Basic Rule Modeling

Corticon® Business Rules Modeling Studio 5.3.2

PROGRESS
software

About this Guide

This ***Basic Rule Modeling Tutorial*** provides an introduction to the Corticon Business Rules Modeling Studio 5.3.

You will learn how to capture rules from business specifications, model the rules, analyze them for logical errors, and test the execution of your rules; all without programming.

Your goal is to create a Decision Service: A group of rules that captures the logic of a single decision-making step completely and unambiguously. In one sense, a Decision Service (when managed with Corticon Studio) is a business-friendly model of your rules (i.e., your decision-making logic). In another sense, a Decision Service is a powerful asset, allowing you to automatically process the rules as a part of business transactions.

Note

The Decision Services that you build using Studio may be deployed as executable, standards-based services available to other software applications via Java, .NET, or SOAP messaging. Corticon Decision Services are in use today across the globe, automating many high-volume decision-intensive processes.

See the ***Server Integration & Deployment Guide*** or the ***Server Deployment Tutorial*** for instructions on how to deploy and integrate the Decision Services you build here.

Note

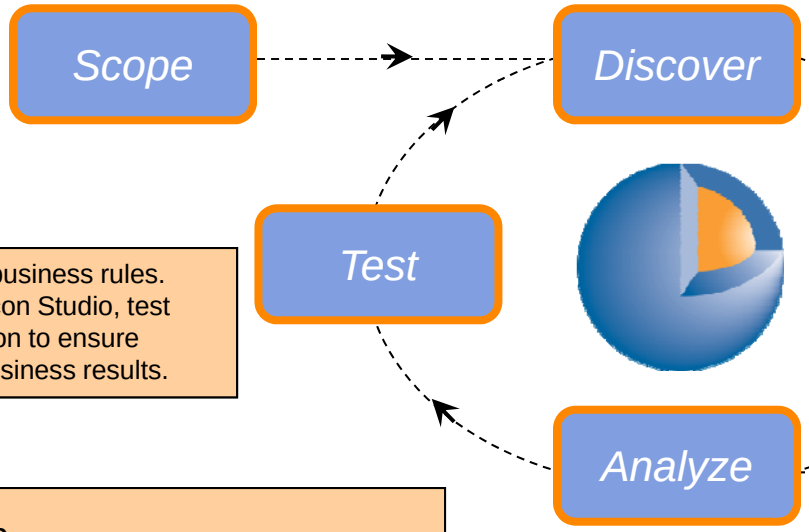
This Tutorial is designed for hands-on use. We recommend that you type along with the instructions and illustrations presented.

The Corticon Decision Services Methodology

Corticon provides a simple yet powerful methodology for modeling business rules called the “Corticon Decision Services Methodology”. This methodology follows the lifecycle of your decision service, and involves the following steps:

1. Scope the business problem. Ask the question: What decision are we trying to make?

2. Discover the business rules. Ask the question: How do we make the decision?



3. Model the business rules. Using Corticon Studio, logically express the rules.

4. Analyze the business rules. Using Corticon Studio, ensure that the rules are complete, consistent and free of logical errors.

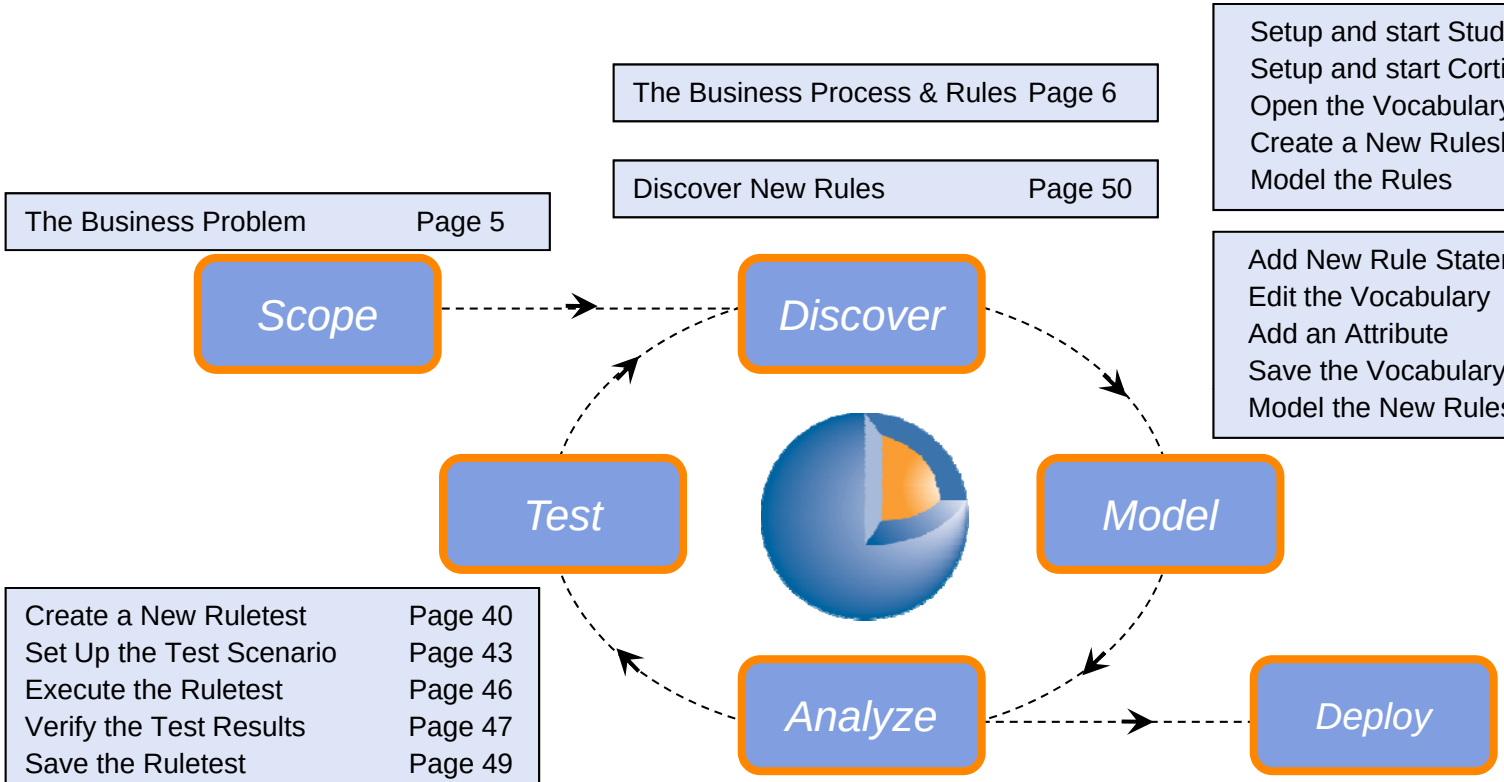
5. Test the business rules. Using Corticon Studio, test rule execution to ensure expected business results.

6. Deploy the business rules. Using Corticon Server, automate the rules across enterprise applications.

Note

Steps 2-6 are repeated when rules change. This tutorial includes two iterations through the lifecycle, including an initial implementation and subsequent change cycle. Deployment is covered in a separate tutorial (see ***Server Deployment Tutorial*** and ***Server Integration & Deployment Guide***).

Table of Contents



The Business Problem

Scope

Note

The example used in this Tutorial was developed from a business problem in which an air cargo company loads cargo of various sizes and weights into containers, then onto its fleet of aircraft prior to shipment.

To operate safely, the company must ensure that an aircraft is never loaded with cargo that exceeds an aircraft's capabilities. Flight plans are created by the company that assign cargo shipments to containers, then containers to aircraft. Part of the flight plan creation process involves verifying that no plan violates any safety or operational rule.

The air cargo company desires to improve the quality and efficiency of the flight planning process by modeling and automating business rules using the Corticon Business Rule Management System.

The Business Process & Rules

Scope

Complex problems such as flight planning are better described in their component parts. The best way to do this is by describing the business process for this problem. From a process diagram, we can easily identify the decision-making activities, which in turn are described by business rules.

Action

First, define your business process as a sequence of activities or steps:

Action

Next, determine which process steps involve decisions. Any step involving a decision is a candidate for automation using Corticon.

In this process, all three steps involve decisions, in addition to physical labor. The **scope** of this tutorial is the "Package Cargo" step, which involves the decision about what container to use for various cargo, based upon such criteria as the cargo's weight, volume and contents.

Today, the packaging decision is made by our shipping personnel based upon their experience. The problem is that some people make better decisions than others, which leads to inconsistent practices. We want to use Corticon to standardize and automate the packaging decision.

The Business Process & Rules

Discover

Now that we have scoped our problem, we need to **discover** our business rules.

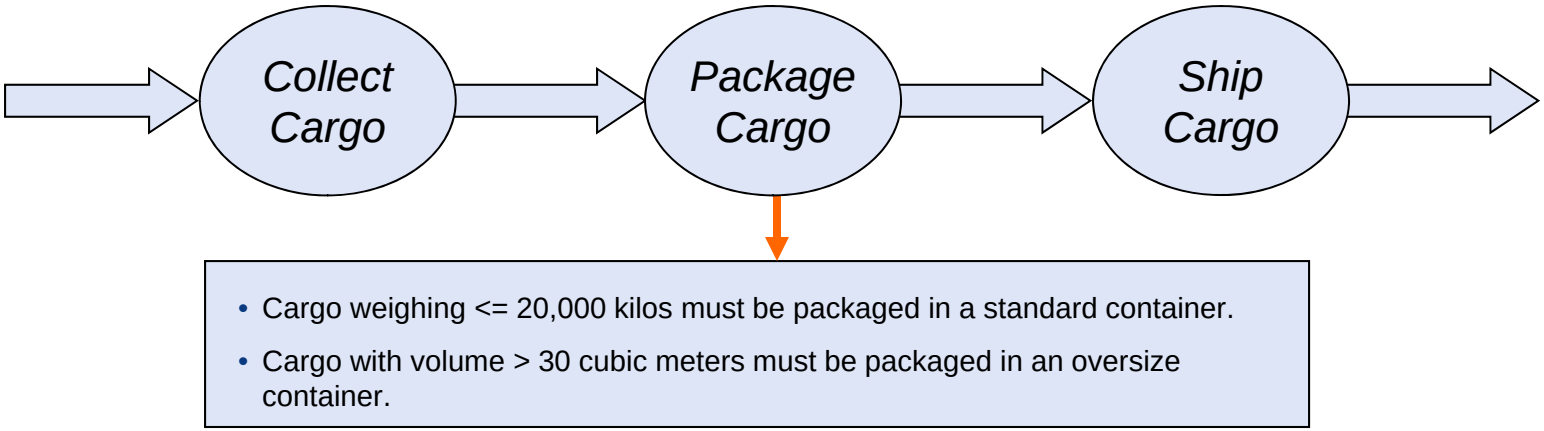
Note

To discover our business rules, we simply ask: “How do we make this decision?”

For this case, we ask “How do we package cargo?” We ask this question to the people who perform and manage this step in the process.

They often provide the answer in the form of a policy or procedure manual, or simply as a set of rules that they follow. Sometimes the rules are embedded in the code of our legacy systems. In other cases, the rules are not documented and found only in the heads of our people.

In all cases, we will capture the discovered rules directly into Corticon Studio.



Corticon Licensing

IMPORTANT

About Corticon licensing
Corticon embeds a timed evaluation license in each Corticon Studio that lets you evaluate Corticon Studio features. Typically, you do not need to do anything to get started.

*But, when you start Studio, if you see a **License Warning alert** it means that the license file is invalid, corrupted, or expired. Then, when you create or modify any Corticon files, you get an **Asset Locked Warning**, indicating that you can just review existing files.*

Contact your Progress Corticon Technical Support or your Progress representative to obtain a workable license. Place the license file on your Studio machine, then launch Studio.

*Choose **Window > Preferences**, then expand **Progress Corticon > Rule Modeling**. Click **Browse** and then navigate to choose your new, valid, unexpired license. When you click **OK**, and restart Studio the license update process is complete.*

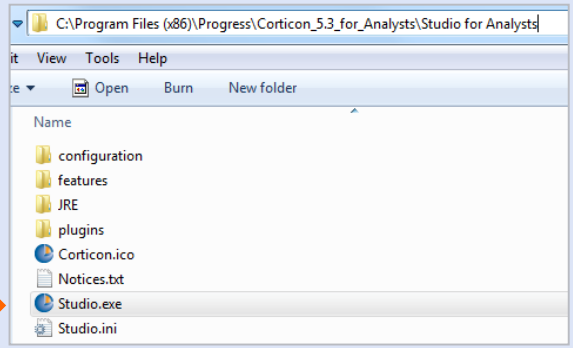
Tutorial set up with Corticon Studio **for Analysts**

Model

Action

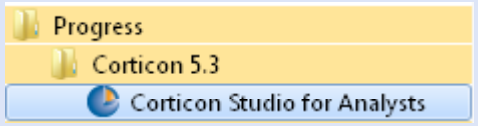
Open Corticon Studio For Analysts

Double click on the **Studio** icon in your Corticon installation directory "*Install Dir>\Studio for Analysts\Studio.exe*"



OR

Choose the **Start** menu path **All Programs > Progress > Corticon 5.3 > Corticon Studio for Analysts**



Note

You first need to install the software. Refer to the Studio Installation Guide for detailed instructions.

Note

For further details and reference information not presented here, you can choose **Help > Contents** and Index from the Studio menubar or click the  icon on the Studio toolbar.

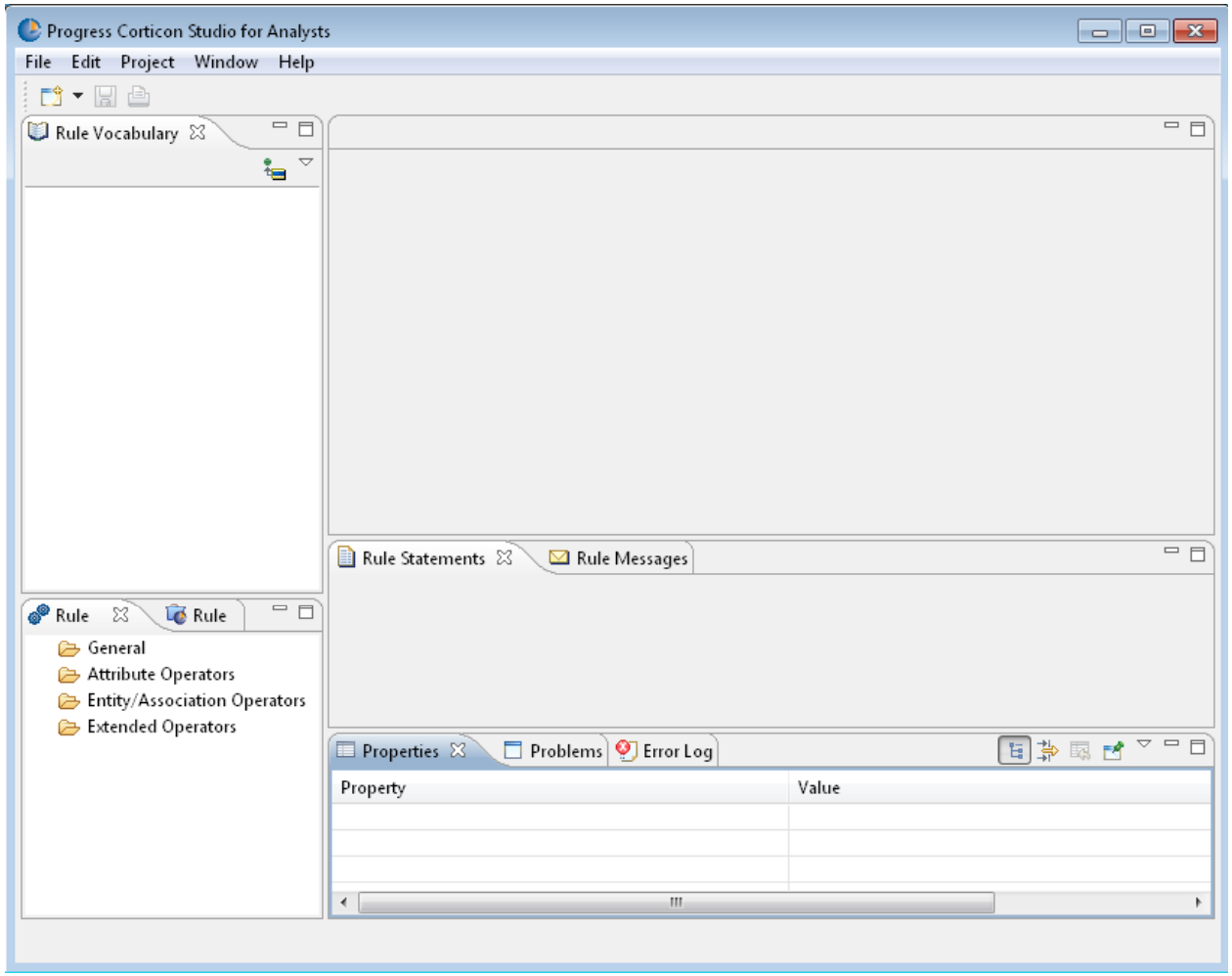
*If you are using Corticon Studio **for Analysts** (the standalone version), complete the next four slides. If you are using the Eclipse plug-in version (Corticon Designer) jump to slide 12 for setup instructions.*

Corticon Studio **for Analysts** Orientation

Model

Note

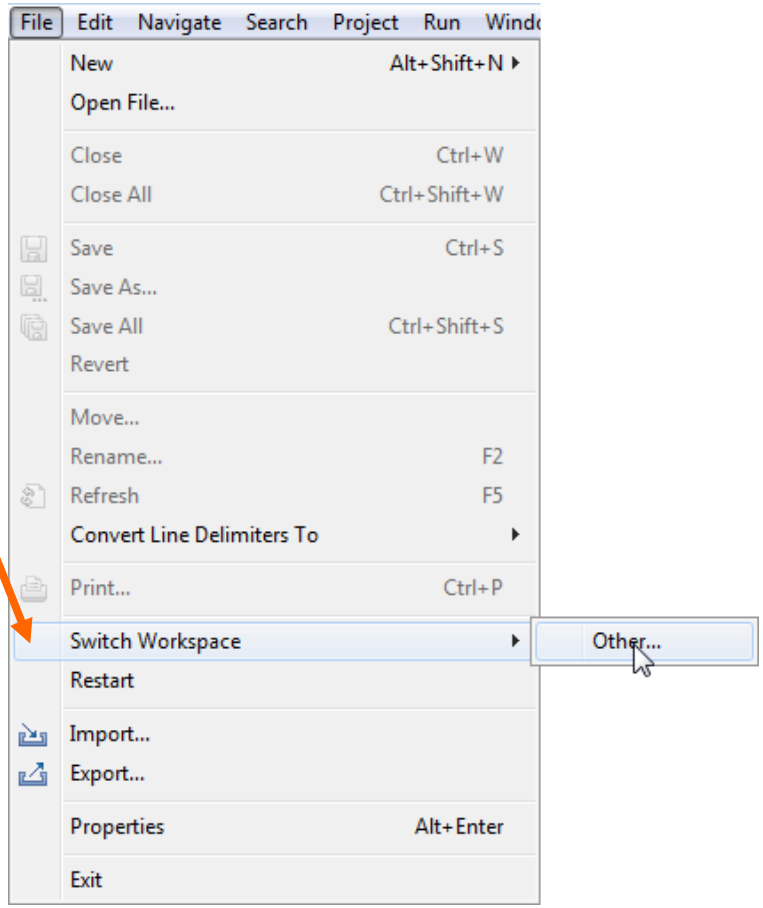
When starting Corticon Studio for Analysts, the screen will look similar to this:



Switch Workspaces

Action

Your initial workspace will be empty. Switch to a new workspace (where this Tutorial's sample files are located) by choosing **File > Switch Workspace** from the Studio menubar.

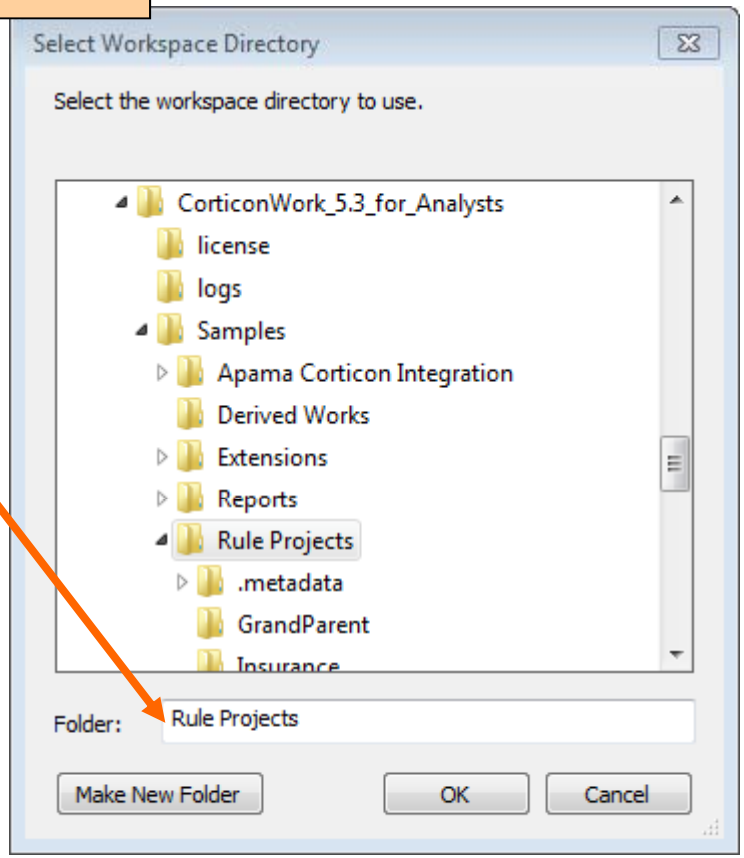


The Rule Projects Workspace

Action

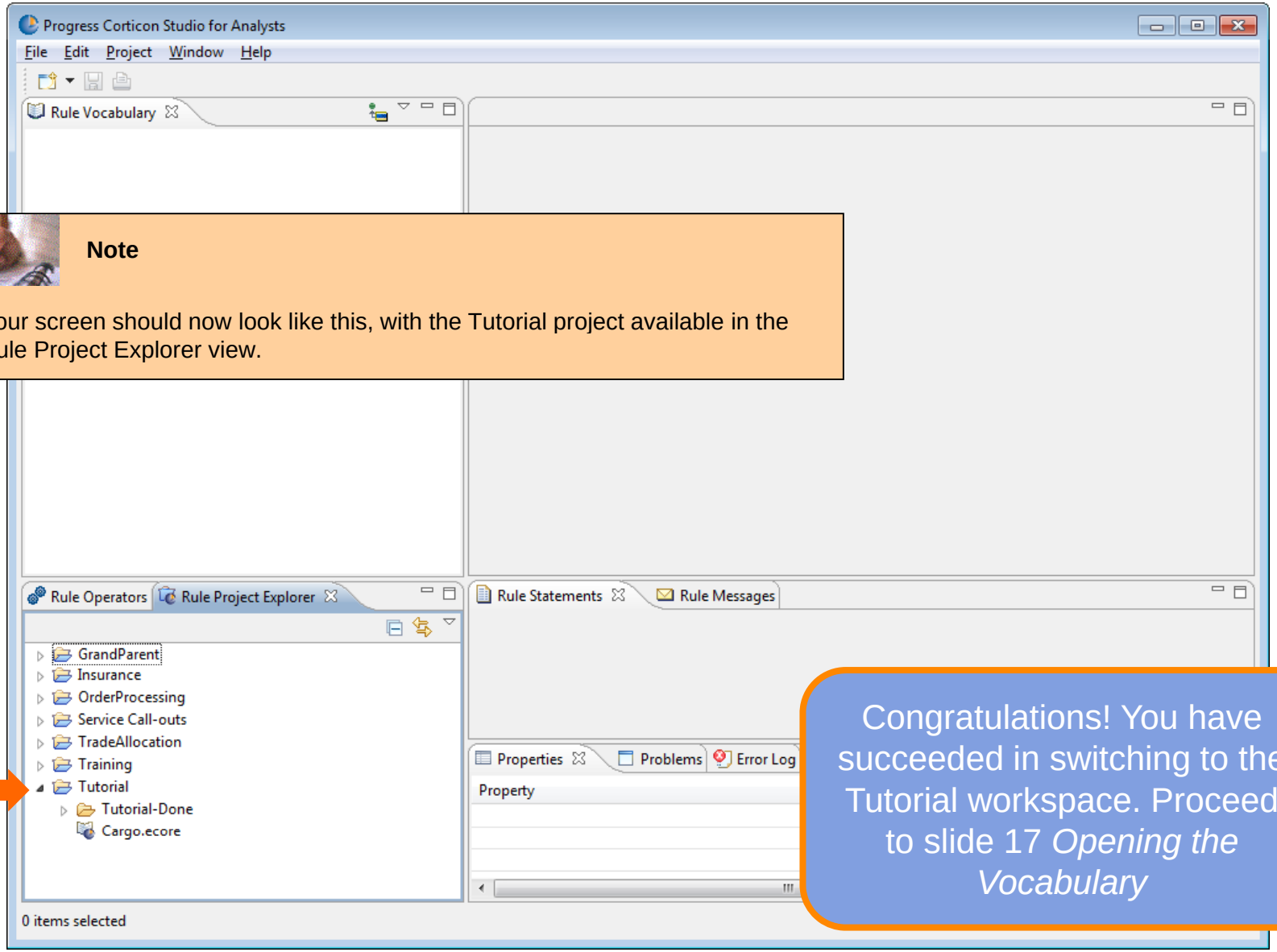
In the navigation window that appears, browse to your Corticon ***work directory*** and select **\Samples\Rule Projects**. Be sure **Rule Projects** appears in the Folder field at bottom. Click **OK**.

Corticon Studio will automatically close and restart, with the new workspace open in the Rule Project Explorer window.



Congratulations! You have succeeded in switching to the Tutorial workspace. Proceed to slide 17 *Opening the Vocabulary*

Tutorials in Rule Project Explorer



Note

Your screen should now look like this, with the Tutorial project available in the Rule Project Explorer view.

Congratulations! You have succeeded in switching to the Tutorial workspace. Proceed to slide 17 *Opening the Vocabulary*

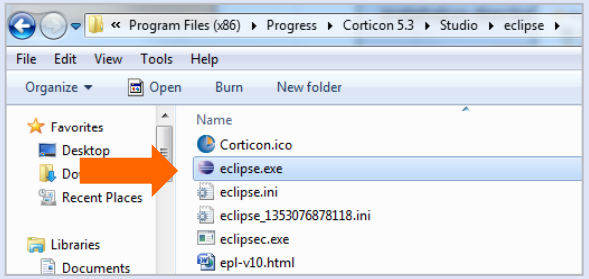
Tutorial set up with full Corticon Studio

Model

Action

Open Corticon Studio

Double click on the **Corticon Studio** eclipse.exe file in your Corticon installation directory *"<Install Dir>/ Studio/eclipse/eclipse.exe"*



OR

Start menu path **All Programs > Progress > Corticon 5.3 > Studio > Corticon Studio**

Note

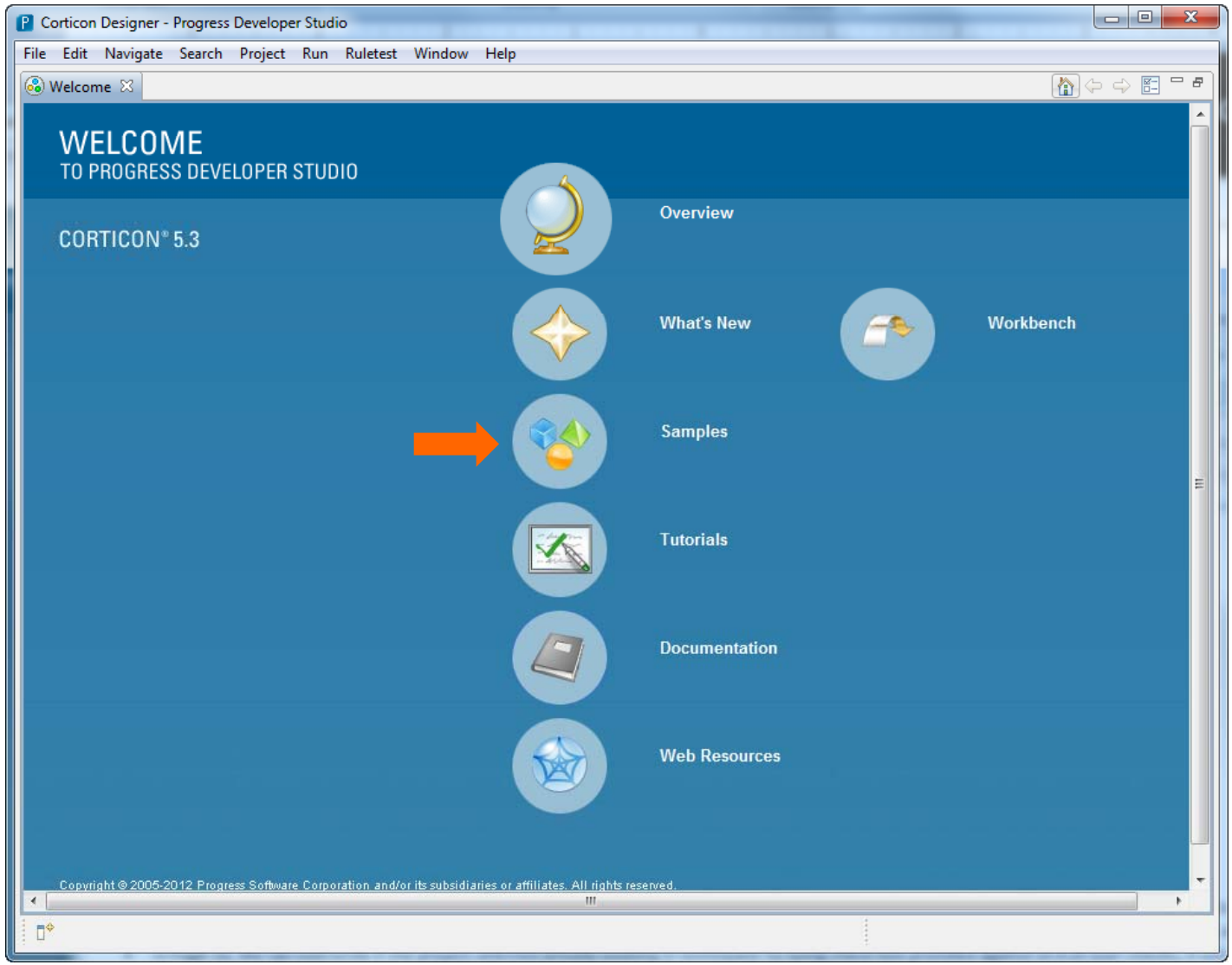
You first need to install the software. Refer to the Studio Installation Guide for detailed instructions.

If you are using Corticon Studio, complete the next four slides. After that the instructions will be the same for both Studio installations.

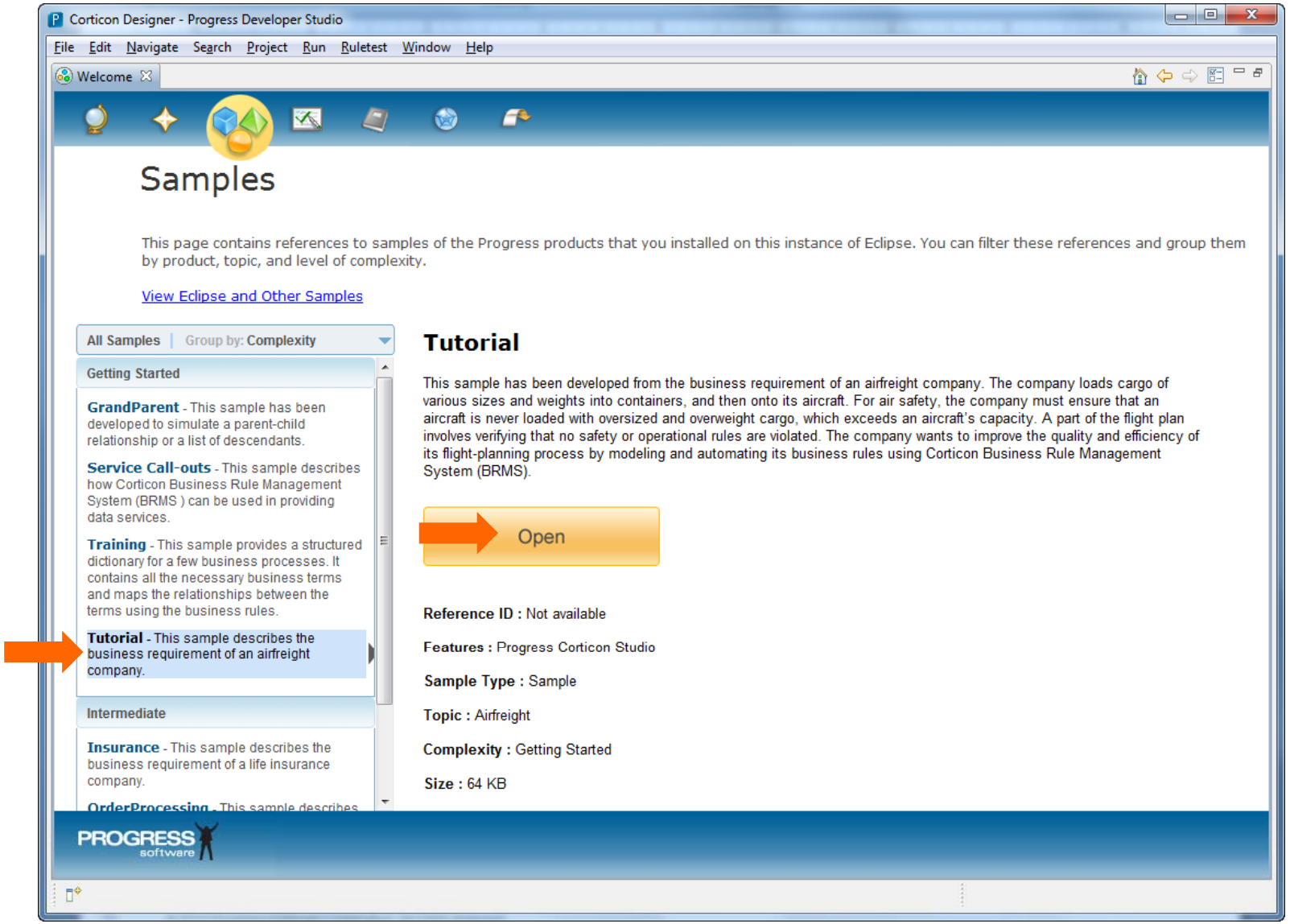
Note

For further details and reference information not presented here, you can choose **Help > Contents** and Index from the Studio menubar or click the  icon on the Studio toolbar.

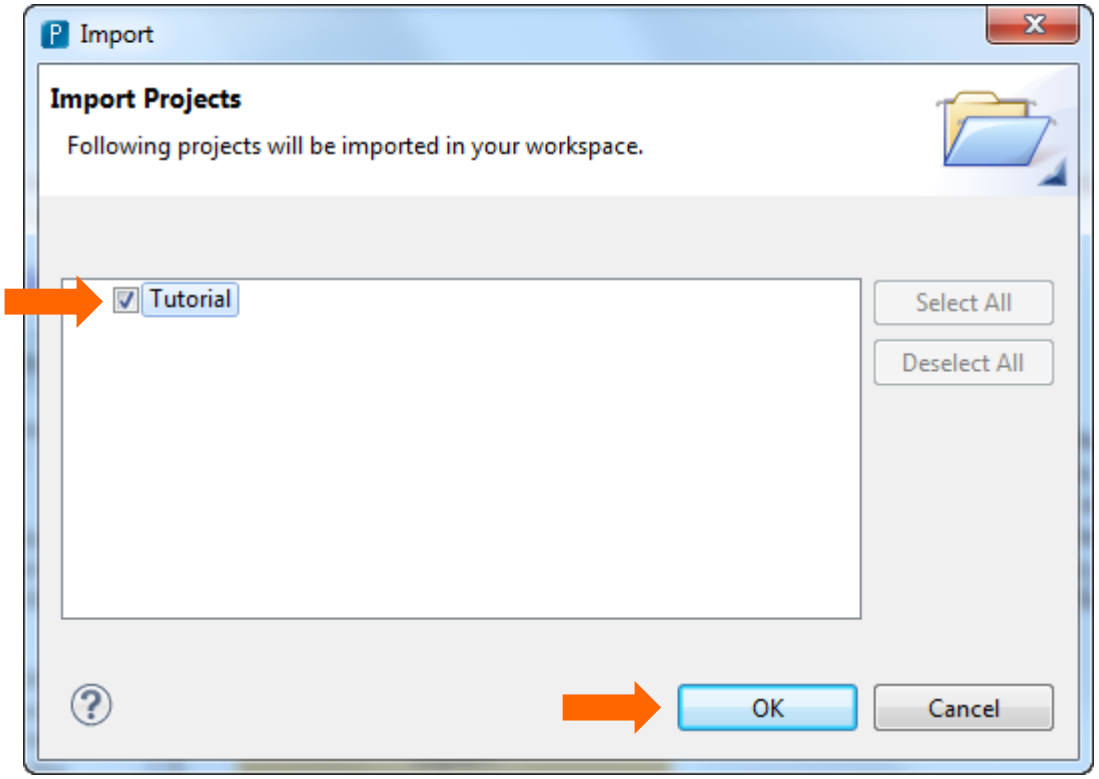
Select **Samples** from the Progress Developer Studio Welcome page



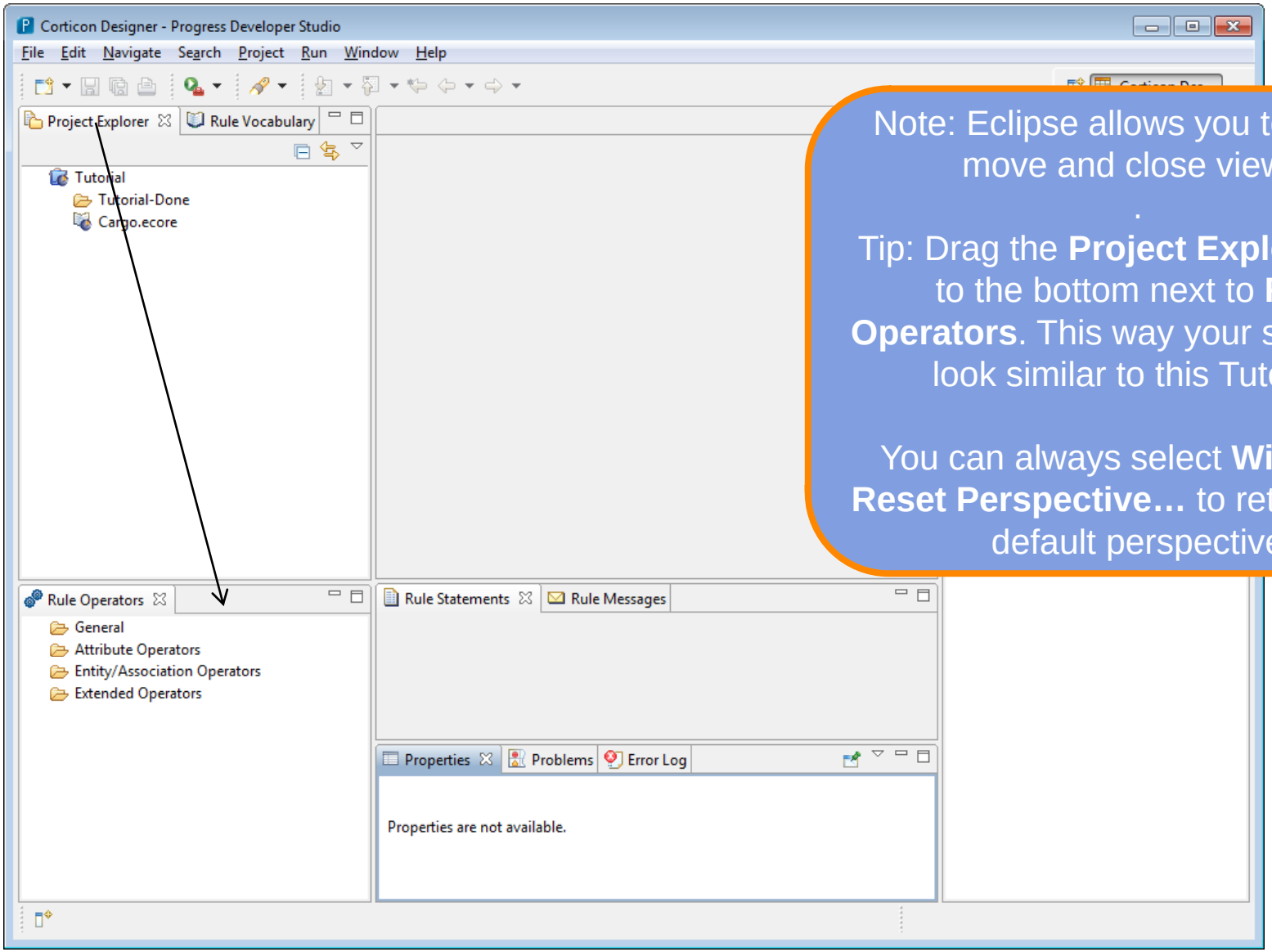
Select the Tutorial and Open



Check Tutorial and OK



Load the project into the workspace



Note: Eclipse allows you to resize, move and close views.

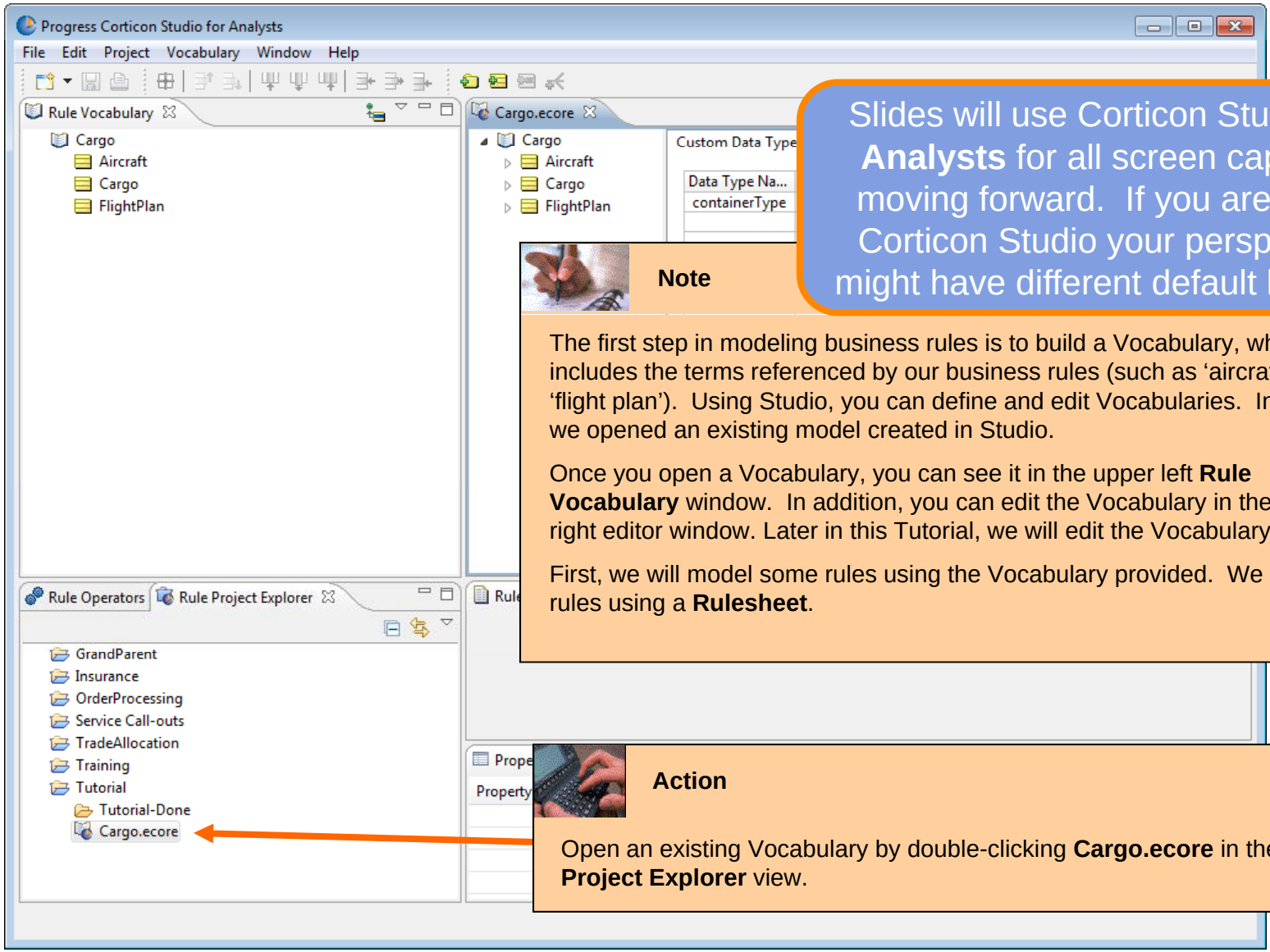
.

Tip: Drag the **Project Explorer** view to the bottom next to **Rule Operators**. This way your screen will look similar to this Tutorial.

You can always select **Window > Reset Perspective…** to return to the default perspective

Open the Vocabulary

Model



Slides will use Corticon Studio **for Analysts** for all screen captures moving forward. If you are using Corticon Studio your perspective might have different default layouts.

Note

The first step in modeling business rules is to build a Vocabulary, which includes the terms referenced by our business rules (such as 'aircraft' and 'flight plan'). Using Studio, you can define and edit Vocabularies. In this case, we opened an existing model created in Studio.

Once you open a Vocabulary, you can see it in the upper left **Rule Vocabulary** window. In addition, you can edit the Vocabulary in the upper right editor window. Later in this Tutorial, we will edit the Vocabulary.

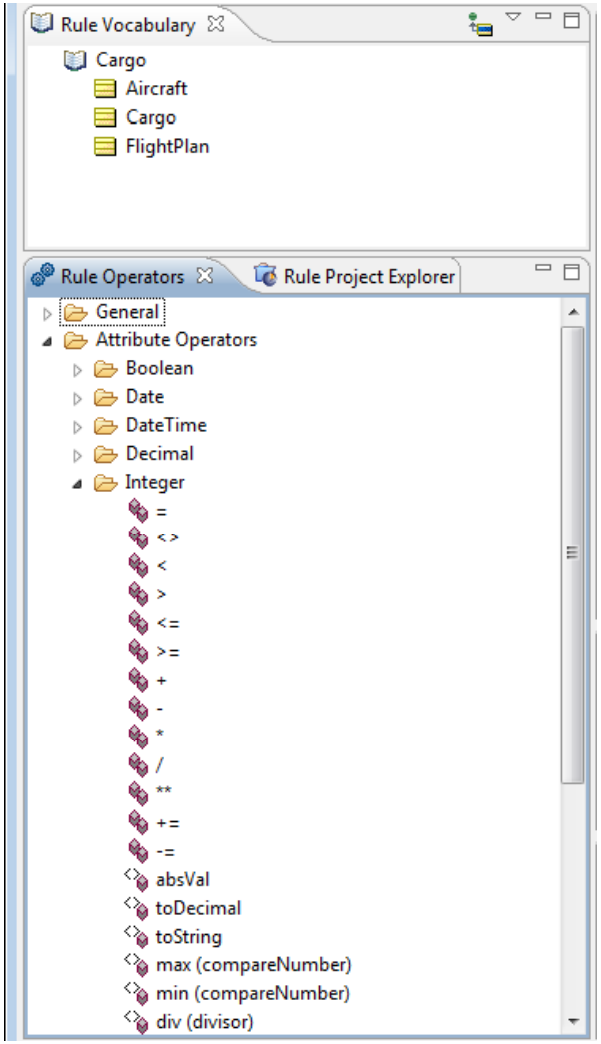
First, we will model some rules using the Vocabulary provided. We model rules using a **Rulesheet**.

Action

Open an existing Vocabulary by double-clicking **Cargo.ecore** in the **Rule Project Explorer** view.

Open the Vocabulary

Model



Action

Take a moment to explore the **Rule Operators**, which are located in a tab to the lower left, adjacent to the **Rule Project Explorer** tab.

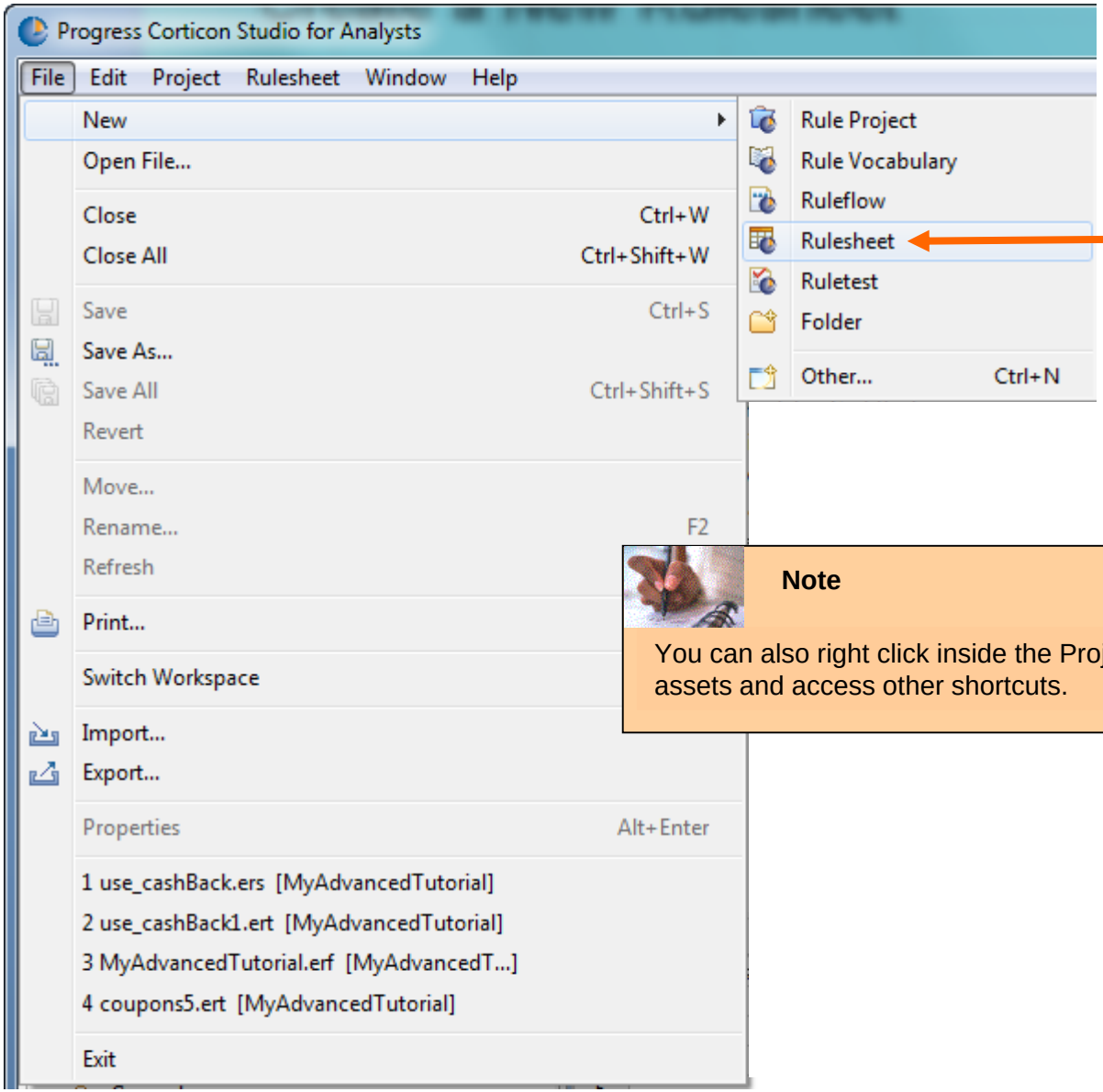
Note

While the **Rule Vocabulary** contains our nouns (the things we reference in our business rules), the **Rule Operators** contain our verbs (the actions we take in our business rules).

Corticon Studio comes with a rich set of operators for manipulating data, similar to the Excel function library. In addition, programmers can also extend Corticon's built-in Operator Library by implementing a documented Corticon Operator API (e.g., to perform a new statistical function or to make a call out). See Appendix D of the ***Rule Language Guide*** for more information.

Create a New Rulesheet

Model



Action

To create a new Rulesheet, select **File > New > Rulesheet** from the Studio menubar.

Note

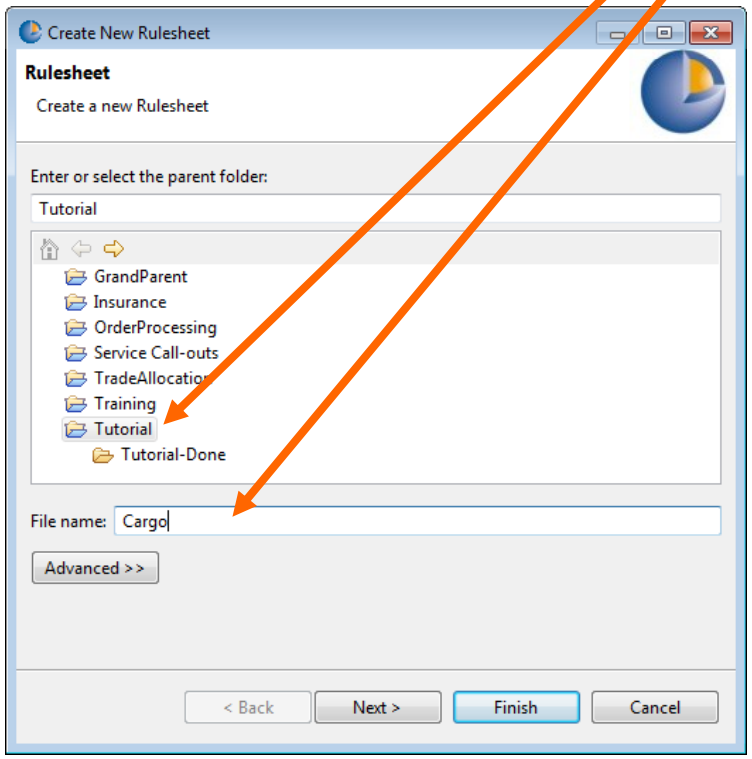
You can also right click inside the Project Explorer view to create new assets and access other shortcuts.

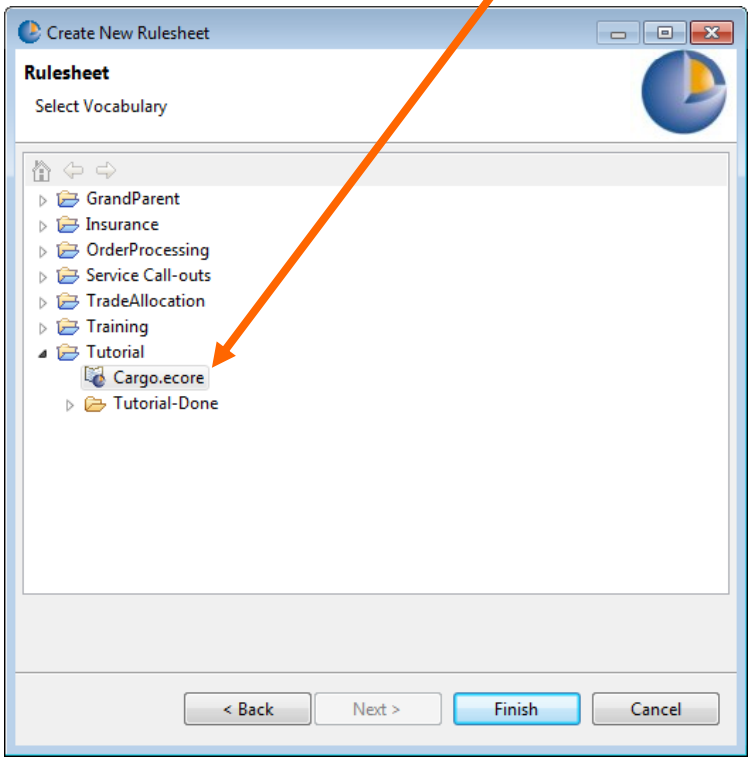
The “Create New Rulesheet” Wizard

Action

Select **Tutorial** as the **Parent Folder** and enter **Cargo** as the **File name**. Click **Next**.

Now, select **Cargo.ecore** as the Vocabulary to associate with your new Rulesheet and click **Finish** to complete the process.

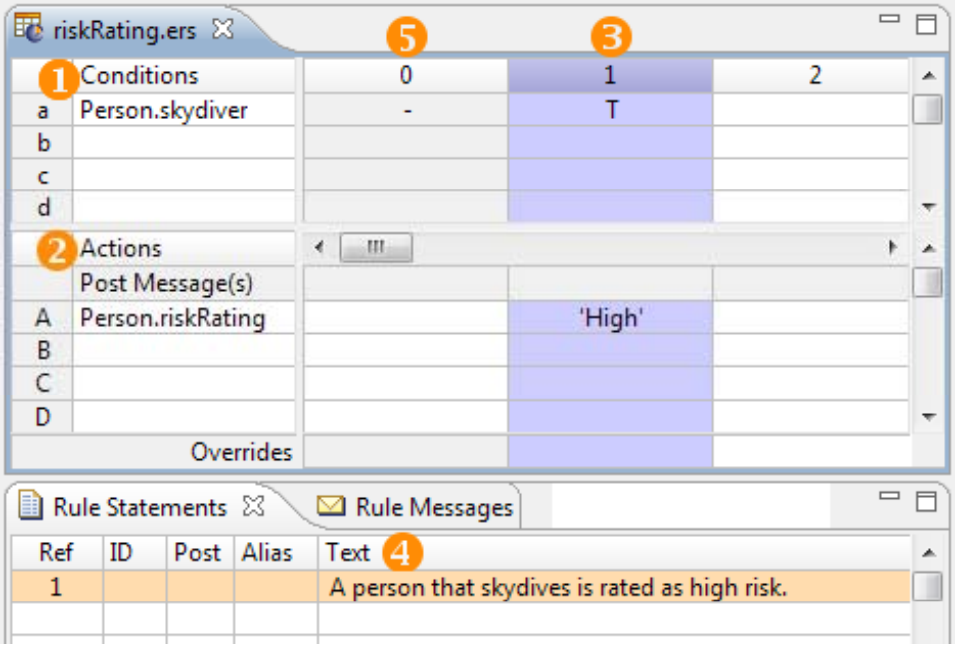




Orientation to Corticon Rulesheets

Model

This is an example of a Corticon Rulesheet, the metaphor used to model your business rules. Based on a decision table, the Corticon Rulesheet has been extended to allow the modeling of any business rules logic from simple to complex inferencing problems. This tutorial models only simple rules. See the ***Advanced Rule Modeling Tutorial*** and ***Rule Modeling Guide*** for some complex examples.



Note

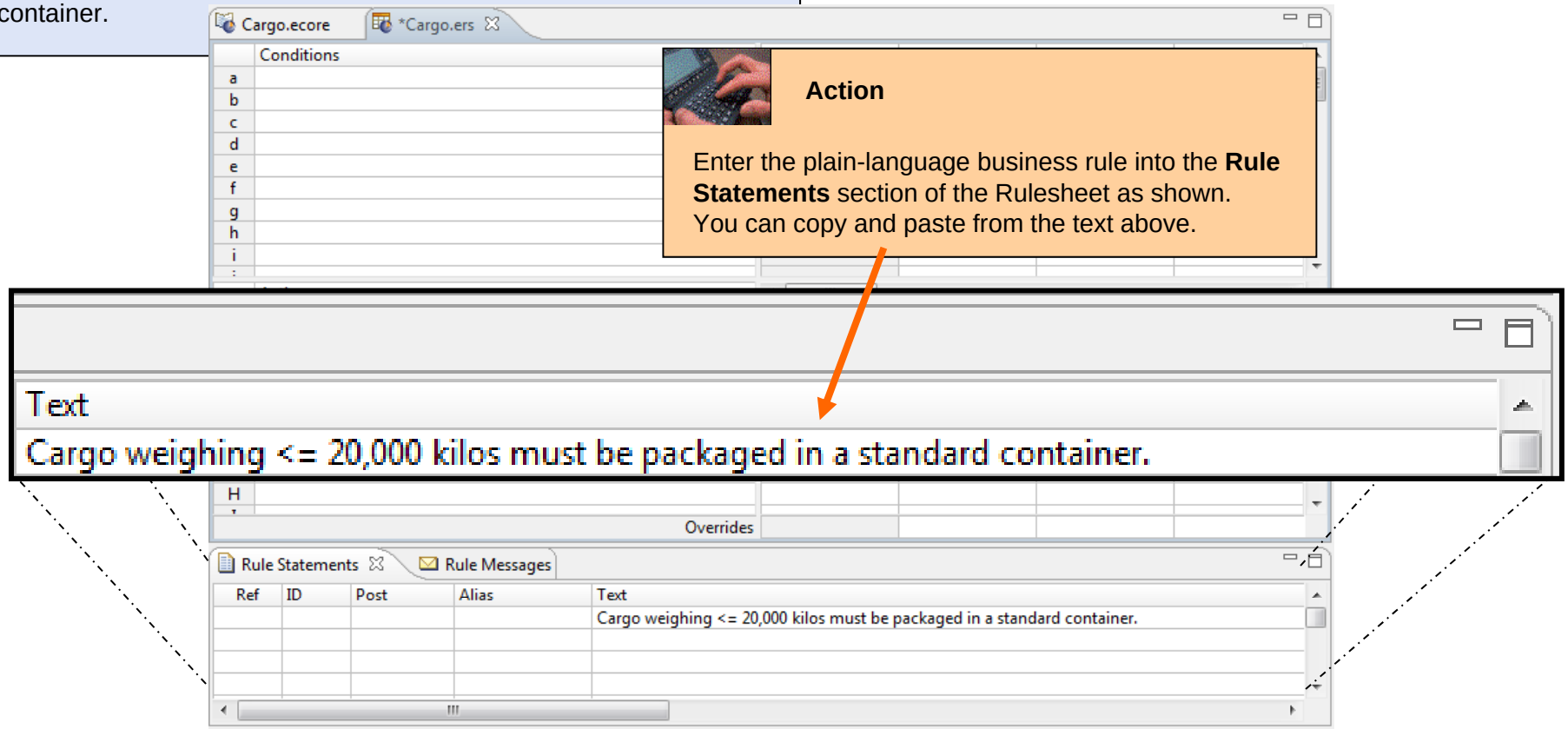
Rulesheets contain sections for specific parts of rules. Sets of Conditions (label 1) and Actions (label 2) are tied together by the vertical columns on the right to form rules. For example, rule column 1 (label 3) is read as "if a Person's skydiver value is true, then assign 'High' to that Person's riskRating. We say that this column provides the model or implementation of the rule statement (label 4). Column 0 (label 5) is used to define calculation rules that contain Actions, but no Conditions (see ***Rule Modeling Guide*** for examples).

Model the Rules – Step 1

Model

Model the first rule:

- Cargo weighing <= 20,000 kilos must be packaged in a standard container.



Model the Rules – Step 2

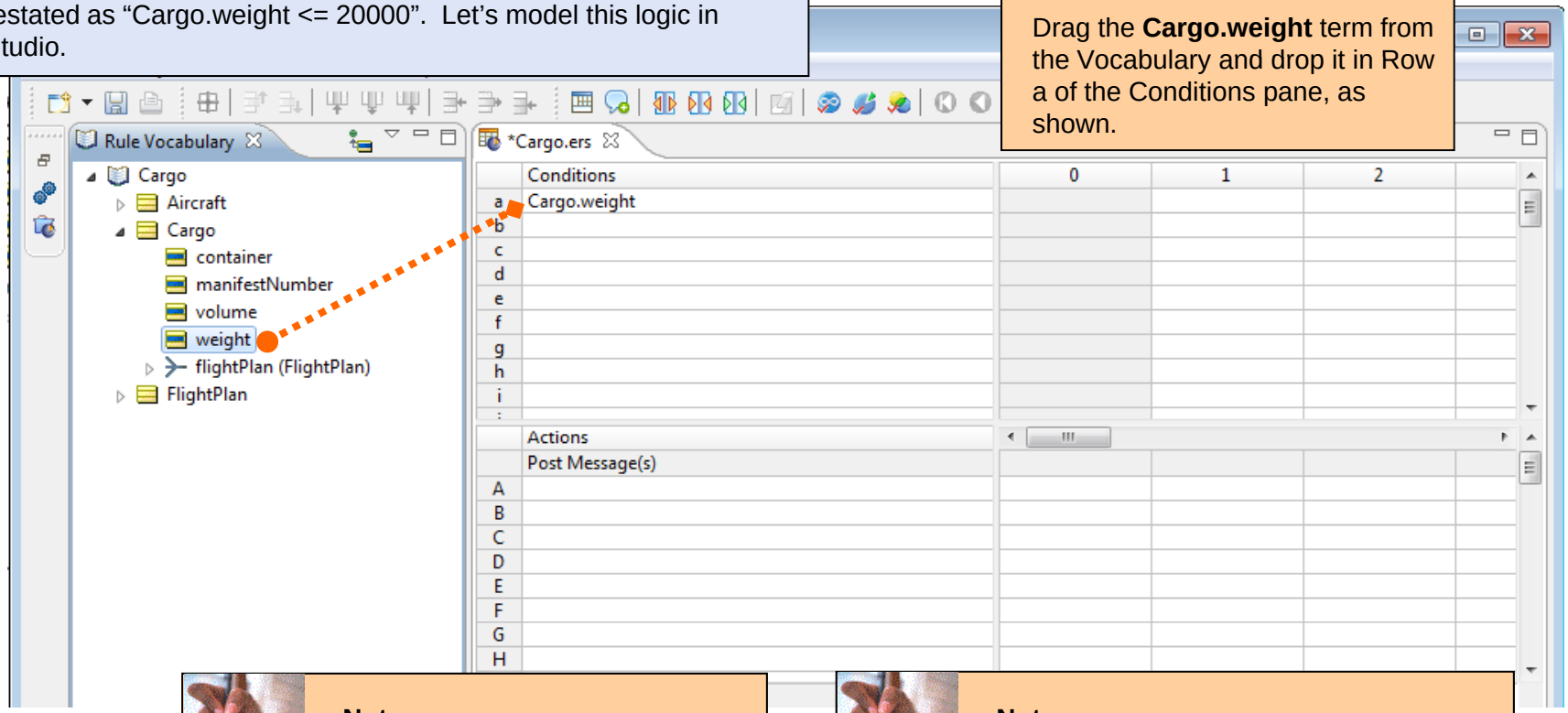
Model

Model the first rule:

The condition of our first rule: “Cargo weighing <= 20,000“ can be restated as “Cargo.weight <= 20000”. Let’s model this logic in Studio.

Action

Drag the **Cargo.weight** term from the Vocabulary and drop it in Row a of the Conditions pane, as shown.



Note

We’ll use an orange dotted line to indicate dragging and dropping. *Drag from* the orange circle, and drop on the orange diamond.

Note

Our first rule evaluates a condition and takes an action if and only if the condition is satisfied. Therefore, we will use the **Conditions** and **Actions** panes to model the rule.

Model the Rules – Step 3

Model

Continue modeling the first rule:

- Cargo weighing <= 20,000 kilos must be packaged in a standard container.

Action

Next we type a value expression for cargo weight in cell 1a (row a, column 1).

Type **<=20000** in the cell.

Don't use commas in value expressions because commas are reserved to indicate multiple values.

*Cargo.ers

	Conditions	0	1
a	Cargo.weight		<= 20000
b			
c			
d			
e			
f			
g			
h			
i			

Model the Rules – Step 4

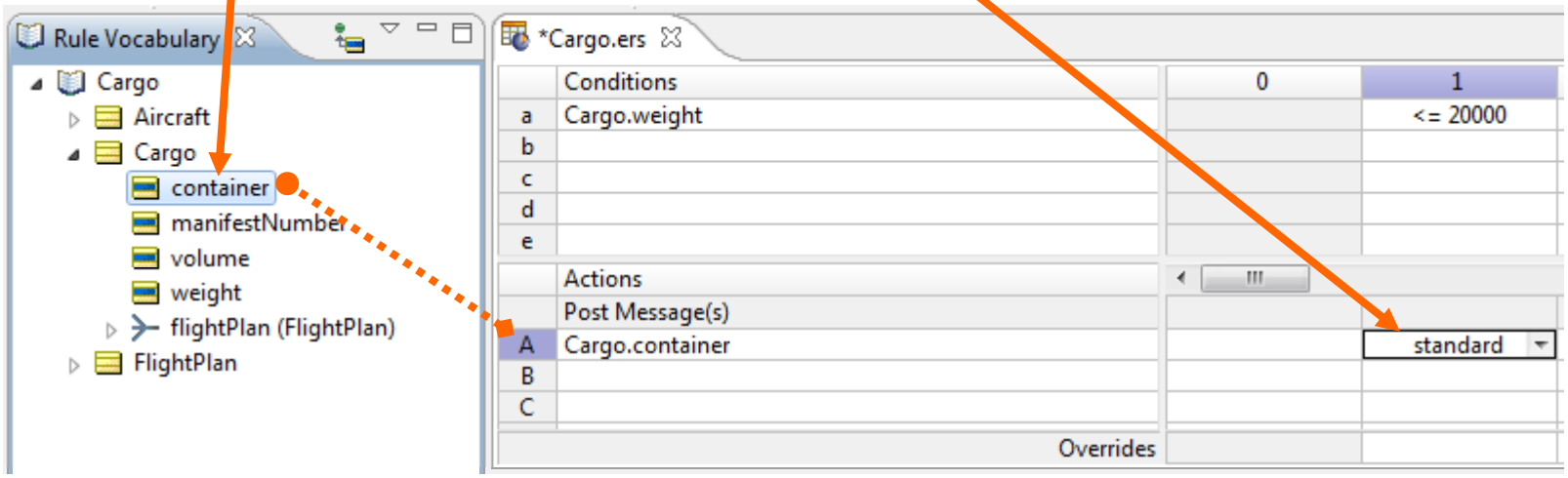
Model

Action

Now drag the appropriate term from the Vocabulary and drop it in row A of the **Actions** section.

Next, define the action for rule 1 by selecting “standard” in the drop-down menu within **Actions** row A of column (rule) 1. The drop-down menu options were defined in the Vocabulary, which we will edit later.

This action assigns the value of “standard” to the Cargo.container attribute.



Model the Rules – Step 5

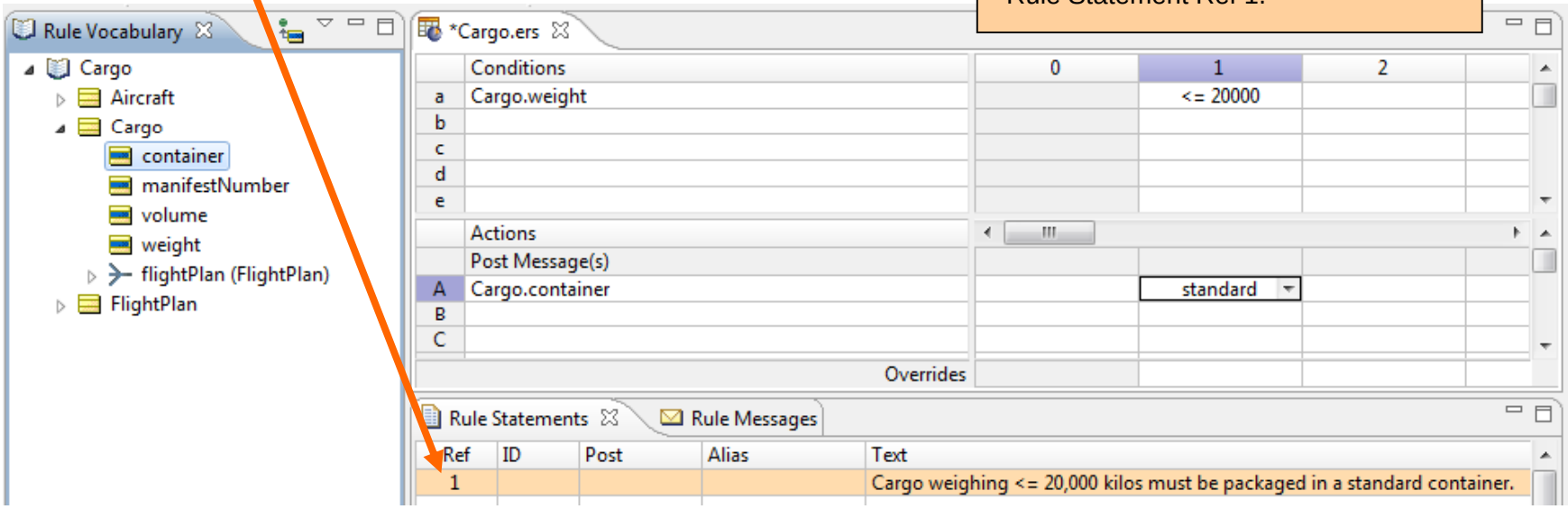
Model

Action

Finally, enter the Rule Statement's **Reference** number. This connects the Rule Statement to the corresponding model in a column in the Rulesheet above.

Note

Reference numbers logically link rows in the **Rule Statements** section to columns in the **Conditions/Actions** section – notice how clicking on Rule Statement Ref 1 causes column 1 to highlight. The highlighting reminds you that column 1 is the model of the rule (expressed in plain-language) in Rule Statement Ref 1.



Model the Rules – Step 6

Model

Model the second rule :

- Cargo with volume > 30 cubic meters must be packaged in an oversize container.

Note

When completed your Rulesheet should look like this…

Action

Finally, save your Rulesheet by selecting **File > Save** from the Studio menubar (or clicking the Save button).

*Cargo.ers

	Conditions	0	1	2
a	Cargo.weight		<= 20000	
b	Cargo.volume			> 30
c				
d				
e				
	Actions			
	Post Message(s)			
A	Cargo.container		standard	oversize
B				
C				
	Overrides			

Rule Statements | Rule Messages

Ref	ID	Post	Alias	Text
1				Cargo weighing <= 20,000 kilos must be packaged in a standard container.
2				Cargo with volume > 30 cubic meters must be packaged in an oversize container.

Cargo.ers

	Conditions	0	1	2
a	Cargo.weight	-	<= 20000	-
b	Cargo.volume	-	-	> 30
c				
d				
e				
	Actions			
	Post Message(s)			
A	Cargo.container		standard	oversize
B				
C				
	Overrides			

Note

When saved, Studio places a dash in the empty cells, meaning that the condition is ignored.

The conditions and actions in a column are “anded” together. For example, rule 1 reads: “Cargo weighing less than or equal to 20,000 kilos, ignoring volume, must be packaged in a standard container.”

Model the Rules – Step 7

Model

Note

Next, we will “Post” the Rule Statements to the “Cargo” entity. This will provide an audit trail during rule execution, which you will see during rule testing. To preview the end result of a post, see slide 46 for green ***Info*** posts.

*Cargo.ers

	Conditions	0	1	2	3	4
a	Cargo.weight	-	<= 20000	-		
b	Cargo.volume	-	-	> 30		
c						
d						
e						
	Actions					
	Post Message(s)		✉	✉		
A	Cargo.container		standard	oversize		
B						
C						
	Overrides					

Rule Statements | Rule Messages

Ref	ID	Post	Alias	Text
1		Info	Cargo	Cargo weighing <= 20,000 kilos must be packaged in a standard container.
2		Info	Cargo	Cargo with volume > 30 cubic meters must be packaged in an oversize container.

Note

When you define a Post, an icon appears in the Post Message(s) row of the Rulesheet.

Action

To Post, select the appropriate Severity Level from the drop-down box in the **Post** column. (in this case, select “Info”) . You must also select an **Alias** for the Rule Statement to post. The Alias defines what Entity the Rule Statement is posted to (in this case, select “Cargo”, which is the only option).

Check for Conflicts

Analyze

Now that we have finished modeling our rules, it is time to analyze our rules for logical errors. Very often, initial business rule specifications are **ambiguous** and **incomplete**. By **ambiguous**, we mean that the rules are **conflicting** under certain scenarios. By **incomplete**, we mean that the rules fail to address all possible scenarios.

Prior to automating your rules, it is critical to eliminate logical errors in order to ensure that our decision service provides correct, consistent results. We call this "Rule Referential Integrity". Studio provides unique and powerful features to help you ensure Rule Referential Integrity. These features will be explored in this Analyze phase of the rule management lifecycle.

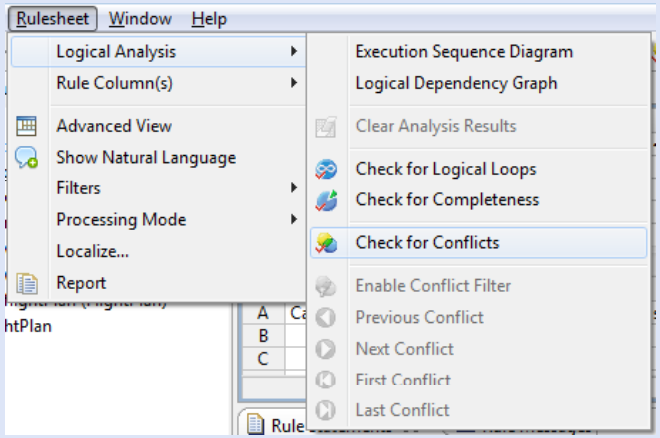
Action

Be sure your **Cargo.ers** tab is selected (colored blue), then **Check for Conflicts**.

Click on the **Check for Conflicts** icon on the toolbar.

OR

Choose **Rulesheet > Logical Analysis > Check for Conflicts** from the Studio menubar.

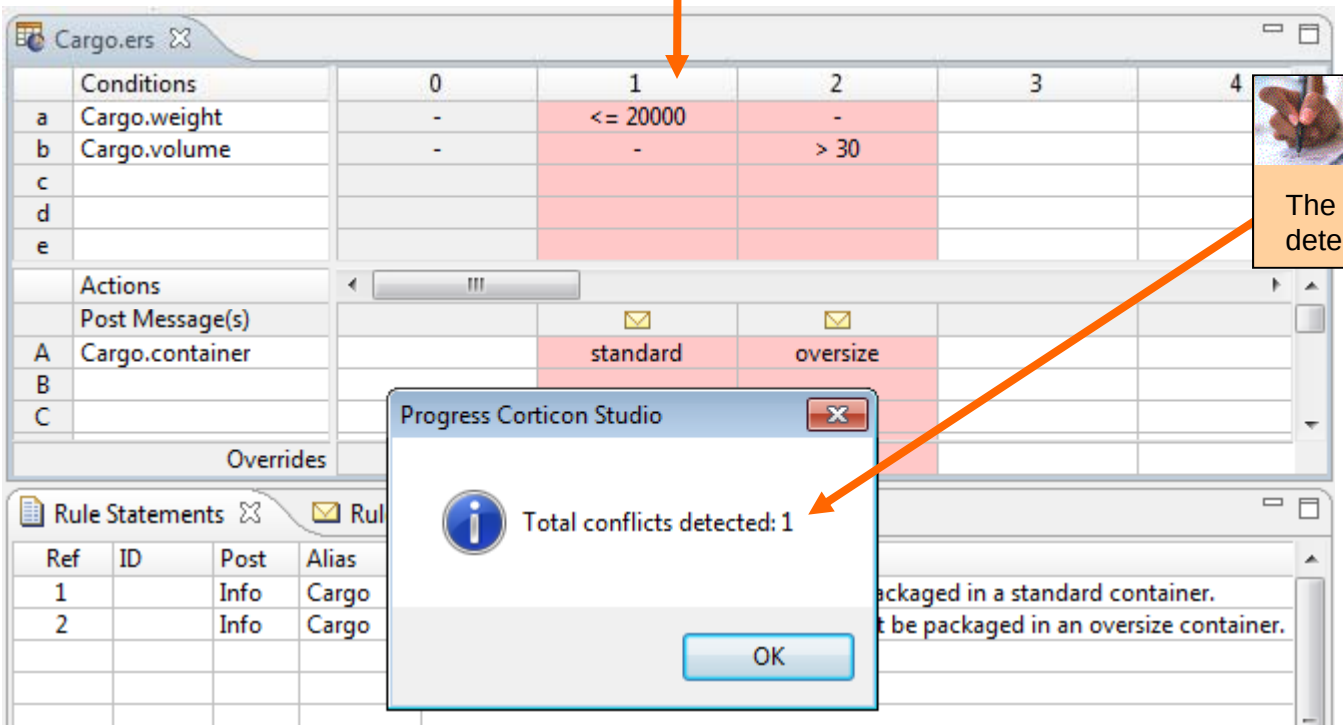


Identify Conflicts

Analyze

Note

Columns containing conflicts are shaded in pink. This indicates that one or more conflicts exist between the pink rules.



Note

The total number of conflicts detected is displayed.

Expand the Rules

Analyze

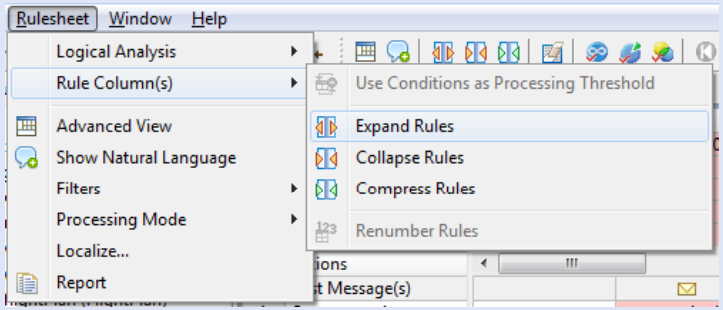
Action

Expand the Rules to reveal sub-rules (rules without dashes) inside the general rules (rules with at least one dash value). This helps you more accurately pinpoint the source of the ambiguity.

Click on the **Expand Rules** icon on the Studio toolbar.

OR

Choose **Rulesheet > Rule Column(s) > Expand Rules** from the Studio menubar.



Cargo.ecore | *Untitled.ers

	Conditions	0	1.1	1.2	1.3	2.1	2.2	2.3
a	Cargo.weight	-	<= 20000	<= 20000	<= 20000	<= 20000	> 20000	null
b	Cargo.volume	-	<= 30	> 30	null	> 30	> 30	> 30
c								
d								
	Actions							
	Post Message(s)							
A	Cargo.container		standard	standard	standard	oversize	oversize	oversize
B								

Note

When the rules are expanded, the source of the conflict becomes obvious. In scenarios with cargo weight <=20000 **and** cargo volume > 30, our rules are in conflict, defining mutually exclusive actions (assigning both standard and oversize containers).

To get your rules right, this scenario must be addressed!

When expanded, rule 1 is represented as two columns (1.1 and 1.2), and rule 2 is represented as two columns (2.1 and 2.2). Expansion shows all of the logical possibilities for each rule. Rule 1 states “Cargo weighing <= 20,000 pounds, ignoring volume, must be packaged in a standard container.” Studio recognizes that there are only two possible ranges for volume (<=30 and >30), which we see in the expanded state.

Resolve Conflict Errors

Analyze

To resolve the conflict, you can either change your original rules, or decide that one rule should override the other. Let's implement the override.

Action

First, collapse your rules back to the original state by clicking on the **Collapse Rules** icon on the Studio toolbar.

1

Action

Next, override Rule 1 with Rule 2.

In the Overrides row, from the overriding rule, select the column number of the rule to be overridden. Multiple selections can be made by holding the **CTRL** key.

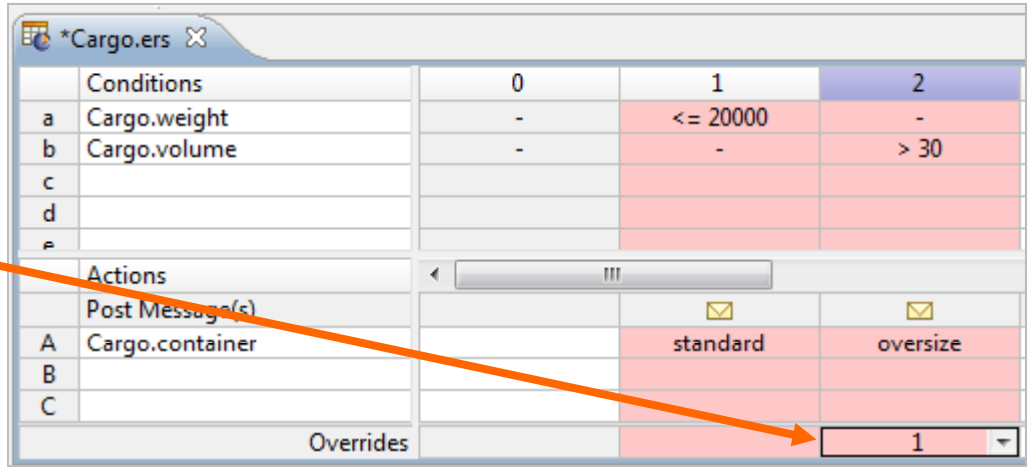
2

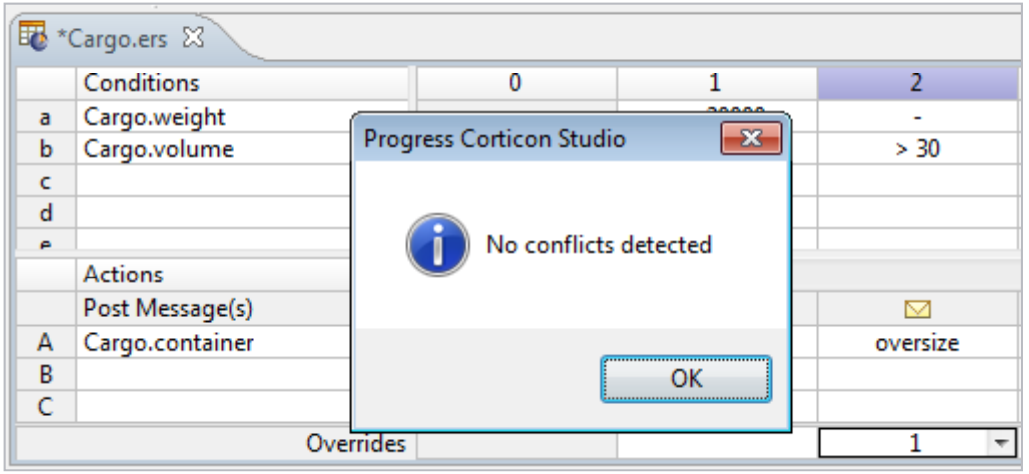
Action

Now, click the Check for Conflicts button again, and you will see that the conflict has been resolved.

With the override, Rule 2 now means "Use oversized containers when volume is >30, **even when** weight is <=20,000."

3





Check for Completeness

Analyze

Conflict is one form of logical error. Another form is incompleteness, or loopholes in our logic.

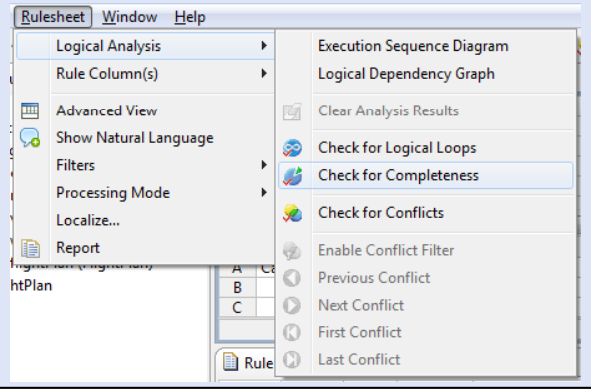
Action

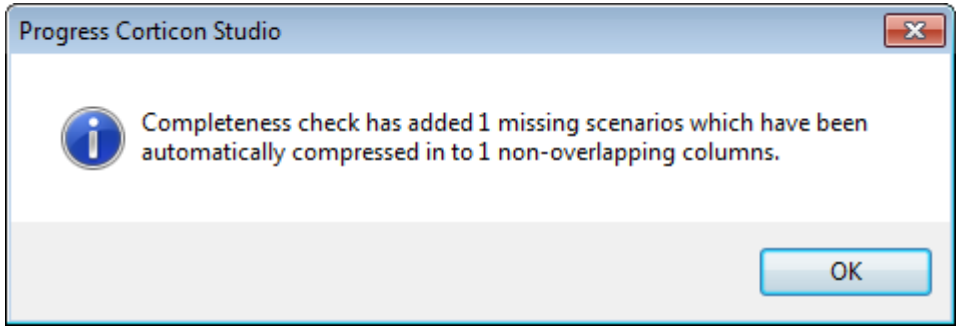
Check for logical errors in the Rulesheet.

Click on the **Check for Completeness** icon on the Studio toolbar.

OR

Choose from the Studio menu **Rulesheet > Logical Analysis > Check for Completeness**





Action

This message window informs us that our rules were incomplete. We missed one scenario.

Click **OK** to dismiss the window.

Resolve Completeness Errors – Step 1

Analyze

Cargo.ecore | *Cargo.ers

	Conditions	0	1	2	3
a	Cargo.weight	-	<= 20000	-	{> 20000, null}
b	Cargo.volume	-	-	> 30	{<= 30, null}
c					
d					
e					
f					
	Actions				
	Post Message(s)		✉	✉	
A	Cargo.container		standard	oversize	
B					
C					
D					
F					
	Overrides				

The Completeness Checking algorithm calculates the set of all possible mathematical combinations of all values in all conditions. The algorithm then compares this set of possible combinations to those already specified in the Rulesheet and automatically inserts missing combinations of conditions as new columns. These new columns are shaded in green.

Note

The Completeness Check adds condition values, but does not choose actions – that's our job as rule modelers.

Let's define a new Rule Statement for this (formerly) missing scenario:

Cargo weighing > 20,000 kilos, with volume <= 30 cubic meters, must be packaged in a heavyweight container.

Resolve Completeness Errors – Step 2

Analyze

Action

First, add the new Rule Statement for rule 3. Next, define an action in rule cell 3A. In this case, select "heavyweight" as the container option. Last, post an Info message to the Cargo entity as we did for the first two rules. Your Rulesheet should look like the one below after you **Clear Analysis Results.**

*Cargo.ers

	Conditions	0	1	2	3	4	5	6
a	Cargo.weight	-	<= 20000	-	> 20000			
b	Cargo.volume	-	-	> 30	<= 30			
c								
d								
	Actions							
	Post Message(s)							
A	Cargo.container		standard	oversize	heavyweight			
B								
C								
	Overrides			1				

Rule Statements | Rule Messages

Ref	ID	Post	Alias	Text	R
1		Info	Cargo	Cargo weighing <= 20,000 kilos must be packaged in a standard container.	
2		Info	Cargo	Cargo with volume > 30 cubic meters must be packaged in an oversize container.	
3		Info	Cargo	Cargo weighing > 20,000 kilos, with volume <= 30 cubic meters, must be packaged in a heavyweight container.	

Don't forget to add enter the Rule Statement **Reference** to link it with the corresponding column.

Note

In this example, incompleteness was resolved by specifying an action for column 3, along with adding a new Rule Statement. Once resolved, remove the green highlighting by clicking the **Clear Analysis Results** button on the Studio toolbar.

Check for Completeness

Analyze

A third form of logical error is circular logic.

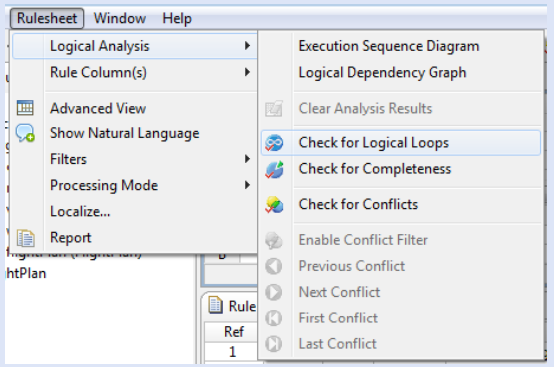
Action

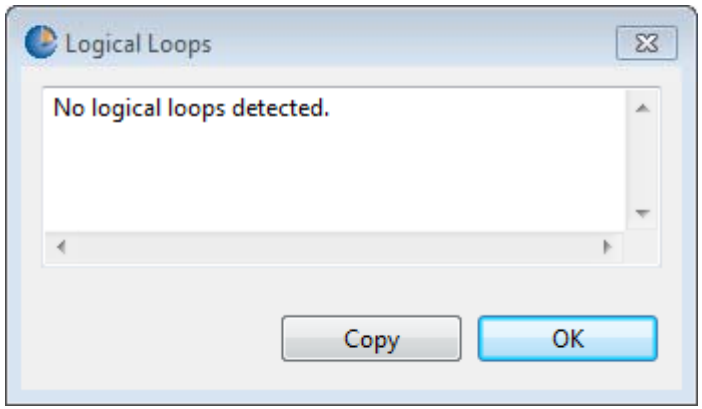
Check for logical errors in the Rulesheet.

Click on the **Check for Logical Loops** icon on the Studio toolbar.

OR

Choose **Rulesheet > Logical Analysis > Check for Logical Loops** from the Studio menubar.





Note

This is a very simple Rulesheet and contains no logical loops. Of note, while unintended logical loops are problematic, sometimes logical loops are a useful technique for solving complex inferencing problems that require recursive reasoning. You can learn more in the ***Rule Modeling Guide***.

Save the Rulesheet

Analyze

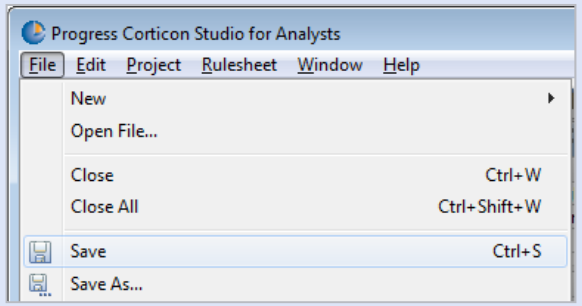
Action

Save your Rulesheet.

Click on the **Save** icon on the Studio toolbar.

OR

Choose **File > Save** from the Studio menubar.



Create a New Ruletest

Test

The Analyze phase helped to ensure the logical integrity of our rules. The Test phase helps to ensure that our rules give us the correct business results. Let's move on to testing.

First, we're going to define a test case for each one of our rules below by defining some input values and expected results. Corticon Studio allows us to pre-define our expected results and then highlights any variances in our test results. The table below defines one test case for each rule.

Cargo.ers

	Conditions	1	2	3
a	Cargo.weight	<= 20000	-	> 20000
b	Cargo.volume	-	> 30	<= 30
c				
d				
	Actions			
	Post Message(s)	✉	✉	✉
A	Cargo.container	standard	oversize	heavyweight
B				
C				
D				
	Overrides		1	

	Test Rule 1	Test Rule 2	Test Rule 3
Input Values			
Cargo.weight	1000	1000	30000
Cargo.volume	10	40	20
Expected Results			
Cargo.container	standard	oversize	heavyweight

Note

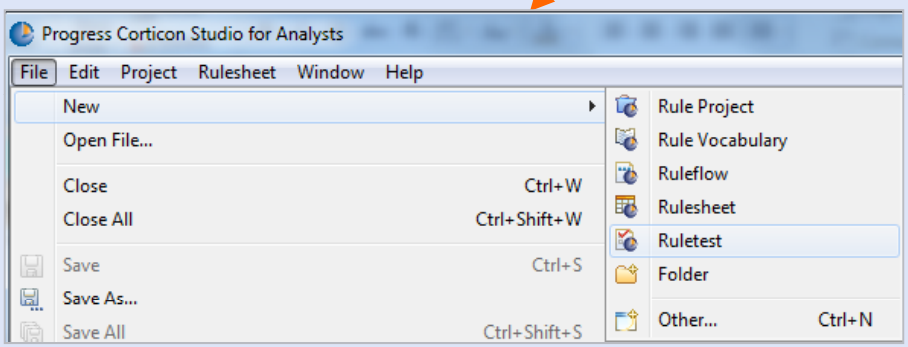
For test 2, we expect rule 2 to override rule 1.

Create a New Ruletest

Test

Action

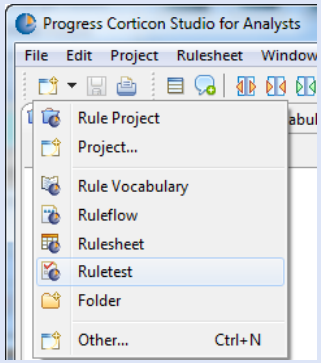
Create a new Ruletest. Select **Tutorial** as the Parent Folder and name the file **Cargo**. All test files are assigned a file extension of **.ert**. Click **Next >** to continue.

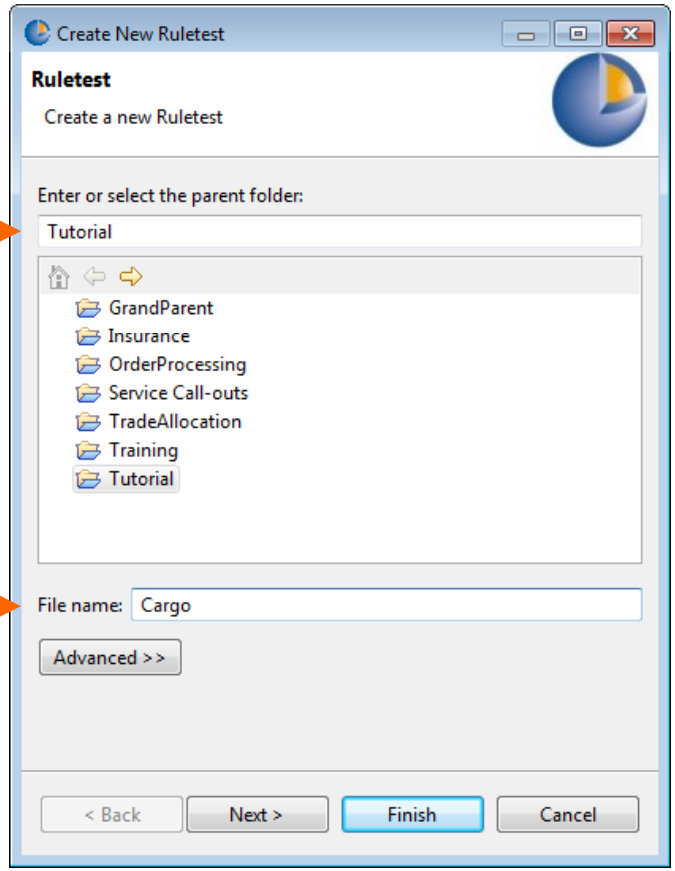


1. *Select File > New > Ruletest on the menubar*

OR

2. *Use the New icon on the toolbar by selecting the down arrow to the right of the icon and select Ruletest.*





Create a New Ruletest

Test

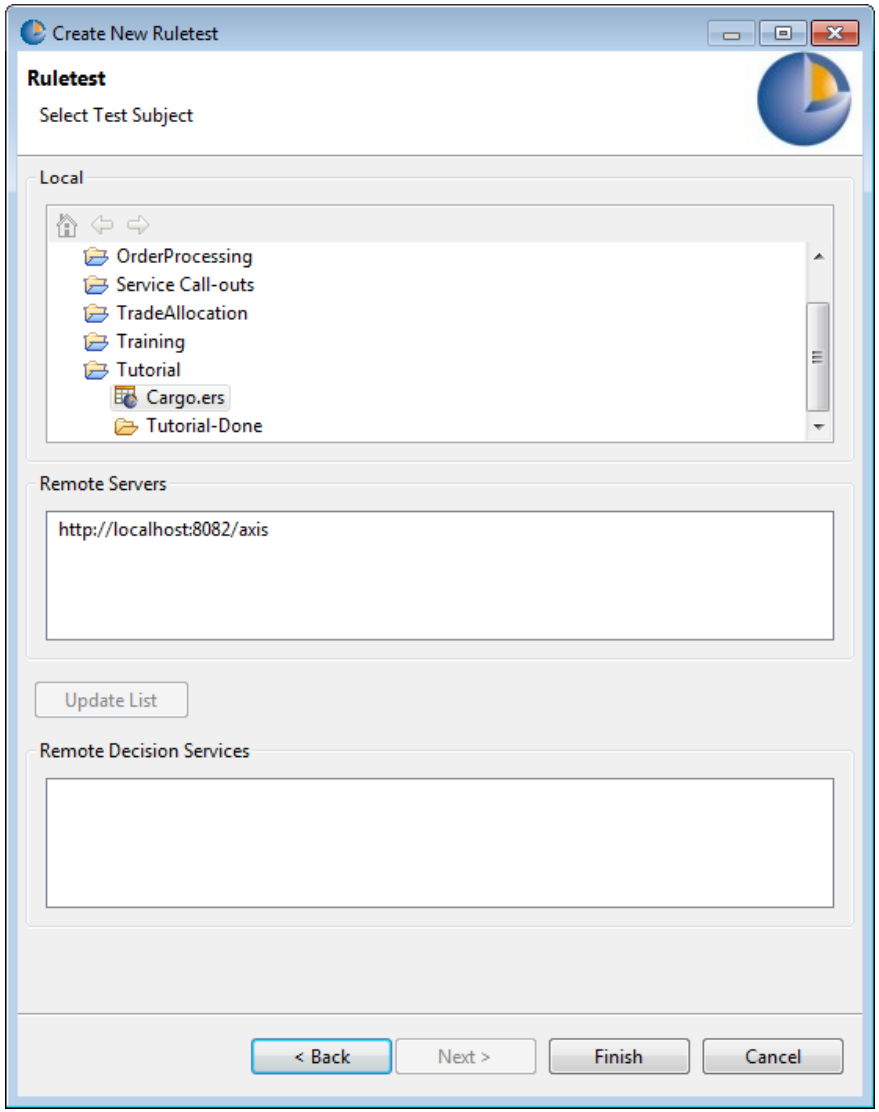
Action

Select the appropriate Rulesheet as your **Test Subject**. For our example, we want to use the **Cargo** Rulesheet within our **Tutorial** project directory.

Click **Finish** to display the new Ruletest.

Note

You can disregard the **Remote Servers** and **Remote Decision Service** panes - if you are interested in those, please refer to the ***Server Deployment Tutorial*** for more information.



Set Up the Test Scenario – Step 1

Test

Action

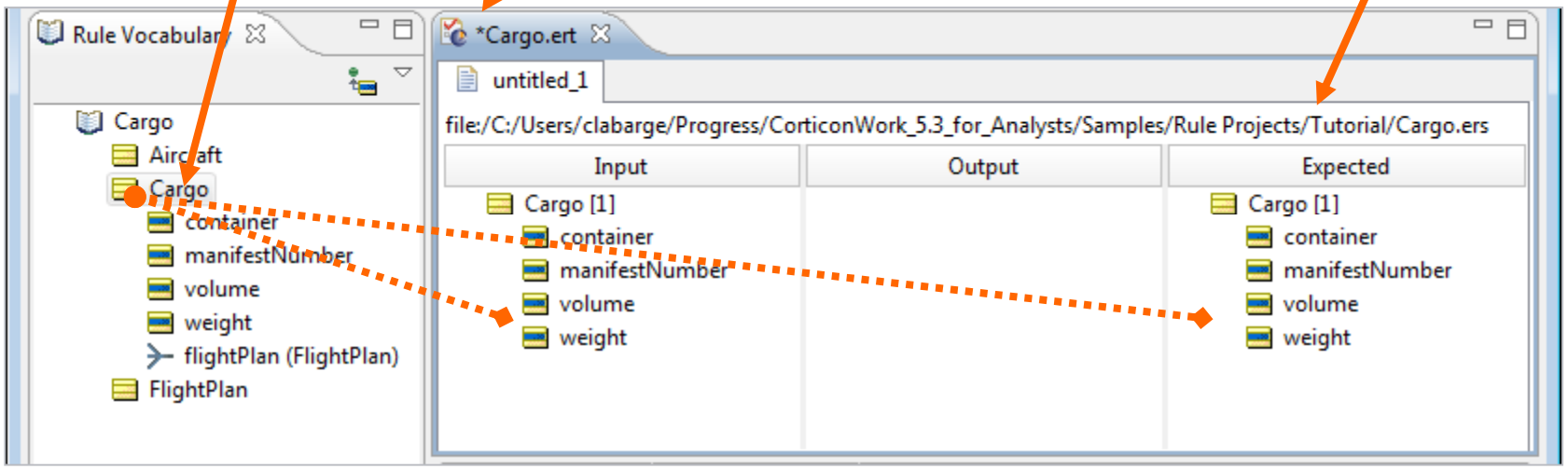
*Drag the Cargo entity from the Vocabulary and drop it anywhere in the **Input** and **Expected** panes of the Cargo Ruletest's default untitled_1 TestSheet. Cargo [1] on this TestSheet's **Input** and **Expected** panes represents a single 'instance' or 'example' of the Cargo entity.*

Note

Changes you make to any Studio file will cause an asterisk character to appear in the file's tab. This is a reminder to us to save the file.

Note

As you can see, your new Ruletest is associated with the appropriate Rulesheet. This ensures that your Ruletest scenario will be tested by the right rules.



Set Up the Test Scenario – Step 2

Test

	Test Rule 1	Test Rule 2	Test Rule 3
Input Values			
Cargo.weight	1000	1000	30000
Cargo.volume	10	40	20
Expected Results			
Cargo.container	standard	oversize	heavyweight

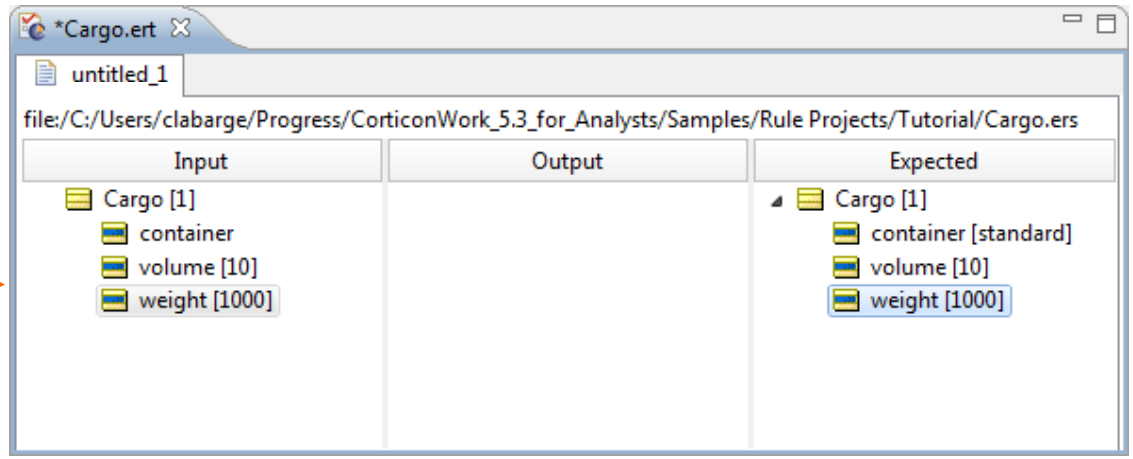
Action

First, remove unneeded attributes by selecting them and pressing the **Delete** key. **Shift-click** and **Ctrl-click** are also supported for multi-selecting contiguous and non-contiguous attributes, respectively.

We will remove the manifestNumber attribute as it is not needed to test these rules.

Action

Next, add test data for test #1 to the TestSheet, per the table above. Double-click on the desired term to open a data entry box. When complete, your Ruletest should look like this.



Set Up the Test Scenario – Step 3

Test

Action

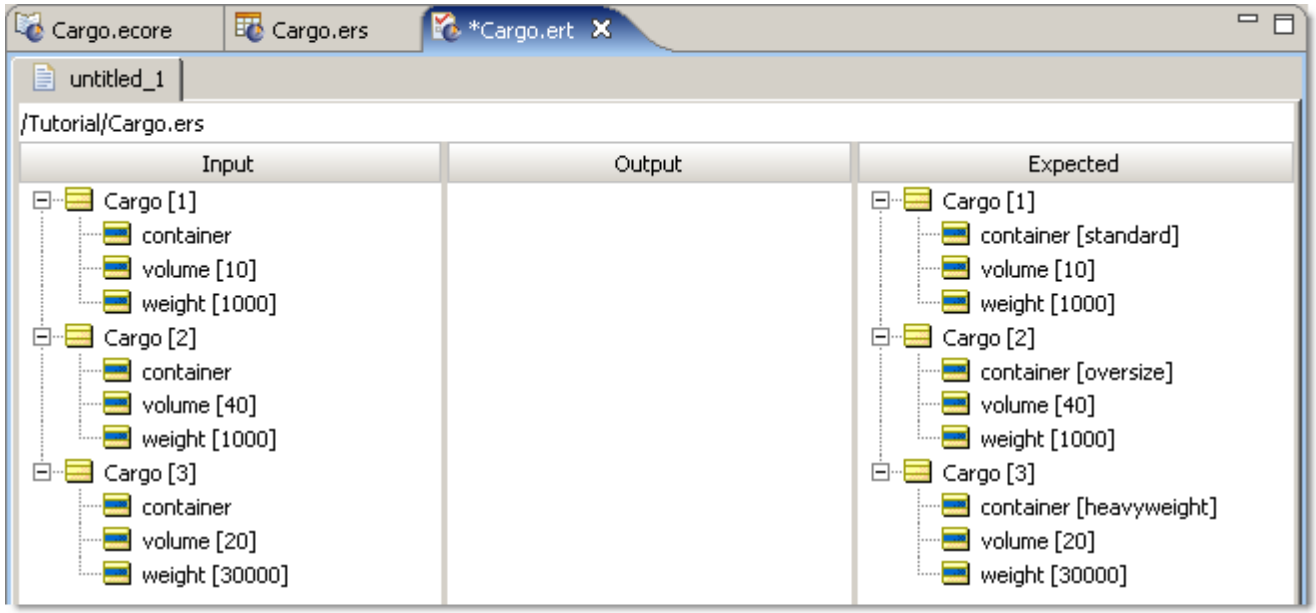
Enter the remaining test data as shown to complete the Input pane of the Ruletest.

You can easily duplicate the first test scenario by selecting Cargo [1], copying it, then pasting it below. Repeat for both the Input and Expected panes

Also, select the *expected* container values from the drop-downs that appear when the container attribute is clicked.

Your Ruletest should look like the one below.

	Test Rule 1	Test Rule 2	Test Rule 3
Input Values			
Cargo.weight	1000	1000	30000
Cargo.volume	10	40	20
Expected Results			
Cargo.container	standard	oversize	heavyweight



Execute the Ruletest

Test

Action

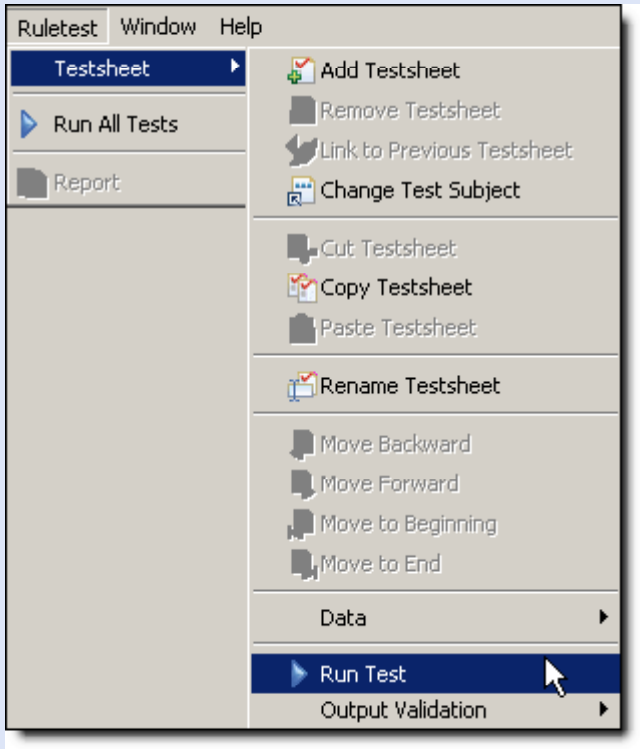
Run the Ruletest.

Running the Ruletest sends the data on the selected Testsheet's input pane to the rule engine. The rule engine fires the appropriate rules and displays the results in the **Output** pane.

Click on the **Run Test** icon on the Studio toolbar.

OR

Choose Ruletest > Testsheet > Run Test from the Studio menubar.



Note

The first time rules are executed, they are automatically compiled from the rule model into an optimized executable form, then deployed into the engine, which may take a few seconds. Once deployed, the rules will execute much faster on subsequent tests.

Verify the Test Results

Test

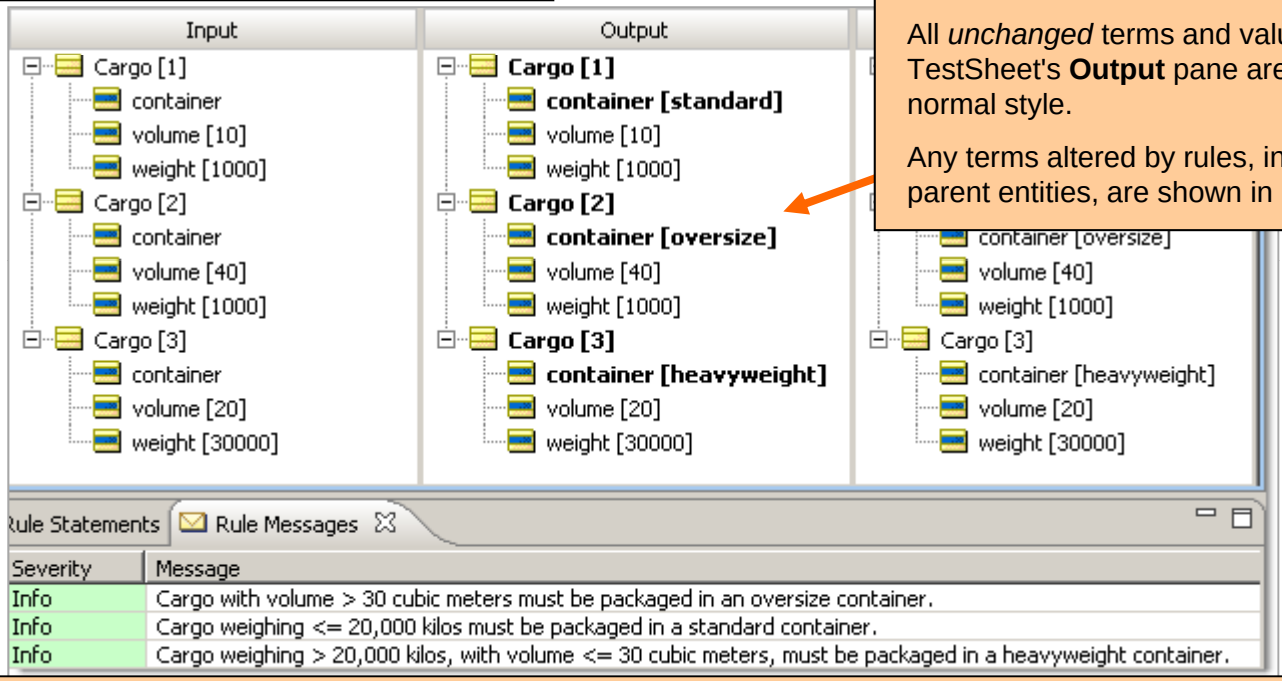
Action

Check the outcome of your test in the TestSheet's **Output** pane

Note

All *unchanged* terms and values in the TestSheet's **Output** pane are displayed in normal style.

Any terms altered by rules, including their parent entities, are shown in **bold** text.



Note

Messages shown in the Rule Messages pane are produced by using the Post command in your Rule Statements.

Severity indicates whether a message contains information, warnings or violations.

Message contains the Rule Statement text.

Entity shows the entity to which this message is bound or linked. When we select the Cargo[1] entity within TestSheet's **Output** pane, the third rule message is highlighted, showing the audit trail of rules that fired for that entity (in this case only one rule fired for Cargo[1]).

Verify the Test Results

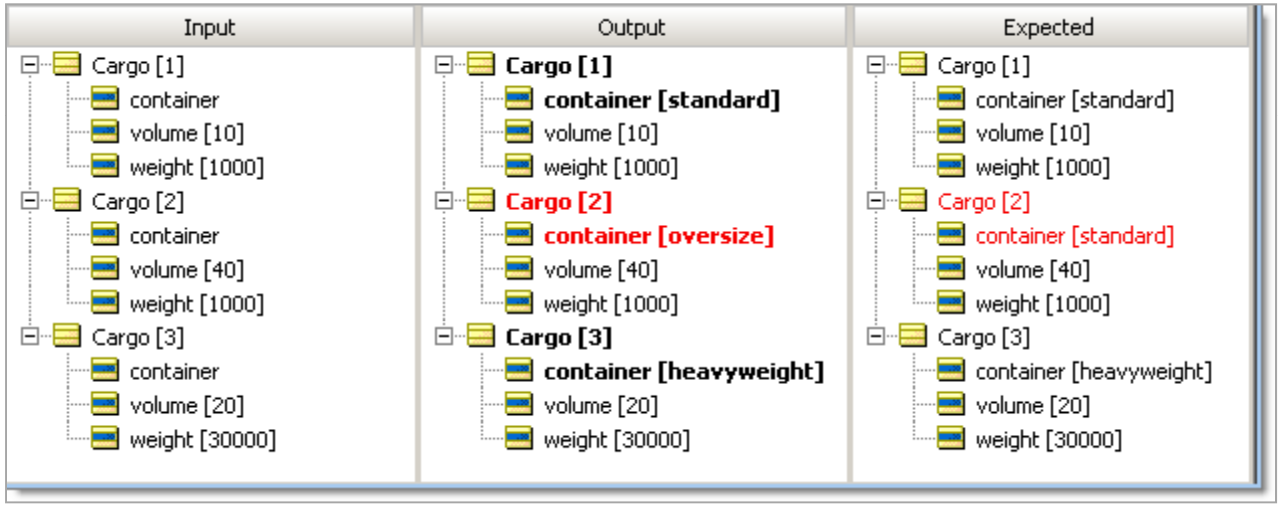
Test

Action

Next, let's change one of the test cases in the Expected pane to illustrate how variance testing works.

In the Expected pane, change the container value in Cargo[2] to **standard**. Then, rerun the test.

Your Ruletest should look like this.



Note

Here we see that the Cargo[2] entity and the container attribute are colored red in both the Output and Expected panes, indicating that our Output results differ from our Expected results. Studio automatically highlights differences in values in red in both the Output and Expected panes.

Other types of differences are also highlighted. Unexpected entities in the Output pane are highlighted in blue. And missing entities are highlighted green within the Expected pane. More details about color codes are included in the ***Studio Quick Reference Guide***.

Be sure to change Cargo[2] Expected container value back to **oversize** before saving the Ruletest on the next page.

Save the Ruletest

Test

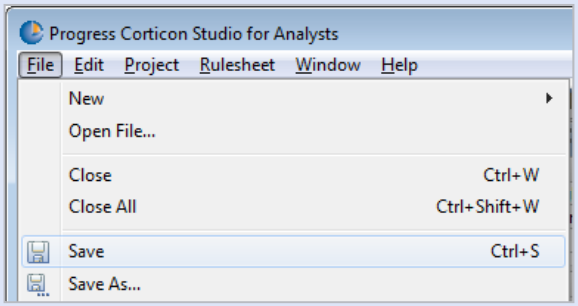
Action

Save the Test for future use.

Click on the **Save** icon on the Studio toolbar.

OR

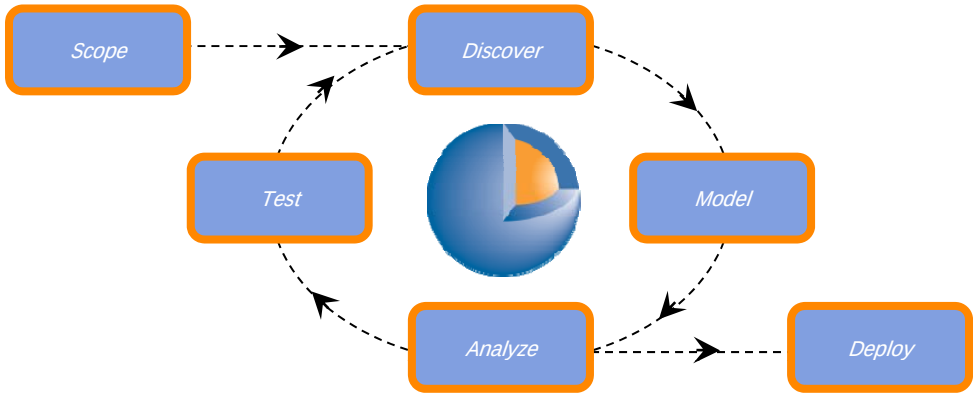
Choose **File > Save** from the Studio menubar.

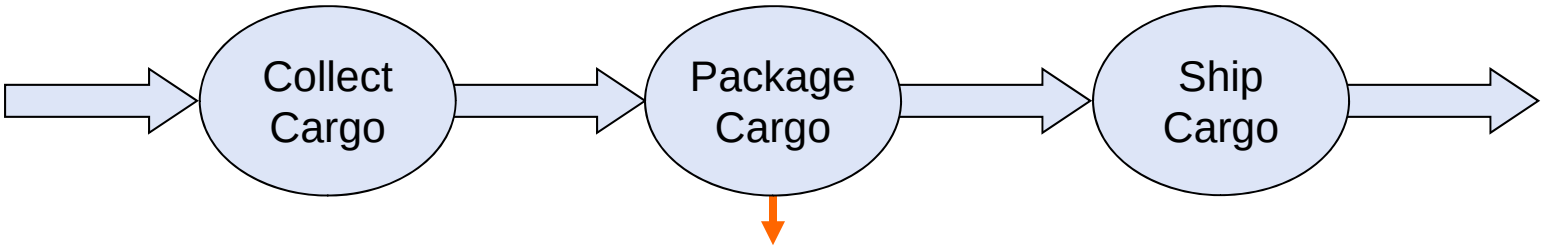


Discover New Business Rules

When the time comes to change your rules, you'll be glad you decided to model and manage them in Corticon Studio.

Let's go through another development lifecycle, starting with the discovery of a new business rule.





Initial Rules:

- Cargo weighing <= 20,000 kilos must be packaged in a standard container.
- Cargo with volume > 30 cubic meters must be packaged in an oversize container.

Added after Completeness Check:

- Cargo weighing > 20,000 kilos, with volume <= 30 cubic meters, must be packaged in a heavyweight container.

New Rule (to add now):

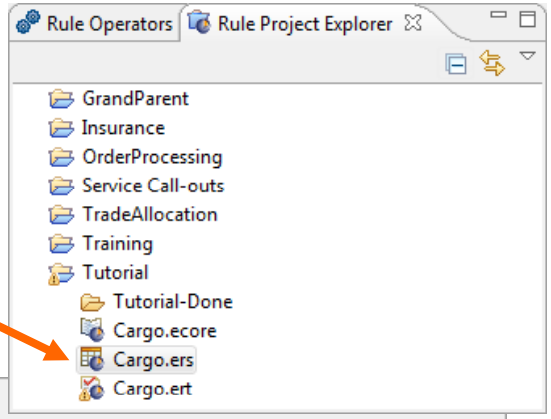
- Cargo requiring refrigeration must be packaged in a reefer container.

Add New Rule Statements

Model

Action

Switch back to your Rulesheet by clicking the **Cargo.ers** tab. If you closed it earlier, reopen it using the **Open** menu or by double-clicking the file inside the **Rule Project Explorer** window.



Rule Statements | Rule Messages

Ref	ID	Post	Alias	Text
1		Info	Cargo	Cargo weighing <= 20,000 kilos must be packaged in a standard container.
2		Info	Cargo	Cargo with volume > 30 cubic meters must be packaged in an oversize container.
3		Info	Cargo	Cargo weighing > 20,000 kilos, with volume <= 30 cubic meters, must be packaged in a heavyweight container.
				Cargo requiring refrigeration must be packaged in a reefer container.

Action

Enter the new Rule Statement from the previous page. This will guide us when we model the new rule.

Note

To model this rule, add two terms to the current Vocabulary. First, add a new attribute to the Cargo entity to define whether the Cargo requires refrigeration or not (call this **needsRefrigeration**). Second, add “reefer” as another possible selection option for the container attribute.

Open and Edit the Vocabulary

Model

If already open , select the **Cargo.ecore** tab. If not open:

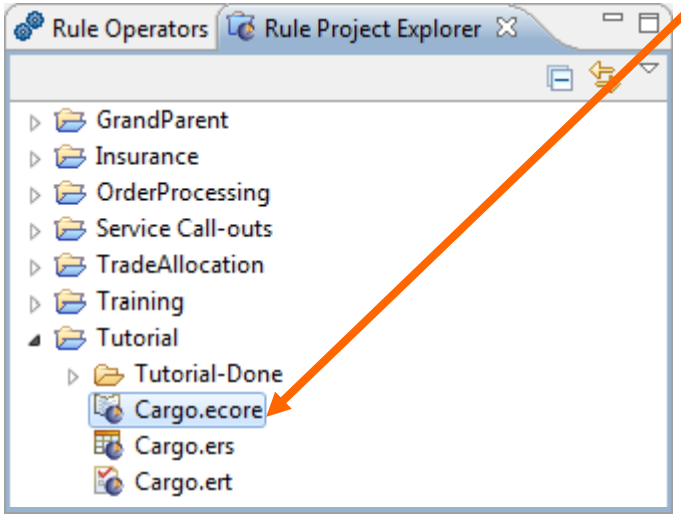
Select **Cargo.ecore** from the **Recent File** list at the bottom of the **File** menu

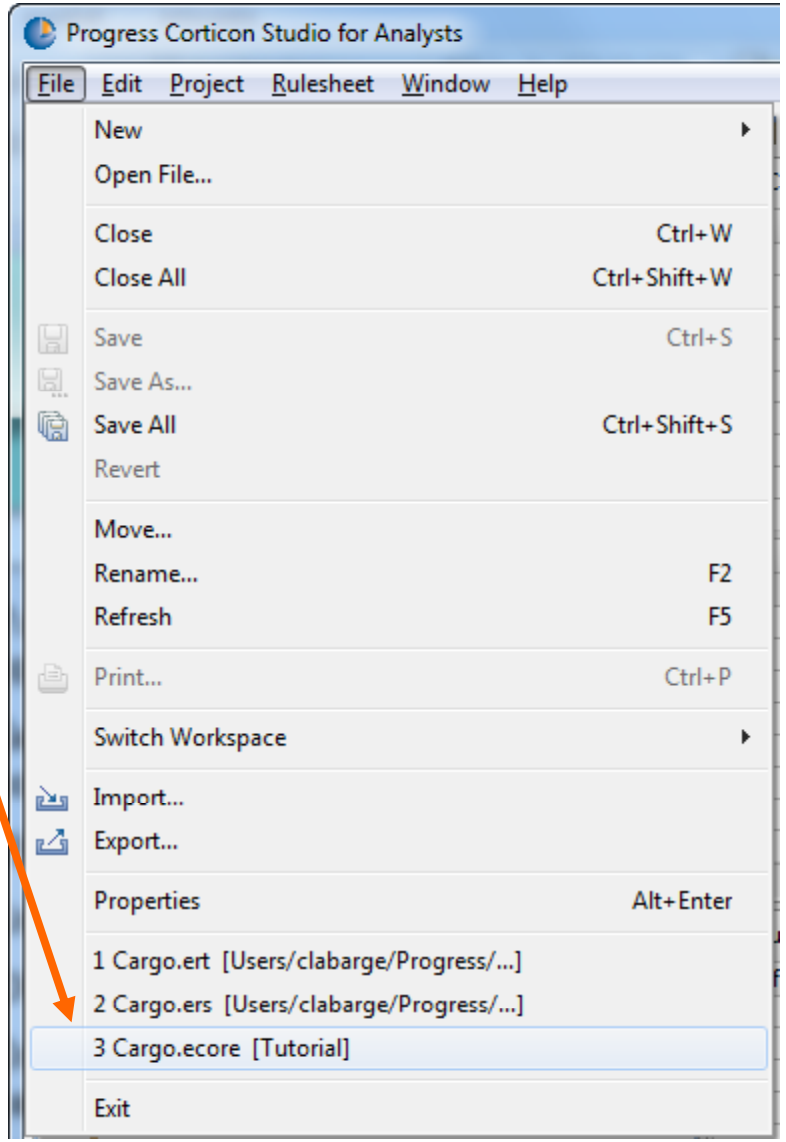
OR

Use the **File > Open File** menu option

OR

Double-click on the file in the **Rule Project Explorer** pane.





Add an Attribute – Step 1

Model

Action

Edit the Vocabulary using Corticon Studio's **Vocabulary Editor**.

Action

Add a new attribute.

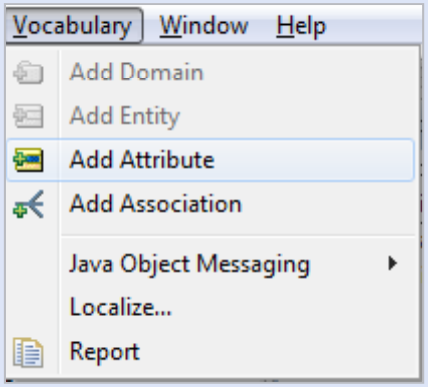
Within the Vocabulary editor window in the upper right pane (not the Vocabulary window in the upper left pane), right click on the Cargo entity and choose **Add Attribute** from the popup menu.

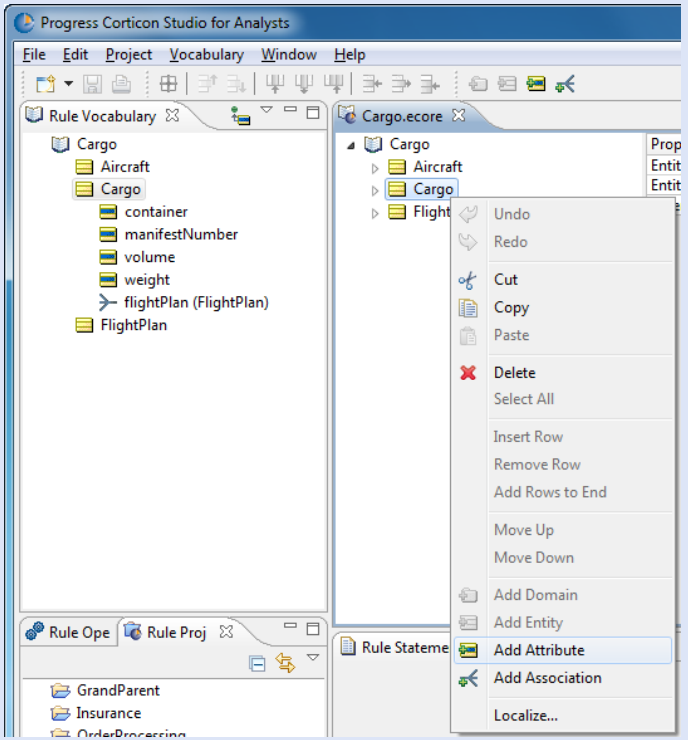
OR

Highlight the Cargo entity and choose the **Add Attribute** icon on the toolbar.

OR

Highlight the Cargo entity and choose **Vocabulary > Add Attribute** from the Studio menubar.



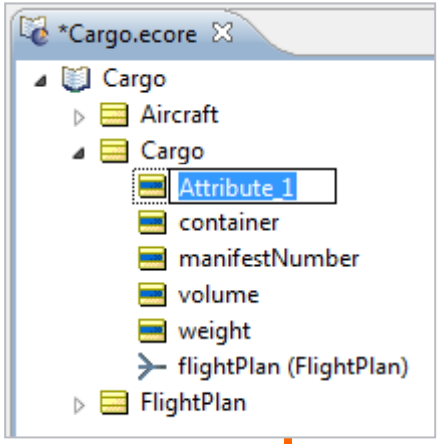


Add an Attribute – Step 2

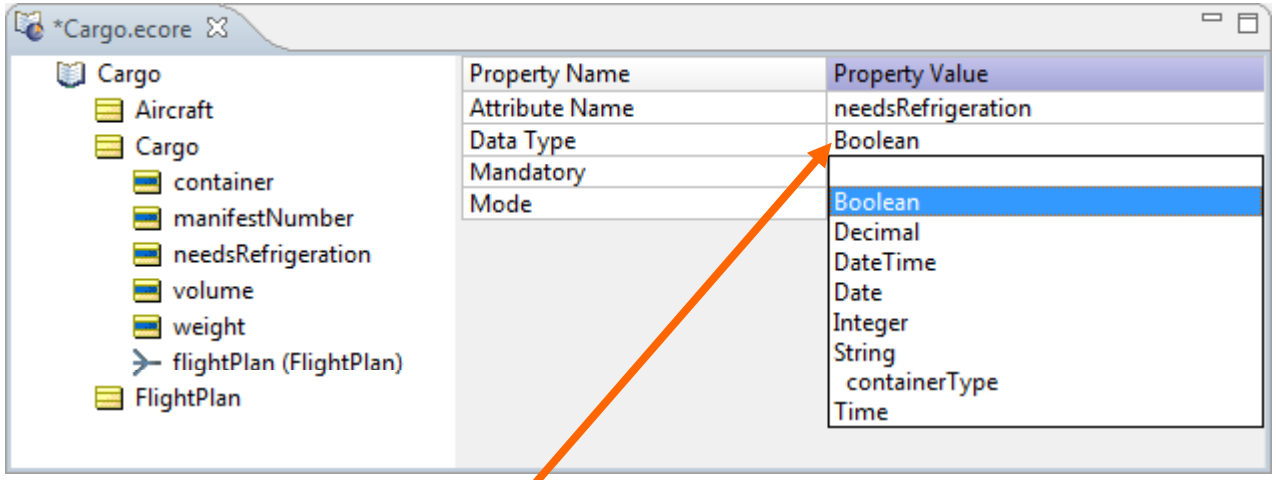
Model

Action

Change the attribute name to **needsRefrigeration** and set the data type to **Boolean**.



First, double click on the attribute name to type over its initial default value.



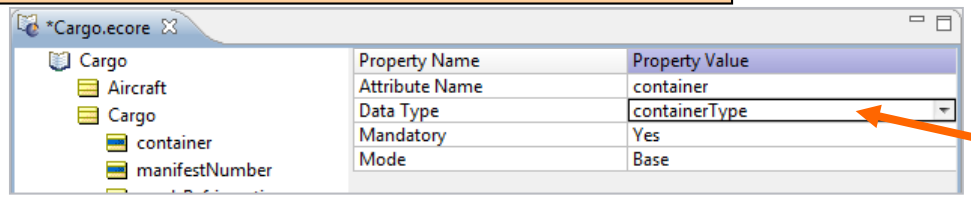
Next, choose the data type **Boolean** in the pull-down menu.

Modify a Custom Data Type

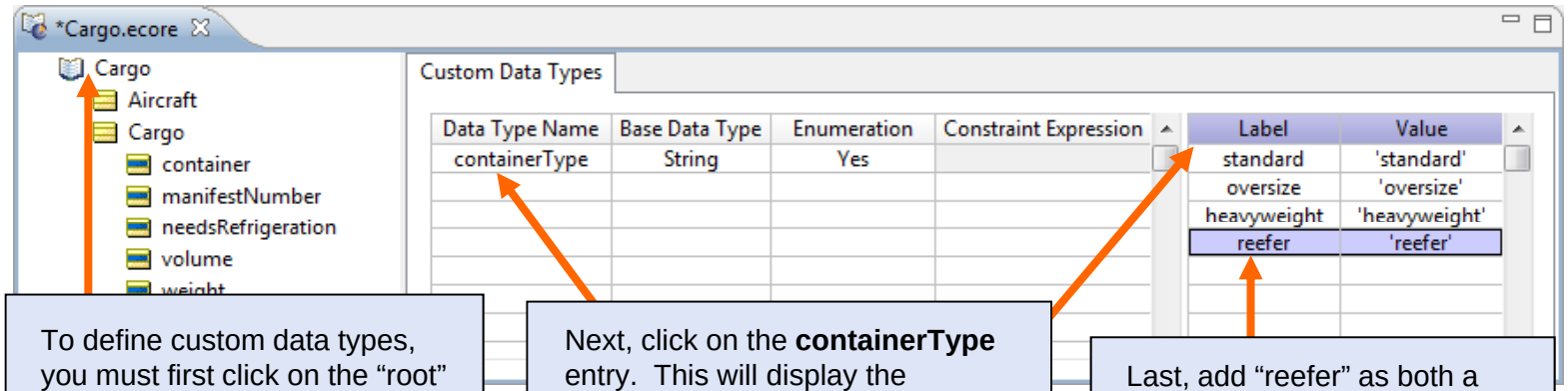
Model

Action

Add “reefer” as another allowable type of container.



Select the **container** attribute and note the Data Type: **containerType**. This is a custom data type that defines a set of allowable values for container (an enumerated set).



To define custom data types, you must first click on the “root” node of the Vocabulary, noted by the open book icon

Next, click on the **containerType** entry. This will display the enumerated set in the rightmost table, if available.

Last, add “reefer” as both a Label and a Value, as above.

Note

Custom data types are a powerful capability that allows you to define rules at the level of the Vocabulary that are reused anywhere the Vocabulary terms are used. You can learn more about custom data types in the ***Rule Modeling Guide***.

Save the Vocabulary Changes

Model

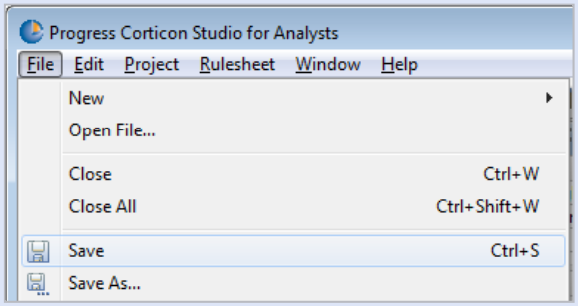
Action

Save the Vocabulary and exit the **Vocabulary Editor** pane.

Click on the **Save** icon on the Studio toolbar.

OR

Choose **File > Save** from the Studio menubar.



Model the New Rules

Model

New rule:

- Cargo requiring refrigeration must be packaged in a reefer container.

Action

Now that the Vocabulary contains the new terms required by the new rule, complete the model as shown below.

Action

Be sure to include Reference links from the Rule Statements to the columns containing the new rule models.

And, add **Post** and **Alias**.

Cargo.ecore | *Cargo.ers

	Conditions	0	1	2	3	4
a	Cargo.weight	-	<= 20000	-	> 20000	
b	Cargo.volume	-	-	> 30	<= 30	
c	Cargo.needsRefrigeration					T
d						
	Actions					
	Post Message(s)					
A	Cargo.container		standard	oversize	heavyweight	reefer
B						
C						
	Overrides			1		

Rule Statements | Rule Messages

Ref	ID	Post	Alias	Text
1		Info	Cargo	Cargo weighing <= 20,000 kilos must be packaged in a standard container.
2		Info	Cargo	Cargo with volume > 30 cubic meters must be packaged in an oversize container.
3		Info	Cargo	Cargo weighing > 20,000 kilos, with volume <= 30 cubic meters, must be packaged in
4		Info	Cargo	Cargo requiring refrigeration must be packaged in a reefer container.

Check New Rules for Conflicts

Analyze

Action

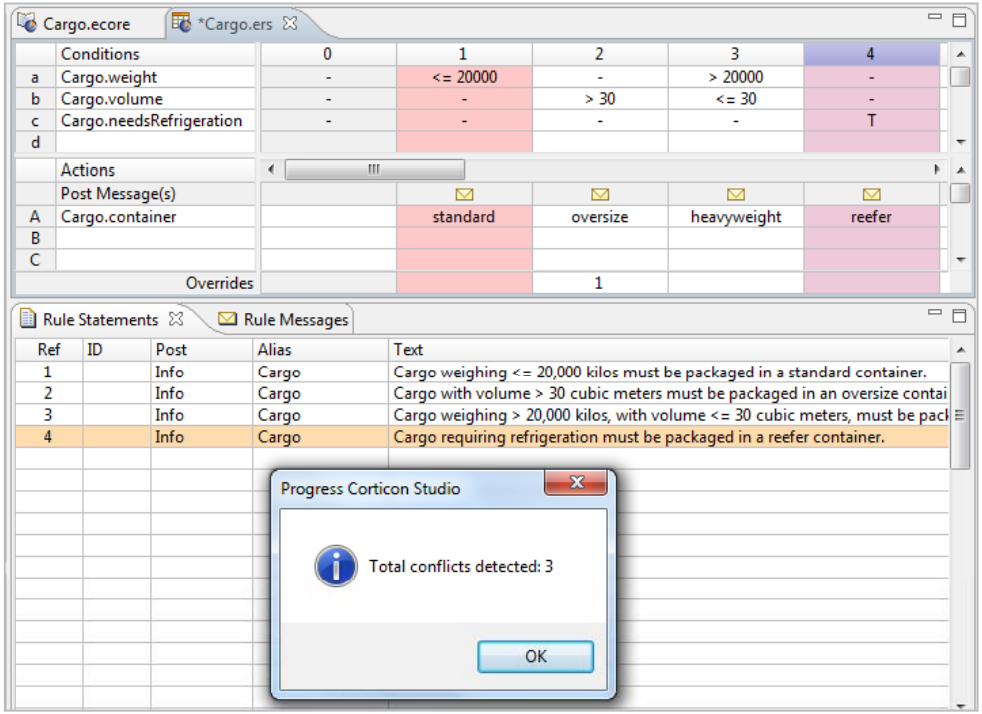
Check for logical errors in the Rulesheet.

To review this procedure, refer to page 25.

Note

Rule analysis is an iterative process. Whenever we add or change our rules, it is necessary to re-analyze. In this case, adding a single new rule has caused three new conflicts, one with each of our three existing rules.

You can step through multiple conflicts, and filter the Rulesheet to view only the conflicting rules, via the buttons to the right of the Conflict Check button:



Check New Rules for Conflicts

Analyze

Action

Reefer containers are only available for standard and heavyweight, but not for oversize loads. Thus, let's set rule 4 to override rules 1 & 3, and rule 2 to override rules 1 & 4.

When complete, your Rulesheet should look like this:

Cargo.ecore | *Cargo.ers

	Conditions	0	1	2	3	4
a	Cargo.weight	-	<= 20000	-	> 20000	-
b	Cargo.volume	-	-	> 30	<= 30	-
c	Cargo.needsRefrigeration	-	-	-	-	T
d						
e						
f						
g						
	Actions					
	Post Message(s)					
A	Cargo.container		standard	oversize	heavyweight	
B						
C						
D						
E						
F						
	Overrides			{1, 4}		{1, 3}

1
2
3

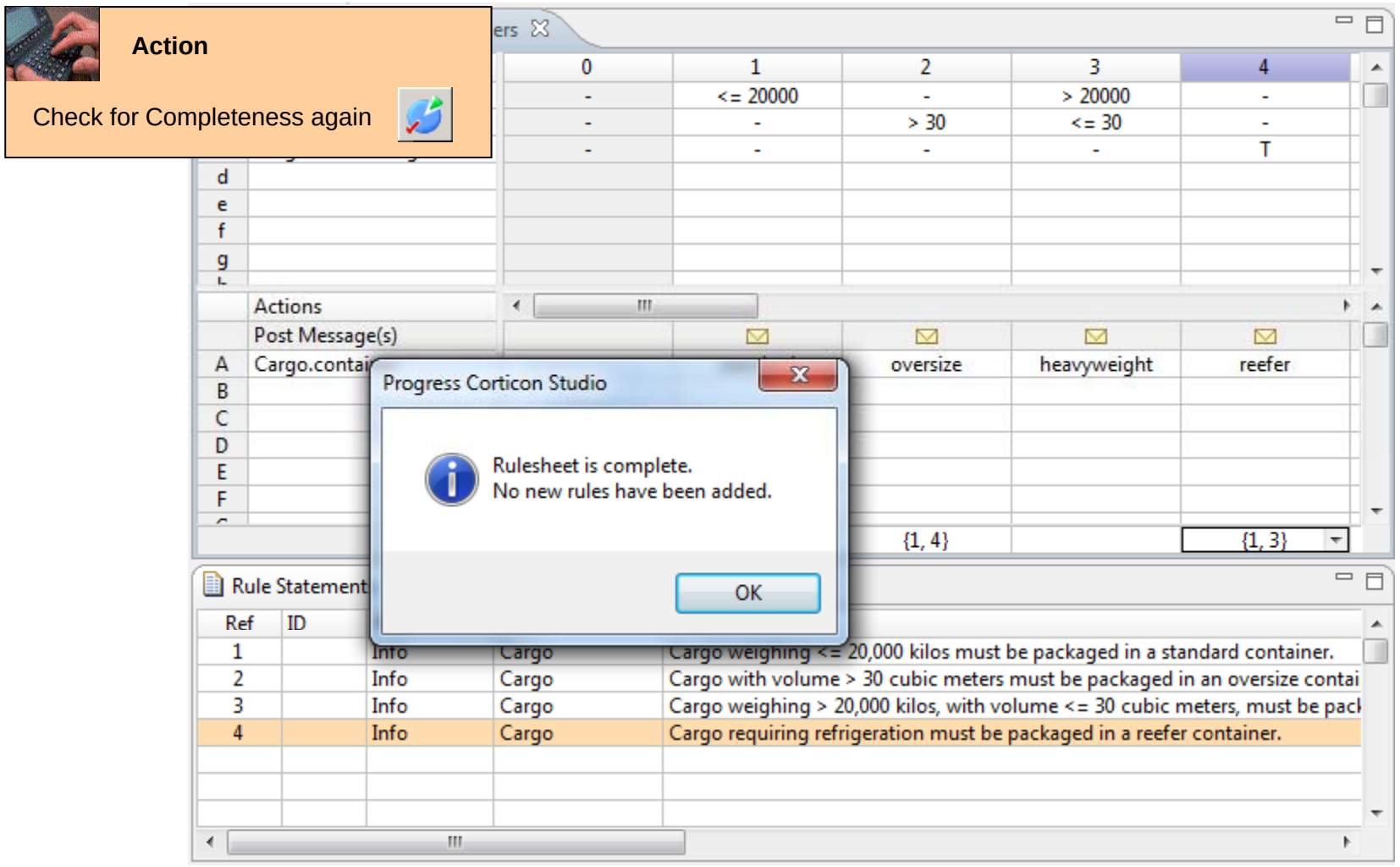
Rule Statements | Rule Messages

Ref	ID	Post	Alias	Text
1		Info	Cargo	Cargo weighing <= 20,000 kilos must be packaged in a st
2		Info	Cargo	Cargo with volume > 30 cubic meters must be packaged in an oversize contai
3		Info	Cargo	Cargo weighing > 20,000 kilos, with volume <= 30 cubic meters, must be pacl
4		Info	Cargo	Cargo requiring refrigeration must be packaged in a reefer container.

You can select multiple values in the override cell by holding down the **Ctrl** key.

Check New Rules for Completeness

Analyze



Modify the Ruletest

Test

Action

Your last step is to modify your test case to test the new rule. First save your rules.

Next, in Ruletest Cargo.ert, first copy and paste Cargo[1] to create Cargo[4], in both the Input and Expected panes.

Next, drag and drop the **needsRefrigeration** attribute from your Vocabulary onto both Cargo[4] entities. In both panes, set the value of **needsRefrigeration** to "true".

Next, in the Expected pane, change the value of container to "reefer".

Last, execute the test. Your Ruletest should look like this:

Cargo.ecore | Cargo.ers | *Cargo.ert

untitled_1

file:/C:/Users/clabarge/Progress/CorticonWork_5.3_for_Analysts/Samples/Rule Projects/Tutorial/Cargo.ers

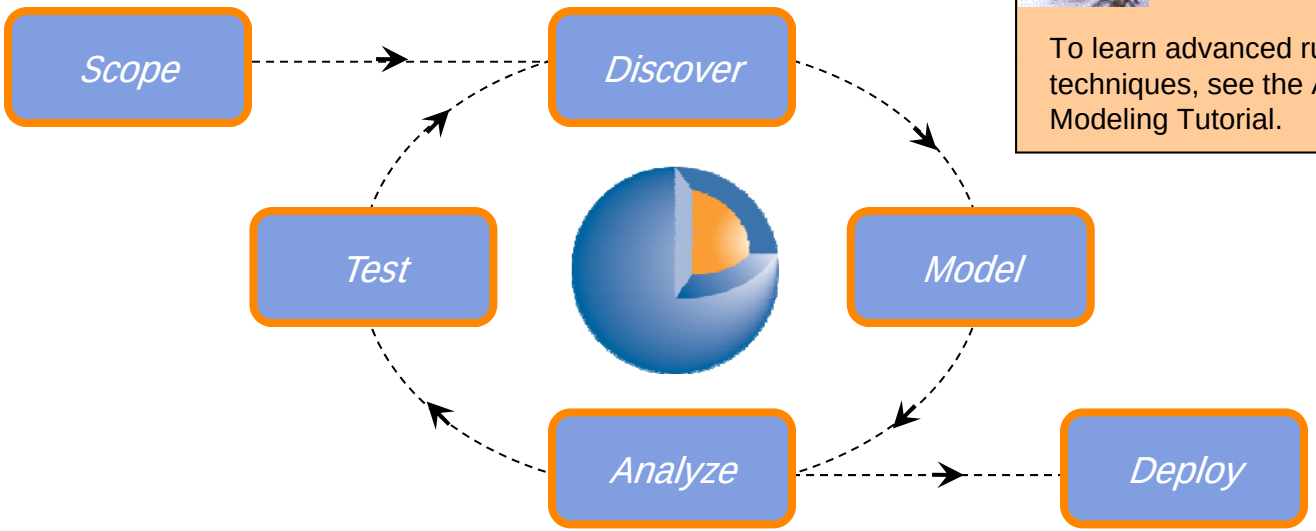
Input	Output	Expected
Cargo [1]	**Cargo [1]**	Cargo [1]
container	**container [standard]**	container [standard]
volume [10]	volume [10]	volume [10]
weight [1000]	weight [1000]	weight [1000]
Cargo [2]	**Cargo [2]**	Cargo [2]
container	**container [oversize]**	container [oversize]
volume [40]	volume [40]	volume [40]
weight [1000]	weight [1000]	weight [1000]
Cargo [3]	**Cargo [3]**	Cargo [3]
container	**container [heavyweight]**	container [heavyweight]
volume [20]	volume [20]	volume [20]
weight [30000]	weight [30000]	weight [30000]
Cargo [4]	**Cargo [4]**	Cargo [4]
container	**container [reefer]**	container [reefer]
needsRefrigeration [true]	needsRefrigeration [true]	needsRefrigeration [true]
volume [10]	volume [10]	volume [10]
weight [1000]	weight [1000]	weight [1000]

Rule Statements | Rule Messages

Severity	Message	Entity
Info	Cargo with volume > 30 cubic meters must be packaged in an oversize container.	Cargo[2]
Info	Cargo requiring refrigeration must be packaged in a reefer container.	Cargo[4]
Info	Cargo weighing > 20,000 kilos, with volume <= 30 cubic meters, must be package...	Cargo[3]
Info	Cargo weighing <= 20,000 kilos must be packaged in a standard container.	Cargo[1]

Summary

Congratulations! You have now completed two full iterations of the Corticon development lifecycle, and understand the basic concepts of rule modeling, analysis, and testing in Studio.



Note

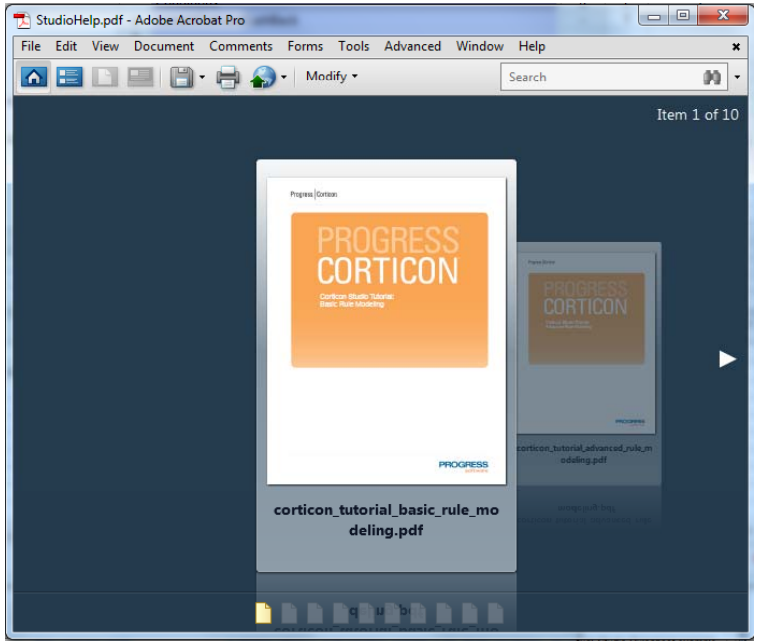
To learn advanced rules modeling techniques, see the Advanced Rules Modeling Tutorial.

Note

To learn how to deploy rules, see the Tutorial for Corticon Server – Deploying Web Services.

Appendix A: Corticon Technical Publications

Corticon Studio for Analysts



Corticon Studio