

# Learn-/Training Document

Siemens Automation Cooperates with Education (SCE) | As of Version V15.1 SP1

**TIA Portal Module 092-300** OPC UA with SIMATIC S7-1500 as OPC Server and OPC SCOUT and SIMIT as OPC Clients

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#### Matching SCE trainer packages for this Learn-/Training Document

#### SIMATIC controllers with SIMATIC STEP 7 BASIC V15

- SIMATIC ET 200SP Distributed Controller CPU 1512SP F-1 PN Safety Order no.: 6ES7512-1SK00-4AB2
- SIMATIC CPU 1516F PN/DP Safety with Software Order no.: 6ES7516-3FN00-4AB2
- SIMATIC S7 CPU 1516 PN/DP with Software Order no.: 6ES7516-3AN00-4AB3
- SIMATIC CPU 1512C-1 PN with Software Order no.: 6ES7512-1CK00-4AB6
- SIMATIC CPU 1512C-1 PN with Software and PM 1507 Order no.: 6ES7512-1CK00-4AB1
- SIMATIC CPU 1512C-1 PN with Software and CP 1542-5 (CP PROFIBUS) Order no.: 6ES7512-1CK00-4AB7
- SIMATIC CPU 1512C-1 PN with Software, PM 1507 and CP 1542-5 (CP PROFIBUS) Order no.: 6ES7512-1CK00-4AB2

#### SIMATIC STEP 7 Software for Training

- SIMATIC STEP 7 Professional V15.1 Single License Order no.: 6ES7822-1AA05-4YA5
- SIMATIC STEP 7 Professional V15.1 6+20 User Classroom License Order no.: 6ES7822-1BA05-4YA5
- SIMATIC STEP 7 Professional V15.1 6+20 User Upgrade License Order no.: 6ES7822-1AA05-4YE5
- SIMATIC STEP 7 Professional V15.1 Student License for 20 Users Order no.: 6ES7822-1AC05-4YA5

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# OPC UA with SIMATIC S7-1500 as OPC Server and OPC SCOUT and SIMIT as OPC Clients

# 1 Goal

The following pages show how the data of SIMATIC S7-1500 can be accessed via OPC UA in a project with SIMATIC S7-1500.

OPC Scout V10 and SIMIT V9.1 are used as OPC UA clients.

# 2 Requirement

This section builds on the section Global data blocks with SIMATIC S7-CPU 1516F-3 PN/DP. To complete this section, you can use the following project, for example: "SCE\_EN\_032-600\_Global\_Data\_Blocks....".

# 3 Required hardware and software

- 1 Engineering station: Requirements include hardware and operating system (for additional information, see Readme on the TIA Portal Installation DVDs)
- 2 SIMATIC STEP 7 Professional software in TIA Portal as of V15.1
- 3 Software OPC Scout as of V10
- 4 Software SIMIT as of V9.1 (with dongle or in Demo mode)
- 5 SIMATIC S7-1500/S7-1200/S7-300 controller, e.g. CPU 1516F-3 PN/DP as of firmware V2.1 with memory card
- 6 Ethernet connection between engineering station and controller



5 SIMATIC S7-1500 controller As of firmware V2.1

# 4 Theory\*

### 4.1 OPC UA General

#### 4.1.1 Overview

The OPC Foundation (an interest group of well-known manufacturers for the definition of standard interfaces) has defined a large number of software interfaces in recent years to standardize the information flow from the process level to the management level. In the past, different OPC (=Open Platform Communications) specifications were developed according to the different requirements within an industrial application: Data Access (DA), Alarm & Events (A&E), Historical Data Access (HDA) and Data eXchange (DX). Access to process data is described in the DA specification, A&E describes an interface for event-based information including acknowledgment, HDA describes functions for archived data and DX defines server-to-server inter-station communication.

Based on the experiences of these classic OPC interfaces, the OPC Foundation has defined a new platform called OPC Unified Architecture (UA). The target of this standard is the generic description and the uniform access to all information that must be exchanged between systems or applications. This includes the functionality of all previous OPC interfaces. In addition, the option has been created to integrate the interface natively into the respective system, regardless of the operating system that is running on the system and regardless of the programming language used to create the system.

#### 4.1.2 What is OPC?

In the past, OPC was a collection of software interfaces for data exchange between PC applications and process devices. These software interfaces were defined according to the rules of Microsoft COM (Component Object Model) and were therefore easy to integrate on Microsoft operating systems. COM or DCOM (Distributed COM) provides the functionality of interprocess communication and organizes the exchange of information between applications, even by means of computer boundaries (DCOM). Therefore, an OPC client (COM client) can exchange information with an OPC server (COM server) using mechanisms of the Microsoft operating system.

The OPC server provides process information of a device available at its interface. The OPC client connects with the server and can access the offered data.

\* From SIEMENS application example "Client example for the OPC UA server of a SIMATIC S7-1500" Entry ID: 109737901, V1.0, 06/2018

The use of COM or DCOM means that OPC server and clients can only be operated on a Windows PC or in the local network and these must implement the communication to the corresponding automation system mostly by means of proprietary protocols. For network communication between client and server, additional tunneling tools often have to be used to get through firewalls or to bypass the complicated DCOM configuration. Moreover, the interface can only be accessed natively with C++ applications, .NET or JAVA applications can only access via a wrapper layer. In practice, these limitations lead to additional communication and software layers, which increase the configuration effort and complexity.

Due to the widespread use of OPC, the standard is increasingly used for general coupling of automation systems and no longer only for the original application as a driver interface in HMI and SCADA systems to access process information.

To solve these limitations in practice and to meet the additional requirements, in the last seven years the OPC Foundation has defined a new platform with the name OPC Unified Architecture. This provides a uniform basis for the exchange of information between components and systems. OPC UA is available as IEC 62541 standard and therefore forms the basis for other international standards.

OPC UA offers the following features:

- Combination of all previous OPC features and information, such as DA, A&E and HDA, in a generic interface.
- Use open and platform-independent protocols for the interprocess and network communication.
- Internet access and communication through firewalls.
- Integrated access control and security mechanisms at protocol and application level.
- Extensive mapping options for object-oriented models; objects may have tags and methods and trigger events.
- Extensible type system for objects and complex data types.
- Transport mechanisms and modeling rules form the basis for other standards.
- Scalability from small embedded systems to enterprise applications and from simple DA address spaces to complex, object-oriented models.

# 4.2 OPC UA address space

The following descriptions explain the address space of an OPC UA server.

#### 4.2.1 Nodes in the address space

A node in the OPC UA address space is of a certain type (such as object, tag or method) and is described by a list of attributes. All nodes have common attributes such as a name or description and specific attributes, such as the value of a tag. The list of attributes is not expandable. Additional information about the node can be added as a property. Properties are a special type of tag. The nodes are connected to one another with references. The references are typified. There are two main groups: Hierarchical references such as HasComponent for the components of an object or non-hierarchical references such as HasTypeDefinition for a connection of an object instance to an object type.

The following figure shows an example for nodes and the connect reference:





### 4.2.2 Available type of nodes in the address space

The following table shows the nodes types defined in the standard:

Node type	Description
Object	An object is used as a typified container or folder for tags, methods and events.
Tag	Tags represent the data of objects or tags, or as attributes the properties of a node.
Method	Methods are components of objects and can have a list of input or output parameters. The parameters are described using defined attributes.
View	Views represent a part of the address space. A node is used as an entry point and as a filter when browsing.
Object type	Object types provide information on the structure or the components of an object.
Tag type	Tag types describe which attributes or data types can be found at an instance of a tag.
Reference type	Reference types define the possible types of references between nodes.
Data type	Data types describe the content of the value of a tag.

#### 4.2.3 Namespaces and node IDs

Each node in the OPC UA address space is uniquely identified by a node ID. This node ID consists of a namespace for distinguishing identifiers from different subsystems and an identifier, which can be either a numeric value, a string or a GUID. Strings are typically use for the ID. This is analogous to OPC Data Access, where the item ID as identifier is also a string. Numeric values are used for static namespaces, such as type system. OPC UA defines a namespace with corresponding namespace index for the nodes defined by the OPC Foundation. The OPC UA servers also define one or more namespaces with index. The namespaces defined by the server are variable and can change. It is therefore recommended that the client asks for the current namespaces when setting up the session.

The following figure explains the structure of a node ID:



Figure 1.2

1.	Namespace index
2.	Node ID type (s=String; i=Numeric: g=GUID)
3.	ID

### 4.2.4 Attributes of the nodes

The following table explains the most important node attributes:

Attribute	Node type	Description
Node ID	All	The unique node ID within the namespace index
Namespace index	All	The namespace index to which the node is assigned.
Identifier type	All	The node ID type
Identifier	All	The unique node ID within the namespace index
Browse name	All	The browse name
Display name	All	The display name
Node class	All	The node class (object, variable, data type)
Description	All	Brief description of the node
Type definition	All	Reference to the data type description of the tag
Write mask	All	Write permissions on node attribute (0=no, 1=yes) without taking user groups into account
User write mask	All	Write permissions on node attribute (0=no, 1=yes) while taking the current user into account
Data type	Tag	Data type of the tag
Value Rank	Tag	Value type of the variable (any, scalar, vector, array)
ARRAY dimensions	Tag	Number or array dimensions
Access level	Тад	Access authorization (read, write, read/write) on the node
Minimum sampling interval	Tag	The smallest possible sampling interval of the tag on the server side
Historizing	Тад	Time lapse of the tag available on the server (yes, no)

# 4.3 OPC UA Security

The following explanations explain the OPC UA security concept.

#### 4.3.1 Security levels

The following figure provides an overview of the security levels of

OPC UA:



#### Figure 1.3

The user authentication is carried out via the session. This is done, for example, by means of a user name and a password or using certificates. Mutual authentication of the application and a message-based backup of the communication are performed via a secure channel. Each message is signed and encrypted to ensure the integrity and confidentiality of the messages. These mechanisms are based on certificates (X509), which uniquely identify the applications by means of a Public Key Infrastructure (PKI) system.

On the socket level, a connection-oriented backup and socket connection via Secure Socket Layer (SSL) or Virtual Private Network (VPN) can be used in addition to or alternatively to the Secure Channel.

### 4.3.2 Configuration options for the security

The following table describes the configuration options for the security mechanisms:

Option	Description				
Security policy	None - No security is used in the Secure Channel.				
	Basic128Rsa15 – Set of encryption algorithms				
	Basic256 – Set of advanced encryption algorithms.				
Message security	None – the messages are not backed up!				
mode	Sign – the messages are signed.				
	Sign&Encrypt – the messages are signed and encrypted.				
User authentication	Anonymous – No user authentication is required.				
	<b>User password</b> – The user authentication is carried out using a user				
	name and a password.				
	<b>Certificate</b> - User authentication is performed using a certificate.				

#### 4.3.3 Certificate exchange between client and server

If all participating applications implement the guidelines of OPC UA for security configuration, only one manual step (4) is required to exchange the certificates on the server, as the certificates are automatically exchanged between the applications and only an administrator has to accept the certificates.

The following figure illustrates the certificate exchange between client and server:



Figure 1.4

No.	Description
1.	When establishing a connection to the server (Session.Create), the client receives the server certificate via the server endpoint.
2.	The client program can then decide how to handle the certificate: reject or accept it.
3.	In the same process, the client sends its certificate to the server. This rejects the certificate first and stores it in a rejected folder.
4.	The client certificate must then be accepted by an administrator on the server. In most cases, this is done by requiring an administrator to copy the client certificate from a rejected folder to a trusted folder.

Table 1.5

#### Note:

- With the OPC UA server of the S7-1500, the client certificate must be loaded onto the controller before the server attempts to establish the connection via the TIA Portal in order to accept the certificate.

# 4.4 OPC UA server of the S7-1500

The section provides an overview of some key data of the OPC UA server of the S7-1500. In addition, notes and tips are provided on how to use the server.

Note:

 For more detailed information on OPC UA server of the SIMATIC S7-1500, refer to the function manual: S7-1500, ET 200MP, ET 200SP, ET 200AL, ET 200pro Communication" (support.industry.siemens.com/cs/document//59192925).

#### 4.4.1 Supported OPC UA services of the data access of S7-1500

The OPC UA server of SIMATIC S7-1500 supports the following services for the data access:

- Read
- Write
- Registered read/write
- Subscriptions

#### 4.4.2 Performance when accessing numerous tags of the server

If you want to read or write a large number of tags of a S7-1500, you can significantly improve performance by structuring the tags on the S7-1500. Use arrays and structures to declare the tags to be read/written.

Viewed individually, arrays offer the best performance. They are about 2 to 3 times faster than structures. These are about 10 to 100 faster than single accesses (with a number of about 1000 tags).

Use "Registered read/write" for recurring accesses to further increase performance.

#### 4.4.3 Licensing concept

CPU type	ET 200SP CPU to S7-1513(F)	1515/1516(F)	1517/1518(F)
Required license:	Small	Medium	Large

Table 1.6

Further details and information can be found in the manuals, which can be downloaded from <u>support.automation.siemens.com</u> and from the homepage of the OPC Foundation <u>opcfoundation.org</u>.

# 4.5 Example programs for OPC UA clients

A few OPC UA clients are presented as examples in the following section.

The **OPC Scout V10** and **SIMIT V9.1** software tools are included in the scope of delivery of the SCE Trainer packages with SIMATIC STEP 7 Professional V15.

OPC Scout V10 is included on the DVD "SIMATIC NET Networking for Industry PC Software V15". SIMIT V9.1 is available as a separate DVD.

#### 4.5.1 OPC Scout V10

The OPC Scout V10 is a support tool for the commissioning and testing of your OPC system.

The following OPC interfaces are supported:

- COM
- Data Access
- Alarms & Events
- XML (Data Access)
- OPC UA (OPC Unified Architecture)

Various functions are available for this purpose:

- Browsing and displaying the available OPC servers
- Browsing for objects with the "Discovery" function is supported for OPC UA.
- Testing connections and objects
- Monitoring items
- Reading and writing values
- Display alarms
- S7 connection diagnostics
- Creating and saving views of the objects to be acquired

#### 4.5.2 SIMIT V9.1

SIMIT is a process simulation software and has the following possible applications:

- Complete plant documentation
- Simulation of signals, devices and plant behavior
- Input and output simulator of test signals for an automation controller
- Testing and commissioning of automation software

SIMIT provides the following components to create a simulation:

#### Chart

To build a simulation, the components available in the libraries are put together in the chart editor and suitable parameters are entered.

#### Visualization

Visualizations provide an overview of your plant's signals. Signals are visualized with controls (input and display objects) and graphical objects.

#### Coupling

The coupling is the interface to the automation system and is required for signal exchange. In addition to couplings to PLCSIM, PLCSIM Advanced, PRODAVE, ... there is also a coupling with SIMIT as OPC UA client.

#### Demo mode

DEMO mode provides you with an idea of the handling and performance of SIMIT without having a valid license.

However, SIMIT has only a limited range of functions in the DEMO mode.

If you start SIMIT without a SIMIT dongle plugged into your computer, a message appears asking you if you want to launch SIMIT in DEMO mode. Confirm this message to start DEMO mode.

In demo mode it is possible to open, simulate and modify models already created. In addition, complete new models can also be created. The models created or modified in the demo mode can only be executed on the computer on which they were created.

SIMIT Simulation is limited to 45 minutes in demo mode, then the simulation must be restarted.

#### 4.5.3 Excel with OPC Labs QuickOPC

To access OPC server data from Excel, an OPC UA client library is required, which contains corresponding development components and commands.

The OPCLabs library is one such example, which can be easily integrated into an Excel worksheet.

The OPC Labs QuickOPC software with the OPCLabs library can be downloaded from the Internet at <u>opclabs.com</u>. A free time-limited trial version is also available here.

Note:

- Please note and follow the licensing instructions for the OPC Labs QuickOPC software.

#### 4.5.4 Node-RED

Node-RED is a free tool or development environment to connect various hardware devices, APIs and online services. The software as originally developed by IBM as Proof-of-Concept and later released as Open Source software. Since then it has been continuously developed and is available free of charge to all users.

The program offers a Web interface, similar to the FBD or LAD for Siemens controllers, with which flow-based programming can be performed. The individual blocks available here are called "nodes" and are comparable to FCs or FBs. They offer inputs and outputs with which the individual nodes can be connected.

The data is transferred between the blocks in the form of messages.

In addition to the standard nodes there is an active community that develops additional nodes and makes these freely available. The public library is available on the Node-RED website: <u>flows.nodered.org</u>

There is also the option to develop and use your own nodes. A documentation for this is available on the documentation page of the project: <u>nodered.org/docs/</u>

# 5 Task

In this section, the OPC UA Server is activated and set up for the CPU from the section "SCE\_EN\_032-600\_Global\_Data\_Blocks S7-1500".

The data block "SPEED\_MOTOR[DB2]" in the CPU should be read and written with different OPC UA clients via the OPC UA server.

# 6 Planning

The OPC UA server is set up in the properties of the CPU, which must have at least firmware version 2.1.

The security settings and the certificate and license management can also be made in these properties.

The programming device and the SIMATIC S7-1500 controller are interconnected via the **Ethernet interface**.

The data for the OPC UA server is enabled in the "SPEED\_ MOTOR[DB2]" data block.

The **OPC Scout V10** and **SIMIT V9.1** software tools included in the scope of delivery of the SCE Trainer packages with SIMATIC Step 7 Professional V15 are used to test OPC UA access.

# 7 Structured step-by-step instructions

You can find instructions on how to carry out planning below. If you already have a good understanding of everything, it will be sufficient to focus on the numbered steps. Otherwise, follow the individual instructions in the steps below.

### 7.1 Retrieving an existing project

→ Before you can expand the "SCE\_EN\_032-600\_Global\_Data\_Blocks..." project from section "SCE\_EN\_032-600\_Global\_Data\_Blocks", you must retrieve this project from the archive. To retrieve an existing project that has been archived, you must select the relevant archive with → Project → Retrieve in the project view. Confirm your selection with "Open". (→ Project → Retrieve → Select a .zap archive ... → Open)



→ The next step is to select the target directory where the retrieved project will be stored. Confirm your selection with "OK". (→ Target directory  $... \rightarrow OK$ ) → Save the opened project under the name 092-300\_OPC UA S7-1500. (→ Project → Save as ... → 092-300\_OPC UA S7-1500 → Save)

Siemens - C:\00_TIA_Portal\032-600_Global	Data_Blocks_V14_V15\032-600_Global_Data_Blocks_V14_V15	_ ¤ X
Project Edit View Insert Online Options	Tools Window Help 2: (# 2: 10) 🖸 🛄 🙀 💋 Goonline 🖉 Gooffline 🏭 🖪 📅 🗶 🖃 🚺 🗸 dearch in projects: 🍇	Totally Integrated Automation PORTAL
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Save Ctrl+S		Tas
Save as Ctrl+Shift+S		✓ Find and replace
Delete project Ctrl+E		· · · · · · · · · · · · · · · · · · ·
Retrieve		Find:
Multiuser		
Open project from Teamcenter		Match case
T Card Reader/USB memory		Find in substructures
The Memory card file		Find in hidden texts
Start basic integrity check		Use wildcards
C:\\032-600_Global_Data_Blocks_V14_V15		Use regular expressions
C:\00_III\032-600_Globale_Datenbausteine		(a) Down
C:\\032-600_Globale_Datenbausteine_V1		
Exit Alt+F4		Find
		Replace with:
	Properties 1 Info	( ) Whole document
	General Cross references Compile Energy Suite	From current position
✓ Details view		Selection
	Snow all messages	Replace Replace all
Nama	! Message Go to ? Date	✓ Languages & resources
Name	Project 032-600_Global_Data_Blocks_V14_V15 opened. 7/21/2	Editing language:
	< III >	·
Portal view     Overview	🔜 🗹 Project 032	2-600_Global_Data_Blocks_V 🎾

# 7.2 Settings OPC UA Server with SIMATIC S7-1500

→ Make sure that access to the data in the data block "SPEED\_ MOTOR[DB2]" is enabled by means of OPC UA. (→ SPEED\_MOTOR[DB2] → Accessible from HMI/OPC UA → W Writeable from HMI/OPC UA)

ŲĄ; s	74 Siemens - C:\00_TIA_Portal\092 300_OPC UA \$7-1500\092 300_OPC UA \$7-1500										
Proje	ect Edit View Insert Online Options	Tools	Wir	ndow	Н	lp					Totally Inter
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Γ	Devices										
		•	2	*		🋃 🐑 🕅 Keep act	ual values   🔒	Snapshot	ter ter	Copy snapshots to start values	🕵 🕵 Load start values a
2				SPE	D_	NOTOR					
E -	092 300_OPC UA \$7-1500	^		-	lame		Data type	Start value	Retain	Accessible from HMI/OPC UA	Writable from HMI/OPC UA
E I	📑 Add new device		1		r S	atic					
160	💼 Devices & networks		2	-		Speed_Setpoint	Real 🔳	14.0			
a	CPU1516F [CPU 1516F-3 PN/DP]		з			Speed_Actual_Value	Real	0.0			
2	Device configuration	=	4		•	Positive_Speed	Struct				
	🧏 Online & diagnostics		5			Threshold_Error	Real	16.0	<b>V</b>		
	🔻 🔙 Program blocks		6			Threshold_Warning	Real	14.0	<b>V</b>		
	📑 Add new block		7			Error	Bool	false	<ul> <li>Image: A start of the start of</li></ul>		
	📲 Main [OB1]		8			Warning	Bool	false	<ul> <li>Image: A start of the start of</li></ul>		
	MOTOR_SPEEDCONTROL [FC10]		9		•	Negative_Speed	Struct				
	MOTOR_SPEEDMONITORING [FC11]		10			Threshold_Error	Real	-16.0	<ul> <li>Image: A start of the start of</li></ul>		
	MOTOR_AUTO [FB1]		11			Threshold_Warning	Real	-14.0	<ul> <li>Image: A start of the start of</li></ul>		
	MAGAZINE_PLASTIC [DB3]		12	-		Error	Bool	false	<ul> <li>Image: A start of the start of</li></ul>		
	MOTOR_AUTO_DB [DB1]		13			Warning	Bool	false	<ul> <li>Image: A start of the start of</li></ul>		
	SPEED_MOTOR [DB2]					-					

→ Enable the **"OPC UA server"** in the **"Device configuration"** of **"CPU\_1516F"** and confirm the security note. (→ CPU\_1516F → Device configuration → OPC UA →  $\blacksquare$  Activate OPC UA server → OK)



→ In the "Settings" for the "Server", select the settings displayed here for time response and number of sessions and nodes. Make a note of "Port number" and "Server addresses", also called URLs of the server. (→ OPC UA → Server → Settings)

CPU1516F [CPU 1516F-3 PN/DP]		Q Properties	i Info	<b>B</b> Diagnostics		•
General IO tags Syste	em constants Texts					
General	I	Activate OPC UA server				~
▶ Fail-safe						
▶ PROFINET interface [X1]	Server addresses					
PROFINET interface [X2]						
<ul> <li>DP interface [X3]</li> </ul>	Address					
Startup	opc.tcp://192.168.0.1:4840					
Cycle	opc.tcp://192.168.1.1:4840					
Communication load						
System and clock memory						
SIMATIC Memory Card	<	1111			>	
<ul> <li>System diagnostics</li> </ul>	<u></u>					
PLC alarms	Standard server interface					
Webserver						
DNS configuration		Enable standard SIMATIC server inter	face			
Display						
Multilingual support	> Ontions					
Time of day	- options					1
Protection & Security	General					
▼ OPC UA						
General	Port:	4840				
✓ Server						
General	Max session timeouts:	30 5				
Options						
✓ Security	Max. OPC UA sessions:	15				
Secure Channel	Max. number of registered	10000				
User authentication	nodes:	10000				
Export	Cuberdations					
<ul> <li>System power supply</li> </ul>	Subscriptions					
Configuration control	Maintain an an line internal.	1000				
Connection resources	winimum sampling interval:	1000			ms 🔻	
Overview of addresses	Minimum publishing interval:	200 ms				
▼ Runtime licenses	Max. number of monitored					
OPC UA	items:	2000				

#### Note:

 Leave the option "Standard SIMATIC Server Interface" selected so that OPC UA clients can automatically connect to the OPC UA server of the CPU and exchange data with it. → To simplify OPC UA access, we also allow the **"No Security"** variant for test purposes in the **"Security policy"**. (→ OPC UA → Server → Security → Secure Channel →  $\blacksquare$  No Security)

CPU1516F [CPU 1516F-3 P	N/DP]				<b>Properties</b>	L Info	<b>B</b> Diagnostics	┛▤▾
General IO tags	System co	nstants Te	exts					
Startup Cycle	^	>> Secure C		* =				
Communication load System and clock memory		Server certi	Server certificate					
SIMATIC Memory Card		In global security settings for the certificate manager are not enabled. Only limited functionality is available.						
PLC alarms Web server DNS configuration		The ser security	The server certificate is used to verify the servers identity when it is accessed and to enable endpoint security.					
<ul> <li>Display</li> <li>Multilingual support</li> </ul>		Server certificate: CPU1516F/OPCUA-1-1						
Time of day <ul> <li>Protection &amp; Security</li> <li>ORC UA</li> </ul>		Security policy						
General	-	Note: When the 'No security' security policy is activated, every OPC UA client can connect using this setting, regardless of any security settings that follow.				in still 7.		
General		Security p	olicies availabl	on the server:				
<ul> <li>✓ Security</li> </ul>		occurry p		on the server.				
Secure Channel User authentication		Activa	te sec Name No securi	ty				
Export			Basic128	Rsa 15 - Sign				
<ul> <li>System power supply</li> </ul>			Basic128	Rsa15 - Sign & Encry	pt			
Configuration control			Basic256	Basic256 - Sign				
Connection resources			Basic256	- Sign & Encrypt				
Overview of addresses			Basic256	sha256 - Sign				
<ul> <li>Runtime licenses</li> </ul>			Basic256	sha256 - Sign & Enci	rypt			
OPC UA								

→ With "Trusted clients" we allow "Automatically accept client certificates during runtime". (→ OPC UA → Server → Security → Secure Channel → Automatically accept client certificates during runtime)

CPU1516F [C	PU 1516F-3 F	PN/DP]							Properties	🛄 Info	Diagnostics	
General	IO tags	Syste	m co	nstants	-	Text	5					
Startup		[	~									^
Cycle				Trus	sted	clients						
Communicat	ion load											
System and o	lock memory			<u> </u>	The	e global Julimite	security settings for the d functionality is availab	certificate r	nanager are not e	nabled.		
SIMATIC Mem	ory Card				То	allow a	connection to the serve	r to be estal	blished for specific	clients, their	certificates can be adde	d to
System diagr	ostics	[			the	e followi	ng list of trusted clients.	To allow an	y client to establis	h a connectio	n, you can enable the	
PLC alarms					"AL	utomati	cally accept all client cer	rtificates du	ring runtime" optio	on.		
Web server												
DNS configur	ation				-	ID Co	mmon name of subject	Issuer	١	/alid until		
Display						<4	dd new>					
Multilingual s	upport											
Time of day												
Protection & !	Security											
<ul> <li>OPC UA</li> </ul>												
General			4									
<ul> <li>Server</li> </ul>												
Genera	I		_ É									- 11
Option	;											
🔻 Securit	/											
Seci	ıre Channel											
User	authentication											
Export												
System power	r supply											
Configuration	control											_
Connection re	esources						_					
Overview of a	ddresses						· 💽 ·	Automatical	lly accept client ce	rtificates duri	ng runtime	

→ To simplify OPC UA access, we also allow a "Guest authentication" for test purposes and leave the "User name and password authentication" disabled. (→ OPC UA → Server → Security → User authentication → I Enable guest authentication)

CPU1516F [CPU 1516F-3 PN/	P] I Properties Linfo Lingnostics I	
General IO tags St	stem constants Texts	
Startup Cycle	▲ → User authentication	*
Communication load	Guest authentication	
System and clock memory		
SIMATIC Memory Card	Note: The guest authentication allows access to the server without authentication by username/password.	
<ul> <li>System diagnostics</li> </ul>		
PLC alarms		
<ul> <li>Web server</li> </ul>		
DNS configuration		
Display	Enable guest authentication	
Multilingual support		
Time of day	User name and password authentication	
<ul> <li>Protection &amp; Security</li> </ul>		
✓ OPC UA	Note: Enabling this option allows users to authenticate themselves by providing a valid user name and password.	
General		
▼ Server		
General		
Options	Enable user name and password authentication	
<ul> <li>Security</li> </ul>		
Secure Channel	User management	
User authentication		
Export		
<ul> <li>System power supply</li> </ul>	Name Password	
Configuration control	<add new="" user=""></add>	

→ The settings of the OPC UA Server interface can also be exported to support offline configuration of OPC UA clients. (→ OPC UA → Server → Export → Exporting an OPC UA XML file)

CPU1516F [CPU 1516F-3 PI	N/DP]						<b>Q</b> Properties	🗓 Info	<b>Diagnostics</b>	
General IO tags	System co	nstants	Texts							
<ul> <li>Protection &amp; Security</li> <li>OPC UA</li> </ul>	^	<ul> <li>Export</li> </ul>								
General		Export O	PC UA XN	IL file of th	ne standard SIMATIC	server interface				
✓ Server										
General				Note:	The OPC UA server pro	vides access to all PLC ta	gs and DB variables	which are ma	rked as 'Accessible fror	n
Options					HMI/OPC UA'. It is poss	ible to export the OPC UA	XML file to support o	ffline configur	ation of OPC UA clients.	. The
<ul> <li>Security</li> </ul>	•				Ore of server method	is are not included in the	export.			
Secure Channel										
User authentication	•				_					
Export	_				Export array elemer	nts as separate nodes				
System power supply	_									
Configuration control					Export OPC UA XM	I file				
Connection resources										

→ Now also select the required "Runtime licenses". (→ Runtime licenses → OPC UA → Type of purchased license → SIMATIC OPC UA S7-1500 medium)

CPU1516F [C	PU 1516F-3	PN/DP]						<b>Q</b> Properties	🗓 Info	🛿 Diagnostics	
General	IO tags	System co	onstants	Texts							
Export		^	OPCILIA								
System power	rsupply		UFC UA								
Configuration	control		Runtime	licenses							
Connection re	esources										
Overview of a	ddresses	-	Ту	pe of require	d license: :	SIMATIC OPC UA \$7-1500 media	um				v
▼ Runtime licer	nses	•	Tvp	e of purchas	ed license:	SIMATIC OPC UA \$7-1500 mediu	m				-
OPC UA											

# 7.3 Save, compile, and download the S7 station

→ Click on the folder "CPU\_1516F [CPU1516F-3 PN/DP]", compile the complete station and save the project now. After successful compilation and saving, download the station to the

controller. ( $\rightarrow$  CPU\_1516F [CPU1516F-3 PN/DP]  $\rightarrow$   $\boxed{1}$   $\rightarrow$   $\boxed{2}$  Save project  $\rightarrow$   $\boxed{1}$ )



# 7.4 Archiving the TIA Portal project

→ As the final step, you need to also archive the complete TIA Portal project. Select the
 → 'Archive ...' command in the → 'Project' menu item. Open a folder in which you want to archive your project and save your project as the file type 'TIA Portal project archive'.
 (→ Project → Archive → TIA Portal project archive → SCE\_EN\_092-300 OPC UA S7-1500.... → Save)



# 7.5 Access to SIMATIC S7-1500 via OPC-UA with OPC Scout V10

→ Open the "OPC Scout V10" from the desktop of your programming device/PC. (→OPC Scout V10)



→ In the left window, select the "UA server" and there "Add server". (→ UA server → Add server)

·		
🔛 (unknown) - Siemens AG - OPC Scout V10		• <b>X</b>
File Edit View Server Explorer Workbook Too	ools Window Help	
🚆 Server Explorer		• * ×
E- Local COM server	ID Value	
Remote COM server		
UA server		
🖵 🛃 Add server		
Web services		
E Last server used		
Workbook • + ×	R A simu 1	×
비 킹 킹 및 💌 🔍		
Deniest 'New assist'	Monitoring ON 💦 Generate values ON 🛄 Read 📈 Write	
Europect New project		
COM server	ID Display name Type Access rights Time stamp (UTC) Value Quality Result Server	New va
XML server		
- D- Views		
DA view 1		
		+
UTC • : 7/21/2018 7:18:32 AM		1

→ Enter the server URL from the configuration settings of the OPC server in the SIMATIC S7-1500 and then click on "**Discovery**". ( $\rightarrow$  opc.tcp://192.168.0.1:4840  $\rightarrow$  Discovery)

🔣 Find endpoints of the	UA server		×
Discovery server URL	opc.tcp://192.168.0.1:4840	•	)iscovery
Endpoints			
Security mode Security policy			• •
		ОК	Cancel

→ If the end point has been found with your entries for the server URL, you can apply this with "**OK**". ( $\rightarrow$  OK)

號 Find endpoints of the	UA server
Discovery server URL	opc.tcp://192.168.0.1:4840    Discovery
Endpoints	opc.tcp://192.168.0.1:4840 [SIMATIC.S7-1500.OPC-UAServer:CPU1516F]
Security mode	None 🔻
Security policy	http://opcfoundation.org/UA/SecurityPolicy#None

→ In the structure of your OPC server, find the tags of your "SPEED\_MOTOR" data block under "DataBlocksGlobal". You can drag them to the "DA view" area for monitoring and change. (→ UA server → opc.tcp://192.168.0.1:4840 → Objects → CPU\_1516F → DataBlocksGlobal → SPEED\_ MOTOR → Actual Speed Value → Speed Setpoint → DA view)

🔛 (unknown) - Siemens AG - OPC Scout V10			
File Edit View Server Explorer Workbook Tools Window Help			
18.1888 🗷 🔍 10 🖂 X 🗐 162 D	8.		
🚊 Server Explorer			▼ # ×.
3			
B G CPU1516F	ables Attributes		
E 🔋 Counters	i	No. Inc.	
E 🔋 DataBlocksGlobal	10 de information	Value	- Al
MAGAZINE_PLASTIC			
E- SPEED_MOTOR	odeID	is=3;s="SPEED_MOTOR"."Speed_Setpoint"	
R Positive Speed	ode class	/ariable	
E- Speed Actual Value Attr	ributes		
E- E Speed_Setpoint			
- 🚰 Icon 🎬 Br	rowse name	i:Speed_Setpoint	
E DataBlocksInstance	isplay name /rite mask	speed_setDoint	
🙂 🔰 Inputs	ser write mask		
E Memory	abstract	False	
E Timers	ype	loat	
DeviceManual	ser access rights	Readable   Writeable	
- PeviceRevision	ini, sampling interval istorizing	ndeterminate Fale	
- GrigineeringRevision			
HardwareRevision Valu	ue		
Icon	alue	14	
Manufacturer St	tatusCode	- Sood	
_] Workbook	• # ×	I CDA view 1	×
[B] B B   B 🛤 🔍		Monitorion DN 😹 Generate values DN 🔲 Read 🖌 Write	
Project 'New project'			
B De Server			
COM server		ID Display name Type Access rights Time stamp ( Value Quality Result Server No	aw value
E. B. UA server		http://www.siemens.com/si Speescua_vaue Toat kw Opc.tcp://192. ♥ http://www.siemens.com/si Speescua_vaue Toat kw Opc.tcp://192. ♥	
opc.tcp://192.168.0.1:4840 [SIMATIC.S7-1500.OPC-UA	AServer:CPU1516F		
B 🕒 Views			
DA view 1			
			F
UTC • : 7/21/2018 7:22:31 AM			1

 $\rightarrow$  In the "DA view" you can now select the tags in the "SPEED\_ MOTOR" data block via OPC

UA " Read	and sel	ect new values "
(unknown) - Siemens AG - OPC Scout V10		
File Edit View Server Explorer Workbook Tools Window	Help	
	a n a	
Server Explorer	~   m •	• a
1		
E- 🔋 CPU1516F	Variables Attributes	
B 🔁 Counters	ID	Value
DataBlocksGlobal	Node information	
B 📦 SPEED_MOTOR	T NodeID	ns=3:s="GBEED MOTOP" "Gnaed Satnoint"
B Segative_Speed	Node class	Variable
Bostive_Speed     Second Astron Value	[	
H H Speed Server 1	Attributes	
Icon	Browse name	3:Speed_Setpoint
🕀 🧊 DataBlocksInstance	Display name	Speed_Setpoint
🗄 🍞 Inputs	Write mask	
🕀 🧊 Memory	User write mask	U Falsa
Outputs	Type	float
B- 🔰 Timers	User access rights	Readable   Writeable
- 🚰 DeviceManual	Min. sampling interval	Indeterminate
- DeviceRevision	Historizing	False
EngineeringRevision		
HardwareRevision	Value	
	ST Value	14
v v	StatusCode	Good
·		
_] Workbook	• # ×	K DA view 1
[]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]		Monitorion ON 24 Generate values ON T Paul 4 Write
Project 'New project'		
B-B Server		
COM server		ID Display name Type Access rights Time stamp ( Value Q Res Server New Value Write re
Revenues IIA server		nttp://www.siemens.com/si Speed_actual_value Toat KW U//21/2018/07/24: 59.25/45 - Good opt.ttp://192.   -
opc.tcp://192.168.0.1:4840 [SIMATIC.S7-1500.0	DPC-UAServer:CPU1516F1	
B->> Views		
DA view 1		
		۲ III III
UTC		0

# 7.6 Access to SIMATIC S7-1500 via OPC-UA with SIMIT V9.1

#### 7.6.1 Copy SIMIT client certificate to the certificate memory

For data exchange over OPC UA, certificates confirm the identity of the connection partner. The certificates are automatically exchanged by the OPC UA client and OPC UA server when a connection is first established. Before each subsequent connection, the system checks whether the certificates are still valid.

During the installation of SIMIT, the private key (certificate) of the OPC UA client SIMIT generated during the installation is stored in the directory "C:\ProgramData\Siemens\Automation\ SIMIT\8.0\PKI\own\private".

The private key is only generated once and is not overwritten when the software is updated.

Before a connection can be established to the OPC UA server of the CPU SIMATIC S7-1500, the certificate generated during the installation of SIMIT must be copied into the certificate store of the user. For this purpose, there is a wizard which can be started by double-clicking on the single file "Simit.OPCua Client [....].pfx" in the folder "C:\ProgramData\Siemens\Automation\SIMIT\8.0\PKI\own\private".  $\rightarrow$ C:\ProgramData\ Siemens \Automation\SIMIT\8.0\PKI\own\private  $\rightarrow$  Simit.OPCUAClient [....].pfx)



 $\rightarrow$  In the first dialog, specify the storage location for the certificate. ( $\rightarrow$  Current user  $\rightarrow$  Next)

Welcome to th	e Certificat	e Import V	Wizard	
This wizard helps you co lists from your disk to a	opy certificates, c certificate store.	ertificate trust	ists, and certifi	cate revocation
A certificate, which is is and contains informatio connections. A certifica	sued by a certific n used to protect te store is the sys	ation authority, data or to esta stem area wher	is a confirmatic blish secure ne e certificates ar	on of your identity twork e kept.
Store Location				
Ourrent User				
To continue, click Next.				

 $\rightarrow$  In the second dialog, confirm the file name of the previously selected certificate. ( $\rightarrow$  Next)

File to Import					
Specify the	e file you want to	import.			
File name:					
AClient [	56A0B0A7C5AAEI	DDE5BA6C8A501	194AB4396DB69F8	.pfx Brow	se
Note: Mor	e than one certifi	icate can be stor	ed in a single file ir	the following fo	ormats:
Person	al Information Exc	change-PKCS #:	12 (.PFX,.P12)		
Crypto	graphic Message	Syntax Standard	- PKCS #7 Certific	ates (.P7B)	
Microso	ft Serialized Cert	ificate Store (.SS	т)		

→ In the following dialog, you can enter a password for the private key and select additional import options. Accept the default settings without password.

 $(\rightarrow Next)$ 

	Private key protection
	To maintain security, the private key was protected with a password.
53 <b>—</b>	Type the password for the private key.
	Password:
	Display Password
	Import options:
	Enable strong private key protection. You will be prompted every time the private key is used by an application if you enable this option.
	Mark this key as exportable. This will allow you to back up or transport your keys at a later time.
	Protect private key using virtualized-based security(Non-exportable)
	☐ Indude all extended properties.

 $\rightarrow$  Allow Windows to select the certificate store automatically. ( $\rightarrow$  Next)

Certifica	te Store				
Cer	tificate stores a	re system areas	s where certifica	tes are kept.	
Win the	dows can autor certificate.	natically select a	a certificate stor	e, or you can spe	cify a location for
(	Automatically	select the cert	ificate store bas	ed on the type of	certificate
(	) Place all certi	ficates in the fo	llowing store		
	Cartificata et	-076)			
	Concincaco a	.016,			Browse
					Drowscin

→ The selected settings for the import are then listed again. Start the import with "Finish" and close the alarm window with "OK". (→ Finish  $\rightarrow$  OK)

Co	mpleting t	he Certificate	Import Wiz	ard	
The	certificate will be	imported after you d	lick Finish.		
You	have specified th	e following settings:			
Ce	ertificate Store Sel	ected Automatically	determined by the	wizard	2
Co	ontent le Name	PFX C+\ProgramD	ata\Siemens\Autor	ation\SIMIT\S 0\	PKT\own\ori
4					>

Certificat	e Import Wizard	×
0	The import was successful.	
	ОК	

### 7.6.2 SIMIT application with "OPC UA Client" coupling

→ Start SIMIT from the desktop of your computer by double-clicking on the logo for the "SIMIT SP" application (→ SIMIT SP)



 $\rightarrow$  Confirm that you want to start SIMIT in "DEMO mode". ( $\rightarrow$  Yes)



→ Create a new project "092 300\_OPC UA S7-1500 SIMIT" project. (→ Create new project → 092 300\_OPC UA S7-1500 SIMIT → Create)

SIMIT DEMO			_ 🗆 ×
			SIEMENS SIMIT DEMO
StartCouplingsSimulation modelSimulation modelAutomatic model creationDiagnostics & visualization	<ul> <li>Open existing project</li> <li>Create new project</li> <li>Retrieve project</li> <li>Retrieve sample project</li> <li>Close project</li> <li>Getting started</li> </ul>	Create new project Projectname Target folder Author Comment	092 300_OPC UA 57-1500 SIMIT         C:\ProgramData\Siemens\Automation\SIMI         Create
	Unstalled software Help User interface language		

1 092 300_OPC UA S7	-1500 SIMI	T.				_ 🗆 ×
						SIEMENS SIMIT DEMO
Start			Getting starte	d		
Couplings	<b>4</b>	Open existing project	Project '092 3	00_OPC UA S7-1500 SIM	IT' was op	ened successfully. Please select the next s
Simulation mode	el 📘	Retrieve project Retrieve sample project	Start			
Automatic model creation	*	Close project				
Diagnostics & visualization	Q	$\sim \sim \sim \sim$	->	Couplings		Add coupling
		Getting started	-	Simulation model	5	Add chart
		Installed software Help	⊢	Automatic model creation	*	Generate charts automatically
						_
		User interface language				<u>.</u>
Project view		Opened project: C:\ProgramData\Siemens\Auto	omation\SIMIT\8	.0\DEMO\Examples\092 30	00_OPC UA	S7-1500 SIMIT\092 300_OPC UA S7-1500 SJ

 $\rightarrow$  Click here to go to the **"Project view"**. ( $\rightarrow$  Project view)

→ Specify a "New coupling" "OPC UA Client" for your project under "Couplings". (→ Couplings → New coupling → OPC UA Client → OK)

Pr	092 300_OPC UA S7-1500 SIMI oject Edit Simulation Window Autom	T atic modelling Options Help	_   ×
	<mark>之</mark> 門 / 現 副   ▶ 回		SIMIT DEMO
4	Project navigation		Macros
avigation	Project Simulation		▼ Basic macros
ct n	👙 092 300_OPC UA S7-1500 SIMI	Selection	? × Sine
Proje	Project manager Couplings New coupling Charts	New coupling SIMIT Unit	C Square
	New chart	PI CSIM Advanced	Viser macros
	Monitoring	PLCSIM	
	Material     Snapshots     Find & replace     Consistency check     Start	OPC DA Server OPC DA Client OPC UA Client Shared Memory	✓         Global macros         Gradient for the second se
		PRODAVE	▼ Project macros
		OK Cance	▼ 092 300_OPC UA 57-1500 SIMIT
	Portal view		

→ Open the settings for the **"OPC UA client"** with a double click and confirm the note for restricted couplings in SIMIT DEMO. ( $\rightarrow$  OPC UA Client  $\rightarrow$  OK)



→ In the "Properties" of the "OPC UA client", enter the server URL from the configuration settings of the OPC server in SIMATIC S7-1500. Select the end point and namespace as shown here. (→ OPC UA client → properties)

Pro	092 300_OPC UA S7-1500 SIM ject Edit Simulation Window Auton	IT natic modelling (	Options He	p					SIEMENS		- 0	×
	🔁 🛃 🔧 🖬 🏦 🕨 🖬									SIMIT DEM	10	
	Project navigation	OPC UA clie	nt (OPCU	AClient)*						_ 12	۲×	
E.	Project Simulation											2
atio		📙 🕞 🕞 Bro	owse									gna
avig		▼ Inputs	Reset filt	er								s
t	🏐 092 300_OPC UA S7-1500 SIMI	Default	Name -		Туре		Multiplier	Comment				
oje	Project manager		Ŧ		*	-	Ŧ	¥				
4	👻 🛁 Couplings	*										
	📣 New coupling											
	🥧 OPC UA client											
	👻 🛐 Charts											
	😭 New chart											
	Monitoring	▼ Outputs	Reset filt	er								
	Material	Name 🔺			Туре		Multiplier	Comment				
	🔒 Snapshots	Ŧ			<b>T</b>	•	*	Ŧ				
	M Find & replace	*										
	Consistency check											
	Start											
		OPC UA client				-				Properties		
		Property		Value								
		Time slice		2					-			
		OPC UA server U	JRL	opc.tcp://192.168.0.1:48	340							
		Endpoint		SIMATIC.S7-1500.OPC-U	AServer:CPU15	16F [Nor	ne, None] [opc.tcp://	192.168.0.1:484	0] 🔹			
		Namespace URI		http://www.siemens.con	n/simatic-s7-opc	ua			•			
		Status display		is_active								
	1											
	Portal view	client										

OPC UA client	Propertie	s 🔻
Property	Value	
Time slice	2	•
OPC UA server URL	opc.tcp://192.168.0.1:4840	
Endpoint	SIMATIC.S7-1500.OPC-UAServer:CPU1516F [None, None] [opc.tcp://192.168.0.1:4840]	•
Namespace URI	http://www.siemens.com/simatic-s7-opcua	•
Status display	is_active	

→ With the next step, you use "**Browse**" to start the import of the tags enabled for OPC UA into SIMATIC S7-1500. (→ Browse)

1	092 300	OPC	UA S7-15	500 SIN	1IT		
Pro	oject Edit	Simula	ition Windo	w Auto	matic modelling	Options	Help
	<u>-</u> 🖪 🖇	di 🗈					
	Project	: navig	ation		OPC UA c	ient (Ol	PCUAClient)*
E	Projec	t	Simulation				
jatic						Browse	

→ The "Actual speed value" and "Speed setpoint" tags from the global data block "SPEED\_MOTOR" are used as "Inputs" with the name "SPEED\_MOTOR"." Actual\_Speed\_Value" and "SPEED\_MOTOR"."Speed\_Setpoint". Enable the two tags in the "Properties" under "General" "Readback- capable signal".

(→ "SPEED\_MOTOR"."Actual\_Speed\_Value" → Signal which can be read back  $\checkmark$  → "SPEED\_MOTOR"."Actual\_Speed\_Value" → Signal which can be read back  $\checkmark$ )

Pro	092 300_OPC UA S7-1500 SIM ject Edit Simulation Window Auton	I <b>IT</b> natic modelling (	Options Help			SIEME	ENS	_ [	×
<b>8</b>							SIMIT D	EMC	<u>)</u>
	Project navigation	OPC UA clie	nt (OPCUAClient)*				_	R 🛓 🗙	< ◀
E	Project Simulation								2
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→ Select " Save all" and " Start" the simulation. (  $\rightarrow$  )

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 $\rightarrow~$  Confirm the message on limited runtime in SIMIT DEMO. (  $\rightarrow$  OK)

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i	Limited runtime. In SIMIT DEMO, the runtime of a simulation is limited to 45 minutes. Snapshots cannot be created nor loaded.
	OK

→ In the I/O field in front of the "SPEED\_MOTOR"."Speed\_Setpoint", this can now already be modified and written to the controller with "Enter". Cyclic reading is not yet possible. To do this, the simulation must first be closed again by clicking on "■". (→ 20.0 → Enter → ■)

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→ Assign the corresponding signals of the "Source" "OPC UA Client" to the "interconnections" of the two tags "SPEED\_MOTOR". "Actual\_Speed\_Value" and "SPEED\_MOTOR"."Speed\_Setpoint" from "Signals". This is done using drag-and-drop operation as shown below. (→ "SPEED\_MOTOR"."Actual\_Speed\_Value" → Connection → OPC UA client "SPEED\_MOTOR"."Actual\_Speed\_Value" → "SPEED\_MOTOR"." Speed\_Setpoint" → Connection → OPC UA Client "SPEED\_MOTOR"."Actual\_Speed\_ Value")

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→ Save your project with "Save All" and "Start" the simulation again. The current values from the controller are now displayed in the I/O field in front of the tags "SPEED\_MOTOR"."Actual\_Speed\_Value" and "SPEED\_MOTOR"."Speed\_Setpoint". Of course, you can still modify the "SPEED\_ MOTOR"."Speed\_Setpoint" tag. This is done by clicking on the "Tield in front of the tag so that it enables the writing of the tag in the "Tield" view. Now you can enter the desired value and write it to the controller using "Enter". (→

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### 7.6.3 Checklist – step-by-step instructions

The following checklist helps trainees/students to independently check whether all steps of the step-by-step instruction have been carefully completed and enables them to successfully complete the module on their own.

No.	Description	Checked
1	Values in the "SPEED_MOTOR" data block for read and write access enabled via OPC UA	
2	Enabling the OPC UA server in the CPU	
3	Security settings made for the OPC UA server	
4	Runtime license selected in the CPU	
5	Compiling successful and without error message	
6	Download successful and without error message	
7	Project successfully archived	
8	Successful test of OPC UA access with the OPC Scout	
9	Successful test of the OPC UA access with SIMIT	

# 8 Additional information

You can find additional information as an orientation aid to familiarize yourself or deepen your knowledge, for example: Getting Started, videos, tutorials, apps, manuals, programming guidelines and trial software / firmware, under the following link:

siemens.com/sce/opc

#### "Additional information" preview

Getting Started, Videos, Tutorials, Apps, Manuals, Trial-SW/Firmware

- > TIA Portal Tutorial Center
- > Getting Started
- > Programming Guideline
- SIMATIC S7-1500/ET 200MP Manual Collection
- SIMATIC S7-1500, ET 200MP, ET 200SP, ET 200AL, ET 200pro Communication
- > Network and Communication diagnostics
- > SIMATIC PROFINET with STEP 7 V15
- > Library for PROFINET data records
- > OPC UA Client Library
- > Creating of OPC UA clients with .NET and helper class
- > Siemens OPC UA Modeling Editor (SiOME) for implementing OPC UA companion specifications
- > OPC UA methods for the SIMATIC S7-1500 OPC UA server
- > How do you obtain the OPC UA variable nodes of the PLC tags of an S7-1500 OPC UA server to address them offline in an OPC UA client?
- > Download Trial Software/Firmware
- > Industry Online Support App
- > TIA Portal, SIMATIC S7-1200/1500 Overview
- > TIA Portal Website
- > SIMATIC S7-1500 Website

### **Additional information**

Siemens Automation Cooperates with Education siemens.com/sce

SCE Learn-/Training Document siemens.com/sce/module

SCE Trainer Packages siemens.com/sce/tp

SCE Contact Partners siemens.com/sce/contact

Digital Enterprise siemens.com/digital-enterprise

Industrie 4.0 siemens.com/future-of-manufacturing

Totally Integrated Automation (TIA) siemens.com/tia

TIA Portal siemens.com/tia-portal

SIMATIC Controller siemens.com/controller

SIMATIC Technical Documentation siemens.com/simatic-docu

Industry Online Support support.industry.siemens.com

Industry Mall catalog and ordering system **mall.industry.siemens.com** 

Siemens Digital Industries, FA P.O. Box 4848 90026 Nuremberg Germany

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