

SAIC Digital Engineering Profile Definition for Rhapsody

Version 2.7

17 May 2023

This presentation consists of SAIC general capabilities information that does not contain controlled technical data as defined by the International Traffic in Arms (ITAR) Part 120.10 or Export Administration Regulations (EAR) Part 734.7-11.

Contents

Profile Summary 1

Assumptions..... 1

Goals..... 1

Validation Rules 2

Profile Contents and Settings..... 3

Profile Property Settings 3

Stereotypes, Tags and Queries..... 3

Copyright and Legal..... 5

Note: This user manual presumes the profile is already successfully added to your SysML model. Please see the installation procedure for instructions on adding the profile to your model.

Profile Summary

The SAIC Solutions and Technology Group is providing this SysML profile (in Rhapsody format) as a courtesy to the worldwide systems modeling and engineering community. It is our hope that it will improve model quality, demonstrate state-of-the-art validation techniques, and stimulate discussion about best practices.

Please see the model itself for licensing terms. Note that example models, explanatory videos, and other relevant content will be provided as this effort continues.

Digital Engineering: <http://www.saic.com/digital-engineering>

Contact Us: DigitalEngineering@saic.com

MBSE Jobs at SAIC: <https://jobs.saic.com/pages/mbse>

Assumptions

- General Disclaimer: We do ***NOT*** claim that someone not fully conformant to our rules is “doing SysML wrong.” The rules represent an attempt to guide model development where multiple choices are available to ensure that a team of modelers always makes the SAME choice. This creates model consistency that is essential for leveraging the power and efficiency of tools used to analyze the technical content in the model and validate its internal integrity.
- Rhapsody and SysML are the focus of this initial effort. Do NOT use UPDM or UAF profiles with this model
- No validation rules are based on the model package’s structure (although we do recommend a structure in an example model that was released in 2021)

Goals

- Maximize the modeling effort *effectiveness* by enabling large teams to build models with consistent style and internal integrity
- Maximize the modeling effort *efficiency* by minimizing the number of elements and relationships needed to rigorously describe the system (get the most value with the fewest “clicks”)
- Rely on data rather than diagrams (although building many diagrams may be part of creating the data)
- Allow redefinition and traceability between architectures (behavioral, logical, physical)
- Accommodate the use of non-textual requirements (i.e. making model elements contractual)
- Accommodate reasonable program variation
- Leverage automation whenever possible to ensure style guide compliance and increase model integrity

Note: This profile and associated validation rules have been tested against a number of models (both public and proprietary) to ensure they function as intended. If you detect false positives or false negatives in your use of the profile, please relay that information to us so we may correct the validation logic. Any and all comments (including feedback on their usefulness or suggestions for additional rules) are welcome.

Validation Rules

SAIC's validation rules are invoked when adding the *SAIC_DE_ToolkitProfile.sbsx* file is added to your SysML model. Once the profile is added the engineer can select the set of Validation Rules to enforce using Rhapsody's built in Model Checker GUI. See the *SAIC DE Toolkit User Manual*, which was included as part of the installation files for how to set and run the Validation Rules.

The Validation Rules are grouped into several domains based on the rules criteria. **Table 1** below lists the DE rule domains.

DE Rule Domains
Activity Diagram Integrity
Model Completeness
DE Profile Validation Rules
Flow Integrity
Forbidden Elements
Interface Integrity
Parametric Element Integrity
Requirements
Sequence Diagram Integrity
State Machine Integrity
Structural Integrity
System Context Integrity
Use Case Integrity

Table 1: DE Validation Rule Domains

For a full list of rules in each domain and their definitions see the file *SAIC DE Validation Rules V2.7 for Rhapsody*, which was included as part of the installation files.



SAIC DE Validation
Rules V2.5 for Rhapsody

Profile Contents and Settings

The SAIC DE Toolkit Profile has additional content and settings beyond the Validation Rules.

Figure 1 shows the content of the Profile. It also contains common queries used to filter the model browser to find diagrams of interest.

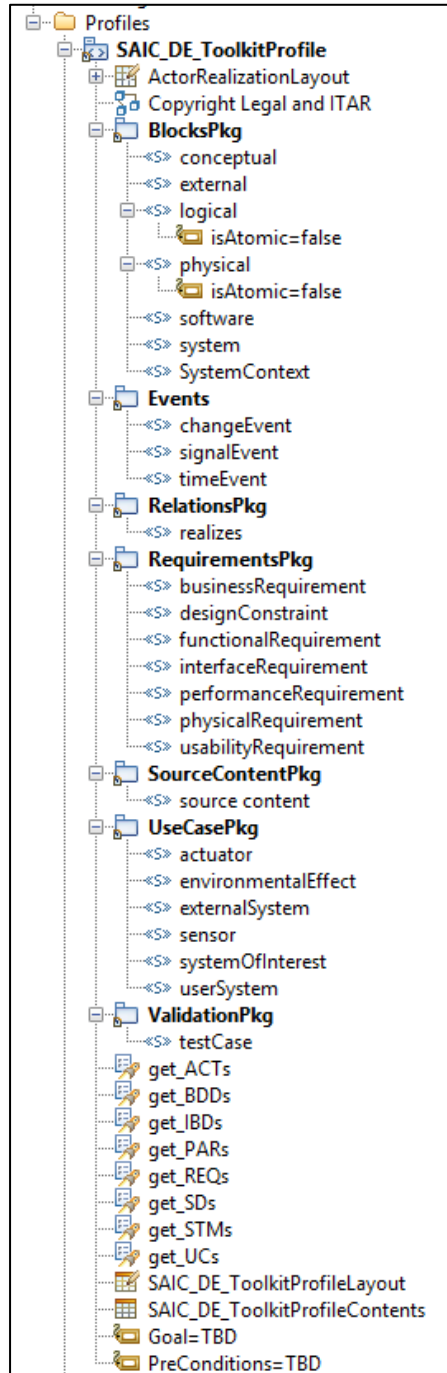


Figure 1: Profile Contents

Profile Property Settings

The profile is “globally applied”, meaning that once added to your SysML model, the property settings of the profile apply to the model itself. **Figure 2** shows the properties that are modified by the profile. Of note, the *Model>Profile>Additional Helpers File* property contains the location (relative location) of the *.hep file. This property setting tells Rhapsody where to find the Validation Rule checkers. **Do not** change these settings or the Validation Rules will not work.

Stereotypes, Tags and Queries

Stereotypes are grouped into packages based on the permissible metaclass applications. **Figure 3** (next page) shows the definition of the profile contents.

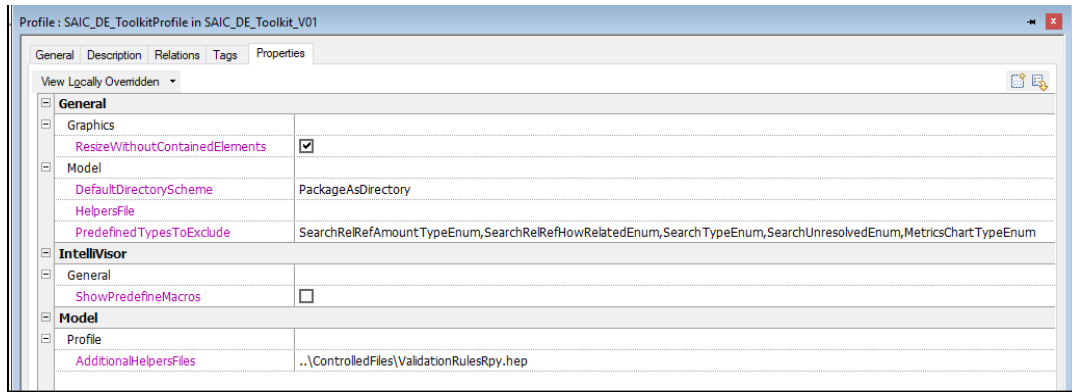


Figure 2: Profile Property Modifications














Found 39 elements		
Element t...	Name	Description
Query	 get_BDDs	Queries on all the Block Definition Diagrams in the model.
Query	 get_UCs	Queries on all use cases and Use Case diagrams in the model.
Query	 get_ACTs	Queries on all the Activity Diagrams in the model.
Query	 get_STMs	Queries on all the State Machine Diagrams in the model.
Query	 get_IBDs	Queries on all the Internal Block Diagrams in the model.
Query	 get_SDs	Queries on all the Sequence Diagrams in the model.
Query	 get_PARs	Queries on all the Parametric Diagrams in the model.
Query	 get_REQs	Queries on all the Requirement Diagrams in the model.
Stereotype	<> signalEvent	Event that represents a signalEvent
Stereotype	<> logical	Block that represents a logical construct.
Stereotype	<> software	Block that represents a software construct.
Stereotype	<> external	Block that is external to the system under development. With this profile, it should be applied to blocks within the system context hierarchy that type parts the realize actors.
Stereotype	<> conceptual	Block that represents the system level of abstraction for the system under development.
Stereotype	<> system	Block that represents the system level of abstraction for the system under development.
Stereotype	<> realizes	Dependency that shows the source element realizes (i.e., expands, defines, etc..) the target element.
Stereotype	<> systemOfInterest	Actor that represents the System of Interest aka, the system under development.
Stereotype	<> changeEvent	Event that represents a changeEvent.
Stereotype	<> physicalRequirement	Requirement that specifies physical characteristics and/or physical constraints of the system, or a system part.
Stereotype	<> usabilityRequirement	Requirement about usability.
Stereotype	<> testCase	Block, Activity Diagram or Operation that represents a test case.
Stereotype	<> physical	Block that represents a physical construct.
Stereotype	<> externalSystem	Actor that represents and external system rather than human.
Stereotype	<> designConstraint	Requirement that specifies a constraint on the implementation of the system or system part, such as the system must use a commercial off the shelf component.
Stereotype	<> functionalRequirement	Requirement that specifies an operation or behavior that a system, or part of a system, must perform.
Stereotype	<> SystemContext	Block that represents the System Context including actors and environment.
Stereotype	<> performanceRequirement	Requirement that quantitatively measures the extent to which a system, or a system part, satisfies a required capability or condition.
Stereotype	<> source content	Requirement or Hyperlink that represents source content outside of the model.
Stereotype	<> interfaceRequirement	Requirement that specifies the ports for connecting systems and system parts and optionally may include the item flows across the connector and/or Interface constraints.
Stereotype	<> environmentalEffect	Actor that represents environmental effects on the system.
Stereotype	<> sensor	Actor that represents a sensor acting on the system.
Stereotype	<> userSystem	Actor that represents a user system.
Stereotype	<> timeEvent	Event that represents a time event.
Stereotype	<> actuator	Actor that represents and acutaactor that interacts with the system.
Stereotype	<> businessRequirement	High-level business requirement.
Tag	 Selected_Query_From	
Tag	 Goal	Goal of the Use Case.
Tag	 isAtomic	Indicates if a <logical> block is at its lowest level of decomposition in the model.
Tag	 PreConditions	Pre-Conditions for the Use Case.
Tag	 isAtomic	Indicates if a <physical> block is at its lowest level of decomposition in the model.

Figure 3: SAIC DE Toolkit Profile Content Definitions

Copyright and Legal

SAIC DE Toolkit Profile

SAIC Digital Engineering Toolkit Profile Copyright (c) 2023 SAIC

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

SAIC Validation Rules

SAIC Digital Engineering Validation Rules Copyright (c) 2023 by SAIC

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.