ENTERPRISE ARCHITECT

User Guide Series

DMN Decision Models

Author: Sparx Systems
Date: 16/10/2024
Version: 17.0

CREATED WITH ENTERPRISE ARCHITECT

Table of Contents

DMN Decision Models 3
Simulate DMN Model 6
DMN Simulation Toolbar 10
Example DMN Simulation 12

DMN Decision Models

After a Decision Model is created, you can:

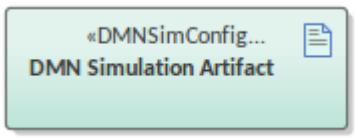
- Configure a DMN simulation Artifact and Validate, Run, Step-through or Debug the model
- Do what-if analysis to ensure the model meets the requirements of the business, by switching data sets
- Generate code for the DMN Server with any of the supported languages: Java, JavaScript, C++ and C#
- Simulate BPMN and DMN together.

This Help topic covers the process of configuring and running a DMN simulation.

Configure a DMN Simulation

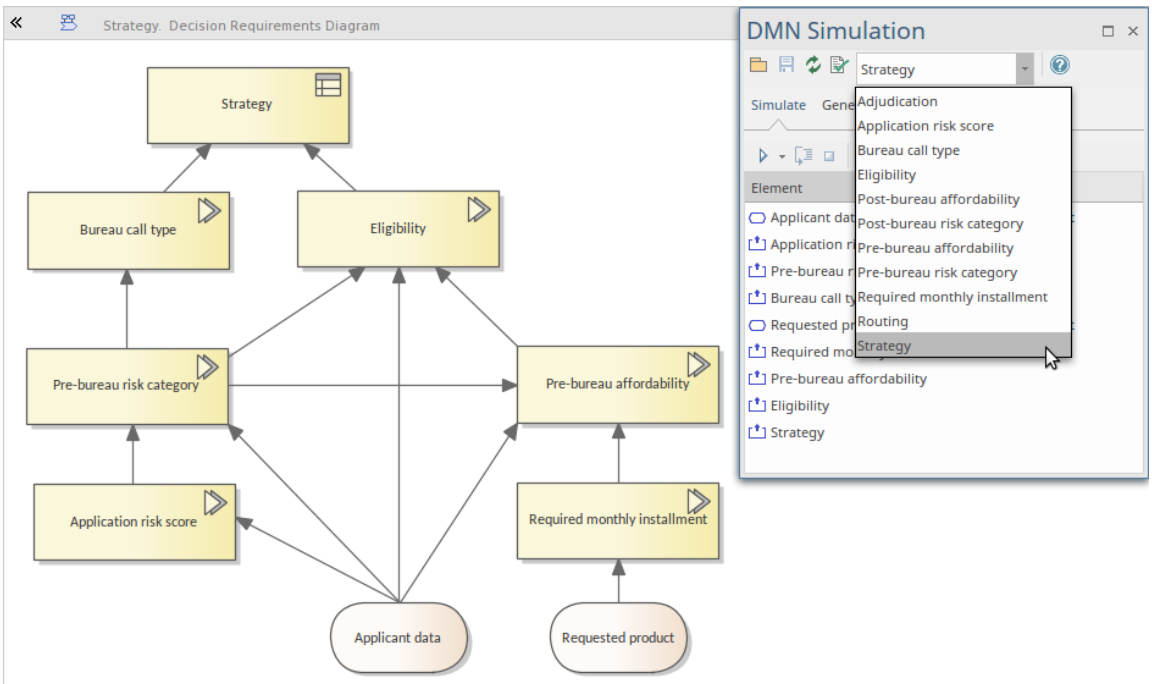
To configure a DMN simulation you must first create a DMNSimConfiguration element:

- Open a Decision Requirements Diagram
- Drag the 'Simulation Configuration' icon from the 'DMN Components' page of the Toolbox onto the diagram

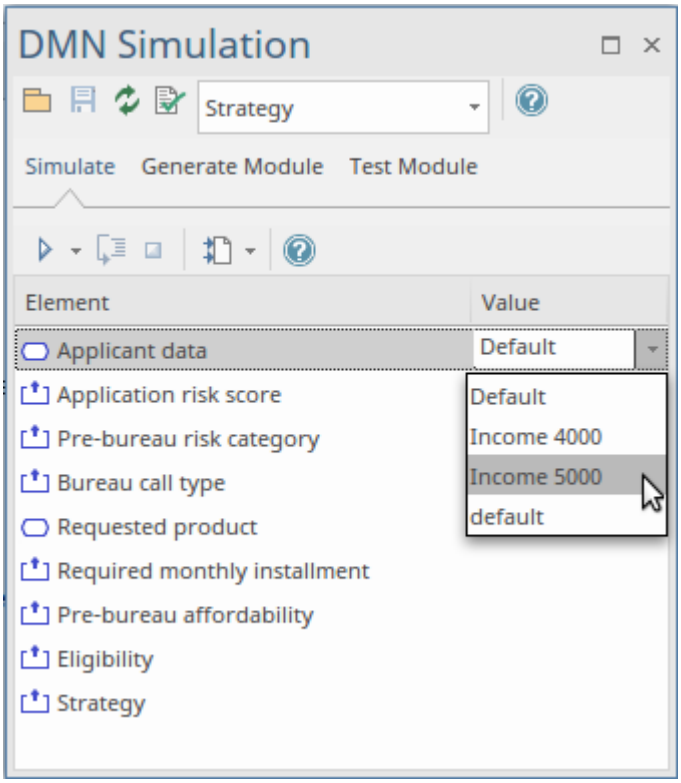


- Double-click to open the DMN Simulation window at the 'Simulate' tab

All DMN elements in the selected Package (Decision, BusinessKnowledgeModel, InputData and ItemDefinition) will be loaded to the DMN Simulation window. The 'Target Decision' combo box will list all the Decisions.

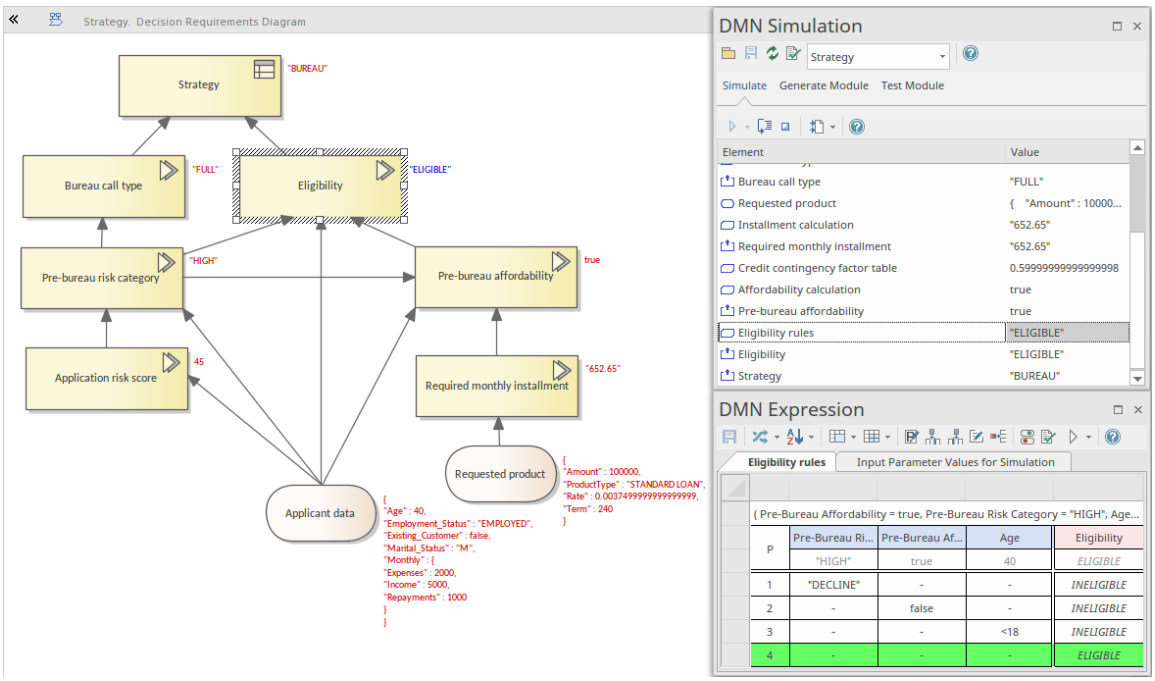


- Choose a target Decision - the dependent InputData elements will be listed in the 'Element' column
- Set a defined dataset by clicking on the 'Value' drop-down arrow in the list
  For example, we might choose the dataset 'Income5000' for the InputData element 'Applicant data', and choose 'default' for the InputData element 'Requested product'



Simulate a DMN Model

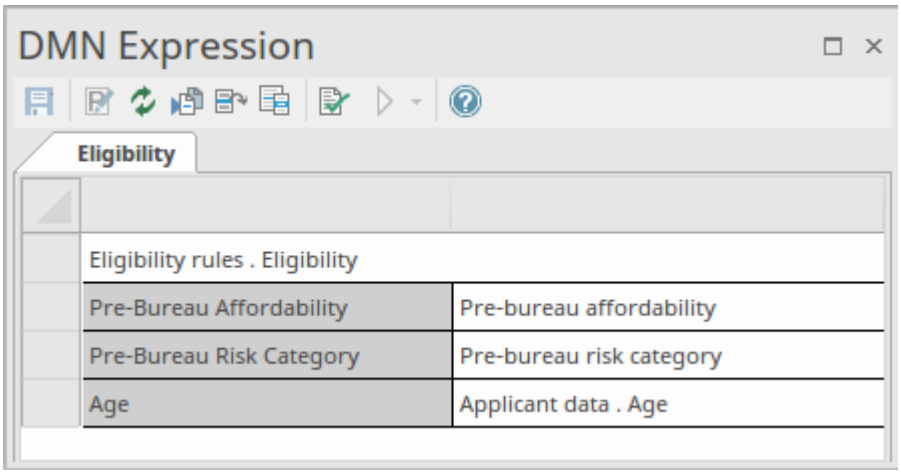
- When a Target Decision is specified, the 'Simulate' tab will list the Decisions, in dependency order
- Click on the Run button to evaluate all the decision values based on the values defined for the Input Data elements
- Click on the Step button to evaluate a single decision and watch the DMN Expression window, which clearly shows the input value for the decision and output based on the input; the diagram containing the decision hierarchy will highlight the executed decisions and show the runtime results on a label



In this example, the decision 'Eligibility' returns a string 'ELIGIBLE' and invokes BusinessKnowledgeModel 'Eligibility

rules' by binding the parameters as shown:

- Bind 'Pre-Bureau Affordability' to the dependent decision 'Pre-bureau affordability' (runtime value: true)
- Bind 'Pre-Bureau Risk Category' to the dependent decision 'Pre-bureau risk category' (runtime value: HIGH)
- Bind 'Age' to the field 'Age' in dependent input data 'Applicant data' (runtime value: 40)



The BusinessKnowledgeModel 'Eligibility rules' has a Hit Policy P (Priority), meaning that multiple rules can match, but only one hit should be returned; the ordering of the list of output values is used to specify the (decreasing) priority.

In this run time case ('Pre-Bureau Affordability' = true, 'Pre-Bureau Risk Category' = HIGH, 'Age' = 40), only one rule with output 'ELIGIBLE' matches.

Simulate DMN Model

A DMNSimConfiguration Artifact contains information to define the simulation of a DMN model depicted by Decision Requirements diagrams, using the DMN Simulation window.

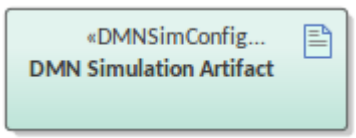
Access

Ribbon	Simulate > Decision Analysis > DMN > Open DMN Simulation | Simulate tab
Other	Double-click on a DMNSimConfiguration element | Simulate tab

DMNSimConfiguration Artifact

To create a DMNSimConfiguration element:

- Open a Decision Requirements Diagram
- Drag the 'Simulation Configuration' icon from the toolbox onto the diagram



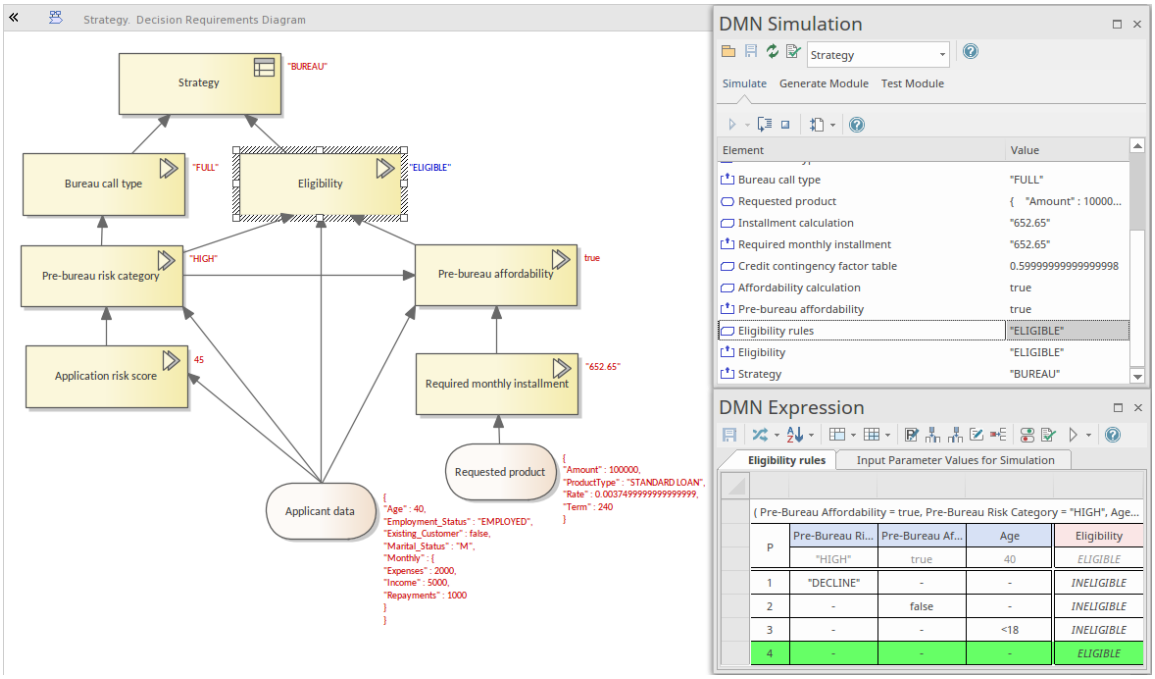
By default, all DMN elements in the current Package (Decision, BusinessKnowledgeModel, InputData and ItemDefinition) will be loaded to the DMN Simulation window.

Simulation Overview

When a target Decision is specified, the 'Simulation' tab will list the related Decisions, in dependency order.

When executing or 'stepping through' the Decision Hierarchy, the Decisions will be evaluated in order and:

- The runtime result will show in the 'Value' column
- The runtime result will be displayed as overlaid text on the diagram
- The Decision logic and input/output data will be presented in the DMN Expression window



Simulation run and stepping through

You can perform a full run of the simulation using the icon. You can step into each Decision to see the invocation sequence using the icon.

For example, in the 'Simulate' tab of our illustration, you can see that:

- The Decision 'Pre-bureau affordability' invokes the BusinessKnowledgeModel 'Affordability calculation'
- BusinessKnowledgeModel 'Affordability calculation' further invokes another BusinessKnowledgeModel 'Credit contingency factor table'

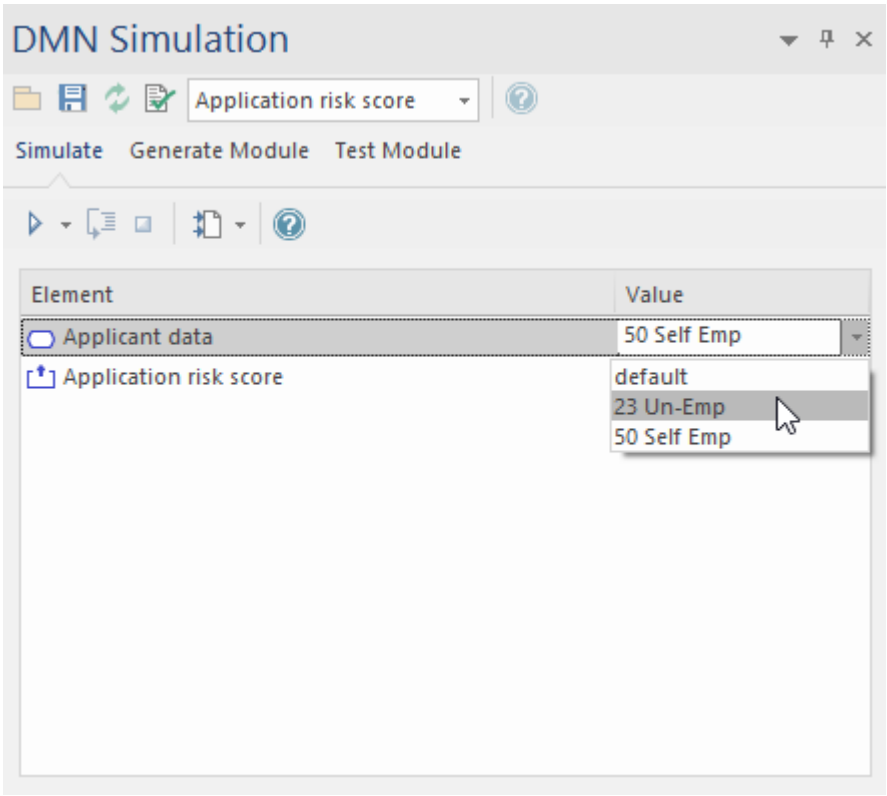
Decision List

When a Package is loaded, a Decision Requirements Graph (DRG) and decision dependency list is created. The DMN InformationRequirement connectors determine the list order.

- All the decisions will be listed in the drop-down for the toolbar data entry field

Data Set & Input Data

When the target Decision is selected, all the dependent InputDatas are added to the 'Element' column. You can then choose from the data sets defined for each InputData element, using the drop-down lists in the 'Value' column. Each data set provides runtime values to use in the simulation.



Advanced Debugging

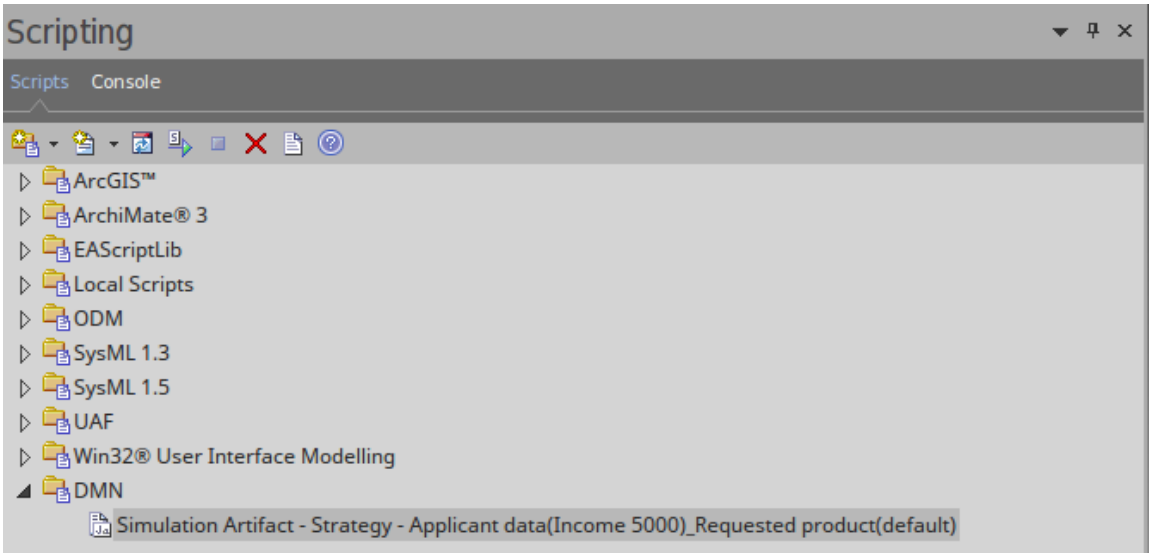
Although Enterprise Architect provides a validation feature to help you locate many modeling issues and DMN expression issues, the simulation might still fail (rarely but possible) due to uncaught issues.

However, Enterprise Architect provides the ability to debug the code that is running behind the simulation. You can also modify the code and run it in cycles until the issue is found and fixed.

The drop-down arrow for the Execute button on the toolbar displays a menu with these options:

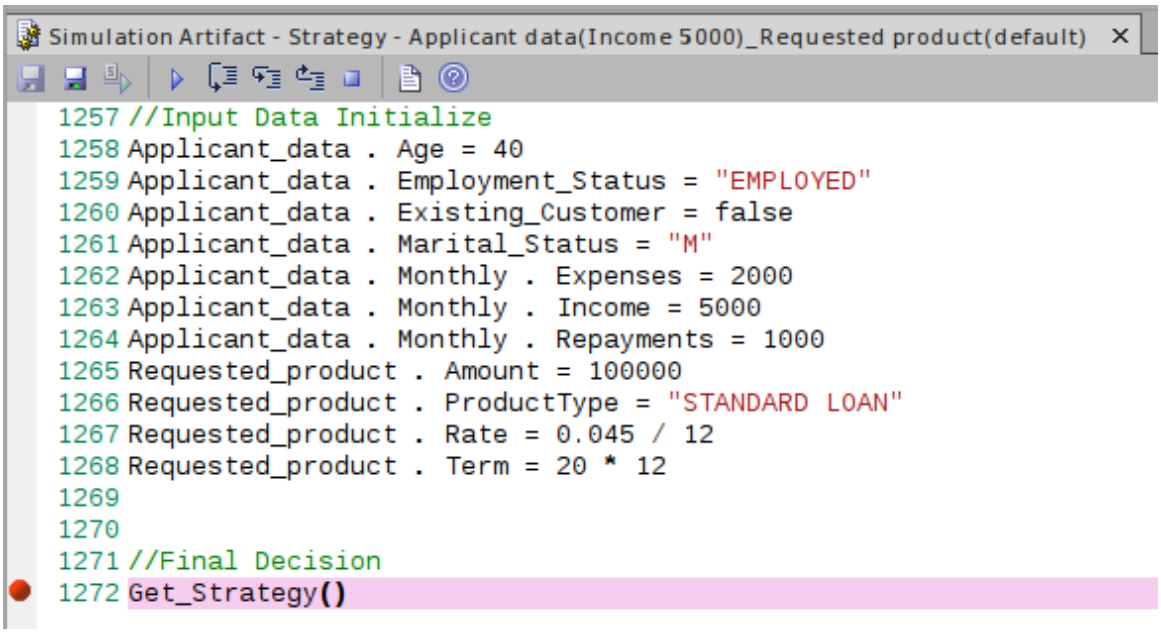
- Generate new Script (Scripting Window)
- Update Selected Script (Scripting Window)
- Run Selected Script (Scripting Window)
- Edit DMN Template

If you select 'Generate New Script (Scripting Window)', the Scripting window displays showing a script created in a Package named 'DMN'.



- The default script name is composed of these parameters: 'ArtifactName - TargetDecision - InputData1(DataSet)_ InputData2(DataSet)_...'

Double-click on this file to open it in the Enterprise Architect Script editor, set a breakpoint, and debug the file.



By selecting the script in the Scripting Window, and if the script matches the model (by the 'Simulation Script Identifier' in the script), you enable the menu option 'Run Selected Script'.

You can customize the DMN Template to generate the correct script for simulation.

DMN Simulation Toolbar

The DMN Simulation window has a toolbar providing functions to prepare for the simulation, and the 'Simulate' tab of the window has a toolbar to execute the simulation.

Access

Ribbon	Simulate > Decision Analysis > DMN > Open DMN Simulation > Simulate tab
Other	Double-click on a DMNSimConfiguration element

Toolbar Options

Option	Description
	Displays the 'Select DMN elements Package' browser, which you use to set the Package for the DMNSimConfiguration Artifact to operate on. All DMN elements under this Package and its sub-Packages will be loaded.
	Saves the information specified in the DMN Simulation window to the DMNSimConfiguration element, including the: • Target Decision • Selected Dataset for each dependent InputData
	Reloads the DMN elements from the configured Packages. For example, when any DMN elements are modified, this command should be run to reload the Package so that the changes will be taken into account for the next DMN Simulation.
	Validates all the dependent DMN elements based on the target Decision. The results of the validation are displayed on the 'DMN Simulation Validation' tab of the System Output window. **Note:** A Decision, BusinessKnowledgeModel, InputData or ItemDefinition element that is **not** on the target Decision hierarchy will not be considered. For example, if you have some unfinished Decision elements in the Package, that have no relationship to the target Decision, they will not impact the simulation.
	Click on the drop-down arrow and, from the list, select a target Decision for the simulation.

Simulation options

Option	Description

	Click on this button to execute the Decision hierarchy in order. The results will be represented by text overlays on the diagram, and shown in the 'Values' column of the DMN Simulation window.
	Click on this button to step through the Decision hierarchy in order. One click will evaluate one decision element. With this feature, you will be able to see the decision-making process; the decision logic and runtime values will be displayed clearly in the DMN Expression window.
	Click on this button to stop the simulation.
	Click on this button to export the InputData elements' DataSets to a BPMN 2.0 DataObject. This appends the InputData 'name = value' records to the DataObject.Notes. The drop-down options include: • Export All Inputs to the BPMN DataObject • Export Selected Inputs to the BPMN DataObject • Export Runtime Results to a CSV Report

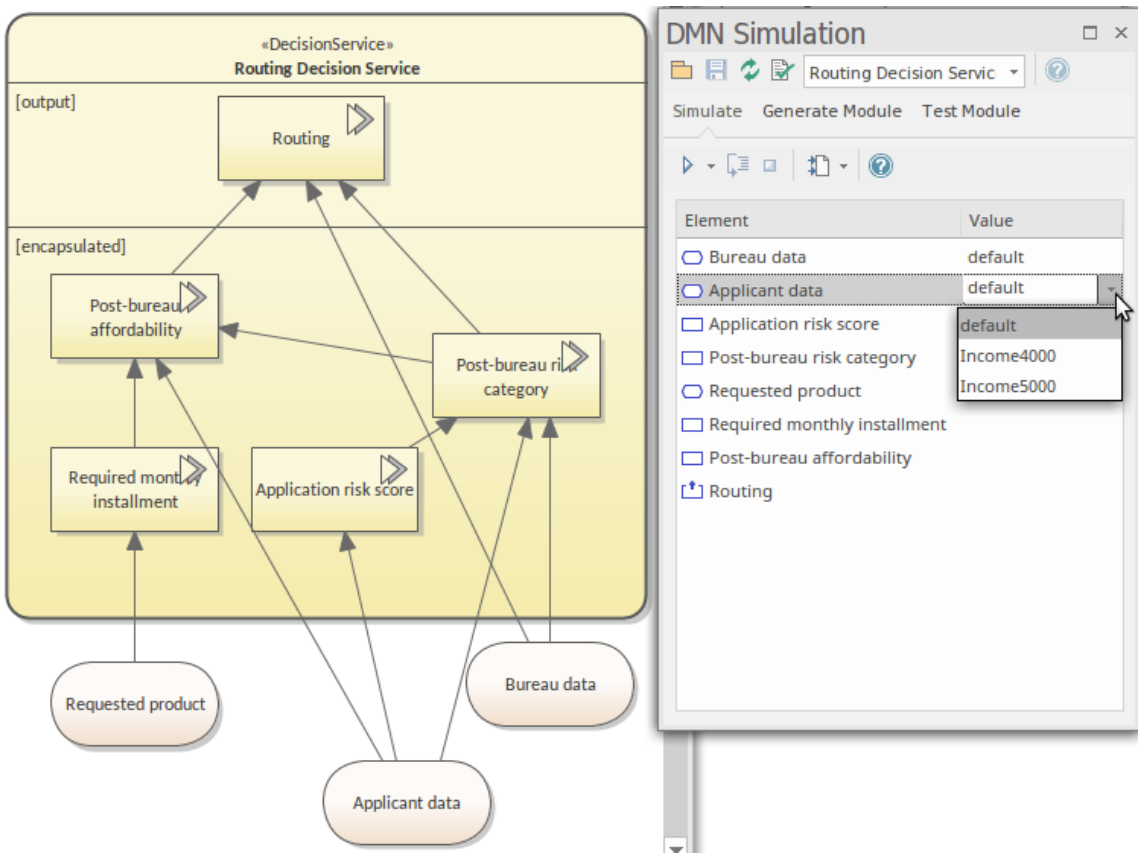
Example DMN Simulation

Enterprise Architect provides an example DMN model on which you can perform a simulation to experience the process and see how the simulation works. The example model is supplied with the EAExample.eap model, and is located in the Package:

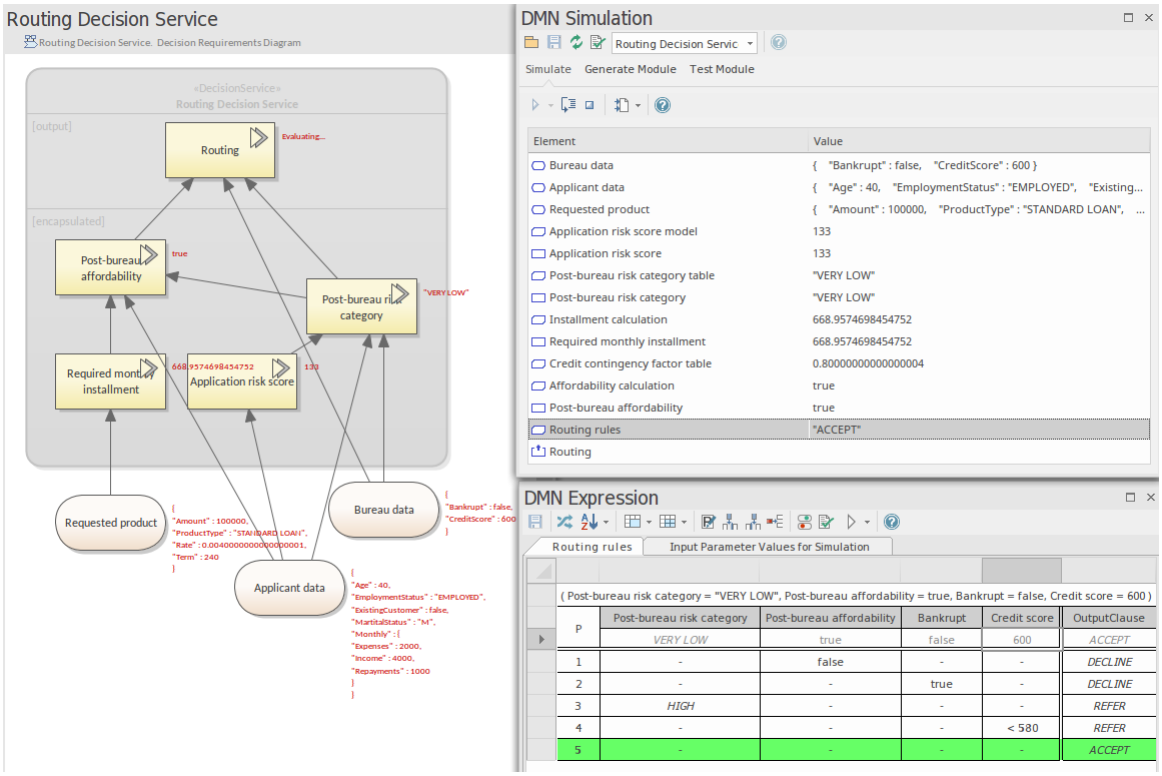
- Example Model > Model Simulation > DMN Models > Decision > A Complete Example > Routing Decision Service (diagram)

The Package contains a 'DMNSimConfiguration' Simulation Artifact that defines the simulation settings for the DMN model. Drag this Artifact onto the Routing Decision Service diagram and double-click on it to open the DMN Simulation window at the 'Simulation' tab.

In the DMN Simulation window, the Routing Decision Service element name is shown in the data entry field in the Toolbar, and the related Input Data, Input Decisions, encapsulated Decisions and output Decisions are loaded in the 'Element' column in execution order.



After you select Data Sets for the Input Data and Input Decisions, the model is ready to run as a simulation. To run the simulation, click on the Run button and allow the simulation to complete. Then use the 'Step Through' toolbar option to pass through the process one step at a time. The diagram fades all elements except those that the 'step through' process has acted on or is currently acting on. The diagram, DMN Simulation window and DMN Expression window all show the input data being applied, as shown:



The list items change from 'static' to 'runtime'; note that the invoked Business Knowledge Models are loaded in the list; in this example:

- Decision 'Post-bureau affordability' is in the state of 'Evaluating' (refer to the diagram text), which means the Decision is invoking the Business Knowledge Model 'Credit contingency factor table' by binding the input values to the parameters

Continue stepping through until you reach the Routing Decision (invoking the Business Knowledge Model 'Routing rules') is reached.

- Given the arguments (Post-bureau risk category: "VERY LOW", Post-bureau affordability: true, Bankrupt: false, Credit score: 600), the output is "ACCEPT"
- After the Business Knowledge Model 'Routing rules' executes, the value will be carried back to the Decision 'Routing'