

Guide to Tool-Specific S* Patterns Support in Dassault Cameo Systems Modeler™

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Change History

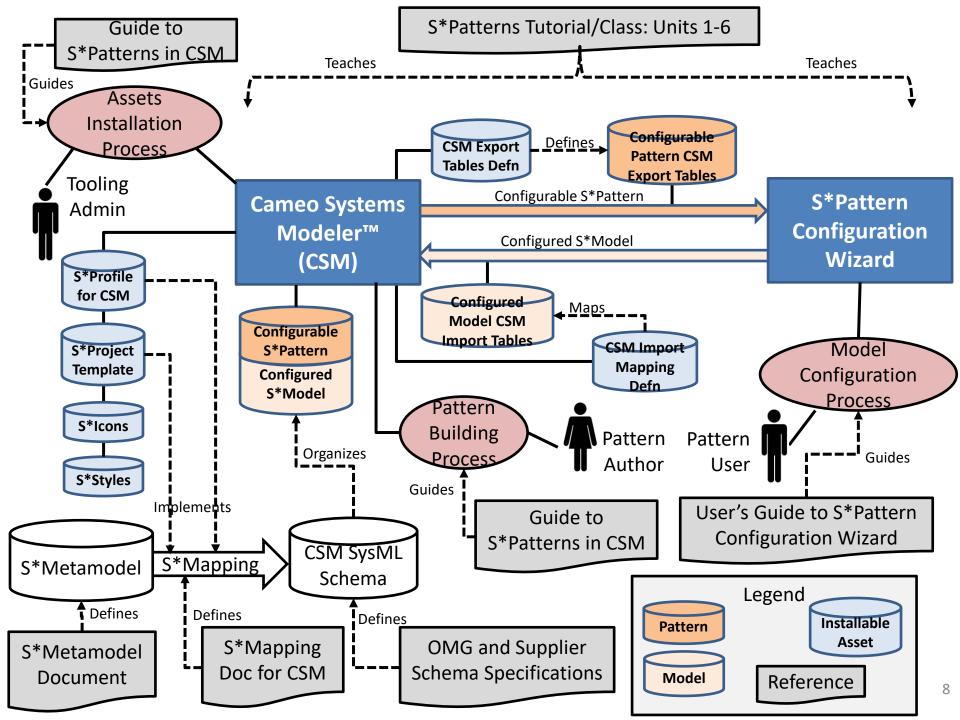
Version #	Date	Who	Description
1.3.28	10.19.2023	Stephen Lewis	Inserted updated diagram on slide 7
1.3.29	10.20.2023	Stephen Lewis	Added Change History Slide, Slides 32, 98-99
1.3.30	10.23.2023	Stephen Lewis	Table of Contents and Section descriptions, Slides 35, 71
1.3.31	10.24.2023	Stephen Lewis	Matrix Guidance Slides 69-71
1.3.32	10.25.2023	Stephen Lewis	Slide 6 Diagram legend
1.3.33	10.26.2023	Stephen Lewis	Companion Assets details, Slide 38, 75
1.3.34	10.27.2023	Stephen Lewis	Slides 8, 17, 19-20, additional Section descriptions
1.3.35	10.31.2023	Stephen Lewis	Slides 2-3, 5-9, 17, 23
1.3.36	11.1.2023	Stephen Lewis	Slides 3-4, 9, 24-28,
1.3.37	11.2.2023	Stephen Lewis	Slides 70-2, 74-7, 94-5, 97, 99, 100
1.3.38	11.3.2023	Stephen Lewis	Import/Export Installation Slides
1.3.39	11.6.2023	Stephen Lewis	Import/Export Execution Slides, Role Overview Table

Change History

Version #	Date	Who	Description
1.3.40	11.7-8.2023	Stephen Lewis	Updated screenshots for tables with new column headings
1.3.41	11.9.2023	Stephen Lewis	Figure Page Number Reference
1.3.42	3.6.2024	Stephen Lewis	CSV Import Literal String Replacement Slide 26
1.3.43	3.20.2024	Stephen Lewis	Export Tables report details, companion asset versions
1.3.44	4.17.2024	Stephen Lewis	CSV Import Path Variable, Slides 25-26

Purpose, scope, companion references, other companion assets

- The purpose of this document is limited to providing detailed directions for (1)installation and use of the S* Profile and S* Project Template, and, (2)with examples, for entry of S*Pattern data into, and specific to, Dassault Cameo Systems Modeler™ (CSM), and (3)toolspecific aspects of pattern and model data export and import between CSM and the Configuration Wizard.
- See the References for other information:
 - To understand the overall significance of that S*Pattern data, refer to the generic S*Patterns class/tutorial reference media.
 - To understand the details of the generic S*Metamodel, refer to the generic S*Metamodel reference.
 - To understand the details of the mapping of the generic S*Metamodel into the CSM-specific SysML schema, refer to the S*Mapping Document specific to CSM.
 - To understand the use of the S*Pattern Configuration Wizard with CSM, refer to the User's Guide to the S*Pattern Configuration Wizard.



Roles Overview

Who	ΤοοΙ	Task	When
Pattern Author	Cameo Systems Modeler	Pattern Building Process	Pattern creation and updating
Pattern User	Cameo Systems Modeler, Configuration Wizard	Model Configuration Process	For each configuration
Tooling Admin	Cameo Systems Modeler	Assets Installation Process	One-time initial setup

Companion References

- Tutorial/Class: Advancing the Practice, Units 1-6. Introduction to S*Models, S*Metamodel, S*Patterns, Mappings to Languages & Tools, S*Configuration Wizard". Contact ICTT System Sciences.
- 2. "Systematica Metamodel", Metamodel Version 8.0, 04/07/2022.
- 3. "S*Metamodel Mapping for MagicDraw/Cameo Systems Modeler Version 19", Version 1.11.4, 2/13/2023.
- "Guide to the S*Pattern Configuration Wizard", V1.2.10, 1/18/2023.

Companion Assets

- 1. S* Project Template Version 12142023, *Systematica.mdzip*.
- 2. S* Profile Version 05082023, Systematica Profile.mdzip.
- 3. S* Diagram Styles, *Systematica.stl*.
- 4. S* Images, Systematica.zip.
- 5. Pattern Export Tables Definition
- 6. CSV Import Mapping Definition
- 7. A general example Pattern or client-specific Pattern may be part of the Companion Asset Package, if not starting a new Pattern Project.

2. Installation of Companion Assets

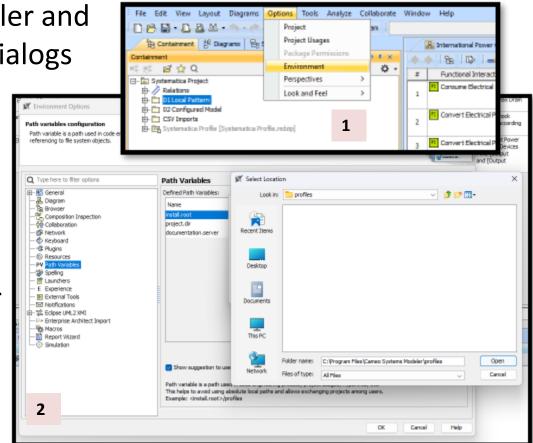
- This section of the guide details the steps for installation of the S* Profile and S* Project Template.
- To prepare CSM for use with this guidance, load the CSM tool with the above listed Companion Assets using the steps shown in the following slides.

• *This section assumes Cameo Systems Modeler has already been installed.*

Installing Systematica Profile

- Open Cameo Systems Modeler and use the menu options and dialogs described below.
- Use Options~Environment~ Path Variables to find install.root folder
- 2. Navigate to the install.root folder using Windows Explorer

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🛃 Requirement constraints	3/15/2020 6:11 AM	Zipped CSM Proje	65 KB
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🛃 RUP_Extensions_Profile	3/15/2020 6:11 AM	Zipped CSM Proje	65 KB
🛃 Scrum_Profile	3/15/2020 6/11 AM	Zipped CSM Proje	102 KB
🖷 SimulationProfile	3/15/2020 6:11 AM	Zipped CSM Proje	265 KB
🖷 Suspect Links Profile	3/15/2020 6/11 AM	Zipped CSM Proje	60 KB
😤 SysML constraints	8/24/2023 7:13 AM	Zipped CSM Proje	102 KB
🛃 SysML Profile	3/15/2020 6/11 AM	Zipped CSM Proje	286 KB
🖬 😤 Systematica Profile	5/8/2023 5:37 PM	Zipped CSM Proje	358 KB
🛃 Time & Performance_Profile	3/15/2020 6/11 AM	Zipped CSM Proje	128 KB
🛃 UI Prototyping profile	3/15/2020 6:11 AM	Zipped CSM Proje	65 KB
🛃 UI-Prototyping Customization	3/15/2020 6:11 AM	Zipped CSM Proje	181 KB
😤 UML_Standard_Profile	3/15/2020 6:11 AM	Zipped CSM Proje	1,155 KB

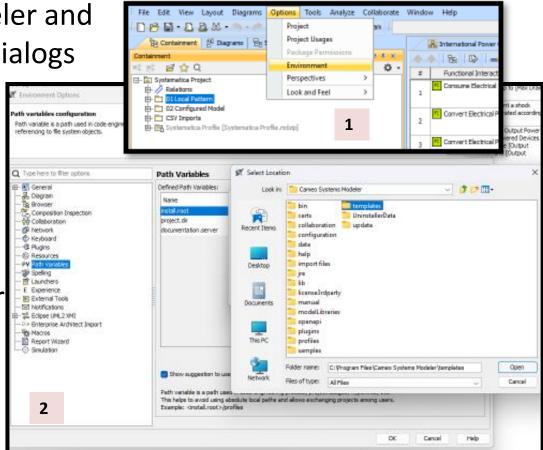


3. Copy Systematica Profile.mdzip to profiles folder from the Deliverables Folder

Installing Systematica Project Template

- Open Cameo Systems Modeler and use the menu options and dialogs described below.
- Use Options~Environment~ Path Variables to find install.root folder
- 2. Navigate to the install.root folder using Windows Explorer

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Synthet.	8/24/2023 7:13 AM	File folder	
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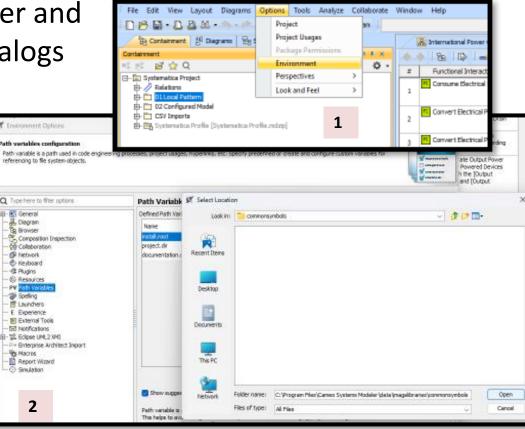


Copy Systematica folder
 to templates folder from the
 Deliverables Folder

Installing Systematica Images

- Open Cameo Systems Modeler and use the menu options and dialogs described below.
- Use Options~Environment~
 Path Variables to find
 install.root folder
- 2. Navigate to the install.root folder using Windows Explorer

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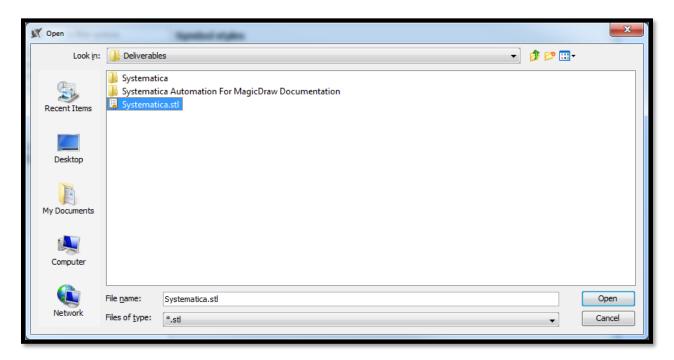
Installing Systematica Diagram Styles

- Open a project in MagicDraw
- Select the menu option ~Options~Project
- Click on 'Symbol styles' in tree in left pane.

Project Options Manage styles and individual elen Specify the shape, path, diagram, and set default styles or apply new styles	stereotype symbol properties. Create, edit, clone, import/export, or remove element display styles. Also	Freeredand such of freeredand such of freeredand such for sum date of consistence.
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		Export
		Apply
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Installing Systematica Diagram Styles, cont'd

- Click the 'Import' button
- Navigate to the Deliverables Folder (see image)
- Select the Systematica.stl file (see image)
- Click the 'Open' button (see image)



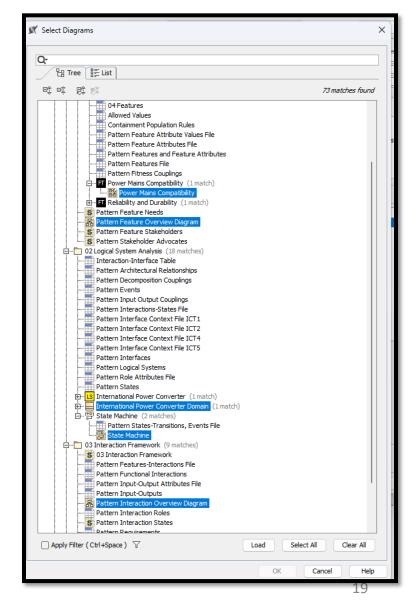
Installing Systematica Diagram Styles, cont'd

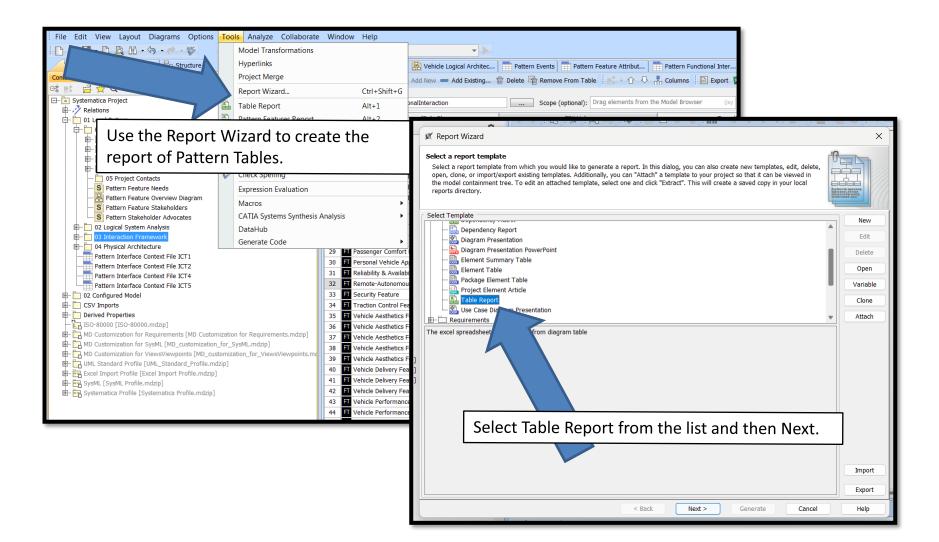
• Expand the 'Symbol styles' node in tree in the left pane.

Y Project Options		×
Manage styles and individual element of Specify the shape, path, diagram, and stere set default styles or apply new styles to exis	eotype symbol properties. Create, edit, done, import/export, or remove element display styles. Also	Megervaksod exilis exifingations e. existingations e. existingations e. existingations e.
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⊕- ∑ General □- □ Diagram Info ⊖- □ Symbol styles ⊕- □ Default (Default) ⊕- □ OMG SysML style ⊕- □ Model Slice Styles ⊕- □ Default model properties	Default (Default) OMG SysML style Model Slice Styles	Clone Rename Delete Make Default Apply Import Export
	ОК Са	ancel Help

Installing Diagram Systematica Styles, cont'd

- Select the 'Systematica Styles' node in tree in the left pane.
- Click the 'Apply' button
- Select which diagrams to apply style to (i.e., Domain Diagram, Pattern Feature Overview
 Diagram, Interaction Overview
 Diagram, State Machine,
 Attribute Coupling, and Slice
 Diagrams)
- Click the 'OK' button





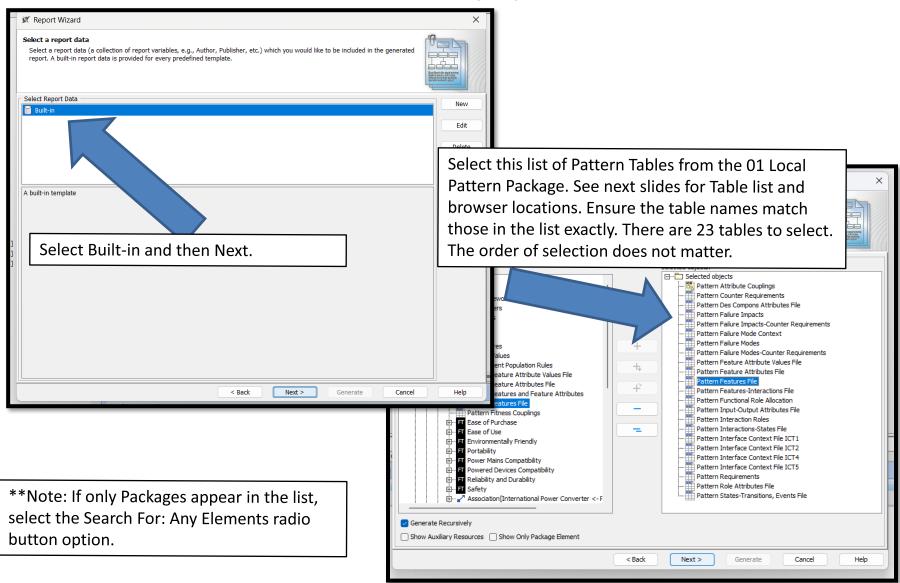


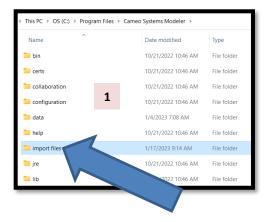
Table Name	Table Browser Location
Pattern Features File	01 Local Pattern>01 Feature Framework>04 Features
Pattern Feature Attributes File	01 Local Pattern>01 Feature Framework>04 Features
Pattern Feature Attribute Values File	01 Local Pattern>01 Feature Framework>04 Features
Pattern Role Attributes File	01 Local Pattern>02 Logical System Analysis
Pattern Interactions-States File	01 Local Pattern>02 Logical System Analysis
Pattern States-Transitions, Events File	01 Local Pattern>02 Logical System Analysis> State Machine
Pattern Interface Context File ICT1	01 Local Pattern>02 Logical System Analysis
Pattern Interface Context File ICT2	01 Local Pattern>02 Logical System Analysis
Pattern Interface Context File ICT4	01 Local Pattern>02 Logical System Analysis
Pattern Interface Context File ICT5	01 Local Pattern>02 Logical System Analysis
Pattern Interaction Roles	01 Local Pattern>03 Interaction Framework
Pattern Requirements	01 Local Pattern>03 Interaction Framework
Pattern Features-Interactions File	01 Local Pattern>03 Interaction Framework
Pattern Input-Output Attributes File	01 Local Pattern>03 Interaction Framework

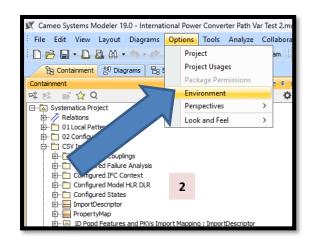
Table Name	Table Browser Location
Pattern Functional Role Allocation	01 Local Pattern>04 Physical Architecture
Pattern Des Compons Attributes File	01 Local Pattern>04 Physical Architecture
Pattern Failure Impacts	01 Local Pattern>05 Risk Framework
Pattern Failure Modes	01 Local Pattern>05 Risk Framework
Pattern Counter Requirements	01 Local Pattern>05 Risk Framework
Pattern Failure Mode Context	01 Local Pattern>05 Risk Framework
Pattern Failure Modes-Counter Requirements	01 Local Pattern>05 Risk Framework
Pattern Failure Impacts-Counter Requirements	01 Local Pattern>05 Risk Framework
Pattern Attribute Couplings	01 Local Pattern

	to configure report files, e.g. to select the report files output location and image format, etc. to start generating the report.
	The output file must be named Export Tables. Choose the repository location to write the Export Tables file. It
Output Options	does not have to be the location shown here.
C:\Program Files\Came	o Systems Modeler\import files\Export Tables.xlsx
Report image format:	
Windows Enhanced Meta	afile (*.emf)
Auto image size:	
Fit image to paper (large	
Display empty value as	Publish to server
Empty text	Select server:
	NA No Upload
Display in viewer afte	er generating report

CSV Import Mapping Definition for Configured Model Data

- In Windows Explorer, create a folder in an accessible location. This is the same location as specified using Button 5 in the Configuration Wizard to store the configured model output files. This folder location and name can be of your creation and choosing as long as read/write privileges are available.
- 2. In Cameo Systems Modeler, from the Menu toolbar, select Options
 → Environment.





CSV Import Mapping Definition for Configured Model Data

- 1. Select Path Variables from the list of Environment Options.
- 2. Select Add to open the Path Variable Dialog Window.
- 3. Enter "csvimport.path" as the Name and "Configured Model CSV Import Files Location" as the Description.
- 4. Select the ellipses to open the location dialog and choose the accessible file location discussed in the previous slide.

X Environment Options		
Path variables configuration Path variable is a path used in code engineering processes, project usages, hyperlinks, etc. :	Image: Select Location Lookin: □ This PC ✓ Image: Select Location	
편- 또 General 	Path Variables Defined Path Variable St Path Variable 3 Vame Export path Name Name: Description Descri	Recent items Desktop
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	Show suggestion to use path variables Path variable is a path used in code engineering process, project usages, hyperlinks, etc. This helps to avoid using absolute local paths and allows exchanging projects among users. Example: <install.root>/profiles</install.root>	Edit Add Remove 2 OK Cancel Help

3. Creating S* Pattern Classes

This section of the guide details the steps for creating formally modeled S* Pattern Classes (metaclasses) as mapped and implemented in Cameo Systems Modeler.

Creating a New S* Pattern Project

- Start CSM and Select Create New Project.
- Select the Systematica Project.
- Name the Project and Select a File Location.

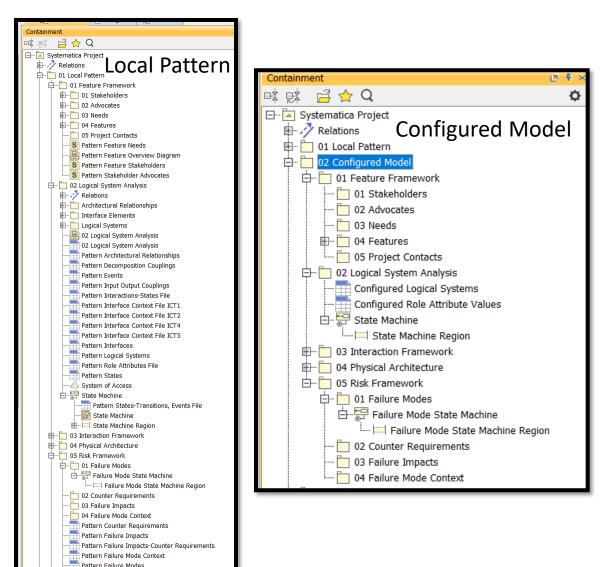
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Systems Engineering Systems for Project Systems for Project Software Engineering Business Process Mod Simulation Other	NagicGrid Blank MagicGrid QuickStart	* * *	ame: New Systematics Pattern Project Project location: Create directory for project and related data Cone custom used projects Prefix to name used projects: Coned	
			OK Cancel +	Help

Systematica Project Template Packages

Pattern Failure Modes-Counter Requirements

🛱 Pattern Attribute Couplings

- S* Projects include 2 main packages
 - Local Pattern: An entire configurable model from which a Configured Model is configured
 - Configured Model: An entire model that is a specific configuration of the Local Pattern
- All of a pattern's classes and relationships should be located within the Local Pattern package
- Package Numbers/Names are pre-defined in the Project Template and Pre-Existing Pattern Files and should not be changed.

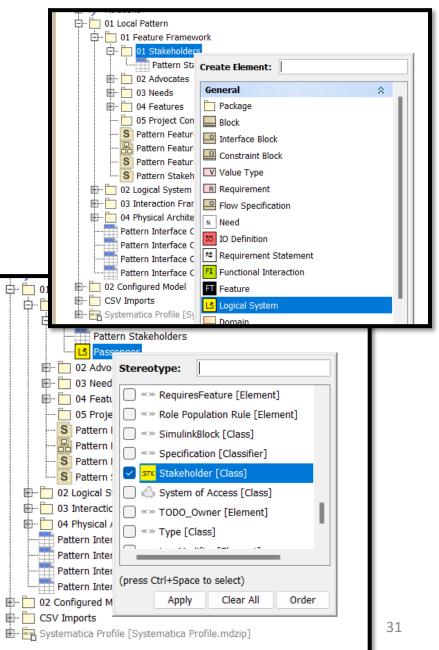


Pattern data entry methods and details

- MBSE tools provide multiple means of entering the same information, in different modes.
- This document focuses on pattern data entry via tool browser GUI and tabular entries.
- Additional methods of entry for the same pattern data include diagram entry and bulk import, not discussed in this document.
- Class Names should not include special characters such as []/\-";
- Use of tilde (~) symbol on following pages indicates use of a mouse right-click or equivalent.

Feature Framework: Creating Stakeholders

- Pattern Stakeholders are created in package 01 Local Pattern::01 Feature Framework::01 Stakeholders
- Use ~Create Element and choose Logical System because Stakeholder is a type of Logical System.
- Right-click on the newly created Logical System, select Stereotype and change the Stereotype to Stakeholder and remove the Logical System Stereotype.



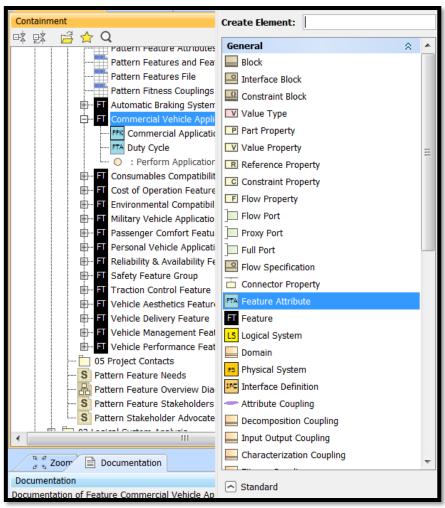
Feature Framework: Creating Features

- Pattern Features are created in package 01 Local Pattern::01 Feature Framework::04 Features
- Use ~Create Element and choose Feature to create an S* Feature

🚊 📋 01 Feature Fra	□ □ 01 Feature Framework							
🖶 🛅 01 Stakeholders								
🖶 🛅 02 Advocates								
🖽 💼 03 Needs								
🛱 💼 04 Features								
🕀 📝 Relat	Create Element:							
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	General	*	^					
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⊡ ••• FT Addit	Block							
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En East	Constraint Block							
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FT Regu	FI Functional Interaction							
	IO Definition							
⊞ <mark>FT</mark> Reus	RS Requirement Statement							
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S Pattern F	Class «fileSchema»							
🔓 Pattern F								
S Pattern F	FT Feature							
S Pattern S	LS Logical System							
🕀 🗠 🚺 02 Logical Sy	E Domain							
🛱 🖓 🗂 03 Interactio								

Feature Framework: Creating Feature Attributes

- Features may have Feature Attributes. A special type of Feature Attribute is called a Feature Primary Key, which is the Feature Attribute that is used to differentiate Configured Features originating from the same parent Feature in the Pattern.
- Select a Feature and use ~Create Element and choose either Feature Attribute or Feature Primary Key
- If adding a Feature Primary Key, enter the name of the Feature Primary Key into its Feature's Primary Key Name tag.



Feature Framework: Feature Attribute Possible Values

- Use the new Feature Attribute's specification to define Possible Value options in the Possible Values tag.
- Each option should:
 - Be on its own line
 - Be followed by a colon and a space
 - May have a value meaning after the colon and space

Specification of Feature Attribute Compon	ant Command Center Size	
Element tagged value specification Select a tag and dick the Create Value		
🗉 🔁 🔁 💋	Tags	
Component Command Center Size Component Command Center Size Componentation Navigation/Hyperlinks Consectors Connectors Constraints Traceability	Profile: <all></all>	Property: Possible Values Value HTML HTML Medium: Small:

Feature Framework: Feature Attribute Possible Values

• The list of colon separated Feature Attributes can also be entered directly into the Possible Values column of the Pattern Feature Attributes Table.

Pattern Feature Attribut × Pattern Role /	Attributes Tim Pattern Interactions-Sta Tim Pattern Interface Cor	ntex Pattern Interface Contex Pattern Interface Conte	x Pattern Interface Contex Pattern Input-Ou	itput Att	
🚸 🚸 🗄 🔂 🗄 🔂 🗮 Add New 😅 Add Existing 🌐 Delete 🖫 Remove From Table 🗄 🛒 - 🕜 🖓 🕌 Columns 🗄 🛅 Export 🛍 - 🗄 📿 🔆 🗭 - 🗄 🔺 🔚					
Criteria					
Element Type: Feature Attribute,Feature Primary Key Scope (optional): Drag elements from the Model Browser 🖓					
# Feature	Attribute Name	Applied Stereotype	Possible Values		
1 FT Reliability and Durability	Design Life	FTA Feature Attribute [Property]			
2 FT Power Mains Compatibility	Power Mains Type	FTA Feature Attribute [Property]			
3 Powered Devices Compatibility	Power Output Capacity	FTA Feature Attribute [Property]			
Powered Devices Compatibility	Power Output Interface ID	Feature Primary Key [Property]	Power Output 1: Power Output 2: Power Output 3:		
5 FT Safety	Safety Risk Type	Feature Primary Key [Property]	Electrical Shock:		
6 FT Power Mains Compatibility	Max Drain on Mains	FTA Feature Attribute [Property]			
	HTML Power Output 1: Power Output 2: Power Output 3:	OK Cancel			

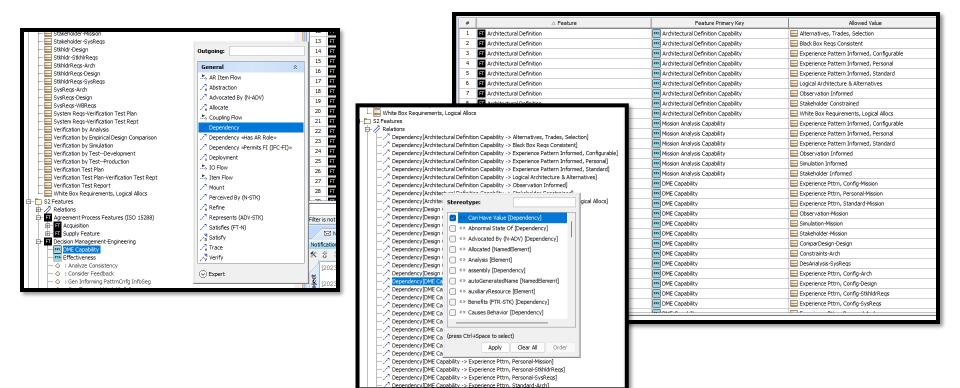
Feature Framework: Feature Attribute Allowed Values

- An alternative method for creating Feature Attributes and connecting them to Features for configuration includes the use of allowed values.
- Enter the complete list of Feature Attribute Values in the Allowed Values Table.

	rn Interactions-Sta
nt (3 # X	
별 ☆ Q 후 ·	Add New 🔿 Add Existing 🍵 Delete 🎳 Remove From Tabl
	Criteria
tematica Project	Element Type: Allowed Value Scope (optional): Drag
Relations 01 Local Pattern	
1 OI Feature Framework	# Name
in - 1 Stakeholders	1 Alternatives, Trades, Selection
⊕- □ 02 Advocates	2 Basic Integration
⊕ 03 Needs	3 Basic Stakeholder Validation
O4 Features	4 Black Box Regs Consistent
👜 💼 Feature Attribute Values	5 Component Capabilities, Margins
🖽 📲 🛅 S2 Features	6 Components and Alternatives
🕮 🗝 🛄 S3 Features	7 Design Feedback to Regs
	8 Development Unit Test
Containment Population Rules	9 Enterprise Unit Assignment
	11 Experience Pattern Informed, Personal
Pattern Features and Feature Attributes Pattern Features File	12 Experience Pattern Informed, Standard
Pattern Fitness Couplings	13 Experience Pttrn, Config-Mission
🛅 05 Project Contacts	14 Experience Pttrn, Personal-Mission
S Pattern Feature Needs	15 Experience Pttrn, Standard-Mission
🔏 Pattern Feature Overview Diagram	16 Facilities Construction
S Pattern Feature Stakeholders	17 Eeasibility, Fault, Risk Analysis
S Pattern Stakeholder Advocates	18 Flow Down Requirements Informed
O2 Logical System Analysis O3 Interaction Framework	19 Hardware Fabrication
03 Interaction Framework	20 Hardware Prototyping
05 Risk Framework	21 Identification and Authorization
B Pattern Attribute Couplings	
CC-BY License	
02 Configured Model	23 Information Navigation and Access
CSV Imports	24 Integration Plan and Tooling
Systematica Profile [Systematica Profile.mdzip]	25 Integration Report
Systematica Project	26 E Logical Architecture & Alternatives
Export Tables	27 Materials Management
	28 MBSE Black Box Capability

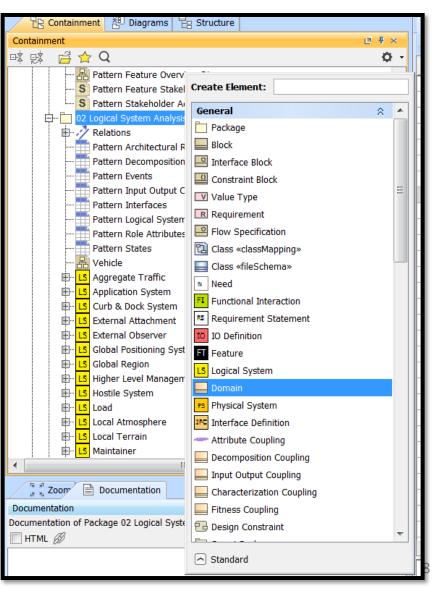
Feature Framework: Feature Attribute Allowed Values

- Create a Dependency relationship between the Feature Primary Key and Feature Attribute Value.
- Set the Stereotype of the relationship to Can Have Value.
- View the result in the Pattern Feature Attribute Values Table.



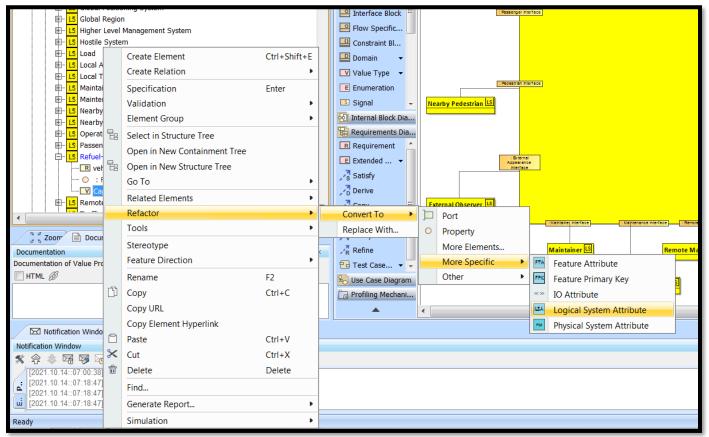
Domain Analysis: Creating Domains and Logical Systems

- Pattern Domains and Logical Systems are created in package 01 Local Pattern::02 Logical System Analysis
- Use ~Create Element and choose Domain or Logical System



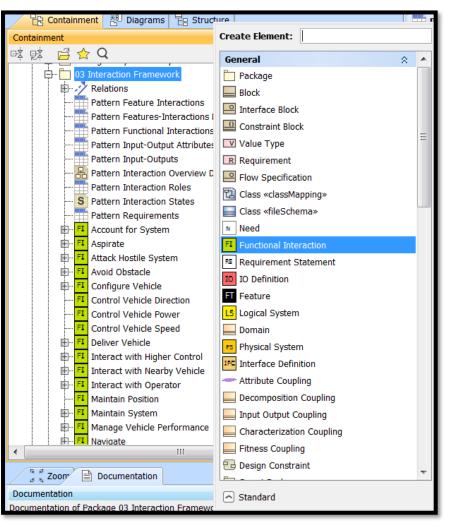
Domain Analysis: Creating Logical System Attributes

- Select a Logical System under the 01 Local Pattern::02 Logical System Analysis package
- Use ~Create Element and choose Value Property
- Right click and refactor the new Value Property as a Logical System Attribute



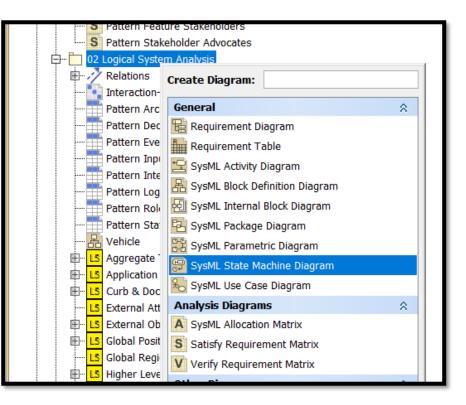
Interaction Framework: Creating Functional Interactions

- Pattern Functional Interactions are created in package 01 Local Pattern::03 Interaction Framework
- Use ~Create Element and choose Functional Interaction



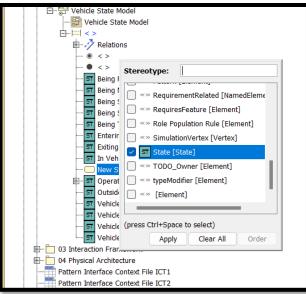
State Machine: Creating State Machine and States

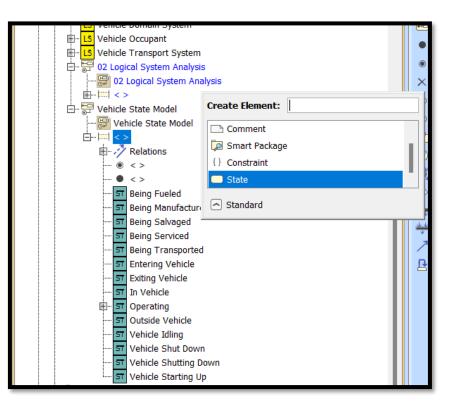
- Pattern State Diagram and States are created in package 01 Local Pattern::02 Logical System Analysis
- Use ~Create Diagram and choose SysML State Machine Diagram



State Machine: Creating State Machine and States

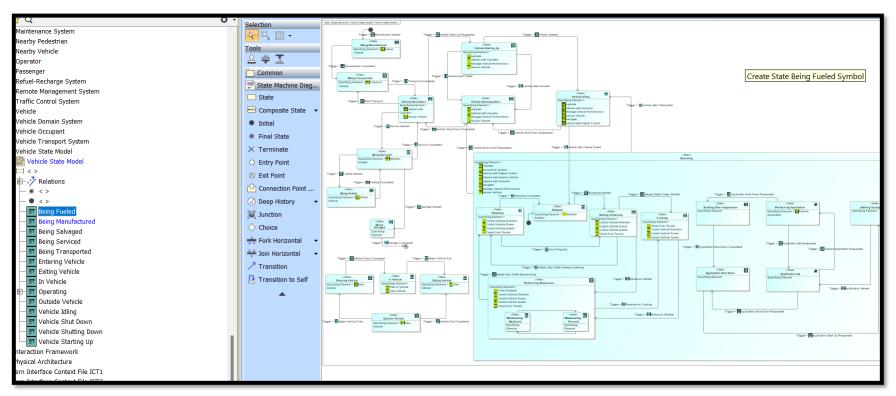
- Right-click the automatically created Region under the State Model and use ~Create Element and choose State. Make sure the menu is expanded to Expert.
- Right-click the newly created State, select Stereotype, and change it to State as shown below.





State Machine: Creating the Diagram

- Open the State Machine Diagram created in the earlier step.
- Populate the State Machine Diagram with States by dragging them from the containment browser onto the diagram.



State Machine: Creating State-State Transitions, Events

 Select the Transition item from the State Machine Diagram Toolbar.

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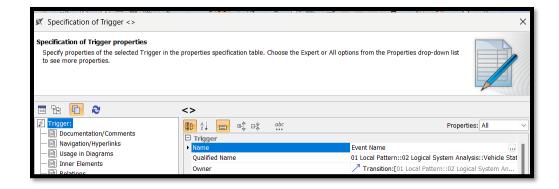
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- Select the two states on the diagram.
- Right-click the new transition and open its specification.
- Select the Trigger property and click the + (Add) button.

nction Specification	tion of Transition <> of Transition properties	Trigger - Noticide Shart Ab orted	ate Servinth Operator Inge Vehiche Pare In Vehiche Pare Int Vehiche Control Inde table Oriente School	X
in Horizontal in Horizontal ransition analytic to Self Transition Transition Docum Naviga	[Vehicle Idling -> Vehicle Starting] ▲↓ uentation/Comments Owner in Diagrams Appliet elements Owner aints Apliet ability Client ions Suppliet bility Suppliet ions Name Active Client Visibility Suppliet ions Visibility ions Visibility Trigger Trigger		Image: second control of the properties drop Image: second control of the properties	Properties: All Cal System Analysis::Ve
		here to filter properties	Close Back	Forward Help

State Machine: Creating State-State Transitions, Events

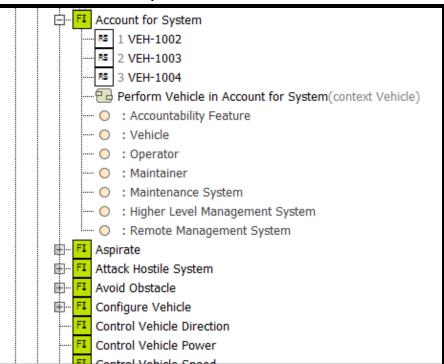
- In the new Trigger Specification window that opens enter the name of the event in the Name property.
- Select the Applied Stereotype property and choose the Event stereotype option.



vent Name	
	Properties: All 🗸
∃ Trigger	
Name	Event Name
Qualified Name	01 Local Pattern::02 Logical System Analysis::Vehicle Stat
Owner	Transition:[01 Local Pattern::02 Logical System An
Applied Stereotype	
Event	Stereotype:
Active Hyperlink	second se
Applied Stereotype Instance	«» ElementReferenceInText [Element]
Owned Comment	
Owned Element	🔽 🖾 Event [Trigger]
Name Expression	
Client Dependency	🗍 «» fmu [Element]
Supplier Dependency	Sector Se
Namespace	
Visibility	public
Port	Subscription Republication
Image	
To Do	
Documentation	(press Ctrl+Space to select)
All Realizing Elements	Apply Clear All Order
All Specifying Elements	
Realizing Element	

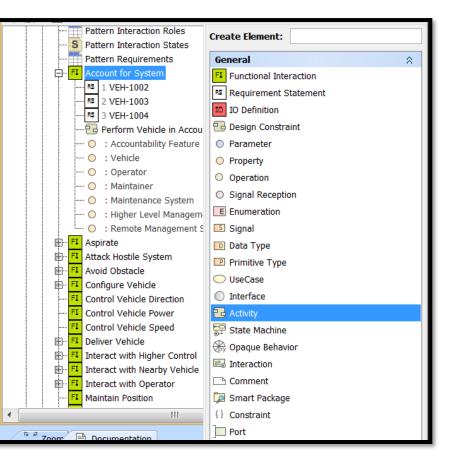
Detail Requirements: Overview

- Requirement Statements and the Requirement Transfer Functions they specify are created under their respective Functional Interaction.
- There should be at least one Requirement Transfer Function for each Interaction-Role pair.



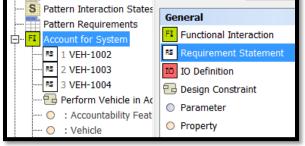
Detail Requirements: Creating Requirement Transfer Functions

- Use ~Create Element and choose Activity
- Add the stereotype "Requirement Transfer Function" to the new Activity
- Create an Allocate dependency from the new Requirement Transfer Function to the Logical System will perform it.



Detail Requirements: Creating Requirement Statements

- Use ~Create Element and choose Requirement Statement
- Name the new Requirement Statement with its Requirement ID.
- Create a Satisfy dependency to the new Requirement Statement from the Requirement Transfer Function it specifies.
- At this point, the Requirement row will appear in the Pattern Requirements Table. The Requirement Statement can be entered in the Text column.

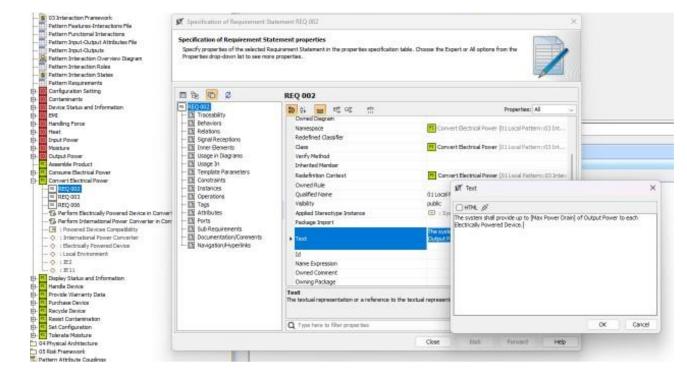


 Alternatively, open the Specification for the new Requirement Statement and enter the statement details in the Text property field.

#	Functional Interaction	IPK Value	Functional Role	RPK Value	Reg ID	RSPK Rule	Text
1	FI Consume Electrical Power		International Power Converter		REQ 001		The system shall consume not more than [Max Drain on Mains] of Input Power from the Local Power Distribution System.
2	FI Convert Electrical Power	*ANY*	International Power Converter	*ANY*	REQ 002	IPK	The system shall provide up to [Max Power Drain] of Output Power to each Electrically Powered Device.
3	FI Convert Electrical Power	*ANY*	LS Electrically Powered Device	*ANY*	REQ 003	IPK	The system shall not consume more than [Max Power Drain] of Output Power.
4	FI Consume Electrical Power		LS Local Power Distribution System		REQ 004		The system shall provide up to [Max Drain on Mains] of Input Power.
5	FI Handle Device		International Power Converter		REQ 005		The system shall not present a shock hazard to users when operated according to its instructions.
6	Convert Electrical Power	*АМҮ*	LS International Power Converter	*ANY*	REQ 006	ІРК	The system shall generate Output Power to attached Electrically Powered Devices which is compatible with the [Output Voltage-Power Profile] and [Output Frequency Profile].

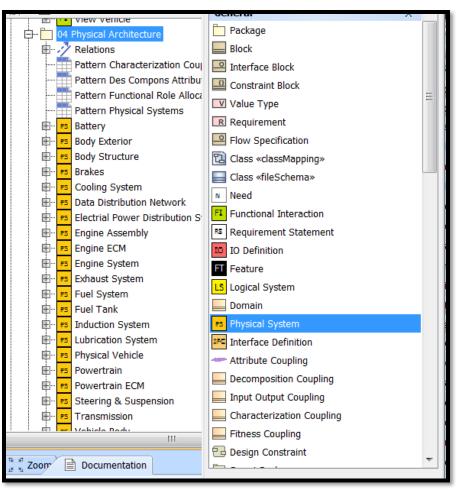
Detail Requirements: Creating Requirement Statements

• Alternatively, open the Specification for the new Requirement Statement and enter the statement details in the Text property field.



High Level Design: Creating Design Components (Physical Systems)

- Pattern Design Components are created as Physical Systems in package 01 Local Pattern::04 Physical Architecture
- Use ~Create Element and choose Physical System



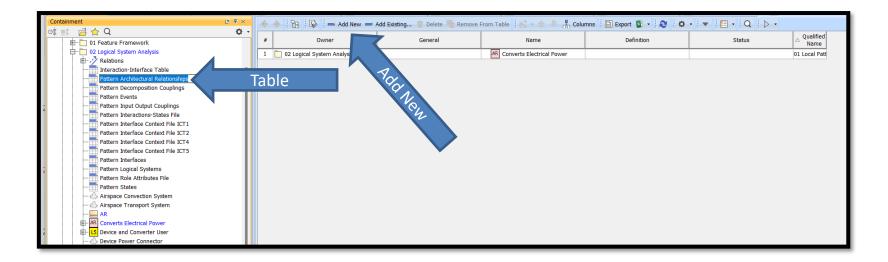
High Level Design: Creating Design Component (Physical System) Attributes

- Use ~Create Element and choose Value Property
- Right click and refactor the new Value Property as a Physical System Attribute

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- 1. r. 1		Related Elements		•					Ψ.		
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ау		Stereotype					More Elements				
		Feature Direction		F			More Specific	FTA	Feature Attribut	e	
		Rename	F2				Other 🕨	FPK	Feature Primary	Key	
	ß	Сору	Ctrl+C					«»	IO Attribute		
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low		Copy Element Hyperlink						PSA	Physical System	Attribut	te
	A	Dente	CH IV								

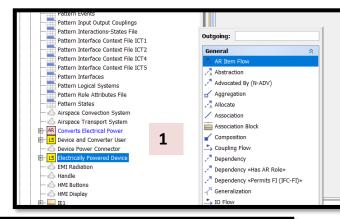
Interface Context: Architectural Relationships

- Architectural Relationships are created in package 01 Local Pattern::02 Logical System Analysis.
- Select and Open the Pattern Architectural Relationships Table and then Select Add New.
- The newly added Architectural Relationship will show up in the table and the Containment Browser



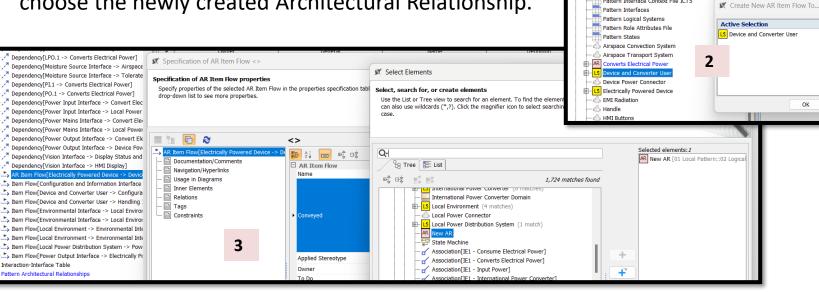
Interface Context: Architectural Relationships

- Select the Logical System or Physical System that conveys the Architectural Relationship > Create Relation > Select Outgoing or Incoming > Select AR Item Flow.
- 2. Select the other Logical System or Physical System involved in the Architectural Relationship.
- 3. Select the new AR Item Flow relation in the browser, open its specification, select the Conveyed property and choose the newly created Architectural Relationship.



Pattern Interface Context File ICT

Pattern Interface Context File ICTS



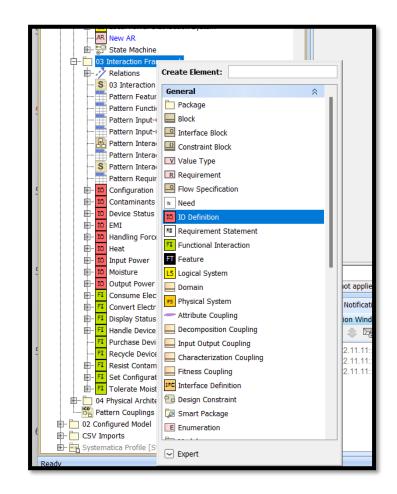
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Cancel

Interface Context: Populating <u>Input-Outputs</u>

- Input-Outputs are created in package 01 Local Pattern::03 Interaction Framework.
- Use ~Create Element and choose IO Definition



Interface Context: Populating Input-Outputs continued

External Observer

Global Region

Hostile System

Local Terrain

Maintainer

Operator

Passenge

Local Atmosphere

Maintenance System

Refuel-Recharge System Remote Management System

Nearby Pedestrian

Nearby Vehicle

Load

Global Positioning System

Higher Level Management System

Outgoing:

General

AR Item Flow

Advocated By (N-ADV)

Abstraction

Aggregation

Association

Composition

Coupling Flow

7 Dependency

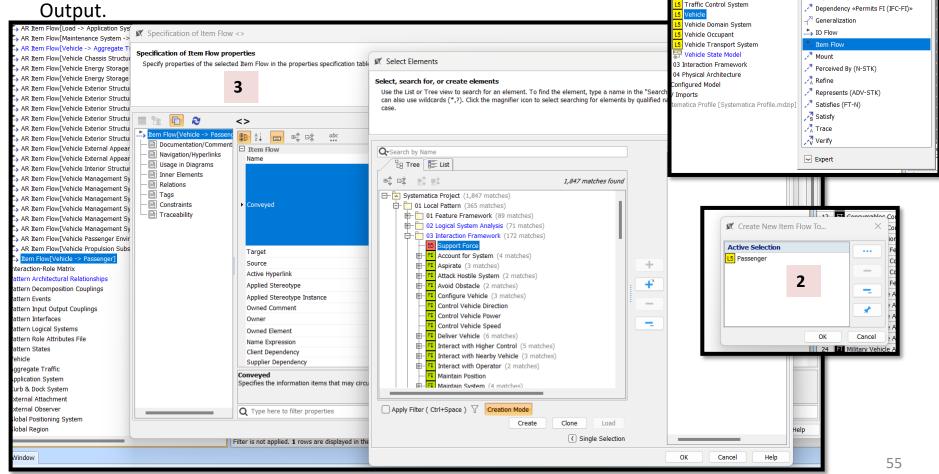
Dependency «Has AR Role»

Association Block

🕂 Allocate

1

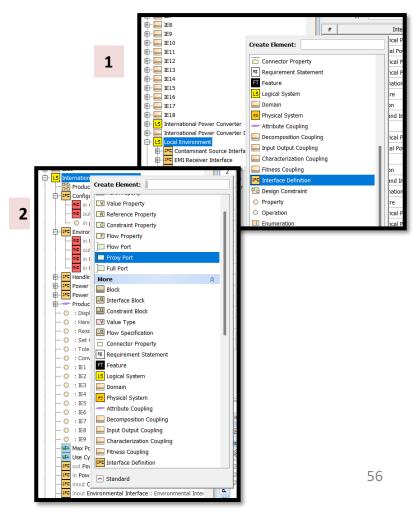
- Select the Logical System or Physical System that conveys the Input-Output > Create Relation > Select Outgoing or Incoming > Select Item Flow.
- 2. Select the other Logical System or Physical System involved in the Input-Output.
- 3. Select the new Item Flow relation in the browser, open its specification, select the Conveyed property and choose the newly created Input-Output.



Interface Context: Populating Interfaces

- Interface Definitions are created in package 01 Local Pattern::02 Logical System Analysis under the Logical System that owns them.
 - 1. Use ~Create Element and choose Interface Definition; give the new Interface a name.
 - Next, use ~Create Element and choose Proxy Port; give it the Proxy Port the same name as the Interface Definition created in the above step.
 - 3. Select the Proxy Port in the browser, select the Stereotype option, then add ifc port stereotype.

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O : Handle 	
I Resist	2
O : Set Ca Set Ca (*** hasGroupName [Property]	5
O : Tolerz 🗌 «» HyperlinkOwner [Element]	
🔿 : Conve 🔽 🃭 ifc port [Port]	
···· O : IE1	
···· O : IE4 D Interval [Property]	
O : IE5 O «> InvisibleStereotype [Element]	
O : IE6	
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(press Ctrl+Space to select)	
Max Pov Apply Clear All Order	
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in Power Input Interface : Power Input Interface	
Interface Port	
International Power Converter Domain	



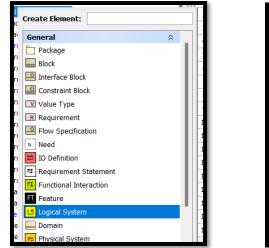
Interface Context: Populating Interfaces, continued

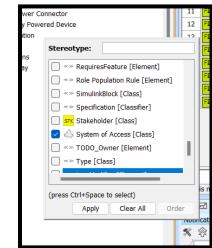
 Select the new ifc port in the browser, open its specification, select the Type property and choose the associated Interface Definition with the same name.

IE15 If Specification of Proxy Port Interface Port IE16 Specification of Proxy Port Interface Port IE17 Specification of Proxy Port Interface Port IE18 Specification of Proxy Port Interface Port Interface Port Interface Port Image: Interface Port Interface Port Image: Interface Port Interface Port Image: Interface Port Interface Port	IE14			
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Moduc Characterization Coupling In Conscience Status and Information Interface In C.2: Evers Status and Information Interface In C.2: Evers Status and Information Interface In R.4: Heat In			in the properties specification table. Choose the Expert	
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Prover Output Interface			Applied Stereotype	
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Interface Port		5		
International Power Converter Domain	International Power Converter Domain	in up		

Interface Context: Populating Systems of Access (SOAs)

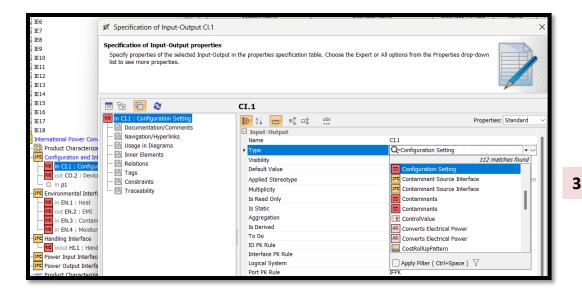
- Systems of Access are created in package 01 Local Pattern::02 Logical System Analysis
- Use ~Create Element and choose Logical System (because System of Access is a type of Logical System).
- Right-click on the newly created Logical System, select Stereotype and change the Stereotype to System of Access and remove the Logical System Stereotype.

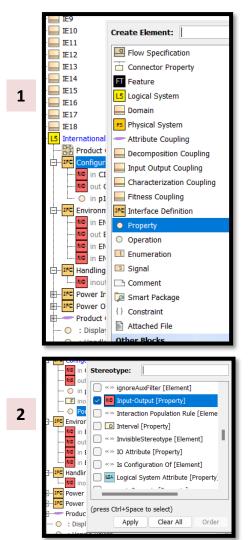




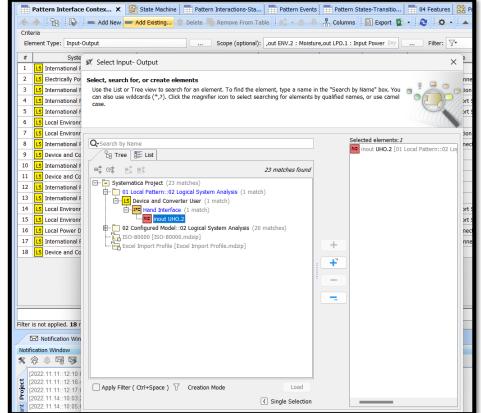
Interface Context: Populating Ports

- Ports are created in package 01 Local Pattern::02 Logical System Analysis under the Interface Definition that owns the Port:
- 1. Use ~Create Element and choose Property.
- 2. Select and right-click the property in the containment browser, choose Stereotype, choose Input-Output [Property].
- 3. Select the Port/IO Property in the browser, open its specification, select the Type property and choose the associated IO Definition.





- Pattern Table ICT1 shows relationships to Ports and also administers the related configuration rules.
- To add a Port to the table, select Add Existing and select the Port from its browser location.
- The Role, Interface, and Input-Output column will have content automatically populated based on the steps on the previous slide.



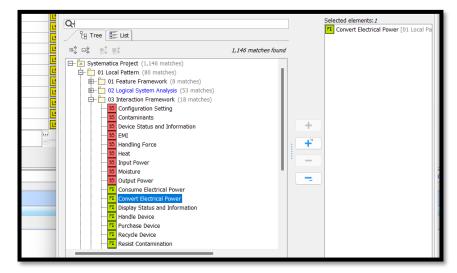
- To create the relationship to Systems of Access (SOAs), doubleclick the cell, then the ellipses to bring up the selection dialog window.
- Choose the related SOA from the containment browser.

Element Type: Input-Output	Scope (option	al): ,out ENV.2 : Moistu	re,out LPO.1 : Inp	out Power ()×y	Filter: 🕎
# System Name	Interface Name	Interface PK Rule	Name	Port PK Rule	e SOA Name
1 LS International Power Converter	Configuration and Information Interface		80 CI.1	IFPK	📣 HMI Buttons
2 LS Electrically Powered Device	IFC Device Power Interface		NO DPI.1	IFPK	Device Power Connect
Select Elements				×	Airspace Convection S
Select Elements					🛆 Airspace Transport Sy
Select, search for, or create elements			0	-	🛆 Airspace Transport Sy
	element. To find the element, type a name in t				🖒 EMI Radiation
can also use wildcards (",?). Click the mag case.	nifier icon to select searching for elements by	quaimed names, or use	camer (2		Airspace Convection S
					🛆 Local Power Connecto
					🖒 HMI Display
		Selected elen	anta 1		🛆 Handle
Q				m [01 Local Pa	attern::02 Logical System Anal
🖉 🗄 Tree 🔚 List					HMI Display
	9,655 matches found		Airspace Co	onvection Sy	EMI Radiation
					🖒 Airspace Transport Sy
Pattern Decomposition Pattern Events	Couplings				🖒 Airspace Transport Sy
Pattern Events Pattern Input Output Co	unlings				🖒 Local Power Connecto
Pattern Interactions-Sta					Device Power Connect
Pattern Interface Conte	xt File ICT1				🖒 HMI Buttons
Pattern Interface Conte					
Pattern Interface Conte Pattern Interface Conte		+			
Pattern Interfaces	XL File ICT3				
Pattern Logical Systems	5	+			
Pattern Role Attributes	File				
Pattern States					
Airspace Convection Sy		-			
Airspace Transport Sys Electrical Pow					
E Device and Converter U					
Connecto					
Electrically Powered De	vice (7 matches)				
📥 EMI Radiation					
EMI Radiation					
📥 EMI Radiation					
📥 EMI Radiation 📥 Handle	on Mode Load				
Handle	on Mode Load		_		

#	System Name	Interface Name	Interface PK Rule	Input Output	IO PK Rule	Direction	Port	Port PK Rule	SOA Name	SOA PK Rule	SOA Internal or External
1	LS International Power Converter	Configuration and Information Interface		Configuration Setting		in	CI.1	IFPK	🛆 HMI Buttons		
2	LS International Power Converter	Configuration and Information Interface		Device Status and Information		out	CO.2	IFPK	🛆 HMI Display		
3	LS Local Environment	Contaminant Source Interface		to Contaminants		out	ENV.1	IFPK	Airspace Transport System		
4	LS Electrically Powered Device	Device Power Interface		Output Power	IPK	in	DPI.1	IFPK	Device Power Connector	IPK	
5	Local Environment	EMI Receiver Interface		IO EMI		in	ENV.3	IFPK	🛆 EMI Radiation		
6	LS Local Environment	Environment Thermal Sink Interface		IO Heat		in	ENV.4	IFPK	Airspace Convection System		
7	LS International Power Converter	Environmental Interface		10 Heat		in	EN.1	IFPK	🛆 Airspace Convection System		
8	LS International Power Converter	Environmental Interface		to Contaminants		in	EN.3	IFPK	🛆 Airspace Transport System		
9	LS International Power Converter	Environmental Interface		to Moisture		in	EN.4	IFPK	📣 Airspace Transport System		
10	LS International Power Converter	Environmental Interface		IO EMI		out	EN.2	IFPK	🛆 EMI Radiation		
11	LS Device and Converter User	Finger Interface		Configuration Setting		out	UCO.1	IFPK	HMI Buttons		
12	LS Device and Converter User	Hand Interface		TO Handling Force		inout	UHO.1	IFPK	🛆 Handle		
13	LS International Power Converter	Handling Interface		10 Handling Force		inout	HI.1	IFPK	🛆 Handle		
14	Local Environment	Moisture Source Interface		to Moisture		out	ENV.2	IFPK	🛆 Airspace Transport System		
15	LS International Power Converter	Power Input Interface		Input Power		in	PI.1		local Power Connector		
16	Local Power Distribution System	Power Mains Interface		IO Input Power		out	LPO.1	IFPK	🛆 Local Power Connector		
17	LS International Power Converter	Power Output Interface	IPK	0 Output Power	ІРК	out	PO.1	IFPK	Device Power Connector	IPK	
18	LS Device and Converter User	Vision Interface		10 Device Status and Information		in	UC1.1	IFPK	🖒 HMI Display		

Example Pattern Interface Context File ICT1

- Pattern Table ICT2 shows relationships among Interactions, Roles, Input-Outputs, and Architectural Relationships.
- Each row is an Interface Element. To add a row, select Add New, double-click the new row and give the Interface Element a name.
- To create the relationships to other elements, double-click the cell, then the ellipses to bring up the selection dialog window.
- Choose the related element from the containment browser.



Add	dd New - Add Existing 👕 Delete 🖷 Remove From Table 📑 - 🗇 + 👖 Columns 🔋 🖻 Export 🛐 - 🛛 🗞 👘 - 🖍 📳 - 🔍 🖒 -									
Criter		vrface Element	cope (optional): IE1	0×y Filter: \\						
Elen										
#	Name	Interaction Name	System Name	IO Name	Arch Relat					
1	🔜 IE1	FI Consume Electrical Power	L5 International Power Converter	IO Input Power	AR Converts Electrical Power					
2	IE2	FI Convert Electrical Power	L5 International Power Converter	10 Output Power	R Converts Electrical Power					
3	IE3	FI Consume Electrical Power	L5 International Power Converter	IO Heat						
4	IE4	FI Consume Electrical Power	L5 International Power Converter	IO EMI						
5	IE5	FI Resist Contamination	LS International Power Converter	TO Contaminants						
6	IE6	FI Tolerate Moisture	LS International Power Converter	IO Moisture						
7	E7	FI Set Configuration	LS International Power Converter	Configuration Setting						
8	IE8	FI Display Status and Information	LS International Power Converter	Device Status and Information						
9	E9	FI Handle Device	LS International Power Converter	III Handling Force						
10	E10	FI Consume Electrical Power	LS Local Power Distribution System	III Input Power	R Converts Electrical Power					
11	📕 IE11	FI Convert Electrical Power	LS Electrically Powered Device	Output Power	R Converts Electrical Power					
12	E12	FI Handle Device	LS Device and Converter User	IO Handling Force						
13	E13	FI Set Configuration	LS Device and Converter User	Configuration Setting						
14	E14	FI Display Status and Information	LS Device and Converter User	Device Status and Information						
15	E15	FI Resist Contamination	LS Local Environment	Contaminants						
16	E16	FI Tolerate Moisture	LS Local Environment	IO Moisture						
17	📕 IE17		LS Local Environment	IO EMI						
18	E18		LS Local Environment	IO Heat						

#	Interaction Name	System Name	IO Name	Arch Relat
1	FI Consume Electrical Power	LS International Power Converter	ID Input Power	AR Converts Electrical Power
2	FI Convert Electrical Power	LS International Power Converter	to Output Power	AR Converts Electrical Power
3	FI Consume Electrical Power	LS International Power Converter	ID Heat	
4	FI Consume Electrical Power	LS International Power Converter	ID EMI	
5	FI Resist Contamination	LS International Power Converter	ID Contaminants	
6	Tolerate Moisture	LS International Power Converter	ID Moisture	
7	FI Set Configuration	LS International Power Converter	Configuration Setting	
8	FI Display Status and Information	LS International Power Converter	Device Status and Information	
9	FI Handle Device	LS International Power Converter	ID Handling Force	
10	FI Consume Electrical Power	LS Local Power Distribution System	Input Power	AR Converts Electrical Power
11	FI Convert Electrical Power	LS Electrically Powered Device	ID Output Power	AR Converts Electrical Power
12	FI Handle Device	LS Device and Converter User	to Handling Force	
13	FI Set Configuration	LS Device and Converter User	Configuration Setting	
14	FI Display Status and Information	LS Device and Converter User	Device Status and Information	
15	FI Resist Contamination	LS Local Environment	ID Contaminants	
16	FI Tolerate Moisture	LS Local Environment	to Moisture	
17	FI Consume Electrical Power	LS Local Environment	IO EMI	
18	FI Consume Electrical Power	LS Local Environment	10 Heat	

Example Pattern Interface Context File ICT2

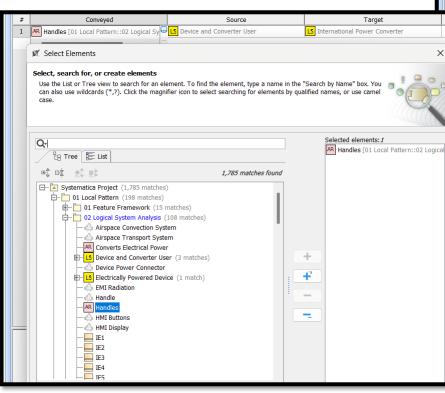
- Pattern Table ICT4 shows details for reified Architectural Relationships.
- Each row is a Has AR Role dependency. To add a row, select Add Existing, navigate to the Has AR Role and add it, or drag the Has AR Role from the browser onto the table.

SÌI	Pattern Interaction Stat., Pattern In	terface Contex 🗙 📑 Patte	ern Interface Contex	Pattern Interface Contex	Pattern F
	🔶 📴 🐼 💳 Add New 💳 Add	Existing 📅 Delete 🖶 Remov	e From Table 🕴 🍂 🔹 🥼	Columns Exp	ort 🛐 📲
Crite	ria				
Eler	ment Type: Has AR Role	Scope	(optional): cal Power -> L	ocal Power Distribution System]	{}xy
#	System Name	Arch Relat	AR PK Rule	Name	AR Role
1	LS Electrically Powered Device	AR Converts Electrical Power		🥕 Sink	IPK
2	LS Local Power Distribution System	AR Converts Electrical Power		🦯 Source	
	Select Dependency « Has AR Rol Select, search for, or create element				×
	Use the List or Tree view to search for can also use wildcards (*,?). Click the r case.	an element. To find the element, t			
	Q			Selected elements: 1	
	Tree E List			Dependency:Converter[01]	Local Patte
		8 ma	tches found		
		System Analysis (1 match) Converts Electrical Power -> Inter Ingical System Analysis (5 matches			

#	System Name	Arch Relat	AR PK Rule	AR Role Name	AR Role PK Rule	AR Internal or External	AR Complexity
1	LS Electrically Powered Device	AR Converts Electrical Power		Sink	IPK		Reified
2	LS Local Power Distribution System	AR Converts Electrical Power		Source			Reified
3	LS International Power Converter	AR Converts Electrical Power		Converter			Reified

Example Pattern Interface Context File ICT4

- Pattern Table ICT5 shows details for simple Architectural Relationships.
- Each row is an AR Item Flow. To add a row, select Add Existing, navigate to the AR Item Flow and add it. Or drag the AR Item Flow from the browser onto the table.
- To add the Conveyed property, click the ellipses, and select the AR.



S Pa	ttern Interaction Stat 🎽 Pattern Interface Contex 🗡 Pattern Interface Contex 🗙 📑 Pattern Interface Contex
()	🔰 🏗 🖟 🖟 🗕 Add New 💳 Add Existing 👕 Delete 🖣 Remove From Table 🕴 🚓 🔹 🏠 🖓 👫 Columns 🕴 📑 Export 😰 🔹
Criteria	
Eleme	ant Tyne: AR Item Flow Scone (ontional): Drag elements from the Model Browser Bxy
#	X Select AR Item Flow
	Select, search for, or create elements Use the List or Tree view to search for an element. To find the element, type a name in the "Search by Name" box. You can also use wildcards (*,?). Click the magnifier icon to select searching for elements by qualified names, or use carnel case.
	Q-
	AR Item Flow[01 Local Pattern::02 Ld
	Image: Second Pattern::02 Logical System Analysis (1 match) Image: AR Item Flow[Device and Converter User >> International Power >> I
	Apply Filter (Ctrl+Space)
	() Single Selection
	OK Cancel Help

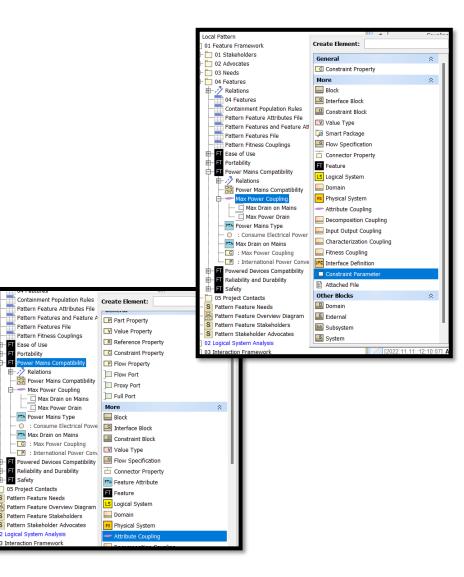
67

#	From Role	To Role	AR	AR PK Rule	AR Internal or External
1	LS Device and Converter User	LS International Power Converter	AR Handles		

Example Pattern Interface Context File ICT5

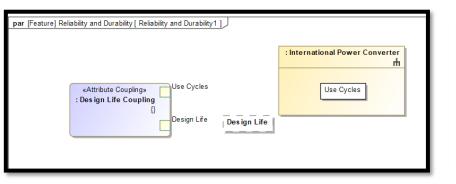
Attribute Couplings

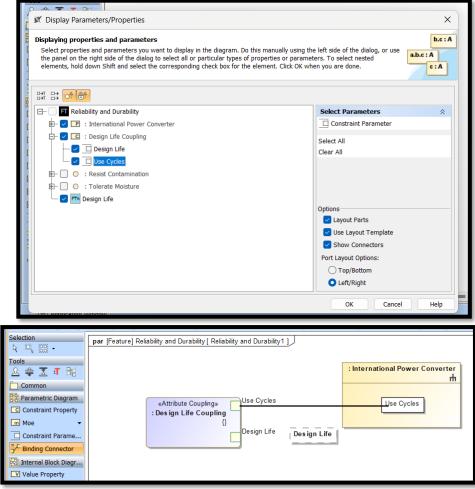
- Attribute Couplings are created under the element that <u>owns</u> them in various packages including Features, Roles, Design Components, and Input-Outputs:
 - A given Attribute Coupling involves multiple Attributes, so which one belongs to the Coupling's owner?
 - Each Coupling drives (in a causality sense) only one Attribute—look there for the Coupling's ownership.
- Use ~Create Element and choose Attribute Coupling.
- Right-click on the new Attribute Coupling, use ~Create Element and choose Constraint Parameter. Give it the same name as the attribute it will be connected to.
- Add the two or more constraint parameters for the coupling(s).



Attribute Couplings

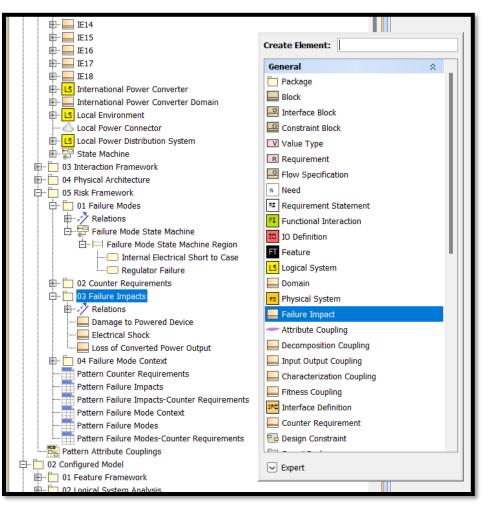
- Right-click on the element that owns the new Attribute Coupling, use ~Create Diagram and choose SysML Parametric Diagram.
- Choose the associated display parameter details as shown in the box to the right.
- View the resulting populated diagram as shown below.
- Create binding connectors from the constraint parameters to the associated attributes as shown in the lower right.





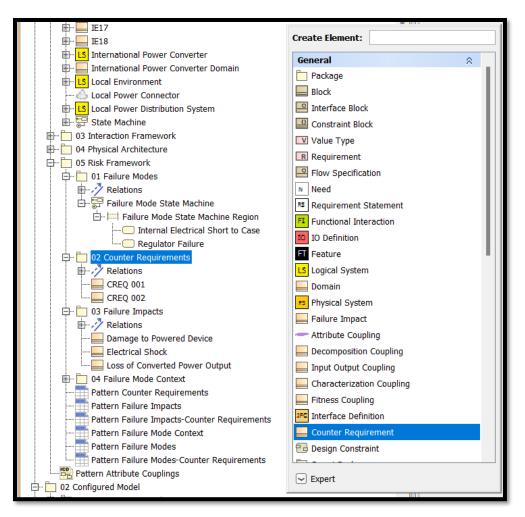
Failure Analysis: Creating Failure Impacts

- Pattern Failure Impacts are created in package 01 Local Pattern::05 Risk Framework::03 Failure Impacts
- Use ~Create Element and choose Failure Impact



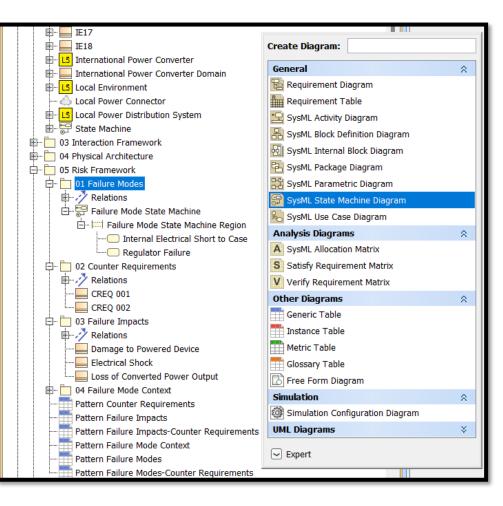
Failure Analysis: Creating Counter Requirements

- Pattern Failure Counter Requirements are created in package 01 Local Pattern::05 Risk Framework::02 Counter Requirements
- Use ~Create Element and choose Counter Requirement



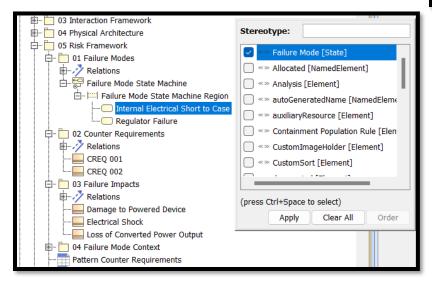
Failure Analysis: Creating Failure Mode State Machine and Failure Modes

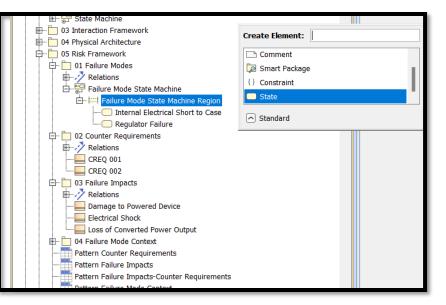
- Pattern Failure Mode State Diagram and Failure Modes are created 01 Local Pattern::05 Risk Framework::01 Failure Modes
- Use ~Create Diagram and choose SysML State Machine Diagram
- Name the Diagram "Failure Mode State Machine".
- Name the Region "Failure Mode State Machine Region".



Failure Analysis: Creating Failure Modes

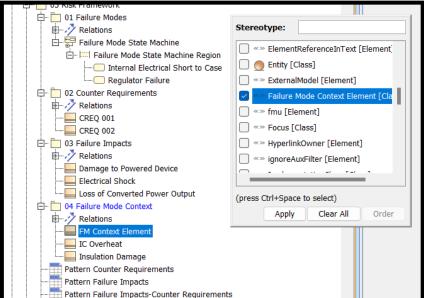
- Right-click the automatically created Region under the State Model and use ~Create Element and choose State. Make sure the menu is expanded to Expert.
- Right-click the newly created State, select Stereotype, and change it to Failure Mode as shown below.

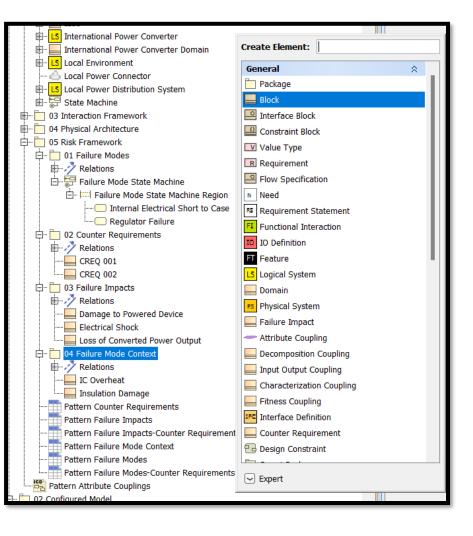




Failure Analysis: Creating Failure Mode Context

- Pattern Failure Mode Context Elements are created in package 01 Local Pattern::05 Risk Framework::04 Failure Mode Context
- Use ~Create Element and choose Block
- Right-Click on the new element, and change stereotype to Failure Mode Context Element





4. Creating S* Pattern Relationships

This section of the guide details the steps for creating formally modeled S* Pattern Relationships (metarelationships) between S* Pattern Classes as mapped and implemented in Cameo Systems Modeler.

Metarelationships: Creating Stakeholder-Feature Relationships

- The simplest way to create relationships is using a matrix.
- Create a Dependency Matrix with Row Type, Row Scope, Column Type, Column Scope, and Dependency Criteria as shown.
- Right-click to create a new Stakeholder-Feature relationship.

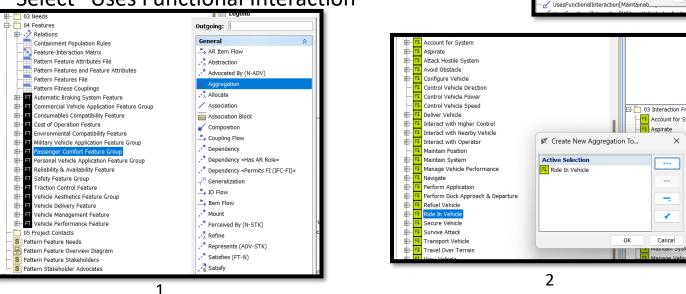
Criteria																			_								
Row Element Type:	Stakeholder) c	olun	nn El	eme	nt Ty	/pe:	Fea	ature	9						
Row Scope:	01 Stakeholders									{}xy					Co	lumr	n Sco	pe:	04	Fea	tures	5					
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Benefits (FTR-ST)	()															<u> </u>	FT	Vehi	cle N i	1ana i	igem	ent	Feat	ure			
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Metarelationships: Creating Feature-Interaction Relationships

- Relationships between Features and Functional Interactions are SysML aggregations.
- Create an Association in which the Feature aggregates the Interaction.
- Add a "Uses Functional Interaction" stereotype to the new Association

Metarelationships: Creating Feature-Interaction Relationships

- 1. Right-Click the Feature, ~Create Relation, Select Outgoing, Choose Aggregation
- 2. Select the related Interaction(s)
- 3. Right-Click the new relationship, ~Stereotype, Select "Uses Functional Interaction"



ger Comfort Feature Group - Ride In Vehicle]

Stereotype:

«» RequiresFeature [Element]

«» Specification [Classifier]

> TODO_Owner [Element]

♀ Stakeholder [Classifier]

«» typeModifier [Element]

(Element)

Apply

Х

» Role Population Rule [Element]

UsesFunctionalInteraction [Association]

Clear All

3

UsesFunctionalInteraction[Accountability Feature - Account for S

UsesFunctionalInteraction[Environme (press Ctrl+Space to select)

✓ UsesFunctionalInteraction[Automatic

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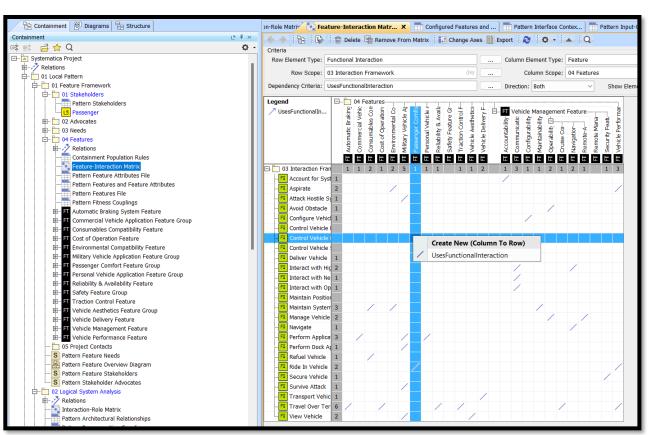
✓ UsesFunctionalInteraction[Environme]

Row Element

Order

Metarelationships: Creating Feature-Interaction Relationships

- The simplest way to create relationships is using a matrix.
- Create a
 Dependency Matrix
 with Row Type,
 Row Scope, Column
 Type, Column
 Scope, and
 Dependency
 Criteria as shown.
- Right-click to create a new Feature-Interaction relationship.



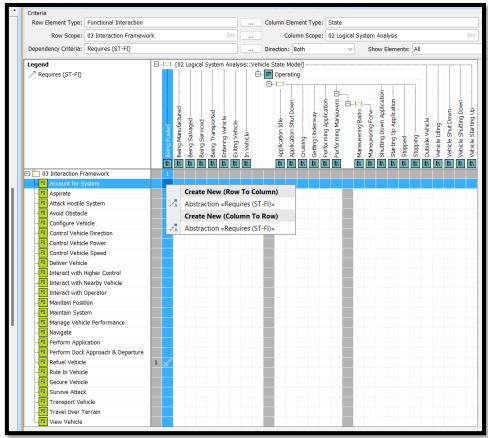
*Note: In Cameo Systems Modeler V19, SysML Aggregation type relationships cannot be <u>entered</u> via matrix, but they can be <u>viewed</u> there.

Other SysML relationship types can be <u>entered</u> and <u>viewed</u> via a matrix.

V2021x supports entering all relationship types via a matrix.

Metarelationships: Creating State-Interaction Relationships

- The simplest way to create relationships is using a matrix.
- Create a
 Dependency Matrix
 with Row Type,
 Row Scope, Column
 Type, Column
 Scope, and
 Dependency
 Criteria as shown.
- Right-click to create a new State-Interaction relationship.



*Note: In Cameo Systems Modeler V19, SysML Aggregation type relationships cannot be <u>entered</u> via matrix, but they can be <u>viewed</u> there.

Other SysML relationship types can be <u>entered</u> and <u>viewed</u> via a matrix.

V2021x supports entering all relationship types via a matrix.

Metarelationships: Creating Interaction-Role Relationships

- Relationships between Functional Interactions and Logical Systems are SysML aggregations.
- Create an Association in which the Interaction aggregates the Logical System.
- Add a "Has Role" stereotype to the new Association

Metarelationships: Creating Interaction-Role Relationships

- The simplest way to create relationships is using a matrix.
- Create a
 Dependency Matrix
 with Row Type,
 Row Scope, Column
 Type, Column
 Scope, and
 Dependency
 Criteria as shown.
- Right-click to create a new Interaction-Role relationship.

	nteraction-Role Matrix 🗴 📑 Feat	ture-In	ntera	ction N	Matr		Co	onfig	ured	Feat	ures	and	I I		Patt	ern i	Inter	rface	e Co	ntex			Patt	ern I	nput	Out	put /	Att	Ĩ	Pa	attern	n Inte	erfac	e Co	nt
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F	Aspirate	2										/											/												
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	Interact with Nearby Vehicle	1										/	1	Asso	ociat	ion	«На	asRo	ole»	»															
	Interact with Operator	1																			.														
	Maintain Position													Crea							KOV	v)													
	I Maintain System	3										/		Asso	ociat	ion	«На	asRo	ole×	•															
	I Manage Vehicle Performance	2										-						/					/												
	Navigate	2					1										1	·					1												
	Perform Application	2		/			1																1												
				· .	,																		1												
	Perform Dock Approach & Departure	2		/							_												4												
	Refuel Vehicle	2																		/			1												
	I Ride In Vehicle	4																	/				/												

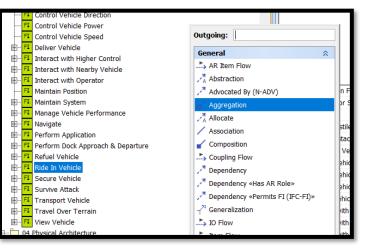
*Note: In Cameo Systems Modeler V19, SysML Aggregation type relationships cannot be <u>entered</u> via matrix, but they can be <u>viewed</u> there.

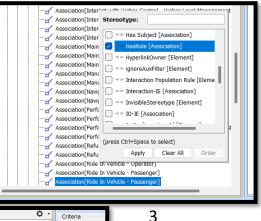
Other SysML relationship types can be <u>entered</u> and <u>viewed</u> via a matrix.

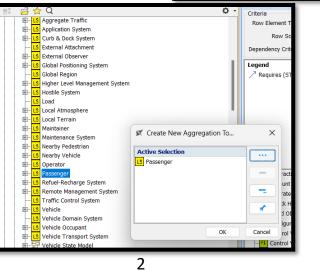
V2021x supports entering all relationship types via a matrix.

Metarelationships: Creating Interaction-Role Relationships

- 1. Right-Click the Interaction, ~Create Relation, Select Outgoing, Choose Aggregation
- 2. Select the related Role(s)
- 3. Right-Click the new relationship, ~Stereotype, Select "Has Role"

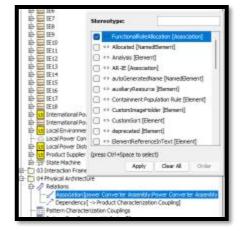




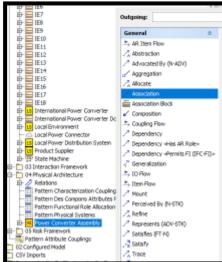


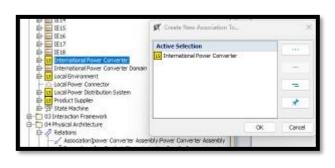
Creating Functional Role Allocations (Role-Design)

- Relationships between Design Components (Physical Systems) and Logical Systems are SysML Associations.
- 2. Create an Association in which the Design Components (Physical System) aggregates the Logical System.
- 3. Add a "Functional Role Allocation" stereotype to the new Association

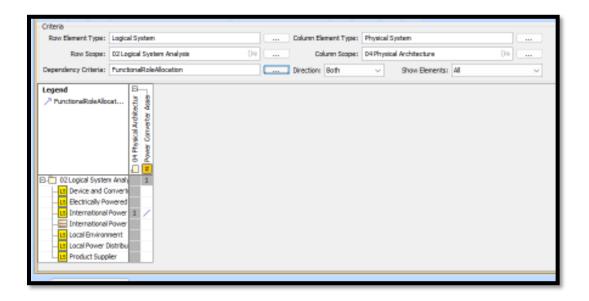








Metarelationships: Creating Functional Role Allocations (Role-Design)



*Note: In Cameo Systems Modeler V19, SysML Aggregation type relationships cannot be <u>entered</u> via matrix, but they can be <u>viewed</u> there.

Other SysML relationship types can be <u>entered</u> and <u>viewed</u> via a matrix.

V2021x supports entering all relationship types via a matrix.

Metarelationships: Creating Failure Analysis Relationships—Impacts Feature

- Create a Dependency relationship with the Failure Impact as the Source and the Feature as the Target.
- Add a "Impacts Feature" stereotype to the new relationship

nation	al Power Conv 📑 Pattern Feature	s-Interac Pattern Failure Impacts 🗙	Pattern Counter Re	equirem 📑 Pattern F	ailure Impacts 🛅 Patter
+	🔶 📴 🚱 💻 Add New 💳	Add Existing 🍵 Delete 🖷 Remove From T	Table 🕴 📑 🕈 🕇 🖡 👖	🖡 Columns 📄 Export	🛛 - 🏾 🕹 🔷 - 🔺
Crite	eria				
Ele	ement Type: Impacts Feature	Scope (optional): ted Power Output -> R	eliability and Durability]	xy Filter: 🕎
#	Feature	Failure Impact	 Feature PK Value Rule 	Failure Impact PK Value Rule	 Severity
1	FT Powered Devices Compatibility	Damage to Powered Device	*ANY*	FPK	Serious
2	FT Safety	Electrical Shock	*ANY*		Severe
3	FT Reliability and Durability	Loss of Converted Power Output	*ANY*	FPK	Serious

Example Pattern Failure Impacts Table

Metarelationships: Creating Failure Analysis Relationships—Causes Impact

- Create a Dependency relationship with the Counter Requirement as the Source and the Failure Impact as the Target.
- Add a "Causes Impact" stereotype to the new relationship

nat	tion	al Power Conv 🔲 Pat	ttern Features-Interac 📑 Pattern	Failure I	impacts	Pattern (Counter Requir	em., 📄 Pa	ttern Failu	re Impa	cts	×
		He Image Image	Add New 📥 Add Existing 🍵 Delet	te 🖶 R	Remove From	Table	et • 🕈 🖣	Columns	Expo	ort 🛐	- 2)
C	rite	eria										
	Elei	ment Type: Causes Impa	ct .	s	cope (option	al): Drag	elements from	the Model Bro	wser	{}xy		Filte
;	#	Counter Requirement Name	Failure Impact									
	1	CREQ 001	Electrical Shock									
:	2	CREQ 002	Damage to Powered Device									

Example Pattern Failure Impacts-Counter Requirements Table

Metarelationships: Creating Failure Analysis Relationships— Replaces

- Create a Dependency relationship with the Counter Requirement as the Source and the Requirement as the Target.
- Add a "Replaces" stereotype to the new relationship.

ation	al Power Conv Pattern Features-Inter	ac Pattern Failure Impacts Pat	ttern Counter Requirem 🗙 📑 Patter	m Failure Impacts Tim Pattern Failure Mo	de Con 📄 Pattern Failure Modes 🖣 🕨								
+	🔶 i 😰 i 🚱 i — Add New 👄 Add E	xisting 🍵 Delete 🆷 Remove From Tabl	le 📑 🕂 - 🛧 🕂 Columns 📄 Exp	oort 🛐 - 😥 🔯 - 🔺 📃 -	Q D -								
Crite	Criteria												
Ele	Element Type: Replaces Scope (optional): Drag elements from the Model Browser ()xy Filter: 🕎												
#	Requirement Name	Counter Requirement Name	Counter Requirement Statement	RSPK Value Rule	O Counter Requirement PK Value Rule								
1	RS REQ 005	CREQ 001	The system presents a shock hazard to users when operated according to its instructions.	*ANY*	RSPK								
2	RS REQ 006	CREQ 002	The system generates Output Power to attached Electrically Powered Devices which exceeds the [Output Voltage-Power Profile].	*ANY*	RSPK								

Example Pattern Counter Requirements Table

Metarelationships: Creating Failure Analysis Relationships—Causes Behavior

- Create a Dependency relationship with the Failure Mode as the Source and the Counter Requirement as the Target.
- Add a "Causes Behavior" stereotype to the new relationship.

hal Po	ower Conv Tim Pattern Features-Interac Tim Pattern Failure Impacts Tim Pattern Counter Requirem T	Pattern Failure Impacts 📑 Pattern Failure Mode Con., 🔁 Pattern Failure Modes-Co 🗙 🚺												
÷	🔶 🗄 🏤 🗄 🛶 Add New 👄 Add Existing 👕 Delete 📑 Remove From Table 🕴 🛤 🔹 🏠 🚽	👖 Columns 📄 Export 🛐 🔹 😥 🔹 🔺 📳 🔹 📿 🗁 🗸												
Crite	ria													
Elei	Element Type: Causes Behavior Scope (optional): Drag elements from the Model Browser ()xy Filter: 🕎													
#	Failure Mode	Counter Requirement Name												
1	C Regulator Failure	CREQ 002												
2	Internal Electrical Short to Case	CREQ 001												

Example Pattern Failure Modes-Counter Requirements Table

Creating Failure Analysis Relationships—Abnormal State Of

- Create a Dependency relationship with the Failure Mode as the Source and the Design Component as the Target.
- Add a "Abnormal State Of" stereotype to the new relationship.

ern F	Features-Interac 🛅 Pattern Failure Impac	cts 📑 Pattern Counter Requirem 📑 F	Pattern Failure Impacts 📑 Pattern Failur	e Mode Con 📑 Pattern Failure Modes-C	0 Pattern Failure Modes 🗶 🌗									
*	🔶 i 📴 i 🚱 i — Add New 📥 Add B	Existing 🍵 Delete 📲 Remove From Tabl	le 🗄 👫 🔹 👚 🕂 🕂 Columns 🕴 🖹 Exp	oort 🛐 - 😥 🔅 - 🔺 🔚 -	Q									
Crit	Criteria													
Ele	Element Type: Abnormal State Of Scope (optional): Drag elements from the Model Browser (xy) Filter: 🕎													
#	O DCPK Value Rule	Probability	O FMPK Value Rule	Design Component	Failure Mode									
1	*ANY*	0.0002	CRPK	PS Power Converter Assembly	C Regulator Failure									
2	*ANY* 0.0003 DCPK Is Power Converter Assembly Internal Electrical Short to Case													

Example Pattern Failure Modes Table

Creating Failure Analysis Relationships—Provides Failure Mode Context

- Create a Dependency relationship with the Failure Mode Context Element as the Source and the Failure Mode as the Target.
- Add a "Provides Failure Mode Context" stereotype to the new relationship.

onv	Pattern Features-Interac	Pattern Failure Impact	Pattern Counter Requirem	Pattern Failure Impact	s Pattern Failure M	Iode Con 🗙 📑 Patteri	n Failure Modes-Co 🏾 📰 P	attern Failure Modes 🖣 🖡						
+	🔶 📴 🚱 💳 Add Ne	w ᄅ Add Existing 🍵 De	lete 📲 Remove From Table 📕	🗧 🛉 🦊 📙 Columns	🗎 Export 🛐 🔹 💫	🕸 - 🔺 🔳 - Q								
Crite	Criteria													
Ele	Element Type: Failure Mode Context Element Scope (optional): Drag elements from the Model Browser													
#	Context Element Name	Failure Mode	Interaction	Causes	Mitigates	O Prevents	 Detects 	O Predicts						
1	IC Overheat	Regulator Failure	FI Assemble Product	1										
2	Insulation Damage	Internal Electrical Short t	FI Convert Electrical Power	1										

Example Pattern Failure Mode Context Table

Creating Failure Analysis Relationships—Provides Failure Context

- Create a Dependency relationship with the Failure Mode Context Element as the Source and the Interaction as the Target.
- Add a "Provides Failure Context" stereotype to the new relationship.

onv	Pattern Features-Interac	Pattern Failure Impact	Pattern Counter Requirem	Pattern Failure Impact	s Pattern Failure M	Iode Con 🗙 📑 Patteri	n Failure Modes-Co 🔲 P	attern Failure Modes 🔍 🗘						
*	🔶 📴 🚱 💳 Add Ne	w ᄅ Add Existing 🍵 De	lete 📲 Remove From Table 📕	🔹 🔶 🦊 💾 Columns	🗎 Export 🛐 🔹 🔗	🕸 - 🔺 🔳 - Q								
Crite	Criteria													
Ele	Element Type: Failure Mode Context Element Scope (optional): Drag elements from the Model Browser (bx) Filter: 🕎													
#	Context Element Name	Failure Mode	Interaction	Causes	Mitigates	O Prevents	 Detects 	O Predicts						
1	IC Overheat	Regulator Failure	FI Assemble Product	1										
2	Insulation Damage	Internal Electrical Short t	FI Convert Electrical Power	1										

Example Pattern Failure Mode Context Table

5. Creating S* Pattern Configuration Rules

This section of the guide details the steps and rules that govern when and how certain pattern metaclasses are to be automatically populated by the Configuration Wizard during Pattern Configuration based on the population of another metaclass(es), using the metarelationships and details described in this section.

Population Rules: Editing Interaction Population Rules

- The "Pattern Feature Interactions" table under the Interaction Framework package allows the user to edit the Interaction Population Rules
- The values in the FPK Value and IPK Rule columns govern when and how Interactions are populated based on which Features have been populated.
- The FPK Value may be blank, *ANY*, or <constant> and helps decide if an Interaction should be populated
- The IPK Rule may be blank, FPK, /<constant>/, or FPK+/<constant>/ and describes how to generate the IPK Value of the Interaction to be populated.
- An IPK Rule of *ANY* will tell the Configuration Agent not to populate an Interaction but to populate a relationship between the Feature and Interaction if they are both populated from other population rules.
- A detailed list of Population Rules is in the Metamodel document reference.

#	Feature	FPK Value	Interaction	IPK Rule
1	Ease of Purchase		Purchase Device	
2	Ease of Use		Display Status and Information	
3	Ease of Use		Handle Device	
4	Environmentally Friendly		Recycle Device	
5	Portability		Handle Device	
6	Power Mains Compatibility		Consume Electrical Power	
7	Powered Devices Compatibility	*ANY*	Convert Electrical Power	FPK
8	Powered Devices Compatibility	*ANY*	Set Configuration	FPK
9	Reliability and Durability		Resist Contamination	
10	Reliability and Durability		Tolerate Moisture	
11	Reliability and Durability		Provide Warranty Data	
12	Safety	*ANY*	Handle Device	

Population Rules: Editing State Population Rules

- The "Pattern Interactions-States" table under the State Machine allows the user to edit the State Population Rules
- The values in the IPK, RPK, and State PK Value Rule columns govern when and how States are populated based on which Interactions and Roles have been populated
- A detailed list of Population Rules is in the Metamodel document reference.

#	State	Interaction	○ IPK	Logical System	O RPK	State PK Value Rule	🔿 State Type
1	হা Operating	FI Convert Electrical Power	*ANY*	LS International Power Converter	*ANY*	IPK	Simple
2	ज Being Purchased	FI Purchase Device		LS International Power Converter	*ANY*		Simple
3	ज्ञ Being Recycled	FI Recycle Device		LS International Power Converter	*ANY*		Simple
4	ज In Service	FI Consume Electrical Power		LS International Power Converter	*ANY*		Simple
5	ज्ञ In Service	FI Display Status and Information		LS International Power Converter	*ANY*		Simple
6	ज In Service	FI Handle Device		LS International Power Converter	*ANY*		Simple
7	ज्ञ In Service	FI Resist Contamination		LS International Power Converter	*ANY*		Simple
8	ज्ञ In Service	FI Set Configuration	*ANY*	LS International Power Converter	*ANY*		Simple
9	ज्ञ In Service	FI Tolerate Moisture		LS International Power Converter	*ANY*		Simple
10	ज Being a Warranty Record	FI Provide Warranty Data		LS International Power Converter	*ANY*		Simple
11	ज्ञ Off	FI Convert Electrical Power	*ANY*	LS International Power Converter	*ANY*	IPK	Empty
12	ज Initial IPC	FI Purchase Device		LS International Power Converter	*ANY*		Initial
13	ज्ञ Terminal IPC	FI Recycle Device		LS International Power Converter	*ANY*		Terminal

Population Rules: Editing State Population Rules, Continued

- The "Pattern States-Transitions, Events" table under the State Machine allows the user to edit the Transition, Event Population Rules
- The values in the From State PK Matching Rule, To State PK Matching Rule, Interaction, Transition PK Value Rule, and Event PK Value Rule columns govern when and how Transitions and Events are populated based on which Interactions and States have been populated.
- A detailed list of Population Rules is in the Metamodel document reference.

#	From State	To State	Event	Interaction	Transition Type	Join Transition Name	○ Transition PK Value Rule	🚫 Event PK Value Rule	From State PK Matching Rule	O To State PK Matching Rule
1	ज Off	ज्ञ Operating	Turn On Request	FI Set Configuration	Simple			IPK	EPK	EPK
2	ज्ञ Off	ज्ज Being Recycled	Start Retirement	FI Recycle Device	Join	Wait for Retire			*ANY*	*ANY*
3	5 Operating	ज Off	Turn Off Request	FI Set Configuration	Simple			IPK	EPK	EPK
4	🛱 Being Purchased	🗊 Being a Warranty Record	Device Purchased	FI Purchase Device	Fork				*ANY*	*ANY*
5	🛱 Being Purchased	डा Off	Device Purchased	FI Purchase Device	Fork				*ANY*	*ANY*
6	🗊 Being a Warranty Record	🚔 Being Recycled	Complete Retirement	FI Recycle Device	Join	Wait for Retire			*ANY*	*ANY*
7	ज्ञ Initial IPC	ज्ञ Being Purchased	Request Purchase	FI Purchase Device	Simple				*ANY*	*ANY*
8	ज्ञ Being Recycled	ST Terminal IPC	Recycling Completed	FI Recycle Device	Simple				*ANY*	*ANY*

Population Rules: Editing Role Population Rules

- The "Pattern Interaction Roles" table under the Interaction Framework package allows the user to edit the Role Population Rules
- The values in the IPK Value and RPK Rule columns govern when and how Logical Systems are populated based on which Interactions have been populated.
- The IPK Value may be blank, *ANY*, or <constant> and helps decide if a Logical System should be populated.
- The RPK Rule may be blank, IPK, /<constant>/, or IPK+/<constant>/ and describes how to generate the RPK Value of the Logical System to be populated.
- A detailed list of Population Rules is in the Metamodel document reference.

#	△ Interaction	IPK Value	Logical System	O RPK Rule
1	Consume Electrical Power	*ANY*	International Power Converter	
2	Consume Electrical Power	*ANY*	Local Power Distribution System	
3	Convert Electrical Power	*ANY*	Electrically Powered Device	IPK
4	Convert Electrical Power	*ANY*	International Power Converter	
5	Convert Electrical Power	*ANY*	Local Environment	
6	Display Status and Information	*ANY*	International Power Converter	
7	Display Status and Information	*ANY*	Device and Converter User	
8	Handle Device	*ANY*	International Power Converter	
9	Handle Device	*ANY*	Device and Converter User	
10	Provide Warranty Data	*ANY*	Product Supplier	
11	Provide Warranty Data	*ANY*	Device and Converter User	
12	Purchase Device	*ANY*	Device and Converter User	
13	Purchase Device	*ANY*	International Power Converter	
14	Recycle Device	*ANY*	Product Supplier	
15	Recycle Device	*ANY*	International Power Converter	
16	Recycle Device	*ANY*	Local Environment	
17	Resist Contamination	*ANY*	International Power Converter	
18	Resist Contamination	*ANY*	Local Environment	
19	Set Configuration	*ANY*	International Power Converter	
20	Set Configuration	*ANY*	Device and Converter User	
21	Tolerate Moisture	*ANY*	International Power Converter	
22	Tolerate Moisture	*ANY*	Local Environment	

Population Rules: Editing Requirement Population Rules

- The "Pattern Requirements" table under the Interaction Framework package allows the user to edit the Requirement Population Rules
- The values in the IPK Value, RPK Value, and RSPK Rule columns govern when and how Requirement Statements are populated based on which Interactions and Logical Systems have been populated.
- The IPK Value may be blank, *ANY*, or <constant> and helps decide if a Requirement Statement should be populated.
- The RPK Value may be blank, *ANY*, or <constant> and helps decide if a Requirement Statement should be populated.
- The RSPK Rule may be blank, IPK, RPK, /<constant>/, or IPK+/<constant>/, or RPK+/<constant>/ and describes how to generate the RSPK Value of the Requirement Statement to be populated.
- A detailed list of Population Rules is in the Metamodel document reference.

Population Rules: Editing Requirement Population Rules

#	Functional Interaction	IPK Value	Functional Role	RPK Value	Req ID	RSPK Rule	Text
1	FI Consume Electrical Power		LS International Power Converter		REQ 001		The system shall consume not more than [Max Drain on Mains] of Input Power from the Local Power Distribution System.
2	FI Convert Electrical Power	*ANY*	LS International Power Converter	*ANY*	REQ 002	ІРК	The system shall provide up to [Max Power Drain] of Output Power to each Electrically Powered Device.
3	FI Convert Electrical Power	*ANY*	LS Electrically Powered Device	*ANY*	REQ 003	ІРК	The system shall not consume more than [Max Power Drain] of Output Power.
4	FI Consume Electrical Power		LS Local Power Distribution System		REQ 004		The system shall provide up to [Max Drain on Mains] of Input Power.
5	FI Handle Device		LS International Power Converter		REQ 005		The system shall not present a shock hazard to users when operated according to its instructions.
6	Convert Electrical Power	*ANY*	LS International Power Converter	*ANY*	REQ 006	IPK	The system shall generate Output Power to attached Electrically Powered Devices which is compatible with the [Output Voltage-Power Profile] and [Output Frequency Profile].

Population Rules: Editing Physical System (Design Component) Population Rules

- The "Pattern Functional Role Allocations" table under the Physical Architecture package allows the user to edit the Physical System (Design Component) Population Rules
- The values in the Configuration Rule and IPPK Value columns govern when and how Physical Systems (Design Components) are populated based on which Logical Systems (Roles) have been populated.
- The Configuration Rule may be blank, *ANY*, or <constant> and helps decide if a Physical System (Design Component) should be populated.
- The IPPK Rule may be blank, RPK, /<constant>/, or RPK+/<constant>/ and describes how to generate the IPPK Value of the Physical System (Design Component) to be populated.
- A detailed list of Population Rules is in the Metamodel document reference.

#	Design Component	O IPPK Value	Role	🔿 Configuration Rule
1	Converter Assembly		International Power Converter	

Population Rules: Table ICT1 Population Rules

- The "Interface Context Table ICT1" under the Local Pattern package allows the user to edit the Interface Context Population Rules
- The values in the Interface PK Rule, IO PK Rule, SOA PK Rule and Port PK Rule columns govern when and how those elements are populated based on which Interactions and Roles have been populated.
- A detailed list of Population Rules is in the Metamodel document reference.

#	System Name	△ Interface Name	Interface PK Rule	Input Output	IO PK Rule	Direction	Port	Port PK Rule	SOA Name	SOA PK Rule	SOA Internal or External
1	LS International Power Converter	Configuration and Information Interface		Configuration Setting		in	CI.1	IFPK	🛆 HMI Buttons		
2	LS International Power Converter	Configuration and Information Interface		Device Status and Information		out	CO.2	IFPK	🛆 HMI Display		
3	LS Local Environment	Contaminant Source Interface		10 Contaminants		out	ENV.1	IFPK	🛆 Airspace Transport System		
4	LS Electrically Powered Device	IFC Device Power Interface		0 Output Power	IPK	in	DPI.1	IFPK	🛆 Device Power Connector	IPK	
5	Local Environment	EMI Receiver Interface		TO EMI		in	ENV.3	IFPK	🛆 EMI Radiation		
6	LS Local Environment	Environment Thermal Sink Interface		IO Heat		in	ENV.4	IFPK	Airspace Convection System		
7	LS International Power Converter	Environmental Interface		10 Heat		in	EN.1	IFPK	🛆 Airspace Convection System		
8	LS International Power Converter	Environmental Interface		TO Contaminants		in	EN.3	IFPK	🛆 Airspace Transport System		
9	LS International Power Converter	Environmental Interface		10 Moisture		in	EN.4	IFPK	🛆 Airspace Transport System		
10	LS International Power Converter	Environmental Interface		IO EMI		out	EN.2	IFPK	🛆 EMI Radiation		
11	LS Device and Converter User	Finger Interface		Configuration Setting		out	UCO.1	IFPK	🛆 HMI Buttons		
12	LS Device and Converter User	IFC Hand Interface		10 Handling Force		inout	UHO.1	IFPK	🛆 Handle		
13	LS International Power Converter	Handling Interface		10 Handling Force		inout	HI.1	IFPK	🛆 Handle		
14	Local Environment	Moisture Source Interface		10 Moisture		out	ENV.2	IFPK	🛆 Airspace Transport System		
15	LS International Power Converter	FC Power Input Interface		10 Input Power		in	PI.1		🛆 Local Power Connector		
16	Local Power Distribution System	Power Mains Interface		Input Power		out	LPO.1	IFPK	🛆 Local Power Connector		
17	LS International Power Converter	Power Output Interface	IPK	0 Output Power	IPK	out	PO.1	IFPK	🛆 Device Power Connector	IPK	
18	LS Device and Converter User	IFC Vision Interface		0 Device Status and Information		in	UC1.1	IFPK	🖒 HMI Display		

Population Rules: Editing Attribute Coupling Population Rules

- The "Pattern Attribute Couplings" table under the Local Pattern package allows the user to edit the Attribute Coupling Population Rules
- The values in the PK column govern when and how Attribute Couplings are populated based on which related driven Attributes have been populated.
- The value in the PK column may be APK<CPK, APK=CPK, CPK<APK, *ANY* or (empty) and helps decide if an Attribute Coupling should be populated.
- A detailed list of Population Rules is in the Metamodel document reference.

#	Coupling Name	Coupling Direction	Attributed Class Name	Metadass of Attributed Class	Port A	Coupling PK Value Rule
1	Product Characterization Coupling	in	PS Power Converter Assembly	Ps Physical System [Class]	Part Number	
2	Max Power Coupling	in	LS International Power Converter	LS Logical System [Class]	Max Power Drain	
3	Max Power Coupling	out	FT Power Mains Compatibility	FT Feature [Class]	Max Drain on Mains	

Population Rules: Editing Failure Impact Population Rules

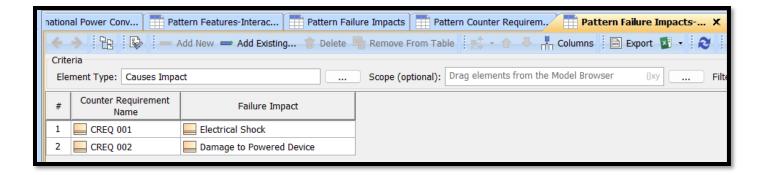
- The "Pattern Failure Impacts" table under the Local Pattern package allows the user to edit the Failure Impact Population Rules
- The values in the PK column govern when and how Failure Impacts are populated based on which related Features have been populated.
- The value in the Failure Impact PK Value Rule column may be FPK, *ANY* or (empty) and helps decide if a Failure Impact should be populated.
- A detailed list of Population Rules is in the Metamodel document reference.

national Power Conv 📑 Pattern Features-Interac. 👘 Pattern Failure Impacts 🗙 📑 Pattern Counter Requirem 📑 Pattern Failure Impacts 📑 Patter						
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Crite	eria					
Element Type: Impacts Feature Scope (optional): ted Power Output -> Reliability and Durability] ()×y Filter: 🕎 •						
#	Feature	Failure Impact	O Feature PK Value Rule	O Failure Impact PK Value Rule	O Severity	
1	FT Powered Devices Compatibility	Damage to Powered Device	*ANY*	FPK	Serious	
2	FT Safety	Electrical Shock	*ANY*		Severe	
3	FT Reliability and Durability	Loss of Converted Power Output	*ANY*	FPK	Serious	

Example Pattern Failure Impacts Table

Population Rules: Editing Causes Impact Relationship Population Rules

- The "Pattern Failure Impacts-Counter Requirements" table under the Local Pattern package allows the user to edit the Causes Impact Population Rules
- The table governs when and how Causes Impact relationships (associating Counter Requirements with the Failure Impacts they cause) are populated based on which related Failure Impacts and Counter Requirements have been populated.
- A detailed list of Population Rules is in the Metamodel document reference.



Example Pattern Failure Impacts-Counter Requirements Table

Population Rules: Editing Counter Requirements Population Rules

- The "Pattern Counter Requirements" table under the Local Pattern package allows the user to edit the Counter Requirement Population Rules
- The values in the PK column govern when and how Counter Requirements are populated based on which related Requirements have been populated.
- The value in the Counter Requirement PK Value Rule column may be RSPK, *ANY*, or (empty) and helps decide if a Counter Requirement should be populated.
- A detailed list of Population Rules is in the Metamodel document reference.

ationa	al Power Conv Pattern Features-Inter	ac Pattern Failure Impacts Pat	tern Counter Requirem 🗴 📑 Patter	n Failure Impacts 📄 Pattern Failure Mo	de Con 🏾 🔛 Pattern Failure Modes 🖣 🕨			
+	🔄 🔶 📴 🗛 🖉 🖛 Add New 😅 Add Existing 👕 Delete 📲 Remove From Table 🛛 🛒 🔹 🎓 🦊 👫 Columns 🗍 🖻 Export 🛐 🔹 🔗 🕴 🌣 🔹 🗮 🗉 📿 👘 🗸							
Crite	ria							
Eler	Element Type: Replaces Scope (optional): Drag elements from the Model Browser							
#	Requirement Name	Counter Requirement Name	Counter Requirement Statement	RSPK Value Rule	O Counter Requirement PK Value Rule			
1	RS REQ 005	CREQ 001	The system presents a shock hazard to users when operated according to its instructions.	*ANY*	RSPK			
2	RS REQ 006	🔜 CREQ 002	The system generates Output Power to attached Electrically Powered Devices which exceeds the [Output Voltage-Power Profile].	*ANY*	RSPK			
				·				

Example Pattern Counter Requirements Table

Population Rules: Editing Causes Behavior Relationship Population Rules

- The "Pattern Failure Modes-Counter Requirements" table under the Local Pattern package allows the user to edit the Causes Behavior Relationship Population Rules
- The table governs when and how Causes Behavior relationships (associating Failure Modes with the Counter Requirements they cause) are populated based on which related Failure Modes and Counter Requirements have been populated.
- A detailed list of Population Rules is in the Metamodel document reference.

nal Po	wer Conv 📑 Pattern Features-Interac 📑 Pattern Failure Impacts 📑 Pattern Counter Requirem	📰 Pattern Failure Impacts 📑 Pattern Failure Mode Con., 🗡 📑 Pattern Failure Modes-Co 🗙 🌗				
+	🔶 📴 📴 — Add New 👄 Add Existing 👕 Delete 📲 Remove From Table 🕴 🛒 - 🛧 🕂 💡	🖣 Columns 📄 Export 🛐 🔹 🔊 🔹 🔺 📳 🔹 📿 🗁 🗸				
Crite	ria					
Eler	Element Type: Causes Behavior Scope (optional): Drag elements from the Model Browser (xy Filter: 🕎					
#	Failure Mode	Counter Requirement Name				
1	C Regulator Failure	CREQ 002				
2	Internal Electrical Short to Case	CREQ 001				

Example Pattern Failure Modes-Counter Requirements Table

Population Rules: Editing Failure Mode Population Rules

- The "Pattern Failure Modes" table under the Local Pattern package allows the user to edit the Failure Mode Population Rules
- The values in the PK column govern when and how Failure Modes are populated based on which Design Components have been populated.
- The value in the FMPK Value Rule column may be CRPK, DCPK, or *ANY*, or (empty) and helps decide if a Failure Mode should be populated.
- A detailed list of Population Rules is in the Metamodel document reference.

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Crite	ria							
Eler	ment Type: Abnormal State Of	Scope (optional):	Drag elements from the Model Browser	8×y Filter: \				
#	O DCPK Value Rule	O Probability	O FMPK Value Rule	Design Component	Failure Mode			
1	*ANY*	0.0002	СКРК	F5 Power Converter Assembly	Regulator Failure			
2	*ANY* 0.0003		DCPK Power Converter Assembly Internal Electrical Short to C					
		·	·		- -			

Example Pattern Failure Modes Table

Population Rules: Editing Failure Mode Context Element Population Rules

- The "Pattern Failure Mode Context" table under the Local Pattern package allows the user to edit the Failure Mode Context Element Population Rules
- The table governs when and how Failure Mode Context Elements are populated based on which related Failure Modes and Interactions have been populated.
- Failure Mode Context Elements relate Interactions to the Failure Modes that they cause, mitigate, prevent, detect, or predict.
- The value in the IPK Rule column may be FMPK, IMPK, CRPK, *ANY*, or (empty) and helps decide if a Failure Mode Context Element should be populated.
- A detailed list of Population Rules is in the Metamodel document reference.

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Ele	Element Type: Failure Mode Context Element Scope (optional): Drag elements from the Model Browser								
#	Context Element Name	Failure Mode	Interaction	O Causes	 Mitigates 	 Prevents 	 Detects 	O Predicts	O IPK Rule
1	IC Overheat	Regulator Failure	FI Convert Electrical Power	1					FMPK
2	Insulation Damage	Internal Electrical Short to Case	FI Assemble Product	1					*ANY*

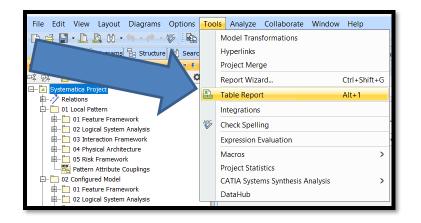
Example Pattern Failure Mode Context Table

6. Exporting and Importing Pattern and Model Data During S* Pattern Configuration

This section of the guide details the steps for (1) Exporting Pattern data from Cameo Systems Modeler into single or multiple output files for consumption by the Configuration Wizard and (2) Importing Configured Model data from the Pattern Configuration Wizard into Cameo Systems Modeler from multiple CSV files. Refer to the diagram on Slide 7 and the Configuration Wizard Guide.

Exporting Pattern Tables Using the Report Wizard

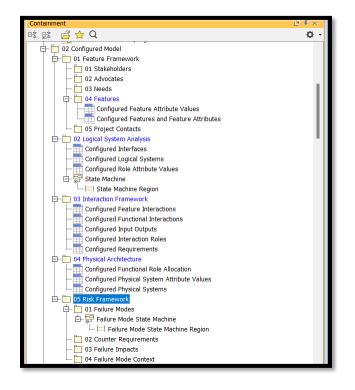
After defining the Export Tables Report as shown in Section 1, it can be invoked by selecting it from the Tools Menu.



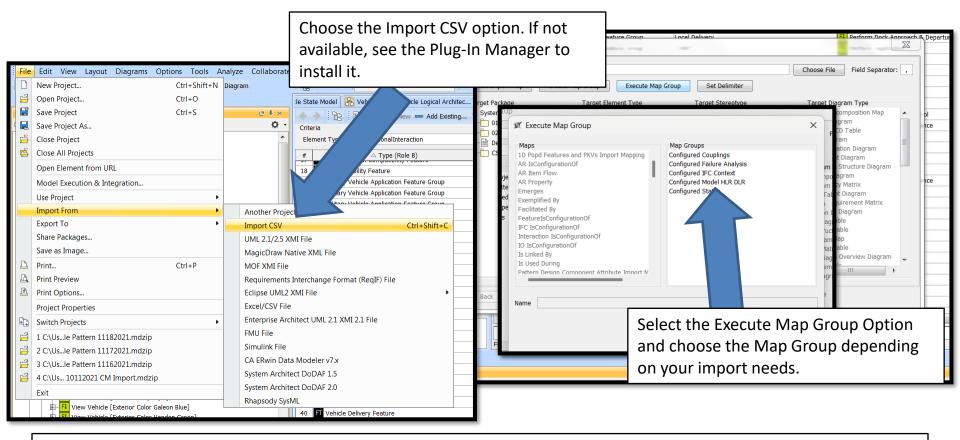
If the Report does not work correctly, refer to Section 1 to define it again.

Emptying the Configured Model Packages Before the Import

Prior to importing a configured model into the repository, any previous model content should be removed from there, leaving the basic framework elements in place. Once it is emptied of previous model data, the empty 02 Configured Model package of the Containment Browser should look like the example shown here. If it contains elements or relations other than what is shown here, those should be deleted, retaining the package structure and tables shown.



Importing the Configured Model Data



-The Configured Model HLR DLR is the first one to select and imports a subset of the entire model including Features, Interactions, Roles, Requirements, and Design Components.

-Configured States includes importing States, Forks/Joins, Events, and Transitions.

-Configured IFC Context includes importing Interfaces, Input-Outputs, Architectural Relationships, Systems of Access, and Ports

-Configured Couplings includes Couplings, Constraint Parameters, and Connectors

-Configured Failure Analysis includes Counter Requirements, Failure Modes, and Failure Impacts

The Configuration Wizard control panel allows for similar configuration grouping choices. (See guide)

Importing the Configured Model Data

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Configured reaction O1 Feature Framework O1 Feature Framework O1 Stakeholders O2 Advocates O3 Needs O4 Features Configured Features and Feature Att O4 Features Configured Features and Feature Att O F Features F Ease of Use F Features F Powered Devices Compatibility F Powered Devices Compatibility [Pow F Powered Devices Compatibility F Dowered Devices Compatibility F S Sete (Electrical Shock) O S Project Contacts Configured Interfaces Configured Role Attribute Values S Device and Converter User S Electrically Powered Device [Power Outp S Electrically Powered Device [Power Outp S Interactional Power Converter S Local Environment S Interactional Power Converter S Local Environment S Product Supplier S State Machine S Product Supplier S State Machine Region O 3 Interaction Framework F Powered S Relations	1 0
Configured Feature Interactions Configured Functional Interactions Configured Input Outputs Configured Interaction Roles	See the Notifications Window for the CSV Import log details. The details are
Configured Requirements Consume Electrical Power Convert Electrical Power [Power Output Convert Electrical Power [Power [Power Output Convert Electrical Power [Power [Power Output Convert Electrical Power [Power [Pow	only displayed after the entire import is completed.

FI Resist Contamination