



S7-1200: Basic Controller with Advanced Functions

OPC UA Server



S7-1200 OPC UA Overview

• The open I4.0/IoT standard interface for easy and secure integration of any 3rd party device to the SIMATIC S7-1200 / S7-1500





OPC UA Server Data Access

Connect any 3rd party device to the S7-1200/S7-1500

Symbolic access to optimized or absolute addressed data of the PLC

Security integrated (Authentication, signed& encrypted communication)

Online browse and offline engineering

More features planned

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Read and write PLC-data easy, standardized and symbolic



Easy setup

2

3

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Confirm that you have purchased the correct license

Create an OPC UA Server Interface and download it to the PLC

Symbolic access via OPC UA

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Enable OPC UA

OPC UA Server Features Enabling the OPC UA Server





- 1. Double-click "Device configuration" in the project Tree
- In the inspector window below: Click "Properties" tab
- 3. Click "General" tab
- 4. Click 'General' settings under the OPC UA > Server > General
- 5. Check the "Activate OPC UA server" check box
- Click "OK" for the security note (This appears because We have not defined global OPC UA Security settings).



OPC UA Server Features Enabling the OPC UA Server

General IO tags	System constants Texts
 Pulse generators (PTO/PWM) Startup 	General
Cycle Communication load	Accessibility of the server
System and clock memory Web server	Activate OPC UA server
Multilingual support Time of day	Server addresses
Protection & Security OPC UA	Address 1
General	
General	
Options Security	< <u> </u>
Secure channel User authentication	









OPC UA Server Features Enabling the OPC UA Server

CPU 1215C [CPU 1215C DO	C/DC/DC]					🔍 Properties	🗓 Info	B Diagnostics	▋▋▋▼
General IO tags	System c	onstants	Texts]					
 PROFINET interface [X1] DI 14/DQ 10 	^	Runtime li	icenses _	·					
AI 2/AQ 2		OPC UA							
AQ1 Signal board									
 High speed counters (HSC) 		Runtime	licenses						
 Pulse generators (PTO/PWM) 									
Startup		T	Type of requi	red license:	SIMATIC OPC U/	A S7-1200 basic			T
Cycle		Тур	e of purchas	sed license:	SIMATIC OPC U/	A S7-1200 basic			
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Web server									
Multilingual support									
Time of day	-								
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Options									
Security									
Secure channel									
User authentication									
Advanced configuration									
Connection resources									
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• Runtime licenses				_					
1									



1. Select "Runtime licenses"

2. Select "SIMATIC OPC UA S7-1200 basic" as the type of license.





OPC UA Server Features Download CPU Project





- Click on the CPU1215C in the project tree. Select the Download icon on the toolbar
- 2. Click the "Download" icon from the project toolbar. 🛄

Since the previous module we disabled all other interfaces for simulation, we will be prompted with the "Extended download to device" screen. For help on this, please ask instructor or refer to instructions in module 4.

- 3. Click 'Load'.
- 4. Continue through the download prompts, as needed.

Note: Since the changed were hardware configuration settings, this download will put the CPU in "STOP".





Starting the OPC UA Client

OPC UA Server Features Starting a OPC UA Client





UaExpert is ready to use.

6/30/2020 4:41:... UaExpert

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OPC UA Server Features Starting a OPC UA Client





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OPC UA Server Features Accepting the CPU certificate

Certificate Validation	Certificate Validation ? X						
Walidating the certificate of server 'SIMATIC.57-1200.0PC-UA.Application:CPU 1215C' returned an error:							
BadCertificateUntrusted							
Certificate Chain							
Name	Trust Status						
CPU1215C/OPCU	A-1 Untrusted						
Certificate Details							
Errors					^		
Error	ok [BadCertificateUntruste	d]					
Subject							
Common Name	CPU1215C/OPCUA-1						
Organization	Siemens						
OrganizationUnit							
Locality							
State							
Country	DE						
DomainComponent							
Issuer							
Common Name	CPU1215C/OPCUA-1						
Organization	Siemens						
OrganizationUnit							
Locality							
State							
Country	DE						
DomainComponent							
Validity							
Valid From	Tue Jun 30 16:15:52 2020						
Valid To	Tue Jun 30 00:00:00 2037						
Info							
Serial Number	01						
Signature Algorithm	RSA-SHA256				. I I		
Cink on Channakh	DCA (2040 Lit)	2			<u> </u>		
		-	Trust Server	Certifica	te		
Accept the server certificat	e temporarily for this session		Continue	Cance	1		
1							



- 1. Check the box to accept the server certificate temporarily for this session.
- 2. Select "Continue"



OPC UA Server Features Viewing system data from the CPU





- 1. The CPU OPC UA Server is now connected
- 2. Select some system data parameter (such as OperatingMode and SerialNumber) and drag them to the Data Access View in the center area.
- 3. Note: The S7-1200 does not automatically create a *ServerInterface* so no process data is available yet.





Creating an OPC UA Server Interface

OPC UA Server Features

Create an OPC UA Server Interface

VA Siemens - C:\Users\Siemens\Documents\Automa	tion\\$7-1200 T	abletop Demo V16 KTP700 V3\S7-1200 Tabletop Demo V16 KTP700 V3
Project Edit View Insert Online Options To	ols Window H	Help
📑 📑 🛃 Save project 📑 🐰 🗐 🗊 🗙 🎝 🛨	🕶 🗄 🛄 I	🔓 🖳 🙀 Go online 🖉 Go offline 🛔 📭 📭 🧩 🖃 🛄 <search in="" projects="" td="" 👫<=""></search>
Project tree	🗉 🖣 S	7-1200 Tabletop Demo V16 KTP700 V3 🔸 CPU 1215C [CPU 1215C DC/DC/DC]
Devices Plant objects		📰 Topology view 🛛 🏪 Netw
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st l		
Name	Versio	Add new server interface X
S7-1200 Tabletop Demo V16 KTP700 V3	~	News
Add new device		Name: Senverinterface 1
🖁 🚠 Devices & networks		beiver interface_1
▼ ☐ CPU 1215C [CPU 1215C DC/DC/DC]		
Device configuration		2 Interface
😮 Online & diagnostics		
Program blocks		Saniar
Technology objects		interface
External source files	= <	J Description:
PLC tags		Server interfaces allow the manual definition of OPC UA nodes with individual structures based on SUM/IIC data type:
PLC data types		based on silvenic data types.
Watch and force tables		
🔻 📴 Online backups	Б	Companion
🕨 🕞 Traces		specification
🔻 🐼 OPC UA communication	1	
👻 🛄 Server interfaces		
👔 Add new server interface	•	
Device proxy data	•	
Program info	•	
PLC alarm text lists		
Local modules		
HMI KTP700 [KTP700 Basic PN]		
Ungrouped devices		
Security settings	•	
Cross-device functions		More
Common data		
Documentation settings		Additional information
Languages & resources		
La Version control interface		Add new and open OK Cancel
Online access		
Card Reader/USB memory	Ŷ	



- Open the TIA Portal project. In the project tree, navigate to OPC UA Communication > Server interfaces > add new server interface
- 2. Leave the default settings for the OPC UA interface.

Note: "Companion specification" option can be used to import standard interfaces like for <u>PackML</u>.



OPC UA Server Features Adding Data to the Server Interface



Export Interface 📑 Consistency check						
OPC UA server interface			OPC UA e	elements		
Browse name	Node type		Project o	lata	Data type	
Server interface_1	Interface	1	🕨 🕨 🔜 P	rogram blocks		
Analog Pot1	UINT	2	🔹 🕨 🎑 Te	echnology objects		
Analog Pot2	UINT	3	💌 💌 🌄 P	LC tags		
clock_byte	BYTE	4	• 🔹 💐	🖌 Default tag table		
<add new<="" td=""><td></td><td>5</td><td></td><td>📲 Tags</td><td></td><td></td></add>		5		📲 Tags		
		6		alwaysFALSE	Bool	
1		7		AlwaysTRUE	Bool	
		8		- Analog Pot1	UInt	
and the second se		- 9		- Analog Pot1 Norm	Real	
		10		- Analog Pot1 Scaled	Real	
		11		- Analog Pot2	UInt	
		_ 12		- Analog Pot2 Norm	Real	
		13		- Analog Pot2 Scaled	Real	
		14		- ASCII_RCV_Complete	Bool	
		15		- ASCII_RCV_CompleteOneS	n Bool	
		16		- ASCII_RCV_Error	Bool	
		17		- ASCII_RCV_Status	Word	
		18		- ASCII_Send_Complete	Bool	
		19		- ASCII_Send_Complete_On	e Bool	
		20		- ASCII_Send_Error	Bool	
		21		ASCII_Send_One_Shot	Bool	
		22		ASCII_Send_Status	Word	
		23		ASCII-In Enable	Bool	

- 1. Drag & drop tags from the OPC UA elements table on the right to the OPC UA server Interface table on the left.
 - PLC Tags \ Default tag table \ Tags \ Analog Pot1
 - PLC Tags \ Default tag table \ Tags \ Analog Pot2
 - PLC Tags \ Default tag table \ Tags \ **clock_Byte**
- 2. Download the project to the CPU





Testing the OPC UA Server Interface

OPC UA Server Features

Refreshing the server interface in the client





- 1. Switch back to UaExpert. Use the right mouse menu for the 1215 Demo under servers to "Disconnect".
- 2. Right mouse again to select "Connect". Accept the certificate again.

Validating the certificat	e of server 'SIMATIC.S/-1200.OPC-UA./	Application:CPU 1215C returned an err
BadCertificateUnt	rusted	
Certificate Chain		
Name	Trust Status	
S CPU1215C/OPCU	A-1 Untrusted	
Certificate Details		
Errors		· · · · · · · · · · · · · · · · · · ·
Error	ok [BadCertificateUntrusted]	
Subject	CPU1215C/OPCUA-1	
Organization	Siemenr	
OrganizationUnit	Siemens	
Locality		
State		
Country	DE	
DomainComponent	DE	
Issuer		
Common Name	CPU1215C/OPCUA-1	
Organization	Siemens	
OrganizationUnit		
Locality		
State		
Country	DE	
DomainComponent		
Validity		
Valid From	Tue Jun 30 16:15:52 2020	
Valid To	Tue Jun 30 00:00:00 2037	
Info		
Serial Number	01	
Signature Algorithm	RSA-SHA256	
Cink on Channakh	DCA (2040 Liz)	
		Trust Server Certificat



OPC UA Server Features

Viewing system data from the CPU



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Unified Automation UaExpert - The OPC U	Unified Architecture Client - N	1. Drag the new tags from the Server interface_1 folder to		
File View Server Document Settings	Help	the Data Access view in the center area.		
🜔 🥟 🕞 🐼 🥥 🖣 📼 🤻	🔉 💥 🔧 🧟 🖹	2. Adjust the 2 potentiometers on the demo kit to see the values change.		
Project E	Data Access View			Ŭ
🗸 🎵 Project	# Server	Node Id Display Name	e Value	Datage
✓ <i>D</i> Servers	1 1215 Demo	NS3 String Oper OperatingMode	e 8 (Run) In	t32
🏹 1215 Demo	2 1215 Demo	NS3 String Seria SerialNumber	S V-M4C77241 St	ring
🛩 📁 Documents	4 1215 Demo	NS4INumerici2 Analog Poti NS4INumerici3 Analog Pot2	14914 U	Intio
📁 Data Access View	5 1215 Demo	NS4 Numeric 4 clock_byte	14 B	rte
Address Space E No Highlight C Root C Dijects S CPU 1215C S CPU 1215C S Server C Server C Server	TX - Drag drag - Drag drag			
 Server interface_1 Analog Pot1 Analog Pot2 Icon clock_byte Types Views 				





S7-1200 OPC UA Additional Information

OPC UA Server for SIMATIC S7-1200 based CPUs Functional scope





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OPC UA Subscription – OPC UA Client subscribing to value change of data



OPC UA server is monitoring variables of the plc



OPC UA Client can ask for specific detailed subscription parameters

Filtering possible to avoid small changes of values



Security is an integral part of OPC UA

"The only communication technology in the factory, with implicit security features and the potential for the challenges posed by Industrie 4.0, that I am aware of today, is OPC-UA."

Result

-- Holger Junker, German Federal Office for Information Security, (BSI)

Workflow



XML-Export to make offline engineering of OPC UA clients even easier



OPC UA XML-Export directly out of the TIA Portal

Clients can be programmed offline without PLC

Standardized OPC UA XML file by the OPC Foundation

Export can be triggered by Openness API to support direct integration in 3rd party engineering





Licensing OPC UA @ SIMATIC S7-1500 CPU / SIMATIC S7-1200 CPU





Easy license concept with individual ordering number depending on the PLC-class



End of 'OPC UA Server'



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