Demo projects with Beckhoff TwinCAT3

See also Selmo Help Center

Content

Customizing the Selmo Studio Project (SEO)	. 2
Installation and configuration of Beckhoff TwinCAT3	. 4
Import and Customize PLC Program	. 5
Preparation of PLC program for local runtime	16
Using User Mode Runtime	20
Installation and configuration of an OPC-UA server	25
Adapting the PLC program for communication via OPC-UA	31
Checking the server with uaExpert	33

Customizing the Selmo Studio Project (SEO)

As part of a new Selmo Studio project, the decision has to be made in which control system the PLC program will be used. Although the main part of the program is identical, there are differences, especially in terms of communication and the use of internal libraries.

In Selmo Studio, the selection of the appropriate controller is done in the Target System section. In the present case, the Beckhoff TwinCAT 3 controller is used together with the communication interface for this purpose. This can be ADS or OPC-UA. With the Boris simulation software, ADS or OPC-UA must be used, with Twin ADS or OPC-UA and with FactoryIO OPC-UA must be used.

Target machine ×	In the Beckhoff TwinCAT 3 target system (with ADS), it is possible to choose between a controller in the network or a runtime on the local computer.
Beckhoff TwinCAT 3	In the case of a more remote control as well as the user runtime, the check mark (1) must be removed and the correct AMS Net Id selected (2).
TwinCAT PLC local TwinCAT AMS Net Id: 192.168.0.10.1.1 TwinCAT PLC Port:	For a classic runtime (XAR) on the local computer, the check mark (1) must be set. In this case, the AMS Net Id is irrelevant.
851 Test ADS Connection	If the PLC is already active, communication can be tested via the button.
Target machine ×	
Target System Select Target System: Beckhoff TwinCAT 3 OPC UA	For OPC-UA communication, the server address and the login data must be provided. These are defined during the installation of the OPC-UA server (see below).
Target OPC UA Settings OPC UA Server Address: opc.tcp://localhost.4840 OPC UA Server Security Policy: None OPC UA Server Security Mode:	Here, too, the communication can then be tested or the OPC-UA server can be restarted.
OPC UA Username:	
OPC UA Password:	
Test OPC UA Connnection Restart OPC UA Serve	When using the User Mode Runtime, please also refer to this section: <u>Using User Mode</u>
Kullulle	

Side 2 / 35

After completion of the modeling, the PLC code is generated and exported in an XML file. It should be noted that the entire PLC program must be exported during the first export.

S Selmo Studio 2024 SP2 Professional [AgitatorTank (AgitatorTank.seo)]
File View Generate Tools Windows Help
: 🗟 🛋 🗿 🗟 🖶 💽 🚾 🚾
Project Explorer 🚽 📮 🗙 Generate PLC-code

As a result, the export should be done without the building blocks of the IO mapping. The corresponding modules are edited in TwinCAT and could be overwritten in a complete export. It should be noted that any links will be lost.



Note that this export and subsequent import in the TwinCAT must take place in the Selmo Studio every time a change is made. For this reason, it is recommended not to make changes in the exported modules in TwinCAT, as they will be overwritten during the next import.

The SelmoBasic library is required to integrate the internal functions. This can be obtained via the export function in the Selmo Studio.



Please note that the version of the library used in TwinCAT must match the version of Selmo Studio. The corresponding procedures for import and activation are explained in the PLC documentation.

Installation and configuration of Beckhoff TwinCAT3

The Visual Studio development environment together with TwinCAT3 can be downloaded and installed on the Beckhoff homepage. The installation can be done with the default settings, but these requirements should be met:

- MS Windows version 10 or 11. The version has an impact on the Beckhoff TwinCAT Runtime, as only UmRT can be run locally with newer versions
- Selmo Studio in the current version 2024 SP2
- The current version of Beckhoff TwinCAT is 3.1.4024.56 with TwinCAT XAE, XAR and UmRT.
- Optional OPC-UA configuration tool TF6100 in version 4.4.184.0 and TF6100 OPC-UA Server in version 4.4.73.0 if OPC-UA is used
- Optional UaExpert, software for diagnosing and monitoring OPC-UA communication

Please check which versions are current and the dependencies on the other components. It should also be ensured that the following ports are not blocked in the operating system:

Service	Ports (Inbound)
IPC Diagnostics	https: 443 / tcp
Remote Desktop – RDP (nur Windows	
7/10)	3389 / TCP
TwinCAT ADS	Discovery: 48899/udp (also outbound)
	Not secured: 48898 / tcp (also outbound)
	Secure ADS: 8016 / tcp (also outbound)
TF6100 OPC UA	4840/tcp (UA server, inbound), changeable
	48050/tcp (UA gateway, inbound), changeable
	See also: TF6100 documentation

Import and Customize PLC Program

Start TwinCAT XAE:

Start Page - TcNaeShell				🖓 Quick Launch (Ctrl+Q) 🛛 🔎 🗕 🛷 🗙
Ele Edit View Broject Debug TwinCAT TwinSAFE PLC Team	Scope Jools Window Help			
○·○ 월·남·날·날 문 산 신 신 / ?·?·	- 🕨 Attach 👘 🕴	Hebevorrichtung_Demo - 🗊 🌶 🗊 🖮 🍇 🍪 🖾		
Build 4024.10 (Default) 📩 🛫 🖆 🛄 💷 🖉 🔨 🐨 🕅 🖉				
Solution Explorer 🔹 👎 🗙	Start Page 🗢 🛪 Source Control Explorer			▪ Properties
000 P	TwinCAT 2	pcevuo	FE	· ·
				E 9+ /
	Recent	Open	Ne	
		Dana Resistant Talanian	5	
	The projects, solutions and folders you open locally annear here.	New project		
. ►		New project		
	control providers will appear on the recent list of other	New TwinCAT Project		
	devices you've signed in to.	New Measurement Project		
		Search project templates	P -	
		🧾 TwinCAT XAE Projekt (XML Format) TwinCAT Projekte		
		TwinCAT SPS Projekt TwinCAT SPS		
	- 27A			
		Create new project		
		63		
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	Error List			
	• 🔇 Errors 🛕 Warnings 🕕 Messages		Search Error List 🖉	
Schelen Ersteur Tem Ersteur				Property Tashes
Contraction of the second s	Support Property			The second second second
C May				

Create a new TwinCAT project:



Create a new "TwinCAT XAE Project" and select the desired file path under "Location":

New Project						? ×
▶ Recent		Sort by: Default	· # E		Search (Ctrl+E)	- م
 Installed TwinCAT Measure TwinCAT Projects TwinCAT PLC TcXaeShell Solution 	ement on	TwinCAT XAE Project (XML format)	TwinCAT Projects	Type: TwinCAT Projects TwinCAT XAE System Manage Configuration	r
Not finding what yo Open Visual St	ou are looking for? tudio Installer					
Name:	Lifting Device					
Location:	C:\Users\SebastianHer	rz\Documents\TcXaeShell			Browse	
Solution name:	Lifting Device			[Create directory for solution 	
					Add to Source Control	
					ОК	Cancel

In the context menu, select the "Add New Item" option via the right mouse button.



Add New Item - DemoLiftingDevice ? \times ▲ Installed • # 🗉 - م Plc Templates Type: Plc Templates Plc Templates Creates a new TwinCAT PLC project containing a task and a program. Empty PLC Project Plc Templates Name DEMO Project $\label{eq:c:UsersSebastianHerzDesktopDemos zum selber BauenBuildYourDEMOLiftingDeviceDEMOLifterDesktopDemos zum selber BauenBuildYourDEMOLiftingDeviceDEMOLifterDesktopDemos zum selber BauenBuildYourDEMOLiftingDeviceDemoS zum selber BauenBuildYourDEMOLiftingDeviceDemoS$

After that, a new "Standard PCL Project" is selected and inserted:

Now you need to import the already exported PLCopenXML file from the Selmo Studio:

DemoLiftingDevice - TcXaeSh	ell						💎 🛛 🗗 Quick Launch (Ctrl+Q	_ م	₫ ×
File Edit View Project B	uild	Debug TwinCAT TwinSAFE PLC	: Team So	ope Tools Window Help					
්ර-ර හි-ක-🖕 🗎	. *	メロコ フ・ペー Release		「RT (x64) - ► Attach	- 📁 GVL.	- 🗊 🖋 🐺 🏛 🍇 🌝 🖂			
Build 4024.10 (Loaded) -	nè 🛛	1 🖪 2 🔍 🗃 💽 🐂 🌿 Der	moLiftingDevice	- <local> - DEMO</local>					
Solution Explorer		- a x							
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Search Solution Explorer (Ctrl+:)		. م							
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									• • ×
				- 💟 Errors 🔥 Warnings 🕕 Mes	sages 🗙 Clear				- م
Solution Explorer Team Explorer			Error List	Jutput					
This item does not support previ	ewing								

Open the exported XML file.

older				EE 🔻 🔟 (?
^	Name	Date modified	Туре	Size	
	LiftingDevice.xml	3/23/2021 10:25 AM	XML Document	244 KB	
~					
le nar	me: LiftingDevice.xml		~ PLCopenXML	. files (*.xml)	~
			Open	Cancel]

Click OK. For subsequent imports, in the event of changes, the option to replace the existing objects must be selected. Also make sure that the folder structure is also imported.

Import PLC	CopenXML	×
Contents	Additional information	
Please All item You car	select the items which should be imported. ns will be imported below the node which is currently selected in the navigator. n change this selection while this dialog is open.	
Current	y selected target object: DEMO [DemoLiftingDevice: PLC]	
Insertab	le items:	_
B	POUs	^
	Diant Plant	
	Global	
	GlobalControl	
	GlobalHmiTextProcessing	
	Global TCMZ	
	E- 🗀 HZ01_LiftingDevice	
	🛛 🗹 🍯 GVL_HZ01_LiftingDevice	
	- 🗹 🙆 GVL_HZ01_LiftingDevice_HMI	¥
Import	folder structure	
Select >	> Deselect > OK Cance	el
TwinCAT DLC	Control	
TWITCAT FEC		
	is gibt bereits ein Objekt mit 'FB_PushButton [Balispiel: PLC: Game]' im Projekt. Was möchten Sie tun?) Neues Objekt umbenennen.	
\subset) Neues Objekt umbenennen (für alle Konflikte).	
C) Bestehendes Objekt ersetzen.	
c	Bestehendes Objekt ersetzen (für alle Konflikte).	
\subset) Neues Objekt überspringen.	
C) Neues Objekt überspringen (für alle Konflikte).	
	OK Abbrechen	

The project has now been opened and all exported blocks have been inserted:



Add a global variable list for your inputs and outputs.



Write your inputs and outputs here. In this case, we used the I/O from our HMI. To ensure communication with the simulation, it is important that the names from the documentation are used.



The variables are linked to the prepared I/Os of the respective sequences in the corresponding "xxx_InputMapping" or "xxx_OutputMapping" modules. For this purpose, it is necessary to remove the comment of the lines and to read or write the variables from the GVL.



Open "MAIN (PRG)" and paste the call "GlobalControl();" there.



If you are using the local XAR runtime, you should also use the Preparation of PLC program for local runtime heed.

It should also be checked whether the current "Selmo Basic" library is already installed.



·, · · · · · · · · · · ·		
Location: System	~	Edit Locations
(C:\TwinCAT\3.1\Components\Plc\Managed Libraries)		
Installed libraries:		Install
Company: (All companies)	\sim	Uninstall
Application	^	Export
E-SE Common		Exportin
SELMO Basic SELMO GmbH		
Util System		
BuildingAutomation		
Controller		
		Find
	v	Details
Group by category		Dependencies

If you have not yet installed the Selmo Basic library, please follow the instructions at Customizing the Selmo Studio Project (SEO).

If you already have the library installed, add the Selmo Basic library to your project:



The library is loaded into your project. Always use the appropriate version for your Selmo Studio version.

殆 Add library 🔀 Delete library 👘 Details 🗐 Placeholders 👔 Library repository					
Name	Namespace	Effective version			
SELMO Basic = SELMO Basic, * (SELMO GmbH)	SELMO	3.0.3.4			
	Tc2_Standard	3.3.3.0			
Tc2_System = Tc2_System, * (Beckhoff Automation GmbH)	Tc2_System	3.4.22.0			
	Tc3_Module	3.3.21.0			

Save all changes:

SELMO4Automation - TcXaeShell		
File Edit View Project Build Debug TwinCAT TwinSAFE PL	.C Team Scope T	lools Window
🔋 〇 - 〇 🏠 - 눕 - 😩 🗎 🔐 🐰 日 台 ウ - ペ - Release	- TwinCAT RT (x64)	- 🕨 A
Build 4024.10 (Loaded) 🔹 🗧 Save All (Ctrl+Shift+S)	LMO4Automation -	<local></local>
Solution Explorer 🔻 👎 🗙	SELMO4Automation 👳	$ imes$ Global_CMZ
○ ○ 습 븝 - Ĭo - ☞ 🗡 🗕	Settings Online Priorit	ties C++ Debugger
Search Solution Explorer (Ctrl+ū)	Router Memory	
J Solution 'SELMO4Automation' (1 project)	Configured Size [MB]:	32
SELMO4Automation	Allocated / Available:	32/31
Real-Time	Available cores (Shared	d/lsolated): 7
▶ 🛅 Tasks	Com.	T. Cara
∰a Routes	Core	(I-Core
🚛 Type System	3 (Shared)	
TcCOM Objects	4 (Shared)	
MOTION	5 (Shared)	

Load the project and start the PLC:



There is a possibility that you will be asked to activate a license. Beckhoff offers a 7-day trial license. This can be reactivated if necessary after expiration.

TcXaeShe	il >	<
?	Some required runtime licenses missing. Generate trial licenses	
	<u>Ja</u> <u>N</u> ein Abbrechen	

If you confirm with "YES", the following window will appear. Enter the displayed key in the field and confirm with "OK".

Enter Security Code	×
Please type the following 5 HN3WH	ОК
HN3WH	Cancel
Activate Configuration Projekt: SELMO4Automation Target: ccommonstattics.com Target: ccommonstattics.com Common Comm	×
TcXaeShell ×	
Restart TwinCAT System in Run Mode	
OK	

The project is now loaded and the PLC jumps into RUN mode.



This button is used to log in.



The application is now running on the controller.



Preparation of PLC program for local runtime

If Windows 10 is installed on the development machine, TwinCAT 3 can be used locally. When loading the program, you may see a message that this is not possible. In this case, the User Mode Runtime (UmRT) is recommended. How these work is explained below.

In order for the local system to be executable for TwinCAT, the batch file "win8settick.bat" must be executed. The file can be found in the TwinCAT system folder under C:\TwinCAT\3.1\System.

→ Dieser PC → Windows (C:) → T	īwinCAT → 3.1 → System		
Name	Änderungsdatum	Тур	Größe
Legal	27.10.2020 08:21	Dateiordner	
Default.old	03.11.2020 16:48	OLD-Datei	3 KB
default.tps	03.11.2020 16:48	TPS-Datei	3 KB
🖁 TcAmsRemoteMgr.exe	17.04.2020 22:47	Anwendung	480 KB
🖄 TcAmsSerial.dll	17.04.2020 22:47	Anwendungserwe	444 KB
🖄 TCATGinaU10.dll	17.04.2020 21:32	Anwendungserwe	24 KB
🖄 TCATGinaU14.dll	17.04.2020 22:47	Anwendungserwe	46 KB
🚳 TCATHooks.dll	17.04.2020 22:47	Anwendungserwe	288 KB
🍊 TCATSysSrv.exe	17.04.2020 22:47	Anwendung	929 KB
🖄 TCATUserManU10.dll	17.04.2020 21:32	Anwendungserwe	81 KB
🖄 TCATUserManU14.dll	17.04.2020 22:47	Anwendungserwe	137 KB
TcComPortConnection.dll	17.04.2020 22:47	Anwendungserwe	102 KB
🗔 TcRteInstall.exe	17.04.2020 22:47	Anwendung	188 KB
🛐 TcStgEditor.exe	05.08.2004 00:02	Anwendung	105 KB
🚳 TcSysUI.exe	17.04.2020 22:47	Anwendung	641 KB
💿 win8settick.bat	18.05.2020 14:02	Windows-Batchda	1 KB

The win8settick.bat file should be run as administrator.

			Öffnen	
Name	Änderungsda		Bearbeiten Drucken	
📙 Legal	02.09.2020 10	-	Als Administrator ausführen	
_TCATSysSrv	19.12.2019 1	S	Mit Skype teilen	919 KI
Default.old	13.10.2020 1		Auf OneDrive verschieben	3 KI
default.tps	13.10.2020 1	2	Edit with Notepad++	3 KI
🜆 TcAmsRemoteMgr	17.04.2020 2	Ŧ	Mit Microsoft Defender überprüfen	480 KI
TcAmsSerial.dll	17.04.2020 2	È	Freigabe	444 KI
🖻 TCATGinaU10.dll	17.04.2020 20		- Vorgängerversionen wiederherstellen	24 KI
TCATGinaU14.dll	17.04.2020 2			 46 KI
TCATHooks.dll	17.04.2020 2		Senden an	 288 K
TCATSysSrv	17.04.2020 2		Ausschneiden	929 K
TCATUserManU10.dll	17.04.2020 20		Kopieren	81 K
TCATUserManU14.dll	17.04.2020 2		Verknünfung erstellen	137 K
TcComPortConnection.dll	17.04.2020 2		Löschen	102 K
TcRteInstall	17.04.2020 2			188 K
🙀 TcStgEditor	04.08.2004 2			105 K
🔯 TcSysUI	17.04.2020 2		Eigenschaften	641 K
🔊 win8settick	18.05.2020 13	:02	Windows-Batchdatei	1 KI

Then start the TwinCAT XAE software, if it is not already open, and open the demo project you want to start.

Then navigate to "System" and configure your local control.

SELMO4Automation - TcXaeShell File Edit View Project Build Debug TwinCAT TwinSAFE PLC	Team Scope	Tools Window	w Help				
	- TwinCAT RT (x MO4Automation	64) - - <local></local>	Attach	- Demo		· / / · · · · · · · · · · · · · · · · ·	
Solution Explorer · 부 × S	ELMO4Automation	+ × Global_CN	MZ Libra	ary Manager 🔒	i		
Search Solution Explorer (Ctrl+u) Solution 'SELMO4Automation' (1 project) SELMO4Automation SYSTEM	Router Memory Configured Size [ME Allocated / Available	1]: 32 a: 32 / 31	_FI	Global Task C Maximal Stac	Config ck Size [KB] 64KB ~	
M License	Available cores (Sha	ared/lsolated):	11 🖨 1 🖨	Read	d from Ta	arget Set on target	
Hand Routes	Core	RT-Core	Base 1	lime Cor	re Limit		
🚰 Type System	4 (Shared)						
TcCOM Objects	5 (Shared)						
A MOTION	6 (Shared)						
	7 (Shared)						
Demo Demo Project	8 (Shared)	in the second se					
External Types	9 (Shared)						
References	10 (Shared)						
🛅 DUTs	11 (Isolated)	Default	1 mc	▼ 100	9/		
GVLs	(isolated)	J. Derudie	11113		/ /0		
T Demotrac	Object		RT-Core			Base Time (ms)	Cycle T
▶ In PicTask (PicTask)	I/O Idle Task		Default (11)		-	1 ms	1 ms
Demo Instance	PIcTask		Default (11)		-	1 ms	10 ms
SAFETY	PIcAuxTask		Default (11)		•	1 ms	(none)
NALYTICS							

First, use the following button to read the number of available cores on your system.

Read from Target

There should be at least 2 cores to maintain a stable runtime. In our case, the system has 12 cores from 0-11.

Settings Online Priorities C++ Debugger										
Router Memory Global Task Config										
Configured Size [MB]: 32										
Allocated / Available: 32 / 31										
Available cores (Shared/Isolated): 11 🗘 Read from Target Set on target										
Core	RT-Core	Ba	ase Time	Core Limit			Latency Warning	^		
2 (Shared)						-				
3 (Shared)						•				
4 (Shared)						-				
5 (Shared)						-				
6 (Shared)						-				
7 (Shared)	Default	11	ms 🚬	80 %		-	(none)			
8 (Shared)						<u> </u>				
9 (Shared)						•				
10 (Shared)						<u>•</u>				
11 (Isolated)								~		
<								>		
Object		RT-Core			Base Time (ms)	Cycle Time (ms)	Cycle Ticks	Priority 🛆		
I/O Idle Task		Default (7)		-	1 ms	1 ms	1	11		
PIcTask		Default (7)		-	1 ms	10 ms	10	20		
PIcAuxTask		Default (7)		-	1 ms	(none)	0	50		

A core must be isolated from this with the following button.

Set on target

Router Memory			Global Task (Config						
Configured Size [MB]	: 32	\$	Maximal Stac	k Size [KB]	64KB ~					
Allocated / Available	32/31									
Available cores (Shar	red/lsolated): 11	≑ 1 ≑	Rea	d from Target	Set on target					
Core	RT-Core	Base	Time	Core Limit			L	atency Warning		^
1 (Shared)					Change number of shared cores	×	-			
2 (Shared)							•			
3 (Shared)					Available (Shared/Isolated):	1 1	•			
4 (Shared)							•			
5 (Shared)					C+1	Canaal	•			
6 (Shared)					Set	Cancer	-			
7 (Shared)	✓ Default	1 ms	-	80 %			💌 (r	ione)		
8 (Shared)							-			
9 (Shared)							<u>•</u>			
10 (Shared)										~
<										>
Object		RT-Core			Base Time (ms)	Cycle Time (ms)		Cycle Ticks	Priority	Δ
I/O Idle Task		Default (7)		-	1 ms	1 ms		1	11	
PIcTask		Default (7)		-	1 ms	10 ms	0 ms 10		20	
PIcAuxTask		Default (7)		-	1 ms	(none)		0	50	

After rebooting the system, the isolated core of TwinCAT must be set to the default value.

Settings Online Priorities C++ Debu	gger							
Router Memory Global Task Config								
Configured Size [MB]: 32 🗢 Maximal Stack Size [KB] 64KB V								
Allocated / Available: 32 / 31								
Available cores (Shared/Isolated):	11 🗘 1 💠 🛛 Rei	ad from Target Set on target						
Core RT-Core	Base Time	Core Limit		Latency Warning		^		
2 (Shared)								
3 (Shared)			<u> </u>					
4 (Shared)								
5 (Shared)								
6 (Shared)			<u>•</u>					
7 (Shared)								
8 (Shared)			<u> </u>					
9 (Shared)			<u> </u>					
10 (Shared)								
11 (Isolated) Vefault	1 ms 💌	100 %	(none)		~		
<						>		
Object	RT-Core	Base Time (ms)	Cycle Time (ms)	Cycle Ticks	Priority	<u></u>		
I/O Idle Task	Default (11)	▼ 1 ms	1 ms	1	11			
PlcTask	Default (11)		10 ms	10	20			
PlcAuxTask	Default (11)		(none)	0	50			

In order not to lose any settings, it is recommended to save the project here.



Using User Mode Runtime

Excerpts from <u>Beckhoff Information System</u>:

The TwinCAT 3 usermode runtime allows a TwinCAT program to be executed without the deep TwinCAT operating system integration that would be necessary to ensure real-time execution. This is difficult or impossible to do with newer operating systems, without affecting the other components.

For this purpose, the same program code of the customer project is executed, but without meeting the real-time requirements.

Limitations

- The TwinCAT 3 Usermode Runtime provides an execution environment for the same program code that is executed in the real-time runtime.
- The TwinCAT 3 Usermode Runtime has no guaranteed deterministic execution properties. The operating system is able to interrupt the usermode runtime at any time.
- The TwinCAT 3 usermode runtime does not have access to EtherCAT. So the IO part of the configuration is usually "disabled".
- Components based on the Realtime Ethernet driver can be executed. The execution times, as well as the jitter, can affect the function due to the principle.
- CCAT-based network cards cannot be used.
- The TwinCAT 3 Usermode Runtime cannot access USB, which means that the licensed USB stick cannot be used, for example.
- Due to the principle, it also does not make sense to use all TwinCAT functions under a TwinCAT 3 usermode runtime. Some TwinCAT functions, for example, require a constant real-time tick.
- Where appropriate, TwinCAT 3 Functions are extended to work with the TwinCAT 3 Usermode Runtime. In particular, if something has to be considered in terms of configuration for the TwinCAT 3 Usermode Runtime, this is documented for the respective products.
- The execution order between the tasks may differ in principle from the behavior in the realtime runtime.
- For this reason, it also makes sense not to make the execution sequence dependent on the task priorities.

Starting the User Mode Runtime

In the current TwinCAT version 4024.56, the User Mode Runtime is started via a batch file. This is usually located under "C:\TwinCAT\3.1\Runtimes\UmRT_Default\Start.bat".

First, open the CMD window and then navigate to the corresponding directory. To do this, enter the command "cd C:\TwinCAT\3.1\Runtimes\UmRT_Default\" in the CMD window.



After pressing the Enter key, the path opens:



Start the batch file by typing "Start.bat" and Enter:



The batch file starts. The configuration mode still has to be switched with the input "c". However, this can also be activated in TwinCAT:



After that, the option "UmRT_Default" should be selectable in TwinCAT XAE under Target Systems:

Itest UmRT - TcXaeShell		
File Edit View Project Build Debug TwinCAT TwinSAFE	E PLC Team Scope Tools Window Help	
🕺 🖸 - 🍽 📩 🔁 - 🖆 💾 🔐 🕺 🗇 🖆 🥍 - 🕫 - 🛛 Rele	ease - TwinCAT RT (x64) - 🕨 Attach 📁 👼	- 🖓 🏓 🐺 🏛 🎎 🍪 🖸 - 🖕
Build 4024.56 (Loaded) 🚽 🚽 🔛 🧟 📜 ⊄ 🔨 🙆 💽 🍡 🖉	🖞 Test UmRT 🗸 UmRT_Default 🚽 💡 PLC1 🚽	丑▶ = (: ? : ∈ ♡ 台 凶 笛 ♡ ♡ ;
Solution Explorer 🔹 👎 🗙		
○ ○ 🏠 🛗 - To - @ 🏓 🗕 → -		
Search Solution Explorer (Ctrl+ü) 🔎 -		
↓ 50 Jointon Test UmRT (1 project) ▲ ● Test UmRT ■ SAFETY ● Ge++		
© vision ፼ Analytics ▶ <mark>⊇</mark> VO		×

Then the configuration can be activated (**I**) and the runtime can be started.

The target system now has the NetId: 192.168.4.1.1.1

In Selmo Studio, this NetId must be entered under "Target System" in order to establish a successful connection with the HMI. In addition, the tick for "TwinCAT PLC local" must be removed.

Selmo Studio 2024.4 SP1 Professional [Te:	st (Test.seo)]
File View Generate Tools Windows	Help
: 📷 💷 🕋 🐻 🕞 🐼 🕼	
Project Explorer 👻 💻 🗙 🏼 Targ	pet machine X
► % \	
🔺 🔲 * Test	larget System
🛄 Target system	Select Target System:
License	Beckhoff TwinCAT 3
Project notes	
A S Plant	Target TwinCAT 3 Settings
Parameters	
🖌 🐑 HwZone1	TwinCAT PLC local
Parameters	TwinCAT AMS Net Id:
> 🖻 TCMZ	192.168.4.1.1.1
Sequence1	TwinCAT PLC Port:
	851
	Test ADS Connection
	HMI Target Window Settings
	Network share to deploy HMI:
	······
	✓ Transfer HMI to target after successful generation
	lest Connection Manually transfer HMI files

Afterwards, it is possible to check the connection by pressing the "Test ADS Connection" button. To do this, however, it is important to ensure that the runtime is in the RUN state. If a positive message is displayed, the HMI can be exported and started.



The Usermode Runtime can now be used with the limitations already mentioned.

Installation and configuration of an OPC-UA server

The following section describes how to use an OPC-UA server. This can be installed on the local development computer as well as on the hardware PLC with Windows operating system.

Beckhoff TF6100 OPC-UA Server - 4.4	1.73.0		×							
Bereit das Programm zu installieren Der Assistent ist bereit, die Installation zu	beginnen.		と							
Klicken Sie auf "Installieren", um mit der Installation zu beginnen. Klicken Sie auf "Zurück", wenn Sie Ihre Installationseinstellungen überprüfen oder ändern wollen. Klicken Sie auf "Abbrechen", um den Assistenten zu beenden.										
Aktiviere none/none Endpunkt										
InstallShield	< Zurück In	stallieren Abb	rechen							

After completing the installation of the TF6100 OPC-UA server and the TF6100 OPC-UA configuration tool, the program is started and the endpoints are read out in the first step. First, a connection is established with the user admin and the password admin.

н. т	winCA	T OPC UA C	onfigurator							_		×
File	Se	erver										
	Ċ	i 🔜 🖥	ri 👘 📖		V Edit Connec	t Disconnect	Connection state:					
Data	Acces	s Historical	Access Alarms & Conditions	s Security Server	Settings Online Panel							
Sett	ings C	onfigured T	winCAT OPC UA Servers					×				
	evi	-				2					Disabled	
		Server URL:	opc.tcp://localhost:4840		Get Endpoints							
		Endpoints:	None - None	~	Add 🔶	-3						
	IC.		Name	ServerUrl	SecurityPolicyUri	SecurityMode	IdentityTokenType	Identity	1			
										_	_	
												_
	C											
_												
Loggi	ng T	arget Browser	r									

Configured Tv	vinCAT OP	C UA Servers								>
Server URL:	opc.tcp://	localhost:4840		Get Endpoints						
Endpoints:	None - No	ne	~	Add						
			C 111			C			11	
	Nan	ne or1	ServerUn	bttp://opcfoup	~	SecuntyMode	Apopumous	/pe	Identity	

Read configuration from the device

- only works when connected to the server.
- reads the current settings from the running server.

😭 TwinCAT C		Configurator	
File Serve	er		1
🗋 📂		Edit Connect Disconnect Connection state: connected	
Data Access	Historicar	Access Alarms & Conditions Security Server Settings Online Panel	
Endpoint			
General set	ttings t: 4840 ttings	Overrides Disable Application URI check Allow deprecated security policies Automatically trust all client certificates	
		SecurityPolicy	
•		http://opcfoundation.org/UA/SecurityPolicy#Basic256Sha256	
		http://opcfoundation.org/UA/SecurityPolicy#Aes256_Sha256_RsaPss	
		http://opcfoundation.org/UA/SecurityPolicy#Aes128_Sha256_RsaOaep	
	<u></u>	http://opcfoundation.org/UA/SecurityPolicy#None	

This is followed by an adjustment of the security guidelines. First the user Anonymous is created and then the user admin is removed. Afterwards, the menu item "Server settings" is supplemented by the option "None" and the corresponding line is moved up in the hierarchy.



Under Settings \rightarrow Data Access \rightarrow Legacy/Array Handling, a check mark must be set.

🔝 TwinCAT C	OPC UA Configurator					- 🗆 ×
File Serve	er					
🗋 💕	🛃 📂 💦 Ser	rver1 V Edit C	Connect Disconne	ect Connection state: connected		
Data Access	Historical Access Alarms	& Conditions Security Server Settings Online	Panel			
Settings						
Devices						
	Name	AmsNetId	1	AdsPort	Туре	Disabled
F	E PLC1	127.0.0.1.1.1	8	51	TwinCAT 3 PLC (TMC) - Filtered	
1.00		(2)				
	Configure device				×	
	Target communication					
	Name:	PLC1	Type:	TwinCAT 3 PLC (TMC) - Filtered	~	
	AmsNetId:	127.0.0.1.1.1 Local Remote	SymbolFile:	[BootDir]\Plc\Port_851.tmc	Upload	
	AdsPort:	851	MaxGetHandle:	100	<u>*</u>	
	AdsTimeout:	2000		Import PlcProperties		
	loMode:	ByHandle ~		ReleaseAdsHandles		
		LegacyArrayHandling		Disable device		
	Device meta-data (DI)	3				
	Manufacturer:	beckhoff.com	SoftwareRevision:			
Date/Tir	Model:	PC-based Control	HardwareRevision	:		
02.10.20	SerialNo:		DeviceRevision:			
02.10.20	DeviceManual:		RevisionCounter:			
02.10.20		·	·			
02.10.20	Miscellaneous					
02.10.20	Identifier:	None	NsNameVersion:	2	~	
Logging Targ						
		4			ucces	sful
		Ok Cancel				
		Gander				

Note!!

When using User Mode Runtime on the local computer, an adjustment of the AmsNetId and the path to the TMC file is required. C:\TwinCAT\3.1\Runtimes\UmRT_Default\3.1\Boot\Plc\Port_851.tmc

Configure device			×
Target communication			
Name:	PLC1	Type:	TwinCAT 3 PLC (TMC) - Filtered
AmsNetId:	192.168.4.1.1.1 Local Remote	SymbolFile:	C:\TwinCAT\3.1\Runtimes\UmRT_[Upload
AdsPort:	851 🖨	MaxGetHandle:	100
AdsTimeout:	2000		Import PlcProperties
loMode:	ByHandle \checkmark		ReleaseAdsHandles
	 LegacyArrayHandling 		Disable device
Device meta-data (DI) Manufacturer: Model: SerialNo:	beckhoff.com PC-based Control	SoftwareRevision: HardwareRevision: DeviceRevision:	
DeviceManual:		RevisionCounter:	
Miscellaneous			
ldentifier:	None	NsNameVersion:	2 ~
	Ok Cancel		

After that, the new configuration will be activated.

릚 TwinCAT (OPC UA Configura	ator							
File Serv	er	_							
1	🚽 📂 🗄	Server1		~ E	dit Connect	Disconnect	Connection	n state: connec	ted.
Data Access	Historical Access	Alarms & Conditions	Security	Server Settings	Online Panel				
Users/Groups	Node permission	IS							
Users						Groupe			
		Configuration	on downlo onfigurati e server?	on download su	ccessful. Would	you like to re	start		

① Attention!!

Please note that special care should be taken when creating a configuration for the server. A faulty security configuration can result in you being locked out of the server.

The user "admin" is now deleted and the endpoints are re-imported. A new server is created with the login "Anonymous".

Configured T	winCA	T OPC UA Se	rvers							×
Server URL:	opc.t	cp://localhost	:4840	Get Endpoints						
Endpoints:	None	e - None	~	Add						
		Name	ServerUrl	SecurityPolicyU	lri	SecurityMode		IdentityTokenType	Identity	
•		Server2	opc.tcp://localhos	. http://opcfoun	. ~	None	\sim	Anonymous 🗸		
								/		

Note!!

In some cases, it is necessary to restart the OPC UA server. In the worst case, a restart of the PC is necessary.

Note!!

If a connection cannot be established by the OPC UA server, a new installation is recommended. After a successful reinstallation of the PC, it is advisable to restart the PC.

Adapting the PLC program for communication via OPC-UA

For each variable that is to be reachable via OPC-UA, the pragma *code* {*attribute 'OPC. UA.DA' := '1'*}.



The TF6100 TC3 OPC-UA license must be added. Here, as with all others, the 7-day trial period applies.

🔋 Build 4024.53 (Loaded) 🕞 🚽 🔛 🧱 📕 🖉 🔅 🛞 🍡 🕫	TwinCAT Project1	PLC1 - 1 - 관 🕨 🖬 🕄 🔅 🥲 👘 🖆 🛱 🖥 🖏 🖏	
Solution Explorer 👻 🕂 🗙	MAIN [Online] TwinCAT Project1 + × GVL [Online]		
◎ ◎ ☆ ☆ - '0 - ♂ 🖋 🗕	Order Information (Runtime) Manage Licenses Project Licenses	Online Licenses	
Search Solution Explorer (Ctrl+ü)	Disable automatic detection of required licenses for project		
Solution 'TwinCAT Project1' (1 project)	Order No	License	Add License
Z SYSTEM	TF6000	TC3 ADS-Communication-Library	Cpu license
🔝 License	TE6020	TC3 ISON Data Interface	cpu licence
Real-Time	TF6100	TC3 OPC-UA	🗸 cpu license
	TF6105	TC3 OPC UA Pub/Sub	cpu license
Dir PicTask	TF6120	TC3 OPC-DA	Cpu license

In the settings of the PLC, under Settings \rightarrow Target Files, check the box for TMC-File.



Now the program can be transferred to the runtime via "Activate configuration".

	TwinCA	AT Projec	:t1 - Tc)	(aeSl	hell				
File	Edit	View	Proje	ct	Build	Debug	Twir	CAT	Twin
6	- 0	ね・	*ם - (<u> </u>	9.09	¥ 🗗	â "	2 - (C" -
8 Bu	ild 4024	.53 (Loa	ded)	•	ð 🌔	*	2 %		0
C 1 1						_			_ 0

Checking the server with uaExpert

Settings login server:

Project Project Project Project Project Project Project Project Documents Data Access	Data Access View Data Access View Data Access View Data Access View
Configuration Configuration Name PKI Store	aServer@DESKTOP-AHTVLO7 ? X :OpcUaServer@DESKTOP-AHTVLO7 efault ~
Server Information Endpoint Url Reverse Connect Security Settings Security Policy Message Security Mode	opc.tcp://DESKTOP-AHTVLO7:4840 Basic256Sha256 V Sign & Encrypt V
Authentication Settings Anonymous Username Password Certificate Private Key Session Settings	Store
Session Name	CTOP-AHTVLO7:UnifiedAutomation:UaExpert

Connecting to the server:



Validate certificate:

Good			,		
ertificate Chain					
Name		Trust Status			
A TcOpcUaServer@D	ESKTOP-AHTVLO7	Untrusted			
ertificate Details					
Country	DE				
DomainComponent	DESKTOP-AHTVLC	7			
/alidity					
Valid From	Tue May 21 12:59:2	5 2024			
Valid To	Mon May 16 12:59	25 2044			
Info					
Serial Number	664C7E8D				
Signature Algorithm	RSA-SHA256				
Cipher Strength	RSA (4096 bit)				
Thumbprint (SHA1)	43EA87EA8C7906B	F80F0B140A4D986BB0D848C9E			
JA Extensions					L L
URI	urn:BeckhoffAutor	nation:TcOpcUaServer			
IPAddresses					. 1
DNSNames	DESKTOP-AHTVLC	7			. I.
Extensions	64 TRUE				11
BasicConstraints	CA: IRUE, pathlen:)			
SubjectKeyIdentifier	/D:3/:46:6F:92:3A:6	b:3C:35:81:69:/3:16:D2:A5:E1:40	.:16:4A:68		1
AuthorityKeyldentifier	keyid:7D:37:46:6F:9 DirName:/DC=DE9 /L=LocationName	2:3A:66:3C:35:81:69:73:16:D2:A5 KTOP-AHTVLO7/C=DE/ST=\x0 /O=Organization/OU=Unit/CN	i:E1:4C:16:4A:68)A = TcOpcUaServer(@DES	
KeyUsage	Digital Signature, N	Ion Repudiation, Key Encipherr	ment, Data Enciph	nerme	
ExtendedKeyUsage	TLS Web Server Au	thentication, TLS Web Client A	uthentication		
					-
					_

Drag variables to the main window for viewing:

