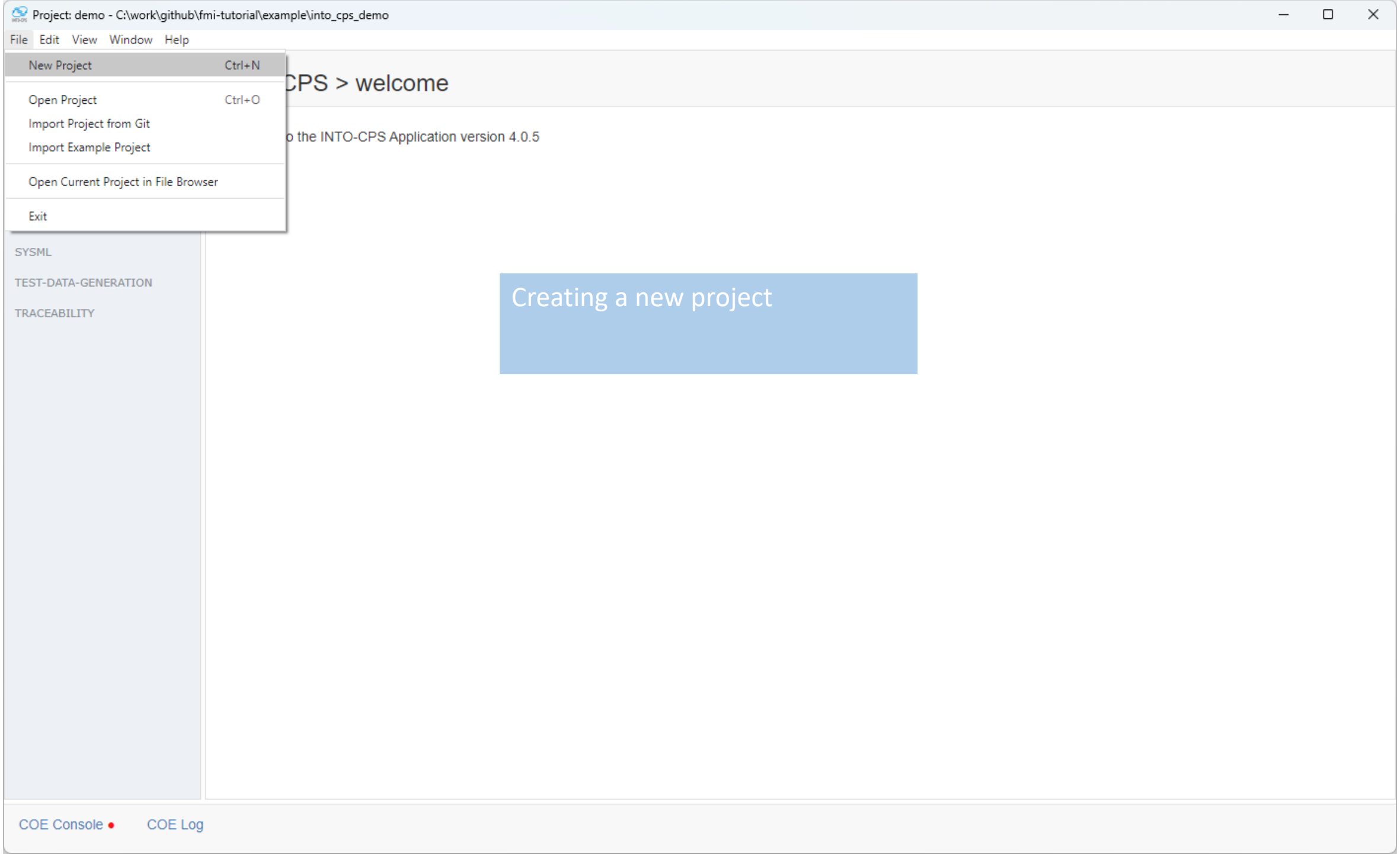
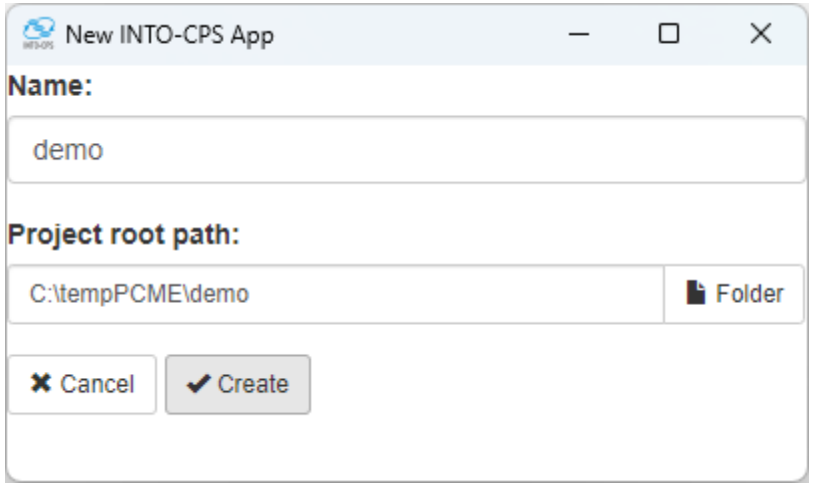
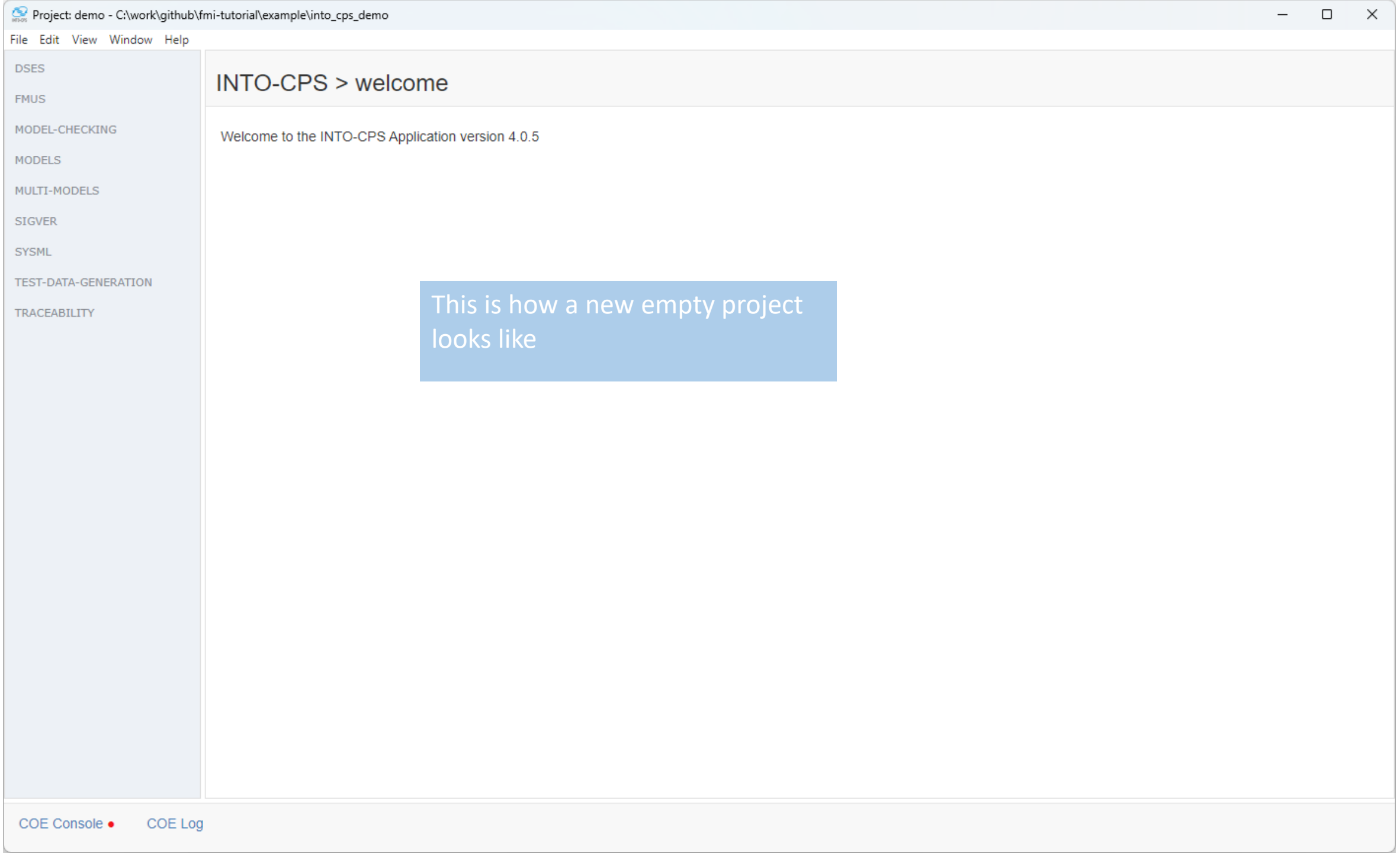
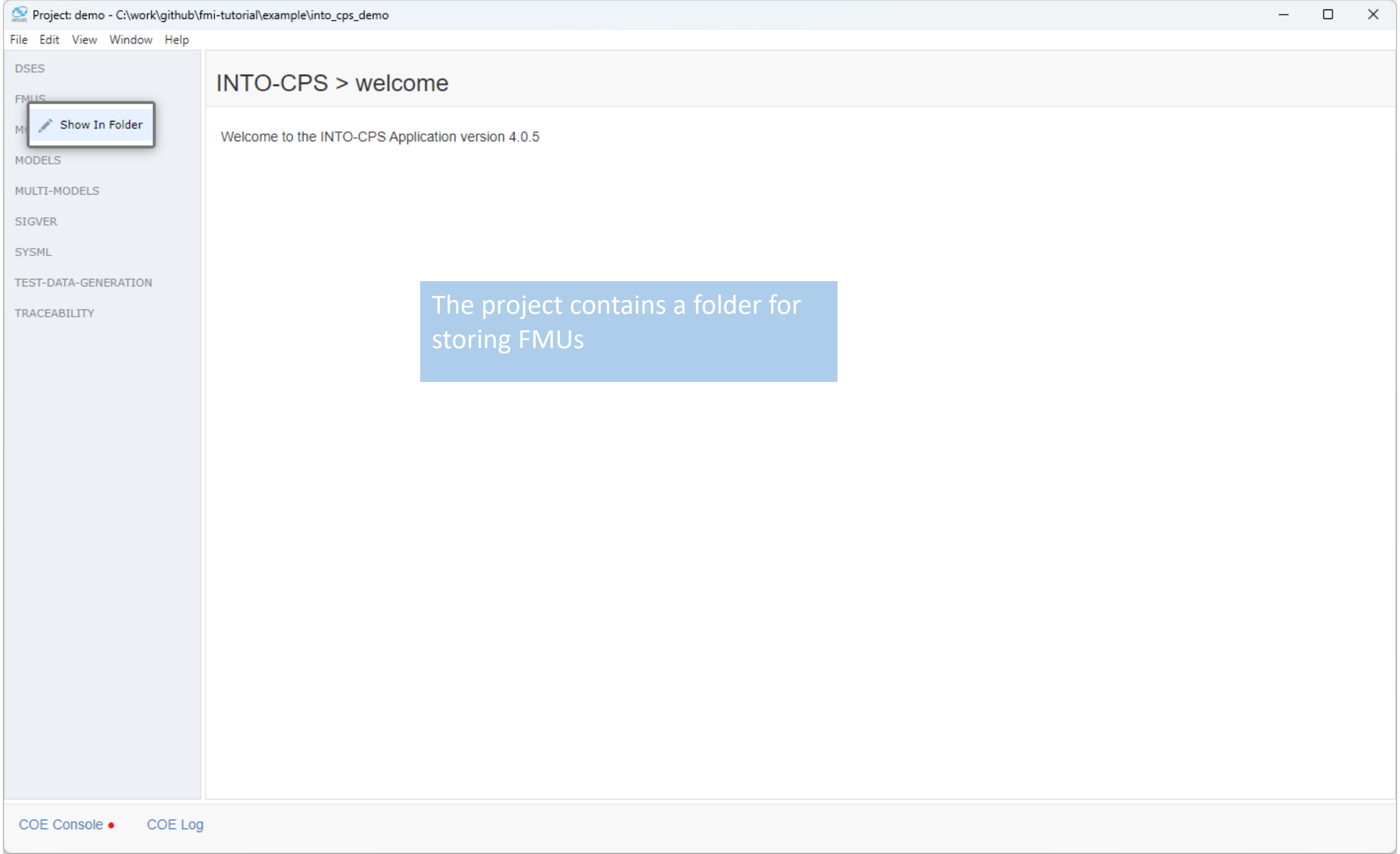
Into-CPS Application Demo

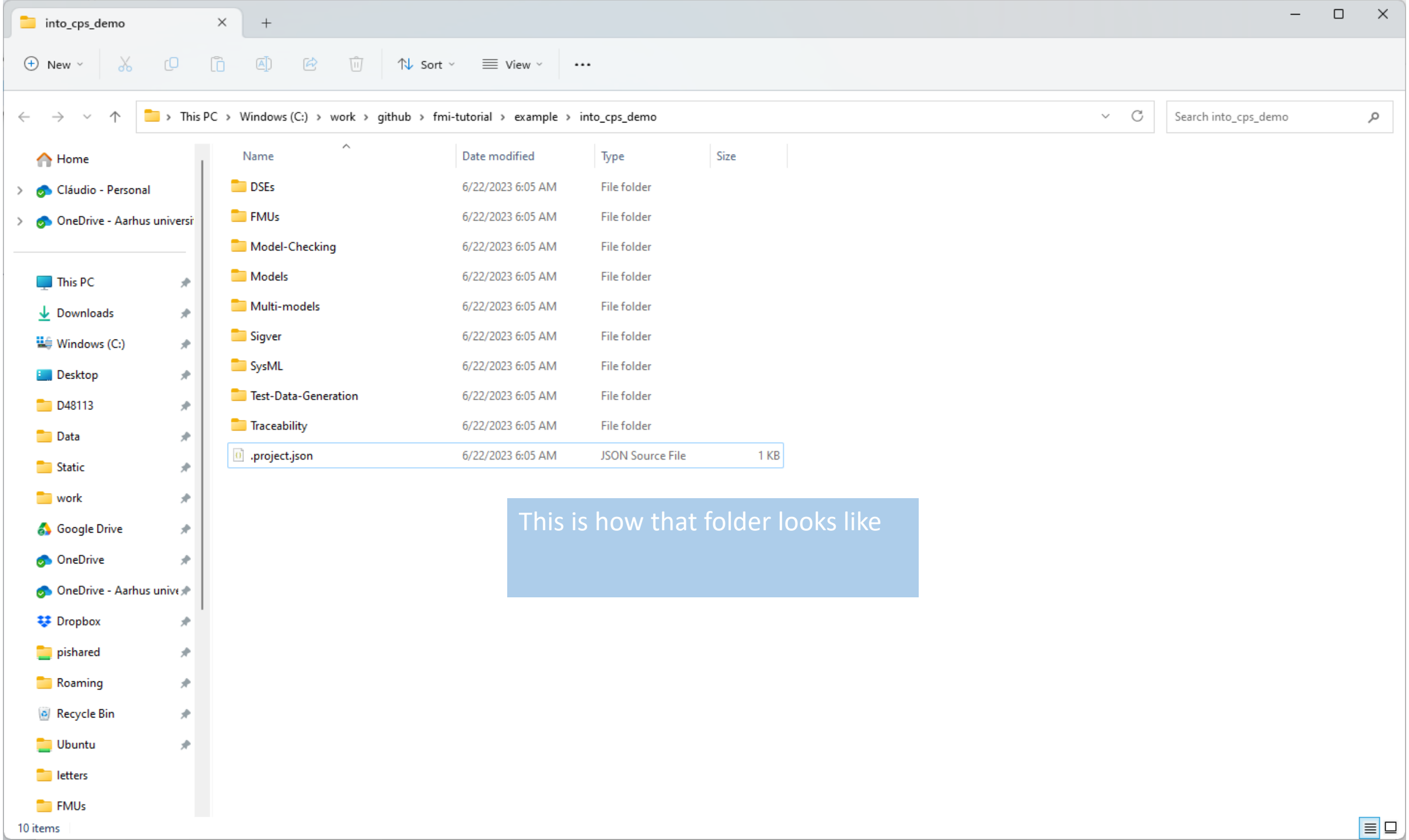

Project: demo - C:\work\github\fmi-tutorial\example\into_cps_demo
File Edit View Window Help
New Project Ctrl+N
Open Project Ctrl+O
Import Project from Git
Import Example Project
Open Current Project in File Browser
Exit
CPS > welcome
o the INTO-CPS Application version 4.0.5
SYSML
TEST-DATA-GENERATION
TRACEABILITY
Creating a new project
COE Console
COE Log

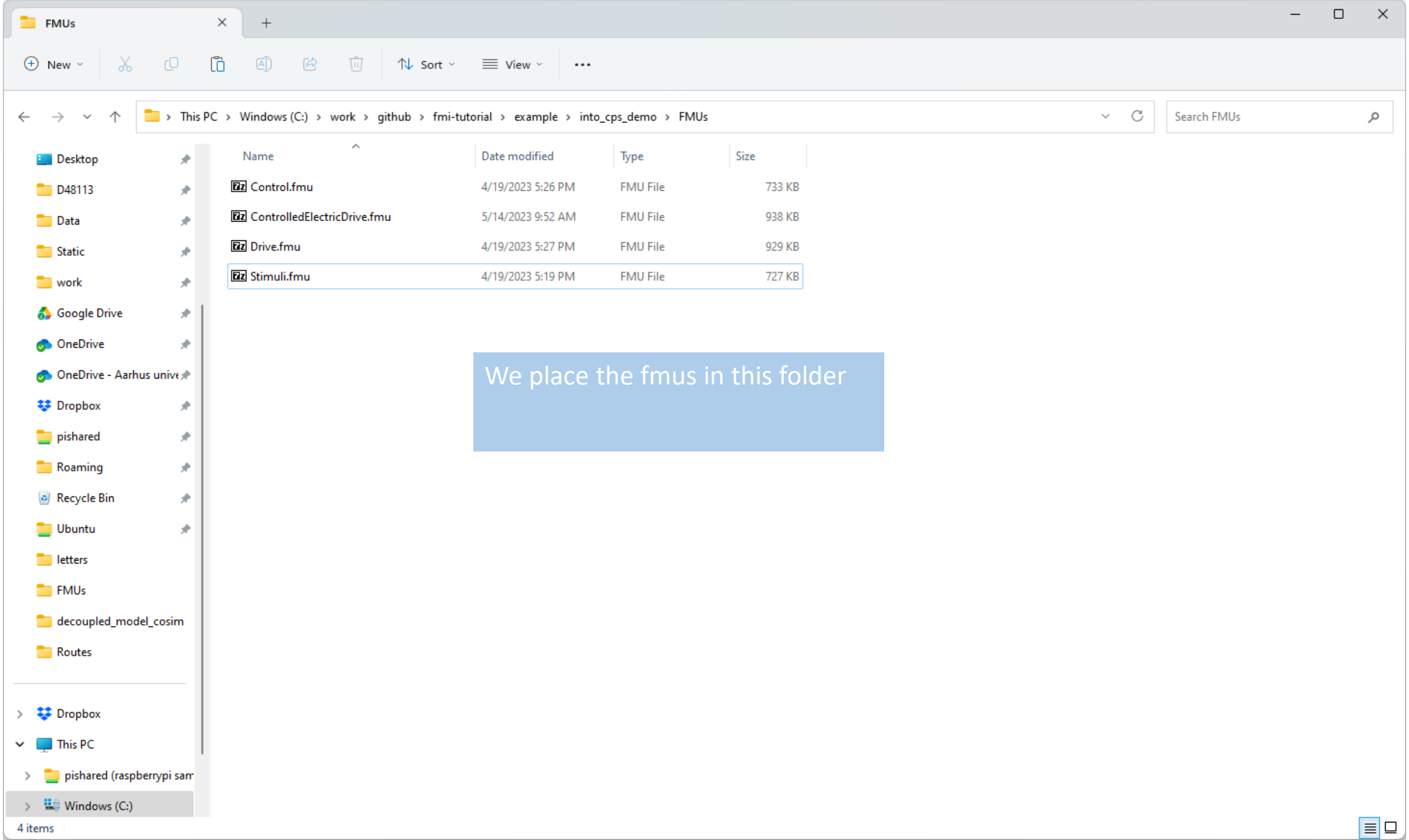
Setting project name

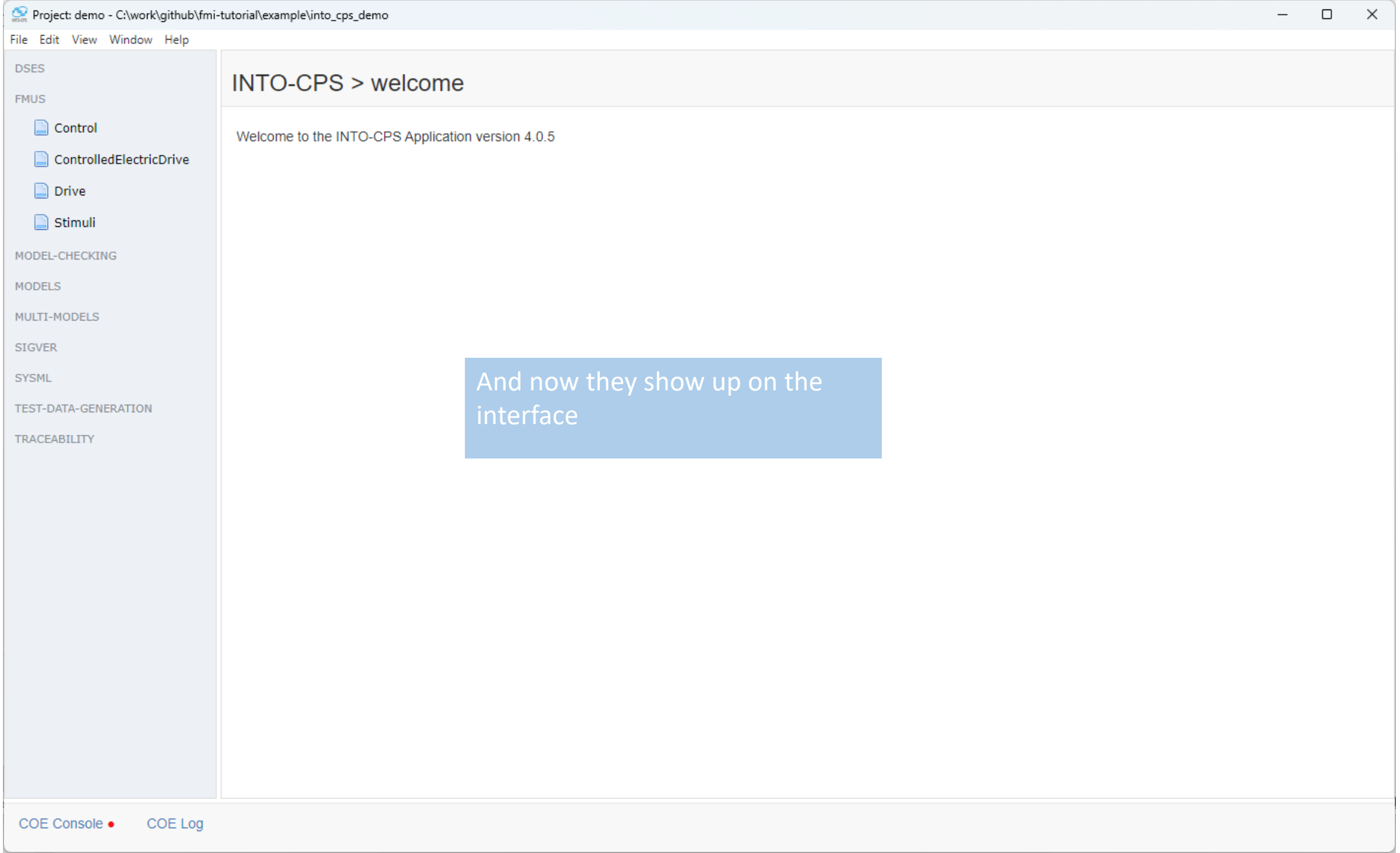


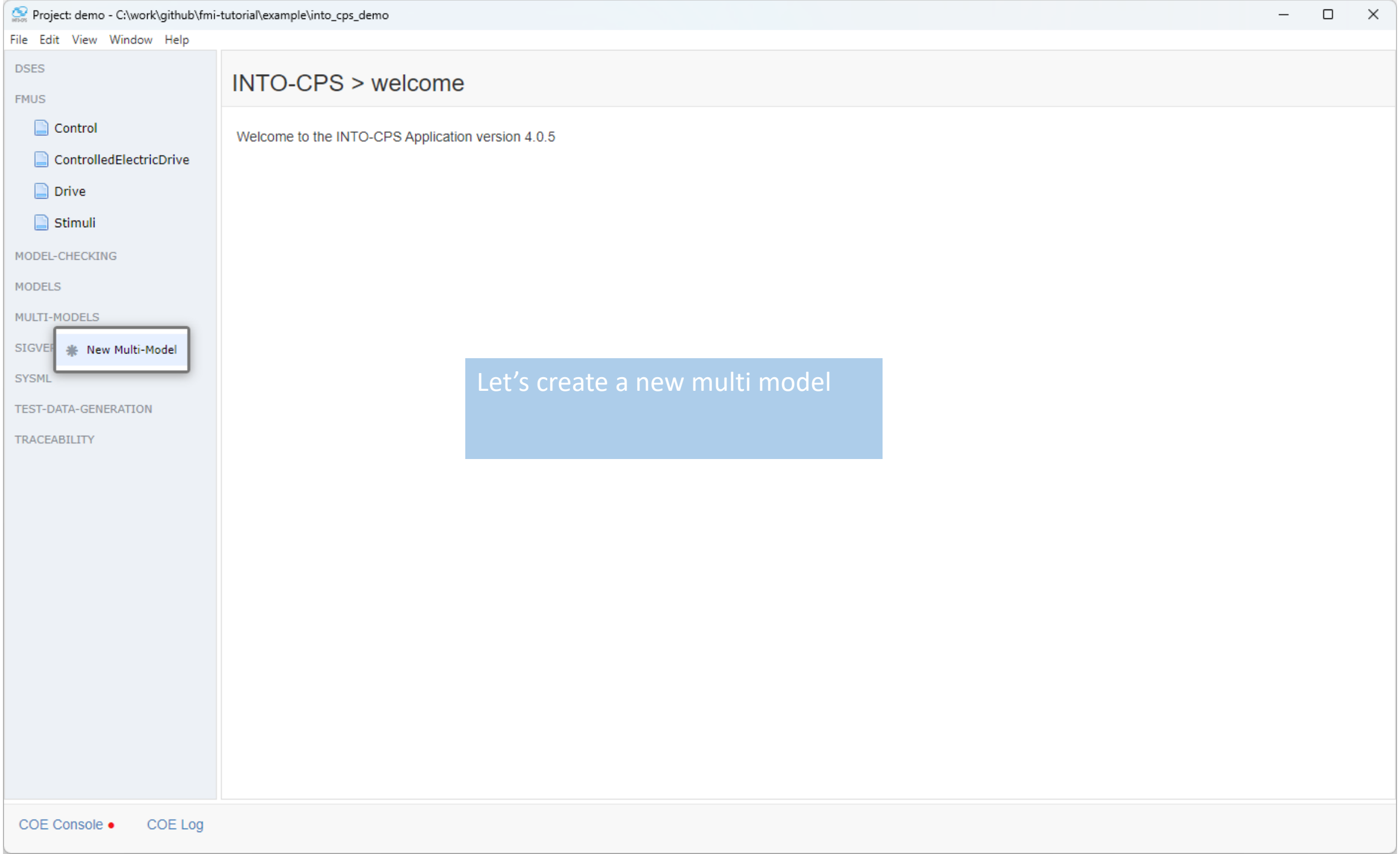

Project: demo - C:\work\github\fmi-tutorial\example\into_cps_demo
File Edit View Window Help
DSES
FMUS
MODEL-CHECKING
MODELS
MULTI-MODELS
SIGVER
SYSML
TEST-DATA-GENERATION
TRACEABILITY
INTO-CPS > welcome
Welcome to the INTO-CPS Application version 4.0.5
This is how a new empty project looks like
COE Console
COE Log

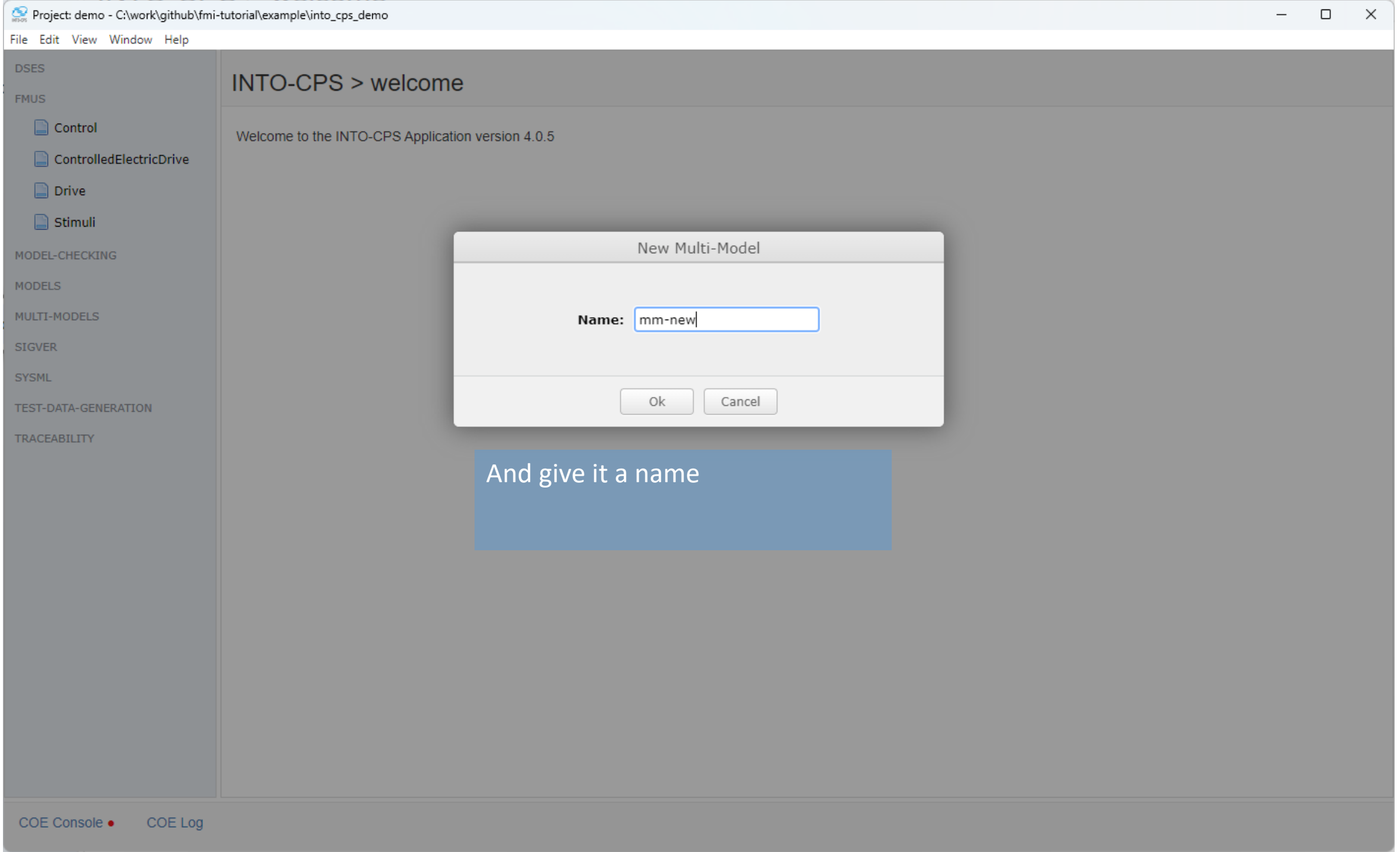

Project: demo - C:\work\github\fmi-tutorial\example\into_cps_demo
File Edit View Window Help
DSES
FMUS
Show In Folder
MODELS
MULTI-MODELS
SIGVER
SYSML
TEST-DATA-GENERATION
TRACEABILITY
INTO-CPS > welcome
Welcome to the INTO-CPS Application version 4.0.5
The project contains a folder for storing FMUs
COE Console
COE Log

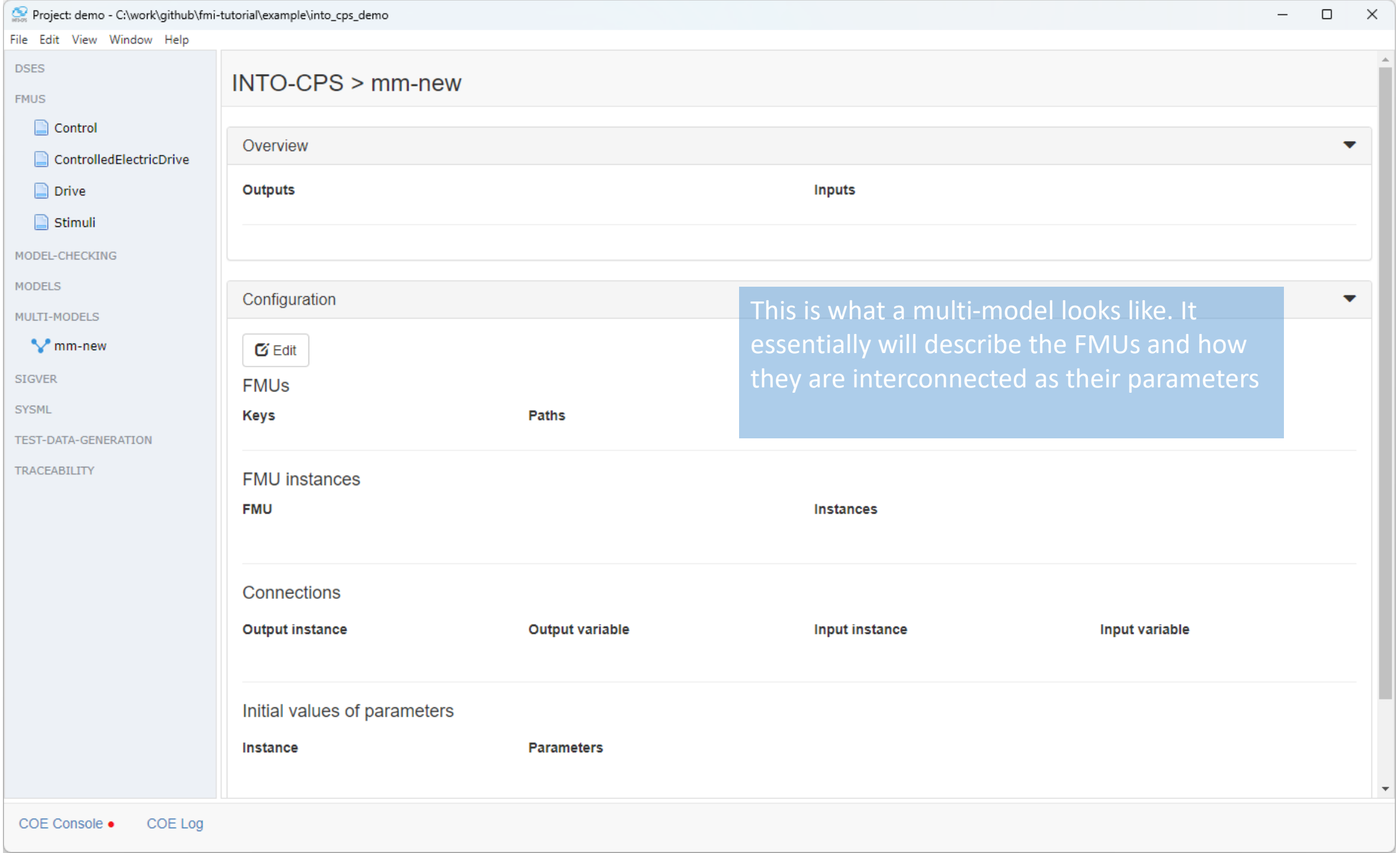

into_cps_demo
New
Sort
View
This PC › Windows (C:) › work › github › fmi-tutorial › example › into_cps_demo
Search into_cps_demo
Home
Cláudio - Personal
OneDrive - Aarhus universi
This PC
Downloads
Windows (C:)
Desktop
D48113
Data
Static
work
Google Drive
OneDrive
OneDrive - Aarhus unive
Dropbox
pishared
Roaming
Recycle Bin
Ubuntu
letters
FMUs
Name
Date modified
Type
Size
DSEs 6/22/2023 6:05 AM File folder
FMUs 6/22/2023 6:05 AM File folder
Model-Checking 6/22/2023 6:05 AM File folder
Models 6/22/2023 6:05 AM File folder
Multi-models 6/22/2023 6:05 AM File folder
Sigver 6/22/2023 6:05 AM File folder
SysML 6/22/2023 6:05 AM File folder
Test-Data-Generation 6/22/2023 6:05 AM File folder
Traceability 6/22/2023 6:05 AM File folder
.project.json 6/22/2023 6:05 AM JSON Source File 1 KB
This is how that folder looks like
10 items

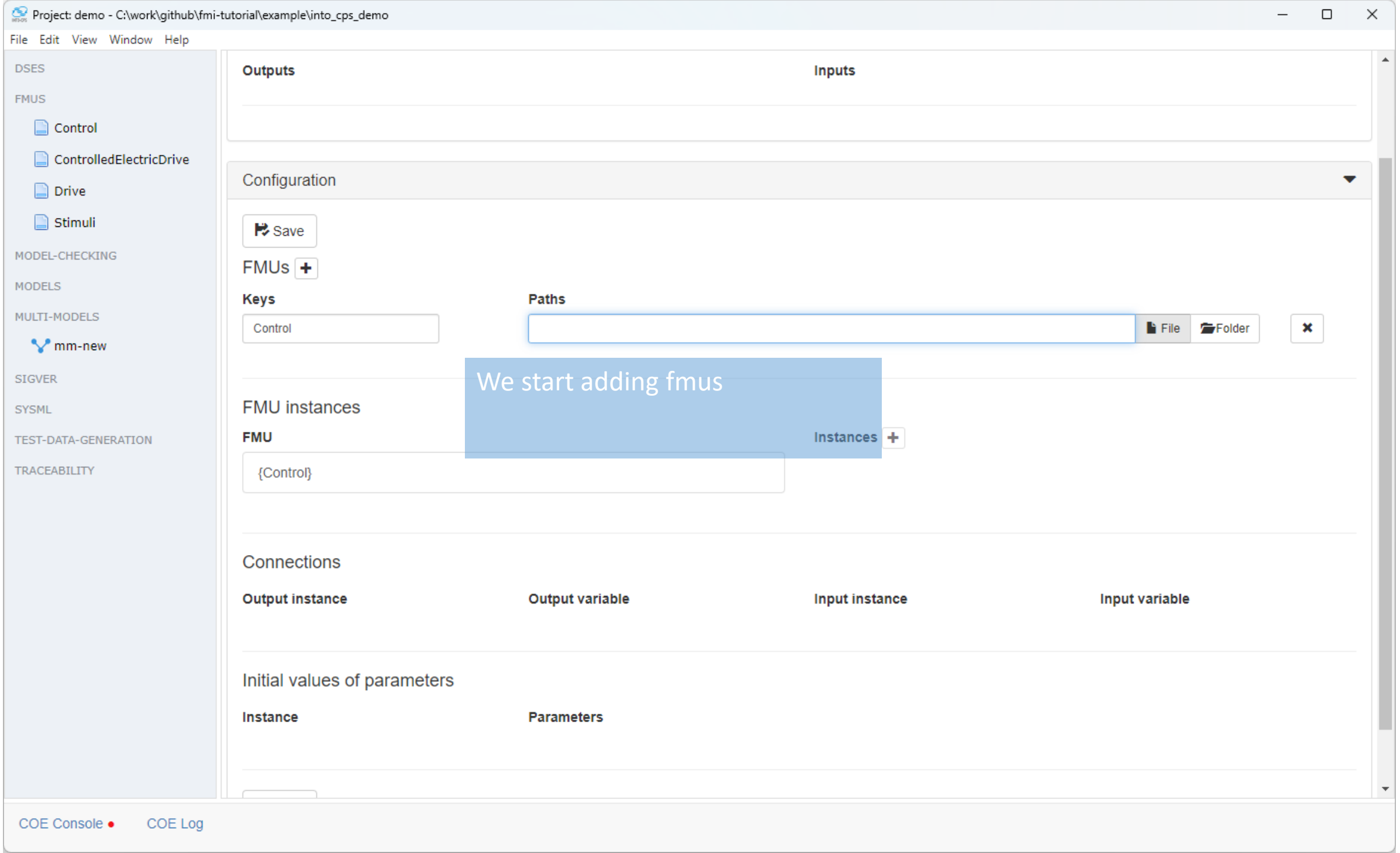

FMUs
New
Sort
View
This PC › Windows (C:) › work › github › fmi-tutorial › example › into_cps_demo › FMUs
Search FMUs
Desktop
D48113
Data
Static
work
Google Drive
OneDrive
OneDrive - Aarhus unive
Dropbox
pishared
Roaming
Recycle Bin
Ubuntu
letters
FMUs
decoupled_model_cosim
Routes
Dropbox
This PC
pishared (raspberrypi sam
Windows (C:)
Name
Date modified
Type
Size
Control.fmu 4/19/2023 5:26 PM FMU File 733 KB
ControlledElectricDrive.fmu 5/14/2023 9:52 AM FMU File 938 KB
Drive.fmu 4/19/2023 5:27 PM FMU File 929 KB
Stimuli.fmu 4/19/2023 5:19 PM FMU File 727 KB
We place the fmus in this folder
4 items

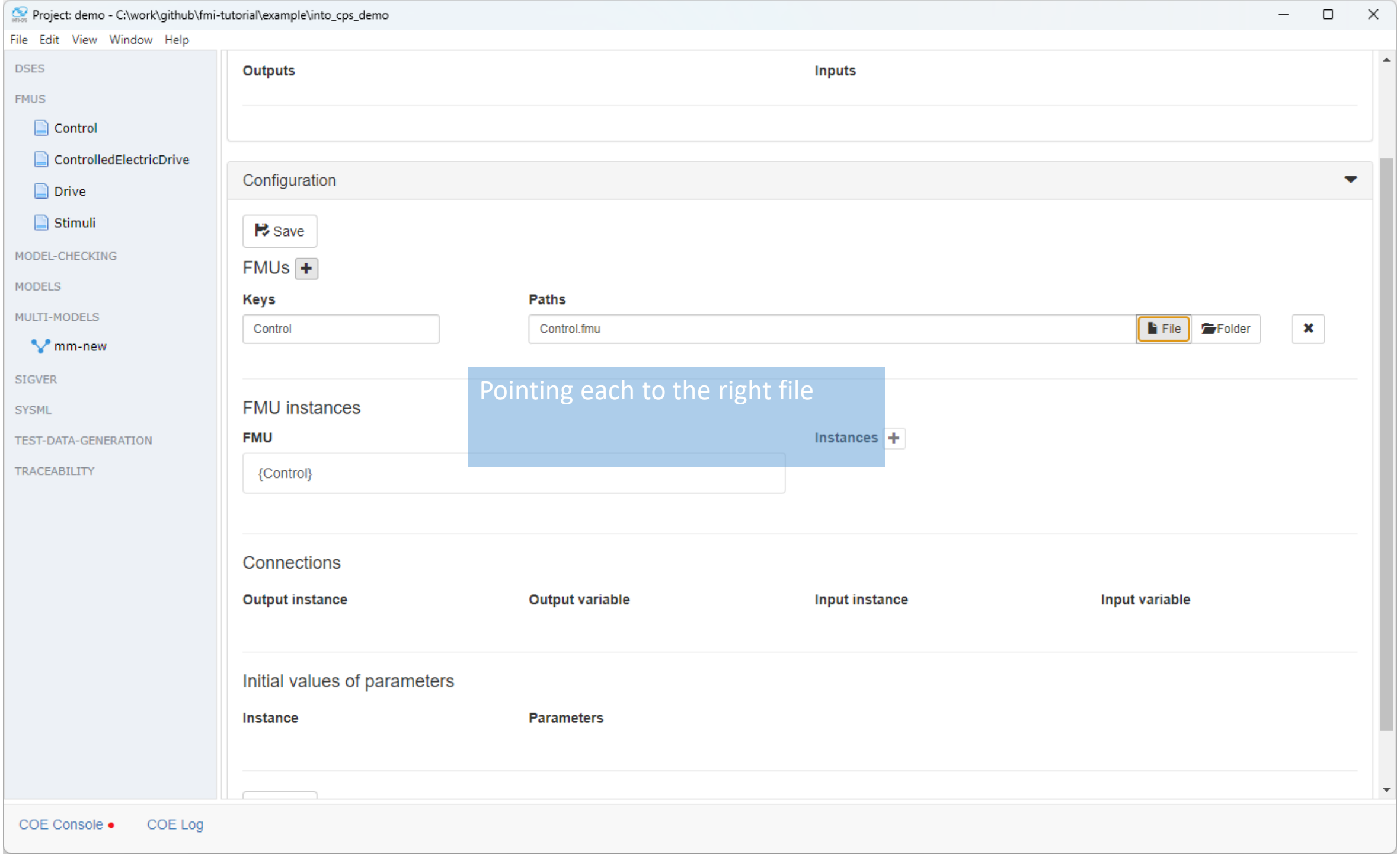

Project: demo - C:\work\github\fmi-tutorial\example\into_cps_demo
File Edit View Window Help
DSES
FMUS
Control
ControlledElectricDrive
Drive
Stimuli
MODEL-CHECKING
MODELS
MULTI-MODELS
SIGVER
SYSML
TEST-DATA-GENERATION
TRACEABILITY
INTO-CPS > welcome
Welcome to the INTO-CPS Application version 4.0.5
And now they show up on the interface
COE Console
COE Log

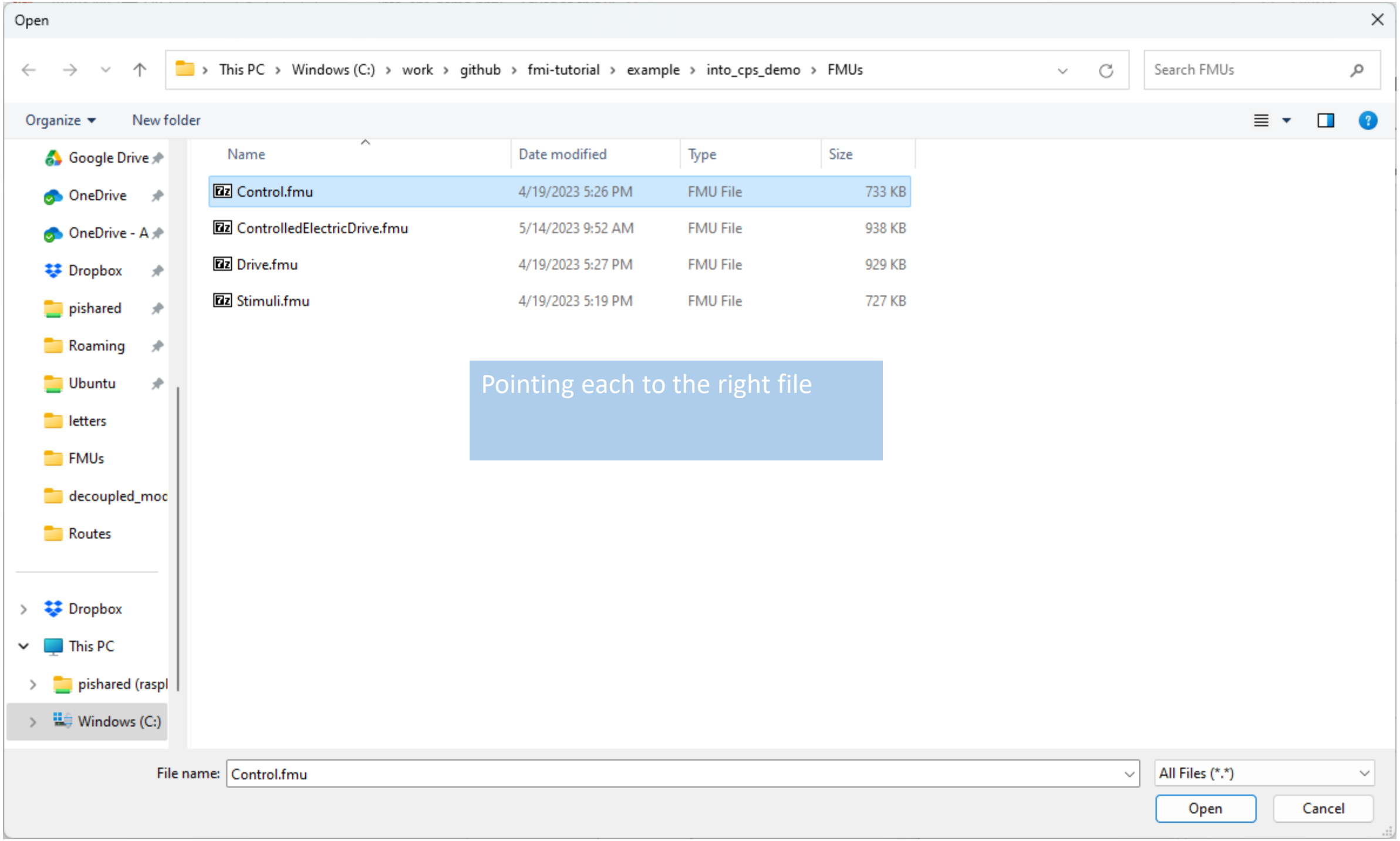

Project: demo - C:\work\github\fmi-tutorial\example\into_cps_demo
File Edit View Window Help
DSES
FMUS
Control
ControlledElectricDrive
Drive
Stimuli
MODEL-CHECKING
MODELS
MULTI-MODELS
SIGVE
New Multi-Model
SYSML
TEST-DATA-GENERATION
TRACEABILITY
INTO-CPS > welcome
Welcome to the INTO-CPS Application version 4.0.5
Let’s create a new multi model
COE Console
COE Log

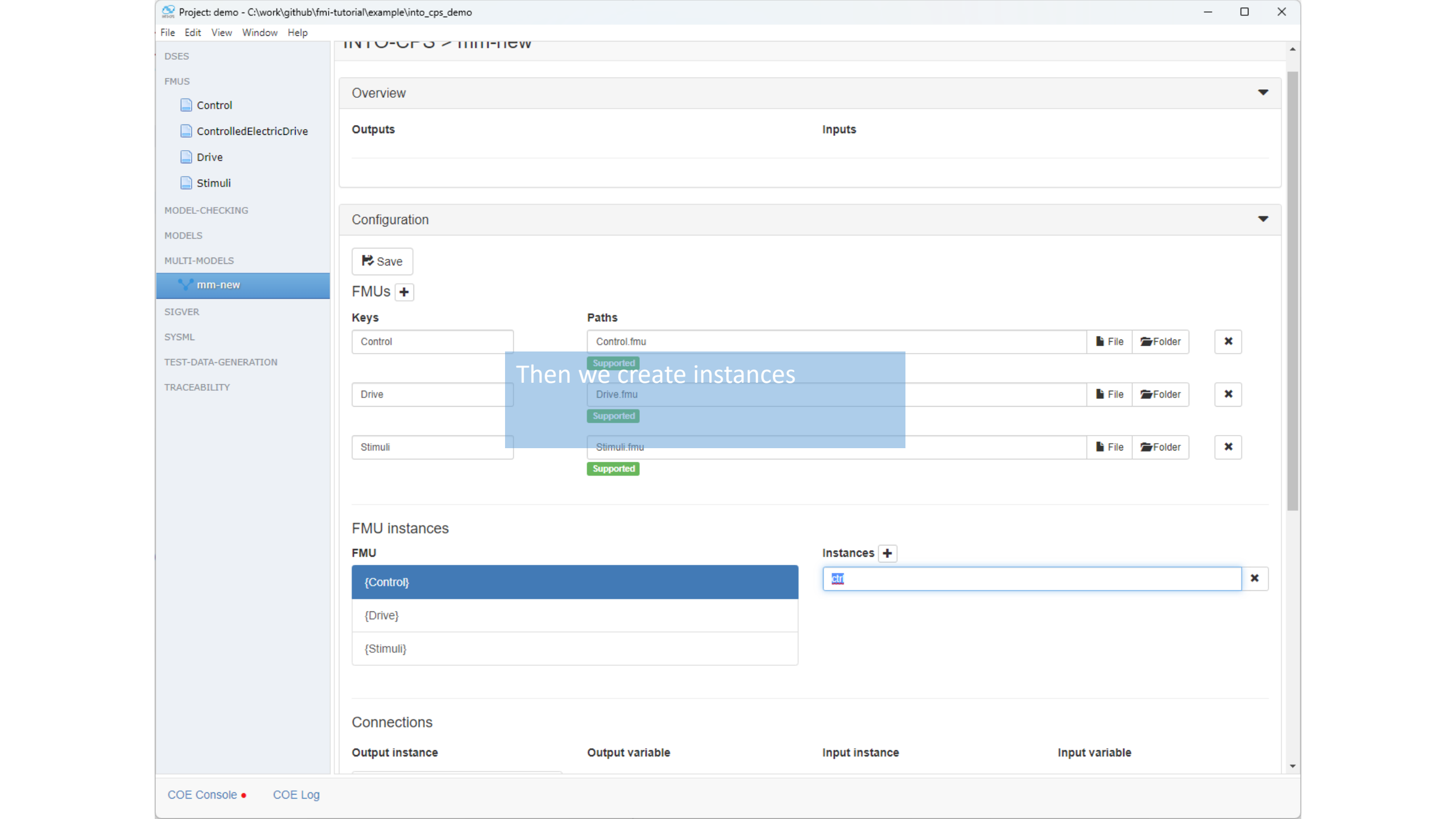

Project: demo - C:\work\github\fmi-tutorial\example\into_cps_demo
File Edit View Window Help
DSES
FMUS
Control
ControlledElectricDrive
Drive
Stimuli
MODEL-CHECKING
MODELS
MULTI-MODELS
SIGVER
SYSML
TEST-DATA-GENERATION
TRACEABILITY
INTO-CPS > welcome
Welcome to the INTO-CPS Application version 4.0.5
New Multi-Model
Name:
mm-new
Ok
Cancel
And give it a name
COE Console
COE Log

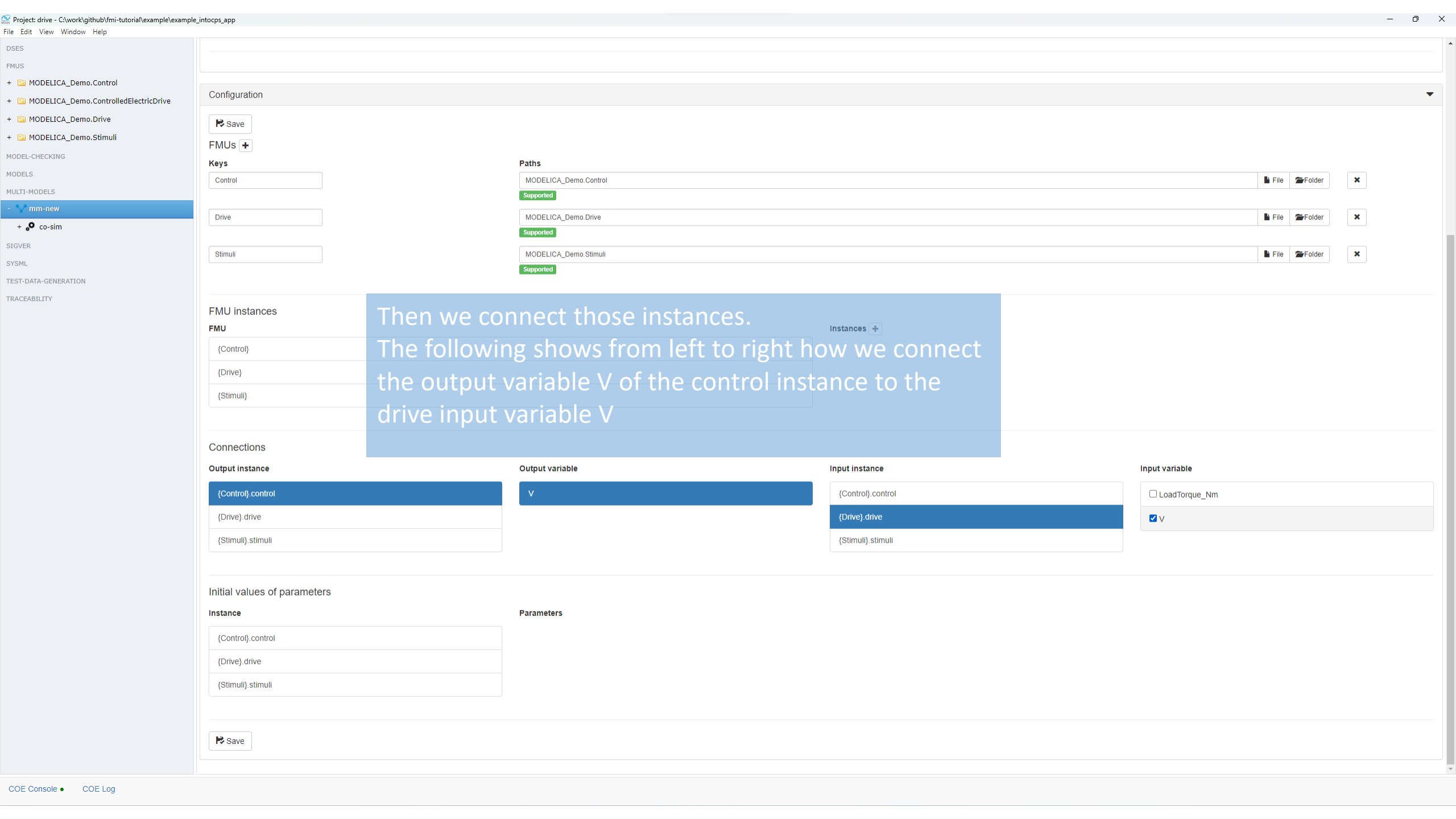

Project: demo - C:\work\github\fmi-tutorial\example\into_cps_demo
File Edit View Window Help
DSES
FMUS
Control
ControlledElectricDrive
Drive
Stimuli
MODEL-CHECKING
MODELS
MULTI-MODELS
mm-new
SIGVER
SYSML
TEST-DATA-GENERATION
TRACEABILITY
INTO-CPS > mm-new
Overview
Outputs
Inputs
Configuration
This is what a multi-model looks like. It essentially will describe the FMUs and how they are interconnected as their parameters
Edit
FMUs
Keys
Paths
FMU instances
FMU
Instances
Connections
Output instance
Output variable
Input instance
Input variable
Initial values of parameters
Instance
Parameters
COE Console
COE Log

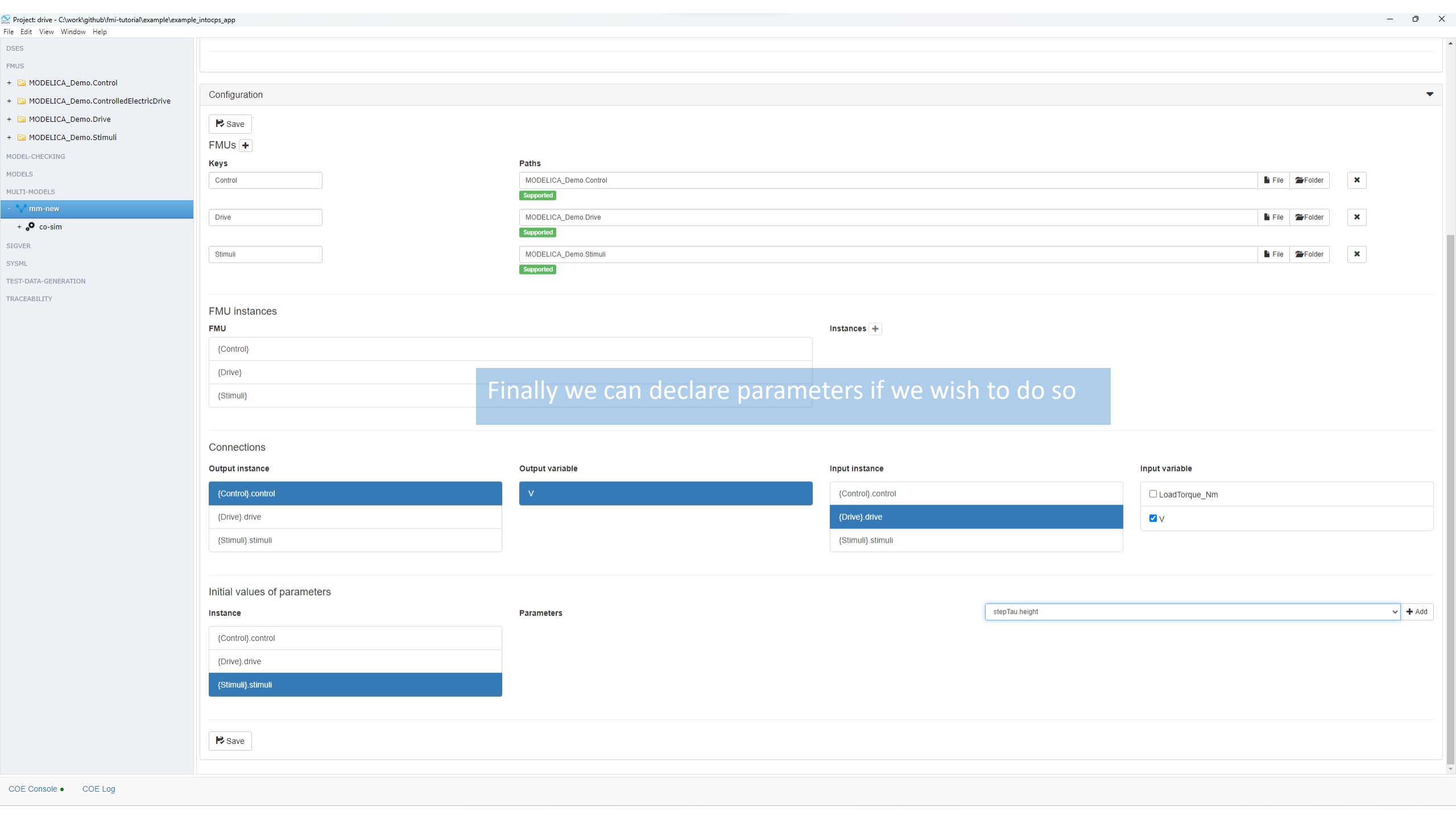

Project: demo - C:\work\github\fmi-tutorial\example\into_cps_demo
File Edit View Window Help
DSES
FMUS
Control
ControlledElectricDrive
Drive
Stimuli
MODEL-CHECKING
MODELS
MULTI-MODELS
mm-new
SIGVER
SYSML
TEST-DATA-GENERATION
TRACEABILITY
Outputs
Inputs
Configuration
Save
FMUs
Keys
Paths
Control
File
Folder
We start adding fmus
FMU instances
FMU
Instances
{Control}
Connections
Output instance
Output variable
Input instance
Input variable
Initial values of parameters
Instance
Parameters
COE Console
COE Log


Project: demo - C:\work\github\fmi-tutorial\example\into_cps_demo
File Edit View Window Help
DSES
FMUS
Control
ControlledElectricDrive
Drive
Stimuli
MODEL-CHECKING
MODELS
MULTI-MODELS
mm-new
SIGVER
SYSML
TEST-DATA-GENERATION
TRACEABILITY
Outputs
Inputs
Configuration
Save
FMUs
Keys
Paths
Control
Control.fmu
File
Folder
Pointing each to the right file
FMU instances
FMU
Instances
{Control}
Connections
Output instance
Output variable
Input instance
Input variable
Initial values of parameters
Instance
Parameters
COE Console
COE Log


Open
This PC › Windows (C:) › work › github › fmi-tutorial › example › into_cps_demo › FMUs
Search FMUs
Organize
New folder
Google Drive
OneDrive
OneDrive - A
Dropbox
pishared
Roaming
Ubuntu
letters
FMUs
decoupled_moc
Routes
Dropbox
This PC
pishared (raspl
Windows (C:)
Name
Date modified
Type
Size
Control.fmu 4/19/2023 5:26 PM FMU File 733 KB
ControlledElectricDrive.fmu 5/14/2023 9:52 AM FMU File 938 KB
Drive.fmu 4/19/2023 5:27 PM FMU File 929 KB
Stimuli.fmu 4/19/2023 5:19 PM FMU File 727 KB
Pointing each to the right file
File name: Control.fmu
All Files (*.*)
Open
Cancel


Project: demo - C:\work\github\fmi-tutorial\example\into_cps_demo
File Edit View Window Help
DSES
FMUS
Control
ControlledElectricDrive
Drive
Stimuli
MODEL-CHECKING
MODELS
MULTI-MODELS
mm-new
SIGVER
SYSML
TEST-DATA-GENERATION
TRACEABILITY
Overview
Outputs
Inputs
Configuration
Save
FMUs
Keys
Paths
Control
Control.fmu
File
Folder
Supported
Drive
Drive.fmu
File
Folder
Supported
Stimuli
Stimuli.fmu
File
Folder
Supported
Then we create instances
FMU instances
FMU
Instances
{Control}
ctrl
{Drive}
{Stimuli}
Connections
Output instance
Output variable
Input instance
Input variable
COE Console
COE Log


Project: drive - C:\work\github\fmi-tutorial\example\example_intocps_app
File Edit View Window Help
DSES
FMUS
MODELICA_Demo.Control
MODELICA_Demo.ControlledElectricDrive
MODELICA_Demo.Drive
MODELICA_Demo.Stimuli
MODEL-CHECKING
MODELS
MULTI-MODELS
mm-new
co-sim
SIGVER
SYSML
TEST-DATA-GENERATION
TRACEABILITY
Configuration
Save
FMUs
Keys
Paths
Control
MODELICA_Demo.Control
File
Folder
Supported
Drive
MODELICA_Demo.Drive
Stimuli
MODELICA_Demo.Stimuli
FMU instances
FMU
Instances
{Control}
{Drive}
{Stimuli}
Then we connect those instances.
The following shows from left to right how we connect the output variable V of the control instance to the drive input variable V
Connections
Output instance
Output variable
Input instance
Input variable
{Control}.control
{Drive}.drive
{Stimuli}.stimuli
V
LoadTorque_Nm
Initial values of parameters
Instance
Parameters
COE Console
COE Log


Project: drive - C:\work\github\fmi-tutorial\example\example_intocps_app
File Edit View Window Help
DSES
FMUS
MODELICA_Demo.Control
MODELICA_Demo.ControlledElectricDrive
MODELICA_Demo.Drive
MODELICA_Demo.Stimuli
MODEL-CHECKING
MODELS
MULTI-MODELS
mm-new
co-sim
SIGVER
SYSML
TEST-DATA-GENERATION
TRACEABILITY
Configuration
Save
FMUs
Keys
Paths
Control
MODELICA_Demo.Control
File
Folder
Supported
Drive
MODELICA_Demo.Drive
Stimuli
MODELICA_Demo.Stimuli
FMU instances
FMU
Instances
{Control}
{Drive}
{Stimuli}
Finally we can declare parameters if we wish to do so
Connections
Output instance
Output variable
Input instance
Input variable
{Control}.control
{Drive}.drive
{Stimuli}.stimuli
V
LoadTorque_Nm
Initial values of parameters
Instance
Parameters
stepTau.height
Add
Save
COE Console
COE Log

Project: drive - C:\work\github\fmi-tutorial\example\example_intocps_app

File Edit View Window Help

DSES

FMUS

+ MODELICA_Demo.Control

+ MODELICA_Demo.ControlledElectricDrive

+ MODELICA_Demo.Drive

+ MODELICA_Demo.Stimuli

MODEL-CHECKING

MODELS

MULTI-MODELS

- mm-new

+ co-sim

SIGVER

SYSML

TEST-DATA-GENERATION

TRACEABILITY

INTO-CPS > mm-new

Overview

Outputs	Inputs
{Control}.control.V	{Drive}.drive.V
{Drive}.drive.w	{Control}.control.w
{Stimuli}.stimuli.w_desired	{Control}.control.w_desired
{Stimuli}.stimuli.LoadTorque_Nm	{Drive}.drive.LoadTorque_Nm

After pressing save it should be possible to see a summary on the top of the cosimulation scenario.

Configuration

Save

FMUs +

Keys	Paths
Control	MODELICA_Demo.Control — File Folder — Supported
Drive	MODELICA_Demo.Drive — File Folder — Supported
Stimuli	MODELICA_Demo.Stimuli — File Folder — Supported

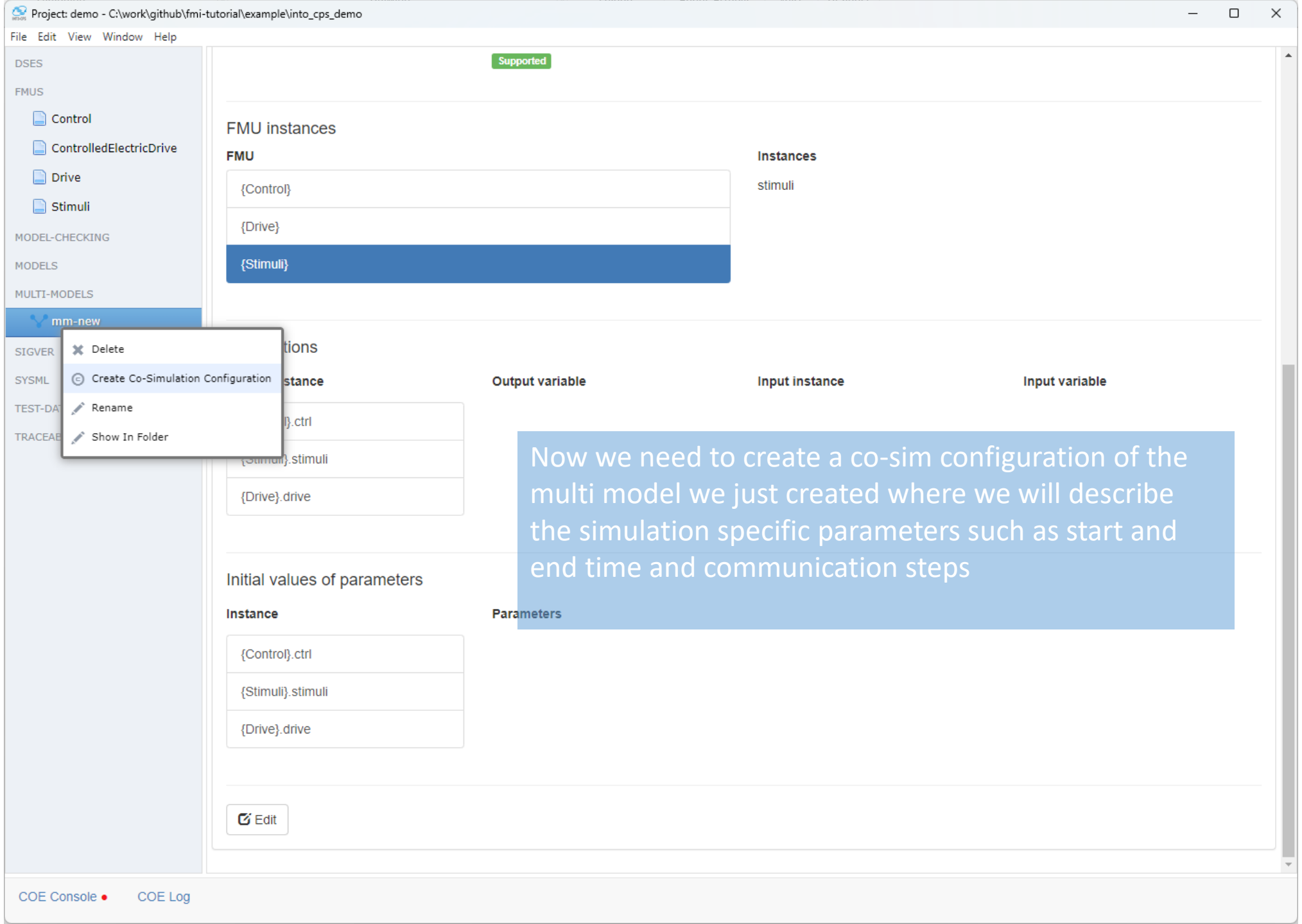
FMU instances

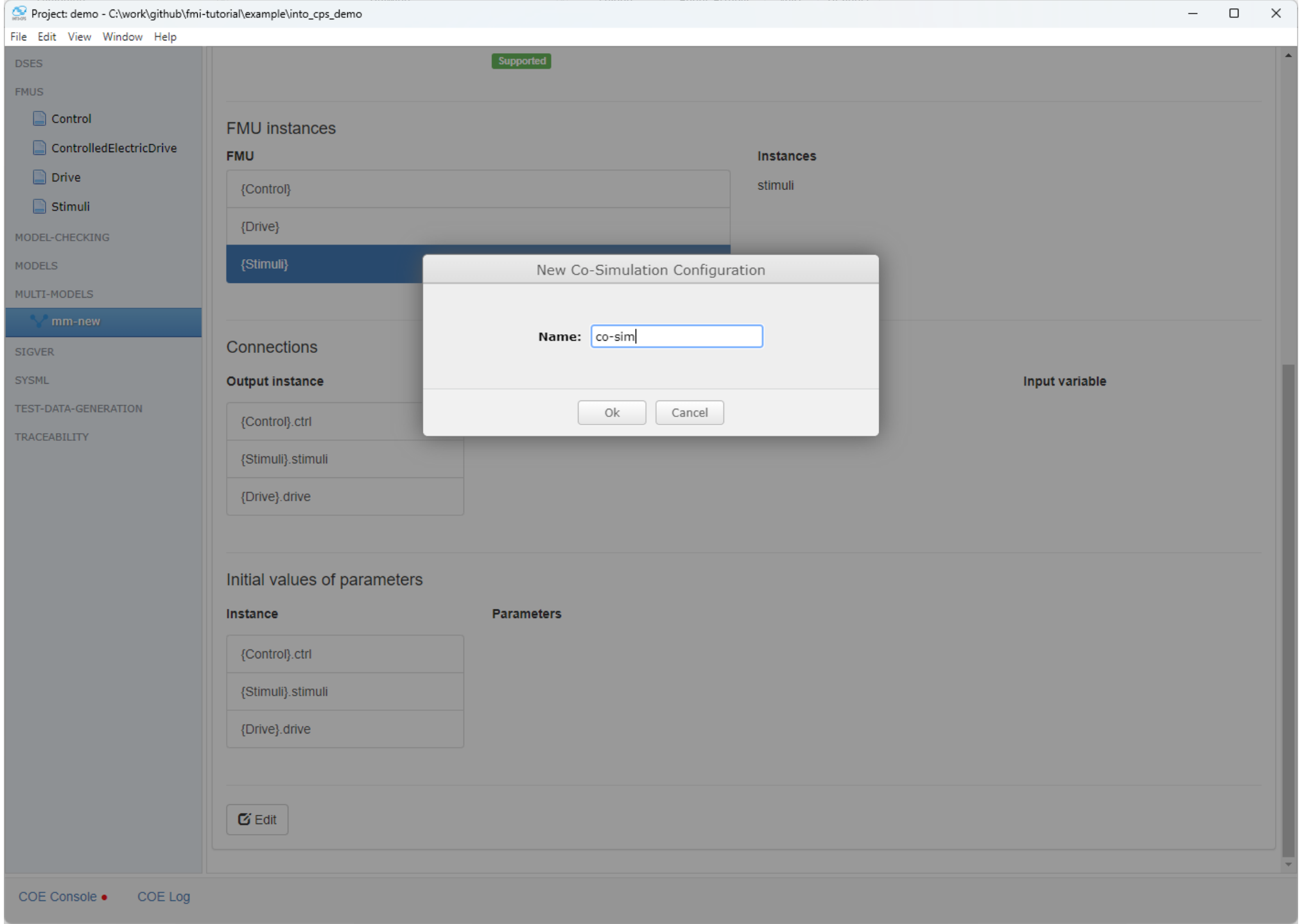
FMU	Instances +
{Control}	
{Drive}	
{Stimuli}	

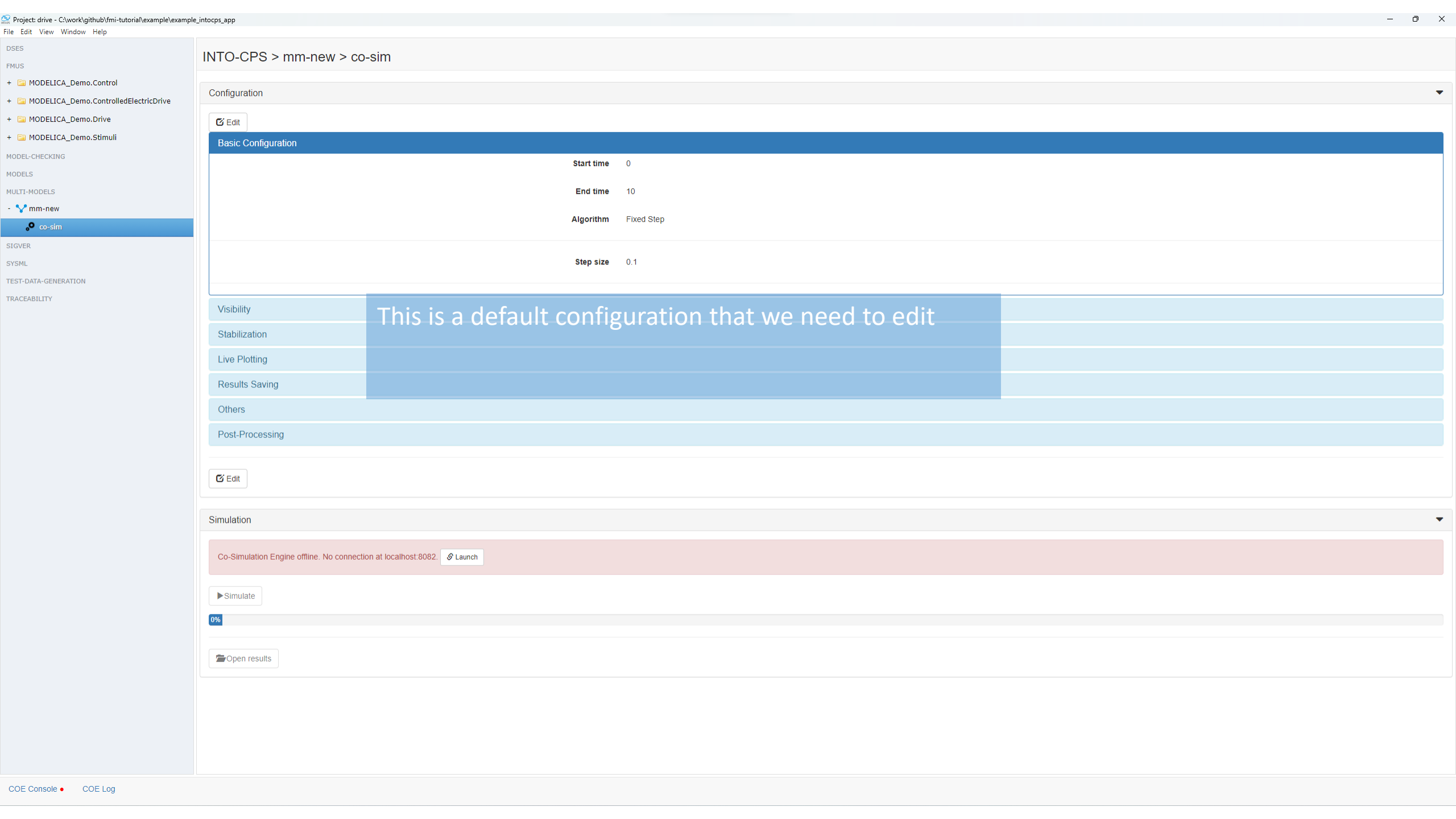
Connections

Output instance	Output variable	Input instance	Input variable
{Control}.control	V	{Control}.control	LoadTorque_Nm

COE Console • COE Log


Project: demo - C:\work\github\fmi-tutorial\example\into_cps_demo
File Edit View Window Help
DSES
FMUS
Control
ControlledElectricDrive
Drive
Stimuli
MODEL-CHECKING
MODELS
MULTI-MODELS
mm-new
SIGVER
SYSML
TEST-DA
TRACEAB
Delete
Create Co-Simulation Configuration
Rename
Show In Folder
Supported
FMU instances
FMU
Instances
{Control}
{Drive}
{Stimuli}
stimuli
tions
stance
Output variable
Input instance
Input variable
}.ctrl
}.stimuli
{Drive}.drive
Now we need to create a co-sim configuration of the multi model we just created where we will describe the simulation specific parameters such as start and end time and communication steps
Initial values of parameters
Instance
Parameters
{Control}.ctrl
{Stimuli}.stimuli
{Drive}.drive
Edit
COE Console
COE Log


Project: demo - C:\work\github\fmi-tutorial\example\into_cps_demo
File Edit View Window Help
DSES
FMUS
Control
ControlledElectricDrive
Drive
Stimuli
MODEL-CHECKING
MODELS
MULTI-MODELS
mm-new
SIGVER
SYSML
TEST-DATA-GENERATION
TRACEABILITY
Supported
FMU instances
FMU
Instances
{Control}
{Drive}
{Stimuli}
stimuli
New Co-Simulation Configuration
Name:
co-sim
Ok
Cancel
Connections
Output instance
Input variable
{Control}.ctrl
{Stimuli}.stimuli
{Drive}.drive
Initial values of parameters
Instance
Parameters
{Control}.ctrl
{Stimuli}.stimuli
{Drive}.drive
Edit
COE Console
COE Log



This is a default configuration that we need to edit

Project: drive - C:\work\github\fmi-tutorial\example\example_intocps_app

File Edit View Window Help

DSES

FMUS

+ MODELICA_Demo.Control

+ MODELICA_Demo.ControlledElectricDrive

+ MODELICA_Demo.Drive

+ MODELICA_Demo.Stimuli

MODEL-CHECKING

MODELS

MULTI-MODELS

- mm-new

co-sim

SIGVER

SYSML

TEST-DATA-GENERATION

TRACEABILITY

INTO-CPS > mm-new > co-sim

Configuration

Save

Basic Configuration

Start time	0
End time	10
Algorithm	Fixed Step
Step size	0.001

Here we set the start, end time, type of algorithm and step size

Visibility

Stabilization

Live Plotting

Results Saving

Others

Post-Processing

Save

Simulation

Co-Simulation Engine offline. No connection at localhost:8082. Launch

Simulate

0%

Open results

COE Console • COE Log

Project: drive - C:\work\github\fmi-tutorial\example\example_intocps_app

File Edit View Window Help

DSES

FMUS

+ MODELICA_Demo.Control

+ MODELICA_Demo.ControlledElectricDrive

+ MODELICA_Demo.Drive

+ MODELICA_Demo.Stimuli

MODEL-CHECKING

MODELS

MULTI-MODELS

- mm-new

co-sim

SIGVER

SYSML

TEST-DATA-GENERATION

TRACEABILITY

Configuration

Save

Basic Configuration

Visibility

Stabilization

Live Plotting

Graph sampling interval (0[s]=allways) 0

Number of graph columns 1

Number of visible graph rows. The graphs will scale such that the given number of rows will be visible without scrolling. 1

Add Graph

And here we said which variables we wish to plot.

Graph Variables

Filter

Name: Live Graph

External Window

{Control}.control V

{Drive}.drive w

{Stimuli}.stimuli LoadTorque_Nm

w_desired

Results Saving

Others

Post-Processing

Save

Simulation

Co-Simulation Engine offline. No connection at localhost:8082. Launch

COE Console COE Log

Project: drive - C:\work\github\fmi-tutorial\example\example_intocps_app

File Edit View Window Help

DSES

FMUS

+ MODELICA_Demo.Control

+ MODELICA_Demo.ControlledElectricDrive

+ MODELICA_Demo.Drive

+ MODELICA_Demo.Stimuli

MODEL-CHECKING

MODELS

MULTI-MODELS

- mm-new

co-sim

SIGVER

SYSML

TEST-DATA-GENERATION

TRACEABILITY

Basic Configuration

Visibility

Stabilization

Live Plotting

Graph sampling interval (0[s]=allways)	0
Number of graph columns	1
Number of visible graph rows. The graphs will scale such that the given number of rows will be visible without scrolling.	1

Graph Variables

Name:	Live Graph
External Window	☐
{Control}.control	
{Drive}.drive	☑ w
{Stimuli}.stimuli	☑ w_desired

After saving the configuration it's time to launch the cosim engine

Results Saving

Others

Post-Processing

Edit

Simulation

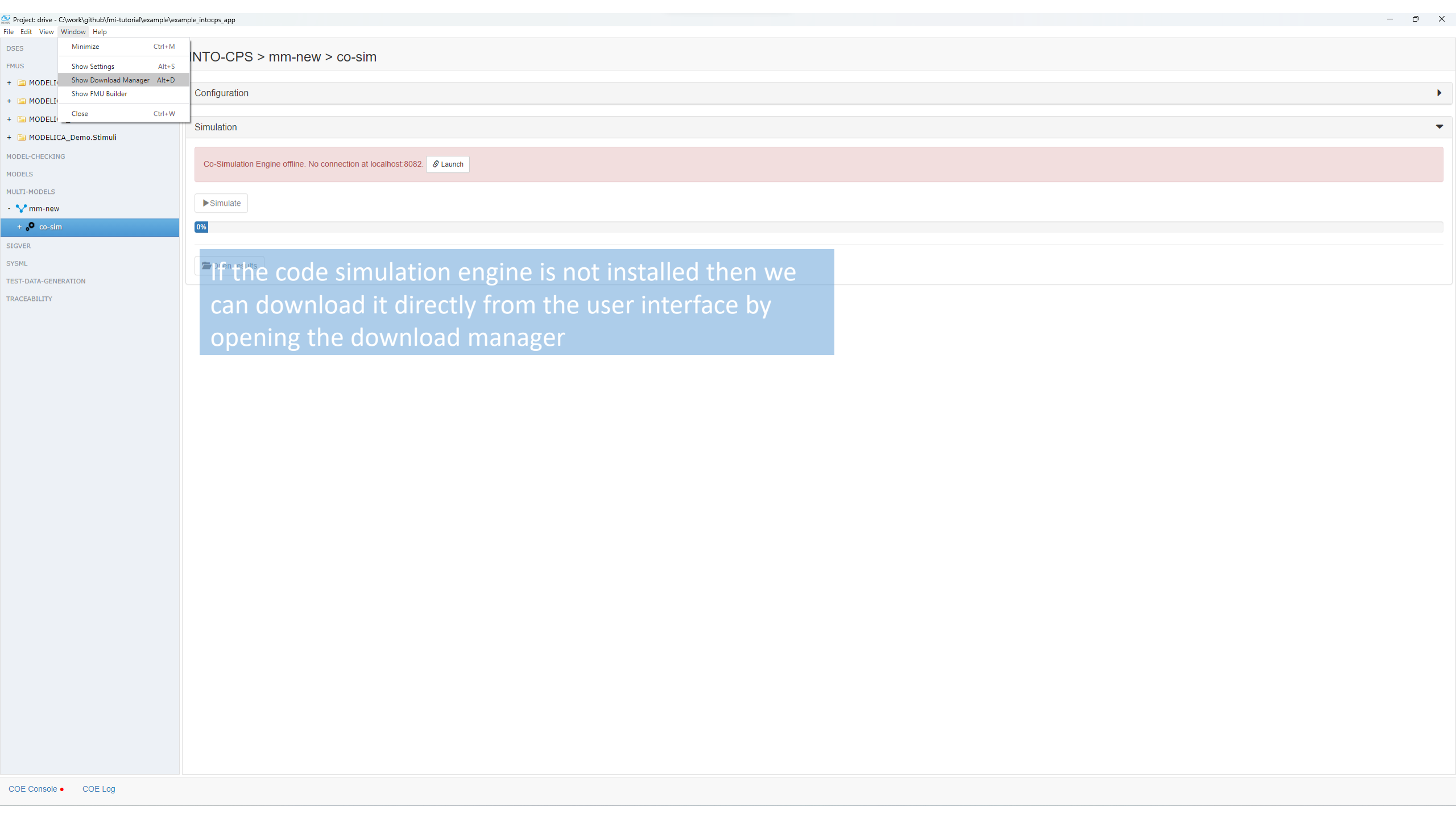
Co-Simulation Engine offline. No connection at localhost:8082. Launch

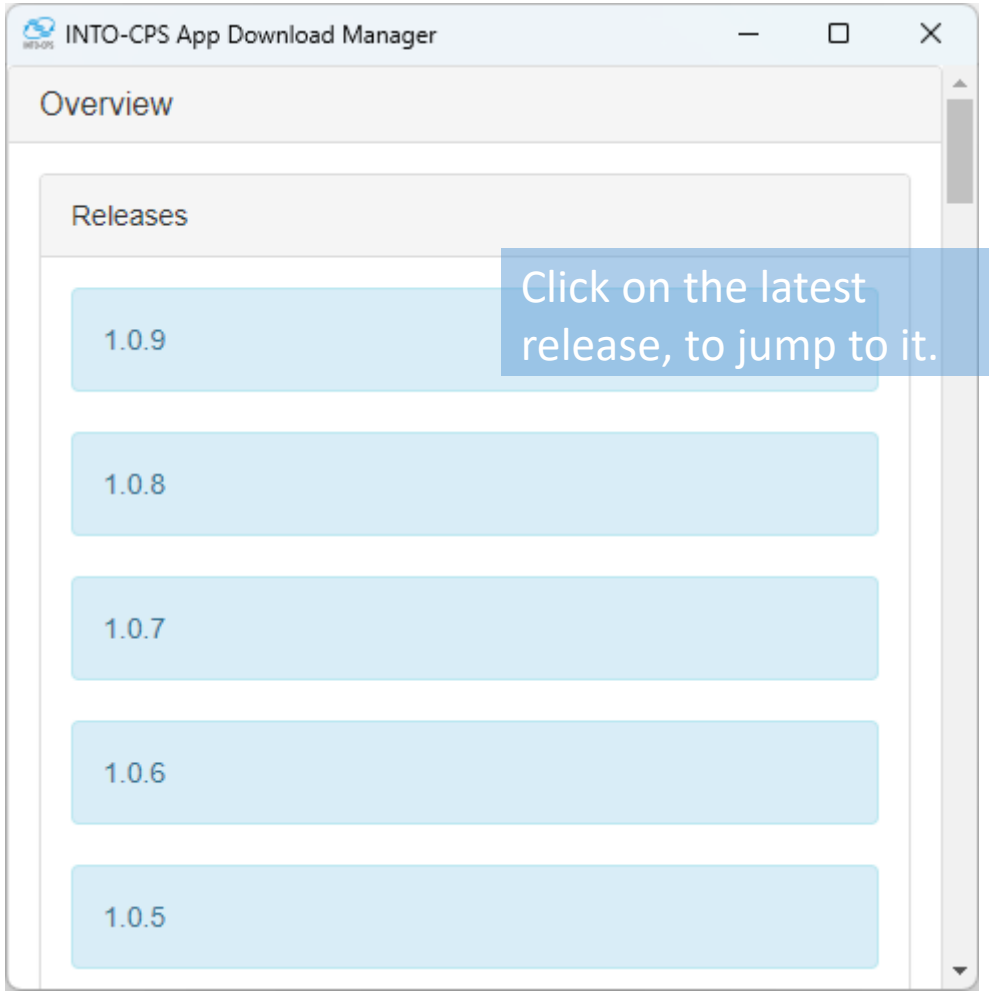
Simulate

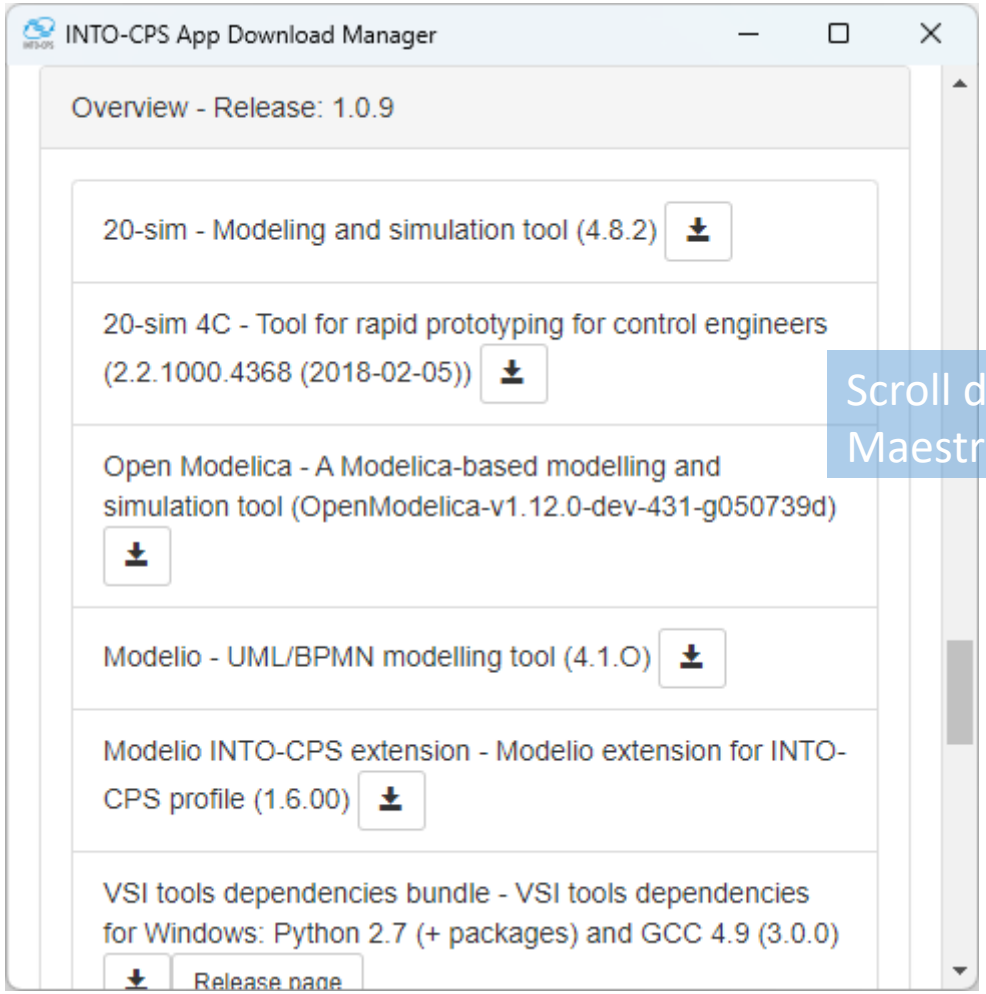
0%

Open results

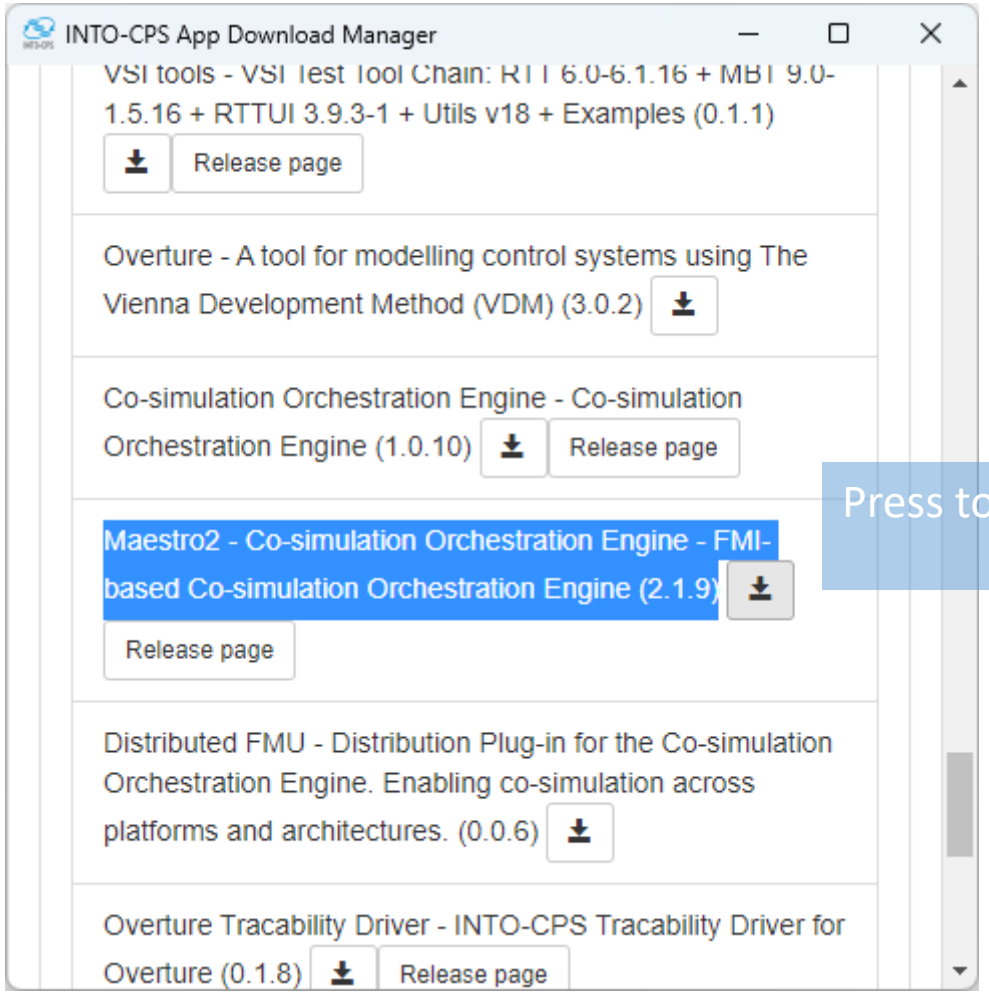
COE Console • COE Log


Project: drive - C:\work\github\fmi-tutorial\example\example_intocps_app
File Edit View Window Help
Minimize Ctrl+M
Show Settings Alt+S
Show Download Manager Alt+D
Show FMU Builder
Close Ctrl+W
DSES
FMUS
MODELICA_Demo.Stimuli
MODEL-CHECKING
MODELS
MULTI-MODELS
mm-new
co-sim
SIGVER
SYSML
TEST-DATA-GENERATION
TRACEABILITY
INTO-CPS > mm-new > co-sim
Configuration
Simulation
Co-Simulation Engine offline. No connection at localhost:8082.
Launch
Simulate
0%
If the code simulation engine is not installed then we can download it directly from the user interface by opening the download manager
COE Console
COE Log

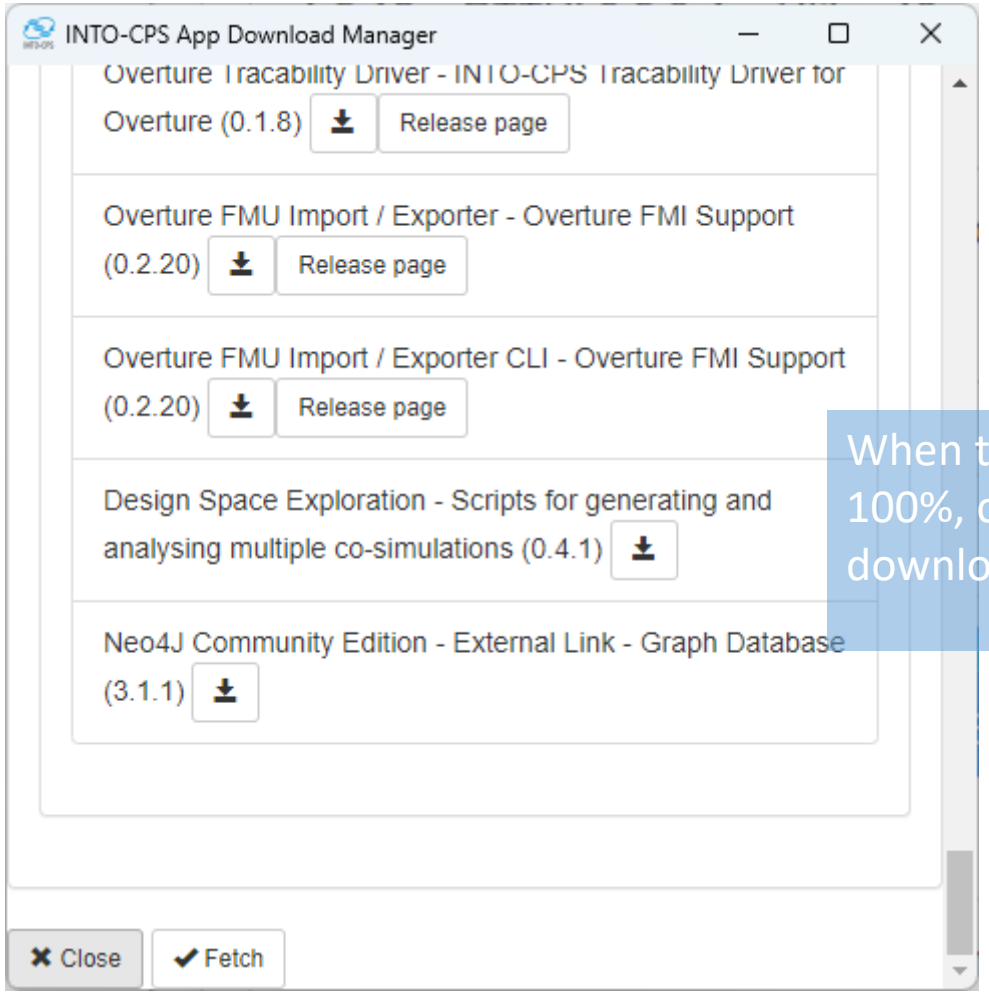

INTO-CPS App Download Manager
Overview
Releases
1.0.9
1.0.8
1.0.7
1.0.6
1.0.5
Click on the latest release, to jump to it.



Scroll down to find the Maestrov2



Press to download…



When the download is 100%, close the download manager

Project: drive - C:\work\github\fmi-tutorial\example\example_intocps_app

File Edit View Window Help

DSES

FMUS

+ MODELICA_Demo.Control

+ MODELICA_Demo.ControlledElectricDrive

+ MODELICA_Demo.Drive

+ MODELICA_Demo.Stimuli

MODEL-CHECKING

MODELS

MULTI-MODELS

- mm-new

co-sim

SIGVER

SYSML

TEST-DATA-GENERATION

TRACEABILITY

Basic Configuration

Visibility

Stabilization

Live Plotting

Graph sampling interval (0[s]=allways) 0

Number of graph columns 1

Number of visible graph rows. The graphs will scale such that the given number of rows will be visible without scrolling. 1

Graph Variables

Name: Live Graph

External Window

{Control}.control

{Drive}.drive w

{Stimuli}.stimuli w_desired

After saving the configuration it's time to launch the cosim engine

Results Saving

Others

Post-Processing

Edit

Simulation

maestroV1, version 1.0.10, online at localhost:8082.

Simulate

0%

Open results

COE Console • COE Log

Project: drive - C:\work\github\fmi-tutorial\example\example_intocps_app

File Edit View Window Help

DSES

FMUS

+ MODELICA_Demo.Control

+ MODELICA_Demo.ControlledElectricDrive

+ MODELICA_Demo.Drive

+ MODELICA_Demo.Stimuli

MODEL-CHECKING

MODELS

MULTI-MODELS

- mm-new

+ co-sim

SIGVER

SYSML

TEST-DATA-GENERATION

TRACEABILITY

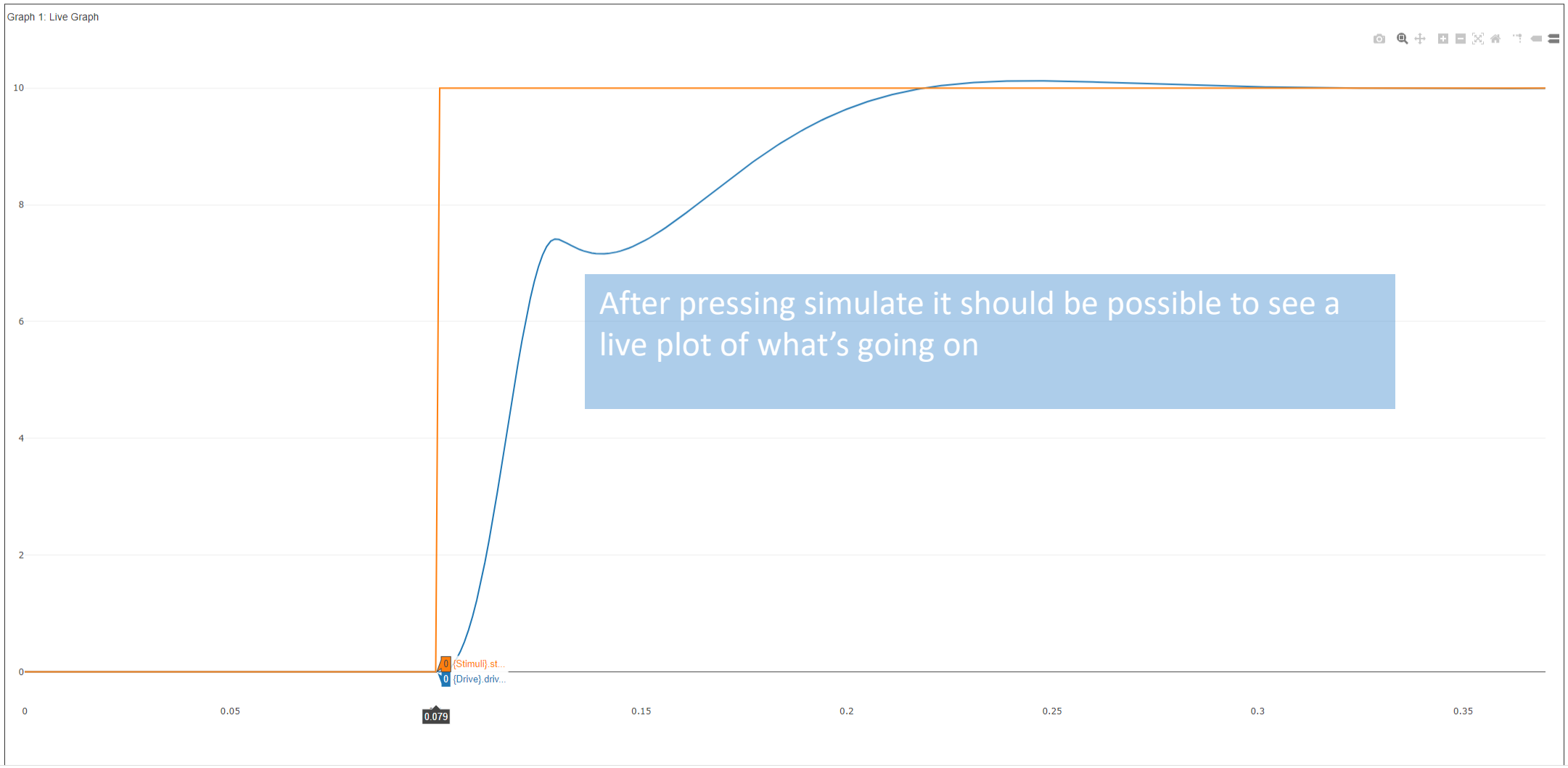
Simulation

maestroV1, version 1.0.10, online at localhost:8082.

■Stop

37%

Graph 1: Live Graph



After pressing simulate it should be possible to see a live plot of what's going on

COE Console ● COE Log

Project: drive - C:\work\github\fmi-tutorial\example\example_intocps_app

File Edit View Window Help

DSES

FMUS

+ MODELICA_Demo.Control

+ MODELICA_Demo.ControlledElectricDrive

+ MODELICA_Demo.Drive

+ MODELICA_Demo.Stimuli

MODEL-CHECKING

MODELS

MULTI-MODELS

- mm-new

+ co-sim

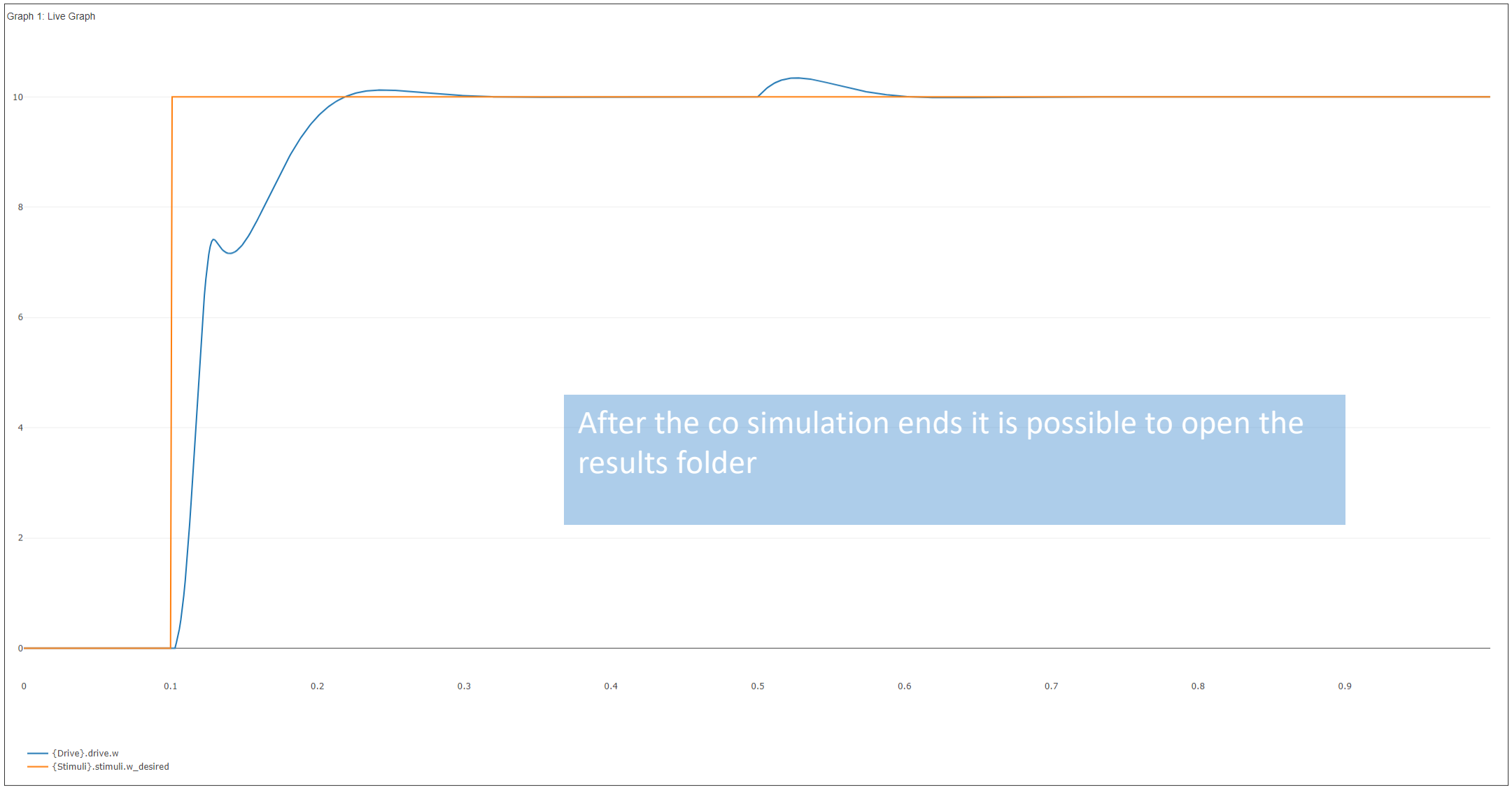
SIGVER

SYSML

TEST-DATA-GENERATION

TRACEABILITY

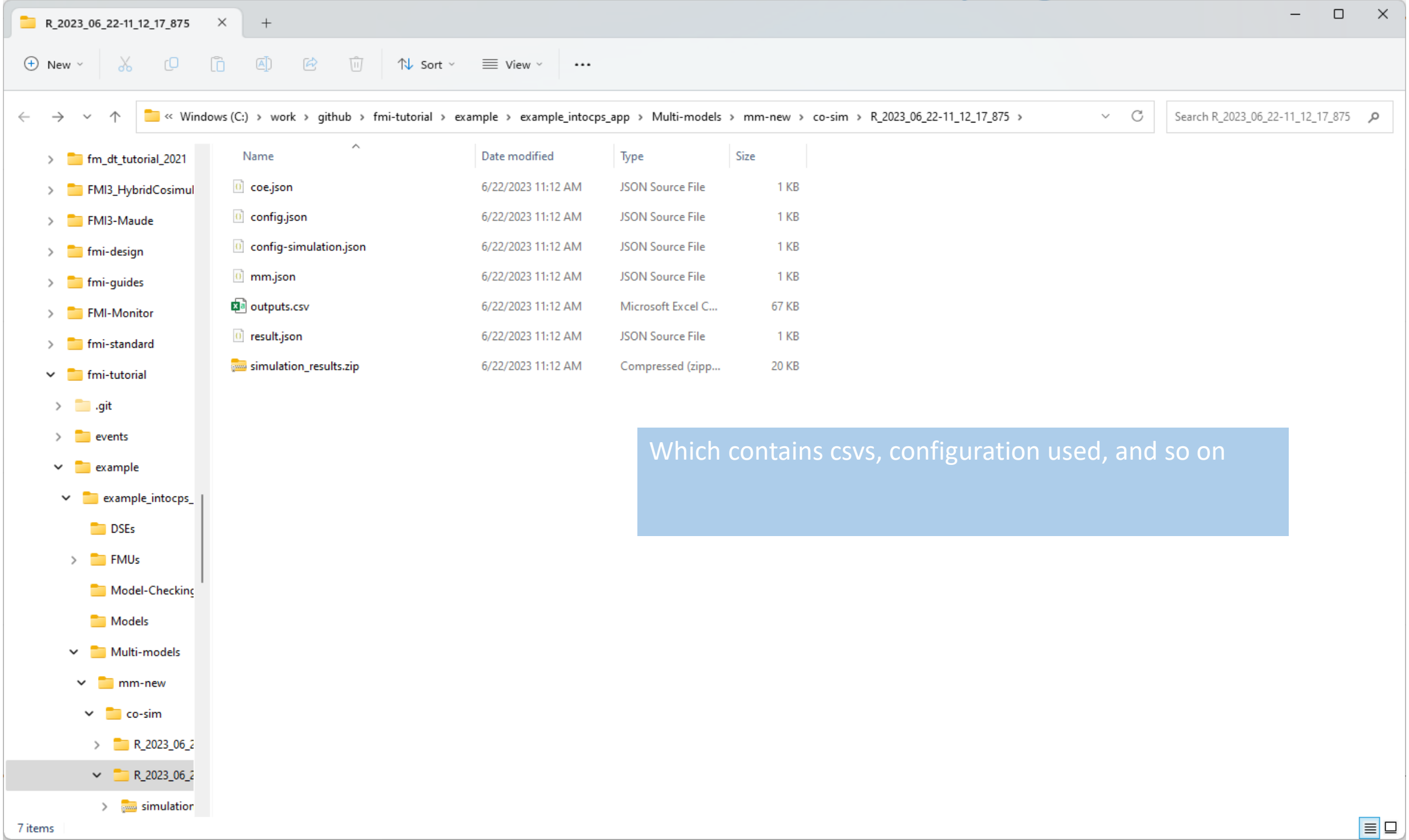
100%



After the co simulation ends it is possible to open the results folder

Open results

COE Console ● COE Log


R_2023_06_22-11_12_17_875
New
Sort
View
« Windows (C:) › work › github › fmi-tutorial › example › example_intocps_app › Multi-models › mm-new › co-sim › R_2023_06_22-11_12_17_875 ›
Search R_2023_06_22-11_12_17_875
fm_dt_tutorial_2021
FMI3_HybridCosimul
FMI3-Maude
fmi-design
fmi-guides
FMI-Monitor
fmi-standard
fmi-tutorial
.git
events
example
example_intocps_
DSEs
FMUs
Model-Checkinc
Models
Multi-models
mm-new
co-sim
R_2023_06_2
R_2023_06_2
simulatior
Name
Date modified
Type
Size
coe.json 6/22/2023 11:12 AM JSON Source File 1 KB
config.json 6/22/2023 11:12 AM JSON Source File 1 KB
config-simulation.json 6/22/2023 11:12 AM JSON Source File 1 KB
mm.json 6/22/2023 11:12 AM JSON Source File 1 KB
outputs.csv 6/22/2023 11:12 AM Microsoft Excel C... 67 KB
result.json 6/22/2023 11:12 AM JSON Source File 1 KB
simulation_results.zip 6/22/2023 11:12 AM Compressed (zipp... 20 KB
Which contains csvs, configuration used, and so on
7 items