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Connection between software controller and WinCC V7 via Windows network

SIMATIC Software Controller / WinCC V7.4

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1 Introduction

1.1 Overview

This document shows you how to establish an HMI connection between a SIMATIC S7-1500 Software Controller and SIMATIC WinCC V7.4 SP1 via the Windows network.

1.2 Components used

This application example was created using the hardware and software components described in the <u>Table 1-1</u>.

Component	Article number	Note
SIMATIC IPC 427E	6AG4141-0BA00-0AA0	
SIMATIC IPC 427D	6AG4140-0BB00-0AA0	
SIMATIC S7-1500 Software Controller V2.6	6ES7672-7AC01-0YG0	CPU 1507S
SIMATIC WinCC V7.4 SP1	6AV6381-2BE07-4AX0	
SIMATIC STEP 7 V15.1	6ES7822-1AA05-0YA5	TIA Portal

Table 1-1: Hardware and software components

1.3 Versions of the SIMATIC S7-1500 Software Controller

With the 2nd generation of the SIMATIC ET 200SP Open Controller, the CPU versions with extended technology functions have been added.

The Open Controller (as of December 2018) is therefore available as...

- CPU 1505SP Standard Version
- CPU 1505SP T Standard Technology Version
- CPU 1505SP F Failsafe Version
- CPU 1505SP TF Failsafe Technology Version

•

The SIMATIC S7-1500 Software Controller for SIMATIC IPC has a further CPU type, the CPU 1508S, from version 2.6. Compared to the CPU 1507S, the CPU 1508S provides a larger program and data memory.

The SIMATIC S7-1500 Software Controller (as of December 2018) is therefore available as

- CPU 1507S Default execution
- CPU 1507S F Failsafe execution
- CPU 1508S Default execution
- CPU 1508S F Failsafe execution
- **Note** To operate a SIMATIC S7-1500 Software Controller Failsafe you need a SIMATIC IPC with NVRAM (e.g. buffered SRAM).

1.4 Hardware configuration

Figure 1-1 shows the hardware setup of the application example. In the software CPU 1507S variables are made available in a global data block for the visualization software SIMATIC WinCC V7.4 SP1. The visualization computer does not have to be located in the PROFINET network, since a communication connection can be established via the virtual interface (V2 and V1) of the software controller (V2.5) with IP routing. Thus, the visualization computer can also be physically located in the Windows network and connected to the software controller computer via the Windows interface (X1).

SIMATIC IPC 427E SIMATIC IPC 427D Windows **CPU 1507S** Windows Internal link WinCC V7.4 SP1 IP routing Data block V2 V1 X1 X2 X3 X1 X2 192.168.001.001 255.255.255.000 255.255.255.000 192.168.002.001 192.168.000.025 255.255.255.000 192.168.000.020 255.255.255.000 PROFINET Ethernet

Figure 1-1: Hardware configuration of both SIMATIC IPC

1.5 Network configuration

The IP addresses of the virtual interface are represented in the Figure 1-2. The subnet masks of both interfaces are as follows 255.255.255.000. Figure 1-2: Virtual interfaces of the SIMATIC IPC 427E



1.6 Requirements

In order to be able to put the application example into operation, you need

- Experience with SIMATIC industrial PCs
- Experience with Windows operating systems
- Experience with SIMATIC STEP 7 TIA Portal
- Experience with the SIMATIC S7-1500 Software Controller
- Experience with SIMATIC WinCC V7

Further information can also be found on the Internet at:

- <u>www.siemens.com/pc-based</u>
- https://support.industry.siemens.com/cs/ww/en/view/75852684

2 Necessary Windows settings

Before you can use the application example, you must make a few Windows settings on the SIMATIC IPC 427E (software controller computer) and the SIMATIC IPC 427D (visualization computer).

Without these Windows settings no connection between the SIMATIC S7-1500 Software Controller and SIMATIC WinCC V7.4 SP1 can be established.

2.1 Windows settings SIMATIC IPC 427E

First you need to change the IP addresses/subnet masks for the Windows interface or virtual interface on the Windows side.

In addition, the Routing and Remote Access service must be activated.

Follow the steps as described in the <u>Table 2-1</u> and make the Windows settings on the SIMATIC IPC 427E (Software Controller Computer).

Step	Action			
	Open the Windows Network Center of the SIMATIC IPC 427E and set the corresponding IP address / subnet mask for the Windows interface .	Э		
1.	Internet Protocol Version 4 (TCP/IPv4) Properties General You can get IP settings assigned automatically if your network supporting properties (Section 2000) Unidentified network Intel(R) Ethernet Connection (2) I Objain DNS server addresses: Peferred DNS server: Alternate DNS server Cotter Otter	× ts r		
2.	Open the Windows Network Center of the SIMATIC IPC 427E and set the corresponding IP address / subnet mask for the virtual interface. Internet Protocol Version 4 (TCP/IPv4) Properties Image: Simatic RT-VMM Network Adapt	÷		

Table 2-1: SIMATIC IPC 427E - Windows settings

Step	Action				
	Open Computer Management of the SIMATIC IPC 427E. Under Services , search for Routing and Remote Access . Right-click on the service and change the start type under Properties to Automatic . Finally, start the service once for the current session.				
	Services - × File Action View Help - ×				
3.	2 O Services (Loca) Name Description Status Statup Type ^ Image: Services (Loca) Routing and Remote Access Name Description Status Statup Type ^ Image: Description: Offers routing services to businesses in local area and wide area network environments. Mame Description: Disabled Image: Offers routing services to businesses in local area and wide area network environments. Image: Offers routing Service Stop g Automatic Image: Offers routing Service STODS Help Service Stop g Automatic Image: Offers routing Service Stop Resume Automatic				
	Startup type: Disabled Restart Manual Automatic Manual Automatic Automatic Manual Disabled Properties 1				
4.	The Routing and Remote Access service is now executed. When the system is restarted, the service will start automatically based on the startup type.				

Note When using the SIMATIC S7-1500 Software Controller under Windows Embedded Standard 7, the Service **Routing and Remote Access** is not available.

A Workaround is described under $\underline{17}$ in section 4.

2.2 Windows settings SIMATIC IPC 427D

On the SIMATIC IPC 427D (visualization computer) you must also adapt the IP addresses/subnet masks for the Windows interface.

In addition, the routing table on the SIMATIC IPC 427D must be extended in order to establish a connection from the local interface to the virtual interface of the software controller.

Follow the steps as described in the <u>Table 2-2</u> and make the Windows settings on the SIMATIC IPC 427D (Software Controller Computer).

Step	Action		
1.	Open the Windows Network Center of the SIMATIC IPC 427D and set the IP address / subnet mask for the corresponding interface .		
	Eigenschaften von Internetprotokoll Version 4 (TCP/IPv4)		
	Algemein		
	IP-Einstellungen können automatisch zugewiesen werden, wenn das Netzwerk diese Funktion unterstützt. Wenden Sie sich andernfalls an den Netzwerk dader Funktion unterstützt. Wenden Sie sich andernfalls an den Netzwerk dader Einstellungen zu beziehen. IP-Adresse automatisch beziehen IP-Adresse: 192 . 168 . 0 . 25 Sydnetzmaske: 255 . 255 . 0 Standardgateway: . Intel(R) 82579LM Gigabit Network Image: DNS-Serveradresse automatisch beziehen Image: Folgende DNS-Serveradressen gerwenden: Bevorzugter DNS-Server: Image: DNS-Server:		
	Alternativer DNS-Server:		
	Einstellungen beim Beenden überprüfen Erweitert		
	OK Abbrechen		
2.	Then start the command line window (CMD) with administrator rights .		
	Enter the following command:		
	route add -p <target address=""> mask <subnet mask=""> <gateway address=""></gateway></subnet></target>		
	Analogous to this example		
	route add -p 192.168.73.0 mask 255.255.255.0 192.168.0.20		
	Administrator: C:\Windows\5ystem32\cmd.exe		
	Microsoft Windows [Version 6.1.7601] Copyright (c) 2009 Microsoft Corporation. Alle Rechte vorbehalten.		
	C:\windows\system32>route add -p 192.168.73.0 mask 255.255.255.0 192.168.0.20 OK!		
	C:\windows\system32>		
	This command makes the entire 192.168.73.xxx subnet accessible via the Windows interface of the SIMATIC IPC 427E.		
	The –p setting is optional and will keep the route even after a reboot.		

Table 2-2: SIMATIC IPC 427D - Windows settings

Step	Action
3.	Then check whether the route has been entered.
	Enter the following command: route print
	C:Administrator: C:\Windows\System32\cmd.exe IPv4-Routentabelle Aktive: Routen: Netzwerkziel 127:0.0.0 127:0.0.1 127:168.0.25 127:168.0.25 121:12.168.0.25 121:12.168.0.25 121:12.168.0.25 121:168.0.25 <td< th=""></td<>
4.	With a simple PING test you can check whether the virtual interface of the SIMATIC S7-1500 software controller is accessible. Enter the following command: ping 192.168.73.1
5.	Open the system control of the SIMATIC IPC 427D and the PG/PC interface menu. PG/PC-Schnittstelle einstellen (32-Bit)
6.	Make sure that the PG/PC interface is linked to the correct network adapter. PG/PC-Schnittstelle einstellen Zugardspunkt der Applikation: Stondard für STEP 7) Benutzte Schnittstellengarametierung: Intel(R) 82579LM Gigabit Network Connet Bernschaften Birtel(R) 82579LM Gigabit Network Connet Birtel(R) 82579LM Gigabi

3 Engineering of the application

3.1 Engineering SIMATIC S7-1500 Software Controller

<u>Table 3-1</u> describes the minimum settings to be made in the TIA Portal project for the software controller in order to establish a connection to the visualization computer via the Windows interface.

Step Action Add a SIMATIC IPC 427E and a SIMATIC S7-1500 Software Controller V2.6 to your project. software plc. PC-System_1 1. 1507S ß 0 П Double-click the three Ethernet / PROFINET interfaces of the SIMATIC IPC 427E and assign the interfaces as well as the IP addresses / subnet mask settings. Assign the left interface (X1) to the SIMATIC PC station. Properties Info i Diagnostics General IO tags System constants Texts General Interface assignment Interface assignment PROFINET interface [X1] Assign interface to an application General Ethernet addresses Advanced options Use interface for: SIMATIC PC station • Location Index: 1 Assign the middle interface (X2) to the PLC_1 software. 🖻 Properties 🚺 Info 🌡 🛂 Diagnostics General IO tags System constants Texts ieneral Project information Interface assignment 2. Assign interface to an application Ethernet addresses Ethernet addresses Time synchronization Operating mode • Advanced options Interface options • Real time settings IO communicatio Use interface for: Software PLC_1 Location Index: Hardware resource: X2 Real time options Port [X2 P1] Interface type: Intel standard Ethernet cor leb server access Assign the right interface (X3) to the PLC_1 software. Properties Info Diagnostics General IO tags System constants Texts General Project information Interface assignment Ethernet addresses Interface assignment Assign interface to an application • Time synchronization Use interface for: Software PLC_1 Derating mode dvanced options Interface options Real time settings IO communication Location Index: Hardware resource: X3 Interface type: Intel standard Ethernet controlle Port [X3 P1] b server access

Table 3-1: SIMATIC IPC 427E - Settings TIA Portal project

Step	Action
	Double-click the CPU 1507S Runtime in the overview and open the submenu Runtime communication interface. Activate the Use router checkbox and enter the IP address of the virtual interface on the Windows side under Router address .
3.	Software PIC_1 (2PU 15075) Properties 10 tags System constants Texts Option Option Info is V blagnostics Image: Software Sof
4.	Load the TIA Portal project into the Software Controller. Note: The first download of the SIMATIC S7-1500 software controller must always be performed via the Windows interface of the SIMATIC IPC 427E.
5.	After successful download, start the software controller and set it to Run mode.

3.2 Engineering SIMATIC WinCC V7.4 SP1

<u>Table 3-2</u> helps you how to create a project in SIMATIC WinCC V7.4 SP1 and how to establish a connection to the SIMATIC S7-1500 Software Controller.

Table 3-2: SIMATIC IPC 427D – Settings WinCC V7.4 SP1

Step	Action
1.	Open the SIMATIC WinCC Explorer with a double click on the SIMATIC IPC 427D.
	The overview window opens.
	Qatel Anscht 2
	Jene given z Keine Objekte vorhanden
2.	Use the New button to create a new project.
	WinCC Explorer
	Neues Projekt: Image: Constraint of the second se

3 Engineering of the application



3 Engineering of the application

_		Action		
F	Right-click on Varia	ble household in the left of	column.	
h	n the context menu	, select Add new driver a	nd then SIMATIC S7-120	0, S7
1	500 Channel.			,
	Wariablenhaushalt - WinCC Configura	ation Studio		
	<u>Datei B</u> earbeiten <u>A</u> nsicht <u>E</u> xtras	Hilfe		
	Variablenhaushalt	Variablen [alle]	Kommentar Datentyp Länge	P - Formata
	Neuen Tre	iber hinzufügen SIMATIC S7 Protocol Suite SIMATIC S7-1200 S7-1500 Channel	Vorzeichenloser 16-Bit Wert 2 Textvariable 8-Bit Zeichensatz 255	
	Kopieren	SIMATIC S5 Serial 3964R	Textvariable 16-Bit Zeichensatz 255	
	* Exportierer	SIMATIC SS Programmers Port AS511	Vorzeichenloser 32-Bit Wert 4	
		7 SIMATIC SS Profibus FDL	Textvariable 8-Bit Zeichensatz 255 Textvariable 16-Bit Zeichensatz 255	
		SIMATIC IS Ethernet Layer 4	Textvariable 16-Bit Zeichensatz 255 Textvariable 16-Bit Zeichensatz 255	
		10 SIMATIC TI Ethernet Layer 4	Textvariable 16-Bit Zeichensatz 255	
		12 SIMATIC 505 TCPIP	Vorzeichenloser 32-Bit Wert 4	
		13 14 Allen Bradley - Ethernet IP	Vorzeichenloser 32-Bit Wert 4 Vorzeichenloser 32-Bit Wert 4	
		15 16 Mitsubishi Ethernet Modbus TCPIP	Textvariable 16-Bit Zeichensatz 255 Textvariable 16-Bit Zeichensatz 255	
		17 OPC	Gleitkommazahl 64-Bit IEEE 754 8	
		10 19 0PC UA WinCC Channel 19 Dec(hep DD	Gleitkommazahl 64-Bit IEEE 754 8	
		20 Profibus DP 21 Profibus FMS	Gleitkommazahl 64-Bit IEEE 754 8	
		22 Simotion		
		24 System Info		
	Variablenhaushalt	25 26		
	Alarm Logging	27 28		
	Tag Logging	29		
	25 aŭ 111	50		
A	A new connection o	ption is created in the left of	column Variable househ	old.
A F	A new connection o Right-click OMS+ and Give this connection	ption is created in the left of nd select New Connection the name Software Cont	column Variable househ n from the context menu. troller.	old.
A F C	A new connection o Right-click OMS+ an Give this connection	ption is created in the left of the name Software Contaction the name Soft	column Variable househ n from the context menu. troller.	old.
A F C	A new connection o Right-click OMS+ at Bive this connection Itter this connection Uter Barbeten Ansicht Extras Variablenhaushalt	ption is created in the left of the name Software Content of the name Software Content of the name Software Content of the state of	column Variable househ n from the context menu. troller.	old.
A F	A new connection o Right-click OMS+ at Bive this connection Utraidenhaushalt Wind Configur Date Bearbeter Ansicht Extras Variablenhaushalt Wrieblenhaushalt	ption is created in the left of the name Software Content of the name Soft	column Variable househ n from the context menu. troller.	old.
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A F C	A new connection o Right-click OMS+ an Bive this connection Warablenhaushalt Warablenhaushalt Warablenhaushalt	tion is created in the left of the name Software Contained by the study of the name Software Contained by the name Software Contained by the name Software Contained by the study of	Column Variable househ n from the context menu. troller.	old.
A F C	A new connection o Right-click OMS+ an Bive this connection Warablenhaushalt Warablenhaushalt Warablenhaushalt	tion is created in the left of the name Software Cont the name Software Cont the Name 2 1 2 3 4 5 6 7 7 7 7 7 7 7 7 7	Column Variable househ n from the context menu. troller.	old.
A F	A new connection o Right-click OMS+ au Bive this connector	The second select New Connection the name Software Content of the name	Column Variable househ n from the context menu. troller.	old.
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A F C	A new connection o Right-click OMS+ an Bive this connection Date Berbert Anstell Variablenhaushalt Variablenhaushalt Variablenhaushalt Variablenhaushalt	The second select New Connection the name Software Content of the name	Column Variable househ n from the context menu. troller.	old.
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A F C	A new connection o Right-click OMS+ an Give this connection Wardstenbauchat Virac Conform Virablenbauchat Virablenbauchat Virablenbauchat Virablenbauchat Virablenbauchat Virablenbauchat Virablenbauchat Virablenbauchat Virablenbauchat	The second select New Connection the name Software Contained in the left of the name Software Contained select New Connection the name Software Contained select New Contained sel	column Variable househ n from the context menu. troller.	old.
A F C	A new connection o Right-click OMS+ an Bive this connection Wardstenbushatter Variabenbushatt Variabenbushatter Variabenbushatter Variabenbushatter Coportieren	The second sector is created in the left of the name Software Content on the name Software Content of the name Software Content	column Variable househ n from the context menu. troller.	old.
A F C	A new connection o Right-click OMS+ as Bive this connection Workberbashat Viriblenhaushat Strabenhaushat Strabenhaushat Strabenhaushat Strabenhaushat Strabenhaushat Strabenhaushat Strabenhaushat Strabenhaushat Strabenhaushat Strabenhaushat Strabenhaushat Strabenhaushat Strabenhaushat	The second second in the left of the name Software Content of the name	Column Variable househ n from the context menu. troller.	old.
A F C	A new connection o Right-click OMS+ as Bive this connection Date Behave Ansche Wirk Conferen Variablenhaushalt	The second select New Connection of the name Software Contained by the select New Connection of the name Software Contained by the select of	Column Variable househ n from the context menu. troller.	old.
A F C	A new connection o Right-click OMS+ as Bive this connection Utic Berbaushalt Utic Berbaushalt Utic Berbaushalt Utic Berbaushalt Utic Berbaushalt Utic Berbaushalt Utic Berbaushalt Utic Berbaushalt Utic Berbaushalt Utic Berbaushalt	The second select New Connection the name Software Contained in the left of the name Software Contained select New Connection the name Software Contained select New Contained select	Column Variable househ n from the context menu. troller.	old.
F C	A new connection o Right-click OMS+ an Bive this connection Bive this connection Variablenhaushalt Variablenhaushalt Variablenhaushalt Variablenhaushalt Variablenhaushalt Variablenhaushalt Variablenhaushalt Variablenhaushalt	the second of the sec	Column Variable househ n from the context menu. troller.	old.
F C	A new connection o Right-click OMS+ an Bive this connection Bive this co	the second select New Connection the name Software Cont the name the name Software Cont the name th	Column Variable househ n from the context menu. troller.	old.
F	A new connection o Right-click OMS+ an Bive this connection Bive this co		Column Variable househ n from the context menu. troller.	old.

Step	Action				
7.	The new Software Controller connection is now displayed in the left column Variable household . Right-click on Software Controller and select Connection Parameters from the context menu				
	Wrablenhauhalt: Writiger genetictic Image: Setting and the genetic genet				
8.	A pop-up window opens with the connection settings of the software controller connection. You must enter the IP address of the virtual interface on the Software Controller page - in this example 192.168.73.1. You must select S7ONLINE as the access point. For the product family, select s71500-connection.				
9.	Then start the SIMATIC WinCC V7.4 SP1 Runtime on the SIMATIC IPC 427D.				

4 **Operation of the Application Example**

4.1 Connection Check

After you have loaded or completed all projects on both SIMATIC IPCs, you can check the connection for correct functionality.

Conditions for establishing a connection:

- SIMATIC S7-1500 Software Controller in operating mode RUN
- SIMATIC WinCC V7.4 SP1 Runtime started

Start the diagnostic tool **Channel Diagnosis** on the SIMATIC IPC 427D in addition to the SIMATIC WinCC V7.4 SP1 Runtime. (<u>Figure 4-1</u>) With this tool you can monitor and control all configured connections.

Eiguro	1 1.	Channel	Diognosio	Tool
rigule	4-1.	Channel	Diagnosis	1001

🔆 WinCC Channel Diagnosis						
	Channels/Connections Configuration			Always on top		
	B ✓ SIMATIC S7-1200, S7-1500 Channel	Counters Connection State Plc Address EntryPoint Plc Attributes (free/max) Plc Subscriptions (free/max) Subscription Memory (free/ Max tags per request (read Plc Operating State Plc Tag Subscriptions Plc Tag Polling Connection Aborts Plc Protection-Level Hmi Protection-Level Hmi Protection-Level Read Duration of Plc Tags Write Duration of Plc Tags	Value ready 192.168.73.1 S70NLINE 8000 / 8000 500 / 500 2097152 / 2097152 100 / 100 Run no tags subscribed 5 s (5), 10 s (1) 0 no protection, full ac invalid password or f 1 ms (3) / 5 ms (5) / 0 ms (0) / 0 ms (0) / DataAccess			
	Cyclic Update	, 				

If you see a green check mark on the connection, the connection is established and intact. A red cross indicates an unestablished/inactive connection.

4.2 Creating a Data Block in the TIA Portal Project

In the TIA Portal project, create a global data block with a test variable for the software controller. (Figure 4-2) Then download the TIA Portal project to the Software Controller again.

Figure 4-2: DB with test variables

SW	с_с	Quick_Start 🕨 PC-Syste	m_1 [IPC427E 3xPf	₩IE] → Softwa	re PLC_1 [(CPU 1507S]	Prog	ram block	s ▶ gDB_[Data [DB1]] _ 🗖	'≡×
∌	2	🔍 🍢 는 🎌 Keepa	actual values 🔒 Sr	napshot 🧤 🖏	Copy snaps	hots to start va	lues 层	- 🖳 Load	start values	as actual va	alues 💵, 🎙	
	gDl	B_Data										
		Name	Data type	Start value	Retain	Accessible f	Writa	Visible in	Setpoint	Supervis	Comment	
1	-	 Static 										
2	-	Test_Tag	Int	0								
3		Add new>										

4.3 Linking Variables to HMI Elements

Open the overview window again by double-clicking on **Variable household.** A right click on the **software controller** connection opens the context menu. Select the entry **AS Symbols** and click on **Load from AS**. (Figure 4-3)

/ariablenhaushalt	«	📦 Variat	olen [Software-Controller]		Suchen		<mark>ب م</mark>
Variablenhaushalt		Name		Kommentar	Datentyp	Länge	Formata 🔺
🕀 💝 Interne Variablen		1 ※					
. SIMATIC S7-1200, S7-	1500 Chanel	2					
OMS+ Software Cent	allar.	4					
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iii walatian tana tak		25					
variablennausnait		26					
Alarm Logging		2/					
Tag Logging		29					
9		30					

Figure 4-3: Search Software Controller Connection

By clicking, the available variables provided by the software controller are displayed in the variable household of SIMATIC WinCC V7.4 SP1. (Figure 4-4) Figure 4-4: Reachable variables in the variable household

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MS+	3		DiagStatusUpdate	Bool	Merker			
Software-Controller	4		AlwaysTRUE	Bool	Merker			
🐼 Strukturvariablen	5		AlwaysFALSE	Bool	Merker		_	
*	6		Clock_Byte	Byte	Merker			
	7		Clock_10Hz	Bool	Merker			Ш
	8		Clock_5Hz	Bool	Merker			Ш
	9		Clock_2.5Hz	Bool	Merker			Ш
	10		Clock_2Hz	Bool	Merker		_	
	11		Clock_1.25Hz	Bool	Merker			
	12		Clock_1Hz	Bool	Merker			
	13		Clock_0.625Hz	Bool	Merker			Ш
			Test Tes	Cheve	aDD. Date	aDR Data Test To		I
	17		-					L)
Variablenhaushalt	17 18 19 20 21 22 23 24 25 26 27							
Variablenhaushalt	17 18 19 20 21 22 23 24 25 26 27 28 29							

For all variables that you want to associate with HMI elements, check the box in the **Access** column, as shown in Figure 4-4.

(**-**1)

Then create an image with an I/O field in your SIMATIC WinCC V7.4 SP1 project. Link the test variable from the DB of the software controller to the I/O field. (Figure 4-5)

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Figure 4-5: Configuration of an I/O field with SIMATIC WinCC V7.4 SP1

Save the SIMATIC WinCC V7.4 SP1 project and start the visualization.

Establish an online connection to the software controller with TIA Portal. You can then change the test variable online in the DB of the SIMATIC controller.

If the value changes, the display value in the I/O field of SIMATIC WinCC V7.4 SP1 also changes. (Figure 4-6)

Figure 4-6: SIMATIC WinCC V7.4 SP1 Screen



5 Data exchange via OPC UA

5.1 Overview

With the integrated OPC UA Server of the SIMATIC S7-1500 Software Controller you can also establish a communication via the Windows interface to the SIMATIC WinCC V7.4 SP1.

This section describes the differences to establishing a connection via the SIMATIC S7-1200, S7-1500 channel of WinCC V7.4 SP1.

Figure 5-1 You can see the changed hardware structure.

Figure 5-1: Hardware structure for data exchange via OPC UA



5.2 Engineering SIMATIC S7-1500 Software Controller

<u>Table 5-1</u> describes the minimum settings to be made in the TIA Portal project for the software controller in order to establish a connection to the visualization computer via the Windows interface and OPC UA.

Step	Action
1.	Add a SIMATIC IPC 427E and a SIMATIC S7-1500 Software Controller V2.6 to your project.
	50 ¹⁰⁰
	PC-System_1
2.	Double-click the three Ethernet / PROFINET interfaces of the SIMATIC IPC 427E and assign the interfaces as well as the IP addresses / subnet mask settings.
	Assign the left interface (X1) to the SIMATIC PC station.
	Assign the middle interface (X2) to the PLC_1 software.
	Huthet onboard@2(X2) Properties Info () () Diagnostics General Io tags System constants Texts General Project information Interface assignment Project information Assign interface to an application Ethernet addresses Use interface for: Software PLC_1 Operating mode Audit of the settings Index: • Real time settings Index: • • For LQ 2P1 Interface type: Interface type:
	Assign the right interface (X3) to the PLC_1 software.
	Ceneral IO tags System constants Texts Ceneral IO tags System constants Texts Ceneral Interface assignment Interface assignment Ethema addresses Interface assignment Interface assignment Constrainty mode Use interface to an application Operating mode Use interface for: Software PLC_1 Operating mode Interface assignment Interface assignment Interface options Interface interface Interface assignment Interface options Interface interface Interface interface Interface options Interface interface Interface Interface options Interface interface Interface Interface options Interface interface Interface Interface options Interface interface Interface Interface options Interface interface Interface Interface options Interface interface Interface Veb Server access Interface interface Interface

Table 5-1: SIMATIC IPC 427E – Settings TIA Portal project



5.3 Engineering SIMATIC WinCC V7.4 SP1

<u>Table 5-2</u> helps you to create a project in SIMATIC WinCC V7.4 SP1 and to establish a connection to the SIMATIC S7-1500 Software Controller via OPC UA. Table 5-2: SIMATIC IPC 427D – Settings WinCC V7.4 SP1

Step	Action
1.	Open the SIMATIC WinCC Explorer with a double click on the SIMATIC IPC 427D .
	SIMATIC Wincc Explorer
	The overview window opens.
	/₂ WinCCExplorer -
	□> ■> ×回道 出わ≫發麗
	Keine Objekte vorhanden
2.	Use the New button to create a new project.
	In this case, select Single-user project.
	Neues Projekt:
	Einzelplatz-Projekt
	C Mehrplatz-Projekt
	문문 C Client-Projekt
	Vorhandenes Projekt:
	OK Abbrechen

5 Data exchange via OPC UA



Step		Action		
5.	Right-click on Variable ho	usehold in the le	ft column.	
	OPC UA WinCC Channel	l.		
	Variablenhaushalt - WinCC Configuration Studio <u>Datei</u> <u>B</u> earbeiten <u>A</u> nsicht <u>E</u> xtras <u>H</u> ilfe			×
	Variablenhaushalt «	Variablen [alle]	Suchen	P ▼ «
	B S Interr Neuen Treiber hinzufügen →	SIMATIC S7 Protocol Suite SIMATIC S7-1200, S7-1500 Channel	Vorzeichenloser 16-Bit Wert Textvariable 8-Bit Zeichensatz Textvariable 16-Bit Zeichensatz	2 255 255
	Einfügen	SIMATIC S5 Serial 3964R SIMATIC S5 Programmers Port AS511	Textvariable 16-Bit Zeichensatz Vorzeichenloser 32-Bit Wert	255 4 B
		SIMATIC S5 Profibus FDL SIMATIC S5 Ethernet Laver 4	Textvariable 8-Bit Zeichensatz Textvariable 16-Bit Zeichensatz	255 255
		SIMATIC TI Serial	Textvariable 16-Bit Zeichensatz	255 255
		SIMATIC TI Ethernet Layer 4	Textvariable 16-Bit Zeichensatz Vorzeichenloser 16-Bit Wert	255
		Allen Bradley - Ethernet IP	UES Vorzeichenloser 32-Bit Wert JEUES Vorzeichenloser 32-Bit Wert	4 4
		Mitsubishi Ethernet	Vorzeichenloser 32-Bit Wert Textvariable 16-Bit Zeichensatz	4 255
		Modbus TCPIP OPC	OND Gleitkommazahl 64-Bit IEEE 754	8
		OPC UA WinCC Channel	E Gleitkommazahl 64-Bit IEEE 754 Gleitkommazahl 64-Bit IEEE 754	8
		Profibus FMS	Gleitkommäzähl 64-Bit IEEE 754	8
		Simotion System Info		
	Variablenhaushalt	25		
	Alarm Logging	27 28		
	Tag Logging	29		
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	11. <u>-</u> I			
0.	Right-click on OPC UA Co context menu. Give this connection the n	onnections and s ame Software Co	elect New Connection	from the
	Datei Bearbeiten Ansicht Extras Hilfe			
	Variablenhaushalt «	Variablen [OPC UA Connection	ons] Suchen	
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		23 24		
	Variablenhaushalt	25 26		
	Alarm Logging	27 28		
	Tag Logging	29 30		
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5.4 Connection Check

After you have loaded all projects to the two SIMATIC IPCs, you can check the connection for correct functionality.

Conditions for establishing a connection:

- SIMATIC S7-1500 Software Controller in operating mode RUN
- SIMATIC WinCC V7.4 SP1 Runtime started

Start the diagnostic tool **Channel Diagnosis** on the SIMATIC IPC 427D in addition to the SIMATIC WinCC V7.4 SP1 Runtime. (Figure 5-2) With this tool you can monitor and control all configured connections.

Figure 5-2: Channel Diagnosis Tool

🛧 WinCC Channel Diagnosis			? ×
Channels/Connections Configuration		□ 4	Always on top
E✓ OPC UA WinCC Channel	Counters Server Status Data Change Notifications Data Change Notification Synchronous Reads Asynchronous Read Tags Asynchronous Reads Asynchronous Reads Asynchronous Reads Asynchronous Read Tags Last Activity Last Error Time Last Error Time Last Error Name Last Error Name Last Error In Call LastDataChangeCallBack t Last Time between CBs	Value RUNNING 0 0 0 0 0 0 0 0 0 Get Connection Status	
Cyclic Update			

If you see a green check mark on the connection, the connection is established and in clock. A red cross indicates an unestablished/inactive connection.

Linking Variables to HMI Elements 5.5

Open the overview window again by double-clicking on Variable household. A right click on the software controller-OPC connection opens the context menu. Select the Search OPC Server entry here. (Figure 5-3)

Variablenhaushalt - WinCC Configuratio	n Studio					_
<u>D</u> atei <u>B</u> earbeiten <u>A</u> nsicht <u>E</u> xtras <u>H</u>	ilfe					
Variablenhaushalt	**	😝 Variablen [Software-Co	troller-OPC]	Suchen		ب م
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	OPC Serve AS Sympo	er durchsuchen ie 7 18 19 20				
Variablenhaushalt		21 22 23 24 25 26 27				
Tag Logging	★ 11 ×	28 29 30				

By clicking, the available OPC servers are displayed in the new window. If you browse to the OPC UA server of the controller, the accessible variables are displayed. (Figure 5-4)

Figure 5-4: Reachable variables in the variable household

mbole	🤹 « 🛛 AS Sy	mbole [gDB_D	ata]		Suchen	. م
Software-Controller-OPC						
e e seve	1		Test_Tag	ns=3;s="gDB_Da Variable	Vorzeichenbehaft	"s="gDB_Data
	3					
	5					
	6					
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Tag Logging	29					
唐 5 田 6 長	1	_				•

For all variables that you want to associate with HMI elements, check the box in the Access column, as shown in Figure 5-4.

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Then create an image with an I/O field in your SIMATIC WinCC V7.4 SP1 project. Link the test variable from the OPC UA server of the software controller with the I/O field. (Figure 5-5)

Figure 5-5:	Configuration	of an I/O	field with	SIMATIC	WinCC Y	V7.4 SP1
0	0					

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Datei Bearb 5 Anordnen Extras Fenster DataConnector ?	
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: EAfeld1	Variable:
NewPdil0 x	Aktualisierung: 2 s
Variablen - Projekt: D:\test\WinCC7_Quick_Start\Quick_Start.mcp	Feldtyp: C Eingabe C Ausgabe C EA-Feld Schriftgröße 12 ent
L	Arial Arial
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Drücken Sie F1, um Hilfe zu erhalten. Deutsch (Deutschland)	EA-Feld1 1: X:70 Y:40

Save the SIMATIC WinCC V7.4 SP1 project and start the visualization.

Establish an online connection to the software controller with TIA Portal. You can then change the test variable online in the SIMATIC controller.

If the value changes, the display value in the I/O field of SIMATIC WinCC V7.4 SP1 also changes. (Figure 5-6)

Figure 5-6: SIMATIC WinCC V7.4 SP1 Screen

🖊 WinCC-Runtime -		
10,000		

Appendix 6

6.1 Service und 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: https://support.industry.siemens.com

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

www.siemens.com/industry/supportrequest

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For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page: www.siemens.com/sitrain

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- 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:

https://support.industry.siemens.com/cs/ww/en/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 Apple iOS, Android and Windows Phone:

https://support.industry.siemens.com/cs/ww/en/sc/2067

6.2 Links and Literature

Table 6-1: Important links

No.	Торіс		
\1\	Siemens Industry Online Support		
	https://support.industry.siemens.com		
\2\	Link to the article page of the application example		
	https://support.industry.siemens.com/cs/ww/en/view/109763254		
\3\	SIMATIC S7-1500 Software Controller manual		
	https://support.industry.siemens.com/cs/ww/en/view/109740725		
\4\	SIMATIC WinCC V7.4 SP1 manual		
	https://support.industry.siemens.com/cs/ww/en/view/109736220		
\5\	SIMATIC IPC 427E manual		
	https://support.industry.siemens.com/cs/ww/en/view/109742190		
\6\	SIMATIC IPC 427D manual		
	https://support.industry.siemens.com/cs/ww/en/view/67235073		
\7\	Internal and external connection via the virtual interface of the software controller		
	https://support.industry.siemens.com/cs/ww/en/view/109760541		

6.3 Change documentation

Table 6-2: Overview history

Version	Date	Change
V1.0	12/2018	First version