



S7-1200: Basic Controller with Advanced Functions

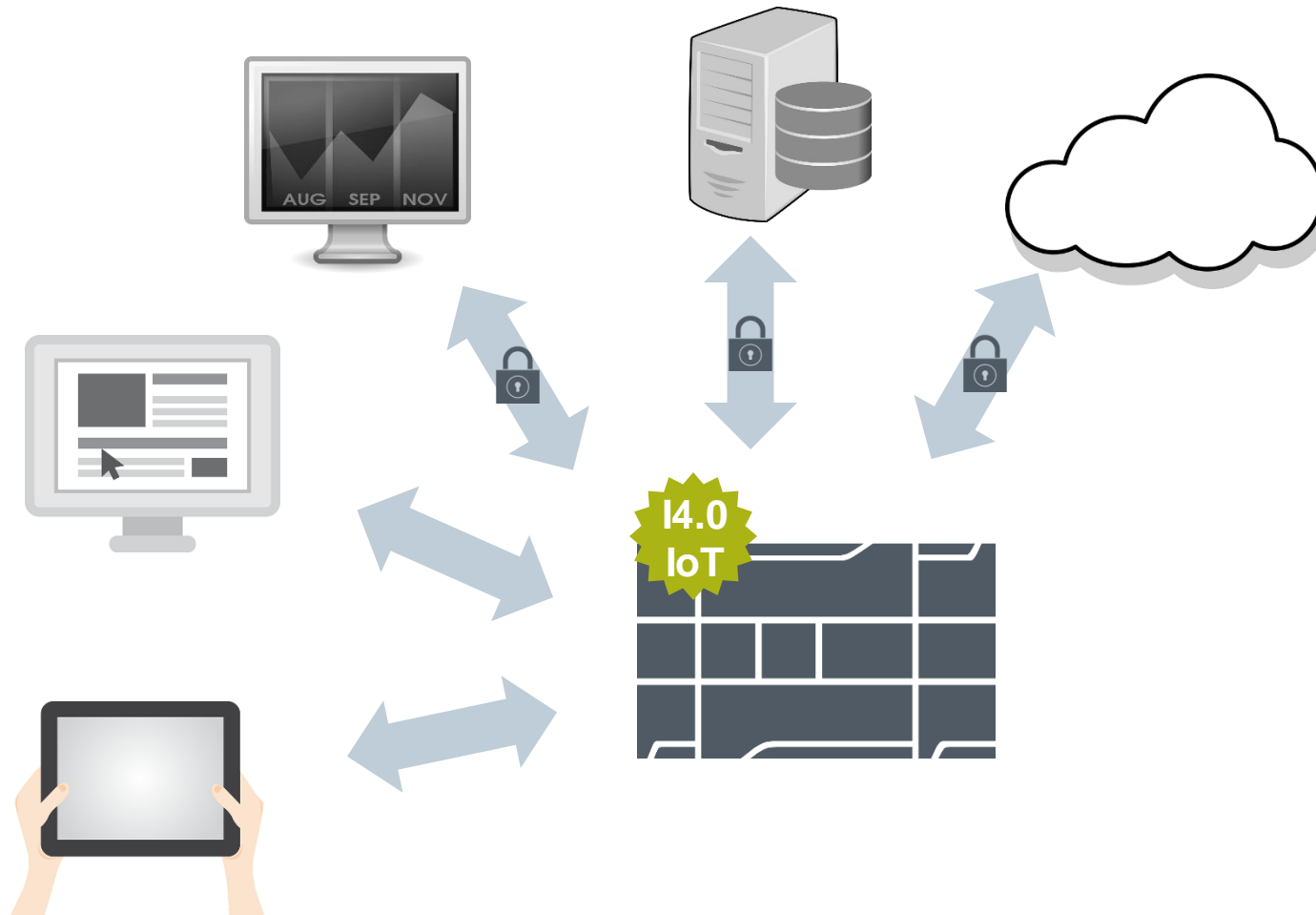
OPC UA Server

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

SIEMENS
Ingenuity for life



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



Read and write PLC-data easy, standardized and symbolic

Easy setup

1

Activate the OPC UA server in the PLC properties

2

Confirm that you have purchased the correct license

3

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

4

Symbolic access via OPC UA



Local data	Data type
Robot [DB 1]	Global DB
RobotName	String
MoveInable	Bool
ReleaseProd	Bool
Jobs	"RobotJob"
Used	Bool
Type	Byte
Reference	Byte
Started	Bool
Error	Bool
Done	Bool

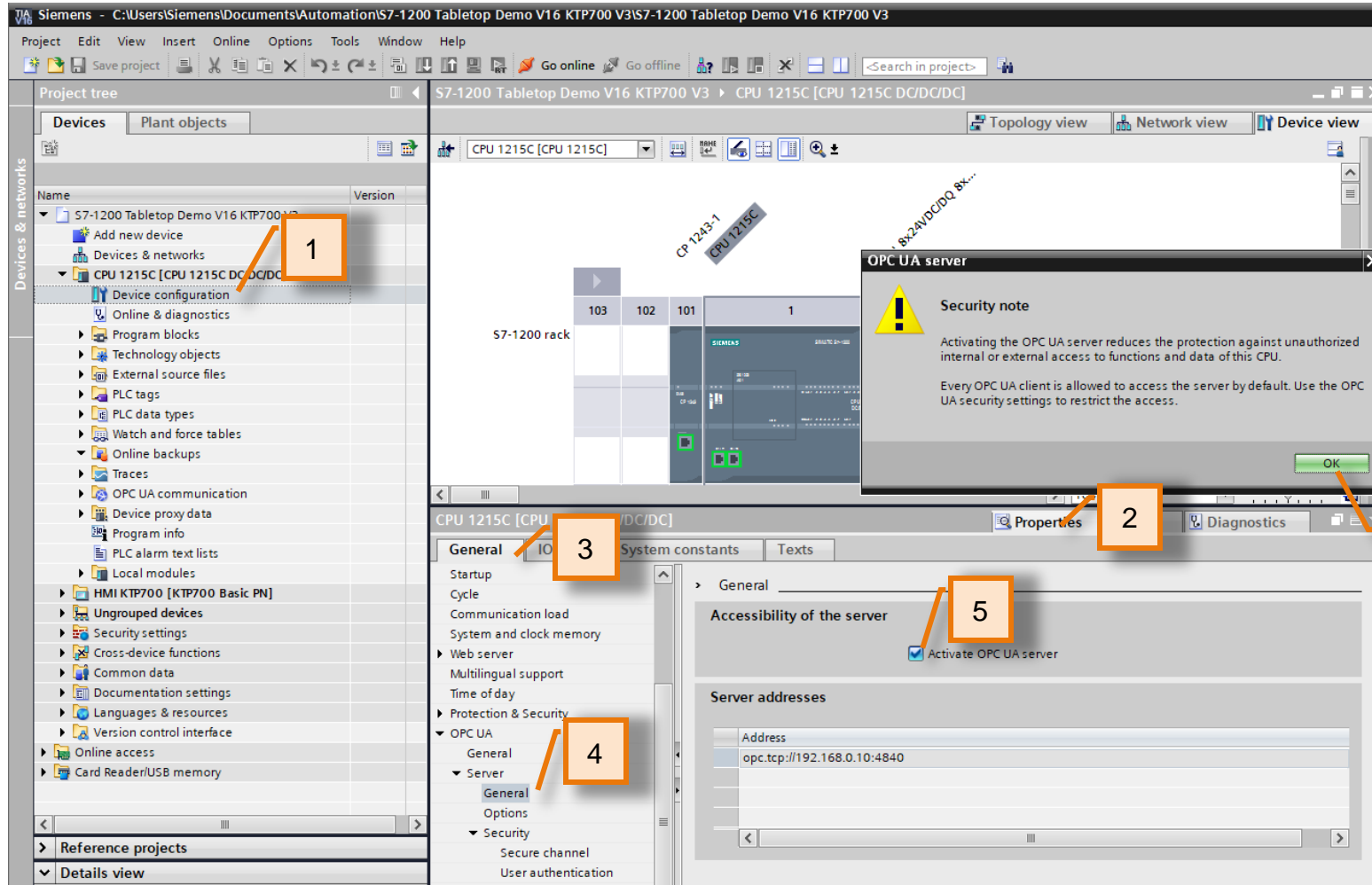
Path	Description	Go to	Errors	Warnings	Time
PLC_1			0	0	1:19:26 PM
OPCUA_Types (DB2)	Block was successfully compiled.		0	0	1:19:27 PM
	Compiling finished (errors: 0; warnings: 0)				1:19:28 PM



Enable OPC UA

OPC UA Server Features

Enabling the OPC UA Server

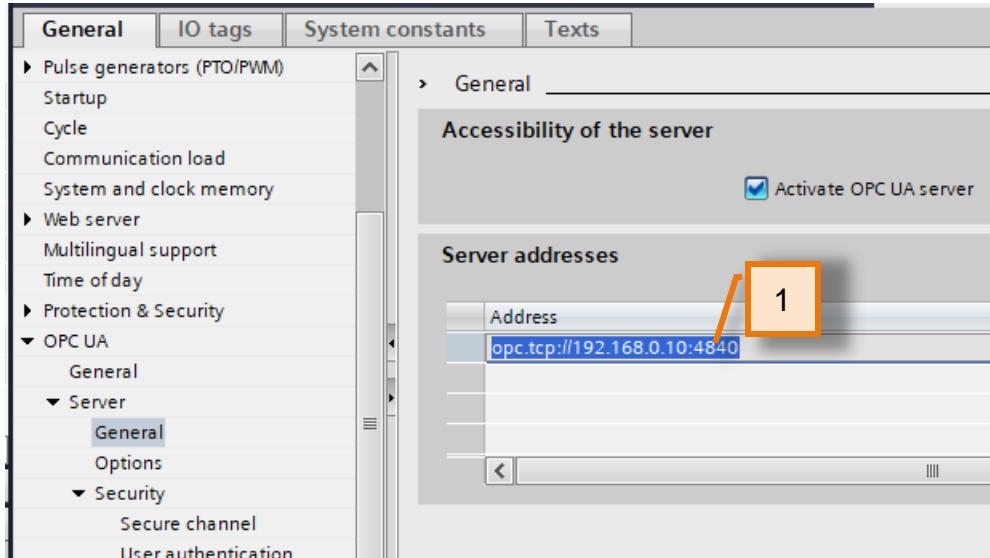


1. Double-click "Device configuration" in the project Tree
2. In the inspector window below:
Click "Properties" tab
3. Click "General" tab
4. Click 'General' settings under the OPC UA > Server > General
5. Check the "Activate OPC UA server" check box
6. Click "OK" for the security note (This appears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



OPC UA Server Features

Enabling the OPC UA Server

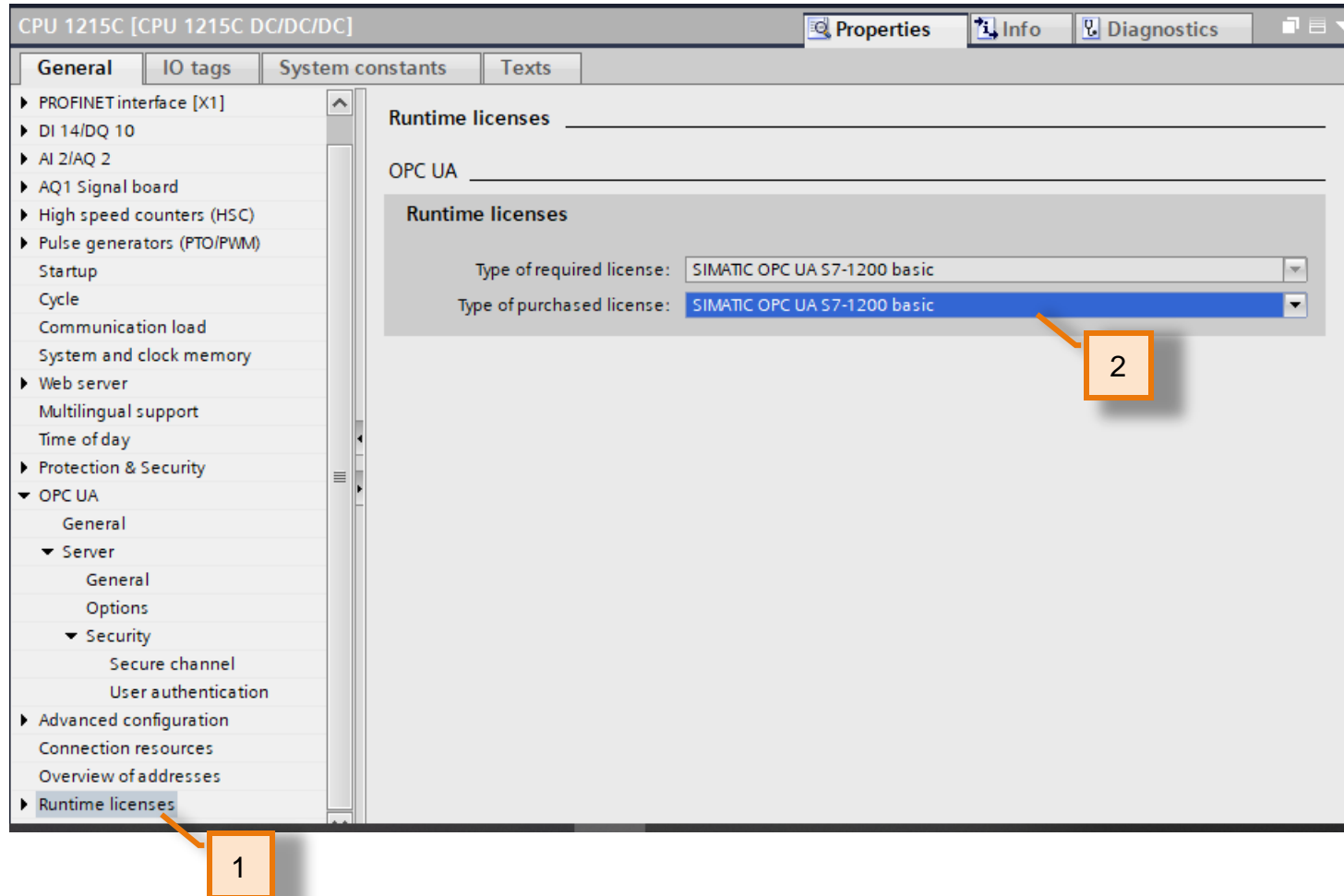


1. Copy the address.



OPC UA Server Features

Enabling the OPC UA Server



1. Select “Runtime licenses”
2. Select “SIMATIC OPC UA S7-1200 basic” as the type of license.




OPC UA Server Features

Download CPU Project

The screenshot shows the Siemens SIMATIC Manager interface. The project tree on the left is expanded to show the 'CPU 1215C [CPU 1215C DCD/DC]' under the 'S7-1200 Tabletop Demo V16 KTP700 V3' project. A callout '1' points to this entry. The main workspace shows a network diagram with a CPU 1215C and a DI 8x24V/DC/DO 8x... module. A callout '2' points to the 'Download' icon on the toolbar. The 'Extended download to device' dialog box is open, showing a table of configured access nodes and a table of target devices. A callout '3' points to the 'Load' button at the bottom of the dialog box.

Device	Device type	Slot	Interface type	Address	Subnet
CPU 1215C	CPU 1215C DCD/...	1 X1	PN/IE	192.168.0.10	PN/IE_2
CP 1243-1	CP 1243-1	101 X1	PN/IE	192.168.1.1	PN/IE_1
CPU 1215C	CP 1243-1	101	TeleService	200165	

Device	Device type	Interface type	Address	Target device
CPU 1215C	CPU 1215C DCD/...	PN/IE	192.168.0.10	CPU 1215C
	Device type	PN/IE	Access address	

1. 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.

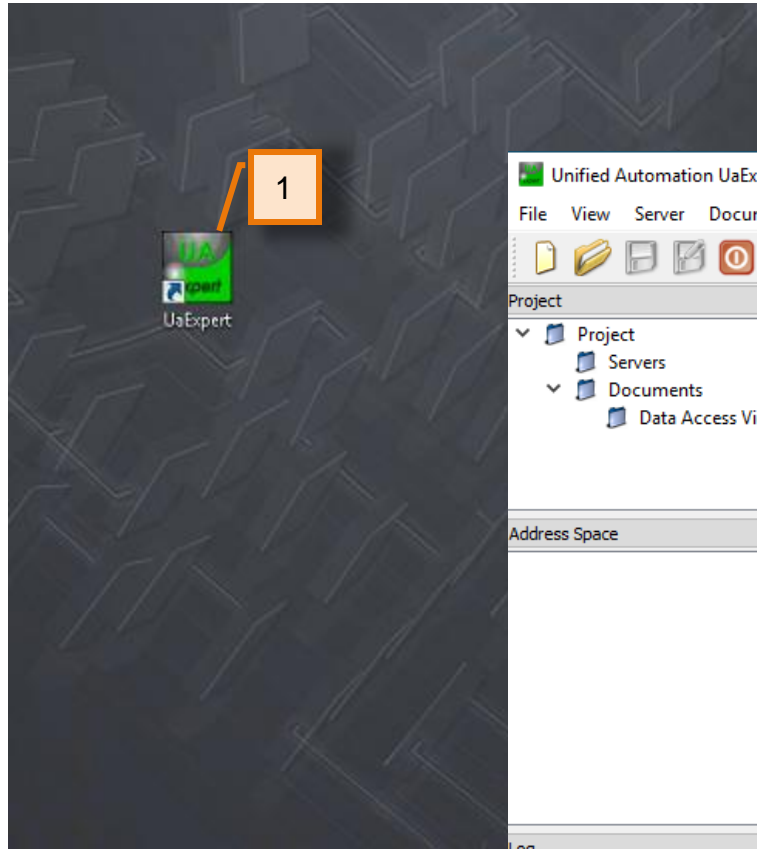
Note: Since the changed were hardware configuration settings, this download will put the CPU in "STOP".



Starting the OPC UA Client

OPC UA Server Features

Starting a OPC UA Client



1. Minimize TIA Portal then from the desktop open the application "UaExpert"

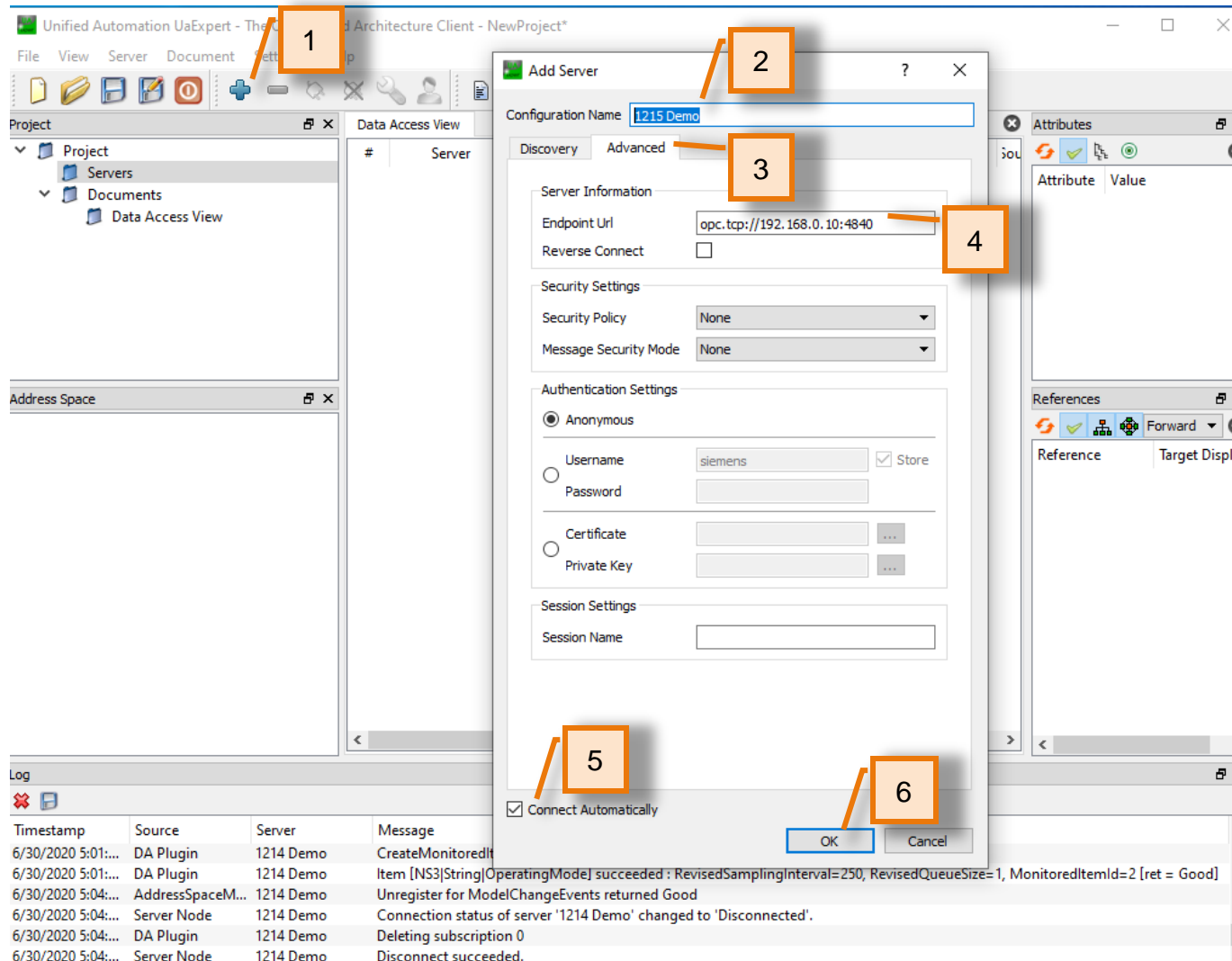
If it ask for additional information when launching enter "Siemens" as Organization .


Timestamp	Source	Server	Message
6/30/2020 4:41:...	UaExpert		Loaded Server Diagnostic Plugin (Static Plugin)
6/30/2020 4:41:...	UaExpert		Loaded Data Logger Plugin (Static Plugin)
6/30/2020 4:41:...	UaExpert		Loaded GDS Push Plugin (Static Plugin)
6/30/2020 4:41:...	UaExpert		Loaded File Transfer Plugin (Static Plugin)
6/30/2020 4:41:...	UaExpert		Loaded XML Nodeset Export Plugin (Static Plugin)
6/30/2020 4:41:...	UaExpert		UaExpert is ready to use.



OPC UA Server Features

Starting a OPC UA Client

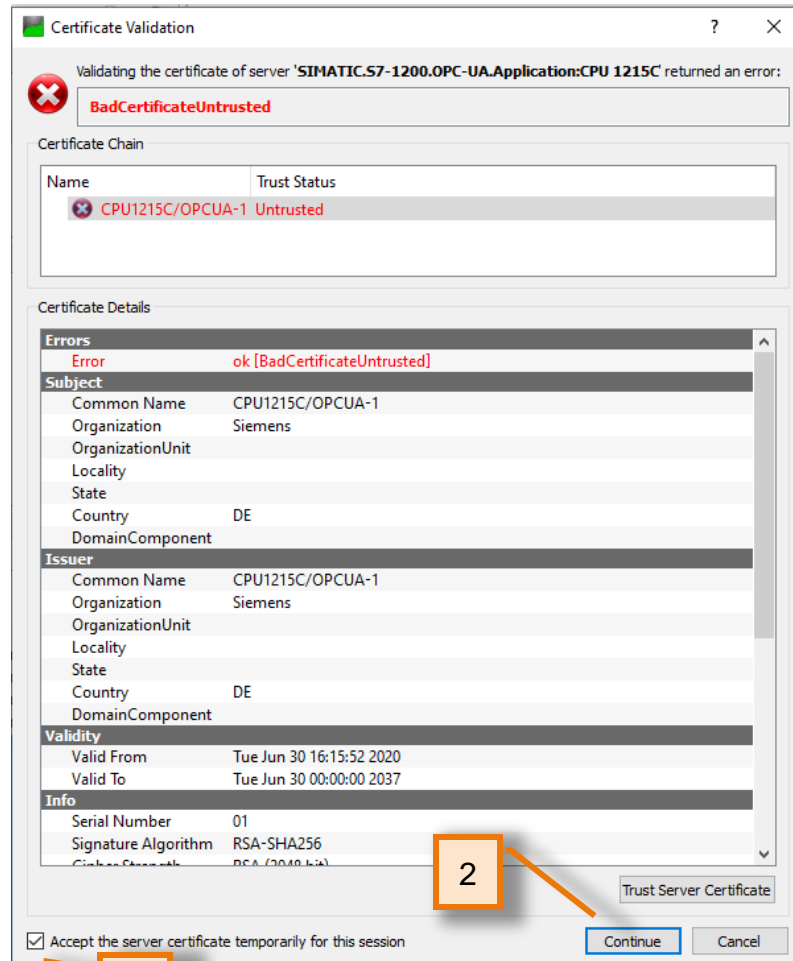


1. Add a new server connection by clicking the blue plus icon on the toolbar. 
2. Name the connection "1215 Demo"
3. Select the "Advanced" tab
4. Paste the Url that was copied from the CPU properties (opc.tcp://192.168.0.10:4840).
5. Make sure "Connect Automatically" is checked
6. Select "OK". This leave the user as "Anonymous" with no security settings.



OPC UA Server Features

Accepting the CPU certificate



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

Unified Automation UaExpert - The OPC Unified Architecture Client - NewProject*

File View Server Document Settings Help

Project

#	Server	Node Id	Display Name	Value	Datatype
1	1215 Demo	NS3 String Oper...	OperatingMode	8 (Run)	Int32
2	1215 Demo	NS3 String Seria...	SerialNumber	S V-M4C77241	String

Address Space

No Highlight

Root

Objects

- CPU 1215C
 - DeviceManual
 - DeviceRevision
 - EngineeringRevision
 - HardwareRevision
 - Manufacturer
 - Model
 - OperatingMode
 - OrderNumber
 - RevisionCounter
 - SerialNumber
 - SoftwareRevision
- DeviceSet
- Server
- ServerInterfaces

Drag & drop

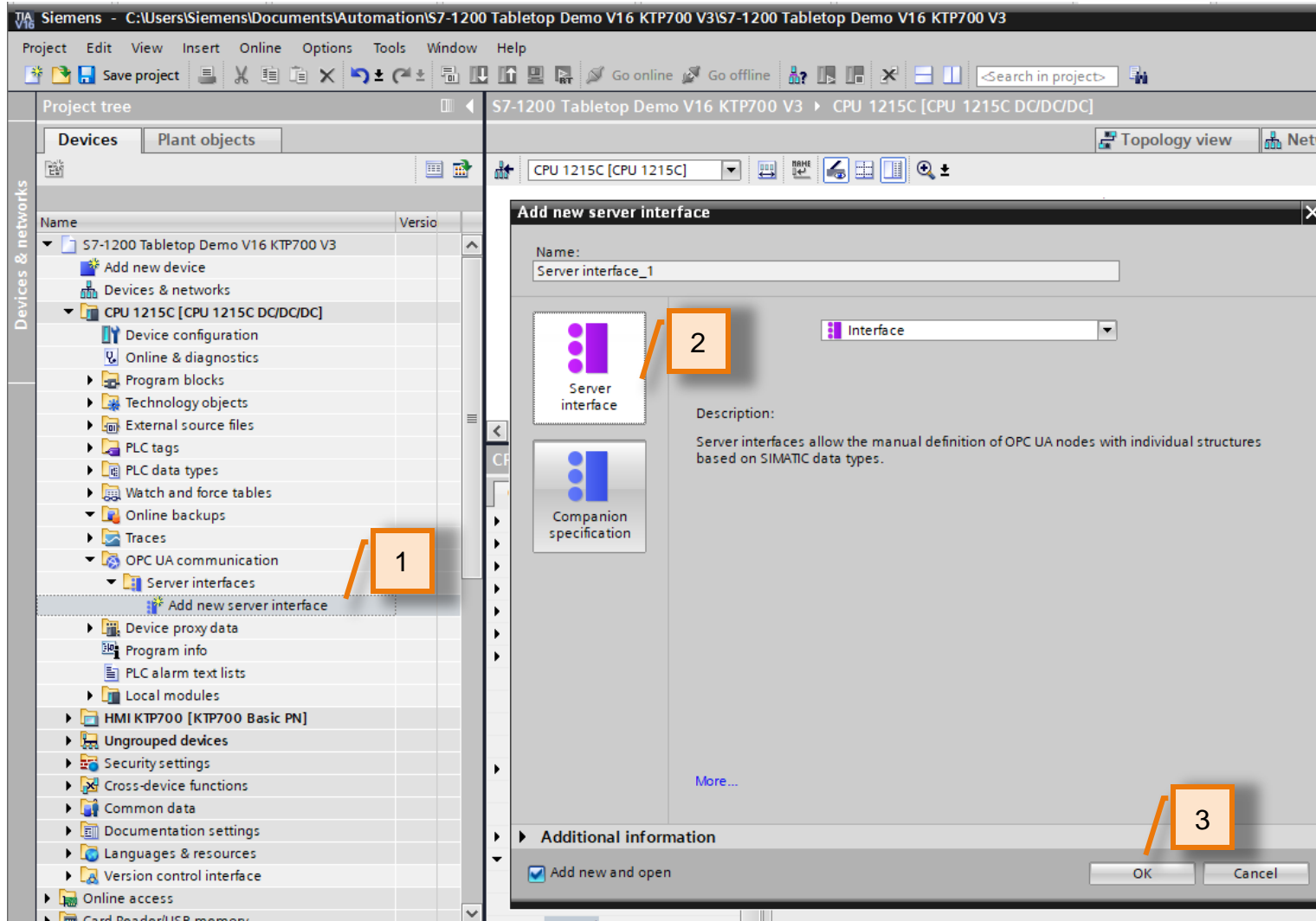
1. The CPU OPC UA Server is now connected
2. Select some system data parameter (such as OperatingMode and SerialNumber) and drag them to the Data Access View in the center area.
3. Note: The S7-1200 does not automatically create a *ServerInterface* so no process data is available yet.



Creating an OPC UA Server Interface

OPC UA Server Features

Create an OPC UA Server Interface



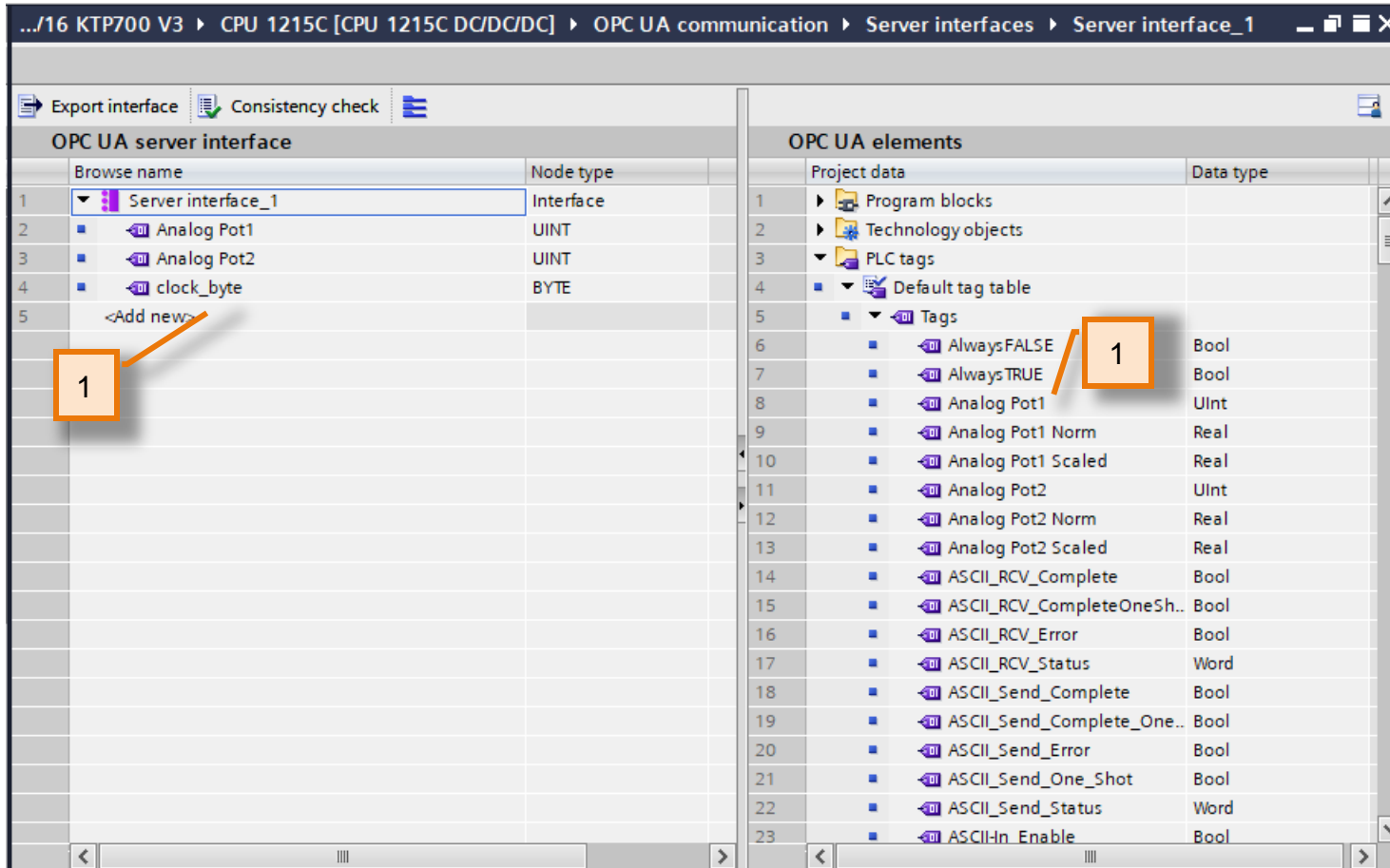
1. Open the TIA Portal project. In the project tree, navigate to *OPC UA Communication > Server interfaces > add new server interface*
2. Leave the default settings for the OPC UA interface.

Note: "Companion specification" option can be used to import standard interfaces like for [PackML](#).



OPC UA Server Features

Adding Data to the Server Interface



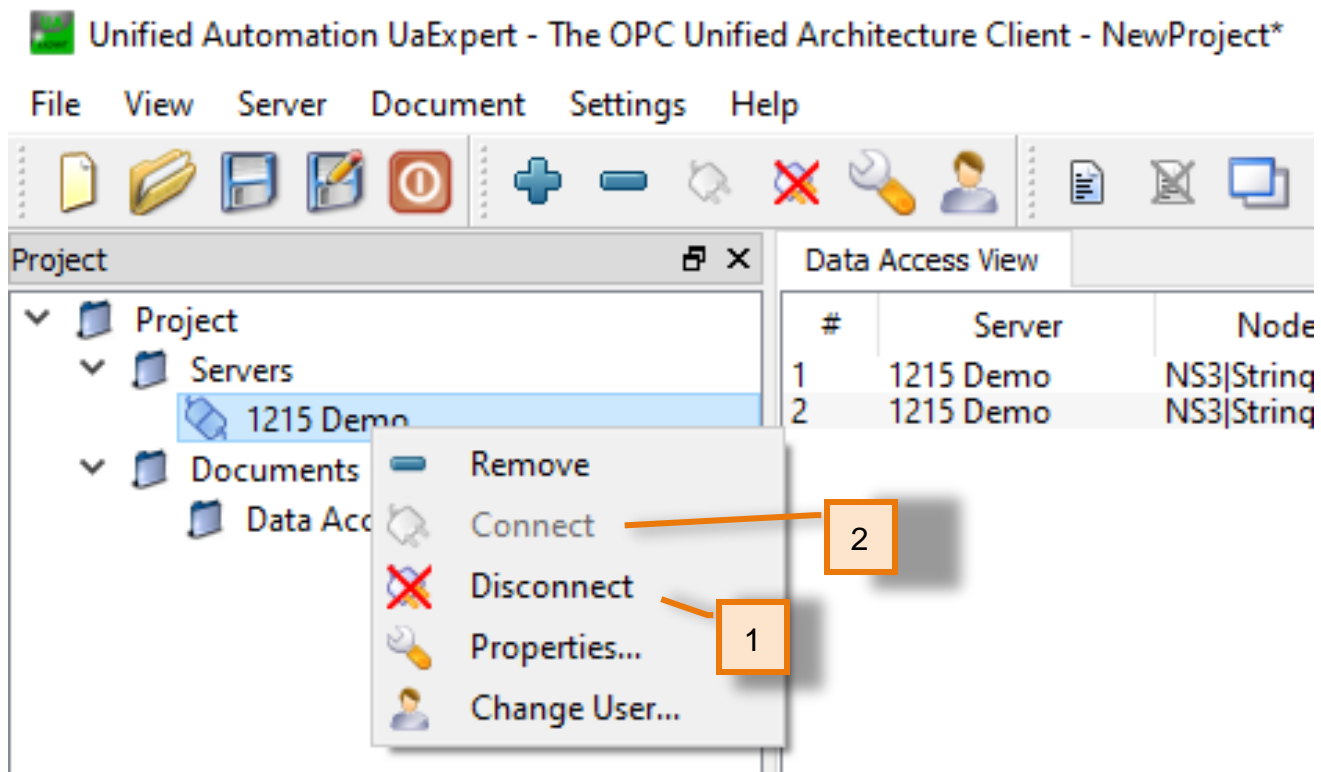
1. Drag & drop tags from the OPC UA elements table on the right to the OPC UA server Interface table on the left.
 - PLC Tags \ Default tag table \ Tags \ **Analog Pot1**
 - PLC Tags \ Default tag table \ Tags \ **Analog Pot2**
 - PLC Tags \ Default tag table \ Tags \ **clock_Byte**
2. Download the project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



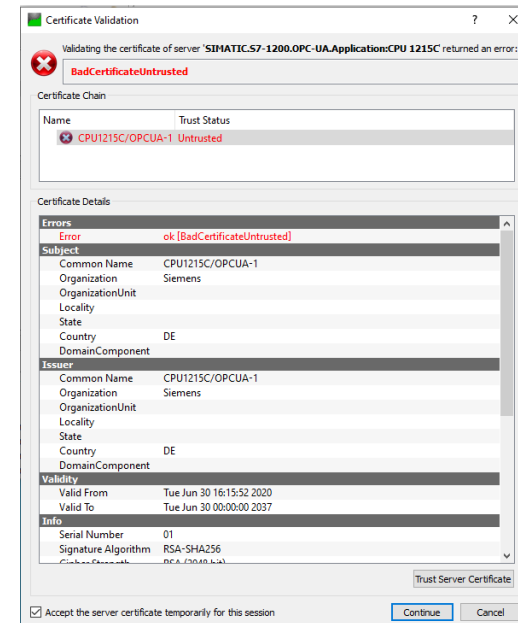
Testing the OPC UA Server Interface

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.



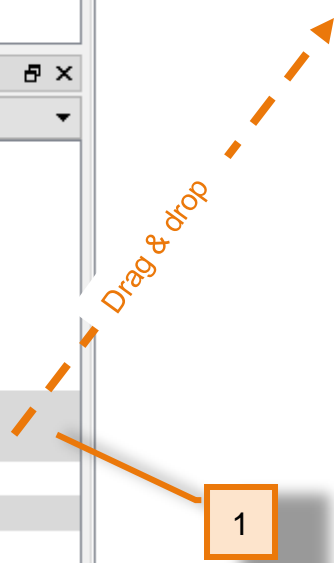
OPC UA Server Features

Viewing system data from the CPU

The screenshot shows the Siemens Unified Automation UaExpert interface. The main window is titled "Unified Automation UaExpert - The OPC Unified Architecture Client - NewProject*". The menu bar includes File, View, Server, Document, Settings, and Help. The toolbar contains various icons for file operations and server management. The Project tree on the left shows a hierarchy: Project > Servers > 1215 Demo > Documents > Data Access View. The Address Space tree on the left shows: Root > Objects > CPU 1215C > DeviceSet > Server > ServerInterfaces > Server interface_1 > Analog Pot1, Analog Pot2, Icon, clock_byte. The Data Access View table in the center displays the following data:

#	Server	Node Id	Display Name	Value	Datatype
1	1215 Demo	NS3 String Oper...	OperatingMode	8 (Run)	Int32
2	1215 Demo	NS3 String Seria...	SerialNumber	S V-M4C77241	String
3	1215 Demo	NS4 Numeric 2	Analog Pot1	9078	UInt16
4	1215 Demo	NS4 Numeric 3	Analog Pot2	14914	UInt16
5	1215 Demo	NS4 Numeric 4	clock_byte	14	Byte

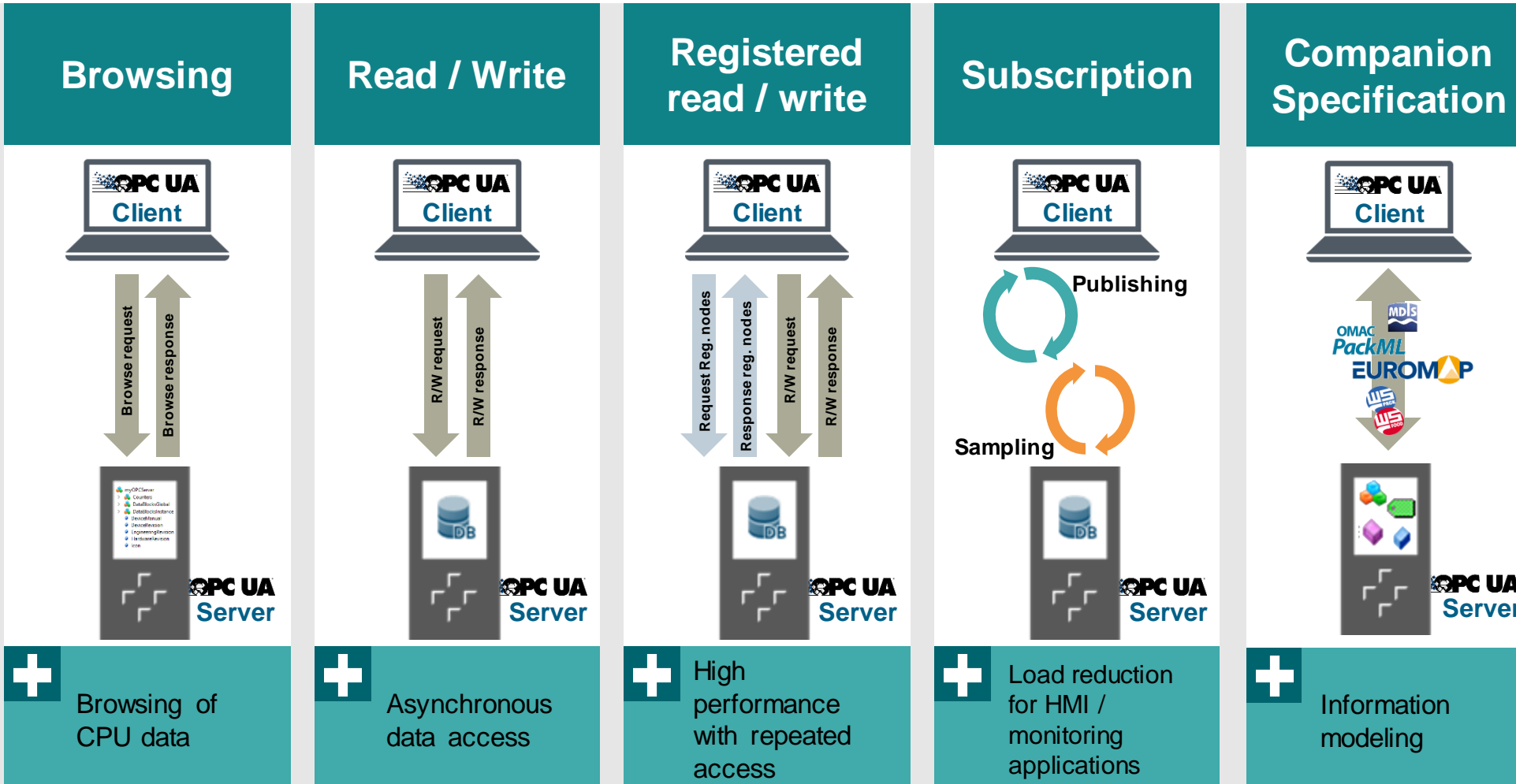
1. Drag the new tags from the Server interface_1 folder to the Data Access View in the center area.
2. Adjust the 2 potentiometers on the demo kit to see the values change.



S7-1200 OPC UA Additional Information

OPC UA Server for SIMATIC S7-1200 based CPUs

Functional scope



Limitations in the first version:

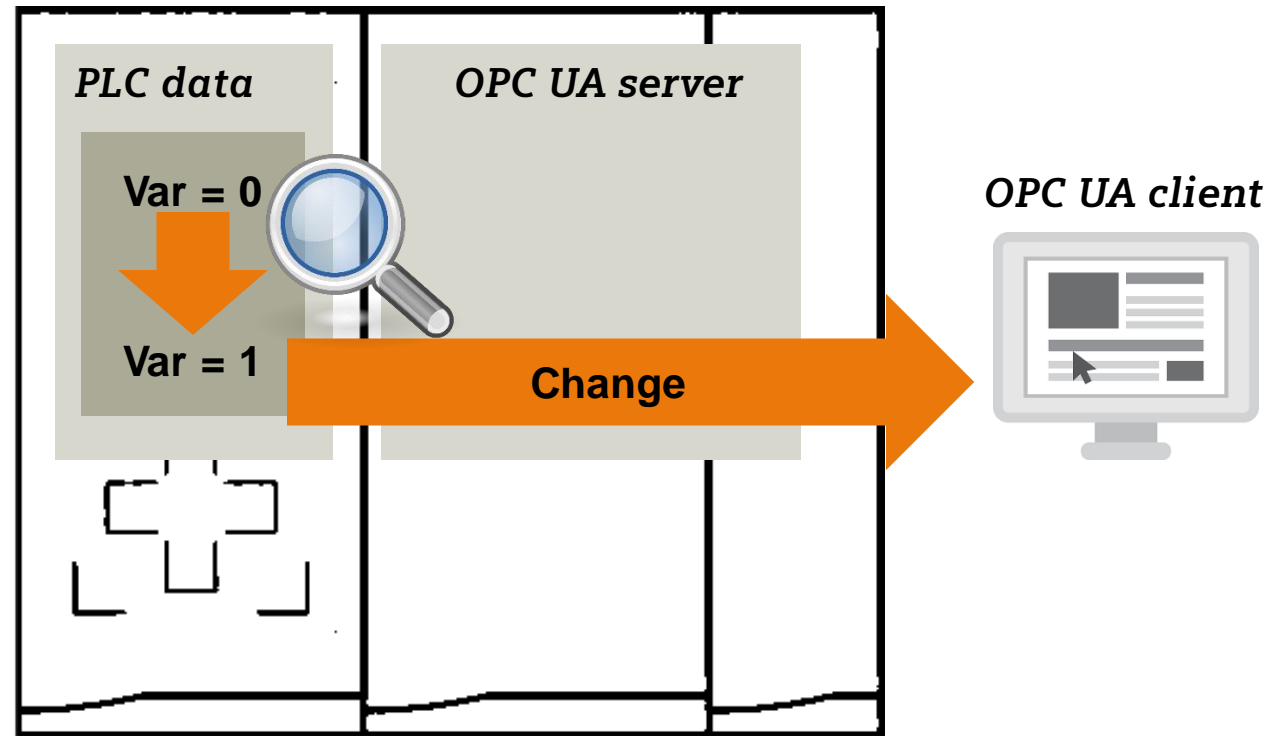
- No support of structured data types and arrays
- No support of Methods
- No support of Alarms & Conditions



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

OPC UA server is monitoring variables of the plc

- + Network bandwidth used is minimized
- + 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

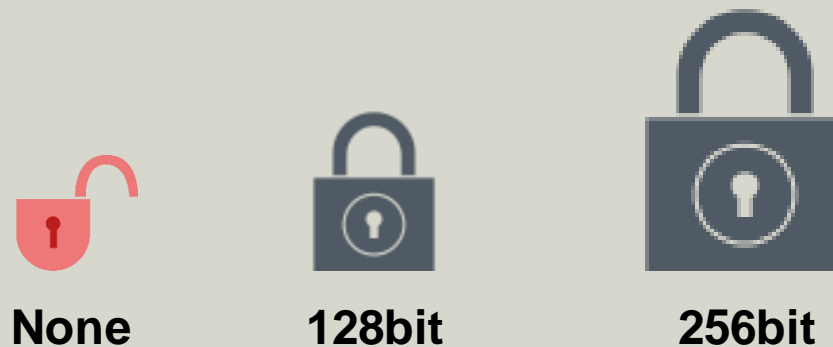
“The only communication technology in the factory, with implicit security features and the potential for the challenges posed by Industrie 4.0, that I am aware of today, is OPC-UA.”

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

Workflow

- 1 Export of the OPC UA server certificate from the TIA Portal and import in 3rd party engineering
- 2 Import of the OPC UA client certificate into the TIA Portal
- 3 Add the OPC UA client certificate to the trust list of the OPC UA server
- 4 User authentication by username & password additionally possible

Offline certificate exchange



Result

Proven technology

Analog common technologies like TLS

2 step concept

Application and user authentication

Use Case specific

Multiple security policies can be offered at the same time

Performance

Unsecure communication possible for maximum performance



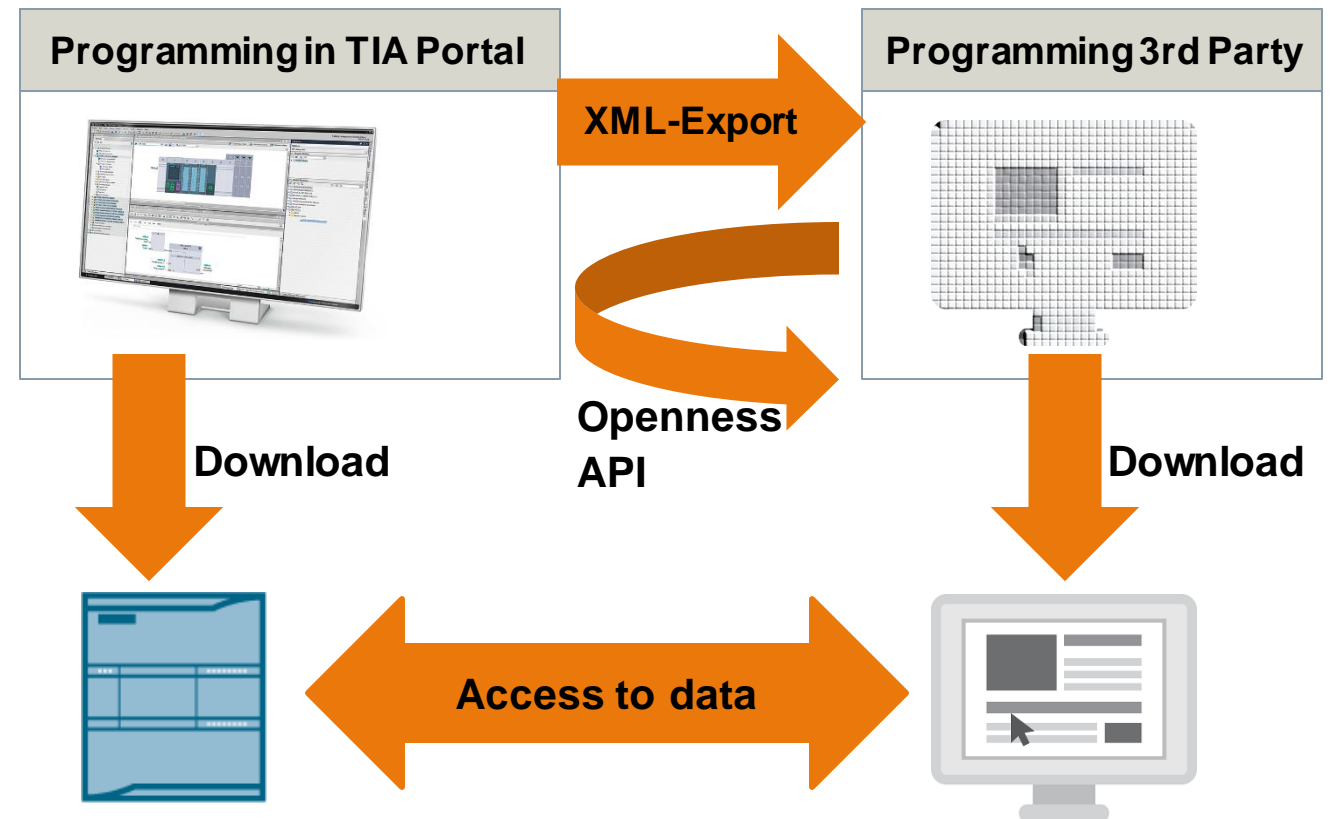
XML-Export to make offline engineering of OPC UA clients even easier

OPC UA XML-Export directly out of the TIA Portal

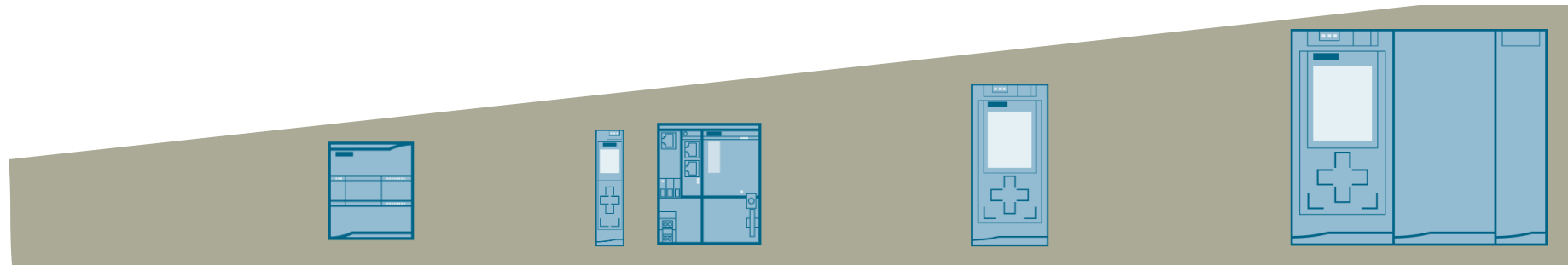
+ Clients can be programmed offline without PLC





+ 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



CPU-Type	CPU-1200	ET 200SP CPU up to CPU-1513 (F)	CPU-1515 / CPU-1516 (F)	CPU-1517 / CPU-1518(F)
Required License	 basic	 small	 medium	 large
Price	50€	100€	200€	300€

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



End of 'OPC UA Server'



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