



**SIEMENS**



Industry Online Support

Home

**SiOME**

**Siemens OPC UA  
Modeling Editor**

**Functional Description**

SiOME V2.7 / OPC UA / TIA Portal

<https://support.industry.siemens.com/cs/ww/en/view/109755133>



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# 1 Introduction

## 1.1 Overview

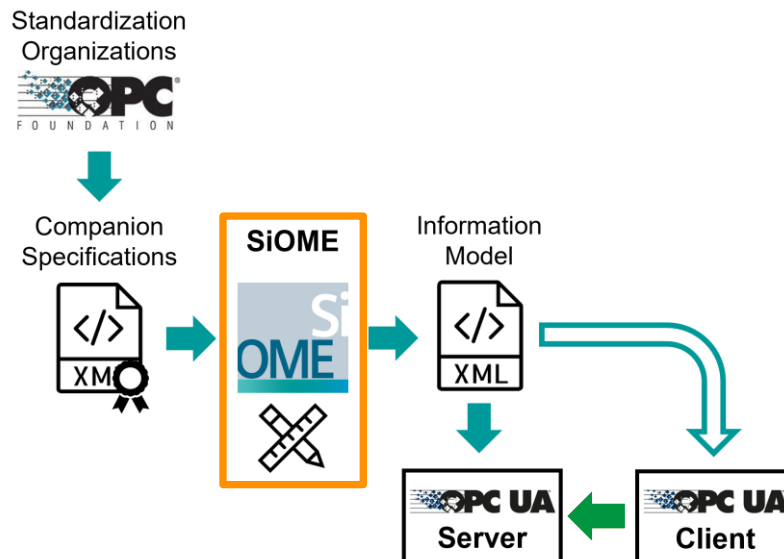
The OPC UA communication protocol enables companies and organizations to create their own standards for an OPC UA Information Model. You can generate a standardized server interface with these functions. For communication to your system or system parts, the OPC UA clients only must know the defined standard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

The platform-independent OPC UA protocol with the companion specifications extension offers 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. Below you will find a selection of these industry organizations:

- Euromap
- AIM
- VDMA
- AutomationML
- OMAC
- VDW

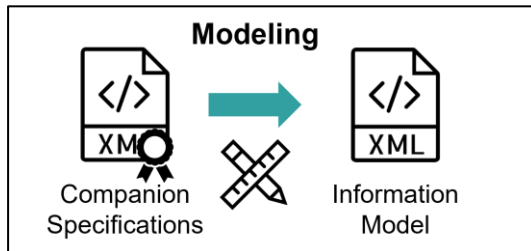
With the free "Siemens OPC UA Modelling Editor" (SiOME) tool, we have created an editor for defining your own OPC UA Information Models or mapping existing companion specifications on your SIMATIC PLC/SINUMERIK. Using this tool, you can import and edit Information Models as XML files or generate and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



## 1.2 Use Cases

### Modeling

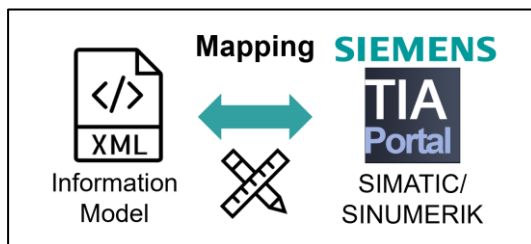
Create Server Interface nodesets based on imported industry standard models (“Companion Specifications”). Use the intuitive user interface to manage Namespaces and to add Types and Instances of the key elements of OPC UA, such as Objects, Variables, Properties or Methods. Get them linked using References and ModellingRules and specify the Attributes and Values of nodes. See chapter 3.



SiOME also includes a graphical editor for State Machines according to UA Part 16, see chapter 3.12.

### Mapping

Create or map an Information model to project or online data of SIEMENS devices. Profit from efficient Drag&Drop interaction with TIA Portal via Openness API interface.

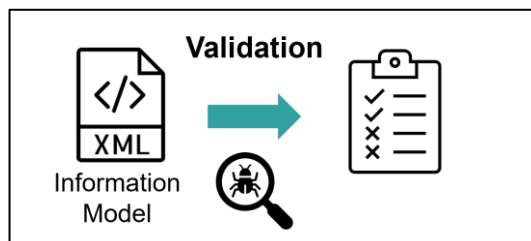


Optimized workflows are provided for the following product families:

- SIMATIC CPU S7-1200/1500, see chapter 4
- SINUMERIK, see chapter 5
- SIMATIC CloudConnect 7, see chapter 6

### Validation

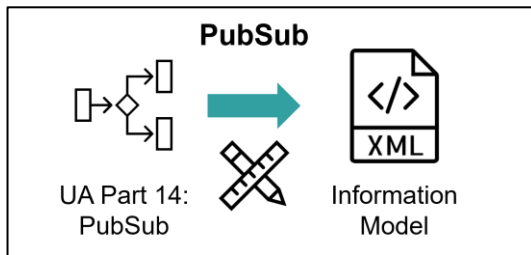
Check Information Model conformity to basic modelling rules or against a Companion Specification. Detect and repair modeling defects.





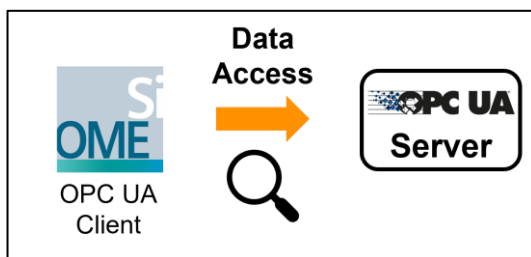
### PubSub

Create a XML configuration for Publish/Subscribe communication model according to UA Part 14. See chapter 7.



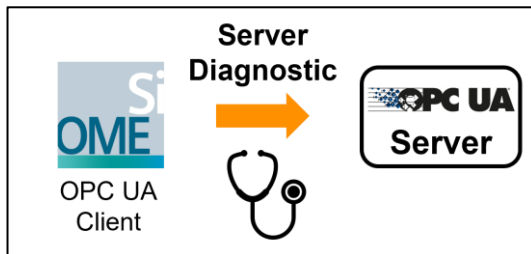
### Data Access

Access process data of an OPC UA Server using Browse, Read and Subscription via an online connection. See chapter 8.



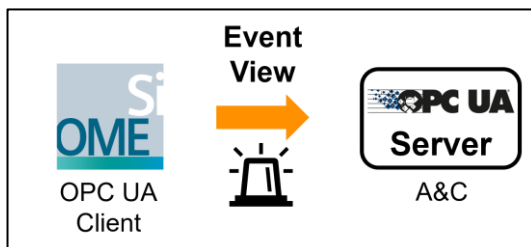
### Server Diagnostic

Display diagnostic information of an OPC UA Server and evaluate error conditions via an online connection. See chapter 8.5.



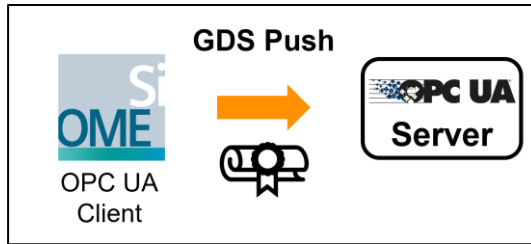
### Event View

Receive and display events and alarms from an online OPC UA Server via Alarms and Conditions (A&C) according to UA Part 9. Call methods for Acknowledgement and Comment. See chapter 9.



### GDS Push

Deploy PKI security certificates via Global Discovery Server Push to an OPC UA Server via an online connection, e.g. to a CPU S7-1500 at runtime. See chapter 10.



## 1.3 Change log

### Version 2.7

- New feature “**PubSub editor**” for creating nodesets containing an Information Model-based Publish/Subscribe configuration according to UA Part 14, see chapter 7
- New feature “**CloudConnect 7**” for creating a OPC UA Server interface for SIMATIC CC7 devices connected to PLC Stations via S7 connection, see chapter 6
- New feature “**SINUMERIK - Online mapping**” as an addition to the options “Server export” and “TIA Portal”, see chapter 5.3
- Optional normalization of array boundaries, see 2.4
- Improvements at connecting to projects of TIA Portal version 18, especially when containing Software Controllers or PLCs with S7 Namespaces and Units
- Improvements at OPC UA Client functionality in feature “Data Access”
- Improvements at modification of structured DataTypes, VariableTypes and their instances
- Improvements at defining Value attribute of structured data, see 3.13
- Improvements at modifying “BrowseName” and/or “DisplayName” of nodes, especially with different settings of default NodeId format (Numeric/String/TIA)
- Improvements at nodeset Validation checks, especially at latest Validation rules “Mandatory members” and “Invalid/Unnecessarily overridden type references”
- Improvements at certificate handling with new Security Policies and when using “GDS Push” feature
- Improvements at Drag&Drop of methods, including possibility of Multi-selection by keeping pressed the Ctrl.-key
- Improvements at function for adding a new non-hierarchical reference
- Further improvements and minor bugfixes

### Version V2.6

- Support of the Openness-interface to TIA Portal V18
- New function of pushing Webserver certificates of S7-CPU's when using the feature “GDS Push”
- Extension of available Security Policies when using Client functionalities
- New function for adding hierarchical references to existing parent nodes
- Improvements at modelling and Validation of nested or derived object types including “Repair references” function
- Extension of mapped SIMATIC data types (e.g. DTL, Date\_and\_Time and other data types based on structures or byte arrays)
- New tab “Server Diagnostic” in layout “DataAccess”
- New possibility for creating or selecting subfolders when creating PLC data types (UDTs)
- New function of showing all usages of a DataType
- Improvements at displaying AssociatedValues and AlarmConditionType of OPC UA Alarms and Conditions (A&C)
- Improvements at entering start values and UNECE characteristics

## 1 Introduction

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- Improvements using multi-selection
- Improvements accessing TIA Portal projects and PLCs with Safety configuration
- Default activation of the setting for showing data types in the Information Model
- Further improvements and minor bugfixes



## 2 General

### 2.1 Execution

#### System requirements

The following system requirements apply to SiOME:

- .NET Framework 4.8 or higher (see [13](#) for download)
- Windows 7 (x64) / Windows 10 (x64)
- Installation of vc\_redist.x64 (see [17](#) for download)

The following system requirements also apply for the use of the TIA Openness function of SiOME:

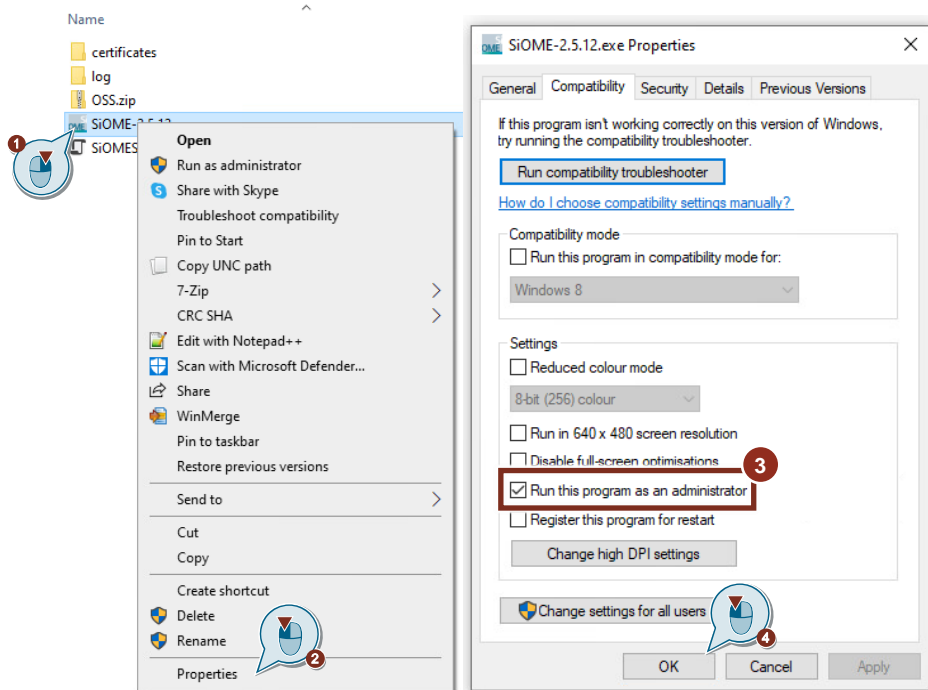
- TIA Portal Openness installation
- Access for TIA Portal Openness, see chapter 4.1

#### Local execution directory

Always launch the SiOME application from a folder on a local drive and not from a network drive or distributed system (e.g., OneDrive).

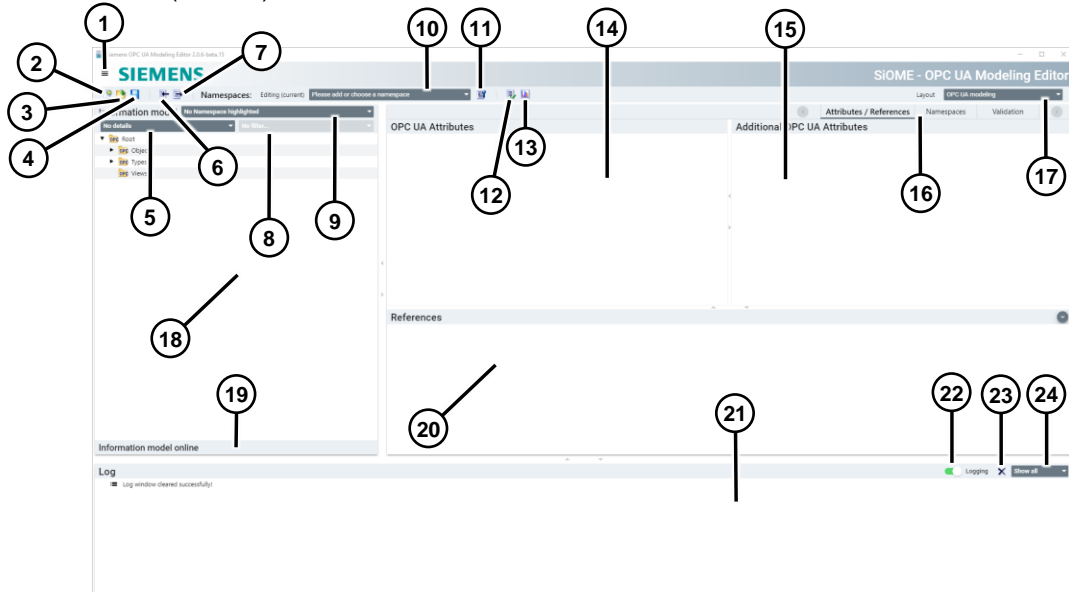
#### Run as administrator

It is recommended to execute the SiOME application with administration rights. This can be achieved by activating the option in the Properties menu of the application file or the desktop shortcut.



## 2.2 User Interface

The following Figure explains the interface of the Siemens OPC UA Modelling Editor (SiOME):



No.	Field	Description
1.	"Hamburger" menu	In the "About" dialog, you will find version information and the link to this SIOS entry. The "Settings" entry provides additional options for the Information Model. The complete description can be found under " <a href="#">Default Settings</a> ". The "Shortcuts" dialog contains a list of available shortcuts in SiOME.
2.	"New" button	Clears the current Information Model. All unsaved changes will be lost.
3.	"Open" button	Opens a SiOME project as an XML file.
4.	"Save as" button	Saves the current SiOME project as an XML file.
5.	"Select detail view" drop-down menu	Opens a range of views to link variables or licenses via drag & drop ("TIA Openness") or manually via text input.
6.	"Import XML" button	Imports a pre-defined NodeSet or a saved XML project status.
7.	"Export XML" button	Exports a modeled NodeSet. In addition to the "Save as" button, the user has the option to export only individually selected namespaces.
8.	"Filter for mapping" Drop-down menu	If the "Mapping" slider is activated, the user is able to filter for different mapping states (e.g. "Conflicts", "correctly assigned"). As soon as a filter is set, the list can be exported as a *.csv file by executing a right-click on this menu, see section 0.
9.	"Highlighted Namespace" drop-down menu	The selected namespace is highlighted

No.	Field	Description
10.	"Namespace" drop-down menu	Lists all namespaces used in the tool. By selecting a namespace from the list, the user can unlock this specific namespace. Additionally, the user can create their own namespaces by clicking "Add New Namespace".
11.	"Namespace settings" button	Opens the "Namespaces" window for editing. The user can delete a specific namespace by right-clicking on it.
12.	"Validate Information Model" button	Validates the linking of OPC UA variables with PLC variables. Displays unresolved conflicts.
13.	"Show number of nodes" button	Shows the number of namespace nodes and the total number of nodes in the project
14.	"OPC UA Attributes" area	This section displays the attributes of the OPC UA nodes. You can add a description of the nodes or change their value here.
15.	"Additional OPC UA Attributes" area	In this section, additional attributes of the OPC UA nodes are displayed. Here, the user can change the value or access level of the nodes. The value data type is also displayed.
16.	Tab area	This area includes different tabs depending on the layout. For example, if the "Namespace settings" button is clicked, the "Namespaces" tab automatically becomes the current tab.
17.	"Layout" drop-down menu	Lists all available layouts. Additionally, the user can create their own layout.
18.	"Information model" area	This section shows the Information Model and offers all functions for modifying it.
19.	"Information model online" dialog box	Opens the OPC UA Server online connection dialog for browsing the namespace.
20.	"References" area	This section contains an overview of the referencing level of the OPC UA nodes. You can toggle between optional and required nodes here.
21.	"Log" area	A log is created in the SiOME directory. The log is used to collect debug information and readjust user input.
22.	"Logging" slider	Enables or disables logging.
23.	"Clear log window" button	Clears the log window
24.	"Filter for log message display" drop-down menu	This section allows the user to filter the log messages.

**Note**

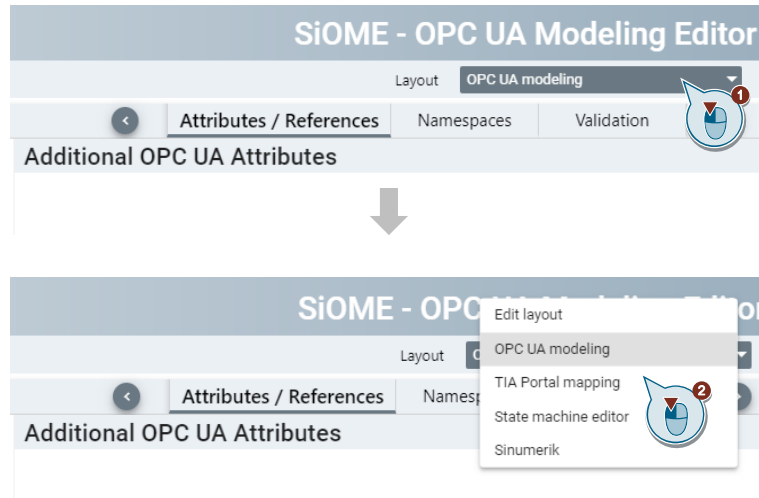
If logging is activated, SiOME creates the "Log" folder in the same directory as the SiOME EXE. In this folder you will find the logs in CSV format.



## 2.3 Layouts

### Selecting a Layout

To switch to another layout, click the drop-down menu and select one of the default layouts.



### Creating a new Layout

You can also create your own layout by selecting "Edit layout".



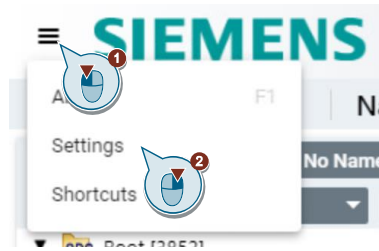
No.	Field	Description
1.	"Remove current layout" button	Removes the current layout. This option is not available for the standard layouts.
2.	"Clone current layout" button	Duplicates the current layout so that the user can add additional tabs to the layout.
3.	"Create new layout" button	Creates an entirely new layout.
4.	"Rename current layout" button	Renames the current layout. This option is not available for the standard layouts.

## 2.4 Default Settings

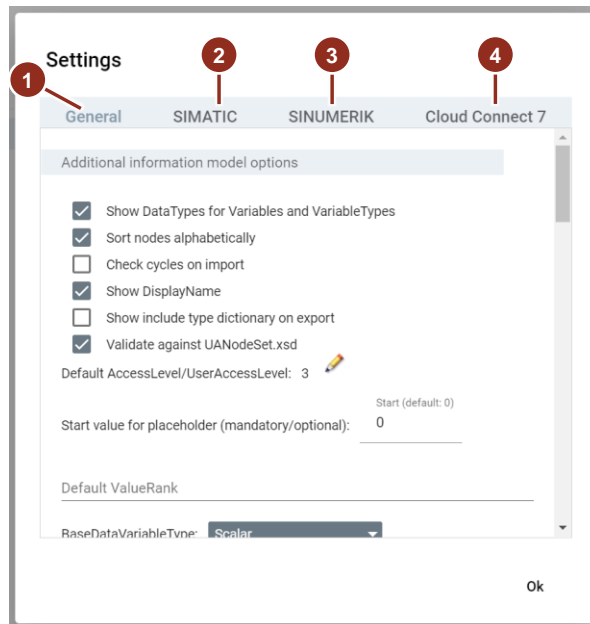
SiOME offers extensive possibilities to customize the default settings for various functions.

These settings are saved in the "SiOMESettingsV2.json" file even after exiting SiOME.

To change the default setting, enter the "Settings" menu.



You can then change the default settings in the Edit menu.



The settings are divided into the following four tabs:

No.	Tab	Description
1.	General	General settings for Modelling and Client functionalities
2.	SIMATIC	Settings for Modelling for SIMATIC-PLCs (chapter 4)
3.	SINUMERIK	Settings for Modelling for SINUMERIK controls (chapter 5)
4.	CloudConnect 7	Settings for Modelling for SIMATIC CloudConnect 7 (chapter 6)

**Settings in tab "General"**

The options in the "General" section are explained in more detail below.

Option	Description
"Show DataTypes for Variables and VariableTypes"	If this checkbox is enabled, SiOME will display the data types in parentheses after the variable in the Information Model.
"Sort nodes alphabetically"	If this checkbox is enabled, nodes are always sorted alphabetically. When disabled, nodes are sorted according to the order in which they are added.
"Check cycles on import"	If this checkbox is enabled, cyclic references are already checked when importing the file into SiOME. Activation can lead to long import processes.
"Show DisplayName"	If this checkbox is enabled, the "Display Name" of the OPC UA nodes is displayed. If disabled, the "Browse Name" is displayed.
"Show include type dictionary on export"	If this checkbox is enabled, the option "Export type dictionary" is displayed in the export dialog for XML files.
"Validate against UANodeSet.xsd"	If the checkbox is enabled, SiOME verifies if the XML file is compliant with the schema of the OPC Foundation (UANodeSet.xsd)
"Default AccessLevel/UserAccessLevel"	Setting for changing the access level of a variable. "Read/Write" is used by default.
"Start value for placeholder"	Depending on the configuration, the number is used as the start of the numbering of placeholders.
"Default ValueRank" "BaseDataVariableType/PropertyType"	Drop-down menu for setting the "Value Rank" of the "BaseDataVariableType" and "PropertyType", respectively. "Scalar" is used by default.
"Maximum amount of node children Offline/Online"	Configuration of the nodes for arrays, objects, and structures that are displayed. If the "Disable children count online" checkbox is unchecked, the operation is aborted after the limit is reached.
"Parallel thread size for read nodes"	This setting configures the number of simultaneous read requests for the OPC UA Client connection. If the number is increased, the Information Model can be loaded faster, but the load on the system on which SiOME is running also increases.
"Default NodeId Type"	"Numeric": Numeric node IDs are assigned by SiOME. "String": Strings are assigned as node IDs by SiOME.
"Maximum amount of nodes for all namespaces"	Sets the maximum number of nodes that can be managed in SiOME.
"Maximum amount of nodes for per namespace"	Setting the maximum nodes per namespace. A warning is displayed when the limit is reached. If the "Disable namespace limitation" checkbox is enabled, this configuration is ignored.
"Certificates directory"	Configuration of the folder directory where SiOME stores the certificates for the OPC UA Client.

Option	Description
"Sort direction for states in the state machine"	Configuration of the sorting in the "State Machine Editor" for the display of the states.
"Default nodeset directory"	Default path for nodeset XML files which are imported upon the start of SiOME.

### Settings in tab "SIMATIC"

The options in the "SIMATIC" section are explained in more detail below.

Option	Description
"Create FB in TIA Portal with DisplayName"	If disabled, the "Browse Name" from SiOME is used, if the checkbox is enabled, the "Display Name" is used
"Use variable path from TIA Portal project as OPC UA BrowseNames"	The String-format Nodeld will be generated according to PLC project structure in TIA Portal. See chapter 4.3.
"Create folder for UDTs"	If this option is activated, the user will be asked for a possible subfolder under "PLC data types" when generating new UDTs in TIA Portal. See chapter 4.4.
"MaxStringLength from OPC UA Variable to TIA Portal Variable"	When character strings are created in TIA Portal, this number is used as the upper limit of characters.
"Default length for ByteString"	When a "ByteString" is created in TIA Portal, this length is used as the default value. Note: Only valid in conjunction with TIA Portal V17 or higher.
"Default length for LocalizedText"	When a "LocalizedText" is created in the TIA Portal, the configured length is used as a default value for the "Locale" and for the text length. Note: Only valid in conjunction with TIA Portal V17 or higher.
"Default string type for LocalizedText"	If a "LocalizedText" is created in the TIA Portal, the selected data type is used for "Locale" and the text. Note: Only valid in conjunction with TIA Portal V17 or higher.
"Numbering of arrays"	"Keep TIA Portal array index": The original array boundaries of S7 (e.g. "Array[-3..5] of") are taken also for the BrowseNames the OPC UA array items (indexes "-3" to "5"). "Start array index with 0": The original array boundaries of S7 (e.g. "Array [-3..5] of") are normalized for the BrowseNames of the OPC UA array items (e.g. "0" to "8").

### Settings in tab "SINUMERIK"

The options in the "SINUMERIK" section are explained in more detail below.

Option	Description
"License column width"	This setting changes the width of the "License" columns in the "Licenses" view for the SINUMERIK. The more licenses are configured, the lower this setting should be.
„Show Instance DBs“	This setting determines whether instance DBs are displayed when connecting to a TIA Portal project.

**Settings in tab “CloudConnect 7”**

See chapter 6.2.1.

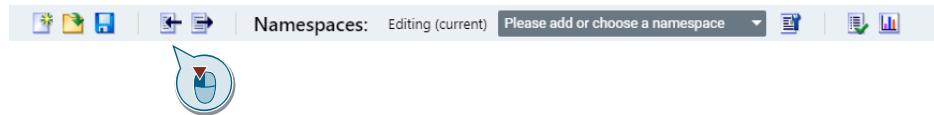
## 3 Modeling of the AddressSpace

In this section, you will learn how to use the functions of SiOME to create an OPC UA Information Model.

### 3.1 Import of OPC UA Models

To import a NodeSet file into SiOME, proceed as follows:

1. Click on the "Import XML" button:



2. In the dialog that appears, select the file that you want to import. SiOME also offers you the possibility to select and import several NodeSets.
3. Click Open in the dialog.

**Note** Alternatively, you can drag & drop a NodeSet XML file into the "Information model" area.

**Note** When importing NodeSets, the following properties are validated:

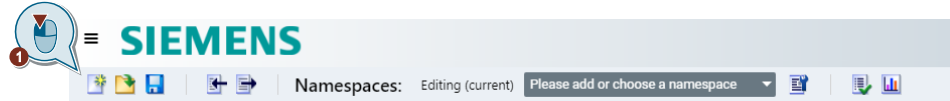
- References
- Publication date
- ParentNodeIds
- Encoding NodeIds

**Note** In the SiOME settings you can disable the validation of the schema (Nodeset.xsd) if the import of the Nodeset fails.

## 3.2 Deleting the current Information Model

To discard the entire project or object model, proceed as follows:

1. Select the "New" button.



2. Click the "Discard changes" button.

Create a new project

Do you really want to create a new project and close the existing project? All unsaved changes will be lost.

Cancel Discard changes Save changes

### CAUTION

### Permanent!

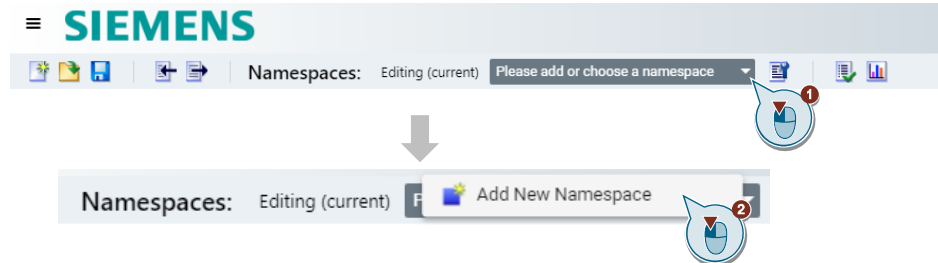
If you reset the project with "New", all changes are lost. Save your project/Information Model beforehand by exporting it via the "Export XML" button. This allows you to import it again later and process it further.

### 3.3 Managing OPC UA Namespaces

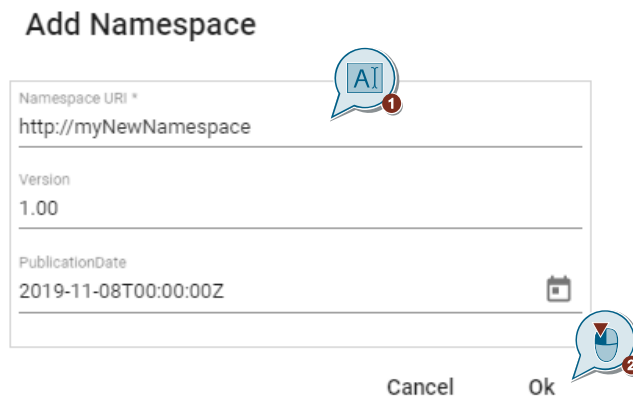
#### Creating a new Namespace

To create a new OPC UA address space, proceed as follows:

1. Click the "Namespaces" drop-down menu and select "Add New Namespace".



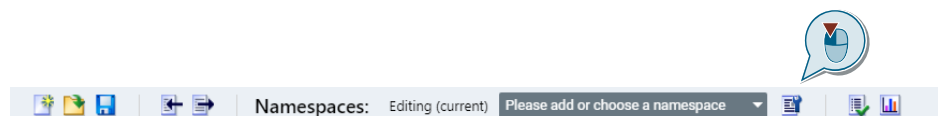
2. Assign a name in the dialog that appears and then confirm with "Ok".



#### Selecting the current namespace

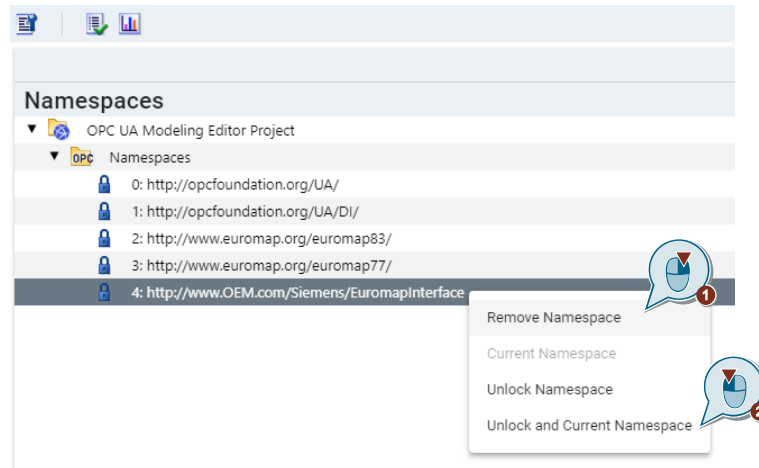
Each type and object in the Information Model must be assigned to a namespace. You can preselect the currently active namespace. When you select a namespace, the corresponding objects are highlighted. Proceed as follows:

1. Import an Information Model or create several namespaces of your own.
2. Left-click on the "Namespace settings" button.



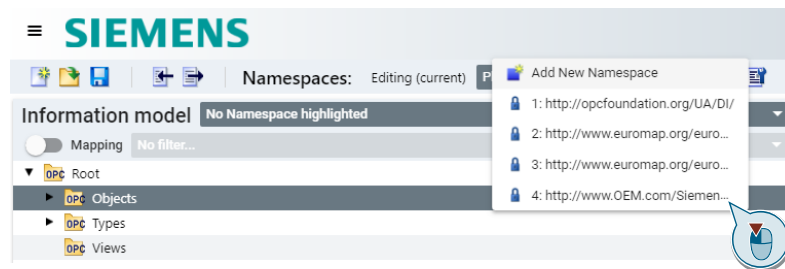
3. The "Namespaces" window appears. Right-click a desired namespace and then click "Unlock and Current Namespace" to select the namespace. If the namespace was previously unlocked, "Current Namespace" is active and the "Unlock and Current Namespace" option is grayed out.





4. All objects created from now on are automatically assigned to the selected namespace. You can change the assignment subsequently.

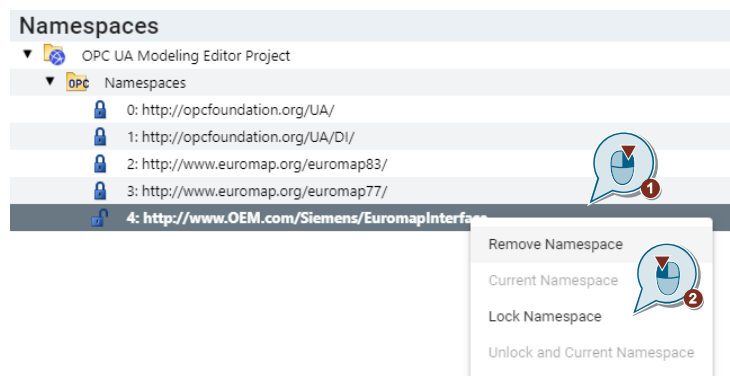
Alternatively, you can click the "Namespaces" drop-down menu and select the namespace you wish to unlock and/or edit.




#### Locking a namespace

For example, if you have created all objects of a namespace and want to protect them against further modifications, you can lock the namespace. Proceed as follows.

1. Import an Information Model or create your own namespace.
2. Right-click on the desired namespace and then click "Lock Namespace" to select the namespace.



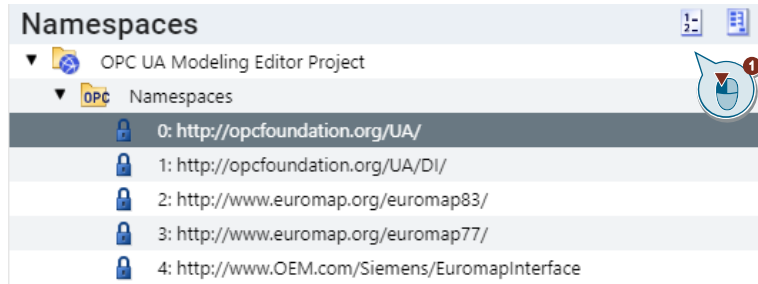
3. A lock symbol indicates that the namespace is locked. From now on, you cannot create new objects for this namespace. To unlock, use the "Unlock and Current Namespace" button on the context menu.

 3: <http://www.euomap.org/euomap77/> [346]

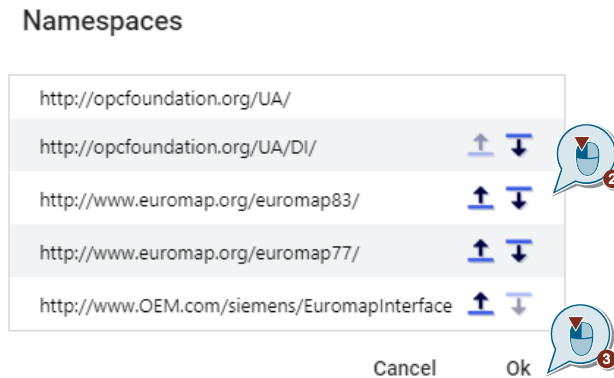
#### Changing the namespace sequence

The sequence of the created namespaces can be changed afterwards. Proceed as follows:

1. In the "Namespaces" area, select the "Change order" button.

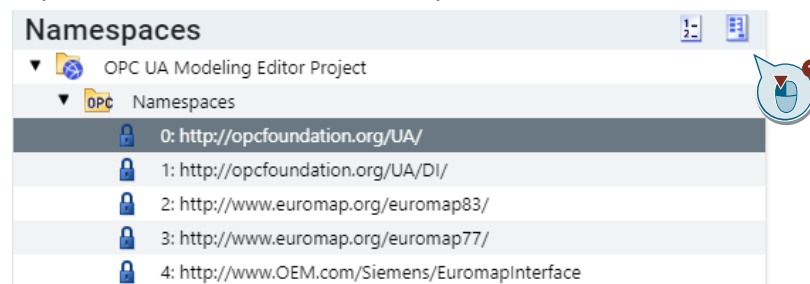


2. You can use the arrows to change the sequence of the namespaces created in the dialog that appears. Confirm with "Ok".

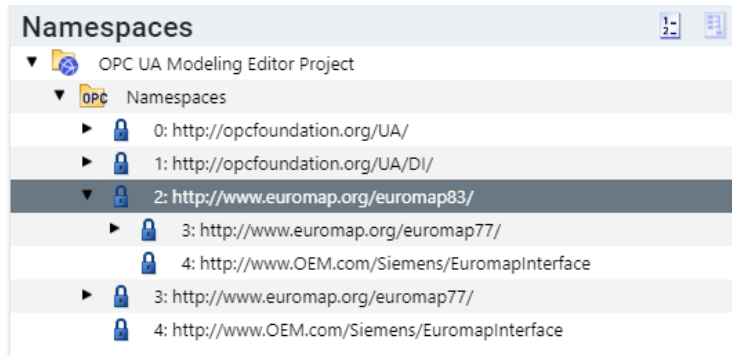


#### Checking dependencies of namespaces

Via the button "Check dependencies" you have the possibility to check the dependencies of the created namespaces

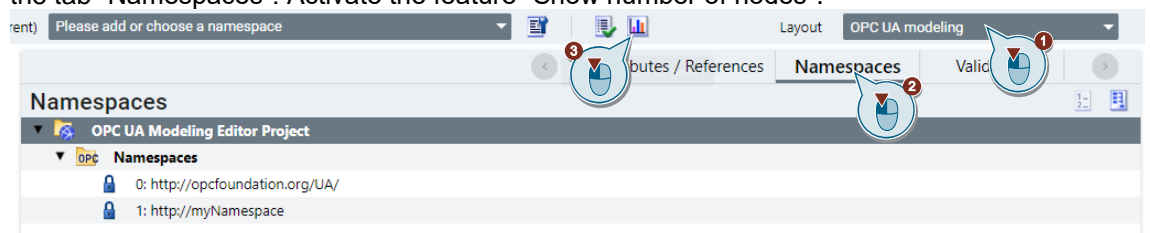


After you have clicked the button, you can expand the individual namespaces to check their dependencies

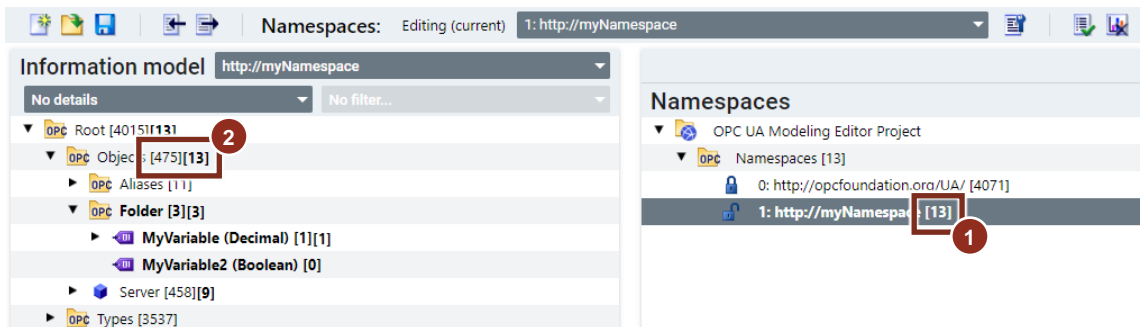


#### Showing the number of nodes

Switch to the default layout “OPC UA modeling” or “TIA Portal mapping” and select the tab “Namespaces”. Activate the feature “Show number of nodes”.



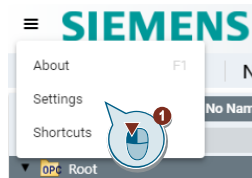
The numbers in square brackets show the total number of nodes in each of the namespaces. The numbers shown behind each element of the Information model show the total number of nodes hierarchically below that node as well as the number of contained nodes which belong to the highlighted namespace.



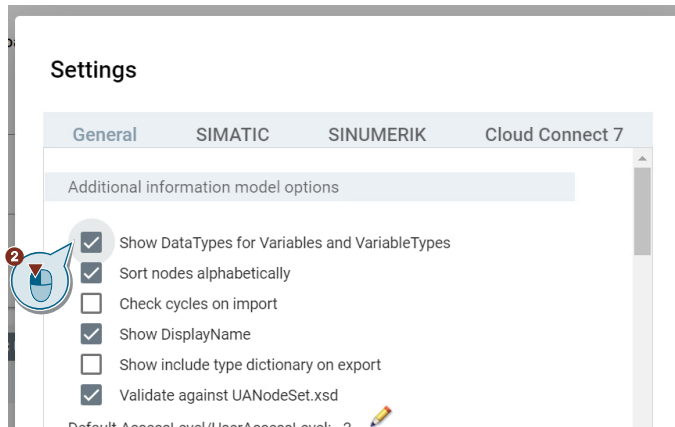
### 3.4 Displaying the DataTypes in the Information Model

If you want to display the data types for all variables in the Information Model directly, proceed as follows:

1. Click the "Hamburger" button at the top left to open the menu.
2. Choose the "Settings" item.



3. Set the check box "Show DataTypes for Variables and VariableTypes" in the tab "General".



**NOTE** This setting is activated by default since version 2.6.

## 3.5 Sorting Nodes alphabetically

When you define your own Information Model, the nodes you create are sorted alphabetically by default. If you want the nodes to appear in the created order, deselect the "Sort nodes alphabetically" checkbox under the "Hamburger" menu > "Settings".

### Settings

**Additional information model options:**

Show dataTypes for variables and variableTypes

Sort nodes alphabetically

Check cycles on import

Start value for placeholder (mandatory/optional):  Start (default: 0)

Default ValueRank of BaseDataVariableType:

Default Nodeid Type:

Prefix Nodeid (default: ")  
"

Delimiter Nodeid (default: ".")  
".

Postfix Nodeid (default: ")  
"

**Example Nodeid:** ns=0;s= " Root "." Objects "

**Choose the direction how states in the state machine should be sorted:**

Top to Bottom (default)

Bottom to Top

Left to Right

Right to Left

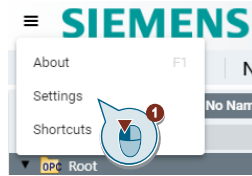
**Ok**

## 3.6 Defining the NodeId

### Default Settings

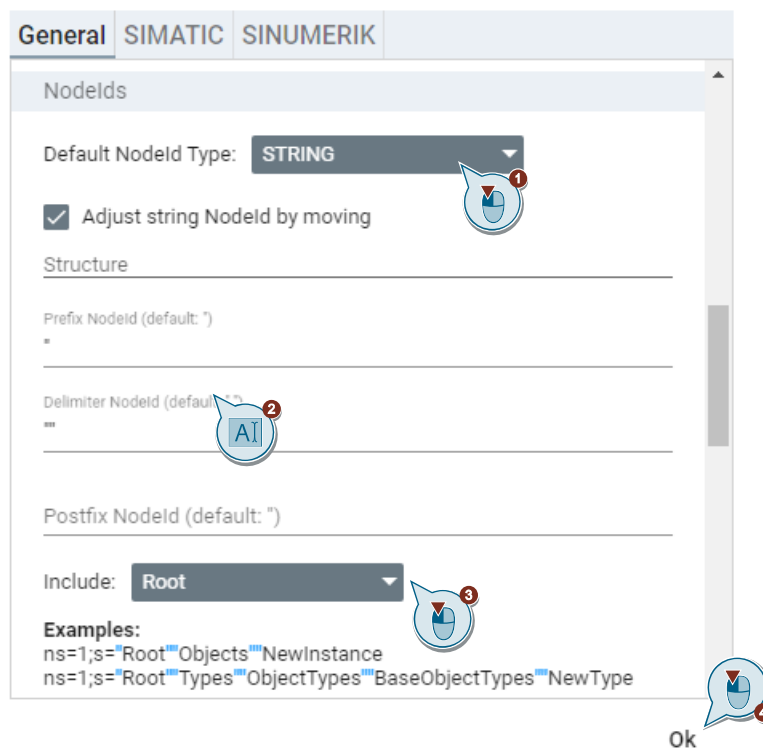
To define the NodeIds default settings, proceed as follows:

1. Choose the "Settings" item.



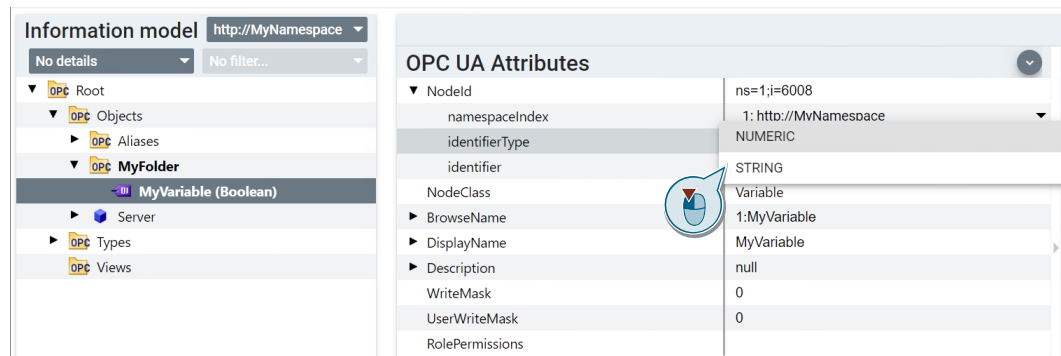
2. In the "Default NodeId Type" drop-down menu, select whether the node IDs are to be generated as strings or numerically. With the "STRING" type, you can predefine a prefix, a postfix, and a separator.
3. Additionally, you have the option to include the "Root", "Object and Types" or "None" in the NodeId definition. With the "NUMERIC" type, you can predefine a starting value for different node classes and instances.

### Settings

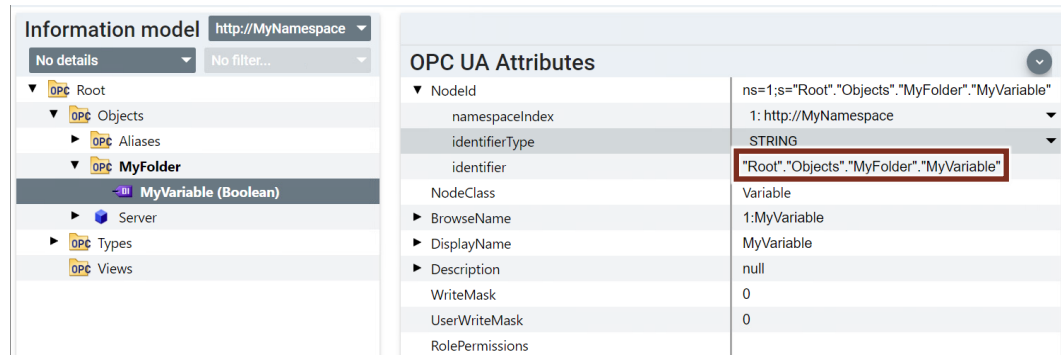


### Change a NodeId

The NodeId of a node is part of the section “OPC UA Attributes”. To change the NodeId format of a single node you can use the selection field “identifierType”.

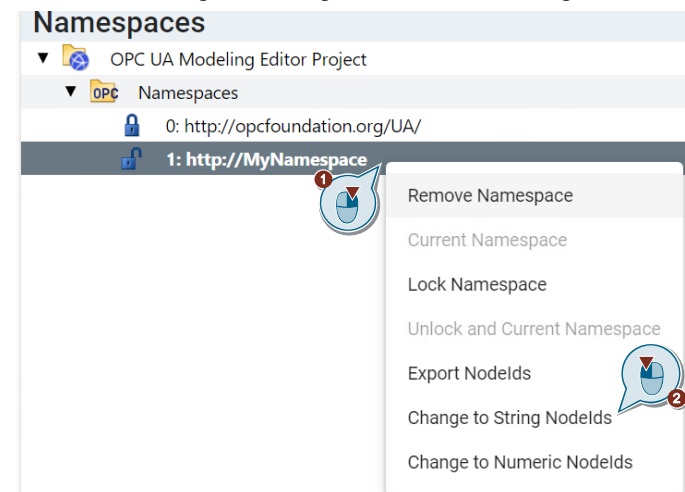


When switching from one format to another, the default settings apply as shown in the previous section.



### Change IdentifierType of all nodes of a namespace

It is also possible to change the IdentifierType of all nodes of a namespace to the same format. Go to the tab “Namespaces” and use one of the context menu functions “Change to String NodeIds” or “Change to Numeric NodeIds”.



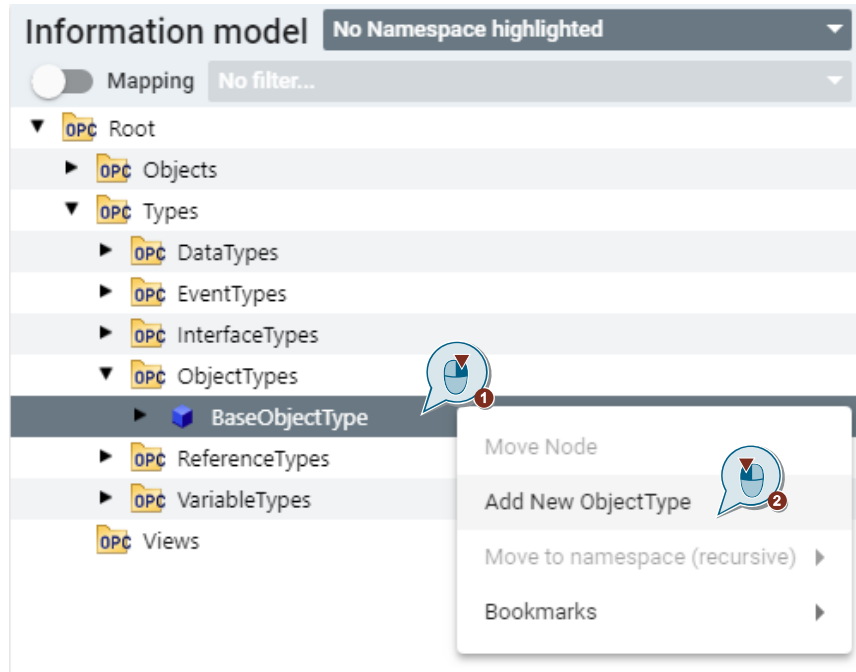
The “identifier” of a NodeId will only be modified if the “identifierType” is changing. NodeIds will not be modified if they already have the intended format.

When switching from one format to another, the default settings apply as shown in the previous sections.

### 3.7 Creating a new Object Type

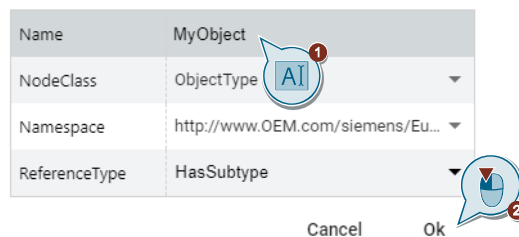
To define a new object type, proceed as follows:

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



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

Add New ObjectType

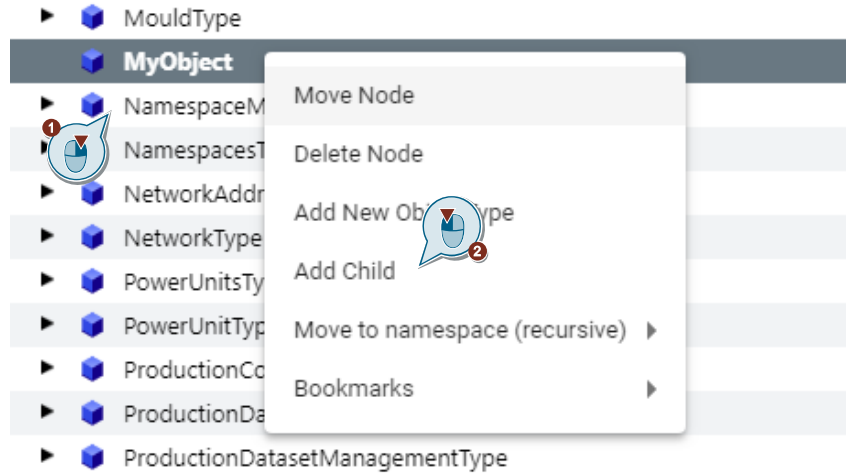




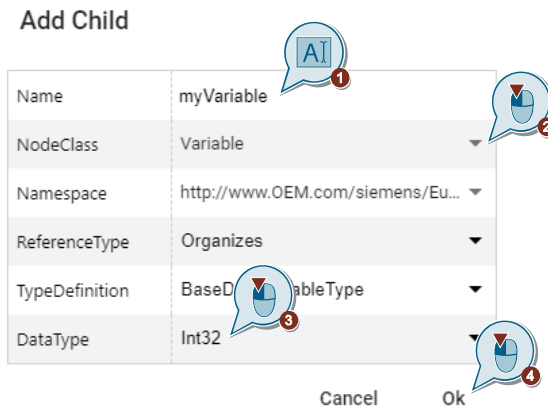
### Adding an Object Child

To fill an object with children, proceed as follows:

1. Right-click on the object just generated and select "Add Child".

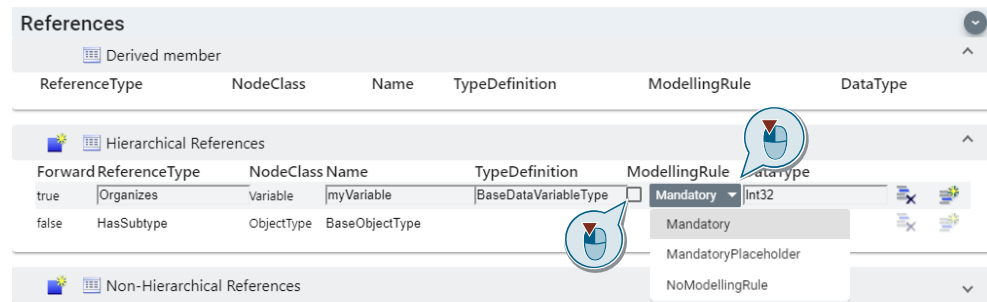


2. Enter a name for the child in the appearing dialog and select the class "Variable" as "NodeClass". Then select a suitable data type (in the example: "Int32") and confirm with "Ok".



#### Define modeling rules for object children

Select the previously created object type by left-clicking on it. You will then find the modeling rules in the "Hierarchical References" area.



To change the modeling rule, proceed as follows:

- You can change the modeling rule from "optional" to "mandatory" using the "ModellingRule" checkbox. The "ModellingRule" determines which references of the object type must be created during instantiation.
- With a click on the drop-down menu "ModellingRule", you can choose between "Mandatory", "Mandatory placeholder", or "No modelling rule".

### Object children of nested Object Types

If an object type integrates another, its members and their modelling rules are passed on. But they can only be modified with certain restrictions in the inheriting object type because of the multiple use of the children.

As an example:

The object type “myObject1“ owns four children with different modelling rules.

The screenshot shows a tree view for 'myObjectType1' with four children: MyMember1, MyMember2<no>, MyMember3, and MyMember4<no>. Below it is a table titled 'Hierarchical References'.

Forward	ReferenceType	NodeClass	Name	TypeDefinition	ModellingRule
true	Organizes	Object	1:MyMember1	BaseObjectType	<input checked="" type="checkbox"/> Mandatory
true	Organizes	Object	1:MyMember2<no>	BaseObjectType	<input checked="" type="checkbox"/> MandatoryPlaceholder
true	Organizes	Object	1:MyMember3	BaseObjectType	<input type="checkbox"/> Mandatory
true	Organizes	Object	1:MyMember4<no>	BaseObjectType	<input type="checkbox"/> MandatoryPlaceholder

An additional object type “myObjectType2“ integrates an instance of the first object type as a derived child by using an “Organizes” reference.

The screenshot shows a tree view for 'myObjectType2' with a child 'myObjectType1Member'. Under 'myObjectType1Member', there are two children: MyMember1 and MyMember2<no>.

As the children “MyMember3“ and “MyMember4“ of “myObjectType1“ have been declared as “Optional“ or “OptionalPlaceholder“ they are not activated when using type 1 in type 2. Additionally, the children must not be modified in the derived object type because that is not the place of their original definition. They are locked within the context of “myObjectType1Member“.

The screenshot shows a table titled 'Derived member' with a lock icon on the left of each row.

ReferenceType	NodeClass	Name	TypeDefinition	ModellingRule
<input checked="" type="checkbox"/> Organizes	Object	1:MyMember1	BaseObjectType	<input checked="" type="checkbox"/> Mandatory
<input checked="" type="checkbox"/> Organizes	Object	1:MyMember2<no>	BaseObjectType	<input checked="" type="checkbox"/> MandatoryPlaceholder
<input type="checkbox"/> Organizes	Object	1:MyMember3	BaseObjectType	Optional
<input type="checkbox"/> Organizes	Object	1:MyMember4<no>	BaseObjectType	OptionalPlaceholder

With the shown mouse click on the lock symbol of a derived member you are offered to execute one of the following options.

The screenshot shows a dialog box titled 'Select' with three radio button options:

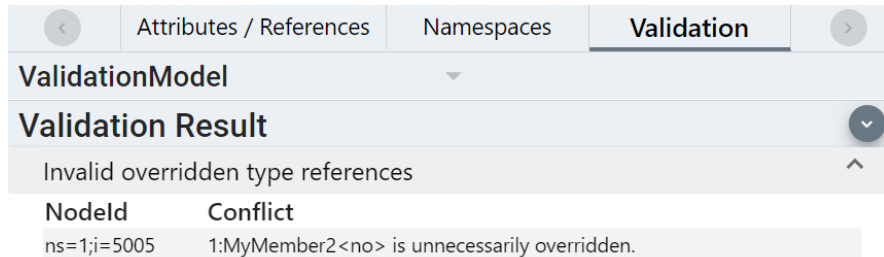
- 1 Edit base InstanceDeclaration (jump to)
- 2 Clone to override
- 3 Remove reference

At the bottom of the dialog are 'Cancel' and 'Ok' buttons.

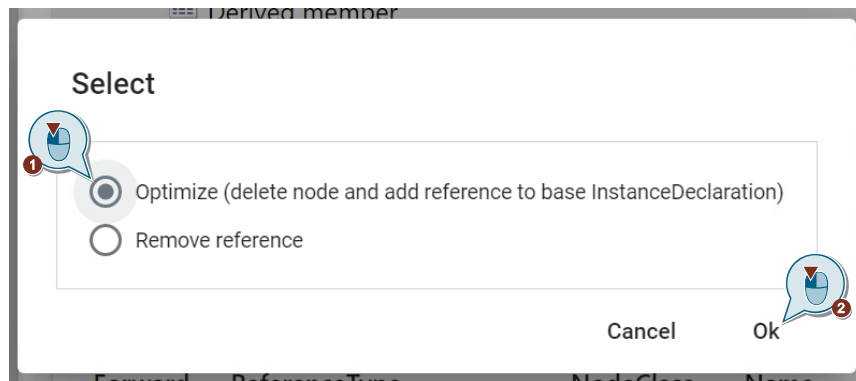
The three actions have the following effects:

- (1) “Edit base InstanceDeclaration (jump to)“: You are navigated to the origin of the derived member in the Information Model in order to modify it there.
- (2) “Clone to override“: You create a clone of the child which can be modified independently of the original child.

This duplication will be shown as a conflict during Validation of the Information Model (error text: “member... is unnecessarily overridden“).

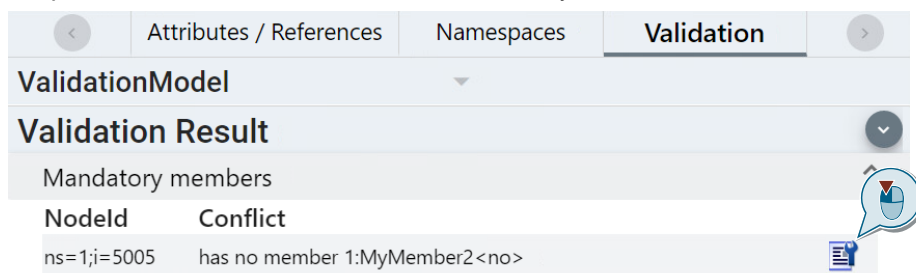


To resolve it, the derivation from the original child can be reestablished by clicking on the lock symbol again and choosing the following option.

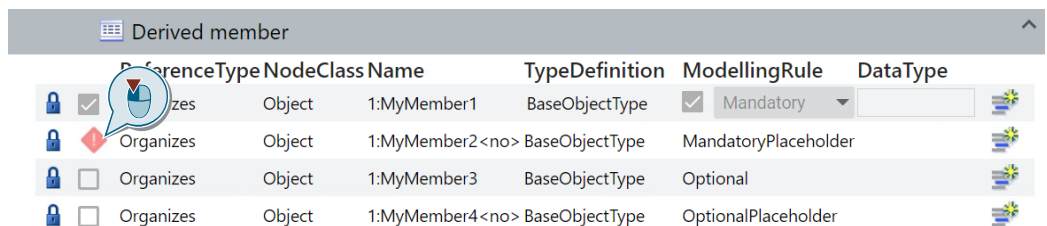


- (3) “Remove reference“: You delete the usage of this child.

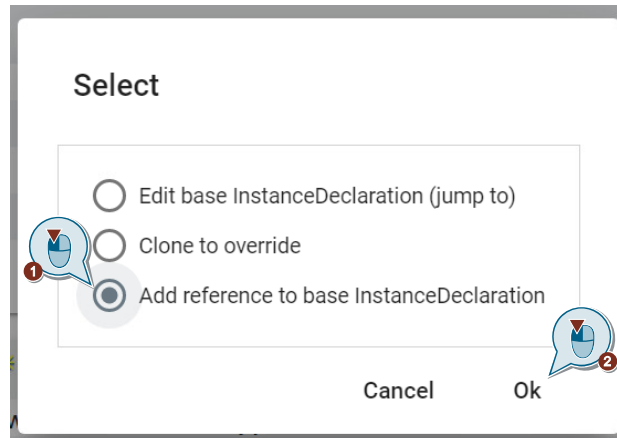
Any missing member will be shown as a conflict during Validation of the Information Model (error text: “has no member...“). To resolve the conflict, the use of the original member can be reestablished by clicking on the “Repair reference” button at the end of the entry line.



The same action is executed when clicking on the red warning icon in the “References” editor.



This repair function is also part of the options when you click the lock symbol again instead.



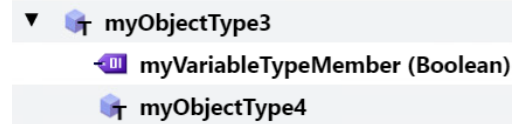
These three possibilities are offered as well if a derived member has to be activated after it was not added by default because it is an optional member.

#### Object children of derived Object Types

Also, when you create an Object Type as a subtype of another one, it will inherit the members and their modelling rules.

As an example:

The object type "myObjectType3" contains a variable of the data type "Boolean". The object type "myObjectType4" is created by using a "HasSubtype" reference under "MyObjectType3".



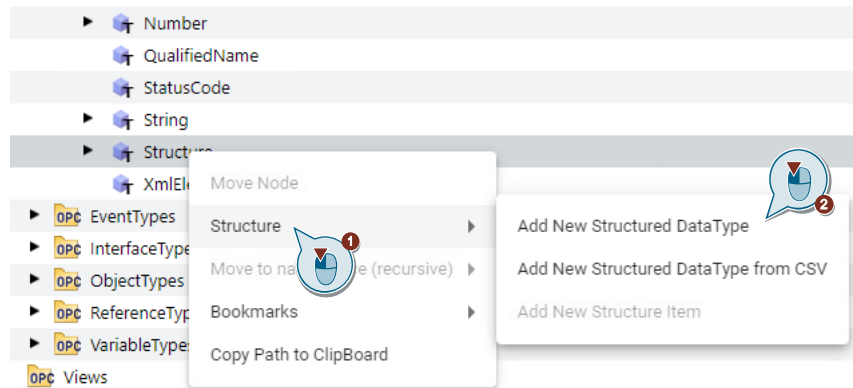
The second object type is inheriting all members and their modelling rules, for example the Boolean variable.

The same restrictions and options apply for modifying the children in the context of the derived object type as mentioned in the previous section.

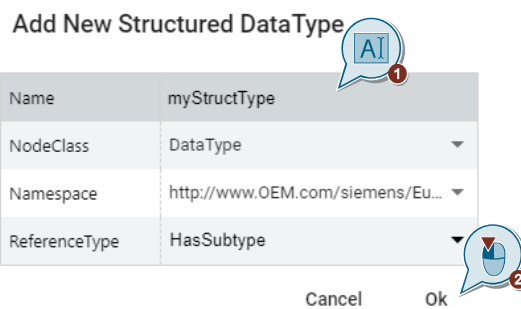
## 3.8 Creating a new Data Type

To create a data type, proceed as follows. A new structure is defined as an example:

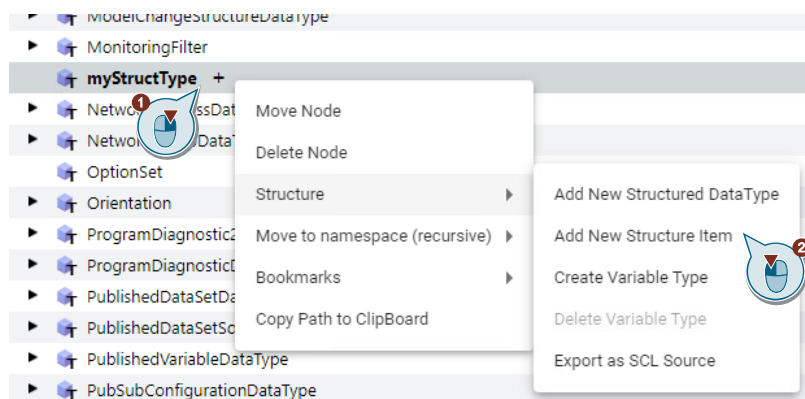
1. Navigate to "Types > DataTypes > BaseDataTypes", right-click on "Structure" and select "Add New Structured Data Type".



2. Enter a name for the structure in the dialog that appears and confirm with "Ok". The active namespace is automatically selected as the namespace in which the structure definition is to be stored.

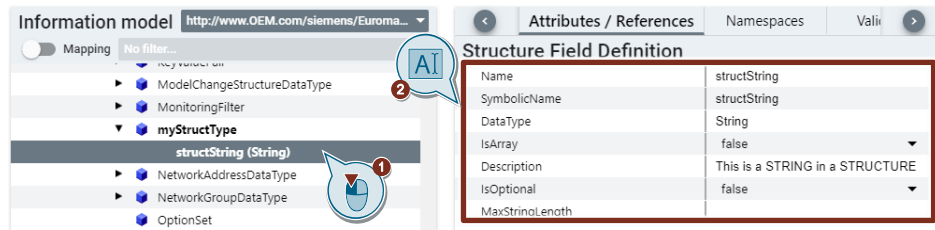


3. Fill the structure with items. Right-click on the structure you just created and select "Add New Structure Item".



4. In the tree view, select the created item with the left mouse button, assign a name in the "Structure Field Definition" area and select the desired data type. Decide whether it is an array of the desired data type and whether this item is optional.

### 3 Modeling of the AddressSpace

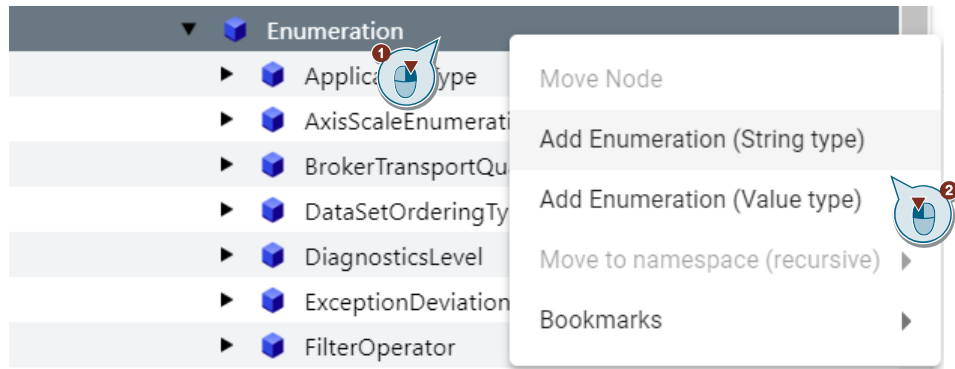


5. Repeat steps 3 and 4 for each required item within your structure.

### 3.9 Creating an Enumeration (DataType)

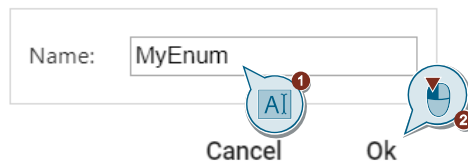
SiOME offers a special UI function for creating enumerations. Proceed as follows to create your own enumeration types:

1. Navigate to Types > DataTypes > BaseDataTypes", right-click "Enumeration" and select "Add Enumeration (String type)" or "Add Enumeration (Value type)".

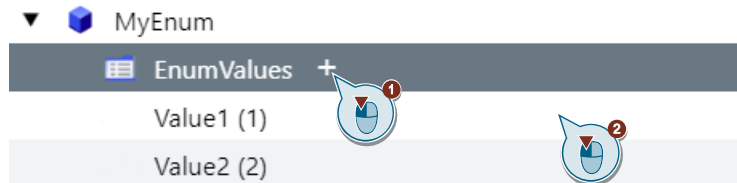


2. Assign a name for the enumeration type in the appearing dialog and confirm with "Ok".

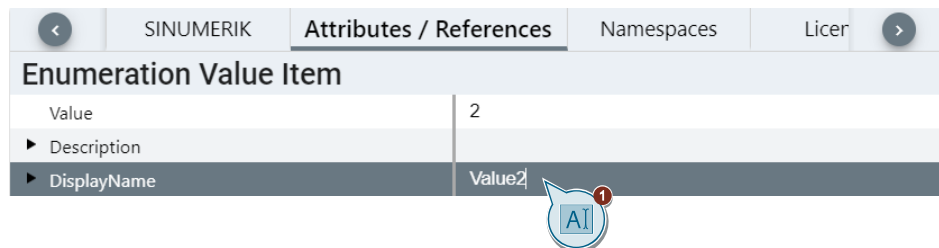
#### Name Enum



3. Navigate to your enumeration type and expand it. Click "+" to create a new entry and mark the entry.



4. Edit the marked enumeration entry in the "Attributes/References" view.



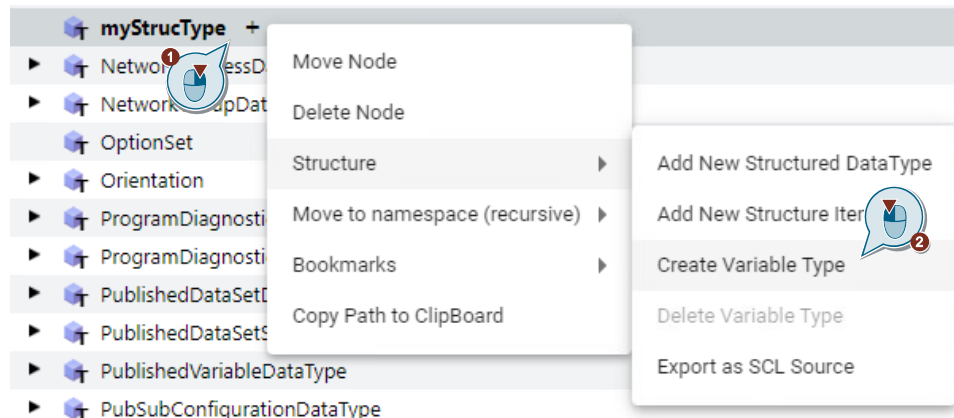


### 3.10 Creating/Deriving a new VariableType

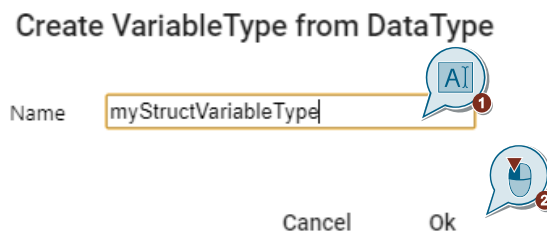
Once you have created a structure type, you can also create the VariableType from it. The advantage is that when you create an instance of the structure using the VariableType, the structure elements are displayed in the OPC UA model. These can then be accessed as individual elements in the structure by OPC UA clients.

The disadvantage is that the OPC UA Information Model contains significantly more nodes.

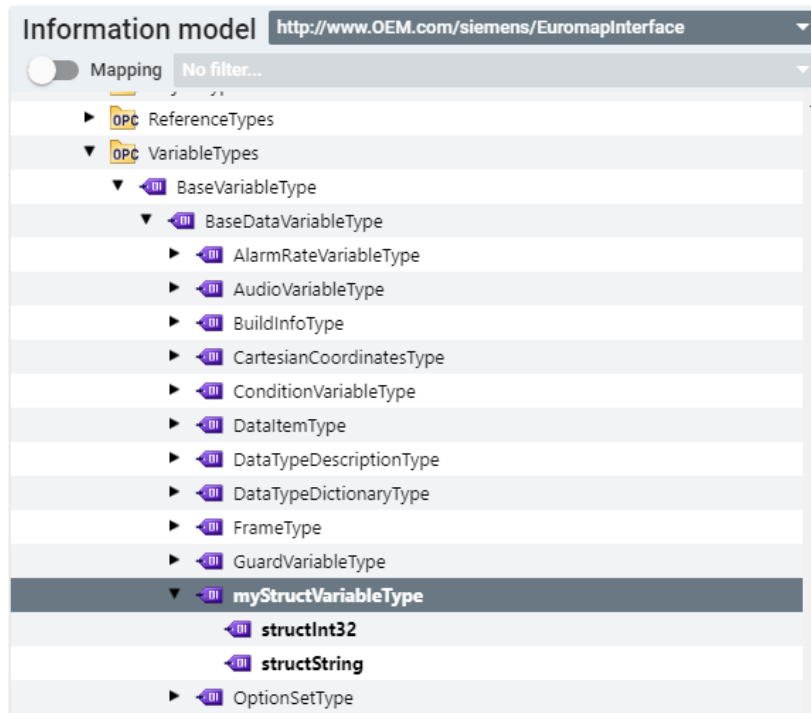
1. Right-click on your structure type and then left-click "Create Variable Type" in the context menu.



2. Enter a name for the VariableType and confirm with "Ok".



Then you can find your variable type in the directory VariableTypes > BaseVariableType > BaseDataVariableType:



**Note**

SiOME offers the possibility to delete the derived variable type if you delete the corresponding data type.

### 3.11 Importing Data Types from CSV File

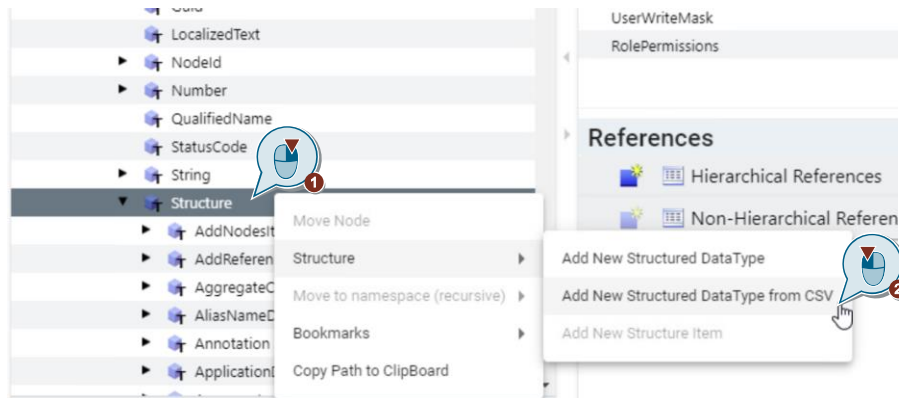
With this function, OPC UA data types ("structures" and "unions") can be imported into SiOME.

For this, the file must be in a defined format. The fields must be separated by either a "semicolon" (;) or a "tabulator" (\t).

**NOTE** To get you started, you can download a sample file in CSV format.

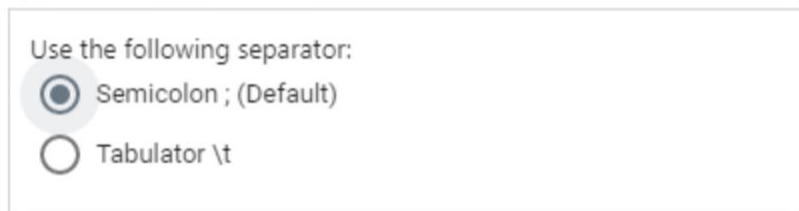
#### Importing the data types from a CSV file into SiOME

In the "Information model" area, navigate to "Types > DataTypes > BaseType", right-click "Structure" and select "Structure > Add New Structure DataType from CSV".



Then select the delimiter of the file.

#### Choose CSV options



Cancel Ok

#### Description of the structure of the CSV file

In this section, you will find an explanation of the structure of the CSV file.

The file must always contain the described header. However, individual cell contents can remain empty as described.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Namespace	NodeId	BrowseName	Description	DisplayName	IsAbstract	EncodingId	StructureType	BaseDataType	CreateVariable	FieldName	FieldDescription	DataType	ValueRank	ArrayDimensions	MaxStringLength	IsOptional	Version 1.0.0

Description of the values in the CSV file.

### 3 Modeling of the AddressSpace

Field name in the header	Description	Valid values
Namespace	Enter the "namespace" in which the structure is to be created. This must be entered for structures and for fields that are a structure.	"http://myNamespace" or "urn:ThisNamespace" Can be left blank for fields that use a data type from namespace 0.
NodeId	Input of a Node ID to be used for the structure. If the field is left blank, a Node ID is automatically generated.	i=1234 or s=ThisText or s="myNodeId" Can be left blank.
BrowseName	"Browse Name" to be used for the structure.	"NameOfStructure" or MaterialDataType
DisplayName	"Display Name" to be used for the structure.	"DisplayNameOfStructure" or MaterialData. Can be left blank.
Description	Description of the structure as text. Should be enclosed in quotation marks (") to use special characters.	"This is a Description". Can be left blank.
isAbstract	Marking whether the structure is abstract or non-abstract.	True/False or "1" or "0". If empty, "False" is assigned.
EncodingId	Default Encoding Node ID. If the field is left blank, a Node ID is automatically generated.	i=1234 or s=ThisText or s="myNodeId" Can be left blank.
StructureType	Definition of what kind of structure is created. If the field is left blank, 0 = Structure is automatically assigned.	0 = Structure 1 = Structure with optional Fields 2 = Union If empty, "0" is assigned.
BaseDataType	Assignment of a NodeId, which specifies the basic data type. If the field is left empty, the NodeID of Structure is automatically assigned.	i=1234 or s=ThisText or s="myNodeId" Can be left blank.
CreateVariableType	Indicates whether a "VariableType" is to be created automatically for the data type.	True/False or "1" or "0". If empty, "False" is assigned.
Fieldname	Name of the field/entry within the structure	"MyVariableName" or temperature
FieldDescription	Description of the field as text. Should be enclosed in quotation marks (") to use special characters.	"This is a Description". Can be left blank.
DataType	Assignment of a NodeID, which specifies the data type of the field. When entering a structure, the field "Namespace" must also be filled.	i=1 for Boolean "s=myMaterialDataType"
ValueRank	Defines whether the field is a	"1": The value is an array

Field name in the header	Description	Valid values
	scalar value or an array. If empty, "-1" is automatically assigned.	with one dimension. "0": The value is an array with one or more dimensions. "-1": The value is not an array (scalar). "-2": The value can be scalar or an array with one or more dimensions. ScalarOrOneDimension "-3": The value is scalar or pure array with one dimension.
ArrayDimension	Defines how large the dimensions of the array are.	"5" "[1,5]" Can be left blank.
MaxStringLen	Defines the maximum number of characters if the field has the data type "String".	"10" Can be left blank.
IsOptional	Indicates whether the field is "optional" within the structure.	True/False or "1" or "0". If empty, "False" is assigned.
Version 1.0.0	Indicates the version supported by SiOME. Must not be changed!	This field must remain empty.

**Notes on processing the CSV file**

The CSV file is processed line by line from top to bottom.

1. Assign a "BrowseName" to indicate the start of a new structure.
2. Then assign a "Fieldname" in each of the following lines to identify a field within the structure.
3. For "DataType" use the numeric identifier from namespace 0 (e.g. "i=1" for Boolean) or the name of the data type (e.g. "Boolean").  
If you want to mark the beginning of a new structure, fill in the "BrowseName" for the new structure again in the next line after the last field of the previous structure.
4. If you want to mark the beginning of a new structure, fill in the "BrowseName" for the new structure in the next line after the last field of the previous structure.

**Note**

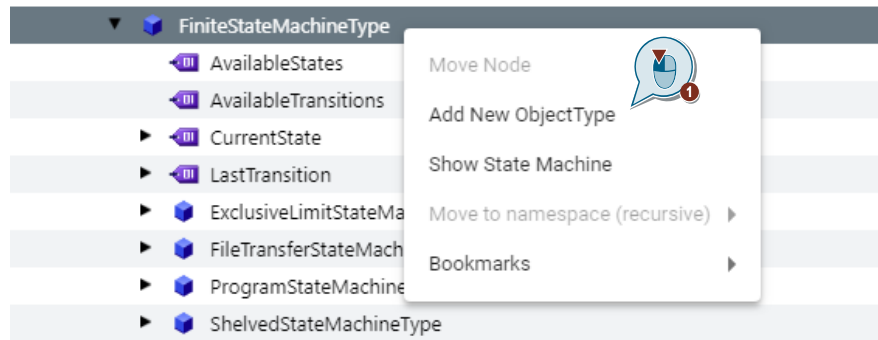
The CSV file is processed line by line from top to bottom. If you want to use a structure data type as "DataType" for a field within the structure, you have to fill the "Namespace" field and then enter the NodeID of the structure (e.g., s=myMaterialDataType) in the "DataType" field.

## 3.12 Using StateMachines

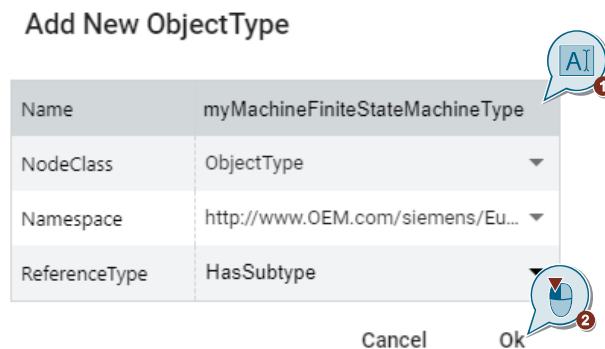
### Creating a StateMachine Type

SiOME offers you the possibility to create StateMachines via an editor.

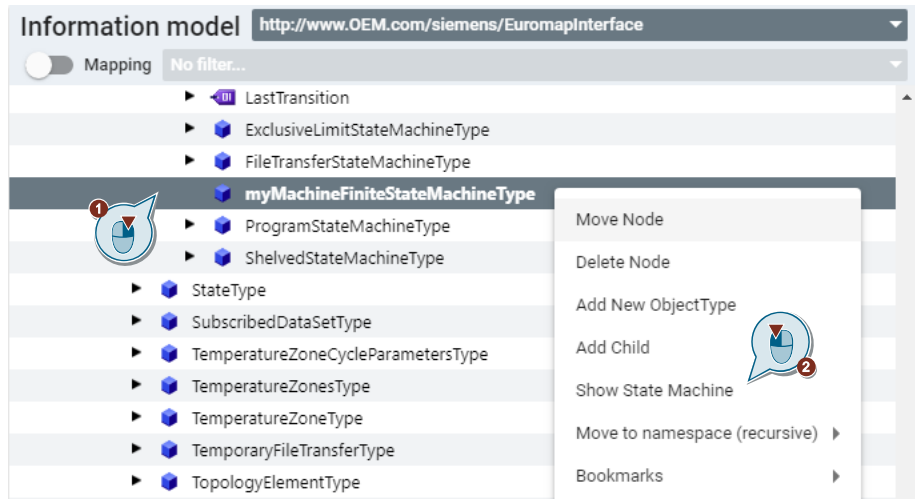
1. Navigate to the ObjectType "FiniteStateMachineType" in the Information Model. The "Find node" feature can help you finding that node, see chapter 3.17.
2. Perform a right-click on the type, and then click "Add New ObjectType" in the context menu.



3. Enter a name for your StateMachine type in the "Add New ObjectType" dialog and confirm with "Ok".

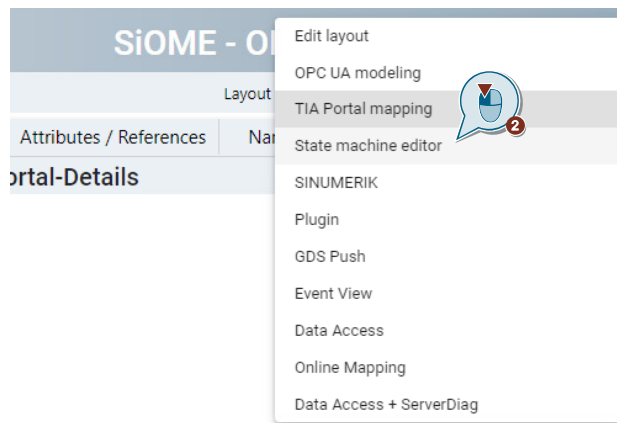
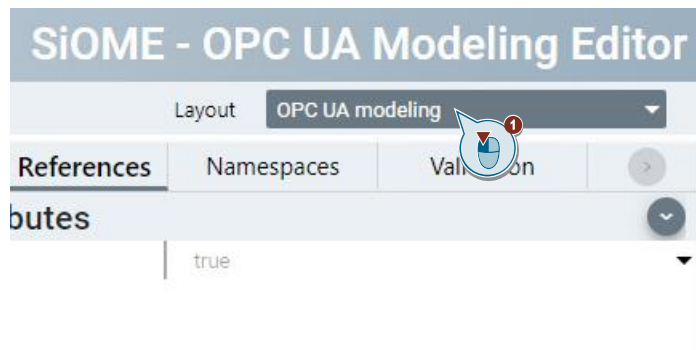


4. Navigate to the created StateMachine type and right-click on it. Click on "Show State Machine" in the context menu to open the StateMachine Editor and configure the StateMachine.



### Opening the State Machine editor layout

Select the layout „State machine editor“.



### 3.13 Defining Attributes and References

In addition to the basic generation of an individualized Information Model, SiOME offers additional options for specifying the Information Model in more detail.

#### Defining attributes of variables and objects

In addition to the name and data type of the variables, you have the option of specifying other attributes. The following Figure and table explain all available attributes. You can adjust the attributes by selecting the desired node in the "Information model" area and then changing the attributes in the "Attributes" area.

OPC UA Attributes		Additional OPC UA Attributes	
▶ NodeId	ns=4;j=1030	Value	
NodeClass	Variable	DataType	myStructType
▶ BrowseName	4.myStructVar	ValueRank	Any
▶ DisplayName	myStructVar	ArrayDimensions	[]
▶ Description	null	AccessLevel	3
WriteMask	0	UserAccessLevel	3
UserWriteMask	0	MinimumSamplingInterval	0
RolePermissions		Historizing	false

Attribute name	Description
NodeId	The unique node address with name space
NodeClass	The class of the node (object, variable, data type)
BrowseName	The name of the node displayed when browsing
DisplayName	The display name of the node
Description	Brief description of the node
WriteMask	Write permissions (0=no, 1=yes) without taking user groups into account
UserWriteMask	Write permissions (0=no, 1=yes) while taking the current user into account
Value	Value of the node, see next chapter
DataType	Data type of the variable
ValueRank	Value type of the variable (any, scalar, vector, array). Set to "Scalar" by default in SiOME.
ArrayDimensions	Number or array dimensions
AccessLevel	Access authorization (read, write, read/write) on the nodes without taking user groups into account
UserAccessLevel	Access authorization (read, write, read/write) on the nodes while taking user groups into account
MinimumSamplingInterval	The smallest possible sampling interval of the variable on the server side
Historizing	Course of time of the variable available on the server (yes, no)

#### Note

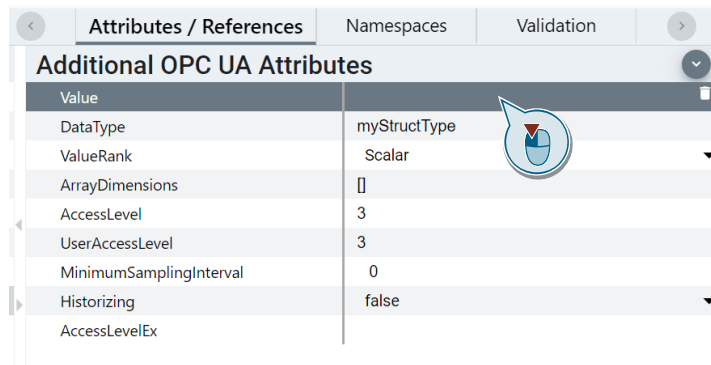
The availability of the attributes depends on the "NodeClass" of the object.

To change the default ValueRank of BaseDataVariableType, go to the "Burger" menu > "Settings" > "Default ValueRank" drop-down menu.

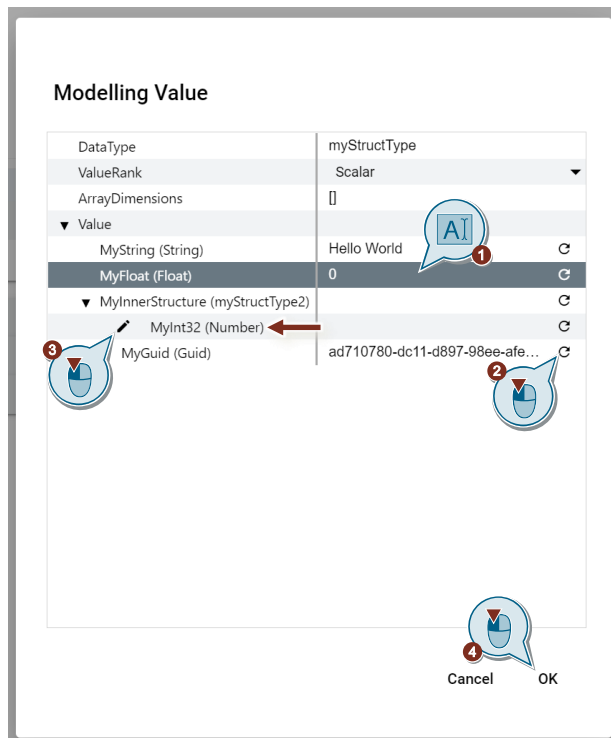


### Defining a Value Attribute

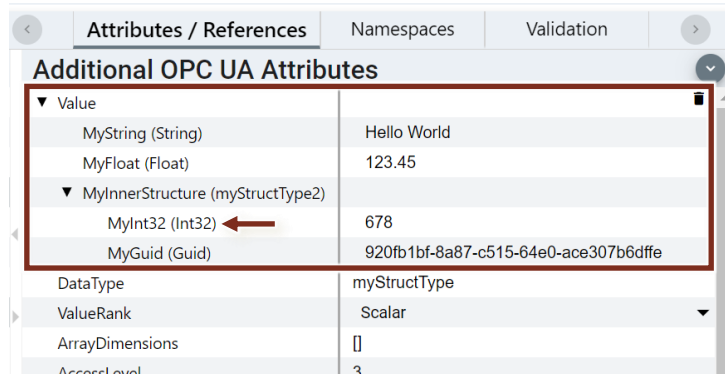
To define the Value Attribute of a Variable, click into the Value field in the section “Additional OPC UA Attributes”.



The following dialogue “Modelling Value” is used to define or reset the values – also of structured items. Click on a field in the right column to edit the entry (1). If you want to reset a Value to its default value, click on the symbol at the end of the line (2). DataTypes like “Guid” receive a new unique value this way. The pen symbol at the front of a line appears for each item of an abstract DataType, like “Number” (3). This allows to refine the abstract DataType to any of its non-abstract variations, like “Int32”. Finally, confirm the dialogue with “OK” (4).



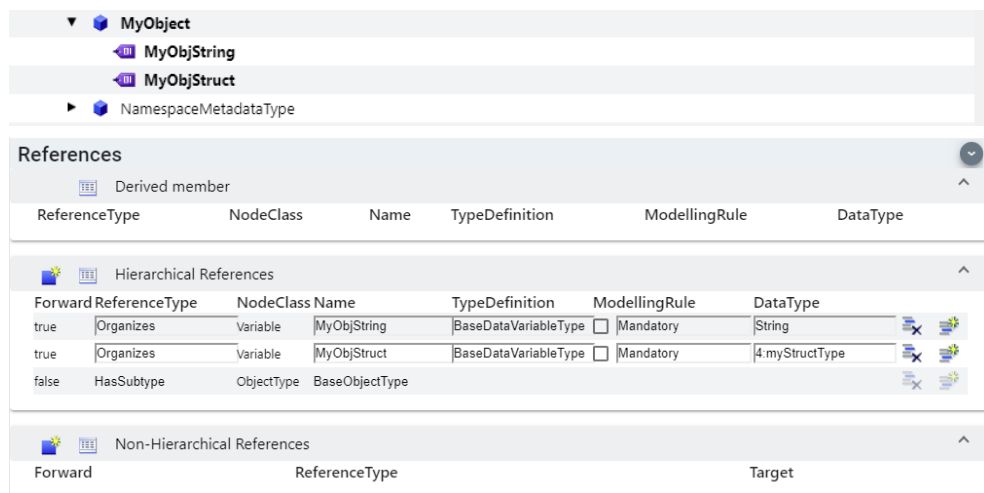
The area of “Additional OPC UA Attributes” shows the modelled Value.



If you want to remove a modelled Value structure, use the trashcan icon at the end of the top line.

#### Defining references

In the "References" area, you can define references for the selected node of the Information Model. If you have generated a child of an object type in the "Information model" area, SiOME automatically generates the necessary "Hierarchical" references for you. Under "References", you can manually enter the references of a node or change existing references. Also important is the "ModellingRule" option, which you can use to decide whether a reference is necessary ("Mandatory") or not when instantiating the type.

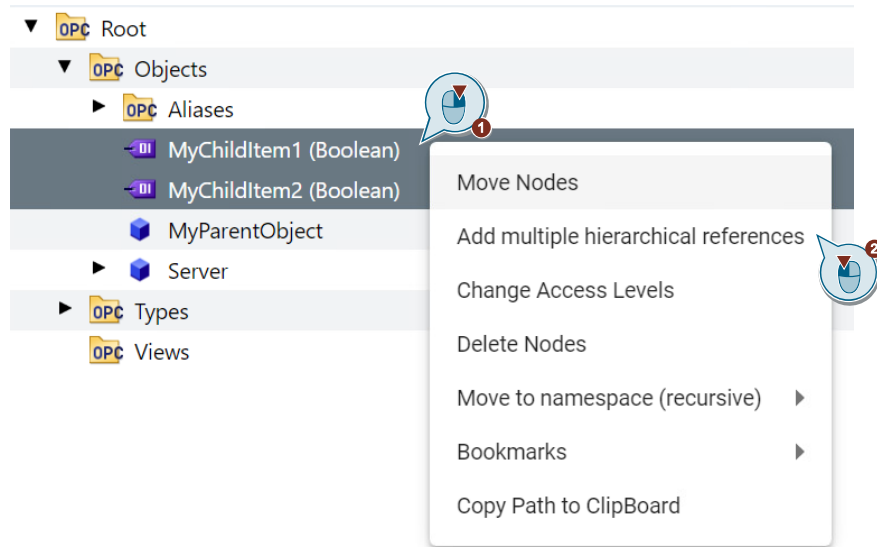


In addition to hierarchical references, you can generate "Non-hierarchical" references to refer to type definitions or descriptions.

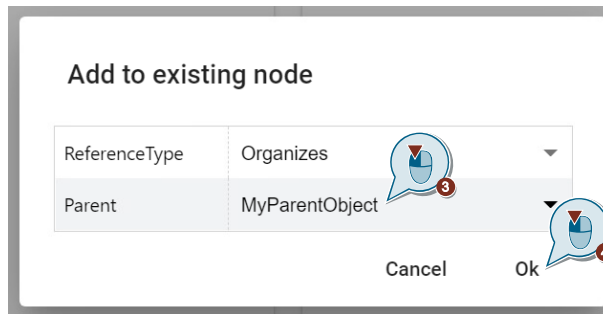
#### Adding hierarchical references to an existing parent node

If you want to create a hierarchical reference to a parent node, you can use the action "Add hierarchical reference" in the context menu of the child node. This is also possible with a multiple selection of nodes (by keeping pressed the Ctrl key).

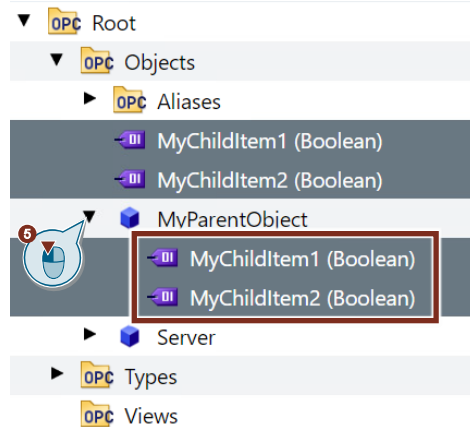
### 3 Modeling of the AddressSpace



In the following dialog, select the parent node and adapt the ReferenceType (if necessary):



The child nodes are then additionally referenced by the chosen parent node:



## 3.14 Creating Interfaces and Add-Ins

With SiOME, you can implement the OPC UA "Interfaces&Addins" extension.

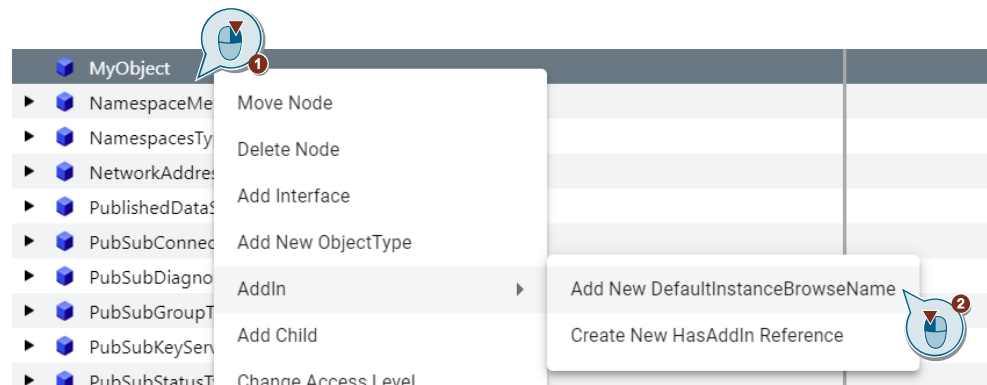
### Creating Add-Ins

Add-ins are used to add additional objects to object types or instances that do not exist in the original object or instance type definition. To do this, you must first create an object type with the property "DefaultInstanceBrowseName". This type can then be used as an add-in for other object types or instances.

### Setting the DefaultInstanceBrowseName

You can assign a predefined "BrowseName" for object types using the right-click context menu in the "Information model" section. A property with the type "QualifiedName" is created for the object. This BrowseName is then automatically assigned when the type is used. Proceed as follows:

1. Right-click an object type (not within namespace 0), navigate to "AddIn", and click "Add New DefaultInstanceBrowseName":



2. Enter the desired BrowseName in the dialog that appears and confirm with "Ok".

### Add New DefaultInstanceBrowseName

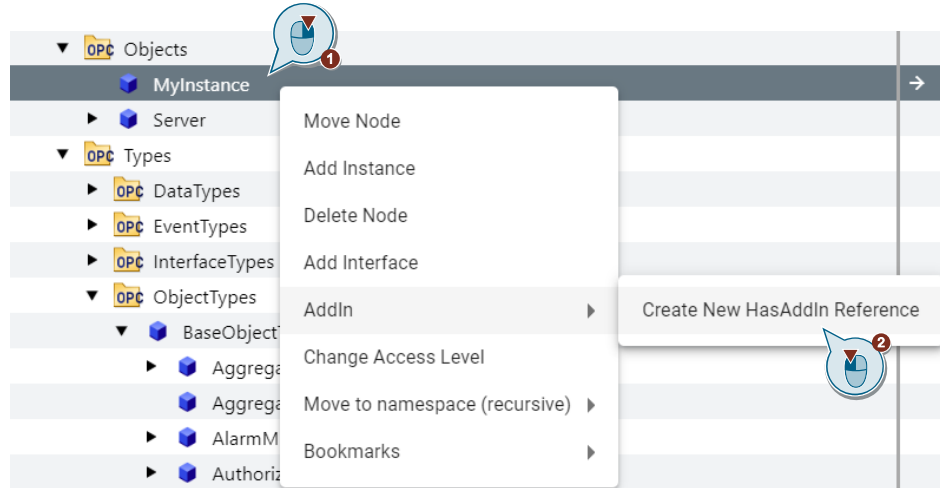
Name	MyDefaultBrowseName
Namespace	http://mytest.org

Cancel    Ok

### Creating a HasAddIn Reference

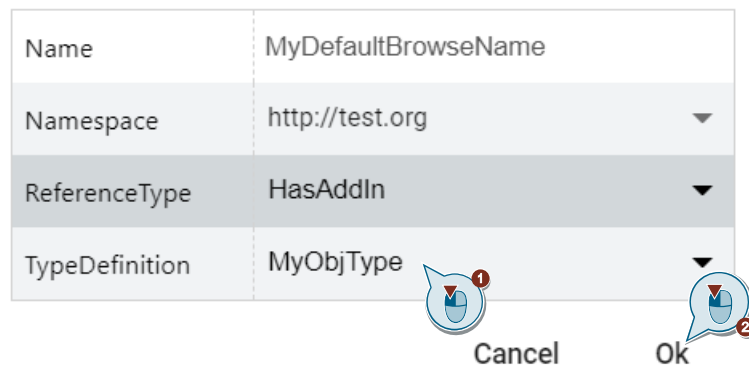
You can create the object type described above as an add-in using the right-click context menu in the "Information model" section. Proceed as follows:

1. Right-click another object type or object instance (not within namespace 0), navigate to "AddIn" and click "Create New HasAddIn Reference":



2. In the dialog that appears, select the object type that you have already assigned a DefaultInstanceBrowseName under "TypeDefinition" and confirm with "Ok".

### Add New HasAddIn Reference

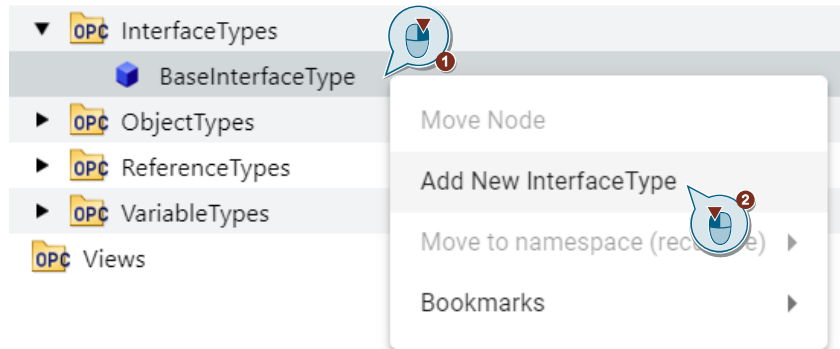


#### Creating Interfaces

Similar to add-ins, you must first create an interface (type) and add it to other objects before you can use interfaces.



To create an interface, proceed as follows:

1. In the "Information model" section, navigate to "Root > Types > InterfaceTypes".
2. Right-click "BaseInterfaceType" and click "Add New InterfaceType".



3. Assign a name for the interface in the appearing dialog and confirm with "Ok".

#### Add New InterfaceType

Name	IMyObject
NodeClass	ObjectType 
Namespace	http://test.org
ReferenceType	HasSubtype 

Cancel Ok

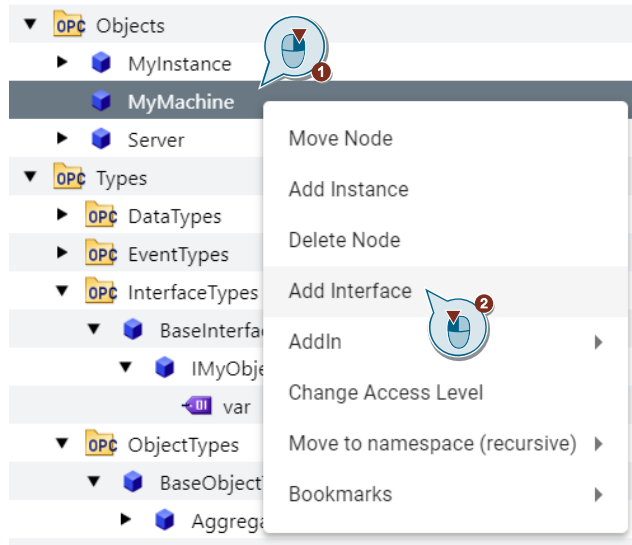
**Note** The interface name should start with "I" in accordance with the specification.

4. Fill the interface with children. Right-click the interface and click "Add Child".

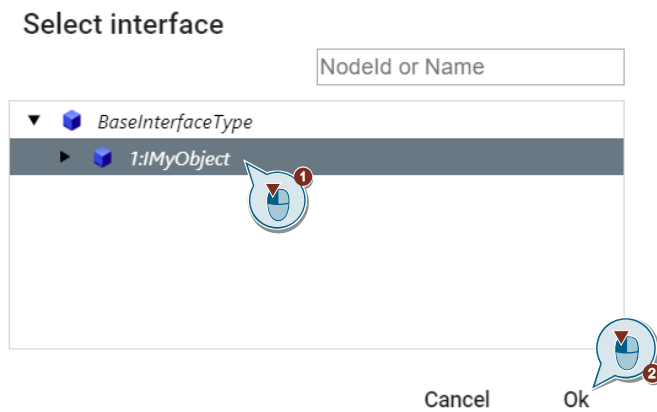
### Using an Interface

Proceed as follows to use an existing InterfaceType:

1. Right-click an object type or object instance and click "Add Interface".



2. Select a previously created interface type in the dialog that appears and confirm with "Ok".



### 3.15 "Mouseover" Functions

SiOME offers a "mouseover" function for various elements. The elements are explained below.

#### Displaying the Data Type and Type Definition Path

If you move the mouse over a type, the path to this type is displayed.

The screenshot shows the 'References' panel with three sections: 'Derived member', 'Hierarchical References', and 'Non-Hierarchical References'. The 'Hierarchical References' section is expanded, showing a table with columns: Forward, ReferenceType, NodeClass, Name, TypeDefinition, ModellingRule, and DataType. A mouseover tooltip is shown over the 'BaseVariableType / PropertyType' entry in the 'TypeDefinition' column.

Forward	ReferenceType	NodeClass	Name	TypeDefinition	ModellingRule	DataType
true	Organizes	BaseVariableType / PropertyType	PropertyType	PropertyType	<input type="checkbox"/> Mandatory	UInt32
false	HasSubtype	ObjectType	BaseObjectT			

The same applies to the data type:

The screenshot shows the 'References' panel with the same structure as the previous one. A mouseover tooltip is shown over the 'BaseDataType / Number / UInteger / UInt32' entry in the 'TypeDefinition' column.

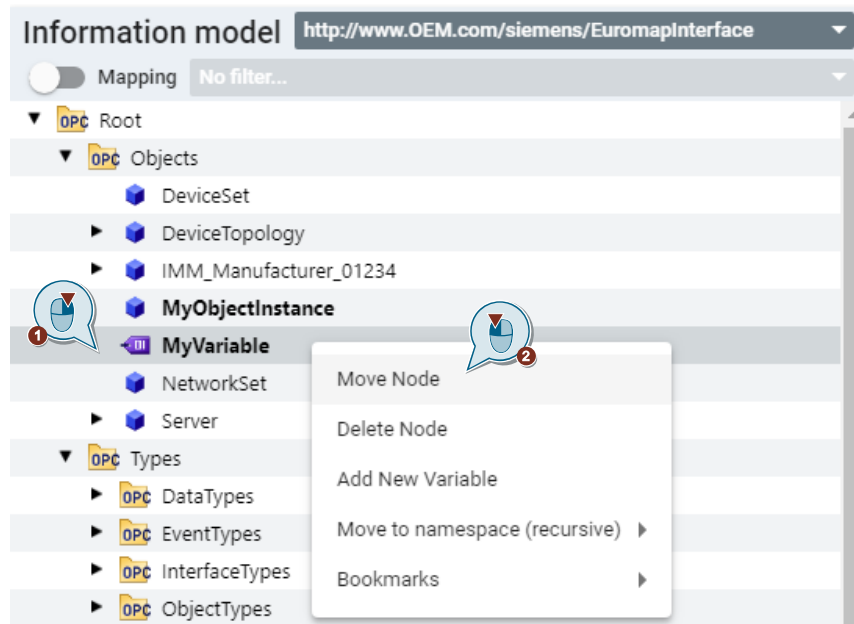
Forward	ReferenceType	NodeClass	Name	TypeDefinition	ModellingRule	DataType
true	Organizes	Variable	MyVa	BaseDataType / Number / UInteger / UInt32		UInt32
false	HasSubtype	ObjectType	BaseObjectT			



## 3.16 Moving and Renaming Nodes

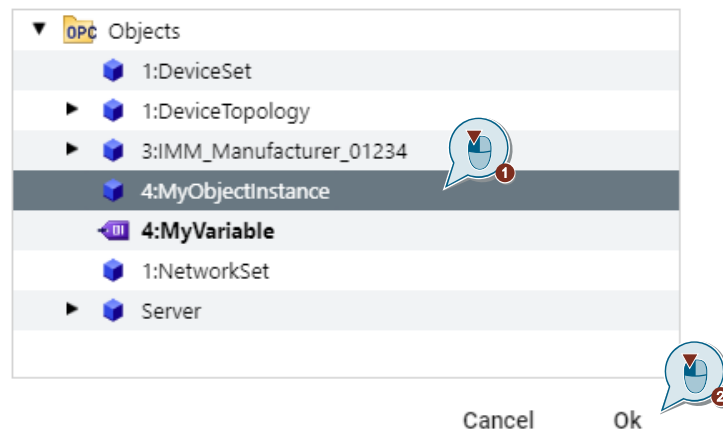
### Moving a node

1. Right-click a node in the address space that you want to move:



2. In the dialog that appears, select the object to which you want to move the selected node and confirm with "Ok":

### Select new parent node



#### Renaming a node

Select a node in the "Information model" section and edit its name in the "References" section:

References						
Type Defined References						
ReferenceType	NodeClass	Name	TypeDefinition	ModellingRule	DataType	
<input type="checkbox"/> Organizes	Variable	MyObjString	PropertyType	Optional	String	
<input type="checkbox"/> Organizes	Variable	MyObjStruct	BaseDataVariableType	Optional	4.myStructType	

Type Defined Placeholder						
--------------------------	--	--	--	--	--	--

Hierarchical References						
Forward	ReferenceType	NodeClass	Name	TypeDefinition	DataType	
true	Organizes	Variable	MyVariable	BaseDataVariableType	UInt32	
false	Organizes	Object	Objects	FolderType		

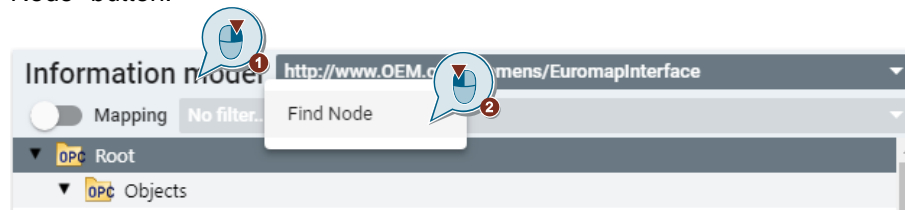
After the entry, the result is automatically accepted.

## 3.17 Navigating in the AddressSpace

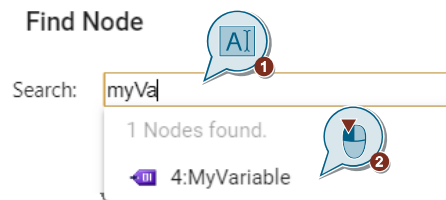
To navigate in the address space, you can search for nodes and jump directly to them. You can also add a new bookmark.

### Finding and jumping to a node directly

1. If you right-click on the "Information model" label field or use the key combination "<CTRL> + <F>", you can jump directly to a node using the "Find Node" button:



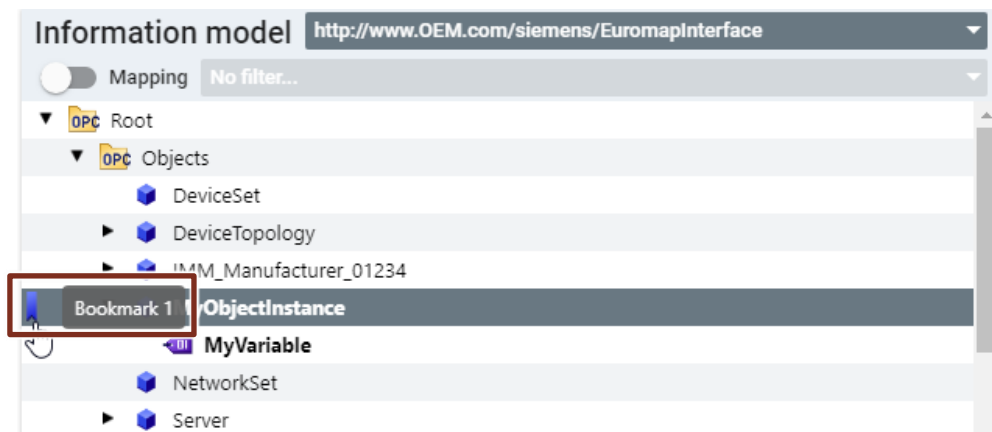
2. In the dialog that appears, enter either the BrowseName or the Node Id with namespace and click on a proposed node to jump to it:



### Bookmark

To navigate quickly in an object model, you can bookmark nodes.

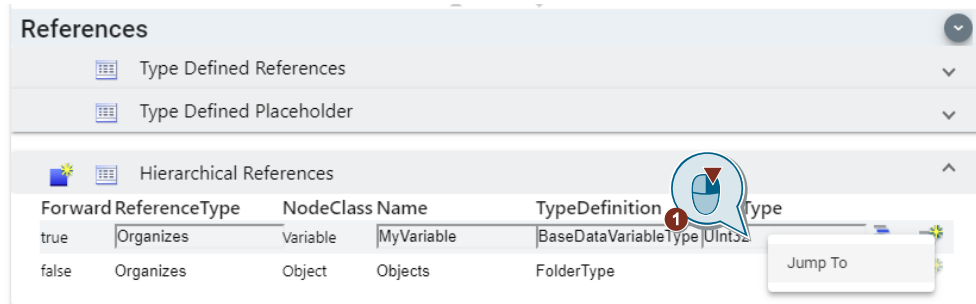
To add a bookmark, use the key combination "<CTRL> + <K>". This allows you to delete the bookmark again.



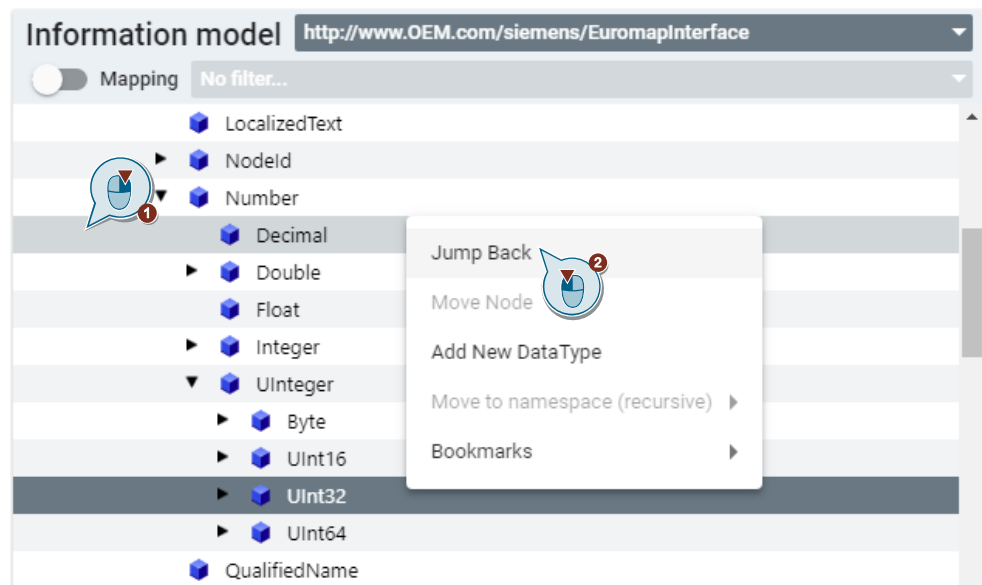
To jump from one bookmark to another, use the key combination "<ALT> + <left arrow>" or "<ALT> + <right arrow>".

### Jumping to a DataType Definition

Right-click on the desired data type in the "References" area and then click on "Jump To" in the context menu to jump to its node:



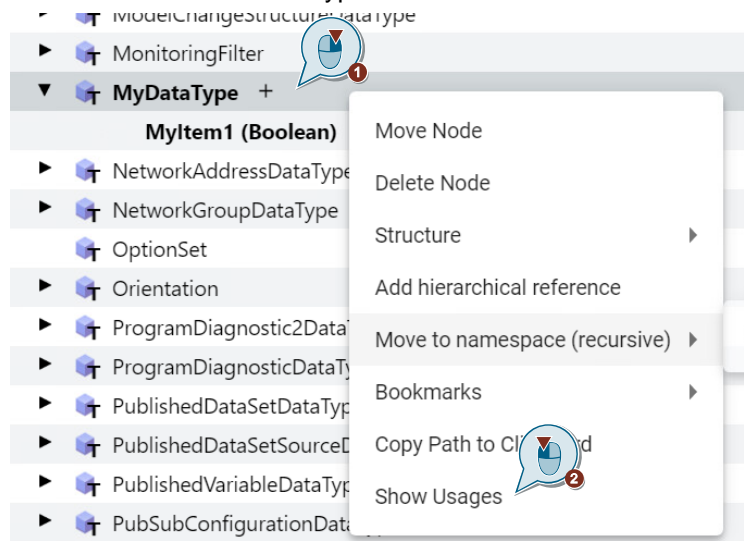
You can then right-click anywhere in the context menu to return to the previous screen:



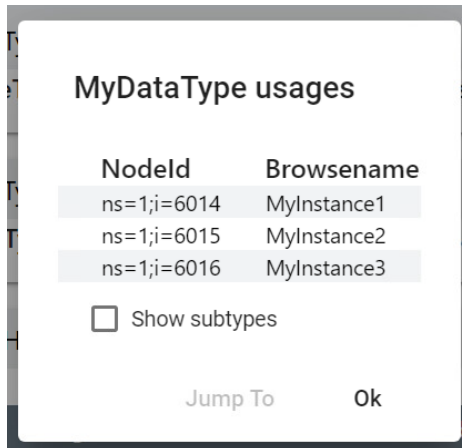
© Siemens AG 2023. All rights reserved.

### Showing all usages of a DataType

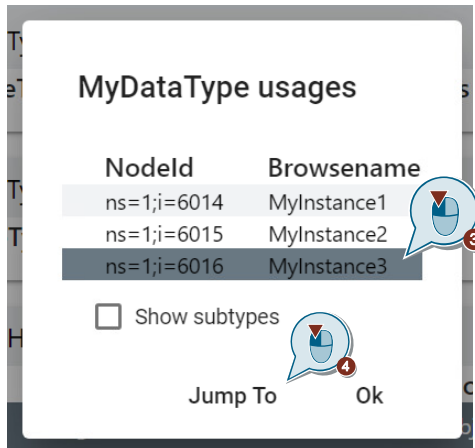
To find all instance usages of a Datatype, use the function „Show Usages“ in the context menu of the DataType:



Then you receive a list with all nodes defined by that DataType:



You can directly jump to one of the instance nodes in the Information Model by selecting the entry and using the function „Jump To“:



### 3.18 Validation of the Information Model

You can validate the address space that you have created or imported. The following rules can be checked during validation:

Choose the validation settings

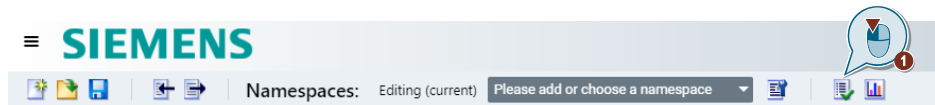
- Validate common OPC UA rules ^
  - Duplicate BrowseName
  - Maximal BrowseName length
  - Reference sources
  - Reference targets
  - ArrayDimensions and ValueRank
  - Encodings
  - Abstract DataTypes and TypeDefinitions
  - Invalid DataType
  - DataType cycles
  - Namespace cycles
  - State machines
  - Role permissions
  - Invalid overridden type references
  - Mandatory members
  - Dictionary references
- Validate extended OPC UA rules ^
  - Missing Types
  - Optional as mandatory
- Validate mapping rules ^
  - Validate mappings
  - Validate type mappings
- Validate AddIns ^
  - Validate DefaultInstanceBrowseName

Cancel Validate

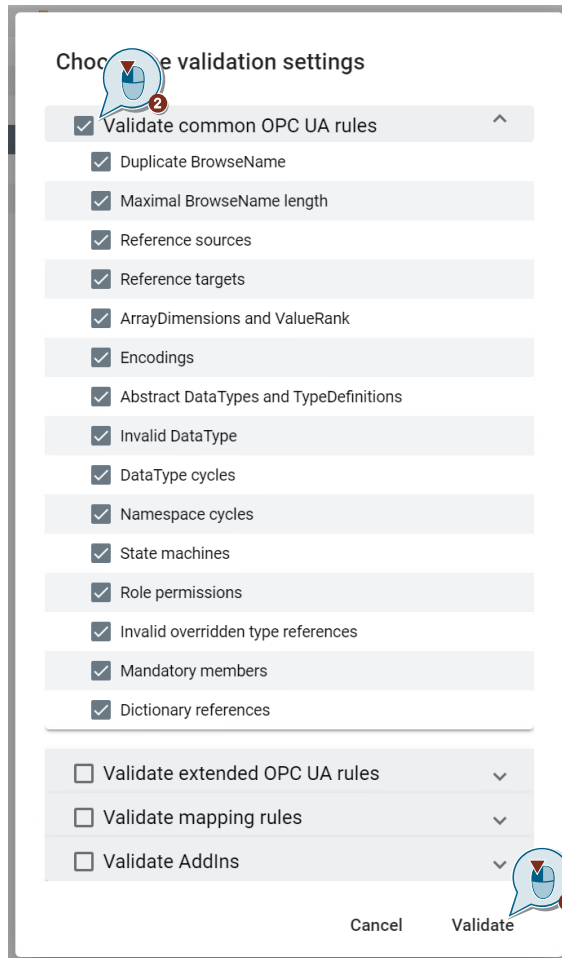
### 3 Modeling of the AddressSpace

Proceed as follows to check the address space:

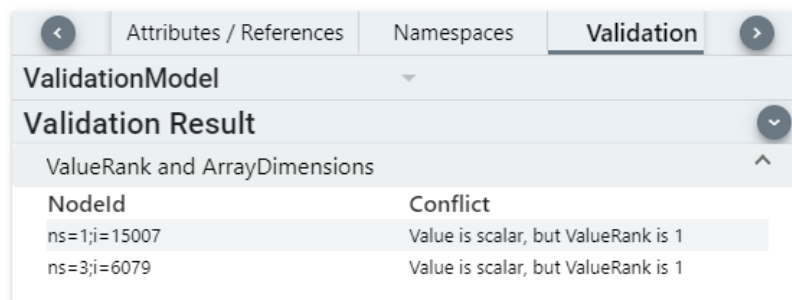
1. Click on the "Validate Information Model" button.



2. In the "Choose the validation settings" dialog box that appears, decide which rules you want to check your address space for and then confirm with "Validate".



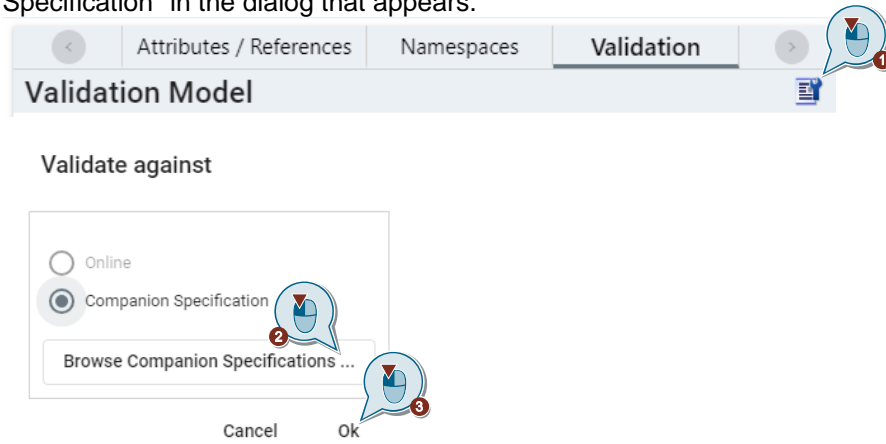
3. The result is shown as a grouped list of conflicts. By clicking an entry, the focus will automatically move to the related node in the Information Model.



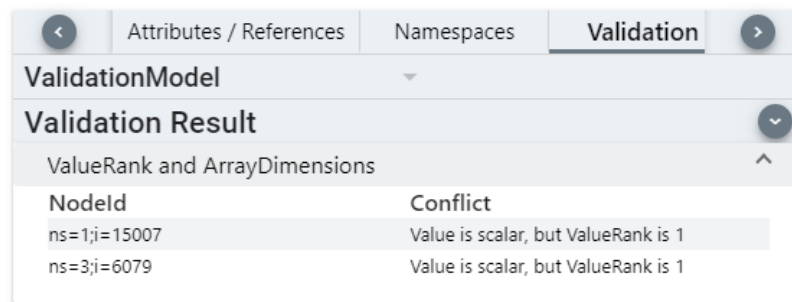
### Validation against a Companion Specification

Optionally, you can also validate mapping rules and/or have the address space checked against a Companion specification. Activate the checkbox "Validate extended OPC UA rules".

1. Before doing so, however, you must first import a corresponding NodeSet by clicking the "Validate settings" button and then selecting "Browse Companion Specification" in the dialog that appears.



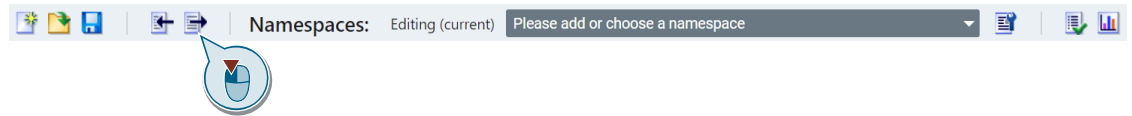
2. After validation, the rule violations are displayed in the "Validation" area.



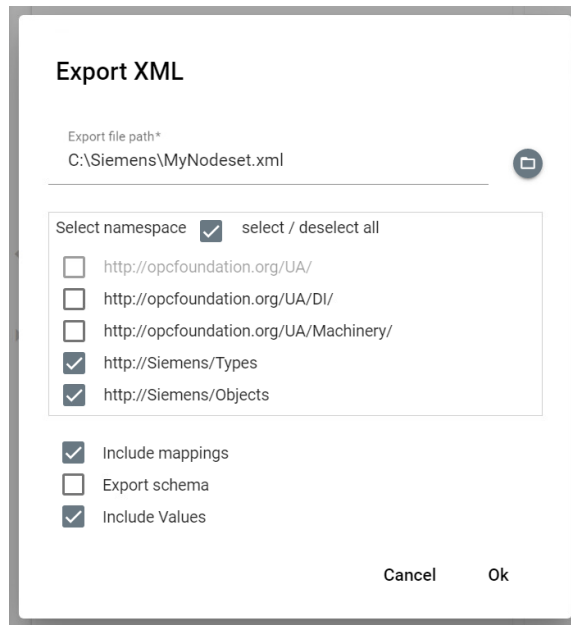


### 3.19 Exporting the Information Model

Click on the „Export XML” button in the header menu for exporting the Information Model as an XML file.



The following dialogue will appear.

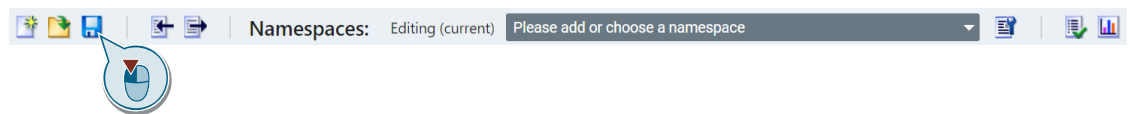


The section „Select namespace“ allows to select the namespaces to be included for the XML export.

„Include mappings“ is only available if the Information model contains any mapping entries.

### 3.20 Saving the Information Model

Click on the disk symbol in the header menu for saving the whole Information Model as an XML.



This function does not offer any additional options. The resulting XML file is the same as from Export function according to chapter 3.19 if the default settings are kept. All available namespaces, mappings and values are included.

## 4 Information Model for SIMATIC-PLCs

In this chapter, you will get an overview of the functionality provided by SiOME together with S7-CPU's in TIA Portal projects.

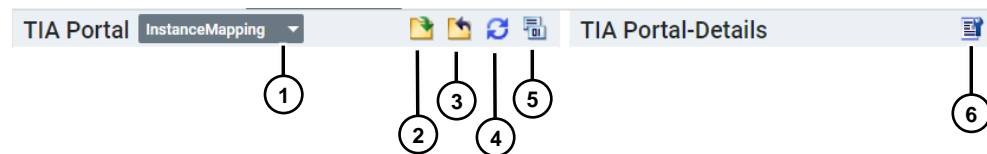
### 4.1 Connecting to TIA Portal project

#### Permit access for TIA Portal Openness

To grant SiOME permission to use TIA Openness, you must assign your currently registered user (windows log in user) to the "TIA Openness" user group. Proceed as follows:

1. Click on "Start", enter "lusrmgr.msc" and confirm with the Enter key.
2. In the tree view on the left side, click on "Groups".
3. In the work area, double-click "Siemens TIA Openness".
4. Click on "Add...".
5. Enter the name of your current user, e.g., "User", in the text box. Confirm with "Ok".
6. Log out from the current Windows session and then log back in.

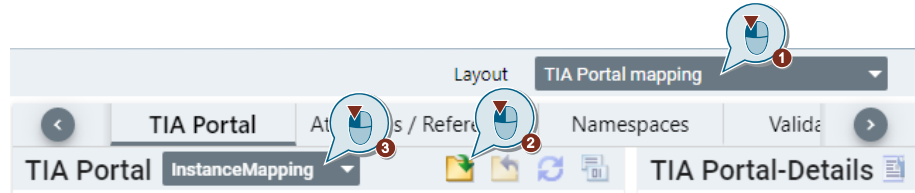
#### SIMATIC Import Window



No.	Object	Description
1.	"InstanceMapping/TypeMapping" drop-down menu	"InstanceMapping": Mapping of OPC UA variables from object instances with SIMATIC S7 variables from data blocks. "TypeMapping": Mapping of OPC UA data types or object types with SIMATIC S7 PLC-datatypes or function blocks.
2.	"Open TIA Portal project" button	Opens a dialog to connect to a TIA Portal project.
3.	"Close TIA Portal project" button	Disconnects from an open TIA Portal project.
4.	"Refresh TIA Portal project" button	Updates an open TIA Portal project.
5.	"Compile TIA Portal project" button	Compiles an open TIA Portal project.
6.	"Change external TIA Portal options" button	When a data block is selected, the user can change the TIA Portal variable options, such as: Accessibility and visibility.

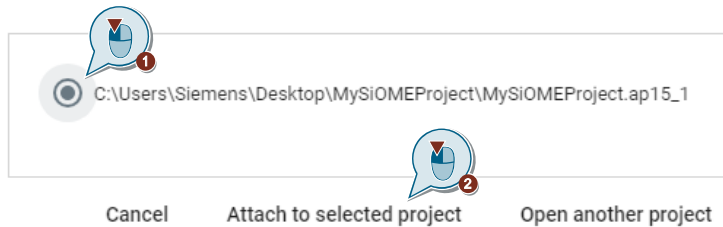
### Open TIA Portal project

1. To create an Information Model or object from a TIA Portal project, switch to the "TIA Portal mapping" layout (1). Then open a TIA Portal project by clicking the "Open TIA Portal project" button (2). Make sure to use the mode for "InstanceMapping" (3).



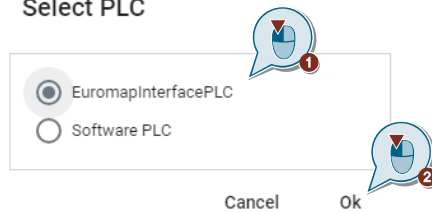
2. If TIA Portal is already started and a project is open in TIA Portal, the dialog "Attach to already opened TIA Portal project" opens. Select the open project and then click on "Attach to selected project":

### Attach to already opened TIA Portal project



3. If you have configured more than one SIMATIC S7-1500 CPU, select the suitable CPU from the appearing list and confirm with "Ok". Then confirm the dialog that opens from the TIA Portal.

### Select PLC

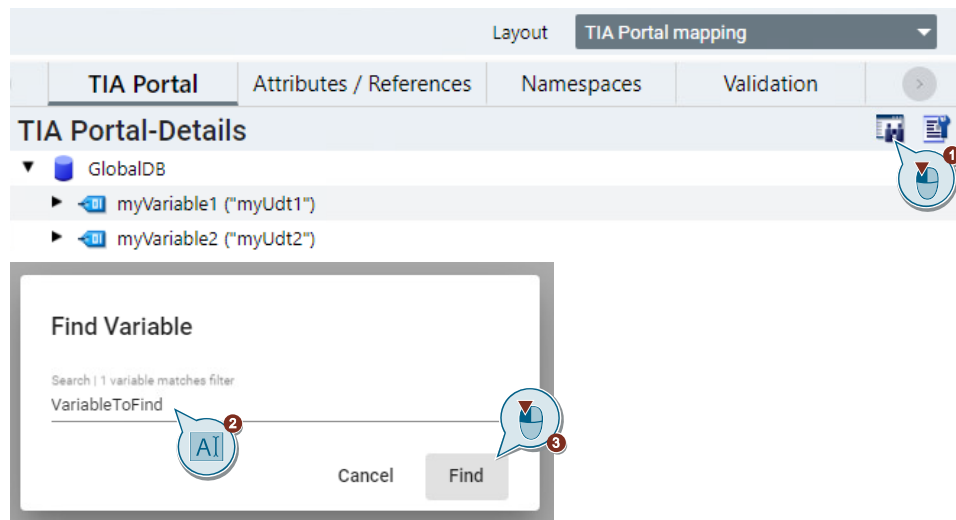


## 4.2 Mapping an Information Model to PLC data of a TIA Portal project

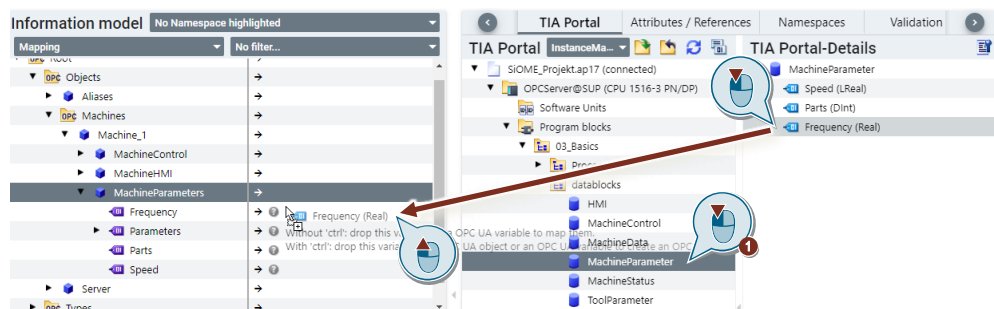
SiOME offers you the possibility to map an Information Model directly to the data blocks of a TIA Portal project of a SIMATIC S7-1200/1500.

1. In the Information model window, make sure to select “Mapping” from the dropdown menu to show the mapping column.
2. In the project tree, navigate to the data block which contains the variable you want to map. On the right side under “TIA Portal details” you will find the variables defined in the data block.
3. Select the variable you want to map.

The function “Find variable” offers the possibility to search a variable and to select it in the DB model.

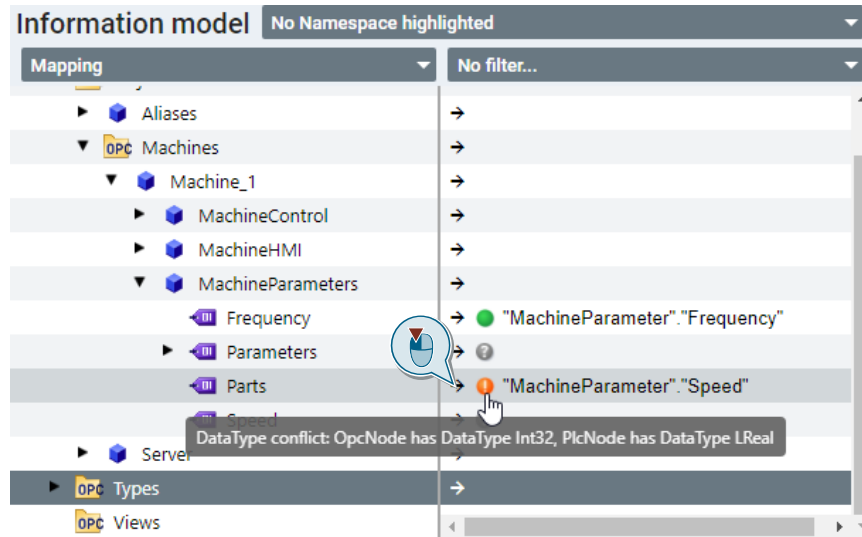


4. Use Drag & Drop to map the variable defined in TIA Portal to the variable in the Information Model.



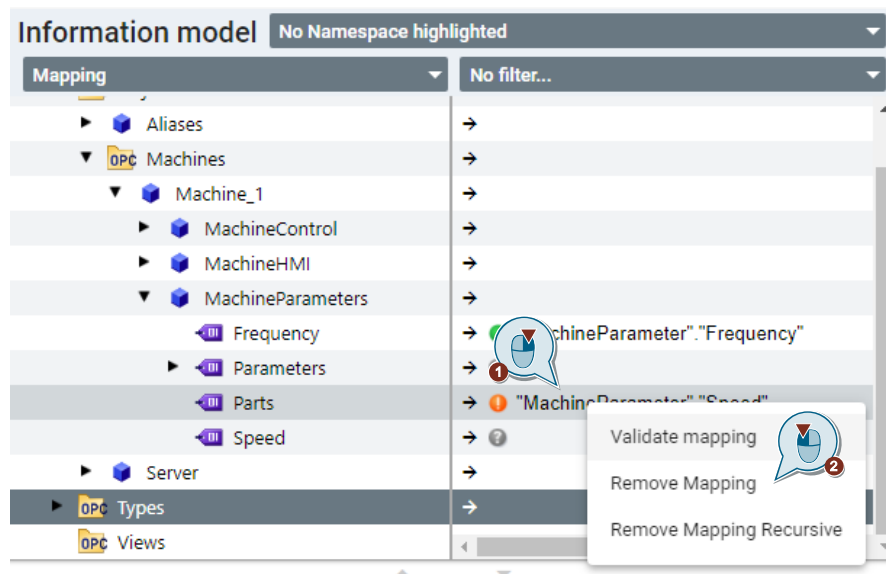
A green icon shows you that the variable has been correctly mapped.

If the mapping is not done correctly, SiOME will show you an exclamation mark icon. Click on the exclamation mark icon to display the message.



### Removing a mapping

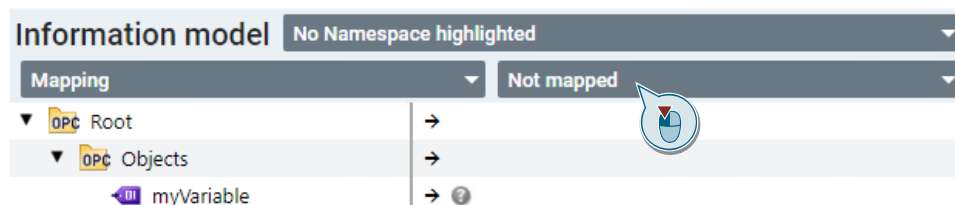
To remove a mapping perform a right-mouse click on the mapping entry and select „Remove Mapping“.



A multiple selection is possible for this action by using the CTRL key.

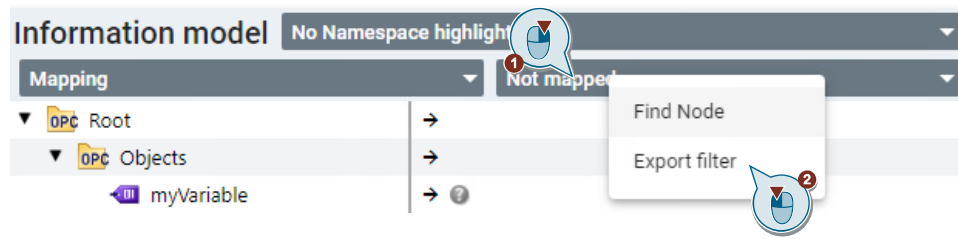
### Filtering the Mapping state and exporting the list

The nodes of the Information Model can be filtered for specific Mapping states by using the selection field above the mapping column, e.g. for all nodes which are “Not mapped”.



After a filter has been applied, the list of all nodes with the selected mapping state can be exported as a \*.csv file.

## 4 Information Model for SIMATIC-PLCs



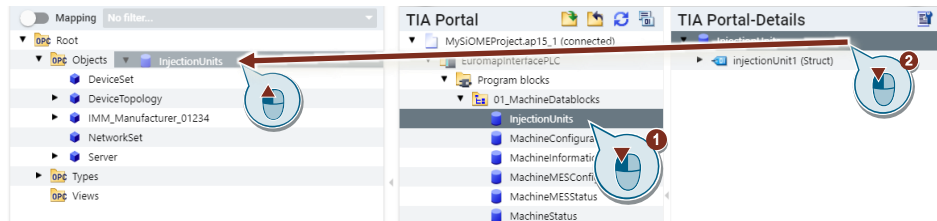
### 4.3 Creating an Information Model from PLC data of a TIA Portal project

SiOME offers you the possibility to create an Information Model directly from TIA Portal. You can derive and map elements directly from a (instance) data block.

#### Creating elements from TIA Portal Data Blocks or Variables

To create elements in the Information Model from TIA Portal project data, proceed as follows:

1. Navigate in the PLC directory to the data block you want to use and select it. On the right side, under "TIA Portal Details", you will find the variables contained in the data block.
2. Select the data block or variables under "TIA Portal Details" from which you want to create elements in the OPC UA Information Model.
3. Hold down CTRL + left mouse click and use Drag & Drop to store the data block in the Information Model.



4. Then you can choose whether arrays, structures or UDTs contained in the block should be created as variable types and whether the node IDs to be created should be of the type "String".

#### Create OPC UA instance

Create variable types and children

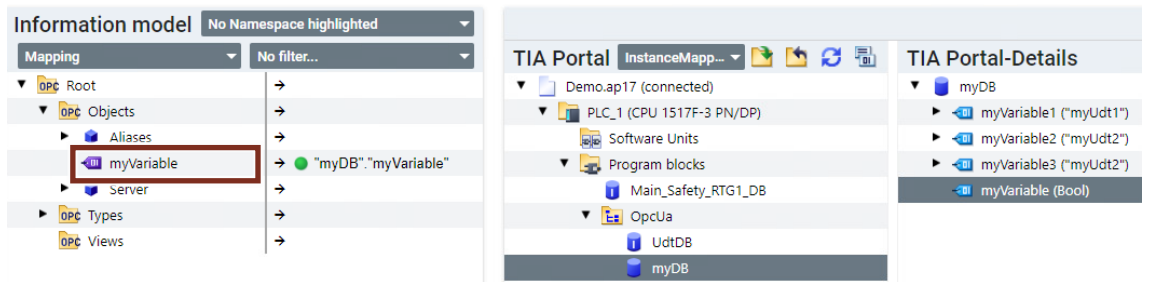
Create array elements

Use String NodeIds

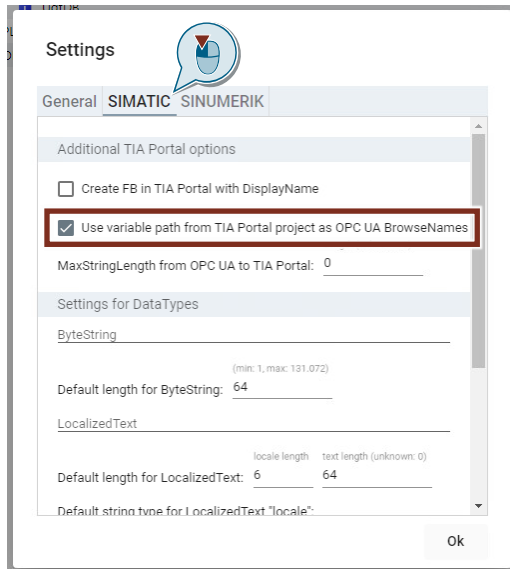
Cancel      Ok

### Creating BrowseName and DisplayName from TIA path structure

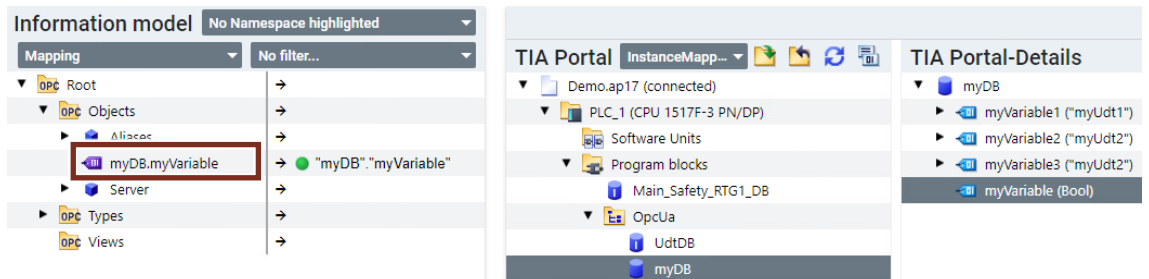
DisplayName and BrowseName of new items by default are only generated from the name of the related variable in the TIA Portal project, e.g. "myVariable":



It is also possible to set these two attributes according to the complete path structure of the TIA Portal project element. This can ease the distinction of objects that have been generated from source elements with identical names. The setting can be found in the Settings menu section „SIMATIC“ > „Additional TIA Portal options“:



After activating this setting, the name attributes will be built from the global path structure of TIA Portal project, e.g. "myDB.myVariable":

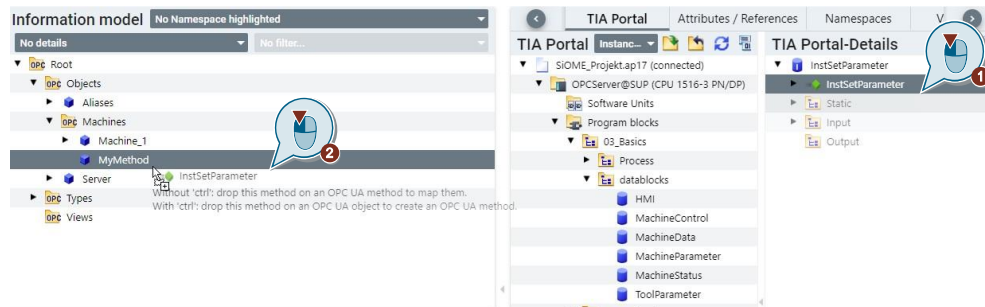




### Creating OPC UA Methods from instance data blocks of methods in TIA Portal

You can also perform the same procedure for OPC UA methods:

1. Select an instance data block of an OPC UA method programmed in the TIA Portal project from which you want to create a method in the OPC UA Information Model.
2. Hold down CTRL + left click and use Drag & Drop to store the method in the Information Model.

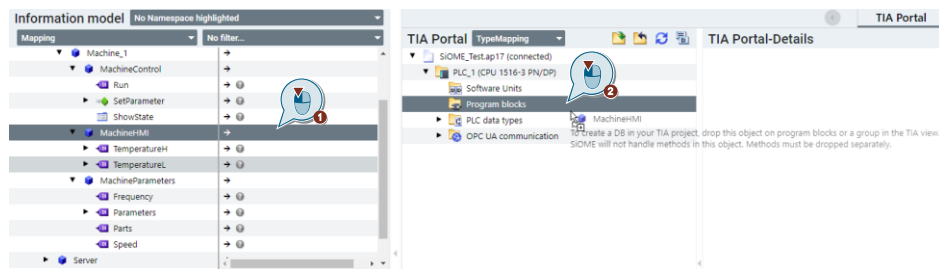


## 4.4 Creating PLC data in a TIA Portal project from an Information Model

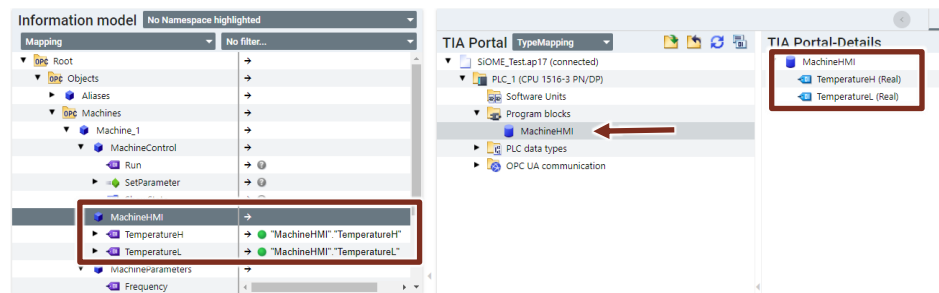
### Creating Program blocks and variables from instances in the Information Model

With this function you can create the data blocks and variables in a TIA Portal project from objects of the OPC UA Information Model.

1. Open an OPC UA NodeSet file in SiOME.
2. Open a TIA Portal project in SiOME.
3. Hold CTRL + left click an object in the SiOME instance area.
4. Drag and drop the object into the TIA Portal view under “Program blocks”.



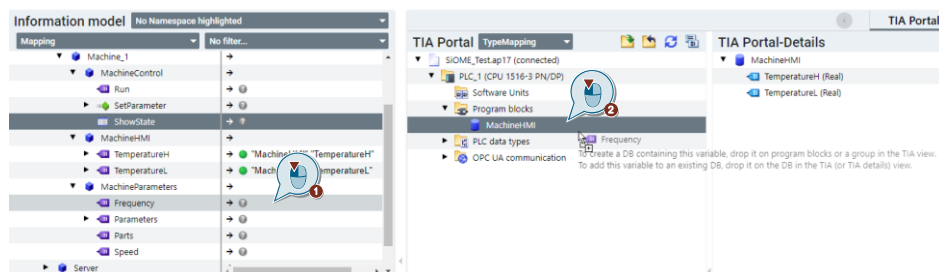
5. A data block containing all variables of the OPC UA object is then automatically created from the object. The variables are automatically mapped correctly.



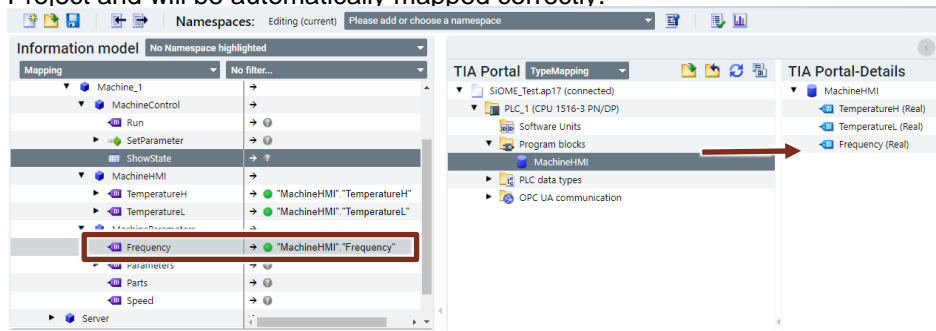
#### NOTE

The Drag & Drop function also works with individual variables from the OPC UA Information Model directly into a data block in TIA Portal.

1. Drag & Drop the variable to an already existing data block in TIA Portal view in SiOME.

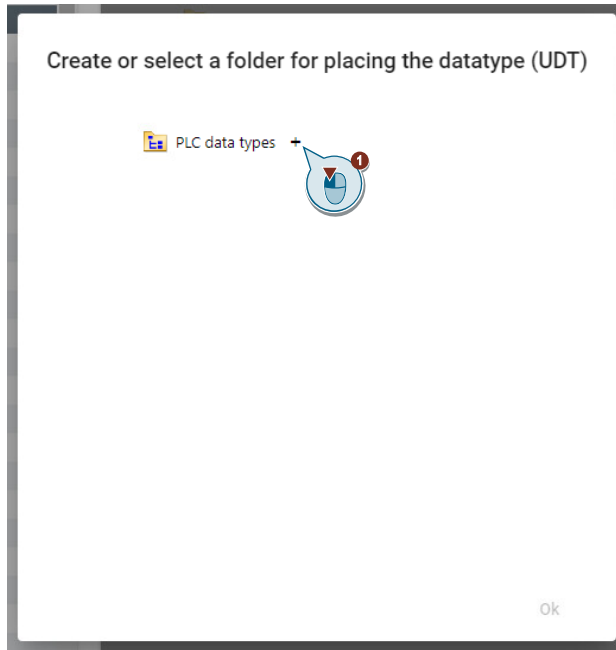


2. In what follows, the variable will be created in the data block of the TIA Portal Project and will be automatically mapped correctly.

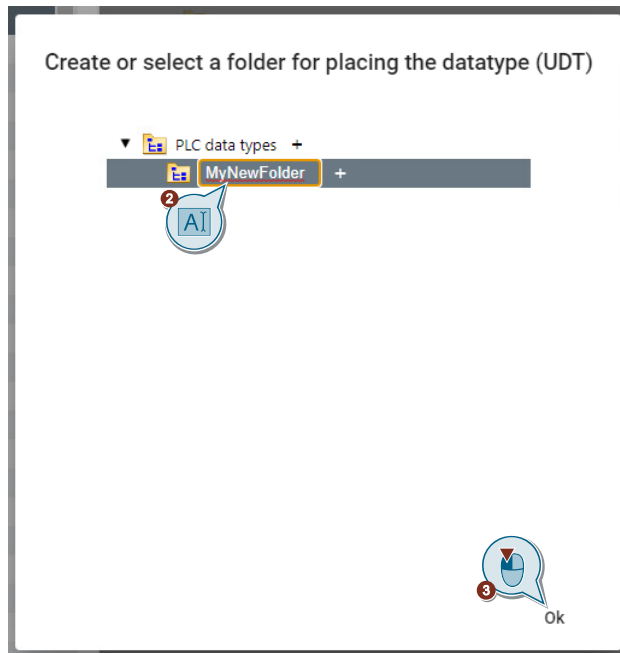


### Creating PLC data types from types in the Information Model

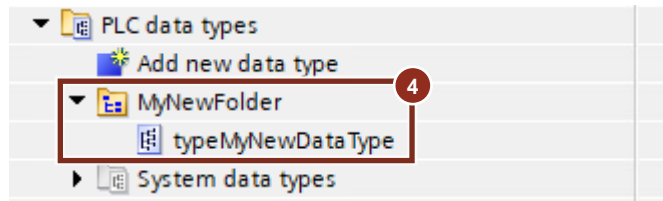
When the creation of a variable in a data block also requires the creation of a new UDT in TIA Portal project, then the following dialog offers the possibility to select and/or create subfolders in the project section “PLC data types”. Select the target folder for the UDT to be placed in. Click the “+” symbol for creating a new subfolder.



Then edit the name of the new folder and confirm the selection with “Ok”.



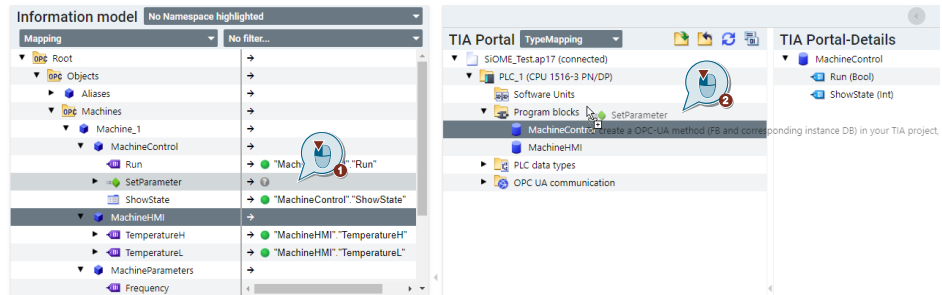
The new subfolder and UDT are then placed in the specified folder in TIA Portal project:



### Creating function blocks and instance data blocks from methods defined in the Information Model

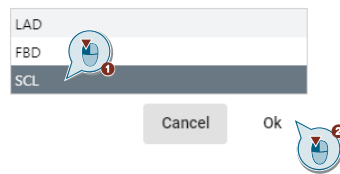
The Drag & Drop function also works with OPC UA methods. This creates a function block and the corresponding instance data block in TIA Portal.

1. Select a method in the OPC UA Information Model and drag & drop this method into the TIA Portal view under "Program blocks" in SiOME.

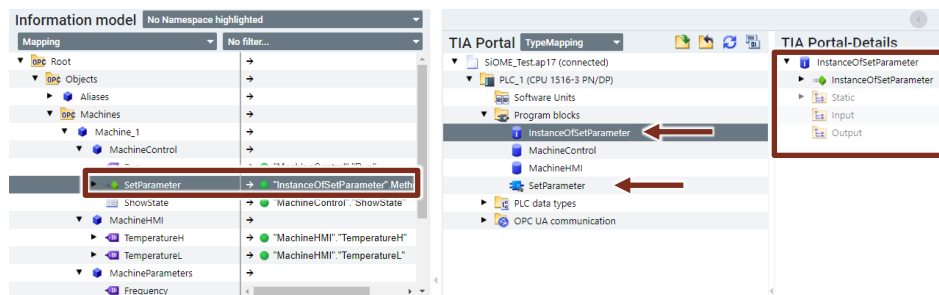


2. In the dialog box that appears, select the desired programming language.

Select Programming Language



3. In what follows, the function block and the corresponding instance data block are automatically created in the TIA Portal Project. The method is automatically mapped correctly.



**NOTE**

SiOME does not automatically create methods defined within an object. The methods must be created separately via drag and drop.

## 4.5 Type Mapping of reference namespaces to TIA Portal function blocks and data types

Starting from TIA Portal V17 Update 2 it is possible to access the SIMATIC S7 PLC data types or the data instances of function blocks via OPC UA.

To achieve this, the OPC UA data types or object types available in a reference namespace must be mapped with the PLC data types or function blocks, respectively. After compiling the project, TIA Portal is able to create OPC UA nodes in the server interface for each instance of the mapped PLC data types of function blocks.

The mapping of the OPC UA DataTypes and ObjectTypes can be done already when creating the Information Model in SiOME.

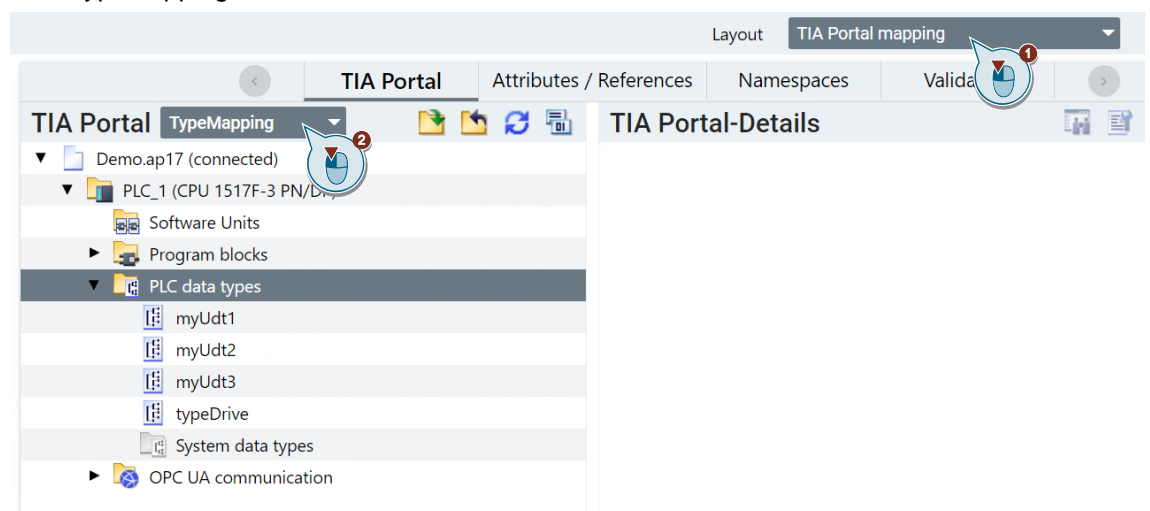
### NOTE

For a detailed description of the reference namespaces in TIA Portal check the online help [5](#) and [6](#).

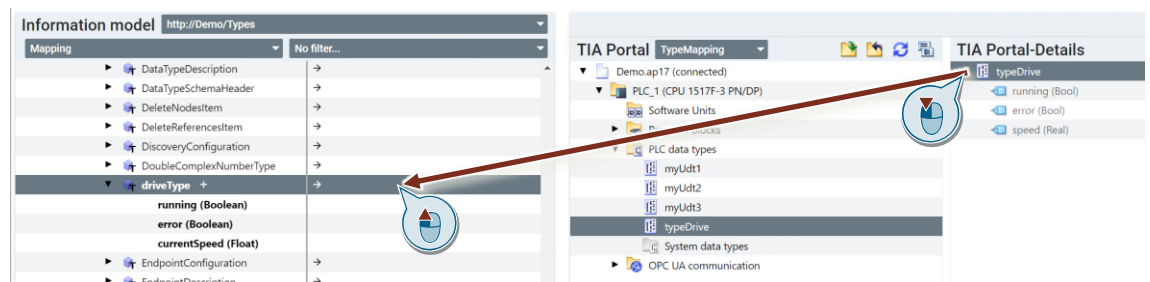
### Mapping an OPC UA data type to a PLC data type

Using SiOME, you have the possibility to map the OPC UA DataTypes to PLC data types.

1. To do this, select the "TIA Portal mapping" layout. In the TIA Portal tab, select "TypeMapping".

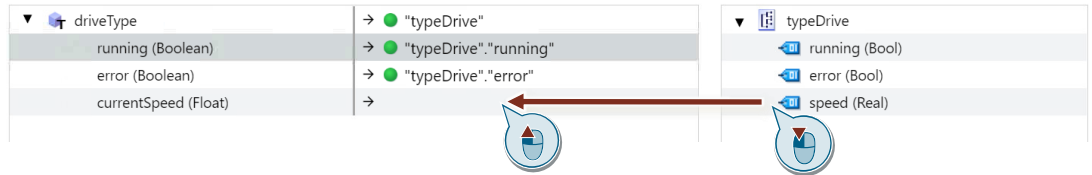


2. In the "TIA Portal" view, select the PLC data type you want to map. Use Drag & Drop from "TIA Portal details" to the corresponding data type in the Information model.



- In the following pop-up dialog, all sub-elements with an exactly matching name have been mapped automatically. You can add mappings manually by Drag&Drop.

Type Mapping



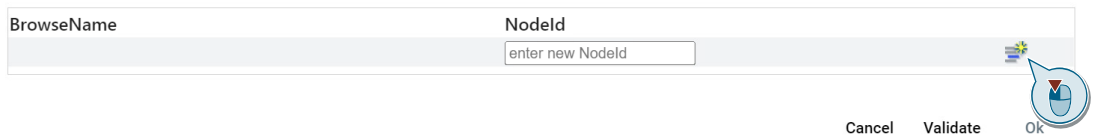
If you keep pressed the Ctrl. key during this action, the mapping will be done recursively for all internal sub-elements of the node (if possible).

It is not allowed to map elements of an OPC UA data type to variables of different PLC data types at the same time. This is the reason why the dialogue only shows the one selected PLC data type and its sub-elements for mapping.

**Defining Target Node references**

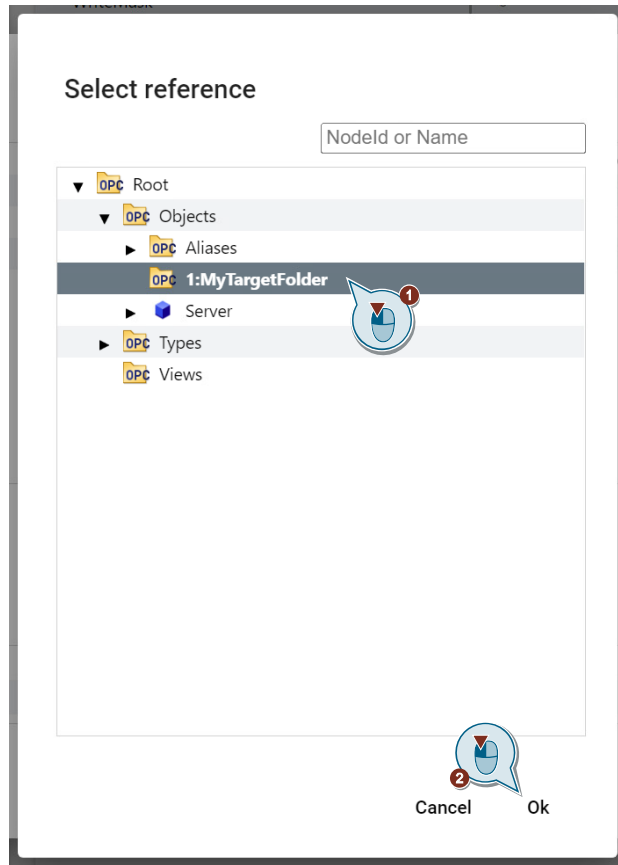
The bottom half of the dialogue allows to assign Target Nodes for instances which might be created in the future based on this TypeMapping.

References



Choose an existing target node in the following pop-up dialogue and confirm with "Ok".





The Target Node will be added to the list of References.

**References**

BrowseName	NodetId
MyTargetFolder	http://Test;i=5003

Cancel Validate Ok

**XML export structure**

You need to enable the option “Include mappings” during the export of the Information Model. The generated XML then contains a structure for the Type Mapping, including the Target Node references.

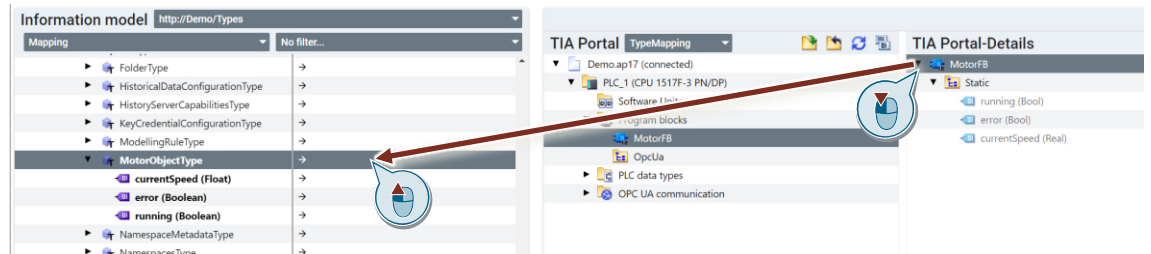
```

<UADatatype NodeId="ns=1;i=3000" BrowseName="1:typeDataToCloud">
  <DisplayName>typeDataToCloud</DisplayName>
  <References>
    <Reference ReferenceType="HasSubtype" IsForward="false">i=22</Reference>
    <Reference ReferenceType="HasEncoding">ns=1;i=5001</Reference>
    <Reference ReferenceType="HasEncoding">ns=1;i=5002</Reference>
  </References>
  <Extensions>
    <Extension>
      <si:TypeMapping PLType="&quot;typeDataToCloud&quot;">
        <si:MemberMapping PLMember="&quot;typeDataToCloud&quot;.&quot;Var1&quot;">
          <si:PathElement Name="Var1"/>
        </si:MemberMapping>
        <si:MemberMapping PLMember="&quot;typeDataToCloud&quot;.&quot;Var2&quot;">
          <si:PathElement Name="Var2"/>
        </si:MemberMapping>
        <si:MemberMapping PLMember="&quot;typeDataToCloud&quot;.&quot;Var3&quot;">
          <si:PathElement Name="Var3"/>
        </si:MemberMapping>
        <si:Reference NodeId="ns=1;i=5003"/>
      </si:TypeMapping>
    </Extension>
  </Extensions>
  <Definition Name="typeDataToCloud">
    <Field DataType="Boolean" Name="Var1"/>
    <Field DataType="Int16" Name="Var2"/>
    <Field DataType="String" Name="Var3"/>
  </Definition>
</UADatatype>

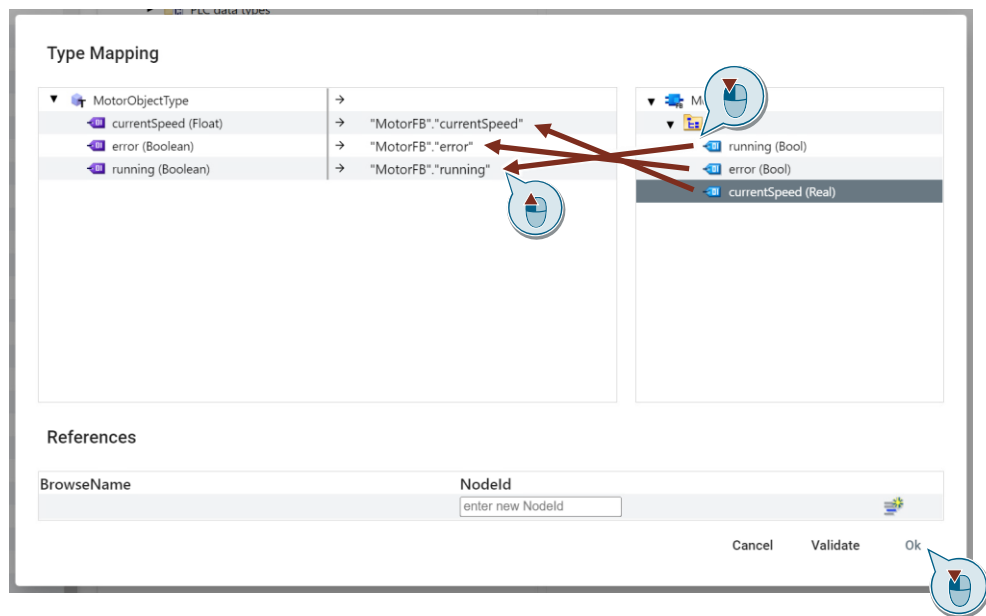
```

### Mapping of an OPC UA object type to a function block of the PLC

1. To map an object type, select the function block under "TIA Portal" the section "Program Blocks".
2. Under "TIA Portal Details" select the function block (FB) and execute a Drag & Drop onto the OPC UA object type in the Information model.

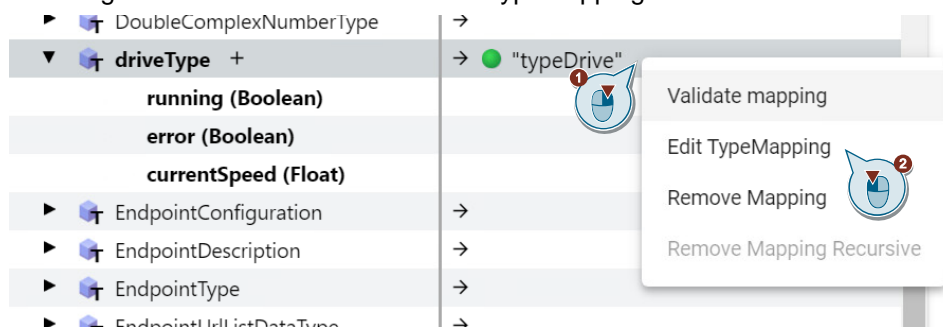


3. In the following pop-up, you can map the static variables of the FB to the individual variables of the object type.



### Editing or removing a type mapping

To change an existing mapping, select the mapping entry in the Information model with a right mouse click and select "Edit TypeMapping" in the context menu.

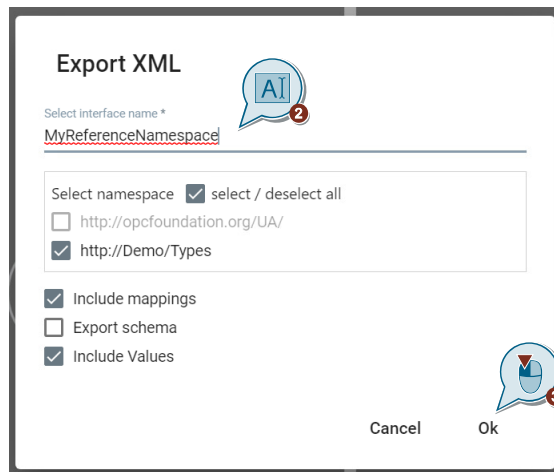
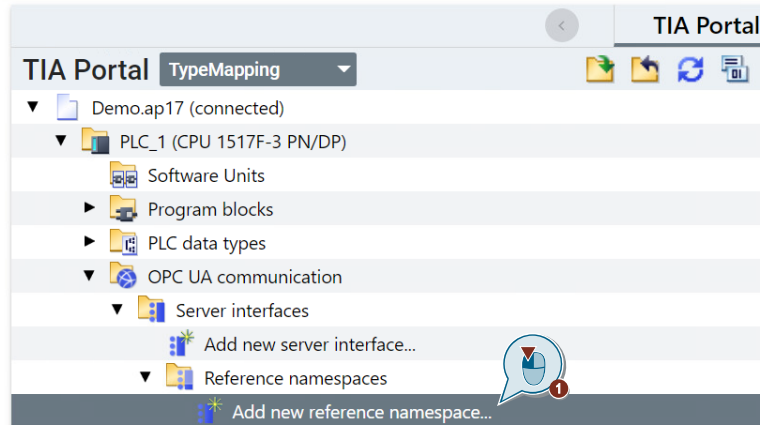


If you want to delete a mapping, select "Remove Mapping" in the context menu instead.

### Exporting as a reference namespace to TIA Portal project

You can either export the mapped reference namespace as an XML file or transfer it directly from SiOME to the TIA Portal project.

1. In SiOME, under "TIA Portal" open the folder "OPC UA communication"
2. Open the folder "Server interfaces"
3. Open the folder "Reference namespaces" and select "Add new reference namespace"

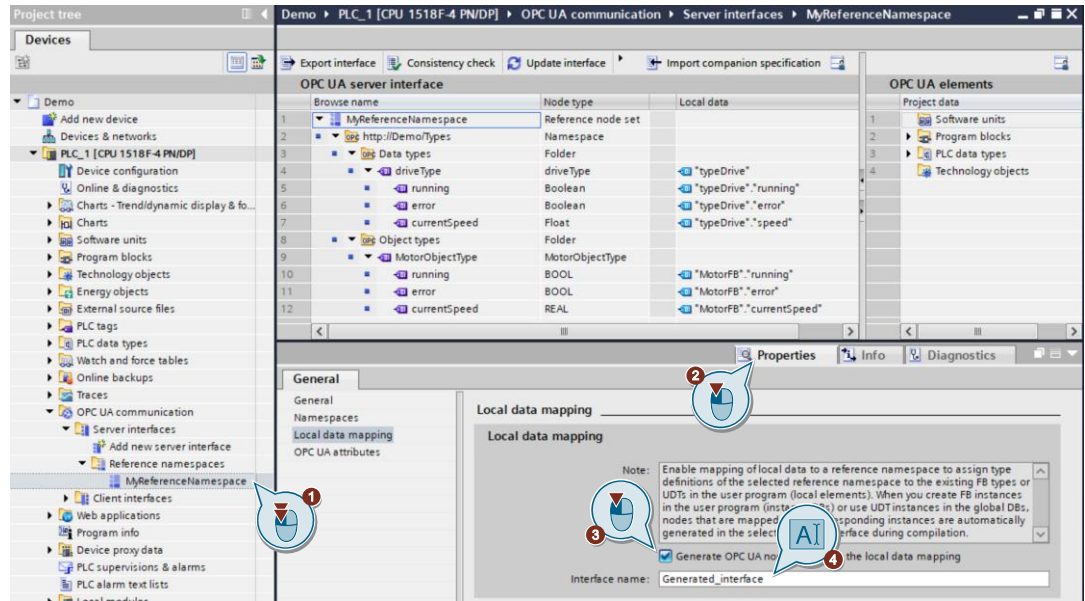


### Generating an OPC UA server interface based on a reference namespace with type mapping

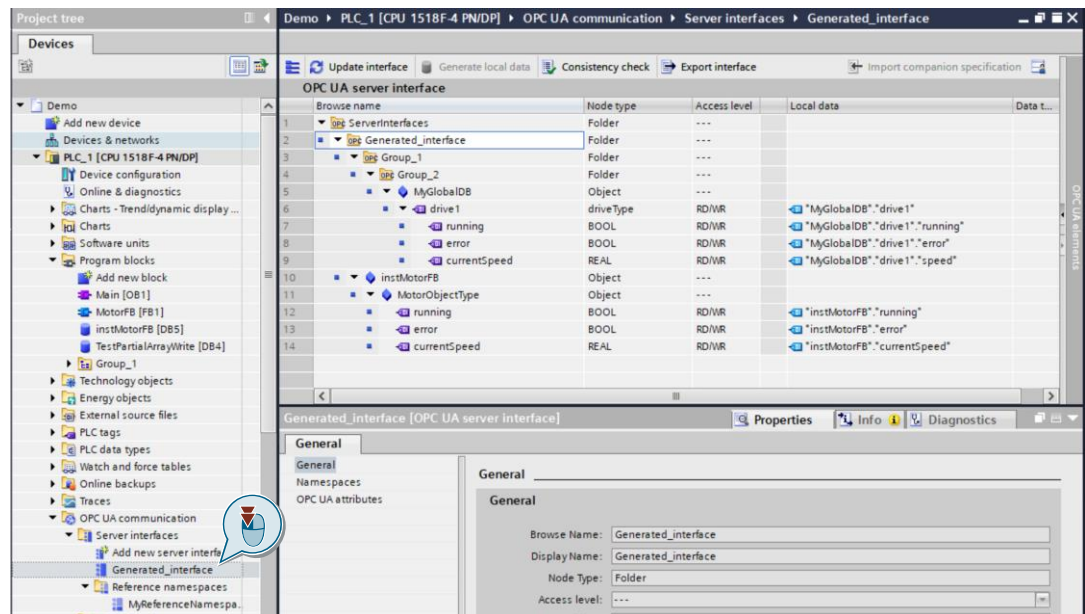
After exporting the reference namespace you can generate an OPC UA server interface in the TIA Portal project.

1. Switch to the TIA Portal project and navigate to the "OPC UA communication" section in the project tree.
2. Open the folder "Server interfaces" and select the "Reference Namespaces" folder.
3. Double click on the imported reference namespace including the type mapping.
4. In the Properties area switch to "Local data mapping" and activate the option "Create OPC UA node based on local data mapping".

5. Enter a name for the server interface in which the OPC UA nodes are to be created.



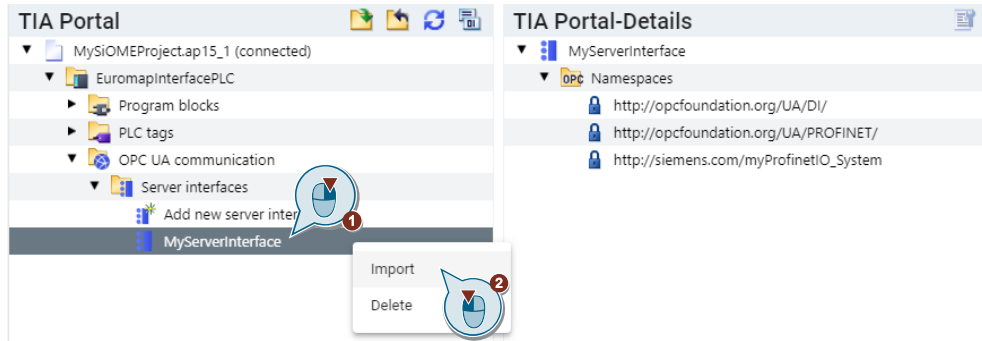
6. When compiling the project, TIA Portal will create the OPC UA nodes in a server interface with the specified name.



## 4.6 Importing a Server Interface from a TIA Portal project

You can import a server interface from an attached TIA Portal project directly into the Information Model of SiOME.

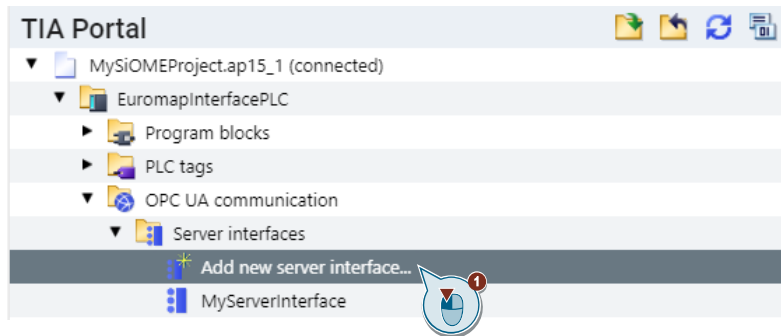
In the "OPC UA communication/server interfaces" folder, right-click on the server interface that you want to import and select "Import".



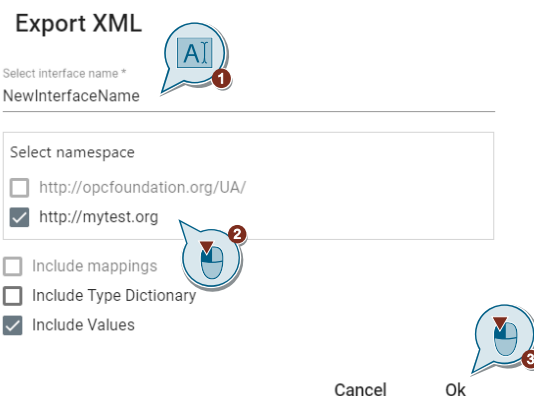
## 4.7 Exporting a Server Interface to a TIA Portal Project

You also have the option of exporting a server interface from SiOME directly into an attached TIA Portal project.

1. Under the folder "OPC UA communication/Server interfaces", click "Add new server interface...".



2. In the dialog box that appears, assign an interface name (1) and select the namespaces you want to export (2). Finally, confirm with "Ok" (3).

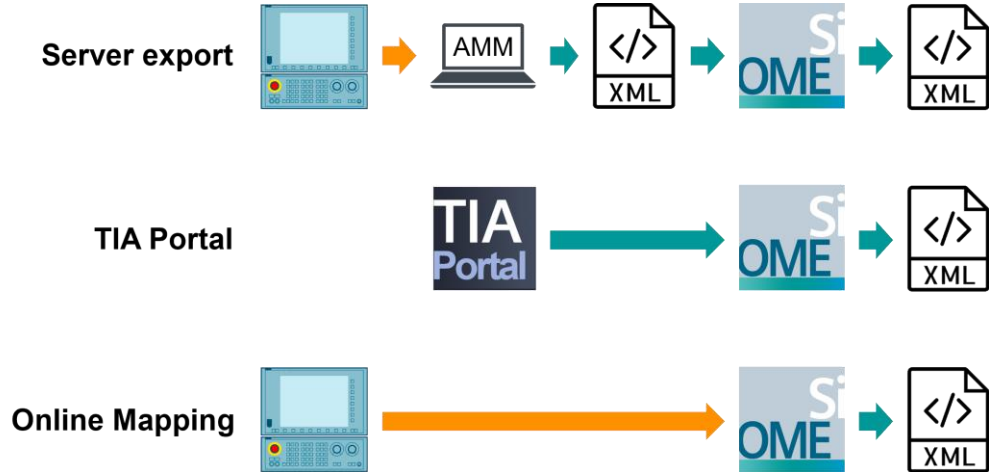


3. You can assign a new name by right-clicking an existing interface and selecting the "Rename" context option.

# 5 Information Model for SINUMERIK

## Workflows

SiOME supports three different workflows for creating an Information Model for SINUMERIK applications:

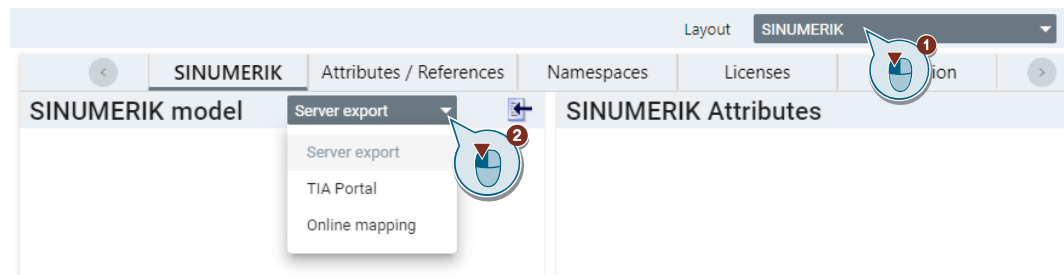


“Server export” requires an application called “Access MyMachine /P2P” to browse the Server of a SINUMERIK machine via an OPC UA connection. The resulting XML must be imported in SiOME. See chapter 5.1.

“TIA Portal” enables to create an Information model from PLC data of a TIA Portal project. See chapter 5.2.

“Online Mapping” allows to browse the Server of a SINUMERIK machine by SiOME via an OPC UA connection directly. See chapter 5.3.

After switching to the SINUMERIK layout (1), the selection of one of the three possible workflows can be chosen via the selection field in the section “SINUMERIK model” (2).



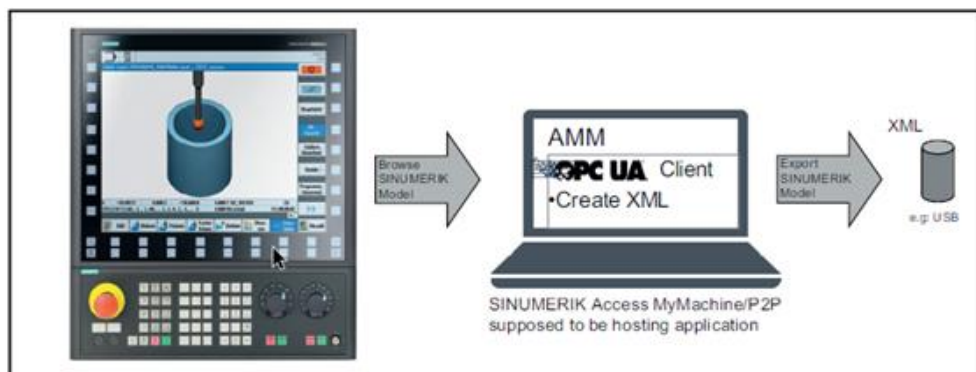
## 5.1 Creating an Information Model from a Server Export XML

For an Information model from SiOME to work with SINUMERIK, it must be linked to the SINUMERIK OPC UA objects. To make this as easy as possible, SiOME allows you to link them via Drag & Drop. However, the SINUMERIK object model must be imported for this purpose.

Since the SINUMERIK namespace is heavily dependent on the individual parameterization (e. g. number of R parameters, GUDs, etc.), it is useful to read in the namespace from a parameterized machine.

The Access MyMachine /P2P SINUMERIK tool must be used for this purpose. AMM/P2P reads the namespace of the individual OPC UA Server and creates a SINUMERIK XML which can then be imported into SiOME.

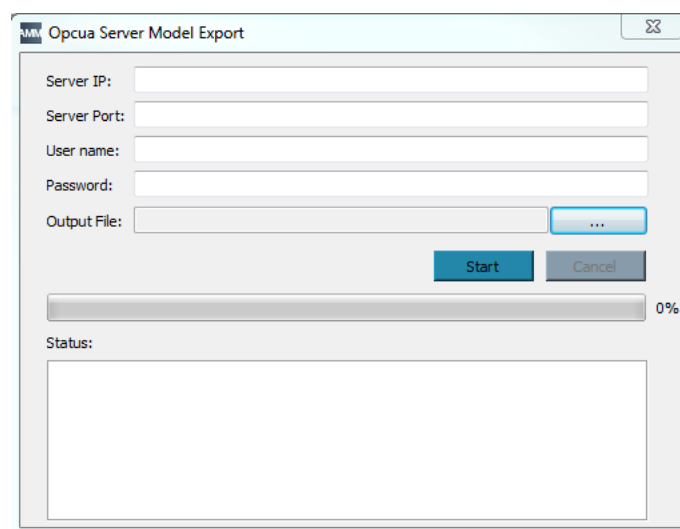
For this, AMM /P2P must be connected to the OPC UA Server of the respective SINUMERIK.



**Note** To be able to import the SINUMERIK namespace, it must first be created with the Access MyMachine /P2P tool.

### Derive OPC UA Namespace from the SINUMERIK OPC UA Server

1. Open the "SINUMERIK Access MyMachine /P2P" program.
2. Click "Tools > Sinumerik Model Export". A pop-up window appears.



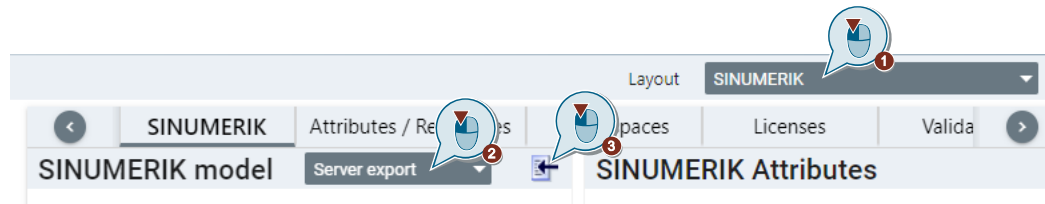


1. Enter the following information of the connected OPC UA Server on: "Server IP", "Server Port", "Username", "Password".
2. Define the location where the XML file should be saved under "output file".
3. Click "Start" to create the XML file. The XML file is stored in the specified path. The saved XML can now be read into SiOME.

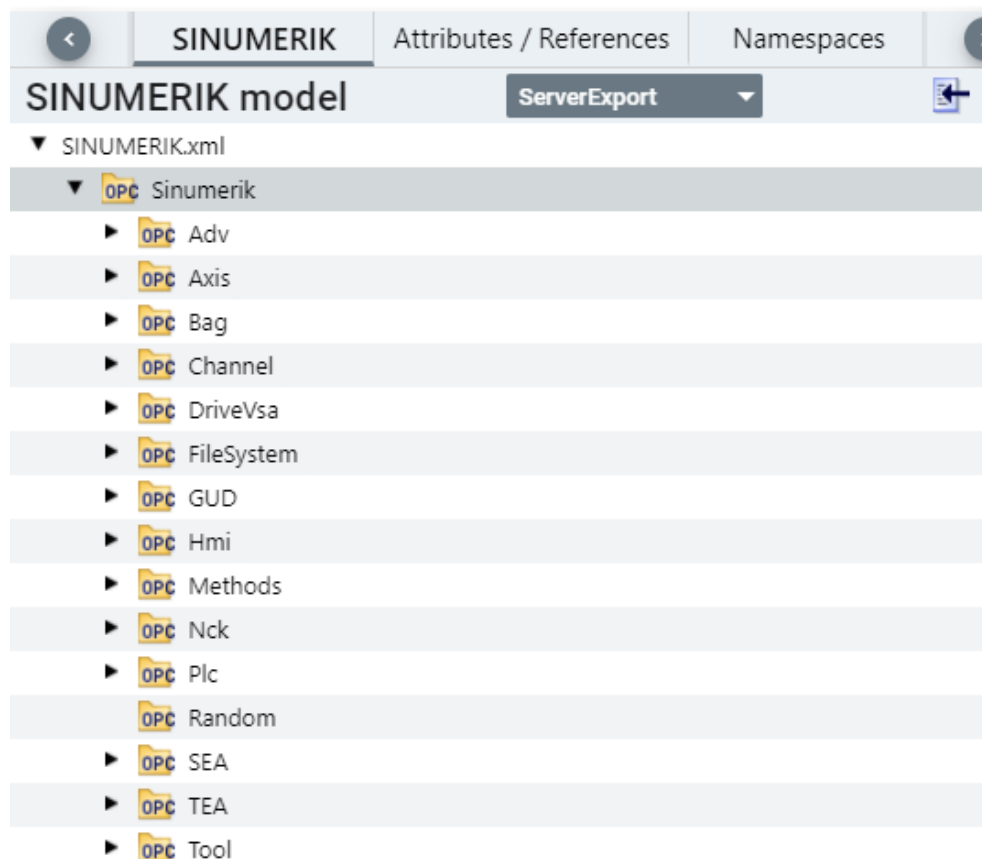
### Importing SINUMERIK XML into SiOME

This can be imported into SiOME after extracting the SINUMERIK XML.

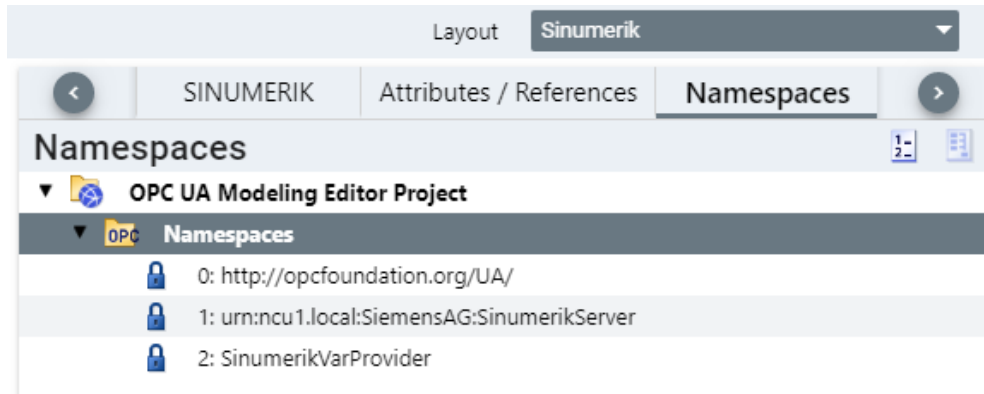
1. Select "SINUMERIK" from the "Layout" drop-down menu.
2. Make sure that the "ServerExport" view is selected.
3. To import the SINUMERIK XML, click "Load SINUMERIK XML file" and select the SINUMERIK XML.



The imported server structure appears as follows.

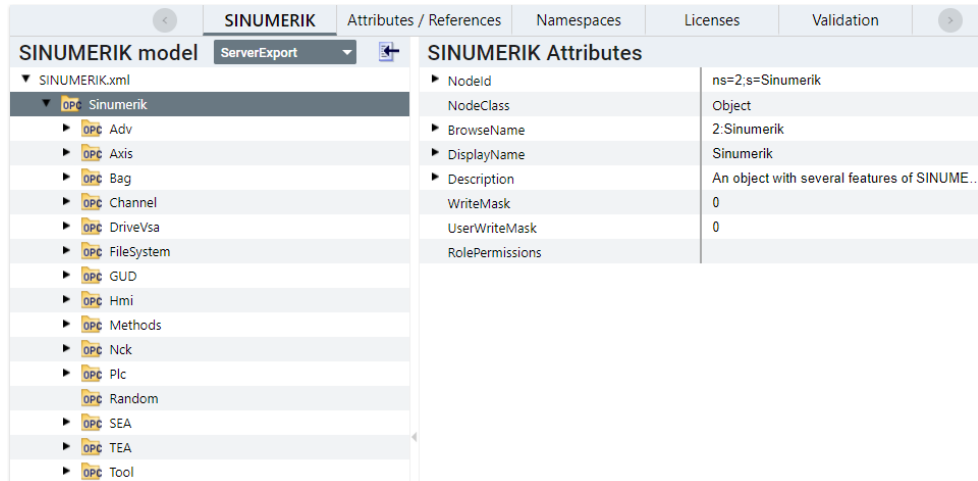


The SINUMERIK OPC UA XML also includes the SINUMERIK namespaces. These are required and may not be deleted or changed.

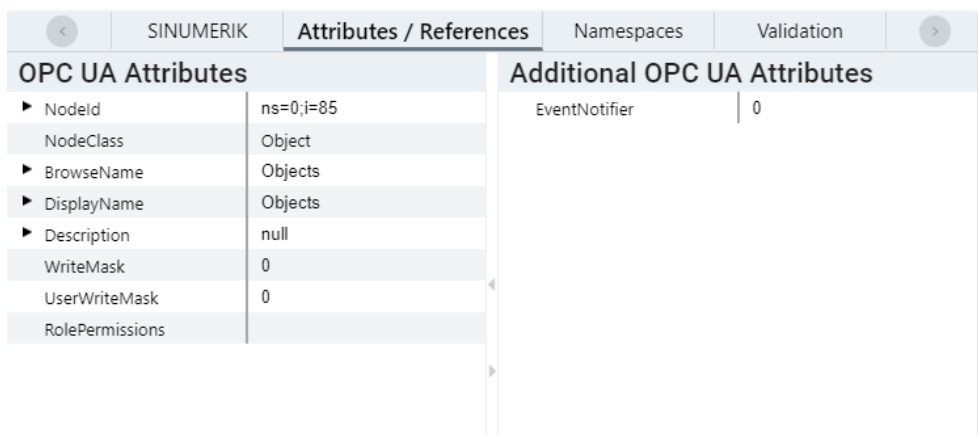


A new namespace must be created for your model.

In addition to the SINUMERIK model, you can see the properties of the selected SINUMERIK variables from the SINUMERIK model under "SINUMERIK Attributes".



The properties of the variable from your own model can be found under the "Attributes / References" tab.



### **Modeling Rules with SINUMERIK OPC UA Server**

The following configuration rules must be observed for correct functioning of the SINUMERIK OPC UA Server:

- The SINUMERIK XML must not be read in the "Information Model" window.
- No new nodes may be created in the SINUMERIK namespaces (namespace 0, 1, and 2).
- The namespaces 0, 1, and 2 may not be changed, deleted, or changed in sequence.
- User-defined namespaces must have index of 3 or higher.

### **Mapping user-defined object models with SINUMERIK objects**

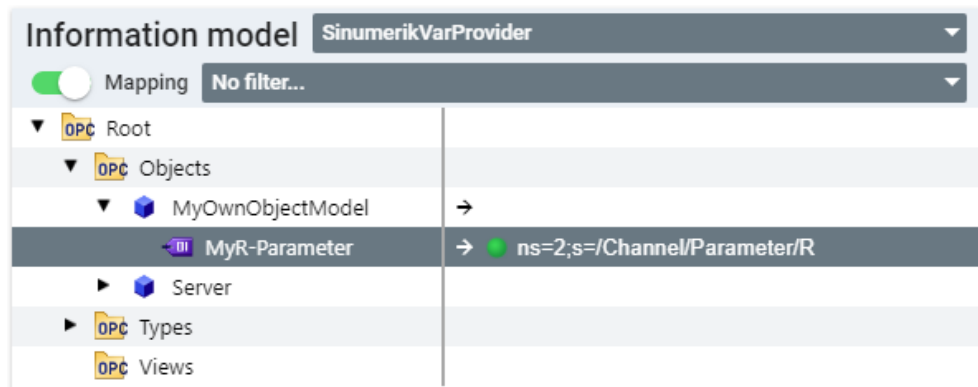
The SINUMERIK namespace has various variables, which are ordered in arrays. The arrays are not resolved in the SINUMERIK OPC UA namespace. Therefore the desired element must be added manually after linking. An exact description of the assignment of addresses can be found in the description of the SINUMERIK OPC UA Server.

**Example, R parameters:**

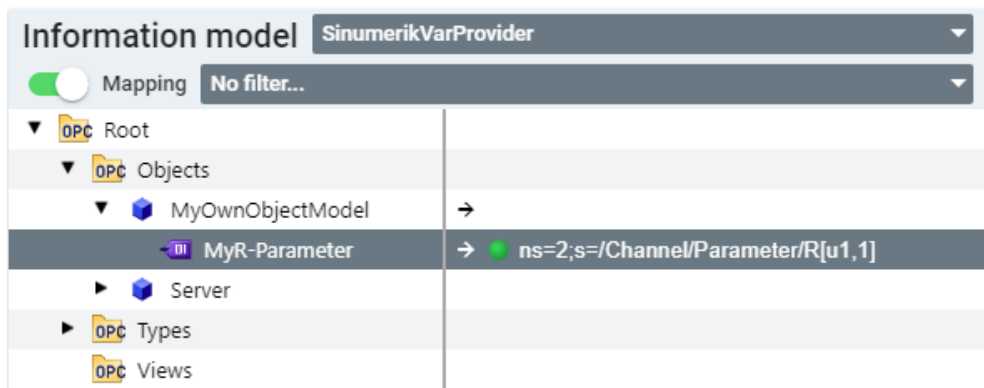
There is only one node for the R parameters in the SINUMERIK namespace. When linked to a variable, the specific percentage must be added.



After linking via drag & drop, the variable is only linked to the object "rpa". To be able to display a specific value, the parameters must be added manually.



In this case "[u1,1]" must be added for parameter R1 from channel 1.



Additional information on modeling (including modeling of alarms and the file system) can be found in the SINUMERIK manual (see links under [4](#)).

## 5.2 Creating an Information Model from PLC data of a TIA Portal project

For SINUMERIK ONE it is possible to map the PLC share directly via the TIA Portal project instead of via the Server Export XML. This offers a maximum of flexibility, as the entire export process does not have to be repeated in case of PLC project changes.

Prerequisites for using the TIAPortal view for mapping SINUMERIK models:

### NOTE

- Works only in conjunction with SINUMERIK ONE
- TIA Portal and SINUMERIK ONE Toolbox must be installed
- TIA Portal and Toolbox version corresponds to the project to be opened (e.g., TIA Portal V16 project can only be opened if a TIA V16 incl. Toolbox for V16 is also installed)

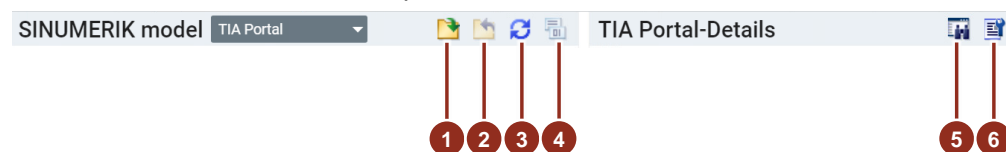
### Granting permission for TIA Openness

Access to the TIA Portal project is possible via Openness. To grant SiOME permission to use TIA Openness, you must assign your currently logged in user to the "TIA Openness" user group. Follow these steps:

1. Click on "Start" and enter "Iusrmgr.msc" and confirm with the enter.
2. Click on "Groups" in the tree view on the left side.
3. In the workspace, double-click on "Siemens TIA Openness".
4. Click on "Add...".
5. In the text box, enter the name of your current user, e.g. "User". Confirm with "OK".
6. Log out of the current Windows session and then log back in.

### TIA Portal view

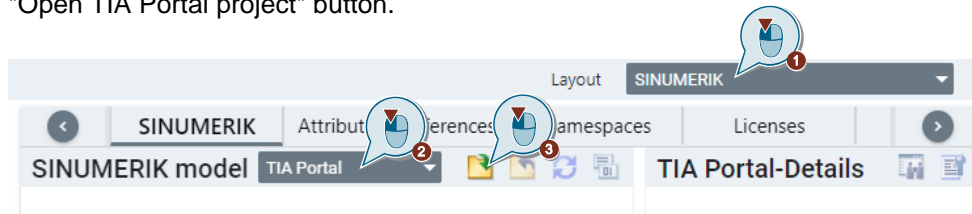
"TIA Portal" view allows the mapping of PLC variables directly from the TIA Portal project. This function is only compatible with SINUMERIK ONE. For the mapping of all other variables, the Server "export" view is also used for SINUMERIK ONE.



No.	Field	Description
1.	Button "Open TIA Portal project"	Opens a dialog to connect to a TIA Portal project.
2.	Button "Close TIA Portal project"	Disconnects from an open TIA Portal project.
3.	Button "Refresh TIA Portal project"	Updates an open TIA Portal project.
4.	Button "Compile TIA Portal project"	Compiles an open TIA Portal project.
5.	Button "Find Variable"	Finding a TIA Portal variable by its name.
6.	Button "Change external TIA Portal options"	When a data block is selected, the user can change the options of the TIA Portal variables, such as e.g.: Accessibility and visibility.

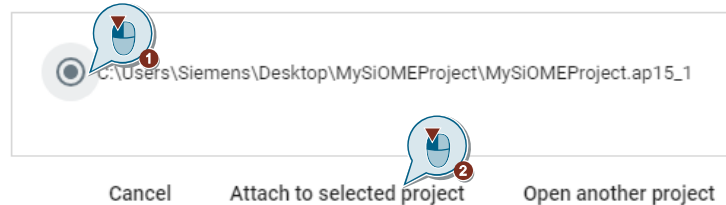
### Opening TIA Portal project

1. To create an Information Model or an object from a TIA Portal project for SINUMERIK ONE, select the "SINUMERIK" layout. Then select the "TIAPortal" view under SINUMERIK and open the TIA Portal project by clicking on the "Open TIA Portal project" button.



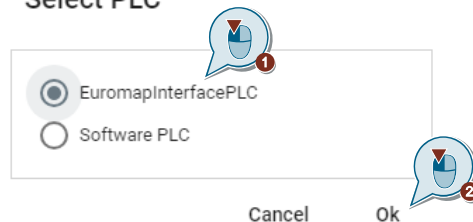
2. If TIA Portal has already been started and a project is open in TIA Portal, the dialog "Attach to already opened TIA Portal project" opens. Select the open project, and then click on "Attach to selected project":

#### Attach to already opened TIA Portal project



3. If you have configured more than one SINUMERIK, select the suitable SINUMERIK PLC from the appearing list and confirm with "Ok". Then confirm the dialog that opens from TIA Portal.

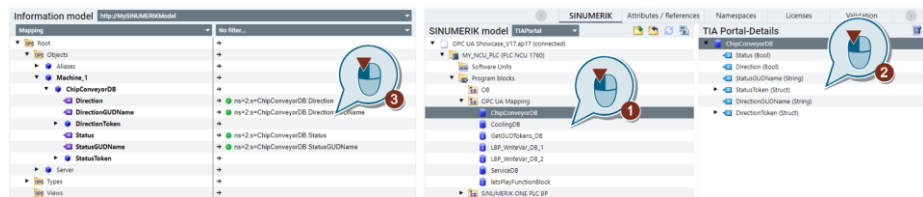
#### Select PLC



### Create an Information Model with TIAPortal View – Connect variables

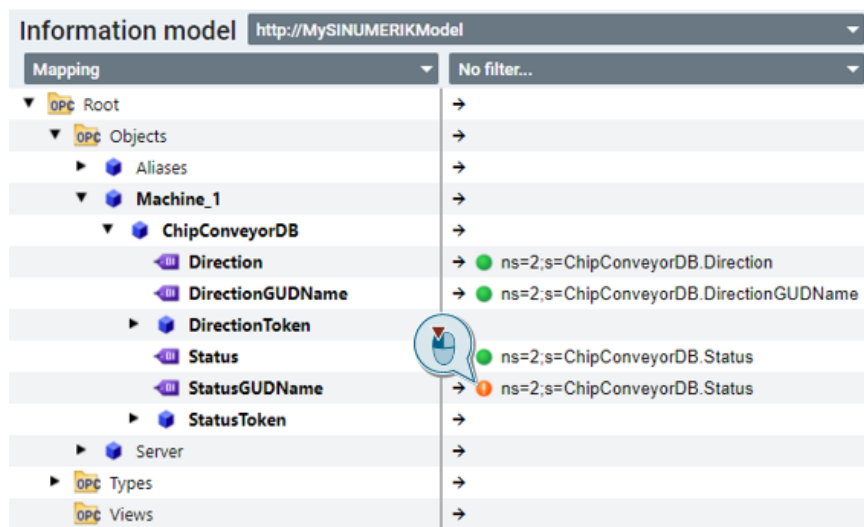
SiOME offers you the possibility to link an Information Model directly with data blocks of a SINUMERIK ONE available in the TIA Portal.

1. In the "Information model" window, select "Mapping" from the drop-down menu to display the mapping column.
2. In the project tree, navigate to the data blocks you want to use and select it. On the right-hand side under the "TIA Portal Details" you will find the variables defined in the data block.
3. Under "TIA Portal Details", select the variable in the data block that you want to link.
4. Use drag & drop to link the variable defined in the TIA Portal to the variable in Information Model.

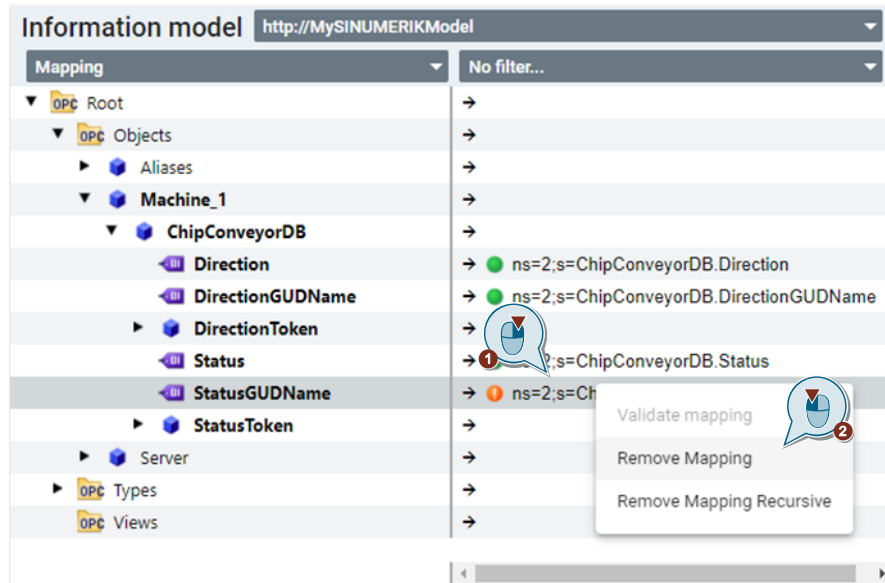


A green icon shows you that the variable has been linked correctly.

If the mapping is not done correctly, SiOME shows you an exclamation mark symbol. Click on the exclamation mark symbol to display the message.



To delete the mapping, right-click on the mapping and choose "Remove Mapping".



**Create an Information Model with TIA Portal View – Create variables**

SiOME offers you the possibility to create an Information Model directly from TIA Portal. You can derive and map objects directly from an (instance) data block.

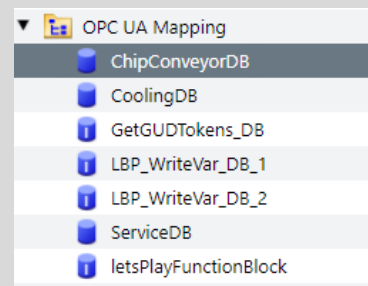
To create objects in the Information Model from the TIA Portal project, proceed as follows:

1. In the project tree, navigate to the data block you want to use and select it. On the right-hand side under the "TIA Portal Details" you will find the variables defined in the data block.
2. Under "TIA Portal Details", select the data block from which you want to create an object in the OPC UA Information Model.
3. Hold down CTRL + left-click and use drag & drop to store the data block in the Information Model. The correct variable types are created and mapped directly. Afterwards you can of course change the names of the variables in the OPC UA model.



**NOTE**

The object tree contains its own DBs as well as instance DBs. Instance DBs can be recognized by the white "I" in the DB symbol. If you do not want instance DBs to be displayed, you can deactivate this via Setting > SINUMERIK.



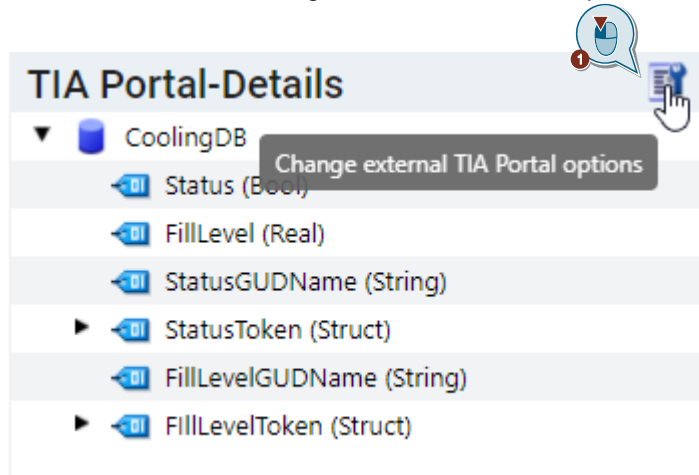


### Change DB properties via SiOME

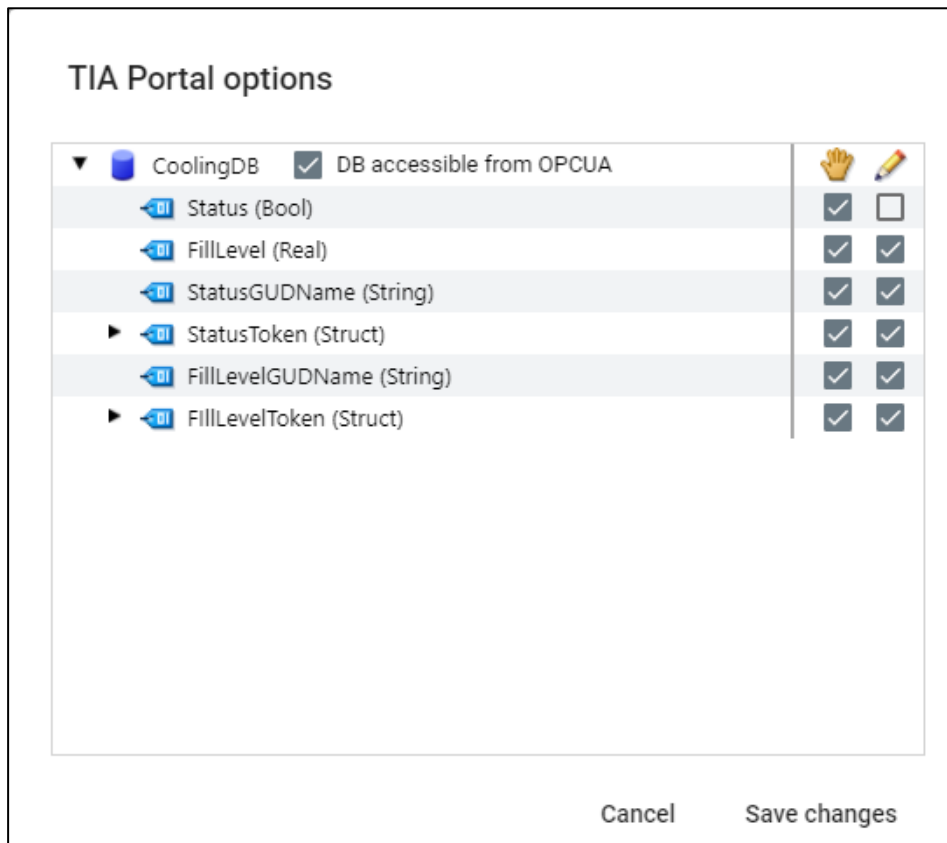
In SiOME, you can change the properties of a DB with regard to accessibility via OPC UA as well as the write and read rights of individual variables.

With this function, you can check before mapping a data block whether the block is also released for access via OPC UA.

To do this, click on "Change external TIA Portal options" under "TIA Portal Details"



Then the following window opens:



- In order for the DB to be accessible via OPC UA, the check mark "DB accessible from OPC UA" must be set.
- For the variables that are to be read or written, the respective check mark must be set.

To save changes, click on "Save changes". The changes are also transferred to the TIA Portal project.



**CAUTION**

**Changing the Datablock variable access level**

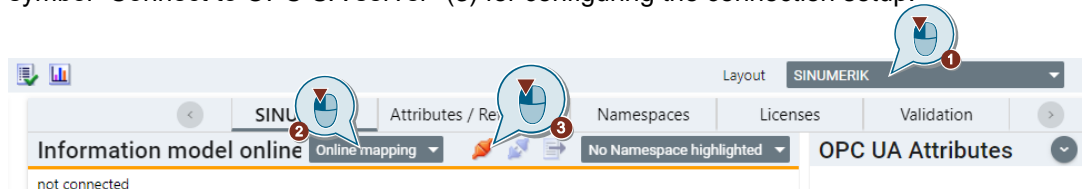
Please note that removing the check mark for individual variables also affects the accessibility of the variable via HMI Base (BTSS).

Therefore, removing a check mark for individual variables in SiOME is only recommended if you are sure that the variable should not be accessible for SINUMERIK Operate and HMI OA applications.

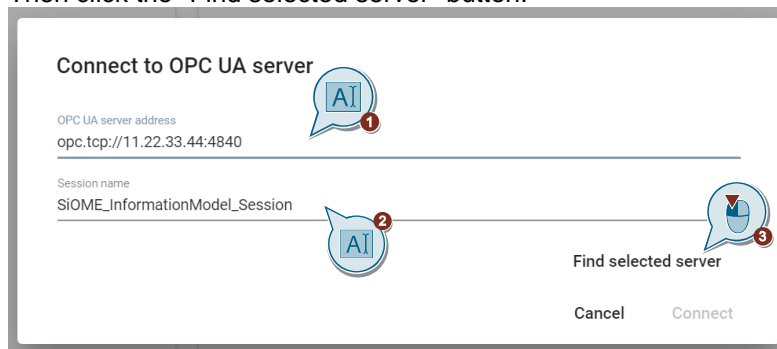
### 5.3 Creating an Information Model from Online Mapping to a SINUMERIK OPC UA Server

The use case "Online Mapping" allows to browse an OPC UA Server of a SINUMERIK machine by SiOME directly.

1. In the SINUMERIK layout (1), switch to the mode "Online mapping" (2) via the selection field in the area "Information model online". Click the orange plug symbol "Connect to OPC UA server" (3) for configuring the connection setup.

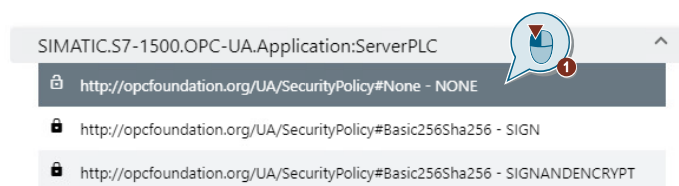


2. In the following dialogue, enter the server address in the "OPC UA server address" field. The definition of the "Session name" can be modified optionally. Then click the "Find selected server" button.

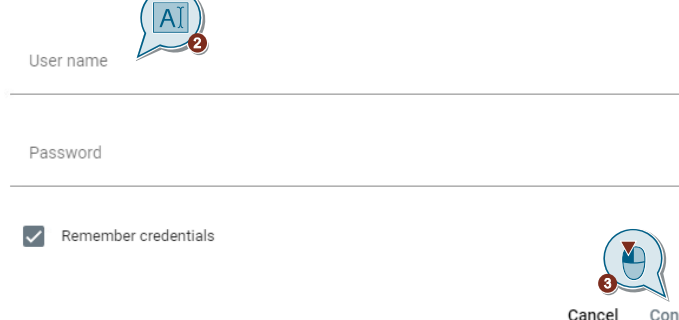


3. Select one of the endpoints offered by the OPC UA Server (1). If authentication with username and password is activated, enter the credentials into the "Username" and "Password" fields (2). Activate the checkbox "Remember credentials" to save the username and password for further logins. Then click "Connect" (3).

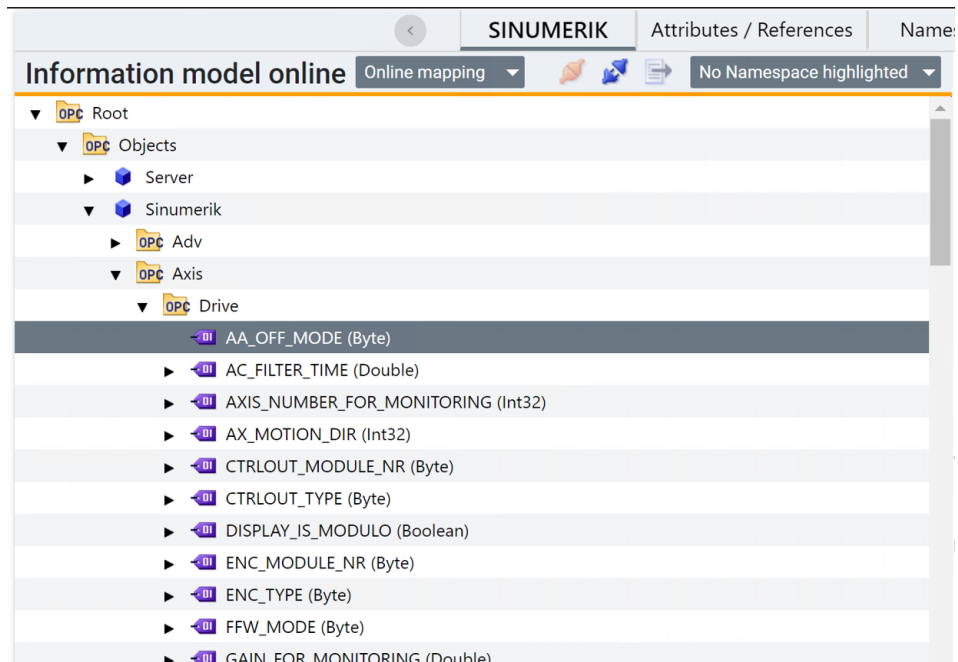
Select OPC UA server endpoint:



User authentication



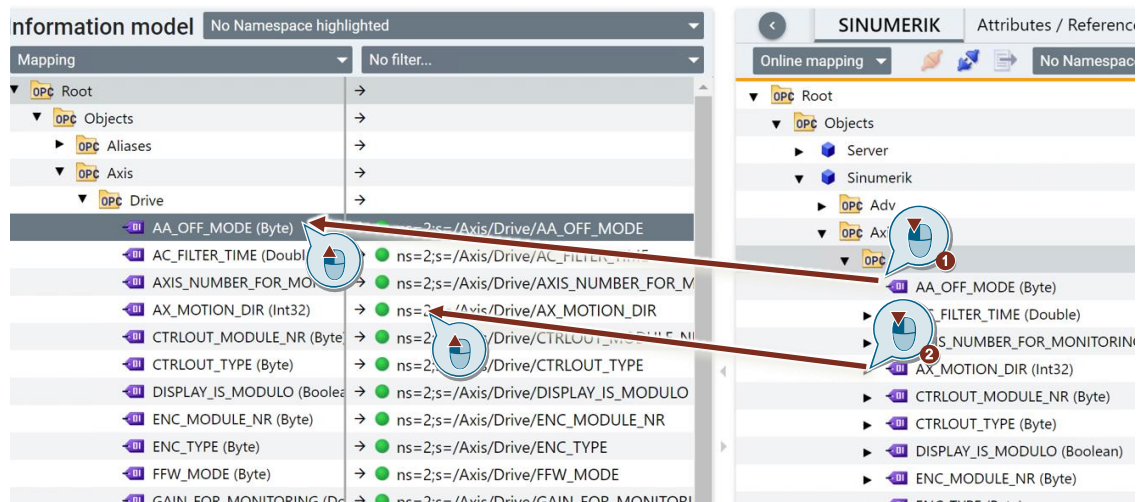
- After the connection is established, you can browse the Server model.



- Creating and/or Mapping nodes in an Information Model from the nodes of an online Server structure follows the typical behavior for a Drag&Drop workflow of this direction:

Execute a Drag&Drop operation with keeping pressed the Ctrl. key to create a new node including the mapping to the online source (1).

Performing a Drag&Drop without Ctrl. key only allows to set the mapping entry of an existing node of the Information Model (2).



The mapping entry has the format of a NodeId as the source of the values is a OPC UA Server itself.

## 5.4 Option Management for Modular Machines Based on Licenses

### Overview

License management can be used to change and restrict access to variables within an Information Model via different licenses. The access rights and associated licenses can be configured in accordance with the customer requirements or the machine manufacturer. Each SINUMERIK variable (PLC/NCK) can be used to activate a license function. With license management, users have the ability to view different variables and methods in accordance with the configuration. The OPC UA Server of the SINUMERIK supports two use cases with CSOM:

- Individual configuration of the Information Model for modular machines at runtime
- Activation of additional functions on the OPC UA server of the SINUMERIK during runtime depending on the licenses acquired by the customer

### NOTE

Access MyMachine /P2P with version  $\geq$  4.8.0.1 is required to use licenses.

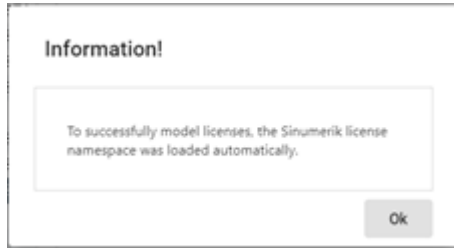
### Adding a license

To add a license, you must follow the steps below:

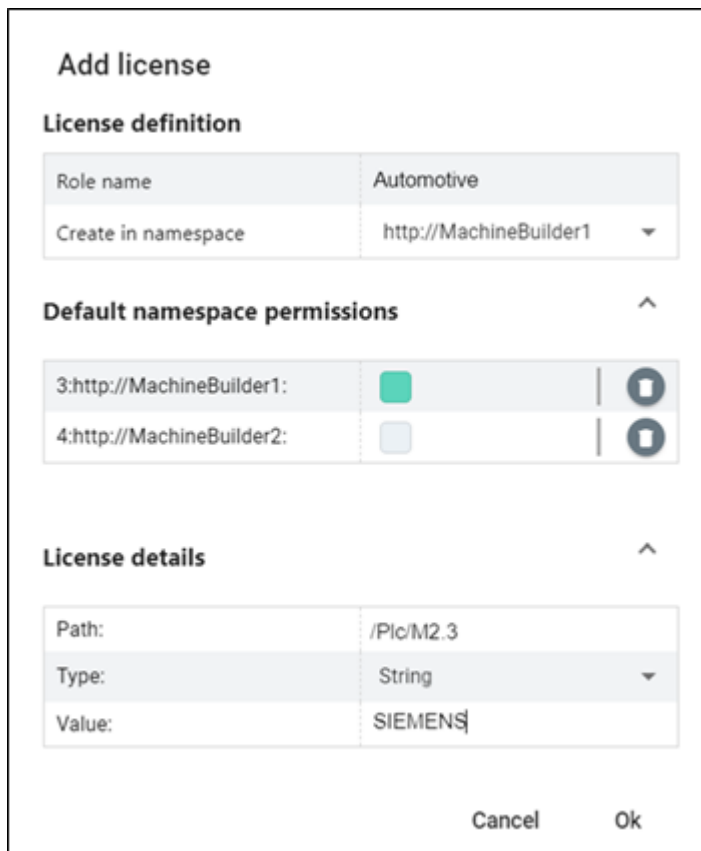
1. Click the drop-down menu "Layout" and select "SINUMERIK"
2. Switch to the "Licenses" tab in the view and click the "+" icon to add licenses.



3. A notification window appears that must be confirmed with "OK". A new namespace is created for the SINUMERIK licenses.




- The "Add License" window appears. Add the settings as shown in the following figure.



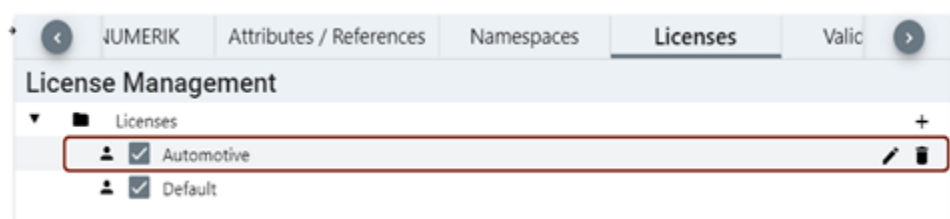
© Siemens AG 2023. All rights reserved

Group	Setting	Description	Example
License definition	Role name	Describes the name of the license	
	Create in namespace	The namespace in which the license is added	
Default namespace permissions		Selection of the default namespace. If a namespace is selected, all variables/nodes of this namespace will also be assigned to the license. Selecting nothing is also an option.	


Group	Setting	Description	Example
		Green: Selected White: Not selected To remove the namespace, click the  icon.	
License details	Path	Adds the path to the variable that activates the license. This must be located in the SINUMERIK Information Model of the OPC UA Server	Absolute addressing "/Plc/M2.3"  Symbolic addressing "/Plc/Memory/activatelicense"
	Type	Select the data type from the drop-down menu	String
	Value	Select a value or enter a value according to the data type.	"Siemens"

**Note** The "Value" for each license should correspond to the value in the variable under "Path". If this is not the case, nodes and variables of the license are not displayed in the OPC UA Server.

5. Click "OK".

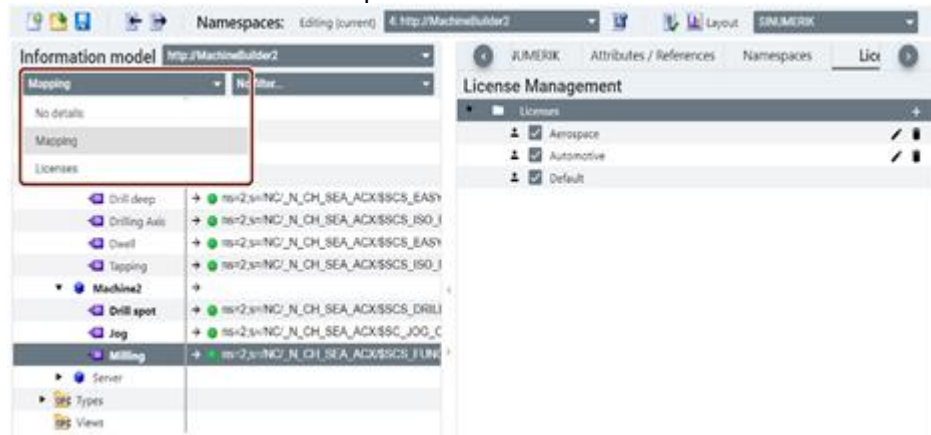


If a license is to be edited, use the  icon.

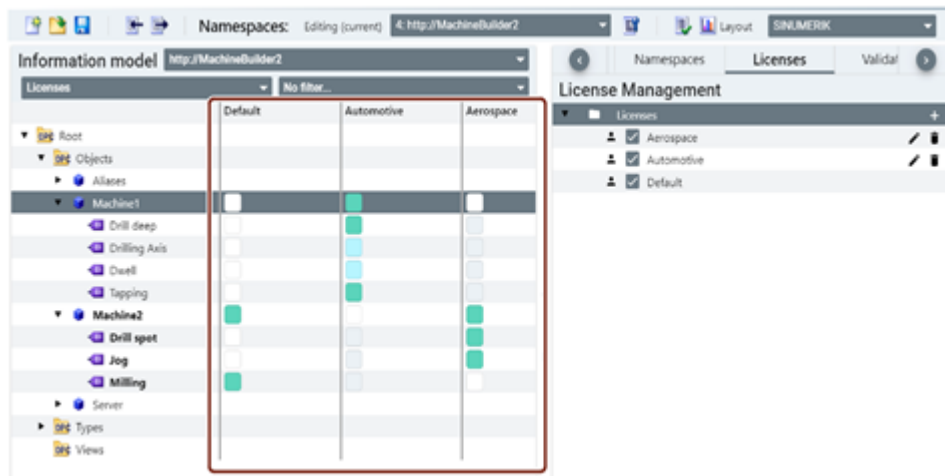
To remove a license, press the  icon.

**Note** You can add up to 20 licenses via the "+" icon.

6. Select "Licenses" from the dropdown menu



7. Add the licenses to the variables and nodes according to your requirements. The variables in the "Default" license namespace are always represented in the address space.



The variables marked in light green are part of the default namespace. You can customize the variable configuration by checking or unchecking the rectangular boxes.

You can access the context menu by right-clicking:



- "Remove License Permissions" disables the license for the selected node.
- "Remove License Permissions Recursive" removes the license for all child nodes under an object.
- "Activate License Permissions Recursive" adds the license for all child nodes under an object.



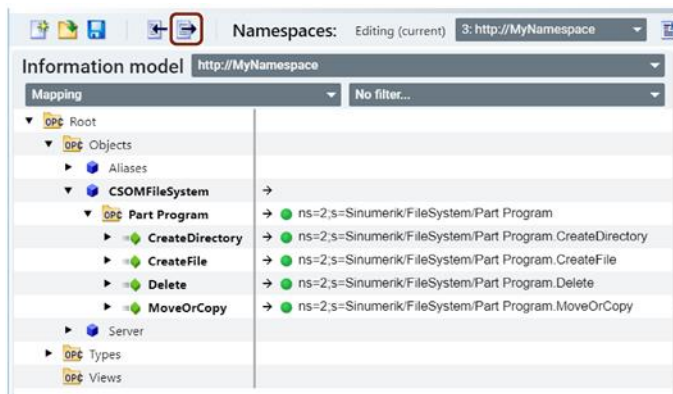
**Note** After a license has been set, restart the OPC UA Server to update the namespace.

8. After the licenses have been added, export the CSOM (XML) as described in the next section.

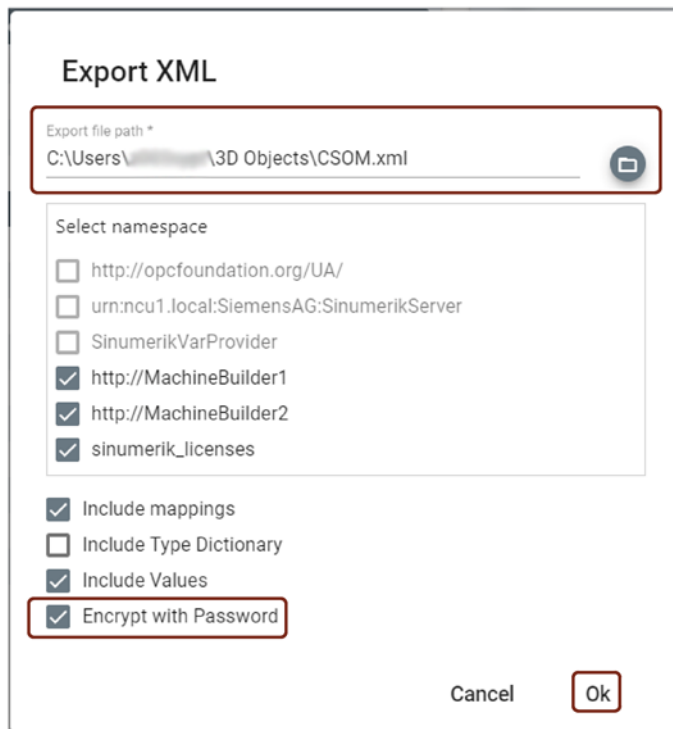
### Exporting the CSOM (XML)

To export the CSOM (XML) to your PC, follow the steps:

1. Click the Export XML  icon.



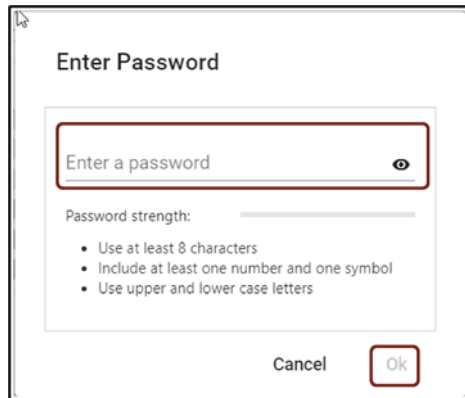
2. The "Export XML" popup appears. Select a storage location.
3. If you want to export the CSOM (XML) file, assign a password.



4. Click "OK" and assign a password.
5. The password will be needed again later during the import of the CSOM from the XML into the SINUMERIK Access MyMachine /P2P.

**Note**

Passwords must contain at least 8 characters.



Enter Password

Enter a password

Password strength:

- Use at least 8 characters
- Include at least one number and one symbol
- Use upper and lower case letters

Cancel Ok

6. Click OK to export the file.

## 6 Information Model for SIMATIC CloudConnect 7

### 6.1 General

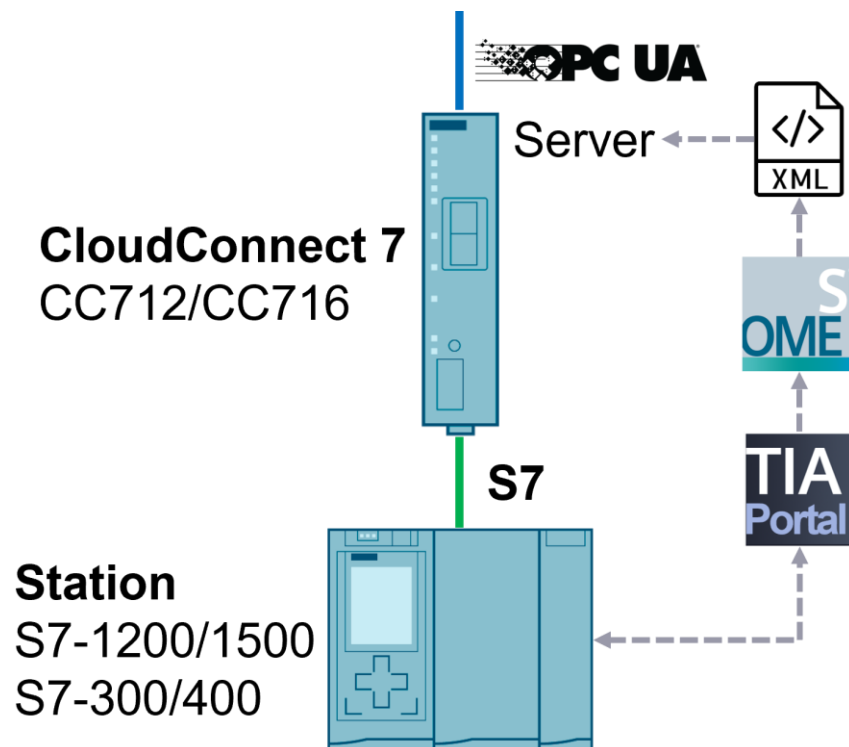
The SIMATIC CC712 and CC716 gateways are designed for connecting process stations in protected automation cells to internal or external cloud systems via MQTT or HTTP and/or to OPC UA clients.

#### Use Case

By connecting to TIA Portal via the Openness interface, SiOME supports creating an XML configuration file for a process station of one of the following types:

- S7-1200/S7-1500
- S7-300/S7-400

The following chart gives you an overview over data workflow (S7, OPC UA) and configuration transfer.



The gateway can be used as OPC UA server for transferring process data supporting the following functions:

- Reading and writing variables
- Monitoring variables (MonitoredItems) using Subscriptions
- Hierarchical address browsing

The OPC UA server role is implemented based on the "Micro Embedded Device 2017 Server Profile" of the OPC Foundation.

The gateway and the SIMATIC station communicate over a S7 connection (based on Ethernet or PROFIBUS). The gateway acts as the active partner during connection setup.

### Firmware Version

**NOTE**

Using XML configuration files is not possible before CloudConnect 7 firmware version 2.2.

### Manual

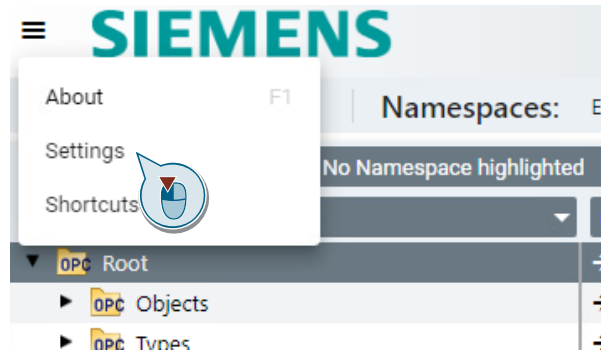
For further and more detailed information about the CloudConnect 7 setup please refer to the official product manual:

<https://support.industry.siemens.com/cs/us/en/view/109767960>

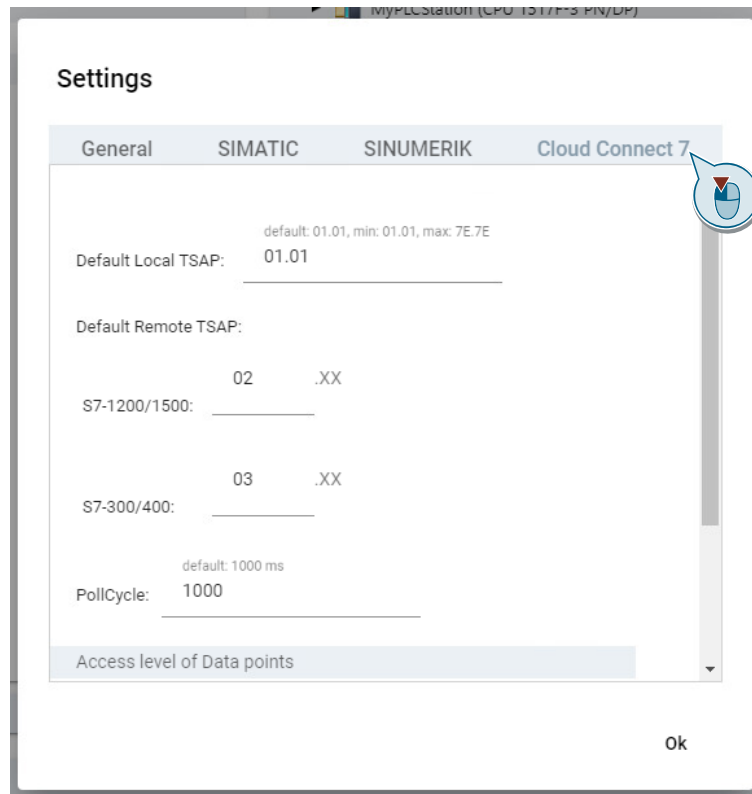
## 6.2 Preparing the modelling

### 6.2.1 Default Settings

SiOME Settings dialogue can be entered via the general user menu.



Then switch to the tab for "CloudConnect 7".



The input fields have the following meaning:

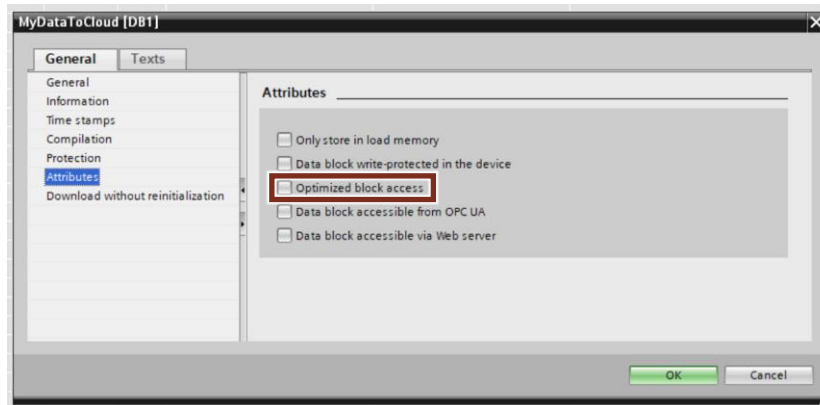
Option	Description
Default Local TSAP	Default value for local Transport Service Access Point (TSAP) as a part of the station configuration. Range of values: 01.01 ... 7E.7E We recommend using the default TSAP "01.01".
Default Remote TSAP	Default value for remote Transport Service Access Point as a part of the station configuration. S7-1200/1500: 02.XX S7-300/400: 03.XX
Default PollCycle	Default value for Polling Cycle (ms). Range of values: 50...100 000 000
Access level of Data points	"Access level based on the OPC UA Access level of the OPC UA variables": The definition of the Access level of each Datapoint of the configuration will be defined according to the specified AccessLevel of the OPC UA node mapped to it. "Set Access level manually: Read/Write/ReadWrite": You define a default Access level which will be assigned to the Datapoints of the configuration.

## 6.2.2 PLC Data accessibility

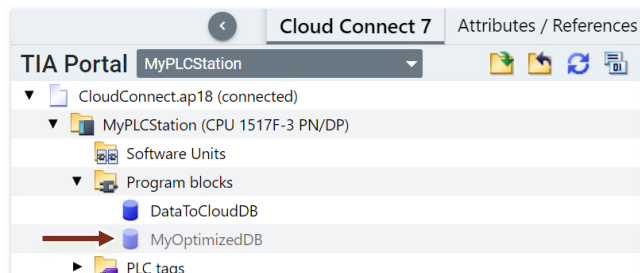
To enable access via S7 protocol, the following settings are required in the CPU properties.

### Disabling Optimized block access

"Optimized block access" must be disabled for relevant DBs of the CPU.

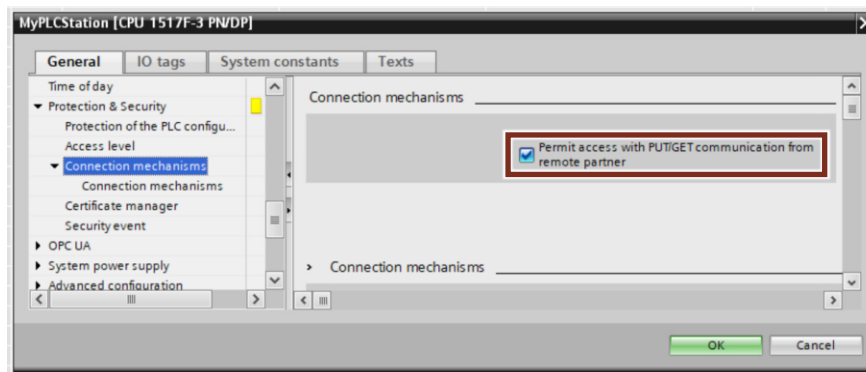


Data blocks with enabled optimized block access can't be used when mapping or creating an Information Model:



### Enabling PUT/GET access

"Permit access with PUT/GET communication from remote partner" must be enabled in the CPU (S7-1500 only).



If not set, SiOME displays a user warning at some point. Openness connectivity from SiOME to TIA Portal is not affected by this setting.

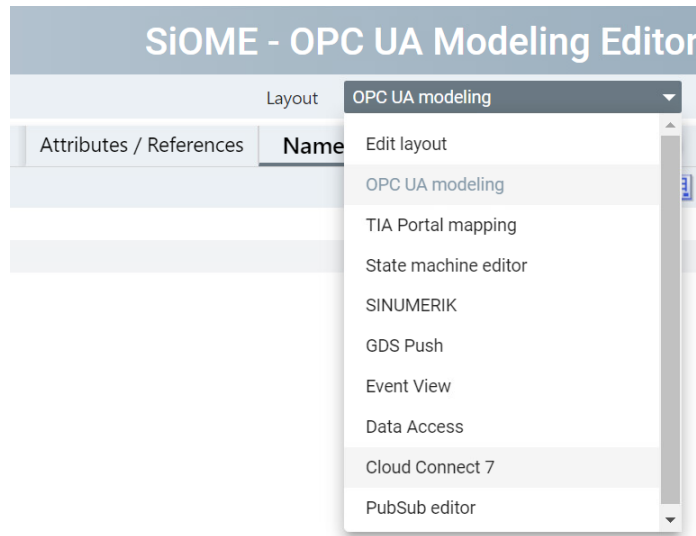


**WARNING**

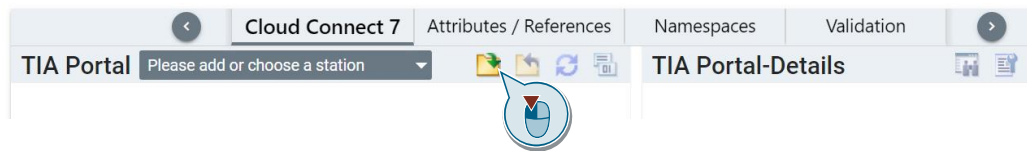
In terms of Industrial Security, enabling PUT/GET access via S7 connection is a potential risk for unauthorized access to the PLC data.

### 6.2.3 Connecting to TIA Portal project

Switch to the layout for CloudConnect 7 configuration.



Then click on the symbol for “Open TIA Portal project”.



Follow the dialogues for the selection of the TIA Portal project and the PLC.



## 6.3 Adding a Station configuration

The following dialogue appears after connecting to a TIA Portal project automatically.

Add station	
Name	MyPLCStation
Address	10.11.59.4
LocalTSAP	01.01
RemoteTSAP	02.01
PollCycle	1000

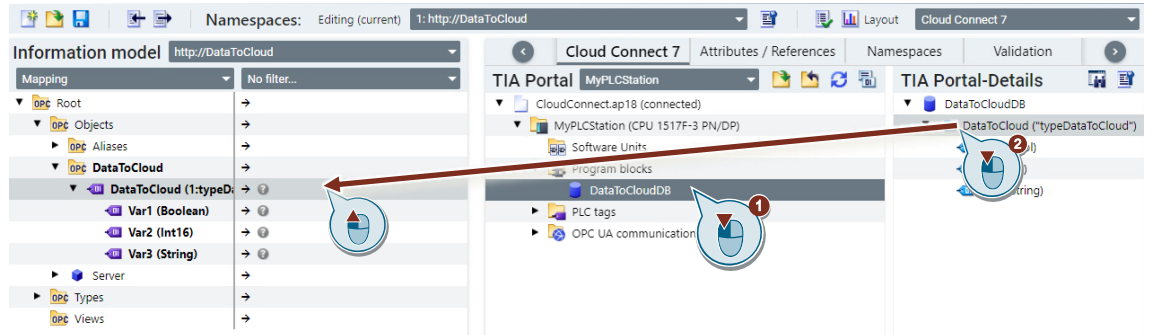
Cancel    Ok

The input fields have the following meaning:

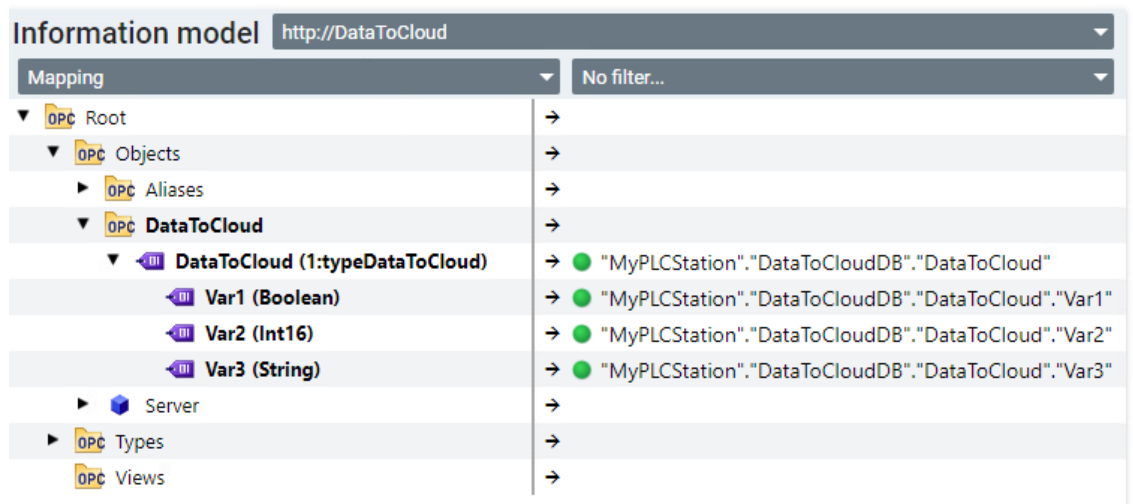
Field	Description	Default
Name	Name of the PLC station. Only a reduced set of characters is allowed. Otherwise, the form shows an error message.	PLC station name in TIA Portal project
Address	IP address of the station which will be used for S7 connection based on Ethernet or Station address (Integer) used for S7 connection based on PROFIBUS	to be chosen from one of the interfaces of PLC station
LocalTSAP	Local Transport Service Access Point Range of values: 01.01 ... 7E.7E	SiOME Settings
RemoteTSAP	Remote Transport Access Point of the S7 connection assigned in STEP 7 at the station end if you have configured a connection with an unspecified partner in the CPU for the gateway. When using a configured unspecified connection, disable the "Active connection establishment" option in STEP 7.	SiOME Settings
PollCycle	Cycle time in milliseconds in which the gateway reads the data from the station. Range of values: 50...100 000 000 Note: If you transfer large volumes of data, the actual cycle time may be longer than configured.	SiOME Settings

## 6.4 Mapping an Information Model to PLC data of a TIA Portal project

If you want to map a PLC variable to a node of the Information Model, simply drag the selected variable from the area of „TIA Portal Details“ and drop it to the mapping column of the node in the Information Model.

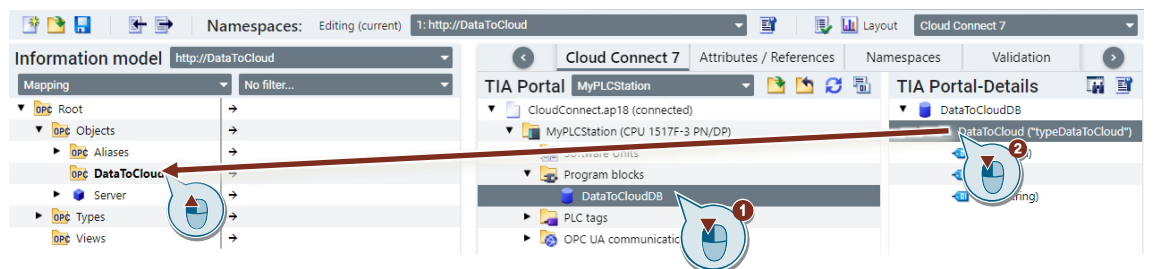


This adds the mapping recursively if their structures match:



## 6.5 Creating an Information Model from PLC data of a TIA Portal project

If you want both to add a new node and to map a PLC variable to it, simply drag the selected variable from the area of „TIA Portal Details“ and drop it onto a parent node of the Information Model.



The result is the same as in chapter 6.4

## 6.6 XML Export

### Save as / Export XML

Please refer to chapters 3.19 or 0.

### Station configuration in XML

Once the configuration was saved or exported you can find the Process Station description as an XML structure like shown in the following example.

```
<cc:Configuration>
  <Station Name="MyPLCStation" Address="10.11.59.4" LocalTSAP="01.01" RemoteTSAP="02.01" PollCycle="1000">
    <Datapoint Name="&quot;DataToCloudDB&quot;.&quot;DataToCloud&quot;" Type="&quot;TYPEDATATOCLOUD&quot;" Area="DB" Offset="0.0" Access="RW"/>
    <Datapoint Name="&quot;DataToCloudDB&quot;.&quot;DataToCloud&quot;.&quot;Var1&quot;" Type="BOOL" Area="DB" Offset="0.0" Access="RW"/>
    <Datapoint Name="&quot;DataToCloudDB&quot;.&quot;DataToCloud&quot;.&quot;Var2&quot;" Type="INT" Area="DB" Offset="2.0" Access="RW"/>
    <Datapoint Name="&quot;DataToCloudDB&quot;.&quot;DataToCloud&quot;.&quot;Var3&quot;" Type="STRING" Area="DB" Offset="4.0" Access="RW"/>
  </Station>
</cc:Configuration>
```

The absolute address offsets are derived automatically.

```
01" PollCycle="1000">
;TYPEDATATOCLOUD&quot;" Area="DB" Offset="0.0" Access="RW"/>
not;" Type="BOOL" Area="DB" Offset="0.0" Access="RW"/>
not;" Type="INT" Area="DB" Offset="2.0" Access="RW"/>
not;" Type="STRING" Area="DB" Offset="4.0" Access="RW"/>
```

They must match the absolute addresses in the original DB of the PLC process station exactly.

DataToCloudDB				
	Name	Data type	Offset	
1	Static			
2	DataToCloud	*typeDataToCloud*	0.0	
3	Var1	Bool	0.0	
4	Var2	Int	2.0	
5	Var3	String	4.0	

# 7 PubSub

## 7.1 General

### Introduction

OPC 10000-14: UA Part 14 introduces a communication model for OPC UA applications acting as decoupled Publishers and Subscribers. This coherent and optimized concept enables new use cases where the service-based Client/Server communication model does not fit. As all participants are only connected to a Message Oriented Middleware, the number of Subscribers receiving data from a Publisher does not influence the Publisher's performance. This makes PubSub suitable for scalable infrastructures with a large number of receivers as well as for high-speed cyclic data distribution.

To cover different use cases, OPC UA PubSub supports two different variants of Message Oriented Middleware:

- A broker-less form, where the Message Oriented Middleware is the network infrastructure itself. Publishers and Subscribers use datagram protocols like UDP.
- A broker-based form, where the Message Oriented Middleware is represented by a message broker as the core component. Subscribers and Publishers use messaging protocols like MQTT or AMQP to communicate with the Broker.

PubSub and Client/Server are both based on a OPC UA Information Model. PubSub therefore can easily be integrated into OPC UA Servers and Clients. Quite typically, a Publisher will be an OPC UA Server (the owner of information) and a Subscriber is often an OPC UA Client. The PubSub Information Model even promotes the configuration of Publishers and Subscribers using the OPC UA Client/Server model. Nevertheless, the PubSub communication does not require such a role dependency. Publishers or Subscribers do not need to be a OPC UA Server or Client to participate in PubSub.

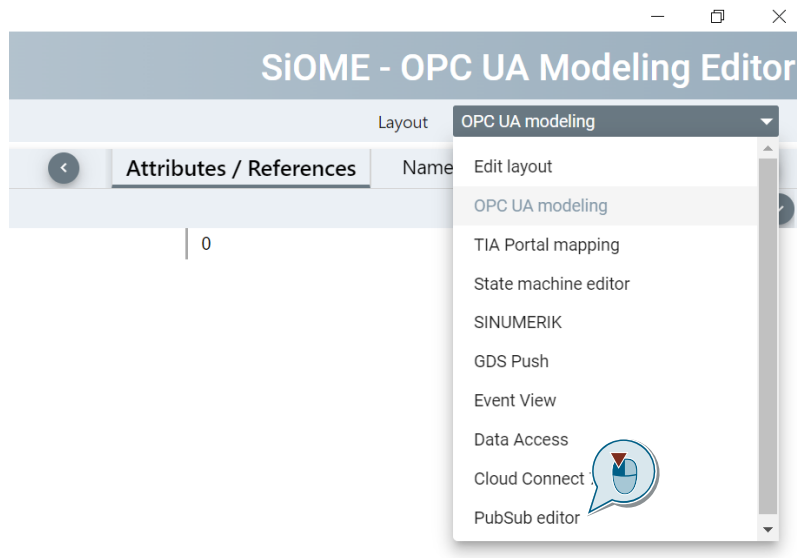
Since release version 2.7, SiOME supports and simplifies modelling the standard elements in the Information Model used to create and expose an OPC UA PubSub configuration in the Address Space.

#### NOTE

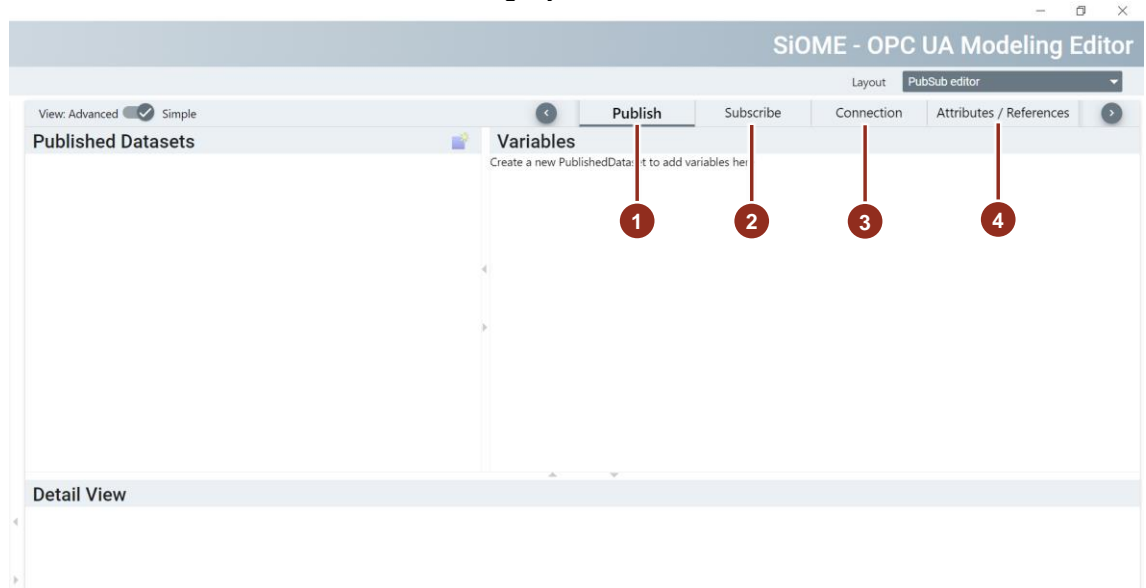
SIMATIC S7-PLCs do not support an Information Model-based PubSub configuration yet. Application examples show you how to implement PubSub based on user program code with standard communication instructions instead.

## PubSub editor layout

For switching to the Publish/Subscribe configuration layout, use the dropdown field in the upper right corner of SiOME and select "PubSub editor".



The user interface switches to the following layout.



The four tabs have the following purpose.

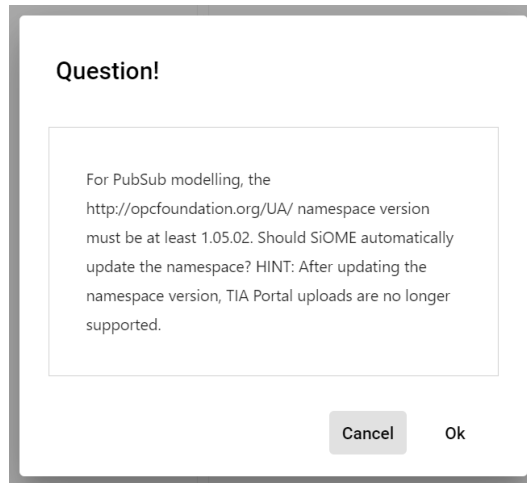
	Tab	Description
1.	Publish	Configuration of components for Publisher role
2.	Subscribe	Configuration of components for Subscriber role
3.	Connection	Configuration of Connections for Publisher and/or Subscriber role
4.	Attributes / References	Configuration of Attributes and References of nodes of the Information model

## UA nodeset version

Some of the important schema elements for OPC UA PubSub have not been published with the UA nodeset of version 1.04 or older. When going to the PubSub editor layout, SiOME automatically switches to the UA nodeset of version 1.05.02.

<b>NOTICE</b>	<p>TIA Portal and PLC firmware do not support UA nodeset 1.05 yet. This means that an exported nodeset may not be used in a TIA Portal project anymore. Furthermore, SiOME does not return to version 1.04 when moving away from the “PubSub editor” layout unless a new project is started.</p>
---------------	--

The following dialog gives an appropriate warning to the user:



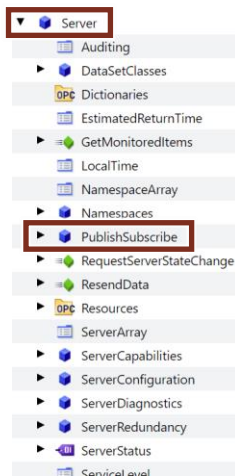
If you click “Cancel”, SiOME will abort the nodeset replacement and return to the default view “OPC UA modelling” instead.

## Simple vs. Advanced View

The following chapters show how to create a Publish and/or Subscribe configuration using the Simple View of the PubSub layout. The Advanced View is only needed for accessing the detailed settings to modify existing PubSub components. Not all settings of the Advanced View are explained in this document.

## PublishSubscribe object in Information Model

All PubSub components such as DataSets, Connections and Writers/Readers will be placed under a central Object node called “PublishSubscribe” in the Information Model. It can be found as a component of the “Server” Object.



## 7.2 Publish

The creation of a Publish configuration requires three important steps:

- creating a Published Dataset (chapter 7.2.1)
- assigning a Connection to it (7.2.2)
- adding Published Variables to it (0)

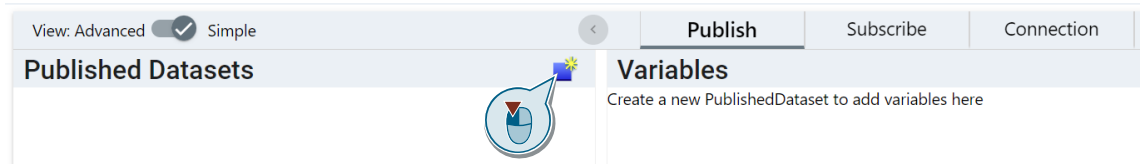
The other important components, such as DataSetWriter and WriterGroup, can be accessed using the Advanced View.

It is recommended to keep Publish configuration and Subscribe configuration in separated Namespaces, as well as separated from a possible Client/Server configuration.

### 7.2.1 Published Dataset

#### Add a new PublishedDataset

In the section of Published Datasets, click on the symbol for “Add a new PublishedDataset”.



The following dialogue guides through the creation of a new PublishedDataSet.

### Add new PublishedDataset

What is the topic of the data you want to publish?

Dataset name AI  
MyPublishData1 1

---

Where you want to publish the data to?

Choose Connection: MyConnection1 2

Target address  
opc.mqtt://11.22.33.44:1234

---

How often shall the data be send?

Publishing interval in ms  
250 3

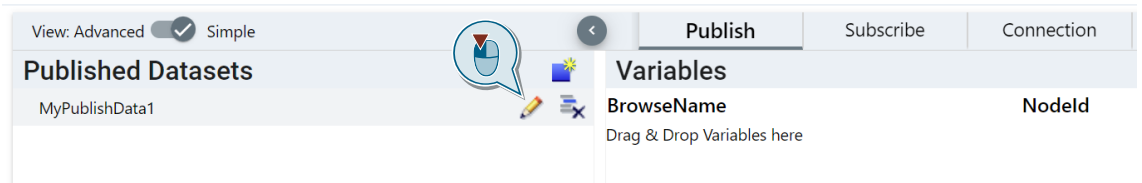
Cancel Add 4

These three main inputs are required:

	Field	Description
1.	DataSet name	The DataSet will be modelled and published with this BrowseName.
2.	Connection	You can choose an existing connection or add a new one (see 7.2.2).
3.	Publishing interval	Interval in milliseconds for publishing NetworkMessages.

### Edit PublishedDataSet (Simple)

In the section of Published Datasets, click on the symbol for “Edit PublishedDataSet” of an existing DataSet.

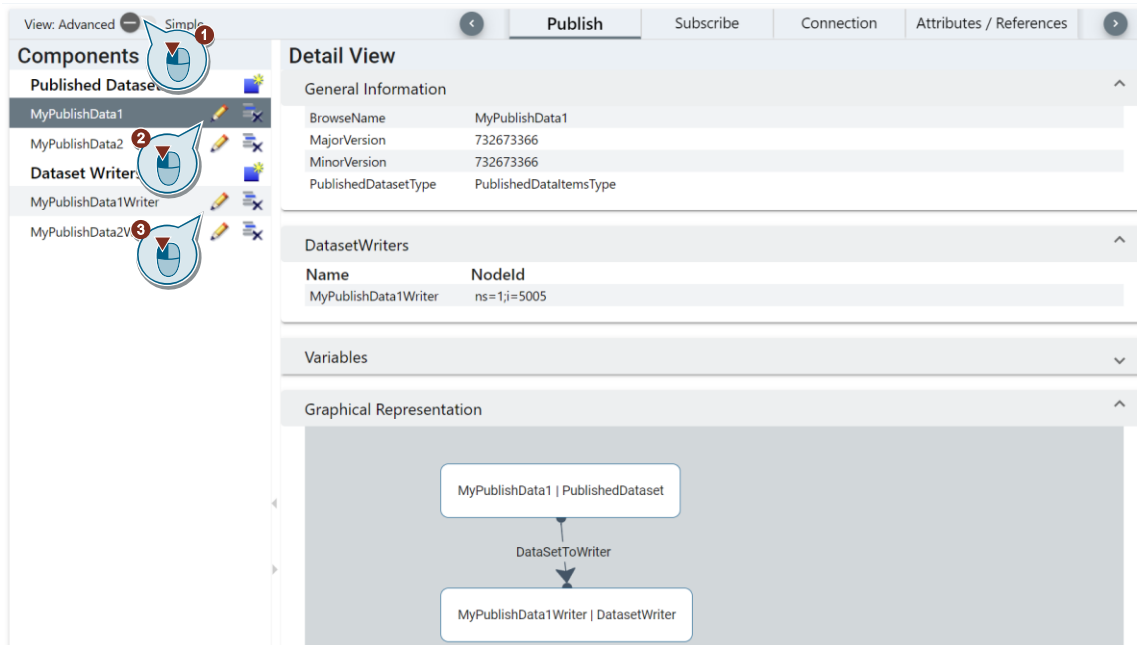


The following dialogue is identical to the one when creating a PublishedDataSet, see chapter 7.2.1.

The assignment of a Connection cannot be changed for an existing PublishedDataSet.

### Edit PublishedDataset or DataSetWriter (Advanced)

After switching to the Advanced View, click on one of the symbols for “Edit PublishedDataSet” (2) or “Edit DataSetWriter” (3):





## 7.2.2 Connection

### Add new Connection

The following dialogue guides through the creation of a new Connection for a broker-based Message Oriented Middleware using **MQTT**.

**Add new Connection**

Connection BrowseName AI<sup>1</sup>  
MyConnection1

---

Target Address AI<sup>3</sup>  
opc.mqtt:// AI<sup>2</sup> 10.11.22.33:1234

---

NetworkInterface AI<sup>5</sup>  
MyNetworkInterface1

---

HeaderLayoutUri: PeriodicFixed AI<sup>6</sup>

Cancel Add AI<sup>7</sup>

The following dialogue guides through the creation of a new Connection for a broker-less Message Oriented Middleware using **UDP**.

**Add new Connection**

Connection BrowseName AI<sup>1</sup>  
MyConnection2

---

Target Address AI<sup>3</sup>  
opc.udp:// AI<sup>2</sup> 239.0.0.1:4840

---

Unicast AI<sup>4</sup>  
 Multi-Cast

---

NetworkInterface AI<sup>5</sup>  
MyNetworkInterface1

---

HeaderLayoutUri: PeriodicFixed AI<sup>6</sup>

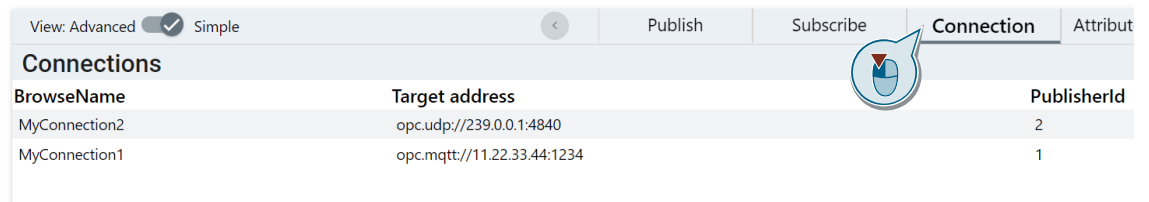
Cancel Add AI<sup>7</sup>

These main inputs are required:

	Field	Description
1.	BrowseName	The Connection will be created with this BrowseName.
2.	MQTT or UDP	Communication protocol depending on the type of Message oriented Middleware, also see explanation in chapter 7.1.
3.	Target Address	The Address parameter contains the network address information for the communication middleware.
4.	Unicast or Multi-Cast (for UDP only)	Unicast: communication from one device to another device in the network (1:1) Multi-Cast: communication from one device to many, but not necessarily to all devices in the network (1:n). This case requires a specific multicast IP address.
5.	NetworkInterface	The name of the network interface used for the communication relation.
6.	HeaderLayoutUri	This Uri parameter defines how flexible the header formats in NetworkMessages and DataSetMessages are handled: PeriodicFixed: A fixed header layout for periodic data exchange ensures that the message layout is the same in every PublishingInterval and known to both Publisher and Subscriber in advance. This allows to omit extra fields, to pre-calculate message lengths and to reduce processing time. Flexible/Dynamic: A dynamic or flexible layout enables dynamically changing message layouts, e.g. for an event-based communication. This requires additional header fields and processing resources.

### Show Connections

The tab "Connection" lists all Connections configured for both Publisher and/or Subscriber role.



BrowseName	Target address	PublisherId
MyConnection2	opc.tcp://239.0.0.1:4840	2
MyConnection1	opc.mqtt://11.22.33.44:1234	1

### Edit Connection or WriterGroup (Advanced)

After switching to the Advanced View, click on one of the symbols for "Edit Connection" (2) or "Edit WriterGroup" (3):

View: Advanced Simple

**Components**

- Connections
  - MyConnection2
  - MyConnection1**
- Reader Groups
- Writer Groups
  - MyPublishData1WriterGroup
  - MyPublishData2Writer

**Detail View**

General Information

BrowseName	MyConnection1
NetworkInterface	MyNetworkInterface1
Address	opc.mqtt://11.22.33.44:1234
PublisherId	1

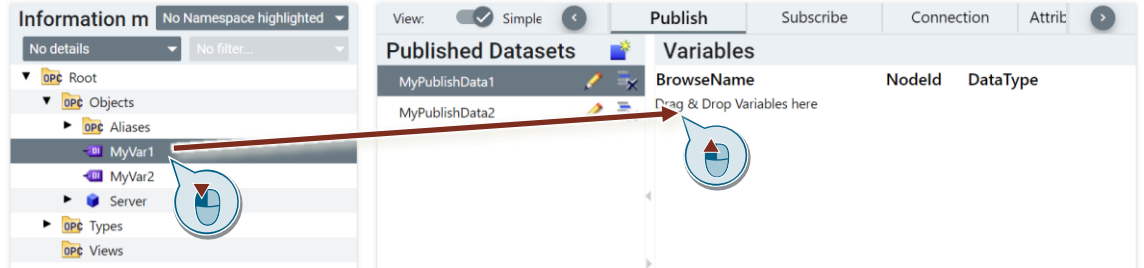
Graphical Representation

```
graph TD; A[MyConnection1 | Connection] -- HasWriterGroup --> B[MyPublishData1 | WriterGroup]; B -- HasDataSetWriter --> C[MyPublishData1 | DatasetWriter]; D[MyPublishData1 | PublishedDataset] -- DataSetToWriter --> C;
```

### 7.2.3 Published Variables

#### Add Variables to a DataSet

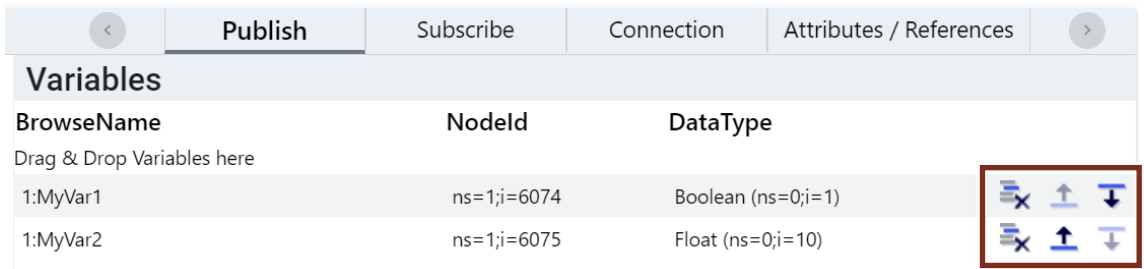
To add a Variable to a Published DataSet, simply Drag&Drop it from the Information Model section to the list of Variables.



A multi-selection of Variables is possible.

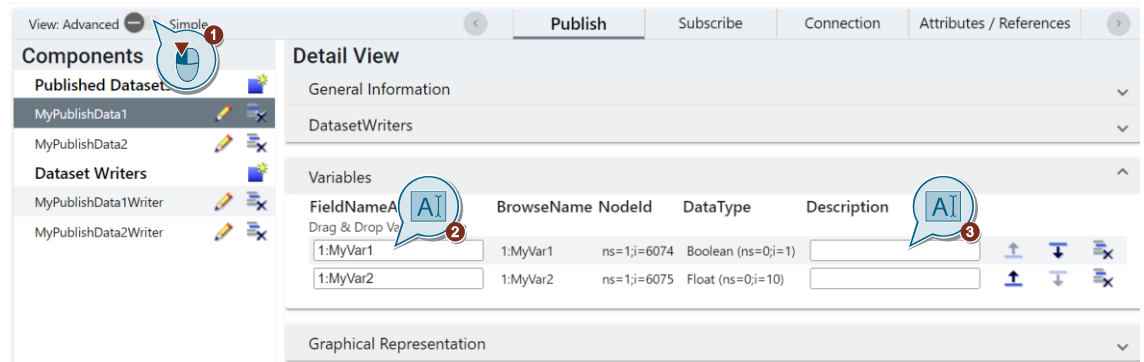
#### Edit Variables of a DataSet (Simple)

The editor in the Simple View only allows to sort or to remove Variables from a DataSet.



#### Edit Variables of a DataSet (Advanced)

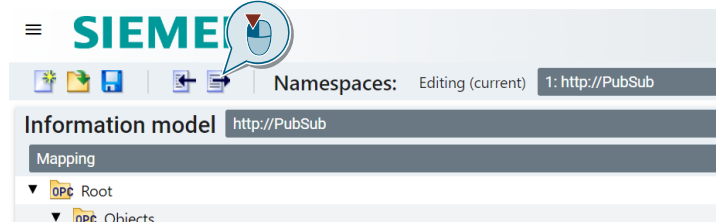
Additionally, the Advanced View enables to rename (2) or describe (3) Variables of a DataSet.



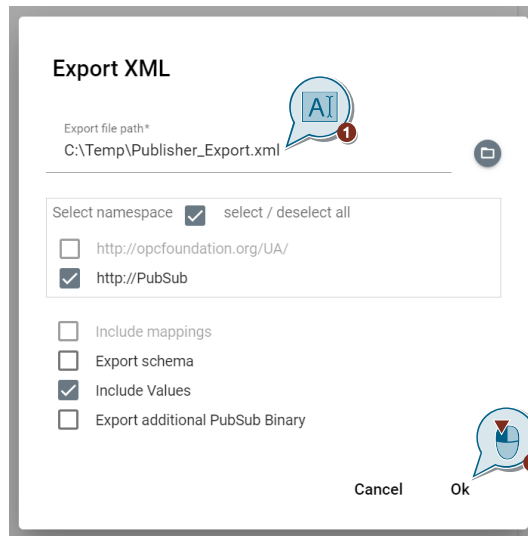
## 7.2.4 Publish Configuration

### Export XML

For exporting the Information Model containing a Publish configuration, use the export function of the main menu.



The following dialogue can be used to select the namespaces and to define export settings.



The option “Export additional PubSub Binary” exports the configuration as a file of the type \*.uabinary additionally.

## 7.3 Subscribe

A Subscribe configuration can only be created with SiOME by importing a Publish configuration and deriving the Subscribe components from it.

This process requires two important steps:

- subscribing to Published DataSets of a Publisher configuration (chapter 7.3.1)
- mapping Variables of Subscribed DataSets to Target Nodes of the Subscriber's Information Model (7.3.3). This can already be done when subscribing to a Published DataSet, see chapter 7.3.1.

Connections (7.3.2) are taken from the Publish configuration automatically and do not have to be modified unless later changes in the Publish Configuration must be adapted on the Subscriber side as well.

The other important components, such as DataSetReader and ReaderGroup, can be accessed using the Advanced View.

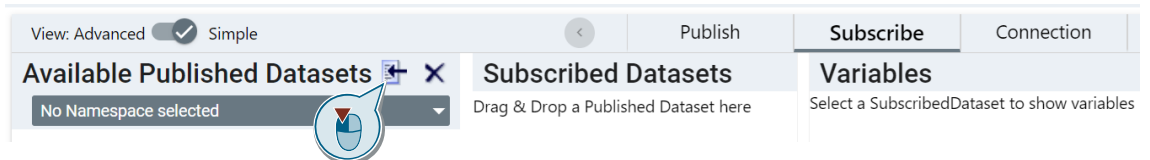
It is recommended to keep Publish configuration and Subscribe configuration in separated namespaces, as well as separated from a possible Client/Server configuration.

The following chapters show creating a Subscribe configuration based on the Publish configuration from chapter 7.2. Modelling a Publish and a Subscribe configuration for the same Variables into one Information Model is not a typical use case though.

### 7.3.1 Subscribed DataSet

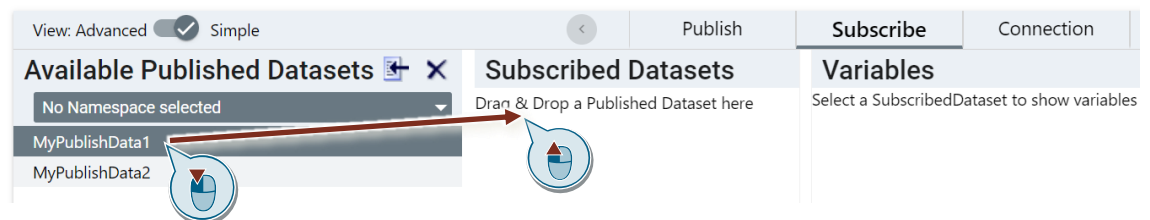
#### Import XML

Use the button "Import XML" to load Publish components from a nodeset, e.g. as generated in chapter 7.2.4.



#### Subscribe to a Published DataSet

An imported configuration may contain more DataSets than required for a specific Subscribe configuration. Therefore you must select the DataSets to be taken on by the Subscriber. This is done by dragging each required Published DataSet to the section of Subscribed DataSets.



## Mapping Variables to Target Nodes of the Information Model

The following dialogue appears when dropping the DataSet.



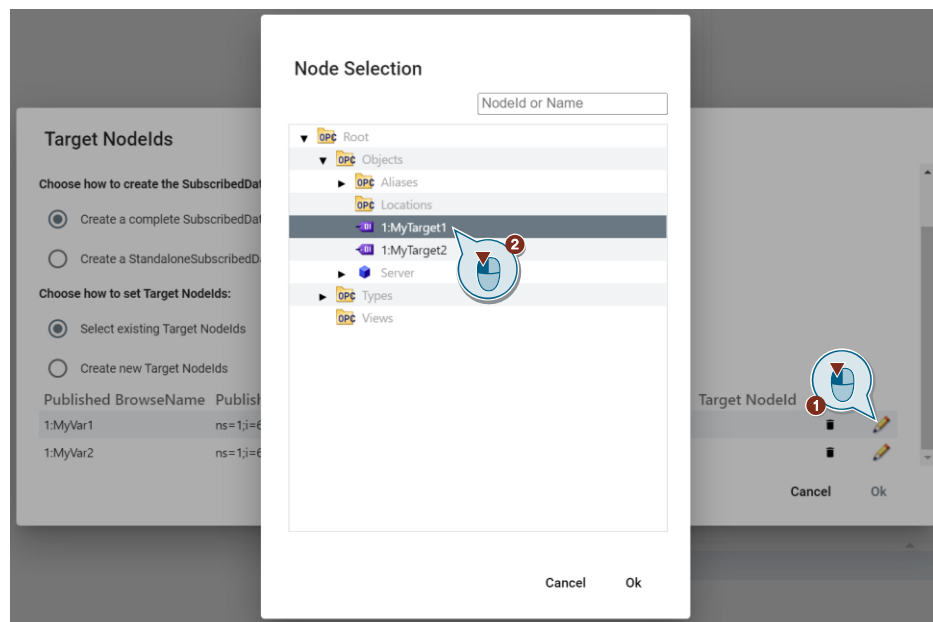
The selection “Choose how to create the SubscribedDataSet” defines whether the related SubscribedDataSet is created solely or along with the other typical instances such as Connection, ReaderGroup and DataSetReader.

The second selection “Choose how to set Target NodeIds” allows to go different ways for assigning the Target Nodes.

### 1. Option “Select existing Target NodeIds”:

It is not required to do the definition of Target Nodes at this moment. If you wish to proceed without assigning them now, just click “Ok” and continue with chapter 7.3.3 at a later moment.

When clicking on the pen symbol for “Select Target NodeId”, you must select an existing node which will be declared as the Target NodeId for a specific Variable.



After you confirm with “Ok”, the selected Node will be entered in the column “Target NodeId” of the Variable.

Choose how to set Target NodeIds:

- Select existing Target NodeIds
- Create new Target NodeIds

Published BrowseName	Published NodeId	Data Type	DataSetFieldId	Target NodeId
1:MyVar1	ns=1;i=6008	Boolean (ns=0;i=1)	2ed2758a-8533-93e0-a546-fbf0d1cf92bd	ns=1;i=6008
1:MyVar2	ns=1;i=6044	Float (ns=0;i=10)	d2a52603-657c-3639-d815-34a7f3016445	

2. Option “Create new Target NodeIds”

This option allows to create Target Nodes matching the Subscribed Variables automatically. Therefore, you need to specify the Parent Node under which the Target Nodes will be placed in the Information Model. Click the pen symbol for “Please select a parent node”. Otherwise, you are not allowed to leave the dialogue.

Choose how to set Target NodeIds:

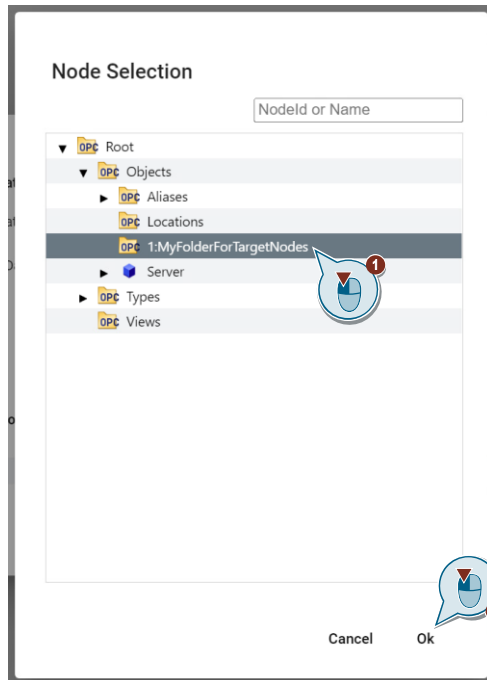
- Select existing Target NodeIds
- Create new Target NodeIds

Parent node: **Please select a parent node**

Published BrowseName	Published NodeId	Data Type	DataSetFieldId
1:MyVar1	ns=1;i=6008	Boolean (ns=0;i=1)	2ed2758a-8533-93e0-a546-fbf0d1cf92bd
1:MyVar2	ns=1;i=6044	Float (ns=0;i=10)	d2a52603-657c-3639-d815-34a7f3016445

Cancel Ok

The following dialogue “Node Selection” requires you to choose a Node that will serve as the parent for all Target Nodes to be created, e.g. a Folder.



The chosen Node is then displayed as the defined “Parent node” and the “Ok” button is now enabled.

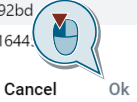


Choose how to set Target NodeIds:

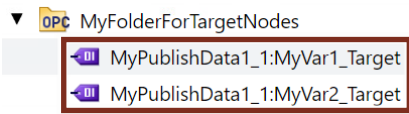
- Select existing Target NodeIds
- Create new Target NodeIds

Parent node: **MyFolderForTargetNodes**

Published	BrowseName	Published NodeId	Data Type	DataSetFieldId
1:MyVar1		ns=1;i=6008	Boolean (ns=0;i=1)	2ed2758a-8533-93e0-a546-fbf0d1cf92bd
1:MyVar2		ns=1;i=6044	Float (ns=0;i=10)	d2a52603-657c-3639-d815-34a7f301644



SiOME then creates Target Nodes for you in the Information Model of the Subscriber automatically. The generated BrowseName and DisplayName are a combination of the name of the DataSet, the name of the Subscribed Variable and the addition "Target".



### View Subscribed DataSet or Edit DataSetReader (Advanced)

After switching to the Advanced View, click on the symbol for "Edit DataSetReader" (2):

The screenshot shows the 'Advanced View' of the 'MyPublishData1Reader' component. The 'Components' tree on the left shows the hierarchy: Components > Subscribed Datasets > MyPublishData1 > Dataset Readers > MyPublishData1Reader. The 'Detail View' on the right shows the following information:

- General Information:** Dataset name: MyPublishData1, Connection: MyPublishData1Connection, Address: opc.mqtt://11.22.33.44:1234
- DatasetReaders:** Name: MyPublishData1Reader, NodeId: ns=1;i=5006
- Graphical Representation:** A diagram showing the component structure:
 

```

            graph TD
            A[MyPublishData1ReaderGroup | ReaderGroup] -- HasDataSetReader --> B[MyPublishData1Reader | DatasetReader]
            B -- HasComponent --> C[MyPublishData1 | SubscribedDataset]
            
```

## 7.3.2 Connection

### Show Connections

Subscribing to a Published DataSet adds the linked Connection to the Subscribe configuration automatically if the related option was chosen (see chapter 7.3.1). The tab “Connection” lists all existing Connections of Publisher and/or Subscriber.

BrowseName	Target address	PublisherId
MyPublishData1Connection	opc.mqtt://11.22.33.44:1234	1

### Edit Connection or ReaderGroup (Advanced)

Existing Connections do not have to be modified usually unless changes in the Publish Configuration must be adapted in the Subscriber configuration at a later moment.

After switching to the Advanced View, click on one of the symbols for “Edit Connection” (2) or “Edit ReaderGroup” (3):

The screenshot displays the Siemens SIMATIC Manager interface in Advanced View. The left pane shows a tree view with three main categories: **Connections**, **Reader Groups**, and **Writer Groups**. Under **Connections**, **MyPublishData1Connection** is selected. Under **Reader Groups**, **MyPublishData1ReaderGroup** is listed. Under **Writer Groups**, **MyPublishData1Reader** is listed. The right pane shows the **Detail View** for the selected connection, including general information and a graphical representation of the data flow.

**General Information**

BrowseName	MyPublishData1Connection
NetworkInterface	MyNetworkInterface1
Address	opc.mqtt://11.22.33.44:1234
PublisherId	1

**Graphical Representation**

```

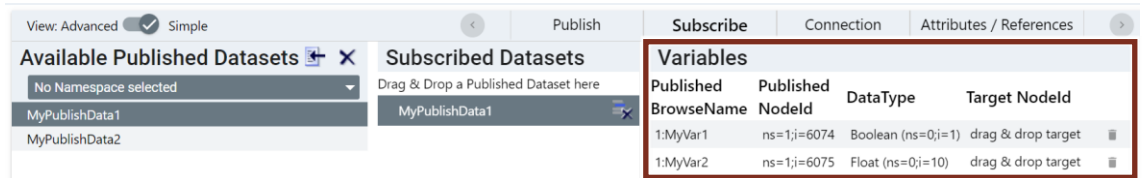
graph TD
    A[MyPublishData1Connection | Connection] -- HasReaderGroup --> B[MyPublishData1ReaderGroup | ReaderGroup]
    B -- HasDataSetReader --> C[MyPublishData1Reader | DatasetReader]
    C -- HasComponent --> D[MyPublishData1 | SubscribedDataset]
  
```

### 7.3.3 Subscribed Variables

It is possible to define the Target Nodes of the Subscribed Variables already at the moment of subscribing to a Published DataSet, see chapter 7.3.1.

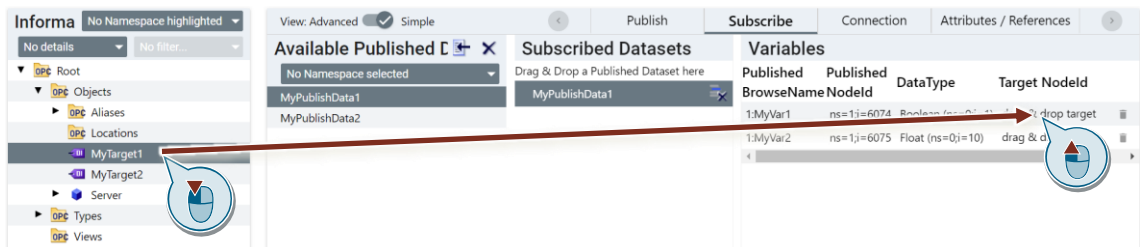
#### Variables of a Subscribed DataSet

The section “Variables” displays the list of Published Variables contained in a Subscribed DataSet.



#### Mapping Variables to Target Nodes of the Information Model

You must specify which nodes in the Information Model of the Subscriber shall receive the values of Subscribed Variables. This is done by dragging a Target Node from the Information Model to the column “Target NodeId” of a Variable.



Only 1:1 relationships are possible. A Target Node cannot be dropped to more than one Variable. For example:

- ✘ Unable to set Target NodeId. MyTarget1 (ns=1;i=6031) is already in use.

An assignment will also be aborted if the DataType of Node and Variable do not match. For example:

- ✘ Unable to set Target NodeId. DataTypes (Float - Boolean) do not match

## 7.4 Configuration Export

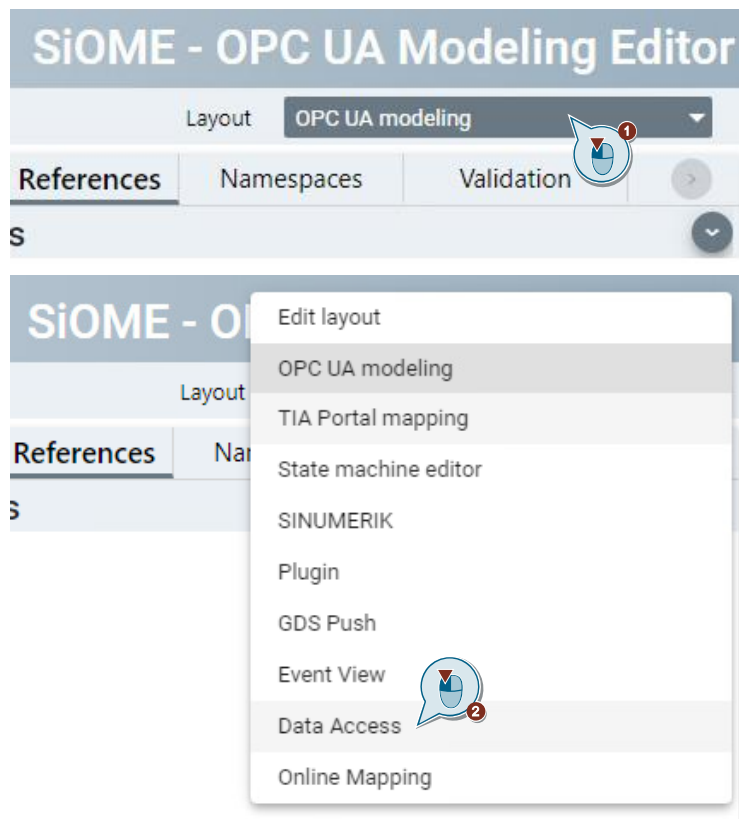
To create a PubSub configuration as an XML file, please refer to chapter 7.2.4.

## 8 Data Access to an OPC UA Server

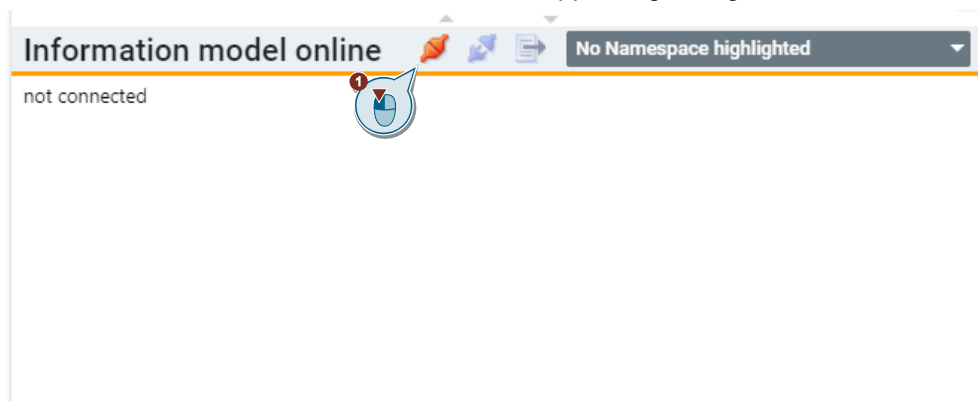
With SiOME you have the possibility to establish an online connection to an OPC UA server. This allows you to browse through the address space on an OPC UA server.

### 8.1 Connecting to the OPC UA Server

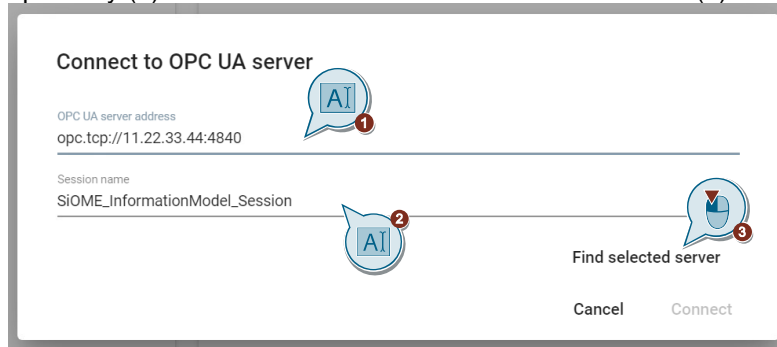
1. Select the layout „Data Access“.



2. Open the dialog "Information model online" in the "Information model" area. Click "Connect to OPC UA Server" in the appearing dialog box.

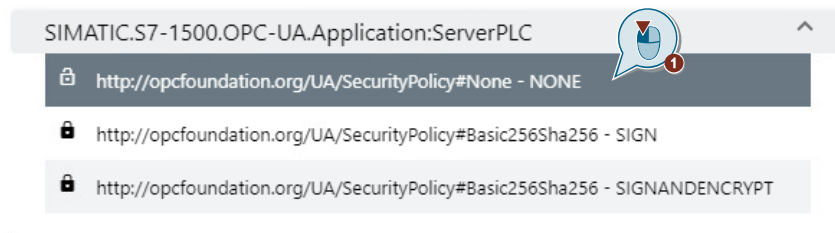


3. In the following dialogue, enter the server address in the "OPC UA server address" field (1). The definition of the "Session name" can be modified optionally (2). Then click the "Find selected server" button (3).

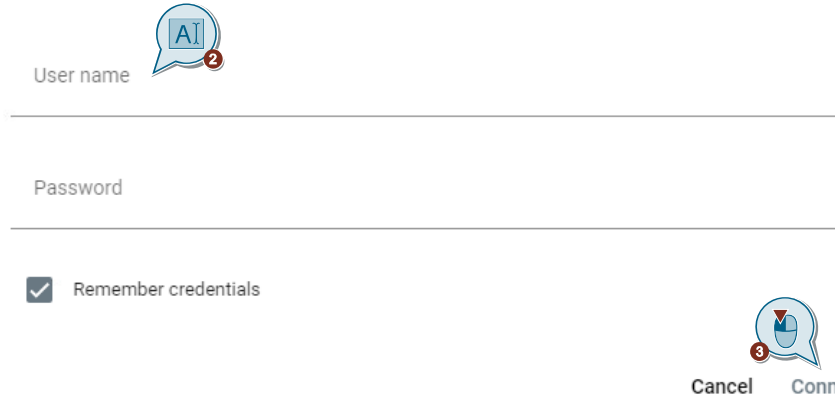


4. Select one of the endpoints offered by the OPC UA Server. If authentication with username and password is activated, enter the credentials into the "Username" and "Password" fields. Activate the checkbox "Remember credentials" to save the username and password for further logins. Then click "Connect".

Select OPC UA server endpoint:



User authentication:

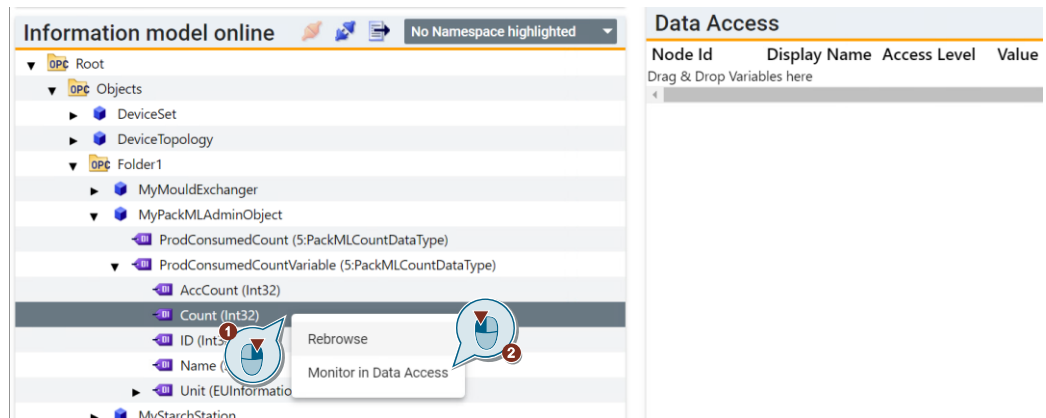


**NOTE** SiOME offers you the possibility to import your own client certificate or to create a self-signed certificate if you have selected a secure endpoint of the OPC UA server.

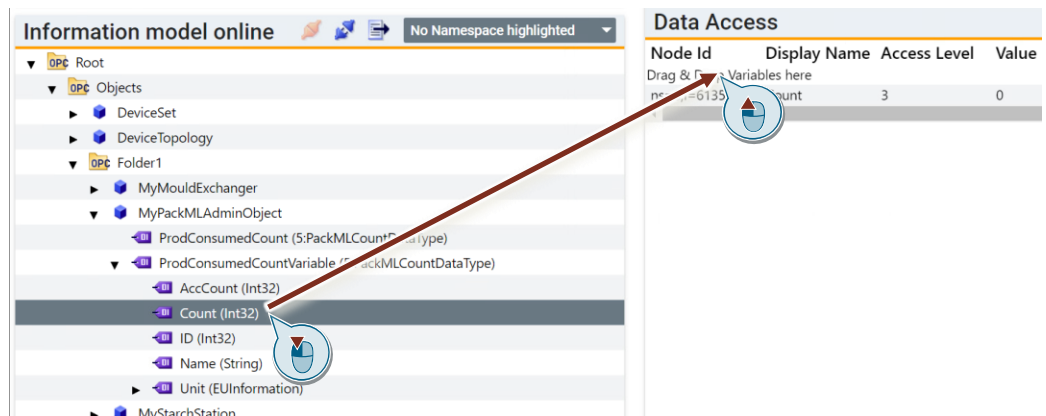
**NOTE** It is not possible to model your address space during the online connection. As soon as the online connection is deactivated, SiOME returns to the previous state.

## 8.2 Monitoring Items

To add nodes as monitored items to the Data Access view, you can use the context menu function “Monitor in Data Access”.



As an alternative, you can drag and drop a node to the subscription view.



## 8.3 Validation during the online connection

### Validation of the Information Model

During the online connection, you can also open the validation window. This allows you to check the OPC UA Server for a valid OPC UA NodeSet. In addition, it is possible to import a NodeSet XML file in the validation window and compare this file with the Information Model of the OPC UA Server. You can use this function to check Companion specifications at runtime.

### Validation of StateMachines

During the online connection to the OPC UA Server, you can check running StateMachines. Navigate to a StateMachine in the address space and open the StateMachine Editor by right-clicking on the StateMachine.

Additionally, you can use the validation window to check the StateMachine against the OPC UA rules. Deviations and errors are displayed in SiOME.

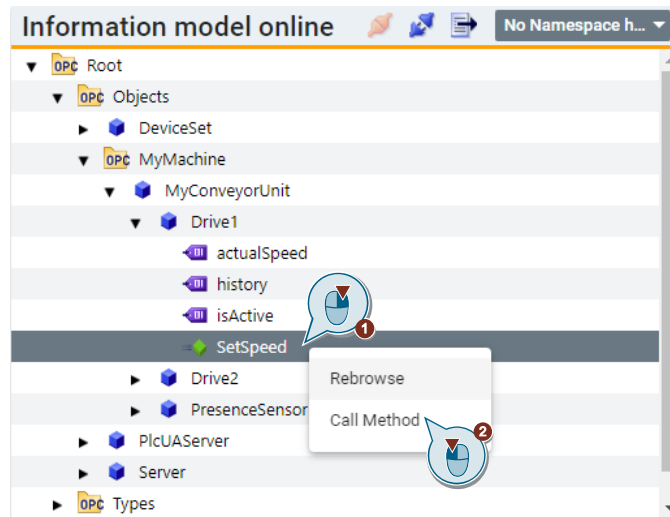
#### NOTE

It is not possible to test the function of the StateMachine within the actual machine. Only the correct function or representation in the OPC UA Server is checked.

## 8.4 Calling OPC UA Methods

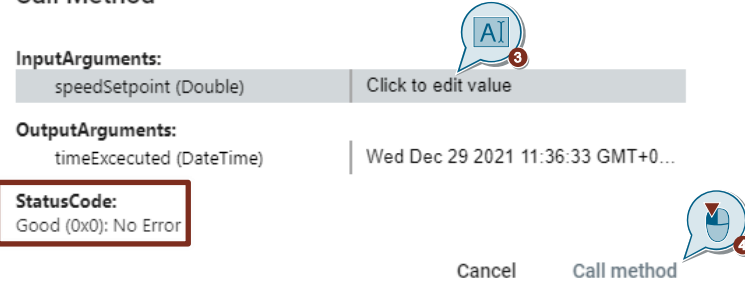
Starting with SiOME V2.4 you have the possibility to call OPC UA methods. Once the online connection to the OPC UA server is established, you can browse the server's address space and select the method to be called.

1. Right-click on the method and select "Call method".

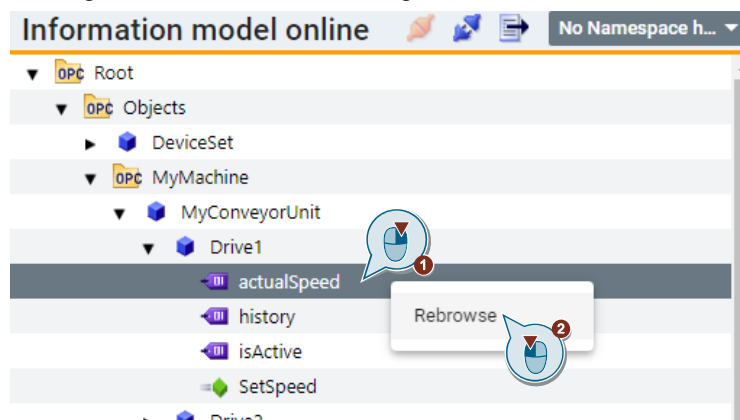


2. In the window that appears, click on the value of the input parameter (in this case speedSetpoint) to set the value, and select "Call method". If the method call was successful, SiOME returns the StatusCode "Good (0x0):No Error".

### Call Method

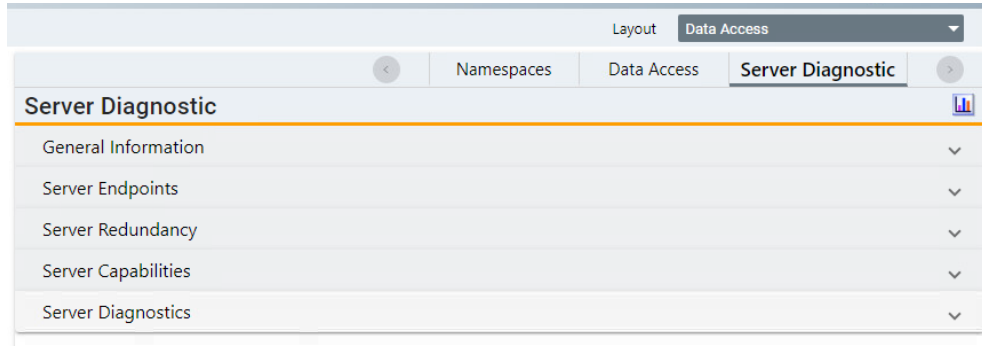


3. The newly set value can be read under "Attributed/References" by right-clicking on the value and selecting "Rebrowse".



## 8.5 Server Diagnostic

After SiOME is connected to the OPC UA Server, you will find 5 categories for server diagnostics in the section "Server Diagnostic". Click the categories to get more information.



Explanation of the categories:

Category	Description
General Information	General overview of the server. Contains server name, status, start time, etc.
Server Endpoints	Overview of available server endpoints. Contains server URLs, discovery URLs, available endpoints, and so on.
Server Redundancy	Information on server redundancy.
Server Capabilities	Information about the performance of the server.
Server Diagnostics	Contains information about the current client. Shows active sessions, subscriptions, monitored items, etc.

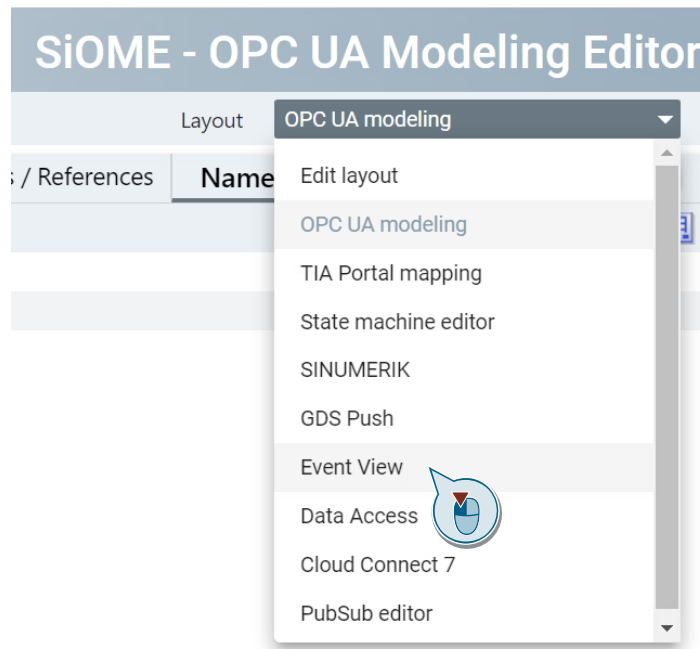


## 9 Event View for receiving Alarms and Conditions (A&C)

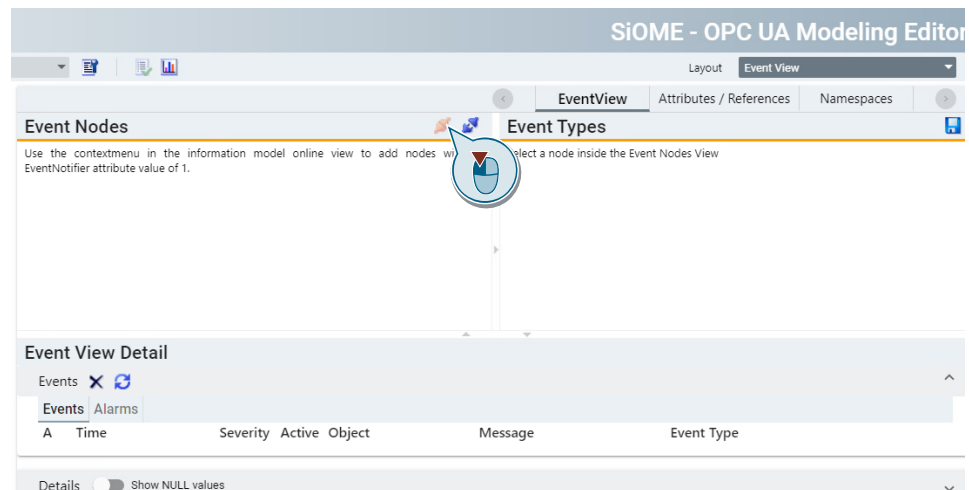
With SiOME, you have the possibility to establish an online connection to an OPC UA Server and receive Alarms and Conditions.

### Connecting to the OPC UA Server

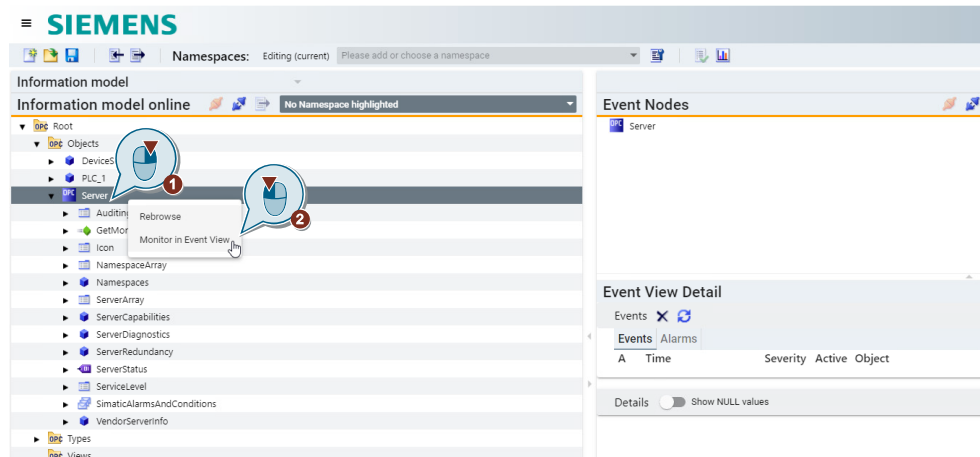
1. In the "Layout" area, open the "Event View" layout.



2. Connect to the OPC UA Server online.



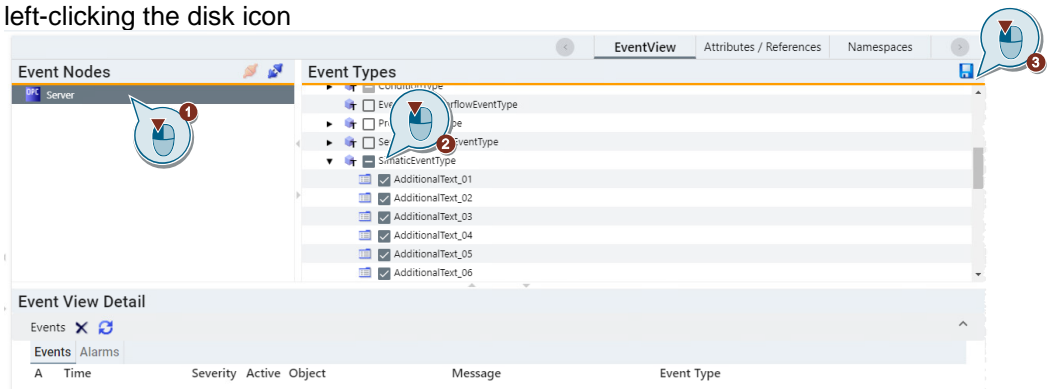
3. To receive an alarm or event, right-click an object with the "EventNotifier" attribute and add it to the "Event Nodes" area with "Monitor in EventView" in the context menu.



## 9.1 Configuration of Additional Fields for Alarms and Events

By default, SiOME reports all event fields that are marked as "mandatory" by the OPC UA specification. If additional event fields are to be received, these must be configured explicitly.

Select the event fields that are to be received additionally and accept the setting by left-clicking the disk icon



## 9.2 Viewing Events and Alarms

As soon as an event is received, the data of the event is displayed in the "Event View Detail" area.

The "Events" tab displays all events received once and a history of alarms.

## 9 Event View for receiving Alarms and Conditions (A&C)

The screenshot shows the 'Event View' interface. On the left, 'Event Nodes' shows a tree structure with 'Server' selected. On the right, 'Event Types' shows a list of event types, including 'SimaticEventType' with several 'AdditionalText' fields. Below this is the 'Event View Detail' section, which has tabs for 'Events' and 'Alarms'. A table below the tabs shows a single event with columns: A, Time, Severity, Active, Object, Message, and Event Type. Below the table is a 'Details' section with a 'Show NULL values' checkbox and a list of key-value pairs for event properties.

No.	Object	Description
1.	"Clear Events and Alarms"	This button allows you to delete all currently displayed events and alarms from the view.
2.	"Refresh"	With this button, you can call the method "ConditionRefresh". This will, for example, retrieve the pending alarms after a reconnection to an OPC UA server.
3.	"Show ZERO values"	If this option is enabled, fields that have been received but do not contain a value (NULL) are also displayed.

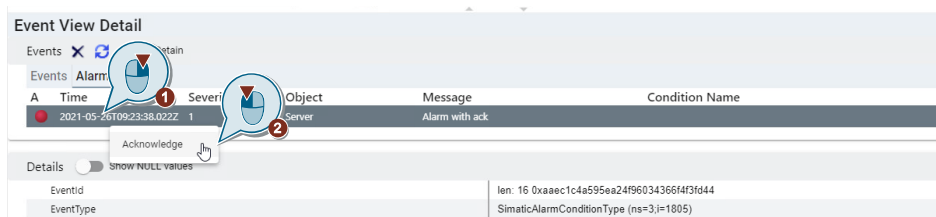
In the "Alarms" tab, only currently pending conditions and alarms are displayed.

The screenshot shows the 'Event View Detail' interface with the 'Alarms' tab selected. A table below the tabs shows a single alarm with columns: A, Time, Severity, Active, Object, Message, and Condition Name. Below the table is a 'Details' section with a 'Show NULL values' checkbox and a list of key-value pairs for alarm properties, including 'ActiveState' which is 'Active'.

No.	Object	Description
1.	"Display of alarms"	This button switches to the alarm view. Current pending alarms and conditions are now displayed.
2.	"Status and acknowledgement of alarms"	The status of the alarm/condition is displayed here. The alarm can be acknowledged with a right-click.

### 9.3 Acknowledging and commenting of alarms

If a current alarm is pending, you can acknowledge it with a right-click and then assign a comment.



Assign a comment to be transmitted to the OPC UA Server when the alarm is acknowledged.

#### Add a comment



## 10 GDS Push for deploying Server Certificates

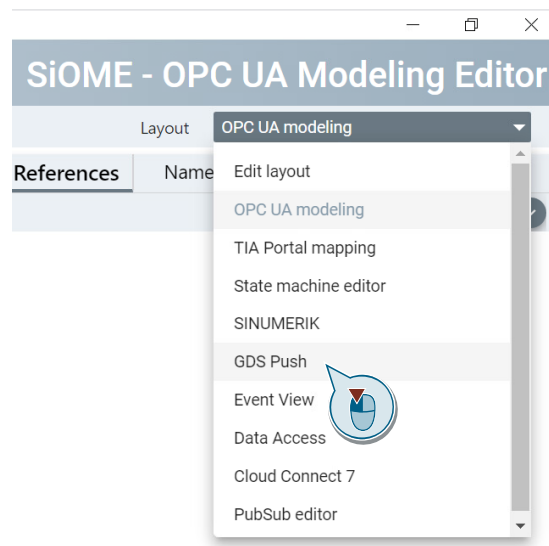
With SiOME you have the possibility to establish an online connection to an OPC UA server in order to download certificates, trust lists and revocation lists via the Feature "GDS Push".

The OPC UA server of the S7-1500 CPU as certificate receiver provides the standardized methods and attributes that the OPC UA clients need to read and write certificates, trust lists and CRLs. The advantage compared to conventional download of hardware configuration is the possibility of using this functionality also at runtime in RUN state of the PLC.

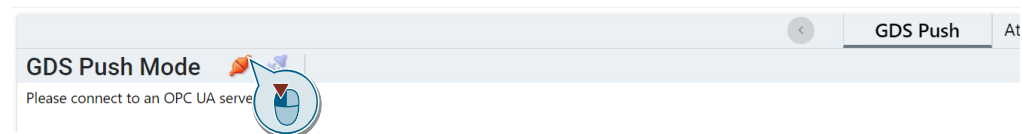
Since TIA Portal V18 and FW 3.0 this feature also allows loading the server certificate for the WebServer of a S7-1500.

### Connecting to the OPC UA Server

Switch to the layout for „GDS Push“.



Connect online to the OPC UA Server:



To download certificates, you have to use the endpoint "Sign & Encrypt". In addition, you must log into the OPC UA Server with a user who has the necessary permissions for certificate management (for more information on configuring the OPC UA Server, see the TIA Portal Online Help under the heading "Configuration GDS").

Establish the connection to the OPC UA Server:

## 10 GDS Push for deploying Server Certificates

### Connect to OPC UA server

OPC UA server address

opc.tcp://192.168.0.1:4840

Session name

SiOME\_InformationModel\_Session

Find selected server

Cancel

Connect

### Connect to OPC UA server

OPC UA server address

opc.tcp://192.168.0.1:4840

Session name

SiOME\_InformationModel\_Session

Find selected server

### Select OPC UA server endpoint:

SIMATIC.S7-1500.OPC-UA.Application:PLC\_1

http://opcfoundation.org/UA/SecurityPolicy#None - NONE

http://opcfoundation.org/UA/SecurityPolicy#Basic256Sha256 - SIGN

http://opcfoundation.org/UA/SecurityPolicy#Basic256Sha256 - SIGNANDENCRYPT

### User authentication:

User name

Password

Cancel

Connect

In addition, a certificate must be selected for the client during the connection. If the OPC UA Server is in "Provisioning Mode", any certificate is accepted. If the server has already been configured, only certificates that are in the "Trustlist" will be accepted.

The certificate and the "private key" for the OPC UA Client can be imported separately from the file system or from a p12 container archive during the connection setup.

## 10 GDS Push for deploying Server Certificates

**Connect to OPC UA server**

<http://opcfoundation.org/UA/SecurityPolicy#Basic256Sha256 - SIGN>


<http://opcfoundation.org/UA/SecurityPolicy#Basic256Sha256 - SIGNANDENCRYPT>

**User authentication:**

User name  
opcua

Password  
.....

**Use a p12 certificate container:**

Load p12 

**Client certificate:**

Browse ... D:\SiOME-2.2.4-beta4\certificates\SiOME\_client\_cert.der

Browse ... D:\SiOME-2.2.4-beta4\certificates\SiOME\_client\_key.pem

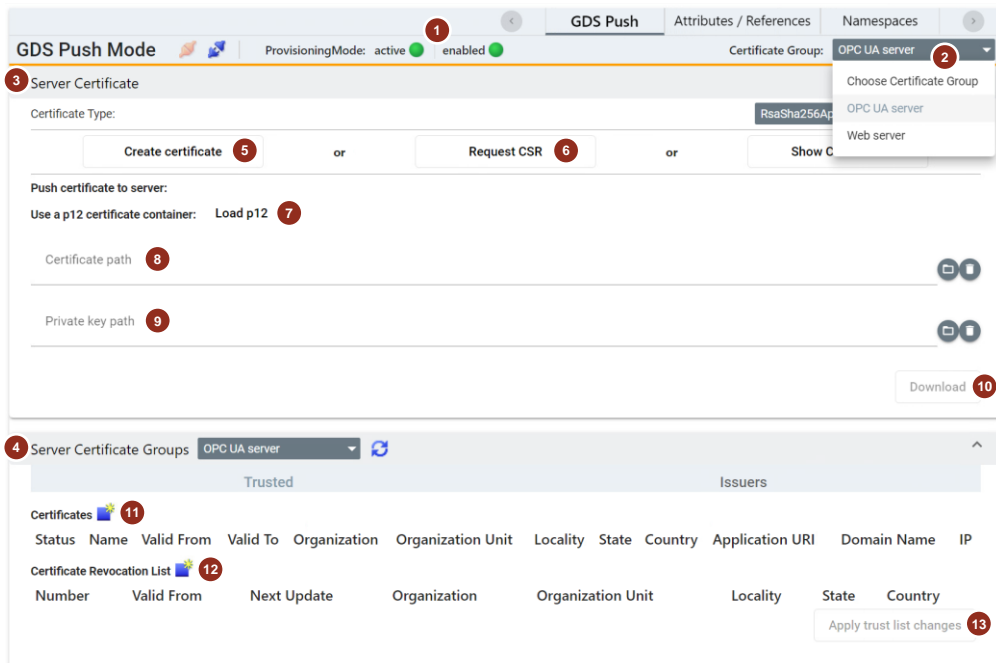
**Create custom certificate:**

Custom certificate name  
SiOME\_client\_cert.der

Cancel Connect

### GDS Push Mode

After the successful connection, the online view of the GDS Push Mode opens:



The screenshot shows the GDS Push Mode interface with the following elements:

- 1** GDS Push mode is active and enabled.
- 2** Certificate Group: OPC UA server
- 3** Server Certificate configuration options:
  - Certificate Type: RsaSha256Ap
  - Buttons: Create certificate (5), Request CSR (6), Show C...
  - Push certificate to server: Use a p12 certificate container: Load p12 (7)
  - Certificate path (8)
  - Private key path (9)
  - Download (10)
- 4** Server Certificate Groups: OPC UA server
- 11** Certificates table with columns: Status, Name, Valid From, Valid To, Organization, Organization Unit, Locality, State, Country, Application URI, Domain Name, IP
- 12** Certificate Revocation List table with columns: Number, Valid From, Next Update, Organization, Organization Unit, Locality, State, Country
- 13** Apply trust list changes button

The fields have the following meaning:

No.	Field	Description
1.	"ProvisioningMode"	Active (green): OPC UA Server is in provisioning mode. Enabled (green): The dynamic certificate handling on the OPC UA Server is enabled.
2.	„Certificate Group“	Selection of the server for which the certificates are to be loaded: "OPC UA server" or "Web server" (since TIA Portal V18 / FW 3.0).
3.	"Server Certificate"	Expand this button: Download and Configure a new server certificate.
4.	"Server Certificate Groups"	Expand this button: <ul style="list-style-type: none"> <li>- Edit the "TrustList"</li> <li>- Edit and download trusted certificates and Certificate Revocation Lists</li> </ul> This area is disabled for Webserver configuration because no certificate groups can be used in that context.
5.	"Create Server Certificate"	This button creates a new server certificate. In a dialog, the contents for the certificate can be defined and a storage location can be specified.
6.	"Request CSR"	This button initiates a "Signing Request" on the OPC UA Server. The OPC UA Server creates a private key, which remains on the OPC UA Server, and a "Signing Request", which is returned to SiOME. This is saved in a file. Afterwards, the "Signing Request" has to be signed by a CA and uploaded to the OPC UA Server again.
7.	"Load p12"	As an alternative to creating a server certificate in SiOME, a server certificate can also be imported together with a private key. After importing the archive, the certificate and key are automatically stored in fields 7 and 8.
8.	"Certificate Path"	In this field, a *.der certificate can be imported into SiOME.
9.	"Private Key Path"	In this field, a *.pem key can be imported into SiOME.
10.	"Download"	Once the certificate and private key have been imported into SiOME, they can be downloaded to the OPC UA Server using the button.



## 10 GDS Push for deploying Server Certificates

No.	Field	Description
11.	"Add new TrustList Entry"	This button can be used to add certificates to the trust list. After adding, the new entries appear in light gray. Only by confirming the configuration (button 12) are the certificates transferred to the OPC UA Server and made effective, as well as displayed "black" in SiOME.
12.	"Add new Revocation List Entry"	This button can be used to add call-back lists. After adding, the new entries appear in light gray. Only by confirming the configuration (button 12) is the call-back list transferred to the OPC UA Server and made effective, as well as displayed "black" in SiOME.
13.	"Apply Trust list changes"	This button downloads the new entries in the "Trustlist" and the "Certificate Revocationlist" to the OPC UA Server and enables them.
14.	"Remove TrustList Entry" (not shown in picture)	With a right-click, you can use the context menu to remove entries from the trust list as well as from the call-back list.

### NOTE

After downloading the OPC UA Server certificate with SiOME, the OPC UA connection is automatically terminated. Therefore, it is recommended to store the OPC UA Client Certificate of SiOME in the "TrustList" of the OPC UA Server first, so that a reconnection is again possible.

# 11 Troubleshooting

Error message	Potential solution
<p><b>Warning:</b> SiOME cannot find a proper TIA Portal version to open the project. Required version: (e.g. 16)</p>	<p>The selected TIA project is created with a TIA version that is not installed on the PC. Install the required TIA Portal version or convert the project to the TIA version installed on the PC. Then open the project again.</p>
<p><b>Warning:</b> Unable to open the project. Either the required software is not installed, or authentication is required. Do you want to proceed with authentication?</p>	<p>Option 1: The project is either protected with a project password. In this case, click OK and enter the project password.</p> <p>Option 2: If there is a SINUMERIK in the project, the corresponding toolbox must be installed so that the project can be opened. Make sure that the correct SINUMERIK Toolbox is installed in the correct version.</p>
<p><b>Openness error:</b> Security error. Can't access this project to acquire needed information Security error. Owner "domain\user" of this process is not member of the windows group 'Siemens TIA Openess'. Please contact your administrator.</p>	<p>Follow the instructions in "Grant permission for TIA Openess" in Chapter 3.</p>

# 12 Appendix

## 12.1 Service and support

### Industry Online Support

Do you have any questions or need assistance?

Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.

The Industry Online Support is the central address for information about our products, solutions and services.

Product information, manuals, downloads, FAQs, application examples and videos – all information is accessible with just a few mouse clicks:

[support.industry.siemens.com](https://support.industry.siemens.com)

### Technical Support

The Technical Support of Siemens Industry provides you fast and competent support regarding all technical queries with numerous tailor-made offers – ranging from basic support to individual support contracts. Please send queries to Technical Support via Web form:

[siemens.com/SupportRequest](https://siemens.com/SupportRequest)

### SITRAIN – Digital Industry Academy

We support you with our globally available training courses for industry with practical experience, innovative learning methods and a concept that's tailored to the customer's specific needs.

For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page:

[siemens.com/sitrain](https://siemens.com/sitrain)

### Service offer

Our range of services includes the following:

- Plant data services
- Spare parts services
- Repair services
- On-site and maintenance services
- Retrofitting and modernization services
- Service programs and contracts

You can find detailed information on our range of services in the service catalog web page:

[support.industry.siemens.com/cs/sc](https://support.industry.siemens.com/cs/sc)

### Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for iOS and Android:

[support.industry.siemens.com/cs/ww/en/sc/2067](https://support.industry.siemens.com/cs/ww/en/sc/2067)

## 12.2 Links and literature

	Topic
\1\	Siemens Industry Online Support <a href="https://support.industry.siemens.com">https://support.industry.siemens.com</a>
\2\	Download page of this entry <a href="https://support.industry.siemens.com/cs/ww/en/view/109755133">https://support.industry.siemens.com/cs/ww/en/view/109755133</a>
\3\	Download from .NET Framework <a href="https://dotnet.microsoft.com/download/dotnet-framework">https://dotnet.microsoft.com/download/dotnet-framework</a>
\4\	SINUMERIK Access MyMachine/OPC UA <a href="https://support.industry.siemens.com/cs/us/en/view/109777871">https://support.industry.siemens.com/cs/us/en/view/109777871</a>
\5\	Generating OPC UA nodes based on local data mappings of FB types and UDTs <a href="https://support.industry.siemens.com/cs/de/de/view/109798671/143869890187?dl=en">https://support.industry.siemens.com/cs/de/de/view/109798671/143869890187?dl=en</a>
\6\	Creating a server interface for reference namespace <a href="https://support.industry.siemens.com/cs/de/de/view/109798671/143871277067?dl=en">https://support.industry.siemens.com/cs/de/de/view/109798671/143871277067?dl=en</a>
\7\	Download of vc_redist.x64 from Microsoft: <a href="https://aka.ms/vs/17/release/vc_redist.x64.exe">https://aka.ms/vs/17/release/vc_redist.x64.exe</a>

## 12.3 Document history

Version	Date	Change
V1.0	07/2018	First version
V1.9	03/2019	Update to version 1.9 with functional enhancements
V1.9.6	09/2019	Update to Version 1.9.6 with SINUMERIK
V2.0	11/2019	Update to Version 2.0 with functional enhancements
V2.1	06/2020	Update to Version 2.1 with functional enhancements
V2.2	10/2020	Update to version 2.2 with new SINUMERIK function
V2.3	06/2021	Update to version 2.3 with new OPC UA client functions for SiOME
V2.5	02/2022	Update to version 2.5 with new reference namespace function
V2.5.12	07/2022	Update to version 2.5.12 with improved SINUMERIK functions
V2.6	11/2022	Update to version 2.6 with functional enhancements
V2.7	04/2023	Update to version 2.7 with new features