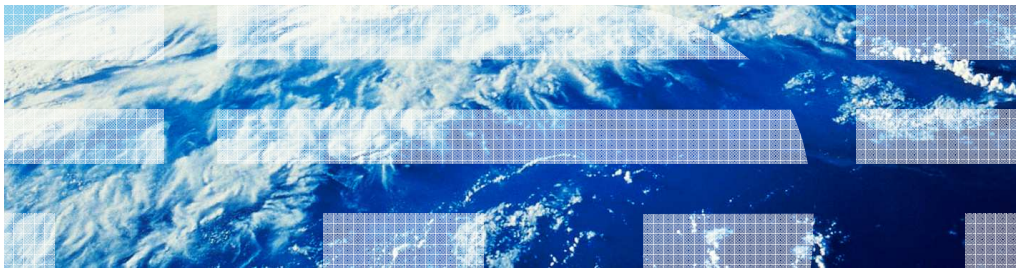
IBM Operational Decision Manager V8.0.1

Enhanced sharing of rule artifacts with COBOL



This presentation looks at several enhancements to IBM Operational Decision Manager version 8.0.1 that enable new scenarios where rules are invoked from COBOL.

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  - Copybook generation with multiple BOMs

First you will learn the motivation behind these enhancements. Then you will look at the enhancements in two groups.

The first group of enhancements is related to the generation of a Java execution object model (XOM) from a COBOL copybook. One is the ability to regenerate a Java XOM from a modified copybook, without losing the code added to the original generated Java. Another is the ability to map a fixed-length COBOL table to a Java list. A third is the mapping of identical COBOL structures to the same Java class.

The second group of enhancements is related to the generation of a COBOL copybook from an existing business object model (BOM). One is support for a BOM containing virtual attributes or virtual classes. Another is better support for the handling of accessors. A third is the generation of a copybook from multiple BOMs.

Motivation

- Motivation for these enhancements:
  - Enable more scenarios allowing a rule project to be shared between COBOL clients and other types of clients.

A rule project can be deployed in such a way that there are a variety of ways to invoke it, for example, calling it as a web service, as an EJB or directly from Java. When a rule project is invoked from a COBOL program, there has to be a mapping between the COBOL copybook and the executable rules. The motivation behind the enhancements described here is to enable more scenarios where a rule project is shared between COBOL clients and other types of clients.

Section

Preserving code added to a generated Java XOM

The first enhancement is the ability to regenerate a Java XOM from a modified copybook without losing updates that were made to the originally generated Java.

Preserving code added to a generated Java XOM (1 of 3)

- Scenario addressed
  - Initial development:
    - Start with an existing COBOL copybook
    - Generate a Java XOM from the copybook
    - Add additional imports and Java methods to the XOM
    - Generate a BOM from the Java XOM
  - At some time in the future, discover a need to modify the COBOL copybook
    - Update the COBOL copybook
    - Regenerate the Java XOM from the modified copybook
    - Resolve differences between the new Java XOM and the BOM
- Releases before V8.0.1
  - Regeneration of the Java XOM overwrites the additional imports and Java methods
  - Imports and Java methods have to be recoded before resolving differences between the Java XOM and the BOM

Here is the scenario that is addressed by this enhancement. Initially, a COBOL copybook is used to generate a Java XOM. Additional import statements and Java methods are added to the XOM and then a BOM is generated from the XOM. At a later date, the copybook needs to be updated and therefore the Java XOM must be regenerated to reflect the modifications to the copybook. Then, differences between the new Java XOM and BOM need to be resolved. This can all easily be done through Rule Designer.

In releases before version 8.0.1, when an updated copybook is used to regenerate the Java XOM, the additional import statements and Java methods are lost. As a result, you have to manually recode in the Java XOM before the Java XOM and BOM differences can be resolved. This enhancement in version 8.0.1 removes the need to do the manual recoding.

Preserving code added to a generated Java XOM (2 of 3)

copybook

example.cpy

```
01 Name.
   05 firstname PIC X(10).
   05 lastname  PIC X(15).
```

V8.0

```
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package example;

import ilog.rules.bom.annotations.CustomProperties;

@CustomProperties(names = {"cobol_level", "cobol_name",
public class Name {

    private String firstname;
    private String lastname;

    @CustomProperties(names = {"cobol_level", "cobol_na
    public String getFirstname() {
        return this.firstname;
    }

    public void setFirstname(String firstname) {
        this.firstname = firstname;
    }

    @CustomProperties(names = {"cobol_level", "cobol_na
    public String getLastname() {
        return this.lastname;
    }

    public void setLastname(String lastname) {
        this.lastname = lastname;
    }
}
```

V8.0.1

```
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package example;

import ilog.rules.bom.annotations.CustomProperties;

//@USER_IMPORT_BEGIN
//@USER_IMPORT_END
```
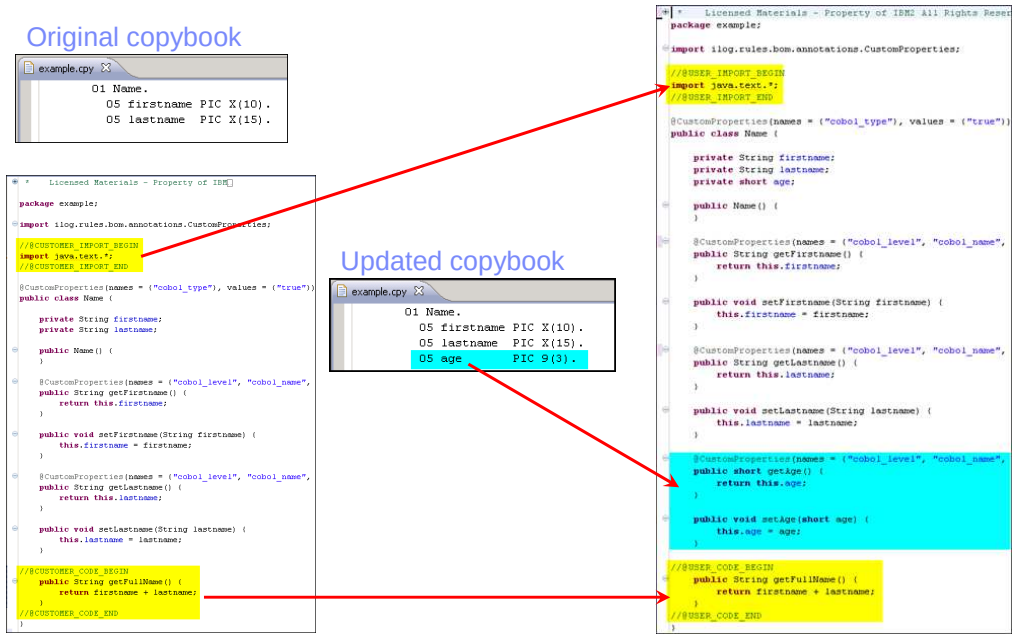

Add imports

```
@CustomProperties(names = {"cobol_type"), values = {"true"})
public class Name {

    private String firstname;
    private String lastname;

    public Name() {
    }

    @CustomProperties(names = {"cobol_level", "cobol_name",
    public String getFirstname() {
        return this.firstname;
    }

    public void setFirstname(String firstname) {
        this.firstname = firstname;
    }

    @CustomProperties(names = {"cobol_level", "cobol_name",
    public String getLastname() {
        return this.lastname;
    }

    public void setLastname(String lastname) {
        this.lastname = lastname;
    }

//@USER_CODE_BEGIN
//@USER_CODE_END
}
```

Add code

In the upper left corner of this slide is a screen capture of a COBOL copybook. Below it is the generated Java XOM produced by version 8.0. On the right is the generated Java XOM produced by version 8.0.1. The only difference is that, in version 8.0.1, there are comments added, which serve as markers for where to add the additional import statements and Java methods. These markers are //@user_import_begin and end, and //@user_code_begin and end.

Preserving code added to a generated Java XOM (3 of 3)



On this slide, the original copybook is in the upper left. Shown in the center of the slide is an updated version of the copybook that contains an additional field, age. On the left side is the originally generated Java XOM, which contains a manually added import statement and Java method. On the right side is the regenerated Java XOM. You can see that the additional import statement and Java method are preserved, and that new accessors for the additional age field from the copybook have been added.

Section

Mapping a COBOL fixed length table to a Java List

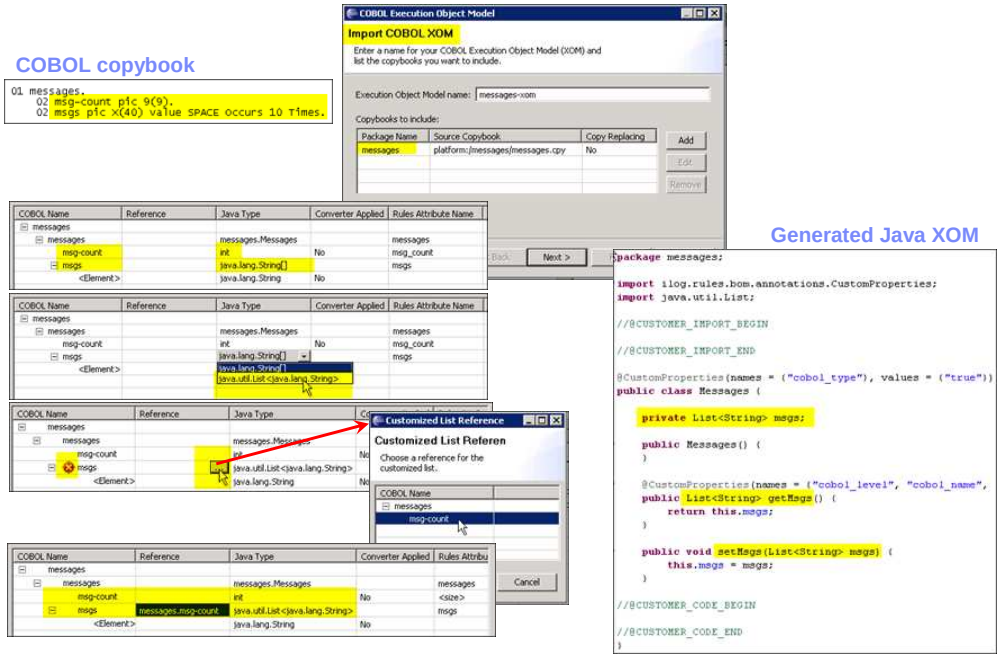
The next enhancement allows a COBOL fixed length table to be mapped to a Java list.

Mapping a COBOL fixed length table to a Java List (1 of 2)

- Scenario addressed
  - A COBOL copybook that contains:
    - A fixed length table
    - A numeric count element associated with the table
  - You are generating a Java XOM from the copybook
  - You want the table to be mapped to a Java List (Java Array is the default)
- Releases before V8.0.1
  - The mapping can only be to a Java Array

In this scenario, you have a COBOL copybook that contains a fixed length table and a numeric count element associated with the table. When generating Java XOM from this copybook, you want the table to be represented as a Java list. In version 8.0, your only option was to have the table represented as a Java array. That is also the default in version 8.0.1.

Mapping a COBOL fixed length table to a Java List (2 of 2)



This slide shows the series of screen captures for generating the Java list in the XOM.

In the upper left, you can see that the COBOL copybook contains a 10-element array, called msgs, and an integer count field, called msg-count. The dialog for generating the Java XOM from the COBOL copybook is shown in the top center of the slide. Down the left side is a series of screen captures showing the steps to do the mapping. At first, the field msgs is mapped to a Java String array. But using a dropdown, msgs can be changed to a Java List. In the next screen capture, you can see the red error indicator next to msgs. This is because you must have a count field when mapping to a List. From the Reference field for msgs, you can open the dialog and select the field to be used as the count. The result is shown in the lower left. On the right is the generated Java XOM with msgs mapped to a Java List.

Section

Mapping identical COBOL structures to same class

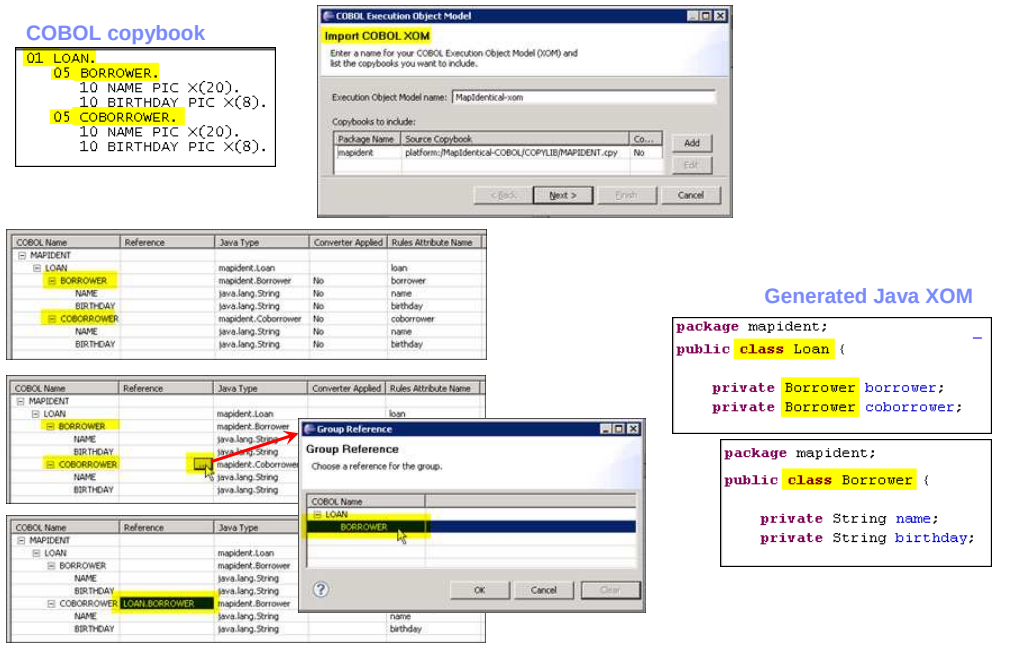
The next enhancement allows identical COBOL structures to be mapped to the same Java class in the XOM.

Mapping identical COBOL structures to same class (1 of 2)

- Scenario addressed
  - A COBOL copybook that contains identical structures
  - You are generating a Java XOM from the copybook
  - You want the structures to map to the same generate class in the Java XOM
- Releases before V8.0.1
  - Each structure mapped to a unique class

This scenario applies when you have a COBOL copybook that contains identical structures and you are generating the Java XOM from the copybook. To prevent the proliferation of Java classes in the generated code, you want to map the identical structures to the same Java class.

Mapping identical COBOL structures to same class (2 of 2)



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This slide shows the series of screen captures for mapping identical structures to the same Java class.

In the upper left, you see that the COBOL copybook contains two identical structures, BORROWER and COBORROWER. The dialog for generating the Java XOM from the COBOL copybook is shown in the top center of the slide. Down the left side is a series of screen captures showing the steps of the mapping. In the first panel, the structure BORROWER is mapped to the Java type Borrower, and COBORROWER is mapped to the Java type Coborrower. In the next panel, the Reference field is used to open a dialog where you can specify that COBORROWER references BORROWER. As a result, the bottom panel shows that COBORROWER is now mapped to the Java class Borrower.

On the right side, you can see that the generated Loan class contains two variables, borrower and coborrower, each of which is of type Borrower. Below that is the generated Borrower class.

Section

BOM with virtual attributes and virtual classes

The next few enhancements are related to the scenario where there is an existing business object model (BOM) from which you generate a COBOL copybook. The first of these deals with a BOM that contains virtual attributes or virtual classes.

BOM with virtual attributes and virtual classes

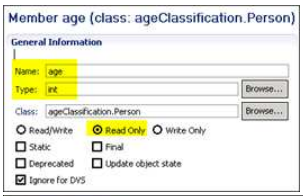
- Scenario addressed
  - Starting point – A rule project with:
    - A Java based XOM
    - A BOM containing a virtual attribute or a virtual class
  - Requirement:
    - Need to invoke the rule project from COBOL
- Releases before V8.0.1
  - The COBOL copybook and marshaller is not correctly generated

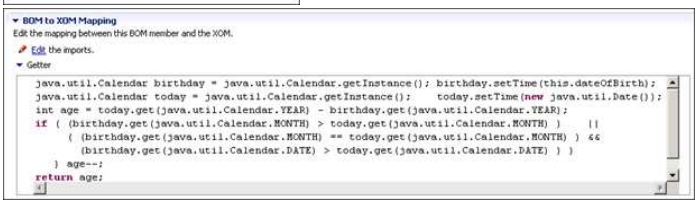
In this scenario, the Java XOM exists and is associated with a BOM containing a virtual attribute or a virtual class. You want to call this rule project from COBOL; so you need to generate a COBOL copybook.

In releases before version 8.0.1, you can't generate a COBOL copybook in this scenario because the copybook and marshaller are not correctly generated for virtual attributes and virtual classes.

BOM with virtual attribute

- What is a virtual attribute?
  - An attribute defined in the BOM that does not exist in the XOM
- Example – BOM attribute ‘age’ where XOM only contains ‘dateOfBirth’





In order to understand this enhancement, the next few of slides provide an explanation of virtual attributes and virtual classes.

A virtual attribute is one that is defined in the business object model but does not exist in the Java execution object model. The example shown here is a BOM with an attribute, age, where the Java XOM only contains the date of birth. The top screen capture shows that, in the BOM, the attribute age is defined as a read-only integer. The bottom screen capture defines the getter method for the attribute. It contains the code that is necessary to compute someone’s age, given their date of birth.

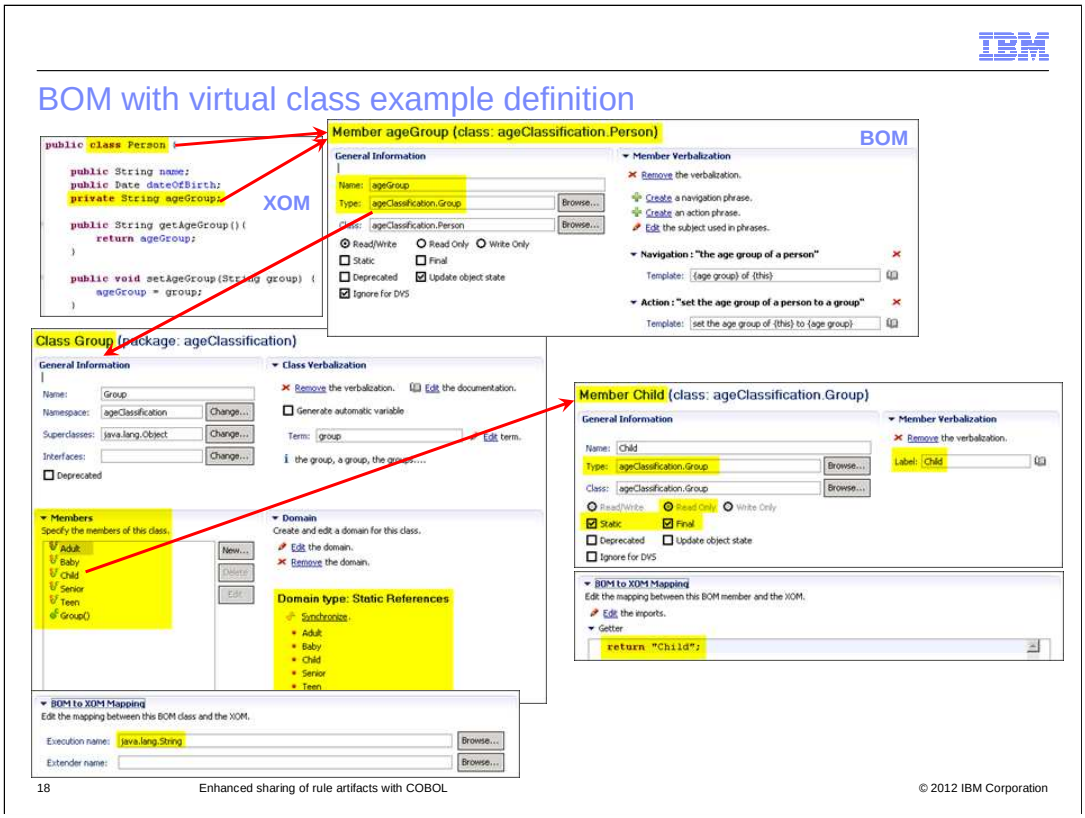
BOM with virtual class

- What is a virtual class?
  - A class defined in the BOM that does not exist in the XOM
- Possible use:
  - Define a domain of static references (enumerated values) in the BOM
  - Associate with a field in the XOM without value restrictions
- Example:
  - XOM contains field → **java.lang.String color**
  - BOM contains class → **MyColors** with static final members **'red', 'green', 'blue'**
  - BOM attribute **color** defined as type **MyColors** rather than as type **String**

Similar to a virtual attribute, a virtual class is one that exists in the business object model but does not exist in the Java execution object model.

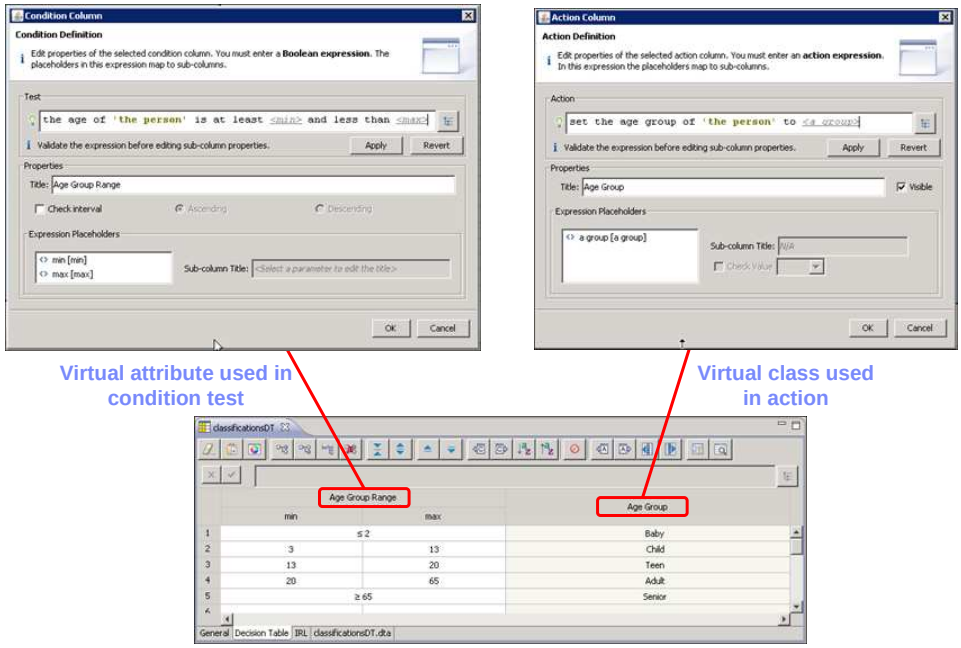
The possible use of a virtual class is where you want to treat an attribute as a set of enumerated values in the BOM, even though its corresponding execution object model field has no value restrictions.

To illustrate this with an example, assume you have a Java XOM with a String field named color. In the BOM, you can have a virtual class such as MyColors, which has a set of static final members red, green and blue. In the BOM, the color attribute can then be defined to be of type MyColors rather than of type String. As a result, the color attribute can only contain one of the strings "red," "green," or "blue."



Here is another example of a virtual class. The execution object model shown in the upper left, has a class Person containing a String variable called ageGroup. In the upper right, you can see the definition in the BOM for the member ageGroup. Notice that the type of ageGroup is defined to be Group rather than String. On the left is the definition for the class Group, which is a virtual class since it does not exist in the execution object model. Group is composed of members Baby, Child, Teen, Adult and Senior, which are all defined as static final members. Each has a getter that returns an appropriate string. For example, the one shown on the right is for the member Child; and its getter returns the string “Child”. In the lower left corner you can see that the class Group has a BOM to XOM mapping of type String. The result of using this virtual class is that the variable ageGroup, although defined as a String in the execution object model, can only contain one of the values defined in the class Group.

Using a virtual attribute and virtual class in a decision table



On this slide you can see the virtual attribute and virtual class from the previous slides being used in a decision table. The left column of the decision table is the condition test and makes use of the age virtual attribute. The right column is the action and sets the member ageGroup, using the values defined in the virtual class Group.

The result is that, given a person's date of birth, this decision table can set the value for the person's age group.

Section

Improved accessor support

The next enhancement provides improved support for accessors.

Improved accessor support (1 of 2)

- Scenario addressed
  - Starting point – A rule project with:
    - A Java based XOM
    - Public attributes with no explicit accessor methods
    - Boolean attribute with ‘isXxxxx’ accessor rather than ‘getXxxxx’
  - Requirement:
    - Need to invoke the rule project from COBOL
- Releases before V8.0.1
  - The COBOL marshaller is not correctly generated

The scenario addressed by this enhancement is a rule project that has an existing Java execution object model. The Java XOM has public attributes but does not have getter and setter methods explicitly defined for those attributes. In addition, there is a Boolean attribute that has an “is” accessor method rather than a “get” accessor method. In releases before version 8.0.1, this Java execution object model can’t be used when calling the rule project from COBOL because the marshalling code is not correctly generated.

Improved accessor support (2 of 2)

V8.0

```
public class Member {

    private  String  name;
    private  int     age;
    private  boolean married;

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

    public int getAge() {
        return this.age;
    }
    public void setAge(int a) {
        this.age = a;
    }

    public boolean getMarried() {
        return this.married;
    }
    public void setMarried(boolean m) {
        this.married = m;
    }
}
```

V8.0.1

```
public class Member {

    public   String  name;
    public   int     age;
    private  boolean married;

    public boolean isMarried() {
        return this.married;
    }
    public void setMarried(boolean m) {
        this.married = m;
    }
}
```


This slide shows an example of a Java XOM that has attributes for name (a String), age (an int) and married (a Boolean). On the left is the code required in version 8.0 to make the XOM compatible for use with COBOL. Each of the attributes has a private variable and explicitly declared getter and setter methods. In version 8.0.1, the XOM on the left still works; but alternatively, the XOM on the right also works. In this case, the name and age attributes are public variables with no explicit getter and setter methods. And the getter method for the Boolean variable married is defined as isMarried rather than getMarried.

Section

Copybook generation with multiple BOMs

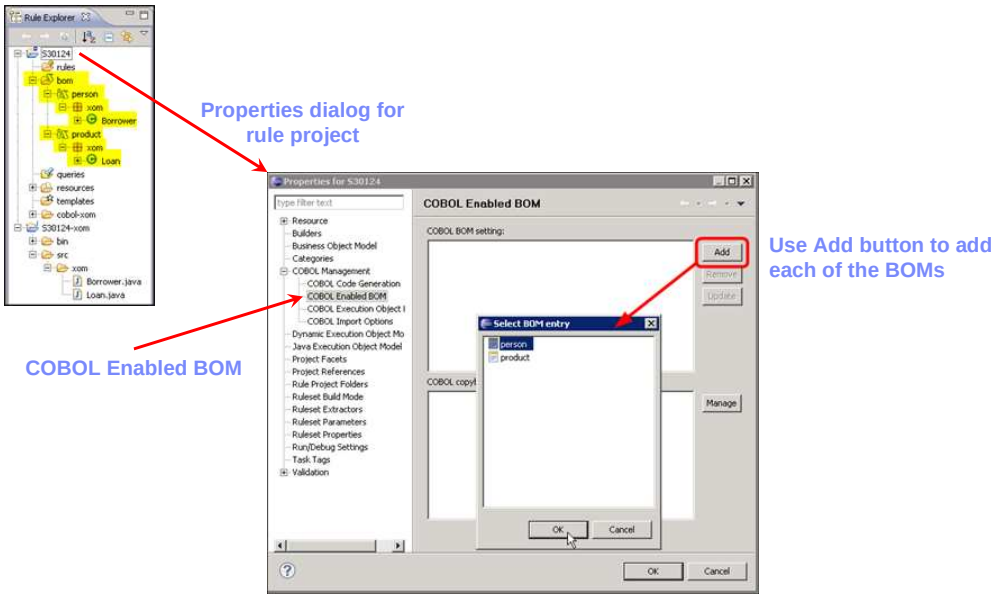
This enhancement affects the ability to generate a COBOL copybook from multiple business object models.

Copybook generation with multiple BOMs (1 of 5)

- Scenario addressed
  - Starting point:
    - A rule project with more than one BOM
  - Requirement:
    - Use a single COBOL copybook when invoking the rule project
- Releases before V8.0.1
  - A COBOL copybook can only be generated from a single BOM

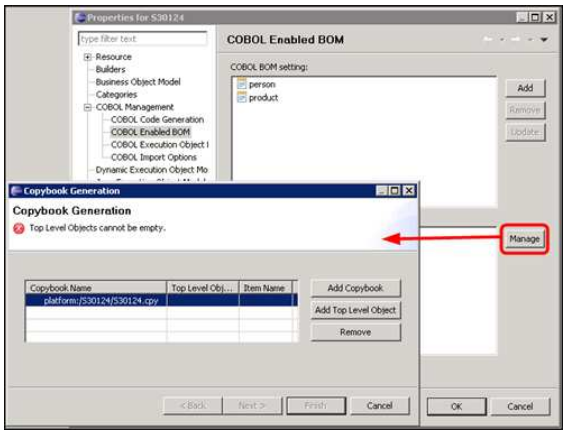
The starting point for this scenario is a rule project that has more than one BOM and the requirement that only one copybook be used when calling these rules from COBOL. In releases before version 8.0.1, separate copybooks have to be generated, one for each BOM. The next few slides show you how to generate a single copybook from multiple BOMs.

Copybook generation with multiple BOMs (2 of 5)



In the upper left is a rule project with two BOMs. One BOM is called person and has a class Borrower; and the other BOM is called product and has a class Loan. The Properties dialog for the rule project is shown in the middle of the slide. To begin the copybook generation, navigate to COBOL Management, and COBOL Enabled BOM. Use the Add button to add a BOM. Do this for each of the BOMs.

Copybook generation with multiple BOMs (3 of 5)

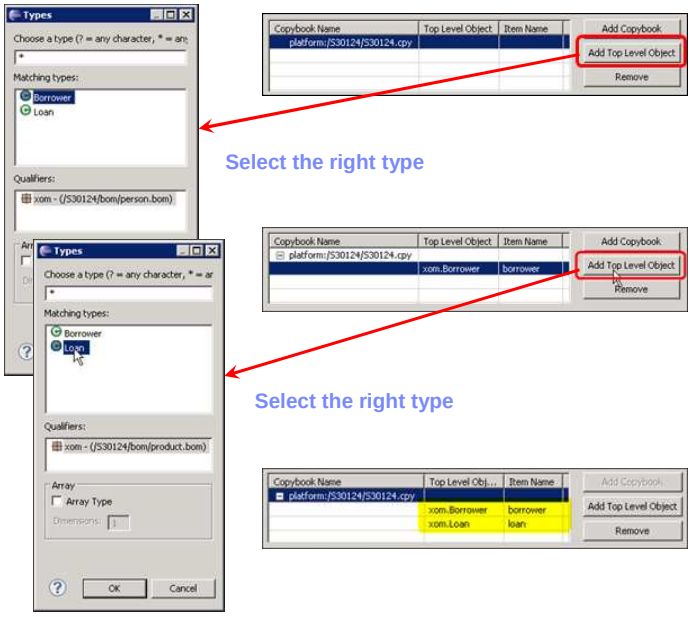


The Manage button will open the Copybook Generation dialog

Top Level Objects still need to be selected

After both BOMs have been added, use the Manage button to open the Copybook Generation dialog. Initially the dialog reports an error because no Top Level Objects have been specified yet.

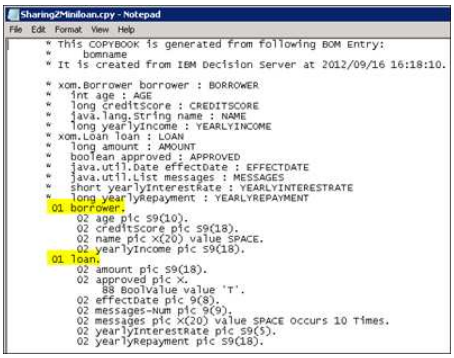
Copybook generation with multiple BOMs (4 of 5)



Use the Add Top Level Object button to add the classes from each of the BOMs. In the bottom right screen capture, you can see that the Borrower and Loan types have been added.

Copybook generation with multiple BOMs (5 of 5)

Resulting copybook maps both BOMs



The resulting copybook contains the data structures for both BOMs, borrower and loan.

Summary

- Explained the motivation for these enhancements
- Looked at the enhancements for
  - Generation of a Java XOM from a COBOL copybook
  - Generation of a COBOL copybook from a BOM

In this presentation, you learned some of the motivation behind these enhancements to Operational Decision Manager. You looked at the enhancements related to generating a Java execution object model from a COBOL copybook and the enhancements related to generating a COBOL copybook from a business object model.

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