
Kuali Rice 2.4.1 KNS to KRAD Conversion Guide

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Introduction

This technical documentation outlines what is needed for conversion of existing Kuali Rice applications using KNS to move to the new KRAD development framework. Here we identify the changes between the KNS and KRAD application features. Detailed documentation of KRAD features and how to use them are not included in this document, but can be found in the [KRAD Guide](#).

The KNS2KRAD Conversion Script is a tool provided by the Kuali Rice team to automate as much as is reasonably possible. Throughout this document the following items are used to indicate if the item is converted via the script or must be done manually.

script conversion Feature can be converted with the conversion script.

manual conversion Feature conversion is not easily automated and needs to be converted manually.

Process Overview

There are five main steps involved in converting from KNS to KRAD:

1. [Convert OJB BusinessObject Mappings to JPA Annotations.](#)
 - Configure and run provided automated conversion script.
 - Review conversions and resolve reported issues.
2. Convert data dictionary into KRAD compliant format.
 - Convert validation patterns to constraint.
 - Convert control definitions into UIF controls.
3. Convert KNS definitions into KRAD UIF components.

- Convert inquiry and lookup definitions into view.
 - Convert section definition into UIF groups
 - Convert field definitions into UIF input fields
4. Convert Struts to Spring MVC.
 - Convert Struts and their actions into UIF controllers.
 - Convert action paths into request mapping annotations in the controller.
 5. Convert JSP and tags into UIF components
 - Convert jsp tags into UIF components.
 - Convert jstl calls into spring el conditionals.
 - Convert document into view.
 - Convert kul:tabs into UIF disclosure.
 - Convert html tables into grid layouts.
 - Convert attributes/control tags into UIF input fields.
 - Convert image submit tags into action buttons

How to Run the Conversion Script

The automated KRAD conversion script is called `KRADConversion.groovy` and will process lookup, inquiry, and `MaintenanceDocumentEntries` into KRAD-compliant XML files. To run the script, complete the following steps:

1. Step 1
2. Step 2
3. ...

Data Dictionary Conversion

The Data Dictionary is a repository of metadata primarily describing data objects and their properties with attribute Definitions that provide the metadata about the attributes (i.e. fields) of a data object. The conversion script will automate part of the conversion for your data dictionary files, but some data dictionary attributes require no conversion since they are virtually identical between KNS and KRAD. The following sections identify the Business Object bean properties, Validation Patterns, and Control Definitions which are converted by the script and those which require manual conversion.

BusinessObjectEntry bean replaced by DataObjectEntry bean

KNS Code example:

```
1 <bean id="Book" parent="Book-parentBean"/>
2 <bean id="Book-parentBean" abstract="true" parent="BusinessObjectEntry">
3   <property name="businessObjectClass" value="org.kuali.rice.knsapp.Book"/>
4   <property name="inquiryDefinition">
5     <ref bean="Book-inquiryDefinition"/>
6   </property>
7   <property name="lookupDefinition">
8     <ref bean="Book-lookupDefinition"/>
9   </property>
10  <property name="titleAttribute" value="id"/>
11  <property name="objectLabel" value="Book"/>
12  <property name="attributes">
13    <list>
14      <ref bean="Book-id"/>
15      <ref bean="Book-title"/>
16      <ref bean="Book-price"/>
17    </list>
18  </property>
19 </bean>
```

KRAD code example:

```
1 <bean id="Book" parent="Book-parentBean"/>
2 <bean id="Book-parentBean" abstract="true" parent="DataObjectEntry">
3   <property name="dataObjectClass" value="org.kuali.rice.knsapp.Book"/>
4   <property name="titleAttribute" value="id"/>
5   <property name="objectLabel" value="Book"/>
6   <property name="attributes">
7     <list>
8       <ref bean="Book-id"/>
9       <ref bean="Book-title"/>
10      <ref bean="Book-price"/>
11    </list>
12  </property>
13 </bean>
```

- The parent bean for data dictionary beans in KRAD is **DataObjectEntry** instead of the KNS **BusinessObjectEntry**. [KNS line: 2, KRAD line: 2] [script conversion](#)
- The data object class is specified via the **dataObjectClass** property is no longer specified via the **businessObjectClass** property. A **businessObject** is no longer required and any object can be used. [KNS line: 3, KRAD line: 3] [script conversion](#)

Attribute Definitions

Attribute Definitions define the meta-data of an object and many of the Attribute Definition properties remain the same between KNS and KRAD. The major differences are in how validation constraints and controls are defined. The examples below demonstrate the differences for defining various validation and controls.

KNS Attribute Definition code example:

```
1 <bean id="Country-code" parent="Country-code-parentBean"/>
2 <bean id="Country-code-parentBean" abstract="true" parent="AttributeDefinition">
3   <property name="name" value="code"/>
4   <property name="forceUppercase" value="true"/>
5   <property name="label" value="Country Code"/>
6   <property name="shortLabel" value="Country Code"/>
7   <property name="maxLength" value="2"/>
8   <property name="required" value="true"/>
9   <property name="summary" value="Postal Country Code"/>
10  <property name="description" value="The code uniquely identify a country."/>
```

```
11 <property name="validationPattern">
12   <bean parent="AlphaNumericValidationPattern"/>
13 </property>
14 <property name="control">
15   <bean parent="TextControlDefinition" p:size="2"/>
16 </property>
17 </bean>
```

KRAD Attribute Definition code example:

```
1 <bean id="Country-code" parent="Country-code-parentBean"/>
2 <bean id="Country-code-parentBean" abstract="true" parent="AttributeDefinition">
3   <property name="name" value="code"/>
4   <property name="forceUppercase" value="true"/>
5   <property name="label" value="Country Code"/>
6   <property name="shortLabel" value="Country Code"/>
7   <property name="maxLength" value="2"/>
8   <property name="required" value="true"/>
9   <property name="summary" value="Postal Country Code"/>
10  <property name="description" value="The code uniquely identify a country."/>
11  <property name="validCharactersConstraint">
12    <bean parent="AlphaNumericPatternConstraint"/>
13  </property>
14  <property name="controlField">
15    <bean parent="Uif-TextControl" p:size="2"/>
16  </property>
17 </bean>
```

- The property **validCharactersConstraint** is used in KRAD in place of the KNS property **validationPattern**. [KNS line: 11, KRAD line: 11] **script conversion**
- The constraint **AnyCharacterPatternConstraint** replaces the KNS pattern **AnyCharacterValidationPattern**. [KNS line: 12, KRAD line: 12] **script conversion**
- The property **controlField** replaces the KNS **control** to define the control used to represent this field. [KNS line: 14, KRAD line: 14] **script conversion**
- The property **Uif-TextControl** replaces the KNS **TextControlDefinition**. [KNS line: 5, KRAD line: 15] **script conversion**
- The property **forceUppercase** remains the same in KRAD, however you can also specify **@ForceUppercase** annotation for a property in KRAD.
- The size property and similar properties of TextControl are converted or carried over by the script. [KNS line: 15, KRAD line: 15] **script conversion**

Validation Patterns

The KNS validation patterns are supported in KRAD, but the naming convention has changed for constraints and patterns even though the functionality is the same. KRAD also has several other validations available which are described in more detail in the [KRAD Guide](#). The example below demonstrates the differences in defining validation constraints using a single validation pattern and several such patterns are available.

KNS validationPattern property example:

```
1 <property name="validationPattern">
```

```
2 <bean parent="AnyCharacterValidationPattern" p:allowWhitespace="true"/>
3 </property>
```

KRAD validCharactersConstraint property example:

```
1 <property name="validCharactersConstraint">
2   <bean parent="AnyCharacterPatternConstraint" p:allowWhitespace="true"/>
3 </property>
```

- The property **validCharactersConstraint** is used in KRAD in place of the KNS property **validationPattern**. [script conversion](#)
- The constraint **AnyCharacterPatternConstraint** replaces the KNS pattern **AnyCharacterValidationPattern**. [script conversion](#)
- The constraint **AlphaNumericPatternConstraint** replaces the KNS pattern **AlphaNumericValidationPattern**. [script conversion](#)
- The constraint **AlphaPatternConstraint** replaces the KNS pattern **AlphaValidationPattern**. [script conversion](#)
- The constraint **CharsetPatternConstraint** replaces the KNS pattern **CharsetValidationPattern**. [script conversion](#)
- The constraint **RegexPatternConstraint** replaces the KNS pattern **RegexValidationPattern**. [script conversion](#)
- The constraint **FixedPointPatternConstraint** replaces the KNS pattern **FixedPointValidationPattern**. [script conversion](#)
- The constraint **FloatingPointPatternConstraint** replaces the KNS pattern **FloatingPointValidationPattern**. [script conversion](#)
- The constraint **ZipcodePatternConstraint** replaces the KNS pattern **ZipcodeValidationPattern**. [script conversion](#)
- The constraint **YearPatternConstraint** replaces the KNS pattern **YearValidationPattern**. [script conversion](#)
- The constraint **TimestampPatternConstraint** replaces the KNS pattern **TimestampValidationPattern**. [script conversion](#)
- The constraint **PhoneUSPatternConstraint** replaces the KNS pattern **PhoneNumberValidationPattern**. [script conversion](#)
- The constraint **MonthPatternConstraint** replaces the KNS pattern **MonthValidationPattern**. [script conversion](#)

- The constraint `JavaClassPatternConstraint` replaces the KNS pattern `JavaClassValidationPattern`. **script conversion**
- The constraint `EmailPatternConstraint` replaces the KNS pattern `EmailAddressValidationPattern`. **script conversion**
- The constraint `DatePatternConstraint` replaces the KNS pattern `DateValidationPattern`. **script conversion**
- The constraint `UTF8AnyCharacterValidationPattern` replaces the KNS pattern `UTF8AnyCharacterValidationPattern`. **script conversion**
- Sub-properties for the validation pattern constraint beans, such as `allowWhitespace="true"` in the above example are either carried over or converted as appropriate. **script conversion**

Other Constraints

In addition to the `validCharactersConstraint`, KRAD has several other constraints available:

- `AllowCharacterConstraint`
- `BaseConstraint`
- `CaseConstraint`
- `CollectionSizeConstraint`
- `DataTypeConstraint`
- `ExistenceConstraint`
- `LengthConstraint`
- `LookupConstraint`
- `MustOccurConstraint`
- `PrerequisiteConstraint`
- `RangeConstraint`
- `SimpleConstraint`
- `WhenConstraint`

See the [KRAD Guide](#) for more detail.

Additional Constraint Patterns

KRAD has additional constraint patterns too such as:

- `ConfigurationBasedRegexPatternConstraint`
- `IntegerPatternConstraint`
- `ValidCharactersPatternConstraint`

- **ValidDataPatternConstraint**

See the [KRAD Guide](#) for more detail.

Controls

Control components are defined to determine which HTML element(s) are rendered to represent the input field. Here is an example of a Text control within an Attribute Definition.

KNS Control example:

```
1 <property name="control">
2   <bean parent="TextControlDefinition" p:size="10"/>
3 </property>
```

KRAD Control example:

```
1 <property name="controlField">
2   <bean parent="Uif-TextControl" p:size="10"/>
3 </property>
```

- The property **controlField** replaces the KNS **control** to define the control used to represent this field. [KNS line: 1, KRAD line: 1] **script conversion**
- The property **control** is currently deprecated.
- The property names of the various controls have changed. In the above example, **Uif-TextControl** replaces the KNS **TextControlDefinition**. [KNS line: 2, KRAD line: 2] **script conversion**
- The sub-properties for the various controls, ex: **p:size="10"** are converted or carried over by the script. [KNS line: 2, KRAD line: 2] **script conversion**

Button Control

An action component that is configured to render a button. The button element can include text (the label) along with an image.

KNS Button Control example:

```
1 <property name="control">
2   <bean parent="ButtonControlDefinition"/>
3 </property>
```

KRAD Button Control example:

```
1 <property name="controlField">
2   <bean parent="Uif-PrimaryActionButton" id="Submit" p:methodToCall="save"/>
3 </property>
```

- The property **Uif-PrimaryActionButton** replaces the KNS **ButtonControlDefinition**. **script conversion**

- There are actually several alternative action controls pre-configured with different styling. These include:

- **Uif-PrimaryActionButton-Small**
- **Uif-SecondaryActionButton**
- **Uif-SecondaryActionButton-Small**
- **Uif-ActionImage**
- **Uif-ActionLink**

See the [KRAD Guide](#). for more detail

Checkbox Control

The Checkbox control renders an HTML input tag with type of “checkbox”. This control is used to toggle the state of a property between two values (usually the Booleans true and false).

KNS Checkbox Control example:

```
1 <property name="control">
2   <bean parent="CheckboxControlDefinition"/>
3 </property>
```

KRAD Checkbox Control example:

```
1 <property name="controlField">
2   <bean parent="Uif-CheckboxControl"/>
3 </property>
```

- The property **Uif-CheckboxControl** replaces the KNS **CheckboxControlDefinition**. **script conversion**
- Also available in KRAD are the Checkbox Group Controls: **Uif-VerticalCheckboxesControl** and **Uif-HorizontalCheckboxesControl**. The CheckboxesGroup control is a multi-value control that presents each option as a checkbox. See the [KRAD Guide](#). for more detail.

Currency Control

Same as a Text control, except has an added style class of 'uif-currencyControl' which adds a right align style to the control useful for displaying currency.

KNS Currency control example:

```
1 <property name="control">
2   <bean parent="CurrencyControlDefinition" p:formattedMaxLength="26" p:size="10"/>
3 </property>
```

KRAD Currency Text control example:

```
1 <property name="controlField">
2   <bean parent="Uif-CurrencyTextControl" p:maxLength="26" p:size="10" />
```

```
3 </property>
```

- The property `Uif-CurrencyTextControl` replaces the KNS `CurrencyControlDefinition`. [KNS line: 2, KRAD line: 2] **script conversion**
- The sub-property `maxlength` replaces the KNS `formattedMaxLength` property. [KNS line: 2, KRAD line: 2] **script conversion**

File Control

The File control is used to allow the user to select a file from their file system whose contents will be submitted with the form. The server can then make use of the file contents or simply store the file on the server (for example a note attachment).

KNS File Control example:

```
1 <property name="control">
2   <bean parent="FileControlDefinition"/>
3 </property>
```

KRAD File Control example:

```
1 <property name="controlField">
2   <bean parent="Uif-FileControl"/>
3 </property>
```

- The property `Uif-FileControl` replaces the KNS `FileControlDefinition`. **script conversion**

Hidden Control

The Hidden control is used to render an HTML input of type hidden. A hidden control is not visible to the user, therefore its value can only be changed by script. These are often used to hold some state that is needed when the page is posted back, or to provide data for scripting purposes.

KNS Hidden control example:

```
1 <property name="control">
2   <bean parent="HiddenControlDefinition"/>
3 </property>
```

KRAD Hidden control example:

```
1 <property name="controlField">
2   <bean parent="Uif-HiddenControl"/>
3 </property>
```

- The property `Uif-HiddenControl` replaces the KNS `HiddenControlDefinition`. **script conversion**

Kuali User Control

The KIM User control is specifically tailored to represent a KIM user. This control does several things for us. First like the group control, it will configured a quickfinder for our field that is configured to invoke the KIM User lookup. The lookup will then return the principal id, principal name (username), and person name (full name). Also like the group control it will automatically add the principal id as a hidden field for us. In addition, it sets up a field query (covered in later on in this chapter) that display the person name under the control on return from the lookup or when tabbing out of the control.

KNS Kuali User control example:

```
1 <property name="control">
2   <bean parent="KualiUserControlDefinition"/>
3 </property>
```

KRAD Kim Person control example:

```
1 <property name="controlField">
2   <bean parent="Uif-KimPersonControl"/>
3 </property>
```

- The property `Uif-KimPersonControl` replaces the KNS `KualiUserControlDefinition`. [script conversion](#)

Link Control

The Link control generates the HTML a (link) tag. The a tag is used to link to another document (the primary mechanism of navigation in the web). The link is presented to use by a label, which when clicked on will take the user to the linked page.

KNS Link control example:

```
1 <property name="control">
2   <bean parent="LinkControlDefinition" p:styleClass="globalLinks"
3     p:target="_blank" p:hrefText="click here" />
4 </property>
```

KRAD Link control example:

```
1 <property name="controlField">
2   <bean parent="Uif-LinkField" p:fieldLabel.cssClasses="globalLinks"
3     p:target="_blank" p:linkText="click here" href="@{#propertyName}" />
4 </property>
```

- The property `Uif-Link` replaces the KNS `LinkControlDefinition`. [KNS line: 2, KRAD line: 2] [script conversion](#)
- The sub-property `target` is carried over during conversion. [KNS line: 2, KRAD line: 2] [script conversion](#)
- The sub-property `linkText` replaces the KNS `hrefText` property. [KNS line: 2, KRAD line: 2] [script conversion](#)

- The sub-property `fieldLabel.cssClasses` replaces the KNS `styleClass` property. [KNS line: 2, KRAD line: 2] **script conversion**

TextArea Control

The TextArea control is similar to the text control with the exception of providing multiple lines for input. This control is used for entering longer strings of data such as a description.

KNS TextArea control example:

```
1 <property name="control">
2   <bean parent="TextareaControlDefinition"/>
3 </property>
```

KRAD TextArea control example:

```
1 <property name="controlField">
2   <bean parent="Uif-TextAreaControl"/>
3 </property>
```

- The property `Uif-TextAreaControl` replaces the KNS `TextareaControlDefinition`. **script conversion**

Text Control

The Text control renders the HTML input element with type of “text”. This is a single-line box that allows the user to type the value.

KNS Text control example:

```
1 <property name="control">
2   <bean parent="TextControlDefinition"/>
3 </property>
```

KRAD Text control example:

```
1 <property name="controlField">
2   <bean parent="Uif-TextControl"/>
3 </property>
```

- The property `Uif-TextControl` replaces the KNS `TextControlDefinition`. **script conversion**

- Note: There are several other text controls to choose from with different default styling:
 - `Uif-SmallTextControl` – Similar to Uif-TextControl but sets the size to 10 and applies an additional style class of 'uif-smallTextControl'.
 - `Uif-MediumTextControl` – The same as Uif-TextControl except adds a style class of 'uif-mediumTextControl'.

- **Uif-LargeTextControl** – Similar to Uif-TextControl but sets the size to 100 and applies an additional style class of 'uif-largeTextControl'.
See the [KRAD Guide](#) for more detail.

Radio Control Group

A radio control allows a user to choose only one of a predefined set of options.

KNS Radio Group control example:

```
1 <property name="control">
2   <bean parent="RadioControlDefinition"
3     p:valuesFinderClass="org.kuali.rice.krad.keyvalues.DelegateRuleValuesFinder"/>
4 </property>
```

KRAD Radio Group control example:

```
1 <bean parent="Uif-InputField" p:propertyName="selectedOpt" p:label="Radio 1">
2   <property name="control">
3     <bean parent="Uif-VerticalRadioControl"/>
4   </property>
5   <property name="optionsFinder">
6     <bean class="org.kuali.rice.krad.keyvalues.DelegateRuleValuesFinder"/>
7   </property>
8 </bean>
```

- To define a Radio Control in KRAD, an **Uif-InputField** with a **Uif-VerticalRadioControl** control is used instead of the KNS **RadioControlDefinition**
script conversion
- The property **optionsFinder** replaces the KNS **valuesFinderClass**. [KNS line: 2, KRAD lines: 5-7] **script conversion**
- **Uif-HorizontalRadioControl** is also available, the options are displayed horizontally instead of vertically.
- Note: **options** or **optionsFinder** may be used to define the choices in the Radio Group control. This also applies to Select controls.

Select Control

A select control provides a drop-down list of options. It is essentially an alternative to radio buttons. Or a checkbox group if set to allow multiple selected values

KNS Select control example:

```
1 <bean id="BookOrder-bookId" parent="BookOrder-bookId-parentBean"/>
2 <bean id="BookOrder-bookId-parentBean" abstract="true" parent="AttributeDefinition">
3   <property name="name" value="bookId"/>
4   <property name="label" value="Book Id"/>
5   <property name="shortLabel" value="Book Id"/>
6   <property name="maxLength" value="19"/>
7   <property name="validationPattern">
8     <bean parent="NumericValidationPattern"/>
9   </property>
```

```
10 <property name="control">
11   <bean parent="SelectControlDefinition" p:businessObjectClass="edu.sampleu.bookstore.bo.Book"
12     p:valuesFinderClass="org.kuali.rice.krad.keyvalues.PersistableBusinessObjectValuesFinder"
13     p:includeKeyInLabel="false" p:includeBlankRow="true" p:keyAttribute="id"
14     p:labelAttribute="para" />
15 </property>
16 </bean>
```

KRAD Select control example:

```
1 <bean id="BookOrder-bookId" parent="BookOrder-bookId-parentBean" />
2 <bean id="BookOrder-bookId-parentBean" abstract="true" parent="AttributeDefinition">
3   <property name="name" value="bookId" />
4   <property name="label" value="Book Id" />
5   <property name="shortLabel" value="Book Id" />
6   <property name="maxLength" value="19" />
7   <property name="validCharactersConstraint">
8     <bean parent="NumericPatternConstraint" />
9   </property>
10  <property name="controlField">
11    <bean parent="Uif-DropdownControl" />
12  </property>
13  <property name="optionsFinder">
14    <bean class="org.kuali.rice.krad.keyvalues.PersistableBusinessObjectValuesFinder" />
15  </property>
16 </bean>
```

- The property **Uif-DropdownControl** replaces the KNS **SelectControlDefinition**. [KNS line: 11, KRAD line: 11] **script conversion**
- The property **optionsFinder** replaces the KNS **valuesFinderClass**. [KNS line: 12, KRAD lines: 13-15] **script conversion**
- The sub-properties for the **SelectControlDefinition** in KNS ex: **p:includeBlankRow="true"** carried over by the conversion script. [KNS line: 13] **script conversion**
- The property **Uif-MultiSelectControl** also replaces the KNS **MultiSelectControlDefinition**. You may also specify multi value select capability from a **Uif-DropdownControl**, by setting property **multiple** to true. **script conversion**

Date Control

A date control is an input element with a type attribute of "date" and represents a control for setting the element's value to a string representing a date.

KNS Date control example:

```
1 <property name="control">
2   <bean parent="TextareaControlDefinition" />
3 </property>
```

KRAD TextArea control example:

```
1 <property name="controlField">
2   <bean parent="Uif-DateControl" />
3 </property>
```

- The property `Uif-DateControl` replaces the KNS `DateControlDefinition`. **script conversion**

Workflow Workgroup Control

- No conversion for Workflow Workgroup Control yet. **manual conversion**

Inquiry Conversion

Inquiries allow users to quickly view a data entity (typically one created via a maintenance document) without having to start editing that entity. They provide a more compact view of these entities and can control which users see what displayed data. KRAD moves all inquiry definitions to a view and displays all inquiries in a lightbox by default. The conversion script will automate part of the conversion for your inquiries to the view format, but some inquiry attributes require no conversion since they are virtually identical between the KNS and KRAD. The following sections provide a typical conversion sample and identify the business object bean properties, sections, collections, helper classes, and other features which are converted by the script and those which require manual conversion.

InquiryDefinition in KNS Data Dictionary to InquiryView in KRAD

KNS Code example:

```
1 <bean id="EntityType-inquiryDefinition" parent="InquiryDefinition">
2   <property name="title" value="Entity Type Inquiry"/>
3   <property name="inquirableClass" value="org.kuali.rice.kim.inquiry.EntityTypeInquirableImpl"/>
4   <property name="authorizerClass" value="org.kuali.rice.kim.authorization.EntityTypeAuthorizer"/>
5   <property name="presentationControllerClass"
6   value="org.kuali.rice.kim.presentation.EntityTypePresentationController"/>
7   <property name="inquirySections">
8     <list>
9       <bean parent="InquirySectionDefinition">
10        <property name="title" value="Entity Type"/>
11        <property name="defaultOpen" value="true"/>
12        <property name="numberOfColumns" value="1"/>
13        <property name="inquiryFields">
14          <list>
15            <bean parent="FieldDefinition" p:attributeName="code" p:noInquiry="true"/>
16            <bean parent="FieldDefinition" p:attributeName="name"/>
17            <bean parent="FieldDefinition" p:attributeName="active"/>
18          </list>
19        </property>
20      </bean>
21      <bean parent="InquirySectionDefinition">
22        <property name="title" value="Entity Type Details"/>
23        <property name="defaultOpen" value="false"/>
24        <property name="inquiryFields">
25          <list>
26            <bean parent="InquiryCollectionDefinition">
27              <property name="numberOfColumns" value="1"/>
28              <property name="businessObjectClass"
29                value="org.kuali.rice.kim.impl.identity.EntityTypeDetailsBo"/>
30              <property name="attributeName" value="entityTypeDetails"/>
31              <property name="inquiryFields">
32                <list>
33                  <bean parent="FieldDefinition" p:attributeName="name"/>
34                  <bean parent="FieldDefinition" p:attributeName="value"/>
35                </list>
36              </property>
37            </bean>
38            <property name="summaryTitle" value="Entity Type Details"/>
39            <property name="summaryFields">
```

```
38         <list>
39             <bean parent="FieldDefinition" p:attributeName="name" />
40         </list>
41     </property>
42 </bean>
43 </list>
44 </property>
45 </bean>
46 </list>
47 </property>
48 </bean>
```

KRAD code example:

```
1 <bean id="EntityType-InquiryView" parent="Uif-InquiryView">
2   <property name="headerText" value="Entity Type Inquiry" />
3   <property name="dataObjectClassName" value="org.kuali.rice.kim.impl.identity.EntityTypeBo" />
4   <property name="viewHelperServiceClass" value="org.kuali.rice.kim.inquiry.EntityTypeInquirableImpl" />
5   <property name="authorizerClass" value="org.kuali.rice.kim.authorization.EntityTypeAuthorizer" />
6   <property name="presentationControllerClass"
value="org.kuali.rice.kim.presentation.EntityTypePresentationController" />
7   <property name="items">
8     <list>
9       <bean id="EntityType-InquiryView-General" parent="Uif-Disclosure-GridSection">
10        <property name="headerText" value="Entity Type" />
11        <property name="disclosure.defaultOpen" value="true" />
12        <property name="layoutManager.numberOfColumns" value="2" />
13        <property name="items">
14          <list>
15            <bean parent="Uif-DataField" p:propertyName="code" p:inquiry.render="false" />
16            <bean parent="Uif-DataField" p:propertyName="name" />
17            <bean parent="Uif-DataField" p:propertyName="active" />
18          </list>
19        </property>
20      </bean>
21      <bean id="EntityType-InquiryView-Details" parent="Uif-Disclosure-StackedCollectionSection">
22        <property name="headerText" value="Entity Type Details" />
23        <property name="disclosure.defaultOpen" value="false" />
24        <property name="layoutManager.numberOfColumns" value="2" />
25        <property name="collectionObjectClass"
value="org.kuali.rice.kim.impl.identity.EntityTypeDetailsBo" />
26        <property name="propertyName" value="entityTypeDetails" />
27        <property name="items">
28          <list>
29            <bean parent="Uif-DataField" p:attributeName="name" p:inquiry.render="false" />
30            <bean parent="Uif-DataField" p:attributeName="value" />
31          </list>
32        </property>
33      </bean>
34      <property name="layoutManager.summaryTitle" value="Entity Type Details" />
35      <property name="layoutManager.summaryFields">
36        <list>
37          <value>name</value>
38        </list>
39      </property>
40    </bean>
41  </list>
42 </property>
43 </bean>
```

Base Inquiry Bean

- Inquiries are now defined via **Uif-InquiryView** definitions instead of the KNS **InquiryDefinition** beans. [KNS line: 1, KRAD line: 1] **script conversion**
- The title of the view is specified via the **headerText** property instead of the **title** property. [KNS line: 2, KRAD line: 2] **script conversion**

- The data object class is specified via the **dataObjectClassName** property and is no longer specified via the **BusinessObjectEntry** as it doesn't exist in KRAD anymore. A **businessObject** is no longer required and any object can be used. [KNS line: n/a, KRAD line: 3] **script conversion**
- The **inquirableClass** has now changed to **viewHelperServiceClass**, along with a class parent change. See below for more information. [KNS line: 3, KRAD line: 4] **script conversion**
- The **authorizerClass** has now moved to the view. Conversion will copy the property. [KNS line: 4, KRAD line: 5] **script conversion** Custom implementations of the **InquiryAuthorizer** class will need refactoring. See InquiryAuthorizer below for more information. **manual conversion**
- The **presentationControllerClass** has now moved to the view. Conversion will copy the property. [KNS line: 5, KRAD line: 6] **script conversion** Custom implementations of the **InquiryPresentationController** class will need refactoring. See InquiryPresentationController below for more information. **manual conversion**

Sections

- The property that contains the inquiry sections was renamed from **inquirySections** to **items**. [KNS line: 6, KRAD line: 7] **script conversion**
- The bean **InquirySectionDefinition** was removed and can be replaced with any subclass of **Group**, although the default is a child of **Uif-Disclosure-GridSection**. [KNS line: 8, KRAD line: 9] **script conversion**
- The title of the section is specified via the **headerText** property instead of the **title** property. [KNS line: 9, KRAD line: 10] **script conversion**
- The property that controls whether the section defaults to open has moved from **defaultOpen** to the **Disclosure** object and is now accessed via **disclosure.defaultOpen**. [KNS line: 10, KRAD line: 11] **script conversion**
- To use multiple columns for the section use the **layoutManager.numberOfColumns** property to configure the layout manager instead of specifying the **numberOfColumns** property. Note that in the layout manager the field label and the field itself have their own columns and therefore the old **numberOfColumns** value needs to be doubled. [KNS line: 11, KRAD line: 12] **script conversion**
- The `org.kuali.rice.kns.inquiry.Inquirable.addAdditionalSections()` has been removed in KRAD. To add additional sections dynamically to an inquiry, override the **performCustomInitialization** method of **ViewHelperService** instead and add custom components. The custom Inquirable implementation can be specified using the **viewHelperServiceClass** property of the view, which in turn would extend **org.kuali.rice.krad.inquiry.InquirableImpl**. **manual conversion**

```
1 <bean id="Sample-InquiryView" parent="Uif-InquiryView">
2   ...
```

```
3 <property name="viewHelperServiceClass" value="org.kuali.rice.krad.inquiry.CustomInquirableImpl/>
4 ...
5 </bean>
```

- The `org.kuali.rice.kns.inquiry.Inquirable.getSection()` has been removed in KRAD. To modify existing sections dynamically in an inquiry, override the `performCustomInitialization` method of `ViewHelperService`. **manual conversion**
- The property that contains the inquiry display fields was renamed from `inquiryFields` to `items`. [KNS line: 12, KRAD line: 13] **script conversion**
- Data fields changed from `FieldDefinition` to `Uif-DataField`. [KNS line: 14-16, KRAD line: 15-17] **script conversion**
- The `attributeName` property on the field is now a `propertyName` property. [KNS line: 14-16, KRAD line: 15-17] **script conversion**
- The `noInquiry` property, which suppresses rendering the inquiry link on the fields, has moved to the `Inquiry` object and is now accessed via `inquiry.render`. Note here that `noInquiry="true"` is equivalent to `inquiry.render="false"`. [KNS line: 14, KRAD line: 15] **script conversion**

Collections

- The bean `InquiryCollectionDefinition` was removed and can be replaced with any subclass of `CollectionGroup`, although the default is a child of `Uif-Disclosure-StackedCollectionSection`. [KNS line: 25, KRAD line: 21] **script conversion**
- The `businessObjectClass` property of the collection has been changed to `collectionObjectClass`. [KNS line: 27, KRAD line: 25] **script conversion**
- The `attributeName` property of the collection has been changed to `propertyName`. [KNS line: 29, KRAD line: 27] **script conversion**
- The property that contains the inquiry display fields was renamed from `inquiryFields` to `items`. [KNS line: 30, KRAD line: 28] **script conversion**
- The property `summaryTitle` has been moved to `layoutManager.summaryTitle`. [KNS line: 36, KRAD line: 34] **script conversion**
- The container `summaryFields` has been moved to `layoutManager.summaryFields` and simplified to just take a list of values. [KNS line: 37, KRAD line: 35] **script conversion**
- In general, only simple nestings such as the ones shown above are supported by the conversion script. Any other combinations, such as a `InquiryCollectionDefinition` directly inside an `inquiryFields` property or inside another `InquiryCollectionDefinition` are not supported and will need to be converted manually. **manual conversion**

Inquirable / KualiInquirableImpl

KRAD adds `InquirableImpl` to eventually replace `KualiInquirableImpl`. Normally, this class does not need to be extended unless advanced customizations are required.

- In order to customize Inquiry links, the code originally in a subclass of `org.kuali.rice.kns.inquiry.Inquirable.getInquiryUrl` will need to move to `org.kuali.rice.krad.inquiry.Inquirable.buildInquirableLink` and be adapted for the new framework. Implementers have a choice between using the convenience method `org.kuali.rice.krad.uif.widget.Inquiry.buildInquiryLink` to automatically build the link or define a completely new link by calling `Inquiry.getInquiryLink().setHref`. **manual conversion**

InquiryAuthorizer

KRAD moves the functionality of `InquiryAuthorizer` to `InquiryViewAuthorizer`. While the data dictionary entry remains the same, if it points to a custom implementation of `InquiryAuthorizer`, then the custom class will need to be reparented to `InquiryViewAuthorizer` and the methods will need to be migrated to `canViewGroup` (for sections) and `canViewField` (for fields). **manual conversion**

InquiryPresentationController

KRAD moves the functionality of `InquiryPresentationController` to `InquiryViewPresentationController`. While the data dictionary entry remains the same, if it points to a custom implementation of `InquiryPresentationController`, then the custom class will need to be reparented to `InquiryViewPresentationController` and the methods will need to be migrated to `canViewGroup` (for sections) and `canViewField` (for fields).

manual conversion

ModuleService / RemoteModuleServiceBase / ModuleServiceBase

KRAD has both added and deprecated methods in this interface and its base classes.

- `getExternalizableBusinessObjectInquiryUrl` has been moved to `getExternalizableDataObjectInquiryUrl`. Helper methods of `getExternalizableBusinessObjectInquiryUrl` (such as `getInquiryUrl` and `getUrlParameters`) have also been deprecated. Any custom implementer configuration in these methods should be folded directly into `getExternalizableDataObjectInquiryUrl`.

manual conversion

Other Inquiry Features

- **Inquiry Header Links**

It is now possible to add links in the header of the Inquiry page. This was supposed to be possible in the KNS but never worked. Thus, any links desired in the header of the Inquiry will have to be added manually. **manual conversion**

```
<property name="page.header.lowerGroup.items">
  <list merge="true">
    <bean parent="Uif-Link" p:href="http://www.kuali.org" p:linkText="Kuali Site"/>
  </list>
</property>
```

- **Section Permission Checks**

The viewability of sections in Inquiries are controlled by a KIM permission only when a **componentSecurity** is configured in the section of the Uif-InquiryView and the appropriate KIM permission exists. The conversion requires that any sections listed in an override of the method **InquiryAuthorizer.getSecurePotentiallyHiddenSectionIds()** will need to have these configurations added, and that new KRAD permissions are created. **manual conversion**

Inquiry View:

```
<property name="componentSecurity">
  <bean parent="Uif-CollectionGroupSecurity" p:viewAuthz="true"/>
</property>
```

KIM Configuration:

A permission which extends the **KR-KRAD : View Group** template will have to be created.

- **Field Permission Checks**

The viewability of fields in Inquiries are controlled by a KIM permission only when either

- **attributeSecurity** is configured in the DD field, or
- **componentSecurity** is configured in the field of the InquiryView and the appropriate KIM permission exists. The conversion requires that new KRAD permissions are created. **manual conversion**

Data Dictionary:

```
<property name="attributeSecurity">
  <bean parent="AttributeSecurity" p:hide="true"/>
</property>
```

KIM Configuration:

A permission which extends the **KR-KRAD : View Field** template will have to be created.

Lookup Conversion

Lookups allow users to search for data entries (typically ones created by a maintenance document) in order to view the results and take actions (if any) on those entries. They allow controlling how much information is shown and what actions the user can currently take on the entry. KRAD moves all lookup definitions to a view. The conversion script will automate part of the conversion for your lookups to the view format, but some lookup attributes require no conversion since they are virtually identical between the KNS and

KRAD. The following sections provide a typical conversion sample and identify the business object bean properties, criteria fields, result fields, helper classes, and other features which are converted by the script and those that require manual conversion.

LookupDefinition in KNS Data Dictionary to LookupView in KRAD

Note

The code example is very inclusive to show the configurations that have changed. As a result the lookups themselves have conflicting settings (i.e. why have custom search buttons when hiding them).

KNS Code example:

```
1 <bean id="EntityType-lookupDefinition" parent="LookupDefinition">
2   <property name="title" value="Entity Type Lookup"/>
3   <property name="menubar" value="&lt;a href=&quot;javascript:void(0)&quot;
4     onclick=&quot;alert('JavaScript triggered action.*)&quot;&gt;Custom Button&lt;/a&gt;"/>
5   <property name="numOfColumns" value="2"/>
6   <property name="extraButtonSource" value="images/tinybutton-createnew.gif"/>
7   <property name="extraButtonParams" value="createNew"/>
8   <property name="disableSearchButtons" value="true"/>
9   <property name="lookupFields">
10    <list>
11     <bean parent="FieldDefinition" p:attributeName="code"/>
12     <bean parent="FieldDefinition" p:attributeName="name" p:noLookup="true"
13       p:treatWildcardsAndOperatorsAsLiteral="true"/>
14     <bean parent="FieldDefinition" p:attributeName="active" p:defaultValue="Y"/>
15    </list>
16  </property>
17  <property name="resultFields">
18    <list>
19     <bean parent="FieldDefinition" p:attributeName="code" p:triggerOnChange="true"/>
20     <bean parent="FieldDefinition" p:attributeName="name" p:noLookup="true"/>
21     <bean parent="FieldDefinition" p:attributeName="sortCode" p:forceInquiry="true"/>
22     <bean parent="FieldDefinition" p:attributeName="amount" p:total="true"/>
23     <bean parent="FieldDefinition" p:attributeName="active"/>
24    </list>
25  </property>
26  <property name="defaultSort">
27    <bean parent="SortDefinition">
28      <property name="sortAscending" value="false"/>
29      <property name="attributeNames">
30        <list>
31         <value>code</value>
32        </list>
33      </property>
34    </bean>
35  </property>
36  <property name="translateCodes" value="true"/>
37 </bean>
```

KRAD code example:

```
1 <bean id="EntityTypeLookupView" parent="Uif-LookupView">
2   <property name="dataObjectClassName" value="org.kuali.rice.kim.impl.identity.EntityTypeBo"/>
3   <property name="headerText" value="Entity Type Lookup" />
4   <property name="page.header.lowerGroup.items">
5     <list merge="true">
6       <bean parent="Uif-Message" value=" [&lt;a href=&quot;javascript:void(0)&quot;
7         onclick=&quot;alert('JavaScript triggered action.*)&quot;&gt;Custom Button&lt;/a&gt; ]"/>
8     </list>
9   </property>
10  <property name="renderLookupCriteria" value="false"/>
```

```
11 <property name="criteriaGroup.layoutManager.numberOfColumns" value="4"/>
12 <property name="criteriaGroup.footer">
13   <bean parent="Uif-LookupCriteriaFooter">
14     <property name="items">
15       <list merge="true">
16         <bean parent="Uif-PrimaryActionButton" p:methodToCall="createNew" p:actionLabel="create new"/>
17       </list>
18     </property>
19   </bean>
20 </property>
21 <property name="renderCriteriaActions" value="false"/>
22 <property name="criteriaFields">
23   <list>
24     <bean parent="Uif-LookupCriteriaInputField" p:propertyName="code"/>
25     <bean parent="Uif-LookupCriteriaInputField" p:propertyName="name" p:enableAutoQuickfinder="false"
26       p:disableWildcardsAndOperators="true"/>
27     <bean parent="Uif-LookupCriteriaInputField" p:propertyName="active" p:defaultValue="Y"/>
28   </list>
29 </property>
30 <property name="resultFields">
31   <list>
32     <bean parent="Uif-DataField" p:propertyName="code"/>
33     <bean parent="Uif-DataField" p:propertyName="name"/>
34     <bean parent="Uif-DataField" p:propertyName="sortCode" p:enableAutoInquiry="false"/>
35     <bean parent="Uif-DataField" p:propertyName="amount"/>
36     <bean parent="Uif-DataField" p:propertyName="active"/>
37   </list>
38 </property>
39 <property name="defaultSortAscending" value="false"/>
40 <property name="defaultSortAttributeNames">
41   <list>
42     <value>code</value>
43   </list>
44 </property>
45 <property name="resultsGroup.layoutManager.columnCalculations">
46   <list>
47     <bean parent="Uif-ColumnCalculationInfo-Sum" p:propertyName="amount" />
48   </list>
49 </property>
50 <property name="translateCodesOnReadOnlyDisplay" value="true"/>
51 <property name="multipleValuesSelectResultSetLimit" value="100"/>
52 <property name="resultSetLimit" value="200"/>
53 </bean>
```

Base Lookup Bean

- Lookups are now defined via **Uif-LookupView** definitions instead of the KNS **LookupDefinition** beans. [KNS line: 1, KRAD line: 1] **script conversion**
- The title of the view is specified via the **headerText** property instead of the **title** property. [KNS line: 2, KRAD line: 3] **script conversion**
- The data object class is specified via the **dataObjectClassName** property and is no longer specified via the **BusinessObjectEntry** as it doesn't exist in KRAD anymore. A **businessObject** is no longer required and any object can be used. [KNS line: n/a, KRAD line: 2] **script conversion**
- Instead of specifying the supplemental menu bar via the **menubar** property, the **page.header.lowerGroup.items** property is used. [KNS line: 3-4, KRAD line: 4-9] **script conversion**
- **multipleValuesSelectResultSetLimit** [KRAD line 51] overrides the **MULTIPLE_VALUE_RESULTS_LIMIT** application/system parameter. This parameter restricts the number of results returned from a lookup that can return multiple values. The parameter

defaults to 100 results, but can either be changed in the database or be overridden by setting **multipleValuesSelectResultSetLimit**. The namespace of the parameter used in KRAD is **KR-KRAD** instead of **KR-NS**. **manual conversion**

- **resultSetLimit** [KRAD line 52] overrides the application/system parameter **RESULTS_LIMIT**. This parameter restricts the number of results returned from a lookup that can return one value. The parameter defaults to 100 results, but can either be changed in the database or be overridden by setting **resultSetLimit**. The namespace of the parameter used in KRAD is **KR-KRAD** instead of **KR-NS**. **manual conversion**

Criteria Fields

- The property that contains the lookup criteria fields was renamed from **lookupFields** to **criteriaFields**. [KNS line: 9, KRAD line: 22] **script conversion**
- Criteria fields changed from **FieldDefinition** to **Uif-LookupCriteriaInputField**. [KNS line: 11-14, KRAD line: 24-27] **script conversion**
- The **attributeName** property on the field is now a **propertyName** property. [KNS line: 11-14, KRAD line: 24-27] **script conversion**
- Not rendering a quickfinder on a lookup criteria field is specified via the **enableAutoQuickfinder** property instead of the **noLookup** property. [KNS line: 12, KRAD line 25] **script conversion**
- Adding additional buttons to the bottom of the search criteria is done by adding a **Uif-PrimaryActionButton** to the **criteriaGroup.footer** item list instead of using the **extraButtonSource** and **extraButtonParms** properties. [KNS line: 6-7, KRAD line: 12-20] **script conversion**
- The property that specifies whether or not to show the search buttons changed from **disableSearchButtons** to **renderCriteriaActions**. [KNS line: 8, KRAD line: 21] **script conversion**
- The rendering of search criteria was suppressed in KNS by adding the **searchCriteriaEnabled=false** parameter to the URL. In KRAD the URL parameter is renamed to **renderLookupCriteria**. Alternatively the **renderLookupCriteria** can be set on the **Uif-LookupView**. [KNS line: n/a, KRAD line: 10] **manual conversion**
- To use multiple columns for the criteria fields use the **criteriaGroup.layoutManager.numberOfColumns** property to configure the layout manager instead of specifying the **numOfColumns** property. Note that in the layout manager the field label and the field itself have their own columns and therefore the old **numOfColumns** value needs to be doubled. [KNS line: 5, KRAD line: 11] **script conversion**
- The **treatWildcardsAndOperatorsAsLiteral** property of **FieldDefinition** changed to **disableWildcardsAndOperators** on **Uif-LookupCriteriaInputField**. [KNS line: 13, KRAD line: 26] **script conversion**

- A default value can be specified in KNS by adding the `<attribute-name>` parameter to the URL. In KRAD the URL parameter naming convention changed to `lookupCriteria[<attribute-name>]`. Alternatively the `defaultValue` can be set on the `Uif-LookupCriteriaInputField`. [KNS line: n/a, KRAD line: 27] **manual conversion**

KNS URL example:

```
http://demo.rice.kuali.org/kr/lookup.do?methodToCall=start
&businessObjectClassName=org.kuali.rice.location.impl.country.CountryBo&code=us
```

KRAD URL example:

```
http://demo.rice.kuali.org/kr/lookup.do?methodToCall=start
&businessObjectClassName=org.kuali.rice.location.impl.country.CountryBo&lookupCriteria[code]=us
```

Results Fields

- Result fields changed from `FieldDefinition` to `Uif-DataField`. [KNS line: 19-23, KRAD line: 32-36] **script conversion**
- The `attributeName` property on the field is now a `propertyName` property. [KNS line: 19-23, KRAD line: 32-36] **script conversion**
- The `forceInquiry` property does not need to be set as inquiry links are rendered automatically. Set the `enableAutoInquiry` property on the `Uif-DataField` to false to suppress the rendering of the inquiry link. [KNS line: 21, KRAD line: 34] **manual conversion**
- Custom actions in the result rows are no longer specified by overriding the `getCustomActionUrls` method of `LookupableHelperService`. Instead the `resultsGroup.lineActions` property list is extended or overridden. Look in `UifLookupDefinition.xml` to see how the edit, copy and delete actions are defined. All types of `Components` (not just `Actions`) may be defined to appear as results group line actions. **manual conversion**
- The `SortDefinition` bean with the `sortAscending` and `attributeName` properties has been replaced. The sort order is specified via the `defaultSortAscending` property and the sort fields via the `defaultSortAttributeName` property list on the `Uif-Lookup-View`. [KNS line: 26-35, KRAD line: 39-44] **script conversion**
- Column totaling is now specified with the `Uif-ColumnCalculationInfo-Sum` property on the layout manager instead via the `total` property on the field definition. [KNS line: 22, KRAD line: 45-49] **script conversion**
- To display the maintenance links (create new, edit, copy, delete) on non maintenance documents the `renderMaintenanceLinks` on the `LookupForm` needs to be set. Note, the quickfinder logic in the framework automatically determines whether to show the return links or the maintenance links. **manual conversion**
- For automatic translation of code fields in lookup the `translateCodes` of the `LookupDefinition` was set. In KRAD the automatic translation is enabled by setting the

`translateCodesOnReadOnlyDisplay` of the `Uif-LookupView`. [KNS line: 36, KRAD line: 50] **script conversion**

- All types of **Components** (not just **Actions**) may be defined to appear in the collection add line actions, via the `resultsGroup.addLineActions` property list **manual conversion**

Lookupable / LookupableHelper Service

KRAD combines the `Lookupable` and `LookupableHelperService` from KNS. The `LookupableImpl` does not need to be extended unless advanced customizations are required.

Lookupable

- `set/getBusinessObjectClass` have been renamed to `setDataObjectClass`. Since now all data objects are supported the requirement that the object is a `BusinessObject` has been removed. The rename of these methods reflect this change. However, don't use this method. In KRAD the data object is specified via the `dataObjectClassName` property of the extended `Uif-LookupView` bean.

```
1 <bean id="Sample-LookupView" parent="Uif-LookupView">
2   <property name="dataObjectClassName" value="org.kuali.rice.SampleBo" />
3   ...
4 </bean>
```

The KNS2KRAD conversion script adds this property based on the `dataObjectClass` property of the `MaintenanceDocumentEntry` in KNS. **script conversion**

- `getHtmlMenuBar/getSupplementalMenuBar` have been removed. Instead these menu bars are configured via `Uif`. The `HtmlMenuBar` used to add additional HTML content to the right of the "Create New" button, while the `SupplementalMenuBar` replaces the "Create New" button with the specified HTML content. Note that with KRAD the "Create New" has been moved out of the lookup header area and instead is right below the header, still at the right side. The following sample displays how to add content after the "Create New". In this example a `Message` is used but any `Uif` component could be used. Append a custom button after the "Create New":

```
1 <bean id="Sample-LookupView" parent="Uif-LookupView">
2   ...
3   <property name="page.header.lowerGroup.items">
4     <list>
5       <bean parent="Uif-CreateNewLink" />
6       <bean parent="Uif-SecondaryActionButton" p:actionLabel="Custom Button"
7         p:actionScript="alert('JavaScript triggered action.')" />
8     </list>
9   </property>
10  ...
11 </bean>
```

Append a custom message to the right in the header

```
1 <bean id="Sample-LookupView" parent="Uif-LookupView">
2   ...
3   <property name="header.rightGroup">
4     <bean parent="Uif-HeaderRightGroup">
5       <property name="items">
6         <list>
7           <bean parent="Uif-Message" p:messageText="Right Group of headerText" />
8         </list>
9       </property>
10    </bean>
11  </property>
12 </bean>
```

```
9     </property>
10    </bean>
11  </property>
12  ...
13 </bean>
```

Instead of "rightGroup" the "upperGroup" and "lowerGroup" can be used to position components above and below the header.

- **getRows** has been removed. Criteria fields can be conditionally displayed and configured via Uif.
- **getColumns** has been removed. The result columns are now specified via the Uif-LookupView (see resultFields property).

```
1 <bean id="Sample-LookupView" parent="Uif-LookupView">
2   ...
3   <property name="resultFields">
4     <list>
5       <bean parent="Uif-DataField" p:propertyName="cd" />
6       <bean parent="Uif-DataField" p:propertyName="description" />
7     </list>
8   </property>
9   ...
10 </bean>
```

- **validateSearchParameters** takes the LookupForm as an additional parameter and returns a boolean value indicating that no validation error message has occurred (true = no error). Warning and informational messages do not affect this return indicator. A ValidationException is no longer thrown. Try using Uif configurations for more complex validation that the default KRAD validation can't handle (e.g. [Constraints](#))
- **performLookup** has been renamed to **performSearch** which takes the LookupForm as an additional parameter. The resultTable parameter has been removed and takes searchCriteria as an additional parameter.
- **getSearchResults** and **getSearchResultsUnbounded** have been removed. Override *executeSearch* for implementing a custom search routine.
- **performClear** takes the **searchCriteria** map as an additional parameter since it is no longer stored in the Lookupable. The **searchCriteria** map is returned after clearing the criteria and setting their default values.
- **getReturnUrl** has been renamed to *buildReturnUrlForResult* which accepts the Link and sets the result from the lookup and the model. Configuration via the Uif-LookupView is also possible:

```
1 <bean id="Sample-LookupView" parent="Uif-LookupView">
2   ...
3   <property name="resultsReturnField">
4     <bean parent="Uif-LinkField" p:href="http://www.kuali.org" p:linkText="Kuali"/>
5   </property>
6   ...
7 </bean>
```

- **getCreateNewUrl** has been removed. The create new url is now specified via the Uif-LookupView:

```
1 <bean id="Sample-LookupView" parent="Uif-LookupView">
2   ...
3   <property name="page.header.lowerGroup.items">
4     <list>
```

```
5     <bean parent="Uif-Link" p:linkText="Create New" p:href="http://www.kuali.org">
6       <property name="cssClasses">
7         <list merge="true">
8           <value>uif-createNewLink</value>
9         </list>
10      </property>
11    </bean>
12  </list>
13 </property>
14 ...
15 </bean>
```

- **getTitle** has been removed. The title is now specified via the Uif-LookupView (see headerText property).

```
1 <bean id="Sample-LookupView" parent="Uif-LookupView">
2   <property name="headerText" value="Sample Lookup" />
3   ...
4 </bean>
```

- **getReturnKeyValues** takes the **LookupView**, **LookupForm** and the data object as an additional parameter.
- **getReturnLocation** has been removed. The return location is now stored on the form. Use **LookupForm.getReturnLocation**.
- **getExtraButtonSource** has been removed. Buttons are configured via **Uif-LookupCriteriaGroup** (see footer property).
- **getExtraButtonParams** has been removed. Buttons are configured via **Uif-LookupCriteriaGroup** (see footer property).
- **checkForAdditionalFields** has been removed. Use [progressive disclosure](#) of the Uif.
- **getDefaultSortColumns** has been removed. Sort columns are configured via Uif-LookupView (see defaultSortAttributeNames property).

```
1 <bean id="Sample-LookupView" parent="Uif-LookupView">
2   ...
3   <property name="defaultSortAttributeNames">
4     <list>
5       <value>cd</value>
6       <value>description</value>
7     </list>
8   </property>
9   ...
10 </bean>
```

- **set/getDocFormKey** has been removed. The document form key is stored on the form. Use **LookupForm.getFormKey**.
- **setFieldConversions** has been removed. The field conversion is specified via Uif (see quickfinder.fieldConversions property).

```
1 <bean parent="Uif-InputField">
2   ...
3   <property name="quickfinder.fieldConversions">
4     <map>
5       <entry key="cd" value="sampleCd" />
6       <entry key="description" value="sample.description" />
7     </map>
```

```
8 </property>
9 ...
10 </bean>
```

- **setReadOnlyFieldsList** has been removed. Read only criteria fields are specified via Uif (see **readOnly** property).

```
1 <bean id="Sample-LookupView" parent="Uif-LookupView">
2 ...
3 <property name="criteriaFields">
4 <list>
5 <bean parent="Uif-LookupCriteriaInputField" p:propertyName="namespace"
6 p:readOnly="true" />
7 <bean parent="Uif-LookupCriteriaInputField" p:propertyName="cd" />
8 </list>
9 </property>
10 ...
11 </bean>
```

- **set/getLookupableHelperService** has been removed. Lookupable helper services are specified via **Uif-LookupView**:

```
1 <bean id="Sample-LookupView" parent="Uif-LookupView">
2 <property name="viewHelperServiceClass"
3 value="org.kuali.rice.SampleLookupableHelperServiceImpl" />
4 ...
5 </bean>
```

- **isSearchUsingOnlyPrimaryKeyValues** has been removed.
- **getPrimaryKeyFieldLabels** has been removed.
- **shouldDisplayHeaderNonMaintActions** has been removed.
- **shouldDisplayLookupCriteria** has been removed.
- **performCustomAction** has been removed. Create **methodToCall** methods for the actions in the [controller](#) for the data object.
- **getExtraField** has been removed (see [getHtmlMenuBar/getSupplementalMenuBar](#) above).
- **get/setExtraOnLoad** has been removed. OnLoad scripts can be specified via the Uif-LookupView:

```
1 <bean id="Sample-LookupView" parent="Uif-LookupView">
2 <property name="onLoadScript" value="alert('Hi!')" />
3 ...
4 </bean>
```

- **applyFieldAuthorizationsFromNestedLookups** has been removed. Conditional masking of result field is done through Uif configuration.

```
1 <bean id="Sample-LookupView" parent="Uif-LookupView">
2 ...
3 <property name="resultFields">
4 <list>
5 <bean parent="Uif-DataField" p:propertyName="cd">
6 <property name="componentSecurity">
7 <bean parent="Uif-DataFieldSecurity">
```

```
8         <property name="attributeSecurity">
9             <bean parent="AttributeSecurity">
10                 <property name="mask" value="true" />
11                 <property name="maskFormatter">
12                     <bean parent="MaskFormatterLiteral" p:literal="*****" />
13                 </property>
14             </bean>
15         </property>
16     </bean>
17 </property>
18 </bean>
19 ...
20 </list>
21 </property>
22 ...
23 </bean>
```

- **applyConditionalLogicForFieldDisplay** has been removed. Conditional displaying of criteria field is done through Uif configuration.

```
1 <bean id="Sample-LookupView" parent="Uif-LookupView">
2     ...
3     <property name="criteriaFields">
4         <list>
5             <bean parent="Uif-LookupCriteriaInputField" p:propertyName="cd"
6                 p:readOnly="@{!#empty(#dp.lookupCriteria['cd'])}" />
7             <bean parent="Uif-DataField" p:propertyName="description"
8                 p:required="@{#dp.lookupCriteria['CD'] == 'A_CD'}" />
9             <bean parent="Uif-LookupCriteriaInputField" p:propertyName="namespace"
10                 p:render="@{#dp.lookupCriteria['CD'] == 'A_CD'}" />
11         </list>
12     </property>
13     ...
14 </bean>
```

LookupableHelper

The functionality of **LookupableHelper** can now be found in the **LookupableImpl** class.

- The method **allowsMaintenanceNewOrCopyAction**, **allowsMaintenanceEditAction**, and **allowsMaintenanceDeleteAction** remain the same.
- The functionality of **getActionUrl** and **getMaintenanceUrl** is handled by **buildMaintenanceActionLink**.
- The logic of **getSearchResults** is now part of **performSearch** which accepts the form, search criteria and the unbounded indicator.

QuickFinder Specifics

- The **overrideLookupClass** and **overrideFieldConversions** don't exist in KRAD since the quickfinder can be directly configured via the **quickfinder.dataObjectClassName** and **quickfinder.fieldConversions** properties **script conversion**

KNS code example:

```
1 <bean parent="MaintainableFieldDefinition" p:name="entityTypeCode" />
2 <property name="overrideLookupClass"
3     value="org.kuali.rice.kim.impl.identity.EntityTypeBo" />
4 <property name="overrideFieldConversions">
5     <map>
```

```
6     <entry key="code" value="entityTypeCode"/>
7   </map>
8 </property>
9 </bean>
```

KRAD code example:

```
1 <bean parent="Uif-InputField" p:propertyName="entityTypeCode">
2   <property name="quickfinder.dataObjectClassName"
3     value="org.kuali.rice.kim.impl.identity.EntityTypeBo"/>
4   <property name="quickfinder.fieldConversions">
5     <map>
6       <entry key="code" value="entityTypeCode"/>
7     </map>
8   </property>
9 </bean>
```

- The **searchIconOverride** doesn't exist in KRAD since the quickfinder can be directly configured via the **quickfinder.quickfinderAction.actionImage.source**. Consequently, it was really not intended to be defined in the XML but rather in the JSP code for a transactional document. KRAD allows for much more flexibility and thus it can be specified as well in the lookup.

manual conversion

KRAD code example:

```
1 <bean parent="Uif-LookupCriteriaInputField" p:propertyName="entityTypeCode">
2   <property name="quickfinder.quickfinderAction.actionImage.source" value="icon.png"/>
3 </bean>
```

Other Lookup Features

- **Custom Forms**

In KNS custom forms are specified in the struts-config.xml file.

```
<form-bean name="TravelAuthorizationForm"
  type="org.kuali.rice.kns.demo.travel.authorization.TravelAuthorizationForm"/>
```

With KRAD the forms are specified as a property of the view.

```
<bean parent="Uif-TransactionalDocumentView">
  <property name="formClass"
    value="edu.sampleu.travel.TravelAuthorizationForm"/>
  ...
</bean>
```

- **Help Items**

Help items can be displayed in the same manner in KRAD as in the KNS.

script conversion

KNS code example:

```
1 <property name="helpDefinition">
2   <bean parent="HelpDefinition" p:parameterNamespace="KR-KRAD" p:parameterDetailType="Lookup"
3     p:parameterName="DEFAULT_HELP_URL"/>
```

```
4 </property>
```

or

```
1 <property name="helpUrl" value="link.html"/>
```

KRAD code example:

```
1 <property name="help">
2   <bean parent="Uif-Help">
3     <property name="helpDefinition">
4       <bean parent="HelpDefinition" p:parameterNamespace="KR-KRAD" p:parameterDetailType="Lookup"
5         p:parameterName="DEFAULT_HELP_URL" />
6     </property>
7   </bean>
8 </property>
```

or

```
1 <property name="help">
2   <bean parent="Uif-Help" p:externalHelpUrl="link.html"/>
3 </property>
```

Maintenance Conversion

Maintenance documents provide an easy way to create and edit simple data entries. They provide layout definitions to display base objects and collections for entering data and editing it, as well as controlling access to data, providing links to attachments, applying rules, and routing the document through several reviewers before finalizing and applying the changes to the database. KRAD modifies the maintenance document entries and moves all relevant display definitions to a view. The conversion script will automate part of the conversion for your maintenance documents to the view format, but some maintenance attributes require no conversion since they are virtually identical between the KNS and KRAD. The following sections provide a typical conversion sample and identify the business object bean properties, sections, collections, lookup definitions, helper classes, and other features which are converted by the script and those that require manual conversion.

MaintenanceDefinition in KNS Data Dictionary to MaintenanceView in KRAD

KNS Code example:

```
1 <bean id="EntityTypeMaintenanceDocument" parent="MaintenanceDocumentEntry">
2   <property name="businessObjectClass" value="org.kuali.rice.kim.impl.identity.EntityTypeBo"/>
3   <property name="documentTypeName" value="EntityTypeMaintenanceDocument"/>
4   <property name="maintainableClass" value="org.kuali.rice.kim.maintenance.EntityTypeMaintainableImpl"/>
5
6   <property name="webScriptFiles">
7     <list>
8       <value>entityType.js</value>
9     </list>
10  </property>
11
12  <property name="maintainableSections">
13    <list>
14      <ref bean="EntityTypeMaintenanceDocument-General"/>
15      <ref bean="EntityTypeMaintenanceDocument-Details"/>
```

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```
16     </list>
17   </property>
18 </bean>
19
20 <bean id="EntityTypeMaintenanceDocument-General" parent="MaintainableSectionDefinition">
21   <property name="title" value="Entity Type"/>
22   <property name="defaultOpen" value="true"/>
23   <property name="helpUrl" value="docs/entityType.html"/>
24   <property name="maintainableItems">
25     <list>
26       <bean parent="MaintainableFieldDefinition" p:name="code"/>
27       <bean parent="MaintainableFieldDefinition" p:required="true" p:name="name"/>
28       <bean parent="MaintainableFieldDefinition" p:required="true" p:name="active"/>
29     </list>
30   </property>
31 </bean>
32
33 <bean id="EntityTypeMaintenanceDocument-Details" parent="MaintainableSectionDefinition">
34   <property name="title" value="Entity Type Details"/>
35   <property name="defaultOpen" value="false"/>
36   <property name="helpUrl" value="docs/entityTypeDetails.html"/>
37   <property name="maintainableItems">
38     <list>
39       <bean parent="MaintainableCollectionDefinition">
40         <property name="summaryTitle" value="Entity Type Detail"/>
41         <property name="businessObjectClass" value="org.kuali.rice.kim.impl.identity.EntityTypeDetailsBo"/>
42         <property name="name" value="entityTypeDetails"/>
43         <property name="maintainableFields">
44           <list>
45             <bean parent="MaintainableFieldDefinition" p:name="name"/>
46             <bean parent="MaintainableFieldDefinition" p:name="value"/>
47           </list>
48         </property>
49         <property name="duplicateIdentificationFields">
50           <list>
51             <bean parent="MaintainableFieldDefinition" p:name="name"/>
52             <bean parent="MaintainableFieldDefinition" p:name="value"/>
53           </list>
54         </property>
55       </bean>
56     </list>
57   </property>
58 </bean>
```

KRAD code example:

```
1 <bean id="EntityTypeMaintenanceDocument-uifMaintenanceDocumentEntry" parent="uifMaintenanceDocumentEntry">
2   <property name="dataObjectClass" value="org.kuali.rice.kim.impl.identity.EntityTypeBo"/>
3   <property name="documentTypeName" value="EntityTypeMaintenanceDocument"/>
4   <property name="maintainableClass" value="org.kuali.rice.kim.maintenance.EntityTypeMaintainableImpl"/>
5 </bean>
6
7 <bean id="EntityTypeMaintenanceDocument-MaintenanceView" parent="Uif-MaintenanceView">
8   <property name="dataObjectClassName" value="org.kuali.rice.kim.impl.identity.EntityTypeBo"/>
9   <property name="additionalScriptFiles">
10     <list>
11       <value>entityType.js</value>
12     </list>
13   </property>
14   <property name="items">
15     <list>
16       <ref bean="EntityTypeMaintenanceDocument-General"/>
17       <ref bean="EntityTypeMaintenanceDocument-Details"/>
18     </list>
19   </property>
20 </bean>
21
22 <bean parent="Uif-MaintenanceGridSection" id="EntityTypeMaintenanceDocument-General">
23   <property name="headerText" value="Entity Type"/>
24   <property name="disclosure.defaultOpen" value="true"/>
25   <property name="help">
26     <bean parent="Uif-Help">
27       <property name="externalHelpUrl" value="docs/entityType.html"/>
28     </bean>
```



```

29 </property>
30 <property name="items">
31   <list>
32     <bean p:propertyName="code" parent="Uif-InputField"/>
33     <bean p:required="true" p:propertyName="name" parent="Uif-InputField"/>
34     <bean p:required="true" p:propertyName="active" parent="Uif-InputField"/>
35   </list>
36 </property>
37 </bean>
38
39 <bean parent="Uif-VerticalBoxSection" id="EntityTypeMaintenanceDocument-Details">
40   <property name="headerText" value="Entity Type Details"/>
41   <property name="disclosure.defaultOpen" value="false"/>
42   <property name="help">
43     <bean parent="Uif-Help">
44       <property name="externalHelpUrl" value="docs/entityTypeDetails.html"/>
45     </bean>
46   </property>
47   <property name="items">
48     <list>
49       <bean parent="Uif-MaintenanceStackedCollectionSection">
50         <property name="collectionObjectClass"
value="org.kuali.rice.kim.impl.identity.EntityTypeDetailsBo"/>
51         <property name="propertyName" value="entityTypeDetails"/>
52         <property name="items">
53           <list>
54             <bean p:propertyName="name" parent="Uif-InputField"/>
55             <bean p:propertyName="value" parent="Uif-InputField"/>
56           </list>
57         </property>
58         <property name="lineActions">
59           <list>
60             <bean parent="Uif-DeleteLineAction" p:render="@{isAddedCollectionItem(#line)}"/>
61             <bean parent="Uif-SaveLineAction"/>
62           </list>
63         </property>
64         <property name="duplicateLinePropertyNames">
65           <list>
66             <value>name</value>
67             <value>value</value>
68           </list>
69         </property>
70       </bean>
71     </list>
72   </property>
73 </bean>

```

Base Maintenance Bean

- The parent bean of the maintenance document has changed from **MaintenanceDocumentEntry** to **uifMaintenanceDocumentEntry**. [KNS line: 1, KRAD line: 1] **script conversion**
- The maintainable class for a given document is specified in the same way in KRAD as was done in KNS using the **maintainableClass** property of **MaintenanceDocumentEntry**. The maintainable class should extend **org.kuali.rice.krad.maintenance.MaintainableImpl**. [KNS line: 4, KRAD line: 4] **script conversion**
- Maintenance sections are now referenced in a completely new bean parented by **Uif-MaintenanceView** instead of the KNS **MaintainableSectionDefinition** beans. Note that the sections are no longer referenced inside the **uifMaintenanceDocumentEntry** and instead are referenced in the view and are linked back to the **uifMaintenanceDocumentEntry** via **dataObjectClassName** [KNS line: 12, KRAD line: 7] **script conversion**
- For including extra Javascript files, **webScriptFiles** has changed to **additionalScriptFiles**. [KNS line: 6-10, KRAD line: 9-13] **script conversion**

Sections

- The title of the view is specified via the **headerText** property instead of the **title** property. [KNS line: 21, KRAD line: 23] **script conversion**
- The property that controls whether the section defaults to open has moved from **defaultOpen** to the **Disclosure** object and is now accessed via **disclosure.defaultOpen**. [KNS line: 22, KRAD line: 24] **script conversion**
- Help links specified by **helpUrl** have now been changed to a full **Uif-Help** which contains a property **externalHelpUrl** where the link is now stored. [KNS line: 23, KRAD line: 25-29] **script conversion**

Collections

- The class of the collection is now specified by the **collectionObjectClass** property instead of the **businessObjectClass** property. [KNS line: 41, KRAD line: 50] **script conversion**
- The name of the collection within the parent object is now specified by the **propertyName** property instead of the **name** property. [KNS line: 42, KRAD line: 51] **script conversion**
- The list of fields is now specified by the **items** property instead of the **maintainableFields** property. [KNS line: 43-47, KRAD line: 52-57] **script conversion**
- To indicate which fields should be used to check for duplicate records is now specified by the **duplicateLinePropertyNames** and is a simple list of property names, instead of the **duplicateIdentificationFields** property. [KNS line: 49-54, KRAD line: 64-69] **script conversion**

Data Dictionary Features

- In order to customize how the backing form populated after a lookup or refresh, the KNS provided **DerivedValuesSetter.setDerivedValues** which could update other objects on the form when one object was updated via the request. KRAD provides a Uif property to do this: **p:refreshWhenChangedPropertyNames="field1, field2"**. so that when an **InputField** specifying this property is updated, **field1** and **field2** are refreshed as well. **manual conversion**
- The KNS **PromptBeforeValidation** class was used to prompt the user with a question before continuing on with routing. This has been deprecated in KRAD in favor of the new Dialog framework. To implement this, first override the base Maintenance controller, call the dialog right before routing, and get the dialog response from **getBooleanDialogResponse**. Next in the Uif, add the dialog to the **MaintenanceView.dialogs** property.

```
1 <property name="dialogs">
2   <list>
3     <bean id="routeConfirmationDialog" parent="Uif-OK-Cancel-DialogGroup" p:promptText="Would you like to
route?"/>
4   </list>
5 </property>
```

manual conversion

- The KNS **LookupReadOnlyControlDefinition** which displayed only a quickfinder icon has been replaced. To create quickfinder only input with no text input field, set the `widgetInputOnly` property on the **InputField**.

```
1 <bean parent="Uif-InputField" p:propertyName="field" p:widgetInputOnly="true">
2   <property name="quickfinder">
3     <bean parent="Uif-QuickFinder"/>
4   </property>
5 </bean>
```

manual conversion

- While default values can be specified via finders, they can also be specified directly on the Uif with complete expression support.

```
1 <bean parent="Uif-InputField" p:propertyName="field" p:defaultValue="@{field2}"/>
```

- Several fields have been removed in favor of the new conditional **readOnly**. The `p:unconditionallyReadOnly="true"` can be replaced directly by `p:readOnly="true"`, while `p:readOnlyAfterAdd="true"` can be replaced with `p:readOnly="@{!#isAddLine}"`.

script conversion

- When the document is in read only mode, an alternate property can be displayed for a field. The KNS property `p:alternateDisplayAttributeName="field"` has been replaced with the KRAD equivalent `p:readOnlyDisplayReplacementPropertyName="field"`.

script conversion

- When the document is in read only mode, an additional property can be displayed with a field. The KNS property `p:additionalDisplayAttributeName="field"` has been replaced with the KRAD equivalent `p:readOnlyDisplaySuffixPropertyName="field"`.

script conversion

- In order to control whether the add line in a collection should be shown, the KNS provided `<property name="includeAddLine" value="false"/>`. The setup in KRAD is a bit more complex but a lot more flexible as it allows implementers to control the exactly when the line should be shown or not depending on an expression.

```
1 <bean parent="Uif-MaintenanceStackedCollectionSection">
2   <property name="addLineActions">
3     <list>
4       <bean parent="Uif-SecondaryActionButton-Small" p:methodToCall="addLine" p:actionLabel="add"
5       p:hidden="true"/>
6     </list>
7   </property>
8 </bean>
```

script conversion

- To specify whether items can be deleted from a collection, the KNS provided the property `p:alwaysAllowCollectionDeletion="true"`. This has been removed in KRAD but has an equivalent replacement:

```
1 <property name="lineActions">
2   <list>
3     <bean parent="Uif-DeleteLineAction" p:render="{isAddedCollectionItem(#line)}"/>
4     <bean parent="Uif-SaveLineAction"/>
5   </list>
6 </property>
```

script conversion

Maintenance Multiple Value Lookups

Multiple value lookups allow for a collection on a maintenance document to be populated with multiple results at once, rather than forcing the user to iteratively add results one after another. For a maintenance document to use a multiple value lookup, the maintenance document must contain a collection, and a collection lookup must be configured for that collection.

KNS code example:

```
1 <bean parent="MaintainableCollectionDefinition">
2   ...
3   <property name="businessObjectClass" value="org.kuali.rice.kim.impl.identity.EntityTypeDetailsBo"/>
4   <property name="sourceClassName" value="org.kuali.rice.kim.impl.identity.CustomEntityTypeDetailsBo"/>
5   <property name="includeMultipleLookupLine" value="true"/>
6   <property name="maintainableFields">
7     <list>
8       <bean parent="MaintainableFieldDefinition" p:name="name" p:required="true" p:template="detailName"/>
9       <bean parent="MaintainableFieldDefinition" p:name="value" p:required="true" p:template="detailValue"/>
10    </list>
11  </property>
12 </bean>
```

KRAD code example:

```
1 <bean parent="Uif-Disclosure-StackedCollectionSection">
2   ...
3   <property name="collectionObjectClass" value="org.kuali.rice.kim.impl.identity.EntityTypeDetailsBo"/>
4   <property name="collectionLookup">
5     <bean parent="Uif-CollectionQuickFinder"
6       p:dataObjectClassName="org.kuali.rice.kim.impl.identity.CustomEntityTypeDetailsBo"
7       p:fieldConversions="detailName:name,detailValue:value"/>
8   </property>
9   <property name="items">
10    <list>
11      <bean parent="Uif-DataField" p:attributeName="name"/>
12      <bean parent="Uif-DataField" p:attributeName="value"/>
13    </list>
14  </property>
15 </bean>
```

- In KNS the **MaintainableCollectionDefinition** is used to specify collections on a maintenance document. With KRAD, one of the Uif collection groups is used. **script conversion**
- In KNS the **includeMultipleLookupLine** property was set to true and the **sourceClassName** was specified to enable multiple value lookups on the collection, using the **template** fields for the field conversions. In KRAD these properties do no longer exist. Instead the **collectionLookup** property is initialized with the **Uif-CollectionQuickfinder** bean. **script conversion**

- **Uif-CollectionQuickfinder** has the following properties but do not need to be specified if the `collectionObjectClass` of the collection group is the same as the `dataObjectClassName` of the multi value lookup:
 - `dataObjectClassName` - the data object that should be looked up **script conversion**
 - `fieldConversions` - from-to mapping of the returned data (`<lookup-field>:<maintenance-collection-field>`) **script conversion**

Base Maintenance Class

Custom documents that extended `org.kuali.rice.kns.document.MaintenanceDocumentBase` will need to reparent to `org.kuali.rice.krad.maintenance.MaintenanceDocumentBase`. **manual conversion**

Section Customization

The KNS provided the hook `Maintainable.getSections` to allow tweaking the section objects to be read only or hidden. Now that KRAD provides dynamic fields on the Uif, this functionality is deprecated in favor of the dynamic fields. These should be used to configure when a given section is read only or hidden. An example of this would be to specify `p:readOnly="@{#dp.propertyName eq null}"`. **manual conversion**

Collection Customization

KNS provided the container `Maintainable.newCollectionLines` for lines being added to a collection to prevent them from being persisted until added. KRAD provides `UiformBase.newCollectionLines` which is similar but also allows customizing the property names and `BindingInfo` via `CollectionGroup.addLinePropertyName` and `CollectionGroup.addLineBindingInfo`.

Rule Customization

The KNS provided methods for setting up convenience objects to process the rules. These methods, `org.kuali.rice.kns.rules.MaintenanceDocumentRule.setupBaseConvenienceObjects` and `org.kuali.rice.kns.rules.MaintenanceDocumentRule.setupConvenienceObjects` have been reparented and can now be overridden in `org.kuali.rice.krad.rules.MaintenanceDocumentRule.setupBaseConvenienceObjects` and `org.kuali.rice.krad.rules.MaintenanceDocumentRule.setupConvenienceObjects`, respectively. **manual conversion**

MaintenanceDocumentPresentationController

KRAD splits the `MaintenanceDocumentPresentationController` interface into one for the maintenance entry and one for the maintenance view. The one for the maintenance entry is also named

MaintenanceDocumentPresentationController but has been reparented. The one for the maintenance view is **ViewPresentationController**.

- Any references to **getConditionallyHiddenSectionIds** and **getConditionallyReadOnlySectionIds** in **MaintenanceDocumentPresentationController** should be moved to **ViewPresentationController** and translated to **canViewGroup** and **canEditGroup** respectively. **manual conversion**
- Sections can contain an ID attribute in KRAD just like they could in the KNS. However, if this ID was not specified in the KNS, it defaulted to the tab name. In KRAD, this defaults to the bean name, so implementers using this defaulting capability in the **getConditionallyHiddenSectionIds** and **getConditionallyReadOnlySectionIds** methods will need to change any references from the tab name to the bean name. **manual conversion**

Specifying a javascript function to call on tab out from a field

In KNS this was achieved using **MaintainableFieldDefinition.webUILeaveFieldFunction**.

```
1 <bean parent="MaintainableFieldDefinition" p:name="name" p:required="false"
2   p:webUILeaveFieldFunction="alert('you are out')"/>
```

However in KRAD Component classes include properties for events that are applicable to the generate HTML elements. The same functionality can be obtained using the **ComponentBase.onBlurScript**. The **MaintainableFieldDefinition.webUILeaveFieldFunction** is transformed to a **onBlurScript** property. **script conversion** A TODO comment will be added "TODO - Check if javascript is still relevant and correct". **manual conversion**

```
<bean parent="Uif-TextAreaControl" p:rows="5" p:cols="40">
  <property name="onBlurScript" value="jq(this).stop().animate({'height':'-=50px'},100);"/>
</bean>
```

Specifying help URL on a per-field basis

In KNS System parameter **ENABLE_FIELD_LEVEL_HELP_IND** enables help on all fields enables help on all fields. You could set help at the field\BO\document page level. In KRAD the **Help widget** is used to render tooltip help and/or external help. Help can be configured at the view, page, section or sub-section, or at the field level. Tooltip help content is defined in the data dictionary.

```
1 <bean parent="Uif-TextControl">
2   <property name="help">
3     <bean parent="Uif-Help" p:tooltipHelpContent="This is my help text"/>
4   </property>
5 </bean>
```

External Help can be specified via the data dictionary, or through a system parameter.

```
1 <bean parent="Uif-View">
2   <property name="help">
```

```
3 <bean parent="Uif-Help" p:externalHelpUrl="http://www.kuali.org/" />
4 </property>
5 </bean>
```

```
1 <bean parent="Uif-View">
2 <property name="help">
3 <bean parent="Uif-Help">
4 <property name="helpDefinition">
5 <bean parent="HelpDefinition" p:parameterNamespace="KR-SAP"
6 p:parameterName="TEST_PARAM"
7 p:parameterDetailType="TEST_COMPONENT" />
8 </property>
9 </bean>
10 </property>
11 </bean>
```

Additional display value

In KNS `LookupDefinition.translateCode` `FieldUtils.setAdditionalDisplayPropertyForCodes` gave the ability to indicate that any property which is the code on a relationship for a BO class that implements `KualiCode` should display itself as a combination of Code + Name in read-only mode. In KRAD this is done using `View.translateCodesOnReadOnlyDisplay` and `DataField.setAlternateAndAdditionalDisplayValue` `translateCodesOnReadOnlyDisplay` is a boolean that indicates whether code properties should automatically be translated to their name property for read only display. `setAlternateAndAdditionalDisplayValue` get the relationship configured in the data dictionary file and set the name additional display value which will be displayed along with the code

Attachments

The KNS provided a way to download an attachment from a Maintenance Document. Typically this was specified both in the business object and the data dictionary as follows:

```
1 private String fileName;
2 private String contentType;
3 private byte[] attachmentContent;
4 private transient FormFile attachmentFile;
```

```
1 <bean id="AttachmentSample-attachmentFile" parent="AttributeDefinition">
2 <property name="name" value="attachmentFile" />
3 <property name="label" value="Attachment File" />
4 <property name="control">
5 <bean parent="FileControlDefinition" p:size="50" />
6 </property>
7 </bean>
```

In KRAD, because of the transition to Spring, this configuration needs to be changed with some additional setup. The Struts `FormFile` should change to `MultipartFile` but should include some additional setup to make sure that all of the rest of the variables are set on the form. KRAD also provides an intelligent way to display the attachments depending on whether the attachment is null or not. When the attachment exists, then this setup allows downloading the attachment via a button. When the attachment is null, the `Uif-ConditionalBeanPropertyReplacer` replaces the button with a simple `Uif-FileControl`.

```
1 private String fileName;
2 private String contentType;
3 private byte[] attachmentContent;
4 private transient MultipartFile attachmentFile;
5
```

```
6 public void setAttachmentFile(MultipartFile attachmentFile) {
7     if (attachmentFile != null) {
8         setContentType(attachmentFile.getContentType());
9         setFileName(attachmentFile.getOriginalFilename());
10        try {
11            setAttachmentContent(attachmentFile.getBytes());
12        } catch (Exception e) {
13            throw new RuntimeException(e);
14        }
15    }
16 }
```

```
1 <bean parent="Uif-VerticalFieldGroup" p:label="Attachment File">
2     <property name="items">
3         <list>
4             <bean parent="Uif-DataField" p:fieldLabel.render="false" p:propertyName="fileName" />
5             <bean parent="Uif-PrimaryActionButton-Small" p:methodToCall="downloadBOAttachment"
6                 p:actionLabel="download attachment" p:title="download attachment"
7                 p:ajaxSubmit="false" p:disableBlocking="true"
8                 p:onClickScript="writeHiddenToForm('ajaxReturnType', 'update-none');">
9                 <property name="actionParameters">
10                    <map>
11                        <entry key="selectedLineIndex" value="@{#index}"/>
12                    </map>
13                </property>
14            </bean>
15        </list>
16    </property>
17    <property name="propertyReplacers">
18        <list>
19            <bean parent="Uif-ConditionalBeanPropertyReplacer" p:propertyName="items" p:condition="@{#dp.fileName
20                eq null}">
21                <property name="replacement">
22                    <list>
23                        <bean parent="Uif-InputField" p:propertyName="attachmentFile" p:fieldLabel.render="false">
24                            <property name="control">
25                                <bean parent="Uif-FileControl" p:size="50"/>
26                            </property>
27                        </bean>
28                    </list>
29                </property>
30            </bean>
31        </list>
32    </property>
33 </bean>
```

Overriding default values

In KNS **Maintainable.setGenerateDefaultValues** was used to set the default values for fields. However in KRAD this functionality is provided by **ViewHelperServiceImpl.applyDefaultValues**. This is called during the finalize phase of the view cycle before the view is rendered.

Customization Hooks

Customization hooks have been provided for the various actions that can be performed on a maintenance document. It involves overriding the specific methods related to that action (new,copy etc). KNS used to provide the following methods:

- `MaintenanceDocument.getNewMaintainableObject`
- `Maintainable.setupNewFromExisting`
- `Maintainable.processBeforeAddLine`
- `Maintainable.processAfterPost`

Similar functionality can be obtained in KRAD using the following methods:

- `MaintenanceDocumentController.setupMaintenance`
- `Maintainable.setupNewFromExisting`
- `Maintainable.retrieveObjectForEditOrCopy`
- `Maintainable.processAfterPost`
- `ViewHelperServiceImpl.processBeforeAddLine`
- `ViewHelperServiceImpl.processAfterAddLine`

Preparing the BO from an external source

In the KNS an external business object was set up using `org.kuali.rice.kns.maintenance.Maintainable.prepareBusinessObject`. To activate this, implementers also had to override `org.kuali.rice.kns.maintenance.Maintainable.isExternalBusinessObject` to return true. In KRAD this functionality has been moved to `org.kuali.rice.krad.maintenance.Maintainable` and replaced. Different methods should be overridden depending on whether the external BO being loaded is from the database or not.

KNS BO Preparation:

```
1 public boolean isExternalBusinessObject();
2 public void prepareBusinessObject(BusinessObject businessObject);
```

KRAD Database BO Preparation:

```
1 public boolean isExternalBusinessObject();
2 public void prepareExternalBusinessObject(BusinessObject businessObject);
```

KRAD Non-Database BO Preparation:

```
1 public void retrieveObjectForEditOrCopy(MaintenanceDocument document, Map<String, String> dataObjectKeys);
```

Custom BO setup

While external Business Objects have methods to handle their setup, there is no way to change the old Business Object after it is loaded but before it is copied into the new Business Object. In edge cases where this needs to happen, the above methods can be used, but it is better to use `org.kuali.rice.krad.maintenance.Maintainable.processAfterCopy` or `org.kuali.rice.krad.maintenance.Maintainable.processAfterEdit` if processing can wait until the new Business Object has been created.

Refreshing references

Specifying which reference objects to refresh on a document can be configured by using the `referencesToRefresh` property. It specifies primary keys of reference objects, which are then used to pull those objects from where they are persisted.

In KNS this was done using the `AbstractLookupableHelperServiceImpl.referencesToRefresh` and `KualiMaintainableImpl.refreshReferences`. In KRAD this has been replaced by `LookupForm.referencesToRefresh` and `ViewHelperService.refreshReferences`.

Permission Checks

Permission checks for maintenance documents in KRAD can be setup the same way as specified in the Other Lookup Features. Note that if any implementers are extending a KNS base class, they need to move that logic over to a KRAD base class. Examples below. **manual conversion**

- Partial Unmask Field checks if a security-masked field can be partially displayed. In KNS this was checked using the `BusinessObjectAuthorizationServiceImpl.canPartiallyUnmaskField`. In KRAD the method name has changed to `ViewAuthorizer.canPartialUnmaskField`. Enabled by setting `attributeSecurity.partialMask` to true on the data field security object of the data. Implementers will have manually do the conversion and move any custom logic in the new method.
- Full Unmask Field checks if a security-masked field can be displayed in the clear. In KNS this was checked using the `BusinessObjectAuthorizationServiceImpl.canFullyUnmaskField`. In KRAD the method name has changed to `ViewAuthorizer.canUnmaskField`. Enabled by setting `attributeSecurity.mask` to true on the data field security object of the data. Implementers will have manually do the conversion and move any custom logic in the new method.
- Modify Maintenance Document Section - In KNS this was accomplished using the `BusinessObjectAuthorizationServiceImpl.considerMaintenanceDocumentAuthorizer` and a permission extending the KR-NS *Modify Maintenance Document Section*. In KRAD the method has changed to `ViewAuthorizer.canEditGroup`. Any custom logic will need to be moved to the new method. A new permission which extends the KR-KRAD *Edit Group template* will have to be created.
- View Inquiry or Maintenance Document Section - In KNS this was accomplished using the `BusinessObjectAuthorizationServiceImpl.considerInquiryOrMaintenanceDocumentAuthorizer` and a permission extending the KR-NS *View Inquiry or Maintenance Document Section*. In KRAD the method has changed to `ViewAuthorizer.canViewGroup`. Any custom logic will need to be moved to the new method. A new permission which extends the KR-KRAD *View Group template* will have to be created.
- Modify Maintenance Document Field - In KNS this was accomplished using the `BusinessObjectAuthorizationServiceImpl.considerBusinessObjectFieldModifyAuthorization` and a permission extending the KR-NS *Modify Maintenance Document Field*. In KRAD the method has changed to `ViewAuthorizer.canEditField`. Any custom logic will need to be moved to the new method. A new permission which extends the KR-KRAD *Edit Field template* will have to be created.
- View Inquiry or Maintenance Document Field - In KNS this was accomplished using the `BusinessObjectAuthorizationServiceImpl.considerBusinessObjectFieldViewAuthorization` and a permission extending the KR-NS *View Inquiry or Maintenance Document Field*. In KRAD the method has changed to `ViewAuthorizer.canViewField`. Any custom logic will need to be moved to the new method. A new permission which extends the KR-KRAD *View Field template* will have to be created.
- Perform Custom Maintenance Document Function - In KNS this was accomplished using the `BusinessObjectAuthorizationServiceImpl.considerCustomButtonFieldAuthorization` and a permission extending the KR-NS *Perform Custom Maintenance Document Function*. In KRAD the logic has moved to the Uif under `Uif-ActionSecurity`. Any custom logic will need to be moved to the new definition below. A new permission which extends the KR-KRAD *Perform Action template* will have to be created.

```
1 <bean parent="Uif-ActionField" p:label="Button">
```

```
2 <property name="action">
3   <bean parent="Uif-PrimaryActionButton" p:id="button" p:actionLabel="Button" p:methodToCall="Button">
4     <property name="componentSecurity">
5       <bean parent="Uif-ActionSecurity" p:performActionAuthz="true" />
6     </property>
7   </bean>
8 </property>
9 </bean>
```

Document Error Handling

Document errors with custom paths, typically specified in a subclass of **MaintenanceDocumentRuleBase**, will not appear on the document unless they are converted to the new KRAD format. For example, if you were throwing an additional error against text entered for notes, in KNS you would write a validation like:

```
1 public boolean isValid(Note note) {
2   boolean isValid = true;
3   if (!StringUtils.isAllUpperCase(note.getNoteText())) {
4     isValid = false;
5     GlobalVariables.getMessageMap().putError("newNote.noteText", "error.note.not.uppercase");
6   }
7   return isValid;
8 }
```

but in KRAD, the beginning of the property path has changed to **newCollectionLines['document.notes']** so the code would have to be modified to

```
1 public boolean isValid(Note note) {
2   boolean isValid = true;
3   if (!StringUtils.isAllUpperCase(note.getNoteText())) {
4     isValid = false;
5     GlobalVariables.getMessageMap().putError("newCollectionLines['document.notes'].noteText",
"error.note.not.uppercase");
6   }
7   return isValid;
8 }
```

Validation of all of these customizations is left to the implementer.

Other Maintenance Features

- Where it used to be possible to specify additional non-standard sections via the Data Dictionary property **additionalSectionsFile**, this is no longer possible since KRAD does not use JSP, preferring instead to use Freemarker. The conversion from JSP files to the KRAD format will vary from use case to use case, and thus it is not possible to provide a straight conversion from JSP to Freemarker. KRAD does however address natively many of the typical non-standard layouts previously addressed by this feature, and implementers can always choose to create custom components to address any other requirements.

manual conversion

- To enable Externalizable Business Objects, users of the KNS would often override the indicator **org.kuali.rice.kns.maintenance.Maintainable.isExternalBusinessObject**. In KRAD, this has been moved to **org.kuali.rice.krad.maintenance.Maintainable.isExternalBusinessObject**. If this has been implemented in an old KNS class, then the logic must be moved to the new KRAD class. **manual conversion**

Transactional Conversion

<introduction here>

KIM Permission Conversion

Note

Currently there is no conversion script to automatically convert or create new KRAD KIM permissions from KNS permissions. This section of the guide documents the KIM structures involved and the KNS / KRAD equivalents. To illustrate the various KIM entities, examples from the Rice KIM management screens are shown.

KRAD uses KIM permissions for checking the ability to open views, view and edit groups, lines and fields, as well as the ability to perform actions. In several instances the KRAD permissions are similar to their KNS counterparts, but use different permissions templates and qualifiers. But there are some differences:

- In KNS the permission was checked against the business object. In KRAD, the permission is checked against the view name. And you may have multiple views on the same object with different permissions.
- In KRAD a view is viewable by all authenticated users by default. In this case, no KIM permissions need to be defined. In KNS, a default KIM permission of the appropriate type is required, with the derived role USER assigned to it.

KIM permissions are stored in Rice database tables. They are created either by SQL script or using the Rice KIM maintenance screens.

Inquiry Permissions

In KNS, there are three types of KIM permissions related to Inquiries

- Inquire Into Records - may the user inquire on objects of that type.
- Full Unmask Field - may a security masked field be displayed in the clear.
- Partial Unmask Field - may a security masked field be partially displayed.


Inquire Into Records

Checks the user's ability to inquiry objects of that type. In KRAD the **Open View** permission is used in place of the KNS **Inquire Into Records** permission.

The KRAD Can View permission uses different KIM entities than the KRAD Inquire Into Records permission.

- KIM Permission

KNS Inquire Into Records Permission

The following example illustrates the differences between a KNS Inquiry Into Records permission and a KRAD Open View permission. 

KRAD Open View Permission

- In KRAD **Open View** permissions are used in place of the KNS **Inquire Into Records** permissions to limit access to an inquiry view.
- In KRAD the **Open View** permission has a single Detail attribute: **viewId**. This is in contrast to the two permission detail attributes **namespaceCode** and **componentName** used by the KNS **Inquire Into Records** permissions to limit access to an inquiry view.
- KIM Permission Template: Inquire Into Records

KNS Namespace or Component KimType:

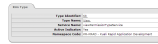
KRAD View KimType:

In KRAD the **Open View** permission template is used in place of the KNS **Inquire Into Records** permission template.

- KIM Type: Namespace or Component

KNS Inquire Into Records Permission Template:

KRAD Open View Permission Template:



- In KRAD the **Open View** permission template is used in place of the KNS **Inquire Into Records** permission template.
- KIM Roles - the same roles can be applied to either KNS or KRAD permissions. It is not necessary to create separate KRAD equivalent roles.

To Restrict an Inquiry to users assigned a supervisor role in KRAD:

1. Create a new KIM Permission Using the KR-KRAD Open View Template



The Open View permission has one Permission Detail attribute: **viewID**. Set the viewId to be the name of the Inquiry View defined for the data object. [Line 1 below]

```

1 <bean id="AgendaBo-InquiryView" parent="Uif-InquiryView">
2     <property name="headerText" value="Agenda Inquiry" />
3     <property name="dataObjectClassName" value="org.kuali.rice.krms.impl.repository.AgendaBo" />
4     <property name="viewHelperServiceClass"
value="org.kuali.rice.krms.impl.repository.AgendaInquiryHelperServiceImpl" />
5     <property name="additionalScriptFiles">
```

2. Assign the newly created permission to the appropriate roles

Edit the role(s) being given permission to open the view. Add the permission to the role.



manual conversion

To make an inquiry available to all users in KRAD:

- Do Nothing!

script conversion

Full Unmask Field

The Full Unmask Field permission is used in both KNS and KRAD. The existing KNS permissions will work as is in KRAD. No conversion or duplication is necessary.



Partial Unmask Field

The Full Unmask Field permission is used in both KNS and KRAD. The existing KNS permissions will work as is in KRAD. No conversion or duplication is necessary.



Lookup Permissions

Maintenance Permissions

OJB to JPA Conversion

Conversion from OJB to JPA should be done a module at a time if possible.

In some cases there are clusters of tables that are related and will need to be converted together, but often there are sets of tables (even within a given module) which are independent from each other and can be converted independently to allow for some amount of testing.

JPA Conversion Tool

As part of the upgrade to use KRAD, you will need to update all your OJB-mapped **BusinessObject** classes into JPA-mapped data objects.

For this, the Rice project has provided a tool which should extract most of your OJB metadata and use it to annotate your Java classes.

The script is written in Groovy and uses a Groovy configuration file for the more verbose elements.

Running the Conversion Tool

1. In the project distribution, copy the contents of the **scripts/jpaconverter** directory to a working directory.

2. If you do not have your own Groovy Grapes setup, place the XML content below into `$HOME/.groovy/grapeConfig.xml`.

```
<ivysettings>
  <property name="ivy.cache.ttl.default" value="24h"/>
  <settings defaultResolver="downloadGrapes"/>
  <resolvers>
    <chain name="downloadGrapes" returnFirst="true">
      <filesystem name="cachedGrapes">
        <ivy pattern="${user.home}/.groovy/grapes/[organisation]/[module]/ivy-[revision].xml"/>
        <artifact pattern="${user.home}/.groovy/grapes/[organisation]/[module]/[types]/[artifact]-[revision](-[classifier]).[ext]"/>
      </filesystem>
      <ibiblio name="localm2" root="file:${user.home}/.m2/repository/" checkmodified="true"
        changingPattern=".*" changingMatcher="regexp" m2compatible="true"/>
      <ibiblio name="mavencentral" root="http://repo.maven.apache.org/maven2/" m2compatible="true"/>
      <ibiblio name="codehaus" root="http://repository.codehaus.org/" m2compatible="true"/>
    </chain>
  </resolvers>
</ivysettings>
```

3. Update (and rename) the `config-sample.groovy` script with the appropriate values for your project.

All the elements below should be set in the Groovy configuration file. See the provided `config-sample.groovy` for examples and use it as a starting point.

- **classpathDirectories** : This is a list of directories, relative to the base path passed in on the command line, which will be used to resolve your compiled classes. The converter inspects the code to obtain needed information, and so needs a compiled version of all business object classes. Each directory is expected to be the base of a class file output directory. (E.g., `target/classes`)
- **classpathJarDirectories** : A list of directories, relative to the base path, which will be scanned for jar files. Each jar file found will be added to the classpath. This should contain paths to all the libraries used by your project in order to resolve dependencies of your business objects. (E.g., a `WEB-INF/lib` directory)
- **sourceDirectories** : A list of directories, relative to the base path, which will be scanned for the matching source files for your business objects. The first `.java` file which matches a given class will be used and modified by this tool.
- **repositoryFiles** : A list of the files, relative to the base path, of the OJB files you want to scan and process. Only classes referenced in `<class-descriptor>` elements in these files will be touched by the conversion process.
- **converterMappings** : A mapping of class name to new JPA converter names. If you edit this map, leave all the existing entries in place and add your application-specific converters to the end of the list. If you have converters in your application which are not covered by the implementations already in the conversion list, you will need to create a new JPA converter class (`javax.persistence.AttributeConverter`) and then add the fully qualified class name in this map.

4. Run the `JpaConverter.groovy` tool as shown below. See the README.md in the same directory as the scripts for troubleshooting information and further recommendations.

Tool Usage

```
usage: groovy JpaConverter.groovy -b <project base directory> -c <location of config file> [options]
```

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```
-b,--base <base directory> Absolute path to the base directory for the
                           conversion.
-c,--config <config file> Location of groovy configuration file
-e,--erroronly             If set, the script will only report any
                           errors or warnings it will encounter and
                           *not* update any files.
-h,--help                 show usage information
-n,--dryrun               If set, the script will dump the resulting
                           java files to the console instead of
                           updating the existing files.
                           --replace
                           Replace all existing JPA annotations on
                           classes referenced by OJB files.
```

JPA Configuration

Create a new spring file for your JPA configuration. Add a uniqueJpaPersistenceUnitName that is unique for the module(location in example). To include classes or whole packages add managedClassNames listed out or add the package prefix.

```
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xmlns:p="http://www.springframework.org/schema/p"
       xmlns:util="http://www.springframework.org/schema/util"
       xmlns:context="http://www.springframework.org/schema/context"
       xsi:schemaLocation="http://www.springframework.org/schema/beans
                           http://www.springframework.org/schema/beans/spring-beans-3.2.xsd
                           http://www.springframework.org/schema/util
                           http://www.springframework.org/schema/util/spring-util-3.2.xsd
                           http://www.springframework.org/schema/context
                           http://www.springframework.org/schema/context/spring-context-3.2.xsd">

  <alias
    alias="kradApplicationDataSource"
    name="locationDataSource" />
  <bean
    id="jpaPersistenceUnitName"
    class="java.lang.String">
    <constructor-arg value="location" />
  </bean>

  <util:list id="jpaPackagesToScan">
    <value>org.kuali.rice.location.impl</value>
  </util:list>

  <util:list id="managedClassNames" />

  <util:list id="additionalMetadataProviders" />
  <util:list id="springMetadataFileLocations" />

  <import resource="classpath:org/kuali/rice/krad/config/KRADSpringBeans-jpa-common.xml" />
</beans>
```

Add the highlighted below section to your ModuleConfigurationBean

```
<bean id="locationModuleConfiguration" class="org.kuali.rice.krad.bo.ModuleConfiguration">
  <property name="namespaceCode" value="KR-NS"/>
  <property name="dataSourceName" value="locationDataSource"/>
  <property name="initializeDataDictionary" value="true"/>
  <property name="dataDictionaryService" ref="dataDictionaryService"/>
  <property name="persistenceService" ref="persistenceServiceOjb"/>
  <property name="dataDictionaryPackages">
    <list>
      <value>classpath:org/kuali/rice/location/web/campus/Campus.xml</value>
      <value>classpath:org/kuali/rice/location/web/campus/CampusType.xml</value>
      <value>classpath:org/kuali/rice/location/web/country/Country.xml</value>
      <value>classpath:org/kuali/rice/location/web/country/County.xml</value>
      <value>classpath:org/kuali/rice/location/web/postalcode/PostalCode.xml</value>
    </list>
  </property>
</bean>
```


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```
<value>classpath:org/kuali/rice/location/web/state/State.xml</value>
<value>classpath:org/kuali/rice/location/web/campus/CampusMaintenanceDocument.xml</value>
<value>classpath:org/kuali/rice/location/web/campus/CampusTypeMaintenanceDocument.xml</value>
<value>classpath:org/kuali/rice/location/web/country/CountryMaintenanceDocument.xml</value>
<value>classpath:org/kuali/rice/location/web/country/CountyMaintenanceDocument.xml</value>
<value>classpath:org/kuali/rice/location/web/postalcode/PostalCodeMaintenanceDocument.xml</value>
<value>classpath:org/kuali/rice/location/web/state/StateMaintenanceDocument.xml</value>
</list>
</property>
<property name="packagePrefixes">
  <list>
    <value>org.kuali.rice.location.</value>
  </list>
</property>
<property name="externalizableBusinessObjectImplementations">
  <map>
    <entry key="org.kuali.rice.location.framework.country.CountryEbo"
      value="org.kuali.rice.location.impl.country.CountryBo" />
    <entry key="org.kuali.rice.location.framework.state.StateEbo"
      value="org.kuali.rice.location.impl.state.StateBo" />
    <entry key="org.kuali.rice.location.framework.postalcode.PostalCodeEbo"
      value="org.kuali.rice.location.impl.postalcode.PostalCodeBo" />
    <entry key="org.kuali.rice.location.framework.county.CountyEbo"
      value="org.kuali.rice.location.impl.county.CountyBo" />
    <entry key="org.kuali.rice.location.framework.campus.CampusEbo"
      value="org.kuali.rice.location.impl.campus.CampusBo" />
    <entry key="org.kuali.rice.location.framework.campus.CampusTypeEbo"
      value="org.kuali.rice.location.impl.campus.CampusTypeBo" />
  </map>
</property>

<property name="providers">
  <list>
    <ref bean="jpaPersistenceProvider" />
    <ref bean="metadataProvider" />
  </list>
</property>
</bean>
```

Entity Conversion

To convert your entity from OJB to JPA you have two options. One is to use the script that will autoconvert for you or to manually convert based on the OJB-repository.xml file for the module. To start here is a sample OJB descriptor for Postal Code in Rice.

```
<class-descriptor class="org.kuali.rice.location.impl.postalcode.PostalCodeBo" table="KRLC_PSTL_CD_T">
  <field-descriptor name="countryCode" column="POSTAL_CNTRY_CD" jdbc-type="VARCHAR" primarykey="true"
    indexed="true" />
  <field-descriptor name="code" column="POSTAL_CD" jdbc-type="VARCHAR" primarykey="true" indexed="true" />
  <field-descriptor name="stateCode" column="POSTAL_STATE_CD" jdbc-type="VARCHAR" />
  <field-descriptor name="cityName" column="POSTAL_CITY_NM" jdbc-type="VARCHAR" />
  <field-descriptor name="objectId" column="OBJ_ID" jdbc-type="VARCHAR" indexed="true" />
  <field-descriptor name="versionNumber" column="VER_NBR" jdbc-type="BIGINT" locking="true" />
  <field-descriptor name="active" column="ACTV_IND" jdbc-type="VARCHAR"
    conversion="org.kuali.rice.core.framework.persistence.ojb.conversion.OjbCharBooleanConversion" />
  <field-descriptor name="countyCode" column="COUNTY_CD" jdbc-type="VARCHAR" />

  <reference-descriptor name="country" class-ref="org.kuali.rice.location.impl.country.CountryBo" auto-
    retrieve="true" auto-update="none" auto-delete="none">
    <foreignkey field-ref="countryCode" target-field-ref="code" />
  </reference-descriptor>

  <reference-descriptor name="state" class-ref="org.kuali.rice.location.impl.state.StateBo" auto-
    retrieve="true" auto-update="none" auto-delete="none">
    <foreignkey field-ref="countryCode" target-field-ref="countryCode" />
    <foreignkey field-ref="stateCode" target-field-ref="code" />
  </reference-descriptor>

  <reference-descriptor name="county" class-ref="org.kuali.rice.location.impl.county.CountyBo" auto-
    retrieve="true" auto-update="none" auto-delete="none">
    <foreignkey field-ref="countryCode" target-field-ref="countryCode" />
  </reference-descriptor>
```

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```
<foreignkey field-ref="countyCode" target-field-ref="code" />
<foreignkey field-ref="stateCode" target-field-ref="stateCode" />
</reference-descriptor>
</class-descriptor>
```

First to declare this class in JPA using `@Entity` and the table it maps to.

```
@Entity
@Table(name = "KRLC_PSTL_CD_T")
class PostalCodeBo extends PersistableBusinessObjectBase implements PostalCodeEbo {
```

Next is to declare each of the columns and what property it maps to.

```
@Entity
@Table(name = "KRLC_PSTL_CD_T")
class PostalCodeBo extends PersistableBusinessObjectBase implements PostalCodeEbo {

    @Column(name = "POSTAL_CD")
    String code;

    @Column(name = "POSTAL_CNTRY_CD")
    String countryCode;

    @Column(name = "POSTAL_CITY_NM")
    String cityName;

    @Column(name = "POSTAL_STATE_CD")
    String stateCode;

    @Column(name = "COUNTY_CD")
    String countyCode;

    @Column(name = "ACTV_IND")
    boolean active;
```

Next is to declare the ID columns. This class has a compound primary key so it uses an more advanced feature of JPA called an `IdClass`.

```
@IdClass(PostalCodeId.class)
@Entity
@Table(name = "KRLC_PSTL_CD_T")
class PostalCodeBo extends PersistableBusinessObjectBase implements PostalCodeEbo {

    @Id
    @Column(name = "POSTAL_CD")
    String code;

    @Id
    @Column(name = "POSTAL_CNTRY_CD")
    String countryCode;

    @Column(name = "POSTAL_CITY_NM")
    String cityName;

    @Column(name = "POSTAL_STATE_CD")
    String stateCode;

    @Column(name = "COUNTY_CD")
    String countyCode;

    @Column(name = "ACTV_IND")
    boolean active;
```

If using an automatically generated ID from a sequence, use the `@GeneratedValue` and `@PortableSequenceGenerator` annotations.

```
@PortableSequenceGenerator(name = "KRLC_PSTL_CD_S")
@GeneratedValue(generator = "KRLC_PSTL_CD_S")
@Id
@Column(name = "PSTL_CD_ID")
private String id;
```

The active indicator used an OJB converter to handle the Y/N conversion into boolean. This is done with a customized EclipseLink Converter now.

```
@IdClass(PostalCodeId.class)
@Entity
@Table(name = "KRLC_PSTL_CD_T")
class PostalCodeBo extends PersistableBusinessObjectBase implements PostalCodeEbo {
    ...

    @Column(name = "ACTV_IND")
    @javax.persistence.Convert(converter=BooleanYNConverter.class)
    boolean active;

    @Converter(
        autoApply = true)
    public class BooleanYNConverter implements AttributeConverter<Boolean, String> {

        protected static final Set<String> YES_VALUES = new HashSet<String>();
        static {
            YES_VALUES.add("Y");
            YES_VALUES.add("y");
            YES_VALUES.add("true");
            YES_VALUES.add("TRUE");
        }

        @Override
        public String convertToDatabaseColumn(Boolean objectValue) {
            if (objectValue == null) {
                return "N";
            }
            return objectValue ? "Y" : "N";
        }

        @Override
        public Boolean convertToEntityAttribute(String dataValue) {
            if (dataValue == null) {
                return false;
            }
            return YES_VALUES.contains(dataValue);
        }
    }
}
```

The next part is to map the relationships that are defined by the reference-descriptor in OJB. The CountyBo has 3 columns as its primary key so it is described as follows.

```
@IdClass(PostalCodeId.class)
@Entity
@Table(name = "KRLC_PSTL_CD_T")
class PostalCodeBo extends PersistableBusinessObjectBase implements PostalCodeEbo {
    ...
    @ManyToOne(targetEntity = CountyBo.class, fetch = FetchType.EAGER)
    @JoinColumns(value=@JoinColumn(name = "COUNTY_CD", referencedColumnName="COUNTY_CD", insertable = false,
        updatable = false),
        @JoinColumn(name="POSTAL_STATE_CD", referencedColumnName="STATE_CD", insertable =
        false, updatable = false),
        @JoinColumn(name="POSTAL_CNTRY_CD", referencedColumnName="POSTAL_CNTRY_CD", insertable
        = false, updatable = false]))
    CountyBo county;
```

Migrate Service methods and Data Access layer to JPA

During the JPA conversion it is a good opportunity to remove any code that is not necessary due to enhancements in the core data fetching layer in the KRAD Data Module. The following are the best practices that should be used when using JPA in Kuali applications. In general the order of consideration for a query should go as the following:

1. Use `DataObjectService` methods in service methods.
2. Create custom DAOs method to use `NamedQuery` in JPA.
3. Use Rice Criteria API if query is too complicated and would require dynamic generation(String concatenation).
4. Use JPA Criteria API if query requires functions not supported in Rice Criteria API.

Simple `DataObjectService` fetch by Primary Key

```
CountryBo countryBo = getDataObjectService().find(CountryBo.class,code);

//Fetch by Compound Primary Key
final Map<String, Object> map = new HashMap<String, Object>();
map.put("countryCode", countryCode);
map.put("code", code);
StateBo stateBo = getDataObjectService().find(StateBo.class,new CompoundKey(map));
```

`DataObjectService` query for matching results

```
//Fetch all matching results by countryCode and that have active equivalent to true
final Map<String, Object> map = new HashMap<String, Object>();
map.put("countryCode", countryCode);
map.put("active", Boolean.TRUE);

QueryResults<PostalCodeBo> postalCodeBoQueryResults = getDataObjectService().
    findMatching(PostalCodeBo.class,QueryByCriteria.Builder.andAttributes(map).build());

//Fetch all Countries that have alternateCountryCode equal to value passed in
QueryByCriteria qbc = QueryByCriteria.Builder.forAttribute(KRADPropertyConstants.ALTERNATE_POSTAL_COUNTRY_CODE,
    alternateCode).build();
QueryResults<CountryBo> countryBoQueryResults = getDataObjectService().findMatching(CountryBo.class,qbc);
List<CountryBo> countryList = countryBoQueryResults.getResults();
```

`DataObjectService` query returning the count based on Criteria

```
//Fetch count based on document id and principal id and current indicator being true
QueryByCriteria.Builder criteria = QueryByCriteria.Builder.create().setPredicates(
    equal(DOCUMENT_ID, documentId),
    equal(PRINCIPAL_ID, principalId),
    equal(CURRENT_INDICATOR, Boolean.TRUE)
);
criteria.setCountFlag(CountFlag.ONLY);
return getDataObjectService().findMatching(ActionTakenValue.class, criteria.build()).getTotalRowCount();
```

Injecting the Shared Entity Manager

```
//Add the following to your Spring DAO implementation to assign the appropriate Persistence
```

```
//Unit to your DAO

public class DocumentTypeDAOJpa implements DocumentTypeDAO {

    @PersistenceContext(unitName="kew")
    private EntityManager entityManager;

}
```

Simple example of Named Query in Rice

```
//Fetch Application Document ID by Document ID
//Define constants for named query in DAO - In this case DocumentRouteHeaderDAOJpa
//Name your queries such that they start with the Entity name
//like @NamedQuery(name="ParameterBo.findAll", query="SELECT p FROM ParameterBo")

public static final String GET_APP_DOC_STATUS_NAME = "DocumentRouteHeaderValue.GetAppDocStatus";
public static final String GET_APP_DOC_STATUS_QUERY = "SELECT d.appDocStatus from "
    + "DocumentRouteHeaderValue as d where d.documentId = :documentId";

//Definition of NamedQuery on Queried Entity(DocumentRouteHeaderValue)
    @NamedQuery(name=DocumentRouteHeaderDAOJpa.GET_APP_DOC_STATUS_NAME, query=
        DocumentRouteHeaderDAOJpa.GET_APP_DOC_STATUS_QUERY)

//Code to call NamedQuery
TypedQuery<String> query = entityManager().createNamedQuery(
    "DocumentRouteHeaderValue.GetAppDocId",String.class);
query.setParameter("documentId",documentId);

String applicationDocId = null;
if(query.getResultList() != null && !query.getResultList().isEmpty()){
    applicationDocId = query.getResultList().get(0);
}
return applicationDocId;
```

More Complex example of NamedQuery

```
//Fetch all distinct document IDs by document type and application document ID
public static final String GET_DOCUMENT_ID_BY_DOC_TYPE_APP_ID_NAME =
    "DocumentRouteHeaderValue.GetDocumentIdByDocTypeAndAppId";
public static final String GET_DOCUMENT_ID_BY_DOC_TYPE_APP_ID_QUERY = "SELECT "
    + "DISTINCT(DH.documentId) FROM DocumentRouteHeaderValue DH, DocumentType DT "
    + "WHERE DH.appDocId = :appDocId AND DH.documentTypeId = DT.documentTypeId AND DT.name = :name";

@NamedQuery(name=DocumentRouteHeaderDAOJpa.GET_DOCUMENT_ID_BY_DOC_TYPE_APP_ID_NAME, query =
    DocumentRouteHeaderDAOJpa.GET_DOCUMENT_ID_BY_DOC_TYPE_APP_ID_QUERY)

TypedQuery<String> query = entityManager().createNamedQuery(GET_DOCUMENT_ID_BY_DOC_TYPE_APP_ID_NAME,
    String.class);
query.setParameter("appDocId",appId);
query.setParameter("name",documentTypeName);
return query.getResultList();
```

Tip

When building named queries you must use an alias the object "select r from KUL_RICE_T r".
If you get the below error you are probably missing an alias.

```
Caused by: java.lang.ClassCastException:
    org.eclipse.persistence.jpa.jpql.parser.NullExpression
    cannot be cast to org.eclipse.persistence.jpa.jpql.parser.IdentificationVariable
```

Using Rice Criteria API

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```
//Example of Dynamic query, this query needs to add date checks dates
//if effectiveDate parameter is not null

//This should be in a DAO class - RuleDAOJpa in this case

public List<RuleBaseValues> fetchAllCurrentRulesForTemplateDocCombination(String ruleTemplateId, List
documentTypes, Timestamp effectiveDate) {
    QueryByCriteria.Builder builder = QueryByCriteria.Builder.create();
    List<Predicate> predicates = new ArrayList<Predicate>();
    predicates.add(equal("ruleTemplateId",ruleTemplateId));
    predicates.add(in("docTypeName", documentTypes));
    predicates.add(equal("active", Boolean.TRUE));
    predicates.add(equal("delegateRule", Boolean.FALSE));
    predicates.add(equal("templateRuleInd", Boolean.FALSE));

    if(effectiveDate != null){
        predicates.add(lessThanOrEqualTo("activationDate",effectiveDate));
        predicates.add(greaterThanOrEqualTo("deactivationDate", effectiveDate));
    }
    List<Predicate> datePredicateList = generateFromToDatePredicate(new Date());
    Predicate[] datePreds = generateFromToDatePredicate(new Date()).
        toArray(new Predicate[datePredicateList.size()]);
    predicates.add(and(datePreds));
    Predicate[] preds = predicates.toArray(new Predicate[predicates.size()]);
    builder.setPredicates(preds);
    QueryResults<RuleBaseValues> results = getObjectService().findMatching(RuleBaseValues.class,
        builder.build());
    return results.getResults();
}

public List<Predicate> generateFromToDatePredicate(Date date){
    List<Predicate> datePredicates = new ArrayList<Predicate>();

    Predicate orFromDateValue = or(lessThanOrEqualTo("fromDateValue",new Timestamp(date.getTime())),
        isNull("fromDateValue"));
    Predicate orToDateValue = or(greaterThanOrEqualTo("toDateValue",new Timestamp(date.getTime())),
        isNull("toDateValue"));

    datePredicates.add(orFromDateValue);
    datePredicates.add(orToDateValue);

    return datePredicates;
}
```

Using JPA Criteria API

```
//Using JPA Criteria Builder

public List<RuleBaseValues> search(String docTypeName, String ruleId, String ruleTemplateId, String
ruleDescription,
String groupId, String principalId, Boolean delegateRule, Boolean activeInd, Map extensionValues, String
workflowIdDirective) {
    CriteriaBuilder cb = getEntityManager().getCriteriaBuilder();
    CriteriaQuery<RuleBaseValues> cq = cb.createQuery(RuleBaseValues.class);
    Root<RuleBaseValues> root = cq.from(RuleBaseValues.class);
    List<javax.persistence.criteria.Predicate> predicates = getSearchCriteria(root,cq,docTypeName,
ruleTemplateId, ruleDescription, delegateRule, activeInd, extensionValues);

    if (ruleId != null) {
        predicates.add(cb.equal(root.get("id"),ruleId));
    }
    if (groupId != null) {
        predicates.add(cb.in(root.get("id").value(getRuleResponsibilitySubQuery(
groupId, cq)));
    }
    Collection<String> kimGroupIds = new HashSet<String>();
    Boolean searchUser = Boolean.FALSE;
    Boolean searchUserInWorkgroups = Boolean.FALSE;

    if ("group".equals(workflowIdDirective)) {
        searchUserInWorkgroups = Boolean.TRUE;
    } else if (StringUtils.isBlank(workflowIdDirective)) {
```

```
        searchUser = Boolean.TRUE;
        searchUserInWorkgroups = Boolean.TRUE;
    } else {
        searchUser = Boolean.TRUE;
    }
}

if (!org.apache.commons.lang.StringUtils.isEmpty(principalId) && searchUserInWorkgroups) {
    Principal principal = null;

    principal = KimApiServiceLocator.getIdentityService().getPrincipal(principalId);

    if (principal == null)
    {
        throw new RiceRuntimeException("Failed to locate user for the given principal id: " +
principalId);
    }
    kimGroupIds = KimApiServiceLocator.getGroupService().getGroupIdsByPrincipalId(principalId);
}
Subquery<RuleResponsibilityBo> subquery = addResponsibilityCriteria(cq,kimGroupIds, principalId,
searchUser, searchUserInWorkgroups);

if(subquery != null){
    predicates.add(cb.in(root.get("id")).value(subquery));
}
cq.distinct(true);
javax.persistence.criteria.Predicate[] preds = predicates.toArray(
    new javax.persistence.criteria.Predicate[predicates.size()]);
cq.where(preds);
TypedQuery<RuleBaseValues> q = getEntityManager().createQuery(cq);

return q.getResultList();
}

private Subquery<RuleResponsibilityBo> getRuleResponsibilitySubQuery(String ruleRespName,
CriteriaQuery<RuleBaseValues> query){
CriteriaBuilder cb = getEntityManager().getCriteriaBuilder();
Subquery<RuleResponsibilityBo> subquery = query.subquery(RuleResponsibilityBo.class);
Root fromResp = subquery.from(RuleResponsibilityBo.class);
subquery.where(cb.equal(fromResp.get("ruleResponsibilityName"),ruleRespName));
subquery.select(fromResp.get("ruleBaseValuesId"));

return subquery;
}
```

Miscellaneous JPA information

Tip

```
//Relationship foreign key updating can go wrong if missing
//"nullable" on JoinColumn. It can insert null into the column instead of
//the actual value of the foreign entity key

public class RouteNodeInstance implements Serializable {
    @ManyToOne
    @JoinColumn(name="RTE_NODE_ID", nullable = false)
    private RouteNode routeNode;
}
```

Note

Due to the fact that JPA returns new copies of objects when an object is saved, several methods in DocumentServiceImpl have been changed to return new Document objects as well. In the past, the same document that was passed in was also passed back to the calling code. To prevent issues, the calling code should always use the object returned from methods in DocumentServiceImpl for future operations. For reference, the following methods used to return the passed-in document but now return a new Document object:

- saveDocument
- updateDocument
- completeDocument
- blanketApproveDocument
- superUserApproveDocument
- superUserCancelDocument
- superUserDisapproveDocument

Filter

In OJB you could add a query customizer that would allow you to add additional criteria or sort a collection. This is facilitated in KRAD Data with the FilterGenerator annotation.

```
<!-- Example in OJB -->
<collection-descriptor name="sourceAccountingLines" proxy="true"
  element-class-ref="org.kuali.kfs.sys.businessobject.SourceAccountingLine"
  collection-class="org.apache.obj.broker.util.collections.ManageableArrayList" auto-retrieve="true">
  <inverse-foreignkey field-ref="documentNumber" />
  <query-customizer class="org.kuali.kfs.sys.dataaccess.impl.OjbQueryCustomizer">
    <attribute attribute-name="financialDocumentLineTypeCode" attribute-value="F" />
  </query-customizer>
</collection-descriptor>
```

```
<!-- Example in KRAD Data, Simply add the annotation with the appropriate criteria -->
@QFilterGenerator(attributeName="financialDocumentLineTypeCode",attributeValue="F")
protected List<SourceAccountingLine> sourceAccountingLines;
```

To resolve a value using a class instead of attributeValue define a full qualified class.

```
@FilterGenerator(attributeName="testCol",attributeResolverClass="org.kuali.bar.Foo")
```

To define sorting behavior on fetch translate this previous usage to use the @OrderBy annotation in JPA. To chain multiple columns together add a comma between them (column1,column2, etc)

```
<!-- Example in OJB -->
<collection-descriptor name="items" proxy="true" element-class-
ref="org.kuali.kfs.module.purap.businessobject.PurchaseOrderItem"
  collection-class="org.apache.obj.broker.util.collections.ManageableArrayList" auto-retrieve="true">
  <inverse-foreignkey field-ref="documentNumber" />
  <query-customizer class="org.kuali.kfs.module.purap.dataaccess.impl.PurapItemQueryCustomizer">
    <attribute
      attribute-name="orderByField.itemLineNumber"
      attribute-value="ASC"
    />
  </query-customizer>
</collection-descriptor>

<!-- Example in JPA -->
@OrderBy("itemLineNumber ASC")
private List<PurchaseOrderItem> items;
```


Accessing Metadata

The metadata about data objects is available now directly via the `DataObjectService.wrap(..)` method, which loads the metadata from the metadata repository and places it in a `DataObjectWrapper`. This wrapper gives access to such information as the primary keys, the business keys, the foreign keys, the attributes, the collections inside the data object, and the relationships to the data object. It also provides methods to perform manual linking between foreign key and relationship values in case that is not possible or unwanted to do automatically through JPA.

For example, if you wanted to get all of the primary key values from a data object, you could write the following:

```
T dataObject = getDataObject();
DataObjectWrapper<T> wrapper = getDataObjectService().wrap(dataObject);
Map<String, Object> primaryKeyValues = wrapper.getPrimaryKeyValues();
```

Deprecated Classes

To ease the transition from OJB to JPA, Rice has kept deprecated classes around to allow the use of both at the same time. Many of these deprecated classes are used by implementers, so here is a general overview of the most popular classes that have been deprecated, why they have been deprecated, and how to move to the new structure.

Table 1. KRAD Data Deprecated Classes

Deprecated Class	Explanation and Conversion
org.kuali.rice.krad.criteria	
CriteriaLookupDao	All DAOs have been consolidated to use the <code>org.kuali.rice.krad.data.DataObjectService</code> as a centralized service.
org.kuali.rice.krad.dao	
BusinessObjectDao	As business objects can now be any object, use the generic methods in <code>DataObjectService</code> for equivalent behavior.
DocumentDao	The generic methods in <code>DataObjectService</code> can be used for documents in the same manner as business objects.
LookupDao	Methods in <code>DataObjectService</code> can be used for the more general cases, but some of the functionality has also been moved to <code>org.kuali.rice.krad.service.LookupService.findCollectionBySearchHelper(..)</code> .
MaintenanceDocumentDao	The method <code>getLockingDocumentId(..)</code> in <code>org.kuali.rice.krad.service.MaintenanceDocumentService</code> may fill the needs of this one method, but it is also possible to use a customized query to search for <code>org.kuali.rice.krad.maintenance.MaintenanceLock</code> via the <code>DataObjectService</code> .
PersistedLookupMetadataDao	Queries wanting to delete objects by a certain criteria (such as before a certain date) can use <code>DataObjectService.deleteMatching(..)</code> .
PersistenceDao	References can be loaded by wrapping the data object in <code>org.kuali.rice.krad.data.DataObjectWrapper</code> using <code>DataObjectService.wrap(..)</code> and calling <code>fetchRelationship(..)</code> .
SequenceAccessorDao	Use <code>org.springframework.jdbc.support.incrementer.DataFieldMaxValueIncrementer</code> to obtain the next sequence values. This can be created as a Spring bean using <code>org.kuali.rice.krad.data.platform.MaxValueIncrementerFactoryBean</code> .
org.kuali.rice.krad.bo	
BusinessObject	Objects used by KRAD are no longer required to implement any specific interface. This was done to improve flexibility, as KRAD needs to deal with both internally persisted objects and externally loaded objects.
BusinessObjectBase	
DataObjectRelationship	This has been replaced by <code>org.kuali.rice.krad.data.metadata.DataObjectRelationship</code> .
ExternalizableBusinessObject	This has not been implemented yet in KRAD Data.
PersistableBusinessObject	Objects used by KRAD are no longer required to implement any specific interface.
PersistableBusinessObjectBase	To take advantage of the automatic mappings to object ID and version number, <code>org.kuali.rice.krad.bo.DataObjectBase</code> is available for optional extension.

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Deprecated Class	Explanation and Conversion
PersistableBusinessObjectExtension	This has been replaced by the KRAD annotation org.kuali.rice.krad.data.provider.annotation.ExtensionFor which maps the extension object type and the property name. This allows for the same flexibility that regular business objects receive.
PersistableBusinessObjectExtensionBase	
TransientBusinessObjectBase	Objects used by KRAD are no longer required to implement any specific interface.
org.kuali.rice.core.api.criteria	
CriteriaLookupService	See org.kuali.rice.krad.criteria.CriteriaLookupDao .
org.kuali.rice.krad.service	
BusinessObjectService	Use the DataObjectService .
DataObjectMetaDataService	Use the methods in DataObjectWrapper obtained via DataObjectService.wrap(..) to access metadata from the repository.
KeyValuesService	Use the DataObjectService .
PersistenceService	See PersistenceDao .
PersistenceStructureService	
SequenceAccessorService	See SequenceAccessorDao .
org.kuali.rice.krad.util	
ObjectUtils	The methods dealing with business objects should no longer be used since objects used by KRAD are no longer required to implement any specific interface.

Legacy Tools

As it is unreasonable to expect that all documents will transition from OJB to JPA at one point, Rice has provided some legacy tools inside of **org.kuali.rice.krad.util.LegacyUtils** that can help moving in and out of the legacy (OJB) context. Most of the time this is dealt with automatically through the KRAD code, but these tools can be used for customization if necessary.

One such area of customization is the **PostProcessorService** which applications often override to insert their own custom tasks during routing. In order to properly detect whether or not the routing document is in the legacy context or not, use the following static method:

```
@Override
public ProcessDocReport doRouteStatusChange(final DocumentRouteStatusChange statusChangeEvent) throws Exception
{
    return LegacyUtils.doInLegacyContext(statusChangeEvent.getDocumentId(), establishPostProcessorUserSession(),
        new Callable<ProcessDocReport>() {
            @Override
            public ProcessDocReport call() throws Exception {
                ...
            }
        });
}
```