Kuali Rice 2.0.0-m5-SNAPSHOT
Technical Reference Guide

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Chapter 1. Global

Rice Client Overview

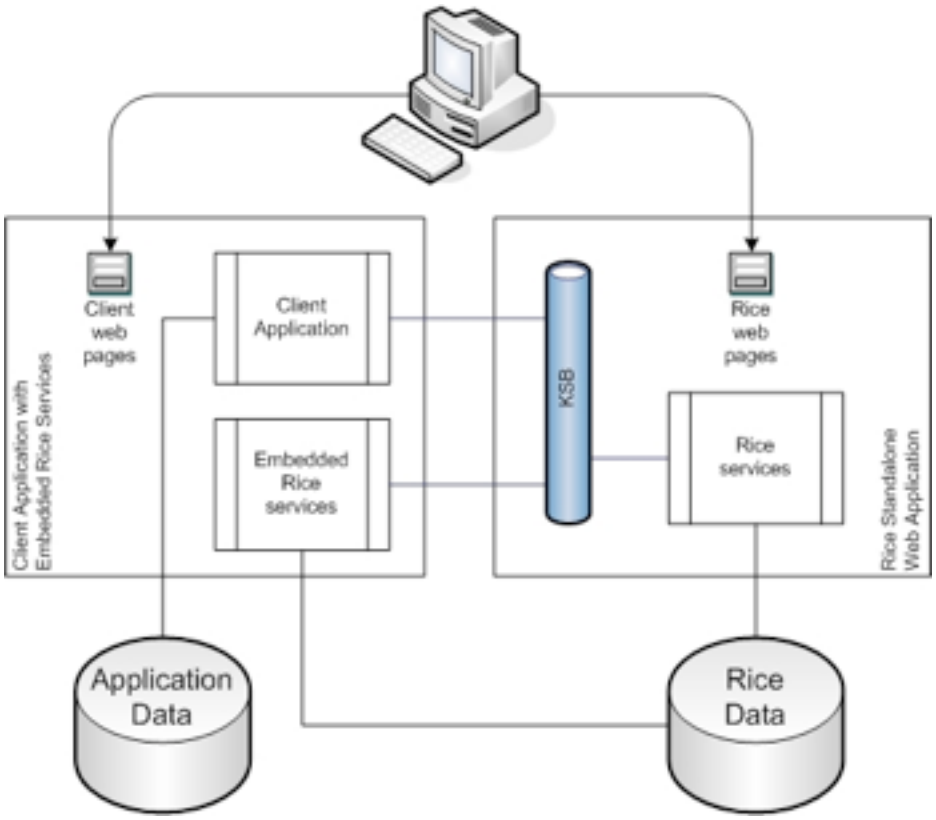
You can integrate your application with Rice using several methods, each described below.

Embedded

This method includes embedding some or all of the Rice services into your application. When using this method, a standalone Rice server for the Rice web application is still required to host the GUI screens and some of the core services.

To embed the various Rice modules in your application, you configure them in the RiceConfigurer using Spring. For more details on how to configure the RiceConfigurer for the different modules, please read the Configuration Section in the Technical Resource Guide for the module you want to embed.

Figure 1.1. Diagram of a sample embedded implementation



Advantages

- Integration of database transactions between client application and embedded Rice (via JTA)
- Performance: Embedded services talk directly to the Rice database
- No need for application plug-ins on the server

- Great for Enterprise deployment: It's still a single Rice web application, but scalability is increased because there are multiple instances of embedded services.

Disadvantages

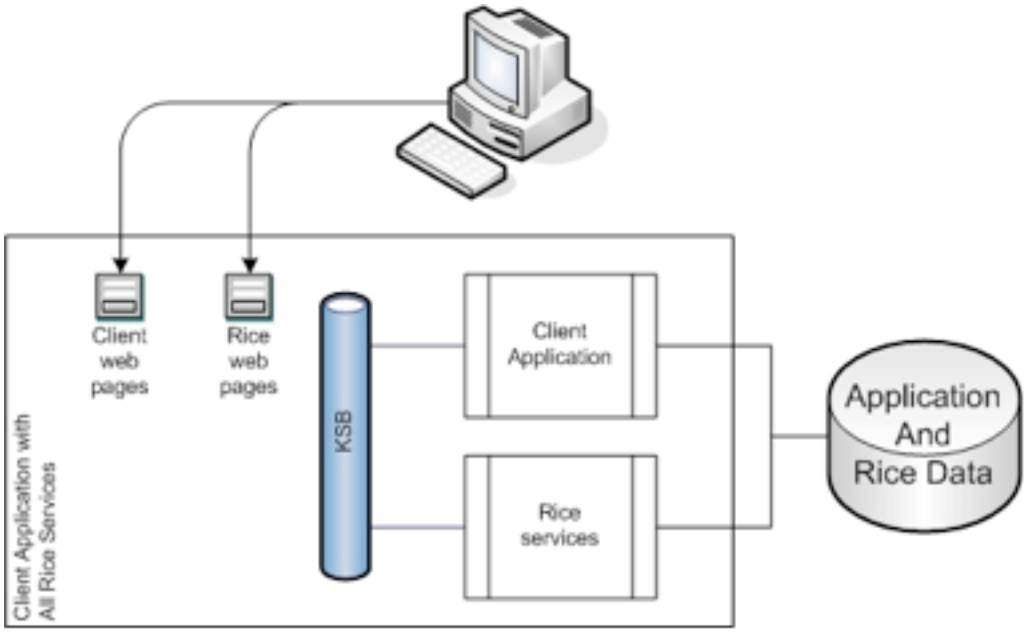
- Can only be used by Java clients
- More library dependencies than the Thin Client method
- Requires client access to the Rice database

Bundled

This method includes the entire Rice web application and all services into your application. This method does not require a standalone Rice server.

Each of the Rice modules provides a set of JSPs and tag libraries that you include in your application. These are then embedded and hooked up as Struts Modules. For more details on how the web portion of each module is configured, please read the Configuration Guide for each of the modules.

Figure 1.2. Diagram of a sample bundled implementation



Advantages

- All the advantages of Embedded Method
- No need to deploy a standalone Rice server
- Ideal for development or quick-start applications
- May ease development and distribution
- Can switch to Embedded Method for deployment in an Enterprise environment

Disadvantages

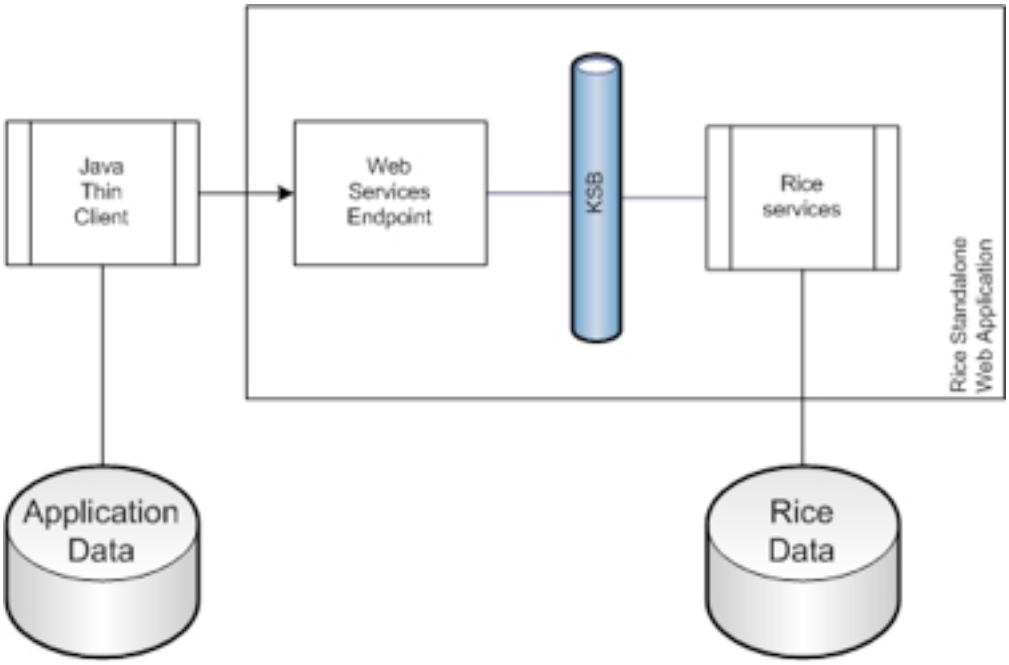
- Not desirable for Enterprise deployment when more than one application is integrated with Rice
- More library dependencies than the Thin Client method and the Embedded Method (since it requires additional web libraries).

Thin Java Client

This method utilizes some pre-built classes to provide an interface between your application and web services on a standalone Rice server.

Many of the Rice services are exposed by the KSB as Java service endpoints. This means they use Java Serialization over HTTP to communicate. If desired, they can also be secured to provide access to only those callers with authorized digital signatures.

Figure 1.3. Diagram of a sample Thin Java Client implementation



Advantages

- Relatively simple and lightweight configuration
- Fewer library dependencies

Disadvantages

- No transactional integration between client and server
- Plug-ins must be deployed to the server if custom Rice components are needed

Web Services

This means directly using web services to access a standalone Rice server. This method utilizes the same services as the Thin Java Client, but does not take advantage of pre-built binding code to access those services.

Advantages

- Any language that supports SOAP web services can be used

Disadvantages

- No transactional integration between client and server
- Plug-ins must be deployed to the server if custom Rice components are needed
- Web Services can be slower than other integration options

Global Configuration Parameters

Table 1.1.

Configuration Parameter	Description	Sample value
app.code	Together with environment, forms the app.context.name which then forms the application URL.	kr
application.id	The unique ID for the application. A value should be chosen which will be unique within the scope of Kuali Rice deployment and integration. There is no default for this value but it must be defined in order for portions of Kuali Rice to function properly.	
application.host	The name of the application server the application is being run on.	localhost
application.http.protocol	The protocol the application runs over.	http
cas.url	The base URL for CAS services and pages.	https://test.kuali.org/cas-stg
config.obj.file	The central OJB configuration file.	
config.spring.file	Used to specify the base Spring configuration file. The default value is "classpath:org/kuali/rice/kew/config/KEWSpringBeans.xml"	
credentialsSourceFactory	The name of the org.kuali.rice.core.security.credentials.CredentialsSourceFactory bean to use for credentials to calls on the service bus.	org.kuali.rice.core.security.credentials.CredentialsSourceFactory
datasource.accessToUnderlyingConnectionAllowed	Allows the data source's pool guard access to the underlying data connection. See: http://commons.apache.org/dbcp/apidocs/org/apache/commons/dbcp/	true

Configuration Parameter	Description	Sample value
	BasicDataSource.html #isAccessToUnderlyingConnectionAllowed()	
datasource.initialSize	The initial number of database connections in the data source pool. See: http://commons.apache.org/dbcp/apidocs/org/apache/commons/dbcp/BasicDataSource.html#initialSize	7
datasource.minIdle	The number of connections in the pool which can be idle without new connections being created. See: http://commons.apache.org/dbcp/apidocs/org/apache/commons/dbcp/BasicDataSource.html#minIdle	7
datasource.ojb.sequenceManager.className	The class used to manage database sequences in databases which do not support that feature. Default value is "org.apache.ojb.broker.platforms.KualiMySQLSequenceManagerImpl"	
datasource.pool.maxActive	The maximum number of connections allowed in the data source pool. See: http://commons.apache.org/dbcp/apidocs/org/apache/commons/dbcp/BasicDataSource.html#maxActive	50
datasource.pool.size	The number of connections in the data source pool; the default is 5.	6
environment	The name of the environment. This will be used to determine if the environment the application is working within is a production environment or not. It is also used generally to express the "name" of the environment, for instance in the URL.	dev
http.port	The port that the application server uses; it will be appended to all URLs within the application.	8080
log4j.settings.props	The log4j properties of the application, set up in property form.	
log4j.settings.xml	The log4j properties of the application, set up in XML form.	
rice.additionalSpringFiles	A comma delimited list of extra Spring files to load when the application starts.	
additional.config.locations	A comma delimited list of additional configuration file locations to load after the main configuration files have been loaded. Note that this parameter only applies to the Rice standalone server.	
rice.custom.ojb.properties	The file where OJB properties for the Rice application can be found.	org/kuali/rice/core/ojb/RiceOJB.properties

Configuration Parameter	Description	Sample value
	The default is "org/kuali/rice/core/ojb/RiceOJB.properties"	
rice.logging.configure	Determines whether the logging lifecycle should be loaded.	false
rice.url	The main URL to the Rice application.	${application.url}/kr
security.directory	The location where security properties exist, such as the user name and password to the database.	/usr/local/rice/
transaction.timeout	The length of time a transaction has to complete; if it goes over this value, the transaction will be rolled back.	300000
version	The version of the Rice application.	03/19/2007 01:59 PM

Rice Service Architecture and Configuration Overview

This document describes how the Rice Service Architecture operates.

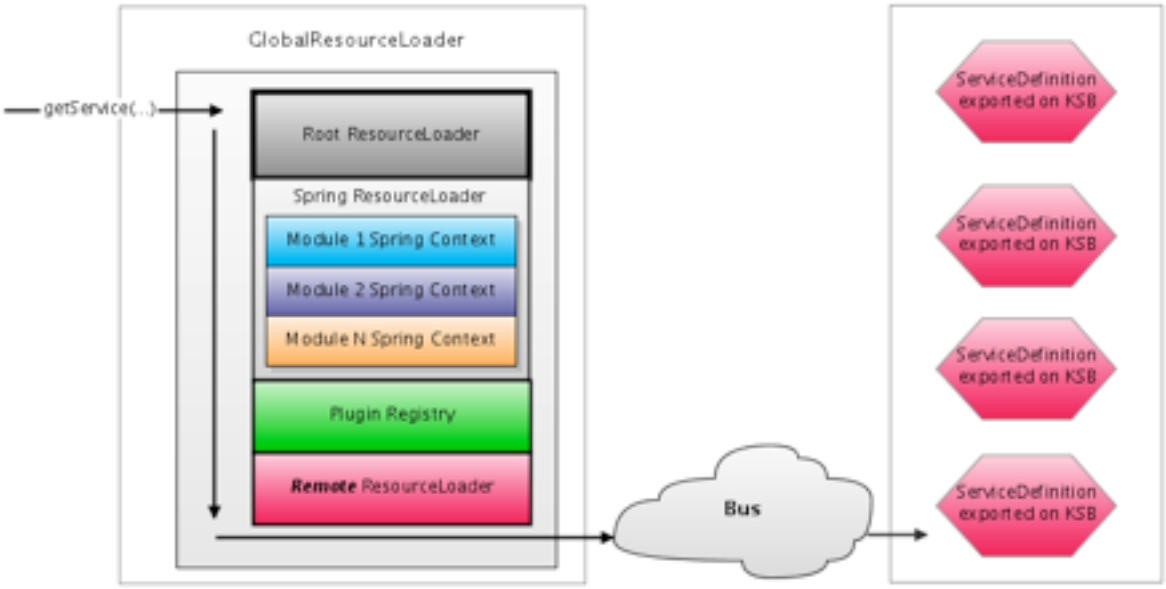
Overview

The Rice System consists of a stack of ResourceLoader objects that contain configuration information and expose service implementations (potentially from remote sources). Each module supplies its own Spring context containing it’s services. These Spring contexts are then wrapped by a ResourceLoader which is used to locate and load those services.

Implementation Details

Rice is composed of a set of modules that provide distinct functionality and expose various services. Each module loads it’s own Spring context which contains numerous services. These Spring contexts are wrapped by a ResourceLoader class that provides access to those services. A ResourceLoader is similar to Spring's BeanFactory interface, since you acquire instances of services by name. Rice adds several additional concepts, including qualification of service names by namespaces. When the RiceConfigurer is instantiated, it constructs a GlobalResourceLoader which contains an ordered chain of ResourceLoader instances to load services from:

Figure 1.4. Resource Loader Stack



All application code should use the GlobalResourceLoader to obtain service instances. The getService(…) method iterates through each registered ResourceLoader to locate a service registered with the specified name. In it's default configuration, the GlobalResourceLoader contacts the following resource loaders in the specified order:

1. **Spring ResourceLoader** – wraps the spring contexts for the various Rice modules
2. **Plugin Registry** – allows for services and classes from to be loaded from packaged plugins
3. **Remote ResourceLoader** – integrates with the KSB ServiceRegistry to locate and load remotely deployed services

As shown above, the last ResourceLoader on the list is the one registered by KSB to expose services available on the service bus. It's important that this resource loader is consulted last because it gives priority to using locally deployed services over remote services (if the service is available both locally and remotely). This is meant to help maximize performance.

Accessing Rice Services and Beans Using Spring

Rice Service as a Spring Bean

In addition to programmatically acquiring service references, you can also import Rice services into a Spring context with the help of the ResourceLoaderServiceFactoryBean:

```
<!-- import a Rice service from the ResourceLoader stack -->
<bean id="aRiceService" class="org.kuali.rice.resourceloader.support.ResourceLoade
```

This class uses the GlobalResourceLoader to locate a service named the same as the ID and produces a bean that proxies that service. The bean can thereafter be wired in Spring like any other bean.

Using Annotations

Rice includes a Spring bean that extends the Spring auto-wire process (unlike the current version of Spring, the auto-wire process in the version of Spring that's included with Rice cannot be extended). With this bean configured into your application, you can use the @RiceService annotation to identify Rice services to auto-wire.

Add this bean definition to the top of your Spring configuration file to configure the Spring extension:

```
<bean class="org.kuali.rice.core.util.GRLServiceInjectionPostProcessor"/>
```

Add the @RiceService annotation to any field or method, following the normal Spring rules for injection annotations. The annotation requires a name property that specifies the name of the service to inject. If the name requires a namespace other than the current context namespace, you must specify the namespace as a prefix (for example, "{KEW}actionListService").

```
@RiceService(name="workflowDocumentService")
protected WorkflowDocumentService workflowDocumentService;
```

Publishing Spring Services to the Global Resource Loader

In certain cases, it may be desirable to publish all beans in a particular Spring context to the Resource Loader stack. Fortunately, there is an easy way to accomplish this using the RiceSpringResourceLoaderConfigurer as shown below:

```
<!—- Publish all services from this Spring context to the GRL -->
<bean class="org.kuali.rice.core.resourceloader.RiceSpringResourceLoaderConfigurer

<bean id="myService1" class="my.app.package.MyService1"/>

<bean id="myService2" class="my.app.package.MyService2"/>
```

In the above example, both myService1 and myService2 would be added to a Resource Loader that would be put at the top of the Resource Loader stack. The names of these services would be "myService1" and "myService2" with no namespace. To load these services you would use the following call to the Global Resource Loader:

```
MyService1 myService1 = GlobalResourceLoader.getService("myService1");
```

Customizing and Overriding Rice Services

Reasons for Overriding Services

The most common reason that one would want to override services in Kuali Rice is to customize the implementation of a particular service for the purposes of institutional customization.

A good example of this is the Kuali Identity Management (KIM) services. KIM is bundled with reference implementations that read identity (and other) data from the KIM database tables. In many cases an implementer will already have an existing identity management solution that they would like to integrate with. By overriding the service reference implementation with a custom one, it's possible to integrate with other institutional services (such as LDAP or other services).

Installing an Application Root Resource Loader

An alternative to using the RiceSpringResourceLoaderConfigurer to publish beans from a Spring context to the Rice Resource Loader framework is to inject a root Resource Loader into the RiceConfigurer.

You can create an implementation of ResourceLoader that returns a custom bean instead of the Rice bean, or you can use a built-in resource loader like the SpringBeanFactoryResourceLoader which wraps a Spring context in a ResourceLoader. Your configuration needs to inject this bean as the RootResourceLoader of the RiceConfigurer using the rootResourceLoader property, as shown below:

```
<!-- a Rice bean we want to override in our application -->
<bean id="overriddenRiceBean" class="my.app.package.MyRiceServiceImpl"/>


<!-- supplies services from this Spring context -->
<bean id="appResourceLoader"
 class="org.kuali.rice.core.resourceloader.SpringBeanFactoryResourceLoader"/>

<bean id="rice" class="org.kuali.rice.core.config.RiceConfigurer">
    <property name="rootResourceLoader" ref="appResourceLoader"/>
    ...
</bean>
```

Warning

Application Resource Loader and Circular Dependencies

Be careful when mixing registration of an application root resource loader and lookup of Rice services via the GlobalResourceLoader. If you are using an application resource loader to override a Rice bean, but one of your application beans requires that bean to be injected during startup, you may create a circular dependency. In this case, you have to make sure you are not unintentionally exposing application beans (which may not yet have been fully initialized by Spring) in the application resource loader, or you have to arrange for the GRL lookup to occur lazily, after Spring initialization has completed (either programmatically, or via some sort of proxy).

Replacing Rice Configuration Files

A Rice-enabled web application (including the Rice Standalone distribution) contains a RiceConfigurer (typically defined in a Spring XML file) that loads the Rice modules. You can override services from the various modules by injecting a list of additional spring files to load as in the following example:

```
<bean id="rice" class="org.kuali.rice.core.config.RiceConfigurer">
    ...
    <property name="additionalSpringFiles" ref="appResourceLoader">
        <list>
            <value>classpath:my/app/package/MyCustomSpringFile.xml</value>
        </list>
    </property>
    ...
</bean>
```

You will need to ensure that any Spring XML files and necessary classes they reference are in the classpath of your application. If you are overriding things in the Rice standlone application itself, then you would need to place classes in the **WEB-INF/classes** directory of the war and any jars in the **WEB-INF/lib** directory.

It's a standard behavior of Spring context loading that the last beans found in the context with a particular id will be the versions loaded during context initialization. The **additionalSpringFiles** property will put any Spring files specified at the end of the list loaded by the RiceConfigurer. So any beans defined in that

file with the same id as beans in the internal Rice Spring XML files will effectively override the out-of-the-box version of those services.

When working with the packaged Rice standalone server, you won't have access to the Spring XML file which configures the RiceConfigurer. In this case, you can specify additional spring files using a configuration parameter in your Rice configuration XML, as in the following example:

```
<param name="rice.additionalSpringFiles"
value="classpath:my/app/package/MyCustomSpringFile.xml"/>
```

Eclipse and Rice

Warning

Recent change in Eclipse setup

Due to its unreliability, we have recently stopped relying on the Maven plugin for Eclipse to manage the project build path. Instead, we are using the eclipse:eclipse plugin for Maven to generate a static build path. Please note the changes in the Eclipse project setup.

Overview

This document describes how to set up an Eclipse environment for running Rice from source and/or for developing on the Kuali Rice project. To create your own Kuali Rice client application, see the instructions in Creating a Rice-Enabled Application.

Download the Tools

1. Install Java 5 SDK - http://java.sun.com.
2. Install the Eclipse Europa Bundle for Java Developers - http://www.eclipse.org/europa/
   - You need to allocate at least 768MB of memory for the Eclipse runtime and at least 512MB of memory for the JVM that Eclipse uses when it runs Java programs and commands.
   - Go to **Eclipse Preferences**.
   - On Windows: *Window --> Preferences --> Java --> Installed JREs*.
   - On Mac OS X: *Eclipse --> Preferences --> Java --> Installed JREs*.
   - Select the JRE and click **Edit**.
   - Add -Xmx768m to **Default VM Arguments**
3. Install Maven2 for command line usage:
   - Download Maven2.0.9 from http://maven.apache.org/download.html.
   - Install Maven2 into **C:\maven** on Windows or **/opt/maven** on Linux. This directory is called the Maven Root directory.
   - Register Maven on your computer's **PATH** so that it can be invoked as an executable without have to run the **mvn** command from the **<maven_root>/bin** directory all of the time.

- Set the **M2_HOME** environment variable on your system to the location of your Maven2 installation.

4. Update **.m2** repository directory (WINDOWS ONLY) By default (on Windows) maven places the **.m2** repo directory in the user directory inside the **Documents and Settings** folder. The space characters can cause issues. To avoid them we need to do the following:

   a. Figure out where you want your local maven repository to be stored, i.e. **C:\work\m2**

   b. Make sure you turn off eclipse if it has auto updating maven turned on.

   c. Move everything from your old maven directory to your new one. This will save you a considerable amount of time. If you do not do this then maven will re-download all repositories to the new location.

   d. Update your settings.xml file. This should be located in **C:\Documents and Settings\user \.m2\settings.xml**. Add this line to the file somewhere inside the <settings> tag:

   ```
   <localRepository>C:\work\m2</localRepository>
   ```

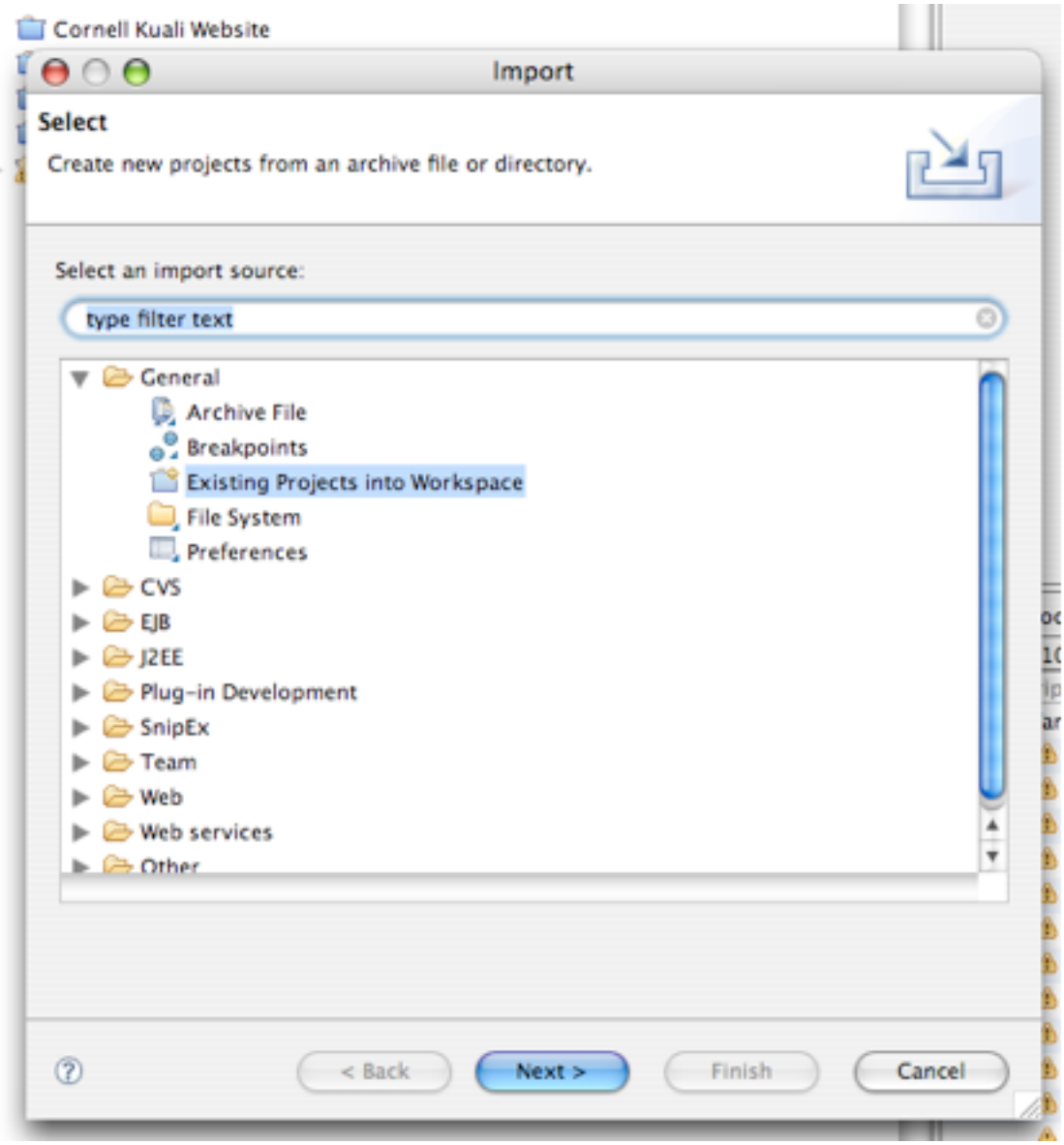
Import rice into Eclipse as a project (Source distribution only)

Note

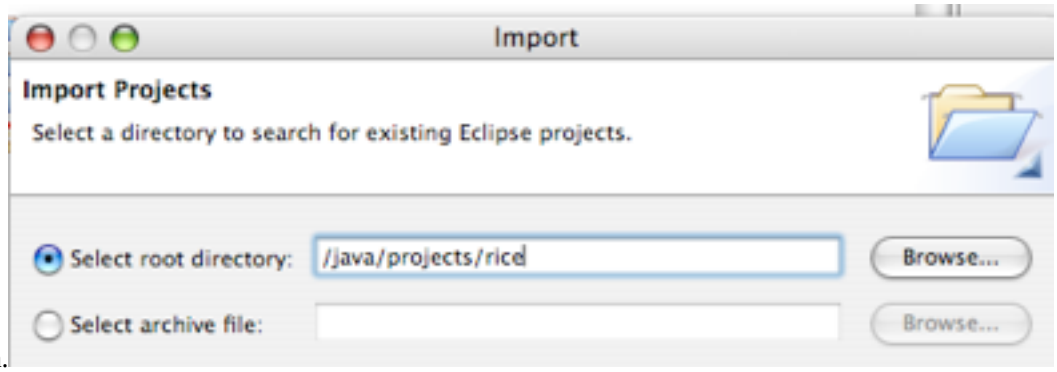
You only need to follow these instructions if you downloaded the source distribution of Rice as a zip file. If you are a contributing developer who will be committing code to CVS, please skip this step (Importing rice into Eclipse as a Project) and go to the next one instead.

1. Open Eclipse.

2. Choose *File --> Import --> Existing Projects into Workspace*.



3. Browse for and select **/java/projects/rice** (or where ever you unzipped the source distribution to) as the root project directory and click Finish.



Check out the Rice code (Non-source SVN distribution only)

> **Note**
> You do not need to perform the steps in this section if you have downloaded the source distribution of Rice as a zip file.

1. We recommend installing Subclipse as a plugin from your Eclipse instance (http://subclipse.tigris.org/install.html)
2. Set up a new SVN repository in Eclipse: https://test.kuali.org/svn/rice
3. Check out the Rice code from the appropriate branch of code (i.e. branches/rice-release-1-0-0-br)

Set up database drivers

Oracle

1. If this is the first time you've set up Eclipse to work with Rice, Maven won't find the Oracle drivers in the Kuali repository.
2. If you do not already have an Oracle driver saved in **/java/drivers** as **ojdbc14.jar**, you can download one from http://www.oracle.com/technology/software/tech/java/sqlj_jdbc/index.html. Save it as **/java/drivers/ojdbc14.jar**
3. Run this command from the command line (this should all be on one line when you enter it):

   UNIX

   ```
   mvn install:install-file -DgroupId=com.oracle -DartifactId=ojdbc14
    -Dversion=10.2.0.3.0 -Dpackaging=jar -Dfile=/java/drivers/ojdbc14.jar
   ```

   Windows

   ```
   mvn install:install-file -DgroupId=com.oracle -DartifactId=ojdbc14
    -Dversion=10.2.0.3.0 -Dpackaging=jar -Dfile=c:/java/drivers/ojdbc14.jar
   ```

   Or, run the equivalent Ant target:

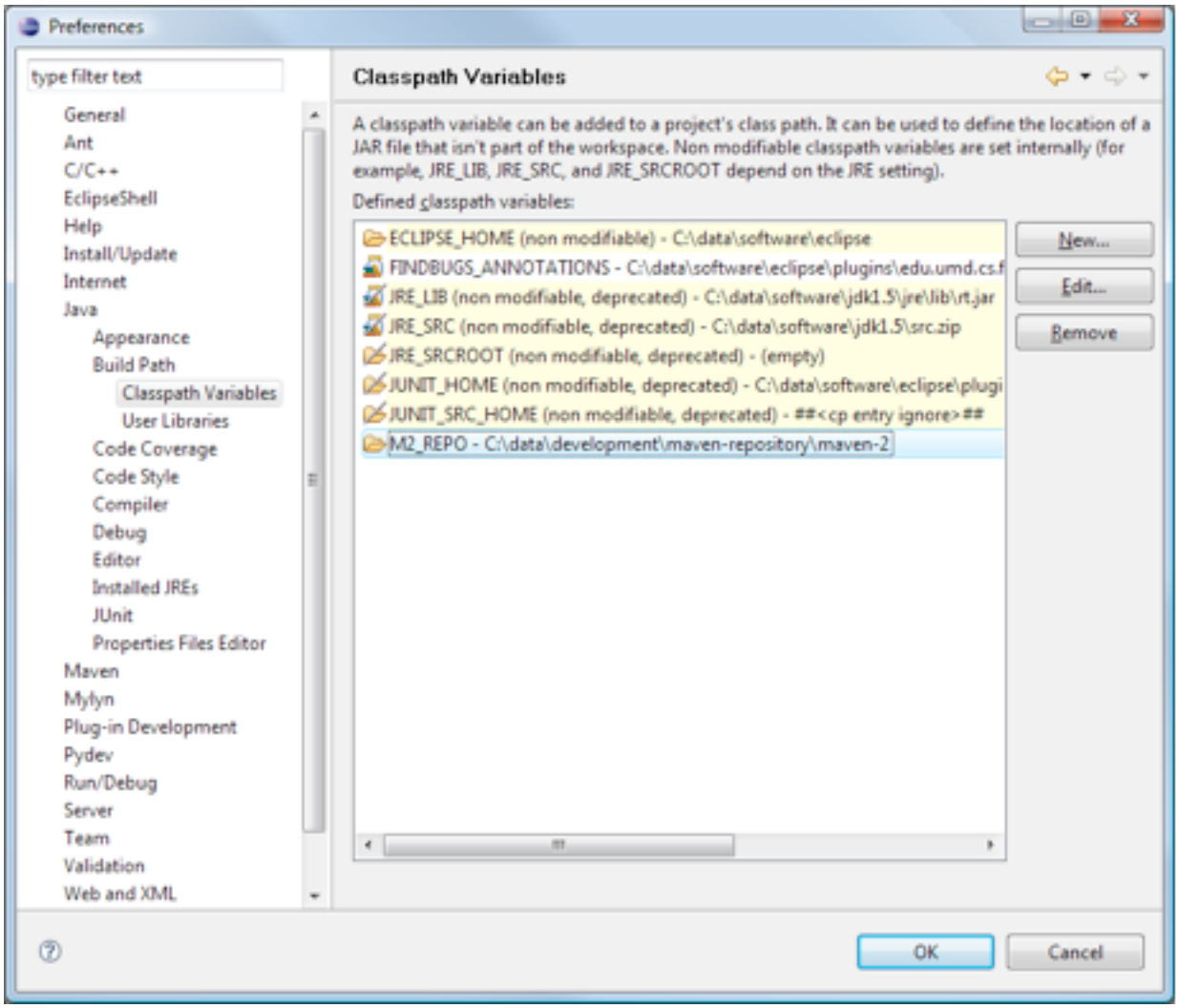
   ```
   ant install-oracle-jar
   ```

Other databases

The driver for MySQL is already referenced by the Kuali Rice project. Rice does not have out-of-the-box support for other RDBMS at this point in time. However, if you want to use other databases, it is possible to add database support for that particular database as long as it's supported by the Apache OJB project (http://db.apache.org/ojb).

Set up Eclipse for Maven

If this is the first time you are using Eclipse with a project build path generated by the eclipse:eclipse Maven plugin, you need to define the **M2_REPO** Classpath Variable in your Eclipse: *Java > Build Path > Classpath Variable*, under the Preferences menu.



The Rice project contains auto-generated build path entries that rely on the presence of this M2_REPO variable to determine the location of dependency libraries.

Rebuild Rice

1. If dependency libraries have been added or removed from the Rice project, including the first time you check out Rice, you should run the retrieve-maven-dependencies Ant target to pull down all necessary libraries.

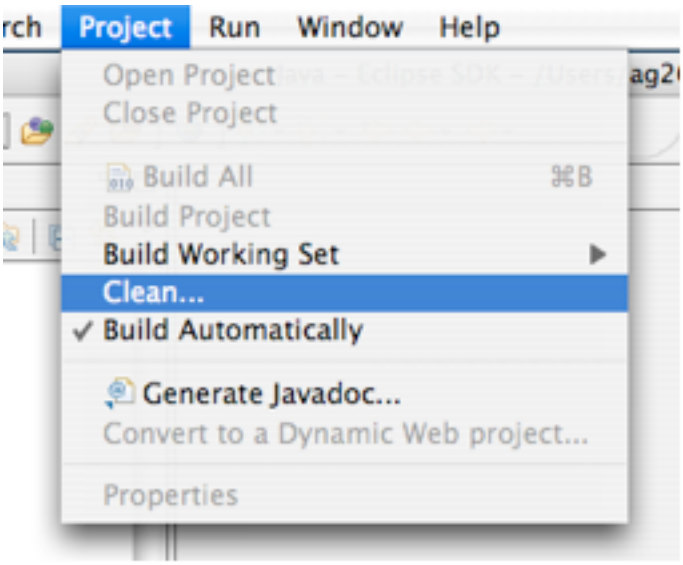
   ### Note

   For the Maven2 Ant tasks to work, Ant has to know where your Maven2 home is. If you have set the **M2_HOME** variable in your system environment, it will be recognized automatically. If not, or if for some reason you want to use a different location (e.g., if you want to have multiple Maven installations), then you can set the **maven.home.directory** property in **/home/ubuntu/kuali-build.properties**.

2. Add the **build.xml** file in the root of the Rice project to your Ant view, or open a shell to the Rice project directory and run the retrieve-maven-dependencies target. You should see Maven retrieving any required dependencies. If you are running this Ant task in Eclipse, then you must recognize the **PATH** environment variable under *Run > External Tools > Open External Tools Dialog > Environment*.

3. Optionally, if you have trouble running this Ant target, you can just run an **mvn compile** from the command line to invoke a Maven compilation. This will download all dependencies into your local maven repository.

4. Execute a clean build of the project in Eclipse:



5. If your build was previously broken due to the **M2_REPO** classpath variable being undefined or due to missing libraries, it should now have been built successfully.

Install the database

To set up the database, please follow the instructions in the Installation Guide under Preparing the Database.

Installing the appropriate configuration files

> **Note**
> Be sure to use an appropriate editor such as vi or Notepad when editing configuration files. For example, we have found that WordPad can corrupt the configuration file.

To install the configuration file for the Kuali Rice sample application, you can do an Ant-based setup or a manual setup.

Ant-based setup

1. Execute the **prepare-dev-environment** Ant target in the **build.xml** file located in the root of the project.

2. This creates: **<user home>/kuali/main/dev/sample-app-config.xml**

Manual setup

1. Copy the **config/templates/sample-app-config.template.xml** file to **<user home>/kuali/main/dev/sample-app-config.xml**.

- For Windows, your user home is: **C:\Documents and Settings\<user name>**
- For Unix/Linux, your user home is: **/home/<user name>**
- For Mac OS X, your user home is: **/Users/<user name>**

2. Add the appropriate database parameters to **<user home>/kuali/main/dev/sample-app-config.xml**

   - Oracle

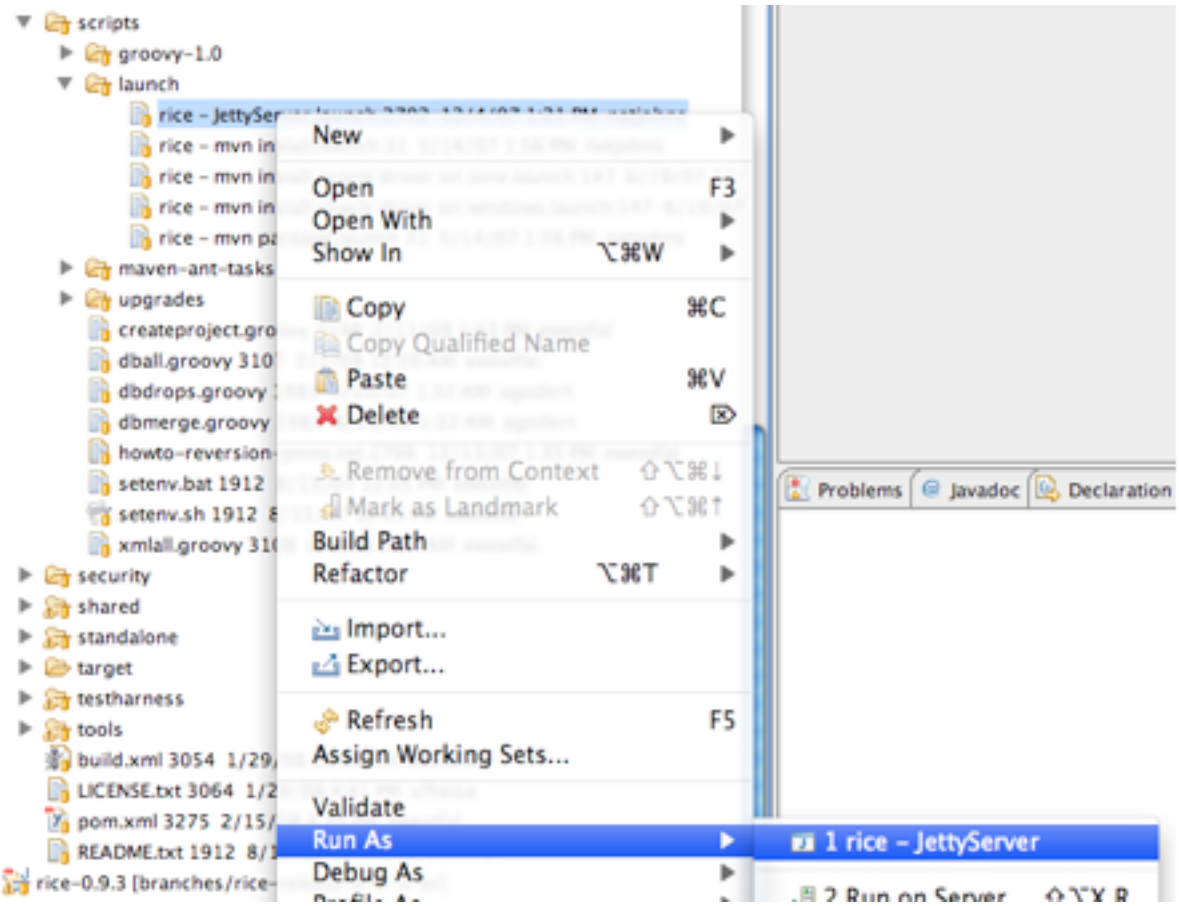
     ```
     <param name="datasource.url">jdbc:oracle:thin:@localhost:1521:XE</param>
     <param name="datasource.username">oracle.username</param>
     <param name="datasource.password">oracle.password</param>
     ```

   - MySQL

     ```
     <param name="datasource.url">jdbc:mysql://localhost:3306/kulrice</param>
     <param name="datasource.username">mysql.username</param>
     <param name="datasource.password">mysql.password</param>
     ```

Run the sample web application

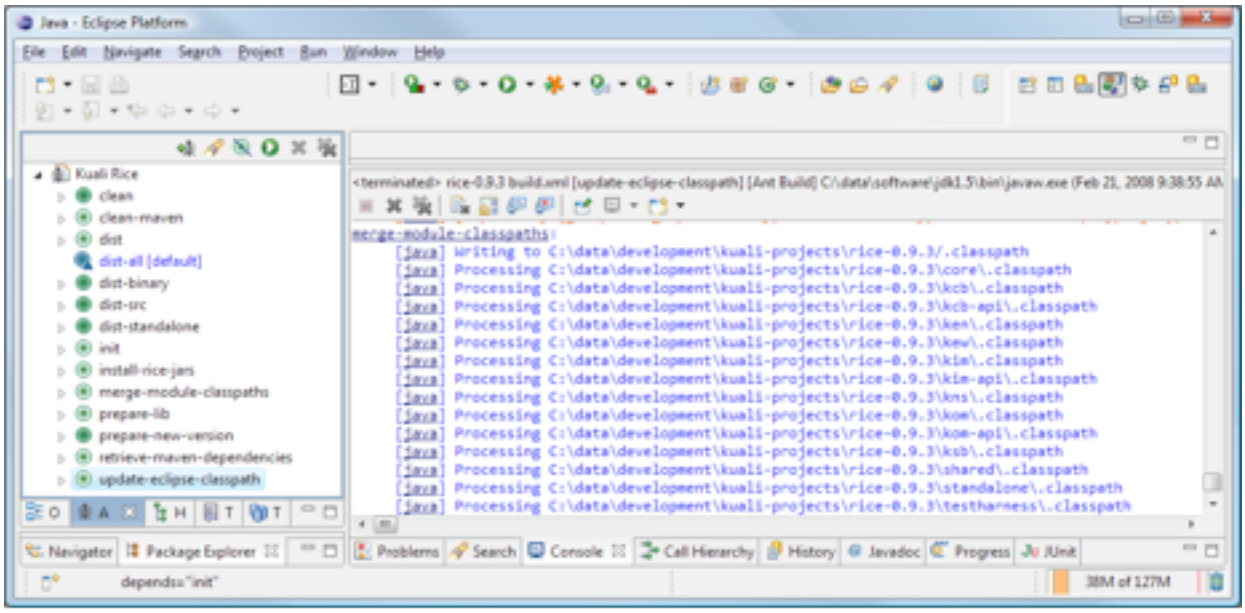
- Back in Eclipse, locate and run the rice - JettyServer.launch file:



- Point your browser to the following url: http://localhost:8080/kr-dev

Changing Rice project dependencies

If you change any of the dependencies in any of the Rice **pom.xml** files, you must run the **update-eclipse-classpath** Ant target to regenerate the top-level Eclipse **.classpath** file for the project.



If you change the dependencies and commit the change, when others update their local source copy they must run the corresponding retrieve-maven-dependencies target again.

Note

Refresh your Eclipse project if dependencies (and therefore the Eclipse.classpath file) have changed.

Other Notes

Settings.xml warning

If this is the first time that you have installed the Maven plugin into your Eclipse environment, you may need to add a file called **settings.xml** in your **<user home>/.m2** directory.

The easiest way to tell if you need to do this is that there will be a warning in the console after building, stating that the settings.xml file is missing. All you need to do is create a settings.xml file with this content:

```
<settings/>
```

Rebuild, and the warning should no longer appear.

Note

You do **NOT** ever need to run any of the context menu Maven commands from inside Eclipse.

You do **NOT** need to run any Maven commands from the command line.

The Eclipse Maven2 plugin is a little bit flaky sometimes. You might need to close Eclipse to flush its memory.

Default workspace JDK not 1.5

If your default workspace JDK is not 1.5, you need to reconfigure the Maven external tools definitions for Rice this way:

1. Open *Run->External Tools->External Tools Dialog...* menu item.
2. Find the m2 build category.
3. Select each preconfigured Rice external tool configuration, select the JRE tab, and ensure the JRE is set to 1.5.

Using a custom maven repository location

The default Maven2 repository location is in your user directory; however, if you have a pre-existing repository (or for some other reason don't want it in your user directory), you can alter Maven2's repository location. The current version of the Maven2 plugin has a bug that does not allow this to work (see http://jira.codehaus.org/browse/MNGECLIPSE-314), but the 0.0.11 development version available from the update site http://m2eclipse.codehaus.org/update-dev/ allows you to specify a custom local repository.

Note

If you make this change, you may have to delete and re-add the Maven Managed Dependencies library to your project build path if you have an existing, invalid, Maven-managed dependencies library.

Setting JDK Compliance version

If your default workspace JDK is not 1.5, then you also need to set the JDK compliance level to the appropriate version for the project. You can find this by right-clicking on the *Project -> Properties -> Java Compiler -> Compiler* compliance level. Be sure the **Enable project specific settings** checkbox is checked.

Turn off validation

Be sure to turn off validation at the project level by right-clicking on the Project, then clicking *Properties -> Validation -> Suspend all Validators*. This can be adjusted once a successful Rice project is up and running.

ORA-12519, TNS:no appropriate service handler found

If you start seeing **java.sql.SQLException: Listener refused the connection with the following error: ORA-12519, TNS:no appropriate service handler found**, there are a couple of things that may remedy the problem.

1. Increase the Oracle XE connection limit:

```
alter system set processes=150 scope=spfile;
alter system set sessions=150 scope=spfile;
```

2. Lower the Atomikos pool size in your rice config.xml:

```
<param name="datasource.pool.size">10</param>
```

Disconnect any other clients and then restart Oracle-XE.

Creating Rice Enabled Applications

Creating a Rice Client Application Project Skeleton

The Kuali Rice source code comes with a script (written in a language called Groovy) which will create a skeleton client application project that bundles Rice. If you do not have Groovy installed on your machine, you will need to download and install it from http://groovy.codehaus.org/

Preparation Steps

To get ready to run the script:

1. Open a shell window or command prompt window.
2. Change your current directory to the scripts directory within the Rice source code tree (for example, if you unpacked the source code into a directory named **/java/projects/rice**, you want to navigate to **/java/projects/rice/scripts**).
3. If the Groovy interpreter is not on your command path (entering the command groovy results in an error stating that the command was not found), enter the command: . **./setenv.sh** in Unix or **setenv.bat** in Windows.
4. Verify that you have Groovy installed by typing the command **groovy** at the comment line. This should print out the groovy usage message.

Command Syntax

Enter groovy createproject.groovy followed by one or more of the following parameters, separated by spaces:

- **-name** defines the name of the project. It must be followed by a space and the desired project name. The project name should consist of letters, numbers, dashes, and underscores only. This parameter is required.
- **-pdir** specifies the directory to hold the new project. It must be followed by a space and the directory. A directory named the same as the project name will be created in this directory. If not specified, the directory **/java/projects** will be used.
- **-rdir** specifies the directory containing the Rice project. It must be followed by a space and the directory. If not specified, the directory /java/projects/rice will be used.
- **-mdir** specifies the home directory for Maven, which is required to set up the Eclipse project's class path information. It must be followed by a space and the directory. If not specified, the script will attempt to find Maven using the following sources:
  - An environment variable named **M2_HOME**
  - An environment variable named **m2.home**
  - A property named **maven.home.directory** in the file **kuali build.properties** in your home directory

- **-sampleapp** requests the sample application to be included in the new project. This can serve as an example for building a Rice application. If not specified, the sample application is not included.
- **-standalone** requests the client project be set up to be run with a standalone rice server. This sets the default configuration files to containing the necessary settings to connect to standalone rice. The rice url and database properties will still need be updated manually.

Sample Script Execution

```
groovy createproject.groovy -name MyFirstProject -sampleapp
```

Further instructions on how to open the project and run it will be printed to the console when the script has finished executing. At this point, you now have a skeleton of a Kuali Rice client application that you can use to begin building your own application. However, before running the application, you will need to create a Rice database (if you're using the sampleapp, you'll need to set up the **demo** database; otherwise, you'll set up a stripped-down **bootstrap** database).

The configuration of this application uses a **bundled** model where the Rice server and client pieces are all being included and loaded by your sample application. This is useful for development purposes since it makes it very easy to get the application running. It is not recommended for an enterprise deployment where you may want to have more than one application integrating with Kuali Rice. In these cases, you would want to install and integrate with a Standalone Rice server. For more information on installing and configuring a standalone server, see the Installation Guide.

Reorder Eclipse Classpath

Once the sample script execution has completed, you will need to import your project into eclipse and reorder the eclipse classpath to account for a change in how the classpath was generated by maven. Navigate to your project properties and select the Order and Export tab from the Java Build Path project property. There will be an entry for JRE System Library at the bottom of the list that should be moved to the very top.

Rice Configuration System

The Rice Configuration System is an XML-based solution which provides capabilities similar to Java property files, but also adds some additional features. The configuration system lets you:

- Configure keys and values
- Aggregate multiple files using a single master file
- Build parameter values from other parameter values
- Use the parameters in Spring
- Override configuration values

Configuring Keys and Values

Below is an example of a configuration XML file. Note that the white space (spaces, tabs, and new lines) is stripped from the beginning and end of the values.

```
<config>
    <param name="client1.location">/opt/jenkins-home/jobs/rice-trunk-site-deploy/w
    <param name="client2.location">/opt/jenkins-home/jobs/rice-trunk-site-deploy/w
```

```
    <param name="ksb.client1.port">9913</param>
    <param name="ksb.client2.port">9914</param>
    <param name="ksb.testharness.port">9915</param>
    <param name="threadPool.size">1</param>
    <param name="threadPool.fetchFrequency">3000</param>
    <param name="bus.refresh.rate">3000</param>
    <param name="keystore.alias">rice</param>
    <param name="keystore.password">super-secret-pw</param>
    <param name="keystore.file">/opt/jenkins-home/jobs/rice-trunk-site-deploy/work
</config>
```

Here is an example of the Java code required to parse the configuration XML file and convert it into a Properties object:

```
Config config = new SimpleConfig(configLocations, properties);
config.parseConfig();
```

In the sample above, configLocations is a List<String> containing file locations using the standard Spring naming formats (examples: **file:/whatever** and **classpath:/whatever**). The variable properties is a Properties object containing the default property values.

Here is an example of retrieving a property value from Java code:

```
String val = ConfigContext.getCurrentContextConfig().getProperty("keystore.alias")
```

Aggregating Multiple Files

The Rice Configuration System has a special parameter, config.location, which you use to incorporate the contents of another file. Typically, you use this to include parameters that are maintained by system administrators in secure locations. The parameters in the included file are parsed as if they had been in the original file at that place. Here is an example:

```
<config>
    <param name="config.location">file:/my_secure_dir/my_secure_file.xml</param>
</config>
```

Building Parameter Values from Other Parameters

Once you have defined a parameter, you can use it in the definition of another parameter. For example:

```
<config>
    <param name="apple">red delicious</param>
    <param name="taste">yummy yummy</param>
    <param name="apple.taste">${apple} ${taste}</param>
</config>
```

When this example is parsed, the value of the parameter **apple.taste** will be set to **red delicious yummy yummy**.

Using the Parameters in Spring

Because the parameters are converted into a Properties object, you can retrieve the complete list of parameters using this code:

```
config.getProperties()
```

You typically use this in Spring to parse a configuration and put its properties in a PropertyPlaceHolderConfigurer so that the parameters are available in the Spring configuration file:

```
<bean id="config" class="org.kuali.rice.core.config.spring.ConfigFactoryBean">
    <property name="configLocations">
        <list>
            <value>classpath:my-config.xml</value>
        </list>
    </property>
</bean>

<bean id="configProperties"
 class="org.springframework.beans.factory.config.MethodInvokingFactoryBean">
    <property name="targetObject" ref="config" />
    <property name="targetMethod" value="getProperties" />
</bean>

<bean class="org.springframework.beans.factory.config.PropertyPlaceholderConfigure
    <property name="properties" ref="configProperties" />
</bean>
```

Once this is complete, the configuration parameters can be used like standard Spring tokens in the bean configurations:

```
<bean id="dataSource" class="org.kuali.rice.core.database.XAPoolDataSource">
    <property name="transactionManager" ref="jotm" />
    <property name="driverClassName" value="${datasource.driver.name}" />
    <property name="url" value="${datasource.url}" />
    <property name="maxSize" value="${datasource.pool.maxSize}" />
    <property name="minSize" value="${datasource.pool.minSize}" />
    <property name="maxWait" value="${datasource.pool.maxWait}" />
    <property name="validationQuery" value="${datasource.pool.validationQuery}" />
    <property name="username" value="${datasource.username}" />
    <property name="password" value="${datasource.password}" />
</bean>
```

Initializing the Configuration Context in Rice

The Config object can be injected into the RiceConfigurer that's configured in Spring and it will initialize the configuration context with those configuration parameters.

This is done as follows:

```
<bean id="config" class="org.kuali.rice.core.config.spring.ConfigFactoryBean">
    ...
</bean>

<bean id="rice" class="org.kuali.rice.core.config.RiceConfigurer">
    <property name=”rootConfig” ref=”config”/>
</bean>
```

Overriding Configuration Values

The primary purpose of overriding configuration values is to provide a set of default values in a base configuration file and then provide a separate file that overrides the values that need to be changed. You

can also update a parameter value multiple times in the same file. Parameter values can be changed any number of times; the last value encountered while parsing the file will be the value that is retained.

For example, when parsing the file:

```
<config>
    <param name="taste">yummy yummy</param>
    <param name="taste">good stuff</param>
</config>
```

The final value of the parameter **taste** will be **good stuff** since that was the last value listed in the file.

As another example, when parsing the file:

```
<config>
    <param name="taste">yummy yummy</param>
    <param name="apple.taste">apple ${taste}</param>
    <param name="taste">good stuff</param>
</config>
```

The final value of the parameter **apple.taste** will be **apple yummy yummy**. This demonstrates that parameters that appear in the value are replaced by the current value of the parameter at that point in the configuration file.

Additionally, you can define certain parameters in such that they won't override an existing parameter value if it's already set.

As an example of this, consider the following configuration file:

```
<config>
    <param name="taste" override=”false”>even yummier</param>
    <param name=”brand.new.param” override=”false”>brand new value</param>

</config>
```

If this file was loaded into a configuration context that had already parsed our previous example, then it would notice that the **taste** parameter has already been set. Since **override** is set to false, it would not override that value with **even yummier**. However, since **brand.new.param** had not been defined previously, it's value would be set.

Data Source and JTA Configuration

The Kuali Rice software require a Java Transaction API (JTA) environment in which to execute database transactions. This allows for creation and coordination of transactions that span multiple data sources. This feature is something that would typically be found in a J2EE application container. However, Kuali Rice is designed in such a way that it should not require a full J2EE container. Therefore, when not running the client or web application inside of an application server that provides a JTA implementation, you must provide one. The default JTA environment that Kuali Rice uses is JOTM. There are other open-source options available, such as Atomikos TransactionsEssentials, and there are also commercial and open source JTA implementations that come as part of an application server (i.e. JBoss, WebSphere, GlassFish).

If installing Rice using the standalone server option and a full Java application server is not being utilized, then the libraries required for JTA will need to be moved to the servlet server which is being used. These libraries have already been retrieved by Maven during project set up; it is a simple matter of moving them from the Maven repository to the libraries directory of the servlet server. Assuming, for

instance, that Tomcat is being used, the following files need to be copied from the Maven repository to **$TOMCAT_HOME/common/lib**:

- **{Maven repository home}/repository/javax/transaction/jta/1.0.1B/jta-1.0.1B.jar**
- **{Maven repository home}/repository/jotm/jotm/2.0.10/jotm-2.0.10.jar**
- **{Maven repository home}/repository/jotm/jotm_jrmp_stubs/2.0.10/jotm_jrmp_stubs-1.0.10.jar**
- **{Maven repository home}/repository/xapool/xapool/1.5.0-patch3/xapool-1.5.0-patch3.jar**
- **{Maven repository home}/repository/howl/howl-logger/0.1.11/howl-logger-0.1.11.jar**
- **{Maven repository home}/repository/javax/resource/connector-api/1.5/connector-api-1.5.jar**
- **{Maven repository home}/repository/javax/resource/connector/1.0/connector-1.0.jar**
- **{Maven repository home}/repository/org/objectweb/carol/carol/2.0.5/carol-2.0.5.jar**

Additionally, the **{Rice project home}config/jotm/carol.properties** configuration file needs to be moved to $TOMCAT_HOME/common/classes, this time from the built Rice project.

Configuring JOTM

Configure the JOTM transaction manager and user transaction objects as Spring beans in your application's Spring configuration file. Here is an example:

```
<bean id="jotm" class="org.springframework.transaction.jta.JotmFactoryBean">
    <property name="defaultTimeout" value=”3600”/>
</bean>

<alias name="jotm" alias="jtaTransactionManager"/>
<alias name="jotm" alias="jtaUserTransaction"/>
```

You can use these beans in the configuration of Spring's JTA transaction manager and the Rice configurer. This configuration might look like the following:

```
<bean id="springTransactionManager" class="org.springframework.transaction.jta.Jta
    <property name="userTransaction">
        <ref local="userTransaction" />
    </property>
    <property name="transactionManager">
        <ref local="jtaTransactionManager" />
    </property>
</bean>

<bean id="rice" class="org.kuali.rice.core.config.RiceConfigurer">
    <property name="transactionManager" ref="jtaTransactionManager" />
    <property name="userTransaction" ref="jtaUserTransaction" />
    ...
</bean>
```

Configuring Transactional Data Sources

JTA requires that the datasources that are used implement the XADataSource interface. Some database vendors, such as Oracle, have pure XA implementations of their datasources. However,

internally to Rice, we use wrappers on plain datasources using a library called XAPool. When configuring transactional data sources that will be used within JOTM transactions, you should use the org.kuali.rice.core.database.XAPoolDataSource class provided with Rice. Here is an example of a Spring configuration using this data source implementation:

```
<bean id="myDataSource" class="org.kuali.rice.core.database.XAPoolDataSource">
    <property name="transactionManager" ref="jtaTransactionManager" />
    <property name="driverClassName" value="${datasource.driver.name}" />
    <property name="url" value="${datasource.url}" />
    <property name="maxSize" value="${datasource.pool.maxSize}" />
    <property name="minSize" value="${datasource.pool.minSize}" />
    <property name="maxWait" value="${datasource.pool.maxWait}" />
    <property name="validationQuery" value="${datasource.pool.validationQuery}" />
    <property name="username" value="${datasource.username}" />
    <property name="password" value="${datasource.password}" />
</bean>
```

Configuring Non-Transactional Data Sources

When using the built-in instance of the Quartz scheduler that Rice creates, you will need to inject a non-transactional data source into the RiceConfigurer in addition to the JTA transactional instance. This is to prevent deadlocks in the database and is required by the Quartz software (the Quartz web site has an FAQ entry with more details on the problem). Here is an example of a non-transactional data source configuration:

```
<bean id="nonTransactionalDataSource"
 class="org.apache.commons.dbcp.BasicDataSource" destroy-method="close">
    <property name="driverClassName" value="${datasource.driver.name}"/>
    <property name="url" value="${datasource.url}"/>
    <property name="maxActive" value="${datasource.pool.maxActive}"/>
    <property name="minIdle" value="7"/>
    <property name="initialSize" value="7"/>
    <property name="validationQuery" value="${datasource.pool.validationQuery}"/>
    <property name="username" value="${datasource.username}" />
    <property name="password" value="${datasource.password}" />
    <property name="accessToUnderlyingConnectionAllowed"
 value="${datasource.dbcp.accessToUnderlyingConnectionAllowed}"/>
</bean>
```

You need to either inject this non-transactional data source into the Quartz SchedulerFactory Spring bean (if you are explicitly defining it) or into the rice bean in the Spring Beans config file as follows:

```
<bean id="rice" class="org.kuali.rice.config.RiceConfigurer">
    ...
    <property name="nonTransactionalDataSource" ref="nonTransactionalDataSource" /
    ...
</bean>
```

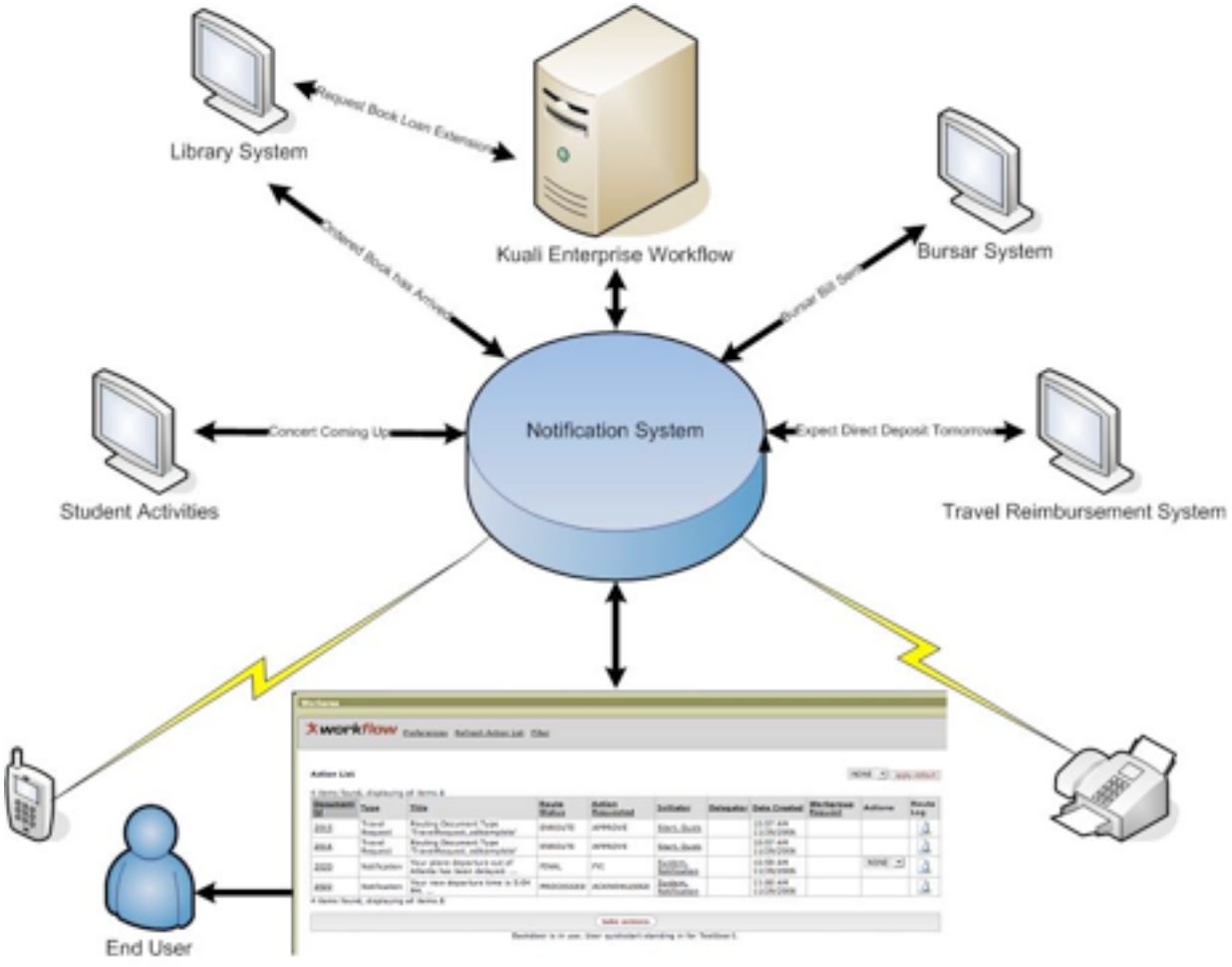
Chapter 2. KEN

KEN Overview

What is KEN?

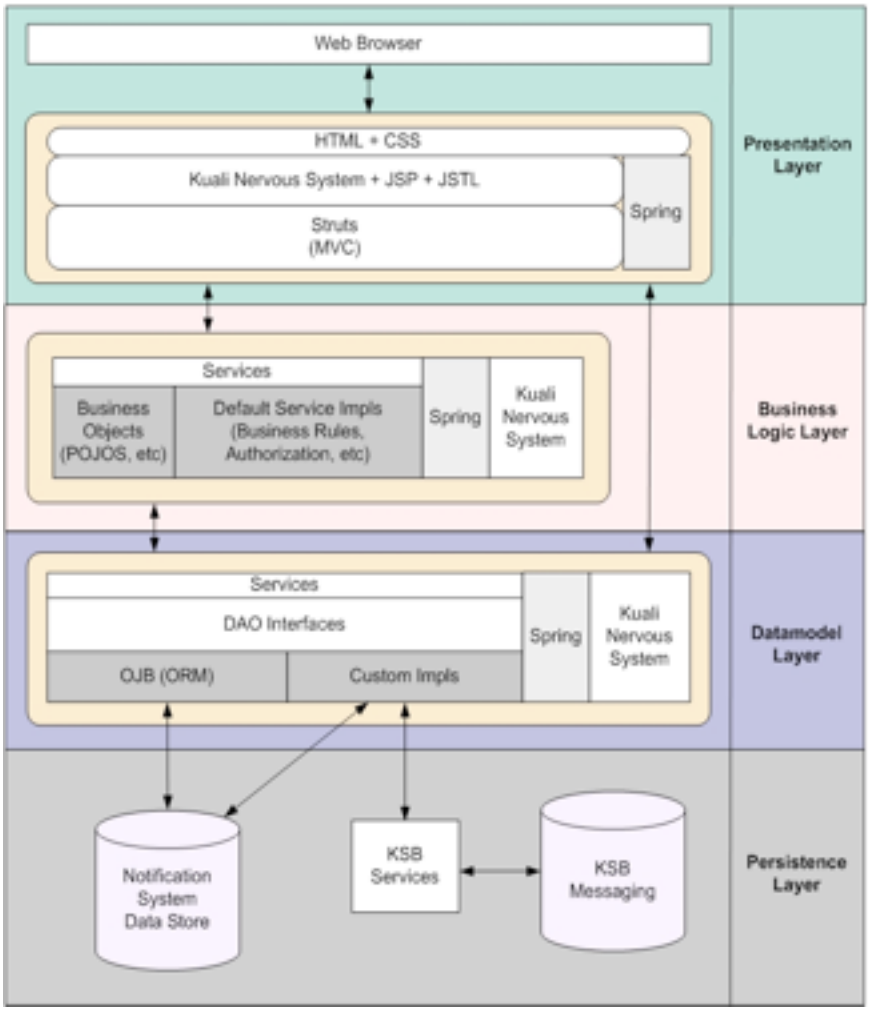
Kuali Enterprise Notification is a form of communication between distributed systems that allows messages to be sent securely and consistently. These messages act as notifications upon receipt and are processed asynchronously within the service layer. The following architectural diagram represents the flow of messages in a typical Rice Environment.

Figure 2.1. KEN Message Flow



From a developer's perspective the diagram below helps to represent the inner workings of how KEN stores data from the Data Modeling Layer into the Persistence Layer.

Figure 2.2. KEN Message Storage



The following sections of documentation aim at describing the inner workings of KEN as well as how those pieces interact with Rice, specifically KEW. KEN itself is an interface that sits on top of KEW's API. This allows for registration and publishing of notifications, which then flow through KEW to result in a KEW action request. See KEW Overview for more information. In addition to the action list, KEW can be optionally configured to forward these requests to the Kuali Communications Broker or KCB for short. This module is logically related to KEN and handles dispatching messages based on the user preferences. Once messages are dispatched, a response or acknowledgement can be created.

KEN Configuration Parameters

Table 2.1. KEN Core Parameters

Configuration Parameter	Description	Default value
ken.url	The base URL of the KEN webapp; this should be changed when deploying for external access	${application.url}/ken

Configuration Parameter	Description	Default value
notification.resolveMessageDeliveries.startDelayMS	The start delay (in ms) of the job that resolves message deliveries	5000
notification.resolveMessageDeliveries.intervalMS	The interval (in ms) between runs of the message delivery resolution job	10000
notification.processAutoRemoval.startDelayMS	The start delay (in ms) of the job that auto-removes messages	60000
notification.processAutoRemoval.intervalMS	The interval (in ms) between runs of the message auto-removal job	60000
notification.quartz.autostartup	Whether to automatically start the KEN Quartz jobs	true
notification.concurrent.jobs	Whether the invocation of a KEN Quartz job can overlap another KEN Quartz job running concurrently	true
ken.system.user	The principal name of the user that KEN should use when initiating KEN-originated documents	notsys
kcb.url	The base URL of the KCB (notification broker) webapp	${application.url}/kcb
kcb.messaging.synchronous	Whether notification messages are processed synchronously	false
kcb.messageprocessing.startDelayMS	The start delay (in ms) of the job that processes notification messages	50000
kcb.messageprocessing.repeatIntervalMS	The interval (in ms) between runs of the notification message processing job	30000
kcb.quartz.group	Group name of the KCB Quartz job	KCB-Delivery
kcb.quartz.job.name	Name of the KCB Quartz job	MessageProcessingJobDetail
kcb.maxProcessAttempts	Maximum number of times that KCB will attempt to process a notification message	3
notification.processUndeliveredJob.intervalMS	The elapsed time, in milliseconds, between runs of the KEN process undelivered notifications job.	10000
notification.processUndeliveredJob.startDelayMS	The elapsed time, in milliseconds, between the start of the application and the first run of the KEN process undelivered notifications job.	10000

Note

As of Rice 1.0.1, The parameter **kcb.smtp.host** is no longer used. The smtp server settings that are required for sending email notifications with KEN are documented in the Kuali Enterprise Workflow (KEW) Technical Reference Guide under **Email Configuration.**

KEN Channels

A KEN Channel is correlated to a specific type of notification. An example of a Channel's use may be to send out information about upcoming Library Events or broadcast general announcements on upcoming concerts. Channels are subscribed to in the act of receiving notifications from a publisher or producer. They can also be unsubscribed to and removed from the data store from within the UI. The Channel Definitions are stored in the database table KREN_CHNL_T. The columns are listed as follows:

Table 2.2. KREN_CHNL_T

Column	Description
CHNL_ID	Identifier for the Channel
NM	Name of the Channel represented in the UI
DESC_TXT	Description of the Channel
SUBSCRB_IND	Determines if the Channel can or cannot be subscribed to from the UI. This also determines if the channel will be displayed in the UI
VER_NBR	Version Number for the Channel

Channel Subscription

Channels can be subscribed to through the UI and also through the direct access to the data store. To add a channel that can be subscribed to simply run the following SQL statement against the data store customizing value entries to your needs:

```
INSERT INTO KREN_CHNL_T (CHNL_ID,DESC_TXT,NM,SUBSCRB_IND,VER_NBR)
  VALUES (2,'This channel is used for sending out information about Library Events
1)
```

KEN Producers

A KEN Producer submits notifications for processing through the system. An example of a Producer would be a mailing daemon that represents messages sent from a University Library System.

Characteristics of a Producer:

- Producers create and send notifications to a specific destination through various Channels.
- Each Producer contains a list of Channels that it may send notifications to.
- Producer Definitions are stored in the database table KREN_PRODCR_T.

Table 2.3. KREN_PRODCR_T

Column	Description
CNTCT_INFO	The email address identifying the Producer of the Notification.
DESC_TXT	A Description of the Producer.
NM	Name of the Producer.
PRODCR_ID	The Producer's Channel Identifier. See the KREN_CHNL_PRODCR_T table found in the database for more information on how Producers link to Channels.
VER_NBR	Version Number for the Producer.

Adding Producers

The Producer can be added through direct access to the data store. To add a Producer run the following SQL statement against the data store customizing value entries to your needs:

```
INSERT INTO KREN_PRODCR_T (CNTCT_INFO,DESC_TXT,NM,PRODCR_ID,VER_NBR)
  VALUES ('kuali-ken-testing@cornell.edu','This producer represents messages sent
```

KEN Content Types

Overview

A Content Type is part of the message content of a notification that may be sent using KEN. It can be as simple as a single message string, or something more complex, such as an event that might have a date associated with it, start and stop times, and other metadata you may want to associate with the notification.

KEN is distributed with two Content Types: Simple and Event.

Warning

It is strongly recommended that you leave these two Content Types intact, but you can use them as templates for creating new Content Types.

Every notification sent through KEN must be associated with a **registered** Content Type. Registration of Content Types requires administrative access to the system and is described in the KEN Content Types section in the User Guide. The rest of this section describes the Content Type attributes that are required for registration.

Content Type Attributes

A Content Type is represented as a *NotificationContent* business object and consists of several attributes, described below:

id - Unique identifier that KEN automatically creates when you add a Content Type

name - This is a unique string that identifies the content. For example, *ItemOverdue* might be the *name* used for a notification Content Type about an item checked out from the campus library.

description - This is a more verbose description of the Content Type. For example, "Library item overdue notices" might be the *description* for *ItemOverdue*.

namespace - This is the string used in the XSD schema and XML to provide validation of the content, for example, *notification/ContentTypeItemOverdue*. The XSD namespace is typically the *name* attribute concatenated to the *notification/ContentType* string. Note how it is used in the **XSD** and **XSL** examples below.

xsd - The XSD attribute contains the complete W3C XML Schema compliant code.

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- This schema defines a generic event notification type in order for it to be a
<schema xmlns="http://www.w3.org/2001/XMLSchema"
        xmlns:c="ns:notification/common"
        xmlns:ce="ns:notification/ContentTypeItemOverdue"
        targetNamespace="ns:notification/ContentTypeItemOverdue"
        attributeFormDefault="unqualified"
        elementFormDefault="qualified">
    <annotation>
        <documentation xml:lang="en">Item Overdue Schema</documentation>
    </annotation>
    <import namespace="ns:notification/common" schemaLocation="resource:notificati

    <!-- The content element describes the content of the notification.  It contai
    <element name="content">
        <complexType>
            <sequence>
                <element name="message" type="c:LongStringType"/>
                <element ref="ce:event"/>
            </sequence>
        </complexType>
    </element>

    <!-- This is the itemoverdue element.  It describes an item overdue notice con
    <element name="itemoverdue">
        <complexType>
            <sequence>
                <element name="summary" type="c:NonEmptyShortStringType" />
                <element name="description" type="c:NonEmptyShortStringType" />
                <element name="location" type="c:NonEmptyShortStringType" />
                <element name="dueDate" type="dateTime" />
                <element name="fine" type="decimal" />
            </sequence>
        </complexType>
    </element>
</schema>
```

xsl - The XSD attribute contains the complete XSL code that will be used to transform a notification in XML to html for rendering in an Action List.

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- style sheet declaration: be very careful editing the following, the
 default namespace must be used otherwise elements will not match -->
<xsl:stylesheet
```

```
    version="1.0"
    xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
    xmlns:n="ns:notification/ContentTypeEvent"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="ns:notification/ContentTypeItemOverdue resource:notificati
    exclude-result-prefixes="n xsi">



    <!-- output an html fragment -->
    <xsl:output method="html" indent="yes" />


    <!-- match everything -->
    <xsl:template match="/n:content" >
        <table class="bord-all">
            <xsl:apply-templates />
        </table>
    </xsl:template>


    <!--  match message element in the default namespace and render as strong -->
    <xsl:template match="n:message" >
        <caption>
            <strong><xsl:value-of select="." disable-output-escaping="yes"/></stro
        </caption>
    </xsl:template>


    <!-- match on itemoverdue in the default namespace and display all children --
    <xsl:template match="n:itemoverdue">
        <tr>
            <td class="thnormal"><strong>Summary: </strong></td>
            <td class="thnormal"><xsl:value-of select="n:summary" /></td>
        </tr>
        <tr>
            <td class="thnormal"><strong>Item Description: </strong></td>
            <td class="thnormal"><xsl:value-of select="n:description" /></td>
        </tr>
        <tr>
            <td class="thnormal"><strong>Library: </strong></td>
            <td class="thnormal"><xsl:value-of select="n:location" /></td>
        </tr>
        <tr>
            <td class="thnormal"><strong>Due Date: </strong></td>
            <td class="thnormal"><xsl:value-of select="n:startDateTime" /></td>
        </tr>
        <tr>
            <td class="thnormal"><strong>Fine: </strong></td>
            <td class="thnormal">$<xsl:value-of select="n:fine" /></td>
        </tr>
    </xsl:template>
</xsl:stylesheet>
```

KEN Notifications

This document provides information about the attributes of a Notification. These attributes are elements such as message content, who is sending the notification, who should receive it, etc. Kuali Enterprise Notification (KEN) supports an arbitrary number of Content Types, such as a simple message or an event notification. Each Content Type consists of a common set of attributes and a content attribute.

Common Notification Attributes

Table 2.4. Common Notification Attributes

Name	Type	Required	Description	Example
channel	string	yes	• Name of a channel • Must be registered	Library Events
producer	string	yes	• Name of the producing system • Must be registered and given authority to send messages on behalf of the <*Library Events*> channel	Library Calendar System
senders	a list of strings	yes	A list of the names of people on whose behalf the message is being sent	TestUser1, TestUser2
recipients	a list of strings	yes	A list of the names of groups or users to whom the message is being sent	library-staff-group, TestUser1, TestUser2
deliveryType	string	yes	fyi or ack	fyi
sendDateTime	datetime	no	When to send the notification	2006-01-01 00:00:00.0
autoRemoveDateTime	datetime	no	When to remove the notification	2006-01-02 00:00:00.0
priority	string	yes	An arbitrary priority; these must be registered in KEN; the system comes with defaults of *normal*, *low*, and *high*	normal
contentType	string	yes	Name for the content; KEN	simple

Name	Type	Required	Description	Example
			comes set up with *simple* and *event*; new contentTypes must be registered in KEN	
content	see below	yes	The actual content	see below

Message Content

Notifications are differentiated using the *contentType* attribute and the contents of the *content* element. The *content* element can be as simple as a message string or it may be a complex structure. For example, a simple notification may only contain a message string, whereas an *Event* Content Type might contain a summary, description, location, and start and end dates and times. Examples of the *Simple* and *Event* Content Types:

Sample XML for a Simple Notification

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- A Simple Notification Message -->
<notification xmlns="ns:notification/NotificationRequest"
    xmlns:xsi=http://www.w3.org/2001/XMLSchema-instance
    xsi:schemaLocation="ns:notification/NotificationRequest
    resource:notification/NotificationRequest">
    <!-- this is the name of the notification channel -->
    <!-- that has been registered in the system -->
    <channel>Campus Status Announcements</channel>


    <!-- this is the name of the producing system -->
    <!-- the value must match a registered producer -->
    <producer>Campus Announcements System</producer>

    <!-- these are the people that the message is sent on -->
    <!-- behalf of -->
    <senders>
        <sender>John Fereira</sender>
    </senders>


    <!-- who is the notification going to? -->
    <recipients>
        <group>Everyone</group>
        <user>jaf30</user>
    </recipients>


    <!--  fyi or acknowledge -->
    <deliveryType>fyi</deliveryType>


    <!-- optional date and time that a notification should be sent -->
    <!-- use this for scheduling a single future notification to happen -->
```

```
    <sendDateTime>2006-01-01T00:00:00</sendDateTime>


    <!-- optional date and time that a notification should be removed -->
    <!-- from all recipients' lists, b/c the message no longer applies -->
    <autoRemoveDateTime>3000-01-01T00:00:00</autoRemoveDateTime>


    <!-- this is the name of the priority of the message -->
    <!-- priorities are registered in the system, so your value -->
    <!-- here must match one of the registered priorities -->
    <priority>Normal</priority>


    <title>School is Closed</title>


    <!-- this is the name of the content type for the message -->
    <!-- content types are registered in the system, so your value -->
    <!-- here must match one of the registered contents -->
    <contentType>Simple</contentType>


    <!-- actual content of the message -->
    <content xmlns="ns:notification/ContentTypeSimple"
        xsi:schemaLocation="ns:notification/ContentTypeSimple
        resource:notification/ContentTypeSimple">

        <message>Snow Day! School is closed.</message>
    </content>
</notification>
```

Sample XML for an Event Notification

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


<notification xmlns="ns:notification/NotificationMessage"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="ns:notification/NotificationMessage
    resource:notification/NotificationMessage">
    <!-- this is the name of the notification channel -->
    <!-- that has been registered in the system -->
    <channel>Concerts Coming to Campus</channel>


    <!-- this is the name of the producing system -->
    <!-- the value must match a registered producer -->
    <producer>Campus Events Office</producer>


    <!-- these are the people that the message is sent on -->
    <!-- behalf of -->
    <senders>
```

```
    <sender>ag266</sender>
    <sender>jaf30</sender>
</senders>


<!-- who is the notification going to? -->
    <recipients>
        <group>Group X</group>
        <group>Group Z</group>
        <user>ag266</user>
        <user>jaf30</user>
        <user>arh14</user>
    </recipients>


<!--  fyi or acknowledge -->
<deliveryType>fyi</deliveryType>


<!-- optional date and time that a notification should be sent -->
<!-- use this for scheduling a single future notification to happen -->
<sendDateTime>2006-01-01 00:00:00.0</sendDateTime>


<!-- optional date and time that a notification should be removed -->
<!-- from all recipients' lists, b/c the message no longer applies -->
<autoRemoveDateTime>2007-01-01 00:00:00.0</autoRemoveDateTime>


<!-- this is the name of the priority of the message -->
<!-- priorities are registered in the system, so your value -->
<!-- here must match one of the registered priorities -->
<priority>Normal</priority>


<!-- this is the name of the content type for the message -->
<!-- content types are registered in the system, so your value -->
<!-- here must match one of the registered contents -->
<contentType>Event</contentType>


<!-- actual content of the message -->
<content>
    <message>CCC presents The Strokes at Cornell</message>


    <!-- an event that it happening on campus -->
    <event xmlns="ns:notification/ContentEvent"
        xsi:schemaLocation="ns:notification/ContentEvent
        resource:notification/ContentEvent">
        <summary>CCC presents The Strokes at Cornell</summary>
        <description>blah blah blah</description>
        <location>Barton Hall</location>
        <startDateTime>2006-01-01T00:00:00</startDateTime>
```

```
            <stopDateTime>2007-01-01T00:00:00</stopDateTime>
        </event>
    </content>
</notification>
```

Notification Response

When KEN sends a notification, it always returns a response. This is an outline in XML of that response:

```
<?xml version="1.0" encoding="UTF-8"?>
<response>
    <status>success</status>
</response>
```

Enterprise Notification Priority

Managing Priorities

There is no user interface page to manage priorities so you must make changes to the list of priorities in the **kren_prio_t** table using SQL.

The table has these columns:

Table 2.5. KREN_PRIO_T

Name	Type	Max Size	Required	Attribute
PRIO_ID	Numeric	8	Yes	ID
NM	Text	40	Yes	Name
DESC_TXT	Text	500	Yes	Description
PRIO_ORD	Numeric	4	Yes	Order
VER_NBR	Numeric	8	Yes	Version

Example 2.1. Example – This is an example of how to add a Priority into the table:

```
INSERT INTO kren_prio_t (PRIO_ID, NM, DESC_TXT, PRIO_ORD, VER_NBR) VALUES (8, 'Bul
```

KEN Delivery Types

This section describes Kuali Enterprise Notification (KEN) Delivery Types, or what are sometimes called Message Deliverers. A Message Deliverer Plugin is the mechanism used to deliver a notification to end users. All notifications sent through KEN appear in the Action List for each recipient for which the notification is intended. This message also contains an Email Delivery Type that allows you to send end users a notification summary as an email message. Note that for a Delivery Type other than the default (KEWActionList), the content of the notification is typically just a summary of the full notification.

Implementing the Java Interface

Creating a new Delivery Type primarily involves implementing a Java interface called **org.kuali.rice.kew.deliverer.NotificationMessageDeliverer**. The source code of the interface:

```
/*
 * Copyright 2007 The Kuali Foundation
 *
 * Licensed under the Educational Community License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 *
 * http://www.opensource.org/licenses/ecl2.php
 *
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.

 */
package org.kuali.rice.ken.deliverer;



import java.util.HashMap;

import java.util.LinkedHashMap;


import org.kuali.rice.ken.bo.NotificationMessageDelivery;
import org.kuali.rice.ken.exception.ErrorList;

import org.kuali.rice.ken.exception.NotificationAutoRemoveException;
import org.kuali.rice.ken.exception.NotificationMessageDeliveryException;
import org.kuali.rice.ken.exception.NotificationMessageDismissalException;


/**
 * This class represents the different types of Notification Delivery Types that t
 * For example, an instance of delivery type could be "ActionList" or "Email" or "
 * adhering to this interface can be plugged into the system and will be automatic
 * @author Kuali Rice Team (kuali-rice@googlegroups.com)
*/

public interface NotificationMessageDeliverer {
  /**
   * This method is responsible for delivering the passed in messageDelivery recor
   * @param messageDelivery The messageDelivery to process
   * @throws NotificationMessageDeliveryException
  */

  public void deliverMessage(NotificationMessageDelivery messageDelivery) throws N
    /**
     * This method handles auto removing a message delivery from a person's list o
     * @param messageDelivery The messageDelivery to auto remove
     * @throws NotificationAutoRemoveException
     */
```

```
public void autoRemoveMessageDelivery(NotificationMessageDelivery messageDeliver
  /**
   * This method dismisses/removes the NotificationMessageDelivery so that it is
   * via this deliverer.  Note, whether this action is meaningful is dependent o
   * deliverer cannot control the presentation of the message, then this method
   * @param messageDelivery the messageDelivery to dismiss
   * @param the user that caused the dismissal; in the case of end-user actions,
   *   which the message was delivered (user recipient in the NotificationMessag
   * @param cause the reason the message was dismissed
   */


public void dismissMessageDelivery(NotificationMessageDelivery messageDelivery,
```

KEN: Sending a Notification

The Kuali Enterprise Notification system (KEN) provides for a way to programmatically send a notification. An application may construct a notification using the KEN web service API.

Send a Notification Using the Web Service API

To send a notification using the web service API, the notification must be constructed as an XML document that validates against a schema for a specific Content Type. For more detail, see the Notifications documentation.

To validate your notification XML, you must construct the XSD schema filename. To construct this file name, append the Content Type value to *ContentType*.

For example, if you create a new Content Type for a library book overdue notification, then the *contentType* element value should be *OverdueNotice* and the schema file you created for validation of the notification XML should be **ContentTypeOverdueNotice.xsd**. This XML schema should be declared as a namespace in the **content** element of the notification XML. Out of the box, KEN comes with *Simple* and *Event* Content Types.

Web Service URL

By default, the Notification Web Service API may be accessed at: http://yourlocalip:8080/notification/services/Notification

A WSDL may be obtained using the following URL: http://yourlocalip:8080/notification/services/Notification?wsdl

Note

In the URLs above, replace yourlocalip with the hostname where KEN is deployed.

Exposed Web Services

Initially, KEN exposes a web service method to send a notification. The *sendNotification* method is a simple String In/String Out method. It accepts one parameter (*notificationMessageAsXml*) and returns a notificationResponse as a String. For the format of the response, see the *Notification Response* document in the TRG for KEN.

Calling the *sendNotification* Service from JAVA

First, create a String that includes the XML content for the notification, as described in the Notification Message document of the TRG for KEN. In the following example code, the XML representation of the notification is read as a file from the file system in the main method, and the code calls the *MySendNotification* method to invoke the Notification web service.

A SOAP style web services binding stub is available in the **notification.jar** file, as described above in the **Dependencies** section.

You may use this code as a template for sending a notification using the web service:

```
package edu.cornell.library.notification;


import org.apache.commons.io.IOUtils;
import org.kuali.notification.client.ws.stubs.NotificationWebServiceSoapBindingStu


import java.io.IOException;

import java.io.InputStream;
import java.net.URL;


public class MyNotificationWebServiceClient   {
  private final  static String WEB_SERVICE_URL = "http://localhost:8080/notificati

  public static void MySendNotification(String notificationMessageAsXml) throws Ex
    URL url = new URL(WEB_SERVICE_URL);
    NotificationWebServiceSoapBindingStub stub = new NotificationWebServiceSoapBin
    String responseAsXml = stub.sendNotification(notificationMessageAsXml);
    // do something useful with the response
    System.out.println(responseAsXml);
  }

  public static void main(String[] args) {
    InputStream notificationXML = MyNotificationWebServiceClient.class.getResource
    String notificationMessageAsXml = "";
    try {
      notificationMessageAsXml = IOUtils.toString(notificationXML);
    } catch (IOException ioe) {
      throw new RuntimeException("Error loading webservice_notification.xml");
    }

    try {
      MySendNotification(notificationMessageAsXml);
    } catch (Exception ioe) {
      throw new RuntimeException("Error running webservice");
    }
  }

}
```

KEN Authentication

Web

KEN can support any Web Sign On technology that results in the population of the HttpServletRequest remote user variable, exposed via the getRemoteUser accessor.

public java.lang.String getRemoteUser()

Returns the login of the user making this request, if the user has been authenticated, or null if the user has not been authenticated. Whether the user name is sent with each subsequent request depends on the browser and type of authentication.

Returns: A *String* specifying the login of the user making this request, or *null*

The generic KEN release comes configured with CAS.

Web Services

Web service authentication is part of the development process and is not implemented by the standalone release of Rice. The notification web service is Axis-based.

Chapter 3. KEW

What is Kuali Enterprise Workflow?

What is workflow, in general?

What is Kuali Enterprise Workflow, in particular?

What problems or functions does KEW solve?

What problems does KEW NOT solve?

With which applications can KEW integrate?

Can I use KEW without building an entire application?

Chapter 4. KIM

Terminology

Principal

Entity

Group

Permission

Responsibility

Role

Reference Information

Services

Using the Services

IdentityManagementService

Retrieving Principal Information

Retrieving Entity Default Information

Retrieving Reference Information

Retrieving Group Membership Information

Retrieving Group Information

Checking Permission

Retrieving Permission Information

Checking Responsibility

Retrieving Responsibility Information

Checking Authentication

RoleManagementService

Checking Role Assignment

Retrieving Role Information

Updating Role Membership

Person Service

Retrieving Personal Information

KIM Types

Implementing Custom KIM Types

KIM Group Type Service

KIM Permission Type Service

KIM Responsibility Type Service

KIM Role Type Service

Chapter 5. KNS

KNS Configuration Guide

Chapter 6. KSB

KSB Configuration Guide

Glossary

A

Action List	A list of the user's notification and workflow items. Also called the user's Notification List. Clicking an item in the Action List displays details about that notification, if the item is a notification, or displays that document, if it is a workflow item. The user will usually load the document from their Action List in order to take the requested action against it, such as approving or acknowledging the document.
Action List Type	This tells you if the Action List item is a notification or a more specific workflow request item. When the Action List item is a notification, the Action List Type is "Notification."
Action Request	A request to a user or Workgroup to take action on a document. It designates the type of action that is requested, which includes: • Approve: requests an approve or disapprove action. • Complete: requests a completion of the contents of a document. This action request is displayed in the Action List after the user saves an incomplete document. • Acknowledge: requests an acknowledgment by the user that the document has been opened - the doc will not leave the Action List until acknowledgment has occurred; however, the document routing will not be held up and the document will be permitted to transaction into the processed state if neccessary. • FYI: a notification to the user regarding the document. Documents requesting FYI can be cleared directly from the Action List. Even if a document has FYI requests remaining, it will still be permitted to transition into the FINAL state.
Action Request Hierarchy	Action requests are hierarchical in nature and can have one parent and multiple children.
Action Requested	The action one needs to take on a document; also the type of action that is requested by an Action Request. Actions that may be requested of a user are: • Acknowledge: requests that the users states he or she has reviewed the document. • Approve: requests that the user either Approve or Disapprove a document. • Complete: requests the user to enter additional information in a document so that the content of the document is complete. • FYI: intended to simply makes a user aware of the document.
Action Taken	An action taken on a document by a *Reviewer* in response to an Action Request. The Action Taken may be: • Acknowledged: Reviewer has viewed and acknowledged document. • Approved: Reviewer has approved the action requested on document.

- Blanket Approved: Reviewer has requested a blanket approval up to a specified point in the route path on the document.
- Canceled: Reviewer has canceled the document. The document will not be routed to any more reviewers.
- Cleared FYI: Reviewer has viewed the document and cleared all of his or her pending FYI(s) on this document.
- Completed: Reviewer has completed and supplied all data requested on document.
- Created Document: User has created a document
- Disapproved: Reviewer has disapproved the document. The document will not being routed to any subsequent reviewers for approval. Acknowledge Requests are sent to previous approvers to inform them of the disapproval.
- Logged Document: Reviewer has added a message to the Route Log of the document.
- Moved Document: Reviewer has moved the document either backward or forward in its routing path.
- Returned to Previous Node: Reviewer has returned the document to a previous routing node. When a Reviewer does this, all the actions taken between the current node and the return node are removed and all the pending requests on the document are deactivated.
- Routed Document: Reviewer has submitted the document to the workflow engine for routing.
- Saved: Reviewer has saved the document for later completion and routing.
- Superuser Approved Document: *Superuser* has approved the entire document, any remaining routing is cancelled.
- Superuser Approved Node: Superuser has approved the document through all nodes up to (but not including) a specific node. When the document gets to that node, the normal Action Requests will be created.
- Superuser Approved Request: Superuser has approved a single pending Approve or Complete Action Request. The document then goes to the next routing node.
- Superuser Cancelled: Superuser has canceled the document. A Superuser can cancel a document without a pending Action Request to him/her on the document.
- Superuser Disapproved: Superuser has disapproved the document. A Superuser can disapprove a document without a pending Action Request to him/her on the document.

	• Superuser Returned to Previous Node: Superuser has returned the document to a previous routing node. A Superuser can do this without a pending Action Request to him/her on the document.
Activated	The state of an action request when it is has been sent to a user's Action List.
Activation	The process by which requests appear in a user's Action List
Activation Type	Defines how a route node handles activation of Action Requests. There are two standard activation types: • Sequential: Action Requests are activated one at a time based on routing priority. The next Action Request isn't activated until the previous request is satisfied. • Parallel: All Action Requests at the route node are activated immediately, regardless of priority
Active Indicator	An indicator specifying whether an object in the system is active or not. Used as an alternative to complete removal of an object.
Ad Hoc Routing	A type of routing used to route a document to users or groups that are not in the Routing path for that Document Type. When the Ad Hoc Routing is complete, the routing returns to its normal path.
Annotation	Optional comments added by a *Reviewer* when taking action. Intended to explain or clarify the action taken or to advise subsequent Reviewers.
Approve	A type of workflow action button. Signifies that the document represents a valid business transaction in accordance with institutional needs and policies in the user's judgment. A single document may require approval from several users, at multiple route levels, before it moves to final status.
Approver	The user who approves the document. As a document moves through Workflow, it moves one route level at a time. An Approver operates at a particular route level of the document.
Attachment	The pathname of a related file to attach to a Note. Use the "Browse..." button to open the file dialog, select the file and automatically fill in the pathname.
Attribute Type	Used to strongly type or categorize the values that can be stored for the various attributes in the system (e.g., the value of the arbitrary key/value pairs that can be defined and associated with a given parent object in the system).
Authentication	The act of logging into the system. The Out of the box (OOTB) authenticaton implementation in Rice does not require a password as it is intended for testing puposes only. This is something that must be enabled as part of an implementation. Various authentication solutions exist, such as CAS or Shibboleth, that an implementer may want to use depending on their needs.
Authorization	Authorization is the permissions that an authenticated user has for performing actions in the system.
Author Universal ID	A free-form text field for the full name of the Author of the Note, expressed as "Lastname, Firstname Initial"

B

Base Rule Attribute

The standard fields that are defined and collected for every *Routing Rule* These include:

- Active: A true/false flag to indicate if the Routing Rule is active. If false, then the rule will not be evaluated during routing.
- Document Type: The *Document Type* to which the Routing Rule applies.
- From Date: The inclusive start date from which the Routing Rule will be considered for a match.
- Force Action: a true/false flag to indicate if the review should be forced to take action again for the requests generated by this rule, even if they had taken action on the document previously.
- Name: the name of the rule, this serves as a unique identifier for the rule. If one is not specified when the rule is created, then it will be generated.
- Rule Template: The Rule Template used to create the Routing Rule.
- To Date: The inclusive end date to which the Routing Rule will be considered for a match.

Blanket Approval

Authority that is given to designated *Reviewers* who can approve a document to a chosen route point. A Blanket Approval bypasses approvals that would otherwise be required in the *Routing* For an authorized Reviewer, the *Doc Handler* typically displays the Blanket Approval button along with the other options. When a Blanket Approval is used, the Reviewers who are skipped are sent Acknowledge requests to notify them that they were bypassed.

Blanket Approve Workgroup

A workgroup that has the authority to Blanket Approve a document.

Branch

A path containing one or more Route Nodes that a document traverses during routing. When a document enters a *Split Node* multiple branches can be created. A *Join Node* joins multiple branches together.

Business Rule

1. Describes the operations, definitions and constraints that apply to an organization in achieving its goals.
2. A restriction to a function for a business reason (such as making a specific object code unavailable for a particular type of disbursement). Customizable business rules are controlled by Parameters.

C

Campus

Identifies the different fiscal and physical operating entities of an institution.

Campus Type

Designates a campus as physical only, fiscal only or both.

Cancel

A workflow action available to document initiators on documents that have not yet been routed for approval. Denotes that the document is void and should be disregarded. Canceled documents cannot be modified in any way and do not route for approval.

Canceled	A routing status. The document is denoted as void and should be disregarded.
CAS - Central Authentication Service	http://www.jasig.org/cas - An open source authentication framework. Kuali Rice provides support for integrating with CAS as an authentication provider (among other authentication solutions) and also provides an implementation of a CAS server that integrates with Kuali Identity Management.
Client	A Java Application Program Interface (API) for interfacing with the Kuali Enterprise Workflow Engine.
Client/Server	The use of one computer to request the services of another computer over a network. The workstation in an organization will be used to initiate a business transaction (e.g., a budget transfer). This workstation needs to gather information from a remote database to process the transaction, and will eventually be used to post new or changed information back onto that remote database. The workstation is thus a Client and the remote computer that houses the database is the Server.
Close	A workflow action available on documents in most statuses. Signifies that the user wishes to exit the document. No changes to Action Requests, Route Logs or document status occur as a result of a Close action. If you initiate a document and close it without saving, it is the same as canceling that document.
Comma-separated value	A file format using commas as delimiters utilized in import and export functionality.
Complete	A pending action request to a user to submit a saved document.
Completed	The action taken by a user or group in response to a request in order to finish populating a document with information, as evidenced in the Document Route Log.
Country Restricted Indicator	Field used to indicate if a country is restricted from use in procurement. If there is no value then there is no restriction.
Creation Date	The date on which a document is created.
CSV	See *comma-separated value*

D

Date Approved	The date on which a document was most recently approved.
Date Finalized	The date on which a document enters the FINAL state. At this point, all approvals and acknowledgments are complete for the document.
Deactivation	The process by which requests are removed from a user's *Action List*
Delegate	A user who has been registered to act on behalf of another user. The Delegate acts with the full authority of the Delegator. Delegation may be either *Primary Delegation* or *Secondary Delegation*.
Delegate Action List	A separate Action List for Delegate actions. When a Delegate selects a Delegator for whom to act, an Action List of all documents sent to the Delegator is displayed. For both *Primary* and *Secondary Delegation* the Delegate may act on any of the entries with the full authority of the Delegator.

Disapprove	A workflow action that allows a user to indicate that a document does not represent a valid business transaction in that user's judgment. The initiator and previous approvers will receive Acknowledgment requests indicating the document was disapproved.
Disapproved	A status that indicates the document has been disapproved by an approver as a valid transaction and it will not generate the originally intended transaction.
Doc Handler	The Doc Handler is a web interface that a Client uses for the appropriate display of a document. When a user opens a document from the Action List or Document Search, the Doc Handler manages access permissions, content format, and user options according to the requirements of the Client.
Doc Handler URL	The URL for the *Doc Handler*.
Doc Nbr	See *Document Number*.
Document	Also see *E-Doc*. An electronic document containing information for a business transaction that is routed for Actions in KEW. It includes information such as Document ID, Type, Title, Route Status, Initiator, Date Created, etc. In KEW, a document typically has XML content attached to it that is used to make routing decisions.
Document Id	See *Document Number*.
Document Number	A unique, sequential, system-assigned number for a document
Document Operation	A workflow screen that provides an interface for authorized users to manipulate the XML and other data that defines a document in workflow. It allows you to access and open a document by Document ID for the purpose of performing operations on the document.
Document Search	A web interface in which users can search for documents. Users may search by a combination of document properties such as Document Type or Document ID, or by more specialized properties using the Detailed Search. Search results are displayed in a list similar to an Action List.
Document Status	See also *Route Status*.
Document Title	The title given to the document when it was created. Depending on the Document Type, this title may have been assigned by the Initiator or built automatically based on the contents of the document. The Document Title is displayed in both the Action List and Document Search.
Document Type	The Document Type defines the routing definition and other properties for a set of documents. Each document is an instance of a Document Type and conducts the same type of business transaction as other instances of that Document Type. Document Types have the following characteristics: • They are specifications for a document that can be created in KEW • They contain identifying information as well as policies and other attributes • They defines the Route Path executed for a document of that type (Process Definition)

- They are hierarchical in nature may be part of a hierarchy of Document Types, each of which inherits certain properties of its *Parent Document Type*.
- They are typically defined in XML, but certain properties can be maintained from a graphical interface

Document Type Hierarchy — A hierarchy of Document Type definitions. Document Types inherit certain attributes from their parent Document Types. This hierarchy is also leveraged by various pieces of the system, including the Rules engine when evaluating rule sets and KIM when evaluating certain Document Type-based permissions.

Document Type Label — The human-readable label assigned to a Document Type.

Document Type Name — The assigned name of the document type. It must be unique.

Document Type Policy — These advise various checks and authorizations for instances of a Document Type during the routing process.

Drilldown — A link that allows a user to access more detailed information about the current data. These links typically take the user through a series of inquiries on different business objects.

Dynamic Node — An advanced type of *Route Node* that can be used to generate complex routing paths on the fly. Typically used whenever the route path of a document cannot be statically defined and must be completely derived from document data.

E

ECL

1. An acronym for Educational Community License.
2. All Kuali software and material is available under the Educational Community License and may be adopted by colleges and universities without licensing fees. The open licensing approach also provides opportunities for support and implementation assistance from commercial affiliates.

E-Doc — An abbreviation for electronic documents, also a shorthand reference to documents created with eDocLite.

eDocLite — A framework for quickly building workflow-enabled documents. Allows you to define document screens in XML and render them using XSL style sheets.

Embedded Client — A type of client that runs an embedded workflow engine.

Employee Status — Found on the Person Document; defines the employee's current employment classification (for example, "A" for Active).

Employee Type — Found on the Person Document; defines the employee's position classification (for example, "P" for Professional).

Entity — An Entity record houses identity information for a given Person, Process, System, etc. Each Entity is categorized by its association with an Entity Type.

Entity Attribute — Entities have directory-like information called Entity Attributes that are associated with them

Entity Attributes make up the identity information for an Entity record.

Entity Type	Provides categorization to Entities. For example, a “System” could be considered an Entity Type because something like a batch process may need to interfact with the application.
Exception	A workflow routing status indicating that the document routed to an exception queue because workflow has encountered a system error when trying to process the document.
Exception Messaging	The set of services and configuration options that are responsible for handling messages when they cannot be successfully delivered. Exception Messaging is set up when you configure KSB using the properties outlined in KSB Module Configuration.
Exception Routing	A type of routing used to handle error conditions that occur during the routing of a document. A document goes into Exception Routing when the workflow engine encounters an error or a situation where it cannot proceed, such as a violation of a Document Type Policy or an error contacting external services. When this occurs, the document is routed to the parties responsible for handling these exception cases. This can be a group configured on the document or a responsibility configured in KIM. Once one of these responsible parties has reviewed the situation and approved the document, it will be resubmitted to the workflow engine to attempt the processing again.
Extended Attributes	Custom, table-driven business object attributes that can be established by implementing institutions.
Extension Rule Attribute	One of the rule attributes added in the definition of a rule template that extends beyond the base rule attributes to differentiate the routing rule. A Required Extension Attribute has its "Required" field set to True in the rule template. Otherwise, it is an Optional Extension Attribute. Extension attributes are typically used to add additional fields that can be collected on a rule. They also define the logic for how those fields will be processed during rule evaluation.

F

Field Lookup	The round magnifying glass icon found next to fields throughout the GUI that allow the user to look up reference table information and display (and select from) a list of valid values for that field.
Final	A workflow routing status indicating that the document has been routed and has no pending approval or acknowledgement requests.
Flexible Route Management	A standard KEW routing scheme based on rules rather than dedicated table-based routing.
FlexRM (Flexible Route Module)	The Route Module that performs the Routing for any Routing Rule is defined through FlexRM. FlexRM generates Action Requests when a Rule matches the data value contained in a document. An abbreviation of "Flexible Route Module." A standard KEW routing scheme that is based on rules rather than dedicated table-based routing.
Force Action	A true/false flag that indicates if previous Routing for approval will be ignored when an *Action Request* is generated. The flag is used in multiple contexts where requests are generated (e.g., rules, ad hoc routing). If Force Action is False, then prior Actions taken by a user can satisfy newly generated requests. If it is True, then the user needs to take another Action to satisfy the request.

FYI	A workflow action request that can be cleared from a user's Action List with or without opening and viewing the document. A document with no pending approval requests but with pending Acknowledge requests is in Processed status. A document with no pending approval requests but with pending FYI requests is in Final status. See also *Ad Hoc Routing* and *Action Request*.

G

Group	A Group has members that can be either *Principals* or other Groups (nested). Groups essentially become a way to organize Entities (via Principal relationships) and other Groups within logical categories. Groups can be given authorization to perform actions within applications by assigning them as members of *Roles*. Groups can also have arbitrary identity information (i.e., *Group Attributes* hanging from them. Group Attributes might be values for "Office Address," "Group Leader," etc. Groups can be maintained at runtime through a user interface that is capable of workflow.
Group Attribute	Groups have directory-like information called Group Attributes hanging from them. "Group Phone Number" and "Team Leader" are examples of Group Attributes. Group Attributes make up the identity information for a Group record. Group Attributes can be maintained at runtime through a user interface that is capable of workflow.

H

Hierarchical Tree Structure	A hierarchical representation of data in a graphical form.

I

Initialized	The state of an Action Request when it is first created but has not yet been Activated (sent to a user’s Action List).
Initiated	A workflow routing status indicating a document has been created but has not yet been saved or routed. A Document Number is automatically assigned by the system.
Initiator	A user role for a person who creates (initiates or authors) a new document for routing. Depending on the permissions associated with the Document Type, only certain users may be able to initiate documents of that type.
Inquiry	A screen that allows a user to view information about a business object.

J

Join Node	The point in the routing path where multiple branches are joined together. A Join Node typically has a corresponding *Split Node* for which it joins the branches.

K

KC - Kuali Coeus	TODO
KCA - Kuali Commercial Affiliates	A designation provided to commercial affiliates who become part of the Kuali Partners Program to provide for-fee guidance, support, implementation, and integration services related to the Kuali software. Affiliates hold no ownership of Kuali intellectual property, but are full KPP participants. Affiliates may provide packaged versions of Kuali that provide value for installation or integration beyond the basic Kuali software. Affiliates may also offer other types of training, documentation, or hosting services.
KCB – Kuali Communications Broker	KCB is logically related to KEN. It handles dispatching messages based on user preferences (email, SMS, etc.).
KEN - Kuali Enterprise Notification	A key component of the Enterprise Integration layer of the architecture framework. Its features include: • Automatic Message Generation and Logging • Message integrity and delivery standards • Delivery of notifications to a user's Action List
KEW – Kuali Enterprise Workflow	Kuali Enterprise Workflow is a general-purpose electronic routing infrastructure, or workflow engine. It manages the creation, routing, and processing of electronic documents (eDocs) necessary to complete a transaction. Other applications can also use Kuali Enterprise Workflow to automate and regulate the approval process for the transactions or documents they create.
KFS – Kuali Financial System	Delivers a comprehensive suite of functionality to serve the financial system needs of all Carnegie-Class institutions. An enhancement of the proven functionality of Indiana University's Financial Information System (FIS), KFS meets GASB and FASB standards while providing a strong control environment to keep pace with advances in both technology and business. Modules include financial transactions, general ledger, chart of accounts, contracts and grants, purchasing/accounts payable, labor distribution, budget, accounts receivable and capital assets.
KIM – Kuali Identity Management	A Kuali Rice module, Kuali Identity Management provides a standard API for persons, groups, roles and permissions that can be implemented by an institution. It also provdies an out of the box reference implementation that allows for a university to use Kuali as their Identity Management solution.
KNS – Kuali Nervous System	A core technical module composed of reusable code components that provide the common, underlying infrastructure code and functionality that any module may employ to perform its functions (for example, creating custom attributes, attaching electronic images, uploading data from desktop applications, lookup/ search routines, and database interaction).
KPP - Kuali Partners Program	The Kuali Partners Program (KPP) is the means for organizations to get involved in the Kuali software community and influence its future through voting rights to determine software development priorities. Membership dues pay staff to perform Quality Assurance (QA) work, release engineering, packaging, documentation, and other work to coordinate the timely enhancement and release of quality

	software and other services valuable to the members. Partners are also encouraged to tender functional, technical, support or administrative staff members to the Kuali Foundation for specific periods of time.
KRAD - Kuali Rapid Application Development	TODO
KRMS - Kuali Rules Management System	TODO
KS - Kuali Student	Delivers a means to support students and other users with a student-centric system that provides real-time, cost-effective, scalable support to help them identify and achieve their goals while simplifying or eliminating administrative tasks. The high-level entities of person (evolving roles-student, instructor, etc.), time (nested units of time - semesters, terms, classes), learning unit (assigned to any learning activity), learning result (grades, assessments, evaluations), learning plan (intentions, activities, major, degree), and learning resources (instructors, classrooms, equipment). The concierge function is a self-service information sharing system that aligns information with needs and tasks to accomplish goals. The support for integration of locally-developed processes provides flexibility for any institution's needs.
KSB – Kuali Service Bus	Provides an out-of-the-box service architecture and runtime environment for Kuali Applications. It is the cornerstone of the Service Oriented Architecture layer of the architectural reference framework. The Kuali Service Bus consists of: • A services registry and repository for identifying and instantiating services • Run time monitoring of messages • Support for synchronous and asynchronous service and message paradigms
Kuali	1. Pronounced "ku-wah-lee". A partnership organization that produces a suite of community-source, modular administrative software for Carnegie-class higher education institutions. See also *Kuali Foundation* 2. (n.) A humble kitchen wok that plays an important role in a successful kitchen.
Kuali Foundation	Employs staff to coordinate partner efforts and to manage and protect the Foundation's intellectual property. The Kuali Foundation manages a growing portfolio of enterprise software applications for colleges and universities. A lightweight Foundation staff coordinates the activities of Foundation members for critical software development and coordination activities such as source code control, release engineering, packaging, documentation, project management, software testing and quality assurance, conference planning, and educating and assisting members of the Kuali Partners program.
Kuali Rice	Provides an enterprise-class middleware suite of integrated products that allow both Kuali and non-Kuali applications to be built in an agile fashion, such that developers are able to react to end-user business requirements in an efficient manner to produce high-quality business applications. Built with Service Oriented Architecture (SOA) concepts in mind, KR enables developers to build robust systems with common enterprise workflow functionality, customizable and configurable user interfaces with a clean and universal look and feel, and general notification features to allow for a consolidated list of work "action items." All of this adds up to providing a re-usable development framework that

	encourages a simplified approach to developing true business functionality as modular applications.

L

Last Modified Date	The date on which the document was last modified (e.g., the date of the last action taken, the last action request generated, the last status changed, etc.).

M

Maintenance Document	An e-doc used to establish and maintain a table record.
Message	The full description of a *notification message*. This is a specific field that can be filled out as part of the Simple Message or Event Message form. This can also be set by the programmatic interfaces when sending notifications from a client system.
Message Queue	Allows administrators to monitor messages that are flowing through the Service Bus. Messages can be edited, deleted or forwarded to other machines for processing from this screen.

N

Namespace	A Namespace is a way to scope both *Permissions* and *Entity Attributes* Each Namespace instance is one level of scoping and is one record in the system. For example, "KRA" or "KFS" could be a Namespace. Or you could further break those up into more finer grained Namespaces such that they would roughly correlate to functional modules within each application. Examples could be "KRA Rolodex", "KRA Grants", "KFS Chart of Accounts". Out of the box, the system is bootstrapped with numerous Rice namespaces which correspond to the different modules. There is also a default namespace of “KUALI”. Namespaces can maintained at runtime through a maintenance document.
Note Text	A free-form text field for the text of a Note
Notification Content	This section of a *notification message* which displays the actual full message for the notification along with any other content-type-specific fields.

O

OOTB	Stands for "out of the box" and refers to the base deliverable of a given feature in the system.
Optimistic Locking	A type of “locking” that is placed on a database row by a process to prevent other processes from updating that row before the first process is complete. A characteristic of this locking technique is that another user who wants to make modifications at the same time as another user is permitted to, but the first one who submits their changes will have them applied. Any subsequent changes will result in the user being notified of the optimistic lock and their changes will not be applied. This technique assumes that another update is unlikely.

Optional Rule Extension Attribute	An Extension Attribute that is not required in a Rule Template. It may or may not be present in a *Routing Rule* created from the Template. It can be used as a conditional element to aid in deciding if a Rule matches. These Attributes are simply additional criteria for the Rule matching process.
Org Doc #	The originating document number.
Organization	Refers to a unit within the institution such as department, responsibility center, campus, etc.
Organization Code	Represents a unique identifier assigned to units at many different levels within the institution (for example, department, responsibility center, and campus).

P

Parameter Component Code	Code identifying the parameter Component.
Parameter Description	This field houses the purpose of this parameter.
Parameter Name	This will be used as the identifier for the parameter. Parameter values will be accessed using this field and the namespace as the key.
Parameter Type Code	Code identifying the parameter type. Parameter Type Code is the primary key for its' table.
Parameter Value	This field houses the actual value associated with the parameter.
Parent Document Type	A Document Type from which another *Document Type* derives. The child type can inherit certain properties of the parent type, any of which it may override. A Parent Document Type may have a parent as part of a hierarchy of document types.
Parent Rule	A Routing Rule in KEW from which another Routing Rule derives. The child Rule can inherit certain properties of the parent Rule, any of which it may override. A Parent Rule may have a parent as part of a hierarchy of Rules.
Permission	Permissions represent fine grained actions that can be mapped to functionality within a given system. Permissions are scoped to *Namespace* which roughly correlate to modules or sections of functionality within a given system. A developer would code authorization checks in their application against these permissions. Some examples would be: "canSave", "canView", "canEdit", etc. Permissions are aggregated by *Roles*. Permissions can be maintained at runtime through a user interface that is capable of workflow; however, developers still need to code authorization checks against them in their code, once they are set up in the system. Attributes 1. Id - a system generated unique identifier that is the primary key for any Permission record in the system 2. Name - the name of the permission; also a human understandable unique identifier

	3. Description - a full description of the purpose of the Permission record 4. Namespace - the reference to the associated *Namespace* Relationships 1. Permission to *Role* - many to many; this relationship ties a Permission record to a Role that is authorized for the Permission 2. Permission to *Namespace* - many to one; this relationship allows for scoping of a Permission to a Namespace that contains functionality which keys its authorization checking off of said
Person Identifier	The username of an individual user who receives the document ad hoc for the Action Requested
Person Role	Creates or maintains the list used in selection of personnel when preparing the Routing Form document.
Pessimistic Locking	A type of lock placed on a database row by a process to prevent other processes from reading or updating that row until the first process is finished. This technique assumes that another update is likely.
Plugins	A plugin is a packaged set of code providing essential services that can be deployed into the Rice standalone server. Plugins usually contains only classes used in routing such as custom rules or searchable attributes, but can contain client application specific services. They are usually used only by clients being implemented by the 'Thin Client' method
Post Processor	A routing component that is notified by the workflow engine about various events pertaining to the routing of a specific document (e.g., node transition, status change, action taken). The implementation of a Post Processor is typically specific to a particular set of Document Types. When all required approvals are completed, the engine notifies the Post Processor accordingly. At this point, the Post Processor is responsible for completing the business transaction in the manner appropriate to its Document Type.
Posted Date/Time Stamp	A free-form text field that identifies the time and date at which the Notes is posted.
Postal Code	Defines zip code to city and state cross-references.
Preferences	User options in an Action List for displaying the list of documents. Users can click the Preferences button in the top margin of the Action List to display the Action List Preferences screen. On the Preferences screen, users may change the columns displayed, the background colors by Route Status, and the number of documents displayed per page.
Primary Delegation	The Delegator turns over full authority to the Delegate. The Action Requests for the Delegator only appear in the Action List of the Primary Delegate. The Delegation must be registered in KEW or KIM to be in effect.
Principal	A Principal represents an *Entity* that can authenticate into the system. One can roughly correlate a Principal to a login username. Entities can exist in KIM without having permissions or authorization to do anything; therefore, a Principal must exist and must be associated with an Entity in order for it to have access privileges. All authorization that is not specific to *Groups* is tied to a Principal.

	In other words, an Entity is for identity while a Principal is for access management. Also note that an Entity is allowed to have multiple Principals associated with it. The use case typically given here is that a person may apply to a school and receive one log in for the application system; however, once accepted, they may receive their official login, but use the same identity information set up for their Entity record.
Processed	A routing status indicating that the document has no pending approval requests but still has one or more pending acknowledgement requests.

R

Recipient Type	The type of entity that is receiving an Action Request. Can be a user, workgroup, or role.
Required Rule Extension Attribute	An Extension Attribute that is required in a Rule Template. It will be present in every Routing Rule created from the Template.
Responsibility	See *Responsible Party*.
Responsibility Id	A unique identifier representing a particular responsibility on a rule (or from a *route module* This identifier stays the same for a particular responsibility no matter how many times a rule is modified.
Responsible Party	The Reviewer defined on a routing rule that receives requests when the rule is successfully executed. Each routing rule has one or more responsible parties defined.
Reviewer	A user acting on a document in his/her *Action List* and who has received an *Action Request* for the document.
Rice	An abbreviation for Kuali Rice.
Role	Roles aggregate *Permissions* When Roles are given to *Entities* (via their relationship with Principals) or *Groups* an authorization for all associated Permissions is granted.
Route Header Id	Another name for the *Document Id*.
Route Log	Displays information about the routing of a document. The Route Log is usually accessed from either the Action List or a Document Search. It displays general document information about the document and a detailed list of Actions Taken and pending *Action Requests* for the document. The Route Log can be considered an audit trail for a document.
Route Module	A routing component that the engine uses to generate action requests at a particular *Route Node*. *FlexRM* (Flexible Route Module) is a general Route Module that is rule-based. Clients can define their own Route Modules that can conduct specialized Routing based on routing tables or any other desired implementation.
Route Node	Represents a step in the routing process of a document type. Route node "instances" are created dynamically as a document goes through its routing process and can be defined to perform any function. The most common functions are to generate Action Requests or to split or join the route path.

- Simple: do some arbitrary work
- Requests: generate action requests using a Route Module or the Rules engine
- Split: split the route path into one or more parallel branches
- Join: join one or more branches back together
- Sub Process: execute another route path inline
- Dynamic: generate a dynamic route path

Route Path — The path a document follows during the routing process. Consists of a set of route nodes and branches. The route path is defined as part of the *document type* definition.

Route Status — The status of a document in the course of its routing:

- Approved: These documents have been approved by all required reviewers and are waiting additional postprocessing.
- Cancelled: These documents have been stopped. The document's initiator can 'Cancel' it before routing begins or a reviewer of the document can cancel it after routing begins. When a document is cancelled, routing stops; it is not sent to another Action List.
- Disapproved: These documents have been disapproved by at least one reviewer. Routing has stopped for these documents.
- Enroute: Routing is in progress on these documents and an action request is waiting for someone to take action.
- Exception: A routing exception has occurred on this document. Someone from the Exception Workgroup for this Document Type must take action on this document, and it has been sent to the Action List of this workgroup.
- Final: All required approvals and all acknowledgements have been received on these documents. No changes are allowed to a document that is in Final status.
- Initiated: A user or a process has created this document, but it has not yet been routed to anyone's Action List.
- Processed: These documents have been approved by all required users, and is completed on them. They may be waiting for Acknowledgements. No further action is needed on these documents.
- Saved: These documents have been saved for later work. An author (initiator) can save a document before routing begins or a reviewer can save a document before he or she takes action on it. When someone saves a document, the document goes on that person's Action List.

Routed By User — The user who submits the document into routing. This is often the same as the Initiator. However, for some types of documents they may be different.

Routing — The process of moving a document through its route path as defined in its Document Type. Routing is executed and administered by the workflow engine.

This process will typically include generating Action Requests and processing actions from the users who receive those requests. In addition, the Routing process includes callbacks to the Post Processor when there are changes in document state.

Routing Priority

A number that indicates the routing priority; a smaller number has a higher routing priority. Routing priority is used to determine the order that requests are activated on a route node with sequential activation type.

Routing Rule

A record that contains the data for the *Rule Attributes* specified in a *Rule Template* It is an instance of a Rule Template populated to determine the appropriate Routing. The Rule includes the Base Attributes, Required Extension Attributes, Responsible Party Attributes, and any Optional Extension Attributes that are declared in the Rule Template. Rules are evaluated at certain points in the routing process and, when they fire, can generate Action Requests to the responsible parties that are defined on them.

Technical considerations for a Routing Rules are:

- Configured via a GUI (or imported from XML)
- Created against a Rule Template and a Document Type
- The Rule Template and it's list of Rule Attributes define what fields will be collected in the Rule GUI
- Rules define the users, groups and/or roles who should receive action requests
- Available Action Request Types that Rules can route
  - Complete
  - Approve
  - Acknowledge
  - FYI
- During routing, Rule Evaluation Sets are "selected" at each node. Default is to select by Document Type and Rule Template defined on the Route Node
- Rules match (or 'fire') based on the evaluation of data on the document and data contained on the individual rule
- Examples
  - If dollar amount is greater than $10,000 then send an Approval request to Joe.
  - If department is "HR" request an Acknowledgment from the HR.Acknowledgers workgroup.

Rule Attribute

Rule attributes are a core KEW data element contained in a document that controls its Routing. It participates in routing as part of a Rule Template and is responsible for defining custom fields that can be rendered on a routing rule. It also defines the logic for how rules that contain the attribute data are evaluated.

Technical considerations for a Rule Attribute are:

- They might be backed by a Java class to provide lookups and validations of appropriate values.
- Define how a Routing Rule evaluates document data to determine whether or not the rule data matches the document data.
- Define what data is collected on a rule.
- An attribute typically corresponds to one piece of data on a document (i.e dollar amount, department, organization, account, etc.).
- Can be written in Java or defined using XML (with matching done by XPath).
- Can have multiple GUI fields defined in a single attribute.

Rule QuickLinks

A list of document groups with their document hierarchies and actions that can be selected. For specific document types, you can create the rule delegation.

Rule Template

A Rule Template serves as a pattern or design for the routing rules. All of the Rule Attributes that include both Required and _Optional_ are contained in the Rule Template; it defines the structure of the routing rule of FlexRM. The Rule Template is also used to associate certain Route Nodes on a document type to routing rules.

Technical considerations for a Rule Templates are:

- They are a composition of Rule Attributes
- Adding a ‘Role’ attribute to a template allows for the use of the Role on any rules created against the template
- When rule attributes are used for matching on rules, each attribute is associated with the other attributes on the template using an implicit ‘and’ logic qualifier
- Can be used to define various other aspects to be used by the rule creation GUI such as rule data defaults (effective dates, ignore previous, available request types, etc)

S

Save

A workflow action button that allows the Initiator of a document to save their work and close the document. The document may be retrieved from the initiator's Action List for completion and routing at a later time.

Saved

A routing status indicating the document has been started but not yet completed or routed. The Save action allows the initiator of a document to save their work and close the document. The document may be retrieved from the initiator's action list for completion and routing at a later time.

Searchable Attributes

Attributes that can be defined to index certain pieces of data on a document so that it can be searched from the *Document Search screen*.

Technical considerations for a Searchable Attributes are:

- They are responsible for extracting and indexing document data for searching

	• They allow for custom fields to be added to Document Search for documents of a particular type • They are configured as an attribute of a Document Type • They can be written in Java or defined in XML by using Xpath to facilitate matching
Secondary Delegation	The Secondary Delegate acts as a temporary backup Delegator who acts with the same authority as the primary Approver/the Delegator when the Delegator is not available. Documents appear in the Action Lists of both the Delegator and the Delegate. When either acts on the document, it disappears from both Action Lists. Secondary Delegation is often configured for a range of dates and it must be registered in KEW or KIM to be in effect.
Service Registry	Displays a read-only view of all of the services that are exposed on the Service Bus and includes information about them (for example, IP Address, or Endpoint URL).
Simple Node	A type of node that can perform any function desired by the implementer. An example implementation of a simple node is the node that generates Action Requests from route modules.
SOA	An acronym for Service Oriented Architecture.
Special Condition Routing	This is a generic term for additional route levels that might be triggered by various attributes of a transaction. They can be based on the type of document, attributes of the accounts being used, or other attributes of the transaction. They often represent special administrative approvals that may be required.
Split Node	A node in the routing path that can split the route path into multiple branches.
Spring	The Spring Framework is an open source application framework for the Java platform.
State	Defines U.S. Postal Service codes used to identify states.
Status	On an Action List; also known as Route Status. The current location of the document in its routing path.
Submit	A workflow action button used by the initiator of a document to begin workflow routing for that transaction. It moves the document (through workflow) to the next level of approval. Once a document is submitted, it remains in 'ENROUTE' status until all approvals have taken place.
Superuser	A user who has been given special permission to perform Superuser Approvals and other Superuser actions on documents of a certain Document Type.
Superuser Approval	Authority given Superusers to approve a document of a chosen Route Node. A Superuser Approval action bypasses approvals that would otherwise be required in the Routing. It is available in Superuser Document Search. In most cases, reviewers who are skipped are not sent Acknowledge Action Requests.
Superuser Document Search	A special mode of Document Search that allows Superusers to access documents in a special Superuser mode and perform administrative functions on those

	documents. Access to these documents is governed by the user's membership in the Superuser Workgroup as defined on a particular Document Type.

T

Thread pool	A technique that improves overall system performance by creating a pool of threads to execute multiple tasks at the same time. A task can execute immediately if a thread in the pool is available or else the task waits for a thread to become available from the pool before executing.
Title	A short summary of the notification message. This field can be filled out as part of the Simple Message or Event Message form. In addition, this can be set by the programmatic interfaces when sending notifications from a client system. This field is equivalent to the "Subject" field in an email.

U

URL	An acronym for Uniform Resource Locator.
User	A person who can log in and use the application. This term is synonymous with “Principal” in KIM.

V

Viewer	A user(s) who views a document during the routing process. This includes users who have action requests generated to them on a document.

W

Web Service Client	A type of client that connects to a standalone KEW server using Web Services.
Wildcard	A character that may be substituted for any of a defined subset of all possible characters.
Workflow	Electronic document routing, approval and tracking. Also known as Workflow Services or Kuali Enterprise Workflow (KEW). The Kuali infrastructure service that electronically routes an e-doc to its approvers in a prescribed sequence, according to established business rules based on the e-doc content. See also *Kuali Enterprise Workflow*.
Workflow Engine	The component of KEW that handles initiating and executing the route path of a document.
Workflow QuickLinks	A web interface that provides quick navigation to various functions in KEW. These include: • Quick EDoc Watch: The last five Actions taken by this user. The user can select and repeat these actions. • Quick EDoc Search: The last five EDocs searched for by this user. The user can select one and repeat that search.

- Quick Action List: The last five document types the user took action with. The user can select one and repeat that action.

X

XML	See also *XML Ingester*. 1. An acronym for Extensible Markup Language. 2. Used for data import/export.
XML Ingester	A workflow function that allows you to browse for and upload XML data.
XML RuleAttribute	Similar in functionality to a RuleAttribute but built using XML only