SIEMENS
Ingenuity for life

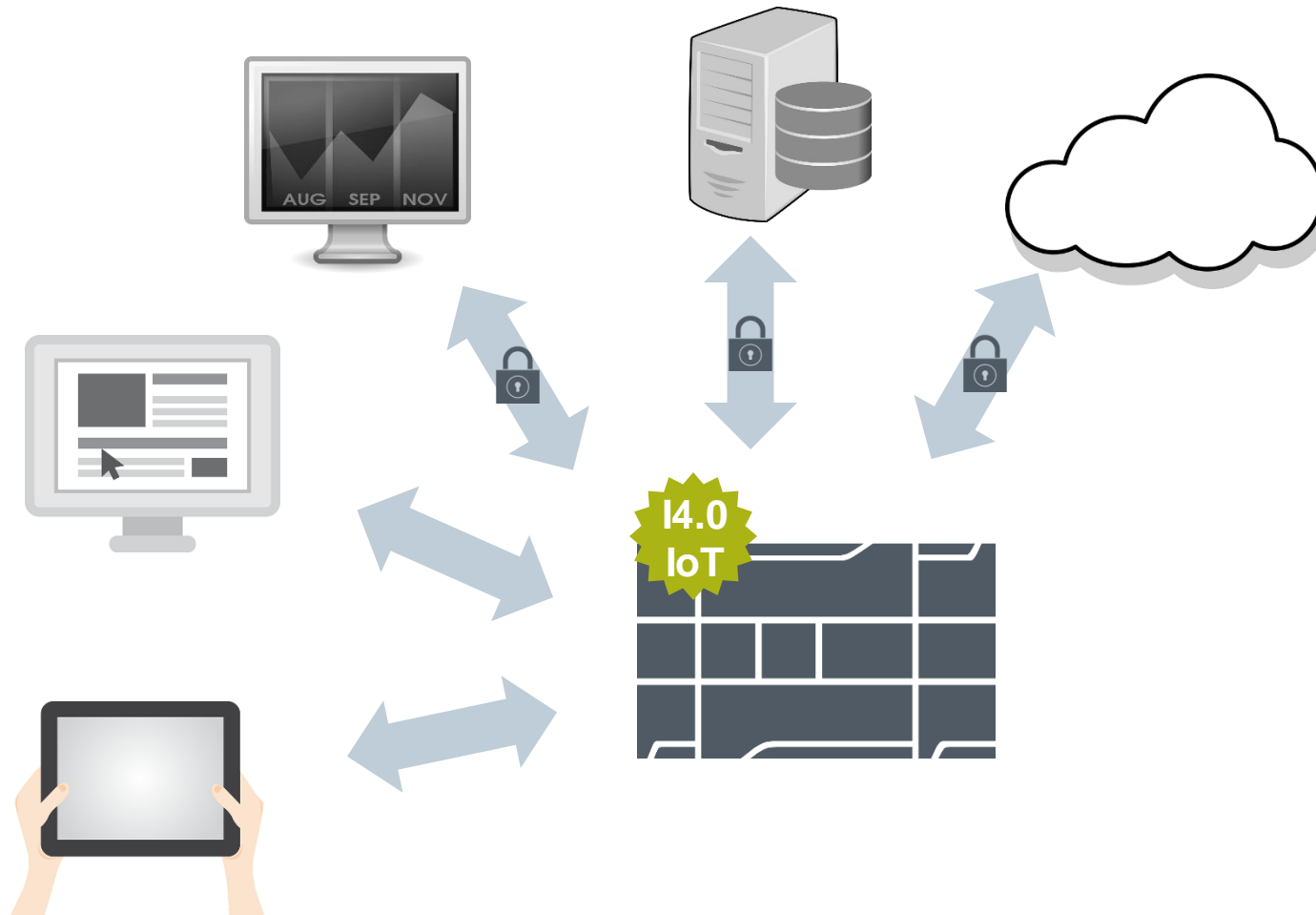# S7-1200: Basic Controller with Advanced Functions

OPC UA Server

S7-1200 OPC UA Overview

OPC UA - 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**

I4.0 IoT

usa.siemens.com/s7-1200

Read and write PLC-data easy, standardized and symbolic

SIEMENS
Ingenuity for life

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 ✓

usa.siemens.com/s7-1200

SIEMENS
Ingenuity for life

Enable OPC UA

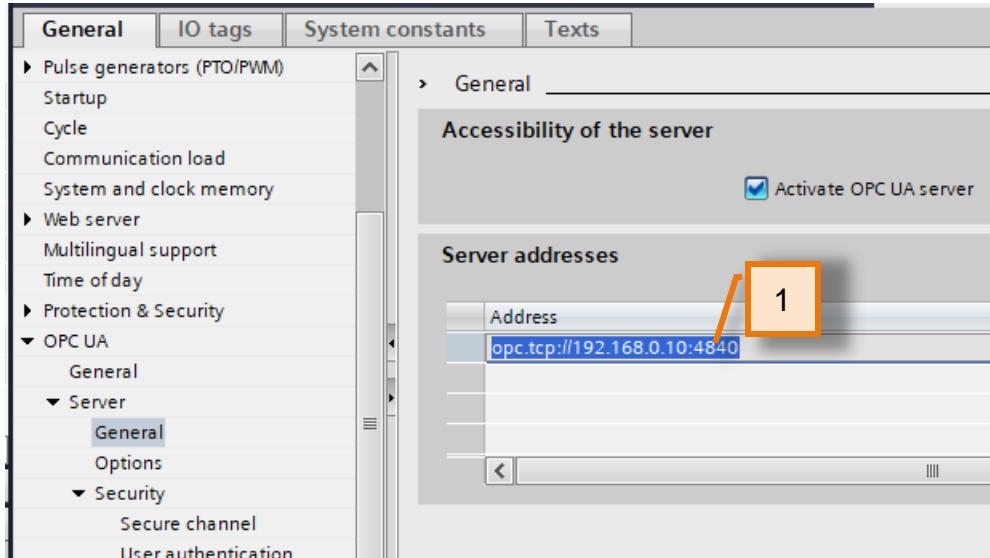# OPC UA Server Features
Enabling the OPC UA Server
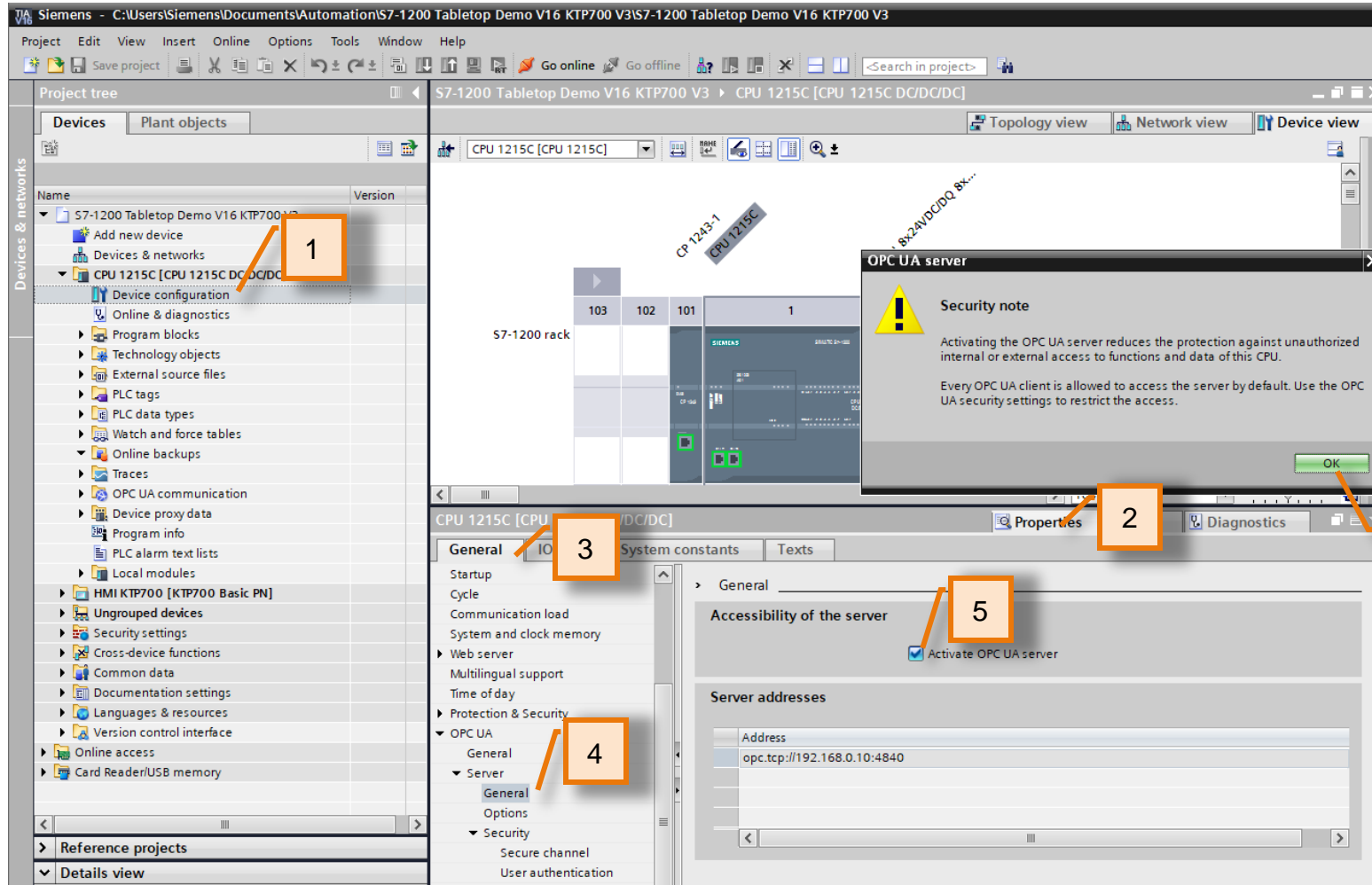
1. Double-click "Device configuration" in the project Tree

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).

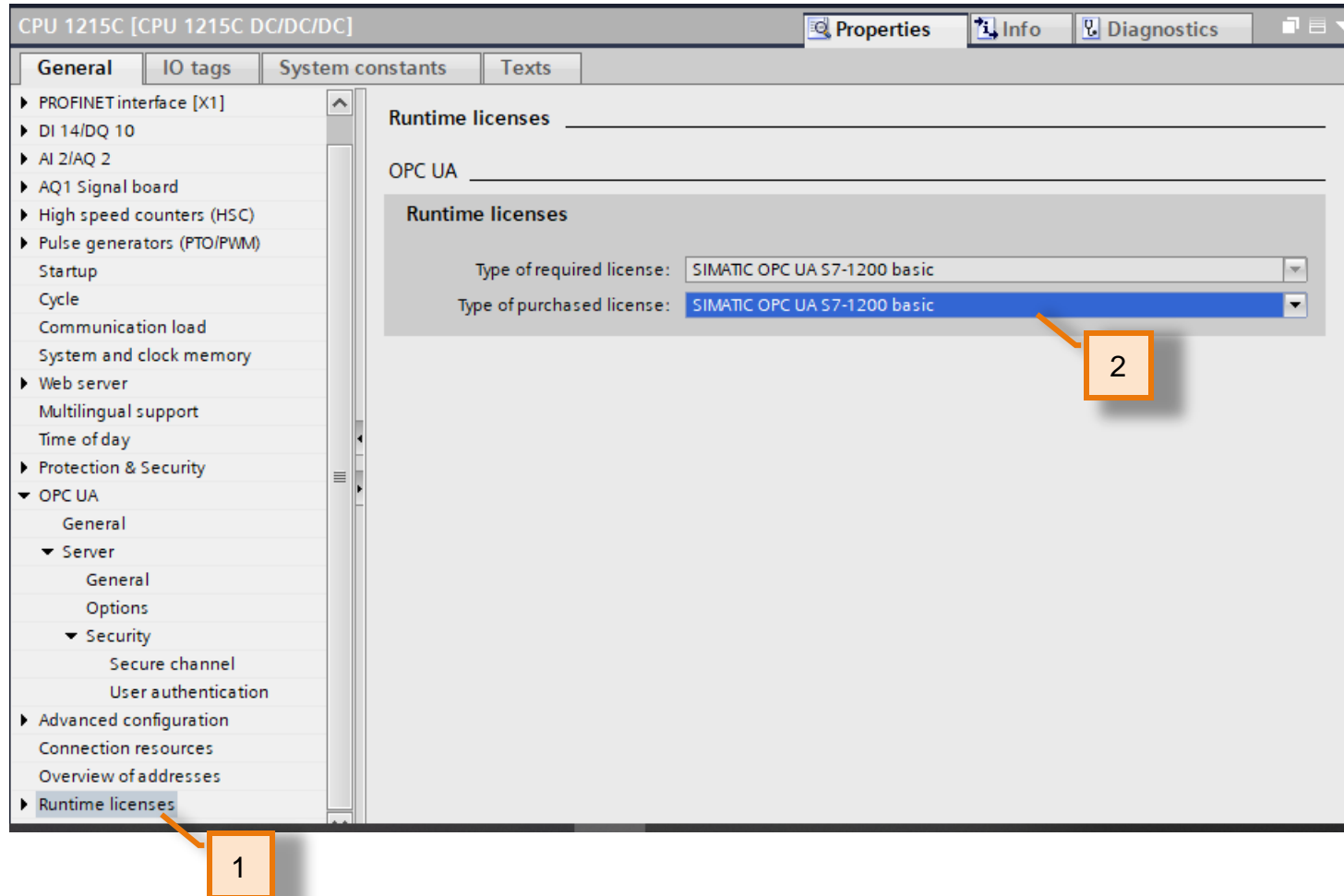# OPC UA Server Features
Enabling the OPC UA Server

General	IO tags	System constants	Texts

- Pulse generators (PTO/PWM)
- Startup
- Cycle
- Communication load
- System and clock memory
- Web server
- Multilingual support
- Time of day
- Protection & Security
- OPC UA
  - General
  - Server
    - General
    - Options
    - Security
      - Secure channel
      - User authentication

> General

Accessibility of the server

☑ Activate OPC UA server

Server addresses

Address
opc.tcp://192.168.0.10:4840

1

1. **Copy the address.**

SIEMENS
Ingenuity for life

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.

usa.siemens.com/s7-1200

OPC UA Server Features
Download CPU Project

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. [icon]

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'.

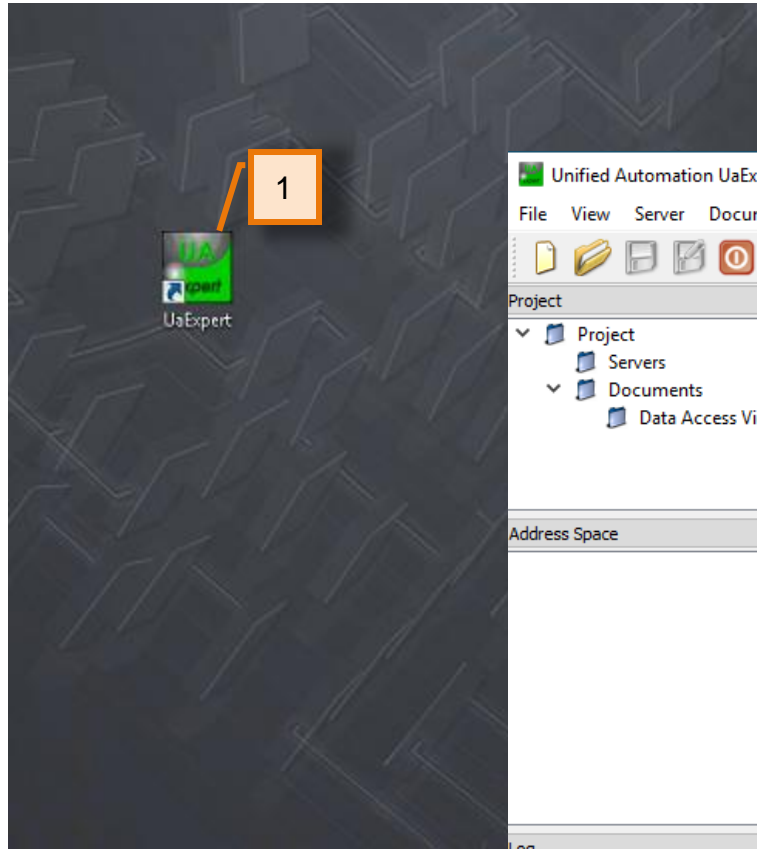4. Continue through the download prompts, as needed.

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

usa.siemens.com/s7-1200

Starting the OPC UA Client

OPC UA Server Features
Starting a OPC UA Client

SIEMENS
Ingenuity for life

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

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

usa.siemens.com/s7-1200

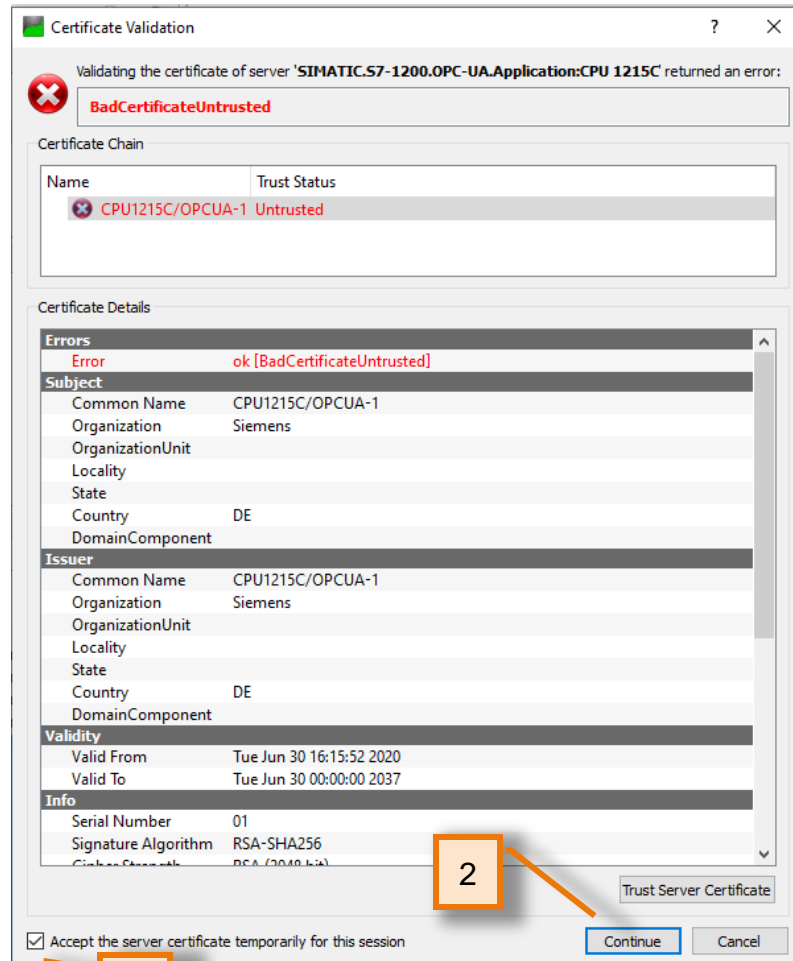# OPC UA Server Features
Starting a OPC UA Client

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.

usa.siemens.com/s7-1200

OPC UA Server Features
Accepting the CPU certificate

1. Check the box to accept the server certificate temporarily for this session.

2. Select "Continue"

usa.siemens.com/s7-1200

OPC UA Server Features
Viewing system data from the CPU

SIEMENS
Ingenuity for life

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.

usa.siemens.com/s7-1200

Creating an OPC UA Server Interface

OPC UA Server Features
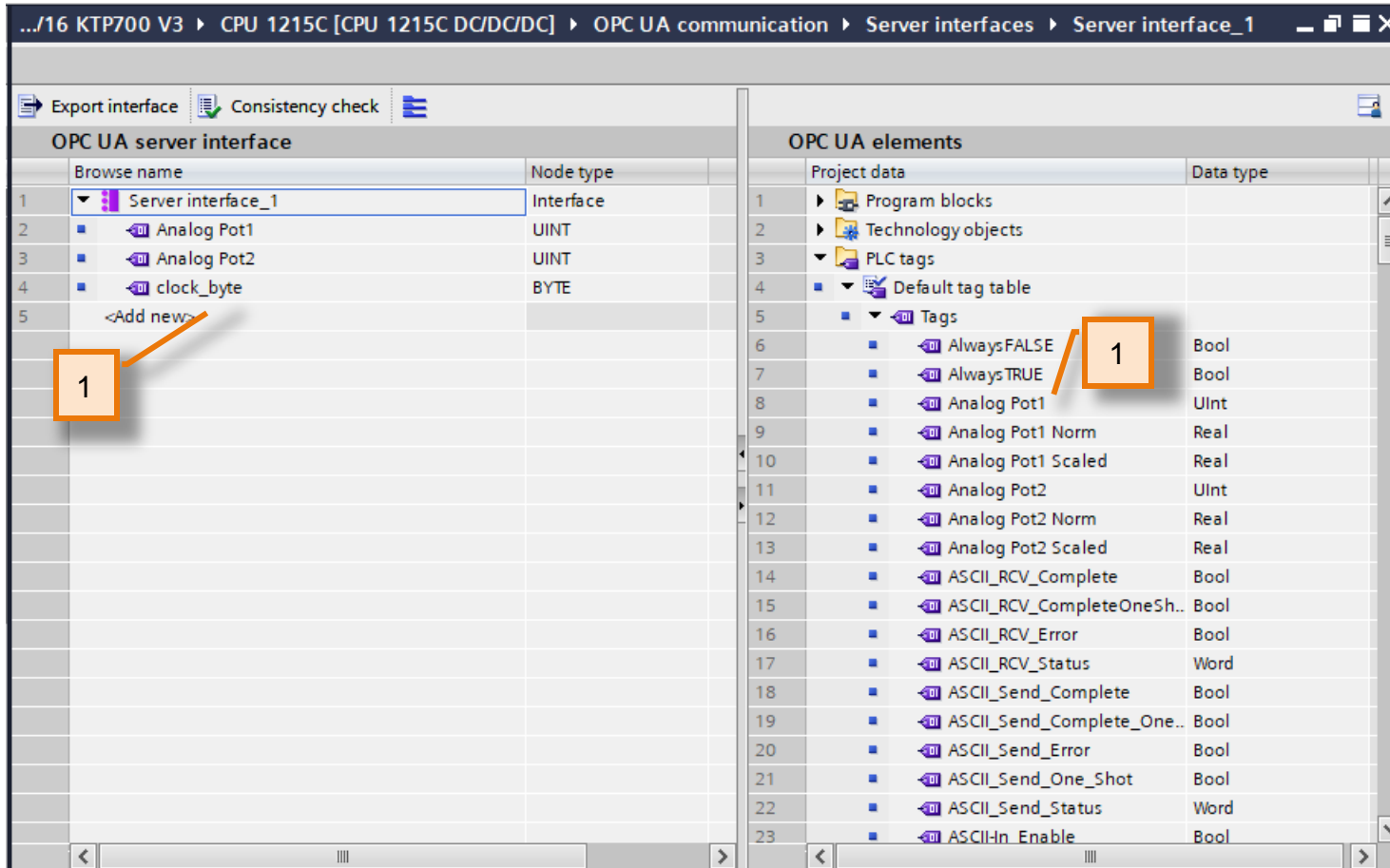## Create an OPC UA Server Interface

SIEMENS
Ingenuity for life
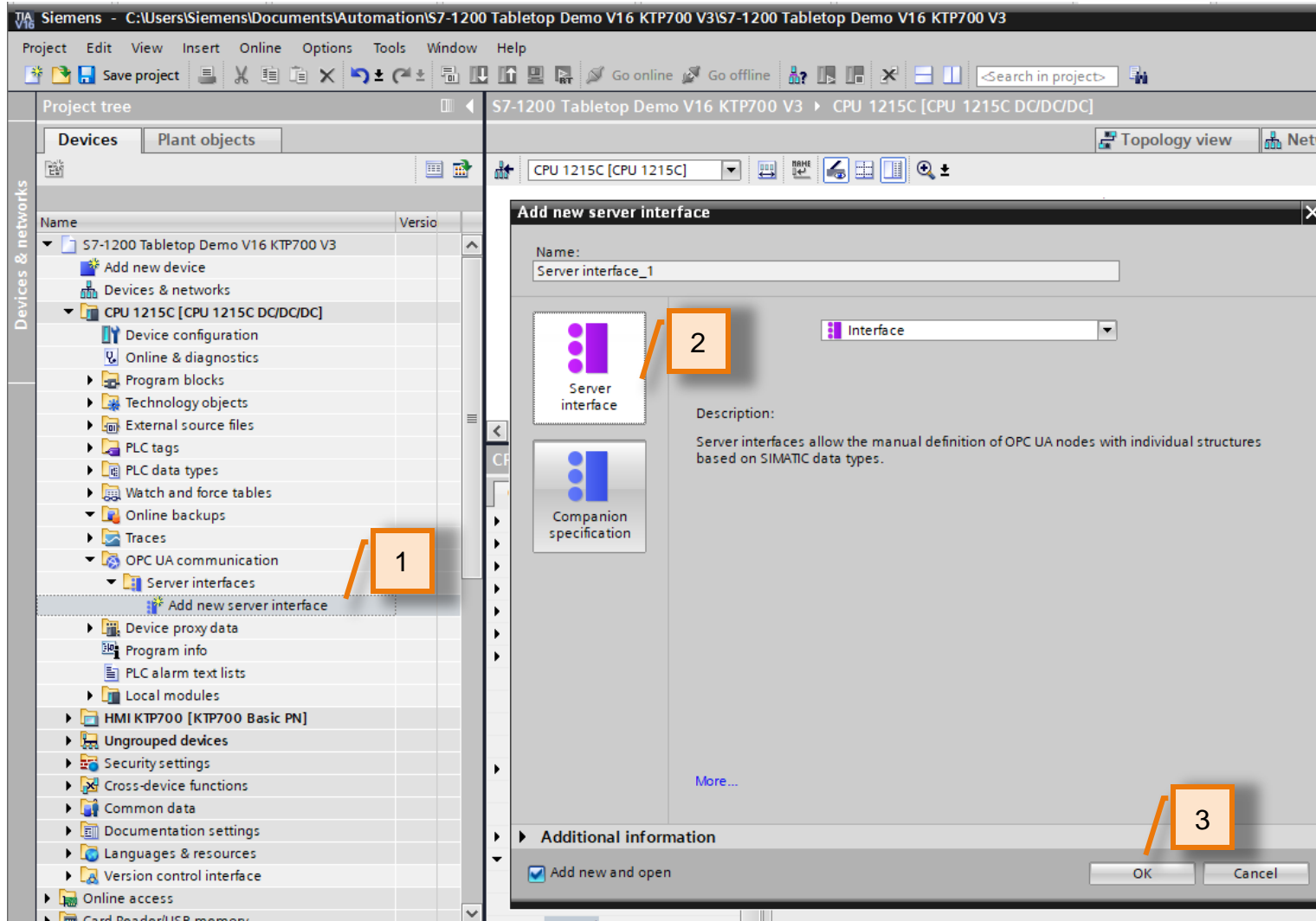
1. Open the TIA Portal project. In the project tree, navigate to *OPC UA Communication > Server interfaces > add new server interface*

2. Leave the default settings for the OPC UA interface.

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

usa.siemens.com/s7-1200

OPC UA Server Features
Adding Data to the Server Interface

SIEMENS

Ingenuity for life

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**
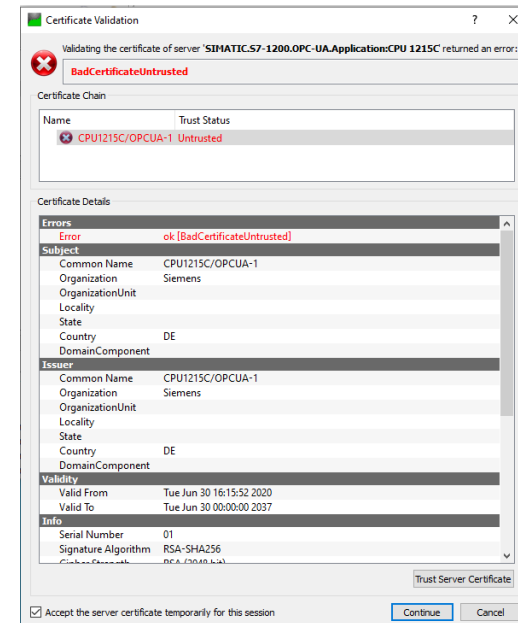
2. Download the project to the CPU

SIEMENS
Ingenuity for life

Testing the OPC UA Server Interface

OPC UA Server Features
Refreshing the server interface in the client
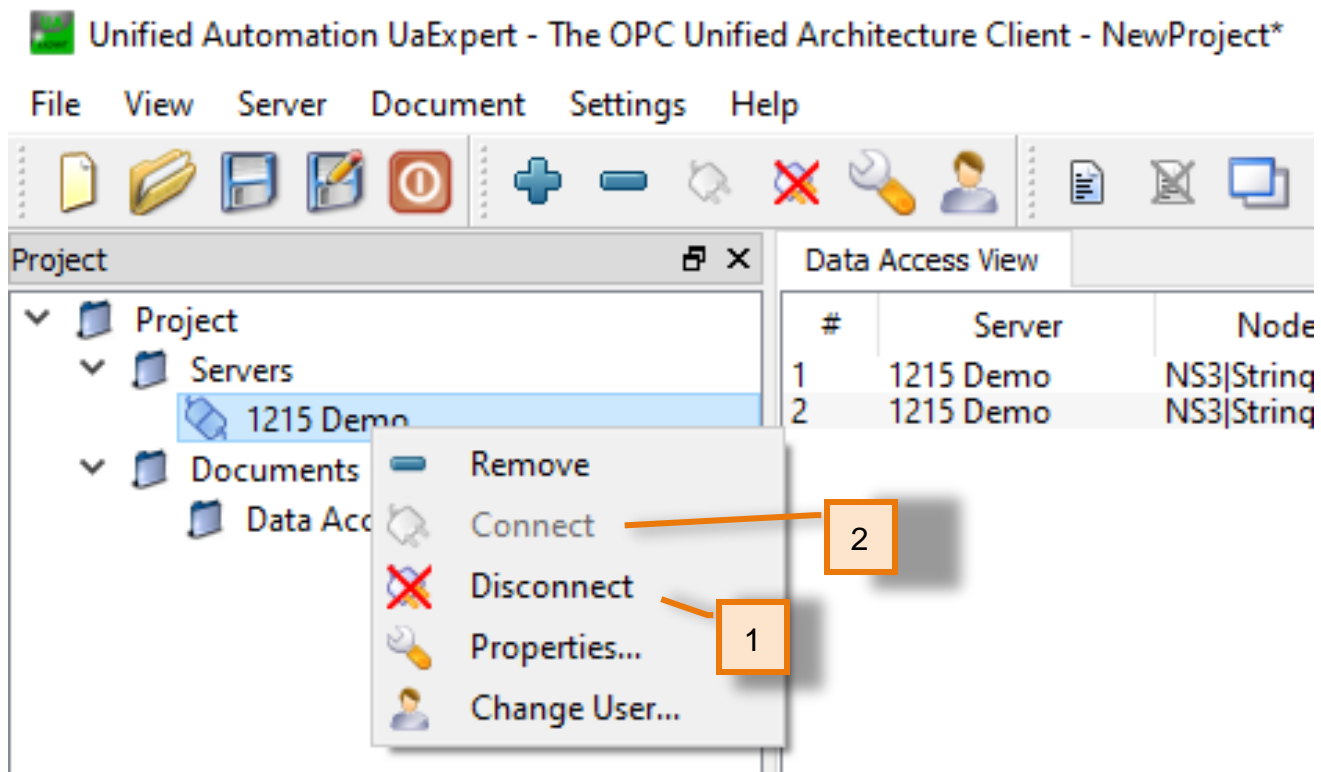
1. Switch back to UaExpert. Use the right mouse menu for the 1215 Demo under servers to "Disconnect".

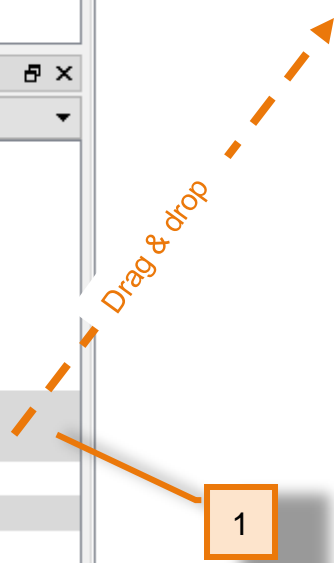2. Right mouse again to select "Connect". Accept the certificate again.

usa.siemens.com/s7-1200

OPC UA Server Features
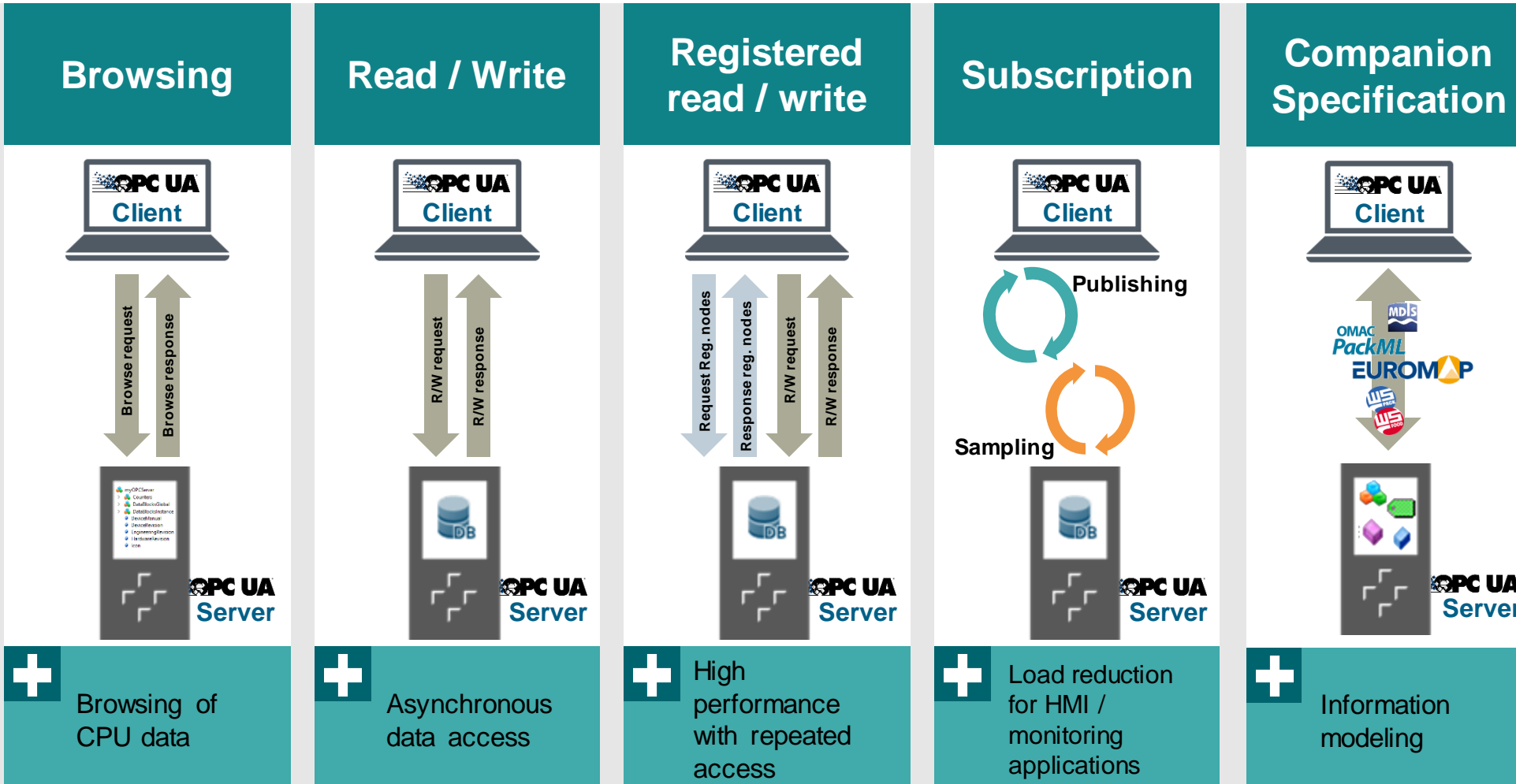## Viewing system data from the CPU

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

SIEMENS
Ingenuity for life

Browsing	Read / Write	Registered read / write	Subscription	Companion Specification
Browsing of CPU data	Asynchronous data access	High performance with repeated access	Load reduction for HMI / monitoring applications	Information modeling

Limitations in the first version:

- **No support of structured data types and arrays**

- **No support of Methods**

- **No support of Alarms & Conditions**

usa.siemens.com/s7-1200

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

SIEMENS
Ingenuity for life

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

PLC data

OPC UA server

OPC UA client

Var = 0

Var = 1

Change

usa.siemens.com/s7-1200
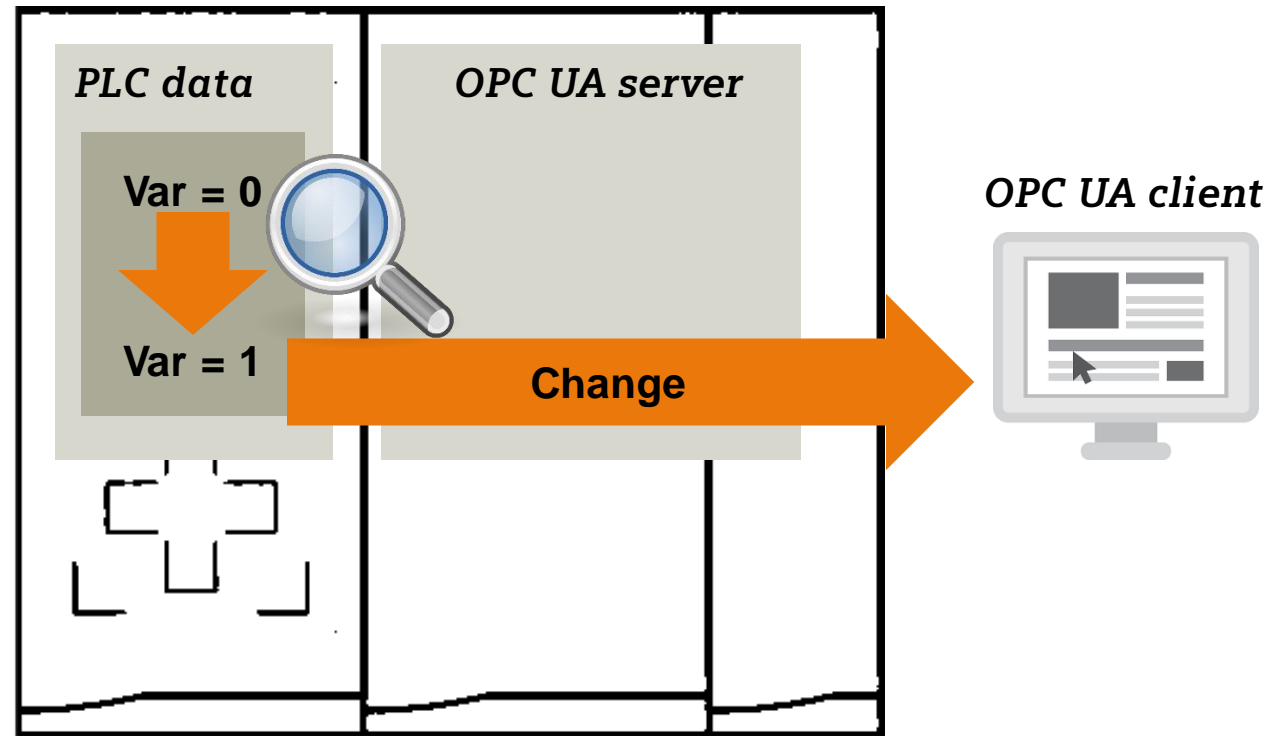
Security is an integral part of OPC UA

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

X.509

X.509

None   **128bit**   **256bit**
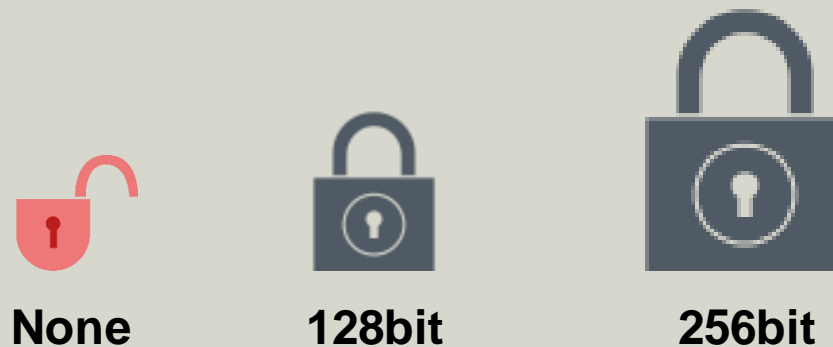
Result

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
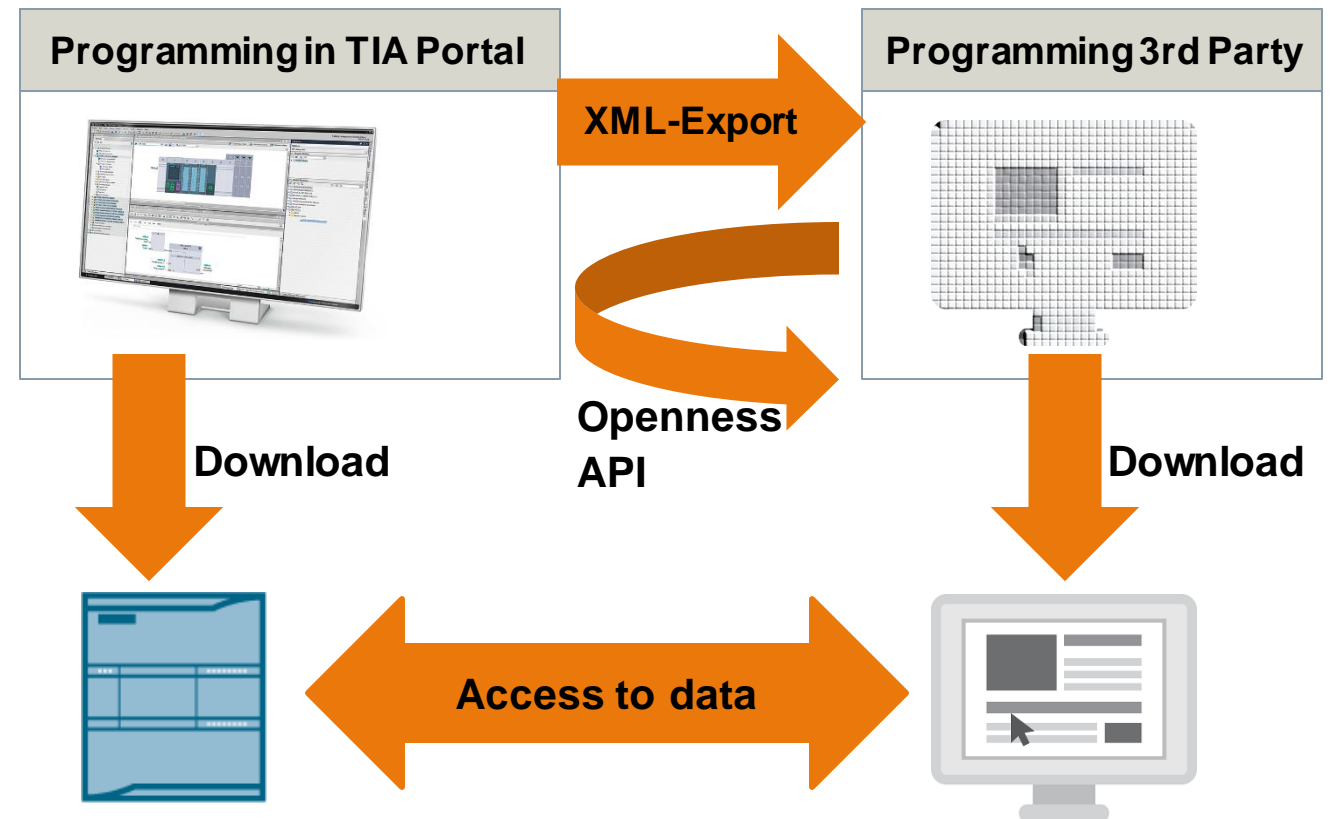Unsecure communication possible for maximum performance

usa.siemens.com/s7-1200

XML-Export to make offline engineering of OPC UA clients even easier
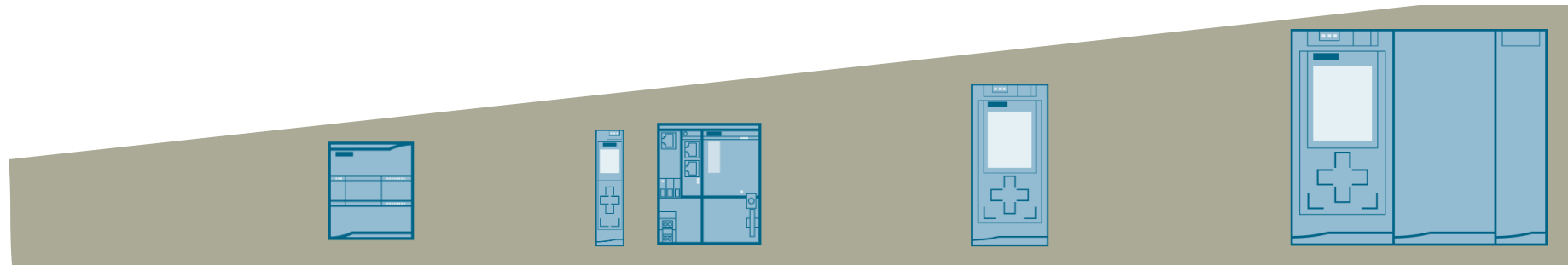
SIEMENS
Ingenuity for life

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**

Programming in TIA Portal

Programming 3rd Party

XML-Export

Openness API

Download

Download

Access to data

usa.siemens.com/s7-1200

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

SIEMENS
Ingenuity for life

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

usa.siemens.com/s7-1200

End of 'OPC UA Server'

SIEMENS
Ingenuity for life

usa.siemens.com/s7-1200