

Descartes Modeling Language – Quick Start Guide

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www.descartes.tools/dml

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1 Introduction

The Descartes Modeling Language (DML) is an architecture-level modeling language for quality-of-service and resource management of modern dynamic IT systems and infrastructures. DML is designed to serve as a basis for self-aware systems management during operation, ensuring that system quality-of-service requirements are continuously satisfied while infrastructure resources are utilized as efficiently as possible. The term quality-ofservice (QoS) is used to refer to performance (response time, throughput, scalability and efficiency) and dependability (availability, reliability and security).

The current version of DML is focused on performance and availability, however, the modeling language itself is designed in a generic fashion and it is intended to eventually support further QoS properties. More information can be found on the tool website: www.descartes.tools/dml.

This document is a quick start guide, leading through installation and execution of the first query, written in Descartes Query Language (DQL). No deeper technical knowledge or understanding of DML concepts is required, nor are the underlying concepts described or explained. Instead, this document is intended to lead as a tutorial through the first steps with DML and to guide the reader in a hands-on fashion. However, further information and guides as well as a list of scientific publications can be found on the tool website www.descartes.tools/dml, explaining the fundamental concepts of the Descartes Modeling Language.

2 Installation

The following steps guide you through the installation of the DML Bench.

2.1 System Requirements

In order to install DML, your system needs to meet the following prerequisites:

- Operating System: Windows 7/8/10, MacOS X or Linux, all 32-bit or 64-bit
- Java Runtime Environment: at least 1.8
- Eclipse: Eclipse Standard 4.4 or higher¹, with the Eclipse Modeling Tools² installed.

2.2 New Installation

You can install the DML bench as an Eclipse plugin from the update site³. Follow these steps:

1. In Eclipse go to $Help \rightarrow Install \ new \ Software$

¹http://www.eclipse.org/downloads/

²https://eclipse.org/downloads/packages/eclipse-modeling-tools/lunasr1

³https://se4.informatik.uni-wuerzburg.de/dml/downloads/snapshot/



2. Add a new repository with https://se4.informatik.uni-wuerzburg.de/dml/downloads/ snapshot/ as location.

🖨 Install				\times
Available Software				
Select a site or enter the location of a site.				
Work with: type or select a site			~ Add.	
	Find more software by working v	with the <u>"Available Soft</u>	tware Sites" pref	erences.
type filter text				
Name	Version	ı		
Add Repository		×		
		Local		
Location: https://se4.informatik.uni	-wuerzburg.de/dml/downloads/snapsł	Archive		
(?)	OK	Cancel		
Select All D	<u> </u>	cuncer		
Details				
				¢
Show only the latest versions of available software	Hide items that are alread	dy installed		
Group items by category	What is already installed?			
Show only software applicable to target environment				
Contact all update sites during install to find required softwa	are			
3	c Dade Marta	Finish	Canad	
	< bdck Next >	Finish	Cance	1

3. Select all desired plug-ins from the DML Bench (usually all) for installation and click next.

Install	_					
Available Software						
Check the items that you wish to install.						
Work with: DML - https://se4.informatik.uni-wuerzburg.de/dml/d	ownloads/snapshot/ ~	Add				
	Find more software by working with the <u>"Available Software S</u>	<u>iites"</u> preferences				
type filter text						
Name	Version					
👻 🗹 💷 Descartes Modeling Language (DML) Bench						
🗹 🖗 Adaptation Framework Feature	2.0.0.201703161338					
🗹 🅸 DML Metamodels	2.0.0.201703161338					
🗹 🏶 DML Model Editors	2.0.0.201703161338					
🗹 🆗 DML Solving Tools	2.0.0.201703161338					
DML tranformation to queueing networks	1.0.0.201702101148					
🗹 🖗 StaLang SDK Feature	2.0.0.201703161338					
Select All Deselect All 6 items selected						
Details						
		0				
Show only the latest versions of available software	Hide items that are already installed					
Group items by category	What is <u>already installed</u> ?					
Show only software applicable to target environment						
Contact all update sites during install to find required software						
0	< Back Next > Finish	Cancel				

- 4. Accept the license agreements.
- 5. Confirm the security warning.



- 6. After completion, restart Eclipse.
- 7. Done. You should now be able to use DML with your Eclipse installation.

2.3 Update Existing Installation

To update an existing installation of any DML plugin follow these steps:

- 1. In Eclipse go to $Help \rightarrow Check$ for Updates
- 2. Wait for the Eclipse operations to complete.
- 3. If a DML update is available, select the plug-ins you want to update (usually all) and follow the next steps to install it. Otherwise, your installation is up-to-date.

- 4. Accept the license agreements.
- 5. Confirm the security warning.



- 6. After completion, restart Eclipse.
- 7. Done. Your DML bench should now be up-to-date.

3 Getting started

This section explains the first steps with a simple example.

3.1 Model import

A set of example models can be found and downloaded at https://se3.informatik. uni-wuerzburg.de/descartes/dml-examples. The easiest way to import is described in the following:

- 1. Download the zip archive containing the examples at https://se3.informatik. uni-wuerzburg.de/descartes/dml-examples/repository/archive.zip?ref=master.
- 2. Unpack the zip archive into a folder of your choosing, e.g. your workspace.
- 3. You can now either import all projects as an existing eclipse projects or just import a simple example. The following steps assume you want to import the "HelloWorld" model.
- 4. Right-click on the *Project explorer*.
- 5. Click on $New \rightarrow Project...$
- 6. From General, select Project and confirm by clicking on Next.

🖨 New Project				
Select a wizard				
Winneder				
type filter text				
✓ ➢ General ➢ Project				 ^
> 🗁 Gradle > 🗁 Java				
> Model to Model T	ransformation			 ~
?	< Back	Next >	Finish	Cancel

7. Enter "HelloWorldExample" or any other name you like as project name and confirm by clicking on *Finish*.

Sew Project			
Project			7
Create a new project resource.			
Project name: HelloWorldExample]
✓ Use default location			
Location: \HelloWorldExample		Browse	
Working sets			
Add project to working sets		New	
Working sets:	/	Select	
? < Back Next > Finish		Cancel	

8. Now, right-click on the new project in the *Project explorer* and select *Import*....

ject E	xplorer 🛛 🛸 Plug-ins		😑 😫 🔝 🗢
Hello	NorldEvampla		
	New	>	
	Go Into		
	Сору	Ctrl+C	
B	Paste	Ctrl+V	
×	Delete	Delete	
2	Remove from Context	Ctrl+Alt+Shift+Down	
	Move		
	Rename	F2	
<u>120</u>	Import		
<u>N</u>	Export		
	Refresh	F5	
	Close Project		
	Close Unrelated Projects		
	Validate		
	Run As	>	
	Debug As	>	
	Restore from Local History		
	Team	>	
	Compare With	>	
	Configure	>	
	Source	>	
	Properties	Alt+Enter	

- 9. From General, select File System.
- 10. After clicking on Next, select Browse in the following window.
- 11. Then browse to the location containing the unpacked DML examples and select the folder *HelloWorldExample*.
- 12. Select all items and then click on *Finish* to import the files into your existing project.

Import					×
File system Import resources from the local file sy	stem.				
From directory: 3-master-1a1f9988052	290861851102e089f	3638c4aca5a62\He	lloWorldExample ~	Browse	
 HelloWorldExample DML-Model DQL-Queries Filter Types Select All Into folder: HelloWorldExample Options Overwrite existing resources without Create top-level folder Advanced >> 	Deselect All	README		Browse	
(?)	< Back	Next >	Finish	Cancel	

13. Your project should now look like this:

 HelloWorldExample > MIL-Model @ min.deployment 2: min.diagram @ min.repository @ min.resourcelandscape @ min.usageprofile > DQL-Queries @ DMLDoF1.dql @ DMLDoF2.dql @ DMLDoF3.dql @ DMLLoF4SelectAllMetrics.dql @ DMLListDeF.dql @ DMLListDeF.icql @ DMLListDeF.icql @ DMLListHetrics.dql @ DMLSelectResponseTimeSample.dql @ DMLWtf1.dql @ SLA_creu.dql @ SLA_creu.dql @ README 	Package Explorer 🛛	E 😫 🐨 🖓
 DML-Model min.deployment min.diagram min.repository min.repository min.sageprofile DQL-Queries DMLDoF1.dql DMLDoF2.dql DMLDoF3.dql DMLDoF3.dql DMLLoF3.dql DMLLoF4.electAllMetrics.dql DMLLoF4.electAllMetrics.dql DMLLoF4.electAllMetrics.dql DMLListIntitiesQuery.dql DMLIstMetrics.dql DMLSelectResponseTimeSample.dql DMLSelectResponseTimeSample.dql SLA_creu.dql SLA_responseTime.dql README 	🗁 HelloWorldExample	
 min.deployment min.repository min.resourcelandscape min.system min.usageprofile DMLDoF1.dql DMLDoF1.dql DMLDoF4.selectAllMetrics.dql DMLLoF4.selectAllMetrics.dql DMLLoF4.selectMiseSuper.dql DMLSelectMetrics.dql DMLSelectMetrics.dql DMLSelectMetrics.dql DMLSelectMetrics.dql SLA_responseTime.dql README 	Y 🗠 DML-Model	
 Imin.repository Imin.repository Imin.repository Imin.system Imin.system Imin.usageprofile DMLDoF1.dql DMLDoF1.dql DMLDoF3.dql DMLDoF4SelectAllMetrics.dql DMLDoF4SelectAllMetrics.dql DMLIstIntitiesQuey.dql DMLIstIntitiesQuey.dql DMLSelectResponseTimeSample.dql DMLSelectResponseTimeSample.dql SLA_responseTime.dql README 	🗟 min.deployment	
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 min.resourcelandscape min.system min.usageprofile DQL-Queries DMLDoF1.dql DMLDoF3.dql DMLLoF3.dql DMLLoF4SelectAllMetrics.dql DMLListDoF.dql DMLListDef.idql DMLListHetrics.dql DMLSelectMetrics.dql DMLSelectMetrics.dql DMLSelectMetrics.dql DMLSelectMetrics.dql SLA_responseTime.dql SLA_responseTime.dql README 	min.repository	
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 min.usageprofile ODL-Queries DMLDoF1.dql DMLDoF3.dql DMLDoF4SelectAllMetrics.dql DMLListChritilesQuery.dql DMLListIntitiesQuery.dql DMLSelectMetrics.dql DMLSelectResponseTimeSample.dql DMLSelectResponseTimeSample.dql SLA_responseTime.dql README 	🗟 min.system	
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 DMLDoF1.dql DMLDoF2.dql DMLDoF3.dql DMLLoF4SelectAllMetrics.dql DMLListDoF.dql DMLListMetrics.dql DMLListMetrics.dql DMLSelectMetrics.dql DMLSelectMetrics.dql DMLSelectResponseTimeSample.dql DMLWhatIf1.dql minmodel.properties SLA_creu.dql SLA_responseTime.dql README 	✓ ➢ DQL-Queries	
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 DMLDoF4SelectAllMetrics.dql DMLListDoF.dql DMLListeTury.dql DMLListMetrics.dql DMLSelectMetrics.dql DMLSelectResponseTimeSample.dql DMLWhatf1.dql minmodel.properties SLA_cpu.dql SLA_responseTime.dql README 	DMLDoF3.dql	
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E SLA_responseTime.dqI ■ README	SLA_cpu.dql	
README	SLA_responseTime.dql	
	README	

3.2 Performance query execution

The projects usually contain multiple folders. The folder *DML-Model* contains all DML model files required to specify the system.

For modeling the application architecture, there are a repository model and a system model. To model the resource landscape, there are resource landscape, container repository, and resource type model. Furthermore, there are deployment models connecting application architecture and resource landscape, as well as usage profile models. For more detailed information about modeling, please see the modeling guide on www.descartes.tools/dml.

In order to solve the DML models, Descartes Query Language (DQL) queries are formulated. A set of example queries is contained in the folder DQL-Queries.

- 1. Double click on any of the files .dql files to the DQL query in the editor.
- 2. If a window pops up, asking if you want to convert the project into a *Xtext project*, you can confirm that by clicking on *Yes*.

Configure Xtext		×
Do you want to convert 'HelloW	/orldExample' to an Xtext project?	
Remember my decision		
	Yes No	Cancel

3. You should be able to see and edit the query you clicked.

DM	LSelectMetrics.dql 🛛
1⊖ S 2⊝ F	SELECT res1.utilization, svc1.throughput, svc2.throughput FOR RESOURCE ' I3ti4EnuEeOWVc o6w1CBw' AS res1.
3	SERVICE '_A_DeMEmxEeOPLK3yYyEQWQ' AS svc1,
5 L	JSING dml@'minmodel.properties';

4. You can run DQL queries using the DQL launcher by right-clicking on the .dql file and selecting $Run \ As \rightarrow DQL \ Launcher$.

Project Explorer	3 📚	Plug-ins		E 🕏 😺 🗵 E C
✓ [™] Hello World Ex	amr	ble		
✓ DML-Model				
🗟 min.deplo	yme	ent		
a min.diagra	am			
📄 min.repos	iton	/		
🗟 min.resou	rcela	indscape		
🗟 min.syster	m			
🗎 min.usage	pro	file		
✓ ➢ DQL-Queries	5			
DMLDoF1	.dgl			
DMLDoF2	dql			
DMLDoF3	.dql			
DMLDoF4	Sele	ctAllMetrics.dql		
🖹 DMLListD	oF.d	ql		
🗎 DMLListEr	ntitie	sQuery.dql		
DMLListM	etric	s.dql		
DMLSelect	tMe	trics dal		
DMLSelec		New	>	
🗎 DMLWhat		Open	F3	
🖹 minmode		Open With	>	
🗎 SLA_cpu.c	150		C11-C	
SLA_response	-	Copy	Ctrl+C	
README		Paste	Ctri+v Delete	
	.	Remove from Context	Ctrl+Alt+Shift+Down	
	d	Mark as Landmark	Ctrl+Alt+Shift+Up	
		Mark as Eanamark	CurrAicroniterop	
		Reserve	F2	
		Kename	FZ	
	è	Import		
	2	Export		
		Refresh	F5	
		Validate		
		Run As	>	1 DQL Launcher
		Debug As	>	Run Configurations
		Team	>	
		Compare With	>	
		Replace With	>	
		Proportion	Alt+Entor	
		riopenies	Ait+chter	

5. After a short waiting period, you should be able to see the result of the query.

□ DQL Query Result □ DMLSelectMetrics.dgl.1] ⊠ □								
Entity Type	Entity Alias	Entity Identifier	Metric Name	StatType Name	Result Valid?	Result Value		
RESOURCE	res1	_I3tj4EnuEeOWVc_o6w1CBw	utilization	DEFAULT	true	1.000000		
SERVICE	svc1	_A_DeMEmxEeOPLK3yYyEQ	throughput	DEFAULT	true	1.999965		
SERVICE	svc2	_yiFNMEeqEeSW4Op0B0Cy	throughput	DEFAULT	true	1.999965		

4 Further reading

More details about the Descartes Modeling Language (DML) can be found on the website www.descartes.tools/dml. There you can find a list of publications, a documentation of the meta-model and a modeling guide for starters.