Siemens OPC UA Modeling Editor for the implementation of OPC UA Companion specifications

SiOME / OPC UA / TIA V16

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Table of contents

1 Introduction

1.1 Overview

The OPC UA communication protocol enables companies and organizations to create their own standards for an OPC UA information model. You can generate a standardized server interface with these functions. For communication to your system or system parts, the OPC UA clients only have to know the defined standard without taking into account detailed information on the system and its devices.

The platform-independent OPC UA protocol with the companion specifications extension greatly facilitates standardized cross-manufacturer communication and reduces implementation effort.

Many organizations and associations already have standardized OPC UA information models for your industry-specific systems and solutions. These include the following organizations, for example:

* Euromap
* AIM
* VDMA
* AutomationML
* OMAC

With the free "Siemens OPC UA Modelling Editor" (SiOME) tool, we have created an editor for defining your own OPC UA information models or mapping existing companion specifications on your SIMATIC PLC. Using this tool, you can import and edit information models as XML files or generate and export individualized models.

Figure 1-1 Function principle:
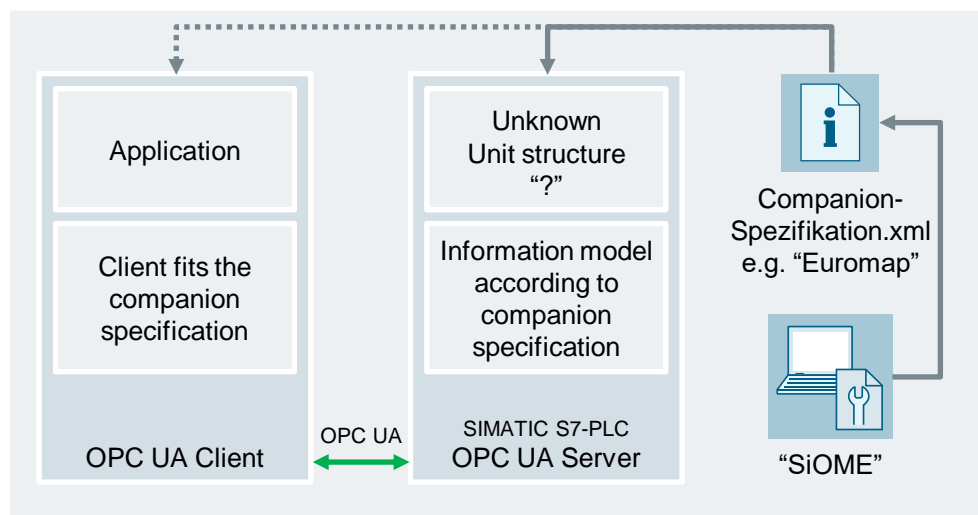
1.2 Content of the application example

In this application example, we will explain the functions of SiOME using the "Euromap77" companion specifications. These specifications define the OPC UA machine interface for injection molding machines.

SiOME is used here to generate an interface from the OPC UA NodeSets from Euromap and then to link it to the variables and methods of the SIMATIC PLC from a TIA Portal project.

In addition, we demonstrate the generation of individual OPC UA types for the definition of a user-specific machine interface.

Use SiOME to generate your own OPC UA information model. Define your own types and objects to perfectly describe your machine. This makes it possible for MES / SCADA OPC UA clients or clients for M2M communication to call up your self-defined OPC UA interface and read and write data in a targeted manner.

1.3 Components used

This application example was created with the following hardware and software components:

Table 1-1

Components	Quantity	Article number	Note
Siemens OPC UA Modelling Editor (SiOME)	1	Freeware	SiOME V1.7 or later
STEP 7 Professional	1	6ES7822-1AA06-0YA5	TIA Portal V15 or later
SIMATIC S7-1500 CPU 1516-3 PN/DP	1	6ES7516-3AN01-0AB0	Firmware V2.5 or later
NodeSets	3	Freeware	-"UA.DI" -"Euromap83" -"Euromap77"

Note	The following system requirements apply to SiOME: • .NET Framework 4.5 or higher • Windows 7 (x32/x64) • Windows 10 (x64) The following system requirements also apply for the use of the TIA Openness function of SiOME: • Windows 7/10 (x64) • TIA Portal openness installation

This application example consists of the following components:

Table 1-2

Components	File name	Note
Documentation	109755133_SiOME_DOC_V21_en.pdf	This document.
SiOME	109755133_SiOME_CODE_V21.zip	Modelling Editor.
System manual	109755133_SiOME_MAN_V21_en.pdf	Manual
NodeSet	109755133_SiOME_XML_V21.zip	Euromap NodeSet for TIA Portal including mapping, generated with SiOME.
TIA Portal project	109755133_SiOME_PROJ_V21.zip	Example project for "Euromap77" with integrated NodeSet.

2 Configuration with SiOME

In this chapter, you will learn fundamentals on how to generate an OPC UA information model with SiOME. Two separate use cases will illustrate this:

- In chapter 2.1 "Example: Euromap specifications" we explain how to use SiOME to generate an information model according to Euromap specifications and how to load this model to a SIMATIC PLC.

- In chapter 2.2 "Example: User-specific information model", the fundamentals for using SiOME to generate your own OPC UA information model are explained.

You can find detailed instructions for SiOME in the manual "109755133_SiOME_MAN_V21_en.pdf" of this article.

2.1 Example: Euromap specifications

In this chapter, we use an information model in accordance with the Euromap specifications to generate machine instances and to link them to the variables and function blocks of a TIA Portal project.

The result of the steps to be taken in this chapter is contained in the provided TIA Portal project. Load the project on a SIMATIC S7-PLC to check the configuration, for example using the free "UaExpert" tool (\6\).

2.1.1 Configuring Euromap specifications with SiOME

Follow these steps to generate a Euromap information model:

1. Download the NodeSet files for "UA.DI", "Euromap77" and "Euromap83". You can find the links in the bibliography (\3\ and \4\). Due to the dependencies of the type definitions, you need all three named Nodesets to configure the Euromap specifications.

| Note	Download the most current version of the NodeSets for "Euromap77" and "Euromap83". The most recent files are indicated by the release note in the file name: "Opc_Ua.EUROMAP77.X_XX.NodeSet2.xml" or "Opc_Ua.EUROMAP83.X_XX.NodeSet2.xml" You can find information on the NodeSets under the download links in the respective PDF files.

2. Download the archive "109755133_SiOME_CODE_V21.zip". (\2\). Unpack the archive and start the "SiOME-2.1.0.exe" application.

3. Click on the "Import XML" button in the "Information model" area and import the "Opc.Ua.Di.NodeSet2.xml" NodeSet.
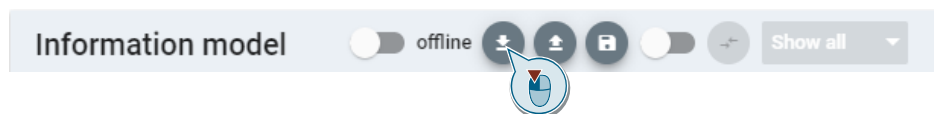

4. Repeat this procedure for NodeSets "Opc_Ua.EUROMAP83.1_00.NodeSet2.xml" and

"Opc_Ua.EUROMAP77.1_00.NodeSet2.xml". Each imported NodeSet automatically creates its own namespace.

5. Create a new name space for your machine. To do this, right-click on "Namespaces" in the "Namespaces" area and select "Add Namespace".
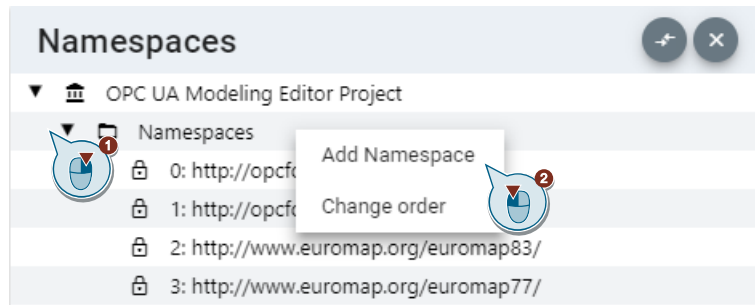
6. Activate the slider "New Namespace" in the appearing dialog and assign a name. Then confirm with "Ok".
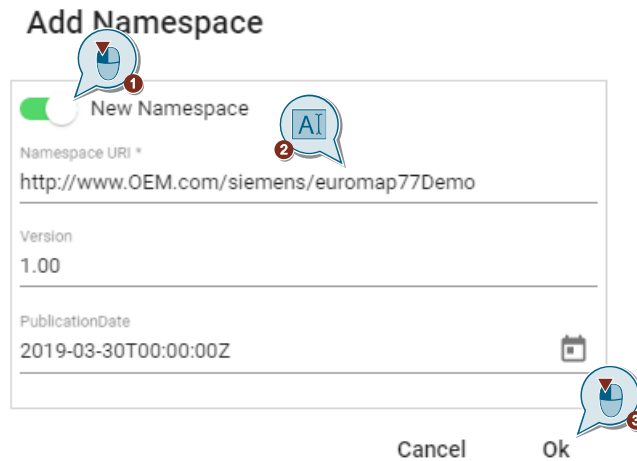
7. Create a new instance for your Euromap interface in the information model. To do this, right-click the DeviceSet object in the Information model pane, and then click "Add Instance".
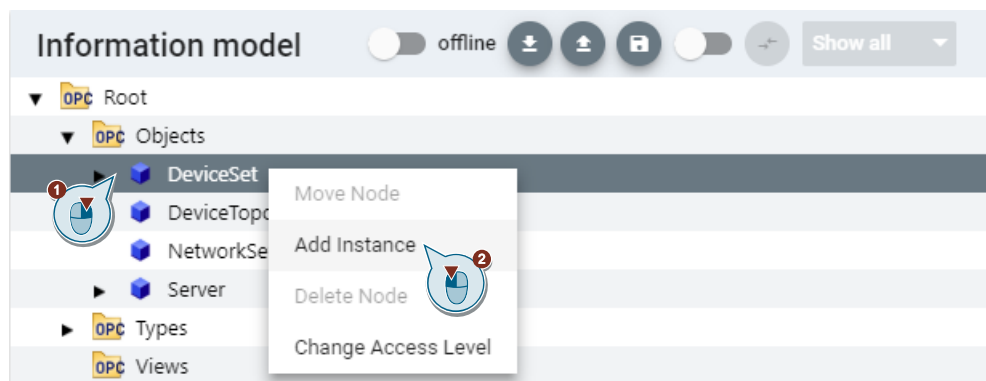
8. Assign a name for the interface in accordance with the Euromap specifications ("IMM_Manufacturer_SerialNumber") in the dialog which appears. Then select the "IMM_MES_InterfaceType" data type as the "TypeDefinition" and confirm with "Ok".

Add Instance

9. Create a new instance for an "InjectionUnit". In the "Information model" area, right-click on "InjectionUnits" and then the "Add Instance" button.
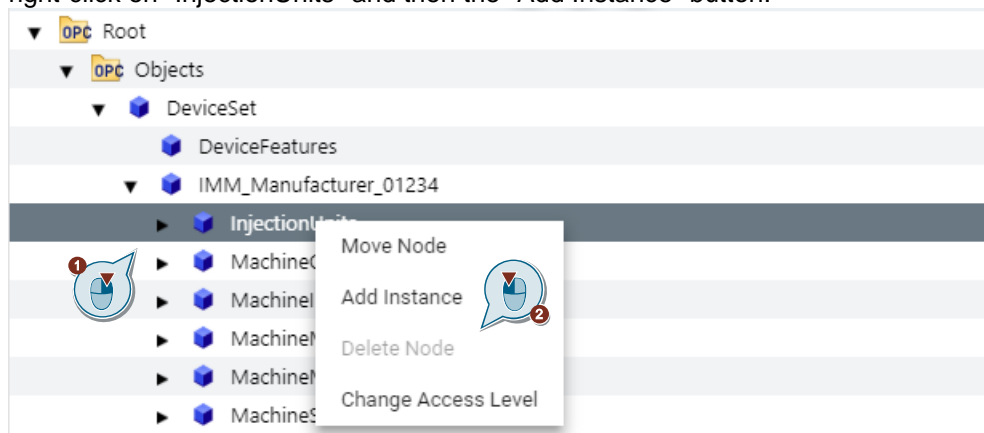

10. Assign a name, e.g. "InjectionUnit_1" in the dialog which appears and select the "InjectionUnitType" data type as the "TypeDefinition". Then confirm with "Ok".

Add Instance

11. Repeat the steps 9 and 0 for "Moulds" and "PowerUnits".

12. Open the TIA project onto which the generated information model is to be transmitted. Click on the "Open TIA Portal project" button in the "TIA Portal" area.
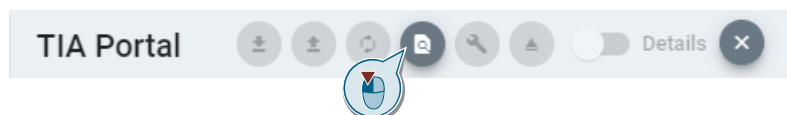
13. Connect to an already open TIA Portal project that provides the objects for the Euromap specification. To do this, click on the check box for your project and then on "Attach to selected project". Alternatively, you can use the "Open another project" button to search for a closed project on your hard disk.
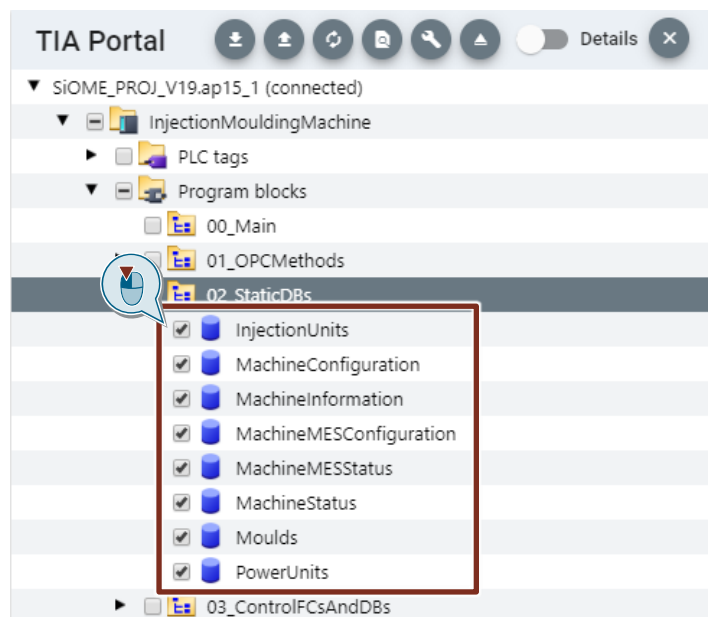
Attach to already opened TIA Portal project

⊙ C:\Users\siemens\Desktop\SiOME_PROJ_V19\SiOME_PROJ_V19.ap15_1 **1**

2

Cancel   Attach to selected project   Open another project
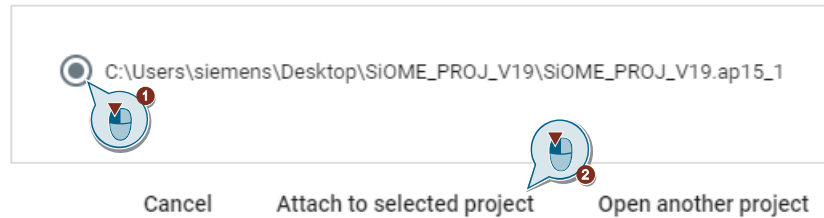
If you receive an error message from Openness, make sure that the currently registered user has the authorization to use Openness. Further information can be found in the manual "109755133_SiOME_MAN_V19_en.pdf" in chapter "2.2.15 Creating an Information Model from a TIA Portal Project".

14. Activate the "Mapping" slider in the "Information model" area.

Information model ◯ offline ⊕ ⊕ ▣ ◯ ⇥ Show all ▾
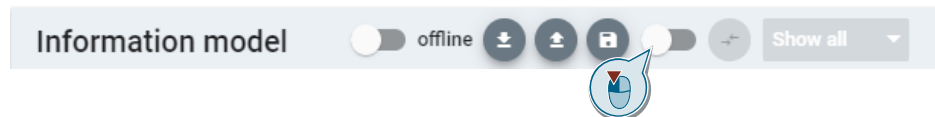
15. In the "TIA Portal" area, select the checkboxes of the data blocks whose variables you want to link ("map") to the OPC UA variables of the information model.

TIA Portal ⊕ ⊕ ⟳ ▣ 🔧 ▲ ◯ Details ✕

▼ SiOME_PROJ_V19.ap15_1 (connected)
  ▼ ☐ ▦ InjectionMouldingMachine
    ▶ ☐ 📁 PLC tags
    ▼ ☐ 📦 Program blocks
      ☐ 🔢 00_Main
      ☐ 🔢 01_OPCMethods
      🔢 02_StaticDBs
        ☑ 🔵 InjectionUnits
        ☑ 🔵 MachineConfiguration
        ☑ 🔵 MachineInformation
        ☑ 🔵 MachineMESConfiguration
        ☑ 🔵 MachineMESStatus
        ☑ 🔵 MachineStatus
        ☑ 🔵 Moulds
        ☑ 🔵 PowerUnits
    ▶ ☐ 🔢 03_ControlFCsAndDBs

16. Activate the "Details" slider in the "TIA Portal" area to make the variables accessible in the data blocks.

TIA Portal ⊕ ⊕ ⟳ ▣ 🔧 ▲ ◯ Details ✕
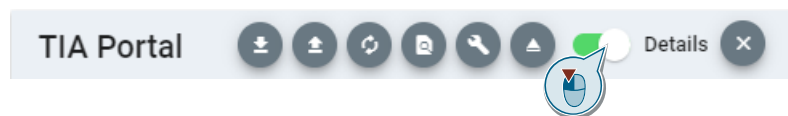
17. Drag and drop the variables from the TIA Portal project to the OPC UA variables.
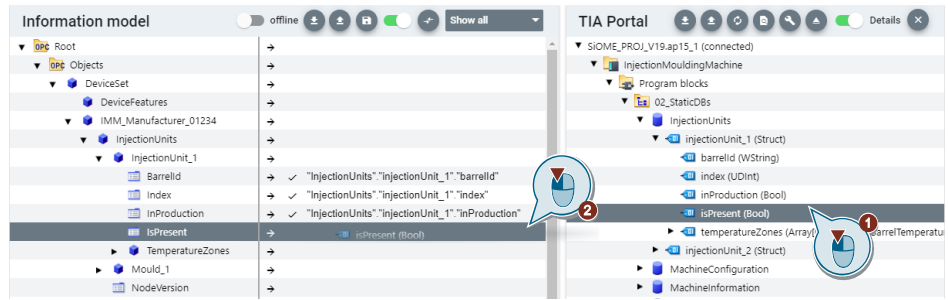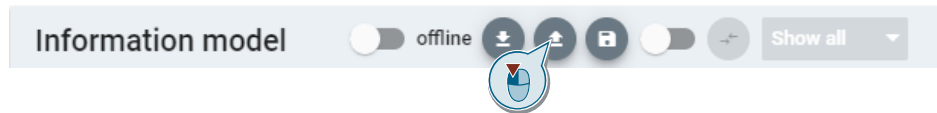
18. Repeat the process for all variables and methods you want to link.

Note	To link methods, you must link the instance data blocks of the respective TIA Portal function blocks to the methods of the information model using drag & drop.

19. Click on the "Export XML" button to saved the generated information model. The generated file can be reused at a later time.

20. Select the "Include mappings" checkbox in the dialog which appears if you need the information model for a OPC UA server of a TIA Portal project. Deactivate the checkbox if you need the information model for a OPC UA client, for example. Confirm with "OK". In the dialog that appears, select a storage location for your information model and click "Save",

Export XML

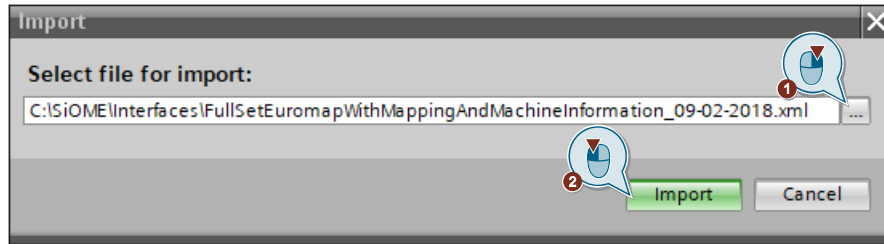### 2.1.2 Importing interface in the TIA Portal

Proceed as follows to load an OPC UA interface generated and mapped with SiOME on the OPC UA server of a SIMATIC PLC:

1. Start the TIA Portal and open the project whose functions are to be made accessible via the interface.

2. In the project tree, navigate to "CPU > OPC UA communication > Server interfaces" and double-click on "Import server interface".
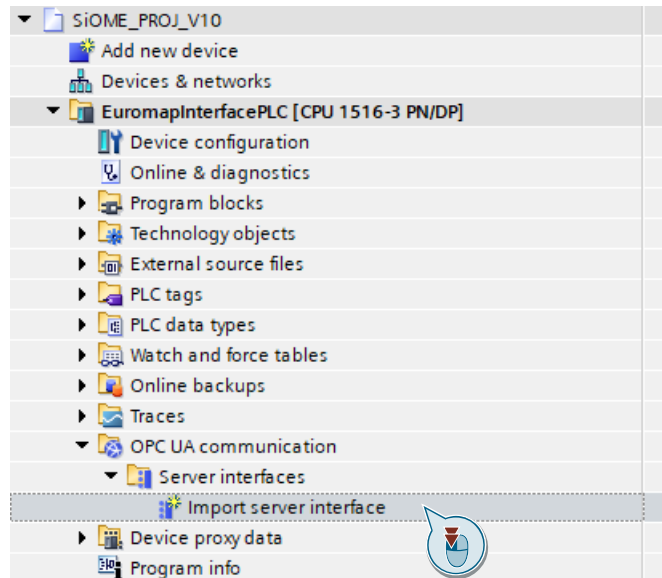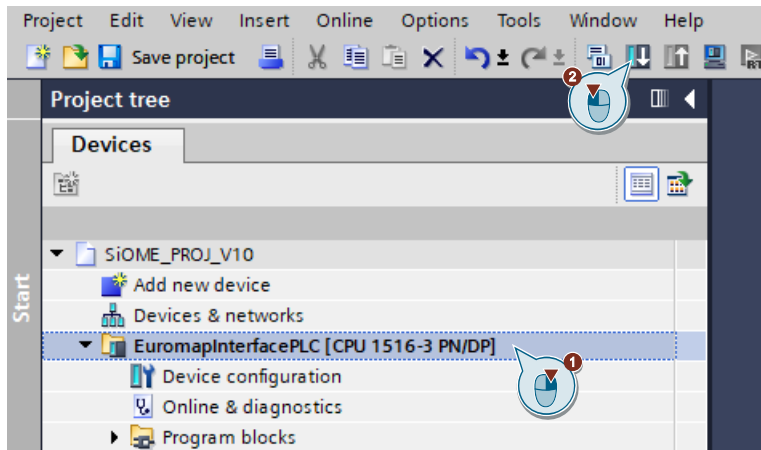
3. In the dialog which appears, search for the directory where the XML file of the mapped interface is located and select the file. Confirm with "Import".

4. Select the CPU in the project tree and click on the "Download to device" button.

| Note | The TIA Portal project in this example already contains an imported Euromap interface. |

2.2 Example: User-specific information model

With a user-specific information model, you can generate OPC UA types and objects specially for your application case or machine. These types and objects are generated in SiOME and then exported as XML files. You can either import the generated interface into the TIA Portal or use it to generate an appropriate OPC UA client.

In this chapter, we will create name spaces, individual variable and object types and instantiate these for the resulting OPC UA information model for illustration purposes.

Creating a user-specific information model

Follow these steps to generate a user-specific information model:

1. Download the archive "109755133_SiOME_CODE_V19.zip". (\2\). Unpack the archive and start the "SiOME 1.9.2.exe" application.

2. Create a new name space for your machine. Right-click on "Namespaces" in the "Namespaces" area and select "Add Namespace".
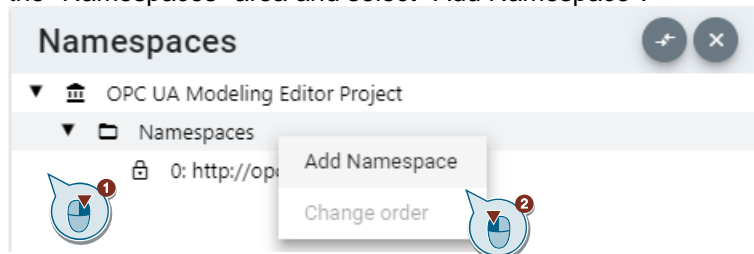

3. Activate the slider "New Namespace" in the appearing dialog and assign a name. Then confirm with "Ok".
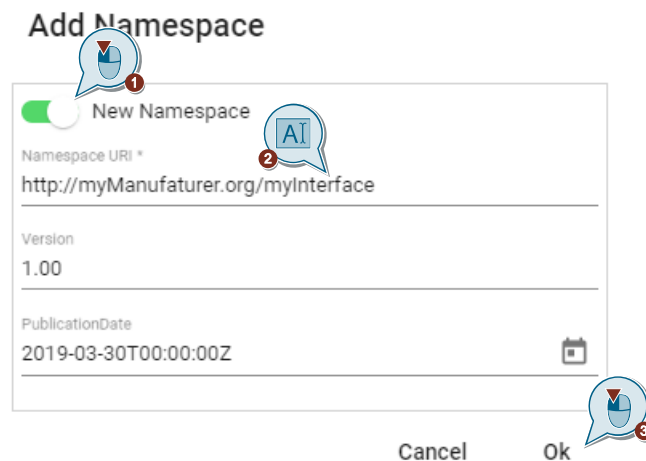
4. In the "Information model" area, create a new data type for your information model. Create a structure in this area. Navigate to "Types > DataTypes > BaseDataTypes", right-click on "Structure" and select "Add New Structured Data Type".
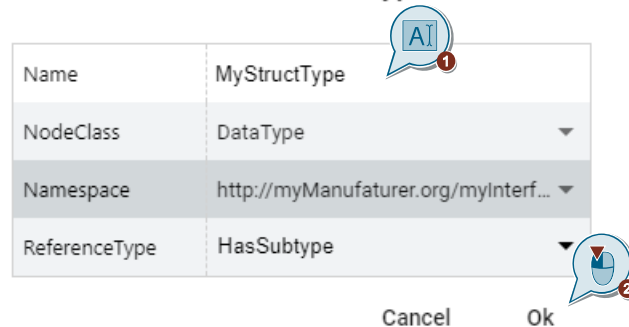
Note	You must assign individual types to their own name space since the "0" name space ("http://opcfoundation.org/UA/") is reserved for the specifications of the OPC Foundation.
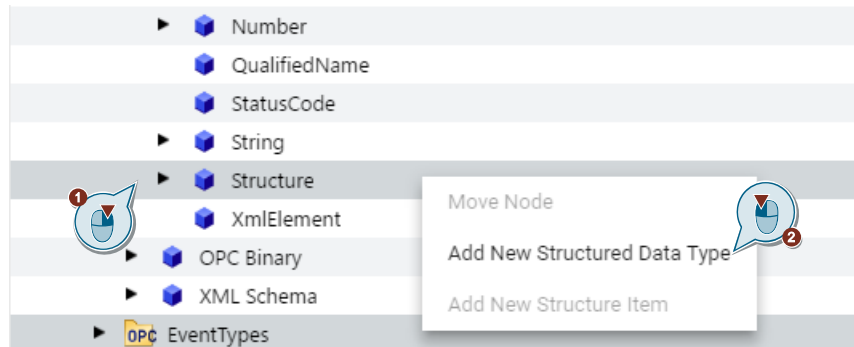
5. Assign a name for the structure in the dialog which appears and confirm with "Ok". The active namespace is automatically selected as the namespace in which the definition of the structure is to be stored.
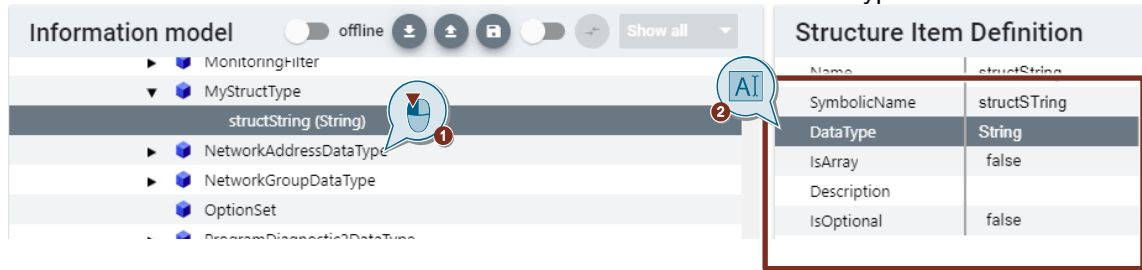

6. Fill the structure with items. Right-click on the structure you just created and select "Add New Structure Item".
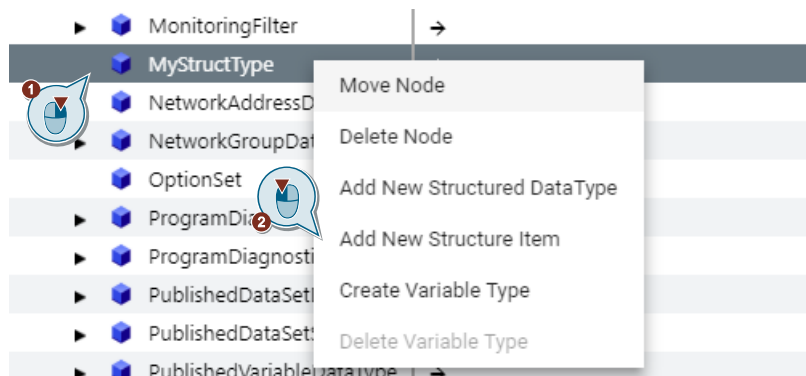
7. In the tree view, select the created item with the left mouse button, assign a name in the "Structure Item Definition" area and select the desired data type.
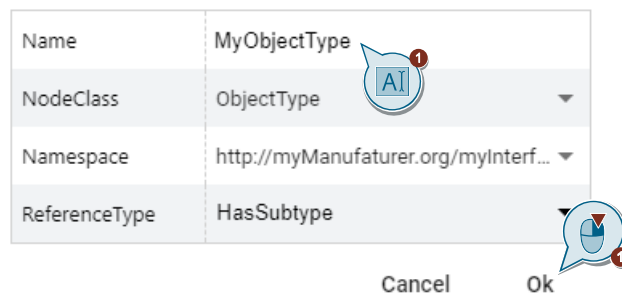

8. Repeat steps 6 and 7 for every required item in your structure.

9. Create an object type to instantiate it later as an object. In the "Information model" area, navigate to "Types > ObjectTypes", right-click on "BaseObjectType" and select "Add New Objecttype".
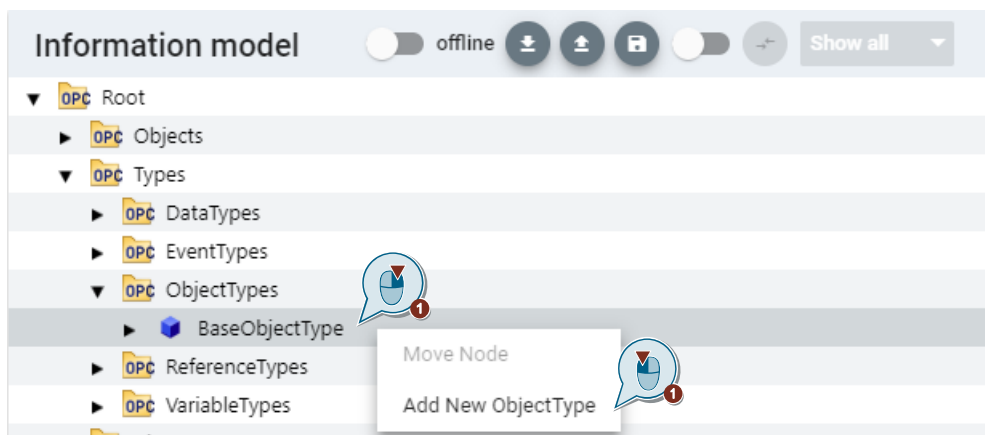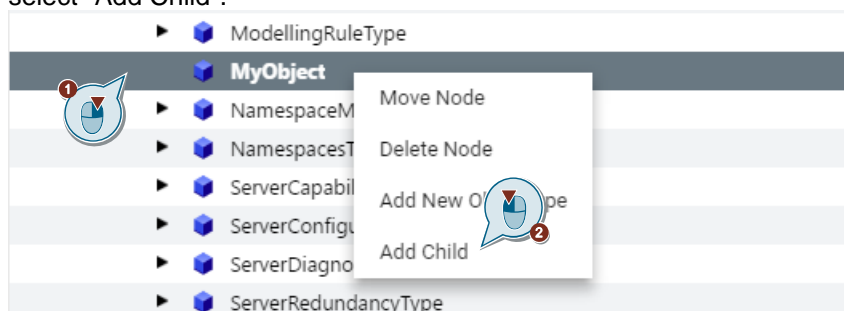

10. In the dialog that appears, enter a name for the object type and confirm with "OK".

11. Select the object with variables. Right-click on the object just generated and select "Add Child".

12. Assign a name for the variable in the dialog which appears, select the "Variable" class as the "NodeClass" and then the desired data type for the variable. To do so, select the user-specific structure which you defined in advance. Confirm with "Ok".
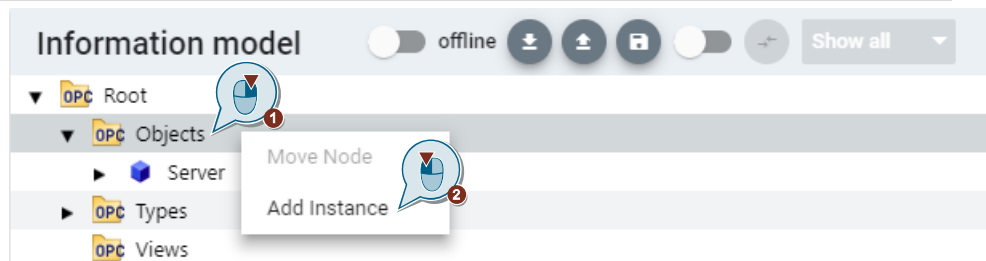
Add Child

Name	MyObjectChild
NodeClass	Variable
Namespace	http://myManufaturer.org/myInterf... ▼
ReferenceType	Organizes ▼
TypeDefinition	BaseDataVariableType ▼
DataType	MyStructType ▼

Cancel   Ok

13. Repeat the process for all variables, methods and objects which should be located in the object type.

14. Generate an instance which should be derived from the object type create in advance. In the Information model area, right-click Objects and select Add Instance.

| Note	We recommend creating a new name space so that the type definitions and the instances derived from them can be filed in a structured manner separated from one another.

Information model   offline

▼ OPC Root
  ▼ OPC Objects
      ► Server   Move Node
  ► OPC Types   Add Instance
      OPC Views

15. Assign a name for the object instance in the dialog which appears and select the desired object type. Select the object type defined in advance. Confirm with "OK".
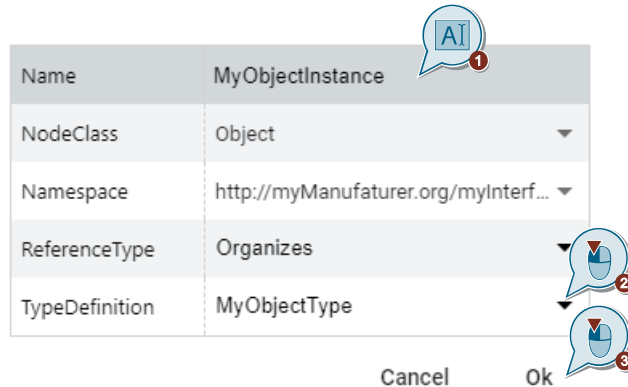
16. Optionally, you can map the instance just generated with a TIA Portal project. Proceed as described in chapter 2.1.1 "Configuring Euromap specifications with SiOME" in steps 12 to 18.

17. Click on the "Export XML" button to saved the information model. The generated file can be reused at a later time.
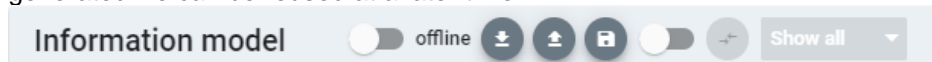
18. Select the "Include mappings" checkbox in the dialog which appears if you need the information model for a OPC UA server of a TIA Portal project. Deactivate the checkbox if you need the information model for a OPC UA client.
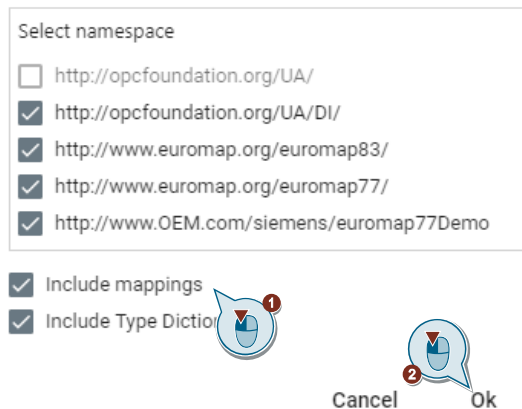
3   Explanations for TIA Portal project

The following explanations describe the TIA Portal project provided in this application example. All functions and data blocks do not contain specific functions and are only used for illustration purposes.

S7 program

The following figure shows the structure of the S7 application program in which the information model with SiOME is depicted in this example. The function and data block and calls in OB-Main only fulfill the requirements that it must be possible to call up the OPC UA methods and that the variables must be read- and writable in accordance with "Euromap77". There is no specific programming logic within the function blocks.

Figure 3-1
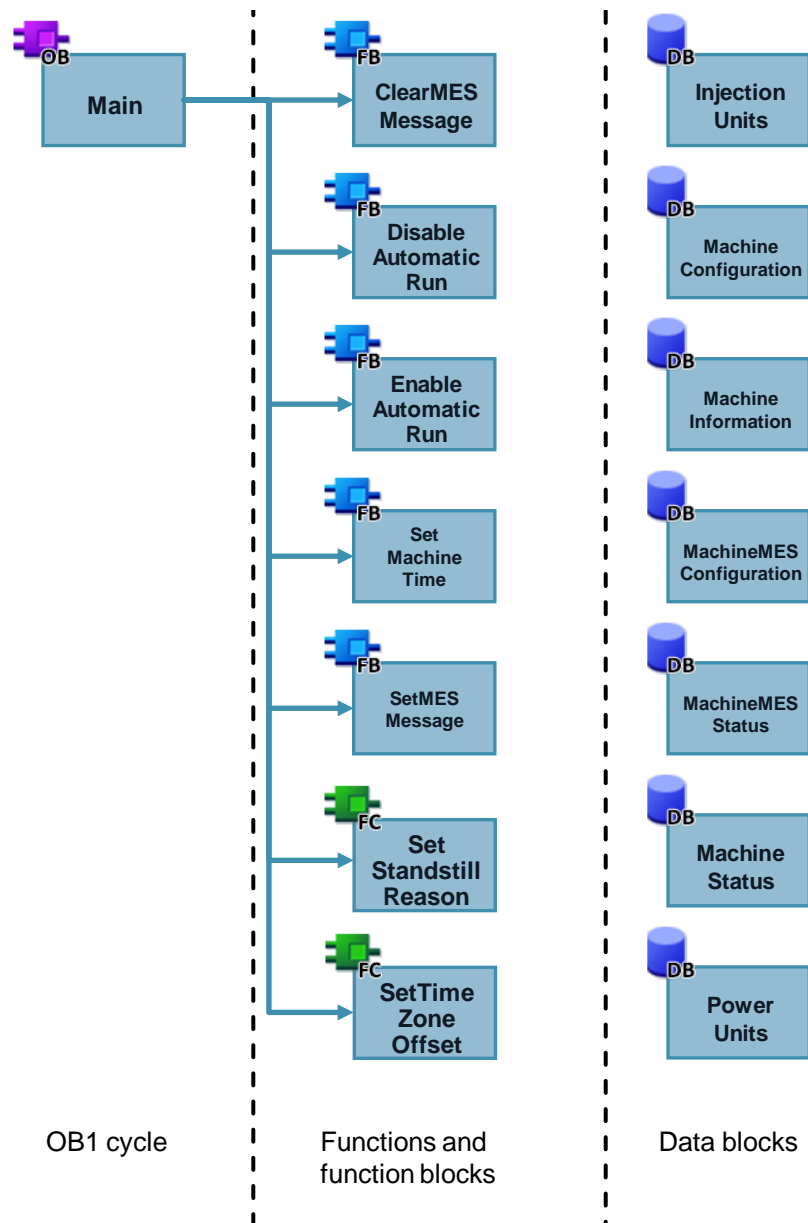
4 Appendix

4.1 Service and support

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https://support.industry.siemens.com/cs/ww/en/sc/2067

5 Links and literature

Table 5-1

	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Download page of this entry https://support.industry.siemens.com/cs/ww/de/view/109755133
\3\	Download of the NodeSet file for UA.DI https://github.com/OPCFoundation/UA-Nodeset/tree/v1.04/DI
\4\	Download of the NodeSet files for "Euromap77" and "Euromap88" http://www.euromap.org/euromap77 http://www.euromap.org/euromap83
\5\	Link to OPC Foundation https://opcfoundation.org/
\6\	UaExpert https://www.unified-automation.com/products/development-tools/uaexpert.html

6 Change documentation

Table 6-1

Version	**Date**	**Modifications**
V1.0	02/2018	First version
V1.1	07/2018	Expansion with manual
V1.9	03/2019	Update to SiOME V1.9
V2.1	06/2020	Update to SiOME V2.1