

FMI to NI VeriStand™ Add-on

User Guide



FMI To NI VeriStandTM Import FMU Model in NI VeriStandTM

FMI To NI VeriStand[™] Add-on

Release 1.5.1

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1. Introduction

1.1. FMI Connection for NI VeriStand

The FMI Connection for NI VeriStand allows you to use FMU model on NI VeriStand.

2. Installation

2.1. Supported Platforms

The FMI Connection for NI VeriStand is supported on Windows XP(32 bit), Windows Vista (32 bit) and Windows 7 (32 bit).

2.2. Installation Procedure

1. Run the installer by double-clicking *FMItoNIVS_x.x.exe*, and click *Next* on welcome page.



Figure 2.1 First installer dialog, welcome text.

2. Read the license agreement, and click *I Agree* to agree to the terms and continue.

Setup - FMU to VeriStand Connection 2011
License Agreement Please read the following important information before continuing.
Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.
DOFWARE
TEMPORARY END-USER LICENSE AGREEMENT 2012
PLEASE READ CAREFULLY BEFORE USING THIS EQUIPMENT: This End- User License Agreement ("EULA") is a legal agreement between (a) you (either an individual or a single entity) and (b) Dofware S.r.1. that governs your use of any Software Product, installed on or made available by Dofware.
I accept the agreement
⊙ I do not accept the agreement
< Back Next > Cancel

Figure 2.2 Second installer dialog, license agreement

3. Choose the directory where the FMI Connection should be installed. The default installation directory, which will be pre-selected, is *C:\Program Files\FMUtoNIVS*. If you use more than one VeriStand version, I suggest to change this name folder. For example if you use NI VeriStand 2011, I suggest to install the connection in *C:\Program Files\FMUtoNIVS2011*.

📔 Setup - FMU to VeriStand Connection 2011 🛛 📃 🗖 🔯
Select Destination Location Where should FMU to VeriStand Connection 2011 be installed?
Setup will install FMU to VeriStand Connection 2011 into the following folder.
To continue, click Next. If you would like to select a different folder, click Browse.
C:\Programmi\FMUtoNIV52011 Browse
At least 20,5 MB of free disk space is required.
< Back Next > Cancel

Figure 2.3 Third installer dialog, select installation folder.

4. Select Install if you are ready to start the installation. Select Back to redo the last step.

5. After the installation has completed you will find a folder created for the FMI Connection in the Windows Start menu and click on it folder you can view folders show below:

Indirizzo	🗀 C:\Program Files\FMUtoNIVS 🛛 💽 Vai
	Documentation
D	Examples
D	external
	License
	Readme.txt Documento di testo 1 KB
	unins000.dat File DAT 6 KB
×	unins000.exe Setup/Uninstall

Figure 2.4 FMI Connection folder.

3. License file installation

After the installation procedure, FMI Connection will be in demo mode. To use the program fully, a license file must be installed. After purchasing a license, you should receive a file named license.lic. Place that file in the *\FMUtoNIVS\License* directory that is found in the *\Program Files* on Windows x86 and *\Program Files (x86)* on Windows x64.

4. Install FMI Add-on in NI RT-Target

🔇 NI-PXI8196-2F0A8BB6 - Measurement & Autom	nation Explorer		_ = 2
File Edit View Tools Help			
🖶 🥸 My System	🕛 Restart 🛛 🖓 Refr	esh 🔒 Set Permissions 🛥 Log In	y Hide Help
🕀 📑 Data Neighborhood			CaBack C A
Devices and Interfaces	General Settings		
	Hostname IP Address DNS Name Model Serial Number System State Comments	NI-PXI8196-2F0A88B6 192.168.0.200 Ethernet NI-PXI8196-2F0A88B6 PXI-8196 2F0A88B6 Connected - Running	LabVIEW Real- Time Target Complete the following steps to configuration remote system for use time Module. For a more complete explemation of these steps, refer to the steps, refer to th
	Locale	English	Real-Time
		🔲 Halt on IP Failure	2. <u>Configure Network</u> <u>Settings</u>
	System Monitor		3. Install Software
	Total Memory	0,98 GB	4. Configure I/O
	Free Memory	867 MB	5. <u>Configure System</u> <u>Settings</u>
	Total Disk Space	37,2 GB	×
	Free Disk Space	37,0 GB	E •
	Rin Curtan Cations 🚺 Marurat	settings 1988 True Settings	Serial Number
	Tal parent perroude a Mermork a	econgo (EBB) unite recordings	
		++ Connected -	Running:

Open the Measurement & Automation Explorer :

Figure 4.1 Measurement & Automation Explorer

Click on "Software" and then "Add/Remove Software", locate "FMI to VeriStand 2011" and Install the feature:

Software - Measurement & Automation Explore	11	
Q My System Q Data Neighborhood	Add/Remove Software	< Show Help
⊕ ∰ Devices and Interfaces ⊕ √ Scales ⊕ ∫ Software ⊕ ∭ IV Drivers ⊕ ∭ IV Drivers ⊕ ∭ IV.PXIE196-2F0A8866 ⊕ ⊖ Data Neighborhood	Software LabVIEW Real-Time Software Wizard: NL-PX18196-2F0A8BB6 (192.168.0.200) Features Select the features to install and installed components to uninstall. NATIONAL INSTRUMENTS	×
⊕ ∰ Devices and Interfaces ⊕ 44 Skoles ⊕ ∰ Software	Network Streams 1.1 Network Streams 1.1 Ne	nenu Item. You can also access
L	7 Help	

Figure 4.2 Install FMI Add-on on your target

You have FMI support on your RT Target:



Figure 4.3 FMI Add-on installed

Now you can deploy your NI VeriStand project that have FMU model in your FMU target.

5. Unistallation Procedure

5.1. For Windows

FMI Connection provides an uninstaller. The following steps uninstalls the FMI Connection.

1. The uninstaller is found in the start menu. Click Uninstall to open the uninstaller dialog.

Indirizzo 🛅 C:\Program Files\FMUtoNIV5 💌 🄁	Vai
Nome 🔺	C
Documentation Examples Texternal	
Control License E Readme.txt unins000.dat	
<]	>

Figure 5.1 FMI Connection folder - unistall.

6. Support

Support inquires are sent to support@dofware.com

7. Dymola: Export Model as FMU

7.1. FMI for Co-Simulation

The Dymola FMU export functionality, has been extended to also support the FMI for Co-Simulation specification version 1.0 for export of models (slaves) with built-in numerical solvers.

The new functionality uses the SUNDIALS suite of numerical solvers (version 2.4.0). The SUNDIALS code is not distributed with Dymola 2012, but can be downloaded from the Sundials website (<u>https://computation.llnl.gov/casc/sundials/main.html</u>) or found into the **\external**\ folder.

To install the SUNDIALS libraries needed to activate the FMU for Co-Simulation export functionality in Dymola, you can follow the instruction on Dymola manuals or unzip the package "**\external\sundials-2.4.0.zip**" into the folder "**<Dymola2012** installation folder>\Dymola 2012\Source\FMI\".

7.2. FMI for Co-Simulation generation

To generate FMU for Co-Simulation from Dymola (2012 FD01) please follow the instructions below:

- Go in Simulation TAB
- Simulation -> Translate ->FMU



Figure 7.1 Translate model as FMU.





Figure 7.2 Translate model as FMU.

8. Import FMU in NI VeriStand

To import the FMU generated into Dymola follow the instruction below:

- Open NI VeriStand;
- Create a New project;
- Copy your FMU into the Project folder;
- Launch the System Explorer related to a System Definition File from the Project Explorer;
- Load the fmu model:



Figure 7.1 Import FMU.

• Save and close the System Explorer Project;

- Open and setup the workspace from the Project Explorer; Deploy and run the Experiment. •
- •

9. Getting Started

9.1. Introduction

This chapter will take you through some example in order to get you started with FMU to NI VeriStand Connection.

9.2. Dymola to NI VeriStand: Step by Step example

9.2.1. Prerequisites

- Dymola 2012 or later
- NI VeriStand 2011
- FMU to NI VeriStand Connection 2011

9.2.2. Generated FMU in Dymola

Start Dymola:



Figure 9.1 Dymola.

In Dymola use "*File -> Open*". Open *FMUToNIVS.moe* library located in your FMUtoNIVS installation folder:







Figure 9.2 Open FMUtoNIVS Dymola example library.

Expand *Example* folder and open one of the example listed. In this starting tutorial I open *fullRobot* example:



Figure 9.3 fullRobot example.

For use models in the example library you have to duplicate it. Duplicate fullRobot Class:



Figure 9.4 Duplicate fullRobot class.

Select Duplicate fullRobot model and check this class:



Figure 9.5 Check fullRobot model.

Go in Simulation Tab and setup your experiment and Simulate it:

😑 fullRobot - fullRobo	ot				😑 Experiment Setup	? 🗙
File Edit Simulation	Plot Animation Com	mands Window	Help		General Translation Output Debug Compiler F	Realtime
	♣ ➡ 100% ✓		5.5 🔟 🔁 🗄 🖄		Experiment	
Unichle Deceman			Speed. 1		Name fulRobot	
variable browser		Plot [1*]				
Variables	Values ^			_	Simulation interval	
fulRobot 1		1.0			Start time 0	
	15 =				Stop time 20	
"∐y □rof⊊uinaTime	9.01	0.8				
rer swing time					Output Interval	
ctarténgle?	-00				Interval length 0.01	
- startAngle3	90	U.6-				
- startångle4	0				O Number of intervals 0	
startAngle5	-110	0.4				
- startAngle6	0	0.4			Integration	
- endAngle1	60				Algorithm Dasd	-
- endAngle2	-70	0.2				
- endAngle3	-35				Tolerance 0.01	
endAngle4	45				Fixed Integrator Step 0	
- endAngle5	110	0.0				
- endAngle6	45	0.0	0.5			
· refSpeedMax[1]	3 🗸					
Advance	d					
× Text style: Custom	- b i u	EESE	🚛 ½: 📾 🖪 e=			
8						
= true						
simulateModel("i	tullKobot", stopT:	ume=20, number0	fintervais=0, output	Inter		-
- raise	fullRobot" et opT	ime=20 number0	fIntervale=0 output	Inter		-
H = true	scopi.	a. zv, numberu	annear vars-v, output			
			III		OK Store in model	Cancel
					🖨 Modeling 🕑 Simi	ulation

Figure 9.6 Setup the experiment.

Generate FMU for co-simulation



Figure 9.7 export FMU.

Now you have the "FMUToNIVS_Examples_fullRobot.fmu" file:



Figure 9.8 FMU file.

Now you can use *FMUToNIVS_Examples_fullRobot.fmu* in VeriStand. Open NI VeriStand 2011 and create a new project:

🖉 Getting Star	rted Window				
	JI VoriS	tand	2011		
New N	I VeriStand Project		News		
Most F 💓 Crea	ate New Project			an-bh& AIT 9	for Real-Time Test Cells •iStand 2011
Proje	ct System Definition	Properties	EcoCAR Competition		
l Unt	itled 1				veloper's Guide
۱ Proj	Project Root Folder C:\HIL\National Instruments\Projects				CAR Challenge unread)
u U Proj	✓ Create folder for project Project Path				iStand
S Ir	HIL\National Instruments\	Projects\Untitled 1\Unt	itled 1.nivsproj		NI VeriStand ning a Project utorials
		ОК	Cancel	Help	5
					Licensed for Evaluatio

Figure 9.9 Open NI VeriStand and create a new project.

Copy in the folder project (C:\HIL\National Instruments\Projects) the **FMUToNIVS_Examples_fullRobot.fmu** file:



Figure 9.10 .fmu file in your project folder

Open System Explorer:



Figure 9.11 System Explorer

Specify the target, in this example I select a PXI target:

😻 System Explorer - Untitled 1. nivssdf*	
Ele Edit Iools Help	
🏂 🔁 🖬 X 🗅 🛈 X AB 🚍 🛕 🦠	
Link of the second	·

Figure 9.12 Define RT Target

Open your fmu model in your project folder:



Figure 9.13 Load fmu model

Your model in VeriStand:

😼 System Explorer - Untitled 1. nivssdf		
Eile Edit <u>T</u> ools <u>H</u> elp		
🏂 🗃 🖬 X 🗅 🛈 X 🛤 🗃 🛕	- 😂 🔯 🐌	
Intitled 1 Image Same Same Same Same Same Same Same Sam	Model Specification	
Gamp Controller	Name FMUToNIV5_Examples_fullRobot	
- 😚 Custom Devices - 🎢 Simulation Models	Description	
Construction Order C		
Execution		
L I w1	Model Settings	
L Signals - ∰ User Channels - ∱ Calculated Channels - ∲ Stimulus - Procedures - Procedures - ∰ XMET Databases - ∰ 2 System Channels	Initial state running Decimation Rate [Hz] Initial state paused 1 (a) 100 Auto Select Decimation Simulation model processor Automatic -2 (b)	
- A Aliases	Model Information	
System Initialization	Simulation model info Model rate: 100 Hz Path: C.\HII.\Wational Instruments\Projects\Untitled 1\FMUToNIV5_Examples_fulRobot.fmu Modfication date/time: 14.16.40,000 19/01/2012 File size (Byte): 362.188 File version: Product name: Internal name: Legal copyright: File description:	

Figure 9.14 fmu model in VeriStand

Save your model, close System Explorer and in the Project Explorer run the project (Operate > Run).

😺 Running Project	X
Running Project C:\HIL\National Instruments\Projects\Untitled 1\Untitled 1.nivsproj	
VeriStand Gateway Status	
 Loading System Definition file: C:\HIL\National Instruments\Projects\Untitled 1\Untitled 1.nivssdf Preparing to deploy the System Definition to the targets Compiling the System Definition file Starting VeriStand PC Engines Initializing TCP subsystem Starting TCP Loops Connection established with target Controller. Sending reset command to all targets Preparing to deploy files to the targets Starting deployment group 1 Target Controller is online. Deployment group 1 is ready. Preparing to system Definition file from the targets Target synchronize with targets 	
System Definition successfully deployed.	•
Close on successful deployment	

Figure 9.15 Running Project



In the Workspace you can view your variable:

Figure 9.16 Load your model info



Figure 9.17 Your model deployed on RT Target