editor.

To test your new Model component, you need a suitable XML document.

A test case will be contrived by placing an arbitrary XML file on disk, and at run time the test application will read the document from disk and place it into the request scope.

Your XML Document Model component does not care where the XML document comes from. In the real world, the XML document will probably be dynamically fetched by the application from the enterprise tier. That is of no concern to your XML Document Model.

a. In any text editor, copy the following XML into a file named "author.xml".

b. **Place author.xml in the same application module directory as XMLDocumentModel1 and XMLDocumentModel2.**

The code you will enter, shown next, is assumed to be in the same directory as your test Models. This is purely a convention of this exercise.

```
<?xml version="1.0"?>
<author>
     <name first="Charles" last="Dickens"/>
     <details birth="1812" death="1870"/>
     <works>
          <book title="Great Expectations" publisher="Penguin USA " pages="544"/>
          <book title="Nicholas Nickleby" publisher="Penguin USA " pages="816"/>
          <book title="A Tale of Two Cities" publisher="Signet Classic" pages="371"/>
          <book title="Hard Times" publisher="Bantam Classic" pages="280"/>
          <book title="Oliver Twist" publisher="Tor Books" pages="496"/>
          <book title="David Copperfield " publisher="Penguin USA " pages="912"/>
          <book title="A Christmas Carol" publisher="Bantam Classics" pages="102"/>
          <book title="Our Mutual Friend" publisher="Indypublish.Com" pages="472"/>
          <book title="Bleak House" publisher="Penguin USA " pages="1036"/>
          <book title="The Pickwick Papers " publisher="Penguin USA " pages="848"/>
          <book title="The Haunted House" publisher="Hesperus Press" pages="128"/>
          <book title="Little Dorrit" publisher="Indypublish.Com" pages="460"/>
          <book title="Barnaby Rudge" publisher="Viking Press" pages="766"/>
          <book title="The Mystery of Edwin Drood" publisher="Penguin USA" pages="432"/>
          <book title="Sketches by Boz" publisher="Penguin USA" pages="635"/>
     </works>
</author>
```

c. **Review author.xml for a moment.**

Notice that for a single author, there are many book entries. Now is the time to point out, that you will utilize the two models (XMLDocumentModel1 and XMLDocumentModel2) to access different parts of the same XML document. You will configure XMLDocumentModel1 to access the scalar author information, name, and details. You will configure XMLDocumentModel2 to access the non-scalar collection of books.

This approach was chosen when the XMLDocumentModel was designed because it simplifies both the implementation of the Model component, and simplifies the usage of the component within an application.

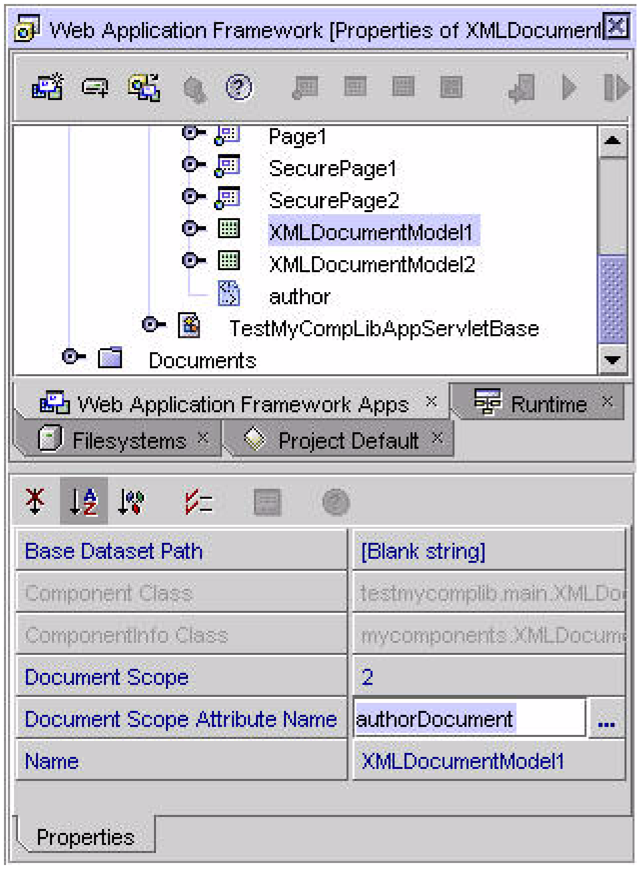
5. **Configure XMLDocumentModel1 to access the scalar author information.**

a. **Select the XMLDocumentModel1 node.**

b. **Edit its Document Scope Attribute Name property.**

Set the value to "authorDocument".

c. **Leave the Document Scope and the Base Dataset Path properties unchanged.**



Base Dataset Path	[Blank string]
Component Class	testmycomplib.main.XMLDo
ComponentInfo Class	mycomponents.XMLDocum
Document Scope	2
Document Scope Attribute Name	authorDocument
Name	XMLDocumentModel1

d. **Expand the XMLDocumentModel1 node so that you can see its Fields sub-node.**

e. **Select the Fields sub-node.**

f. **Right-click, and select the pop up menu's Add Field ... action.**

This will automatically add a field with a default name.

In this case the default name will be "field1".

g. **Repeat the previous step to create additional fields "field2", "field3", and "field4".**

For the purposes of this exercise you will leave the names unchanged.

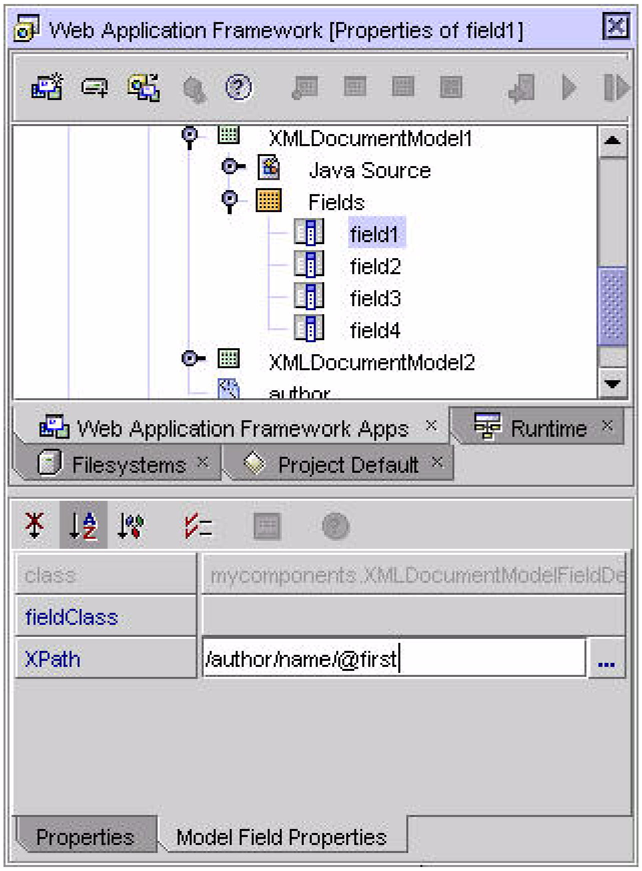
In a real application, the Model developer would probably change the field names to make them more descriptive of their role.

h. **Select the field1 node.**

Select the Model Field Properties tab on its property sheet.

i. **Edit field1's XPath property.**

   Set the value to the XPath expression "/author/name/@first".



class	mycomponents.XMLDocumentModelFieldDe
fieldClass	
XPath	/author/name/@first

j. **Repeat the previous step, and adjust the XPath property for the remaining three fields as follows:**

   - Set field2's XPath value to "/author/name/@last"
   - Set field3's XPath value to "/author/details/@birth"
   - Set field4's XPath value to "/author/details/@death"

6. **Configure XMLDocumentModel2 to access the "books" dataset.**

   a. **Select the XMLDocumentModel2 node.**

   b. **Edit its Document Scope Attribute Name property.**

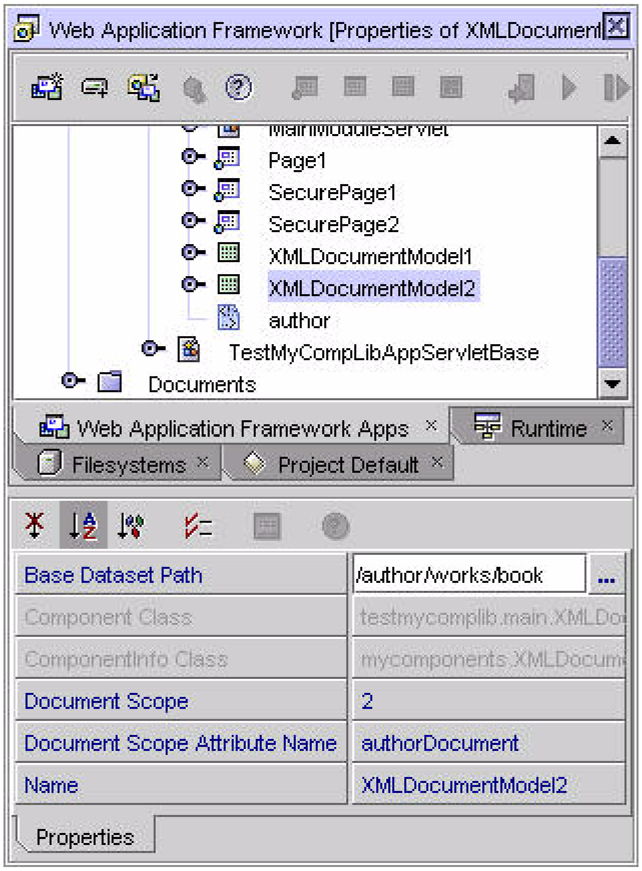
      Set the value to "authorDocument".

c. **Edit its Base Dataset Path property.**

Set the value to the XPath expression "/author/works/book".

That is an XPath expression that will address the collection of book entries (for example, a Web Application Framework dataset).

d. **Leave the Document Scope property unchanged.**



Base Dataset Path	/author/works/book
Component Class	testmycomplib.main.XMLDo
ComponentInfo Class	mycomponents.XMLDocum
Document Scope	2
Document Scope Attribute Name	authorDocument
Name	XMLDocumentModel2

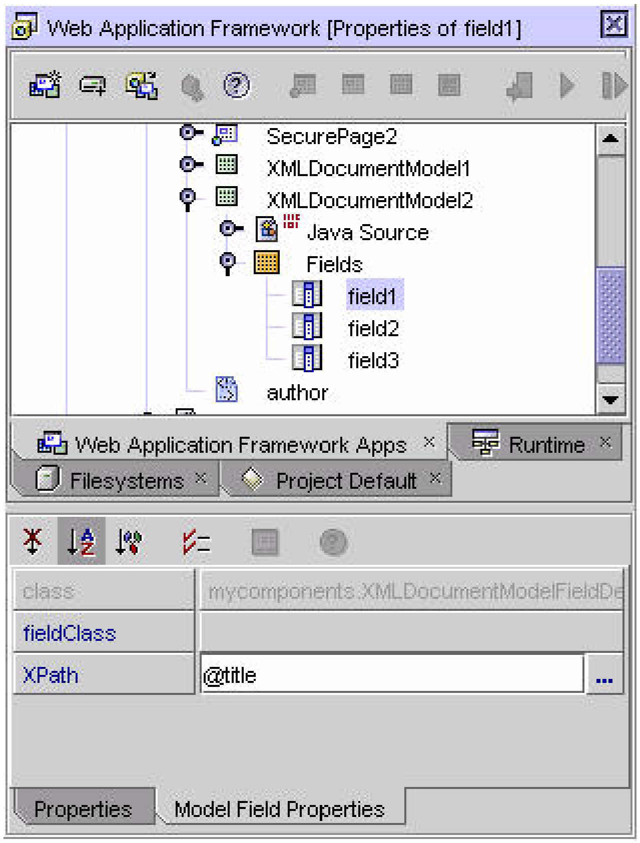
e. **Expand the XMLDocumentModel2 node so that you can see its Fields sub-node.**

f. **Select the Fields sub-node.**

g. **Right-click, and select the pop up menu's Add Field ... action to add "field1", "field2", and "field3".**

h. Edit each field's XPath property to XPath expressions relative to the value of the Base Dataset Path property set above.

- Set field1's XPath value to `@title`
- Set field2's XPath value to `@publisher`
- Set field3's XPath value to `@pages`



class	mycomponents.XMLDocumentModelFieldDe
fieldClass	
XPath	@title

The models have now been configured. Now you need to create some Views to use the Models, and also provide some application logic to read the `author.xml` document from disk and store it in the request scope attribute "authorDocument".

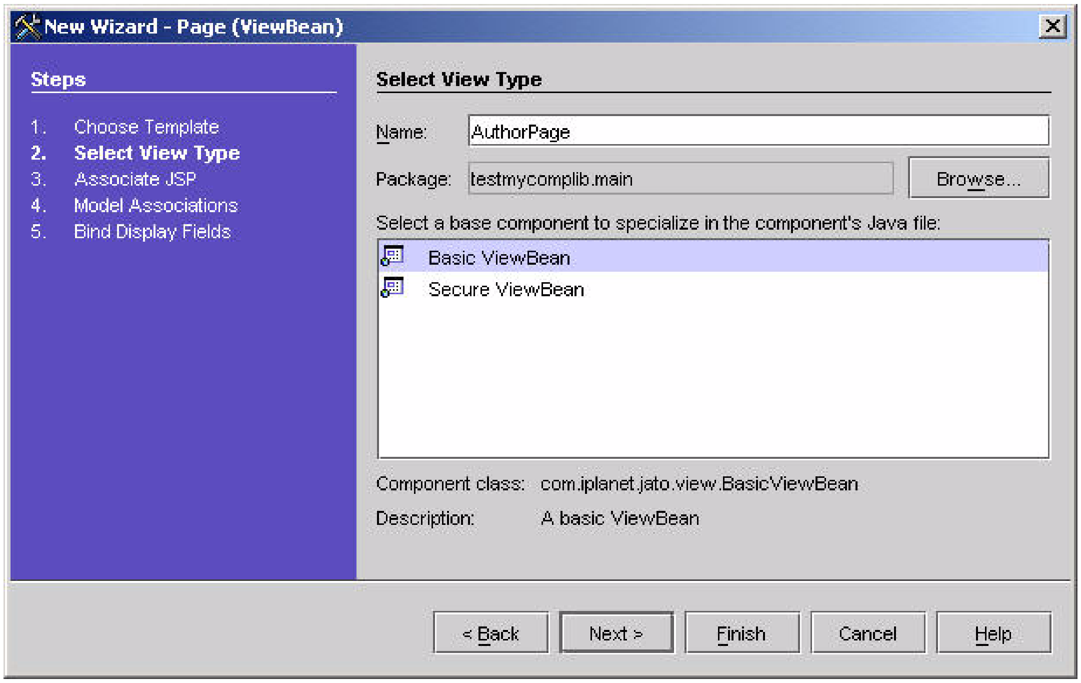
First, create the Views.

Advisory: Read this next step fully before attempting, since if you follow the instructions correctly, you can save some time and effort by utilizing the full capability of the "New View" wizard. It is perfectly acceptable to create a ViewBean that will exercise the XMLDocumentModel1 without following the steps detailed next, and you can create the ViewBean according to your preferred style. But, for newcomers to the Web Application Framework, the following steps are, hopefully, the most concise.

7. **Create the AuthorPage**

   a. **Invoke the "New View" wizard.**

   - In the Select View Type panel (next) select the "Basic ViewBean" component.
   - Explicitly set the Name to be "AuthorPage".
   - Press Next.



Name: AuthorPage

Package: testmycomplib.main

Select a base component to specialize in the component's Java file:

Basic ViewBean

Secure ViewBean

Component class: com.iplanet.jato.view.BasicViewBean

Description: A basic ViewBean

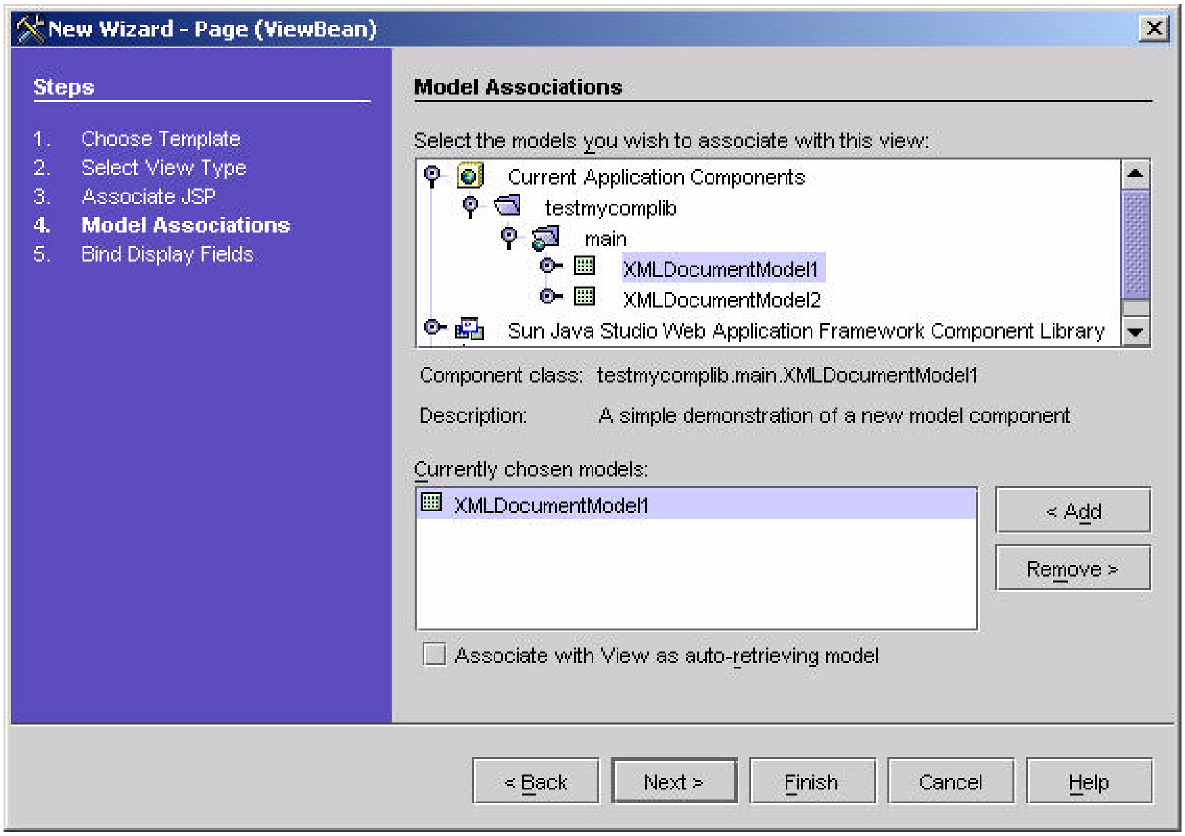
   b. **Take the default values in the Associate JSP panel, and press Next.**

   c. **In the Model Associations panel (shown in the next figure), expand the Current Application Components node until you find "XMLDocumentModel1".**

   - Select "XMLDocumentModel1" and press the Add button to create the association between the ViewBean and the Model.

     That will cause the "XMLDocumentModel1' to appear in the Currently chosen models section of the panel.

   - Press Next.



Model Associations

Select the models you wish to associate with this view:

Current Application Components
testmycomplib
main
XMLDocumentModel1
XMLDocumentModel2
Sun Java Studio Web Application Framework Component Library

Component class: testmycomplib.main.XMLDocumentModel1

Description: A simple demonstration of a new model component

Currently chosen models:

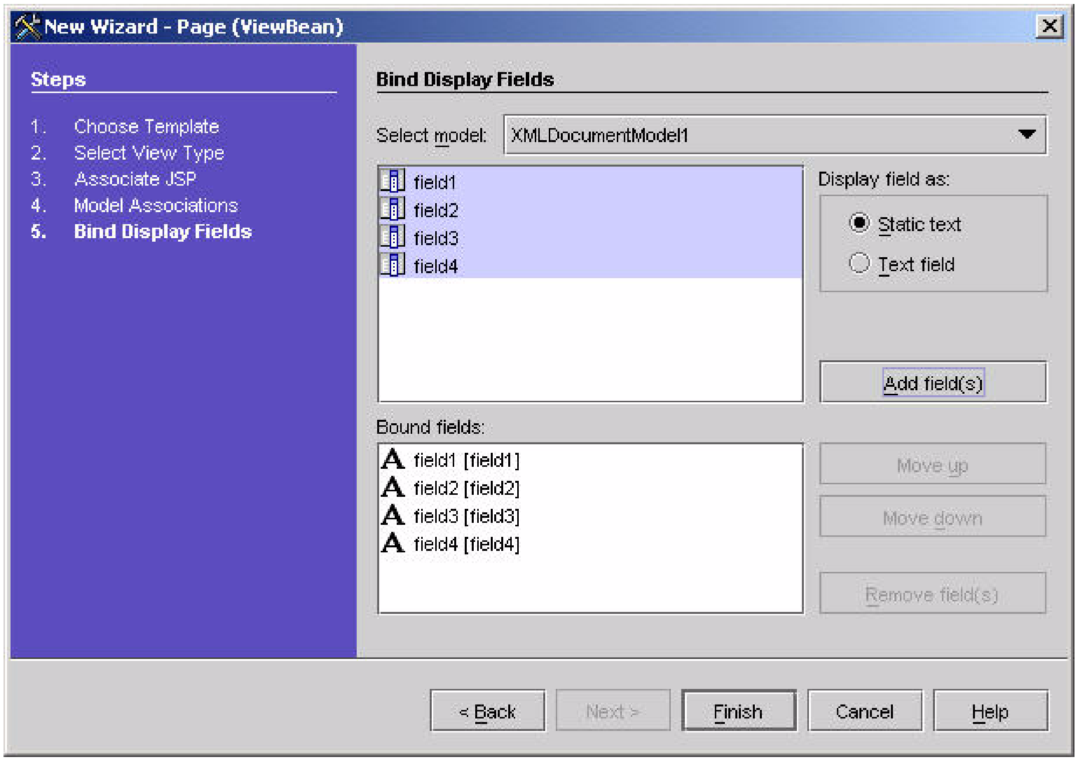
XMLDocumentModel1

☐ Associate with View as auto-retrieving model

d. **In the Bind Display Fields panel (shown in the next figure), select all four of the Model fields that are available, and press the Add Fields button.**

   That will cause four entries to appear in the Bound Fields section of the panel.

e. **Press Finish.**


New Wizard - Page (ViewBean)

Steps

1. Choose Template
2. Select View Type
3. Associate JSP
4. Model Associations
5. **Bind Display Fields**

Bind Display Fields

Select model: XMLDocumentModel1

field1
field2
field3
field4

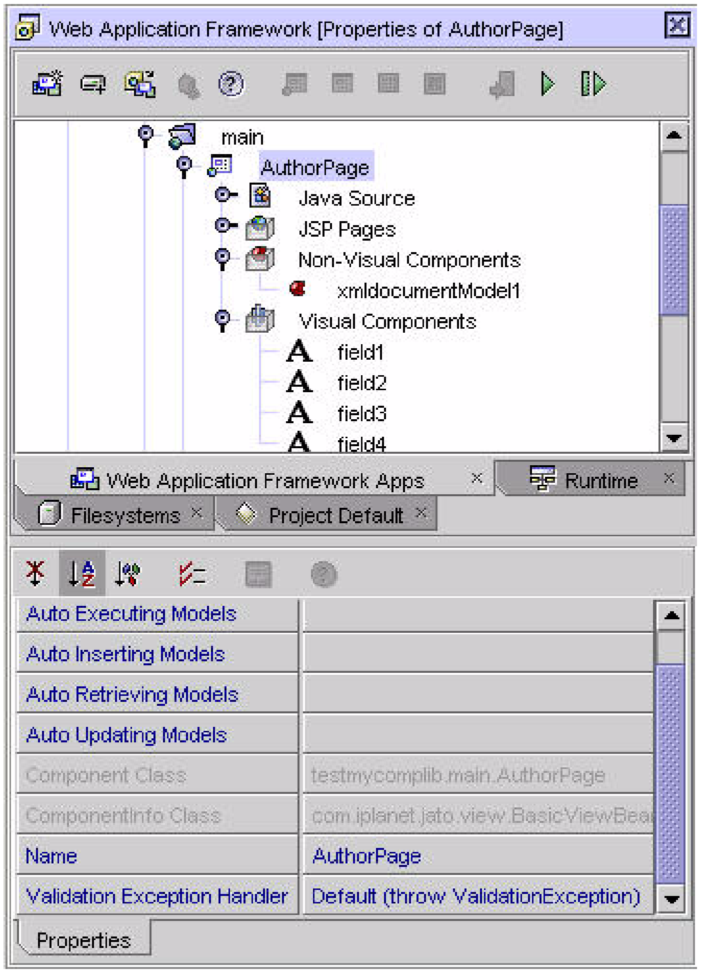
Display field as: [✓ Static text] Text field

Bound fields:

field1 [field1]
field2 [field2]
field3 [field3]
field4 [field4]

After completing the wizard in the manner described above, you should find that the AuthorPage node looks like this.

The individual child display fields should be properly bound to the corresponding XMLDocumentModel1 fields.



Auto Executing Models	
Auto Inserting Models	
Auto Retrieving Models	
Auto Updating Models	
Component Class	testmycomplib.main.AuthorPage
ComponentInfo Class	com.iplanet.jato.view.BasicViewBea
Name	AuthorPage
Validation Exception Handler	Default (throw ValidationException)

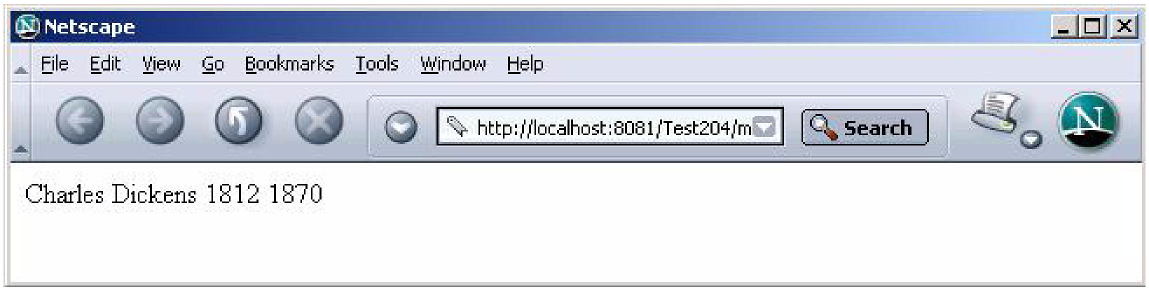
8. **Open AuthorPage.java, and add the following code to the constructor.**

   This code will read the "author.xml" document from disk and store it in the request scope attribute named "authorDocument", which is where the XMLDocumentModel1 expects to find it. The choice of placing this code here in the AuthorPage constructor is simply an arbitrary test stratagem. As stated before, the XMLDocumentModel does not care how or when the XML document is placed into the agreed upon attribute, as long as it is there when the Model is accessed. Note the extra import statements at the top. Also, note the getResourceAsStream method's parameter must take a parameter which reflects the name of your test application (for example, `getResourceAsStream("/testmycomplib/main/author.xml")`.

```
import org.w3c.dom.*;
import org.xml.sax.InputSource;
import javax.xml.parsers.DocumentBuilderFactory;

/**
 *
 *
 */
public class AuthorPage extends BasicViewBean
{
     /**
      * Default constructor
      *
      */
     public AuthorPage()
     {
          super();
          try {

               InputSource in = new InputSource(AuthorPage.class.
                    getResourceAsStream("/testmycomplib/main/author.xml"));
               DocumentBuilderFactory dfactory = DocumentBuilderFactory.newInstance();
               dfactory.setNamespaceAware(true);
               Document doc = dfactory.newDocumentBuilder().parse(in);
               doc.normalize(); // Make sure text in the document is in normal form
               RequestManager.getRequest().setAttribute("authorDocument", doc);
               System.out.println("Author XML Document has been put into request");
          }
          catch(Exception e) {
               System.out.println("Exception trying to load author.xml" + e);
          }
     }
```

9. **Compile all the classes in the application and test run the AuthorPage.**

   The author's data should appear in the browser as follows:


Netscape
File Edit View Go Bookmarks Tools Window Help
http://localhost:8081/Test204/m
Search

Charles Dickens 1812 1870

10. **Create a TiledView.**

    Now you want to test XMLDocumentModel2 and its dataset capability.

    For this you will need to create a TiledView. Essentially, duplicate the steps taken in creating AuthorPage, but select a "Basic TiledView" instead of a "Basic ViewBean" and associate it with XMLDocumentModel2 instead of XMLDocumentModel1.

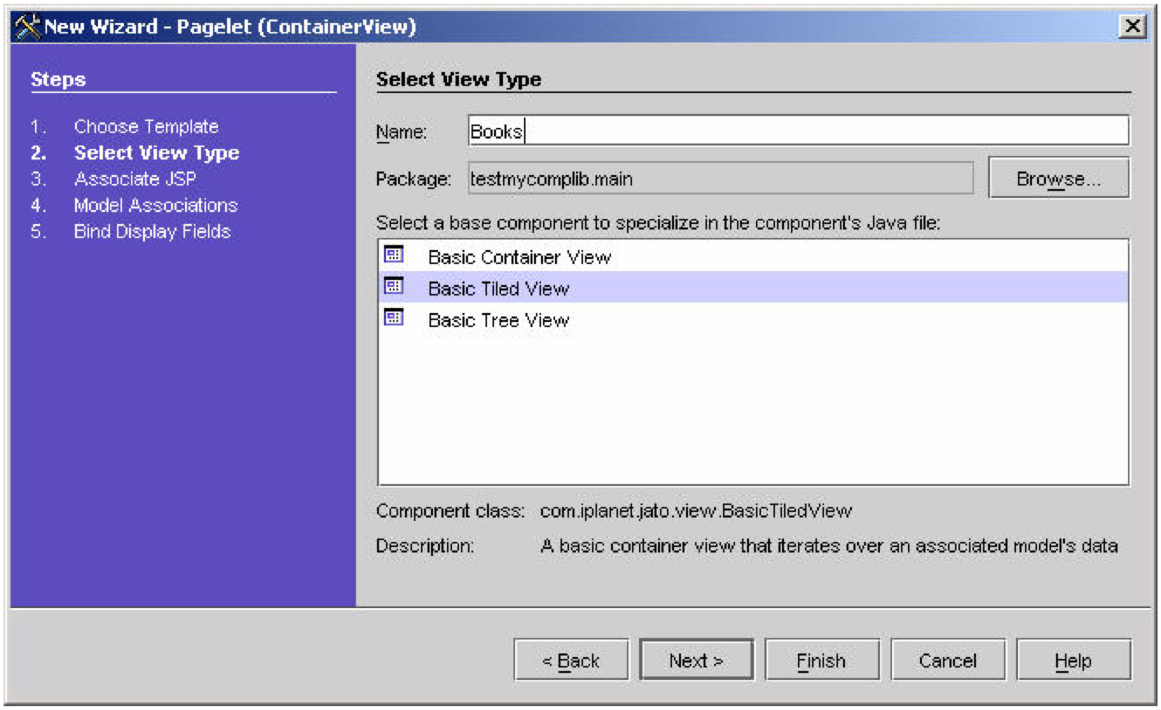
    Here are the detailed steps:

    a. **Invoke the "New View" wizard.**

    b. **In the Select View Type panel (shown in the next figure) select the "Basic Tiled View" component.**

    c. **Explicitly set the Name to be "Books".**

    d. **Press Next.**


New Wizard - Pagelet (ContainerView)

Steps

1. Choose Template
2. **Select View Type**
3. Associate JSP
4. Model Associations
5. Bind Display Fields

Select View Type

Name: Books

Package: testmycomplib.main

Select a base component to specialize in the component's Java file:

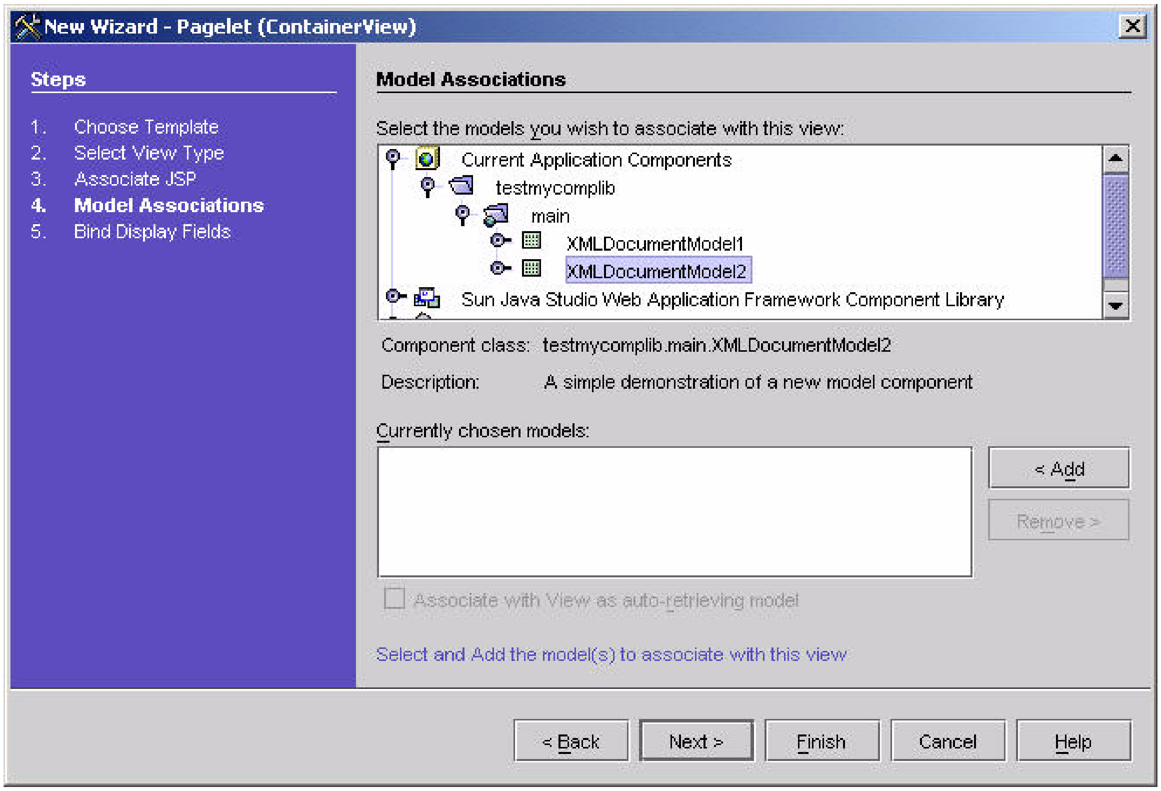
- Basic Container View
- Basic Tiled View
- Basic Tree View

Component class: com.iplanet.jato.view.BasicTiledView

Description: A basic container view that iterates over an associated model's data

- Take the default values in the Associate JSP panel and press Next.
- In the Model Associations panel (shown in the next figure) expand the Current Application Components node until you find "XMLDocumentModel2".
- Select "XMLDocumentModel2", and press the Add button to create the association between the TiledView and the Model.

  That will cause the "XMLDocumentModel2' to appear in the Currently chosen models section of the panel.
- Press Next.



Select the models you wish to associate with this view:

- Current Application Components
  - testmycomplib
    - main
      - XMLDocumentModel1
      - XMLDocumentModel2
- Sun Java Studio Web Application Framework Component Library

Component class: testmycomplib.main.XMLDocumentModel2

Description: A simple demonstration of a new model component

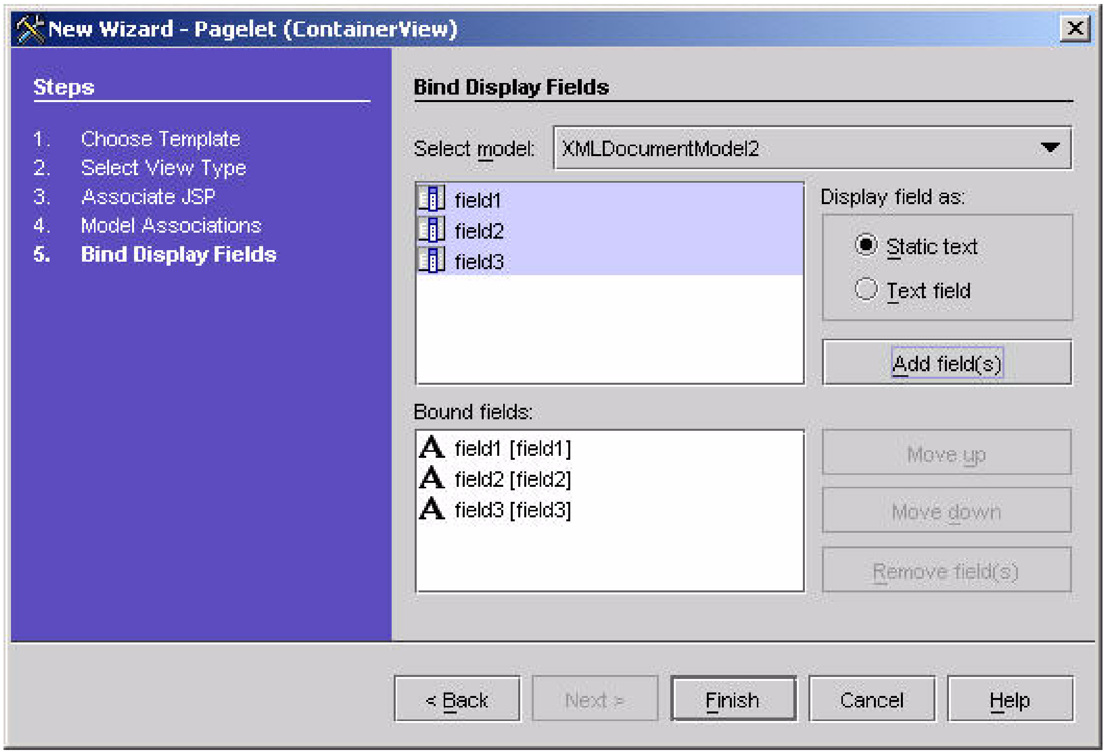
Currently chosen models:

Associate with View as auto-retrieving model

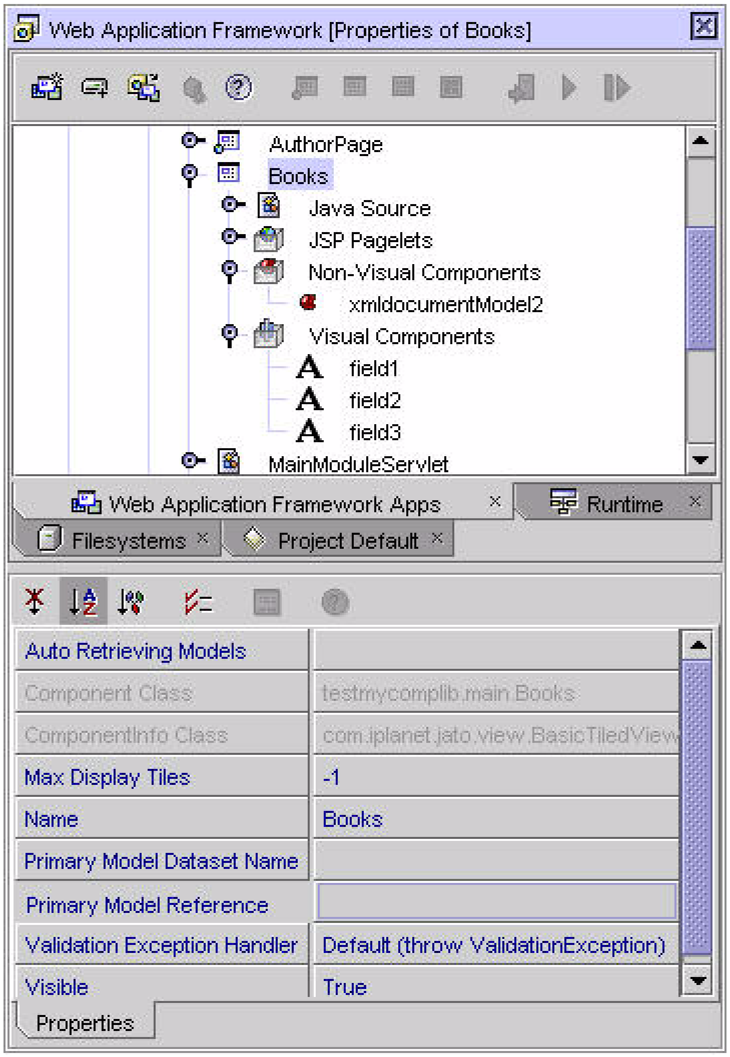
Select and Add the model(s) to associate with this view

- In the Bind Display Fields panel (shown next), select all three of the Model fields that are available, and press the Add Fields button.

  That will cause three entries to appear in the Bound Fields section of the panel.
- Press Finish.



- After completing the wizard in the manner described above, you should find that the Books TiledView node looks like this. The individual child display fields should be properly bound to the corresponding XMLDocumentModel2 fields.



Web Application Framework [Properties of Books]

- AuthorPage
- Books
  - Java Source
  - JSP Pagelets
  - Non-Visual Components
    - xmldocumentModel2
  - Visual Components
    - field1
    - field2
    - field3
- MainModuleServlet

Web Application Framework Apps | Runtime | Filesystems | Project Default

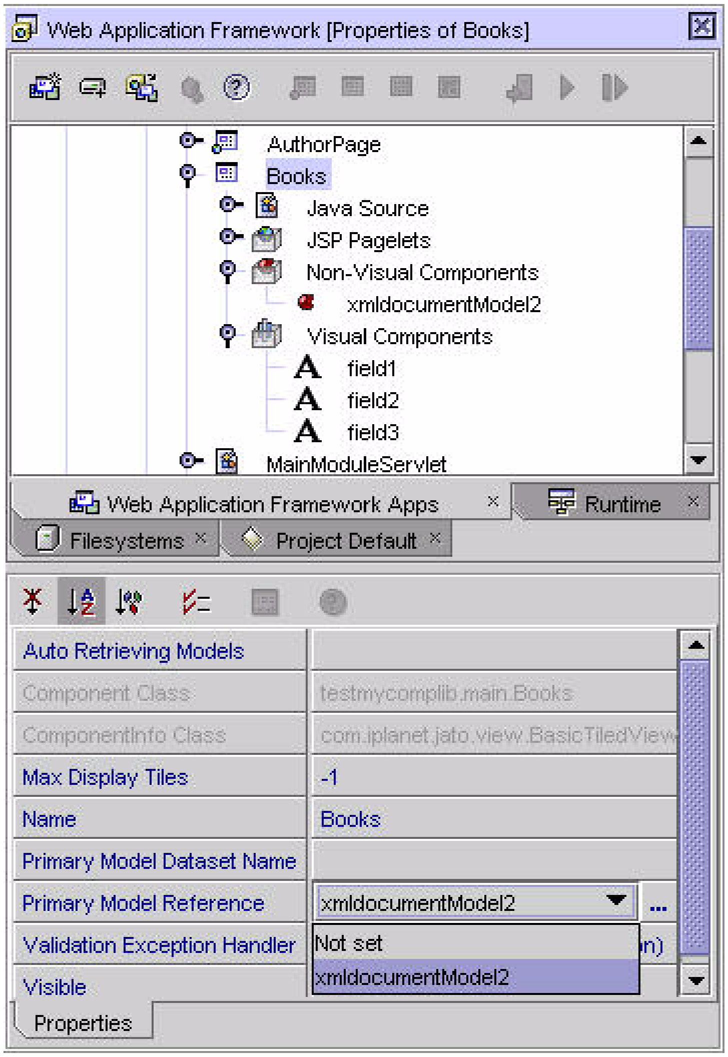
Auto Retrieving Models	
Component Class	testmycomplib.main.Books
ComponentInfo Class	com.iplanet.jato.view.BasicTiledView
Max Display Tiles	-1
Name	Books
Primary Model Dataset Name	
Primary Model Reference	
Validation Exception Handler	Default (throw ValidationException)
Visible	True

Properties

11. The TiledView requires one additional configuration step that you have not seen before in this guide.

You need to configure the :Book TiledView's Primary Model Reference property to reference "XMLDocumentModel2". If you do not configure this property, the test run of this TiledView will show no data. That is a common Web Application Framework application developer error.

Edit the Primary Model Reference property (shown next), and from its drop down list select the "xmldocumentModel2" value.

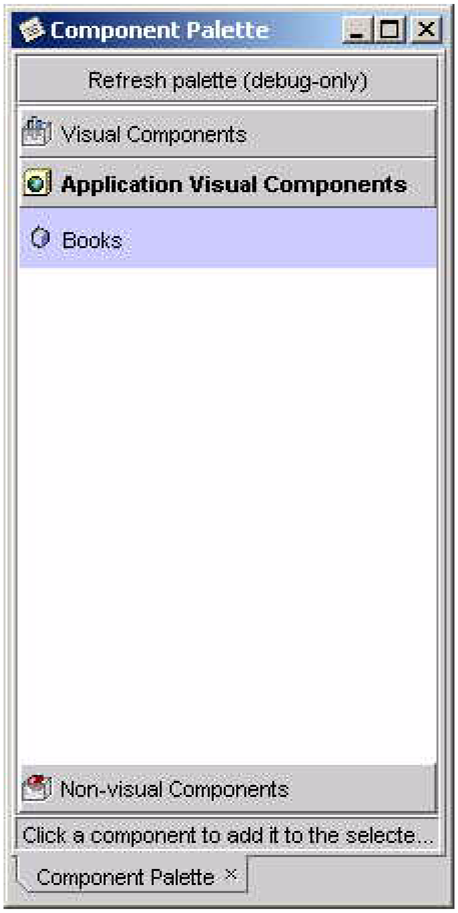

Web Application Framework [Properties of Books]

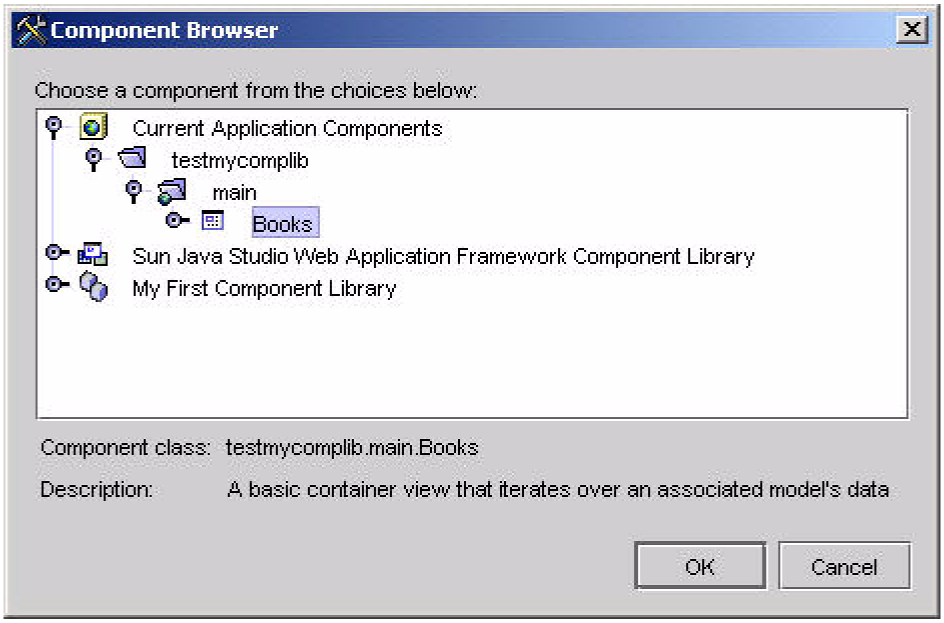
AuthorPage
Books
Java Source
JSP Pagelets
Non-Visual Components
xmldocumentModel2
Visual Components
field1
field2
field3
MainModuleServlet

Auto Retrieving Models	
Component Class	testmycomplib.main.Books
ComponentInfo Class	com.iplanet.jato.view.BasicTiledView
Max Display Tiles	-1
Name	Books
Primary Model Dataset Name	
Primary Model Reference	xmldocumentModel2
Validation Exception Handler	
Visible	

12. **Before you can test run the Books TiledView, you must add it to a ViewBean. To make this example more interesting, add the Books TiledView as a child of the AuthorPage. This is a good example of Web Application Framework's hierarchical view support.**

    Add an instance of Books TiledView to AuthorPage. Again, you can achieve this by selecting Books TiledView from either the Component Palette or the Component Browser, just as you did earlier with the various text fields and button components. Except this time, the component will be located in the Current Application Components section of either the Component Palette or Component Browser.

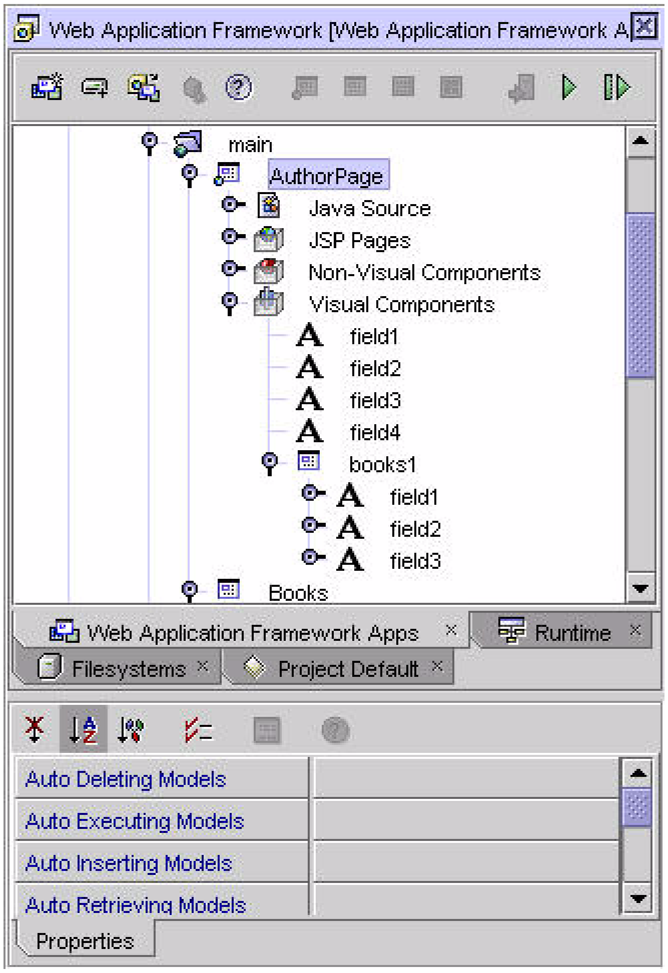

Component Palette
Refresh palette (debug-only)
Visual Components
Application Visual Components
Books
Non-visual Components
Click a component to add it to the selecte...
Component Palette


Component Browser
Choose a component from the choices below:
Current Application Components
testmycomplib
main
Books
Sun Java Studio Web Application Framework Component Library
My First Component Library
OK
Cancel

Component class: testmycomplib.main.Books

Description: A basic container view that iterates over an associated model's data

After adding Books as a child view, the AuthorPage node should look as follows:



13. **You can now format the JSP associated with the AuthorPage to suit your taste.**

By default when you add a container view child to a ViewBean, the IDE toolset will add the container view child and its children's tags to the ViewBean's JSP(s). The application developer may use the Synchronize to View action on the JSP node to batch remove tags for any child container view children. Take this opportunity to also add some basic formatting to the JSP so it renders more neatly.

a. **Select and expand the AuthorPage's JSPs node.**

b. **Select the actual AuthorPage.jsp node.**

c. **Double-click the AuthorPage.jsp node to open the JSP file in the editor so you can edit it.**

d. Add some basic formatting (for example, <p> and <br>) to the `AuthorPage.jsp` **so that you will get some separation between rows of Book data.**

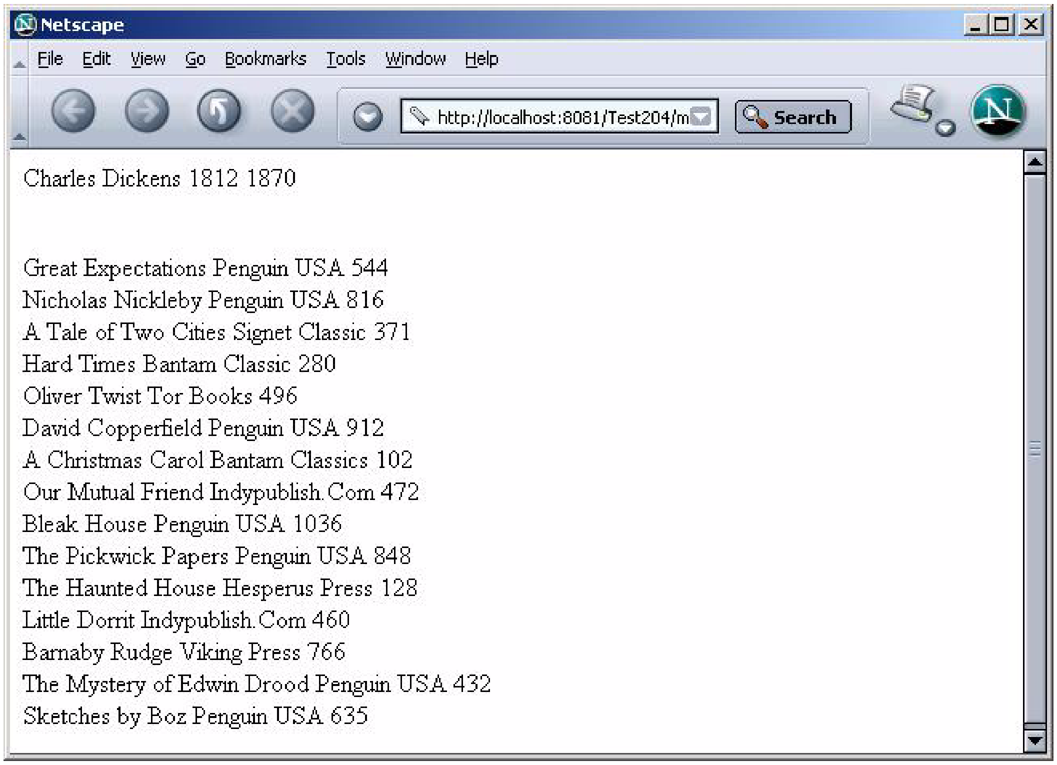
When done, the `AuthorPage.jsp` should look something like the following:

```
<%@page contentType="text/html; charset=ISO-8859-1" info="AuthorPage" language="java"%>
<%@taglib uri="/WEB-INF/jato.tld" prefix="jato"%>

<jato:useViewBean className="testmycomplib.main.AuthorPage">

<html>
<head>
<title></title>
</head>
<body>

<jato:form name="Author" method="post">

<jato:text name="field1"/>
<jato:text name="field2"/>
<jato:text name="field3"/>
<jato:text name="field4"/>
<p>
<jato:tiledView name="books1">
<br>
<jato:text name="field1"/>
<jato:text name="field2"/>
<jato:text name="field3"/>
</jato:tiledView></jato:form>

</body>
</html>

</jato:useViewBean>
```

14. Test run AuthorPage again.

Make sure you select the ExecutePage (Redeploy) action, not the Execute Page action. Otherwise you will not see the effects of the recent changes.

The contents of `AuthorPage.jsp` should show up in the browser (because the user had accumulated the required tokens).


Netscape
File Edit View Go Bookmarks Tools Window Help
http://localhost:8081/Test204/m
Search

```
Charles Dickens 1812 1870


Great Expectations Penguin USA 544
Nicholas Nickleby Penguin USA 816
A Tale of Two Cities Signet Classic 371
Hard Times Bantam Classic 280
Oliver Twist Tor Books 496
David Copperfield Penguin USA 912
A Christmas Carol Bantam Classics 102
Our Mutual Friend Indypublish.Com 472
Bleak House Penguin USA 1036
The Pickwick Papers Penguin USA 848
The Haunted House Hesperus Press 128
Little Dorrit Indypublish.Com 460
Barnaby Rudge Viking Press 766
The Mystery of Edwin Drood Penguin USA 432
Sketches by Boz Penguin USA 635
```

Ship It?

Not yet. Provide a custom editor for that "Document Scope" property.

Recall that the XMLDocumentModel's Document Scope property is currently vulnerable to user error, because it exposes a raw int value for direct editing. What you really need is a custom editor that presents the application developer with a fool-proof drop down list containing only valid choices. You would normally spend a little time and develop a custom property editor. The details of that task are beyond the scope of this document, but can be found in any basic JavaBean reference.

CHAPTER 5

Developing Command Components

This section assumes that you have already read "Develop Your First Component" on page 19.

Developing an Extensible Command Component

This section describes how to create a new Command component that adds value on top of the ValidatingDisplayField you created in the Develop a Non-Extensible View Component section found in Chapter 3, Developing View Components.

This is called the ValidatingCommand component, and it encapsulates some reusable logic related to the processing of pages which contain instances of the ValidatingDisplayField.

This exercise is intended to focus on the mechanics of extensible Command component design and, as such, only scratches the surface of extensible Command possibilities.

The mechanics of creating extensible Commands are very straightforward. If you have completed the previous sections, you know the mechanics by now. The reality is that Commands are structurally simple. This section will reinforce your familiarity with the command design pattern, introduce you to its role in the Web Application Framework, and hopefully encourage you to become creative in leveraging this simple, but powerful pattern.

This example introduces several additional Web Application Framework component model topics:

- CommandComponentInfo
- CommandDescriptor

Your validating Command component should support the following design-time functionality:

- Allow developers to subclass your ValidatingCommand, and add some application specific behavior on top of the behavior encapsulated in the base class.

  Specifically, subclass developers will focus on implementing two component specific methods `handleInvalid` and `handleValid`, instead of the conventional `Command execute` method. The application command developer will rely on the component base class to determine if the page on which the component has been activated is valid or invalid, and invoke the appropriate handler. Therefore, application command developers can focus on responding to the valid or invalid state, and not need to worry about detecting the state.
- The extensible command allows component authors to specify configuration properties, like you did with the View and Model components. However, in this example none will need defining.

Your validating Command component should support the following run-time functionality:

The ValidatingCommand base class implementation of the execute method will perform a deep search on the submitted ViewBean, detect any and all instances of ValidatingTextField, and check to see if any of those fields are invalid.

- If any field is found to be invalid, the ValidatingCommand base class will invoke the `handleInvalid` method. It is assumed that ValidatingCommand will override the `handleInvalid` method if they wish to perform some command specific behavior. The base class implementation of `handleInvalid` will simply redisplay the invalid page. This behavior may be deemed sufficient in some cases.
- If no fields are found to be invalid, the ValidatingCommand base class will invoke the `handleValid` method. It is assumed that ValidatingCommand will override the handleValid method to perform some command specific behavior. The base class implementation of handleValid is an abstract method. This command assumes that the application specific command developer will implement the `handleValid` method.

The choice to implement this Command component as outlined above is purely a matter of style. As pointed out the command pattern is elementary. Therefore, personal OO style will factor largely into component authors designs.

To meet these requirements, you will design and implement the following classes:

- Component class - `mycomponents.ValidatingCommand`
- ComponentInfo class - `mycomponents.ValidatingCommandComponentInfo`

Additionally, you will implement a custom Java template which the IDE toolset will use as the basis for application specific sub-types of your ValidatingCommand.

Finally, you will edit the mycomponents `complib.xml` to add the new component to the Web Application Framework component library.

This example assumes the co-existence of the mycomponents.ValidatingDisplayField. Before continuing, complete the Develop a Non-Extensible View Component section in Chapter 3, Developing View Components, if you have not already done so.

Create the Web Application Framework Component Class

1. **In any Java editor, create the class** `mycomponents.ValidatingCommand`**.**
2. **Make ValidatingCommand extend** `com.iplanet.jato.comand.BasicCommand`**.**
3. **Implement the appropriate constructor for the component type.**

   All Command components must implement a no-arg constructor.
4. **Implement the remaining methods that are required to fulfill your component specific requirements.**
   - Implementation of execute method, which will enforce the component's validation logic.
   - Default implementation of the component's `handleInvalid` method.
   - Abstract declaration of the component's `handleValid` method.

   After these steps, `mycomponents/ValidatingCommand.java` should look as follows:

```
package mycomponents;
import java.util.*;
import com.iplanet.jato.*;
import com.iplanet.jato.command.*;
import com.iplanet.jato.model.*;
import com.iplanet.jato.view.*;
import com.iplanet.jato.view.event.*;


public abstract class ValidatingCommand extends Object implements Command {


    public ValidatingCommand() {
        super();
    }


    public void execute(CommandEvent event) throws CommandException {
        Map map=event.getParameters();
        try {
            boolean isValid = true;
            ViewBean viewBean =  ViewBase.getRootView((View)event.getSource());
            List vFields = getValidatingTextChildren(viewBean);
            Iterator iter = vFields.iterator();

            while(iter.hasNext()) {
                ValidatingDisplayField vText = (ValidatingDisplayField)iter.next();
                if(! vText.isValid()) {
                    isValid = false;
                    break;
                }
            }

            if( isValid ) {
                handleValid(event);
            }
            else {
                handleInvalid(event, viewBean);
            }

        }
        catch (Exception e) {
            if (e instanceof CommandException)
                throw (CommandException)e;
            else {
                throw new CommandException(
                    "Error executing ValidatingCommand",e);
            }
        }
    }


    public List getValidatingTextChildren(ContainerView container) {
        List result=new LinkedList();

        String[] childNames=container.getChildNames();
        for (int i=0; i<childNames.length; i++) {
            Class childType=container.getChildType(childNames[i]);
            if (ValidatingDisplayField.class.isAssignableFrom(childType)) {
                ValidatingDisplayField child=(ValidatingDisplayField)
                container.getChild(childNames[i]);
                result.add(child);
            }
            else if (ContainerView.class.isAssignableFrom(childType)) {
                ContainerView child=
                    (ContainerView) container.getChild(childNames[i]);
                result.addAll(getValidatingTextChildren(child));
            }
        }
        return result;
    }


    public abstract void handleValid(CommandEvent event) throws CommandException;


    public void handleInvalid(CommandEvent event, ViewBean invalidVB)
        throws CommandException {
        // default implementation is to just redisplay the invalid page
        invalidVB.forwardTo(event.getRequestContext());
    }

}
```

Create the Extensible Component's Java Template

Extensible components serve as base classes for application defined entities. Therefore, the Web Application Framework component model provides extensible component authors the opportunity to provide a custom Java template.

The IDE toolset will, subsequently, use the component supplied template to create the application specific sub-type. Component authors can utilize the custom template to enhance the application developer's experience. Component authors may prepare the component specific Java template with a set of template tokens defined in `com.iplanet.jato.component.ExtensibleComponentInfo`. For token details, see ExtensibleComponent API.

Component authors can also utilize any arbitrary Java constructs within the Java template (for example, import statements, methods, variables, interface declarations, and so on). Minimally, the custom template will ensure that the new Java class extends from the extensible component class.

In this example you will use the template to assist the developer in the implementation of methods which are declared abstract in the base class.

In any text editor, create the template `mycomponents.resources.ValidatingCommand_java.template`.

The template contents should look as follows:

Note – The tokens follow a __TOKEN__ pattern.

```
package __PACKAGE__;

import com.iplanet.jato.*;
import com.iplanet.jato.command.*;
import com.iplanet.jato.model.*;
import com.iplanet.jato.view.*;
import com.iplanet.jato.view.event.*;
import mycomponents.*;

/**
 *
 *
 */
public class __CLASS_NAME__ extends ValidatingCommand
{
    /**
     * Default constructor
     *
     */
    public __CLASS_NAME__()
    {
        super();
    }

    /**
     *
     *
     */
    public void handleValid(CommandEvent event) throws CommandException
    {
        // TODO - Developers must implement this method.
    }

}
```

Create the ComponentInfo Class

The ComponentInfo class defines the design-time metadata that the IDE toolset requires to incorporate the component. In this example, you will extend an existing ComponentInfo, and in true OO style, simply augment it. You could, of course, choose to implement the `ComponentInfo` interface from scratch, but that would be unproductive in this case.

In this example, you are not going beyond the functionality revealed in the earlier component examples.

1. **Create the class** `mycomponents.ValidatingCommandComponentInfo`**.**
2. **Make ValidatingCommandComponentInfo extend** `com.iplanet.jato.command.BasicCommandComponentInfo`**.**
3. **Implement the no-arg constructor.**

   There is no need to Implement the `getComponentDescriptor()` method since you do not need to define any new properties.
4. **Implement the** `getPrimaryTemplateAsStream()` **method to return a Java template file which you want the IDE toolset to use as the starting point for new classes derived from this extensible component.**

   After these steps, `mycomponents/ValidatingCommandComponentInfo.java` should look as follows:

Note – In this sample code, String values have been embedded directly for ease of demonstration. Utilize resource bundles if you anticipate the need to localize your display strings.

```
package mycomponents;
import java.util.*;
import java.awt.Image;
import java.io.*;
import com.iplanet.jato.component.*;
import com.iplanet.jato.command.*;


public class ValidatingCommandComponentInfo extends BasicCommandComponentInfo  {


    public ValidatingCommandComponentInfo()
    {
        super();
    }


    public ComponentDescriptor getComponentDescriptor()
    {
        // identify the component class
        ComponentDescriptor result=new ComponentDescriptor(
            "mycomponents.ValidatingCommand");

        // The name will be used to determine a name for the component instance
        result.setName("ValidatingCommand");

        // The display name will be used to show the component in a chooser
        result.setDisplayName("Validating Command");
```

```
          // The description will be the tool tip text for the component
          result.setShortDescription("A validating command component");

          return result;
     }


     public String getPrimaryTemplateEncoding()
     {
/* Production version would be resource bundle driven, like this:
return getResourceString(getClass(),
"PROP_ValidatingCommand_SOURCE_TEMPLATE_ENCODING", "ascii");
*/

          return "ascii"; // NOI18N
     }


     public InputStream getPrimaryTemplateAsStream()
     {
/* Production version would be resource bundle driven, like this:

return ValidatingCommandComponentInfo.class.getClassLoader().
getResourceAsStream(
getResourceString(getClass(),
"RES_ValidatingCommandComponentInfo_SOURCE_TEMPLATE",""));
*/

          return mycomponents.ValidatingCommandComponentInfo.class.getResourceAsStream(
          "/mycomponents/resources/ValidatingCommand_java.template"); // NOI18N
     }

}
```

Augment the Component Library Manifest

The component manifest has already been created in the earlier example. Now you will add additional information.

Note that you will add additional types of information not seen in the prior example.

The Web Application Framework library manifest must be named `complib.xml`. Within the JAR file, the Web Application Framework library manifest must be placed in the `/COMP-INF` directory.

1. **Create/Open the file** `COMP-INF/complib.xml`**.**

2. **Add an extensible component element to declare the ValidatingCommand component.**

   After these steps, the `COMP-INF/complib.xml` file should look as follows:

   Note – For clarity, only the significant delta to the prior version of this file shown earlier is shown here.

```
<?xml version="1.0" encoding="UTF-8"?>
<component-library>
        <tool-info>
                <tool-version>2.1.0</tool-version>
        </tool-info>
        <library-name>mycomponents</library-name>
        <display-name>My First Component Library</display-name>

        ...

    <extensible-component>
        <component-class>mycomponents.ValidatingCommand</component-class>
        <component-info-class>mycomponents.ValidatingCommandComponentInfo</component-info-
class>
    </extensible-component>

        ...

</component-library>
```

Recreate the Component Library JAR File

JAR up the component classes as you did in the first example, so they can be ready for distribution as a library.

1. **The name of the JAR file is arbitrary.**

   In this case, name it "mycomponents.jar".

2. **You can omit the Java source files from the JAR.**

3. **You should include in the JAR any necessary ancillary resources, like icon images, or resource bundles.**

   In this case there are none.

   In this case you are now including several new classes and a Java template file.

4. **The** `mycomponents.jar` **internal structure should look as follows:**

```
mycomponents/resources/SecureViewBean_java.template
mycomponents/resources/ValidatingCommand_java.template
mycomponents/resources/XMLDocumentModel_java.template
mycomponents/MissingTokensEvent.class
mycomponents/MyTextField.class
mycomponents/MyTextFieldComponentInfo.class
mycomponents/SecureViewBean.class
mycomponents/SecureViewBeanComponentInfo.class
mycomponents/TypeValidator.class
mycomponents/ValidatingCommand.class
mycomponents/ValidatingCommandComponentInfo.class
mycomponents/ValidatingDisplayField.class
mycomponents/ValidatingTextFieldComponentInfo.class
mycomponents/ValidatingTextFieldTag.class
mycomponents/Validator.class
mycomponents/XMLDocumentModel.class
mycomponents/XMLDocumentModelComponentInfo.class
mycomponents/XMLDocumentModelFieldDescriptor.class
mycomponents/mycomplib.tld
COMP-INF/complib.xml
```

Test the New Component

Additional Web Application Framework IDE toolset features introduced in this section:

- The new Command Wizard
- The Command Descriptor property editor

1. **Deploy the new version of the library into your previously created test application**

   Important IDE note: The IDE will not let you delete or copy over a JAR file that is currently mounted.

   You should shut down the IDE whenever you need to replace one of the JAR files that is currently mounted. If you are trying to test the new version of component library in a project that is already open inside the IDE, you should first shut down the IDE.

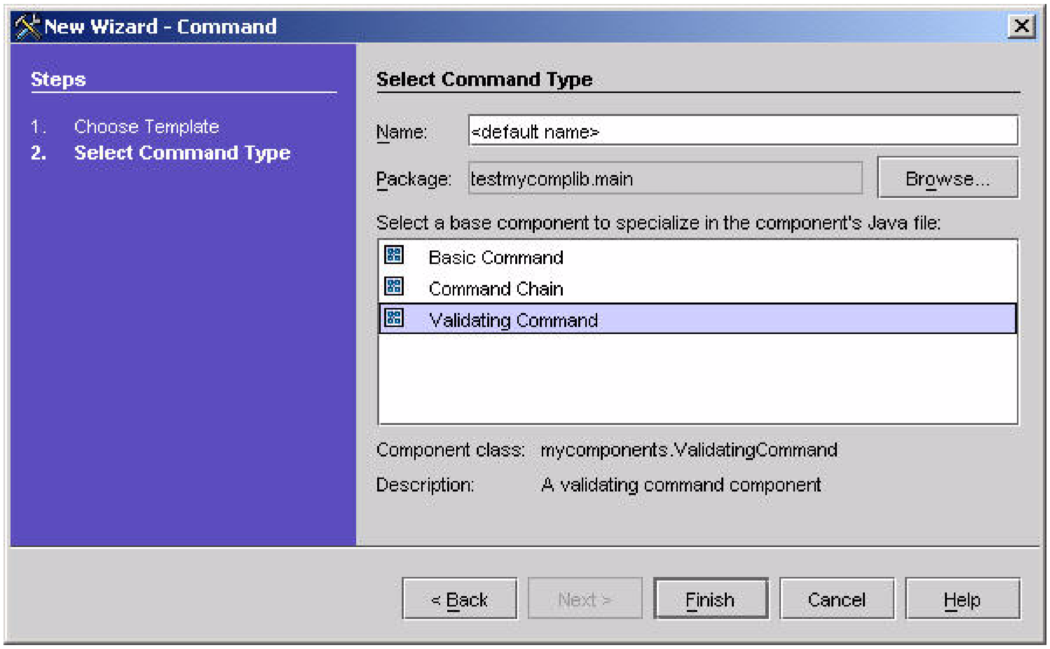
   Once the IDE has released its hold on the old copy of the library JAR file, you can copy the new version of the JAR file over the old version.

   After successfully deploying the new version of the library, you can reopen the application in the IDE.

2. **Create a new Command object.**

Note – If you have not done this before, complete the *Web Application Framework Tutorial*).

The "New Command" wizard should now look as follows:


New Wizard - Command

Steps

1. Choose Template
2. **Select Command Type**

Select Command Type

Name: <default name>

Package: testmycomplib.main

Select a base component to specialize in the component's Java file:

- Basic Command
- Command Chain
- Validating Command

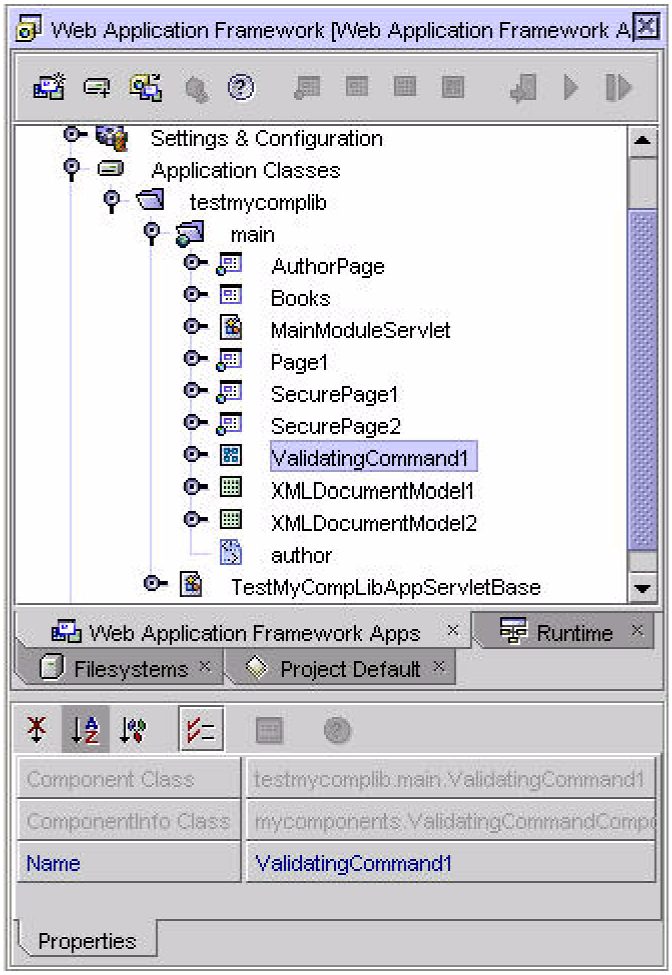
Component class: mycomponents.ValidatingCommand

Description: A validating command component

3. **Select "Validating Command" from the component list, and complete the wizard.**
4. **Take the default settings and let the wizard create ValidatingCommand1 for you.**

   After the wizard completes, you can see that the IDE toolset has created a new class based on the component supplied template.

   You application should now contain a ValidatingCommand1 object.



Component Class	testmycomplib.main.ValidatingCommand1
ComponentInfo Class	mycomponents.ValidatingCommandComp
Name	ValidatingCommand1

The remaining steps assume that your test application already contains two pages that you can leverage in testing your new ValidatingCommand.

The two pages you will need are as follows:

- Page1 from the Develop a Non-Extensible View Component section.
- SecurePage1 from the Develop an Extensible View Component section.

You can see those ViewBeans in the test application explorer graphic just above.

First, you need to complete the coding of ValidatingCommand1.

As designed, the superclass will handle validation state detection, while the application specific class (for example, ValidatingCommand1) is responsible for determining what to do when the submitted page is valid.

This is a very application specific determination. In the interest of simply testing the component, you will code its `handleValid` method to just display SecurePage1.

a. **Open the java source for ValidatingCommand1.**

b. **Implement its `handleValid` method.**

```
public void handleValid(CommandEvent event) throws CommandException
     {
          ViewBean next = event.getRequestContext().getViewBeanManager().getViewBean(
               SecurePage1.class);
          next.forwardTo(event.getRequestContext());
     }
```

To test a ValidatingCommand component, in particular, you need a ViewBean that contains some ValidatingDisplayFields.

You created just such a ViewBean earlier, Page1

5. **Select the Page1 node.**

   To test any Command component, you need to set up a uses relationship between a command client (for example, a CommandField like a Button or HREF) and your command object.

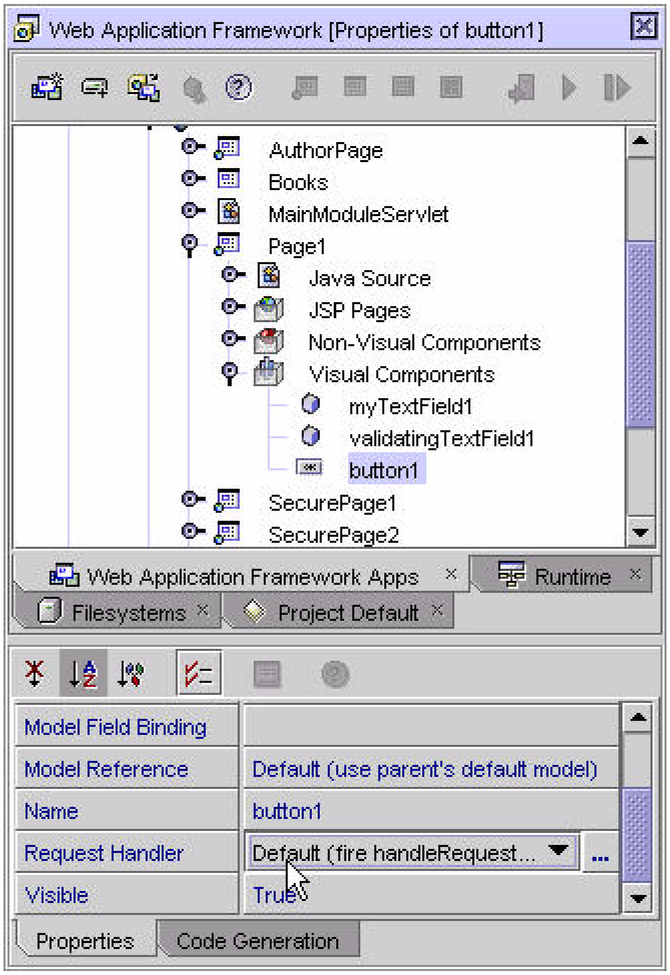
   At run-time, the CommandField will use (activate) the command object. At design-time one establishes this uses relationship by configuring a CommandDescriptor (to declaratively describe a Command instance) and associating this CommandDescriptor with a CommandField.

   The IDE toolset actually makes this relatively easy by allowing developers to initiate this multi-step configuration process by selecting the CommandField first, and it will automatically walk you through the configuration of the CommandDescriptor as part of the CommandField configuration.

   Learning is doing, so follow the steps below and see.

   a. **Select its Visual Components sub-node.**

   b. **Select the node for button1 (below).**



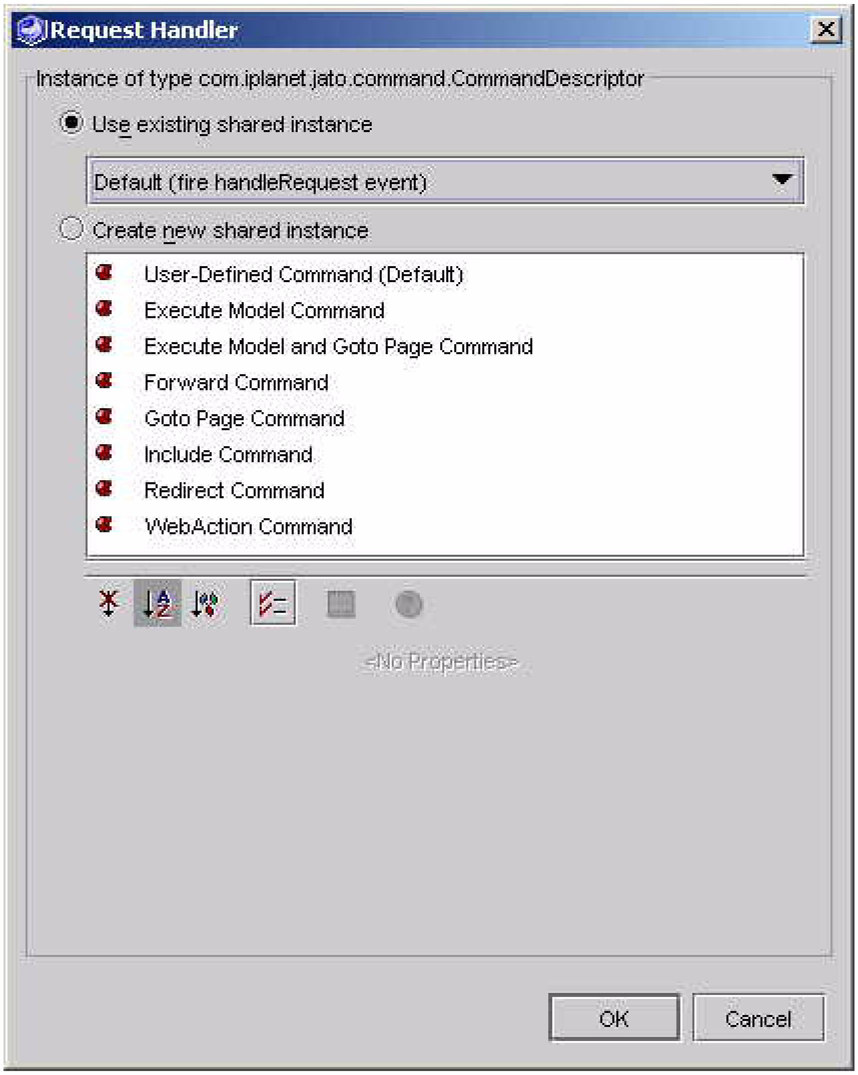
Model Field Binding	
Model Reference	Default (use parent's default model)
Name	button1
Request Handler	Default (fire handleRequest...
Visible	True

6. **Edit button1's Request Handler property.**

   a. **Click the property's ellipsis to bring up the full blown Command Descriptor Property Editor.**

      This is a very sophisticated editor and takes some effort to get familiar with it, but the payoff is substantial, as it offers exciting additional opportunities to component authors, which is discussed later.

      First you must become comfortable using the editor. The Command Descriptor Property Editor contains a dynamic list of available CommandDescriptor types and it also contains an embedded property sheet (at the bottom of the editor) which will dynamically display the properties for the type of CommandDescriptor that is selected (this will become more clear in subsequent steps).


Request Handler
Instance of type com.iplanet.jato.command.CommandDescriptor
Use existing shared instance
Default (fire handleRequest event)
Create new shared instance
User-Defined Command (Default)
Execute Model Command
Execute Model and Goto Page Command
Forward Command
Goto Page Command
Include Command
Redirect Command
WebAction Command
<No Properties>
OK
Cancel

7. **Select the Create new shared instance radio button.**

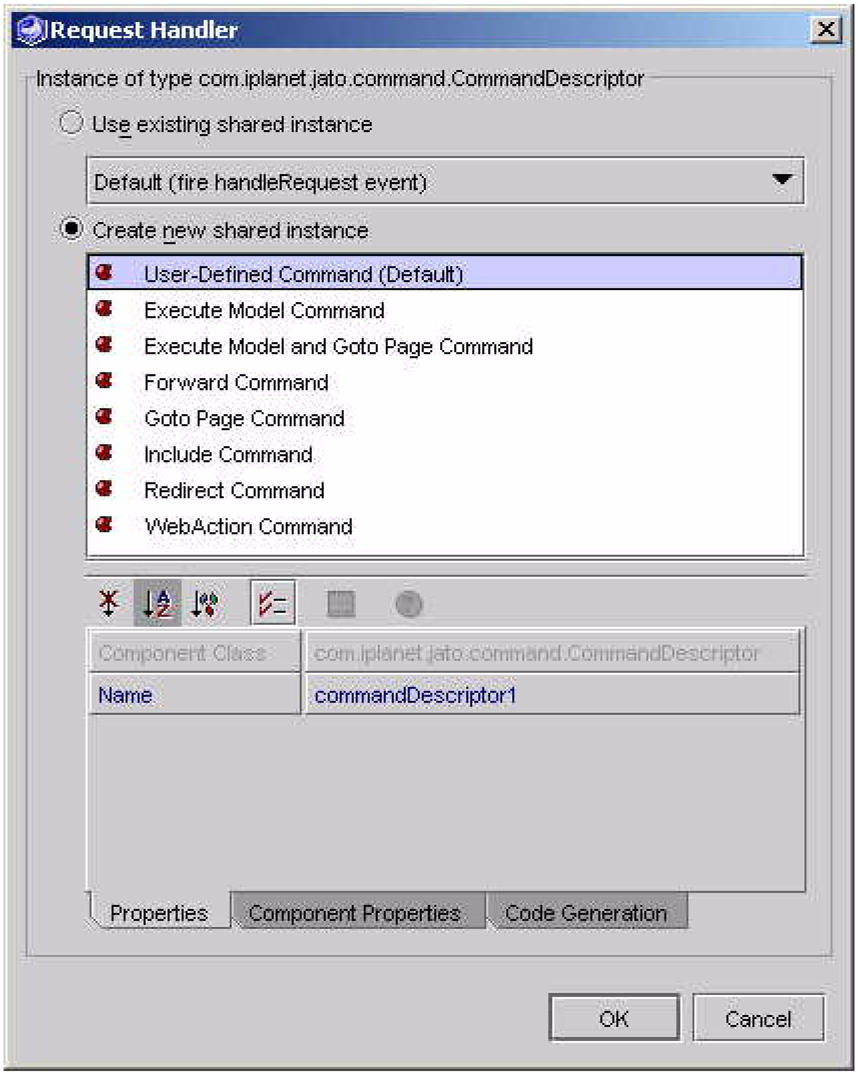
Note – The meaning of "shared instance" is explained a few steps later.

---

8. **Select the "User-Defined Command (Default)" item from the list of available descriptor types (see graphic above).**

   As you select a given command descriptor type, the bottom section of the editor displays the properties which are particular to the type of descriptor you selected.

   Your property editor should look as follows:

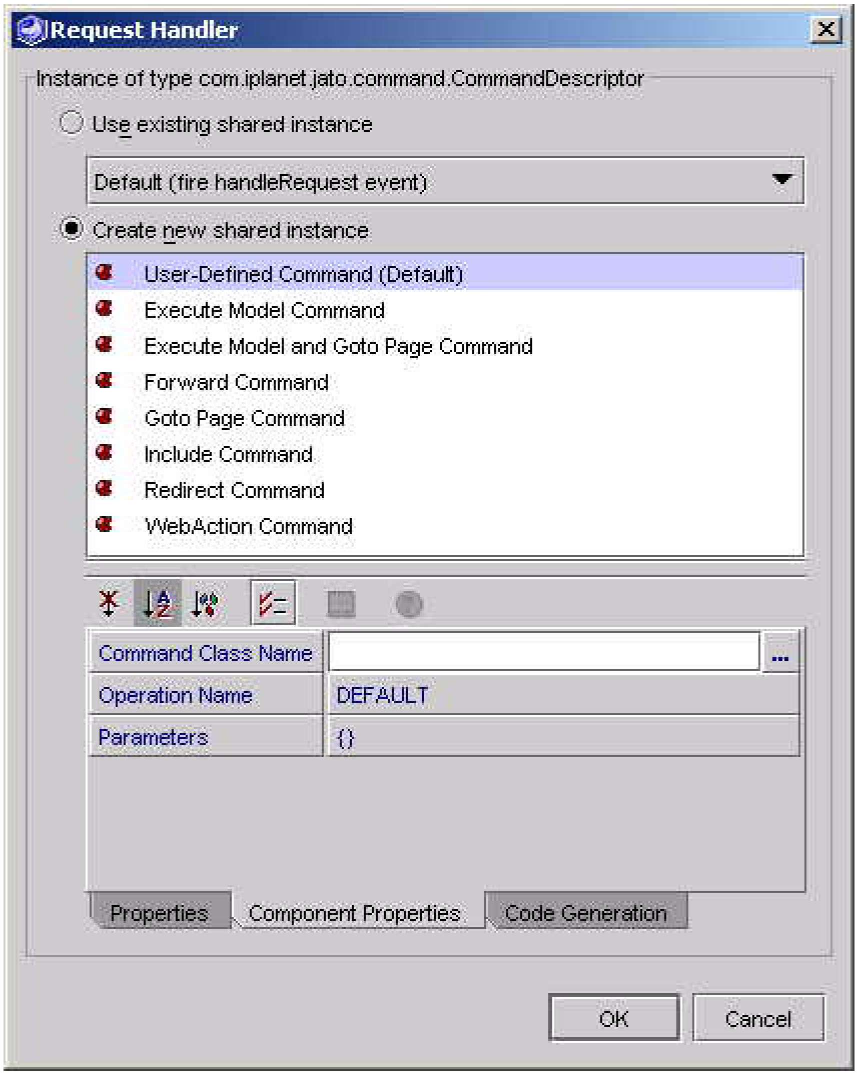

Request Handler
Instance of type com.iplanet.jato.command.CommandDescriptor
Use existing shared instance
Default (fire handleRequest event)
Create new shared instance
User-Defined Command (Default)
Execute Model Command
Execute Model and Goto Page Command
Forward Command
Goto Page Command
Include Command
Redirect Command
WebAction Command
Component Class
com.iplanet.jato.command.CommandDescriptor
Name
commandDescriptor1
Properties
Component Properties
Code Generation
OK
Cancel

The embedded property sheet contains three tabs, as follows:

- Properties.
- Component Properties.
- Code Generation.

9. **Select the Component Properties tab.**

10. **Within the Component Properties tab, select the Command Class Name property (shown below).**


Request Handler

Instance of type com.iplanet.jato.command.CommandDescriptor

Use existing shared instance

Default (fire handleRequest event)

[✓ Create new shared instance]

- User-Defined Command (Default)
- Execute Model Command
- Execute Model and Goto Page Command
- Forward Command
- Goto Page Command
- Include Command
- Redirect Command
- WebAction Command

Command Class Name	
Operation Name	DEFAULT
Parameters	{}

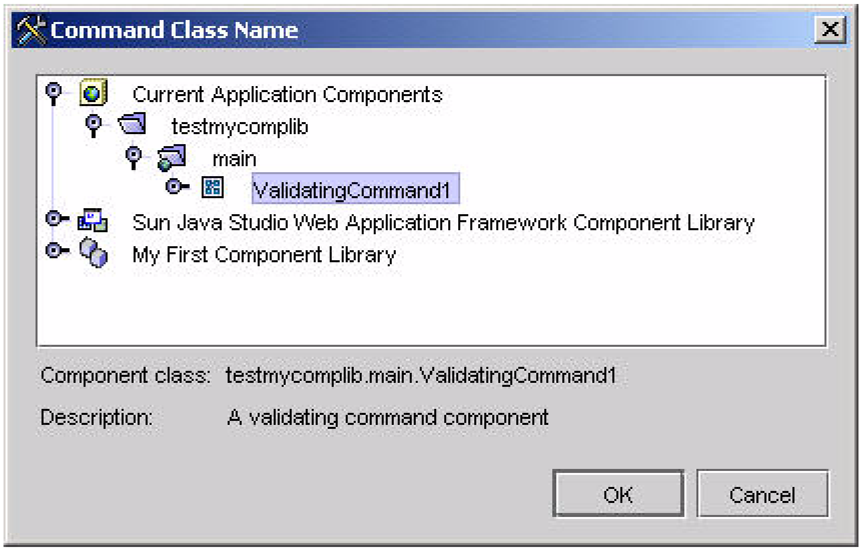
The Command Class Name property is of type `java.lang.String`.

11. **Instead of directly typing into the exposed property field, select the ellipsis to bring up the full blown editor.**

    You should now see that the Command Class Name property editor is actually the same non-extensible Component browser that you have seen in several other contexts.

    In this context, however, it intentionally filters the list of components to those which are appropriate for the context (for example, Command components).

12. **Fully expand the Current Application Components node, and you should see "ValidatingCommand1" available (shown below).**

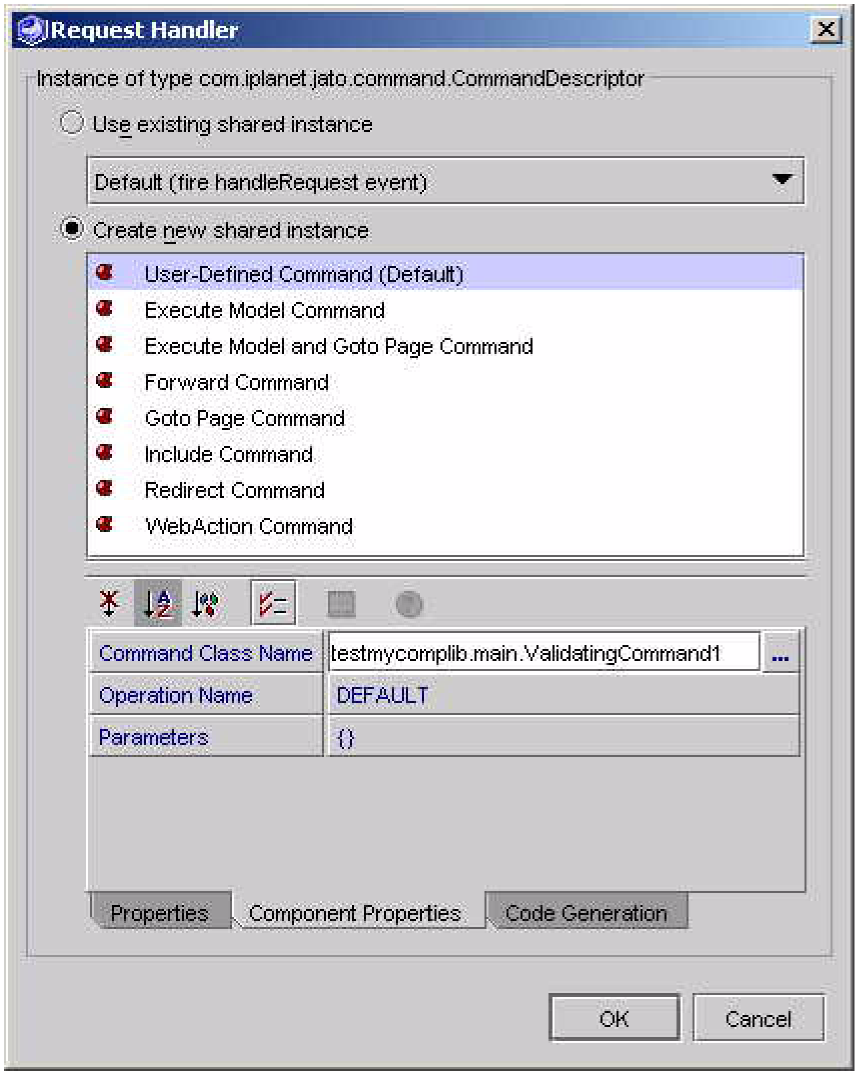

Command Class Name
Current Application Components
testmycomplib
main
ValidatingCommand1
Sun Java Studio Web Application Framework Component Library
My First Component Library
OK
Cancel

Component class: testmycomplib.main.ValidatingCommand1

Description: A validating command component

13. **Select the "ValidatingCommand1" node from the property editor, and click OK (shown above).**

    Notice that the Command Class Name property in the CommandDescriptor's embedded property sheet now contains the fully qualified class name for ValidatingCommand1 (shown below).


Request Handler

Instance of type com.iplanet.jato.command.CommandDescriptor

Use existing shared instance

Default (fire handleRequest event)

[✓ Create new shared instance]

- User-Defined Command (Default)
- Execute Model Command
- Execute Model and Goto Page Command
- Forward Command
- Goto Page Command
- Include Command
- Redirect Command
- WebAction Command

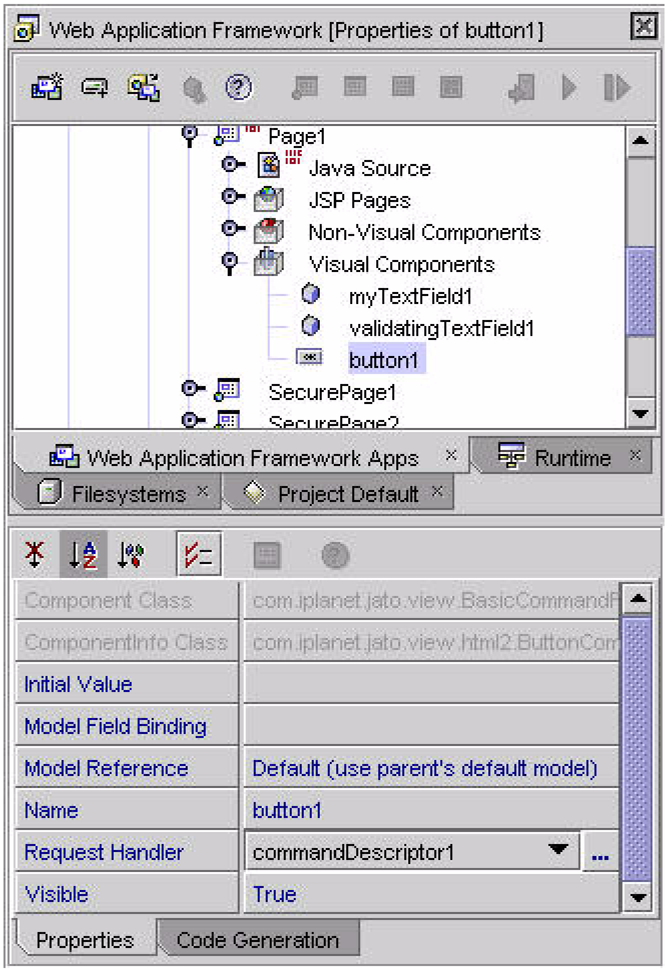
Command Class Name	testmycomplib.main.ValidatingCommand1
Operation Name	DEFAULT
Parameters	{}

Note – You could have directly typed in the fully qualified name of the Command class (for example, <*yourTestApplication*>`.main.ValidatingTest1`) into the Command Class Name property. However, direct editing of the Command Class Name property should only be done in special cases (for example, where you need to refer to a Command Class that exists only as a `.class` file, and is therefore not visible for direct selection in the Command Component browser as shown above.

14. Click OK to complete the configuration of the CommandDescriptor.

Before further configuration, spend a moment to fully understand the impact of the previous configuration on the Page1.

Note that the value of button1's Request Handler property now reads "commandDescriptor1" (shown below).



Component Class	com.iplanet.jato.view.BasicCommandF
ComponentInfo Class	com.iplanet.jato.view.html2.ButtonCon
Initial Value	
Model Field Binding	
Model Reference	Default (use parent's default model)
Name	button1
Request Handler	commandDescriptor1
Visible	True

You might be wondering where commandDescriptor1 is.

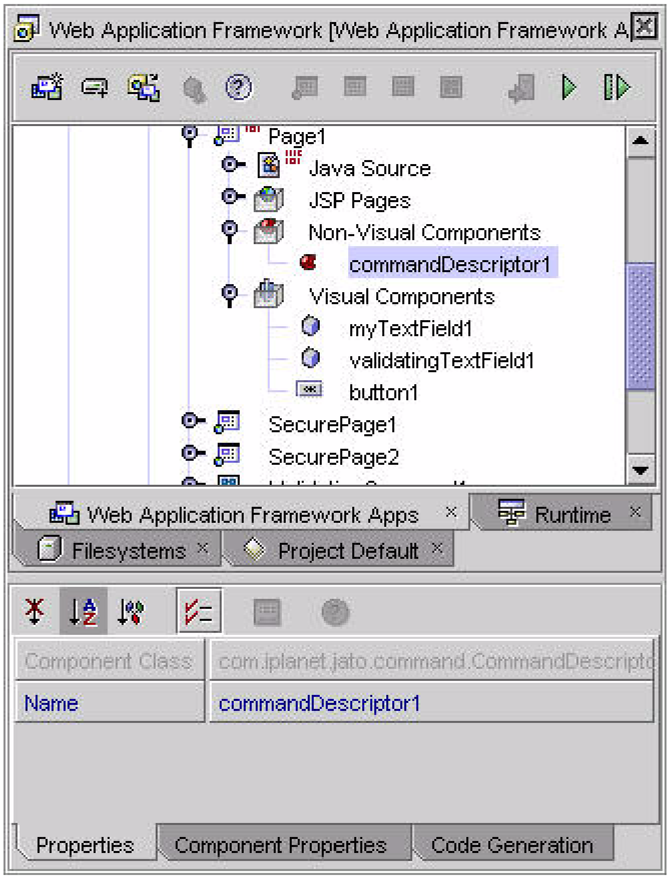
You might also be wondering about the "Create new shared instance" radio button in the CommandDescriptor property editor that you selected (shown above).

The following step provides the answers.

15. **Expand the Page1's Non-Visual Components node (shown below).**

There you will find a new non-visual component node "commandDescriptor1". It is the CommandDescriptor object you configured just moments ago. It is a CommandDescriptor that you configured as a "shared instance".

To visually express its "shared" nature, the IDE toolset provides the "Non-visual Components" node to house all of these shared instances.



Component Class	com.iplanet.jato.command.CommandDescripto
Name	commandDescriptor1

The "Non-Visual Components" node is an Web Application Framework component model construct. It provides a ContainerView scoped space for the configuration of JavaBean objects (for example, Configured Beans) which are referenceable by properties elsewhere in the current ContainerView.

In this example, "commandDescriptor1" is a configured CommandDescriptor (which is a JavaBean), which is referenced by button1's Request Handler property. The key to this component model feature is that the same configured non-visual component can be referenced by more than one property within the current ContainerView scope (for example, more than one button or HREF could have its CommandDescriptor property also set to refer to commandDescriptor1).

A quick glance at the IDE toolset generated Java code for Page1 would reveal how this is expressed in Java terms. The benefits to both component authors and application developers are substantial. As a further clarification, not only can multiple CommandFields (for example, Buttons, HREFs, and so on) share commandDescriptor1 by each referring to it in their specific "Command Descriptor" property, but any property within the current ContainerView whose type is assignable from `com.iplanet.jato.command.CommandDescriptor` may be set to refer to commandDescriptor1. In essence, the non-visual components are class scoped, IDE configurable JavaBean objects which might be referenced in a type safe manner by any number of other visual components within the class.

At this time, the IDE toolset does not support the ability to have one non-visual component refer to another non-visual component.

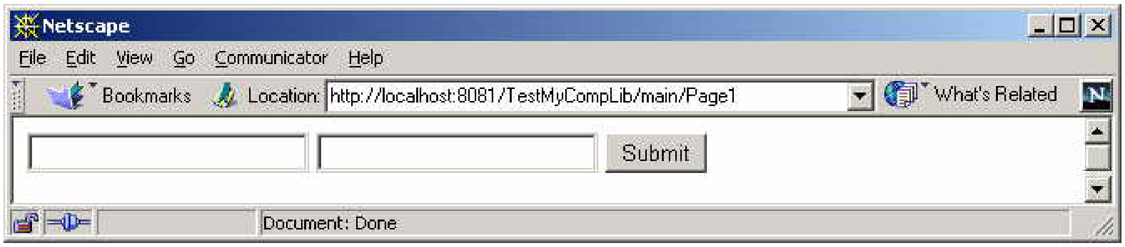
Application developers must understand and respect the shared nature of the non-visual components. Modifications to the configuration of an existing non-visual component will indirectly affect all circumstances in which that instance of the non-visual component is referenced at run-time.This is why the CommandDescriptor editor (or more generally, the non-visual component editor) always allows one to "Create a new shared instance" of a non-visual component. More often than not, multiple CommandFields within a given ContainerView will not share the same instance of CommandDescriptor, but rather, refer to different and distinctively configured instances of CommandDescriptor.

Now you have configured Page1 to instantiate ValidatingCommand1 and invoke its execute method whenever button1 is indicated in a form submit.

16. **Test run the page flow from Page1 to SecurePage1 which is now controlled by ValidatingCommand1.**

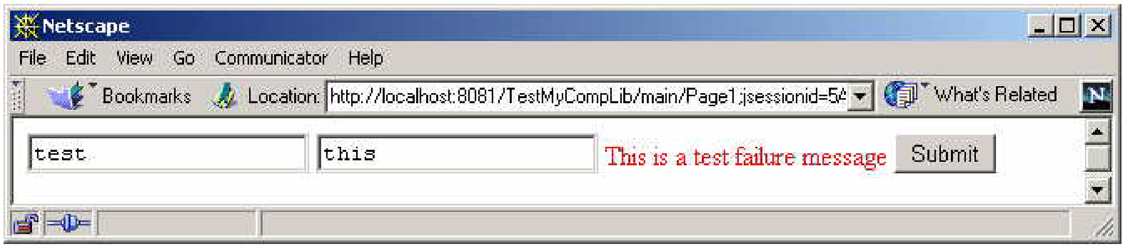
    Test run Page1

    The contents of `Page1.jsp` should show up in the browser.


Netscape
File Edit View Go Communicator Help
Bookmarks Location: http://localhost:8081/TestMyCompLib/main/Page1 What's Related
Submit
Document: Done

17. **Enter an invalid value (any non-integer) in the ValidatingTextField text input, and submit the page.**

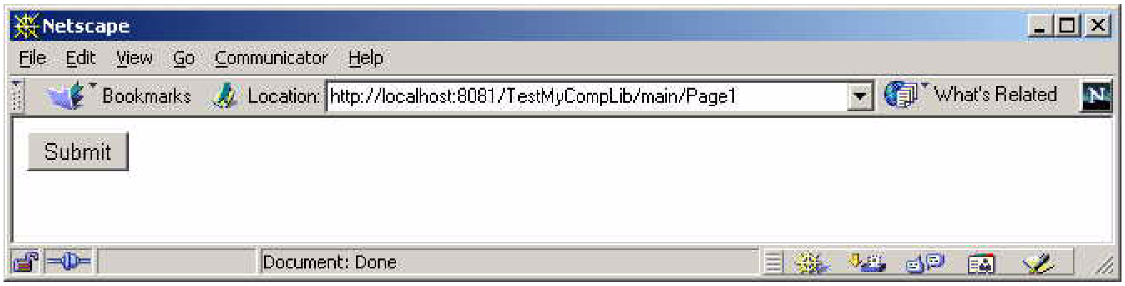
    The page should immediately redisplay with the text of the "Validation Error Message" property immediately following the ValidatingTextField.


Netscape
File Edit View Go Communicator Help
Bookmarks Location: http://localhost:8081/TestMyCompLib/main/Page1;jsessionid=5 What's Related
test
this
Submit

This is a test failure message

18. **Enter a valid value (for example, 55, or any other valid Integer), and submit the page.**

    Now, instead of Page1 redisplaying as it did earlier in this guide, the logic within ValidatingCommand1 will display SecurePage1.


Netscape
File Edit View Go Communicator Help
Bookmarks Location: http://localhost:8081/TestMyCompLib/main/Page1 What's Related
Submit
Document: Done

CHAPTER 6

ConfigurableBeans (Non-Visual Components)

ConfigurableBeans are JavaBean types which have been explicitly designated as ConfigurableBeans in a component library manifest.

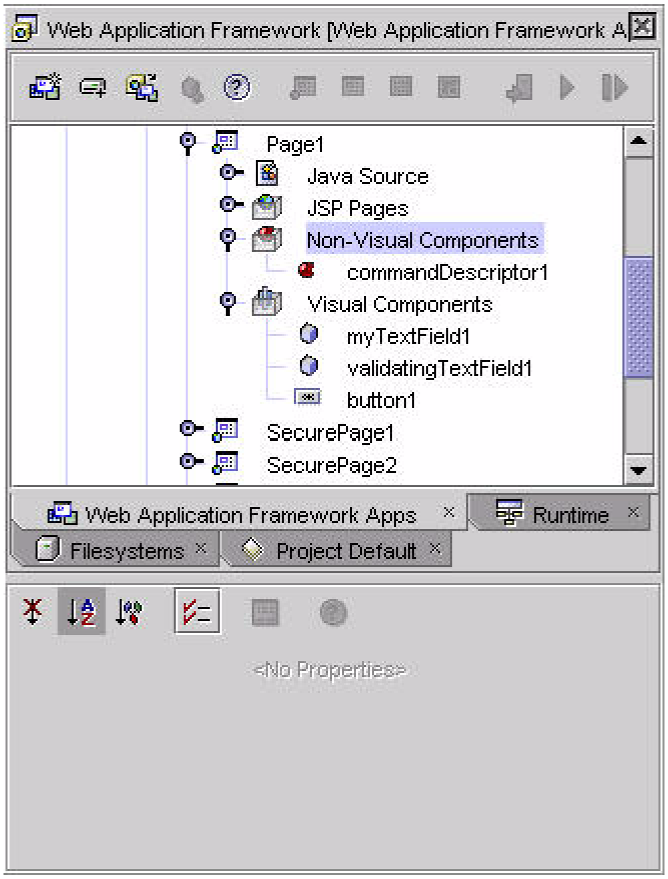
The IDE toolset automatically inspects all component library manifests and builds a dynamic list of ConfigurableBean types in memory. After the component manifest has been inspected, these types are said to be registered with the IDE toolset.

A snippet of the Web Application Framework Component Library manifest that declares some ConfigurableBeans is shown below.

As you can see, the designation is straightforward.

```
<configurable-bean>
       <bean-class>com.iplanet.jato.model.SimpleModelReference</bean-class>
</configurable-bean>
<configurable-bean>
       <bean-class>com.iplanet.jato.command.CommandDescriptor</bean-class>
</configurable-bean>
<configurable-bean>
       <bean-class>com.iplanet.jato.view.command.WebActionCommandDescriptor</bean-class>
</configurable-bean>
```

Note that the technical name for these components is ConfigurableBeans. That is the name by which these entities are declared within the component library manifest. However, within the IDE toolset, application developers see the more developer friendly term Non-Visual Components.



Only component authors need to understand that ConfigurableBeans and Non-Visual Components are essentially the same thing.

Technically speaking, the Non-Visual Components, which are visible as a sub-node of a ContainerView, are just a special case of the IDE toolset exposing ConfigurableBeans as nodes.

Formally speaking, all Non-Visual Components are ConfigurableBeans, but not all ConfigurableBeans are Non-Visual Components. There are, in fact, other cases of ConfigurableBeans being used within the IDE toolset which do not appear as explicit nodes. See ConfigPropDescriptors API - Value Policy.

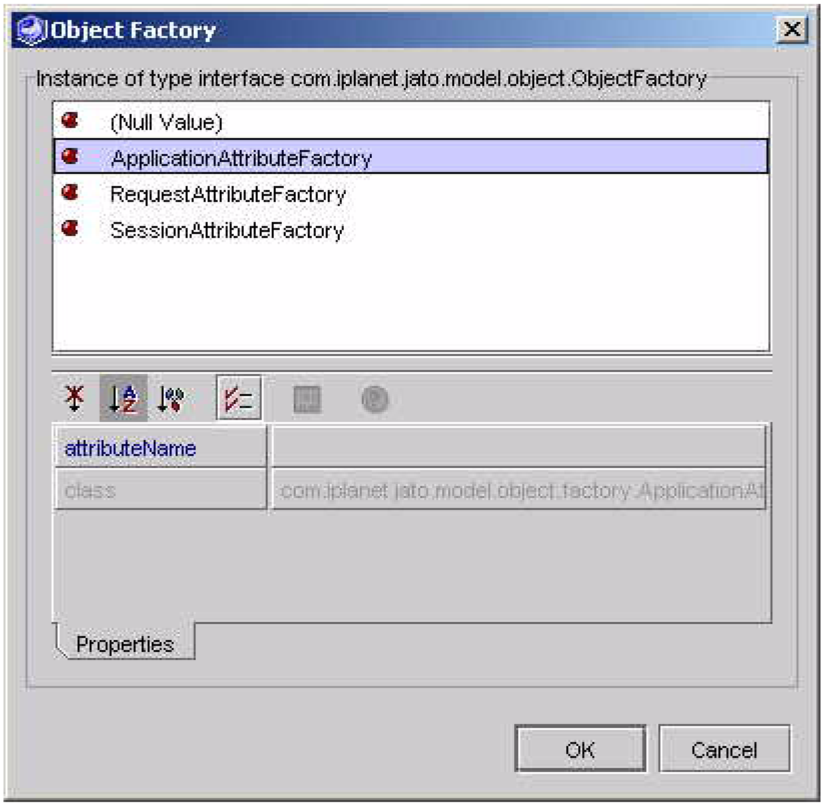
How does the IDE toolset make use of the ConfigurableBean? What role do they play?

ConfigurableBeans are just ordinary JavaBean types which play a well defined but subtle role within the Web Application Framework IDE toolset. The Web Application Framework component model relies on ConfigurableBeans to *complement* the standard Web Application Framework components (Model, View, Commands).

Specifically, ConfigurableBeans complete the story begun by Web Application Framework ConfigPropertyDescriptors. Component authors add ConfigPropertyDescriptors to ComponentInfo whenever they need to specify a configuration property that they want to expose for design time configuration. Each ConfigPropertyDescriptor specifies a property "type". Application developers must edit/configure these properties within the IDE. Since the properties are typed, the IDE toolset can leverage this formalism, and provide a type specific editor. For example, if the configuration property type is Boolean.TYPE, the IDE will invoke the standard Boolean editor. This behavior is typical of any JavaBean aware IDE.

However, the Web Application Framework IDE toolset offers functionality above and beyond that of the standard JavaBean editor. This extra functionality involves the special treatment that the IDE toolset provides for Web Application Framework configuration properties whose property types correspond to ConfigurableBean designated types.

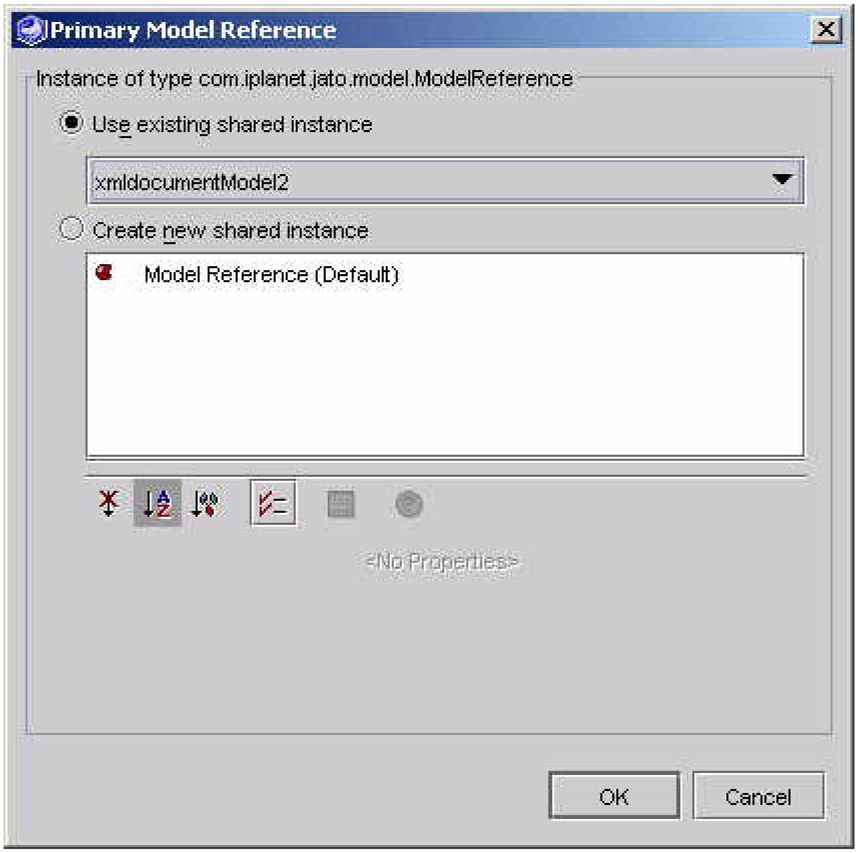
The IDE toolset uses a lookup algorithm to determine if the configuration property type corresponds to a registered ConfigurableBean type, and if so, it automatically invokes one of two special ConfigurableBean editors. These special Web Application Framework ConfigurableBean editors are shown below.



Instance of type interface com.iplanet.jato.model.object.ObjectFactory

- (Null Value)
- ApplicationAttributeFactory
- RequestAttributeFactory
- SessionAttributeFactory

attributeName	
class	com.iplanet.jato.model.object.factory.ApplicationAt


Primary Model Reference

Instance of type com.iplanet.jato.model.ModelReference

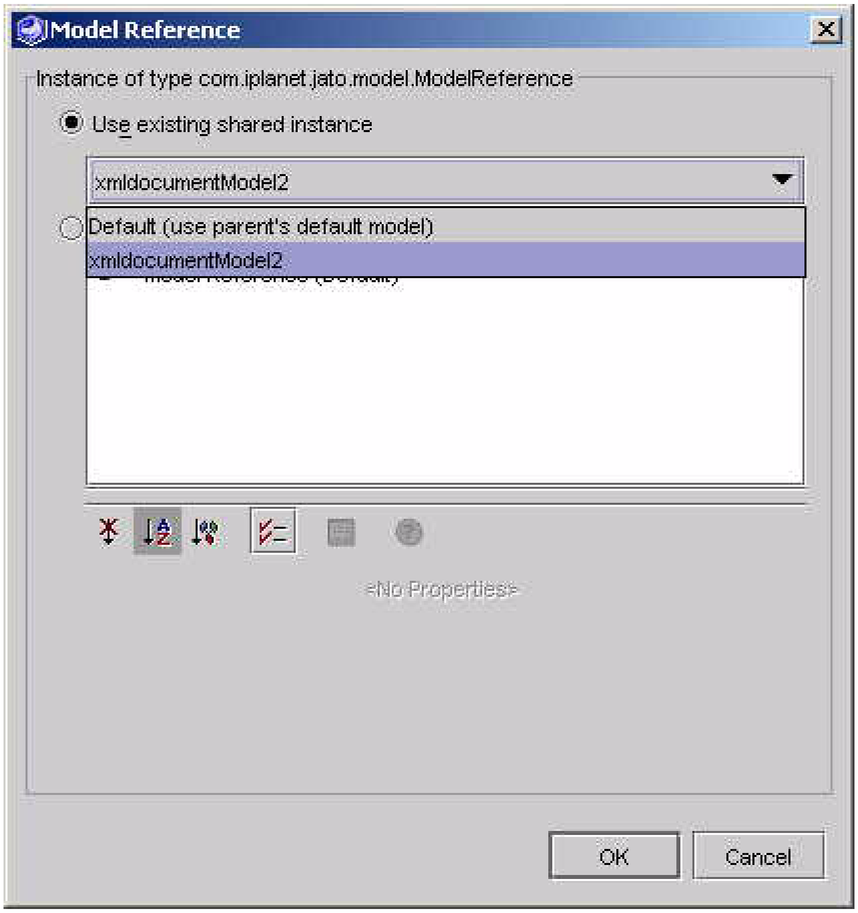
(●) Use existing shared instance

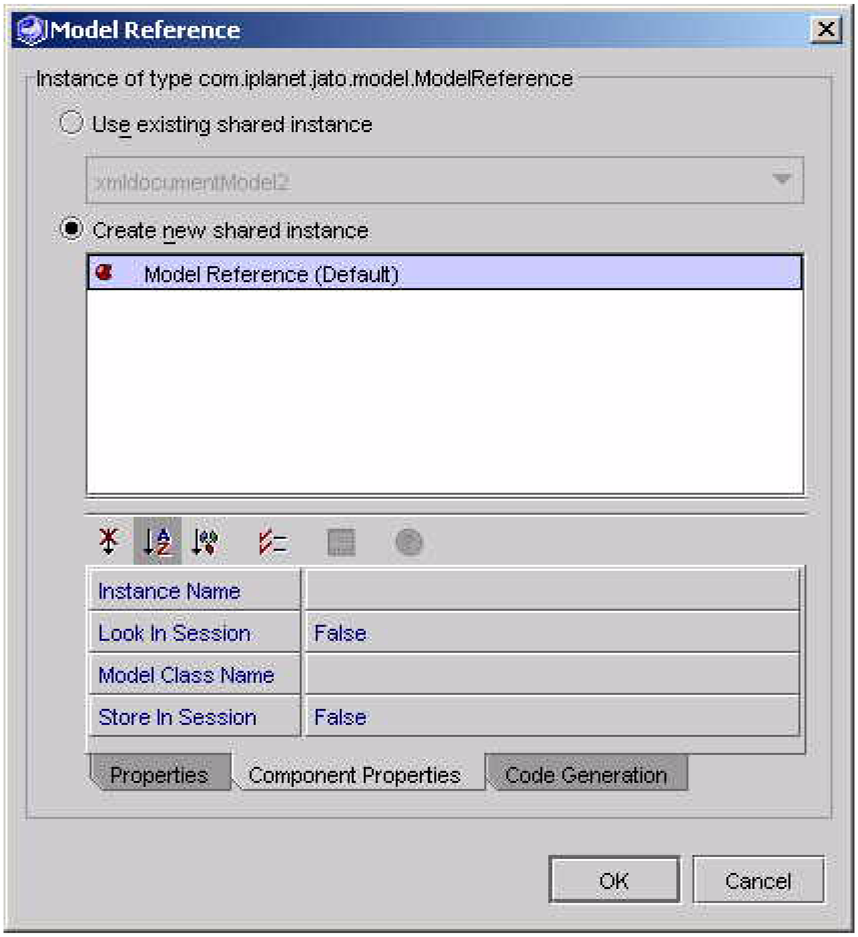
xmldocumentModel2

( ) Create new shared instance

Model Reference (Default)

<No Properties>


Model Reference
Instance of type com.iplanet.jato.model.ModelReference
Use existing shared instance
xmldocumentModel2
Default (use parent's default model)
xmldocumentModel2
<No Properties>
OK
Cancel


Model Reference

Instance of type com.iplanet.jato.model.ModelReference

○ Use existing shared instance

xmldocumentModel2

● Create new shared instance

Model Reference (Default)

Instance Name	
Look In Session	False
Model Class Name	
Store In Session	False

The IDE toolset will invoke one of the two editors above based on a further subtlety in the ConfigPropertyDescriptor, known as the value policy. The details of value policy are beyond the scope of this section, for more information see ConfigPropDescriptors API - Value Policy.

For this section, it is sufficient to observe that while their layout is radically different, both of the ConfigurableBean editors provide a common core functionality. Both of these editors provide the application developer with a dynamic list of ConfigurableBean types which are assignable from the configuration property type. That is the key value add of the ConfigurableBean component. It is this mechanism which allows the IDE to seamlessly and dynamically incorporate new choices into properties that otherwise would normally be severely restricted.

For instance, the IDE will enable the editing of a configuration property of type CommandDescriptor with the ConfigurableBean editor that displays a dynamic list of CommandDescriptor sub-types. The application developer first selects the type of

CommandDescriptor from the list, and then configures an instance of that type. The properties of the selected sub-type, of course, are dynamically exposed via conventional JavaBean logic.

Instead of being limited to a very plain vanilla CommandDescriptor editor which would be the case if left to the standard JavaBean handling, the Web Application Framework IDE toolset provides an unlimited opportunity for component authors to introduce custom ConfigurableBean types with their own sets of properties, and potentially, custom property editors. The IDE then transparently leverages these type/property sheet/editor combinations into the IDE as new offerings for simply defined properties. Effectively, the ConfigurableBean editor introduces an extra level of indirection that is extremely powerful and somewhat unprecedented. It is so unprecedented that it may take component authors some time to actually fully appreciate the opportunity that this offers them.

What is the relationship between Web Application Framework and the ConfigurableBean types?

ConfigurableBeans are a value added feature of the Web Application Framework component model.

Component authors are not required to utilize the ConfigurableBean feature. There is no formal notion of ConfigurableBean in the Web Application Framework run-time environment, or framework API. Rather, ConfigurableBeans are a feature offered by the component model to empower component authors and make the IDE experience richer for developers. Component authors are encouraged to come up with new ConfigurableBean types to either augment existing components, or enhance entirely new components.

The Web Application Framework Component Library does define quite a few ConfigurableBean types. Component authors should familiarize themselves with the usage of these ConfigurableBean types, as they provide the best illustration of the feature. Component authors should understand the manner in which the Web Application Framework standard components declare configuration properties which are satisfied by ConfigurableBean types. In addition to writing new components, component authors should understand that they can also immediately augment the existing Web Application Framework components by providing additional ConfigurableBean types that are appropriate for the already defined Web Application Framework configuration properties identified below.

Following is a table to help guide your review.

ComponentInfo	ConfigPropertyDescriptor	ConfigBeans Assignable From Property Type
BasicDisplayFieldComponentInfo	ConfigPropertyDescriptor("modelReference", com.iplanet.jato.model.ModelReference.class)	com.iplanet.jato.model.SimpleModelReference
BasicCommandFieldComponentInfo	ConfigPropertyDescriptor("commandDescriptor", com.iplanet.jato.command.CommandDescriptor.class)	com.iplanet.jato.command.CommandDescriptor com.iplanet.jato.view.command.WebActionCommandDescriptor com.iplanet.jato.view.command.ExecuteModelCommandDescriptor com.iplanet.jato.view.command.GotoViewBeanCommandDescriptor
ObjectAdapterModelComponentInfo	ConfigPropertyDescriptor("objectFactory", com.iplanet.jato.model.object.ObjectFactory.class)	com.iplanet.jato.model.object.factory.SessionAttributeFactory com.iplanet.jato.model.object.factory.ApplicationAttributeFactory com.iplanet.jato.model.object.factory.RequestAttributeFactory
BasicChoiceDisplayFieldComponentInfo	IndexedConfigPropertyDescriptior("choices",com.iplanet.view.Choice.class)	com.iplanet.jato.view.SimpleChoice

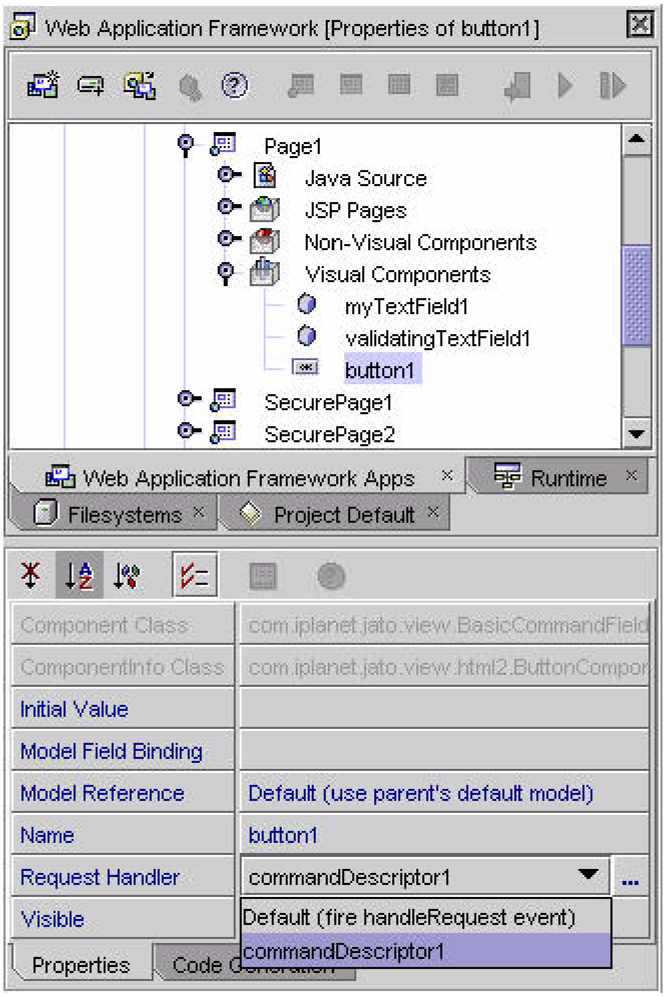
Configurable Bean Example: CommandDescriptor

The obvious Command components are the extensible Command components. Extensible Command components are custom implementations of the `com.iplanet.jato.command.Command` interface, which are intended for specialization by application developers. The specialization by application developers will usually consist of application developers adding custom logic to their application specific Commands. Command objects have minimal formal structure, being arbitrary implementations of a very simple interface, `com.iplanet.jato.command.Command`. Therefore, there is not as much of an opportunity to formalize the construction of new Command types within the IDE beyond the specification of properties.

Additionally, the Web Application Framework offers other Command component opportunities. To understand this opportunity, it is necessary for the component author to fully understand the formal role of CommandDescriptors. Effectively, CommandDescriptors are configurable beans that allow for the design-time configuration of Command object instances.

The Web Application Framework and the IDE toolset utilize CommandDescriptors to allow the application developer to configure the usage of Command objects. That is to say, there is a formal uses relationship between CommandFields and Command objects and this relationship is mediated by CommandDescriptors. CommandFields are Views (for example, Buttons and HREFs) which invoke Command objects when activated. The application developer specifies which Command object will be invoked when the CommandField is activated via the field's Command Descriptor property.

A CommandDescriptor is a Web Application Framework object that encodes the information needed at run-time to construct a particular instance of a Command class and invoke it. Minimally, the CommandDescriptor specifies which Command class should be instantiated at run-time. The CommandDescriptor also allows developers to specify Command specific parameterized values. For instance, it is very common for a single Command object to be associated with multiple CommandFields. Each CommandField would employ a distinctly configured CommandDescriptor to direct and influence the execution of the Command. For more detailed information on this subject, see the *Web Application Framework Developer's Guide*.



Web Application Framework [Properties of button1]

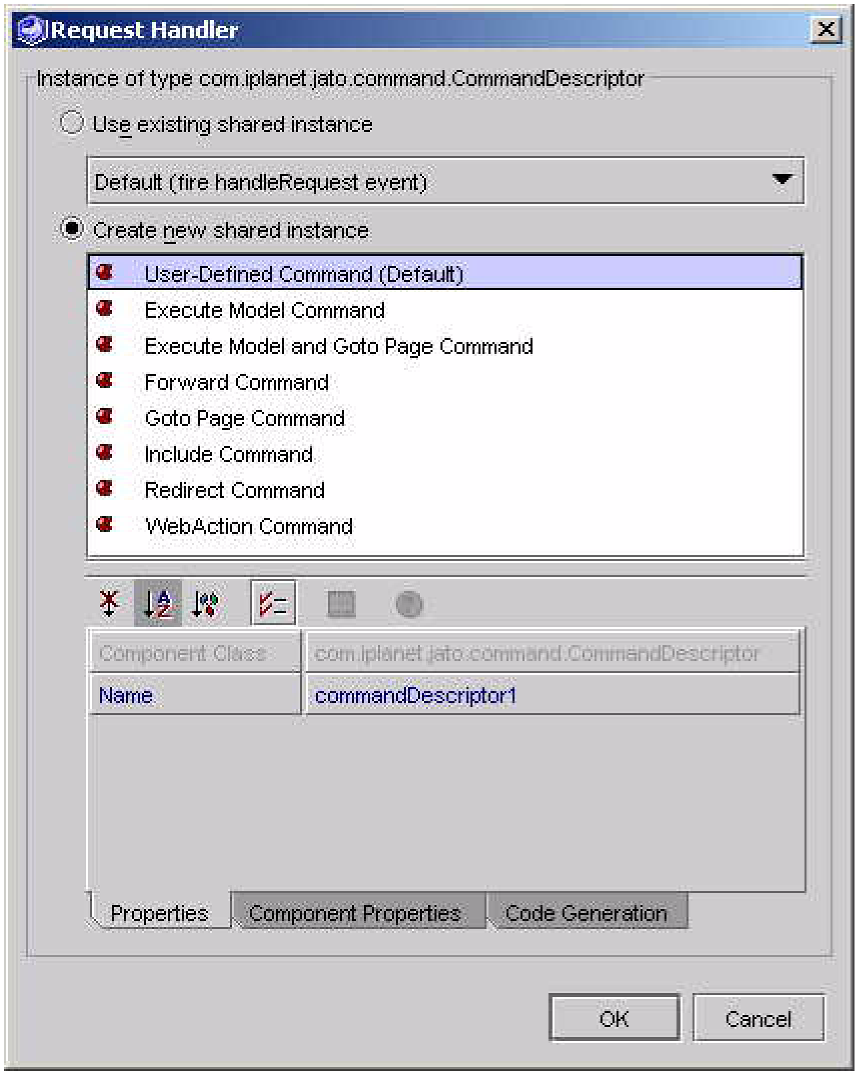
```
Page1
    Java Source
    JSP Pages
    Non-Visual Components
    Visual Components
        myTextField1
        validatingTextField1
        button1
SecurePage1
SecurePage2
```

Web Application Framework Apps | Runtime | Filesystems | Project Default

Component Class	com.iplanet.jato.view.BasicCommandField
ComponentInfo Class	com.iplanet.jato.view.html2.ButtonCompon
Initial Value	
Model Field Binding	
Model Reference	Default (use parent's default model)
Name	button1
Request Handler	commandDescriptor1
Visible	

Default (fire handleRequest event)
commandDescriptor1

Properties | Code Generation


Request Handler
Instance of type com.iplanet.jato.command.CommandDescriptor
Use existing shared instance
Default (fire handleRequest event)
Create new shared instance
User-Defined Command (Default)
Execute Model Command
Execute Model and Goto Page Command
Forward Command
Goto Page Command
Include Command
Redirect Command
WebAction Command
Component Class
com.iplanet.jato.command.CommandDescriptor
Name
commandDescriptor1
Properties
Component Properties
Code Generation
OK
Cancel

Given the role of the CommandDescriptor, the opportunity exists for component authors to create a very rich Command component story through the combination of non-extensible Command components and component specific CommandDescriptor classes.

For instance, a component author can create and distribute a non-extensible Command component plus a custom CommandDesciptor class designed to allow developers to visually configure the invocation of the non-extensible Command component. The custom CommandDescriptor, itself, can be distributed as a ConfigurableBean component. ConfigurableBeans are visually exposed by the IDE toolset as Non-Visual Components.

CHAPTER 7

Developing and Distributing Non-Extensible Model, Command and ContainerView Components

Recall that there is a fundamental difference between extensible and non-extensible components (see the earlier section "Extensible vs. Non-Extensible Components" on page 33).

In the previous exercises, the development, distribution, and test cycle for five components was demonstrated. All but two of those were extensible components.

- MyTextField (non-extensible DisplayField component).
- ValidatingDisplayField (non-extensible DisplayField component).
- SecureViewBean (extensible ViewBean component).
- XMLDocumentModel (extensible Model component).
- ValidatingCommand (extensible Command component).

What about the possibility of developing and distributing non-extensible Model, ContainerView, and Command components?

The short answer is that such components are possible, easy to develop, and easy to distribute. A non-extensible Model, ContainerView or Command component is a concrete Model, ContainerView, or Command that has been *created within the IDE from an extensible Model, ContainerView, or Command component*. It is no different from an application specific Model, ContainerView, or Command, except that is subsequently distributed in a component library JAR file with the express purpose of being incorporated into multiple applications, like any other distributed component. The distribution technique is common for non-extensible Models, ContainerViews, and Commands.

Why would someone develop and distribute non-extensible Model, ContainerView, and Command components?

Non-extensible Model, ContainerView and Command components provide several opportunities for component authors to deliver highly leveraged components to their component consumers. The discussion which follows only scratches the surface of this topic.

The most obvious opportunity provided by non-extensible Model, ContainerView, and Command components is the opportunity for component authors to move beyond delivering small building blocks to large reusable application and organization sized components. Non-extensible Model, ContainerView, and Command components typically form the top end of the component food chain. They allow component authors to deliver arbitrarily complex, very coarse grained components. If you consider DisplayField components to be the most fine grained components, the non-extensible Model, ContainerView, and Command components are at the opposite end of the component spectrum. Companies or organizations can create very sophisticated horizontal or vertical libraries of non-extensible Model, ContainerView, and Command components from which application developers can assemble applications out of very large, very reusable, very powerful building blocks.

For instance, non-extensible Model components can provide pre-packaged ready to use access to specific organizational data. Application developers can then simply define new Views and visually bind these applications specific Views to the pre-packaged Model.

Non-extensible ContainerView components can deliver pre-configured visual building blocks comprised of arbitrarily complex aggregations of smaller Views.

Non-extensible Command components can provide plug and play behavior.

Non-extensible components can be preconfigured to use other non-extensible components within the library. For example, a ShoppingCart ContainerView component can be pre-configured to use a companion non-extensible Model component.

Together, such preconfigured ContainerView and Model components provide ready to use already integrated visual presentation and data access. On top of that, the component author could preconfigure said ContainerView component to use one or more non-extensible Command components, thereby adding already integrated command behavior to the composite.

Organizations can create toolboxes comprised of collections of integrated non-extensible Model, ContainerView, and Command components. These toolboxes can be used internally to facilitate the rapid development of applications, or even delivered to partners as part of a broader business to business architecture.

The opportunity is boundless.

Develop a Non-Extensible Model, ContainerView, or Command Component

1. **Develop the component within the Web Application Framework IDE as you would an ordinary Web Application Framework application object.**
   - Use the appropriate Model, ContainerView, or Command wizard to construct the component.
   - Configure the component's properties.
   - Add arbitrary behavior to the component's Java class.
   - (ContainerView components only) Optionally add zero or more child view components to the ContainerView.
   - (ContainerView components only) Optionally associate zero or more JSP pagelets, to provide the rendering specification for the ContainerView component.
   - (Model components only) Optionally add zero or more model fields or model operations to the Model.
2. **Create a ComponentInfo class for the new component.**

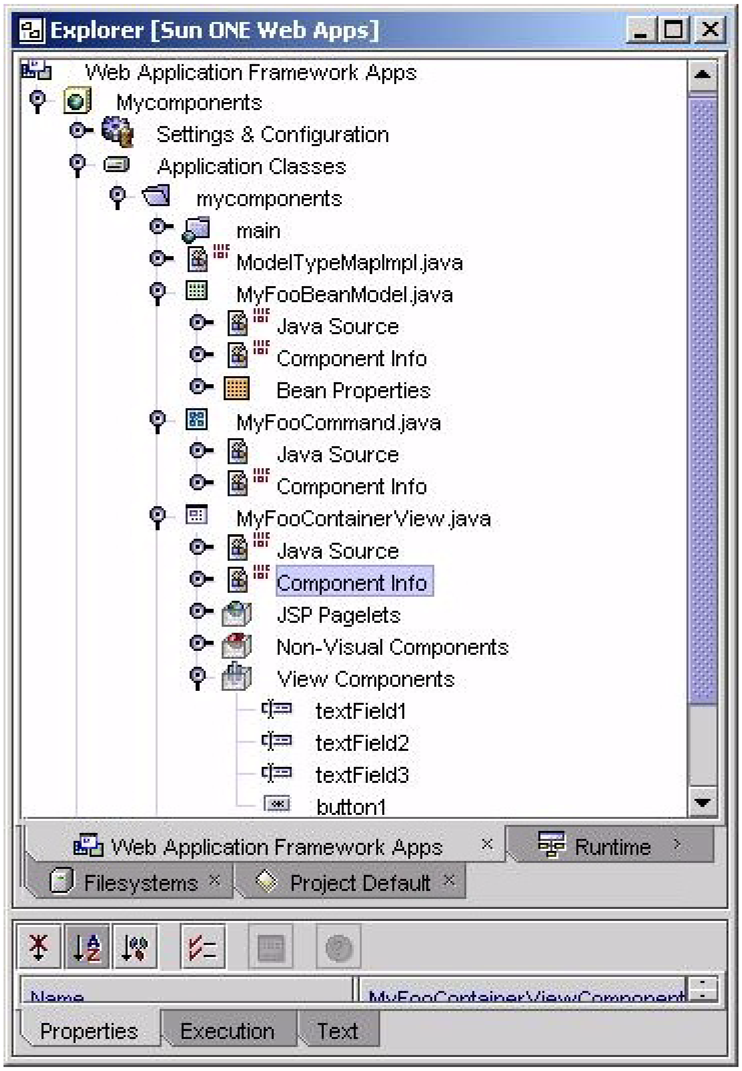
   This is highly recommended, though strictly speaking, not required.

   A component specific ComponentInfo is recommended to minimally provide a component specific ComponentDescriptor. Optionally, the ComponentInfo can be used to specify any and all of the advanced component model features which are appropriate for non-extensible components.

Note – To visually create any non-extensible Model, ContainerView, or Command components within the IDE, you must construct the components within the context of an Web Application Framework application. That is to say, you must, first create an Web Application Framework application before you can leverage the IDE toolset to create any new non-extensible Model, ContainerView, or Command components. This is because the IDE toolset does not currently support a "library only design" mode. Future versions of the Web Application Framework IDE toolset might allow developers to choose between a "new library" or a "new application". However, currently, you can only leverage the Web Application Framework new object wizards within a Web Application Framework application. The fact that a component author will design these new components within an "application" has no bearing on the future independence of the components. The application merely provide the IDE toolset recognized context that allows the component author to leverage the complete visual IDE feature set during the authoring process. The ultimate end product of the component authoring will be the component's Java resources, which are totally independent of the application in which they might have been originally visually designed.

Assuming that you intend to create a new Web Application Framework application merely for the purposes of designing some new non-extensible Model, ContainerView, or Command components, the name of the application itself does not matter. One recommended approach is to consider the application as a convenient "test application" for your new non-extensible Model, ContainerView, or Command components. After you are satisfied with their performance within the test application, you add the new components to a component library JAR file.

The IDE Toolset will treat a Web Application Framework component's ComponentInfo Java source as "part" of the component. This means that the ComponentInfo Java source node will appear as a child of the component's primary node, just as the component's Java source appears as a child of the component's primary node.


Explorer [Sun ONE Web Apps]
Web Application Framework Apps
Mycomponents
Settings & Configuration
Application Classes
mycomponents
main
ModelTypeMapImpl.java
MyFooBeanModel.java
Java Source
Component Info
Bean Properties
MyFooCommand.java
Java Source
Component Info
MyFooContainerView.java
Java Source
Component Info
JSP Pagelets
Non-Visual Components
View Components
textField1
textField2
textField3
button1
Web Application Framework Apps
Runtime
Filesystems
Project Default
Name
MyFooContainerViewComponent
Properties
Execution
Text

Distributing a Non-extensible Model, ContainerView, or Command Component

1. **Add a component element to the component library's `complib.xml` with one additional sub-element not discussed previously.**
   - The component element must include a `design-reference-resource` sub-element.
   - The `design-reference-resource` sub-element must specify the location of the component's object definition resource.
2. **Add the non-extensible component to a Web Application Framework component library JAR.**
   - Include any classes and other component specific resources as you would for any Web Application Framework component.
   - Include the component's object definition file. This is the key distinction, as this is not required for the other components discussed in this guide.
   - Include any special "Additional Files" resources. See “Automated Unpacking of "Additional Files"” on page 199.

     Common additional file resources will include ContainerView components' associated JSP pagelet files.

   An example of a non-extensible component entry in a `complib.xml` is as follows:

```
<component>
          <component-class>mycomponents.MyFooCommand</component-class>
          <component-info-
class>com.iplanet.jato.command.BasicCommandComponentInfo</component-info-class>
          <design-reference-resource>/mycomponents/MyFooCommand.command</design-reference-
resource>
</component>
```

The emphasis on non-extensible Models, ContainerViews, and Commands being *created within the IDE* is intentional and important. All preceding component examples in this guide did not assume or require that the component types themselves be developed inside of the IDE. The visual use of the components within the IDE did require the use of the Web Application Framework enabled IDE, but the authoring of the component classes, ComponentInfo, complib.xml, and the preparation of the component library JAR files did not assume or require the use of the IDE.

However, with non-extensible Models, ContainerViews, and Commands that is not the case. They must be developed within the IDE because it is only the IDE which can generate the non-extensible component metadata, called the object definition file. In short, the key to distributing a non-extensible Model, ContainerView, or Command is to distribute its object definition file *along with* the class and ComponentInfo.

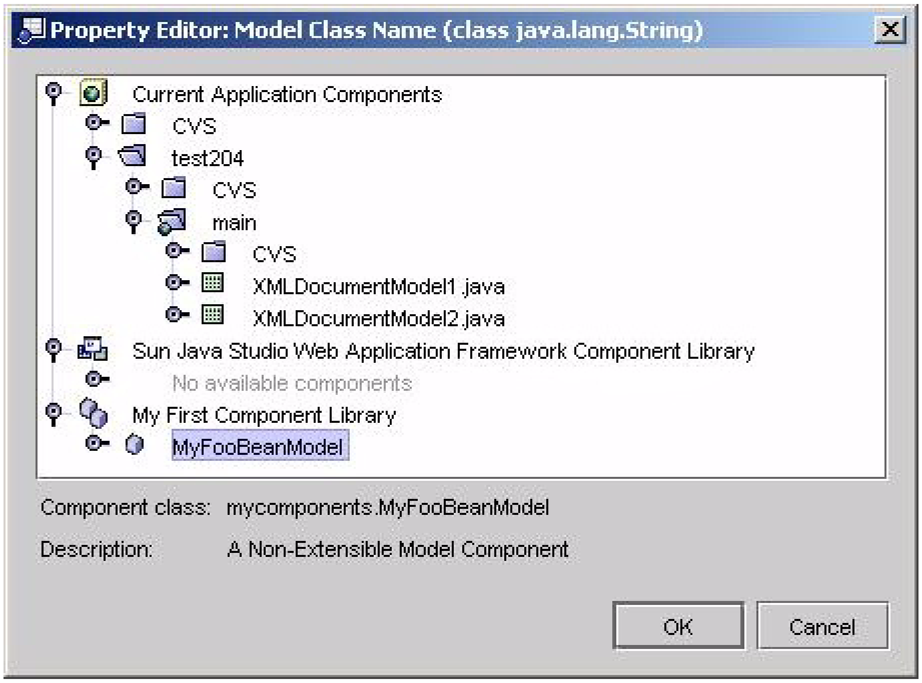
Can a component author mix non-extensible Model, Command, and ContainerView components in the same library with extensible Model, Command, and ContainerView components?

Absolutely yes. This is expected and encouraged.

After non-extensible Model, Command, and ContainerView components have been distributed in a Web Application Framework component library, how do application developer's make use of the components?

The non-extensible Model, Command, and ContainerView components within a given Web Application Framework component library will appear in the IDE toolset in exactly the same IDE contexts that the current application's non-extensible components appear. If this sounds tautological, it is intentionally so. Its points out that from the Web Application Framework IDE toolset's perspective all Model, View and Command objects are components. As far as the IDE toolset is concerned, it does not matter whether it discovers the components in a component library JAR or within the current application space.

The images below will demonstrate this point by showing that the various component choosers within the IDE toolset allow the application developer to choose freely and transparently between library supplied non-extensible components and application defined non-extensible components.

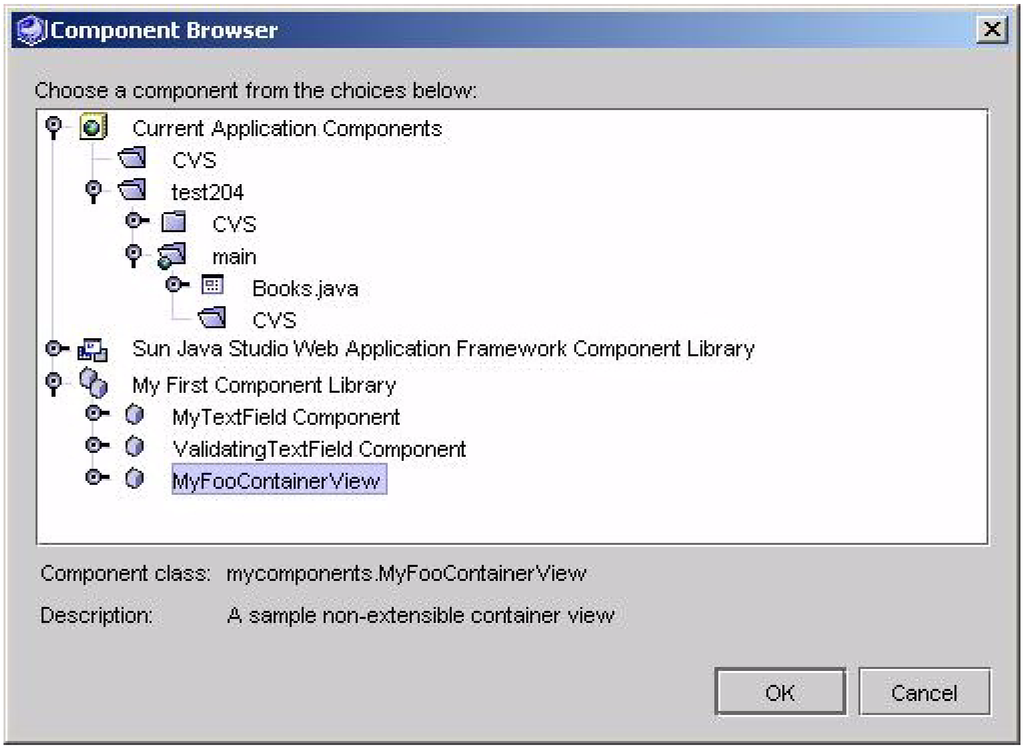


Property Editor: Model Class Name (class java.lang.String)

Current Application Components
CVS
test204
CVS
main
CVS
XMLDocumentModel1.java
XMLDocumentModel2.java
Sun Java Studio Web Application Framework Component Library
No available components
My First Component Library
MyFooBeanModel

Component class: mycomponents.MyFooBeanModel

Description: A Non-Extensible Model Component

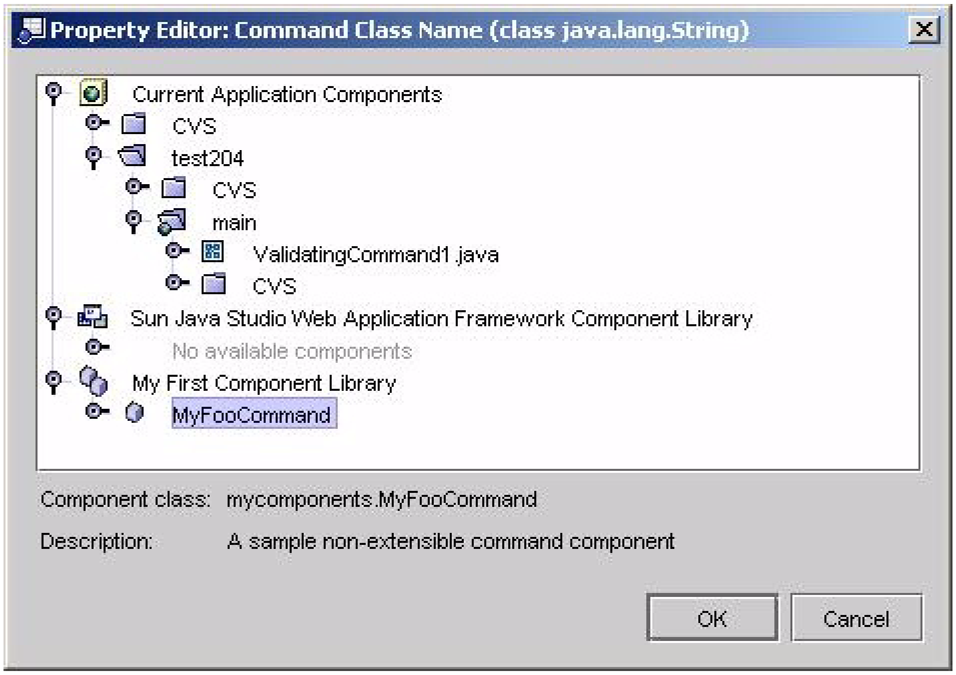


Choose a component from the choices below:

- Current Application Components
  - CVS
  - test204
    - CVS
    - main
      - Books.java
      - CVS
- Sun Java Studio Web Application Framework Component Library
- My First Component Library
  - MyTextField Component
  - ValidatingTextField Component
  - MyFooContainerView

Component class: mycomponents.MyFooContainerView

Description: A sample non-extensible container view


Property Editor: Command Class Name (class java.lang.String)
Current Application Components
CVS
test204
CVS
main
ValidatingCommand1.java
CVS
Sun Java Studio Web Application Framework Component Library
No available components
My First Component Library
MyFooCommand
OK
Cancel

Component class: mycomponents.MyFooCommand

Description: A sample non-extensible command component

The Object Definition File (non-extensible component metadata)

Suffice to say that both component authors and application developers should understand that the object definition files are produced by the IDE toolset and should be treated as first class application resources.

- They should be preserved in source code control systems along with the conventional application resources.
- They should not be edited by hand.
- They have zero run-time value and need not be deployed to the servlet container.
- They do need to be distributed with non-extensible Model, ContainerView, and Command components.

The following details of the object definition files are provided for information purposes only. These are implementation details of the Web Application Framework component model that neither component authors nor application developers are required to know

The Web Application Framework IDE toolset stores design-time state in XML format within its object definition files. The term object definition file is an arbitrary designation for these files. The object definition files:

- Are XML files that conform to the Web Application Framework Model, ContainerView and Command DTDs.
- Are the authoritative representation of Web Application Framework design-time state.
  - They are produced by the IDE toolset to capture the application developer design-time decisions (for example, object hierarchy declarations property configurations).
  - They are read by the IDE toolset to restore the design-time state across IDE sessions.
  - The IDE toolset generates Java code within the component's Java source file which is a Java equivalent of the design-time state stored in the object definition file. This code is generated into the IDE's Java source code editor protected blocks (for example, non-editable blocks).
- Have file suffixes recognized by the Web Application Framework IDE toolset `.model`, `.viewbean`, `.cview`, and `.command`.
- Have no run-time value at all.

  The IDE toolset generates Java code within the application class which is a Java equivalent of the design-time state stored in the object definition file. Therefore, the object definition files have absolutely no run-time role or presence.

CHAPTER 8

Design Actions

This section assumes that you have already read “Develop Your First Component” on page 19 and “Developing Model Components” on page 89.

Developing Extensible Components Which Have Component Design Actions

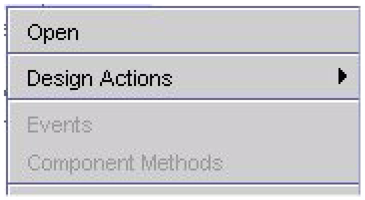
This section provides a description of the basic steps involved in adding design actions to your extensible component.

Component design actions encapsulate arbitrary design time behavior for a component. The design action might post an "About" or "Credits" dialog, perform validation, autoconfigure the component, synchronize support files, display messages or warnings, open complex editors and wizards, and even read and edit the finest details of the component object model.

To support component design actions, a new interface to Web Application Framework component architecture, called DesignableComponentInfo, is introduced. DesignableComponentInfo is an optional specialization of ExtensibleComponentInfo that allows the component author to define special design time behavior for extensible components. The practical use of DesignableComponentInfo is to expose design actions to the developer in the IDE. Any extensible command, mode,l and view ComponentInfo classes may optionally implement DesignableComponentInfo to expose ComponentDesignActionDescriptors.

The IDE module only exposes design actions for extensible components and therefore, the DesignableComponentInfo specializes ExtensibleComponentInfo to impose this rule.

When available, the IDE uses ComponentDesignActionDescriptors to present a submenu list of the defined design actions in the component node's contextual menu "Design Actions".



Because DesignableComponentInfo is a recent addition to the Web Application Framework component architecture, only the Bean Adapter Model uses DesignableComponentInfo to expose the Update Properties design action.

What is a Component Design Action?

Although a component design action may be used to perform practically anything, here are some guidelines to consider.

The standard mechanism a developer expects to use when configuring an extensible component during design time is the property sheet of the primary component node and/or the contained property sheets of subnodes. The component author should first turn to automatic support for config properties and optionally any custom editors which may be applicable for complex config properties. If component authors are using design actions to take the place of config properties or custom editors, they might be going in the wrong direction.

Discrete component config property editors alone are often not enough for managing the design aspects of certain components. An editor for a config property will not have scope to other config properties or other parts of the component object model. Therefore, it is not possible to edit a subset of related config properties as a whole. In the case of models and container views, there is no way for a collection of model fields or child views to be edited together. Also, there is currently no support in the component architecture to specify wizards or initialization mechanisms to be used by the developer when creating a new component.

A solution to these issues is the component design action. You will see later in this section that, while performing a component design action, the component author is provided a context in which very powerful design changes (even continuous and re-entrant design changes) might be implemented.

A good example of a component design action can be found in Bean Adapter Model in the Web Application Framework component library. Although the Bean Adapter Model has a config property "Bean Type" which allows the developer to specify the type/class of the adapted Java Bean, there is no easy way for the developer to automatically generate model fields for the properties of the Bean. The Update Properties design action of the Bean Adapter Model validates the Bean Type config property and ensures that at least the full set of bean properties have representative model fields. This design action supports continuous design, because the action can be used as the adapted Bean changes.

An opportunity is provided with component design actions for component authors to publish "black box" components, which may be configured by a mechanism which does not use the component object model. For instance, an existing view or model component, or the foundation of a new component, which uses a custom runtime XML descriptor or properties file, might already exist. In this case, the component author needs a way to provide editors for this custom configuration. Advanced APIs of the ComponentDesignContext support such situations.

The rest of this section assumes that you has reviewed the JavaDocs for the `com.iplanet.jato.component.design` and `com.iplanet.jato.component.design.objmodel` packages.

A simple example of how to specify a ComponentDesignAction for an extensible component using the DesignableComponentInfo and ComponentDesignActionDescriptor APIs is presented.

Exposing Design Action in ComponentInfo

To expose component design actions for your extensible component, the first step is to implement DesignableComponentInfo.

In the example shown below, you build onto the XMLDocumentModel example. You will create a simple design action called "About" which presents an informational dialog to the developer dumping some component details including name, logical name, and config properties.

1. **Have your component info implement** `DesignableComponentInfo`**.**
2. **Implement method** `getComponentDesignActionDescriptors()` **(see code example shown below).**

3. **Because the** `ComponentDesignActionDescriptor` **bean requires the** `ComponentDesignAction` **class to be assigned, you also need to create the action class.**

   The minimum that you need is a class implementing `ComponentDesignAction`, including the `performAction(ComponentDesignContext)` method.

   A simple technique is to have an inner class of the component info define the action class as is shown in the code example below, where there is the static inner class AboutDialog.

   The component design action mechanism will only call the default (no arg) constructor of the design action class. Therefore, avoid using alternate constructors, for they will have no use.

   The `performAction()` method is not required to do anything other than return promptly; in our minimal example below we will post a modal dialog and call a helper method aboutDisplayMessage()

   In this sample code, String values have been embedded directly for ease of demonstration. Utilize resource bundles if you anticipate the need to localize your display strings.

   The following code represents what needs to be added to the `XMLDocumentModelComponentInfo.java`. Non-relevant code has been snipped as represented by the ellipsis " . . ."

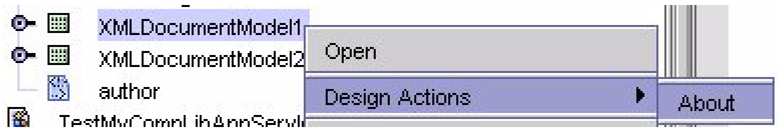
```
. . .
import com.iplanet.jato.component.design.*;
import com.iplanet.jato.component.design.objmodel.*;

public class XMLDocumentModelComponentInfo extends ExtensibleModelComponentInfo
        implements DesignableComponentInfo
{
        . . .

        public ComponentDesignActionDescriptor[] getComponentDesignActionDescriptors()
       {
                if(null != designActionDescriptors)
                        return designActionDescriptors;

                List descriptors=new ArrayList();

                ComponentDesignActionDescriptor descriptor = new
ComponentDesignActionDescriptor(AboutDialog.class);
                descriptor.setName("About");

                descriptor.setDisplayName("About");
                descriptor.setShortDescription(
                        "Displays a small list of component details");
                descriptors.add(descriptor);
                designActionDescriptors = (ComponentDesignActionDescriptor[])
                        descriptors.toArray(
                                new ComponentDesignActionDescriptor[descriptors.size()]);
                        return designActionDescriptors;
                }

                public static class AboutDialog implements ComponentDesignAction
{
                        public void performAction(ComponentDesignContext context)
                                throws DesignActionException
                        {
                                javax.swing.JOptionPane.showMessageDialog(
                                        context.getMainWindow(),
                                        aboutDisplayMessage(context),
                                        "XMLDocumentModel About Design Action",
                                        javax.swing.JOptionPane.INFORMATION_MESSAGE);
                        }

                        private String aboutDisplayMessage(ComponentDesignContext context)
                        {
                                StringBuffer msg = new StringBuffer(
                                        "Component Name: " +
                                        context.getComponentInfo().getComponentDescriptor(
).getName() +
                                        "\nComponent Logical Name: " +
                                        context.getComponentLogicalName() + "\n");
                                ConfigPropertyNode[] props =
((ConfigPropertyNodeContainer)
                                        context.getPrimaryObjectModel()).getConfigProperty
Node();
                                for(int i=0;i<props.length;i++)
                                {
                                        props[i].dump(msg, "\t");
                                        msg.append("\n");
                                }
                                return msg.toString();
                     }
        }

        . . .

        private ComponentDesignActionDescriptor[] designActionDescriptors;
}
```

In the AboutDialog design action, a Swing informational modal dialog box is presented to the developer. The "MainWindow" property of the ComponentDesignContext is used to place the Swing visual component. The message presented comes from the helper method `aboutDisplayMessage()`.

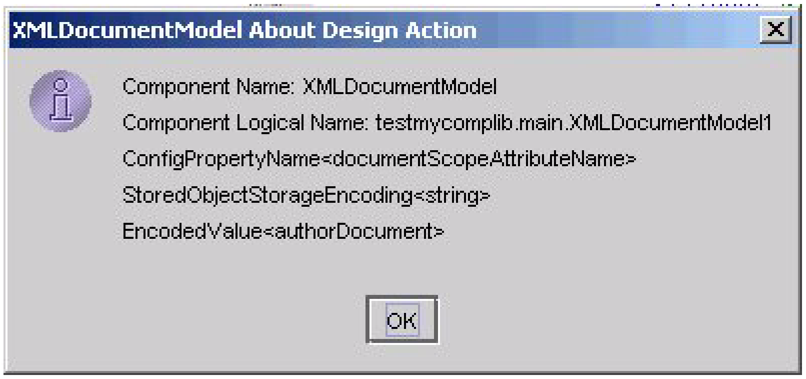
Again, the various properties of the ComponentDesignContext are used to acquire information about the component including its name, logical name, and you loop through the config properties and dump their values.

To access the config properties, advantage is taken of object model interfaces ConfigPropertyNodeContainer and ConfigPropertyNode. This AboutDialog example can be used on Command, ContainerView, ViewBean, and Model extensible components. This example is not Model specific.

After compiling, packaging, and using this component in an application, instances of XMLDocumentModel will provide the design action "About".



The result of performing the design action is:



```
Component Name: XMLDocumentModel
Component Logical Name: testmycomplib.main.XMLDocumentModel1
ConfigPropertyName<documentScopeAttributeName>
StoredObjectStorageEncoding<string>
EncodedValue<authorDocument>
```

APPENDIX **A**

Component Library Structure

Component Library Overview

Web Application Framework components are packaged and distributed in ordinary JAR files. The JAR file must contain:

- A component library manifest (`/COMP-INF/complib.xml`)
- Component library specific Java resources (component classes, ComponentInfo classes, resource bundles, component icon images, and any other ancillary files). Any classes (component, ComponentInfo, and any other ancillary files) should be placed in the JAR in accordance with standard Java convention.

Optionally, a Web Application Framework component library JAR may contain:

- A special directory named `/webapp`

  The contents of the `/webapp` directory are called the "Additional Files". This is a Web Application Framework IDE toolset value add feature that allows developers to distribute arbitrary additional files inside their component library JAR. The Web Application Framework IDE toolset will "unpack" these additional files into the Web application development environment. See "Automated Unpacking of "Additional Files"" on page 199.

Component Library Structure

The contents of a Web Application Framework component library JAR must be structured as follows:

```
/COMP-INF/complib.xml
/[Java classes and resources]
/webapp/[additional files intended for IDE toolset design-time auto-extraction]
```

Note: The webapp directory is optional

The Component Manifest

Web Application Framework *requires* that each component library JAR contain a special Web Application Framework component library manifest file. The component library manifest file is a simple XML document that describes the collection of components within the library. A component library manifest may declare any number of components and associated Web Application Framework component model resources.

The IDE toolset automatically introspects each JAR file mounted in an Web Application Framework application's `WEB-INF/lib` directory. It specifically looks inside the JAR for the component library manifest file. If the IDE toolset finds a valid component library manifest file in the prescribed location within the JAR file, the IDE toolset will expose any properly declared components for design time utilization within the IDE toolset. If it does not find the component library manifest file in the expected location within the JAR file, or if the component library manifest is invalid, the IDE toolset will not recognize the JAR as a component library.

The component library manifest must comply with the following strict rules:

- The component library manifest file must be named `complib.xml`.
- The `complib.xml` file must be a well formed XML file.
- The `complib.xml` file must comply with the jato-component-library_1_0.dtd (shown below).
- The `complib.xml` file must be located in the component library JAR's `/COMP-INF` directory.

jato-component-library_1_0.dtd

```
<!--
The component-library element is the root element of the component manifest
-->
<!ELEMENT component-library (tool-info, library-name, display-name,
    description?, legal-notice?, icon?, interface-version, implementation-
version,
    author-info?, taglib*, component*, extensible-component*,
    configurable-bean*)>
```

```
<!--
The tool-info elements contains information about the tool environment this
library was written against
-->
<!ELEMENT tool-info (tool-version)>

<!--
The tool-version element contains the interface version of Web Application
Framework
Framework/JATO this library targets.  Should be a dot-separated version number,
for example "2.1.0".
-->
<!ELEMENT tool-version (#PCDATA)>

<!--
The library-name element contains the internal name of the component library.
This name is expected to be globally unique, and should follow the standard
Java package naming convention. For example, the library name of the Web
Application Framework/JATO component library is "com.iplanet.jato", the root of
its package structure.
-->
<!ELEMENT library-name (#PCDATA)>

<!--
The display-name element contains a short display name of the library which
will be presented in GUI tools.
-->
<!ELEMENT display-name (#PCDATA)>

<!--
The description element is used to contain descriptive text about its parent
element.
-->
<!ELEMENT description (#PCDATA)>

<!--
The legal-notice element contains legal or copyright text that should accompany
this library.  This element is meant to provide an additional opportunity to
keep this information in proximity to the library itself; however it should not
be considered a sufficient means of conveying licensing terms or other legally
binding terms to users of the library.
-->
<!ELEMENT legal-notice (#PCDATA)>

<!--
The icon element contains a small-icon and a large-icon element
which specify the location within the Web application for a small and
large image used to represent the Web application in a GUI tool. At a
```

```
minimum, tools must accept GIF format images.
-->
<!ELEMENT icon (large-icon?, small-icon?)>

<!--
The large-icon element contains the resource name within the library
of a file containing a large (32x32 pixel) icon image. The resource name must
follow standard Java resource name syntax, with individual path elements
separated by forward slashes ("/").
-->
<!ELEMENT large-icon (#PCDATA)>

<!--
The small-icon element contains the resource location within the library
of a file containing a small (16x16 pixel) icon image.  The resource name must
follow standard Java resource name syntax, with individual path elements
separated by forward slashes ("/").
-->
<!ELEMENT small-icon (#PCDATA)>

<!--
The author-info element contains information on the author(s) of this library.
-->
<!ELEMENT author-info (author*, info-resource*) >

<!--
The author element contains information about a particular author of the
library.
-->
<!ELEMENT author (author-name, description?, author-contact?) >

<!--
The author-name element contains the author's full name.
-->
<!ELEMENT author-name (#PCDATA)>

<!--
The author-contact element contains the author's contact information, usually
an email address.
-->
<!ELEMENT author-contact (#PCDATA)>

<!--
The info-resource element contains information describing external
informational resources relevant to this library, such as a link to a
publisher's homepage, a public link to API documentation, or a support email
address.
-->
```

```
<!ELEMENT info-resource (info-resource-name, description?, info-resource-
contact?) >

<!--
The info-resource-name element contains an arbitrary descriptive name of the
resource that can be presented to the user of the library.
-->
<!ELEMENT info-resource-name (#PCDATA)>

<!--
The info-resource-contact elements contains the actual contact information
for the resource, such as an email address or HTTP link.
-->
<!ELEMENT info-resource-contact (#PCDATA)>

<!--
The interface-version element contains the interface version of this library,
used to determine interface compatibility of the contained code.  The version
should be a dot-separated numeric version number, such as "1.0.0".  The version
number can contain as many dot-separated elements as desired.
-->
<!ELEMENT interface-version (#PCDATA)>

<!--
The implementation-version element contains the interface version of this
library, used to determine the implementation version of the contained code.
This version number usually takes the form of a timestamp or build number.
The version should be a dot-separated numeric version number, such as
"2003.1.31".  The version number can contain as many dot-separated elements as
desired.
-->
<!ELEMENT implementation-version (#PCDATA)>

<!--
The taglib element declares any JSP tag libraries included in this library.
Declared tag libraries will be automatically unpacked from the library and
registered in the web.xml of the application under this URI.
-->
<!ELEMENT taglib (taglib-uri, taglib-resource, taglib-default-prefix)>

<!--
The taglib-uri element contains a logical URI that will be used to identify the
tag library within the application.  This URI will be registered to the declared
tab library descriptor in the application's web.xml file.  Note that this URI
is purely logical and need not have any relation to the physical location of
the tag library descriptor file (which will be unpacked into a physical location
determined solely by the GUI tool).  This URI must match the TaglibURI property
value in a component's JspTagDescriptor.
-->
```

```
<!ELEMENT taglib-uri (#PCDATA)>

<!--
The taglib-resource element contains the resource name of the tag library's
taglib descriptor (.tld) file.  The resource name must follow standard Java
resource name syntax, with individual path elements separated by forward
slashes ("/").  This file will automatically be extracted and registered with
the application.
-->
<!ELEMENT taglib-resource (#PCDATA)>

<!--
The taglib-default-prefix element specifies the tag prefix that should be used
for this tag library in JSP pages that use the tag library.  For example, the
default prefix for the Web Application Framework/JATO tag library is "jato".
This prefix may be changed by the JSP author on any given page; this element
simply
gives the default name of the prefix when the tag library declaration is
automatically
added to a page.
-->
<!ELEMENT taglib-default-prefix (#PCDATA)>

<!--
The component element declares a non-extensible component within this library.
All components must be declared in the component manifest in order to be
recognized at design-time.
-->
<!ELEMENT component (component-class, component-info-class, design-reference-
resource?)>


<!--
The extensible-component element declares an extensible component within this
library.  All extensible components must be declared in the component manifest
in order to be recognized at design-time.
-->
<!ELEMENT extensible-component (component-class, component-info-class)>

<!--
The component-class element specifies the fully-qualified class name of the
component.
-->
<!ELEMENT component-class (#PCDATA)>

<!--
The component-info-class element specifies the fully-qualified name of the
component's ComponentInfo class.
-->
```

```
<!ELEMENT component-info-class (#PCDATA)>

<!--
The design-reference-resource specifies the metadata file resource that will
be used at design-time to inspect the component.  Components without this
declaration will generally not be inspectable at design-time other than through
ComponentInfo. The resource name must follow standard Java resource name
syntax, with individual path elements separated by forward slashes ("/").

-->
<!ELEMENT design-reference-resource (#PCDATA)>

<!--
The configurable-bean element declares a non-visual bean component contained
within this library.
-->
<!ELEMENT configurable-bean (bean-class)>

<!--
The configurable-bean element specifies the fully-qualified class name of the
non-visual component bean.
-->
<!ELEMENT bean-class (#PCDATA)>
```

Automated Unpacking of Component Tag Libraries (TLD) Files

As part of a Web Application Framework component library, a library developer may provide one or more tag libraries to support rendering of the library's View components. Tag libraries are declared in the component library's component manifest file, and when the IDE toolset recognizes the component library, its tag library descriptors (.tld files) are automatically unpacked from the library JAR file for use by the application. In addition, the IDE toolset automatically adds tag library entries to the `web.xml` file.

Tag library descriptor files are unpacked to a special location under the application's `WEB-INF/tld` directory based on the name of the library to ensure that same-named files from different libraries do not conflict. In this scheme, library names are converted to directory names by replacing dots (".") with underscores ("_"). For example, the Web Application Framework Component Library's internal library name is "com.iplanet.jato", which is translated to "com_iplanet_jato" when unpacking the tag library descriptor. The SCL's tag descriptor file ultimately appears under the `WEB-INF/tld/com_iplanet_jato` directory in your application.

The tag descriptor's derived physical directory name is automatically registered to a logical resource name in the `web.xml` file for use by the application. This logical name is chosen by the component library author and specified in the component library manifest. In the SCL's case, the descriptor is registered as the resource `/WEB-INF/jato.tld`.

The tag descriptor unpacking mechanism makes use of timestamps to determine if an existing file should be overwritten when a new version of the library is added to an application. This feature ensures that upgrading of an application's component libraries is just a single step for a developer.

Referring to the example "mycomponents" library described in this guide. The library author has created a tag library tld file called `mycomplib.tld` and arbitrarily placed it in the mycomponents package. Therefore, looking into the `mycomponents.jar` file, the tld appears physically located as follows:

```
/COMP-INF/complib.xml
/mycomponents/*.class
/mycomponents/mycomplib.tld
/mycomponents/...
```

Inside of the `complib.xml`, the component author has declared a taglib element as follows:

```
<taglib>
      <taglib-uri>/WEB-INF/mycomplib.tld</taglib-uri>
      <taglib-resource>/mycomponents/mycomplib.tld</taglib-resource>
      <taglib-default-prefix>mycomp</taglib-default-prefix>
</taglib>
```

Based on the configuration described by the taglib element, whenever the `mycomponens.jar` is deployed into a Web Application Framework Web application's `WEB-INF/lib` directory, the IDE toolset will automatically perform the following steps. These steps will allow the run-time JSP engine to properly locate the tag library. This frees the application developer from having to perform any configuration.

- Automatically adds the following entry to the Web application's `web.xml` file, which sets up a conventional servlet container run-time mapping between the logical resource and its physical location.

```
<taglib>
      <taglib-uri>/WEB-INF/mycomplib.tld</taglib-uri>
      <taglib-location>/WEB-INF/tld/mycomponents/mycomplib.tld</taglib-location>
</taglib>
```

- Automatically extracts the `mycomplib.tld` file from the `mycomponents.jar`, and places it into the following location:

```
[current app]/WEB-INF/tld/mycomponents/mycomplib.tld
```

Also, at design-time, as the developer builds application Views, the IDE toolset will perform the following:

- Automatically ensure that the appropriate tag library declaration is present in any associated JSP files. This declaration contains the "prefix" as specified by the component author in the `complib.xml`'s taglib element.

```
<%@taglib uri="/WEB-INF/mycomplib.tld" prefix="mycomp"%>
```

- Automatically ensures that as the IDE toolset adds additional component library specific tags to the JSP, it also utilizes the prefix declared in the taglib directive. For example:

```
<mycomp:validatingTextField name="validatingTextField1"/>
```

Web Application Framework recognizes that taglib prefix is a JSP page specific directive. J2EE allows each page to declare arbitrary prefixes for the included tag libraries via the tablib directive. The IDE toolset will always utilize the current taglib directive declared prefix as it parses the JSP looking for tags, or whenever it automatically inserts additional tags into the JSP in conjunction with the developer's View design decisions. The IDE toolset merely utilizes the `complib.xml` specified taglib "prefix" to insert an initial taglib directive into the application JSP files. Application developers can subsequently manually change the prefix declared in the page specific taglib directive. The IDE toolset thereafter utilizes the newly declared prefix for any additional tags, but it will not automatically change any already declared tags to coincide with the adjusted prefix. This is an application developer issue. It is mentioned here so that component authors fully understand the design-time usage of `complib.xml`'s taglib element.

Automated Unpacking of "Additional Files"

Optionally, a Web Application Framework component library JAR might contain arbitrary "Additional Files" arranged hierarchically underneath the `/webapp` directory.

Do not confuse a Web Application Framework component library JAR's internal `/webapp` directory with the common servlet container directory called "webapps". There is absolutely no relationship between the two.

The hierarchical arrangement of the files within the Web Application Framework component library JAR's /webapp root is totally up to the discretion of the component library author. As a value added feature, the Web Application Framework IDE tools will "unpack" these additional files into the Web application development environment in direct correspondence to the additional files location relative to the /webapp root.

Note – This is a pure value added, totally optional, "resource distribution" opportunity provided to component authors by the Web Application Framework IDE toolset. The assumption is that the extracted files will provide some arbitrary design time or run time value as determined by the component author. It is further assumed that to provide this arbitrary value, the extracted files must be extracted to the Web application's file system. Otherwise, they need not be placed in the "Additional Files" (for example, /webapp) section of the JAR, and should be placed in the conventional location within the JAR where they will be picked up by the Java runtime.

For example, consider a mycomponents.jar that contains the following /webapp structure:

```
/mycomponents/...
/mycomponents/mycomplib.tld
/webapp/mycomponents/foo.jsp
/webapp/mycomponents/bar.jsp
/webapp/mycomponents/images/banner.gif
/webapp/WEB-INF/jato/templates/jsp/MyViewBeanJSP.jsp
/webapp/WEB-INF/jato/templates/jsp/FooContainerViewJSP.jsp
/webapp/WEB-INF/lib/helper.jar
/webapp/WEB-INF/mycomponents/config-files/configA.xml
/webapp/WEB-INF/mycomponents/config-files/configB.xml
```

When the mycomponents.jar, with the above content, is deployed into a Web Application Framework application, the IDE toolset will extract the /webapp content into the particular Web Application Framework application's structure.

For example, consider a Web Application Framework application called "AppOne" which has the following initial structure created by the Web Application Framework IDE toolset.

```
AppOne/index.html
AppOne/WEB-INF/classes/...
AppOne/WEB-INF/jato/templates/jsp/DefaultViewBeanJSP.jsp
AppOne/WEB-INF/jato/templates/jsp/DefaultContainerViewJSP.jsp
AppOne/WEB-INF/lib/jato-2_1_0.jar
AppOne/WEB-INF/tld/com_iplanet_jato/jato.tld
```

After "deploying" the `mycomponents.jar` (for example, dropping it into `AppOne/Web-INF/lib`), the IDE toolset will discover that it is a Web Application Framework component library and extract the "additional files" which will result in the creation of the following integrated structure:

```
AppOne/index.html
AppOne/mycomponents/foo.jsp
AppOne/mycomponents/bar.jsp
AppOne/mycomponents/images/banner.gif
AppOne/WEB-INF/classes/...
AppOne/WEB-INF/jato/templates/jsp/DefaultViewBeanJSP.jsp
AppOne/WEB-INF/jato/templates/jsp/DefaultContainerViewJSP.jsp
AppOne/WEB-INF/jato/templates/jsp/MyViewBeanJSP.jsp
AppOne/WEB-INF/jato/templates/jsp/FooContainerViewJSP.jsp
AppOne/WEB-INF/lib/jato-2_1_0.jar
AppOne/WEB-INF/lib/mycomponents.jar
AppOne/WEB-INF/lib/helper.jar
AppOne/WEB-INF/mycomponents/config-files/configA.xml
AppOne/WEB-INF/mycomponents/config-files/configB.xml
AppOne/WEB-INF/tld/com_iplanet_jato/jato.tld
AppOne/WEB-INF/tld/mycomponents/mycomplib.tld
```

Component library authors can leverage the Additional Files Feature to provide any arbitrary resources which they consider appropriate for extraction. Examples of common Additional Files are (but not limited to):

- Component specific JSP files (for example, component pagelets).
- Arbitrary Web application document resources (for example, images, static HTML pages, style sheets, JavaScript).
- Additional arbitrary JAR files.

  For example, assume that the component library relies on a custom XML parsing library. The component author can "bundle" that JAR inside the component library JAR. This is potentially a more convenient distribution model than requiring the application developer to deploy these extra libraries manually.
- Arbitrary Web application WEB-INF resources.

  For example suppose the component author designs a set of components which support extra configuration via arbitrary configuration file(s). These configuration files can be "bundled" with the component library and extracted into the appropriate location via the Additional Files mechanism.

Note – The automated extraction of the component library tld file(s) is handled via a different mechanism. The component library tld file(s) should not be located under the `/webapp` root, but rather placed in their normal "resource" appropriate location within the component library JAR (for example, `mycomplib.tld` above). See "Automated Unpacking of Component Tag Libraries (TLD) Files" on page 197.

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