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Designing for adaptability and evolution in system of systems engineering

# Implementation of the Goal and Contract Specification Language

D\_6.4.2

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# 1 Introduction

The GCSL Editor allows the user to create and modify/refine GCSL statements in Rhapsody UPDM models. The Editor interacts with Rhapsody via an OSLC interface.

This document is an update of the previous D6.4.1 report and it is used as part of the tool documentation. Therefore only the section 3 differs from the previous report.

#### 1.1 Installation / Pre-requisites

The following programs are required to run the tools contained in the installer bundle:

- 1. Java JRE: http://www.oracle.com/technetwork/java/javase/downloads/index.html
- 2. IBM Rational Rhapsody 8.0
- 3. DANSE Profile for Rhapsody

#### **1.2 Installation Notes**

Launch the installer bundle to perform the installation. If there is a previous installation, it is strongly recommended to run the uninstaller when prompted. If any of the prerequisites are missing, a message box should indicate so. The default installation options are recommended.

#### 1.3 How to obtain a License

The tools in this bundle use a personalized license mechanism. The tools are not useable without a license. To obtain a license, please send a request with the following information to: <u>danse-support@danse-ip.eu</u>.

The installed tool will check the license on each start and if the license is not found or is not valid the window as in Figure 1-1 opens including the required information for the license request.

GCSL Editor			
Lice	nse check failed		
Please fill in this f If you already ha	orm and contact OFFIS to obtain a licence. ave a license, click button below.		
Information —			
Name:			
Company:	Enter your company's name here		
E-Mail:	Enter your e-mail address here		
MAC address:	00-C1		
Volume ID:	90D		
Version:	1.0.0		
Load license file Save as .txt Send E-Mail			

Figure 1-1: License Check Tool





# 2 Using the Tool

### 2.1 Create a Contract in Rhapsody

- 1. Open a UPDM 2.0 Rhapsody model
- 2. Add the DANSE Profile for Rhapsody to the model (see Figure 2-1)
- 3. Open a diagram view (e.g. a SV-1 System Interface Description) and add a Constraint (Drawing ToolBar Common) to the view (see Figure 2-2)
- 4. Open the Feature Dialog of the new Constraint and add the GCSL stereotype
- 5. Open the Tags tab in the Feature Dialog and edit the contract/goal (see Figure 2-3)



Figure 2-1: UPDM 2.0 and DANSE Profile



Implementation of the Goal and Contract Specification



Language



Figure 2-2: Add a Constraint to View

Standard Standard System Vi System Vi System Constru- Ger Ger Ger	arrise         arrise           dardsViewPkg         iew Pkgs           emViewPkg         onstraints           b) «GCSL» No_0         b) «GCSL» No_1           b) «GCSL» No_3         isopher           raint : No_3 in System         ineral	ViewPkg	化) Etoba(Mean oity area 化) Etoba(The fire is stop) 化)
	GCSL		
	GCSL		
G	Assumption	Always(true)	
G	GCSL_ID	0	
	Guarantee		
	ame:ate OK Ap	Value: Add	

Figure 2-3: Rhapsody Constraint





#### 2.2 Create a Contract in the GCSL Editor

- 1. Open a UPDM 2.0 Rhapsody model
- 2. Add the DANSE Profile for Rhapsody to the model (see Figure 2-1)
- 3. Start the OFFIS OSLC Server for Rhapsody and the GCSL Editor (Figure 2-4)
- 4. Via "New Contract" a new Contract/Goal is created in (the currently open project of the "first" instance of) Rhapsody (see Figure 2-5)



Figure 2-4: Rhapsody Server and GCSL Editor

Pattern Edi	itor			
ile Edit Windo	ow Help			
Open Require	ment			
New Contract				
Close Close All	Ctrl+W Ctrl+Shift+W			
] Save	Ctrl+S			
Exit				
Properties 2	S S Error Log	Value		
rioporcy		Valac		
			1	

Figure 2	-5: Cre	ate a Co	ntract wi	ith the (	GCSL	Editor

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#### 2.3 Editing a Contract

To edit the contract one can do it directly in Rhapsody or use the GCSL Editor. The benefit of using the GCSL Editor is that the list of GCSL pattern and a syntax check is integrated which is not available in Rhapsody. In order to edit an existing contract in the Editor open the UPDM model which contains the contracts you want to edit and start the click on "Open Requirement" in the Editor. A tree view of the model opens where a contract can be selected (see Figure 2-6).



Figure 2-6: Select an existing Contract

In Figure 2-7 the Assumption of the Contract "No\_1" is selected. In the Properties view the used "always condition" pattern is displayed. Note that with opening the dropdown menu the list of GCSL pattern is displayed and the user can select one of these. Below the "Pattern" section a "Description" and the entry for

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the "condition" is shown. The "Pattern Properties" section depends on the selected "Pattern" and the user must only "fill the holes" of the pattern with the specific content. This content is automatically checked for correctness of the syntax.

🗧 Pattern Editor	
<u>File E</u> dit <u>R</u> equirements Editor <u>Wi</u> ndow <u>H</u> elp	
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Carl Resource Set	
http://127.0.0.1:8003/GUID08f57b43-94a0-4720-ba6e-0b35153ef677     Gontract No_1     Assumption     Promise	
🔲 Properties 🛛 🔮 Error Log 🔤 🛃 🛃	- 0
Assertion       This section describes general information about this assertion.         Pattern:       always condition         Description:       This pattern describes an invariant condition that has to be valid at the specified component, or, if there has no component been defined, in general.	
Pattern Properties         This section describes information about the current selected pattern.         condition:       true	
Selected Object: Assumption	

Figure 2-7: Edit a Contract

Any changes of the contract are stored in the Rhapsody model if the user "saves" them.

To distinguish between global and local contracts the user have to select a "Anchored Element" in the Feature Dialog within Rhapsody (see Figure 2-8). The anchored element is the component which shall satisfy the Contract.





Language

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ge						
tei	Locate (	OK Apply				
che						

Figure 2-8: Link Contract to model element





# 3 What is new in D6.4.2

This section includes the changes of the updated version of the GCSL Editor. The usage description of the previous sections is still valid and the new features of the extended GCSL specification are added in the following.

#### 3.1 Goal Specification

The language extension as described in section 4 of the D6.3.2 "GCSL Specification" document is supported by a text field in the editor that supports checking the syntax of the definition of metrics that refer to attribute, classes and objects in the model. These references are full qualified names of the elements and thereby clearly defined.

#### 3.2 Dynamicity Contracts

The new class of contracts – the dynamicity contracts – are supported by an additional layout of the contract dialog which supports not only the common features but also the reference to an architectural characterization as defined in D6.3.2 section 3.6 "Syntax of a GCSL Contract". In Figure 2-1 the initial Contract Dialog is illustrated which contained the "Type" and "Scope" dropdown menus which have been removed because of redundancy. The new Dynamicity Contract Dialog (see Figure 3-2) contains is addition the ability to specify an architectural characterization in OCL which is checked for correctness of the syntax.





Language

🗲 Pattern Editor									
Ele Edit Help									
😡 GUID/65d3bba-1acd-439a-b607-e0d871dd2918 🖾									
Resource Set									
http://127.0.0.1:8003/	GUIDf65d3bba-1acd-439a-b607-e0d871dd2918								
🖻 🇐 Contract constraint	5								
Assumption									
- Promise	1								
Properties 🛛 🥺 Erro	Properties 🕱 🧕 Error Log								
Contract General									
This section de	scribes general information about this element.								
Name:	constraint_5								
Commonte									
Comment:									
		~							
Feel/Feetra	*								
This section de	This section describes general information about this contract.								
Type:	constraint	~							
	lecal.								
Scope:		<u> </u>							
ID:	1								
Probability:	0.0								
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Selected Object: Contract constr	aint_5								

Figure 3-1: Contract Dialog

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陷 Resource	purce Set							
http://127.0.0.1:8003/GUIDf65d3bba-1acd-439a-b607-e0d871dd2918     Gontract constraint_6     Assumption     Promise								
Properties	🔲 Properties 🛛 🔮 Error Log							
Contract	Contract General This section describes general information about this element.							
	Name:	constraint_6						
	Comment:							
			~					
	Goal/Contract							
	Rule:	SUM( SoS.itsFireStations ) > 7						
	ID:	12						
	Probability:	0.95						
	System:	<cs 505=""></cs>						

