Public FAQ

Support

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 - Disable (forced) device user management (as of Codesys Version SP17) (EN) (see page 74)
 - How to: Perform a start / stop for a Codesys runtime from a command line (EN) (see page 81)
 - Location of the configuration file (EN) (see page 82)
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 - Visu, Filetransfer (EN) (see page 88)
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1.3 CODESYS Engineering - FAQ (EN)

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 - 32Bit/64Bit capable applications (EN) (see page 94)
 - Codemeter Control Center FAQ (EN) (see page 95)
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 - How to: Setup a Wibu Network Server Access for Licenses (EN) (see page 97)
 - License is not found, License System Message, Product Code: 13 (EN) (see page 102)
 - Error Message: "Invalid result package" (EN) (see page 103)
 - How to: Go online via CAN connection (EN) (see page 106)
 - Libraries FAQ (EN) (see page 106)
 - 'ConvertUTF8toUTF16': How is the parameter 'bStrictConversion' intended? (EN) (see page 106)
 - CAA File Library (EN) (see page 107)
 - Code-sign a library (EN) (see page 107)
 - Library Development, Project Information: 'Library compatibility' and 'Released' check (EN) (see page 108)
 - Microsoft Edge Webview2 Runtime (EN) (see page 110)
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- Modularization of the Development System Installation Issues (>= SP17) (EN) (see page 112)
- Some new things to look out for in CODESYS SP18 (EN) (see page 115)
- Programming of Applications FAQ (EN) (see page 117)
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 - Codesys Exception: division by zero (Implicit Checks: Division checks) (EN) (see page 126)
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 - How to: Applicative use of the time zone (Util-Lib) (EN) (see page 141)
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 - Symbol configuration: Error message "Found dependency cycle in the types" (EN) (see page 183)
 - SysFile: Saving Files in UTF-8 Format (see page 183)
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 - TCP, Resolve Hostname: Using the Interface "itfAsyncProperty" (EN) (see page 189)
 - TCP: Example for Server and Client (see page 192)
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 - Which IOs are updated in which Tasks / Fieldbus Bus Cycle Tasks (EN) (see page 214)

- Working with Strings More Than 255 Characters (see page 216)
- Setup and Installation FAQ (EN) (see page 221)
 - (V3.5) 'Standalone' Gateway Installation: The CODESYS Edge Gateway (see page 221)
 - CODESYS Installer logs (EN) (see page 223)
 - CODESYS Setup configuration via command line (EN) (see page 224)
 - Downloading missing libraries (see page 226)
 - Installation of several CODESYS versions (see page 229)
 - Library documentation (LibDoc.exe) (>=SP17) (EN) (see page 231)
- Signing Packages (EN) (see page 232)
- The CODESYS Integrated Development Environment (IDE) FAQ (EN) (see page 233)
 - CODESYS communication: Limited data size between PLC and CODESYS IDE (EN) (see page 233)
 - Coloring the background of the search function, color for the marking of the search results (see page 234)
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 - Online or Offline created 'boot application' have different sizes (EN) (see page 241)
 - Report problems and error messages to CODESYS (EN) (see page 242)
 - Report problems and error messages to CODESYS FAQ (EN) (see page 252)
 - Incomplete CoreDump (core file incomplete) (see page 252)
 - RTE, How to: Analyze a BSOD/Crash of the application (see page 253)
 - Why accurate 'steps for reproducing a problem' are important for any Technical Support (see page 256)
 - Switch off the precompilation (EN) (see page 257)
 - What are the meanings of the memory occupation data in the message window? (see page 259)
- CODESYS Error Messages FAQ (EN) (see page 260)
 - Internal error status of a "_TO_" POU when created with addon "CODESYS LD FBD" in version 4.3.0.0 (see page 260)

1.4 CODESYS Fieldbus - FAQ (EN)

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 - BACnet: Cyclic Reading of a Property (see page 261)
 - BACnet: Reading and writing a Calendar object (see page 269)

- BACnet Writing of a Property (PresentValue) (see page 274)
- CODESYS EtherCAT FAQ (EN) (see page 278)
 - EtherCAT: Redundancy (see page 278)
 - EtherCAT: Switching Off/On a Slave from the IEC Program (see page 282)
- CODESYS EtherNet/IP FAQ (EN) (see page 285)
 - Connecting to a WAGO Fieldbus Coupler via Ethernet/IP (IP scanner) (see page 285)
 - Detection of a disconnected Ethernet cable / cable break (see page 289)
 - Ethernet/IP: Setting the IP Address of a Remote Adapter (see page 290)
 - Trouble Shooting for Ethernet IP connections (see page 292)
- CODESYS Ethernet Adapter FAQ (EN) (see page 295)
 - Ethernet Adapter (see page 295)
- CODESYS KNX FAQ (EN) (see page 297)
 - KNX: Integrating a CODESYS Controller (see page 297)
- CODESYS Modbus FAQ (EN) (see page 304)
 - Connecting to a WAGO Controller via Modbus (TCP) (see page 304)
 - Modbus master slave communication over Ethernet (see page 308)
 - Modbus RTU: Dynamic Configuration (see page 316)
 - Modbus TCP Slave: Dynamic Setting of the IP Address (see page 320)
 - Modbus TCP Slave: Using the "Application" Channel Trigger (see page 323)
- CODESYS PROFINET FAQ (EN) (see page 327)
 - How to enable MRP (media redundancy protocol) (see page 327)
- EtherCAT / Ethernet IP / Profinet connection guide (see page 328)
- I/O variables not updating (see page 335)
- Multicore Systems and Fieldbuses (see page 338)

1.5 CODESYS Libraries - FAQ (EN)

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 - AWS IoT Core Client getting started (see page 340)
- IIoT Libraries SL (EN) (see page 347)
- IIoT Libraries SL FAQ (EN) (see page 348)
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1.6 CODESYS Scripting - FAQ (EN)

- Script example: Set I/O variable names (see page 350)
- Script example: Set online path (see page 353)
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1.7 CODESYS SoftMotion - FAQ (EN)

- Difference of fEditor and fTable in SMC_CAMTable* (SM3_Basic Library) (see page 357)
- DXF: File Import, 'Maximum gap size' (see page 358)
- Error diagnostics: Meaning of an value for wCommunicationState > 1000 (see page 359)
- Error diagnostics: SMC_AXIS_GROUP_FOLLOW_SETVALUE (see page 359)
- Generic CiA 402 drive: MC_Power.Status output stays FALSE (see page 360)
- Import a CAM from csv file (see page 361)
- Remark on the 'table' units under SMC_CAMTable* (SM3_Basic Library) (see page 361)
- Scale and Shift Example for fTable and fEditor under SMC_CAMTable* (SM3_Basic Library): (see page 363)
- SoftMotion CNC with strange, jumpy, abrupt movements (see page 363)
- SoftMotion limitations for CAM, Tappets and CNC Programmes (see page 365)
- SoftMotion Task error: "SMC_FB_CALLED_FROM_WRONG_TASK" (see page 366)
- Version difference in the operation of Axis.nAxisState (see page 368)

1.8 CODESYS Visualization - FAQ (EN)

- Access to Text Lists from the IEC Code (see page 371)
- Debugging Visu Exception (see page 372)
- How to: Disable the Microsoft Windows Edge gestures when using a Visualisation (see page 374)
- Including an Interface (Example "IKeyEventHandler") (see page 376)
- Knowhow: Images with SVG file format (see page 381)
- RemoteTargetVisu: Reading the Client Name (see page 383)
- Script Error Warning in Codesys (see page 388)
- Setting the update time of the Visu 'Update rate' and the 'VISU_TASK' (see page 390)
- Trace and memory requirements (see page 392)
- Unresolved references after update visualization (see page 394)
- Visu, Alarm Management: Formatting the Time Stamp (see page 394)
- Visu, Alarm Management: Get 'Group' and 'Class' names from Alarm Storage Data (see page 398)
- Visu, Linux: Multitouch problems on Targets (see page 399)
- Visu: Dialogs with and without directly passing variables ({attribute 'VAR_IN_OUT_AS_POINTER'}) (see page 401)
- Visu: Disabling an Entry for WebVisualizations Only (see page 409)
- Visu: Fonts (see page 414)
- Visu: Performance FAQ: limiting number of Visu-Elements or Objekts (see page 417)
- Visu: Trace recording history (see page 418)
- Visu: Trend FAQ (EN) (see page 419)
 - Visu, Trend: Behaviour of trend data during a project update (see page 419)
 - Visu: Deleting a trend recording history (see page 420)
- Visu: Using a Table as an Input Element (see page 420)
- Visu: Using Events of the User Management (Login/Logout) (see page 424)

- VISU Dialogs FAQ (EN) (see page 430)
 - Creating and using your own dialog (EN) (see page 430)
 - Use Customize keypad or numpad inputs from VisuDialogs (see page 433)
- WebVisu: Reading the IP Address of the Client (see page 436)
- Workaround: Webserver and Webvisu Certificate issues with recent Browser versions (2023) (see page 444)
- Working with color variables (see page 445)

2 CODESYS Communication - FAQ (EN)

2.1 OPC UA - FAQ (EN)

2.1.1 OPC UA-Client - FAQ (EN)

2.1.1.1 How to use the OPC UA Client (>=SP17)

This example requires an anonymous login: OPC UA Server: Anonymous login¹

1. Ensure CODESYS Communication package is installed

CODESTS INStaller						
				Ad	ld Installation	n
odesys 3.5 sp	17 <mark>(64</mark> bit)					
stallation Name efault						
cation :\Program Files'	CODESYS 3.5.17	7.0\CODESYS\Addi	tionalFolders\Default			Brows
annel for Setups						
eleases						
annel for AddOns						
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AddOns CODESYS Com Installed CODESYS C	m Browse	Updates	Q ■ CODE Version:	Inst Export Config SYS Communication 4.0.0	Import (n I	Config

¹ https://faq.codesys.com/display/CDSFAQ/OPC+UA+Server%3A+Anonymous+login

2. Add a datasource to your project and select "OPC UA Server" as source:

	_
Devices	Add Data Source X
Untitled7	
□····································	The data source object can be used to attach another data source to the current PLC.
🖹 🧑 Application	
Data Sources Manager	
📶 Library Manager	Name
PLC_PRG (PRG)	Datasource
Task Configuration	Select data source type
DatasourcesTask (IEC-Tasks)	CODESYS ApplicationV3
Datasources.Datasources_PRG	CODESYS ApplicationV3
🖻 💖 MainTask (IEC-Tasks)	OPC UA Server
PLC_PRG	6

3. Set the URL and the security settings of the server which you want to connect:

📲 Initialize Data Source Wizard - Provider settings

Initialize the Data Source

Set the communication parameters

opc.tcp://192.168.99.146:4840					
rce					
http://opcfoundation.org/UA/, 15.07.2020 (opcfound: $\scriptstyle imes$					
None	~				
None	~				
ou pc	ource pcfoundation.org/UA/, 15.07.2020 (opcfoundation) ode None None				

4. Select the nodes you want to connect:

```
🖷 Initialize Data Source Wizard - Browse data items
```

Initialize the Data Source

Choose the data items

Variables	Access right	Maximal access right	Туре
🗏 📝 DeviceSet			
🖻 👿 📄 CODESYS_Control_for_Raspberry_Pi_MC_SL			
🖮 📝 📄 Resources			
🖮 📝 📄 Application			
🖮 📝 📄 Programs			
🖻 - 📝 📄 PLC_PRG			
👽 🛷 udi1	N	N	UDINT
🖲 🔲 📄 DeviceTopology			
🖻 🗐 Server			

5. For automatic updating, the option "Update always" must be set

Devices 👻 👎	X Patasource X						
= 🗿 Untitled7	 Variables Type Mappings Communication General ar 	nd Diagnosis					
Image: Book of the second	Co Updete variables						
Application	Local variable	Access right	Update Iways	Create or Map	Type mapping	Remote variable	
😑 🚟 Data Sources Manager	DeviceSet	N		N 199	DeviceSet	DeviceSet	
	CODESYS_Control_for_Raspberry_Pi_MC_SL	* *			CODESYS_Control_for_Raspberry_Pi_MC_SL	CODESYS_Control_for_Raspberry_Pi_MC_SL	
B DataSources_Objects	Resources	* *	V		Resources	Resources	
👘 Library Manager	Application	*			Application	Application	
PLC_PRG (PRG)	Programs	5 (r)			Programs	Programs	
😑 🎉 Task Configuration	PLC_PRG	5 Q			PLC_PRG	PLC_PRG	
🖶 🅩 DatasourcesTask (IEC-Tasks)	udi1	N]	UDINT	udi 1	
Datasources.Datasources_PRG							
😑 🅪 MainTask (IEC-Tasks)							
PLC_PRG							

Local type

Note: your types must not conflict with any local objects, commonly PLC_PRG.

OPCUAClientTutorial	• ^	Variables Type M	appings Commun	nication General ar	nd Diagnosis			
⊡		Local type		Create or Map	Mapping nan	ne	Remote type	
Application		Application		*	Application		Application	
🗏 📟 Data Sources Manager		CODESYS_Contro	l_Win_V3_x64	*	CODESYS_Con	trol_Win_V3_x64	CODESYS_Control_Win_V3_x64	4
Datasource		DeviceSet		*	DeviceSet		DeviceSet	
DataSources Objects		PLC_PRG		×	PLC_PRG		PLC_PRG	
Library Manager		Programs		**	Programs		Programs	
PLC_PRG (PRG)		Local variable a	Access right	Type mapping INT		Remote variable a		
<	>							
🛣 Devices 🗋 POUs 🛃 Raspberry Pi 🛃 Linux		OPC UA Server						
Messages - Total 2 error(s), 0 warning(s), 2 message(s)								
Build	- [🖸 2 error(s) 😗 0 v	varning(s) 🚺 1	message(s) 🗙	×			
Description								Proj
Build started: Application: Device.Application	Build started: Application: Device.Application							
Typify code								
C0177: 'PLC_PRG' is of type PROGRAM and cannot be instantiated OPCL								
C0177: 'PLC_PRG' is of type PROGRAM and cannot be instantiated OPC					OPCL			

To fix this, simply change the Local type in the Type Mappings tab:

Variables	Type Mappings	Commun					
Local ty	Local type						
Applicatio	Application						
CODESYS	CODESYS_Control_Win_V3_x64						
DeviceSe	t						
PLC_PRG	PLC_PRG_remote						
Programs	Programs						

opcua²

- CODESYS Group³ We software Automation.
- Imprint⁴
- Data protection declaration⁵

Atlassian⁶

2.1.2 OPC UA-Server - FAQ (EN)

2.1.2.1 OPC UA: How many variables is the limit?

The title is a frequently asked question that can be answered quite easily: "There is no fixed limit." Nevertheless, there are various possibilities to minimize the performance demand of the OPCUA server and thus to lighten the load on the controller. The influence of hardware is ignored in this article.

All values refer to the online mode. Load peaks during login or browsing of the data points via the client are not examined.

A Raspberry Pi 3 serves as controller and the Unified Automation UaExpert was used as client. A POU with 1000 variables of type *UDINT* as created as a test project. A value change can be switched on or off at the variables:

² https://faq.codesys.com/label/CDSFAQ/opcua

³ https://www.codesys.com

⁴ https://www.codesys.com/imprint.html

⁵ https://www.codesys.com/privacy-policy.html

⁶ http://www.atlassian.com/

M./whomana project - CDBRV0							
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	1 3	MELOOP 1- GOLDECT					
	1 3	which is not been					
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		100100 = 11000					
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	1 3	statut in second					
	1 3	which an addition					
	1 14	whith a white					
	- 12	widdlight on with Data					
	1 20	websildi na weblikay					

This POU can then be copied as often as required, working with 10,000 "prepared" variables. The copied POUs are called using the code of *PLC_PRG*.

EA, Serformance, project" - 000FDVI					
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NAMES OF A DOMESTIC STATE STATE AS A DOMESTIC					
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10 10 Device (CODESHS Central for Registerry P.S.)	a 2	100			
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		street in should			
	1000	1011994 1- 1012101/			
	1000	salates in seacher			
	1200	widthin in widthing			
	1941	ukibo? on ukiCany			
	1000	ME1856 1= MEDUAN			
		001999 (= 000CM/)			
	1.544	RC 882 3 D 4			
	1200	82,84,201			
	1007	850_896_8 p.r			
	1.000	HLC_290_4 D.1			
	1000	PLC_PR0_5 D1			
	1220	NO. 100 100			
	11113	PLC 290 8 011			
	1111	850 896 9 DI			
	1111				
	1111				

Simply providing the data points has no negative influence on the CPU load because the data is not used. However, the compiler process takes longer.

In the test project, the CPU has a load of \sim 8%, whereby the monitoring of the CODESYS IDE is continuously active.

🛃 pi@ThK_raspberry: ~	-				territori e critor linge
top - 08:58:29 up Tasks: 112 total, %Cpu(s): 0.6 us, KiB Mem: 882500 KiB Swap: 0	2:58, 1 runn 2.2 sy, total, total,	1 user, 1 ing, 111 s 0.0 ni, 153200 u 0 u	oad average leeping, 97.1 id, (sed, 729; sed,	e: 1.12, 1.0 0 stopped, 0.0 wa, 0.0 300 free, 0 free.	8, 1.05 0 zombie hi, 0.1 si, 0.0 st 13528 buffers 79600 cached Mem
PID USER PR	NI	VIRT RE	S SHR S	SCPIL SMEM	TIME+ COMMAND
713 root 20	0 2	9876 2398	8 2228 S	7.9 2.7	19:57.22 codesyscontrol.
222 root 20	0	0	0 0 D	6.6 0.0	12:27.93 rcio_worker
197 root 20	0	0	0 0 S	1.3 0.0	2:30.92 spi1
979 pi 20	0	5112 254	0 2164 R	0.7 0.3	1:09.01 top

As soon as the client is connected, the load increases to ~9%, which is the base load.



2.1.2.1.1 Value changes

When the first 1000 data points are activated by the client, the load increases to ~17%.

Dat	a Access View																						Θ
#			Ser	ver								Node I	d			C	isplay Name	2	Value	Dataty	pe	ource Timestan	n 🔺
1	OPCUAServer@7	ThK raspber	rry - No	ne - None I	uatep-uase	-uabinary)	NS4IStringIly	rarICO	ODESYS	Contro	ol for Rasp	berry Pi S	SL.Applicat	on.PLC PRO	5.udi000	udi	000	0		UInt32		11:04:19.769	=
2	OPCUAServer@	ThK raspber	rry - No	ne - None	uatcp-uasc	-uabinary)	NS4 String v	arico	ODESYS	Contro	ol for Raspl	berry Pi S	L.Applicat	on.PLC PRG	5.udi001	udi	001	0		UInt32		11:04:19.769	-
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4	OPCUAServer@	FhK_raspber	rry - No	ne - None I	(uatcp-uasc	-uabinary)	NS4 String v	rar CC	ODESYS	Contro	ol for Rasp	berry Pi S	SL.Applicat	on.PLC_PRG	5.udi003	udi	003	0		UInt32		11:04:19.769	
5	OPCUAServer@	FhK_raspber	rry - No	ne - None I	(uatcp-uasc	-uabinary)	NS4 String v	rar CC	ODESYS	Contro	ol for Rasp	berry Pi S	SL.Applicat	on.PLC_PRG	5.udi004	udi	004	0		UInt32		11:04:19.769	
6	OPCUAServer@	ThK_raspber	rry - No	ne - None	(uatcp-uasc	-uabinary)	NS4 String v	rar CC	ODESYS	Contro	ol for Rasp	berry Pi S	SL.Applicat	on.PLC_PRG	5.udi005	udi	005	0		UInt32		11:04:19.769	
7	OPCUAServer@	ThK_raspber	rry - No	ne - None I	uatcp-uasc	-uabinary)	NS4 String v	rar CC	ODESYS	Contro	ol for Rasp	berry Pi S	SL.Applicat	on.PLC_PRC	5.udi006	udi	006	0		UInt32		11:04:19.769	
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10	han 00.04	. 20	2.04	1			. 1 . 24 . 1	1.0	1 07	-			_							1132		11:04:19.769	-
112	cop - 09:04	:36 up	3:04,	i use	r, ioac	i average	: 1.24, 1	.10,	, 1.07											1132		11:04:19.769	
12	Tasks: 112 1	total,	1 ru	nning,	111 slee	ping,	0 stopped		0 zon	nbie										102		11:04:19.709	
14	%Cpu(s): 2	.7 us,	3.1 s	y, 0.0	ni, 94.	2 id, 0	.0 wa, 0	.0 h	hi, (0.0 s	si, 0.0) st								nt52		11:04:19:709	
15	KiB Mem:	882500	total	, 153	480 used	i, 7290	20 free,	1	13588	buff	ers									nt32		11:04:19.769	-
16	KiB Swap:	0	total		0 used		0 free.	7	79600	cach	ied Mem									nt32		11.04.19.769	
17	· ·																			ht32		11:04:19.769	1
18	DID USED	DD	MT	VIDT	DFC	cup c	SCDII SME	м	TTA	EL C	OWAND.									ht32		11:04:19.769	
19	PID USER	PR	NI	VIRI	RED	SHK S	SCPU SME	m	111	ne+ c	OPIPIAND	_	-							ht32		11:04:19.769	
20	/13 root			29876	23988	2228 S	16.5 2.	1 2	20:38.	.03 c	codesys	contro.	1.							ht32		11:04:19.769	
21	222 root	20				0 D	7.3 0.	0 1	12:53.	.21 r	cio_wo	rker								ht32		11:04:19.769	
22	197 root								2:36.	.09 s	spi1									ht32		11:04:19.769	
23	979 ni	20	0	5112	2540	2164 R	0.7 0.	3	1:11.	.50 t	:on									ht32		11:04:19.769	

When we start the counter, we have a constant value change of the variable. This increases the load to \sim 23%.

Data	Access View																	Θ
#			Serve	er							Node Id		Display Name	V	alue	Datatype	iource Timestam	^
1	OPCUAServer@	ThK_raspber	ry - Non	e - None (uatcp-uasc	-uabinary)	NS4 Strin	g var C	ODESYS Co	ntrol fo	for Raspberry Pi SL.Application.PLC_PRG.udi	li000	udi000	1074		UInt32	11:07:35.100	=
2	OPCUAServer@	ThK raspber	ry - Non	e - None (uatcp-uasc	-uabinary)	NS4 Strin	gllvarlC	ODESYS Co	ntrol fo	for Raspberry Pi SL.Application.PLC PRG.udi	1001	udi001	1074		UInt32	11:07:35.100	
3	OPCUAServer@	ThK_raspber	ry - Non	e - None (uatcp-uasc	-uabinary)	NS4 Strin	g var C	ODESYS Co	ntrol fo	for Raspberry Pi SL.Application.PLC_PRG.udi	1002	udi002	1074		UInt32	11:07:35.100	
4	OPCUAServer@	ThK_raspber	ry - Non	e - None (uatcp-uasc	-uabinary)	NS4 Strin	g var C	ODESYS Co	ntrol fo	for Raspberry Pi SL.Application.PLC_PRG.udi	li003	udi003	1074		UInt32	11:07:35.100	
5	OPCUAServer@	ThK_raspber	ry - Non	e - None (uatcp-uasc	-uabinary)	NS4 Strin	g var C	ODESYS Co	ntrol fo	for Raspberry Pi SL.Application.PLC_PRG.udi	li004	udi004	1074		UInt32	11:07:35.100	
6	OPCUAServer@	ThK_raspber	ry - Non	e - None (uatcp-uasc	-uabinary)	NS4 Strin	ig var C	ODESYS Co	ntrol fo	for Raspberry Pi SL.Application.PLC_PRG.udi	li005	udi005	1074		UInt32	11:07:35.100	
7	OPCUAServer@	ThK_raspber	ry - Non	e - None (uatcp-uasc	-uabinary)	NS4 Strin	ig var C	ODESYS Co	ntrol fo	for Raspberry Pi SL.Application.PLC_PRG.udi	1006	udi006	1074		UInt32	11:07:35.100	
8 (-OBCUAC	TLV menters	11	- M (NCAIChain	Coloredo	ODECVC C-		Con December 201 Cl. Annelisetien DLC DDC web	1:007		1074		-Int32	11:07:35.100	
9	pi@ThK_ras	berry: ~			-	-					to beginned it is special work (1997) of	_				ht32	11:07:35.100	
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11	cop - 09:0:	:33 up		1 usei	r, loac	1 average	: 1.30,	1.10	, 1.09						^	nt32	11:07:35.100	
12	Tasks: 111	total,	1 run	ning,	110 slee	ping,	0 stopp	oed,	0 zombi	e						nt32	11:07:35.100	
13	%Cpu(s): 3	.8 us,	2.1 sy	, 0.0	ni, 93.	5 id, 0	.0 wa,	0.0	hi, 0.1	si,	, 0.0 st					nt32	11:07:35.100	
15	KiB Mem:	882500	total,	153	348 used	1, 7291	52 free	÷.,	13636 bi	iffer	rs					11.52	11:07:35.100	
16	KiB Swan:	0	total.		0 used	1.	0 free		79604 @	iched	d Mem					n+22	11:07:25 100	
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18	DTD HODD		117	11700	222	0110 0	0.0011	1000	m Th (D)	0.01	10/21/20					at32	11:07:35 100	
19	PID USER	PR	NI	VIRT	RES	SHR S	SCEO 4	MEM	TIME	- COM	MMAND					nt32	11:07:35.100	
20	713 root	20		29876	23988	2228 S	22.8	2.7	21:08.43	cod	desyscontrol.					nt32	11:07:35.100	
21	222 root	20				0 D	7.3	0.0	13:05.58	rci	io worker					nt32	11:07:35.100	
22	197 root	20	0		0	0 5	1.7	0.0	2:38.54	spi	11					ht32	11:07:35.100	
23	979 ni	20	0	5112	2540	2164 P	0 7	0 3	1.12 69	ton	2					nt32	11:07:35.100	
24	575 pr	20		0112	2010	LIUI R		0.0	1.12.0.	, 00p	P					ht32	11:07:35.100	

The measurement results with an increasing number of data points are summarized in the following table:

Number of data points	Subscribed data points without value change	Subscribed data points with value change
0	~10% (base load) of the project	~10% (base load) of the project
1000	~17%	~23%
2000	~25%	~35%
3000	~30%	~45%
4000	~36%	~55%
5000	~41%	~67%

The first conclusion can be drawn as follows:

• The CPU load, and therefore also the number of variables, depends on the number of value changes.

The next point, the sampling rate, can also be derived from this.

2.1.2.1.2 Sampling rate

The above measurement results are recorded with the default settings of the OPCUA client with an refresh rate of 500 milliseconds.

There are many values and parameters for which a slower refresh rate at the client has practically no influence.

As an example, a room temperature or preset/setpoints, such as the parameters of a PID controller, should be mentioned here.

Starting from the worst case in the above table, more and more data is now set to a lower sampling rate, while the others remain unchanged:

Sampling rate / Number of data points	0	1000	2000	3000	4000	5000
1000	~67%	~65%	~64%	~62%	~60%	~59%
2000	~67%	~64%	~62%	~59%	~58%	~56%
5000	~67%	~64%	~61%	~59%	~56%	~54%

A mixed operation of 1000 variables each with a sampling rate of 500, 1000, 2000, 3000, and 4000 milliseconds resulted in a CPU load of ~59%.

The second conclusion can be drawn as follows:

• The CPU load can also be reduced by dividing the variables into groups with different refresh rates.

2.1.2.1.3 Combination of data points in one array

The variables of a project can be combined not only in time-based groups via the OPCUA client, but also by data type on the controller.

For demonstration purposes, the program is extended a little bit:



This time as well, the values are recorded with and without the value being changed. Again, the sampling rate is at 500 milliseconds.

Unified Automation UaExpert - The OPC Unified Architecture	e Client - NewProject*	•			•	
File View Server Document Settings Help						
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Project 6	P × Data Access View					
4 🃁 Project	# Server		Node Id	Display Name	Value	Datatype
4 📁 Servers	1 OPCUAServe	@ NS4 String var CODESYS Contro	ol for Raspberry Pi SL.Application.DataArray.audi1	audi1	{0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.	0.0.0.0.0.0.0 UInt32
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•	PID USER	PR NT VIRT RES	SHR S %CPU %MEM TIME+ COMMA	ND		
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No Highlight	222 root	20 0 0 0	0 D 6.6 0.0 24:26.21 rcio	worker		
	197 root	20 0 0 0	0 S 1.7 0.0 4:54.75 spi1			
Koot	979 pi	20 0 5248 2540	2164 B 0.7 0.3 2:20.40 top			

Number of data pointsalue change	Without value change	With value change
1000	~10%	~11%
2000	~10%	~12%
3000	~11%	~13%
4000	~11%	~14%
5000	~12%	~14%

Even if combining data points in different groups/arrays means more work in the actual project, this investment should be made for larger plants.

Please note that all tests were performed with only one client connected.

Of course, every additional client also increases the CPU load.

Here the first measurement (1000 individual variables with a value change) with two connected OPCUA clients:

Unified Automation UaExpert - The OPC Unified Archite	ecture Client - PerformanceTest_1000	Winfied Automation UaExpert - The OPC Unified Architecture Client - Performance	ceTest_1000						
File View Server Document Settings Help		File View Server Document Settings Help							
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Project	🗗 🗙 Data Access View	Project 6	× Data Access View						
Project Servers OPCUAServer@ThK_raspberry - None - Non Documents Data Access View		Project Decvers OPCUAServer@ThK_raspberry - None - None (uatcp-uasc-uabinary) Documents Data Access View	Server Server OPCUAServer® NSIString var/CODESYS Control for Rapberr OPCUAServe®						
Adress Space A	top - 12:37:18 up 6:37, 1 u. Tasks: 112 total, 1 running Açbu(s): 3.7 us, 1.9 sy, 0 K1B Mem: 882500 total, 1 K1B Swap: 0 total, PID USER PR NI VIR 713 root 20 0 3023 222 root 20 0 197 root 20 0 979 pi 20 0 524	er, load average: 1.33, 1.29, 1.20 111 sleeping, 0 stopped, 0 zombie 0 ni, 94.14, 0.0 wa, 0.0 hi, 0.3 si, 0.0 st 6100 used, 726400 free, 15756 buffers 0 used, 0 free, 72660 cached Mem RES SHR S 10F01 MEM TIME+ COMMAND 24540 2228 S [23.6] 7.8 106:31.13 codesyscentrol. 0 0 0 0 6.6 0.0 27:30.67 rcio.yovker 0 0 0 5 1.7 0.0 5:31.53 spl1 2540 2164 R 1.0 0.3 2:38.48 top							

2.1.2.2 OPC UA: Lowered Performance due to Encryption

The fact that communication between the OPC UA server and the OPC UA client can now be encrypted is a feature that also has disadvantages.

This affects establishing connections as well as power requirements during operation.

It was tested with a weaker device – the Raspberry Pi 3 – in which the results can be seen more clearly.

UaExpert was used as the OPC UA client.

The measurements were performed manually and the variables changed their value in cycles (worst case scenario).

2.1.2.2.1 Establishing communication

When creating a server certificate for a CODESYS controller, you can determine the length of the encryption:



A temporal difference can already be noticed when the certificate is created.

Depending on the length of the key, the following times may result when establishing communication:

Variable count / Key lenght	unencrypted	2048	3072	4092
1000 variables	~ 1 Sek.	~ 6 Sek.	~ 16 Sek.	~ 25 Sek.
2000 variables	~ 2 Sek.	~ 8 Sek	~ 18 Sek.	~ 26 Sek.

Depending on the client, it may not be possible to establish a connection to the controller. The "ConnectionTimeout" in UaExpert has to be edited (default setting: 10 seconds):

Configure UaExpert	
Filter:	
Parameter	Value
EventsPlugin.QueueSize	4294967295
EventsPlugin.SamplingInterval	500
EventsPlugin.ShowDateWithTimestamps	false
EventsPlugin.ShowDialogConditions	true
EventsPlugin.ShowNullEventFields	false
General.AutomaticReconnect	true
General.BrowseTimeout	10000
General CallTimeout	10000
General.ConnectTimeout	60000
General.DisableError.CertificateIssuerKevocationUnknown	false
General.DisableError.CertificateIssuerTimeInvalid	false

The device is running at full capacity when the connection is established. => CPU load: ~ 100%

🛃 pi@ThK_raspberry: ~			
top - 07:11:28 up 1	min, 1 user, 10	ad average: 0.91, 0.28, 0.10	A
Tasks: 117 total,	2 running, 115 sl	leeping, 0 stopped, 0 zombie	
%Cpu(s): 24.5 us,	1.5 sy, 0.0 ni, 7	73.5 id, 0.0 wa, 0.0 hi, 0.5 si,	0.0 st
KiB Mem: 882500	total, 111868 us	sed, 770632 free, 10244 buffer	rs
KiB Swap: 0	total, 0 us	ed, 0 free. 51908 cached	i Mem
PID USER PR	NI VIRT RES	S SHR S SCPU SMEM TIME + COM	IMAND
706 root 20	0 20320 14532	2 2140 S 99.6 1.6 0:12.28 cod	lesyscontrol.
215 root 20	0 0 0	0 R 6.0 0.0 0:04.49 rci	lo_worker
188 root 20	0 0 0	0 S 1.3 0.0 0:00.95 spi	11
825 pi 20	0 5112 245	5 2100 R 0.7 0.3 0:00.17 top	2

To illustrate how strongly the influence depends on the device, here is a connection from an OPC UA client to a CODESYS Control Win V3.

With 1000 variables and a key length of 3072 bits, this takes approximately 1 second:

📆 C	DESYSContro	olService.exe:5340 Properties	
Ima	ge Performar	nce Performance Graph GPU Graph Services Threads TCP/IP Security Environment Strings	
	PU Usage		
	3.38%		

2.1.2.2.2 Normal operation

Even during normal operation, the encryption requires a little more computing power, as the following table shows:

Variable count / Key length	unencrypted	2048	3072	4096
1000 variables	~ 23 %	~25 %	~ 25 %	~ 25 %
2000 variables	~ 35 %	~ 39 %	~ 40 %	~ 40 %

2.1.2.3 OPC UA Server: Anonymous login

For security reasons, anonymous login is no longer permitted by default as of SP17, but can be adjusted via the communication settings of the device.

Devices – 4 X	Device X	
Hugo_SymboConfig Hugo_SymboConfig Device Iconnected] (CODESYS Control for Baseherr	Communication Settings	Scan Network Gateway Device -
=-∰ PLC Logic =-⑦ Application	Applications	
brary Manager myPOU (PRG)	Backup and Restore	
PLC_PRG (PRG)	Files	
Task Configuration	Change Communication Policy	×
B WainTask (IEC-Tasks)	Communication	
- B myPOU	New policy	Optional encryption
a Soloriou Cereira Aus rou a InC ∰⊕ GPIOs_A_B (GPIOs A,B) b Onewire ⇒ a Camera device - C <emoty></emoty>	New poilty	Quotana et a your The device apports both encrypted and unencrypted communication. This can be decided by the user.
SPI	Device User Management	
	Current policy	Enforced user management
	New policy	Enforced user management The user management on the device is active and cannot be disabled by the user
	¢	The user management of the device is a civic and cannot be deaded by the user.
		OK Cancel

Changing the setting requires a restart of the runtime.

2.1.2.4 Symbol configuration: Creating and using multiple symbol configurations

If different clients should have access to different data areas of the controller, then multiple groups of symbols are necessary.

In CODESYS controllers, access to the respective symbol set is assigned to the controller by means of user management.

As a result, the client has to supply the user and password, which should certainly be encrypted by today's standards.

From these requirements, encrypted communication with the controller is necessary. Especially with large amounts of data, encryption can lead to a higher load on the controller and, for example, prolong the startup behavior of the OPC UA server. Also note that not every client supports encrypted communication, for example an OPC**DA**-Client

=> mixed operation is not possible.

 Create a project with encrypted communication for 3 variables and test the communication, for example with the "UaExpert" OPCUA client.

Step-by-step instructions are found in the help:



2.1.2.4.1 Creating user management for the controller

If user management is already activated on the controller, then you can skip this step.

• In the configuration area of the controller, open the Users and Groups tab. Click the *Refresh* button.
Communication Settings	
Applications To get started, either connect to a device to upload its con	figuration or load a configuration from disc.
Backup and Restore	
iles	♦ Import
	Edit
	Delete
LC Settings	
LC Shell	
sers and Groups	
ccess Rights	
ymbol Rights	
ask Deployment	
caroups	
formation	
	• Import
	Edit
	© Delete

This is followed by a dialog that you confirm by clicking Yes.

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•

Then a login dialog opens for you to login on the controller as the default user *Administrator* (*password: Administrator*).

As this is the first time you have used user management, you will then be prompted to enter a new password.

Password expired, please	enter a new one!	x
Name:	Administrator	
Password:	•	
Confirm password:	•	
Password strength:	Very weak 📝 Hidepassword	
	 ✓ Password can be changed by user ✓ Password must be changed at first login 	\searrow
	ок	Cancel

• Create a new user group (example: "grOPCUA") by clicking the *Add* button.

spolacitors made Al Anges as immediatly downloaded to the device.	Communication Settings	💠 📄 🔛 Device user: Administrator		
adup and flastore ince age age age age age age age ag	pplications	Synchronized mode: All changes are immediately downloaded t	to the device.	
Nea Ag AG Strings AC String	Backup and Restore	Administrator		O Add
ag ag C Settings C Setting C Settings C Settings C Settings C Settings	llar			O Import
ag Stange AC Sahari Jaren and Groups Tesk Deployment Baha Montantan				Edit
As Shell As Shell See as d Groups See	.og			© Delete
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Attra of server of server and the Administrator and the Server and the Se	ask Deployment			
Mormation + 52 Advisibility Io - 64 + 52 Provideor - 62 Provideor + 53 Provideor	Status	Groups		
	nformation	Administrator		🔍 🗢 Add
		* Stopper		C Import
* € Sisnica €8 wash		91 gropcua		🛃 Edit
- ss men		*-93 Service		O Delete
		- Ss Watch	De	

•

• Use this button to create a new user (example: "usrOPCUA") in this area. In the configuration dialog, assign the created group "grOPCUA" to the user:

Add User	22
Name:	usrOPCUA
Default group:	grOPCUA v
Password:	•
Confirm password:	•
Password strength:	Weak 📝 Hidepassword
	Password can be changed by user
	Password must be changed at first login
	OK Cancel

Communication Settings	🙋 🖙 🔚 Device user: Administrator		
Applications	Synchronized mode: All changes are immediately downloade Users	d to the device.	
Backup and Restore	Administrator		Add
Files	Is member of group 'grOPCUA'		C Import
.og			Delete
LC Settings			
PLC Shell			
Isers and Groups			
ccess Rights			
iymbol Rights			
ask Deployment			
itatus	Groups		
nformation	- Si Administrator		O Add
	Seveloper Seveloper Seveloper		O Import
	as gropcua	N	Edit
	has user member 'usrOPCUA' service	ьg	Delete
	Watch		



2.1.2.4.1.1 Creating a new configuration

• In the Symbol Configuration, select the option Settings\Enable Symbol Sets:



This makes the existing configuration the default set.

• Add a new group by clicking the *Add a new symbol set* button.

× tings → Tools →							
oles which are not re	eferenced by t	the IEC code. I	Reading ar	nd writing to th	hem may not ha	ave the desired effect(s).	Remove
		- (+)	0) 🗙 Ca	onfigure Symbo	ol Rights	
will be transferred w	ith the next do	ownload or on	line chang	e			
Access Rights	Maximal	Attribute	Туре	Members	Comment		
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• In the dialog, type in a meaningful name for the group:

Add a new symbol set		×
Symbol-Set Name	symOPCUA	
After adding a syn	bol set you have to set permission:	s in the plc
		Add Cancel

• Assign a variable to the group:

•

Niew 🔹 🏬 Build 🛛 🖓 Set	tings - Tools -							
! There are 1 configured varia	bles which are not re	eferenced by	the IEC code.	Reading a	nd writing to t	hem may not h	ave the desired effect(s).	Remo
armORCIUA				- -		onfigure Symbo	al Pights	
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Changeo symbol configuration	will be transferred wi	ith the next d	ownload or or	nline chang	e			
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■								
IoConfig_Globals Inc_PRG Inc_PRG Inc_PRG Inc_PRG		-		BOOL				
IoConfig_Globals IOCo	N 9	54) 54)		BOOL				

• Download the project to the controller.

•

•

2.1.2.4.2 Assigning from the symbol set to the user group

• Open the *Symbol Rights* tab in the controller and update the contents by clicking the *Refresh* button. The available symbol sets should now be listed:

Applications Symb	ool Sets	Rights:	
Backup and Restore	Application	Groups	Access
Tile-	erection default	Administrato	r <u>–</u>
riles	-> Symorcox	Developer	
Log		Everyone	
		gropcua	
PLC Settings		Watch	<u>_</u>
PLC Shell			
Users and Groups			\searrow
Access Rights			
Symbol Rights			
Task Deployment			
Status			
Information			

Now you can select the symbol set in the list on the left and assign it by double-clicking the user group:

Symbol Configuration	Device X	
Applications	Synchronized mode: All changes are immediately download Symbol Sets	led to the device.
Backup and Restore		Groups Access
	e default	Administrator 🕂
Files	SymOPCUA	Developer
		Everyone -
Log		grOPCUA -
DLC Sattings		Service -
PLC Settings		Watch -
PLC Shell		

Applications	Symbol Sets	Rights:	
Backup and Restore	E-	Groups	Acces
		Administrator	-
Files	symOPCUA	Developer	-
		Everyone	-
Log		grOPCUA	+
		Convior	

2.1.2.4.3 Testing with the OPC UA client

In the OPC UA client, change the connection option to use a user:

Project	8 ×	Data Acce	ss View					
4 🗊 Project		#	Server	Node Id	Display Name	Value	Datatype	iource Timestamp Server Timestamp
Servers OPCIIaServer@KernTPC3 - None - None (uaton-uaso-uabinary)								
Servers Servers COLAServer@KemTPC3 - None - None (ustop-ussc-usbinary) Documents Documents Dota Access View Server Information Endpoint UH opc.ttp://Kem Security Policy Basic2555ha25 Message Security Mode Sign & Emorphil Authentication Settings Generation Generation Servers Servers Security Policy Basic2555ha25 Message Security Mode Sign & Emorphil Authentication Settings Generation Servers Servers Servers Security Policy Basic2555ha25 Message Security Mode Sign & Emorphil Servers Servers	PC3 - None - None (u.	tcp-uasc-ua	binary)					2 ×
Session Name umsternTPC-U	ifiedAutomation:UaExpe	t@KernTPC						OK Cancel

If you login as user *usrOPCUA*, ten you only get the variables that have been assigned to the symbol set *symOPCUA*.

Project	
🔺 🎵 Pro	ject
4 🞵	Servers
	OPCUAServer@KernTPC3 - None - None (uatcp-uasc-uabinary)
⊿ 📶	Documents
	Data Access View
Address Spa	ce
G No High	light
B Root	
	iarte
00	DeviceSet
	CODESVS Control Win V2
	4 Application
	Application
	DeviceNation
	Globall/arr
	A HardwareRegizion
	Manufacturer
	Ø Model
	Programs
	A burner olinter
	SerialNumber
	SoftwareRevision
	👌 📤 Tasks
D 🔉 🔔	Server
i - 2 🕶	

2.2 Symbol Configuration - FAQ (EN)

2.2.1 Symbol Configuration: The option "Support calls to functions, FBs, Methods, and Programs" can lead to "found dependency cycle in the types ..." error

If the option "Support Calls of Functions, FBs, Methods, and Programs⁷" is selected in the symbol configuration, the error (shown in the screenshot) for "found dependency cycle in the types ..." can occur.

	Symbol Configuration X		
	🕅 View 👻 🛗 Build 🗱 Settings 👻 Tools 👻		
	Changed symbol configu		
	Symbols 1 Include Comments in XML Type Members Comment Configure comments and attributes Configure comments and attributes Configure synchronosation with EC tasks Configure synchronosation with EC tasks Configure synchronosation with EC tasks Check/DivLine Check/DivLine Use empty namespaces by default (V2 compatibility) Enable default (J0 Access Check/Range V Support calls to Functions, FBs, Methods and Programs Check/Range Include can information in XML Check/Range Include can informa		
Messages - Total 26 error(s), 2 warning(s), 15 message(s)			
Build 🔹 🗘 2	error(s)		
Description	Y	Project Object	Position
Build complete 0 errors, 0 warnings : Ready for download			
Found dependency cycle in the types[SingleAxis, REFERENCE TO Sin	eAxis_REF, AxisGroup, AxisGroup, HmiStatus, REFERENCE TO AxisGroup_REF, SingleAxis]. Cannot calculate signature offsets.	Symbol	Symbol
Found dependency cycle in the types[SingleAxis, REFERENCE TO SingleAxis]	JeAxis_REF, AxisGroup, AxisGroup, HmiStatus, REFERENCE TO AxisGroup_REF, SingleAxis]. Cannot calculate signature offsets.	Symbol	Symbol

2.2.1.1 Technical background and FAQs

A type is called, that contains itself. This cannot work.

⁷ https://content.helpme-codesys.com/en/CODESYS%20Communication/_cds_obj_symbolconfiguration.html

The problem is the way the symbol configuration handles REFERENCE⁸, they are "knocked flat" (so to speak), and it behaves as if the referenced values are directly there without there "references". This can lead to such cycles.

Advise

The best approach here is to never export REFERENCE with the symbol configuration!

 $\rightarrow\,$ This leads to many more variables being released than would normally be desired, and

otherwise only causes additional problems.

The user should rethink his export format in the symbol configuration and try to do it without REFERENCE⁹. This may lead to the need to rebuild the project.

How can the user then export e.g. methods from FBs (with references) with the option "Support calls from..." without having to rebuild the FB and possibly the whole project?

The rebuilding of the project can be quickly demanded from the user. But isn't this a problem of a Codesys component, that gets passed on to the user to fix?

2.2.1.1.1 Answer

We don't see it that way.

The fact is that the data structures that a program uses (internally for data processing) are not always suitable as a transfer format between controllers.

Pointers/references are an obvious example of problematic types here.

The symbol configuration cannot relieve the user of this implementation of the data structures specified in the project.

It can not determine a better format, redefine it, or even consider whether the reference types must be really transferred here.

This operation must be specified by the user himself - and thus possibly entails the conversion/rebuilding of his project.

Is this option then the single trigger for this error massage?

If not, what else is the cause of the problem?

2.2.1.1.2 Answer

No.

Activating the option forces more types to be exported, which leads to cyclic dependencies. If the export methods looked here different, the error message might not come up.

It is also possible to have cyclic dependencies without enabling this option.

When the option is only the trigger that this type is exposed, and not real part of the problem, what is?

⁸ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_datatype_reference.html

⁹ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_datatype_reference.html

2.2.1.1.3 Answer

The example error/problem only occur with the use of REFERENCE¹⁰.

Advise

The best approach here is to never export REFERENCE with the symbol configuration! This leads to many more variables being released than would normally be desired, and otherwise only causes problems.

2.2.1.2 Related FAQs:

Wouldn't there still be a need for optimization here to limit the malfunction or to correct it in general?

2.2.1.2.1 Answer

No.

This works exactly as designed!

A REFERENCE¹¹ Data Type is simply difficult to transfer between controllers, so we advise against it!

Why are the affected symbol(s) not displayed in the symbol configuration when double-clicking on the error output?

The user maybe aware that the position is not very clear, but is only indicated with "Symbol configuration", which is insufficient for a clear position to surche fore. How is the user supposed to find the corresponding symbol based on this error message alone?

2.2.1.2.2 Answer

This would be a better solution for the user. A corresponding implementation may be possible in future versions.

For the moment, the error message gives the names of the types, after all. Our assume would be, that the user knows all types published by his controller.

¹⁰ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_datatype_reference.html 11 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_datatype_reference.html

3 CODESYS Control - FAQ (EN)

3.1 CODESYS Control for Linux SL - FAQ (EN)

3.1.1 CODESYS Control for Linux SL: Retains (EN)

For the generic Linux SL products, there are different possibilities to support retain/persistent variables or persistent storage of information/variables.

"Classic" Retains:

- 1) Store Retains in File
- 2) Store Retains in special memory (e.g. SRAM / NVRAM ...)
- 3) Store Retains in shared memory

Besides this, it is also possible to use other features of CODESYS to better fulfill your needs, as they provide a higher level of persistence that we highly recommend:

- Recipe Management
 https://help.codesys.com/webapp/_cds_using_recipes;product=codesys;version=3.5.17.0
- Persistence Manager https://help.codesys.com/webapp/ f_application_composer_persistence_manager;product=core_Application_Composer;version=3.5.17.
 0

3.1.1.1 1) Store Retains in File

The runtime requires either a proper shutdown to stop the application and then stores the retain variables in a file, or you can also trigger the storage manually inside the IEC application via the IEC library "*CmpApp*" \rightarrow "AppStoreRetainsInFile"

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AppCallGetProperty2Release		ApoStoreRetainsInFile	PTS IEC PERHIT				
AppCallGetProperty3		* pApp	POINTIP TO APPLICATION				
AppCallSetProperty		* pszfilName	DEFEDENCE TO STRING				
 AppCallSetProperty2 			no cherce to smart				
AppFindApplicationByName							
AppGenerateException		- Inputs/Outputs	Graphical 🕜 Documentation				
AppGetApplicationByAreaAddress							
AppGetApplicationFlags			AppStoreRetainsInFile	T. Anotherson	abole statile		
AppGetApplicationInfo		-pop Polarization		Appscoreio	ecal builtie -		
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Pro:

- Easy to configure (is default)
- No special memory/HW required
- Single data consistency: ok (if finished properly/graceful shutdown) or perfect if manually triggered inside your IEC application

Con:

- · Processing time might be long
- No "logical" consistency possible, except you trigger the "storage" by yourself: see "CmpApp" → AppStoreRetainsInFile() library function!

Configuration:

Nothing to do, as this is the default!

3.1.1.2 2) Store Retains in special memory

You can configure the runtime via the cfg File (CODESYSControl.cfg) so that it directly uses a given memory (e.g. physically mapped).

Pro:

- · Easy to configure
- Processing time fast

IEC Code directly accesses the retain variables inside the special memory

- Single data consistency (for standard datatypes smaller or equal the architecture size (e.g. 32 bits)) ok
- no further "glue code" required for storage

Con:

- Single data consistency (for data bigger than architecture size (e.g. 32 bits)): no guarantee possible
- Special memory/HW required (Kerneldriver etc.)
- No "logical" consistency possible

Configuration:

```
[CmpApp]
RetainType.Application=InSRAM
[CmpRetain]
Retain.SRAM.Size=0x....
Retain.SRAM.AddressMapped= -> in case you have a mapped address or:
Retain.SRAM.Address= -> in case you have a physical address
```

3.1.1.3 3) Store Retains in shared memory

You can configure the runtime via the cfg File (CODESYSControl.cfg) so that it uses a shared memory memory. Then you can easily adapt to whatever "real" retain storage you have.

See also the following help page:

https://help.codesys.com/webapp/ _rtslext_retains_in_shared_memory;product=CODESYS_Control_SL_Extension_Package;version=4.4.0.0

Pro:

- Easy to configure
- Processing time fast
- · No special memory/HW required, but is possible

Con:

- · Single data consistency: no guarantee possible
- A bit of "glue code" is required to put the retains from shared memory to whatever real retain storage you have.

Configuration:

```
[CmpApp]
RetainType.Application=InSHM
[CmpRetain]
Retain.SHM.Size=0x....
Retain.SHM.Name= -> Filename of the shared memory to use
```

See also

- Our Codesys Online Help (OLH)¹² Website
- Basic information to the Codesys Development System (Codesys Homepage)¹³
- OLH:General details about 'Data Persistence'¹⁴ and Preserving Data with Persistent Variables¹⁵
- OLH¹⁶: The Online-help introduction for the Codesys Development System (IDE)¹⁷
- OLH: For the CODESYS Control for Linux SL¹⁸ Add-on

3.1.2 CODESYS Control for Linux SL: Set up 'Ethernet over EtherCAT' (EoE) (EN)

The function EoE is supported by all Linux SL products, like the "CODESYS Control for Raspberry Pi MC SL".

For routing on Linux, there is the following instruction:

The following example contains exemplary IP addresses, please perform with real data of the used device to be configured!

• Set up tap0 device: On a Linux system with 'tuntap' support, this looks somehow like this:

```
/sbin/ip tuntap add tap0 mode tap
/sbin/ip link set tap0 up
/sbin/ip addr add 192.168.2.1/24 dev tap0
```

Maybe you need to add a additional route?

echo 1 >/proc/sys/net/ipv4/ip_forward' ...

• Using the Codesys default setting for EoE on "tab0" in your System Set-up! **If your system uses more than one tap device**,...

... choose the correct one by using, e.g.:

export RTS_EOE_DEV=tap1

¹² https://help.codesys.com/

¹³ https://www.codesys.com/products/codesys-engineering/development-system.html

¹⁴ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_f_setting_data_persistence.html

¹⁵ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_preserve_data_with_persistent_variables.html 16 https://help.codesys.com/

¹⁷ https://help.codesys.com/webapp/_cds_f_development_system_introduction;product=codesys;version=3.5.17.0

¹⁸ https://help.codesys.com/webapp/_Inx_f_help;product=codesys_control_for_linux_sl;version=4.4.0.0



- Start the Codesys Runtime system
- Download the EtherCAT stack with EoE device. (The IP of the EoE device should be in this case e.g.: 192.168.2.2)
- ping the IP (e.g. 192.168.2.2) and check the response
- If a response is received, the EoE is basically working
- The set-up can also be checked with ARP and ICMP with Wireshark attached to your tap device

3.1.2.1 FAQ:

Communication issues

Check your used addresses. Your EoE address range f.e. must be the same as the programming port. Do not mix them with the EtherCAT (alias) address! Make sure to use the correct EoE address range to communicate over EtherCAT with the Ethernet protocol.

For further Information on EoE see or OnlineHelp EoE Dokumenation¹⁹.

3.1.3 Installation 4.1.0.0 fails for Control for Linux SL (EN)

3.1.3.1 Problem

The Installation for v4.1.0.0 fails

3.1.3.2 Solution

New packages now have dependencies that are downloadable via CODESYS Installer.

Hint: You must use SP17 or higher

Steps:

- 1. Open CODESYS Installer (Windows Start Menü > CODESYS > CODESYS Installer)
- 2. Select Change of your SP17 installation
- 3. Install any available updates
- 4. Go to Browse, Search for the CODESYS Control for * SL package, select it and install

See also

- Our Codesys Online Help (OLH)²⁰ Website
- Basic information to the Codesys Development System (Codesys Homepage)²¹
- OLH²²: The Online-help introduction for the Codesys Development System (IDE)²³
- OLH: For the CODESYS Control for Linux SL²⁴ Add-on

21 https://www.codesys.com/products/codesys-engineering/development-system.html

¹⁹ https://content.helpme-codesys.com/en/CODESYS%20EtherCAT/_ecat_edt_slave_eoe_settings.html 20 https://help.codesys.com/

²² https://help.codesys.com/

²³ https://help.codesys.com/webapp/_cds_f_development_system_introduction;product=codesys;version=3.5.17.0

²⁴ https://help.codesys.com/webapp/_lnx_f_help;product=codesys_control_for_linux_sl;version=4.4.0.0

3.1.4 Linux realtime / performance / network - draft (EN)

Question: Which steps need to be done to make Linux SL realtime capable?

Answer: Please see our Codesys OnlineHelp²⁵ article on 'Optimization of Real-Time Performance²⁶'.

3.2 CODESYS Control for PFC100/200 SL - FAQ (EN)

3.2.1 PFC200/PFC100: Commissioning the Runtime and Connected Terminals

3.2.1.1 Hardware

- 1x WAGO fieldbus coupler 750-82xx or 750-810x
- 1x analog input terminal 750-459
- 1x analog output terminal 750-559
- 1x meter terminal 750-638
- 2x analog output terminal 750-550
- 1x end terminal 750-600

3.2.1.2 Requirements for the WAGO controller

- Assign the IP address (for example with the tool WAGO Ethernet Settings).
- Plug the adapters into the fieldbus coupler and check the functionality (for example, with the WAGO-IO-Check).

25 https://www.helpme-codesys.com/

²⁶ https://content.helpme-codesys.com/en/CODESYS%20Control/_rtsl_performance_optimization.html

🛃 Knoten1 - WAG	O-I/O-Check 3				-	- Nacional Sciences
DATEI ANSICHT	KNOTEN MOE	UL	EINSTELLUNGEN	HILFE		
Beenden	Öffnen	•	Speichern	Identifizie	ren Control-Modu	Monitor-Modus
Navigation		×	Pos. 06: 75	0-600, En	Idklemme	
750-8202 (192	2.168.99.106)					
Pos. 01: 75	60-459			0	1 2 3	4 5 6
Pos. 02: 75	0-559				9C_9C_9C_9C_9	C_NC_N
Pos. 03: 75	0-638					
Pos. 04: 75	0-550		100 US	RUN		00,00,00
Pos. 05: 75	0-550		# 2	■ ■ 1/0 ■ ■ MS		
Pos. 06: 75	0-600		🧐 U2	NS NS		
				80	00000000	0000000
				, D'		
			:		00000000	00-00-00
					00,00,00,00	88 88 88 88
				1 19-000		750-550 750-550 750-660

Fig.: WAGO-IO-Check3-Tool after successful "Identification"

• As an alternative, the PFC200/PF100 can also get the IP address (this is the default setting of the PFCs).

3.2.1.2.1 Requirements for CODESYS

• Install the package directly from the CODESYS user interface:



As an alternative, you have downloaded the latest package (*CODESYS Control for PFC200 SL* <*Version>.package oder CODESYS Control for PFC100 SL* <*Version>.package*) from the CODESYS Store and installed it via *Tools/Package Manager*.

rrrently installed packages:	5		Sort by	y: Name	 Install
lame	Version	Installation date	Update info	License info	Uninstall
CODESYS Control for PFC200 SL CODESYS SoftMotion	3.5.12.10 4.3.2.0	19.03.2018 19.03.2018		No license required Searching	Details
					Updates
					Download
					CODESYS Store
					Rating

After installing the package, CODESYS must be restarted. The package will be installed in the following directory: C:\Users\<username>\CODESYS Control for PFC200 SL / C:\Users\<username>\CODESYS Control for PFC100 SL

• To install the CODESYS runtime, open the configuration dialog in *Tools/Update PFC200/PFC100*. The default user is *root* and the default password is *wago*.

You can enter the IP address manually or select the controller via the scan dialog:

PFC200		👻 🕂 🗙 🛃 Start Page 🗙
✓ Login credentials – User name	root	CODESYS V3.5 SP12 Pat
Password	••••	
✓ Select target	192. 168.xxx.yyy	Scan PFC200
✓ Package Version V3.5.1 V3.5.1 V3.5.1 Int	1.20 (2.0 stall Remove	
Package directory C:\Users\t.kern\CODES	/S Control for PFC200	
✓ System System info	Reboot target	
A Runtime		OK Cancel

If there are multiple versions of the package, then you will have to select the one you want to install. If no packages are offered, then the path of the package must be checked and modified if necessary.

• The version can be installed on the fieldbus coupler by clicking the *Install* button.

PPC200		-	.Ф.	×
.« Login credentials				
Uper name	root			
Password	••••			
# Select target				
IP Address	192.168.99.105			
	Scan			
Package				
Version V3.5	5.11.20			
	Install Remove			
Package directory				
C:/Users1t.kem/CODE	25//5 Control for PFC200			
		Þ		
# System				
System info	Reboot target			
(Runtima				
	Rec			
Start	scop			
Dis	able application			

The version can be viewed by clicking the *System info* button. (The PFC may have to be rebooted by clicking the *Reboot target* button).

System information: root@192.168.99.106	
A CPU Info	
processor :0 model.nmm :400/7 Processor nev 7 (v71) BogoUTS :600.47 Features ::101/1 thum feature type dsp thumbee neon vfpv3 tls vfpd32 CPU implementor: :001 CPU implementor: :001 CPU variant :001 CPU variant :001 CPU variant :001 CPU variant :001	
A Network Info	
br0 Link encep:threnet Header 00:300:44:52:55 inet darf:10:31.16.99.40:85:21:35 HeAK:1255.255.248.0 uP BROACGST RUNNING MULTICAST MULTISED Metricit: Rest:123.168:30:30:40:35 TX politici:21:48 errors:0 dropped:0 verruns:0 frame:0 Rest:123.168:30:30:40:40:40:40:40:40:40:40:40:40:40:40:40	
A Package billy	4
Jones: codesyscontrol version: 35.12.00 Status: intall user installed recritecture: a Nutalled-Time: 132848437 Scontrolly terminets	
A Runtime Info	
<pre>cloggernme./tmp/cdesyscontrol.log/loggernmes cloggernme./tmp/cdesyscontrol.log/loggernmes cloggernmes/tmp/cdesyscontrol.log/loggernmes clogernmes/tmp/chapternmes clogernmes/tmp/chapternmes clogernmes/tmp/chapternmes clogernmes/tmp/chapternmes clogernmes/tmp/chapternmes clogernmes/tmp/chapternmes/</pre>	
Refresh OK)

3.2.1.2.2 Project engineering:

• Create a standard project and select CODESYS Control for PFC200/PFC100 SL as the device:



• Establish a connection to the device.

To do this, open the device dialog by double-clicking the device in the tree:

Devices	- 4 X	Device X					
□ Drc200Project							
Device (CODESYS Control for PEC200 SL)		Communication Settings	Scan network Gateway -	Device -			
PLC Logic							
🖻 🧔 Application		Applications					
Library Manager	a) a) communication Settings Applications Backup and Restore Files Log PLC Settings PLC Settings PLC Settings PLC Settings PLC Settings Access Rights Task Deployment Status Information						
a lask Configuration		Files	•				•
PLC_PRG		Log			Gateway		
Pfc200Bus (Wago PFC200 internal bus)				Gateway-1	•	KERNTPC	•
		PLC Settings		IP-Address: localhost			
		PLC Shell		Port:			
		Users and Groups		1217			
		Access Rights					
		Task Deployment					
		Status					
		Information					
1							

Open the dialog by clicking the Scan network button. All detected devices of the type are listed:

erät auswählen		×
Netzwerkpfad zum Gerat auswählen:	Gerätename: Gateway-1 IP-Address: locahost Port: 1217 Treiber: TCP/IP	Geräte suchen Blinken
	<u></u>	Abbre <u>c</u> hen

Select the corresponding device by double-clicking it.

Ge	erät auswählen
	Netzwerkpfad zum Gerät auswählen:
	Gateway-1
The	last two characters correspond to the last part of the IP address (hexadecimal).

CODESYS establishes a connection to the device and reads the device Information:

Communikation	Netzwerk durchsuchen Gatewa	y ▼ Gerät ▼		
Applikationen				
Sichern und Wiederherstellen				
Dateien			··· (5
Log		Gateway ateway-1	[0301.A000.036A] (aktiv)	
SPS-Einstellungen	IP	-Address:	Gerätename: PEC200-405C56	
5PS-Shell	Pc	ort:	Geräteadresse:	
Benutzer und Gruppen	12	117	0301.A000.036A	
Zugriffsrechte			Zielsystem-ID: 0000 0013	
Taskaufstellung			Zielsystemtyp: 4096	
Status			Zielsystemhersteller: 35 - Smart Software Solutions Gmb	н
Information			Zielsystemversion: 3.5.12.10	

- Now login to the device by clicking *Online/Login*. It is not necessary to start the application.
- Open the scan dialog of the K-bus from the context menu.

Be Est view brotet Buil galae Debug Tools (Undow jedo De Est view brotet Buil galae Debug Tools (Undow jedo Devices ▼ 9 X Be (Active Company) Device X Be (Active Company)
Devicer v 0 X B - 2 A A A A A A A A A A A A A A A A A A
Devices v 9 X
Contraction of the second se
Safrewark Device - Communication Settings
and the second s
B processor Backup and Restore
Files
Geteway Geteway
Gateway-1 (0301.A000.036A) (active)
Ba Copy 2) PLC Settings IP-Address: Device Name:
Pacter localhost PFC200-405C56
PLC Shell Port: Device Address:
Jeece 1217 0301,4000,036A
Browse Target ID:
Refactoring Access Rights 0000 0013
Target Type:
Add Object Task Deployment Hugo
Target Vendor: Status 35-5-5-mart Software Solutions GmbH
Information 3,5,12,10
Scan for Devices
Deable Device
Edit Object onymous Last buld: 📀 0 😗 0 Procomple: 🗸 🔓 STOP Program loaded Program unchanged

After a short time, all detected adapters are listed:

					_	 _
Scanned Devices						
Devicename	Devicetype					
_75x_459	75x-459/0000 4AI, 0-10 V (3.5.12.10)					
	75x-559/0 000 4AO, 0-10 V (3.5.11.10)					
	75x-638 2CNT (3.5.10.0)					
_75x_550	75x-550/0 000 2AO, 0-10 V (3.5.11.10)					
_75x_550	75x-550/0000 2AO , 0-10 V (3.5.11.10)					

There may be adapters with special subtypes that cannot be resolved.

In these cases, you can click the ellipsis button to open another dialog where the adapter can be specified:

Devicename	Devicetype					
	75x-459/0000 4AI	0-10 V (3.5.12.10)				
	75x-559/0000 4AC), 0-10 V (3.5.11.10)				
	75x-638 2CNT (3.5.1	0.0)				
	75x-550/0000 2A0), 0-10 V (3.5.11.10)				
Select the I	Device Description	Vendor		Version	Order Number	Description
75x-5	75~550.240, 0.10 V		ik GmbHu Co KG	3 5 12 10	75x-550	2-Channel Anal
/ 36. 1		The second second		0.0.12.10		

Now all adapters can be added to the project by clicking the Copy all devices to project button.

Pfc200Project.project* - CODESYS	· · · · · · · · · · · · · · · · · · ·		
Elle Edit View Project Build Online Debug Tools Window Help	~~		
19 🚔 🖬 🚑 🗠 🗠 🕹 🗞 🗙 🙈 😘 🖓 🖓 👘 19 - 1	위표 🔍 🐗 🖡 📲 🔍 💷 위	비행 책 양 (수) 完) 중 (장)	
Devices			
E Devices + # 2	Device X		
Prizerroject Prizerroject Prizerroject CODESYS Control for PFC200 SL) Prizerroject	Communication Settings	Scan network Gateway + Device +	
Application [stop]	Applications		
Ibrary Manager EP PLC_PRG (PRG)	Backup and Restore		
i i i i i i i i i i i i i i i i i i i	Files		•
PLC_PRG	Log	Gateway	- [0201.0000.0263] (active)
	PLC Settings	IP-Address: localbest	Device Name: PEC200-405C56
- 75x_638 (75x-638 2CNT) - 75x_550 (75x-550 (0.,-000 2AO, 0-10 V)	PLC Shell	Port	Device Address: 0301 4000 0364
75x_550_1 (75x-550/0000 2AO, 0-10 V)	Users and Groups	26.27	Target ID:
	Access Rights		0000 0013
	Task Deployment		4096
	Status		Target Vendor: 35 - Smart Software Solutions GmbH
	Information		Target Version: 3.5.12.10
Device user: Anonymous	Last build: 😳 0 😗 0 Precompile: 🧹	STOP Program loaded	Program modified (Online change)

- Logout to the device by clicking *Online/Logout*.
- Set the outputs and test the input adapters.

In CODESYS, only that data is updated which is used in the program. For testing the adapters, open the *PLC Settings* tab in the device dialog and set *Always update variables* to *Always update variables* to *Enabled 2* (*always in bus cycle task*).



 Download the modified application to the controller by logging in again and start it by clicking *Debug/* Start.

The symbols in the tree should now be green.

In the I/O mapping of the respective adapter (double-click the adapter), you can set the outputs or view the current values of the input adapter.

Pfc200Project.project* - CODESYS								
Ele Edit View Project Build Online Debug Tools Window Help								
○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○	ት በመጠማ 💜 🕠 🖕 火 💷 የ	a 4a 4a 8 e a	위국 1 전					
Devices								
Evices + 4	Device75x_638	×						
	PEC200 Module I/O Mapping	Find		Filter Show all			•	
= 1 PLC Logic				<i>a</i>		-	6	
- O Application [run]	Statis	Variable	Mapping	Channel	Address	Туре	Current Value	Prepared Value U
Library Manager				STATUS Channel 0	%IB8	USINT	0	
	Information	🍫		CNT_VAL Channel 0	%IW5	UINT	1536	
		* *		STATUS Channel 1	%IB12	USINT	0	
I ask Configuration		- *>		CNT VAL Channel 1	%IW7	UINT	0	
III Si MainTask		- No		CONTROL Channel 0	%OB8	USINT	0	
·····································		- N		CNT_SET Channel 0	960W5	LIINT	0	
🗟 💮 Pfc200Bus (Wago PFC200 internal bus)		- K		CONTROL Channel 1	00010	LICTAT	0	
- C] _75x_459 (75x-459/0000 4AI, 0-197)		K.		CONTROL Channel 1	76QD12	USINI	0	
75x 559 (75x-559/0000 4A2, 0-10 V)		····· 🖗		CNI_SEI Channel 1	%QW7	UINI	U	
C 1 75x 550 (75x-550/0, -000 2AO, 0-10 V)								
75x 550 1 (75x-550/0000 240, 0-10 V)							Reset mappin	g Always update
		🍫 = Create new vari	able 🎲 = M	ap to existing variable				
	Device user: Anonymous L	ast build: 🟮 0 🕐 0 🛛 Pre	compile: 🧹 🔒 🔒	RUN	Prog	ram loaded		Program unchanged

3.3 CODESYS Control for Raspberry Pi SL - FAQ (EN)

3.3.1 CmAct licenses after update lost / new empty container is created (EN)

3.3.1.1 Objective

Update files with existing licenses (xxx.WibuCmRaU), which were saved with runtimes < v4.5.0.0 (Codesys SP18), can no longer be used in runtimes since v4.5.0.0! (SP18)

3.3.1.2 Workaround:

An old runtime must be installed (<v4.5.0.0) then the WibuCmRaU update file must be activated, and then the runtime must be updated!

You can download all needed version from the Codesys Store²⁷.

See the 'Versions' Tab within the Product page.

Product Description	Versions
Version History	
Version	Release Notes

3.3.1.3 How to:

- Make sure you have the WibuCmRaU update file:
- Downgrade the runtime to v4.4.0.0.
- Go to CODESYS Tools \rightarrow Update Pi²⁸ and install this older version.
- Use Putty²⁹ and connect to the controller.
- Navigate to the Config file (Location of the configuration file³⁰).

nano/etc/CODESYSControl_User.cfg

• Edit the .cfg: remove the entry:

²⁷ https://store.codesys.com/en/catalogsearch/result/index/?cat=4&q=raspberry

²⁸ https://content.helpme-codesys.com/en/CODESYS%20Control/_rtsl_install_runtime_on_controller.html 29 https://www.putty.org/

³⁰ https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file

[CmpCodeMeter] FCBoundWithHashedSerNo.0=5000304

Navigate to

cd/var/opt/codesys/.cmact_licenses/

• Delete the directory completely

sudo rm *

• Stop and restart the runtime

sudo /etc/init.d/codesyscontrol stop sudo /etc/init.d/codesyscontrol start

- Go to CODESYS Tools → license Manager
- · Upload the saved xxx.WibuCmRaU fileback to the System
- Use CODESYS Tools → Update Pi→ Update to >=4.5.0.0 to update the runtime to the former used (or newer) version.

See also

- Our Codesys Online Help (OLH)³¹ Website
- OLH: How to Licensing a Controller (Activating and Backing up a license in Codesys)³²

3.3.2 How to: backing up and restoring a license on Raspberry Pi & other SL runtimes

This procedure does not apply to: Linux SL / Control Win SL / Control RTE SL / Linux Arm SL !

After activating the license on the device, the license should be backed up in case the SD/OS image needs to be restored in the future.

A soft-license can only be restored on the same device and not transferred to another. Alternatively, a license can be installed on a CODESYS dongle that can be used on any Raspberry Pi's.

There are differences to versions, before and after CODESYS 3.5 SP17 or SL runtime, smaller than v4.1.0.0 - see information notices.

³¹ https://www.helpme-codesys.com/

³² https://content.helpme-codesys.com/en/CODESYS%20Control/_rtsl_license_controller.html

Quick links:

- How to back up a license file
- How to restore a license

3.3.2.1 How to back up a license file

There are two ways to do this:

1. Back up from the device via the CODESYS file manager

After establishing a connection to the device,

- a. Select the Files tab of the Device window
- b. Choose a location to save the file in your PC or an external drive
- c. Click on the Refresh button on the Runtime side
- d. Select the "CMLicenseNew.WibuCmRaU" file in the Runtime's file system
- e. Click on the "<<" button



2. <u>Only when using CODESYS >= 3.5 SP13</u>: There should be a back-up already on the PC where the license was activated from

If the license was originally activated using CODESYS V3.5 SP13 or newer, the license backup file can be found under:

"C:\ProgramData\CODESYS\Licenses\<license ticket number>" (there will be a folder for every license ticket)

The license file will have the following naming format: "*Hardware serial number of the device>*.*WibuCmRau*". For example:

Raspberry Pi 🗾 👻	4 X System information		×
Login credentials	A CPU Info		
User name pi	CPU implementer : 0x41		^
Pacoword	CPU architecture: 7		
Password	CPU variant : 0x0		
	CPU revision : 4		
Select target	Hardware : BCM2709		
	Nevision . 002002		
IPAddress 192.168.99.38	Serial : 000000009d6b0fb7		~
			•
Scan	Network Info		
	Link enca Ethernet HWaddr b8:27:eb:6b:0f:b7		^
	inet addr. 92.168.99.38 Bcast:192.168.103.255 Mask:255.255.248.0		
	inet6 addr fe80::5623:5830:42ca:e982/64 Scope:Link		
CODESYS Runtime Package	DV BROADCAS ROUNING MULTICASI MIDI 1500 METTICII		
Version V3.5.15.20	TX packets:39 errors:0 dropped:0 overruns:0 carrier:0		
	collisions:0 topueuelen:1000		
	RX bytes:11108 (1.0 MiB) TX bytes:77066 (75.2 KiB)		
Install Do ava	JIO Link encap:Local Loopback		~
Instan Re ove	Package Info		
Package directory	Desired=Unknown/Install/Remov/Purge/Hold		
	Status=Not/Inst/Conf-files/ ppacked/half-conf/Half-inst/trig-aWait/Trig-pend		
C:\Users\m.asef\CODESYS Control for .aspbe .	<pre>// Err?=(none)/Reinst-required (Status,Err: uppercase=bad)</pre>		
	Version Architecture Description		
	11 codesuscontrol 3 5 15 20 1 V2 5 15 20 Do 14 Nov 14:55:55 CET 2010		
Additional Packages			
Additional Fackages			
Tostall Manage	🔚 🗌 🖓 📙 듖 🛛 D:\ApaddonManager\ rgets\3.5.15.20x86\Licenses\SB8B6-3GCQ9-B7BGE-SCKEX-KZ	A28	
instantin inditigent			
	Datei Start Freigeben Ansich		
System	C\Programbata\CODESTS\LICENSES(SB0B0-SOCQ9-B/BOE-SCKEA-KZA20		
	^ Name	Änderungsdatum	Typ
System info Reboot target	schnellzugriff	Anderdingsdatann	1319
	00000009d6b0fb7.WibuCmRau	17.01.2020 08:54	WIBU CM remote
	Desktop 🖈		
Runtime			
Start Stop	🗄 Dokumente 🖈		
	Rilder *		
Disable application			
0	_PFD		
Configure			

3.3.2.2 How to restore a license

There are two ways to do this:

From version CODESYS 3.5 SP17 (4.1.0.0) on forward, the content can only be deleted using the command:

sudo rm /var/opt/codesys/.cmact_licenses/**

For versions < CODESYS 3.5 SP17 or SL runtime smaller than v 4.1.0.0

In older versions, the path is " /var/opt/codesys/cmact_licenses/ " without the dot at the beginning of the last folder name.

If you are using an image or another license had already been activated on the device, delete the *cmact_license* folder from the Runtime's file system, and restart the device before proceeding to restore the license.

ices 👻 🕈 🗙	Device X						
Untitled4		Host Location			Puntime Location > /		
Device (CODESYS Control for Raspberry Pi MC SL	Communication Settings	Those Electronic					
PLC Logic	Applications	Name	Size	Modified	Name S	Size	
🖹 💮 Application	Applications	- C:\				_	
🖓 Library Manager	Backup and Restore	D:\			Cmact licenses		
PLC_PRG (PRG)		E Fi			Piccoqic		
🖹 🌃 Task Configuration	Files	G:\			ia cert		
🖹 🐨 MainTask		H:\			ia backup		
PLC_PRG	Log	P:\			a.cnc		
SoftMotion General Axis Pool		S:\			🧀 visu		

The Codesys File manager does not show the dot for the " .cmact_licenses " folder name!

1. Restore the license with the activation ticket

- Using the License Manager (Tools>License Manager...),
 - a. Click on **Additional Functions**
 - b. Enter the license activation ticket
 - c. Click Restore

Container	Co-Basetalace (0) Ot
ontainer	Softcontainer: [U]: SN=
Products -	
	Name
	Company
	Unit counter
	License quantity
	Usageperiod
	Feature map
	Restore Licenses X
	Description
<	>
🔽 The li	icanse for the product evicts on the selected license container
The li	icense for the product exists on the selected license container.
- IIIC II	icense for the product exists on the selected intense container, but is invalid (e.g. expired).
The la	i sana a kanaka ana dulak da sa ank sujak an kha palankad linanan pankainan

2. Restore the license from the license file

Open the License Manager (Tools>License Manager...) and

- a. Click on Install Licenses...
- b. Select Install license and click Next >
- c. Select the license file and click *Finish*

License Manager	×
Container Softcontainer: [0]: SN= Install licenses on Device Soft container - Select Operation X	Refresh Blink
Install Licenses What do you want to do?	
Activate license Use this option if this machine has internet access and the software vendor has supplied a license activation ticket to you.	
If this machine does not have internet access, then you can create a context file of your dongle, which can be activated over the internet on another machine. Then the resulting license update file can be installed on this machine by means of "Install license". (Install license b) If you have received a license update file, then use this option to install it to your dongle.	Install Licenses on Device Soft container - Install License X Install Licenses Update your dongle with a license update file.
Cancel < Back Next > N Fimish	Specify the path to the license update file which has been downloaded during software activation over the internet.
	Cancel < Back Next> Finish

If using CODESYS V3.5 older than Service Pack 13, instead of the License Manager, there is the *Edit Licenses* option found in the *PLC Settings* tab of the Device window:

Communication Settings	Application for I/O handling: Application	•		
Applications	PLC settings Update I0 while in stop		X	
Backup and Restore	Behaviour for outputs in Stop: Do Install Licenses - Sel	ect Operation	gle(s)	
Files	Always update variables: F Install License	s	atv.	
Log	Edit Licenses. What do you wan	t to do?	Smart Software Solutions	
PLC Settings	Bus cycle options Bus cycle task: O Activate licens	se		
PLC Shell	Additional settings Use this option in license activation	f this machine has internet access and the software vendor has supplied a n ticket to you.		
Users and Groups	Generate force variables for : Characteristics and Characteristic	se		
Task Deployment	If this machine d dongle, which ca	loes not have internet access, you can create a context file of your in be activated over internet on another machine. The resulting license	0304	
Status	update file can t	nen be installed on this machine using "Install license".		
Information	Install license If you have got	a license update file, use this option in order to install it to your dongle.	A	
		Cancel < Back Next > Finish		
	No incense on doing			
	Install licenses		Close	

3.3.3 Raspberry Pi: FAQ

You need the CODESYS programming environment version 3.5 in order to be able to use Raspberry. You can download this free of charge from the CODESYS store

http://store.codesys.com/engineering/codesys.html

Subsequently, you need the package CODESYS Control for Raspberry Pi SL from the CODESYS store, which you can then install directly via CODESYS (Tools \rightarrow Package Manager \rightarrow Install...):

jeip								
° ₩	≝∣¢;≪;) = ≪∣(⊒	FI & I + I & 4	> ≓ ♥ ○					
×	Store X P Devic	e Ethernet	PLC PRG	Library Manager				
	Back DEprward	ome						
						My Account	Login My Wishlist	Service
	E	ngineering App	lication Commun	ication Devices	Systems	Accessories AI	l Products	≡ Cart:
	s	earch Term	All F	Product Areas	«	Search >		Nev Ger
		Home / Systems / CODE	SYS Control for Raspberry	Pi SL				
		Raspberry Pi Download >	CODESYS Control for Ra pi. Without purchasing a lic fours without functional Version: 3.5.8.0 Order number: 2302000	ontrol for spberry Pi SL is an ad ense (just download) limitations and shuts	Raspberi lapted CODESYS the CODESYS Co down automatic	Control runtime system ntrol for Raspberry Pi ally (demo).	n for Raspberry runs for two	
								Qty: 1
							A	dd to My Wishlist
×	Pr	oduct Description	System Requirements	All versions	Reviews	Support	More products fro	m this supplier
•		CODESYS Co	ntrol for Raspb	erry Pi SL				

https://store.codesys.com/codesys-control-for-raspberry-pi-sl.html

Please restart CODESYS after installing this package.

What needs to be installed on the Pi itself?

If you don't have an image, it can be downloaded from http://www.raspberrypi.org/downloads. You then have to flash it to the SD card.

Activation of SSH

Activate SSH:

https://www.raspberrypi.org/documentation/remote-access/ssh/ http://forum.codesys.com/viewtopic.php?f=22&t=6345&p=12781#p12781

If you already use the Raspberry Pi for other things, you can of course continue to use your existing image.

The CODESYS PLC is installed via the following menu item:



The Raspberry Pi must be located in the same network as the CODESYS PC from which the installation is executed.

You can now scan the Raspberry Pi in your network. All the Raspberry Pi devices in this network appear in the scan.

Update Raspberry PI	I
Package Version V3 V3 V3 V3 Choose pack	3.5.7.10 3.5.8.0 3.5.8.10
C:\Users\e.sch	hwellin Raspberry PI Scan
Login Username Password Network IPAddress	192.168.100.130 192.168.101.27 192.168.101.89 192.168.101.97 192.168.101.133 192.168.101.205 OK Cancel
Scan	
	OK Cancel

Login data

User name: **pi** Password: **raspberry**

Update Raspberry PI	×
Package Version V3.5 V3.5 V3.5 Choose packag C:\Users\e.schwe	7.10 8.0 8.10 e dir ellinger\CODESYS Control for Raspber
Login Username Password	oi ●●●●●●●●
Network IPAddress Scan	192.168.101.179
	OK Cancel

The Debian package from the store download is now installed on the Raspberry Pi and the PLC is also started directly. The message Update finished in the window *Messages -> RaspberryPI* indicates a successful installation.

Messages - Total 1 error(s), 0 warning(s), 1 message(s)	
aspberryPI	 O error(s) • 0 warning(s) • 1 message(s)
Description	
Update finished	

After that you can use the Raspberry Pi directly with CODESYS. To do this, open one of the sample projects:

C:\Users\<user_name>\CODESYS Control for Raspberry PI\<version>\Examples\Webvisu.project

Please update the device via the context menu (right mouse button) so that it matches the current PLC version on the Raspberry Pi.

WetterstationPi				•
🖹 🔟 Device (CODESY	e Con	steal for Disaphorey Dil		
🖻 🗐 PLC Logic	Ж	Cut		
🖹 🚺 Applica	Dev	ice (CODESYS Control for Raspbe	rry Pi)	
🔶 🗘 Wea	Ē.	Paste		
[≁] ⊈ Wea	×	Delete		
- 🎁 Libra	E.	Properties		
- M	* =	Add Object 🕨		
- M	\bigcirc	Add Folder		
IM R		Add Device		
		Update Device		

Subsequently, set the Compiler Version and the Visualization Profile to the latest version via Project \rightarrow Project Settings....

Now you can scan the Raspberry Pi in CODESYS under the *Communication Settings* of the *Device*. Log in with *Online* \rightarrow *Login* and start the application with Debug \rightarrow Start.

e / 🔐 Device 🗙	📄 ComReader 🏾 👔 ComReader.Close 👋 ComReader.FB_Exit 👘 Co	mReader.Open 👔 ComReader.Read 🍸
Communication Setting	s Scan network Gateway - Device -	
Applications		
Backup and Restore	Select Device	×
Files	Select the network path to the controller:	
Log	Gatevay-9 (scanning)	Device Name: raspbi2 Scan network
PLC settings	Tra bberrypi [0001.A159] Tra berrypi [0001.A185] Tra berrypi [0001.A185]	Device Address: 0001.A1B3
PLC shell	<pre>raspbi2 [0001.A1B3] wetterstation_pi [0001.A161]</pre>	Target Version: 3.5.8.10
Users and Groups	XfdControllerQS[0001.A214]	Target Vendor: 3S
Task deployment		Target ID: 0000 0010
Status		Target Name: Raspberry Pi
Information		Target Type: 4102
	-	
		OK Cancel

When the webvisu project is running, you can call and display the webvisu of the project in a browser with the link *http://<raspberrypi_ip_address>:8080/webvisu.htm*.

You can use the following fieldbuses / features with the Raspberry Pi:

• EtherCAT master

- Profinet controller / Profinet device
- Modbus TCP / master, slave
- Modbus RTU / master, slave
- Ethernet/IP scanner and adapter
- CANopen over EL6751 gateway terminal

Pi-specific features:

- Address PiCAM from the PLC
- PiFace (8 inputs / 8 outputs via SPI)
- I2C
- Address GPIO
- Control RC servos via SoftMotion and PLCopen function blocks
- further example for i2C analog input / temperature measurement
- and much more...

Here is a first-steps video for this: https://www.youtube.com/watch?v=6FPf3RHWyeU

Example – EtherCAT and SoftMotion: http://www.youtube.com/watch?v=GFN9T_cXLEU

Example – RC servos: http://www.youtube.com/watch?v=oDha-2y3pH4

You can also get useful information from our forum: You can also find libraries and devices from other CODESYS Raspberry Pi users here:

http://forum-de.codesys.com/viewforum.php?f=18&sid=372d536cd6b0615779d94f49e3d27d46 http://forum.codesys.com/viewforum.php?f=21&sid=847359a6c4f57dd5f6f63d96fbab291b

The forum FAQ is also very helpful for this: http://forum.codesys.com/viewforum.php?f=22

3.3.4 Raspberry Pi & Linux SL products: SysTimeRTCSetTimezone is not implemented / Executing bash commands (EN)

As a workaround, the time zone can be set via a Linux command line

The package "systemd" must be installed on the system, for timedatectl to be used.

== >> on PFC100/PFC200 runtimes, systemd is not used, but the following commands can be used instead

Use the "/etc/config-tools/config_timezone"-command in place of the "timedatectl settimezone"-command:

```
TZ="CET-1CEST,M3.5.0/2,M10.5.0/3"
or
/etc/config-tools/config_timezone tz-string="CET-1CEST,M3.5.0/2,M10.5.0/3"
```

The timezone abbreviation list for PFC100/PFC200 can be found here:

cat /usr/share/zoneinfo/allzones

Allow the command first, as described here: SysProcess³³

The list of available time zones can be read out via the command line

timedatectl list-timezones

Declaration

```
VAR
    sCmdCet : STRING := 'timedatectl set-timezone Europe/Berlin';
    sCmdGmt : STRING := 'timedatectl set-timezone Etc/GMT';
    xSetGmt : BOOL;
    xSetCet : BOOL;
    rtsResult : SysTypes.RTS_IEC_RESULT;
    diReturn : DINT;
END_VAR
```

Implementation

IF xSetGmt THEN
 xSetGmt := FALSE;

³³ https://faq.codesys.com/display/CDSFAQ/SysProcess
```
diReturn := Sysprocess.SysProcessExecuteCommand(pszComand := sCmdGmt,
ADR(rtsResult));
END_IF
IF xSetCet THEN
    xSetCet := FALSE;
    diReturn := Sysprocess.SysProcessExecuteCommand(pszComand := sCmdCet,
ADR(rtsResult));
END_IF
```



3.4 CODESYS Control Win V3 / RTE V3 - FAQ (EN)

3.4.1 RTE: Change the RTE-PLC Configuration path (EN)

3.4.1.1 Requirement:

If needed, to change the path for where the RTE stores the boot project and all application files. The path can be set under the following RTE setting: System Configuration – Component Manager³⁴

³⁴ https://content.helpme-codesys.com/en/CODESYS%20Control/_rtsl_dlg_system_config_component_manager.html

System Configuration	? ×
Diagnostic Startup Component Manager Application	Logger Scheduler File Target
Plc Configuration Path: C:\ProgramData\CODESYS\CODESYSControlRTE\	/3\
Additional Components:	Component is installed as Windows-driver
•	Component is installed as Windows-driver

3.4.2 RTE: Slow connection (EN)

3.4.2.1 Issue

It may happen that there are difficulties in using traces in Codesys Development Software. In this case, the update rate of for example a traces drops so much that it can no longer be used reliably. In addition, it can be observed that the download time increases.

This behavior sometimes occurs in the use of an RTE (but does not have to be limited to that).

3.4.2.2 Countermeasure

A probable fix is, either by

- installing a gateway on the Controller/RTE side, then logging in via the new remote gateway, or
- install the CODESYS driver on the adapter that does the CODESYS login on the Controller/RTE

In most cases, this is simply a network configuration problem.

3.5 Frequently needed settings - FAQ (EN)

3.5.1 Disable (forced) device user management (as of Codesys Version SP17) (EN)

Important recommendations for data protection!

In order to minimize the risk of data security violations, we recommend the following organizational and technical actions for the system where your applications are running.

- Whenever possible, avoid exposing the PLC and control networks to open networks and the Internet.
- Use additional data link layers for protection, such as a VPN for remote access.
- · Install firewall mechanisms. Restrict access to authorized people.

- Use high-strength passwords.
- At commissioning, change any existing default passwords and change them on a regular basis.

Use the security features supported by CODESYS and the respective controller, such as encryption of communication with the controller and intentionally restricted user access.

For devices which support a device user management, the device editor includes the Users and Groups³⁵ and Access Rights³⁶ tabs.

When offered by the device, the user can view the user management for the device here as well as edit it in synchronization mode (not in online mode).

Here, the user can grant or deny specific permissions on the controller to the defined user groups.

If this is urgently needed, then it is possible to deactivate this device user management.

3.5.1.1 There are two ways to proceed:

Solution 1: Disable the device user management via the Codesys Engineering interface and the plc device

Related OLH Article: Disabling User Management³⁷.

1. At the first connection attempt to the PLC, this window will show up:

CODESYS	5	×
?	The mandatory use of the user management is configured for the device. This means that in order to connect to the device an activated user management must be available. Currently, the user management is not activated on the device. Would you like to activate it now? Please note: When activating the user management you will be asked to create a new admin user. Then you will be asked to login as this user.	
	Ja Nein	

- 2. You have to confirm this massage with "Ja/Yes" in order to be able to connect to your PLC.
- 3. In the next step, you have to choose a username and password:

³⁵ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_edt_device_users_and_groups.html 36 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_edt_device_access_rights.html 37 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_sec_faq_deactivating_usermanagement.html

Add Device User	×
Name	
Default group	Administrator \checkmark
Password	⊘
Confirm password	
Password strength	Very weak
	Password can be changed by user
	Password must be changed at first login
	OK: Cancel

4. You then can log in/connect to your device. Your submitted user and password information will be requested here.

Device User Logon	×
You are currently and password o	not authorized to perform this operation on the device. Please enter the name an user account which has got the sufficient rights.
Device name	
Deviceaddress	036B
User name	
Password	Output
Operation: Object:	View "Device"
	0K Cancel

Device	User Logon		\times
P	You are currently and password o	not authorized to perform this operation on the device. Please enter the nam f an user account which has got the sufficient rights.	ie
	Device name	Device (CODESYS Control Win V3)	
	Deviceaddress		
	User name		
	Password		>
	Operation: Object:	View "Device"	
		OK Cancel	

- 5. Once connected to your device, you can deactivate the user management.
- 6. Go to your PLC Device "Communication Settings" Tab.
- 7. Open the "Device" "Change Communication Policy..." settings (see OLH "Changing the communication policy (encryption, user management³⁸):

Device X	
Communication Settings	Scan Network Gateway - Device -
Applications	Options
	Rename Active Device
Backup and Restore	Wink Active Device
Files	Send Echo Service
Log	Encrypted Communication
PLC Settings	IP-Address: localhost

8. Set the new policy to "Optional encryption" (see OLH "Changing the communication policy (encryption, user management³⁹):

³⁸ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/ _cds_encrypting_communication_changing_security_policy.html

³⁹ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/

_cds_encrypting_communication_changing_security_policy.html

Change Communication Polic	/	×
Communication Current policy New policy	Optional encryption Optional encryption The device supports both encrypted and unencrypted communication. This can be decided by the user.	~
Device User Management Current policy New policy	Enforced user management Enforced user management Optional user management Enforced user management	~
	Allow anonymous login If anonymous login is activated, certain registered components (e.g. OPC UA) can establish a connection without providing credentials even if user management is enabled.	
	OK Cance	el

9. In order to delete the old user management from your PLC, right-click on your device and select "Reset Origin Device⁴⁰":

⁴⁰ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_reset_origin_device.html



10. in the confirm dialog, mark the "User Management" and confirm with "Yes":

CODESY	/S			\times
?	Do you re Resetting Deleting j configura	ally want to reset the d the device will delete a ust a subset of items n tion of the device, addi	evice to its original state? Il of the selected items below. nay render other items inoperable. Depending on the tional items may also get deleted.	
	Delete	ltem		
		User Management		
		PLC Logic		
		Certificates		
			Yes No	

 \rightarrow Now the user management is deleted and only optional anymore.

Solution 2: Permanently disable user management via the configuration.

This setting allows the usage of the CODESYSControl runtime without an activated user management.

	This setting is not recommended to be turned off! For safety reasons, this option should always be used! The user must be aware of the risks when using this option!
1.	Depending on the runtime, the configuration file is located in the following place: Location of the configuration file ⁴¹
2.	Set the entry to

⁴¹ https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file

3.5.2 How to: Perform a start / stop for a Codesys runtime from a command line (EN)

To start / stop by SysTray you can use this command line:

RTE Example:

```
"<RTE Installation Path>\CODESYSControlRTESysTray.exe" start
"<RTE Installation Path>\CODESYSControlRTESysTray.exe" stop
```

ControlWinV3 Example:

```
"<ControlWin Installation Path>\CODESYSControlSysTray.exe" start
"<ControlWin Installation Path>\CODESYSControlSysTray.exe" stop
```

Codesys Services in the SysTray:

- Depending on which service is currently installed in the Windows services, this service is then started.
- This also happens if you call a SysTray-Exe from a completely different path.
- Only one service can be active at a time!

When ControlWin is started in a Windows Command line via:

<path_to_plc>CODESYSControlService.exe -d

The user can stop the ControlWin with 2 times pressing the "Return" Key in the Command Window:

- · After pressing the Enter key for the first time to stop the Runtime,
- Press Enter key again to close the window

```
Linux Example:
```

```
"sudo /etc/init.d/codesyscontrol start"
"sudo /etc/init.d/codesyscontrol stop"
```

3.5.3 Location of the configuration file (EN)

Control RTE:

C:\ProgramData\CODESYS\CODESYSControlRTEV3\CODESYSControl_User.cfg

Control WIN:

c:\ProgramData\CODESYS\CODESYSControlWinV3x64\xxxxxxx\CODESYSControl.cfg

Linux SL, Raspberry, PFC100/200: /etc/CODESYSControl_User.cfg

emPC: /data/etc/CODESYSControl_User.cfg

3.5.4 NETSERVER_MAXCHANNELS (EN)

Depending on the runtime, the configuration file is located in the following place: Location of the configuration file⁴²

Defines the available communication buffers in the communication server.

- · BUFFERSIZE is the overall amount of memory to be used by all channels
- MAXCHANNELS defines the number of channels that may be handled concurrently.

Since each channel needs separate send and receive channels the available communication buffer is BUFFERSIZE / (2*MAXCHANNELS)

Most runtime use the default 4 MAXCHANNELS :

[CmpChannelServer]

⁴² https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file

Buffersize=4000000 MaxChannels=4

Change number of channel Example:

If needed to increase to f.e.g. 8:

[CmpChannelServer]

```
Buffersize=1600000
MaxChannels=8
```

3.5.5 OPC UA Server Settings (EN)

Depending on the runtime, the configuration file is located in the following place: see Location of the configuration file⁴³

3.5.5.1 Define the port

[CmpOPCUAServer] NetworkPort=4841

3.5.5.2 Binding to an adapter

[CmpOPCUAServer] NetworkAdapter=eth0

3.5.5.3 Max. nodes per read (>=SP17)

[CmpOPCUAServer] MaxNodesPerRead=100

⁴³ https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file

3.5.5.4 Max. Sessions (>=SP17)

[CmpOPCUAServer] SessionsMax=100

3.5.5.5 Max. Speed

[CmpOPCUAServer]
ItemMinSamplingRate=100 ; ms

3.5.5.6 Deactivating

[CmpOPCUAServer] SECURITY.Activation=DEACTIVATED

3.5.5.7 Restricting Mode or Policy

```
[CmpOPCUAServer]
Security.CommunicationPolicy=POLICY_AES128SHA256RSAOAEP ; can be
POLICY_AES256SHA256RSAPSS, POLICY_BASIC256SHA256, POLICY_BASIC256,
POLICY_BASIC128RSA15
Security.CommunicationMode=ALL ; can be SIGNED_AND_ENCRYPTED, MIN_SIGNED,
ALL,ONLY_PLAINTEXT
```

3.5.5.8 Namespace change for OPC UA server (>=SP17Patch2)

```
[Cmp0PCUAProviderIecVarAccess]
UseNodeName=1
UseNodeNameForNodeIds=1
or
[Cmp0PCUAProviderIecVarAccess]
CustomNodeName=MyPLC123
```

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This will let you use the nodename instead of the device name. You then just have to fix the devicename. You then do this by changing it via the IDE (see OLH: Device - Rename Active Device⁴⁴), or with either of these config file settings.

```
[SysTarget]
NodeName="TEST"
NodeNameUnicode="T\00E\00S\00T\00"
```

3.5.6 SysCom (EN)

Depending on the runtime, the configuration file is located in the following place: Location of the configuration file⁴⁵

3.5.6.1 All devices with a particular prefix available

[SysCom]

```
Linux.Devicefile=/dev/ttyUSB
```

;with this setting, ttyUSB0 will be available in CODESYS IDE as COM1, ttyUSB1 will be available in CODESYS IDE as COM2 and so on

3.5.6.2 Alternatively make a selection of devices available

[SysCom]

Linux.Devicefile.1=/dev/ttyUSB0

Linux.Devicefile.2=/dev/ttyAMA1

Linux.Devicefile.4=/dev/serial

;with this setting, ttyUSB0 will be available as COM1, ttyAMA1 as COM2, and /dev/serial as COM4

⁴⁴ https://help.codesys.com/webapp/_cds_edt_device_communication_settings;product=codesys;version=3.5.17.0 45 https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file

3.5.7 SysFile, Persistence Manager, Datalog Manager (EN)

Depending on the runtime, the configuration file is located in the following place: Location of the configuration file⁴⁶

3.5.7.1 Store Persistence Manager and Datalog Manager on removable media (e.g. an SD Card or USB Storage)

The numbers must start from 1 and be in sequential order. Use other numbers, if you already have existing PlaceholderFilePath.x entries

With the option ".View=1" the placeholder shows up in the filetransfer dialog.

With the option ".VParent=\$PlcLogic\$" the placeholder shows up additionally as child of the "\$PlcLogic\$" placeholder.

With the option ".Volatile=1" the specified folder is not created automatically at startup and the placeholder is visible in the filetransfer window only when the folder exists. This is important for removable media.

Replace /mnt/USBDevice with the correct filepath of your removable storage, eg. F:\ or /mnt/ SDCard

```
[SysFile]
PlaceholderFilePath.1=/mnt/USBDevice, $ac_persistence$
PlaceholderFilePath.1.View=1
PlaceholderFilePath.1.VParent=$PlcLogic$
PlaceholderFilePath.1.Volatile=1
PlaceholderFilePath.2=/mnt/USBDevice, $ac_datalog$
PlaceholderFilePath.2.View=1
PlaceholderFilePath.2.VParent=$PlcLogic$
PlaceholderFilePath.2.VParent=$PlcLogic$
```

⁴⁶ https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file

3.5.8 SysProcess (EN)

For security reasons, the issuing of bash commands is deactivated by default in Linux-based runtimes.

See OnlineHelp: SysProcess⁴⁷

3.5.8.1 Allow single command:

```
[SysProcess]
Command.0=shutdown
Command.1=COMMAND_XYZ
..
Command.X=...
```

3.5.8.2 Allow 'all' commands:

This setting is not recommended to be turned on! For safety reasons, this option should not be used! The user must be aware of the risks when using this option!

[SysProcess] Command=AllowAll

⁴⁷ https://www.helpme-codesys.com/search.html?L=1&id=888&tx_solr%5Bq%5D=SysProcess

3.5.9 Visu, Filetransfer (EN)

Depending on the runtime, the configuration file is located in the following place: Location of the configuration file⁴⁸

3.5.9.1 Enable the file transfer

[CmpWebServerHandlerV3]

AllowFileTransferServices=1

3.5.10 WebServer (EN)

Depending on the runtime, the configuration file is located in the following place: Location of the configuration file⁴⁹

3.5.10.1 Set connection type

[CmpWebServer] ConnectionType=3

Possible values:

⁴⁸ https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file 49 https://faq.codesys.com/display/CDSFAQ/Location+of+the+configuration+file

HTTP_ONLY, /* = 0 */ HTTPS_ONLY, /* = 1 */ HTTP_AND_HTTPS, /* = 2 */ REDIRECT_HTTP_TO_HTTPS /* = 3 */

3.5.10.2 Define the port

[CmpWebServer]
WebServerPortNr=9090 // HTTP
WebServerSecurePortNr=443 // HTTPS

3.5.10.3 Binding to an address

```
[CmpWebServer]
LocalAddress=127.0.0.1
```

3.5.10.4 Binding to an adapter

```
[CmpWebServer]
LocalAdapterName=LAN-Connection
or
LocalAdapterNameUnicode=L\00A\00N\00-\00C\00o\00n\00e\00e\00c\00t\00i\00o\00n\00
```

4 CODESYS Engineering - FAQ (EN)

4.1 CODESYS Development System - FAQ (EN)

- 32Bit/64Bit capable applications (EN) (see page 94)
- Codemeter Control Center FAQ (EN) (see page 95)
 - Codemeter CmDongle FAQ (EN) (see page 95)
 - Update the firmware of the selected CmDongle (EN) (see page 95)
 - Wibu, Codesys Key, Dongle: License is not found on the USB dongle (EN) (see page 96)
 - How to: Setup a Wibu Network Server Access for Licenses (EN) (see page 97)
 - License is not found, License System Message, Product Code: 13 (EN) (see page 102)
- Error Message: "Invalid result package" (EN) (see page 103)
- How to: Go online via CAN connection (EN) (see page 106)
- Libraries FAQ (EN) (see page 106)
 - 'ConvertUTF8toUTF16': How is the parameter 'bStrictConversion' intended? (EN) (see page 106)
 - CAA File Library (EN) (see page 107)
 - Code-sign a library (EN) (see page 107)
 - Library Development, Project Information: 'Library compatibility' and 'Released' check (EN) (see page 108)
- Microsoft Edge Webview2 Runtime (EN) (see page 110)
- New CODESYS Versions FAQ (EN) (see page 112)
 - Modularization of the Development System Installation Issues (>= SP17) (EN) (see page 112)
 - Some new things to look out for in CODESYS SP18 (EN) (see page 115)
- Programming of Applications FAQ (EN) (see page 117)
 - Acknowledge Alarms from the IEC Code (see page 117)
 - Automatic Restart of the Application after Resetting from IEC Code FAQ (see page 121)
 - Checking values for invalidity ('NaN') (see page 126)
 - Codesys Exception: division by zero (Implicit Checks: Division checks) (EN) (see page 126)
 - CODESYS Task configuration (EN) (see page 128)
 - Error Checking with "POU for implicit checks" (see page 133)
 - Exception: "ProcessorLoadWatchdog" (EN) (see page 139)
 - How to: Applicative use of the time zone (Util-Lib) (EN) (see page 141)
 - How to: Distribute an application to several controllers (EN) (see page 143)
 - How to: Setting the time zone in Runtime/OS (EN) (see page 144)
 - Identifying the Hardware and Operating System (see page 149)
 - Including an Interface (Example: "IKeyEventHandler") (see page 152)

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- Licensing: Querying the Container Information (see page 163)
- Reading the Alarm ID (see page 166)
- Reading the Application Information with the library "CmpApp" (see page 171)
- Reading the Compiler and Runtime Version (see page 173)
- Reading the IP and MAC Addresses from AdapterInfo (EN) (see page 175)
- Reading the Manufacturer Information of the Controller (see page 179)
- Symbol configuration: Error message "Found dependency cycle in the types" (EN) (see page 183)
- SysFile: Saving Files in UTF-8 Format (see page 183)
- Task Configuration: Reading the Cycle Time and Other Information (see page 186)
- TCP, Resolve Hostname: Using the Interface "itfAsyncProperty" (EN) (see page 189)
- TCP: Example for Server and Client (see page 192)
- TCP: Pinging a Network Address (see page 204)
- UDP: Example for Server and Client (see page 206)
- Which IOs are updated in which Tasks / Fieldbus Bus Cycle Tasks (EN) (see page 214)
- Working with Strings More Than 255 Characters (see page 216)
- Setup and Installation FAQ (EN) (see page 221)
 - (V3.5) 'Standalone' Gateway Installation: The CODESYS Edge Gateway (see page 221)
 - CODESYS Installer logs (EN) (see page 223)
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 - Downloading missing libraries (see page 226)
 - Installation of several CODESYS versions (see page 229)
 - Library documentation (LibDoc.exe) (>=SP17) (EN) (see page 231)
- Signing Packages (EN) (see page 232)
- The CODESYS Integrated Development Environment (IDE) FAQ (EN) (see page 233)
 - CODESYS communication: Limited data size between PLC and CODESYS IDE (EN) (see page 233)
 - Coloring the background of the search function, color for the marking of the search results (see page 234)
 - Expired certificates message for encrypted communication (EN) (see page 236)
 - How to open an Example Project (EN) (see page 238)
 - Online or Offline created 'boot application' have different sizes (EN) (see page 241)
 - Report problems and error messages to CODESYS (EN) (see page 242)
 - Report problems and error messages to CODESYS FAQ (EN) (see page 252)
 - Incomplete CoreDump (core file incomplete) (see page 252)
 - RTE, How to: Analyze a BSOD/Crash of the application (see page 253)
 - Why accurate 'steps for reproducing a problem' are important for any Technical Support (see page 256)

- Switch off the precompilation (EN) (see page 257)
- What are the meanings of the memory occupation data in the message window? (see page 259)

4.2 CODESYS Error Messages - FAQ (EN)

 Internal error status of a "_TO_" POU when created with addon "CODESYS LD FBD" in version 4.3.0.0 (see page 260)

4.3 CODESYS Development System - FAQ (EN)

4.3.1 32Bit/64Bit capable applications (EN)

4.3.2 Codemeter Control Center - FAQ (EN)

- Codemeter CmDongle FAQ (EN) (see page 95)
 - Update the firmware of the selected CmDongle (EN) (see page 95)
 - Wibu, Codesys Key, Dongle: License is not found on the USB dongle (EN) (see page 96)
- How to: Setup a Wibu Network Server Access for Licenses (EN) (see page 97)
- License is not found, License System Message, Product Code: 13 (EN) (see page 102)

4.3.3 Error Message: "Invalid result package" (EN)

4.3.4 How to: Go online via CAN connection (EN)

4.3.5 Libraries - FAQ (EN)

- 'ConvertUTF8toUTF16': How is the parameter 'bStrictConversion' intended? (EN) (see page 106)
- CAA File Library (EN) (see page 107)
- Code-sign a library (EN) (see page 107)
- Library Development, Project Information: 'Library compatibility' and 'Released' check (EN) (see page 108)

4.3.6 Microsoft Edge Webview2 Runtime (EN)

4.3.7 New CODESYS Versions - FAQ (EN)

- Modularization of the Development System Installation Issues (>= SP17) (EN) (see page 112)
- Some new things to look out for in CODESYS SP18 (EN) (see page 115)

4.3.8 Programming of Applications - FAQ (EN)

- Acknowledge Alarms from the IEC Code (see page 117)
- Automatic Restart of the Application after Resetting from IEC Code FAQ (see page 121)
- Checking values for invalidity ('NaN') (see page 126)
- Codesys Exception: division by zero (Implicit Checks: Division checks) (EN) (see page 126)
- CODESYS Task configuration (EN) (see page 128)
- Error Checking with "POU for implicit checks" (see page 133)
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- How to: Applicative use of the time zone (Util-Lib) (EN) (see page 141)
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- Reading the IP and MAC Addresses from AdapterInfo (EN) (see page 175)
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- Symbol configuration: Error message "Found dependency cycle in the types" (EN) (see page 183)
- SysFile: Saving Files in UTF-8 Format (see page 183)
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- TCP: Example for Server and Client (see page 192)
- TCP: Pinging a Network Address (see page 204)
- UDP: Example for Server and Client (see page 206)
- Which IOs are updated in which Tasks / Fieldbus Bus Cycle Tasks (EN) (see page 214)
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4.3.9 Setup and Installation - FAQ (EN)

- (V3.5) 'Standalone' Gateway Installation: The CODESYS Edge Gateway (see page 221)
- CODESYS Installer logs (EN) (see page 223)

- CODESYS Setup configuration via command line (EN) (see page 224)
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4.3.10 Signing Packages (EN)

4.3.11 The CODESYS Integrated Development Environment (IDE) - FAQ (EN)

- CODESYS communication: Limited data size between PLC and CODESYS IDE (EN) (see page 233)
- Coloring the background of the search function, color for the marking of the search results (see page 234)
- Expired certificates message for encrypted communication (EN) (see page 236)
- How to open an Example Project (EN) (see page 238)
- Online or Offline created 'boot application' have different sizes (EN) (see page 241)
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 - Incomplete CoreDump (core file incomplete) (see page 252)
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 - Why accurate 'steps for reproducing a problem' are important for any Technical Support (see page 256)
- Switch off the precompilation (EN) (see page 257)
- What are the meanings of the memory occupation data in the message window? (see page 259)

4.3.12 32Bit/64Bit capable applications (EN)

to make an application run on 64 bit or 32 bit you have to:

- The CODESYS Development system, Compiler Version and Runtime Version must be at least V3.5.5.0

- Use interfaces-lib CmpError2 and SysTypes2 instead of CmpError and SysTypes, namespaces are the same but: RTS_INVALID_HANDLE is now in SysTypes and no longer in CmpErrors!

There are more libraries which are explicitly marked as 32-bit only, such as SysSem23. These will lead to the below error message. You will have to migrate to the new usage in the alternative library SysSem. If there is no obvious library to migrate to, you could ask the developer of the library, or if you have the source code, you can convert it yourself.

----- Build started: Application: Device.Application ------

Typify code...

[ERROR] syssem23, 3.5.15.0 (system): Library Manager [Device: PLC Logic: Application]: C0338: The Library 'syssem23, 3.5.15.0 (system)' is only supported in 32 bit applications

Compile complete -- 1 errors, 0 warnings

 \times

```
Build complete -- 1 errors, 0 warnings : No download possible
```

- Replace 32 bit pointer variables by 64 bit (_XWORD or Alias XWORD). Tip: The Static Analysis Package from the Professional Development Edition can help identify instances, where the application has converted a POINTER into a DWORD or vice versa.

4.3.13 Codemeter Control Center - FAQ (EN)

4.3.13.1 Codemeter CmDongle - FAQ (EN)

CodeMeter Kontrollzentrum Datei Aktion Ansicht Hilfe Lizenz Ereignisse CmStick/B 3-5114102 Name: CmStick/B Bich Protection Only 4512942 Sercence 1002 Version: CmStick/B 4.40 28-21153665 Version: CmStick/B 4.40

4.3.13.1.1 Update the firmware of the selected CmDongle (EN)

 28-21153665
 2

 1
 Kapazität: 98 % frei (310544 Bytes)

 Status:
 Status:

 Status:
 Status:

 Aktiviert solange angeschlossen

 Status:
 Auswerfen

 Kennwort ändern

This button updates the firmware of the selected CmDongle. This ensures the correct execution of elementary functions and fixes any problems that may occur.

To perform a firmware update, an Internet connection is necessary.

4.3.13.1.2 Wibu, Codesys Key, Dongle: License is not found on the USB dongle (EN)

4.3.13.1.2.1 Problem:

There may be a problem when using the Codesys Key/Dongle and the starting of the plc.

The Codesys Key/Dongle seems to be recognized a few seconds after the PLC is started, depending on the system.

As a result, the controller may run without a license and thus switches to demo mode, which only runs for two hours.

After that, a manual restart is necessary.

Fieldbuses without license switch to demo mode, which lasts for 30 minutes.

4.3.13.1.2.2 Problem description

The mount of a WIBU dongle only happens with WIBU USB dongles in mass storage mode!

The WIBU runtime does not manage the mount and needs a few seconds more. Even Linux doesn't have shares in it, it's simply the code meter.

For example, with a Raspi reboot, this is simply too slow / too late until it is recognized.

Simple solution:

- Activate the license directly on the PLC as a Softlicense.
- Switch the USB dongle to HID mode (f.e via a "MEM_TO_HID.bat") MEM_TO_HID.bat Example

```
@echo off
set Path=%Path%;C:\Program Files (x86)\CodeMeter\Runtime\bin\
cmu32.exe -v"
cmu32 --list
:nochmal
echo Abrechen mit Strg-C
set /p cmcontainer=Bitte CM Container (Dongle Seriennummer) eingeben:
if "%cmcontainer%"=="" goto nochmal
cmu32 /s %cmcontainer% --set-config-disk HidCommunication
pause
```

Then The USB dongle is not mounted and everything works even when the Linux is rebooted. **HID mode does not work. What do you have to enable in the Linux kernel for this?**

These two switches are needed, included in the driver components:

CONFIG_HID

CONFIG_HIDRAW

This is due to the lack of HID support in the Linux kernel. This must be changed on the Linux Kernel side. So there are no changes needed in CODESYSControl.cfg.

Solution 1:

One solution could be, to start the runtime after the dongle is mounted.

Solution 2:

The second solution could be, to check the "StartDone" event (after a view seconds), and see if the USB stick is mounted.

Perform an AppReset() if the dongle is not found mounted.

This is only a weak workaround.

It is still suitable, if there is just a single application with this problem.

4.3.13.1.2.3 Reference

Can the license query be made later? Maybe controlled via the application?

Examples:

- CODESYS IIoT SL License not found
- CODESYS Profiler License not found
- ...

No, because this can take quite a long time the first time it is executed. Codesys can not solve this possible mounting with an application approach.

We have therefore included the query in 'call after init' - the problem should rather be solved on the PLC side. Codesys assumes that the licenses are available at start-up.

4.3.13.2 How to: Setup a Wibu Network Server Access for Licenses (EN)

These instructions are based on the Wibu-Systems specifications. For further Information, please refer to the FAQ on www.wibu.com - 'Distribute Server Search List centrally'⁵⁰

⁵⁰ https://www.wibu.com/us/support/faq/codemeter-networking.html#faq-96

Please note the different application cases and proceed according to the setup corresponding to your system.

4.3.13.2.1 License Server on Windows (Host) - license request under Linux (Client)

The following description applies to cases where the Wibu/Codemeter Network Server is running on a Windows System, and the license query is performed in a Linux runtime.

To use the Wibu Webserver/Network Server in the Codemeter Control Center, follow the steps below:

1. Open the Codemeter Control Center.

Default filepath "C:\Program Files (x86)\CodeMeter\Runtime\bin\CodeMeterCC.exe"

2. Go to the '*WebAdmin'* via the button. The 'CodeMeter WebAdmin' will be opened in a Browser.



3. CodeMeter WebAdmin: Go to 'Settings' - 'Server' - 'Server Access'

shboard Container ~ License Monitoring ~ Diagr	nosis 🗸 Configuration 🗸	Info	
Basic Configuration Server Search List	Basic	→	English (US) ~
Server Search List Proxy WebAdmin Ba	Server	Server Access	
Server Search List	Advanced	License Access Permissions	
		License Transfer Configuration	
 add new Server add automatic server search 			
	Apply Restore Defa	aults	

4. CodeMeter WebAdmin, Server Access: Activate the Network Server Access (Enable)

shboard Container 🗸	License Monitoring Diagnosis Configuration Info	
Server Configuration Ser	ver Access	😗 😧 🗏 English (US)
Server Access Lic	ense Access Permissions License Transfer Configuration	
Network Server		
O Disable		
 Enable 		
Network Port:	22350	
-CmWAN Server-		
Disable		

5. Apply the settings change.

The local CmRuntime has now been configured as license server, ad can be reached via port 22350 (Default setting)!

6. Open the CODESYSControl_User.cfg config file:



7. Option-in the settings to use a Server and set the License Server IP:

[CmpCodeMeter] EnableNetLicenses=1 LicenseServer.1=192.168.99.107

4.3.13.2.2 License Server on a Linux System (Host)

The following description applies to cases where the Wibu/Codemeter Network Server is running on a Linux System.

To activate a Wibu Network Server on Linux, settings must be performed in the Server.ini file.

Default filepath

/etc/wibu/CodeMeter/Server.ini

Follow the steps below:

1. Stop the CmWebAdmin Deamon

/etc/init.d/codeMeter-webadmin stop

2. Stop the **CodeMeter Deamon**

/etc/init.d/codeMeter stop

3. Open the Server.ini file in an editor, filepath:

/etc/wibu/CodeMeter

4. Change/Edit the entry to:

IsNetworkServer=1

- 5. Save the Server.ini file
- 6. Start the CodeMeter Deamon

/etc/init.d/codeMeter start

7. After restarting the CodeMeter service, the **Server.ini** file is updated and the server is in the Server Search List.

4.3.13.3 License is not found, License System Message, Product Code: 13 (EN)

4.3.13.3.1 Error Message:

Protection System Message: CodeMeterAct Firm Code 5000304 Product Code: 13



4.3.13.3.2 How to fix the message

Here, the "Patch Protection" must now be included in the Codemeter Container.

CodeMeter Kontrollzentrum	—		×
Datei Aktion Ansicht Hilfe			
Lizenz Ereignisse			
CODESYS Runtime Key, c 2-2684981 Datch Protection Only Serien-Nr.: 128-4512942			
Patch Protection Only 128-4512942 Version: CmActLicense 1.19			
 3S-Smart Software Solut 128-17651678 CODESYS GmbH UFC Par 130-575194080 			
CODESYS GmbH UFC Cn 130-3567758728 Status: Status: Lizenz aktiviert			
Lizenzaktualisierung Lizenz löschen			
Der CodeMeter-Dienst wird ausgeführt.		Web	Admin

Please Check if this "PatchProtection" container exists in Codemeter Control Center ("C:\Program Files (x86)\CodeMeter\Runtime\bin\CodeMeterCC.exe").

If not, you can drag and drop the file or use double click to re-install. You can find the file, located per default, here:

"C:\Program Files\3S CODESYS*VERSION*\Temp\Patch_ProtectionUpdateFile.WibuCmRaU"

4.3.14 Error Message: "Invalid result package" (EN)

CODESYS	×
Invalid result package	
ОК	

During the PLC login, a message "Invalid result package" / "Invalid response from device" can be reported to the user.

This is a generic error code if the response from the runtime system is not complete or not consistent.

Meaning:

the reply of some communication request to the runtime system resulted in an answer that was not expected or cannot be interpreted by the development system.

For example:

- The given length of the data (in the header of a service) does not correspond to the length of the contained data.
- An error occurs when parsing the header.
- ...

4.3.14.1 How to bypass this message:

Keep the runtime up to date!

4.3.14.1.1 For Example:

When trying to connect with a PLC with a Runtime version 3.5.15.xx with a newer Codesys IDE (f.e. v3.5.17.40), the error "Invalid Result Package" will appear.

With SP17 there were major changes due to some security issues, e.g. the requirement of an enforced user management on the plc.

This behavior is determined by the version of the device description.

When using a device description < SP17, this will not yet apply and the login procedure will reach the point where the check about the version mismatch is done, and it will be properly displayed.

If you use a device description >= SP17, the check about an available user management will be done before even checking the version compatibility.

That is the point when the error occurs.

There is no chance to workaround this problem, since this is a bug in the old runtime SP15, which cannot be avoided anymore.

This error is already fixed for versions >= SP16 (in the runtime system).

<u>Within this example:</u> When using an SP17 Development System and an SP17 device description, then also use a corresponding SP17 runtime system as well!

Restart the Gateway

Restart the Gateway via the Task Icon in the Taskbar.



Then perform a new Scan for the PLC and performed action again.

Restart the Codesys IDE

Communication components may have changed or hung internally and cannot be restored.

When needed, save your project and then close the Codesys Development System⁵¹ (IDE). After a restart, the error message should no longer occur.

When using the CODESYS Application Composer

When using the Command 'Generate, Compile and Login', several commands are executed with one mouse click.

(First, the code is created and compiled. Then, if possible, the application is logged in to the controller and then started.)

This can sometimes result in the sequence of commands being overlapped in border areas, which can lead to communication requests that cannot be processed. The result can then sometimes be the shown message.

Alternatively, try the following steps:

- · Select "Generate" from the "Composer" menu
- Select "Clean all" from the "Build" menu
- Perform a Login to the PLC

Perform a 'Reset Origin Device'

If the IDE is frozen or does not respond, this is not an option.

But if possible, try to perform a 'Reset Origin Device⁵²' on the Applicaton Device. Alternative: Remove all contents from the PlcLogic/Application folder.

Once the old application has been removed from the device, perform a now Login/download.

⁵¹ https://faq.codesys.com/display/CDSFAQ/CODESYS+Development+System

⁵² https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_reset_origin_device.html

4.3.15 How to: Go online via CAN connection (EN)

Normally, the IDE always connects to the runtime system via Ethernet. But it is also possible that the IDE can also connect via CAN.

4.3.15.1 Prerequisite:

- The runtime must support this
- The gateway must be set up accordingly

The following config entries are necessary in the Gateway.cfg file:

```
[ComponentManager]
Component.1=CmpBlkDrvCANClient
Component.2=CmpPCANBasicDrv
;Component.5=CmpNameServiceServer
[CmpRouter]
0.MainNet=<NetzwerkName>
1.MainNet=BlkDrvCanClient
[CmpBlkDrvCanClient]
0.Name=BlkDrvCanClient
0.NetId=0 ; CANbus Network Id (0..n)
0.Baudrate=500 ; CANbus Baudrate in kbit/s
0.NodeId=1 ; unique NodeId im CanNetz
```

4.3.16 Libraries - FAQ (EN)

4.3.16.1 'ConvertUTF8toUTF16': How is the parameter 'bStrictConversion' intended? (EN)

Here we refer to the following entry in the Codesys Online Help (OLH): ConvertUTF8toUTF16 (FUN)⁵³

4.3.16.1.1 Explanation

Not every sequence of bytes is a UTF-8 string. So if the input is wrong, errors can occur when reading the string.

⁵³ https://help.codesys.com/webapp/f05s9gz_szohAX709_ptH3StSaE%2FConvertUTF8toUTF16;product=StringUtils;version=3.5.17.0

The option '**bStrictConversion**' is to be interpreted in such a way that the function terminates as soon as an error occurs during reading.

- After that (if such an error occurred during reading) there is not much usable data left to continue working with.

Without the option, it will probably output an illegal character and simply continue with the next byte.

4.3.16.1.2 Our recommendation

So we would recommend here to always use "true" for this option.

See also

- Our CODESYS Online Help⁵⁴
- Other customer questions submitted under Forge⁵⁵
- The Codesys Online Help (OLH)⁵⁶ Website (pre SP18 link)

4.3.16.2 CAA File Library (EN)

4.3.16.2.1 Error code and meaning

• 5802

The error is generated by the subordinate library "CAA Async Manager". This can execute only 20 jobs (file operations) simultaneously.

4.3.16.3 Code-sign a library (EN)

4.3.16.3.1 Problem and error description

The following steps are required when signing a compiled library with a Digital Signature is requested.

4.3.16.3.2 Step-by-step guide

1. Create a code signing certificate and add it to the Windows cert store (See informational note below on the 'Powershell command')

⁵⁴ https://www.helpme-codesys.com/

⁵⁵ https://forge.codesys.com/forge/talk/

⁵⁶ https://help.codesys.com/

2. Add the certificate into View > Security Screen > User > Digital Signature

Certificate Selection -					
Select the certificate for your digital signature. You need the private key for this certificate.					
		Issued for	Issued by	Valid from	
1	ing and a second se	But surely you have your own CA signed code signing cert	But surely you have your own CA signed code signing cert	21/07/2021 15:09	
F	_				
	<u>د ا</u>				
	Â.	×			
Ŀ	N V V V	certificate from the store below to the selection above			
			Issued for	lssu	
			But surely you have your own CA signed code sig	ning cert But s	

- 3. Select the "Enforce signing of compiled libraries" on that same screen
- 4. Save as compiled library

Powershell command:

\$cert = New-SelfSignedCertificate -DNSName "www.self.signed" -CertStoreLocation Cert: \CurrentUser\My -Type CodeSigningCert -Subject "But surely you have your own CA signed code signing cert"

4.3.16.4 Library Development, Project Information: 'Library compatibility' and 'Released' check (EN)

The article refers to the Library Development⁵⁷, Project Information⁵⁸

⁵⁷ https://content.helpme-codesys.com/en/LibDevSummary/guidelines.html 58 https://content.helpme-codesys.com/en/LibDevSummary/projectinfo.html
le Summary Prop	erties Statistics Licensing Signing
Company	35 - Smart Software Solutions GmbH
Title	CODEYS Common Library Template
Version	3.5.16.XX
Library Categories	
Default namespace	TMP
Placeholder	PlaceholderTemplate
Author	35 - Smart Software Solutions GmbH
Description	Library project template with all possible element types, docu and a sample project structure
Library compatibility	CODESYS V3.5 SP16
The fields in bold lett	ters are used to identify a library.
Automatically generate	'Library Information' POUs
Automatically generate	'Project Information' POUs

4.3.16.4.1 What is the 'Library compatibility' under Project Information for?

The 'Library compatibility' version was introduced mainly to cover, that signed libraries cannot be used in older projects anymore.

So, it was for checking the compatibility between different CODESYS Versions.

This setting has been removed since SP17 and is substituted by internal checks.

Company	CODESYS GmbH
Title	CODEYS Common Library Template
Version	3.5.17.0 Release
Library Categories	
Default namespace	TMP
Placeholder	PlaceholderTemplate
Author	CODESYS GmbH
Description	Library project template with all possible element types, docu and a sample project structure
The fields in hold let	ters are used to identify a library
	the area to rate in y and any.
	him to former a financia

4.3.16.4.2 When is the 'Released' box supposed to be checked? Is there a guideline for this?

The "Released" flag should be set as soon as a library has reached the final state of development and testing and will be deployed to your customers.

We always set this flag for the final release build of a new version.

See also: Library Properties⁵⁹

See also

- Our CODESYS Online Help⁶⁰ (OLH)
- OLH: Our Library Development Summary⁶¹ for library development
- OLH, library development: Project Information⁶², and Library Properties⁶³
- Other customer questions submitted under Forge⁶⁴
- The Codesys Online Help⁶⁵ Website (pre SP18 link

4.3.17 Microsoft Edge Webview2 Runtime (EN)

The Codesys Visualization is using the alternative browser WebView2 since the release of Codesys Visualization Add-on v4.3.0.0.

- If the computer is online, Microsoft Edge Webview2 Runtime is automatically installed with the Codesys Setup.
- If the computer is offline, the user has to manually install the software before executing the Codesys installation.

You can download the standalone installer from the Microsoft side: https://developer.microsoft.com/en-us/microsoft-edge/webview2

- 62 https://content.helpme-codesys.com/en/LibDevSummary/projectinfo.html
- 63 https://content.helpme-codesys.com/en/LibDevSummary/properties.html
- 64 https://forge.codesys.com/forge/talk/

⁵⁹ https://content.helpme-codesys.com/en/LibDevSummary/properties.html 60 https://www.helpme-codesys.com/

⁶¹ https://content.helpme-codesys.com/en/LibDevSummary/index.html

⁶⁵ https://help.codesys.com/

4.3.17.1 Some known issues:

Problems when displaying the visualization in online mode.

User can experience some problems when displaying the visualization in online mode. There, the following error message will showed up:

The installed WebView2 Runtime version is not compatible to the Visualization version. Please update your WebView2 installation to at least version 95

4.3.17.1.1 Solution:

Apparently, there are some installations where a fixed and pretty old version of the WebView2 runtime is installed, which triggers this problem.

To fix this, you can uninstall the currently installed WebView2 Runtime using the installed program dialog of your Windows computer:

- Use [Windows] and [I] keys, to start in the Windows-settings, then chose the "Apps" Section.
- Select the 'Microsoft Edge Webview2 Runtime' and use the uninstallation function:

Microsoft Edge WebVie	w2-Laufzeit	
 113.0.1774.50		
	Ändern	Deinstallieren

• Afterward, you can install the self updating package ("evergreen") from the Microsoft Website: https://developer.microsoft.com/en-us/microsoft-edge/webview2/#download-section

All recent released versions of CODESYS Setups will already deliver this variant of the WebView2 runtime, so customers should not experience such problems.

An error is shown when using "Support client animations..." option.

If "Support client animations..." is activated, an error message can appear when calling up the images in "online" mode:

It is not jet possible to display visualization in online mode when client animation and overlay of native controls are active.

4.3.17.1.2 Solution:

The overlay visu is displayed online via an embedded browser in the programming system.

Since version 4.3.0.0 of the Visu, WebView2 is typically used here. Previously (and currently still as a fallback) also CEF is used.

The Codesys Setup does not recognize the WebView2 Runtime.

After installing the Microsoft Edge Webview2 Runtime manually, the CODESYS setup doesn't recognize this installation.

4.3.17.1.3 Solution:

Install Microsoft Edge Webview2 Runtime with Windows Admin rights.

4.3.18 New CODESYS Versions - FAQ (EN)

4.3.18.1 Modularization of the Development System - Installation Issues (>= SP17) (EN)

Important

Everyone working with SP17 or newer must read the Whitepaper: Modularization from the User Perspective⁶⁶

4.3.18.1.1 Summary

With SP17 the CODESYS Development System has been modularised. This means that much of the functionality which was built into the SP16 installer has been moved to addons. Normally, if one selects

⁶⁶ https://help.codesys.com/webapp/_cds_codesys_modularization;product=codesys;version=3.5.17.0

"Complete Installation" these addons are automatically installed, but there could be a problem installing these addons, for example low disk space.

4.3.18.1.2 Problem 1

I want everything that was in SP16 before the modularisation.

4.3.18.1.3 Solution 1

Here is an export of a fresh installer immediately after installing with SP17 Patch 0 "Complete Install" option. Install it with Start > CODESYS > CODESYS Installer: EverythingFromTheSP17_0Setup.installation-config (see page 112)

4.3.18.1.4 Problem 2

I only have the option to create a POU in ST

4.3.18.1.5 Solution 2

Ladder, FBD, IL, SFC and CFC are now optional free addons. The setup selects these by default but you are able to unselect them. Also if you use CODESYS Installer to Add an Installation, it will not select these plugins for you.

So if you want Ladder or Function Block Diagram or Instruction List, you must open Start > CODESYS > CODESYS Installer, select "Change" for your installation, select Browse, and search for the package named "CODESYS LD/FBD" with the magnifying glass. Note that for search purposes, the package does not have "Ladder" nor "Function Block Diagram" nor "Instruction List" in the name nor details. If you need Instruction list, you still need to enable it in the IDE using Tools > Options > FBD, LD and IL editor > IL > Enable IL.

Continuous Function Chart is another package, you must search for "CFC".

Sequential Function Chart is another package, you must search for "SFC".

4.3.18.1.6 Problem 3

There was an error installing "Compatibility Package" during install

4.3.18.1.7 Solution 3

- 1. Uninstall CODESYS
- 2. Delete the following folder C:\ProgramData\AP\PlugInCaches
- 3. Cleanup CODESYS installation folder by deleting it (e.g. C:\Program Files\CODESYS 3.5.17.0)
- 4. Reinstall CODESYS

5. If the problem is still there, uninstall all Microsoft Visual C++ Redistributable versions from windows, and then repeat the reinstallation above

4.3.18.1.8 Problem 4

I try to install package A, but it complains that it is missing a dependency package B

4.3.18.1.9 Solution 4

Install the package instead via Windows Start Menu > CODESYS > CODESYS Installer. This will resolve the dependencies. Alternatively, locate package B and install it first.

4.3.18.1.10 Problem 5

I cannot find the CODESYS Installer.

4.3.18.1.11 Solution 5

It is typical to find programs using \[Windows Key] + Type the name of the program you are looking for. This Search however requires that your Start Menu is indexed by your operating system. Often an administrator will have disabled Cortana. If this is the case, your start menu index is not updated, so you can find old entries such as Notepad, but not new entries such as CODESYS Installer.

The alternative way to find programs from the start menu, if you have this MS Windows limitation, is to scroll through the list to CODESYS > CODESYS Installer

Alternatively, it is here: "C:\Program Files (x86)\CODESYS\APInstaller\APInstaller.GUI.exe"

4.3.18.1.12 Problem 6

I cannot use the newest version Vizualisation AddOn to work with an older PLC Application.

Or, I cannot use the newest version of a particular AddOn to work with an older PLC Application.

4.3.18.1.13 Solution 6

Essentially, if you want to use Visualisation Profile Version 4.1.0.0 in your project, you need to have exactly Visu Addon 4.1.0.0 installed as the latest Visu Addon. Specifically not 4.2.0.0, nor 4.0.0.0.

If you want to use version 4.0.0.0 or earlier (eg 3.5.16.10) in your project, you need to have exactly Visu Addon 4.0.0.0 installed as the latest Visu Addon. Specifically not 4.1.0.0.

This is because, through modularisation, the latest IDE no longer is tied down to a specific version of a package. So for maximum compatibility, the user can now be assured that when working with a project at a particular Visu version profile, they are using exactly the matching addon for this.

So what are the options for the user:

1. Always upgrade to the latest version. If you open an older project, update the Visualisation version profile to the latest, and you can now use the old project. The problem here is, you will not be able to go online to an exwithout downloading a change.

2. Use CODESYS Installer to prepare another installation, which uses instead the other versions of the Addons. Note that even though another installation is listed, in practice this is just one 'installation' of the CODESYS IDE on the hard drive, with each one loading a different set of plugins.

In future, when you open a project which was created with Visualisation Addon 4.1.0.0, in a Installation which has Visualization Addon 4.2.0.0, you will be prompted to either switch to an existing or create a new installation, which uses the correct Addon Version.

The same compatibility rules now hold true for almost all addons - if you want to use a previous project, you either use exactly the same addon versions, or you can choose upgrade the project to use the latest addons. An upgrade may require either an online change, or a complete download.

4.3.18.1.14 Problem 7

For some fieldbusses, some tabs are missing, for example the General Tab of Modbus.

4.3.18.1.15 Solution 7

Use CODESYS Installer to install the correct Addon for your Fieldbus, for example CODESYS Modbus.

4.3.18.2 Some new things to look out for in CODESYS SP18 (EN)

4.3.18.2.1 1 You can no longer switch to an older compiler version

This was done with improvement number CDS-74626

- Release Note:
 - [[GENERAL]]

* The choice of the compiler version is limited to only the newest version or the version already used in the project.

This applies to the project compiler settings and the project environment dialog.

...

See also the Whitepaper: Modularization from the User Perspective⁶⁷

⁶⁷ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_codesys_modularization.html

- If you want to create a new project for an old controller, you should use the newest compiler version anyway.
- If for some reason you need exactly an older compiler version for a new project, you must install that old version and create a project there.

4.3.18.2.2 2 Datatype STRING can now be either UTF8 or the old format, ASCII

Check out the documentation https://content.helpme-codesys.com/en/ CODESYS%20Development%20System/_cds_utf8_encoding.html

You can enable it with this setting (below screenshot), and all STRINGs will be treated as UTF8 strings.

If it is deselected, you can still have a UTF8 STRING literal, by typing UTF8#'aäoöuü'. In this case, the string is stored as [61 **C3 A4** 6F **C3 B6** 75 **C3 BC** 00]. If you have the setting unticked and type instead 'aäoöuü', you get [61 **E4** 6F **F6** 75 **FC** 00]

You can also decorate a STRING with this attribute to force UTF8 monitoring. {attribute 'monitoring_encoding' := 'UTF8'}

Project Settings	
Compile options	Compile options
Compiler warnings	Constitution
前 Library development	Compiler Version
Monitoring	Fix version 3.5.18.0
🗁 Page Setup	1 The newest available compiler version is used
👸 Security	
🕄 SFC	Settings
SoftMotion	Allow unicode characters for identifiers
🖷 Source Download	Replace constants
🖇 Static Analysis Light	Enablelogging inbreakpoints
😫 Users and Groups	
Visualization	
Visualization Profile	Compiler Warpings

4.3.18.2.3 3 You can now symbolically access the IO channels

Check out the OnlineHelp for more information on Symbolic Access to I/O Channels⁶⁸.

This is a new feature.

In case of any problems, a workaround is to just use the old access method, which is still possible.

4.3.18.2.4 4 Generic constants for Functionblocks

Check out the OnlineHelp for more information on Variable: VAR_GENERIC CONSTANT⁶⁹

These are intended to replace the deprecated Library parameter list.

⁶⁸ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_symbolic_access_io_channels.html 69 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_vartypes_var_generic_constant.html

4.3.18.2.5 5 "Offline" Online help and "Online" Online help have changed

help.codesys.com⁷⁰ has been replaced with www.helpme-codesys.com,⁷¹ and has become a completely new platform. Keyword: Faster.

The Offline .chm files are now HTML files, which duplicates the www.helpme-codesys.com⁷² website for offline use.

The web page (help.codesys.com⁷³) will still remain. The reason for this is that old Codesys development environments have implemented their link to the old online help on it, and this must continue to exist at least as a basis for these environments.

4.3.19 Programming of Applications - FAQ (EN)

4.3.19.1 Acknowledge Alarms from the IEC Code

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

AlarmIecAck.project* - CODESYS			-	
File Edit View Project Build Online Debug Tools Windo	ow Help			
🎦 😅 📓 🗠 🗠 🖇 🖻 🛍 🗙 🖬 🏰 🌿 📗 🌾 🎌	1 🖻 🛅 🕤 🔠 🔍 🦻	🗉 % Çili Fili dil 🕫 🖇	◆ 罰 〒 ∛	
Devices 👻 🕂 🗙	Device X			
AlarmIecAck		Constant Coloma D	ter des	
Device (CODESYS Control Win V3)	Communication Settings	Scan network Gateway • D	evice •	
B C Application	Applications			
👔 Library Manager			•	
PLC_PRG (PRG)	Backup and Restore		10 10 10 10	
King Task Configuration Add State (IEC Tasks)	Files	•		•••
PLC PRG	1		Gateway	
	LOG		Gateway-1	▼ [0301.A000.034A] (active)
	PLC Settings	I	P-Address:	Device Name:
	DLC Shall	 	ocalhost	KERNTPC
	r Lo Jilei	P 1	Port: 217	Device Address: 0301.4000.0344
	Users and Groups			Tt ID.
	Access Rights			0000 0001
				Target Type:
	Symbol Rights			4096
	Task Deployment			Target Vendor: 35 - Smart Software Solutions GmbH
	Status			Target Version: 3.5.14.30
	Information			

• Adapt the POU PLC_PRG as follows:

- 71 http://www.helpme-codesys.com,
- 72 http://www.helpme-codesys.com

⁷⁰ http://help.codesys.com

⁷³ http://help.codesys.com

Declaration

VAR	vCroateAlarm1		POOL •
	xcreateAtarmi	•	DUUL;
	xCreateAlarm2	:	BOOL;
	xCreateAlarm3	:	BOOL;
	xCreateAlarm4	:	BOOL;
	xAckAll	:	BOOL;
	xAckErr	:	B00l;
END	_VAR		
	_		

Insert an Alarm configuration in the device tree.
 Here, the Error, Info and Warning, alarm classes are created automatically, as well as the AlarmStorage object.

In addition, an AlarmManagerTask is created.



Form the alarm classes, set the acknowledgement type to REP_ACK:

Devices	→ ₽ X	/	T Device		Warning >	(
AlarmIecAck					Advanuladay	ment		
🖻 🕤 Device (CODESYS Control Win V3)		P	riority: 30	* *	Acknowledge	ement amant mathoda		
i≡			Archiving		Acknowledg	fement method	KEP_ACI	
🖻 🧔 Application					acknowl	edge separately		
Alarm Configuration								
Error		l f	Notification act	ions				
🗠 📶 Info			Action		activate	deactivate	confirm	Details
Warning			Click here to a	idd a				Click here to add a
🗠 🚮 AlarmStorage								
grpError								
grpWarning								

Insert two new alarm groups, *grpError* and *rgrpWarning*, in the *Alarm configuration* and configure the alarms as follow:

Textlist:	grpError_1	Archiving:	🔞 (none)		 Deactivation: 			
ID	Observation type	Details	Deactivation	Class	Message	Min. pend. time	Latch var 1	Latch var 2
0	01 Digital	PLC_PRG.xCreateAlarm1 = TRUE		🖄 Error	Error: Message 1			
1	01 Digital	PLC_PRG.xCreateAlarm2 = TRUE		📶 Error	Error: Message 2			
	Click here to add a new alarm	Click here to add a new alarm						
	Click here to add a new alarm	Click here to add a new alarm						

🖉 🗍 De	vice 📄 PLC_PRG 🔼 g	rpError 🔥 grpWarning 🗙						
Textlist:	grpWarning_1	 Archiving: 	🔞 (none)		✓ Deactivation:			
ID	Observation type	Details	Deactivation	Class	Message	Min. pend. time	Latch var 1	Latch var 2
0	01 Digital	PLC_PRG.xCreateAlarm3 = TRUE		<u>M</u> Warning	Warning: Message 1			
1	01 Digital	PLC_PRG.xCreateAlarm4 = TRUE		🙆 Warning	Warning: Message 2			
	Click here to add a new alarm	Click here to add a new alarm						

• Adapt the POU PLC_PRG as follows:

Implementation

```
If xAckAll Then
    xAckAll := FALSE;
    AlarmManager.g_AlarmHandler.AcknowledgeAll();
END_IF
If xAckErr Then
    xAckErr := FALSE;
    AlarmManager.g_AlarmHandler.AcknowledgeAllOfGroup(usiAlarmGroupID :=
Alm_AlarmConfiguration_Alarmgroup_IDs.ID_grpError);
END_IF
```

The alarm groups which you have created are provided in the SmartCoding view:



 Insert a visualization in the device tree. Then the Visualisierung Manager is inserted automatically with the TargetVisu and WebVisu visualization types. In addition, a VISU_TASK is also created automatically.



In the Visualization, set an Alarm Table element and configure the element as follows:

Properties	¥ 9
V Hiter - 1 K Sortiou - 24 Sort and	kr • 🗹 Advanced
Property	Yakar
Dement name	Gentleninst_4
Type of element	Alarm table
Delesiource	clocal application>
 Alarm configuration 	
 Generalisable configuration 	
Columna Columna	Lill Create new
 Column 	
× (8)	X Delete
Column header	
Use text alignment L.	10
Vidth.	120
Type of data	Time stamp
Text alignment	Centered
 Colorsettings 	
H [4	X Delete
Column header	
Use text alignment L.	11
Viideh	120
Type of data	Time stamp inactive
Text alignment	Lett
 Colorsettings 	
H [2]	X Delete
Column header	
Use text alignment L.	10
Victh.	276
Type of data	Message
Text alignment	Centered
Coloraettings	
Activate color se	
- Cell fill color	
Colorvarable	
Line-calor ait	10
- Text color	
Coloryariable	
List-calor air	11

· Start the project and test the functionality.

4.3.19.2 Automatic Restart of the Application after Resetting from IEC Code FAQ

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the *Network scan*.



 Open the Library Manager and add the following libraries: CmpApp SysTypes2 interfaces

PLC_PRG Device Manager X		
🔓 Add library 🗙 Delete library 🛛 😭 Properties 🗃 Details 🛛 🗐 Placeholders 🛛 🎁 Library repos	tory	
Name	Namespace	Effective version
ਡੇ⊡•ໝ 3SLicense = 3SLicense, 3.5.12.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.12.0
BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0
CmpApp = CmpApp, 3.5.13.0 (System)	CmpApp	3.5.13.0
🕬 🚥 IoStandard = IoStandard, 3.5.13.0 (System)	IoStandard	3.5.13.0
Standard = Standard, 3.5.13.0 (System)	Standard	3.5.13.0
SysTypes Interfaces, * (System)	SysTypes	3.5.2.0

Create a persistent variable named *PersistentVars*.
 Adapt *PersistentVars* as follows:

Declaration

```
{attribute 'qualified_only'}
VAR_GLOBAL PERSISTENT RETAIN
    xAutoRestart : BOOL;
    udiCnt : UDINT;
END_VAR
```

• Adapt the POU *PLC_PRG* as follows:

Declaration

```
VAR
sAppName : STRING := 'Application';
result : RTS_IEC_RESULT;

pApp : POINTER TO CmpApp.APPLICATION;
udiState : UDINT;
udiOpState : UDINT;
xInit : BOOL := TRUE;
xReset : BOOL;
END_VAR
```

Implementation

```
IF xInit THEN
    pApp := CmpApp.AppFindApplicationByName(pszString := sAppName, pResult :=
ADR(result));
    xInit := False;
    PersistentVars.xAutoRestart := False;
END_IF
IF xReset THEN
    xReset := FALSE;
    PersistentVars.xAutoRestart := True;
    CmpApp.AppReset(pApp := pApp, usResetOption := CmpApp.RTS_RESET);
END_IF
```

• Create a new function named *taskev_StopDone* with the return type *DWORD*.

lame:	l	di la
askev_StopDone		
Type		
Program		
C Function Block		
Distents:		
Implements		
E final	Abstract	
Arress specifier:		
		-
Method implement	ation language:	
Structured Text (ST)	Ŧ
Function		
Return type:	WORD	***
implementation languag		
and the street		

Then adapt the function as follows:

Declaration

```
FUNCTION taskev_StopDone : DWORD
VAR_INPUT
    EventPrm: CmpApp.EVTPARAM_CmpAppStop;
END_VAR
VAR
END_VAR
```

Implementation

```
IF PersistentVars.xAutoRestart THEN
    PersistentVars.udiCnt := PersistentVars.udiCnt + 1;
    CmpApp.AppStartApplication(PLC_PRG.pApp);
END_IF
```

• Open the tab in the task configuration:

Devices	-	д	×	PLC_PRG Device Contract Manager 🧭 Pe
ApplicationRestartAfterReset			-	Task Groups Monitor Variable Usage System Events Properties
🖮 🔟 Device (CODESYS Control Win V3)				
			9	Add Event Handler Skemove Event Handler 🛛 👽 Event Info 📋
🖹 💮 Application				Name Description
📶 Library Manager				
PLC_PRG (PRG)				
taskev_StopDone (FUN)				
🖃 🌃 Task Configuration				
😑 💕 MainTask (IEC-Tasks)				
PLC_PRG				
T PersistentVars				

Create a new event of type *StopDone* and assign the function *taskev_StopDone* to it.

Add Event Handler	×
Event:	StopDone
Function to call:	taskev_StopDone
Scope:	Application POUs
Implementation language	Structured Text (ST)
Description:	Called afterapplication stops. Context=Communicationtask. Debugging=Disabled
	OK Cancel

Task Groups Mor	itor Variable Usage System Events Propertie	es						
🖶 Add Event Handler 💥 Remove Event Handler 🐠 Event Info 📄 Open Event Function								
Name	Description	Context Debugging		Function to call	Active			
🞸 StopDone	Called after application stops	Communication task	×	taskev_StopDone				

• Start the project and set the variable *xReset* to *TRUE* in order to index it.

Devices	▼ ₽ 3	×	PLC_PRG M De	vice 🎢 Libra	ary Manager 🛛 🔏 P	ersistentVars 🗙 📄	taskev_StopDone	
ApplicationRestartAfterReset	[•	Device.Application.Persis	tentVars				
🖹 🧐 Device [connected] (CODESYS Control	l Win V3)			-				-
🖹 🗐 PLC Logic		- 11	Expression	Type	Value	Prepared value	Address	Com
🖹 🔘 Application [run]			xAutoRestart	BOOL	FALSE			
📲 📶 Library Manager			🧭 udiCnt	UDINT	5			
PLC_PRG (PRG)		- 11						
taskev_StopDone (FUN)		- 11						
🖃 🌃 Task Configuration		- 11						
🖹 👙 MainTask (IEC-Tasks)		- 11						
PLC_PRG		- 11				N		
T PersistentVars						13		
		- 11						
			i					

The variable PersistantVars.udiCnt is incremented from the application with each restart.

4.3.19.3 Checking values for invalidity ('NaN')

The library *FloatingPointUtils* is available for this from version V3.5.9.0.

Alternatively, the variable can also be tested against itself.

Devices 💌 🔻 👎	х	Library Manager	PLC_PRG 🗙 🖷	Device
		Device.Application.PLC_	_PRG	
□ OPTICE [connected] (CODESTS Control Win V3) □ - □ PLC Logic		Expression	Туре	Value
🖃 💮 Application [run]		r1	LREAL	NaN
📶 Library Manager		🔷 iVal	INT	-1
PLC_PRG (PRG)		🔷 xIsRealVal	BOOL	INUE
🖃 🎆 Task Configuration		🔷 xIsNaN	BOOL	TRUE
□ 读 Maintask 上型 PLC_PRG		1 r1 NaN 2 3 xIsRealVal 4 5 xIsNaN TRUE 6 RETURN	:= SQRT(iVal -1 RUE := FPU.IsLReal := r1 NaN <>); NaN(r1 <u>NaN</u>); r1 <u>NaN</u> ;

4.3.19.4 Codesys Exception: division by zero (Implicit Checks: Division checks) (EN)

Device 🗙				
Communication Settings	Compone	ents 🕶 ቅ 🖶 😫 🚺 0	♀ 0 € 4 ● 101 ⑨ 0 Search in messages ♀ ♀ ♀ PlcLog	▼ UTC Time I I III
Applications	Severity	Time Stamp	Description	Component
Applications		:00:11.416	*SOURCEPOSITION* App=[Sim.Device.Application] area=3, offset=48991	CmpIecTask
Backup and Restore		:00:11.416	*EXCEPTION* [DivisionByZero] occurred: App=[Sim.Device.Application], Task=[MainTask]	CmpIecTask
	0	:00:04.253	Application [Sim.Device.Application] loaded via [Download]	СтрАрр
Files	0	.:57:23.689	CODESYS Control ready	CM
	0	.:57:23.689	Setting router 1 address to (0000)	CmpRouter
Log	0	.:57:23.689	Network interface for mainnet=BlkDrvTcp not found	CmpRouter
	• •	.:57:23.689	Setting router 0 address to (0000)	CmpRouter
PLC Settings	0	.:57:23.689	Network interface for mainnet=Placeholder_not_use not found	CmpRouter
	0	:57:23.687		CM

To prevent an exception in the application (caused by a division by zero) it is best to check all code for division by any variable,

and make sure it can never be zero (or at least won't execute the division if it is zero).

If you don't want to do this (and f.e. want to automatically divide by 1 if there is a zero), you can add the objects "POUs for Implicit Checks...⁷⁴." to your application.

Use the Steps within the OnlineHelp for more detail⁷⁵. In principle, the following is done:

- Enable the "Division checks" options.
- CODESYS will automatically create a code and call this with every division to check if the variable value is 0.
- The Code will then replace this by 1, see Example.



4.3.19.4.1 Regarding Implicit Checks:

Consequence when using Implicit Checks

- The code will be somewhat larger and therefor slower.
- Our recommendation is to use it only on application development phase, later on the final machine remove them.
 Reason: it will use a lot of resources and performance.
- Keep in mind, that actually the check functions are only wrapped around the FB's / POU's in the project, they are not used in the libraries of the project.

⁷⁴ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_f_obj_pous_implicit_check.html 75 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_using_pous_for_implicit_check.html

The POUs for implicit checks must NOT be copied, renamed or the declaration changed in any way! See also, the comment above the functions insistently will point this out! Which function is called, depends in principle on the involved data types with the divisions (usually from the largest involved, (e.g. LINT / INT => LINT variant).

For more Information, consult the Codesys OnineHelp under POUs for Implicit Checks.⁷⁶ See also the faq on Error Checking with "POU for implicit checks"⁷⁷.

4.3.19.5 CODESYS Task configuration (EN)

See also the Codesys OnlineHelp on 'Object: Task Configuration'78

4.3.19.5.1 Questions:

What if the task computation time is longer than its cycle time?

4.3.19.5.1.1 Questions:

- What happens, if the computation time of a task is longer than its cycle time? (Linux, rt_Preempt patched kernel)
- Does the task list then become longer and longer?
- Or are these task calls discarded?

4.3.19.5.1.2 Answer:

This does depend on their set priority.

Real-time tasks (0-15):

- The task is restarted immediately.
- If the task has calculated longer than twice the cycle time, no attempt is made to make up for all lost cycles, only the last one.

non-real-time tasks (16-31):

⁷⁶ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_f_obj_pous_implicit_check.html

⁷⁷ https://faq.codesys.com/pages/viewpage.action?pageId=3538982

⁷⁸ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_f_reference_task_configuration.html

- The lost cycles are discarded.
- Next start time is the next cycle time in the future.

By the setting

```
[SysTask]
Linux.SkipLostCycles=1
```

the same behavior can be achieved for realtime tasks as for non-realtime tasks.

Prioritys: The use of 'realtime' and 'non-realtime'.

4.3.19.5.1.3 Questions:

- What is the difference between 'realtime' (priority 0-15) and 'non-realtime' (priority 16-31)? (Linux, rt_Preempt patched kernel)
- Are the priorities within the range of 0-15 and 16-31 in principle equivalent?

4.3.19.5.1.4 Answer:

For example, on a Linux Runtime System: The Prio setting 0-15 is mapped to the Linux Schedule Policy SCHED_FIFO The Prio setting 16-31 is mapped to the Linux schedule policy SCHED_OTHER

Prio 0-15 runs in the context of realtime, if your Linux has a rt_Preempt patched kernel⁷⁹.

Prioritys: One task priority settings.

4.3.19.5.1.5 Question:

For a project with only one task, does it make a difference if the task priority is 0 or 15? (Linux, rt_Preempt patched kernel)

4.3.19.5.1.6 Answer:

Basically, you always have to observe and consider the whole system. That is important! The IEC tasks competes with the SystemTask of Linux or those of other applications running on the device.

For example, under Linux:

- SoftIRQS are scheduled with the SCHED_FIFO/50 priority.
- The IEC-prio 0 is mapped to SCHED_FIF0/56
- The IEC-prio 10 to SCHED_FIFO/46.

⁷⁹ https://rt.wiki.kernel.org/index.php/Main_Page

This means the two priorities behave differently with respect to a high interrupt load. Tasks with priority 10 are not affected in their runtime behavior, but tasks with priority 10 may be affected.

See also: Mapping of Task Priorities on a Linux System⁸⁰

Type Freewheeling: Definition.

4.3.19.5.1.7 Questions:

- · Type Freewheeling what is the definition?
- · How exactly does it work?

4.3.19.5.1.8 Answer:

For multitasking systems that use our full scheduler: This task does not run in a fixed grid, but puts itself to sleep for a certain time when it has finished calculating.

The minimum "sleep time", which is always ensured by the Runtime, is 1ms, the default "sleep time" is 10ms.

Furthermore, the runtime ensures that all freewheeling tasks together do not cause more than 50% PLC load. Therefore, the "sleep time" is extended if necessary.

Alternatively, the "sleep time" can also be set via the configuration file.

```
[CmpSchedule]
Task.Freewheeling.Cycletime=<time in ms>
```

Type Freewheeling: What are the advantages?

4.3.19.5.1.9 Question:

What is the advantage of cyclic-interval to freewheeling?

4.3.19.5.1.10 Answer:

None, In terms of behavior, such a freewheeling task is comparable to a cyclic 10ms task with priority 15-31.

Type Status: Executions and re-execution.

4.3.19.5.1.11 Questions:

- Regarding Type Status will the execution occurs once?
- Or will the execution be done again and again as long as the status is true?

⁸⁰ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_task_mapping_in_the_linux_system.html

4.3.19.5.1.12 Answer:

It will occur again and again, as long as the status variable is TRUE. See also: External Event Task⁸¹

Type Status: The difference to Events.

4.3.19.5.1.13 Question:

What is the difference for Type Status to Event?

4.3.19.5.1.14 Answer:

The event task needs a rising edge FALSE->TRUE of the event variable to run.

Watchdog: Sensitivity settings.

4.3.19.5.1.15 Questions:

- · What is the purpose of the Watchdog sensitivity setting
- How exactly does it work?

4.3.19.5.1.16 Answer:

- With a Sensitivity of 0 or 1, the watchdog is triggered the first time the WatchdogTime is exceeded.
- With a sensitivity of <n> the watchdog is triggered when
 - the WatchdogTime was exceeded in <n> consecutive task cycles, or
 - if a cycle has calculated longer than <n> times the WatchdogTime.

This is intended for applications, which can tolerate a single exceeding of the specified time, but not a multiple exceeding.

Task Monitor: Main assessments, based on the task monitor data

4.3.19.5.1.17 Questions:

- How is the task monitor to be judged?
- (Especially the Max. Cycle Time)

4.3.19.5.1.18 Answer:

These values are really true and trustworthy - In the motion area, the jitter display on the right is very helpful.

⁸¹ https://content.helpme-codesys.com/en/CODESYS%20Control/_rtsl_extension_external_event_task.html

See also: Monitoring⁸²

Task Monitor: Does the task monitoring ever falsify data, when necessary?

4.3.19.5.1.19 Question:

Can a user/developer trust the task monitor values blindly, or are they falsified if necessary with the start process of the PLC?

4.3.19.5.1.20 Answer:

Yes!

F.e.g. there can be cycle extensions during startup, but these are real measures.

Task Monitor: Values assessment.

4.3.19.5.1.21 Questions:

- · How are the task monitor values to be interpreted?
- How should a "healthy" load look like?

4.3.19.5.1.22 Answer:

Based on our application experience, the load should only exceed 80% in exceptional cases. Here the PLCload⁸³ is much more crucial (See PLCshell command⁸⁴) as the task load itself.

Task configuration: Recommendations and guidelines.

4.3.19.5.1.23 Questions:

- Are there any recommendations or a guideline how to design a task configuration?
- · When is the point to use more than one task?

4.3.19.5.1.24 Answer:

To be considered here are all things that can block your task processing (like Modbus / Files services / also Visu)

These always belong to their own task.

The highest priority task (most EtherCAT/SoftMotion operations) should not be affected by such things.

⁸² https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_obj_task_config_monitor.html 83 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_obj_task_config_core_deployment.html 84 https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_edt_device_plc_shell.html

Task configuration: Multicore Systems.

4.3.19.5.1.25 Question:

What effects does multicore have on the task configuration?

4.3.19.5.1.26 Answer:

With MultiCore, you can support your tasks much more. F.e.g. you can run a Visu on its own core, etc.. In principle, you can also achieve smaller jitter times or scale/utilize the system even better.

Starting up the controller and the field buses

4.3.19.5.1.27 Questions:

- Does the PLC already start up, before the fieldbuses are running?
- Does this have to be taken into account in the program?

4.3.19.5.1.28 Answer:

Yes, this is indeed the case!

The user has to take care, in the application himself, that he is only starting or using things from the fieldbus when the bus is operational.

4.3.19.6 Error Checking with "POU for implicit checks"

Sometimes it happens that the application on the controller crashes mysteriously with a message such as "Access violation". Double-clicking the "Source position" in the PLC log jumps to the code position, showing crash positions that do not appear to have any connection to the problem (for example, a simple TON box or a library). Another indication for these types of errors is when the code position changes when the application is changed.

The common cause is writing beyond the bounds of an array.

This can be detected, for example, by using "POU for implicit checks", and here particularly with the function "CheckBounds".

For reasons of performance, "POU for implicit checks" should be removed from the project after debugging. It is not enough to rename it.

The implicit checks are performed only for code within the project.

If libraries are to be checked, then the compiler definition checks_in_libs must be set.

Example:

4.3.19.6.1 Requirement

- Create a "Standard project" and select "CODESYS ControlWin V3" as the device.
- Define the target system by means of the Network scan.

Devices	• # X	PLC_PRG	ask Configuration 🛛 🔐 Device 🗙			
FehlersucheMitCheckBound	•					
Device (CODESYS Control Win V3)		Communication Settings	Scan Network Jateway •	Device +		
E PLC Logic						
E O Application		Applications				
Library Manager		Backup and Restore				
E MainTask		Files				· ()
스O PLC_PRG		Log		Gateway	•	(0317) (active)
		PLC Settings		IP-Address: localhost		Press ENTER to set active path
		PLC Shell		Port:		
		Users and Groups		1217		
		Task Deployment				

• Adapt the "PLC_PRG" POU as follows:

Declaration

```
VAR

iIndex : INT;

astInst : ARRAY [1..5] OF INT := [5(101)];

xActivate : BOOL;

END_VAR
```

Implementation

```
IF xActivate THEN
    xActivate := FALSE;
    FOR iIndex := 0 TO 5 D0
        astInst[iIndex] := 234;
    END_FOR
END_IF
```

4.3.19.6.2 Downloading and starting the project

- Download the project to the controller and start the application.
- The following image is displayed after you set the xActivate variable:

Devices 👻 👎 🗙		ÌF	<u>יוכ</u>	PRG 🗙 🔣 Task Cor	nfiguration De	evice	
FehlersucheMitCheckBound	D	evi	ce.A	pplication.PLC PRG	_		
🖻 😳 🛐 Device [connected] (CODESYS Control Win V3)	C.m.				Turne	Value	
□ 🗐 PLC Logic	Expl	ress	ion		туре	value	
🖹 🔘 Application [run]		\$	iInd	ex	INT	235	
Library Manager	8	\$	astl	nst	ARRAY [15] OF INT		
PLC_PRG (PRG)			۰	astInst[1]	INT	101	
Task Configuration	1		۰	astInst[2]	INT	101	
🖻 🥸 MainTask			۰	astInst[3]	INT	101	
PLC PRG				astInst[4]	INT	101	
			۰	astInst[5]	INT	101	
		(xAct	ivate	BOOL	FALSE	
		1		TE vActivate EALSE	THEN		
		2	1.	xActivate FALSE	:= FALSE:		
		3		FOR iIndex 23	:= 0 TO 5 DO		
		4		astInst[i]	Index 235 1 222	:= 234:	
		5		END FOR			
		6	•	END IFRETURN			

The expected result is that all elements of the array are set to the value "234".

As the lower bound of the array is set to "1", the memory area of the counter variable is described incorrectly with 234 in the first executed loop (iIndex has value "0") because it is located in the memory area before the array.

In the next executed loop, it is detected that the cancellation condition of the loop is fulfilled, and as a result no element of the array will be written.

These kinds of mistakes in the memory can have unexpected results as severe are the controller crashing.

4.3.19.6.3 Including the function "CheckBounds"

• Add the object "POU for implicit checks" to the project:



The following dialog opens automatically where the type of check can be selected. Select the option Bound checks.

Add POU for implicit checks
Create special check functions for an application (for checking array bounds, divisions and pointer)
Ayailable functions:
Bound Checks
Division Checks
Range Checks
LRange Checks
Pointer Checks
Note: Adding a checkfunction will provoke a full recompile and prohibit an online change
Add Cancel

Only one option should be selected. The check may have to be repeated with another option.

4.3.19.6.4 Using the function "CheckBounds"

- Download the project to the controller and start the application.
- Set a breakpoint at the desired check.

If a bound violation is detected, then the project is halted at the breakpoint.

Devices 👻 # 🗙	PLC_PRG	eckBounds × 🕤 Device					•
CheckBoundsExample	Device.Application.Ch	eckBounds					
ODESYS Control Win V3)	Expression	Туре	Value	Prepared value	Address	Comment	E
Application [run]	CheckBounds	DINT	<set breakpoint="" in="" order="" td="" to="" watch<=""><td>this variable></td><td></td><td></td><td></td></set>	this variable>			
Library Manager	🍫 index	DINT	<set breakpoint="" in="" order="" td="" to="" watch<=""><td>this variable></td><td></td><td></td><td></td></set>	this variable>			
PIC PRG (PRG)	Iower	DINT	<set breakpoint="" in="" order="" td="" to="" watch<=""><td>this variable></td><td></td><td></td><td></td></set>	this variable>			
CheckBounds (FUN)	* upper	DINT	<set breakpoint="" in="" order="" td="" to="" watch<=""><td>this variable></td><td></td><td></td><td></td></set>	this variable>			
Task Configuration	4		111			Þ	
🖹 🕸 MainTask	1 // Automati	sch erzeugter Code:	Es handelt sich hierbei um einen	Implementierungsvorschlag.			
一 PLC_PRG	B 2 IF index	???? < lower ??	? THEN				
	3 CheckBo	unda 777 := low	er 777 ;				=
	5 CheckBo	unda ??? := upp	er ???				
	B 6 ELSE						
	7 CheckBo	unda 777 := ind	ex 77? ;				
	8 END_IF						
	10 (*Es ist au	ch möglich, einen Ha	ltepunkt zu setzen, Meldungen au	fzuzeichnen, oder beispiels	veise an e	iner Except:	10
	11 Add CmpApp.	library, SysExcept.1	ibrary and SysTypes2_Itf as neve	st.		100 %	R -
	4		III				F.
	Messages - Total 0 error(s),	0 warning(s), 0 message(s)				* 7	×
		- 00	error(s) ¹ 0 warning(s) ¹ 0 message(s)	××			
	Description			Project Obje	ct P	osition	
POUs Z Devices	Messages - Total 0 error(i), 0 warning(s), 0 message(s)	🐺 Watch 1 🗃 Breakpoints 🖗 Call Stack				
Last build: O 0 0 Precomple: 🗸	na RUN	Program loaded	Program unchanged	Current user: (nobody) II	VS Ln 34 C	Col 1 Ch 1 🔍	

• Switch to the PLC_PRG POU and set the xActivate variable to TRUE.

The projects stops at the breakpoint regarding lower bound violation.

Devices 👻 🖲 🗙	PLC_PRG	unds 🗙 🗑 Device					-
CheckBoundsExample	Device.Application.CheckBou	inds					
C @ Device [connected] (CODESYS Control Win V3) C @ Device [connected] (CODESYS Control Win V3) @ Device [connected] (CODESYS Control	Percession Expression ** CheckBounds * Index * Unper *	Type DNT DNT DNT DNT DNT DNT DNT Cloves[] 0 } upper[5 0] = upper[0] = index[upper] 0] = index[upper] 0] = index[upper] 0] = 0 error	Value 0 0 1 5 1 1 5 1 1 1 1 1 1 1 1 1 1 1 1 1	Prepared value an Implementierungsvorschlag. sufruseichnen, oder beispiels vest. > > > Project Objet	Address veise an ei	Comment , , , , , , , , , , , , , , , , , , ,	· · · · · · · · · · · · · · · · · · ·
POUs 🕱 Devices	Messages - Total 0 error(s), 0 war	ming(s), 0 message(s) 🔜	Vatch 1 🗃 Breakpoints 🚯 Call Stack				_
Lart huid: 0.0 0 0 Procomplex .		Program loaded	Program unchanged	Current user: (nobody) 11	NS 103 CO	15 ch 2	0
Last build. V o V Precomple. V		riogramioadea	r rogram anchangea	current user. (nobody)	15 115 00	13 012	d

• Exit the CheckBounds function by stepping (press F10 two times) and the debugger jump automatically to the position where the boundary violation was detected:

Devices + # x	PLC_PRG × CheckBou	nds 💮 Device					•
CheckBoundsExample	Device.Application.PLC_PRG						
= 😳 🗑 Device [connected] (CODESYS Control Win V3)	Expression	Type	Value	Prenared value	Address	Comment	5
E PLC Logic	a Index	INT	0	Prepared value	Muuress	comment	- 6
Application [halt on breakpoint]		APPAY [1 STOE INT	•				-
- 💼 Library Manager	váchate	BOOL	EALSE				
PLC_PRG (PRG)	+ Antilvate	BOOL	THESE				
CheckBounds (FUN)	•						·
Task Configuration	I IF xActivate FALSE	THEN					
🖹 🗇 MainTask	2 xActivate 245	FALSE;					
PLC_PRG	40 astInst[Index 0 1 ???	:= 234:				
	5 END FOR						
	6 BND_IFRETURN						
						100 9	6 👧
	Messages - Total 0 error(s), 0 warnin	g(s), 0 message(s)					0 X
		- 0 error	(s) 🔮 0 warning(s) 🔍 0 message(s)	×¥			
	Description			Project Object		losition	
	Description			Project Object		Calcon	
POUs 😹 Devices	Messages - Total 0 error(s), 0 war	ning(s), 0 message(s) 🐺 V	Vatch 1 🗿 Breakpoints 🙀 Call Stack				-
Last build: 🗢 0 🔹 0 Precomple: 🗸	HALT ON BP	Program loaded	Program unchanged	Current user: (nobody) IN	NS Ln 4 C	ol 9 Ch 9	0

• As an alternative, the call stack can also be displayed and and from there a jump made to the relevant position:

Devices 👻 🕈 🛪	PLC_PRG	inds 🗙 🗐 De	vice					•
CheckBoundsExample	Device.Application.CheckBou	nds						
	Expression CheckBounds index	Type DINT DINT	Value 0	Pre;	pared value	Address	Comment)
PLC_PRG (PRG) CheckBounds (FUN)	* upper	DINT	5					
= ਯੂ Task configuration ਂਦ ਉ ManTask ਂ_ਦੀ PLC_PRG	<pre>// Automatisch e: 2 IF index 0 3 CreckBounds 4 ELSIF index 5 ExeckBounds 8 6 ELSIF index 5 CreckBounds 8 7 CreckBounds 8 800_IF 9 10 (*Es ist auch moj 11 Add CapApp.libra.</pre>	<pre>veugter Co veugter Co veugte</pre>	in the state of th	einen Implementierungsv gen aufzuzeichnen, oder s nevest.	orschlag. beispielsv	reise an ci	ner Except	tic
	*							F.
	Cal Stack Application: Device.Application	Task: MAINTAS					•	φ×
	POU		Location Instance pat	h				
	CheckBounds [Device: PLC Log PLC_PRG [Device: PLC Logic: A	ic: Application] pplication]	Line 3, Column 2 (Impl) Line 4, Column 1 (Impl)					
POUs 😹 Devices	Messages - Total 0 error(s), 0 war	ning(s), 0 messi	gge(s) 🐺 Watch 1 🔊 Breakpoints 🔞 Cal	Stack				
Last build	i: 🔷 0 🔮 0 🛛 Precomple: 🗸	HALT ON I	Program loaded	Program unchanged	Cur	rrent user: (not	ody)	0

4.3.19.7 Exception: "ProcessorLoadWatchdog" - (EN)

This watchdog must be activated in the CODESYSControl.cfg configuration file.

The limit is defined in the *CmpSchedule* section.

Experience has shown that communication problems occur more often in the case of controllers under high loads.

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

ProcessorLoadWatchdog.project - CODESYS						
<u>File Edit View Project Build Online Debug Tools Window</u>	Help					
🎦 🚅 🛃 🖆 🗠 🛪 🏦 🛍 🗙 🖊 🌿 🖺	🏪 🖷 🛗 😂 🕥 🕟 👘 💆	(1) 3 ≤ ≤ ≤ 3 ≤ 4	黒 ヨ シ			
Devices 👻 🕂 🗙	Device X					
ProcessorLoadWatchdog						
Device (CODESYS Control Win V3)	Communication Settings	Scan network Gateway -	Device •			
PLC Logic	Annelisetisen					
= Q Application	Applications					
Library Manager	Backup and Restore					
Task Configuration					0.0	
AninTask (IEC-Tasks)	Files				•	
PLC_PRG	100		G	ateway		
	Log		Gateway-1	•	[0301.A000.034A] (active)	-
	PLC Settings		IP-Address:		Device Name:	
			localhost		KERNTPC	
	PLC Shell		Port:		Device Address:	
	Users and Groups		1217		0301.A000.034A	
					Target ID:	
	Access Rights				0000 0001	
	Task Deployment				Target Type: 4096	
	rask Deployment				Tourselverden	
	Status				CODESYS GmbH	
					Target Version:	
	Information				3.5.12.40	

• Edit the PLC_PRG POU as follows:

Declaration

```
VAR

xToggle : BOOL;

xSwitch : BOOL;

udiCnt : UDINT;

END_VAR
```

Implementation

```
udiCnt := udiCnt + 1;
IF xSwitch Then
    WHILE TRUE DO
        xToggle := NOT xToggle;
    END_WHILE
END_IF
```

• Start the project and set the *xSwitch* variable to *TRUE*.

ProcessorLoadWatchdog.project* - CODESYS			<u> </u>			-	<u> </u>
File Edit View Project Build Online Debug	Tools Window Help						
🎦 🚅 📓 🗠 🗠 🌾 🖻 🛍 🗙 🛤 🌿	🔺 🐪 🎋 🌾 🖳 🛅 - 🖆 🕯	🗄 09 💜 🔸 👘 🖄 🗇 🖓	:*:\$ ¢ ∭ ≓	7/			
Devices 👻 🕂 🗙	Device PLC_PRG :	×					
ProcessorLoadWatchdog	Device.Application.PLC_PRG						
G Device [connected] (CODESYS Control Win V3)	Expression			Type	Value	Prepared value	Address
E I PLC Logic	a xToggle			ROOL	FALSE	Prepared value	Address
Application [stop]	xSwitch			BOOL	TRUE		
PLC PRG (PRG)	🔷 udiCnt			UDINT	367		
Task Configuration	1					~	
🖻 🍪 MainTask	= 2 O IF xSwitch TRUE T	= udicite 367 + 1;					
PLC_PRG	B 3 WHILE TRUE DO						
	4 🗘 xToggleFA	<pre>LSE := NOT xToggle FALSE ;</pre>					
	6 END IFRETURN						
	Messages - Total 0 error(s), 0 warning(s), 0 message(s)					
	Build	 O error(s) 😗 0 warning(s) 🚺 0 mes	isage(s) 🗙 💥			
	Description					Pro	oject
	The application is up to date						
	Build complete 0 errors, 0 warnin	gs : ready for download!					
							N
😪 Devices 👔 POUs							13
		Device user: Anonymous	Last build: 🗿 0 😗 0	Precompile: 🗸	STOP	Program load	ed - EXCEPTION

The following entries are located in the log:

	Device X PLC_PRG				
	Parling and Parling	Severity	Time Stamp	Description	Component
H	backup and Restore	۲	11.10.2018 15:17:55.616	*SOURCEPOSITION* App=[Application] area=3, offset=18097	CmpIecTask
H	Files	۲	11.10.2018 15:17:55.616	*EXCEPTION* [Watchdog] occurred: App=[Application], Task=[MainTask]	CmpIecTask
Ц		۲	11.10.2018 15:17:55.616	*EXCEPTION* [ProcessorLoadWatchdog] occurred in: App=[all], Task=[all]	CmpIecTask
l	Log	۲	11.10.2018 15:17:55.616	*DETAILS* Task=[MainTask] does not react within timeout switching to stop! An application reset is necessary!	CmpIecTask

With the introduction of multicore support (V3.5.SP13), the processor load is calculated as the average of all CPUs.

This also applies for the runtime license without multicore support.

Therefore, the following situation results in the case of an active infinite loop for an 8-core processor:

addisering 21.5 Low reverses: 24 3 4 5 7 adding and Kanzaw Court Di 0 3 2 3 4 5 7 Account Di Court Di 0 3 2 3 4 5 7 Account Di Court Di 4 44 54 14 54 14 54 14 54 14 54 14 54 14 54 14 54 14 54 14 14 54 14 14 54 14 14 14 55 14 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15 15	Communication Sattings	ploied								
Constraint 0 2 2 3 4 5 4 7 Constraint PIC Code Data 4 44 24 24 24 24 24 44 Constraint PIC Code Data 4 44 24 24 24 24 44 Code PIC Code Data 4 44 24 24 24 24 44 Code PIC Code Data 10 10 2 2 2 4 8 6 7 Code Data PIC Code Data 0 2 2 2 4 8 6 7 Code Data PIC Code Data 0 2 2 3 4 8 7 Code Data PIC Code Data 0 2 2 3 4 8 7 Code Data PIC Code Data 0 2 2 3 4 8 7 Pic Code Data PIC Code Data 2 2 3 4 8 7 Pic Code Data PIC Code Data 2 2 3 4 8 7 Pic Code Data P	aplication	PLC load average:	24							
Name Not Not <td></td> <td>Court ID:</td> <td>a</td> <td>1</td> <td>2</td> <td>3</td> <td></td> <td></td> <td></td> <td>т</td>		Court ID:	a	1	2	3				т
Nime Jillood Log Jillood PLC Sefteps FUG PLC Sefteps Setters Deem end Groups Jillood Ansat Rejits PLC Core 3 and Setters Jillood Marce Rejits PLC Core 3 and Setters Jillood Marce Rejits Jillood Setters Jillood Marce Rejits Jillood Jillood Jillood	rackup and Redtone	MSC Cope load:	- 14	45	24	24	24	24	24	45
Log piccoat RL 5880ap 200 Lood everyer: 109 RL 50al 0000200 3 2 2 3 6 6 7 Overs md Orongo Access liftgits Twelvel liftgits Tab Opelyymat Bios Marmadon	1 er									
R.C Soldings 220 Loss and sevenues: 101 R.C Soldings 0 3 2 3 6 6 7 Users and Orougs 0 3 2 3 6 6 7 Access lights 5 2 3 2 2 2 2 2 2 3 6 6 7 Subolit Hights Table Deployment 5 2 2 2 2 2 2 2 2 2 2 3 4 7 7 3 2 3 4 6 7 7 3 2 3 4 8 4 7 7 3 2 3 3 2 3 4 3 7 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	.eg	alciost								
PLC Deal 2 2 3 4 6 7 Uters and Groups FLC Deal 2011 28 24 28 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29 29	LC Settings	PLO load everage:	144	>						
Users and Omoya Actual Rights Storber Rights Tash Deployment Billion Deformation	LC Shell	CoreID:	a	1	2	а			4	т
Azara Righta Suebel Righta Tash Deployment Salars	Jaera and Groups	FLC Cose Lond:	100%	38	2%	24	2%	28	2%	28
Speliel Rights Task Deployment Satus Defermation	Access Rights									
Tash Dapleyment Makes Diferention	webel Rights									
maka Direnation	Task Deployment									
Diferention .	Refus									
	Mormation									

To trigger the watchdog, the limit has to be set to approximately 10% in the ini file.



4.3.19.8 How to: Applicative use of the time zone (Util-Lib) (EN)

In an application, it is often necessary that there is access to the local time of a certain time zone. The time zone does not necessarily have to correspond to the time zone of the control.

Possibly even different time zones are needed, e.g. for a mobile control.

In this article, the following application examples are described:

LDATE⁸⁵ and LTOD⁸⁶, 64-bit specified date and time datatypes, are not supported within the Util Library.

⁸⁵ https://content.helpme-codesys.com/en/libs/Test%20Manager%20IEC%20Unit%20Test/Current/Assertions/Date/LDATE/fld-LDATE.html

⁸⁶ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_operands_constant_date.html

4.3.19.8.1 Setting the time and time zone of a controller

The CODESYS runtime provides a variety of different functions for setting the time and time zone.

However, it is not always advisable to implement this via the CODESYS runtime. This will be considered in more detail in the following article: How to: Setting the time zone in Runtime/OS⁸⁷

Our recommendation is to define the time zone(s) in the application itself and to manage them there, in place of the CODESYS runtime!

The Util-Lib provides functions for this, with which you can define your own time zones as IEC structure based on the time in the Coordinated Universal Time (UTC).

4.3.19.8.2 Reading the time (UTC)

The DateTimeProvider⁸⁸ of the Util-Lib returns the time (UTC) in milliseconds since 01/01/1970, 00:00.

4.3.19.8.3 Time zone configuration

The time zone for which the controller is currently configured is not always the time zone suitable for displaying the current time. Therefore, the possibility to select the "correct" time zone suitable for the particular output option (WebVisu, Log Files, Email, ...) should be provided in the particular application.

The Util.TimeZone⁸⁹ structure can be used to specify the bias, the switchover times for summer and winter time and the time offset.

The bias represents the deviation from UTC. This value is given in minutes.

- In eastern direction, starting from the zero meridian, the offset is positive.
- In western direction, starting from the prime meridian, the offset is negative.

4.3.19.8.4 Calculation of the local time

The calculation of the local time.

⁸⁷ https://faq.codesys.com/pages/resumedraft.action?draftId=148046058&draftShareId=e40297a2-a0a9-462a-93de-a1a21e24581b& 88 https://content.helpme-codesys.com/en/libs/Util/Current/TimerSwitch/FunctionBlocks/DateTimeProvider.html 89 https://content.helpme-codesys.com/en/libs/Util/Current/TimerSwitch/Structs/TimeZone.html

4.3.19.8.5 Splitting the local time

The Util.SplitDateTime function can be used to split the time specification (milliseconds since 1970 00:00) into the components: year, month, day, hours, minutes, seconds, milliseconds and the day of the week.

Code Example

· · · · ·	-

The function Util.SeperateDateTime can be used to split the time specification (milliseconds since 1970 00:00) into the data types DATE and TIME_OF_DAY.

Code Example



See also

- How to: Setting the time zone in Runtime/OS⁹⁰
- Our Codesys Online Help (OLH)⁹¹ Website
- OLH: TimerSwitch Example⁹²
- OLH: Advanced Topic's- Duration, Date and Time⁹³
- Basic information to the Codesys Development System (Codesys Homepage)⁹⁴

4.3.19.9 How to: Distribute an application to several controllers (EN)

It is possible to distribute a project to two or more controllers without losing the OnlineChange capability. The handling to distribute a project to two or more controllers is quite complex.

It is error-prone, and therefore some things have to be considered.

A better alternative is to use the Codesys Automation Server⁹⁵.

4.3.19.9.1 Download

1. Download of the application to the 1st controller.

⁹⁰ https://faq.codesys.com/pages/resumedraft.action?draftId=148046058&draftShareId=e40297a2-a0a9-462a-93de-a1a21e24581b& 91 https://www.helpme-codesys.com/

⁹² https://content.helpme-codesys.com/en/libs/Util/Current/TimerSwitch/fld-TimerSwitch.html

⁹³ https://content.helpme-codesys.com/en/LibDevSummary/date_time.html

⁹⁴ https://www.codesys.com/products/codesys-engineering/development-system.html

⁹⁵ https://faq.codesys.com/display/CDSFAQ/CODESYS+Automation+Server

- 2. Backup of the download information of the 1st controller.
- 3. Download the application to the 2nd controller.
- 4. Saving the download information of the 2nd controller.
- 5. Download the application to the n-th controller.
- 6. Saving the download information of the nth controller.

4.3.19.9.2 Code change

- 1. Retrieve the download information of the 1st controller.
- 2. Execute code change.
- 3. OnlineChange on the 1st controller.
- 4. Save the download information of the 1st controller.
- 5. Retrieve the download information of the 2nd controller.
- 6. Execute code change.

•••

- 7. OnlineChange on the 2nd controller.
- 8. Saving the download information of the 2nd controller.

Every change must be updated on all controllers! As soon as two changes have been made on the 1st controller, no online change can be made on the 2nd controller!

4.3.19.10 How to: Setting the time zone in Runtime/OS (EN)

It is not always advisable to implement access to the local time of a certain time zone via the CODESYS runtime.

This article considers more background and details on this, and the following application examples and topics are addressed:

4.3.19.10.1 General

The time used in a CODESYS controller is always in Coordinated Universal Time (UTC). Also in the programming interface, e.g. in the device logger, the time is displayed in UTC.

On the other hand, users always want to have their local time displayed, adapted to their own time zone and taking into account summer/winter time.
This often results in the desire to set the time and the time zone of the controller from the CODESYS application.

The CODESYS runtime also provides various functions for this purpose.

Please consider the advantages and disadvantages when setting the time and time zone.

4.3.19.10.1.1 Overview of possible reasons:

- Not all controllers support setting the time zone equally.
- Other processes on the controller (apart from the runtime) cannot cope with setting the time/time zone. Many processes in an operating system need a continuously running time.
- Switching between summer and winter time (and vice versa) must be done manually.
- In a network with multiple controllers, the clocks do not run synchronized.
- Users may not have the necessary rights in the application (restricted by the operating system or CODESYS user management) to set the time.
- Depending on the operating system, other functions must be called so that the hardware RTC is also set.

4.3.19.10.2 Setting the time and time zone within the controller

There are the following possibilities to set the time and the time zone of a controller. The listing is in descending order:

• 4.3.19.10.2.1 Use NTP server

If there is an internet connection, an NTP server should be used if possible. There may also be a local infrastructure that provides a time base.

Advantage:

- All controllers in the network run synchronized with the same time.
- The time zone corresponds to the "local" time zone, depending on the NTP server used.
- Switching between summer and winter time, and vice versa, is automatic.
- 4.3.19.10.2.2 Setting the time via the operating system

Some operating systems offer their own option for setting the time and time zone via a graphical interface or (shell) commands.

- 4.3.19.10.2.3 Setting the time from the CODESYS application
 - Some operating systems offer a number of (shell) commands that can be used to set the time and time zone.

These commands can be called with the function SysProcessExecuteCommand⁹⁶ or SysProcessExecuteCommand2⁹⁷.

Not all shell commands are allowed on the runtime systems! These are often restricted by the Controller's Original Equipment Manufacturer or by end customers for security reasons!

- If all these possibilities are not available, the time can be set only with still help of the Sys-Functions:
 - SysTimeRtc.SysTimeRtcSet
 - SysTimeRTC.SysTimeRtcHighResSet

Disadvantage:

- The time must be set manually with each summer/winter time change.
- Or UTC is always used.

UTC does not have to be reset for summer/standard time switching! This concerns only the case with the conversion of UTC to local time. The summer/standard time 'Switchover times' must be taken into account here!

4.3.19.10.3 Setting the time and time zone at the operating system level

4.3.19.10.3.1 Windows

On Windows systems, the time zone can be set by a simple click on the clock in the SysTray. The operating system takes care of setting the current time and changing from summer to winter time and vice versa.

⁹⁶ https://content.helpme-codesys.com/en/libs/SysProcess%20Implementation/Current/SysProcessExecuteCommand.html 97 https://content.helpme-codesys.com/en/libs/SysProcess%20Implementation/Current/SysProcessExecuteCommand2.html

4.3.19.10.3.2 Linux

Setting the time zone

Depending on the distribution used, a configuration tool for setting the time zone is also available here. If a configuration tool is available, then only this should be used for administration.

If no tool is available, then this can be realized only over Bash commands.

Implement example for setting the time zone via bash commands

To set the time zone, date and time, the user must be logged in as root.

The available time zones are stored in the directory /usr/share/zoneinfo, e.g. /usr/share/zoneinfo/Europe/ Paris for CET/CEST.

To set the time zone, you need to set a symbolic link to the time zone:

ln -sf /usr/share/zoneinfo/Europe/Paris /etc/localtime

After that, the link should look like this:

In the next step, the system time should be set. First can check this with the following command:

```
date
   $ Tue May 15 14:05:49 CEST 2018
date -u
   $ Tue May 15 12:05:49 CEST 2018
```

'date' returns the date, time and time zone. With the -u option, the time is output in UTC.

Otherwise, the local time is given.

If the time is not correct, then it can be set as follows:

Local timezone

date -s "2018-05-15 15:00"

UTC

```
date -u -s "2018-05-15 13:00"
```

Show current setting of the hardware clock:

hwclock --show \$ Tue May 15 12:19:44 2018 0.000000 seconds

Then set the hardware clock to the previously set system time:

hwclock --systohc

Check the settings:

```
hwclock --show
$ Tue May 15 14:19:44 2018 0.000000 seconds
```

Configuration of boot scripts

When booting, the software clock is set after the hardware clock. To do this, the boot scripts must know whether the hardware clock contains UTC or local time.

In many distributions this can be set in an admin tool, e.g. YaST.

Typically, a shell variable *GMT="u*" is set for UTC or *GMT=""* for local time.

The idea is that at boot time either

```
hwclock -su
```

or

hwclock -s

is executed, depending on whether the hardware clock is set to UTC or local time. After these settings, all time information should be correct.

4.3.19.10.4 Definition and use of the time zone in the application

In the application, it is often necessary that there is access to use the local time of a certain time zone.

The following FAQ article covers this, How to: Applicative use of the time zone (Util-Lib)⁹⁸.

See also

- Our Codesys Online Help (OLH)⁹⁹ Website
- How to: Applicative use of the time zone (Util-Lib)¹⁰⁰
- OLH: TimerSwitch Example¹⁰¹
- OLH: Advanced Topic's- Duration, Date and Time¹⁰²

4.3.19.11 Identifying the Hardware and Operating System

Particularly in library development, the controller manufacturer must be able to execute the library on his device only.

One could also imagine that it is necessary to access the information of the operating system, processor, or CODESYS version.

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

⁹⁸ https://faq.codesys.com/pages/resumedraft.action?draftId=148046051

⁹⁹ https://www.helpme-codesys.com/

¹⁰⁰ https://faq.codesys.com/pages/resumedraft.action?draftId=148046051

¹⁰¹ https://content.helpme-codesys.com/en/libs/Util/Current/TimerSwitch/fld-TimerSwitch.html

¹⁰² https://content.helpme-codesys.com/en/LibDevSummary/date_time.html

SysTarget.project - CODESYS		-	~ ~	-
Eile Edit View Project Build Online Debug Too	s <u>W</u> indow <u>H</u> elp			
🎦 📽 🖬 😂 🗠 🗠 🐇 🖻 🛍 🗙 🕼 🎼	🛓 🌿 i 🖷 i 🛅 • 💣 i 🏦 i 🥰 🧐	() = X (0 % 6 % 8 1	아름글 👽	
Devices - 4 X	Device X			
🗏 🎒 SysTarget 💌				
😑 🔛 Device (CODESYS Control Win V3)	Communication Settings	Scan network Gateway - Device	•	
PLC Logic	A sufficient sure			
Application	Applications		•	
Library Manager	Backup and Restore			
Task Configuration				
🖻 🛞 MainTask	Files			• •
PLC_PRG	100		Gateway	U
		Gatewa	ay-1	▼ [0301.A000.034A] (active) ▼
	PLC Settings	IP-Add	ress:	Device Name:
	n och H	localho	at .	KERNTPC
	PLC Shell	Port:		Device Address:
	Users and Groups	121/		0301.A000.034A
	· · · · · · · · · · · · · · · · · · ·			Target ID:
	Access Rights			0000 0004
	Task Deployment	3		Target Type: 4096
	hak beployment			TaraakVandari
	Status			CODESYS GmbH
				Target Version:
	Information			3.5.12.30

• Open the *Library Manager* and add the *SysTarget* library.

Add library 🗙 Delete library 🖙 Properties 🗃 Details 🔄 Placeholders 🎁 Library reposit		
	ory	
ame	Namespace	Effective version
↔ अ 3SLicense = 3SLicense, 3.5.12.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.12.0
• 🎟 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0
າຈໝ IoStandard = IoStandard, 3.5.10.0 (System)	IoStandard	3.5.10.0
າ 🕬 Standard = Standard, 3.5.12.0 (System)	Standard	3.5.12.0
ംഞ SysTarget = SysTarget, 3.5.5.0 (System)	SysTarget	3.5.5.0
→ SysTypes2 Interfaces, * (System)	SysTypes	3.5.4.0

• Adapt the POU *PLC_PRG* as follows:

Declaration

VAR			
	dwType	:	DWORD;
	dwId	:	DWORD;
	dwVersion	:	DWORD;
	iecResult	:	<pre>SysTypes.RTS_IEC_RESULT;</pre>
	wName	:	WSTRING;
	udiNameLength	:	UDINT;
	udi0sInfo	:	UDINT;
END.	_VAR		

Implementation

```
iecResult := SysTarget.SysTargetGetType(ADR(dwType));
iecResult := SysTarget.SysTargetGetId(ADR(dwId));
iecResult := SysTarget.SysTargetGetVendorName(ADR(wName),ADR(udiNameLength));
iecResult := SysTarget.SysTargetGetVersion(ADR(dwVersion));
udiOsInfo := SysTarget.SysTargetGetOperatingSystemId(ADR(udiOsInfo));
```

· Start the project.



Compare:

🕤 Device 🗙 🎁 Library Manag	jer				
Communication Settings	Scan network Gateway 👻	Device +			
Applications					
Backup and Restore					
Files					•••
Log			Gateway		
PLC Settings		Gateway-1		Ŧ	[0301.A000.034A] (active)
PI C Shell		localhost			KERNTPC
Users and Groups		Port: 1217			Device Address: 0301.A000.034A
Assess Bishts					Target ID: 0000 0004
Access Rights					Target Type:
Task Deployment					4096 Target Vendor:
Status					CODESYS GmbH
Information					Target Version: 3.5.12.30

4.3.19.12 Including an Interface (Example: "IKeyEventHandler")

4.3.19.12.1 Requirement

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Add a "Visualization" to the application.
 A "Visualization Manger" is added to the project automatically.
 Add the library "VisuElemBase" as a top-level library in the "Library Manager".

,			
Devices v 4 X	🕤 Device 🕘 Visualization 👔 PLC_PRG 🕍 Library Manager 🗙		
KeyEven#kander	2 Add library X Delete library Properties in Details I Placeholders in Library reposit	tory	
Device (CODESYS Control Win V3)		- /	
RLC Logic	Name	Namespace	Effective version
Application	Image: Structure = 35License, 3.5.10.0 (35 - Smart Software Solutions GmbH)	_35_LICENSE	3.5.10.0
Library Manager	* • • BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (35 - Smart Software Solutions GmbH)	BPLog	3.5.5.0
- R.C. PRG (PRG)	IoStandard = IoStandard, 3.5. 20.0 (System)	IoStandard	3.5.10.0
Reg Task Configuration	- *29 Standard = Standard, 3.5.9.0 (System)	Standard	3.5.9.0
🖷 🚯 MainTask	*-** System_VouElem3DPath = VouElem3DPath, 3.5.10.0 (System)	VsuElem30Path	3.5.10.0
-∰ PLC_PRG	System_VsuElenBase = VsuElenBase, 3.5.11.0 (System)	VsuElenBase	3.5.11.0
🖹 🚯 VISU_TASK	System_VouElenCanDisplayer = VouElenCanDisplayer, 3.5.10.0 (System)	VsuElemCamDisplayer	3.5.30.0
WouElems.Visu_Pro		-	
Wsualization Manager	WouElenBase, 3.5.11.0 (System)		
TargetVisu	* 💭 Private Implementation		
Gi WebVieu	* 🗀 Project Information		
	* 🗀 Public Parts		
El montener			

• Define the target system by means of the Network scan.



4.3.19.12.2 Creating the EventHandler

· Create a new FB named "EventHandler" and implement the interface "IKeyEventHandler".

Add POU	
Create a new PO	Lð AU (Program Organization Unit)
Name: EventHandler	
Type	
Program	
Function Block	
Extends:	Roomtype1
Implements:	KeyEventHandler
Access specifier:	
Mathed Implement	•
Structured Text (S	T) T
C Function	
<u>R</u> eturn type:	
Implementation (angua	ge:
Structured Text (ST)	•
	Add Cancel

The method "HandleKeyEvent" is created automatically with the FB:



· Add an output variable of type "UDINT" to the EventHandler:

Declaration

```
FUNCTION_BLOCK EventHandler IMPLEMENTS IKeyEventHandler
VAR_INPUT
END_VAR
VAR_OUTPUT
udiKeyDownCount : UDINT;
END_VAR
VAR
END_VAR
```

· Edit the method "HandleKeyEvent" so that the counter is incremented only when a key is pressed:

Declaration

```
{warning 'add method implementation '}
(* This method will be called after a key event is released.
RETURN:
TRUE - When the handler has handled this event and it should not be handled by
someone else
FALSE - When the event is not handled by this handler*)
METHOD HandleKeyEvent : BOOL
VAR_INPUT
    (* The event type. The value is true if a key up event was released.*)
   bKeyUpEvent
                 : BOOL;
    (* The key code*)
   dwKey
           : DWORD;
    (* The modifiers. Possible values are:
VISU_KEYMOD_SHIFT :
                               DWORD := 1;
 VISU_KEYMOD_ALT :
                                 DWORD := 2;
VISU_KEYMOD_CTRL :
                                  DWORD := 4;*)
   dwModifiers : DWORD;
    (* A pointer to the client structure were tje event was released*)
   pClient : POINTER TO VisuStructClientData;
END_VAR
```

Implementation

```
IF bKeyUpEvent THEN
   THIS^.udiKeyDownCount := THIS^.udiKeyDownCount + 1;
END_IF
```

4.3.19.12.3 Instantiating the Eventhandler

• Create an FB instance in PLC_PRG, as well as a variable for reading the current value:

```
Declaration

PROGRAM PLC_PRG

VAR

instEvHandler : EventHandler;

udiCurValue : UDINT;

END_VAR
```

Implementation

udiCurValue := instEvHandler.udiKeyDownCount;

4.3.19.12.4 Assigning the EventHandler to the visualization

Versionen < V3.5.SP10

In old versions, the following approach is not possible, because the assignment of a program from the visualization manager was not possible:

For these versions, an initialization must take place in the program code.

- · Create a new POU of type "Program" and name it "Visulnit" for example.
- Write the following program code:

Declaration

PROGRAM VisuInit VAR END_VAR

```
Implementierung
VisuElems.VisuElemBase.g_VisuEventManager.SetKeyEventHandler(PLC_PRG.instE
vHandler);
```

• Assign the program in the "Visualization Manager".

Devices + 0 X	R Vesalization Manager x	
* 3 Rybert	🜒 Settings 🕐 Dalog settings 🗔 Default riotieus 🕷 Vaualizations 😫 User management 🍨 Font setti	198
Concest Excess (and all mix 12) Concest Excess (and all m	Generalization de strings Conservations available Sole careford avail	Addread vertings Addread vertings Addread send to send on a sequence of availage Addread send or sequence of availage Addread verting vertified of availage Addread vertified ve

4.3.19.12.5 Downloading and starting the project

- Download the project to the controller and start the application.
- The visualization starts automatically. Click the visualization window to make sure that it is the active window.
- The variable "udiCurValue" is incremented by one each time a key is pressed on the keyboard.

Devices 👻 🦊	×	PLC_PRG X 🕤 C	Nevice				
KeyEventHandler		Device Application PLC	PRG				
Device [connected] (CODESYS Control Win V3)			Terr	Mahar	Descendentes	Address	-
B II PLC Logic	_ 11*	expression	Type	value	Prepared value	Address	0
Application [run]	1	instEvHandler	EventHandler	\sim			
- 🎁 Library Manager		udiCurValue	UDINT				
EventHandler (FB)				\sim			
HandleKeyEvent							
PLC_PRG (PRG)							
VisuInit (PRG)							
= 🧱 Task Configuration							
😑 🥩 MainTask							
- @ PLC_PRG							
B- 🕸 VISU_TASK		1 💿 udiCurValue	6 := ins	tEvHandler.udi	KeyDownCount 6	RETURN	
UsuElems.Visu_Prg							
😑 🛃 Visualization Manager							
- 🔂 TargetVisu							
🤕 WebVisu							
Visualization							

4.3.19.13 Including an Interface (Example "ICmpEventCallback") (EN)

4.3.19.13.1 Requirement

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

Devices 👻 म् 🗙	Device X		
EventCallbacks EventCallbacks Device (CODESYS Control Win V3 x64)	Communication Settings	Scan Network) Gateway 👻 Device 👻	
Application	Applications		
Ibrary Manager IDC_PRG (PRG)	Backup and Restore		
□-∰ Task Configuration □-∯ MainTask (IEC-Tasks)	Files		•••
PLC_PRG	Log	Gateway	
	PLC Settings	IP-Address: localhost	Device Name: KERNTPC
	PLC Shell	Port:	Device Address:
	Users and Groups		Target ID:
	Access Rights		Target Type:
	Symbol Rights		4096 Target Vendor:
	IEC Objects		35 - Smart Software Solutions GmbH
	Task Deployment		3.5.15.30

 Open the Library Manager and add the following libraries: CmpApp CmpEventMgr StringUtils SysTypes2 Interfaces

Device iii Library Manager 🗙		
🕒 Add Library 🗙 Delete Library 🖙 Properties 🗃 Details 🖙 Placeholders 🎁 Library Repos	itory 🕕 Icon le	gend
Name	Namespace	Effective version
□□□ 3SLicense = 3SLicense, 3.5.14.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.14.0
🛱 🔚 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0
🕮 🗠 📒 CAA Device Diagnosis = CAA Device Diagnosis, 3.5.15.0 (CAA Technical Workgroup)	DED	3.5.15.0
E CmpApp = CmpApp, 3.5.15.0 (System)	CmpApp	3.5.15.0
CmpEventMgr = CmpEventMgr, 3.5.14.0 (System)	CmpEventMgr	3.5.14.0
🕮 📙 IoStandard = IoStandard, 3.5.15.0 (System)	IoStandard	3.5.15.0
Standard = Standard, 3.5.15.0 (System)	Standard	3.5.15.0
🕮 📙 StringUtils = StringUtils, 3.5.15.0 (System)	Stu	3.5.15.0
SysTypes2 Interfaces, * (System)	SysTypes	3.5.4.0

4.3.19.13.2 Creating the EventHandler

• Create a new FB named FB_EventHandler and implement the interface CmpEventMgr.ICmpEventCallback.

Add POU 🗾	
Name FB_EventHandler	
Type Program	
Function block Detends	
Imperents Andrew Alexander Imperents Accessspection Accessspection	
Method implementation language Count and Text (CT)	
Function Return type	
Implementation language	
Structured Text (ST)	1
Add Cancel	J

The method *EventCallback* is created automatically with the FB:



• Add the following variables to the FB_EventHandler:

Declaration

```
FUNCTION_BLOCK FB_EventHandler IMPLEMENTS ICmpEventCallback
VAR_OUTPUT
  udiStartDone : UDINT;
udiStopDone : UDINT;
   udiLogin
                    : UDINT;
END_VAR
VAR
  hEventStart : SysTypes.RTS_IEC_HANDLE;
hEventStop : SysTypes.RTS_IEC_HANDLE;
   hInterfaceStart : SysTypes.RTS_IEC_HANDLE;
   hInterfaceStop : SysTypes.RTS_IEC_HANDLE;
   iecResult
                    : SysTypes.RTS_IEC_RESULT;
   itfEvtCallback : CmpEventMgr.ICmpEventCallback;
   hEventLogin : SysTypes.RTS_IEC_HANDLE;
   hInterfaceLogin : SysTypes.RTS_IEC_HANDLE;
   _dwStopReason : DWORD;
  _sAppName
                     : STRING;
END_VAR
```

Adapt the method EventCallback as follows:

Declaration

```
METHOD EventCallback : CmpEventMgr.RTS_IEC_RESULT
VAR_INPUT
    (*Pointer to the event parameters, see Struct EventParam*)
    pEventParam : POINTER TO CmpEventMgr.EventParam;
END_VAR
VAR
    pStartParam : POINTER TO EVTPARAM_CmpApp;
    pStopParam : POINTER TO EVTPARAM_CmpAppStop;
    pLoginParam : POINTER TO EVTPARAM_CmpAppComm;
END_VAR
```

```
CASE pEventParam^.EventId OF
    CmpApp.EventIDs.EVT_StartDone:
        pStartParam := pEventParam^.pParameter;
        IF pStartParam <> 0 THEN
            StrCpyA(ADR(_sAppName), SIZEOF(_sAppName),
ADR(pStartParam^.pApp^.szName));
        END_IF
        udiStartDone := udiStartDone + 1;
    CmpApp.EventIDs.EVT_PrepareStop:
        pStopParam := pEventParam^.pParameter;
        IF pStopParam <> 0 THEN
            _dwStopReason := pStopParam^.ulStopReason;
        END_IF
        udiStopDone := udiStopDone + 1;
    CmpApp.EventIDs.EVT_Login:
        pLoginParam := pEventParam^.pParameter;
        udiLogin := udiLogin + 1;
END_CASE
```

Add the method FB_Init to the FB_EventHandler and adapt the code as follows:

Declaration

```
METHOD FB_Init: BOOL
VAR_INPUT
    bInitRetains: BOOL; // TRUE: the retain variables are initialized (reset
warm / reset cold)
    bInCopyCode : BOOL; // TRUE: the instance will be copied to the copy code
afterward (online change)
END_VAR
```

```
itfEvtCallback := This^;
hEventStart := EventOpen(CmpApp.EventIds.EVT_StartDone,
CmpApp.EventIds.CMPID_CmpApp, iecResult);
hEventStop := EventOpen(CmpApp.EventIds.EVT_PrepareStop,
CmpApp.EventIds.CMPID_CmpApp, iecResult);
hEventLogin := EventOpen(CmpApp.EventIds.EVT_Login ,
CmpApp.EventIds.CMPID_CmpApp, iecResult);
hInterfaceStart := EventRegisterCallback(hEventStart, itfEvtCallback,
iecResult);
hInterfaceStop := EventRegisterCallback(hEventStop, itfEvtCallback, iecResult);
hInterfaceLogin := EventRegisterCallback(hEventLogin, itfEvtCallback, iecResult);
hInterfaceLogin := EventRegisterCallback(hEventLogin, itfEvtCallback, iecResult);
```

• Add the method FB_Exit to the FB_EventHandler and adapt the code as follows:

Declaration

```
METHOD FB_Exit: BOOL
VAR_INPUT
bInCopyCode: BOOL; // TRUE: the exit method is called in order to leave the
instance which will be copied afterwards (online change).
END_VAR
```

```
EventUnregisterCallback(hEventStart, hInterfaceStart);
EventUnregisterCallback(hEventStop, hInterfaceStop);
EventUnregisterCallback(hEventLogin, hInterfaceStop);
EventClose2(hEventStart);
EventClose2(hEventStop);
EventClose2(hEventLogin);
```

4.3.19.13.3 Instantiating the event handler and test the functionality

• Adapt the POU *PLC_PRG* as follows:

Declaration

```
VAR

udiCntStart : UDINT;

udiCntStop : UDINT;

udiCntLogin : UDINT;

fbEventHandler : FB_EventHandler;

END_VAR
```

Implementation

```
fbEventHandler(udiStartDone => udiCntStart, udiStopDone => udiCntStop, udiLogin
=> udiCntLogin);
```

Download the project to the controller and start it.
 When logging in/out and starting the project, the counters are incremented.

evices	💌 🤋 🗶 📝 Device 🎁 Library Manager 📄 FB_EventHandler	FB_EventHandler.FB_Init FB	EventHandler.FB_Exit	t 📝 📄 PLC_PF	G 🗙 🙀 FB_	EventHandler.EventCallback
Di EventCalbacks	Device-Application.PLC_PRG					
Device [connected] (CODESYS Control Win V3 x64)	Example 2	I	Value	Descendently of	Address	Communit
E PLC Logic	Expression	Type	value	Prepared value	Address	Comment
Application [run]	udiCntStart	UDINT	1			
- 🎁 Library Manager	udiCntStop	UDINT	0			
= E FB_EventHandler (FB)	udiCntLogin	UDINT	1			
EventCalback	🖻 fbEventHandler	FB_EventHandler				
R FB Exit	🚺 udiStartDone	UDINT	1			
FB Init	🐐 udiStopDone	UDINT	0			
PLC PRG (PRG)	🍫 udiLogin	UDINT	1			
Task Configuration	hEventStart	POINTER TO BYTE	16#000000001			
E G S MainTask (IEC-Tasks)		POINTER TO BYTE	16#000000001			
PLC PRG	InterfaceStart	POINTER TO BYTE	16#000000140			
	A hInterfaceStop	POINTER TO BYTE	16#000000140			
	ø iecResult	UDINT	0			
	# # itfEvtCallback	CmpEventMgr.ICmp	16#000000001			
	🗷 🍦 hEventLogin	POINTER TO BYTE	16#000000002			
	📧 🚸 hInterfaceLogin	POINTER TO BYTE	16#000000140			
	_dwStopReason	DWORD	0			
	sAppName	STRING	'Application'			
	1 fbEventHandler(udiStartDone 1 => ud	iCntStart 1 , udiStopDone 0	=> udiCntSto	p 0 , ud	Login 1	=> udiCntLogin 1

4.3.19.14 Licensing: Querying the Container Information

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.



Open the Library Manager and add the following libraries: CmpCodeMeter SysTypes2 interfaces

Device Manager X									
👆 Add library 🗙 Delete library 🖙 Properties 🙃 Details 🔄 Placeholders 👔 Library repository									
Name	Namespace	Effective version							
∭…•ໝ 3SLicense = 3SLicense, 3.5.12.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.12.0							
🖗 📲 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0							
m → 💷 CmpCodeMeter = CmpCodeMeter, 3.5.5.0 (System)	CmpCodeMeter	3.5.5.0							
🛙 📲 IoStandard = IoStandard, 3.5.13.0 (System)	IoStandard	3.5.13.0							
າໝ Standard = Standard, 3.5.13.0 (System)	Standard	3.5.13.0							
SysTypes2 Interfaces, * (System)	SysTypes	3.5.4.0							

• Create a "Structure" named *ST_CODEMETER_INFO_EX*. Adapt the *ST_CODEMETER_INFO_EX* as follows:

Declaration

```
TYPE ST_CODEMETER_INFO_EX :
STRUCT
stRTS_CODEMETER_INFO : CmpCodeMeter.RTS_CODEMETER_INFO;
wsContainerName : WSTRING;
END_STRUCT
END_TYPE
```

• Adapt the POU *PLC_PRG* as follows:

Declaration

VAR CONSTANT cw_MaxInfos END_VAR VAR	: WORD := 3;
xReadInfo	: BOOL;
iecResult	: SysTypes.RTS_IEC_RESULT;
iecHandle	: SysTypes.RTS_IEC_HANDLE;
iecPrevHandle	: SysTypes.RTS_IEC_HANDLE;
wIndex	: WORD;
aInfo	: ARRAY [0cw_MaxInfos] OF ST_CODEMETER_INFO_EX;
END_VAR	

```
IF xReadInfo THEN
    xReadInfo := FALSE;
    iecHandle := CmpCodeMeter.CodeMGetFirst(iecResult);
    iecPrevHandle := SYSTYPES.RTS_INVALID_HANDLE;
   wIndex := 0;
   WHILE iecHandle <> SYSTYPES.RTS_INVALID_HANDLE DO
        IF wIndex = 0 THEN
            CmpCodeMeter.CodeMGetInfo(hCodeMeter := iecHandle, info :=
aInfo[wIndex].stRTS_CODEMETER_INFO);
            CmpCodeMeter.CodeMGetName(hCodeMeter := iecHandle, wstName :=
aInfo[wIndex].wsContainerName, nLenBytes :=
SIZEOF(aInfo[wIndex].wsContainerName));
        ELSE
            iecPrevHandle := iecHandle;
            iecHandle := CmpCodeMeter.CodeMGetNext(hPrevCodeMeter :=
iecPrevHandle, Result := iecResult);
            IF iecHandle <> RTS_INVALID_HANDLE THEN
                CmpCodeMeter.CodeMGetInfo(hCodeMeter := iecHandle, info :=
aInfo[wIndex].stRTS_CODEMETER_INFO);
                CmpCodeMeter.CodeMGetName(hCodeMeter := iecHandle, wstName :=
aInfo[wIndex].wsContainerName, nLenBytes :=
SIZEOF(aInfo[wIndex].wsContainerName));
            END_IF
        END_IF
        wIndex := wIndex + 1;
   END_WHILE
END_IF
```

• Start the project and set the *xReadInfo* variable to *TRUE*.

ContainerInfo.project - CODESYS							
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vices v 3 X	🖉 Device 🁔 Library Manager 🏘 ST_CODEMETER_DIPO_EX 🦯 👔 PLC_PRG 🗙						
🖗 Conteiner/ofe	Device Application.PLC_PRG						
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ST_CODEMETER_INFO_EX (STRUCT)	sociation A instance	600,	14				
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The read container/dongle information is saved in the array.

For comparing the information from the *License Manager*.



FAQ: https://faq.codesys.com/display/CDSFAQ/Licensing%3A+Querying+the+Container+Information

4.3.19.15 Reading the Alarm ID

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.



• Insert an Alarm configuration in the device tree.

Here the *Error*, *Info*, and *Warning* alarm classes are created automatically, as well as the *AlarmStorage* object. In addition, a *AlarmManagerTask* is also created.



• Create a global variable list GVL with the variable g_sAlarmID.



 Create a new FB named FB_AlarmNotifiable and implement the interface AlarmManager.IAlarmNotifiable.

Add POU	
Create a new POU (Prog	ram Organization Unit)
Name:	
fbAlarmNotiffable	
Туре	
Program	
Function Block	
Extends:	
Implements: Mana	ger.1AlarmNotflable
Access specifier:	
	•
Method implementation la	nguage:
Structured Text (ST)	-
Function	
Return type:	
Implementation language:	
Structured Text (ST)	•
	Add Cancel

The method the *Execute* method is created automatically with the FB:



• Adapt the *Execute* method as follows:

Declaration

```
//{warning 'add method implementation '}
(* Executes the action.*)
METHOD Execute
VAR_INPUT
    (* The currently processed alarm state transition. This will be
evaluated in order to determine, whether the action has to be
 executed or not*)
    eCurrTransition
                      : ALARMMANAGER.AlarmStateTransition;
    (* The alarm, for which the action has to be performed*)
   itfAlarm : ALARMMANAGER.IAlarm;
    (* An optional pointer to a structure variable containing
 additional parameter*)
    pbyAdditionalData : POINTER TO BYTE;
END_VAR
VAR
    itfAlarmGroup : ALARMMANAGER.IAlarmGroup;
END_VAR
```

Implementation

```
itfAlarmGroup := itfAlarm.GetAlarmGroup();
GVL.g_sAlarmID := itfAlarmGroup.GetStringID(itfAlarm.GetID());
```

• Adapt the POU PLC_PRG as follows:

Declaration

```
VAR

xAlarm : BOOL;

fbAlarmNotifiable : FB_AlarmNotifiable;

END_VAR
```

Implementierung

// no implementation

ReadAlarmId.project* - CODESYS			· · ·			<u> </u>	<u> </u>			
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G Device (CODESYS Control Win V3)	Textlist:	AlarmGroup		 Archiving 	: 🐑 (none)		•	Deactivation:		
PLC Logic										
Application	ID	Observation type	Details	Deactivation	Class	Message	Min. pend. time	Latch var 1	Latch var 2	Higher prio. alarm
🗏 🎆 Alarm Configuration	MyAlarmId	18 Digital	PLC_PRG_xAlarm = TRUE		📖 🙆 Error	The message text				
- 🙆 Error		Click here to add a new alarm	Click here to add a new alarm							
- 🖄 Info										
- 🖄 Warning										
AlarmGroup										
- 🖄 AlarmStorage										
AlarmGroup										
- 🥘 GVL										
Library Manager										
🖶 💼 FB_AlarmNotifiable (FB)										
K Execute										
PLC_PRG (PRG)										

• Insert a new alarm group in the *Alarm configuration* and configure an alarm as follows:

In order for the *fbAlarmNotifiable* instance to also be called at an alarm, the *Error* alarm class must still be notified about it.

ReadAlarmId.project* - CODESYS						<u> </u>		_	
Ele Edit View Project Build Online Debug Tools	s <u>W</u> indow <u>H</u> elp								
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- ReadAlarmId					um				
E fil Device (CODESYS Control Win V3)	Priority: 10 🔶	Acknowledge	ement						
E PLC Logic	Archiving	Acknowledg	gement method	REP_AC	K 🔹				
G Application		acknowl	edge separately						
Alarm Configuration									
Error	Notification actions								
🗥 Info	Action	activate	deactivate	confirm	Details	Deactivation			
🖄 Warning	() Call				PLC_PRG.fbAlarmNotifiable				
AlarmGroup	Click here to add a				Click here to add a new notification a.				
- 🔯 AlarmStorage									
AlarmGroup									
- 🥘 GVL	Call								
Library Manager	Function block insta	ance PLC_	PRG.fbAlarmNot	fiable					
FB_AlarmNotifiable (FB)									
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	Waiting for confirmati	on							

• Load the project to the controller and start it.

Set the *xAlarm* variable to *TRUE* in the POU *PLC_PRG*.

Now the global variable *GVL.g_sAlarmID* will pass the *MyAlarmId* that was set up in the alarm configuration.

ReadAlarmId.project* - CODESYS			~	-	-			
<u>File Edit View Project Build Online Debug Tools W</u>	ndow <u>H</u> elp							
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Devices 👻 🕂 🗙	GVL FB_AlarmNotifiable	ice B_AlarmNotifiable.Execut	e PLC_PRG 🗙 🗥 AlarmGroup	A Error				
ReadAlarmId	Device.Application.PLC_PRG	200						
O Device [connected] (CODESYS Control Win V3)	Expression				Type	Value P	repared value	Addr
PLC Logic	a válam				ROOL	TRUE	cpurcu roide	71001
Application [run]	B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B B				EB AlarmNotifiable			-
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AlarmGroup								
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PLC_PRG (PRG)								
😑 🧱 Task Configuration								
🖶 🍪 AlarmManagerTask				III				
AlarmManager.Alarm_Prg	Watch 1							
AinTask	Expression		Application	Туре	Value	Prepared value	Execution point	t .
PLC_PRG	GVL.g_sAlarmID		Device. Application	STRING	'MyAlarmId'		Cyclic Monitoring	
			15					

4.3.19.16 Reading the Application Information with the library "CmpApp"

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.



• Open the Project/Project information dialog and fill in the following fields:

Project Information	•	
File Summary Prop	entes Statistics Licensing Signing	
Company	пуСопрату	
Itle	myTitle	
Version:	3.4.5.6	Ecleased
Library Categories:		-
Default namespacer		
åathar:	nyName	
Descriptes:	ar,Cescopton	
The fields in bold let	ters are used to identify a library.	
Automatically generate	Library Information' POUs	
Automatically generate	Project Information' POUs	
		OK Cancel

- Open the Library Manager and add the following libraries:
 - CmpApp
 - SysTypes2 Interfaces

Device Ibrary Manager 🗙			
🔁 Add library 🗙 Delete library 🛛 😭 Properties 🟐 Details 🛛 🗐 Placeholders 🖉 Library reposi	tory		
Name	Namespace	Effective version	Ī
⊞…•⊡ 3SLicense = 3SLicense, 3.5.12.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.12.0	
🗑 📲 📾 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0	
⊞	CmpApp	3.5.11.0	
🗑 📲 IoStandard = IoStandard, 3.5.10.0 (System)	IoStandard	3.5.10.0	
····• Standard = Standard, 3.5.12.0 (System)	Standard	3.5.12.0	
•ໝ SysTypes2 Interfaces, * (System)	SysTypes	3.5.4.0	

• Adapt the POU *PLC_PRG* as follows:

Declaration

VAR			
sAppNa	ame	:	STRING := 'Application'; // must identic to the name in the
device tre	ee		
iecRes	sult	:	RTS_IEC_RESULT;
xInit		:	BOOL := TRUE;
рАрр		:	POINTER TO CmpApp.APPLICATION;
stApp]	Info	:	CmpApp.APPLICATION_INFO;
pstAp	oInfo	:	<pre>POINTER TO CmpApp.APPLICATION_INFO := ADR(stAppInfo);</pre>
sProje	ectName	:	STRING;
sAutho	or	:	STRING;
sVers	ion	:	STRING;
sDesc		:	STRING;
sLast	Change	:	STRING;
END_VAR			

```
IF xInit THEN
    pApp := CmpApp.AppFindApplicationByName(pszString := sAppName, pResult :=
ADR(iecResult));
    pstAppInfo := CmpApp.AppGetApplicationInfo(pApp := pApp, pResult :=
ADR(iecResult));
    IF iecResult = 0 THEN
        sProjectName := pstAppInfo^.pstProjectName^;
        sAuthor := pstAppInfo^.pstAuthor^;
        sVersion := pstAppInfo^.pstVersion^;
        sDesc := pstAppInfo^.pstDescription^;
        sLastChange := DT_TO_STRING(pstAppInfo^.dtLastChanges);
    END_IF
        xInit := False;
END_IF
```

· Start the project.

Process	ReadApplicationInformation.project - CODESYS		Ļ				_ 0	×
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<pre></pre>	di PLC PRG	🛞 🌒 pstAppInfo	POINTER TO CmpAp	16#007FFEE8				
• Audor • STRING "WNum" • Vreiso • Vreiso • Vreiso • Vreiso • Ureiso • Ureis		sProjectName	STRING	'ReadApplicationInformation'				
<pre></pre>		sAuthor	STRING	'myName'				
		sVersion	STRING	'3.4.5.6'				
<pre>\$ 1.stChang</pre> \$ TRUE \$ 1.stChang \$ 1.stChang \$ 1.stChang \$ 1.stChang \$ 1.stChang \$ 2.stChang <p< td=""><td></td><td>ø sDesc</td><td>STRING</td><td>'myDescription'</td><td></td><td></td><td></td><td></td></p<>		ø sDesc	STRING	'myDescription'				
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<pre> i i [P # fait[25] [Web</pre>								
<pre>plppIMEDTERPT = (chphp.hgbriteLicieD)Meme Exploration [: e AbplimedTerpT = AbplimedTerpT</pre>		I I F xInit FALSE THEN	A V					
<pre>s prigiping important in complex hyperbrack into (https://www.setaints.com/setaints/seta</pre>		2 phpp16#007FFBF0 := Cmphpp.hppFindApplicationByName(pszSt	ring := sAppName 'Applicatio 🕨, pRe:	sult := ADR (iecResult	• ();			
<pre>if iclearsing - 0 THME = 0 THME =</pre>		3 pstAppInfo 16#007FFEE8 := CmpApp.AppGetApplicationInfo(pJ	pp := pApp 16#007FFBF0 , pResult := .	ADR(iecResult 0));			
<pre>afroyections fmakey: 1 := patkpild(*.patkpopting); afroyections fmakey: 1 := patkpild(*.patkpild(*.patkpopting); afroyections fmakey: 1 := patkpild(*.patkpopting); afroyections fmakey: 1 := patkpild(*.patkpopting); afroyections fmakey: 1 := patkpild(*.patkpild(*.patkpopting); afroyections fmakey: 1 := patkpild(*.patkpopting); afroyections fmakey: 1 := patkpild(*.patkpopting); afroyections fmakey: 1 := patkpild(*.patkpild(*.patkpopting); afroyections fmakey: 1 := patkpild(*.patkpopting); afroyections fmakey: 1 := patkpild(*.patkpild(*.patkpopting); afroyections fmakey: 1 := patkpild(*.patkpopting); afroyections fmakey: 1 := patkpild(*.patkpopting); afroyect</pre>		IF iecResult 0 = 0 THEN						
<pre>aduthoc mydewd i: pstuppint*, pstustor late sierion_late select_mydewg]: pstuppint*, pstustor late select_mydewg]: pstuppint*, pstuestor late select_mydewg]</pre>		5 sProjectName ReadAppic > := pstAppInfo^.pstProjectN	ame^ ReadApplic > ;					
<pre>afVersion_lass := production-provension_lass; a stele=[mpdemsc]: production-provension[mpdemsc]; a startCanage[Stelese2] := 07 [mSTRIMS(priopintor.stlastChanges_Disclesion]; a startCanage[Stelese2]; a startStart[Stelese]; a startStart[Stelese];</pre>		6 sAuthor 'myName' := pstAppInfo^.pstAuthor^ 'myName'	lame' :					I
albed_implexery_l; pstdbedription statichange j: pstdbedription pstdbedription pstdbedription pstdbedription </td <td></td> <td>7 sVersion 3456 := pstAppInfo^.pstVersion^</td> <td>3.4.5.6'</td> <td></td> <td></td> <td></td> <td></td> <td> I</td>		7 sVersion 3456 := pstAppInfo^.pstVersion^	3.4.5.6'					I
<pre>i Lastcandog [request] : UT_N_switch (priopinto'.stlastchanges presidenti 44) :</pre>		<pre>sDesc myDescript > := pstAppInfo^.pstDescription^ m</pre>	yDescript 🕨 :					
Log Log Life Table 7		9 sLastChange DT*2018-02 + := DT TO STRING (pstAppInfo*	.dtLastChanges DT#2018-2-13-11:49:42					
		10 END IF						I
		An a mm Therease (= Faise)						
		TA DAD_LEREIURN					100	× 6
		Instituide O 0 0 0 Descender d O	Dealerson landad	Des anno machana and	0	at water (as had a)	100 In 12 Col 7 Ch 7	0

- 4.3.19.17 Reading the Compiler and Runtime Version
 - Create a "Standard project" and select CODESYS Control Win V3 as the device.
 - Define the target system by means of the Network scan.

Devices 👻 🕈 🗙	Device X				
ReadingCompileRuntimeVersion Provide CODESYS Control Win V3 x64)	Communication Settings	Scan Network Gateway - D	evice 👻		
PLC Logic	Applications				
Ibrary Manager	Backup and Restore				
□-₩ Task Configuration □-♥ MainTask (IEC-Tasks)	Files		Gateway	•	•••
PLC_PRG	Log		Gateway-1	~	KERNTHPC (active)
	PLC Settings		IP-Address: localhost		Device Name: KERNTHPC
	PLC Shell		Port:		Device Address:
	Users and Groups		121/		Target ID:
	Access Rights				0000 0004
	Symbol Rights				4096
	IEC Objects				Target Vendor: 3S - Smart Software Solutions GmbH
	Task Deployment				Target Version: 3.5.16.30

• Adapt the POU *PLC_PRG* as follows:

Declaration

```
VAR
verCompiler : Version;
verRuntime : Version;
i1, i2, i3, i4: INT;
END_VAR
```

```
verRuntime := __SYSTEM.Constants.RuntimeVersion;
verCompiler := __SYSTEM.Constants.CompilerVersion;
// as pragma
{IF RUNTIMEVERSION(>=,'3.5.16.20')}
    i1 := i1 + 1;
{ELSE}
    i2 := i2 + 1;
{END_IF}
{IF COMPILERVERSION(=,'3.5.16.20')}
    i3 := i3 + 1;
{ELSE}
    i4 := i4 + 1;
{END_IF}
```

· Load the project to the controller and start it.



4.3.19.18 Reading the IP and MAC Addresses from AdapterInfo (EN)

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

AdapterInfo_JpAddr_MacAddr.project* - CODESYS									
Ele Edit View Broject Build Qnline Debug Iools Window Help									
🛍 📽 🖬 📾 타이스 & 🏗 🖹 🗙 🙀 🖄 🝓 🖄 • 💼 👹 • 🌒 👹 🥨 • 👔 💘 티트 크 네트 크 카이트 케이트 카이트 🗮 🐨 🖉 🖕									
Devices 👻 🕂 🗙	🚹 Device 🗙								
AdapterInfo_IpAddr_MacAddr									
Device (CODESYS Control Win V3)	Communication Settings	Scan network Dateway - Device -							
E I PLC Logic									
Application	Applications								
- 데 PLC.PRG (PRG) - 데 PLC.PRG (PRG) - 행 Task Configuration - 양 MainTask - 렌 PLC.PRG	Backup and Restore		-	·····					
	Files		Gataway						
	Log	Gateway-1	•	[034A] (active)					
	PLC Settings	IP-Address: localhost		Device Name: KERNTPC					
	PLC Shell	Ports		Device Address:					
	Users and Groups	1217		Target ID:					
	Access Rights			0000 0001					
	Task Deployment			Target Type: 4096					
	Status			Target Vendor: 3S - Smart Software Solutions GmbH					
	Information			Target Version: 3.5.12.0					

- Open the Library Manager and add the following libraries:
 - SysSocket
 - SM3_Shared
 - SysTypes2 Interfaces

Library Manager 🗙 🔐 Device						
🔁 Add library 🗙 Delete library 🛛 😭 Properties 🔋 Details 🛛 💷 Placeholders 🛛 🎁 Library repository						
Name	Namespace	Effective version				
🗟 🚥 🚳 3SLicense = 3SLicense, 3.5.12.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.12.0				
🖶 - 🚥 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0				
🖬 📲 IoStandard = IoStandard, 3.5.10.0 (System)	IoStandard	3.5.10.0				
🗄 - 🚥 SM3_Shared = SM3_Shared, 4.3.0.0 (3S - Smart Software Solutions GmbH)	SM0	4.3.0.0				
າໝ Standard = Standard, 3.5.12.0 (System)	Standard	3.5.12.0				
🖶 📲 SysSocket = SysSocket, 3.5.12.0 (System)	SysSocket	3.5.12.0				
SysTypes2 Interfaces, * (System)	SysTypes	3.5.4.0				

• Adapt the POU PLC_PRG as follows:

Declaration

VAR	
AdapterInfo	: SOCK_ADAPTER_INFORMATION;
hAdapter	: RTS_IEC_HANDLE;
udiStructSize	: UDINT := SIZEOF(AdapterInfo);
rResult	: RTS_IEC_RESULT;
sIpAddr	: STRING(15);
sMacAddr	: STRING(17);
xFirstAdapter	: BOOL;
xReadInfo	: BOOL;
END_VAR	

```
IF xReadInfo THEN
    xReadInfo := FALSE;
    xFirstAdapter := TRUE;
    rResult := 0;
   WHILE rResult = 0 DO
        IF xFirstAdapter THEN
            hAdapter := SysSockGetFirstAdapterInfo(ADR(AdapterInfo),
ADR(udiStructSize), ADR(rResult));
        ELSE
            hAdapter := SysSockGetNextAdapterInfo(hAdapter, ADR(AdapterInfo),
ADR(udiStructSize), ADR(rResult));
        END_IF
        IF rResult = 0 THEN
            sIpAddr :=
Standard.CONCAT(BYTE_TO_STRING(AdapterInfo.IpAddr.S_un_b.s_b1),'.');
            sIpAddr :=
Standard.CONCAT(sIpAddr,BYTE_TO_STRING(AdapterInfo.IpAddr.S_un_b.s_b2));
            sIpAddr := Standard.CONCAT(sIpAddr,'.');
            sIpAddr :=
Standard.CONCAT(sIpAddr,BYTE_TO_STRING(AdapterInfo.IpAddr.S_un_b.s_b3));
            sIpAddr := Standard.CONCAT(sIpAddr,'.');
            sIpAddr :=
Standard.CONCAT(sIpAddr,BYTE_TO_STRING(AdapterInfo.IpAddr.S_un_b.s_b4));
            sMacAddr :=
Standard.CONCAT(SM0.Byte_To_HexString(AdapterInfo.abyMac[0]),'-');
            sMacAddr :=
Standard.CONCAT(sMacAddr,SM0.Byte_To_HexString(AdapterInfo.abyMac[1]));
            sMacAddr := Standard.CONCAT(sMacAddr,'-');
            sMacAddr :=
Standard.CONCAT(sMacAddr,SM0.Byte_To_HexString(AdapterInfo.abyMac[2]));
            sMacAddr := Standard.CONCAT(sMacAddr,'-');
            sMacAddr :=
Standard.CONCAT(sMacAddr,SM0.Byte_To_HexString(AdapterInfo.abyMac[3]));
            sMacAddr := Standard.CONCAT(sMacAddr,'-');
            sMacAddr :=
Standard.CONCAT(sMacAddr,SM0.Byte_To_HexString(AdapterInfo.abyMac[4]));
            sMacAddr := Standard.CONCAT(sMacAddr,'-');
            sMacAddr :=
Standard.CONCAT(sMacAddr,SM0.Byte_To_HexString(AdapterInfo.abyMac[5]));
        END_IF
        xFirstAdapter := FALSE;
    END_WHILE
END IF
```

• Start the project and set a breakpoint in line 6 of the POU PLC_PRG.

AdapterInfo_JpAddr_MacAddr.project* - CODESYS							- 8 2
e Edit yew Broject Build Online Debug Tools y 1 De Del deb ⊳ ⇔ X Parille X AA 15 AA 15	gindow gelp Salado At Sa Sa Sa Ba (Ba (Sa)	- MURICION	8 : • : : : : : : : : : : : : : : : : :				'
ices v a	X All Device D PIC PE						
AdapterInfo Jokdd: MacAdd:							_
G Device (connected) (CODESYS Control Win V3)	Device Application PTC_Pro-	•			_		
B D PLC Logic	Expression	Туре	Value	Prepared value	Address	Comment	
Application (run)	Adepterinfo	SOCK_ADAPTER_INFORMATION					
Bubrary Manager	in o hAdepter	POINTER TO BYTE	16#00000000				
PLC_PRG (PRG)	udiStructSize	UDBNT	1064				
Task Configuration	Ø rResult	UDBNT	•				
= 🕸 MainTask	 stbyog. 	518196(15)					
DLC_PRG	smacAbdr	51RDNG(17)	1417				
	xrinstvidispeer	800.	74.50				
	· Averatino	BUUL	11				
	10 1000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 11000 110	spect with the spectra of the spectr	1100 Margarelline Malangerelline 110 FERDINAL AND PERSON	Info), ABR (wilfsruction) = pl(1994 —) , AUR (1994] 	eald <u>a</u>))	
Device user: Anonymous Li	ast build: 🔕 0 🔹 0 Precomple: 🗸	Program le	paded Program unchang	jed Project	user: (nobody)	INS Ln 3 Col 14	100 Ch 11

• After setting the *xReadInfo* variable, the variables are read for each adapter:

	Vente / RC_P	le X					
pterinto_lolddr_Aleolddr	Device Application.PLC_PRO						
pevice (connected) (CODESTS Control Win V3) D El C Logic	Expression	Туре	Value	Prepared value	Address	Comment	
Application (halt on breakpoint)	🛎 🧶 Adapterinfo	SOCK_ADAPTER_INFORMATION					
Library Manager	🖹 🧶 hAdepter	POINTER TO BYTE	16#008A8A88				
PLC_PRG (PRG)	udiStructSize	UDINT	1064				
= 🧱 Task Configuration	rResult	UDDNT	0				
🗏 🥵 MainTask	🖗 slpAddr	STRING(15)	192.160.99.74				
D PLC_PRG	sMacAddr	STRING(17)	DC-4A-38-6D-28-38				
	# xfirstAdapter	BOOL	TRUE				
	*ReadInfo	BOOL	FALSE				
	× (
	800_17 8 11 0 IF The 12 0 81 13 0 81 14 8 81 15 8 81 15 8 81	pult 0 = 0 THEN Add: 10 183 183 9 + 1 = Standard.CONCAI (SU Add: 10 183 183 9 + 1 = Standard.CONCAI (SI Add: 10 183 9 + 1 = Standard.CONCAI (SI SI	TE TO STRING (AdapterInfo, IpAddr, S_un_b., pAddr 18: 18: 98 BVTE TO STRING (Adapte pAddr 19: 18: 19: 1 1 pAddr 19: 19: 19: 1 1 pAddr 19: 19: 19: 1	s_bl∰g,/./); rInfo.IpAddr.5_um_b.s_b2∰ rInfo.IpAddr.5_um_b.s_b3∰	D)); D));		
	17 0 81 18 0 20 19 0 20	1 sijded SUBET = Suskest CONTINUES SUBET IN DE SUBET SUBE SUBET SU					
	210 220 220 221 0 220 23 0 220 24 0 20	acAddr OC44424 + := Standard.CONCAT(# acAddr OC44424 + := Standard.CONCAT(# acAddr OC44424 + := Standard.CONCAT(# acAddr OC44424 + := Standard.CONCAT(# acAddr Oc44424 + := Standard.CONCAT(#	NacAddr DC44324 + SN0.Byte_To_BexStri NacAddr DC44324 + SN0.Byte_To_BexStri NacAddr DC44324 + SN0.Byte_To_BexStri	ng (AdapterInfo.abyNac[2] 📧 ng (AdapterInfo.abyNac[3] 🔞	01: 01:		
	26 o 250 26 o 250	acAddr DC-4A-3E4 > := Standard.CONCAT(s acAddr DC-4A-3E4 > := Standard.CONCAT(s	MacAddr DC-4A3E4 + SM0.Byte_To_HexStri: MacAddr DC-4A3E4 + ('-');	ng (AdapterInfo.abyMac[4]	D 12		

4.3.19.19 Reading the Manufacturer Information of the Controller

For example, if a library should run on specific devices only, then you have to access the manufacturer information on the controller.

Normally the functionality is restricted by the "TargetType".



- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

ReadingDeviceInformation.project - CODESYS		A A					
Ele Edit Yew Project Build Online Debug Tools Window Help BACNet 111 日本							
Devices 👻 🕂 🗙	Device X						
ReadingDeviceInformation							
Device (CODESYS Control Win V3)	Communication Settings Scan network	teway + Device +					
PLC Logic Application	Applications						
LDrary Manager IDrary Manager ILC_PRG (PRG)	Backup and Restore						
i≕ 👹 Task Configuration i 🌚 🍪 MainTask (IEC-Tasks)	Files		•••				
(∰) PLC_PRG	Log	Gateway-1	[0301.A000.034A] (active)				
	PLC Settings	IP-Address: localhost	Device Name: KERNTPC				
	PLC Shell	Port:	Device Address:				
	Users and Groups	1217	Target ID:				
	Symbol Rights		0000 0001				
	Task Deployment		4096				
	Status		Target Vendor: 35 - Smart Software Solutions GmbH				
	Information		Target Version: 3.5.13.10				

 Open the Library Manager and add the following libraries: SysTarget SysTypes2 interfaces
Device Ibrary Manager 🗙										
눱 Add library 🗙 Delete library 🛛 😁 Properties 📷 Details 🛛 🚐 Placeholders 🛛 🎁 Library repository										
Name	Namespace	Effective version								
🗑 🐨 🐨 3SLicense = 3SLicense, 3.5.12.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.12.0								
🖶 📲 📾 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0								
🗑 📲 IoStandard = IoStandard, 3.5.13.0 (System)	IoStandard	3.5.13.0								
ະພະຈະໝີ Standard = Standard, 3.5.13.0 (System)	Standard	3.5.13.0								
Im ∞ SysProcess = SysProcess, 3.5.7.0 (System)	SysProcess	3.5.7.0								
🖶 👓 SysTarget = SysTarget, 3.5.5.0 (System)	SysTarget	3.5.5.0								
SysTypes2 Interfaces, * (System)	SysTypes	3.5.4.0								

• Adapt the POU PLC_PRG as follows:

Declaration

VAR		
	xRead	: BOOL;
	iecResult	: SysTypes.RTS_IEC_RESULT;
	dwType	: DWORD;
	dwTargetId	: DWORD;
	wsVendorName	: WSTRING;
	diVendorName	: DINT := SIZEOF(wsVendorName);
	wsDeviceName	: WSTRING;
	wsDev	: DINT := SIZEOF(wsDeviceName);
	dwVersion	: DWORD;
	wsNodeName	: WSTRING;
	udiNodeName	: UDINT := SIZEOF(wsNodeName);
	udiProcessorId	: UDINT;
	udiOsId	: UDINT;
	sSerialNumber	: STRING;
	psSerialNumber	: POINTER TO STRING := ADR(sSerialNumber);
	diSerialNumber	: DINT := SIZEOF(sSerialNumber);
END	_VAR	

```
IF xRead THEN
    xRead := FALSE;
    // Control WinV3: 4096 - 0000 0001
    iecResult := SysTarget.SysTargetGetType(pulType := ADR(dwType));
    iecResult := SysTarget.SysTargetGetId(pulTargetId := ADR(dwTargetId));
    iecResult := SysTarget.SysTargetGetVendorName(pwszName := ADR(wsVendorName),
pnMaxLength := ADR(diVendorName));
    iecResult := SysTarget.SysTargetGetDeviceName(pwszName := ADR(wsDeviceName),
pnMaxLength := ADR(wsDev));
    iecResult := SysTarget.SysTargetGetVersion(pulVersion :=
ADR(dwVersion)); // V3.5.SP13.10 == > 50662666 = 16#03050D0A
    iecResult := SysTarget.SysTargetGetNodeName(pwszName := ADR(wsNodeName),
pnMaxLength := ADR(udiNodeName));
        // SystemInfo
    iecResult :=
SysTarget.SysTargetGetOperatingSystemId(pudiOperatingSystemId := ADR(udiOsId));
    iecResult := SysTarget.SysTargetGetProcessorId(pudiProcessorId :=
ADR(udiProcessorId));
    //Unique RT identifier
    iecResult := SysTarget.SysTargetGetSerialNumber(ppsSerialNumber :=
ADR(psSerialNumber), pnMaxLen := ADR(diSerialNumber));
END_IF
```

• Start the project and set the *xRead* variable to *TRUE*.



4.3.19.20 Symbol configuration: Error message "Found dependency cycle in the types" (EN)

Can appear, when the option: 'Support Calls of Functions, FBs, Methods, and Programs¹⁰³' is activated.

4.3.19.20.1 Meaning of the Error:

A type is called, that contains itself.

4.3.19.20.2 Problem

The way the Symbol configuration has to handle REFERENCE here. These are (depicted in a simple way) "flat" and will behave as if the referenced values are directly there without a reference. This then can lead to such cycles of dependency.

4.3.19.20.3 Solution

The best approach here is, to never export REFERENCE with the symbol config. This leads to many more variables being released than would normally be the case (and desirable). Also, this can cause more problems.

The user should rethink his export format in the symbol config and try to do it without REFERENCE.

The "Support calls to functions..." error is usually only the trigger that this type is exported, and not really part of the problem.

4.3.19.21 SysFile: Saving Files in UTF-8 Format

Data can be stored in UTF-8 format when working with the *WSTRING* type in the IEC code. By using the ConvertUTF16toUTF8 function from the *StringUtils* library, the text is converted to UTF-8 format and can be saved to a file.

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

¹⁰³ https://content.helpme-codesys.com/en/CODESYS%20Communication/_cds_obj_symbolconfiguration.html

WriteUTF8File.project* - CODESYS				
File Edit View Project Build Online Debug Tools Window He	p			
🛅 🖆 🔚 🗁 🗠 🖇 🖦 🕾 🗙 🗛 🌿 🦓 🖳 🏪 🕻 i 🕮 🕻	🖇 🧐 🖒 🗉 🤻 🗇 역표 💷 응 🌼	罰 =	ß	
Devices 👻 🕂 🗙	Device X			
🖻 🎒 WriteUTF8File 💌				
Device (CODESYS Control Win V3)	Communication Settings Scan n	etwork Dateway - Device -		
E IL PLC Logic				
C Application	Applications			
Library Manager	Backup and Restore			:
PLC_PRG (PRG)			**	
- Ask Configuration	Files	•	·	• •
B PLC PRG		Gatewa	.y	
<u> 100</u> 100	Log	Gateway-1	▼ [0301.	A000.034Al (active)
	PLC Settings	10.4.4	Device	Name
		lo calhost	KERNT	PC
	PLC Shell	Port	Device	Address:
		1217	0301.A	000.034A
	Users and Groups		Target	ID:
	Symbol Rights		0000 0	001
			Target	Type:
	Task Deployment		4096	
			Target	Vendor:
	Status		35 - Sr	nart Software Solutions GmbH
	Information		Target	Version:
			3.5.13.	20

 Open the Library Manager and add the following libraries: StringUtils SysFile SysTypes2 Interfaces

Device Intrary Manager 🗙										
🔁 Add library 🗙 Delete library 🛛 😁 Properties 🔋 Details 🛛 🚐 Placeholders 🛛 🎁 Library repository										
Name	Namespace	Effective version								
ⓓ	_3S_LICENSE	3.5.12.0								
🗟 🕬 📾 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0								
🖩 🚥 IoStandard = IoStandard, 3.5.13.0 (System) IoStandard 3.5.13.0										
• 💷 Standard = Standard, 3.5.13.0 (System)	Standard	3.5.13.0								
±st StringUtils = StringUtils, 3.5.13.20 (System)	Stu	3.5.13.20								
⊌ • SysFile = SysFile, 3.5.9.0 (System)	SysFile	3.5.9.0								
SysTypes2 Interfaces, * (System)	SysTypes	3.5.4.0								

• Edit the *PLC_PRG* POU as follows:

Declaration

Ξ;
. E

Implementation

```
IF xWrite THEN
    xWrite := FALSE;
    hFile := SysFileOpen(szFile:=szFileName, am:=SysFile.AM_Write ,
pResult:=ADR(iecResult));
    IF hFile <> RTS_INVALID_HANDLE THEN
        Stu.ConvertUTF16toUTF8(sourceStart := ADR(wsTextLine), targetStart :=
ADR(sUTF8TextLine), dwTargetBufferSize := SIZEOF(wsTextLine),
bStrictConversion := TRUE);
    udiWrite := SysFileWrite(hFile:=hFile, pbyBuffer:=ADR(sUTF8TextLine),
ulSize:=INT_TO_UDINT(LEN(sUTF8TextLine)), pResult:=ADR(iecResult));
    iecResult := SysFileClose(hFile:=hFile);
END_IF
END_IF
```

• Start the project and set the *xWrite* variable to *TRUE*.

WriteUTF8File.project* - CODESYS										
File Edit View Project Build Online Debug Tools	Window Help									
11 📽 🖬 ● ♀ ♀ \$ № ★ ▲ 🍇 ▲ ▲ 🧏 🌾 摘 14 • 17 • 11 ● ■ ● ■ ■ ■ ■										
Devices 👻 🕂 🗙	Device Dibrary Manager PLC_PRG X									
🖻 🗿 WriteUTF8File 💌	Device.Application.PLC_PRG									
E 😏 🚹 Device [connected] (CODESYS Control Win V3)					a					
🖻 🗐 PLC Logic	Expression	Type Value	Prepared value	Address	Comment					
🖹 🔘 Application [run]	xWrite	BOOL FALSE								
Library Manager	ø szFileName	STRING(128) 'c:/tmp/TestUTF.								
PLC PRG (PRG)	🗷 🚸 hFile	POINTER TO BYTE 16#00B6A7A8								
- 🧱 Task Configuration	iecResult	UDINT 0	_							
🖹 🎲 MainTask (IEC-Tasks)	wsTextLine	WSTRING(10) "Übersetzer"			го					
- B PLC PRG	sUTF8TextLine	STRING 'Übersetzer'	-> trans	ate to 01	r-o					
	🖗 udiPos	DWORD U								
	🖗 udiWrite	DWORD 11								

If the file is viewed in an editor, then the text is displayed correctly:

TestUTF8.txt - Editor									
Datei	Bearbeiten	Format	Ansicht	?					
Übens	etzer								

4.3.19.22 Task Configuration: Reading the Cycle Time and Other Information

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

IECTask_Information.project - CODESYS			N
Eile Edit View Project Build Online Debu	ug <u>T</u> ools <u>W</u> indow <u>H</u> elp		43
🎦 🚅 🔚 🚭 🗠 🗠 🌡 🛍 🏝 🗙 🞼	🛦 🍇 🐴 🛀 I 📾 I 🛅 • 🕤 I 🗄	비야 얘 🕨 📲 🗶 💷 역 역 역 왕 [한 [蒙] 물 [장	
Devices 👻 🕂 🗙	Device X		
E Di IECTask_Information			
Device (CODESYS Control Win V3)	Communication Settings	Scan network Gateway + Device +	
E E PLC Logic	Applications		
Application	-		
PLC PRG (PRG)	Backup and Restore		
SecTask (PRG)			
🖹 🌃 Task Configuration	Files		• •
🖻 🕸 MainTask	Log	Gateway	
PLC_PRG		Gateway-1	▼ [034A] (active) ▼
Myseclask	PLC Settings	IP-Address:	Device Name:
E Sector	PLC Shell		RENTIFC .
		Port 1217	Device Address: 034A
	Users and Groups		Tarnat ID:
	Access Rights		0000 0001
			Target Type:
	Task Deployment		4096
	Chabura		Target Vendor:
	Status		35 - Smart Software Solutions GmbH
	Information		Target Version: 3.5.12.0

 Open the Library Manager and add the following libraries: CompErrors CmplecTask SysTypes2 Interfaces

👔 Library Manager 🗙			
🔁 Add library 🗙 Delete library 🛛 😁 Properties 💿 Details 🛛 🛒 Placeholders 🛛 👘 Library reposit	tory		
Name	Namespace	Effective version	Ī
🖼 👓 🚥 3SLicense = 3SLicense, 3.5.14.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.14.0	
🛱 🚥 🚾 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0	
CmpErrors = CmpErrors, 3.3.1.40 (System)	CmpErrors	3.3.1.40	
🕮 👓 🚾 CmpIecTask = CmpIecTask, 3.5.14.0 (System)	CmpIecTask	3.5.14.0	
🕮 🚥 🚥 IoStandard = IoStandard, 3.5.13.0 (System)	IoStandard	3.5.13.0	
Standard = Standard, 3.5.14.0 (System)	Standard	3.5.14.0	
SysTypes2 Interfaces, * (System)	SysTypes	3.5.4.0	

• Create a new POU named *SecTask* and a new task named *MySecTask*. Assign the POU *SecTask* to the task *MySecTask* and set the call interval to 50 milliseconds.

• Adapt the POU SecTask as follows:

Declaration

VAR iIndex : INT; sIndex : STRING; END_VAR

Implementation

```
FOR iIndex := 0 TO 1000 D0
    //Do something to raise the cycle time
    sIndex := INT_TO_STRING(iIndex);
END_FOR
```

• Adapt the POU *PLC_PRG* as follows:

Declaration

:	DWORD;
:	DWORD;
:	STRING;
:	RTS_IEC_HANDLE;
:	RTS_IEC_RESULT;
:	<pre>STRING := 'Application';</pre>
:	POINTER TO
	:::::::::::::::::::::::::::::::::::::::

Implementation

```
hFirstTask := CmpIecTask.IecTaskGetFirst(pszAppName := ADR(sAppName), pResult :=
ADR(iecResult));
IF ((hFirstTask <> RTS_INVALID_HANDLE) AND (iecResult =
CmpErrors.Errors.ERR_OK)) THEN
    pIecInfo := CmpIecTask.IecTaskGetInfo3(hIecTask := hFirstTask, pResult :=
ADR(iecResult));
    dwIntervalMainTask := pIecInfo^.dwInterval;
    dwCycleTimeMainTask := pIecInfo^.dwCycleTime;
    sNameMainTask := pIecInfo^.pszName^;
    hSecTask := IecTaskGetNext(pszAppName := ADR(sAppName), hPrevIecTask :=
hFirstTask, pResult := ADR(iecResult));
    IF ((hSecTask <> RTS_INVALID_HANDLE) AND (iecResult =
CmpErrors.Errors.ERR_OK)) THEN
        pIecInfo := CmpIecTask.IecTaskGetInfo3(hIecTask := hSecTask, pResult :=
ADR(iecResult));
        dwIntervalSecTask := pIecInfo^.dwInterval;
        dwCycleTimeSecTask := pIecInfo^.dwCycleTime;
        sNameSecTask := plecInfo^.pszName^;
    END_IF
END_IF
```

• After you have uploaded and started the project on the controller, you can compare the values between the task configuration and the IEC code.

IECTask_Information.project* - CODESYS													×
Ele Edit Yew Project Build Online Debug Iools W 習 교 문제 이 아이 것 같은 전 시험 역 성 생 성	indow <u>H</u> elp	ĵi∰iq	0 4	(3 ¢3 ¢3	18 ¢ 🛒	≓ ∛							٣
Devices v A X	All Device	in Lib	rary Manager	PLC PRG	Task Conf	iguration ×							-
- Directask_Information	Properties Su	tem Evente	Monitor Variable Lie	202		Ld							
은 🧐 Device [connected] (CODESYS Control Win V3)	Task	Status	IEC-Cycle Count	Cyde Count	Last Cycle Time (µs)	Average Cycle Time (µs)	Max. Cycle Time (µs)	Min. Cycle Time (µs)	Jitter (µs)	Min. Jitter (us)	Max. Jitter (µs)	Core	
Application [run]	MainTask	Valid	6818	6994	7	6	112	1	1276	-295	981	0	
● Loroy Huroger ● Loroy Huroger ● Sectask (PRG) ● 영 Inst Configuration ● 영 HuroTask ● 한 HuroTask ● 한 HuroTask ● 양 HydecTask ● 한 Sectask	U MysecTask	Valid	2727	2797	156	165	380	2	1086	-164	922		
Desia una di		Lasthui		aromola:	G- DID	5	arean la selad		a aram wash			relatives: (asked	



4.3.19.23 TCP, Resolve Hostname: Using the Interface "itfAsyncProperty" (EN)

The "itfAsyncProperty" must be passed during initialization. Otherwise the FB "ResolveHostname" is executed synchronously, which leads to an increased cycle time

	n	Туре	Value	Prepared value	Address
E 🧔 in	stResolveHostname	NBS.ResolveHostname			
xF	Resolved	BOOL	FALSE		
xF	Resolve	BOOL	FALSE		
E 🤌 m	IY IP	NBS.IPv4Address			
E 🤣 m	yIPInterface	NBS.IIPAddress	16#766A1240		
The second se	heIPYouAreLookingFor	UDINT	3585479260		
🗉 🤣 fb	Async	NBS.AsyncProperty			
	tgTaskGroup	STRING(255)	'IEC-Tasks'		
	anAppName	STRING(255)	'Application'		
×	tnTaskName	STRING(255)	'MyTask'		
×	👂 usiTaskPrio	USINT	5		
	udiTaskInterval	UDINT	1000		
3 2	instResolveHostname(
3 2 4 3 4 5 6 7 8 9 10	<pre>instResolveHostname (xfArecuteHostname (xfArecuteHostname (xfArecuteHostname (xfBreathow Hostname (xfBreathow Hostname</pre>	//10sec timeout .codesys.com',			
2 (3 4 5 6 7 8 9 10 11	<pre>instResolveHostname(xfxcutefIxefFixeFixes)veFixeFixeFixeFixeFixeFixeFixeFixeFixeFix</pre>	//lose timeout .codesys.com', /IPudlIPAddress 155447556);			
2 (3 4 5 6 7 8 9 10 11 (12 4	<pre>instResolveBostname(xExecuteErester * AkesolveErester xExecuteErester * AkesolveErester xDoneErester * AkesolveErester xDoneErester * AkesolveErester itfIEAddrease = witDinterface, ItfAaynCProperty := CoMaync } } TheIPYouAreLookingFor[33547955] := my Exername Exerna</pre>	//lose timeout .codesys.com', /IPudilFAddrese[35507550];			
2 (3 4 5 6 7 8 9 10 11 (12 4 7 12 4	<pre>instResolveHostname(xfxecutefreeTest: keesolvefreeTest: xdfileedrefreeTest: keesolvefreeTest; xdootnameverty: isfnayne iffEddirear: wilfInterfree; iffAgorProperty := fnAyne } ThePFyoukeLookingFor[33557955] := m; seruman set Configuration X</pre>	//10sec timeout .codesys.com', /IPudiIPAddress_33507500 ;			
2 4 3 4 5 6 7 8 9 10 11 1 12 1 7 Task Grou	<pre>instResolveHostname(xExecuteExest; escolveFixe; xExecuteExest; escolveFixe; loop() xDoneExest; escolveGixe; loop() xDoneExest; escolveGixe; loop() xDoneExest; escolveGixe; loop() xExest; escolveGixe; escolveGi</pre>	//lose timeout .codesys.com', /IPudiIPAddress ISSERCED; tes CPULoad	Aurona Cuda Tan (a)	May Code Tare (ur)	Min. Curls Time

(Compare this also with the screeshot at the end of this article)

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

🕡 ResolveHostname.project - CODESYS							
File Edit View Project Build Online	Debug To	ools Window Help	BACNet				
🎦 🖆 🛃 🎒 🗠 🗠 🏅 🖿 🛍 🗙 🗚	🕼 🚵 📋	川 別 別 街 簡 管	• 🖞 🛅 /	Application (Devi	ice: PLC Logic] 🝷 👒 👒) 🗉 🔏 (Çi çi çi çi)	8
Devices	→ ∓ X	💮 Device 🗙					
ResolveHostname ResolveHostname Device (CODESYS Control Win V3 x64)	•	Communication Settings	s	ican Network	ateway 🔹 Device 👻		
⊨- ⊕ PLC Logic ⊨- Application		Applications		\sim			
Library Manager		Backup and Restore					
🖻 🎉 Task Configuration 🖃 🎲 MainTask (IEC-Tasks)		Files		·		Cathorne	•••
PLC_PRG		Log			Gateway-1	Gateway	KERNTHPC (active)
		PLC Settings			IP-Address: localhost	,	Press ENTER to set active path
		PLC Shell			Port:		
		Users and Groups			1217		
		Access Rights					

• Open the *Library Manager* and add the following libraries: *Net Base Services*

Device 🎢 Library Manager 🗙		
🛨 Add Library 🗙 Delete Library 🛛 🕋 Properties 💿 Details 🛛 🔄 Placeholders 🖉 Library Reposit	ory 🕕 Icon Leg	gend 🗎 Summary
Name	Namespace	Effective Version
🕮 💼 3SLicense = 3SLicense, 3.5.17.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.17.0
🗄 💼 BreakpointLogging = Breakpoint Logging Functions, 3.5.17.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.17.0
🗄 😳 CAA Device Diagnosis = CAA Device Diagnosis, 3.5.17.0 (CAA Technical Workgroup)	DED	3.5.17.0
🗑 🕒 🕒 IoStandard = IoStandard, 3.5.17.0 (System)	IoStandard	3.5.17.0
🗄 🛅 NetBaseSrv = Net Base Services, 3.5.17.0 (3S - Smart Software Solutions GmbH)	NBS	3.5.17.0 0
🗈 Standard = Standard, 3.5.17.0 (System)	Standard	3.5.17.0

• Edit the PLC_PRG POU as follows:

Declaration

VAR	
fbAsyncProperty	: NBS.AsyncProperty := (tnTaskName := 'itfAsyncTask',
usiTaskPrio := 75, udiTas	skInterval := 1000);
fbResolveHostname	: NBS.ResolveHostname := (itfAsyncProperty :=
<pre>fbAsyncProperty);</pre>	
xResolve	: BOOL;
ipAddress	NBS.IPv4Address;
itfIpAddress	: NBS.IIPAddress := ipAddress;
END_VAR	

¹⁰⁴ http://www.codesys.com

/ 🖷 D	Device 👔 Library Manager												
Device	Device.Application.PLC_PRG												
Expression Type Val							Value	Prepared value	Address	Commer	nt		
🗉 🤌 ft	bAsyncPro	perty			NBS.Asy	ncProperty							
🗉 🔷 ft	bResolveH	ostname			NBS.Res	olveHostname							
🔅 🔅	Resolve				BOOL		FALSE						
🖃 < ip	oAddress				NBS.IPv	łAddress							
*	👂 ipAddre	ss			STRING	15)	'213.182.18.92'						
4	👂 _udiIPA	ddress			UDINT		3585479260			host byte	order !!		
4	🌢 _xValid				BOOL		TRUE						
• •	SUPER'				IIPAddre	ss							
🗄 🔌 it	fIpAddres	;			NBS.IIP	ddress	16#0000022F85.						
<pre>bResolveHostname(xExecuteFALSE):= xResolveFALSE),</pre>													
E 6	• IF fk	Resolve	Hostname.xDone	FALSE THEN									
I Task Configuration X													
Task Grou	ups Monit	or Variat	ole Usage System E	vents Propert	ies CPU Load								
Task	Sta	tus	IEC-Cycle Count	Cycle Count	Configure	Last Cycle Time (µs)	Average Cycle Time (µs)	Max. Cycle Time (us)	Min. Cycle Time (us)	Jitter (µs)	Min. Jitter (µs)	Max. Jitter (µs)	Core
MainT	Task Val	id	3332	3332	20 ms	3	3	30	1	60	-285	1893	1

• Load the project to the controller and start it. Set The variable *xResolve* to *TRUE*.

4.3.19.24 TCP: Example for Server and Client

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.



4.3.19.24.1 As of SP16:

 Open the Library Manager and add the following libraries: Net Base Services SysTypes2 interfaces SysTimeRtc Util

👔 Device 🎢 Library Manager 🗙		
🛃 Add Library 🗙 Delete Library 🛛 😁 Properties 🙃 Details 🛛 💷 Placeholders 🖉 Library Reposit	ory 🕕 Icon Leg	end 🗎 Summary
Name	Namespace	Effective Version
🖫 🕒 3SLicense = 3SLicense, 3.5.17.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.17.0
🖹 🕒 BreakpointLogging = Breakpoint Logging Functions, 3.5.17.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.17.0
🖳 😰 CAA Device Diagnosis = CAA Device Diagnosis, 3.5.17.0 (CAA Technical Workgroup)	DED	3.5.17.0
🖹 🗈 🕒 IoStandard = IoStandard, 3.5.17.0 (System)	IoStandard	3.5.17.0
🗈 🕒 NetBaseSrv = Net Base Services, 3.5.17.0 (3S - Smart Software Solutions GmbH)	NBS	3.5.17.0
🗄 🕒 Standard = Standard, 3.5.17.0 (System)	Standard	3.5.17.0
🗈 🛅 SysTimeRtc = SysTimeRtc, 3.5.17.0 (System)	SysTimeRtc	3.5.17.0
SysTypes2 Interfaces, * (System)	SysTypes	3.5.17.0
⊞ 🚹 Util = Util, 3.5. 17.0 (System)	Util	3.5.17.0

• Create a global variable list named gvlSetting and define the following variables:

Declaration

```
VAR_GLOBAL CONSTANT
   gc_wMaxTelegram : INT := 15;
   gc_uiPort : UINT := 50001;
END_VAR
VAR_GLOBAL
   gc_stIpAddr : String(19) := '192.168.99.109';
END_VAR
```

```
Adapt the IP address and the port to your system.
```

• Create a new POU named TcpServer and adapt it as follows:

Declaration

```
VAR CONSTANT
    c_wMaxTelegram : INT := 15;
END_VAR
VAR
    ipAddress : NBS.IPv4Address;
    fbTcpConnection : NBS.TCP_Connection;
    fbTcpServer : NBS.TCP_Server;
    fbTcpRead : NBS.TCP_Read;
    fbTcpWrite : NBS.TCP_Write;
    abyRx : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;
    abyTx : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;
    iIndex : INT;
    xRead : BOOL := TRUE;
    xWrite : BOOL := TRUE;
    xAckTelegram : BOOL;
    xBlockAck : BOOL;
    udiRead : DINT;
END_VAR
```

```
IF fbTcpRead.xReady THEN
    IF (fbTcpRead.udiCount = (gvlSetting.gc_wMaxTelegram + 1)) THEN
        IF ((abyRx[0] = 87) AND (abyRx[1] = 68) AND (abyRx[2] = 58) AND (abyRx[3]
= 32)) THEN // 'WD: ' = Watchdog-Telegram
            FOR iIndex := 0 TO c_wMaxTelegram DO
                abyTx[iIndex] := 0;
            END_FOR
            // 'ACK: ' = Acknowledge-Telegram
            abyTx[0] := 65;
            abyTx[1] := 67;
            abyTx[2] := 75;
            abyTx[3] := 58;
            abyTx[4] := 32;
            // Receive-Counter
            abyTx[5] := abyRx[4];
            abyTx[6] := abyRx[5];
            abyTx[7] := abyRx[6];
            abyTx[8] := abyRx[7];
            xWrite := TRUE;
        END_IF
        xWrite := TRUE;
   END IF
ELSIF fbTcpRead.xError THEN
   xRead := FALSE;
END IF
fbTcpWrite(xExecute := xWrite AND NOT xBlockAck, itfConnection :=
fbTcpConnection, udiSize := SIZEOF(abyTx), pData := ADR(abyTx), udiTimeOut := 0)
IF fbTcpWrite.xDone OR fbTcpWrite.xError THEN
    xWrite := FALSE;
END_IF
```

• Create a new POU named TcpClient and adapt it as follows:

Declaration

```
VAR CONSTANT
    c_tInterval : TIME := T#1S;
c_udiInterval : UDINT := 3 * TIME_TO_UDINT(c_tInterval)/1000;
END_VAR
VAR
    ipAddress : NBS.IPv4Address;
    fbTcpClient
                     : NBS.TCP_Client;
                   : NBS.TCP_Read;
: NBS.TCP_Write;
    fbTcpRead
    fbTcpWrite
    abyTx
                      : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;
    abyRx
                      : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;
                      : BLINK := (TIMELOW := c_tInterval, TIMEHIGH :=
    fbBlink
c_tInterval);
    xBlink
                      : BOOL; // Memory of the last state of PLC_PRG.fbBlink
    udiVal
                    : UDINT;
    pudiVal
iIndex
                     : POINTER TO BYTE;
                     : INT;
    xConnect
                     : BOOL;
                      : BOOL;
    xRead
    xMissingAck : BOOL;
udiResult : UDINT;
udiLastAck : UDINT;
udiNow : UDINT;
    udiRead : UDINT;
eRErrorID : NBS.ERROR;
eWErrorID : NBS.ERROR;
END_VAR
```

```
IF NOT fbTcpClient.xActive THEN
    ipAddress.SetInitialValue(ipAddress := gvlSetting.gc_stIpAddr);
END_IF
fbTcpClient(xEnable := xConnect, itfIPAddress := ipAddress, uiPort :=
gvlSetting.gc_uiPort, udiTimeOut := 0);
fbBlink(ENABLE := TRUE);
IF (fbBlink.OUT AND (xBlink <> fbBlink.OUT) ) THEN
    udiVal := udiVal + 1;
    FOR iIndex := 0 TO gvlSetting.gc_wMaxTelegram DO
```

```
abyTx[iIndex] := 0;
    END_FOR
    // 'WD: ' = Watchdog-Telegram
    abyTx[0] := 87;
    abyTx[1] := 68;
    abyTx[2] := 58;
    abyTx[3] := 32;
    // Counter
    pudiVal := ADR(udiVal);
    abyTx[4] := pudiVal^;
    pudiVal := pudiVal + 1;
    abyTx[5] := pudiVal^;
    pudiVal := pudiVal + 1;
    abyTx[6] := pudiVal^;
    pudiVal := pudiVal + 1;
    abyTx[7] := pudiVal^;
    fbTcpWrite(xExecute := xConnect,itfConnection := fbTcpClient.itfConnection,
udiTimeOut := 0, udiSize := SIZEOF(abyTx), pData := ADR(abyTx));
ELSE
    fbTcpWrite(xExecute := FALSE);
END IF
xBlink := fbBlink.OUT;
fbTcpRead(xEnable := xRead AND xConnect, itfConnection :=
fbTcpClient.itfConnection, udiSize := SIZEOF(abyRx), pData := ADR(abyRx),
udiCount => udiRead);
IF fbTcpRead.xReady THEN
    IF (fbTcpRead.udiCount = (gvlSetting.gc_wMaxTelegram + 1)) THEN
        IF ((abyRx[0] = 65) AND (abyRx[1] = 67) AND (abyRx[2] = 75) AND (abyRx[3]
= 58) AND (abyRx[4] = 32)) THEN // 'WD: ' = Watchdog-Telegram
            udiLastAck := SysTimeRtc.SysTimeRtcGet(udiResult);
        END_IF
   END_IF
ELSIF fbTcpRead.xError THEN
    fbTcpRead(xEnable := FALSE);
END_IF
IF NOT fbTcpClient.xActive AND NOT fbTcpClient.xBusy AND NOT fbTcpClient.xDone
THEN
    xConnect := TRUE;
ELSIF fbTcpClient.xDone THEN
    xConnect := FALSE;
END_IF
udiNow := SysTimeRtc.SysTimeRtcGet(udiResult);
IF (udiNow > (udiLastAck + c_udiInterval)) THEN
    xMissingAck := TRUE;
ELSE
    xMissingAck := FALSE;
END_IF
```

• Adapt the POU *PLC_PRG* as follows:

Implementation

TcpServer();
TcpClient();

• Load the project to the controller and start it. Set The variable *TcpClient.xRead* to *TRUE*.



4.3.19.24.2 Up to SP16:

 Open the Library Manager and add the following libraries: CAA Net Base Services SysTypes2 interfaces SysTimeRtc Util

Add library X Delete library Properties Details Placeholders Library repository							
Name		2 E 12 0					
Solicense = Solicense, S.S. 12.0 (SS - Smart Solicitons GmbH) BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (SS - Smart Software Solutions GmbH)	BPLog	3.5.5.0					
≝ ∞∞ CAA NetBaseSrv = CAA Net Base Services, 3.5.13.0 (CAA Technical Workgroup)	NBS	3.5.13.0					
🖩 👓 🖅 IoStandard = IoStandard, 3.5. 13.0 (System)	IoStandard	3.5.13.0					
Standard = Standard, 3.5.13.0 (System)	Standard	3.5.13.0					
sysTimeRtc = SysTimeRtc, 3.5.5.0 (System)	SysTimeRtc	3.5.5.0					
····→ ™ SysTypes2 Interfaces, * (System)	SysTypes	3.5.4.0					

• Create a global variable named *gvlSetting*. Adapt *gvlSetting* as follows:

Declaration

```
{attribute 'qualified_only'}
VAR_GLOBAL CONSTANT
   gc_uiPort : UINT := 50001;
   gc_stIpAddr : NBS.IP_ADDR := (sAddr := '192.168.99.74');
   gc_wMaxTelegram : INT := 15; // Length o the telegram
END_VAR
```

Adapt the IP address and the port to your system.

• Create a new POU named *TcpServer* and adapt it as follows:

Declaration

```
VAR CONSTANT
    c_wMaxTelegram : INT := 15;
END_VAR
VAR
fbTcpConnection : NBS.TCP_Connection;
fbTcpServer : NBS.TCP_Server;
fbTcpRead : NBS.TCP_Read;
fbTcpWrite : NBS.TCP_Write;
abyRx : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;
abyTx : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;
iIndex : INT;
xRead : BOOL := TRUE;
xWrite : BOOL := TRUE;
xAckTelegram : BOOL;
xBlockAck : BOOL;
udiRead : UDINT;
END_VAR
```

```
fbTcpServer(xEnable := TRUE, ipAddr := gvlSetting.gc_stIpAddr, uiPort :=
gvlSetting.gc_uiPort);
fbTcpConnection(xEnable := fbTcpServer.xBusy, hServer := fbTcpServer.hServer);
fbTcpRead(xEnable := fbTcpConnection.xActive, hConnection :=
fbTcpConnection.hConnection, szSize := SIZEOF(abyRx), pData := ADR(abyRx),
szCount => udiRead);
IF fbTcpRead.xReady THEN
    IF (fbTcpRead.szCount = (gvlSetting.gc_wMaxTelegram + 1)) THEN
        IF ((abyRx[0] = 87) AND (abyRx[1] = 68) AND (abyRx[2] = 58) AND (abyRx[3]
= 32)) THEN // 'WD: ' = Watchdog-Telegram
            FOR iIndex := 0 TO c_wMaxTelegram DO
                abyTx[iIndex] := 0;
            END_FOR
            // 'ACK: ' = Acknowledge-Telegram
            abyTx[0] := 65;
            abyTx[1] := 67;
            abyTx[2] := 75;
            abyTx[3] := 58;
            abyTx[4] := 32;
            // Receive-Counter
            abyTx[5] := abyRx[4];
            abyTx[6] := abyRx[5];
            abyTx[7] := abyRx[6];
            abyTx[8] := abyRx[7];
            xWrite := TRUE;
        END_IF
        xWrite := TRUE;
    END_IF
ELSIF fbTcpRead.xError THEN
    xRead := FALSE;
END_IF
fbTcpWrite(xExecute := xWrite AND NOT xBlockAck, hConnection :=
fbTcpConnection.hConnection, szSize := SIZEOF(abyTx), pData := ADR(abyTx),
udiTimeOut := 0);
IF fbTcpWrite.xDone OR fbTcpWrite.xError THEN
    xWrite := FALSE;
END_IF
```

• Create a new POU named *TcpClient* and adapt it as follows:

Declaration

```
VAR CONSTANT
   c_tInterval : TIME := T#1S;
    c_udiInterval : UDINT := 3 * TIME_TO_UDINT(c_tInterval)/1000;
END_VAR
VAR
    fbTcpClient : NBS.TCP_Client;
    fbTcpRead : NBS.TCP_Read;
fbTcpWrite : NBS.TCP_Write;
               : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;
    abyTx
    abyRx
                 : ARRAY [0..gvlSetting.gc_wMaxTelegram] OF BYTE;
                  : BLINK := (TIMELOW := c_tInterval, TIMEHIGH :=
    fbBlink
c_tInterval);
    xBlink
                 : BOOL; // Memory of the last state of PLC_PRG.fbBlink
    udiVal
                 : UDINT;
   udiVal : UDINT;
pudiVal : POINTER TO BYTE;
iIndex : INT;
xConnect : BOOL;
            : BOOL := TRUE;
    xRead
    xMissingAck : BOOL;
    udiResult : UDINT;
    udiLastAck : UDINT;
             : UDINT;
    udiNow
    udiRead
                 : UDINT;
END_VAR
```

```
fbTcpClient(xEnable := xConnect, ipAddr := gvlSetting.gc_stIpAddr, uiPort :=
gvlSetting.gc_uiPort, udiTimeOut := 0);
fbBlink(ENABLE := TRUE);
IF (fbBlink.OUT AND (xBlink <> fbBlink.OUT) ) THEN
    udiVal := udiVal + 1;
    FOR iIndex := 0 TO gvlSetting.gc_wMaxTelegram DO
        abyTx[iIndex] := 0;
    END_FOR
    // 'WD: ' = Watchdog-Telegram
    abyTx[0] := 87;
    abyTx[1] := 68;
    abyTx[2] := 58;
    abyTx[3] := 32;
    // Counter
    pudiVal := ADR(udiVal);
    abyTx[4] := pudiVal^;
    pudiVal := pudiVal + 1;
    abyTx[5] := pudiVal^;
    pudiVal := pudiVal + 1;
    abyTx[6] := pudiVal^;
    pudiVal := pudiVal + 1;
    abyTx[7] := pudiVal^;
    fbTcpWrite(xExecute := xConnect,hConnection := fbTcpClient.hConnection,
udiTimeOut := 0, szSize := SIZEOF(abyTx), pData := ADR(abyTx));
ELSE
    fbTcpWrite(xExecute := FALSE);
END_IF
xBlink := fbBlink.OUT;
fbTcpRead(xEnable := xRead AND xConnect, hConnection := fbTcpClient.hConnection,
szSize := SIZEOF(abyRx), pData := ADR(abyRx), szCount => udiRead);
IF fbTcpRead.xReady THEN
    IF (fbTcpRead.szCount = (gvlSetting.gc_wMaxTelegram + 1)) THEN
        IF ((abyRx[0] = 65) AND (abyRx[1] = 67) AND (abyRx[2] = 75) AND (abyRx[3]
 = 58) AND (abyRx[4] = 32)) THEN // 'WD: ' = Watchdog-Telegram
            udiLastAck := SysTimeRtc.SysTimeRtcGet(udiResult);
        END_IF
   END_IF
ELSIF fbTcpRead.xError THEN
    fbTcpRead(xEnable := FALSE);
END_IF
IF NOT fbTcpClient.xActive AND NOT fbTcpClient.xBusy AND NOT fbTcpClient.xDone
THFN
   xConnect := TRUE;
ELSIF fbTcpClient.xDone THEN
   xConnect := FALSE;
END_IF
udiNow := SysTimeRtc.SysTimeRtcGet(udiResult);
IF (udiNow > (udiLastAck + c_udiInterval)) THEN
   xMissingAck := TRUE;
ELSE
    xMissingAck := FALSE;
END_IF
```

• Adapt the POU PLC_PRG as follows:

Implementation

```
TcpServer();
TcpClient();
```

• Load the project to the controller and start it.



4.3.19.25 TCP: Pinging a Network Address

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

PingCommand.project* - CODESYS	_		-
Ele Edit View Project Build Online [Debug Tools Window Help		
Devices 👻 🕂 🗙	👔 Device 🗙 👔 Library Manag	er	
PingCommand PingCommand Device (CODESYS Control Win V3)	Communication Settings	Scan network Deteway + Device +	
E-E PLC Logic	Applications		
Library Manager	Backup and Restore		
□ 🖓 Task Configuration	Files	Gateway	· O
···면비 PLC_PRG	Log	Gateway-1	[0301.A000.034A] (active)
	PLC Settings	IP-Address: localhost	Device Name: KERNTPC
	PLC Shell	Port: 1217	Device Address: 0301.A000.034A
	Users and Groups		Target ID: 0000 0001
	Access Rights		Target Type:
	Task Deployment		Target Vendor:
	Status		35 - Smart Software Solutions GmbH
	Information		3.5.12.0

• Open the Library Manager and add the SysSocket library.

💮 Device 🏾 🎢 Library Manager 🗙	~~						
🔁 Add library 🔀 Delete library 🛛 😁 Properties 💿 Details 🛛 🔄 Placeholders 🛛 🎁 Library repository							
Name	Namespace	Effective version					
ⓓ	_3S_LICENSE	3.5.12.0					
🗑 📲 📾 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0					
🖬 📲 IoStandard = IoStandard, 3.5.10.0 (System)	IoStandard	3.5.10.0					
·····································	Standard	3.5.12.0					
i SysSocket = SysSocket, 3.5.12.0 (System)	SysSocket	3.5.12.0					

• Adapt the POU *PLC_PRG* as follows:

Declaration

VAR			
хC	CheckDevice	:	BOOL;
sI	pAddr	:	STRING := '192.168.99.198';
ud	liReplayAverage	e:	UDINT;
tT	imeout	:	TIME := T#50MS; // Must greather than 25 ms => minimum
in the	e function!!		
хC	Connected	:	BOOL;
END_VA	\R		

Implementierung

```
IF xCheckDevice THEN
    xCheckDevice := FALSE;
    IF SysSocket.SysSockPing(szIPAddress := sIpAddr, ulTimeout :=
TIME_TO_UDINT(tTimeout), pulReplyTime := ADR(udiReplayAverage)) = 0 THEN
    xConnected := TRUE;
    ELSE
        xConnected := FALSE;
    END_IF
END_IF
```

Depending on the operating system, the function has different minimum runtimes. Therefore, timeout times of 25 milliseconds or more should be used. In this way, it is appropriate to outsource the function call in a separate task whenever possible.

• Start the project and set the *xCheckDevice* variable to *TRUE*.



4.3.19.26 UDP: Example for Server and Client

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

UdpServerClient.project* - CODESYS		· · ·		
<u>File Edit View Project Build Online Debug To</u>	ols <u>W</u> indow <u>H</u> elp			
🎦 📽 🖬 🚭 🗠 여 🐰 🖻 🖻 🗙 🖬 😘	🐴 🌿 📾 🏪 - 📑 🔠 😂 (행 🕞 📲 💐 🕼 🕫 🖆 🕫 🖇 🛛 🏚 🛛 🛒 🚍	172	
Devices 🗸 🗸 🛪 🗙	Device X			
UdpServerClient Device (CODESYS Control Win V3) Device (CODESYS Control Win V3)	Communication Settings	Scan network 🕽 sateway 👻 🛛 Device 👻		
Application	Applications			
Library Manager	Backup and Restore			
Task Configuration	Files			
- S MainTask		Gatew	way U	
	Log	Gateway-1	 [0301.A000.034A] (active) 	
	PLC Settings	IP-Address: localhost	Device Name: KERNTPC	
	PLC Shell	Port	Device Address:	
	Users and Groups	1217	0301.A000.034A	
	Access Rights		Target ID: 0000 0001	
	Task Deployment		Target Type: 4096	
	Status		Target Vendor: CODESYS GmbH	
	Information		Target Version: 3.5.12.20	

4.3.19.26.1 As of SP17:

 Open the Library Manager and add the following libraries: Net Base Services StringUtils

👔 Device 🏾 🎢 Library Manager 🗙		
🗄 Add Library 🗙 Delete Library 🛛 😁 Properties 🙃 Details 🛛 🚐 Placeholders 🛛 🎁 Library Reposi	tory 🕕 Icon Leg	gend 📋 Summary
Name	Namespace	Effective Version
🗑 – 🚹 3SLicense = 3SLicense, 3.5.17.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.17.0
🕒 💼 BreakpointLogging = Breakpoint Logging Functions, 3.5. 17.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.17.0
🗄 🖸 CAA Device Diagnosis = CAA Device Diagnosis, 3.5.17.0 (CAA Technical Workgroup)	DED	3.5.17.0
🕒 💼 IoStandard = IoStandard, 3.5.17.0 (System)	IoStandard	3.5.17.0
MetBaseSrv = Net Base Services, 3.5.17.0 (3S - Smart Software Solutions GmbH)	NBS	3.5.17.0
- 💼 Standard = Standard, 3.5.17.0 (System)	Standard	3.5.17.0
🗄 🛅 StringUtils = StringUtils, 3.5.17.0 (System)	Stu	3.5.17.0
🗄 🛅 SysMem = SysMem, 3.5.17.0 (System)	SysMem	3.5.17.0

• Create a global variable list named gvlSettings gvlSettings and define the following variables:

```
{attribute 'qualified_only'}
VAR_GLOBAL
    // !!! Make sure that the firewall does not block these ports !!!
    uiPort : UINT := 50000; // Port for the sender => receiver will set to
uiPort + 1
    sIPAddres : STRING(19) := '192.168.99.109';
END_VAR
```

• Add a POU to the project and name is UdpClient.



Adapt the POU UdpClient as follows:

Declaration

```
VAR
fbPeerClient : NBS.UDP_Peer;
ipAddress : NBS.IPv4Address;
xPeerActiv : BOOL := TRUE;
fbSend : NBS.UDP_Send;
xSend : BOOL;
sSendMsg : STRING(255) := 'Hello World';
END_VAR
```

```
IF xPeerActiv AND NOT fbPeerClient.xBusy THEN
   ipAddress.SetInitialValue(ipAddress := gvlSettings.sIPAddres);
    fbPeerClient(xEnable := TRUE,
                itfIPAddress := ipAddress,
                uiPort := gvlSettings.uiPort + 1);
END_IF
fbPeerClient();
fbSend(xExecute := xSend AND fbPeerClient.xBusy,
                    itfPeer := fbPeerClient,
                    itfIPAddress := ipAddress,
                    uiPort := gvlSettings.uiPort,
                    pData := ADR(sSendMsg),
                    udiSize := DINT_TO_UDINT(Stu.StrLenA(ADR(sSendMsg))));
IF xSend THEN
    xSend := FALSE;
END_IF
```

```
    Adapt the POU PLC_PRG as follows:
```

Declaration

VAR			
	fbPeerServer	:	NBS.UDP_Peer;
	ipAddress	:	NBS.IPv4Address;
	fbReceive	:	NBS.UDP_Receive;
	xPeerActiv	:	BOOL := TRUE;
	xRead abyReceive	:	BOOL; ARRAY [0255] OF BYTE;
END.	sLastValidReceive udiIndex _VAR	::	<pre>STRING(255); UDINT;</pre>

```
IF xPeerActiv AND NOT fbPeerServer.xBusy THEN
    ipAddress.SetInitialValue(ipAddress := gvlSettings.sIPAddres);
    fbPeerServer(xEnable := TRUE,
                    itfIPAddress := ipAddress,
                    uiPort := gvlSettings.uiPort);
END_IF
fbPeerServer();
fbReceive(xEnable := fbPeerServer.xBusy, itfPeer := fbPeerServer, pData :=
ADR(abyReceive), udiSize := SIZEOF(abyReceive));
IF fbReceive.udiCount > 0 THEN
    IF fbReceive.udiCount < SIZEOF(sLastValidReceive) THEN</pre>
        SysMem.SysMemCpy(pDest := ADR(sLastValidReceive), pSrc :=
ADR(abyReceive), udiCount := fbReceive.udiCount);
        // Set End of String
        sLastValidReceive[fbReceive.udiCount] := 0;
   END_IF
END_IF
UdpClient();
```

- News
 •
 Deck
 De
- Start the project and set the *xSend* variable to *TRUE*.

4.3.19.26.2 Up to SP16:

• Open the *Library Manager* and add the *Network* library.

Device Library Manager X Device Manager Manager X Device Manager Manager X Device Manager Manager Manager X Device Manager M									
Name	Namespace	Effective version							
SLicense = 3SLicense, 3.5.12.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.12.0							
🛱 🚥 🚾 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0							
🕮 🚥 🚥 IoStandard = IoStandard, 3.5.10.0 (System)	IoStandard	3.5.10.0							
🕮 👓 Metwork, 3.5.7.0 (3S - Smart Software Solutions GmbH)	Network	3.5.7.0							
Standard = Standard, 3.5.12.0 (System)	Standard	3.5.12.0							

• Add a global variable list to the project and define the following variables:

```
{attribute 'qualified_only'}
VAR_GLOBAL
    sIpAddr : NBS.IP_ADDR := (sAddr := '192.168.99.74'); // Change to own
IP-Address
    // !!! Make sure that the firewall does not block these ports !!!
    uiPort : UINT := 8181; // Port for the sender => receiver will set to
uiPort + 1
END_VAR
```

• Add a POU to the project and name is UdpClient.



• Adapt the POU UdpClient as follows:

Declaration

VAR			
	fbPeerClient	:	NBS.UDP_Peer;
	fbReceive	:	NBS.UDP_Receive;
	sRcvMsg	:	STRING;
END	_VAR		

• Adapt the POU *PLC_PRG* as follows:

Declaration

Г

VAR		
fbPeerServer	:	NBS.UDP_Peer;
fbSend	:	NBS.UDP_Send;
xSend	:	BOOL;
sSendMsg	:	STRING := 'Hello World';
END_VAR		

• Start the project and set the *xSend* variable to *TRUE*.

UdpServerClient.project - CODESYS		-	-	-					_	_	-
Ele Edit View Project Build Online Debug Io	ools <u>Wi</u> ndow Help										
≌⊯∎ @ !♡☆メ№危× #な	6 45 [ab] 4 % % % [6] [1 0 • C] [ê	≝i≪ % } = ≪	Ç∃ 93 63 4	= \$ ¢ \$ =	11						
Devices 💌 🤻 🗱	🖌 👔 Device 🎁 Library Manager 🥁	GVL UdpClient	×			-	PLC_PRG X				
B-D UdpServerClient	Device_Application.UdpClient						Device_Application.PLC_PRG				
 Signature (connected) (CODESYS Control Win V3 Signature (connected) (CODESYS Control Win V3 	B) Expression	Туре	Value	Prepared value	Address	3	Expression	Type	Value	Prepared value	Address
Application [run]	* # fbPeerClient	NBS.UDP_Peer					* Ø fbPeerServer	NBS.UDP_Peer			
GVL	# Ø fbReceive	NBS.UDP_Receive					Image:	NBS.UDP_Send			
- 🎁 Library Manager	sRcvMsg	STRING	'Hello World'				xSend	BOOL	FALSE		
PLC_PRG (PRG)							sSendMsg	STRING	'Hello World'		
ें की मधनाक े की सट,मब	<pre>/</pre>	TRUE, ipAdd = GVL. PeerClient.hPeet = fDFerClient.hPeet = SIBOU (ARCWHeg Hee) = ADR (ARCWHeg Hee)	rt[phddr, uiB	loru <u>sisz</u> := GVL.u WA.gc_hINVALID),	iPort <u>8181</u>	<pre>+ 1);</pre>	<pre></pre>	= - TRUE, ipAddr := SE ↔ CAA.qc_hII ×SendFAXES := fbFeetEvrer.1 ipAddr, V.uiPort_SHI + := AJR(sSendHsg	GVL.stlpAddr, t svALIE 0 hPeer 19492424 1, ng Helo Wol > Jelo Wol > 1;	11Fort[111] := GVL] THEM ,	.uiPort 111 ;

4.3.19.27 Which IOs are updated in which Tasks / Fieldbus Bus Cycle Tasks (EN)

4.3.19.27.1 Updating the IEC data:

Basically, the input data used for each IEC task is read before each task and the written outputs are transmitted to the IO driver.

The implementation in the IO driver is decisive for the further transport of the IO data and thus responsible for the time frame and at which the actual transmission to the respective bus system takes place.

4.3.19.27.2 Bus Cycle Task

- · Can be set globally for the PLC (under PLC settings) for all fieldbuses.
- Can be changed for some fieldbuses independently of the global setting.

The bus cycle task is automatically the task with the shortest cycle time. This setting is also used when unspecified, so if no bus cycle task is defined. The messages are normally sent on the bus in this task.



Further, tasks only copy the IO data from an internal buffer, which is only exchanged with the real hardware in the bus cycle task.

4.3.19.27.3 Bus Cycle Task for fieldbuses (OLH links):

- EtherCAT¹⁰⁵
- EtherNet/IP ¹⁰⁶
- PROFIBUS DP¹⁰⁷
- Modbus¹⁰⁸
- J1939¹⁰⁹
- CANopen:
 - CANopenManager¹¹⁰

¹⁰⁵ https://help.codesys.com/webapp/_ecat_buscycle_task;product=core_EtherCAT_Configuration_Editor;version=4.1.0.0
106 https://help.codesys.com/webapp/_enic_buscycle_task;product=core_EthernetIP_Configuration_Editor;version=4.1.0.0
107 https://help.codesys.com/webapp/_pbdp_buscycle_task;product=core_ProfibusDP_Configuration_Editor;version=3.5.17.0
108 https://help.codesys.com/webapp/_mod_buscycle_task;product=core_modbus_configuration_editor;version=3.5.16.0#general-information

¹⁰⁹ https://help.codesys.com/webapp/_can_j1939_buscycle_task;product=core_canbus_configuration_editor;version=3.5.17.0 110 https://help.codesys.com/webapp/

_can_canopen_manager_buscycle_task;product=core_canbus_configuration_editor;version=3.5.17.0

- CANopen Device¹¹¹
- SercosIII¹¹²

4.3.19.27.4 Task Deployment

To view the used IO channels and the update in the different tasks, there is the "Task Deployment" window in the PLC (OLH: Tab 'Task deployment'¹¹³)

In this window, the IO channels, the set bus cycle task and the use of the channels are displayed. Here, it is also possible to detect multiple use of outputs in several tasks.

If an output is written in several tasks, the state is undefined, as it can be overwritten in each case!

When the same inputs are used in several tasks, it can happen that the input changes during the processing of a task, if the task is interrupted by a task with higher priority and thus the process image is read in again!

Remedy: Copy the input variables into variables at the beginning of the IEC task, and then only work with the local variables in the further code.

Therefore, using the same inputs and outputs in several tasks does not make sense and can lead to unforeseen states in some cases!

See also

- Our Codesys Online Help (OLH)¹¹⁴ Website
- Basic information to the Codesys Development System (Codesys Homepage)¹¹⁵
- OLH¹¹⁶: The Online-help introduction for the Codesys Development System (IDE)¹¹⁷
- OLH¹¹⁸: Tab 'Task deployment'¹¹⁹
- OLH¹²⁰: Tab 'PLC Settings'¹²¹

4.3.19.28 Working with Strings More Than 255 Characters

All functions are also included in the standard library. However, these are restricted to strings less than 255 characters due to historical limitations.

- 112 https://help.codesys.com/webapp/_serc_buscycle_task;product=core_SercosIII_Configuration_Editor;version=3.5.17.0
- 113 https://help.codesys.com/webapp/_cds_edt_device_task_deployment;product=codesys
- 114 https://help.codesys.com/

118 https://help.codesys.com/

120 https://help.codesys.com/

¹¹¹ https://help.codesys.com/webapp/

_can_canopen_local_device_buscycle_task;product=core_canbus_configuration_editor;version=3.5.17.0

¹¹⁵ https://www.codesys.com/products/codesys-engineering/development-system.html

¹¹⁶ https://help.codesys.com/

¹¹⁷ https://help.codesys.com/webapp/_cds_f_development_system_introduction;product=codesys;version=3.5.17.0

¹¹⁹ https://help.codesys.com/webapp/_cds_edt_device_task_deployment;product=codesys

¹²¹ https://help.codesys.com/webapp/_cds_edt_device_plc_settings;product=codesys
Twenty years ago, it was simply inconceivable to work with longer strings on a control system.

In order to maintain backwards compatibility, a separate *StringUtilities* library had to be created for these applications.

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.



• Open the Library Manager and add the StringUtils library.

Device Ibrary Manager 🗙			
鞈 Add library 🗙 Delete library 🛛 😁 Properties 🔋 Details 🛛 💷 Placeholders 🛛 🎁 Library reposi	tory		
Name	Namespace	Effective version	
SLicense = 3SLicense, 3.5.12.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.12.0	
🕮 🚥 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0	
🗓 🗝 🚾 IoStandard = IoStandard, 3.5.10.0 (System)	IoStandard	3.5.10.0	
Standard = Standard, 3.5.12.0 (System)	Standard	3.5.12.0	
StringUtils = StringUtils, 3.5.11.0 (System)	Stu	3.5.11.0	

• Adapt the POU PLC_PRG as follows:

Declaration

VAR			
sT	Го	:	<pre>STRING(300) := 'Hello ';</pre>
ps	sTo	:	POINTER TO BYTE := ADR(sTo);
sF	From	:	<pre>STRING(7) := 'World';</pre>
ps	sFrom	:	POINTER TO BYTE := ADR(sFrom);
×F	Result	:	BOOL;
xC	Concat	:	BOOL;
di	iLen	:	DINT;
di	iCopied	:	DINT;
sC	Copied	:	STRING(300);
iF	Find	:	INT;
sN	Mid	:	STRING;
ui	iMid	:	UINT;
sl	Jpperlext	:	SIRING := 'This Text will be converted';
ps	stUpper	:	POINTER TO BYTE := ADR(sUpperText);
xl	Jpper	:	BOOL;
×L	Lower	:	BOOL;
s	Cmp1	:	STRING := 'Hello':
s	Cmp2	:	STRING := 'HEllo':
xC	CaseCmp	:	BOOL:
xC	CaseCmpEnd	:	BOOL:
xC	CaseCmpStart	:	BOOL:
iF	Result	:	INT:
xC	CmpEnd	:	BOOL;
xC	CmpStart	:	BOOL;
	·		
s	Delete	:	<pre>STRING := '2 characters will delete';</pre>
хD	Delete	:	BOOL;
- 7	r:		CTDING.
SI 	1 r 1 m T	:	STRING;
	ורות דיבי	:	BOOL;
		:	BOOL;
	IrimStart	:	BUUL;
s	OldReplace	:	<pre>STRING(50) := 'Hello World';</pre>
sF	Replace	:	STRING := ', good morning CODESYS-';
×F	Replace	:	BOOL;
END_VA	AR		

Implementation

Γ

```
diLen := STu.StrLenA(pstData := psTo);
IF xConcat THEN
        xConcat := FALSE;
        IF NOT Stu.StrIsNullOrEmptyA(pstData := psFrom) THEN
```

```
// Create an string with more than 255 characters
        //Concat-Function
        WHILE Stu.StrConcatA(pstFrom := psFrom,pstTo := psTo, SIZEOF(sTo) - 8)
DO
        // Dummy line
        END_WHILE
        // Copy the whole string
        diCopied := Stu.StrCpyA(pBuffer := ADR(sCopied), SIZEOF(sCopied),
pStr := psTo);
        sFrom := 'CODESYS';
        Stu.StrConcatA(pstFrom := psFrom,pstTo := psTo, SIZEOF(sTo));
        // Find position of the first substring
        iFind := Stu.StrFindA(pst1 := psTo, pst2 := psFrom, uiSearchStart := 1);
        // Copy just a part of the string
        Stu.StrMidA(pst := psTo, uiInputBufferSize := SIZEOF(sTo), iLength := 5,
iPosition := iFind , pstResult := ADR(sMid), uiResultBufferSize := uiMid);
    END_IF
END_IF
If xUpper Then
    xUpper := False;
    Stu.StrToUpperA(pString := pstUpper);
END IF
IF xLower THEN
   xLower := FALSE;
    Stu.StrToLowerA(pString := pstUpper);
END_IF
IF xCaseCmp THEN
    xCaseCmp := FALSE;
    // caseinsensitive comparison !!
   iResult := Stu.StrCaseCmpA(pByte1 := ADR(sCmp1), pByte2 := ADR(sCmp2));
END_IF
IF xCaseCmpEnd THEN
   xCaseCmpEnd := FALSE;
    // sCmp1 := 'Hello'; sCmp2 := 'll0';
   //=> Retdurns "0" = for equal
   iResult := Stu.StrCaseCmpEndA(pString := ADR(sCmp1), pSuffix := ADR(sCmp2));
END_IF
IF xCaseCmpStart THEN
    xCaseCmpStart := FALSE;
    // sCmp1 := 'Hello'; sCmp2 := 'HELL';
    //=> Retdurns "0" = for equal
   iResult := Stu.StrCaseCmpStartA(pString := ADR(sCmp1), pPrefix :=
ADR(sCmp2));
END_IF
IF xCmpEnd THEN
```

```
xCmpEnd := FALSE;
    // sCmp1 := 'Hello'; sCmp2 := 'll0';
    //=> Retdurns "-1" = for not equal
    iResult := Stu.StrCmpEndA(pString := ADR(sCmp1), pSuffix := ADR(sCmp2));
END_IF
IF xCmpStart THEN
   xCmpStart := FALSE;
   // sCmp1 := 'Hello'; sCmp2 := 'HELL';
   //=> Retdurns "-1" = for not equal
   iResult := Stu.StrCmpStartA(pString := ADR(sCmp1), pPrefix := ADR(sCmp2));
END_IF
IF xDelete THEN
    xDelete := FALSE;
    Stu.StrDeleteA(pby := ADR(sDelete), iLength := 2, iPosition := 4);
END_IF
IF xTrim THEN
   xTrim := FALSE;
    sTrim := ' The spaces will removed ';
   Stu.StrTrimA(pString := ADR(sTrim)); // Space character on the left and the
right side will removed
END IF
IF xTrimEnd THEN
    xTrimEnd := FALSE;
    sTrim := ' The spaces will removed ';
    Stu.StrTrimEndA(pString := ADR(sTrim)); // Only the space character on the
right side will removed
END_IF
IF xTrimStart THEN
   xTrimStart := FALSE;
    sTrim := ' The spaces will removed
                                          ۰;
    Stu.StrTrimStartA(pString := ADR(sTrim)); // Only the space character on the
left side will removed
END_IF
IF xReplace THEN
   xReplace := FALSE;
   Stu.StrReplaceA(
   pstInput:= ADR(sOldReplace),
   uiInputBufferSize:= SIZEOF(sOldReplace),
    pstReplaceWith:= ADR(sReplace),
   iLengthInput:= DINT_TO_INT(Stu.StrLenA(ADR(sOldReplace))),
   iLengthToReplace:= 1, // 1 = only the space character will replaced; 2 = "
W" will replaced
    iLengthToReplaceWith:= DINT_TO_INT(Stu.StrLenA(ADR(sReplace))),
   iPosition:= 6);
END_IF
```

• Start the project and, for example, set a breakpoint in line 11 of the POU *PLC_PRG*. Then step through the single function samples.

ingUtils.project* - CODESYS		
gdt yew groject guid grine g C D AB ⊂ ⊂ I Ban P.X	λαρι (μαλαγιμόν) Δλ. Δ. Αλλιμικός τως δεματικής τη Ε.Π. (Ε. Δ. τη Ε.Π. 1997) τη τη 2.1 το Ε.Π. (Ε. Γ. Ε. Β. 1997)	
s • • ×	C Centor D Uberry Manager R St. C. RBG X	
StringUlta	Device Application FCC_FRG	
RCLopic RCLopic Rollingic Rection (halt on break) Dray Manager Process(ma) Rection (mail) Rect		
₩URCPAG		
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	<pre>11 # #freei = Concentry: 12 # Stational agents an entro(</pre>	
	<pre>1/ (by yim s part of the string</pre>	
	a zi IT shipe IZEZ Tena 2 zi Shipe IZEZ Tena 2 si Shipe IZEZ - Faleri	
	2 Bit Charles and Charles a	
	<pre>rie schemeErie = rLN2r; 99.00_rLN2reinderschigdring = perDpert[SectionErie]); 10 ED_12 11</pre>	
	8 20 8 17 # 50+000100 1996 20 8 #50+0000000 1997 105517 4 // commissionsettive comparison //	
	35 iBesuit := Stu.StrCaseCmpA(pDytel := ADR(sCmp1 +ew), pDytel := ADR(sCmp1 +ew));	

4.3.20 Setup and Installation - FAQ (EN)

4.3.20.1 (V3.5) 'Standalone' Gateway Installation: The CODESYS Edge Gateway

4.3.20.1.1 Installing via the Store

You can obtain a 'standalone' installation of the CODESYS Gateway (V3.5) via the following Store Link:

>> CODESYS Edge Gateway for Windows¹²²

The CODESYS Edge Gateway can be operated on a controller or on a stand-alone device in the local network. It also allows the CODESYS Automation Server, and all clients that establish a connection via the Automation Server (so CODESYS and the Webvisu/Browser) full access to all services provided by the runtime system via the communication interfaces.

The Edge Gateway works on all runtime systems with CODESYS Control V3.5 SP10 or higher. A current IDE version is only needed if the the gateway must be configurated (f.e. CODESYS Automation Server¹²³).

¹²² https://store.codesys.com/en/codesys-edge-gateway-for-windows.html 123 https://store.codesys.com/en/codesys-automation-server.html

4.3.20.1.2 Installing via the standard CODESYS Setup

The solution would require a **2 GB download** of the CODESYS Setup, just to install the gateway component. This should only be considered as an emergency solution, and is not recommended (especially since there is the standalone installation from the store)!

- In this case, the gateway understandably 'matches' the CODESYS IDE, in addition to which the gateway is registered automatically as a service.
- To do this, select only the gateway in the setup during the installation:

InstallShield Wizard	X
Select Features Select the features setup will install.	
Select the features you want to install, and deselect the	features you do not want to install. Description
CODESYS Converter CODESYS Gateway CODESYS OPC Server 3 CODESYS Gateway V2.3 CODESYS Control Win V3	CODESYS Gateway Next generation gateway (communication layer) for CODESYS V3
0.00 MB of space required on the C drive 230745.46 MB available on the C drive InstallShield	
< Bad	Next > Cancel

• You can see in the services, or by the symbol in the task bar, whether the gateway is running (if it was installed via CODESYS):

2 Dienste			a trac	_			(in	
Datei Aktion Ans	heht ?							
(+ +) 🗔 🖸 🖸	X 🔿 🚺 🔟 🕨 💷 🖬 🕨 👘							
😩 Dienste (Lokal)	Diensin (Lokal)							
	CODESYS Gateway V3 Version	Name	Beschreibung	Status	Starttyp	Anmelden als		
	3.5.8.40	CNG-Schlüsselisolation	Der CNG-Schlüsselisolationsdienst wird im I SA-Prozess gehostet. Der Dienst stellt eine Schlüs-	Gestartet	Manuell	Lokales System		
		CodeMater Runtime Server	CodeMater Runtime Server	Gentertet	Automa	Lokaler System		
	Den Dienst beenden	CoDeSus Control Rty Service	Helper Service for CoDeSus Control Bty	00010-101	Manuell	Lokales System		
	Den Dienst neu starten	CODESYS Control Win V3 Version 3.5.7.50	SoftPLC based on a Windows service that is running in user mode		Manuell	Lokales System		-
		CODESYS Gateway V3 Version 3.5.8.40	Gateway Server as a Windows service to connect to CODESYS programmable devices	Gestartet	Automa	Lokales System		
	Beschreibung:	CODESYS ServiceControl Version 3.5.8.10	Service for starting/stopping the services of CODESYS Control Win V3 and CODESYS Gateway	Gestartet	Automa	Lokales System		
	to connect to CODESVS	COM+-Ereignissystem	Unterstützt den Systemereignis-Benachrichtigungsdienst (SENS), mit dem Ereignisse automa	Gestartet	Automa	Lokaler Dienst		
	programmable devices	COM+-Systemanwendung	Verwaltet die Komponentenkonfiguration und -überwachung von COM+-basierten Kompon		Manuell	Lokales System		
		Computerbrowser	Führt eine aktuelle Liste der Computer im Netzwerk und gibt diese an als Browser fungierend		Manuell	Lokales System		
		DCOM-Server-Prozessstart	Mit dem DCOMLAUNCH-Dienst werden COM- und DCOM-Server in Objektaktivierungsanfo	Gestartet	Automa	Lokales System		
		C Defragmentierung	Stellt Funktionen zur Datenträgerfragmentierung bereit.		Manuell	Lokales System		
		🔍 Designs	Stellt die Designverwaltung zur Verfügung.	Gestartet	Automa	Lokales System		
		C DHCP-Client	Registriert und aktualisiert IP-Adressen und DNS-Einträge für diesen Computer. Dieser Comp	Gestartet	Automa	Lokaler Dienst		
		🔍 Diagnosediensthost	Der Diagnosediensthost wird vom Diagnoserichtliniendienst als Host für Diagnosen verwend	Gestartet	Manuell	Lokaler Dienst		
		Diagnoserichtliniendienst	Der Diagnoserichtliniendienst ermöglicht die Problemerkennung, Problembehandlung und	Gestartet	Automa	Lokaler Dienst		
		Caling Diagnosesystemhost	Der Diagnosesystemhost wird vom Diagnoserichtliniendienst als Host für Diagnosen verwend		Manuell	Lokales System		
		C Diagnostics Tracking Service	The Diagnostics Tracking Service enables data collection about functional issues in Windows	Gestartet	Automa	Lokales System		
		Distributed Transaction Coordinator	Koordiniert Transaktionen, die sich über mindestens zwei Ressourcenverwaltungen wie Daten		Manuell	Netzwerkdienst		
		Client DNS-Client	Der DNS-Clientdienst (dnscache) speichert DNS-Namen (Domain Name System) zwischen u	Gestartet	Automa	Networkdienst		_
		C Druckwarteschlange	Lädt Dateien zum späteren Drucken in den Arbeitsspeicher.	Gestarte	-	CONTRACT	Colore C. T. Consiler	
		ENI Server				COULSIE OF	Gateway SysTray(running	23
	a ma (manual	Se Enumeratordienst für tragbare Geräte	Erzwingt Gruppenrichtlinien für Wechsel-Massenspeichergeräte. Ermöglicht Anwendungen	Gestarte	LinkList	- 🛩 🗊 🖝 🖸 🖩	14:10 06:06:2016	
	Erweitert / Standard /						00002010	

4.3.20.1.3 Starting manually from the folder "GatewayPLC"

- Copy the folder C:\Program Files (x86)\3S CODESYS\GatewayPLC from an existing CODESYS installation to any desired directory on the computer on which the gateway is to run.
- Create a shortcut to the file GatewayService.exe and add the destination in the properties with the option "-d" (<Path>GatewayPLC\CODESYSControlService.exe -d).
 The gateway thus starts in debug mode and displays the log outputs. You can also add this shortcut to the Windows start menu.

4.3.20.2 CODESYS Installer logs (EN)

In case of CODESYS Installer problems check the Windows Event Viewer.

• How to add a custom view for 'AP Installer' in the Windows Event Viewer:

Event Viewer		-	Create Custom V	íew .	
File Action View Help			Filter XML		
 Event View (Local) Cutom View Cutom View Applications and Services Logs Subscriptions 	Custom Views Name Administrativ	Actions Custom Views Create Custom View Import Custom View View Refresh Help Administrative Events Open Properties Help	Logged: Event level: By log By source Includes/Exclu exclude criteria Task category: Keywords: User: Computer(s):	Any time Critical Warning Verbose Error Information Event logs: Application Event sources: AP Installer Ø AP Installer Ø Application Event IDs: Entee AppAgent hype a minus sign Application Application Flore Application Flore Application Flore Application Flore Application Management Application Server-Applications Application Server-Applications Application-Sperience ApplicationExperience ApplicationExperience ApplicationExperience ApplicationExperience ApplicationExperience ApplicationExperience	 ✓ ▲ as. To ■ ✓ ■ ✓
	< >>		-	AppModel-MessagingDataModel	Cancel

• Save the new filter:

Event Viewer		- 🗆 X
File Action View Help		
🗢 🄿 🖄 🖬 🚺 🖬		
Event Viewer (Local)	Custom Views Actions	
> Windows Logs	Save Filter to Custom View X	•
 Applications and Services Lo Subscriptions 	Name CODESYS Installer	iew
	Description Installer logs	ïew
	Select where to save the Custom view:	•
	- Event Viewer OK	
	i Custom Views Cancel	
	New Folder	-
l		
Creates a new view.		

4.3.20.3 CODESYS Setup configuration via command line (EN)

We provide different setups to install the development system CODESYS, the runtime system CODESYS Control Win and some more products.

This table shows which setup includes which products.

Setup	CODESYS (32) ¹⁾	CODESYS 64 ¹⁾	Packages ³⁾	Converter	Gateway (32)	Gateway (64)	Control Win (32)	Control Win 64	OPC DA	AEConfigurator	Gateway V2.3	IMH
CODESYS	х		x	3)	х		х		4)	4)	4)	
CODESYS 64		х	х			х		х				
CODESYS Gateway					х							
CODESYS Control Win					х		х					
CODESYS Control Win 64						х		х				
CODESYS HMI					х							х
CODESYS OPC DA Server					x				x	х	х	

1) CODESYS Development System.

- 2) From 3.5.15.0 CODESYS Converter no longer part of the installation.
- 3) From 3.5.16.0: Subfeature SoftMotion installs package CODESYS SoftMotion, and Subfeature CASConnector installs packages CODESYS Automation Server Connector. From 3.5.17.0: Various Packages are installed.

4) From 3.5.17.0 OPC DA, AEConfigurator and Gateway V2.3 no longer part of the CODESYS installation.

4.3.20.3.1 Customizing

Each installation can be configured with some command line parameters. You can combine arguments like in this example:

```
<Setupname>.exe /s /v/qn /v"INSTALLDIR=\"C:\Program Files (x86)\My Destination\"" /v" /l*v c:\test.log"
```

4.3.20.3.1.1 Silent Mode

To run an installation silently, use the following command line:

```
<Setupname>.exe /s /v/qn
```

4.3.20.3.1.2 Log file

To create a log file during installation, you can add this command line parameter

```
/v"/l*v c:\test.log"
```

4.3.20.3.1.3 Uninstall

To uninstall, use the following command line:

<Setupname>.exe /x

4.3.20.3.1.4 Destination folder

To set a different default destination folder for the installations, add a value for INSTALLDIR. Please use the appropriate Program Files folder for x86 and for x64 setups.

Sample for a 32-bit setup

/v"INSTALLDIR=\"C:\Program Files (x86)\My Destination\""

Sample for a 64-bit setup

/v"INSTALLDIR=\"C:\Program Files\My Destination\""

4.3.20.4 Downloading missing libraries

👔 Library Manager 🗙					
🏝 Add library 🔀 Delete library 🕼 Properties 👼 Details	Download missing libraries	Placeholders	🛍 Library repository		
Name	A	Namesp	ace Effective version		
■-** 3SLicense = 3SLicense, 3.5.10.0 (3S - Smart Software So	_3S_LIC	ENSE 3.5.10.0			
🚯 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH) BPLog 3.5.5.0					
IoStandard = IoStandard, 3.5.10.0 (System)		IoStanda	rd 3.5.10.0		
Standard = Standard, 3.5.9.0 (System)		Standard	3.5.9.0		

4.3.20.4.1 Problem

After executing the menu command *Download missing libraries*, the status "Download failed" is displayed for the selected libraries.

4.3.20.4.2 Solution

4.3.20.4.2.1 Possibility 1: It is not a CODESYS library

In general, we only make our **own** libraries available via this download mechanism. Libraries from other manufacturers must be hosted by these manufacturers themselves on a server. The link must be entered in the options in order to gain access to this server:

Optic	ons		X
۵	CFC Editor		Library download
• •	CoDeSys 2.3 converter		Download servers:
	Declaration editor		https://store.codesys.com/CODESYSLibs/
1	Device description download		(Enter new download server here)
1	Device editor		
Ð	FBD, LD and IL editor		
1	International Settings		
Î	Libraries	Ξ	
l 🛍	Library download		
1	Load and Save		
	PLCopenXML		
2	Proxy Settings		
1	Refactoring		
E	SFC editor		
1	SmartCoding		
=	Store		
	Syntax Highlighting		(standard download server: https://store.codesys.com/CODESYSLibs/)
	Text editor	-	
•	111	•	
			<u>O</u> K <u>C</u> ancel

If you are missing libraries that were not made by us, please contact the manufacturer.

4.3.20.4.2.2 Possibility 2: Missing or incorrect proxy settings

If you access the Internet via a proxy, you must make the following settings:

Windows control panel:

Automatisc	he Konfiguration	
Die automa setzen. De der manue	itische Konfiguration kann die manuellen Einstellungen außer Kra aktivieren Sie die automatische Konfiguration, um die Verwendu len Einstellungen sicherzustellen.	ng
🔽 Einstelly	ingen automatisch erkennen	
Skript f	ir automatische Konfiguration verwenden	
<u>A</u> dresse		
Proxyserve Proxyserve VPN- oc	r rver für LAN verwenden (diese Einstellungen gelten nicht für Ier Einwählverbindungen)	
Adresse:	Port: 80 Erweitert	
	kyserver für lokale Adressen umgehen	
Pro:		

CODESYS:

Options	1 June	4	Standard	33.84	X
 Declaration editor Device description downloa 	nd	Proxy Settings			
Device editor		Use proxy settings			
FBD, LD and IL editor					
International Settings		Enter proxy credentials			
Libraries					
Library download					
൙ Load and Save					
PLCopenXML					
🙎 Proxy Settings					
Refactoring	=				
SFC editor					
SmartCoding					
≓ Store					
Syntax Highlighting					
Text editor					
Visualization					
Visualization styles					
Visualization user managem	ent 👻				
•					
			OK	Can	cel
			Ξň		

The button Enter proxy access data... becomes active if the settings have been made beforehand in Windows.

4.3.20.5 Installation of several CODESYS versions

The architecture of CODESYS makes it possible to install several versions of CODESYS in parallel on one computer, even in the same directory.

This description provides recommendations regarding what needs to be observed as well as the advantages and disadvantages of the different variants.

4.3.20.5.1 Versions < SP13:

4.3.20.5.1.1 Installation in the same directory

Several CODESYS versions can be installed at the same time in the same directory.

In doing so the following must be observed (recommendation):

- Never install an older CODESYS version over a newer one
- Never uninstall an older CODESYS version

This can lead to unexpected effects.

Advantage

• All previously installed packages will be available automatically after the installation of the new version.

Disadvantage

- Only the newest version of CODESYS Control Win V3 and the gateway are available
- Problems with the installation are difficult to solve without affecting the other installations

4.3.20.5.1.2 Installation in different directories

You can also install each version in a separate directory.

Advantage

- · You can uninstall each version separately
- Gateway and CODESYS Control Win V3 exist separately for each version

Disadvantage

• All previously installed packages are not automatically included in the new CODESYS version and must be installed again.

4.3.20.5.2 Versions >= SP13:

4.3.20.5.2.1 Installation in different directories (mandatory)

An empty directory is required for the installation.

Advantage

- · You can uninstall each version separately
- Gateway and CODESYS Control Win V3 exist separately for each version

Disadvantage

• None

It is possible to import packages from the previous installation during the first start-up of the new version.

Please note that in all cases the repositories are commonly used by all CODESYS versions. This can lead to unexpected behavior

- when creating new projects
- when diverting library placeholders
- when referencing libraries with "latest" (which one should never do, except for interface and use case libraries)

4.3.20.5.2.2 For advanced users

Versions can also be installed completely separately (including the repositories) Proceed as follows to do this:

- 1. Make sure that the directory <C:\ProgramData\CODESYS> does not exist, or rename it if necessary.
- 2. Install the first CODESYS version.
- 3. Move the directory <C:\ProgramData\CODESYS> to a new directory, which will be unique to this CODESYS version (e.g. to <C:\ProgramData\CODESYS <CODESYS version>>)

Please note, a non-admin user has no write access to <C:\Program Files\> So it is recommended that the newly created directory is instead stored in <C:\Program Data\>

- 4. Open the file <**CODESYS_install_dir>\CODESYS\Settings\RepositoryLocations.ini** and replace all paths to <**C:\ProgramData\CODESYS>** by the new path (search/replace).
- 5. Proceed in exactly the same way with the second CODESYS installation.

4.3.20.6 Library documentation (LibDoc.exe) (>=SP17) (EN)

With SP17, the library documentation has been outsourced to a separate package.

You must install it via the Codesys Installer:

CODESYS Installer					-		
				Add	l Installat	ion	
DESYS 3.5 SP17 (64 bit)							
^{stion} Program Files\Codesys\Release\3_5_17_00\CODESYS						Bro	w
nnel for Setups BASES							
nel for AddOns eases							
ddOns							
ddOns loc	۹		Install File	Export Config	Impor	t Conf	ig
idOns loc Installed Browse Updates	Q		Install File	Export Config	Impor	t Conf	ig
dd ons loc Installed Browse Updates #CODESYS Library Documentation Support	Q	CODESYS	Install File	Export Config umentation Sup	Impor oport	t Conf	ig
ioc Installed Browse Updates CODESYS Library Documentation Support	Q	ECODESYS	Install File	Export Config umentation Sup	Impor oport	t Conf	ig
ddons loc Installed Browse Updates t CODESYS Library Documentation Support	Q	# CODESYS Version: Description	Install File Library Doct 4.0.0 This package e to CODESYS.	Export Config umentation Sup	Impor oport 	t Conf Insta nentat	ig dl
ddone loc Installed Browse Updates #CODESYS Library Documentation Support	Q	CODESYS Version: Description Vendor:	Install File Library Doct 4.0.0 This package a to CODESYS. CODESYS Gmb	Export Config umentation Sup adds support for libr	Impor oport ary docur	t Conf Insta	ig II ic
ddone loo Installed Browse Updates #CODESYS Library Documentation Support	Q	t CODESYS Version: Description Vendor: Copyright:	Library Doct 4.0.0 This package a to CODESYS. CODESYS Gmb Copyright (c) 2 GmbH	Export Config umentation Sup adds support for libr add 017-2021 CODESYS	Impor oport ary docur	t Conf Insta nentat	ig II io

If the package is missing, you get the following message:



4.3.21 Signing Packages (EN)

Packages can be signed, but this is not obligatory. If an unsigned package is installed, the user has to confirm that he accepts this package:

Allow unsigned and self-signed packages

You can sign your package with the PackageManagerCLI.

The relevant command line arguments are:

--signPackage="<package file path>" --pkcs12Path="<PKCS#12 file path>" --pkcs12Passwd="<PKCS#12 password>"

This will sign a package file with the certificate and private key from the PKCS#12 file.

Optionally, you can use --tsaTimestampServiceUrl="<url>" to specify a TSA timestamp service to add a timestamp to the signature. If you do not do this, the users of your package will not be able to verify your package, once the certificate expires.

USAGE:

```
PackageManagerCLI <option> <option> <...>
--profile="<profile name>"
The version profile to be used for execution of this process.
(Mandatory.)
--culture="<culture name>"
The language to be used for execution of this process, e.g. "de-DE".
If not specified, the operation system language is used.
(Optional.)
--install="<package file path>"
Installs the package at the specified file path.
 (Cannot be used together with --uninstall, --uninstallAll or --create
PackageArchive.)
--uninstall="<package GUID>;<version>"
Uninstalls the package with the specified GUID and version.
(Cannot be used together with --install, --uninstallAll or --createPackageArchive.)
--uninstallAll
Uninstalls all packages.
```

```
(Cannot be used together with --install, --uninstall or --createPackageArchive.)
--components="<component ID>;<component ID>;<...>"
Selects the specified component IDs for installation. The other components
in the same package will not be installed, unless required by the selected
components.
You can also specify "typical" or "complete" instead of the ID list.
If this option is not specified, "complete" is assumed by default.
 (Optional, can only be used together with --install.)
--targetProfiles="<profile>;<profile>;<...>"
Selects the specified target profiles for installation.
If this option is not specified, all target profiles are selected by default.
 (Optional, can only be used together with --install.)
--targetDirectories="<ID>=<path>;<ID>=<path>;<...>"
Sets the specified target directories. Each target directory is identified
by its target directory ID (an integer value).
 (Optional, can only be used together with --install.)
--createPackageArchive="<package folder path>;<target filename>"
Creates a package archive out of a folder. "packae folder path" has to be an
existing folder.
(Cannot be used together with --install, --uninstall or --uninstallAll.)
--signPackage="<package file path>" --pkcs12Path="<PKCS#12 file path>" --
pkcs12Passwd="<PKCS#12 password>"
Signes a package file with the certificate and private key from the PKCS#12 file.
 (Optional, can use --tsaTimestampServiceUrl="<url>" to specifiy a TSA timestamp
service to add a timestamp to the signature.)
--validateSignature="<package file path>"
Validate the signature of a package file.
--verbose
Display detailed progress information on the console.
```

4.3.22 The CODESYS Integrated Development Environment (IDE) - FAQ (EN)

4.3.22.1 CODESYS communication: Limited data size between PLC and CODESYS IDE (EN)

4.3.22.1.1 Limitation

In a (f.e. WireShark) recording between the communication of a PLC and the CODESYS IDE (Integrated Development Environment),

it can be seen, that this communication is limited to a maximum data size per packet of 550 bytes.

Example:

3979 0.000037 192.168.1.120	1740 192.168.1.9	1740 UDP	550 1740 → 1740 Len=508
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4.3.22.1.2 Background:

The data size is fixed, because the CODESYS routing protocol for communication must not only take UDP communication into account, but must also be able to support CAN, serial and/or USB connections. In addition, any communication must be considered which refer to devices without a memory, for which 512 bytes + header would be already too large, in order to be able to guarantee error-free communication.

This maximum data size cannot be changed or increased.

4.3.22.1.3 Related articles

How to open an Example Project¹²⁴

4.3.22.2 Coloring the background of the search function, color for the marking of the search results

4.3.22.2.1 Up to SP13:

Open the menu *Tools* \rightarrow *Options* and set the desired color for the text editor.

¹²⁴ https://faq.codesys.com/display/CDSFAQ/How+to+open+an+Example+Project

3 END_VAR	Find Find what: Match case Match whole the Search:	PRO word Entir	GRAM	> Find Next Find Al sions Replace >> Close		
 Declaration Device dest FBD, LD an International Library down Lubrary down Lubrary down Proxy Setti Refactoring SFC editor SmartCoding Store Syntax Higi Text editor Visualzation Visualzation Visualzation 	editor editor cription download or di L editor al Settings vinload ave the ditor di la ditor di la di constructione di la di constructione di la di constructione di constructio		Text editor Editina Text area Marain M Highlight current line: Matching brackets: End of line markers: Wrap guide: Caret color: Selection color: Folded line foreground: Folded line background: Folded line background:	Ionitorina ElightYellow • Black • Teal • SteelBlue • Black • ElightSteelBlue • Teal • LightGray • e to edit): AaBbC cXx:	Inactive:	DeepPink MediumViolett DeepPink HotPink LavenderBlusf PaleVioletRed Crimson Pink LightPink V

4.3.22.2.2 As of SP14:

Open C:\Program Files\CODESYS 3.5.15.30\CODESYS\Themes

The color scheme is available as a JSON file in the "themes" folder.

You could edit or copy it and paste it with a new name in the folder mentioned.

They are then read in again and you could also exchange them.



4.3.22.3 Expired certificates message for encrypted communication (EN)

4.3.22.3.1 Problem and error description

CODESYS ×

The connected PLC uses certificates which are about to expire. Would you like to open the security screen for details?

Remember decision

Yes No

The following error message is displayed in the Codesys IDE:

Under the 'Security Screen', existing certificates are displayed which will expire in the near future:



This warning of an expiring certificate is intended to alert the user in a timely manner so that the user still has enough time to react.

4.3.22.3.2 Solution

4.3.22.3.2.1 The following solutions are available if you want to resolve this message and the reason behind it:

1. create a certificate with longer duration (e.g. 365 days) with the security agent. Then the message comes at least more rarely.

2. if it is ensured that no encrypted online communication is used (of course not recommended from a security point of view), the communication policy can be set to "no encryption".

This means that the Runtime no longer allows encrypted online communication and does not have to maintain a valid certificate.

Accordingly, the LZS no longer generates the corresponding certificate.

After setting the communication policy to "no encryption", any existing certificates may have to be deleted so that they can no longer expire.

4.3.22.3.3 In the event of a transitional period

For the assurance of a further possible communication, the Runtime automatically generates a new selfsigned certificate as soon as the certificate has expired. Otherwise, one would indeed lock oneself out if only encrypted communication is allowed.

When logging in, a message appears that the controller uses an unknown certificate and the question whether the user wants to trust it.

All other certificates are not renewed automatically and must be created and renewed according to the user's specifications.

4.3.22.3.4 Configurations settings

! Not recommended from a security point of view !

If the following setting is written into the CODESYSControl.cfg before the first start, then the Runtime does not even initially generate a certificate for the encrypted communication and the user does not have to delete any:

[CmpSecureChannel] SECURITY.CommunicationMode=ONLY_PLAIN

Setting the communication policy to "no encryption" uses the same setting:

(Change Communication Policy	
	Communication	
	Current policy	No encryption
	New policy	No encryption
		The device does not support encrypted communication.

4.3.22.4 How to open an Example Project (EN)

When you open an example project, it may have been created in an older or newer version, with missing plugins, or with a different type of PLC to the one you are using.

These instructions list the general procedure which can be translated to most any CODESYS example project.

4.3.22.4.1 Quick step-by-step guide

The steps can be summarised as:

- 1. Ensure IDE version is newer than the one the project was created in
- 2. Obtain all addons used in the project
- 3. Change the PLC to the one you are using
- 4. Update and or obtain device descriptions
- 5. Update project environment
- 6. Obtain missing libraries
- 7. Compile and download
- 8. Fix any outstanding errors

4.3.22.4.2 Detailed step-by-step guide

Detailing each step:

1. 4.3.22.4.2.1 IDE version must be newer than the one it was created in

- a. The simplest would be to always use the latest CODESYS Development System from Store¹²⁵
- b. If you must use an older version, for example you use a custom IDE from an OEM, then you must first open the example in the later version, and use the Save As... dialog to save it as an older version.



2. 4.3.22.4.2.2 Obtain all addons used in the project

- Projects saved from SP17 contain a list of installed addons. When you open these projects, you are prompted to install any missing addons.
 CODESYS GmbH addons can be downloaded through CODESYS installer.
 Third party addons will have to be obtained from elsewhere and installed seperately.
- b. For projects prior to SP17, no such information is available in the project itself. Much of the inbuilt features from SP16's development system has been modularised into addons, so it is wise to start with a complete installation if you want to open an example which was created in a version prior to SP17 (see Modularisation of the Development System - Installation Issues (>= SP17)¹²⁶).
- c. Any additional Addons should be clearly documented by the example, and may need to be obtained from the Manufacturer or Addon Developer.

¹²⁵ https://store.codesys.com/codesys.html

¹²⁶ https://faq.codesys.com/pages/viewpage.action?pageId=105152517

3. 4.3.22.4.2.3 Change the PLC to the one you are using

- a. So now you have opened the project, but perhaps see lots of compile errors and maybe red circles in your device tree.
- b. For some reason, a prompt appears to update some things in your project But you should cancel this dialog, at least until you have selected the right PLC.
- c. Open the devices view (Alt + 0), right click the PLC device, and update it to the PLC you are actually going to run the example on.

4. 4.3.22.4.2.4 Update and or obtain device descriptions

- a. Some device descriptions contain a clear update path, and can be updated via the Project Environment dialog in the next step.
 But some you will need to right click in the device tree and choose 'Update Device' and see if you have a newer version of that same device.
- b. If you still have some devices which you do not have device description for, you will see a red circle with a question mark as the icon for this object.
 Right click them and select "Download Missing Device Description".
 If this fails to download, you will have to seek out a device description from the manufacturer of the device.

5. 4.3.22.4.2.5 Update project environment

- a. By now, all of your device version should be correct.
- b. Using the Menu command Project > Project Environment, click the "Set All to Newest" Button and hit OK.

Note

OSCAT BASIC is one specific exception here:

The older version was v3.31, but the newer version currently downloadable from store is v3.3.4.0.

The version 3.31 is offered as an upgrade, but the version from store.codesys.com¹²⁷ should be used.

6. 4.3.22.4.2.6 Obtain missing libraries

 a. Open the Library Manager of every application and hit the download missing libraries button (this button is only shown if you have missing libraries).
 Prior to SP16, you may have to hit this several times to download the dependencies of your newly downloaded libraries.

¹²⁷ http://store.codesys.com

- b. Additionally, do this for the Library Manager in the POUs view.
- c. Any other missing libraries, you may have to track them down from their manufacturer. Note

Libraries marked as version (*) mean to always use the newest version. These cannot be automatically downloaded, if you should find yourself without this library. This is because the download mechanism requires a specific version. In most cases, this library can be obtained from the latest version of the CODESYS Development System.

- 7. 4.3.22.4.2.7 Compile and download
 - a. Press the F11 to compile the code.
 - b. Login to your PLC to download it and run.

8. 4.3.22.4.2.8 fix any outstanding errors

a. In rare circumstances there will be some outstanding build errors.
 Try to solve them yourself.
 When asking for help, it is helpful to refer to this FAQ and at what point you could not proceed.

4.3.22.4.3 Related articles

4.3.22.5 Online or Offline created 'boot application' have different sizes (EN)

The size of the boot application is different depending on the creation method whether done 'Online' or 'Offline'.

The difference in boot application size results from the following assumptions:

When created offline, a default value for the communication's buffer is applied which may make the boot app larger than one created online.

4.3.22.5.1 Explanation

4.3.22.5.1.1 Offline generation:

- When a boot application is created offline, a default value for the communication's buffer is applied.
- Since a determination with the PLC does not take place, a size is selected, which permits it in 99,9% of all cases these then with the Downloaden without problems to transfer to be able.

• This takes into account that there are also controllers which are equipped accordingly "small".

4.3.22.5.1.2 Online generation:

- Depending on the hardware/PLC is determined/negotiated how large the buffer for downloading is, and the boot project is divided into correspondingly large/fewer parts.
- This also requires less communication's headers and fewer splits in the code.
- This can be noticeable with significantly less code in the boot application and therefore accordingly be smaller in size.

See also

- Our Codesys Online Help (OLH)¹²⁸ Website
- How to Generating Boot Applications¹²⁹
- Settings for Application 'Properties' 'Boot Application'¹³⁰

4.3.22.6 Report problems and error messages to CODESYS (EN)

Check the FAQ's and the FORGE page before reporting bugs.

Please check if the occurring errors have already been covered in the FAQs¹³¹ or if they have already been recorded and answered under our Forge community¹³². In addition, it can be helpful to inform you about the use of function blocks, methods and addons (provided by Codesys) in the Codesys Online Help (OLH)¹³³. Here, the usage, configuration, description and possible applications as well as general problems, that users might expect to encounter, are described.

Any error reports to CODESYS should contain the following information:

- · The versions used within the Project,
- · A clear error description of what exactly occurs and when,
- The exact 'Steps to repeat' (STR) to reproduce the error,
- If possible, a **simplified**/reduced **example project** (as a full project archive) with the necessary scope/ extent to be able to reproduce the error in it.

¹²⁸ https://help.codesys.com/

 $^{129\,}https://help.codesys.com/webapp/_cds_creating_a_boot_application; product=codesys; version=3.5.17.0$

¹³⁰ https://help.codesys.com/webapp/_cds_dlg_properties_boot_application;product=codesys;version=3.5.17.0

¹³¹ https://faq.codesys.com/

¹³² https://forge.codesys.com/neighborhood

¹³³ https://www.helpme-codesys.com/

Besides the above information, the principle of "more is better" applies here. In order to be able to answer inquiries efficiently, it is useful to provide all relevant data

-> see also which additional data is helpful and why¹³⁴:

- All used version information (see page 0)
- How to reproduce the problem (see page 0)
- Additional related specifics (see page 0)
- Reporting a runtime exception (see page 0)
- Reporting an exception in the Codesys Visualization (see page 0)

See also the section for which additional data is helpful and why (see page 0):

The more detailed information the support team receives, the faster the problem can be isolated, and a resolution provided.

Whom to contact for vendor-specific errors?

• The errors must be reproducible under the Codesys IDE and with a CODESYS SL PLC.

- For errors that occur only under other IDEs, which were modified via brand labelling, the corresponding manufacturer must be contacted.

- For errors that occur only with a device manufacturer's PLC, the device manufacturer should be contacted to pursue a resolution for the problem.

- This is due to the fact that other IDE manufacturers use Codesys as a platform, but can build their own restrictions or extensions that deviate

from the default interaction, behavior and standards of the Codesys IDE, and therefore can not be pursued by us.

• Errors that occur with a library, not developed by CODESYS GmbH

- For errors that occur with a library which was written by a 'third party', this 'third party' should be contacted for support.

Check the FAQ's and the FORGE page before reporting bugs.

Please check if the occurring errors have already been covered in the FAQs¹³⁵ or if they have already been recorded and answered under our Forge community¹³⁶.

¹³⁴ https://faq.codesys.com/display/CDSFAQ/

Report+problems+and+error+messages+to+CODESYS#ReportproblemsanderrormessagestoCODESYS-0 135 https://faq.codesys.com/

¹³⁶ https://forge.codesys.com/neighborhood

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4.3.22.6.1

4.3.22.6.2 Which additional data is helpful and why?

All used version information

To be able to detect problems which may only be related with the used version(s), or to be able to exclude known issues,

the following version information should be provided:

- Version of the CODESYS programming environment (IDE).
- Version of the operating system, the used runtime and processor of the target system.
- Version of the used CODESYS Packages (like SoftMotion, Ethernet, Visualization, etc.).
- Version of the used Visualization Profile for visualization problems within the Visualization Editor¹³⁸ and Visu Display Variants¹³⁹.

How to reproduce the problem

We always need accurate information and data to recreate the error profile:

- Exact 'Steps to repeat' to be able to reproduce the error. The more precisely the individual steps are described, the less need there is to ask for error reproductions and the less room there is for interpretation when retesting.
- A full project archive (not only the CODESYS project!). This contains the libraries used, the application structure of used functions, etc.
- For more complex processes, in addition to the written steps, a short screen recorded video, showing the steps and then the error that occurs, can be very useful.
- Note that sporadic errors are very difficult to solve.
 In these cases, you should endeavor to determine the conditions under which it occurs, so that the support team has a chance to reproduce it and investigate.

See also Why accurate 'steps for reproducing a problem' are important for any Technical Support¹⁴⁰

Additional related specifics

Depending on the existing problem, different additions to be reported are necessary (or at least helpful in order to correctly understand and comprehend error profiles):

137

https://faq.codesys.com/display/CDSFAQ/

Report+problems+and+error+messages+to+CODESYS#ReportproblemsanderrormessagestoCODESYS-Top 138 https://help.codesys.com/webapp/_visu_editor;product=core_visualization;version=3.5.17.0

¹³⁹ https://help.codesys.com/webapp/_visu_struct_execute_display_variants;product=core_visualization;version=3.5.17.0 140 https://faq.codesys.com/display/CDSFAQ/Why+accurate+

^{%27}steps+for+reproducing+a+problem%27+are+important+for+any+Technical+Support

- If available, controller logs, with the appropriate log filter settings, should always be given.
- · Screenshots of the error when it occurs in the Codesys IDE.
- In case of fieldbus related errors (or incorrectly displayed values in the different editors of the fieldbus), recording of the communication via 'Wireshark', that ranges from the download/login/start of the controller to after the occurrence of the error behavior, are needed.

4.3.22.6.3 Reporting a runtime exception

By any exception in the runtime, first check if it is caused by an application structure in a POU, FB or library.

To do this, use the Implicit Checks¹⁴¹ available in the Codesys IDE.

4.3.22.6.3.1 Exception Example:

evices	▼ Ŧ X				
B-GP Device [connected] (CODESYS Control)	Applications	Severity	Time Stamp	Description	Componer
PLC Logic		•		*SOURCEPOSITION* App=[Application] area=3, offset=215884	CmpIecTas
= 💮 Application [stop]	Backup and Restore			*EXCEPTION* [AccessViolation] occurred: App=[Application], Task=[EtherCAT_Task]	CmpIecTas
Library Manager	Files			"EXCEPTION" [IoUpdateError] in application [Application]	CmpApp
PLC_PRG (PRG)	The state of the s				
Task Configuration	Log		11 10 10 10 10 10 10 10 10 10 10 10 10 1		
EtherCAT_Task (IEC-Tasks	· · · · · · · · · · · · · · · · · · ·			NV. New Yorks 1 (1) 1 (1) (1) (1)	-
	PLC Settings			house and the descent strage study and the	-
s The second se				We have a second on a little down in the second second	-
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	Access Pights			March 1997 - California and and	
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				A second se	-
	Licensed Software Metrics			to use the set of	-

See also our OLH on how to 'Create a Core Dump'¹⁴², and how to 'Creating a Core Dump of the running application manually¹⁴³.

Please provide:

¹⁴¹ https://help.codesys.com/webapp/_cds_f_obj_pous_implicit_check;product=codesys;version=3.5.17.0

¹⁴² https://help.codesys.com/webapp/_cds_cmd_create_core_dump;product=codesys;version=3.5.17.0

¹⁴³ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_using_core_dump.html

Deb	ug Tools Window	Help	
¥.	Start	F5	
н.	Stop	Shift+F8	
	Single Cycle	Ctrl+F5	
đ	New Breakpoint		
3	Edit Breakpoint		
	Toggle Breakpoint	F9	
D	Disable Breakpoint		
Ð	Enable Breakpoint		
Ξ	Step Over	F10	-
1	Step Into	F8	
-=	Step Out	Shift+F10	
Ξ	Run to Cursor		
₿.	Set Next Statement		
⇒	Show Next Statement		
	Write Values	Ctrl+F7	
	Force Values	F7	
	Unforce Values	Alt+F7	
τ.	Toggle Flow Control Mod	e	· •
	Core Dump	•	Create Core Dump
	Display Mode	•	Load Core Dump
	Check Memory for Active	Application	Load Device Log from Core Dump
			Close Core Dump

• The Coredump, created at the time the exception occurred.

• Send a full project archive¹⁴⁴, with the associated *Callstack* and a Core Dump¹⁴⁵, created at the time of the crash.

¹⁴⁴ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_save_send_archive.html 145 https://help.codesys.com/webapp/_cds_using_core_dump;product=codesys;version=3.5.17.0

File	Edit	View	Project	Build	Online	Debug	Tools	Window	Help
1	New Pr	oject			Ctrl+	N			
2	Open P	roject			Ctrl+	• o			
	Close P	roject							
	Save Pr	oject			Ctrl	+S			
	Save Pr	oject as							
	Project	Archive				•	Extr	act Archive	
	Source	Upload					Save	e Archive	
	Source	Downloa	ad			ľ			
4	Print							4	
	Print Pr	eview				ł			
	Page Se	etup				î		•	
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Project Archive	×
Project Archive Include the following information into the archive Core Dump Device.Application Device.Application Coptions Copti	
Additional Files Comment Save Cancel	

If you need technical support, please purchase a Support Ticket¹⁴⁶ in the CODESYS Store. Note that certain products in the CODESYS Store already include a Support Ticket.

To report **software bugs** or if you have a question concerning the products in the CODESYS Store,

click on the "My Question¹⁴⁷" button next to the shopping cart in the CODESYS Store¹⁴⁸.

4.3.22.6.3.2 FAQ:

Whom to contact for vendor / 'third party' specific errors?



How to proceed, when an Exception error occurs from one of the CODESYS Visualization Element?

• Please set the compiler-define: VISU_NO_EXCEPTION_HANDLING

¹⁴⁶ https://store.codesys.com/en/codesys-support-ticket.html

¹⁴⁷ https://store.codesys.com/en/contact

¹⁴⁸ https://store.codesys.com/en/

ImagePool Properties - Application [Device: PLC Logic]	×
Library Manager	
PLC_PRG (PRG) Task Configuration Task PLC_PRG VISU_TASK VISU_TASK Visualization Manager Visualization ftMotion General Axis Pool IOs (GPIOs A/B) I I Iewire mera device OK	Incel Apply

• Send a full project archive¹⁴⁹, with the associated *Callstack* and a Core Dump¹⁵⁰, created at the time of the crash.

More detailed information can be found under debugging a Visu Exception¹⁵¹ FAQ.

4.3.22.6.4 For reporting a runtime exception

By any exception in the runtime, first check if it is caused by an applicative structure in a POU, FB or library. To do this, use the Implicit Checks¹⁵² available in the Codesys IDE.

See also our OLH on how to 'Create a Core Dump'¹⁵³.

¹⁴⁹ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_save_send_archive.html 150 https://help.codesys.com/webapp/_cds_using_core_dump;product=codesys;version=3.5.17.0

¹⁵¹ https://faq.codesys.com/display/CDSFAQ/Debugging+a+Visu+Exception

¹⁵² https://help.codesys.com/webapp/_cds_f_obj_pous_implicit_check;product=codesys;version=3.5.17.0

¹⁵³ https://help.codesys.com/webapp/_cds_cmd_create_core_dump;product=codesys;version=3.5.17.0

For any exception in the runtime, we need basic a complete repository/project archive and a Coredump, in which these exceptions have been marked with to be able to debug the problem:

 send a full project archive, with the associated Callstack and a Core Dump¹⁵⁴, created at the time of the crash:



• When an Exception error occurs from one of the CODESYS visualization elements, please set the *compiler-define*:

VISU_NO_EXCEPTION_HANDLING

and send a full project archive, with the associated *Callstack* and a Core Dump¹⁵⁵, created at the time of the crash:

Applications
e: PLC Logic]
as control Built (A)

More detailed information can be found under Debugging a Visu Exception¹⁵⁶.

¹⁵⁴ https://help.codesys.com/webapp/_cds_using_core_dump;product=codesys;version=3.5.17.0

¹⁵⁵ https://help.codesys.com/webapp/_cds_using_core_dump;product=codesys;version=3.5.17.0

¹⁵⁶ https://faq.codesys.com/display/CDSFAQ/Debugging+a+Visu+Exception

If you need technical support, please purchase a Support Ticket¹⁵⁷ in the CODESYS Store. Note that certain products in the CODESYS Store already include a Support Ticket.

To report **software bugs** or if you have a question concerning the products in the CODESYS Store, click on the "My Question¹⁵⁸" button next to the shopping cart in the **CODESYS Store**¹⁵⁹.

4.3.22.6.4.1

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See also

- Our CODESYS Online Help¹⁶¹
- The Codesys Online Help (OLH)¹⁶² Website (pre SP18 link)
- Basic information to the Codesys Development System (Codesys Homepage)¹⁶³
- OLH¹⁶⁴: The Online-help introduction for the Codesys Development System (IDE)¹⁶⁵
- OLH¹⁶⁶: To set or find the used 'Compiler Version'¹⁶⁷ within a Codesys Project
- OLH¹⁶⁸: To set or find the used 'Visualization Profile'¹⁶⁹ within a Codesys Project
- OLH¹⁷⁰: The use-case and possibilities of implicit monitoring functions 'Implicit Checks'¹⁷¹
- OLH¹⁷²: How to 'Analyzing Errors with Core Dump'¹⁷³ and how to 'Create a Core Dump'¹⁷⁴ in the first place
- OLH¹⁷⁵: Visualization: a system overview, mechanism and display variants¹⁷⁶
- How to Debugging a Visu Exception¹⁷⁷

158 https://store.codesys.com/en/contact

159 https://store.codesys.com/en/ 160

https://faq.codesys.com/display/CDSFAQ/

Report+problems+and+error+messages+to+CODESYS#ReportproblemsanderrormessagestoCODESYS-Top 161 https://www.helpme-codesys.com/

162 https://help.codesys.com/

164 https://help.codesys.com/

166 https://help.codesys.com/

170 https://neip.codesys.com/

172 https://help.codesys.com/

175 https://help.codesys.com/

¹⁵⁷ https://store.codesys.com/en/codesys-support-ticket.html

¹⁶³ https://www.codesys.com/products/codesys-engineering/development-system.html

¹⁶⁷ https://help.codesys.com/webapp/_cds_dlg_project_environment_compiler_version;product=codesys;version=3.5.17.0 168 https://help.codesys.com/

¹⁶⁹ https://help.codesys.com/webapp/_cds_dlg_project_environment_visualization_profile;product=codesys;version=3.5.17.0 170 https://help.codesys.com/

 $^{171\} https://help.codesys.com/webapp/_cds_f_obj_pous_implicit_check; product=codesys; version=3.5.17.0$

¹⁷³ https://help.codesys.com/webapp/_cds_using_core_dump;product=codesys;version=3.5.17.0

¹⁷⁴ https://help.codesys.com/webapp/_cds_cmd_create_core_dump;product=codesys;version=3.5.17.0

¹⁷⁶ https://help.codesys.com/webapp/_visu_f_core_visualization;product=core_visualization;version=3.5.17.0#id3

¹⁷⁷ https://faq.codesys.com/display/CDSFAQ/Debugging+a+Visu+Exception

4.3.22.7 Report problems and error messages to CODESYS - FAQ (EN)

4.3.22.7.1 Incomplete CoreDump (core file incomplete)

Massage: "The loaded Core Dump is incomplete. Not all data might be available for monitoring."



The main problem is that there is no Callstack, which can be accessed to display corresponding data. This must be done here at DEBUG CoreDump -> Load device log from Core Dump.

Therefore, this must also be saved and selected (after saving the core dump) together in the project archive

De	bug Tools Window	Help
•	Start Stop Single Cycle	F5 Shift+F8 Ctrl+F5
1111111111111111111111111111111111111	New Breakpoint New Data Breakpoint Edit Breakpoint Toggle Breakpoint Disable Breakpoint Enable Breakpoint	F9
	Step Over Step Into Step Out Run to Cursor Set Next Statement	F10 F8 Shift+F10
2*	Show Next Statement Write Values Force Values Unforce Values Toggle Flow Control M	Ctrl+F7 F7 Alt+F7 lode
	Core Dump Display Mode	•
	Check Memory for Act	ive Application

4.3.22.7.1.1 Similar causes

The following causes can also lead to a CoreDump not being complete:

- Error message when saving a single section.
- Exception when saving a single section
• The filesystem is full

4.3.22.7.1.2 Solution approaches

- Does the error only occur on one controller?
- · Is the error pattern reproducible?
- For more detailed analysis, you have to debug it directly via CmpCoreDump or add instrumentation via log outputs.

See also

- CODESYS Online Help (OLH)¹⁷⁸ Website
- OLH: Analysing Errors with Core Dump¹⁷⁹

4.3.22.7.2 RTE, How to: Analyze a BSOD/Crash of the application

This "How To' is for RTE applications that crash with a BSOD¹⁸⁰/ RTE exception.

When such a crash happens, please perform the following steps to ensure repeatability and reproducibility of the error and to record it.

4.3.22.7.2.1 1. Save and provide the PLC logfiles.

If it is possible to restart the RTE again after the crash has happened, then the PLC log should contain important information here.

Please provide a full project archive, together with the last status, which is also running online!

¹⁷⁸ https://www.helpme-codesys.com/

 $^{179\} https://content.helpme-codesys.com/en/CODESYS\% 20 Development\% 20 System/_cds_using_core_dump.html$

¹⁸⁰ https://en.wikipedia.org/wiki/Blue_screen_of_death

4.3.22.7.2.2 2. Increase the RTE stacksize:

The second step (if the first one is not given here more insight), is to increase the stacksize via a new registry entry. Set StackSizePerTask f.e. to 30000 hex (double the default 10000 value, and test the application again).



After increase the stacksize, clean up the project and delete the boot project manually before logging in on the RTE again!

4.3.22.7.2.3 3. Provoke the Bluescreen.

To make this more trackable, please set the following in the Windows Registry:

```
HKEY_LOCAL_MACHINE\SOFTWARE\3S-Smart Software Solutions GmbH\CoDeSys SP\3SRTE3
```

"CreateBluescreenOnFirstException"

```
DWORD-Value CreateBluescreenOnFirstException = 1
```

Windows key + Pause -> "Startup and Recovery" -> Settings -> under System Error select "Kernel Memory dump" and confirm.

ystem Properties	X Startup and Recovery	×
Computer Name Hardware Advanced System Protection Remote You must be logged on as an Administrator to make most of these changes Performance Visual effects, processor scheduling, memory usage, and virtual memory Settings User Profiles Desktop settings related to your sign-in Settings Settings	s. Default operating system: Windows 10 ✓ ☐ Time to display list of operating systems: ☐ Time to display recovery options when needed 30	5
Settings Startup and Recovery System startup, system failure, and debugging information Settings Environment Variables	System failure Write an event to the system log Automatically restart Write debugging information Automatic memory dump	
OK Cancel Apply	(none) Small memory dump (256 KB) Kernel memory dump Complete memory dump Automatic memory dump Active memory dump Disable automatic deletion of memory dumps when disk space is	; lc
	OK Cancel	

4.3.22.7.2.4 4. Share the data with the Support.

Provide the Windows 'kernel memory dump', together with the appropriate CODESYS archive for the Codesys Support.

To Report Problems to Codesys, see our Homepage on 'CODESYS Store Customers'¹⁸¹ and the Codesys Store FAQ for 'How do I get support in the CODESYS Store?'¹⁸²

See also

- Report problems and error messages to CODESYS¹⁸³
- Our CODESYS Online Help (OLH)¹⁸⁴ Website

¹⁸¹ https://www.codesys.com/support-training/codesys-support.html

¹⁸² https://store.codesys.com/en/frequently-asked-questions-faq

 $^{183\} https://faq.codesys.com/display/CDSFAQ/Report+problems+and+error+messages+to+CODESYS$

¹⁸⁴ https://www.helpme-codesys.com/

- OLH¹⁸⁵: How to 'Analyzing Errors with Core Dump'¹⁸⁶ and how to 'Create a Core Dump'¹⁸⁷ in the first place
- OLH: the PLC Log¹⁸⁸ and how to Reading the PLC Log¹⁸⁹

4.3.22.7.3 Why accurate 'steps for reproducing a problem' are important for any Technical Support

The most important information in any defect, bug or exception documentation are the exact steps to reproduce a defect.

Without a clear understanding of the problem, any bug here may be incorrectly prioritized or incorrectly tracked.

Or the problem may be misunderstood and not immediately worked on a fix when the development team could have spent the time on a more serious issue.

4.3.22.7.3.1 Therefore, here are a few points to keep in mind:

Recovering the correct error image

The first thing the Support or Developer Team will do, when trying to find or fix a bug is, to try to reproduce it in the development environment.

If the steps to recover the problem are not accurate or the steps do not result in the error occurring every time, the developer may assume that the problem has already been fixed as a side effect of another problem in the current environment.

Subsequently, he will return this error to the support team as non-reproducible. These types of delays can really hold up any case progress.

Test it again

Before sending a bug report, please practice some due diligence. Test the bug in standard Codesys environments using standard WinV3 control - if possible.

Also, any additional information that can be included may prove critical.

If a bug is attempted to be reproduced on a different system and in a different environment, there is a good chance that this will not be able to reproduce and will therefore ask for additional information.

If these things are documented and attached to the request in advance, this will save time and inquiries from the Support Team.

The prioritizing of the bug

By recording the exact steps, that lead to the error, anyone investigating the error can correctly reproduce the steps and understand exactly what is being reported.

¹⁸⁵ https://help.codesys.com/

¹⁸⁶ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_using_core_dump.html

¹⁸⁷ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_create_core_dump.html

¹⁸⁸ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_edt_device_log.html

¹⁸⁹ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_reading_plc_log.html

Not only does the Support Team need to correctly assign and categorize these bugs, but they also need to prioritize them for development in order to assign the correct severity to bugs and problems.

The internal allocation of resources based on the reported bug

It is important that the bug is properly assigned to the required development team. A single screenshot of a bug usually does not contain enough information to assign the problem to the correct team or problem group.

However, providing written steps leading to the screenshot of the bug, or a video of the steps, makes it easier to assign the correct resources to the problem.

Conclusion

Please take a little extra time when reporting issues to verify that you have taken the proper steps to reproduce an issue can prevent a bug from being passed from one team to another. Not only does this delay troubleshooting, but it can also lead to frustration for those trying to track down the problem.

Keeping an accurate record of the steps leading to a bug is therefore an important general contribution for us, and ultimately for all customers, in order to lead to a faster bug fix, a possible workaround, or possible solutions.

If you need technical support, please purchase a Support Ticket¹⁹⁰ in the CODESYS Store. Note that certain products in the CODESYS Store already include a Support Ticket.

To report **software bugs** or if you have a question concerning the products in the CODESYS Store,

click on the "My Question¹⁹¹" button next to the shopping cart in the CODESYS Store¹⁹².

4.3.22.8 Switch off the precompilation (EN)

So that errors can already be displayed when coding in Codesys, there is the "precompiler", which underlines errors in the editors.

The precompiler does not generate any code!!! Therefore, the message of the build process are the decisive ones

191 https://store.codesys.com/en/contact

¹⁹⁰ https://store.codesys.com/en/codesys-support-ticket.html

¹⁹² https://store.codesys.com/en/

Unfortunately, there can be different displays between the precompilation and the actual compilation process (as demonstrated in the following example with the compiler version V3.5.16.30).



If desired, the precompiler can be switched off via the option "Tools\Options...\SmartCoding\Underline errors in the editor".

Options	×
FBD, LD and IL editor Help International Settings	SmartCoding
Library download	Dedare unknown variables automatically (AutoDedare) Enable for ST editor
Load and Save Monitoring	Show all instance variables in input assistant Show symbols from system libraries in input assistant
Proxy Settings	List components after typing a dot (.) List components immediately when typing
Runtime Deploy Tool	☐ Insert with namespace ☐ Convert keywords to uppercase automatically (AutoFormat)
	Automatically list selection in cross reference view
 Visualization Visualization styles 	✓ Underline errors in the editor ✓ Highlight symbols

4.3.22.9 What are the meanings of the memory occupation data in the message window?

Each time code is generated, data for the memory occupation are displayed in the message window. The terminology used is explained below.

Messages - Total 0 error(s), 0 warning(s), 6 message(s)	
Build	 O error(s) O warning(s) 6 message(s)
Description	
Build started: Application: Device.Application	
typify code	
generate code	
generate global initializations	
generate code initialization	
generate relocations	
Size of generated code: 1668804 bytes	
Size of global data: 840680 bytes	
O Total allocated memory size for code and data: 2377	1766 bytes
Memory area 0 contains Data, Input, Output, Memory	ory and Nonsafe Data: size: 1048576 bytes, highest used address: 708958, largest contiguous memory gap: 339618 bytes (32 %)
Memory area 2 contains Persistent Data: size: 4096	i bytes, highest used address: 48, largest contiguous memory gap: 4048 bytes (98 %)
Memory area 3 contains Code: size: 2169450 bytes	, highest used address: 1668808, largest contiguous memory gap: 500642 bytes (23 %)
Build complete 0 errors, 0 warnings : ready for do	wnload!

Size of generated code

The sum of all code pieces produces the size of the generated code.

Size of global data

The size of the global data indicates the entire memory occupied by the global variables. Inputs and outputs are not taken into account in this, unless inputs or outputs are mapped in the area of the global variables.

Total allocated memory size

Encompasses the entire allocated memory, including the gaps caused by incremental compilation or online change. In addition, this area also contains memory that is reserved for online change and is still unused for the time being; i.e. it contains no code and no data. The memory that is occupied corresponds to the **highest used address**.

Highest used address

This is the highest occupied address in the memory range. When compiling for the first time, the memory addresses are issued to variables in ascending order, taking into account the alignment (as a rule 8 bytes). The highest used address corresponds approximately to the memory used.

Largest contiguous memory gap

In the case of an online change, memory is used only for new variables and new code. Memory previously occupied by deleted variables and code is freed up. This can result in gaps in the memory. After many online changes the memory may become fragmented, i.e. many small gaps are created that can no longer be used.

The largest contiguous memory gap is the assured size that can still be used in any case for further data. Memory gaps are used, of course. If, for example, a global variable of the type byte is added, it is placed in the first free byte in the memory. An FB instance, a variable of the type structure or array, or the code for a POU have to be saved contiguously and therefore occupy more memory accordingly. Therefore one can only assure the largest contiguous free memory.

4.4 CODESYS Error Messages - FAQ (EN)

4.4.1 Internal error status of a "_TO_" POU when created with addon "CODESYS LD FBD" in version 4.3.0.0

4.4.1.1 Error message:

An inconsistent element has been detected (Improper inputs count). Consider making a correction.

Unknown box type xxx_TO_xxx.

4.4.1.2 Reason for error message:

Some library blocks with the name "_TO_" (i.e. block names such as "BYTE_TO_STRING") generated incorrect error messages in addon version 4.3.0.0 and can not be used. If a project with blocks created in this way is opened with a CODESYS with the addon "CODESYS LD FBD" in a version lower or higher than 4.3.0.0, the above error messages are displayed for this POU. The error status is stored invisibly in the function block and is only overwritten during generation or a forced update.

4.4.1.3 Error fixing:

Execute the "Update Parameters" command on the POU (context menu by right-clicking on the block). The error messages should no longer appear.

5 CODESYS Fieldbus - FAQ (EN)

5.1 CODESYS BACnet - FAQ (EN)

5.1.1 BACnet: Cyclic Reading of a Property

5.1.1.1 Hardware

- Raspberry Pi as a BACnet server (provides data points)
- CODESYS Control Win V3 as a BACnet client (cyclic reading of the data points)

5.1.1.2 Requirements for the server and client

Check that the following entries are present in the file CODESYSControl.cfg.

- Including the BACnet component: [ComponentManager] Component.[n+1]=CmpBACnet
- Including the INI file of the BACnet stack (pay attention to the syntax): [CmpBACnet] IniFile=bacstacd.ini

5.1.1.3 Requirements for the BACnet server

- · Create a "Standard project" and select "CODESYS Control Raspberry Pi SL" as the device.
- Define the target system by means of the *Network scan*.

-				
BACNetServerOnRaspberry.project* - CODESYS	5			
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BACNetServerOnRaspberry				
Device (CODESYS Control for Raspberry Pi SL)	Communication Settings	Scan Network Sateway - Devi	ice -	
= H PLC Logic	Applications	\sim		
= Q Application	Applications			
Lbrary Manager	Backup and Restore		· · · · · · · · · · · · · · · · · · ·	
FLC_PRG (PRG)				A
B-S MainTask	Files			• •
PLC PRG	1.00		Gateway	
BACnet_Server (BACnet Server)	Log	Gat	teway-1 -	[0301.A000.03C6] (active)
BACnet_Analog_Value (BACnet Analog Value)	PLC Settings	IP-A	Address:	Device Name:
 SoftMotion General Axis Pool 		loca	alhost	ThK_raspberry
\$ 12C	PLC Shell	Port	t.	Device Address:
SPI	the second formula	121	7	0301.A000.03C6
GPIOs_A_B (GPIOs A/B)	Users and Groups			Target ID:
Converte	Task Deployment			0000 0010
Camera device				Target Type:
Ceer / (Chipty /)	Status			4102
	Information			Target Vendor: 35 - Smart Software Solutions GmbH
				Target Version: 3.5.11.0

• Insert a "BACnet Server" and a "BACnet Analog Value" object in the device tree:



• Every device in a BACnet network must have a unique ID. Set this in the tab *BACnet Interface Parameters* of the "BACnet Server" object.

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evices will be		Part and famous M			
A RACHEServerDoRassberry	PLC_PRG	withet server x			
E M Device (CODESYS Control for Raspberry Pi SL)	BACnet Interface Parameters	Parameter	Туре	Value	Default Value
Real PLC Logic		- VisedBACnetStringType	Enumeration of DINT	BACNET STRING UTF 8	BACNET STRING UTF 8
Application	BACnet Interface I/O Mapping	 SupportUnspicitedCOV 	BOOL	FALSE	FALSE
Library Manager		HideToOutside	BOOL	FALSE	FALSE
- PLC_PRG (PRG)	Status	8- Cas Device Properties			
🖻 🧱 Task Configuration	Information	APDUSegmentTimeout	UDINT	2000	2000
🖻 🥵 MainTask	showaddi	APDUTimeout	UDINT	3000	3000
DIC_PRG		 	WSTRING(255)	*1.0*	"1.0"
BACnet_Server (BACnet Server)		DaylightSavingsStatus	BOOL	TRUE	TRUE
BACnet_Analog_Value (BACnet Analog Value)		- I Description	WSTRING(255)	"Description"	"Description"
 SoftMotion General Axis Pool 		FirmwareRevision	WSTRING(255)	"1.0"	"1.0"
- 3 1%		 Ø LocaDate 	DATE	D#1970-1-1	D#1970-1-1
- & SPI		 DecalTime 	TIME	T#0s	T#0s
GPIOs_A_B (GPIOs A/B)		 Ø Location 	WSTRUNG(255)	"Location"	"Location"
 a Onewire 		 MaxAPDULengthAccepted 	UDINT	1476	1476
E a Camera device		MaxInfoFrames	UDINT	1	1
Leer> (<empty>)</empty>		- 🌻 MaxMaster	UDINT	127	127
		- I ModelName	WSTRING(255)	"Model"	"Model"
		NumberOfAPDURetries	UDINT	5	5
		InstanceNumber	DWORD	718	1
		InstanceName	WSTRING(255)	"BACnet_Server"	"BACnetDevice"
		ProtocolObjectTypesSupported	STRUNG	,11111111101111111100111001,	'1111111111011111111001110101'
		ProtocolServicesSupported	STRING	'1111111111111011110010000011110011111011'	'111111111111111111011110010000011111001111
		ProtocolVersion	UDINT	1	1

Within a device, every instance of a BACnet object type (BACnet Analog Value, BACnet Binary Value, etc.) receives a unique ID. This remains unchanged here as the value "1".



Both the instance ID of the device and the instance ID of the object type are reused in the source code of the BACnet client.

• Adapt the "PLC_PRG" as follows:



Declaration

VAR			
xSwitc	h	:	BOOL;
lrValu	е	:	LREAL := 0.23;
END_VAR			

Implementation

```
// Numeric simulation
IF xSwitch then
    lrValue := lrValue + 0.01;
    IF lrValue >= 5.0 THEN
        xSwitch := False;
    END_IF
ELSE
    lrValue := lrValue - 0.01;
    IF lrValue <= -5.0 THEN
        xSwitch := True;
    END_IF
END_IF
BACnet_Analog_Value.PresentValue := lrValue;</pre>
```

5.1.1.4 Requirements for the BACnet client (As of BACnet-Version 1.2.0.0)

- Create a "Standard project" and select "CODESYS Control Win V3" as the device.
- Define the target system by means of the network scan (see BACnet server).
- Insert a "BACnet Server" object and rename it to "BACnet_Client"



Adapt the PLC_PRG POU as follows:

Declaration

```
VAR
fbReadProperty
xReadExecute
lrReadValue
: BOOL;
LREAL;
xInitDone
END_VAR
: BOOL := FALSE;
```

Implementation

5.1.1.5 Requirements for the BACnet client (Up to BACnet-Version 1.2.0.0)

- Create a "Standard project" and select "CODESYS Control Win V3" as the device.
- Define the target system by means of the network scan (see BACnet server).
- Insert a "BACnet Server" object and a "BACnet Client Property Access" object in the device tree.

BACNetClientOnWinV3.project - CODESYS
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Devices 👻 🕂 🗙
BACNetClientOnWinV3
🖻 🕤 🚰 Device (CODESYS Control Win V3)
PLC Logic
🖹 💮 Application
📲 🎁 Library Manager
PLC_PRG (PRG)
🖃 🙀 Task Configuration
🖻 🍪 MainTask
PLC_PRG
😑 🤛 BACnet_Server (BACnet Server)
BACnet_Client_Property_Access (BACnet Client Property Access)

• Adapt the "PLC_PRG" POU as follows:



Declaration

VAR readPropertyFB : BACnet.ClientReadProperty; readReal : LREAL; END_VAR

Implementation

```
//Simply execute the FB reading out a property
readPropertyFB(clientFB := BACnet_Client_Property_Access,
                dwTargetDeviceNumber := 718,
                objType := BACnet.CmpBACnet.IEC_BACNET_OBJECT_TYPE.OBJ_ANALOG_VALUE,
                objInst := 1,
                propID := BACnet.CmpBACnet.IEC_BACNET_PROPERTY_ID.PROP_PRESENT_VALUE);
//Start execution and send BACnet-request to BACnet-network
IF NOT readPropertyFB.xExecute THEN
    readPropertyFB.xExecute := TRUE;
END_IF
//Wait for the answer on the request. When xDone is TRUE, an answer has been received.
IF readPropertyFB.xDone THEN
    //Read out the answers contents
    readReal := BACnet.GetRealFromContents(readPropertyFB.ReadPropertyResult);
    //Reset FB and also its contents
    readPropertyFB.xExecute := FALSE;
END_IF
```

5.1.1.6 Downloading and starting the projects

5.1.1.6.1 BACnet server

• Download the application to the PLC.

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= 📷 Task Configuration								
iii 🥵 MainTask								
- ଶ୍ରୀ PLC_PRS	1 // Numeric simulation							
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OU BACnet_Analog_Value (BACnet Analog Value)	1 11Value 495 > 1= 11Value 495 > + 0.011							
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- Camera device	10 0 xSwitch nut := True:							
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	generate global initializations							
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	generate relocations							
Devices	Size of generated code: 329408 bytes							
	Lastbuic Q 0 0 Precent	te ∠ 9a	RUN	Program loade	d	Program unchanged	Current user: (nobady) INS La 1	1 Cel 1 Ch 1 0

5.1.1.6.2 BACnet client

• Download the application to the PLC.

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O II Device [connected] (CODESIIS Control Win V3)	Device Application PLC_PR6				
RC Logic	Expression	Type Value	Prepared value Address Comment		
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III MainTask	dyTargetDeviceNum	214 14 119			
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G * skoret_clent_moperty_access gworet cle	C propil was seen a	:= BACnet.CmpBACnet.IEC_BACHET_PROPERTY_ID.PROP_PRESENT_VALUE);			
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	13 //Weit for the answer on the requ	urt. When shows is THUE, an answer has been received.			
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5.1.1.7 Reading a device property

If for example general properties of the device be read, then you have to pay attention that the ID of the device number agrees with the object instance. Example: Reading the revision number of the firmware:

Implementation

5.1.2 BACnet: Reading and writing a Calendar object

The BACnet server from the FAQ BACnet: Cyclic Reading of a Property is used as the server here.

5.1.2.1 Requirements for the BACnet server

- · If you have followed the steps in the above linked FAQ exactly, then
 - add a BACnet object of type BACnet Calendar to the BACnet Server in the device tree
 - delete the exisiting BACnet Analog Value
- Adapt the "PLC_PRG" as follows:

Declaration

```
VAR
   xAddCalendar
                       : BOOL;
   // API does not check dayOfweek!!! == >> DAY_OF_WEEK_UNSPECIFIED
                       : CmpBACnet.IEC_BACNET_DATE := (year := 2020, month := 2,
   bacDate
dayOfMonth := 7, dayOfWeek :=
CmpBACnet.IEC_BACNET_DAY_OF_WEEK.DAY_OF_WEEK_FRIDAY);
   bacDate2
                        : CmpBACnet.IEC_BACNET_DATE := (year := 2020, month := 2,
dayOfMonth := 14, dayOfWeek :=
CmpBACnet.IEC_BACNET_DAY_OF_WEEK.DAY_OF_WEEK_UNSPECIFIED);
                      : CmpBACnet.IEC_BACNET_DATE := (year := 2020, month := 2,
   bacDateStartRange
dayOfMonth := 17, dayOfWeek :=
CmpBACnet.IEC_BACNET_DAY_OF_WEEK.DAY_OF_WEEK_UNSPECIFIED);
   bacDateEndRange
                       : CmpBACnet.IEC_BACNET_DATE := (year := 2020, month := 3,
dayOfMonth := 25, dayOfWeek :=
CmpBACnet.IEC_BACNET_DAY_OF_WEEK.DAY_OF_WEEK_UNSPECIFIED);
   udiCnt
                        : UDINT;
   xMatchCurDay
                        : BOOL;
END_VAR
```

Implementation

```
BACnet_Calendar.GetEntryCount(count => udiCnt);
xMatchCurDay := BACnet_Calendar.PresentValue;
IF xAddCalendar THEN
    xAddCalendar := FALSE;
    BACnet_Calendar.AddBACnetDate(bacDat := bacDate);
    BACnet_Calendar.AddBACnetDate(bacDat := bacDate2);
    BACnet_Calendar.AddBACnetDateRange(bacStartDat := bacDateStartRange,
bacEndDat := bacDateEndRange);
END_IF
```

• Download the project to the controller and set the *xAddCalendar* variable to *TRUE*. If successful, the entry count for the BACnet Calendar will increase by three.

Devices 👻 👎 🗙	PLC_PRG 🗙 🎁 Library Manager	Device
BACNetServerKalendarOnRaspberry	Device.Application.PLC_PRG	
🖹 🤣 👘 Device [connected] (CODESYS Control for Raspberry Pi MC SL		
📮 🗐 PLC Logic	Expression	Type Value
🖹 💮 Application [run]	AddSchedule	BOOL FALSE
👘 Library Manager	표 🧼 bacDate	CmpBACnet.IEC_BA
PLC_PRG (PRG)	표 🛷 bacDate2	CmpBACnet.IEC_BA
🖃 🧱 Task Configuration	🗉 🛷 bacDateStartRange	CmpBACnet.IEC_BA
🖹 😏 鰺 MainTask (IEC-Tasks)	🗉 < bacDateEndRange	CmpBACnet.IEC_BA.
PLC PRG	🔷 udiCnt	UDINT 3
SACnet Server (BACnet Server)	xMatchCurDay	BOOL TRUE
BACnet_Calendar (BACnet Calendar)		

5.1.2.2 Requirements for the BACnet client

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the network scan (see BACnet server).
- Insert a "BACnet Server" object and rename it to "BACnet_Client"



Open the Library Manager and add the following libraries
 CmpBACnet

Library Manager 🗙						
🛃 Add Library 🗙 Delete Library 🖙 Properties 💿 Details 🗐 Placeholders 🎁	Library Repository 🕕 Icon le	:gend				
Name	Namespace	Effective version				
🖫 🕑 35License = 35License, 3.5.14.0 (35 - Smart Software Solutions GmbH)	_35_LICENSE	3.5.14.0				
🖷 📙 BACnet = BACnet, 1.5.0.0 (35 - Smart Software Solutions GmbH)	BACnet	1.5.0.0				
🖷 🖳 📙 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solut	tions GmbH) BPLog	3.5.5.0				
🕸 📙 CAA Device Diagnosis = CAA Device Diagnosis, 3.5.15.0 (CAA Technical Workgroup)	DED	3.5.15.0				
🕮 📒 CmpBACnet = CmpBACnet, 3.5.15.30 (35 - Smart Software Solutions GmbH)	CmpBACnet	3.5.15.30				
🕸 📙 IoStandard = IoStandard, 3.5.15.0 (System)	IoStandard	3.5.15.0				
Standard = Standard, 3.5.15.0 (System)	Standard	3.5.15.0				

• Adapt the "PLC_PRG" as follows:

Declaration

VAR	CONSTANT	
	c_udiMaxEntries	: UDINT := 10;
	c_sDelimeter	: String := '.';
END_	_VAR	
VAR		
	fbReadProperty	: BACnet.BACnetClientReadProperty;
	xReadExecute	: BOOL;
	xInitDone	: BOOL := FALSE;
	bacCalendarContents	: CmpBACnet.IEC_BACNET_PROPERTY_CONTENTS;
	udiIndex	: UDINT;
	asEntries	: ARRAY [0c_udiMaxEntries] OF STRING;
	pbyRawBuffer	: POINTER TO BYTE;
	pCalenderEntry	: POINTER TO CmpBACnet.IEC_BACNET_CALENDAR_ENTRY;
	dat	: CmpBACnet.IEC_BACNET_DATE;
	<pre>// Value is used if</pre>	type is set to "date range"
	dateRange	: CmpBACnet.IEC_BACNET_DATE_RANGE;
	<pre>// Value is used if</pre>	type is set to "week-n-day"
	weekNDay	: CmpBACnet.IEC_BACNET_WEEK_AND_DAY;
	_	
	sHelp	: STRING;
END_	_VAR	

Implementation

```
xReadExecute := FALSE;
        bacCalendarContents := fbReadProperty.result;
        IF bacCalendarContents.tag =
CmpBACnet.IEC_BACNET_DATA_TYPE.DATA_TYPE_CALENDAR_ENTRY THEN
            pCalenderEntry := bacCalendarContents.buffer.pBuffer;
            FOR udiIndex := 0 TO bacCalendarContents.nElements -1 D0
                CASE pCalenderEntry[udiIndex].tag OF
                    CmpBACnet.IEC_BACNET_CALENDAR_ENTRY_TYPE.CALENDAR_ENTRY_DATE
:
                        sHelp :=
CONCAT(BYTE_TO_STRING(pCalenderEntry[udiIndex].entry.dat.dayOfMonth), '.');
                        sHelp := CONCAT(sHelp,
TO_STRING(pCalenderEntry[udiIndex].entry.dat.month));
                        sHelp := CONCAT(sHelp, '.');
                        sHelp := CONCAT(sHelp,
WORD_TO_STRING(pCalenderEntry[udiIndex].entry.dat.year));
                        asEntries[udiIndex] := sHelp;
                        CmpBACnet.IEC_BACNET_CALENDAR_ENTRY_TYPE.CALENDAR_ENTRY_
DATE_RANGE:
                        sHelp :=
CONCAT(BYTE_TO_STRING(pCalenderEntry[udiIndex].entry.dateRange.startDate.dayOfMo
nth), '.');
                        sHelp := CONCAT(sHelp,
TO_STRING(pCalenderEntry[udiIndex].entry.dateRange.startDate.month));
                        sHelp := CONCAT(sHelp, '.');
                        sHelp := CONCAT(sHelp,
WORD_TO_STRING(pCalenderEntry[udiIndex].entry.dateRange.startDate.year));
                        sHelp := CONCAT(sHelp, ' ... ');
                        sHelp := CONCAT(sHelp,
BYTE_TO_STRING(pCalenderEntry[udiIndex].entry.dateRange.endDate.dayOfMonth));
                        sHelp := CONCAT(sHelp, '.');
                        sHelp := CONCAT(sHelp,
TO_STRING(pCalenderEntry[udiIndex].entry.dateRange.endDate.month));
                        sHelp := CONCAT(sHelp, '.');
                        sHelp := CONCAT(sHelp,
WORD_TO_STRING(pCalenderEntry[udiIndex].entry.dateRange.endDate.year));
                        asEntries[udiIndex] := sHelp;
                    CmpBACnet.IEC_BACNET_CALENDAR_ENTRY_TYPE.CALENDAR_ENTRY_WEEK
_AND_DAY:
                        // Do Something
                    ELSE
                        // Should never used == >> Implement ErrorHandling
                END_CASE
                IF pCalenderEntry[udiIndex].tag =
CmpBACnet.IEC_BACNET_CALENDAR_ENTRY_TYPE.CALENDAR_ENTRY_DATE THEN
                    dat := pCalenderEntry[udiIndex].entry.dat;
                END_IF
                IF pCalenderEntry[udiIndex].tag =
CmpBACnet.IEC_BACNET_CALENDAR_ENTRY_TYPE.CALENDAR_ENTRY_DATE_RANGE THEN
                    dateRange := pCalenderEntry[udiIndex].entry.dateRange;
                END IF
```

END_FOR END_IF END_IF END_IF

• Download the project to the controller and set the *xReadExecute* auf den Wert *TRUE*. If successful, the values are transmitted from the server to the client.

BACNetClientKalendarOnWinV3.project* - CODESYS			
File Edit View Project Build Online Debug Tools	Window Help BACNet		
🎦 🚔 🔄 🗠 🗠 🎖 ங 🛍 🗙 🛤 🌿 🎽 🌿 🔳	🕯 🐐 🀐 🔚 🛅 - 📬 🔛 App	lication [Device: PLC Logic]	• 0\$ 0\$ • • • % [I 91 41 43 • 🛒 =
Devices 👻 🕂 🗙	Library Manager	PRG X R Device	
BACNetClientKalendarOnWinV3		X	
🖹 😏 🛐 Device [connected] (CODESYS Control Win V3)	Device.application.rec_rkd		
PLC Logic	Expression	Туре	Value
🖹 🔘 Application [run]	c_udiMaxEntries	UDINT	G 10
1 Library Manager	c_sDelimeter	STRING	G 11
PLC_PRG (PRG)	🗄 🛷 fbReadProperty	BACnet.BACnetClien	
🖃 🌃 Task Configuration	xReadExecute	BOOL	FALSE
😑 😏 🕸 MainTask (IEC-Tasks)	XInitDone	BOOL	TRUE
PLC_PRG	🗉 🛷 bacCalendarContents	CmpBACnet.IEC_BA	
- 😏 🥃 BACnet_Client (BACnet Server)	< udiIndex	UDINT	3
	😑 🛷 asEntries	ARRAY [0c_udiMa	
	asEntries[0]	STRING	'7.2.1900'
	asEntries[1]	STRING	'14.2.2020'
	asEntries[2]	STRING	'17.2.2020 25.3.2020'
	asEntries[3]	STRING	н
	asEntries[4]	STRING	н
	asEntries[5]	STRING	н
	asEntries[6]	STRING	н
		STRING	

5.1.3 BACnet Writing of a Property (PresentValue)

The BACnet server from the FAQ *BACnet: Cyclic Reading of a Property* is used as the server here. Reduce this one to reading the analog value.

File Edit View Project Build Online De	ebug Tools Window Help		
🎦 🚔 🖬 🎒 い つ 湯 ங 🛍 🗙 🛤 🌿 🌢	🗄 🌿 📕 🐄 🦄 🖓 📾 🎙	🔄 🖞 🎬 🧐 💖 🕞 🔳 帐 I	(= f= t= t= \$ \$ # #
Derfere and the			
	Device PLC_PR	G X	
BACNetServerOnkaspberry_WriteProperty	Device.Application.PLC_PRG		
Device [connected] (CODESTS Control for Ras	Expression	Туре	Value
E O Application [run]	IrValue	LREAL	0
Library Manager			
PLC_PRG (PRG)			
🖹 🎆 Task Configuration	1 IrValue 0	= BACnet_Analog_Value.Pre	sentValue 0; RETURN
🖹 🍪 MainTask (IEC-Tasks)			
PLC_PRG			
🖨 😏 🧊 BACnet_Server (BACnet Server)			

5.1.3.1 Requirements for the server and client

Check that the following entries are present in the file CODESYSControl.cfg.

- Integration of the BACnet component: [ComponentManager] Component.[n+1]=CmpBACnet
- Integration of the INI file of the BACnet stack (pay attention to the syntax): [CmpBACnet] IniFile=bacstacd.ini

5.1.3.2 BACnet client project

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the network scan (see BACnet server).
- · Insert a "BACNet Server" object into the device tree and rename it as "BACnet_Client".



• Open the *Library Manager* and add the following libraries: *CmpBACnet*

👔 Library Manager 🗙	🎁 Library Manager 🗙						
😤 Add library 🔀 Delete library 🛛 😁 Properties 👘 Details 🛛 🔄 Placeholders 🖉 Library repository							
Name	Namespace	Effective version	Ī				
III	_3S_LICENSE	3.5.14.0					
BACnet = BACnet, 1.2.1.0 (3S - Smart Software Solutions GmbH)	BACnet	1.2.1.0					
🕮 👓 🐨 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0					
🕮 👓 CmpBACnet = CmpBACnet, 3.5.14.0 (3S - Smart Software Solutions GmbH)	CmpBACnet	3.5.14.0					
🕮 👓 🖅 IoStandard = IoStandard, 3.5.13.0 (Sys 👷)	IoStandard	3.5.13.0					
Standard = Standard, 3.5.14.0 (System)	Standard	3.5.14.0					

• Edit the PLC_PRG POU as follows:

Declaration

```
VAR
   fbWriteProperty : BACnet.BACnetClientWriteProperty;
   writePropVal : BACnet.CmpBACnet.IEC_BACNET_REAL := 16.34;
   writePropCont : BACnet.CmpBACnet.IEC_BACNET_PROPERTY_CONTENTS;
   xWriteExecute : BOOL;
   writePrio : CmpBACnet.IEC_BACNET_SIGNED := 16;
   xInitDone : BOOL := FALSE;
END_VAR
```

Implementation

```
IF NOT xInitDone THEN
    fbWriteProperty.RegisterToServer(BACnet_Client);
    fbWriteProperty(dwTargetDeviceNumber := 718,
                    objType :=
BACnet.CmpBACnet.IEC_BACNET_OBJECT_TYPE.OBJ_ANALOG_VALUE, objInst := 1,
                    propID :=
BACnet.CmpBACnet.IEC_BACNET_PROPERTY_ID.PROP_PRESENT_VALUE);
    xInitDone := TRUE;
ELSE
   writePropCont.buffer.pBuffer := ADR(writePropVal);
   writePropCont.buffer.nBufferSize := SIZEOF(writePropVal);
    writePropCont.nElements := 1;
    writePropCont.tag := BACnet.CmpBACnet.IEC_BACNET_DATA_TYPE.DATA_TYPE_REAL;
    fbWriteProperty(xExecute := xWriteExecute,
                    propertyContents := writePropCont,
                    nWritePriority := writePrio);
END_IF
```

• Download the project to the controller and set the *xWriteExecute* variable to *TRUE*. The value is transferred to the server.



• The *PresentValue* property is written with priorities from 1 to 16, where 16 is the lowest.

When you write a value with a higher priority to the server, it is retained until it is deleted or overwritten by an even higher priority.

During the delete operation, the value of the highest set priority is then output as PresentValue.



5.2 CODESYS EtherCAT - FAQ (EN)

5.2.1 EtherCAT: Redundancy

For a detailed understanding, please consult our online help and all settings at Redundancy Settings¹⁹³ and subordinate articles.

To note:

Redundancy is depending on the available runtime system components. There are different types of redundancy:

- Controller Redundancy
- Cable Redundancy of EtherCAT
- Redundant I/O system
- Combinations

¹⁹³ https://content.helpme-codesys.com/en/CODESYS%20Control/_rtsl_redundancy_reference_tab_settings.html

5.2.1.1 Example setup:



5.2.1.1.1 EtherCAT cabling with controller redundancy

Customize the 'Synchronization timeout' setting

Synchronization timeout should not be 0.

Set a value (for example) to a 30 (ms) limit.

Otherwise, EtherCAT network fails when the connection is disconnected with the Primary cable and then reconnect.

Increasing the Distributed Clock Cycle Time seems to have solved this problem.



5.2.1.1.2 EtherCAT cabling with controller and cable redundancy

With EtherCAT cabling redundancy, the EtherCAT distributed clocks¹⁹⁴ are not supported!

For a EtherCAT Cable Redundancy, every PLC needs two ports:

- One switch for PLC1 Port1 and PLC2 Port1, and
- the second switch for PLC1 Port2 and PLC2 Port2.

Redundancy task n	ame	MainTask	
Timeout (mo)	anc	20	 ▲
nmeour (ms)		30	•
Synchronisation tin	neout (ms)	0	- -
Fieldbus Settings			
Fieldbus Settings	r NIC settings ss (MAC) PLC 1	74-FE-48-3E-09-D7	Browse
Fieldbus Settings Fieldbus Settings EtherCAT Ethercat Master Source addres Source addres	r NIC settings ss (MAC) PLC 1 ss (MAC) PLC 1 redundan	74-FE-48-3E-09-D7 cy 00-00-00-00-00-00	Browse
Fieldbus Settings EtherCAT Ethercat Master Source addret Source addret Source addret	r NIC settings ss (MAC) PLC 1 ss (MAC) PLC 1 redundan ss (MAC) PLC 2	74-FE-48-3E-09-07 cy 00-00-00-00-00-00 74-FE-48-56-6F-33	Browse Browse

¹⁹⁴ https://content.helpme-codesys.com/en/CODESYS%20EtherCAT/_ecat_edt_master_master.html

5.2.1.2 FAQ:

Log Error message: "Connection broke after x. Check BootupWaitTime"

In case of a such a sync fails, after f.e. an online change.

This can be solved by increasing the value of BootupWaitTime in the runtime configuration file. The Default is 5000 [ms], and should be doubled for a redundancy setup, to 10000 [ms].

Power Cycling on a switch within a redundancy setup

It is possible, when Power Cycling or simply switching of a switch, a communication gap can occur when it is switched back on.

As a rule, this can be about 1 sec.

Example:

	Statistics		
	SendFrameCount	4212	
	FramesPerSecond	0	
	LostFrameCount	2963	
	TxErrorCount	0	
	RxErrorCount	4434	
	Recv Time (Avg)	LTIME#70us830ns	Average Time for receiving Ethernet frames per paket
	Recv Time (Max)	LTIME#780us	Max Time for receiving Ethernet frames per paket
	Send Time (Avg)	LTIME#41us5ns	Average Time for sending Ethernet frames per paket
	Send Time (Max)	LTIME#625us	Max Time for sending Ethernet frames per paket
	LostCycleCount	0	Number of lost iec cycles
1			

The xErrorCount increases by about 50 when the switch is turned on again, and the LostFrameCounter increases by about 300.

To compensate for this, set a fixed bit rate (100MBIT) and full duplex on the controllers. Then the network card does not have to search for the speed and thus the interruption time is shorter.

Please note, there will always be a small interruption, as this is caused by the hardware.

Power cycling of the Primary Network Switch will always generate a failure of the EtherCAT network!

For example, if the power supply of the switch is broken.

Should powering off the network switch happen knowingly, unplug the Ethernet cable before restart the switch.

• This way, there will be no disconnection.

• When the switch is booted, plug in the cables and the connection will run without interruption.

5.2.2 EtherCAT: Switching Off/On a Slave from the IEC Program

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of Network scan.



• Activate the Diagnosis for devices.



• Insert an *EtherCat Master* Ethernet adapter and specify the interface to be used.

If a target system has not been defined yet, then the error message "Gateway not configured" is displayed.

EtherCatDeaktivateSlave.project* - CODESYS	and the second second		
<u>File Edit View Project Build Online Debug Tools Window Hel</u>	р		
🎦 😅 🔚 🕼 🗠 🗠 🕹 🖻 🛍 🗙 🖊 🌿 🏙 🔛 🌘	🕴 🗐 🕞 📲 👋 (1 🖓 👘 👘	8 + ∭= ∛	
Devices 👻 🕂 🗙	Device PLC_PRG	Library Manager EtherCAT_Master	×
EtherCatDeaktivateSlave			
🖻 🎬 Device (CODESYS Control RTE V3)	General	Autoconfig Master/Slaves	EtherCAT
P DI PLC Logic			
C Application	Sync Unit Assignment	EtherCAT NIC Setting	
Library Manager	EtherCAT I/O Mapping	Destination Address (MAC) FF-FF-FF-FF-FF-FF	Broadcast Enable Redundancy
EI PLC PRG (PRG)		Seurce Address (MAC) 00.00.00.00.00.00	Browse
	EtherCAT IEC Objects	3041CE Address (IAC)	
		Network Name LAN B Real-time	
- Del C PRG	Status	Select Network by MAC Select Network	vork by Name
EtherCAT Master (EtherCAT Master)	Information		
	Information	Distributed Clock	Options
		Cycle Time 4000 is	Use LRW instead of LWR/LRD
		Sync Offeet 20 A %	🔲 Enable messages pertask
			Automatic Restart Slaves
		Sync Window Monitoring	
		Sync Window 1 µs	

• Insert a slave below the EtherCat Master or scan the bus.



• Edit the PLC_PRG POU as follows:

Declaration

```
VAR

xDisable : BOOL;

xEnable : BOOL;

xReconfigure : BOOL;

itfNodeSlave : DED.INode;

fbReconfigure : DED.Reconfigure;

eState : IoDrvEthercatLib.ETC_SLAVE_STATE;

END_VAR
```

Implementation

```
itfNodeSlave := EK1100;
IF xDisable THEN
    xDisable := FALSE;
    itfNodeSlave.Enable := FALSE;
    xReconfigure := TRUE;
END_IF
IF xEnable THEN
    xEnable := FALSE;
    itfNodeSlave.Enable := TRUE;
    xReconfigure := TRUE;
END_IF
fbReconfigure(xExecute := xReconfigure, itfNode := EtherCAT_Master);
IF fbReconfigure.xDone THEN
    xReconfigure := FALSE;
END_IF
EK1100(); // Necessary for the status to be updated
eState := EK1100.wState;
```

· Start the project and test the functionality by deactivating and activating the slave.



5.3 CODESYS EtherNet/IP - FAQ (EN)

5.3.1 Connecting to a WAGO Fieldbus Coupler via Ethernet/IP (IP scanner)

5.3.1.1 Hardware

- 1x WAGO fieldbus coupler 750-352/000-001
- 1x digital input terminal 750-401
- 1x digital output terminal 750-504
- 1x end terminal 750-600

5.3.1.2 Requirements for the Wago controller

- Issue the IP address (e.g. using the tool WAGO Ethernet Settings).
- Activate output variables (e.g. using the tool WAGO Ethernet Settings → Ethernet/IP).
- Procure the manual for the fieldbus coupler.
- Download the current EDS file for the device from the WAGO website.

5.3.1.3 Requirements for CODESYS

- Install the Wago EDS file via Tools → Device Repository... → Install...
- Create a standard project and define your own device (e.g. *CODESYS Control Win V3*) Scan the network and select the device.
- · Insert an Ethernet adapter, an Ethernet/IP scanner and a Wago fieldbus coupler in the project.



5.3.1.4 Settings on the Ethernet adapter

• Define the network interface to be used.

Untitled1.project* - CODESYS				
File Edit View Project Build Online Debug Tools Window Help				
物産目通しのと防衛と議論に同じった日間間のよう	*101914121618	T		
Province a M				
R (a United)	g tosenet x g Devoe			•
- M Device (CODESI'S Control Win V3)	General		\frown	
RC Logic		Interface: LAN-Verbindung		
🖹 🔘 Application	Ethernet Device Parameters	Disa Operating System Settings	\smile	
💼 Ubrary Manager	Qatur	Change Operation System Settions		
PLC_PRG (PRG)	20107	Count of a row of a row of		
Task Configuration	Ethernet Device 1/O Mapping	IP Address 192 . 168 . 20 . 62		
B Divertier 19 Scener 10Cude		Subnet Mask 255 , 255 , 248 , 0		
B (B) RUPScappederviceTask	Information	Defends Calarama (402 - 440 - 420 - 4		
Ethenhet_P_Scanner.ServiceCycle		Deaux Galeway 192 - 100 - 100 - 1		
🖻 🚯 MainTask				
- PLC_PRG			D	*
· · · Ethernet (Ethernet)				
Etherhiet_P_Scanner (Etherhiet/IP Scanner)				
 — () WAGO_750_352020_000_Ethernet_STD (WAGO 750-352020-000 Ethernet-STD) 				
	Messages - Total 0 error(s), 0 warning(s)	, 2 message(s)		* 3 X
	Devices	O error(s) O warr	iing(s) • 2 message(s) ×	
	Description	Project	Object	Posi
	Oreated task 'ENIPScamerIOTask'.			
	Oreated task 'ENIPScannerServiceTa	sk'.		
<u>к</u> — п — н				
Services 👔 POUs 🗊 Modules	•	11		· ·
			Last build: 🧿 0 🕐 0 Precomple: 🗸	Current user: (nobody)

5.3.1.5 Settings on the device

5.3.1.5.1 Tab General

• Enter the IP address of the device.

The option Check Major Revision can be deactivated in order to avoid errors.

Croteerz CodeSrs Control Win V3)			S2020_000_Ethernet_STD X	
	Genell Consolitions Assemblins Etherhold Parameters Etherhold Parameters Etherhold Parameters Etherhold Parameters Etherhold Parameters Etherhold Parameters	Address Settings PrAddress: 122 - Mile - 199 - 222 Electronic Knying Gengeziolis Cada Gengeziolis Cada Colas Interior Cada Colas Interior Cada Colas Interior Cada Cada Interior Cada Colas Interior Cada Electronic Cada Cada Interior Cada Cada Interior Cada Electronic Cada Cada Interior Cada Cada Interiori	Caude the part of you are not sure	
	Nesages - Total 0 amorbi), 0 warreg(s), Desces Description © Created task 1567/scanner/07ael/ © Created task 1587/scanner/fervio/Task	Smeanpeld) × O Serve(s) ® O waveleg(s) Priped C.	0 2meniaptij) X Object	• 8 Pi

5.3.1.5.2 Tab Connections

• Through the EDS file a standard connection is created with the connection path 20 04 2C 65 2C 68.

P	WAG0_750_352020_000_Ethernet_STD X							
	General	Connection Name	RPI (ms)	0->T Size (Bytes)	T->O Size (Bytes)	Config#1 Size (Bytes)	Config#2 Size (Bytes)	Connection Path
	Connections	- 1. dass1 - exclusive owner	10	5	6	comig-1 site (oyies)	coning-2 size (oyies)	20 04 2C 65 2C 68
	Assembliss							

From the Wago manual (WAGO Assembly Instances) it can be seen that 0x65 (101) in the connection path means the following: 0x65 (101) \rightarrow for **analog and digital** output data Since we are only using a digital output terminal, you need to change this value to 0x66 (102): 0x66 (102) \rightarrow for **digital** output data Also, change the value 0x68 (104) \rightarrow for analog and digital input data with status byte to 0x69(105) for digital input data with status byte. This produces the following connection path: 20 04 2C **66** 2C **69** To be able to change the connection path you have to delete the existing connection and add a new one. Set the new connection to generic connection (freely configurable) and the settings for the connection path to user-defined path. In addition, make the following settings:

Connection Path Settings	
🔘 generate path automatically	
Configuration Assembly	Cancel
Class ID 16# 4 Instance ID 16# 0	Attribute ID 16# 3
Consuming Assembly (0>T)	
Class ID 16# 4 Instance ID 16# 0	Attribute ID 16# 3
Producing Assembly (T>0)	
Class ID 16# 4 Instance ID 16# 0	Attribute ID 16# 3
 user-defined path 	
Generic Parameters	
Connection Path 20 04 2C 66 2C 69	
Trigger Type Cyclic 🔹	RPI (ms) 10
Transport Type Exclusive Owner 🔻	Timeout Multiplier 4
Scanner to Target (Output)	Target to Scanner (Input)
0>T Size (Bytes)	T>0 Size (Bytes) 2
Config#1 Size (Bytes) 0	
Config#1 Size (Bytes) 0 1x Digital output	t 1x Digital input and 1x status byte
comigat size (b) test o	
Connection Type Point to Point	Connection Type Point to Point
Fixed/Variable Fixed -	Fixed/Variable Fixed -
Transfer Format 32 Bit Run/Idle 🔹	Transfer Format 32 Bit Run/Idle 🔻

5.3.1.5.3 Tab Ethernet/IP I/O mapping

• So that the values from the bus are displayed without variable connection, set updating to *Activated 2* (always in the bus cycle task).
General	Find		Filter Show all			•		
Connections	Variable	Mapping	Channel	Address	Туре	Unit	Description	
connections	B- 🐐		Generic AssemblyParam0	%180	BYTE			
Assemblies	B- 🍫		Generic AssemblyParam1	%IB1	BYTE			
	B- 🖗		Generic AssemblyParam0	%Q80	BYTE			
iser-Defined Parameters								
EtherNet/IP Parameters								
therNet/IP I/O Mapping								
Status								
nformation								
						Re	set mapping	Always update variables: Enabled 2 (always in bus cycle task)
	IEC Objects							
			Туре					
	Variable	Mapping						
	Variable	Mapping	RemoteAdapter					

5.3.1.6 Loading the project to the controller and starting it

	• • • • • • • • • • • • • • • • • • •											
s 🗸 🗸	X / B WAGO_750_352020_000_Et	# WAC0_750_352020_008_fthemet_STD x										
Chited 7 Gill Device [connected] (CODESYS Control Win V3)	General	Find Filter, Draw all										
# M PLC Logic		Variable Mag	no Changel	Address	Type	Current Value	Prepared Value	Unit Description				
- O Application (run)	Connections		Ceneric IssenbluDaram)	54,790	ROTE	1						
E Lbrary Manager	Assembles		Generic AssemblyParam1	56201	TOTE	0						
- PLC_PRG (PRG)	Albertolia	0.5	Generic Assembly/Paramit	56000	IN/TE	3						
Task Configuration	User-Defined Parameters	- 14	81)	\$6000.0	800	TRUE						
BOPScamerIOTask		-	811	\$6000.1	8001	TRUE						
C di Etherliet P_Scenner.IOCycle	EtherNet/32 Parameters	- 14	512	%QX0.2	BOOL	FALSE						
e 🕼 DiPScamerServiceTask		-	8:3	16(2)(0.3	BOOL	FALSE						
 Wij strenet je joarne selvicecyce Wij strenet je joarne selvicecyce 	EtherNet/3P 1/O Mepping	- 14	814	%QX0.4	8004	FALSE						
- go Mantas	Bata	-14	815	%QN0.5	8000	PALSE						
	SCALER	- •	815	%QND.6	BOOL	FALSE						
Coll Charles ID Connect (Directive ID Connect)	Information	- *	517	%QX0.7	BOOL	FALSE						
 Compare Comparison (or phases) Compare Compared (or phases) 	7778					Reset mapping	Always update v	eriables: Frohied 2 (No	ways in hus cycle task)			
		THE Objects										
		and objects										
		Variable Map	ng Type									
		- @ WAGD_750_352020	RemoteAdapter									
		L										
		🍫 – Create new variable 🏻 🍫	 Map to existing variable 									
	Messages - Total 0 error(3), 0 warning(3)	, 5 message(s)										
	Build	Auld • O 0 error(b) • 0 warring(b) O S message(b) ×										
		• O ener(s)										
	Description	Project		Objec	tt.			Position				
	Description generate global initializations	Project		Obje	đ			Position				
	Description generate global initializations generate code initialization	Project		Obje	đ			Position				
	Description generate global initializations generate code initialization generate relocations	Project		Obje	1			Position				
	Description generate global initializations generate code initialization generate relocations Size of generated code: 412212 byt	Project		Obje	đ			Position				
	Description generate pilolal initalizations generate relocations generate relocations Sise of generated code 412212 byth Sise of generated code 412212 byth Sise of global data 98601 bytes	Project		Obje	a			Position				
	Description generate global initializations generate code visibalazion generate indicatione Gias af generated code: 4122121b/t Gias af generated code: 4122121b/t Gias af generated code: 412212 b/t Gias af generated code: 41221 b	Project		Obje	a			Position				

5.3.2 Detection of a disconnected Ethernet cable / cable break

5.3.2.1 Question:

Why is it not possible to determine a cable break or a disconnected in a TCP/IP connection via the Net Base Services Library?

5.3.2.2 Example structure

A TCP server (FB TCP_Server¹⁹⁵) runs on a PLC, to which several clients can connect without problems during normal operation.

After the disconnect of a client, the disconnected connection (FB TCP_Connection¹⁹⁶) can be recognized by an error during cyclic reading (FB TCP_Read¹⁹⁷).

The connection termination of an existing connection, by disconnecting the Ethernet cable between the controller and the PC are not recognized by the PLC.

(Nor f.e. by the TCP server, running on the PLC, whereby the connection, FB TCP_Connection cannot be released for a new client and is permanently blocked.)

Cyclic reading on such a connection does not generate an error, and the output *xActive* of the FB TCP_Connection¹⁹⁸ is still *TRUE*.

5.3.2.3 Reference

When possible, do not use CAA NBS (CAA Net Base Services)! Please use the NBS¹⁹⁹(Net Base Services²⁰⁰) without the CAA prefix.

- The one-sided closing of the connection can be detected by regular reading.
- This behavior is as-designed within the TCP/IP protocol.
- A cable break can be recognized with TCP/IP only over the fact that client and/or server recognize, that for a certain time (timeout) an expected telegram is missing.
 - The protocol must therefore be designed in such a way that telegrams are regularly exchanged between client/server.
 - · If a timeout occurs, both sides can close the connection independently of each other.
 - It can then be used again for a new connection setup.

5.3.3 Ethernet/IP: Setting the IP Address of a Remote Adapter

Establish a connection to the device that you want to link via Ethernet/IP. In this example, a Wago controller (Ethernet/IP adapter) is used again. The required steps are listed in this FAQ article:

¹⁹⁵ https://content.helpme-codesys.com/en/libs/Net%20Base%20Services/Current/NetBaseServices/Function-Blocks/TCP/ TCP_Server.html

¹⁹⁶ https://content.helpme-codesys.com/en/libs/Net%20Base%20Services/Current/NetBaseServices/Function-Blocks/TCP/ TCP_Connection.html

¹⁹⁷ https://content.helpme-codesys.com/en/libs/Net%20Base%20Services/Current/NetBaseServices/Function-Blocks/TCP/ TCP_Read.html

¹⁹⁸ https://content.helpme-codesys.com/en/libs/Net%20Base%20Services/Current/NetBaseServices/Function-Blocks/TCP/ TCP_Connection.html

¹⁹⁹ https://content.helpme-codesys.com/en/libs/Net%20Base%20Services/Current/index.html

²⁰⁰ https://content.helpme-codesys.com/en/libs/Net%20Base%20Services/Current/index.html

Connecting to a WAGO Fieldbus Coupler via Ethernet/IP (IP scanner)²⁰¹

Your project should look like this:

Devices v 4 ×	Device X		
Ethernet/p_RemoteAdapter_Set/p	1	Correctionale Contension Devices	
= 5 1 Device [connected] (CODESYS Control Win V3)	Communication Settings	Scan network Gateway * Device *	
= 🗐 PLC Logic	Analisations		
G Application [run]	Applications		
- III) Library Manager - III PLC_PRG (PRG)	Backup and Restore		
III ask Configuration Internation Internation	Files		•
EtherNet_IP_Scanner.IOCycle Security EntPScannerServiceTask	Log	Gateway-1	[0301.A000.034A] (active)
	PLC Settings	IP-Address: localhost	Device Name: KERNTPC
PLC_PRG	PLC Shell	Port	Device Address:
General Control (Control)	Users and Groups	1217	Target ID:
	Access Rights		0000 0001
	Task Deployment		4096
	Status		Target Vendor: CODESYS GmbH
	Information		Target Version: 3.5.12.40

• Adapt the POU *PLC_PRG* as follows:

Declaration

VAR	
xSet	: BOOL;
abyNewIp	: ARRAY [03] OF BYTE := [192, 168, 99, 139]; // =
wrong IpAddr !!	
itfEthIpRmAdapter	: IoDrvEthernetIP.IRemoteAdapter2;
END_VAR	

Implementation

```
IF xSet Then
    xSet := FALSE;
    itfEthIpRmAdapter := WAGO_750_352020_000_Ethernet_STD; // must be the exact
name of the tree node
    itfEthIpRmAdapter.IPAddress := abyNewIp;
END_IF
```

²⁰¹ https://faq.codesys.com/pages/viewpage.action?pageId=1310885

- Download the modified project to the controller.
- By setting the variable, the incorrect IP address is sent to the remote adapter and its connection is lost.

Devices 👻 🕈 🗙	Device PLC_PRG X					
Ethernetip_RemoteAdapter_Setip	Device Application.PLC_PRG					
E 😌 👔 Device [connected] (CODESYS Control Win V3)						
E III PLC Logic	Expression	Type	Value	Prepared value	Address	Comment
🖹 🔘 Application [run]	ø xSet	BOOL	FALSE			
👘 Library Manager	😑 < abyNewIp	ARRAY [03] OF BYTE				
PLC_PRG (PRG)	ø abyNewIp[0]	BYTE	192			
🖹 🎉 Task Configuration	abyNewIp[1]	BYTE	168			
😑 🎲 ENIPScannerIOTask	abyNewIp[2]	BYTE	99			
EtherNet_IP_Scanner.IOCycle	abyNewIp[3]	BYTE	139			
🖶 🍪 ENIPScannerServiceTask	ItfEthIpRmAdapter	IoDrvEthernetIP.IRemoteAdapter2	16#05A49E24			
EtherNet_IP_Scanner.ServiceCycle						
😑 🍪 MainTask						
PLC_PRG						
= 😏 🔟 Ethernet (Ethernet)						
😑 😏 🌉 EtherNet_IP_Scanner (EtherNet/IP Scanner)						
AG0_750_352020_000_Ethernet_STD (WAGO 750-352020-000 Ethernet-STD)						
	= 1 TF xSet FAISE Then				A V	
	2 xSet FARSE := FALSE:					
	3 itfEthIpRmAdapter :	 WAGO_750_352020_000_Etherne 	t_STD; // must	the exact name o	f the tree no	de
	4 🌒 itfEthIpRmAdapter.I	PAddress := abyNewIp;				
	5 BND_IPRETURN					

When the correct IP address is sent, the connection to the Ethernet/IP adapter is reestablished.

5.3.4 Trouble Shooting for Ethernet IP connections

5.3.4.1 General suggestions

- Check the network connection: Execute a ping between the systems to determine a general connection.
- · Check the Firewall settings. Codesys uses the following settings by default:
 - To open a connection: TCP 44818
 - For IO-data exchange: UDP 2222
 - See the Info from CIP Specification:

TCP Port Number

TCP Port Numbers

The following TCP port numbers are reserved with the Internet Assigned Numbers Authority (IANA) for use with the EtherNet/IP encapsulation protocol:

Table 2-2.1 TCP Port Numbers

Port Number	Description
44818 (0xAF12)	Used for non-secure encapsulation of messages
2221 (0x08AD)	Used in conjunction with TLS to provide a secure transport for encapsulation messages. Refer to Volume 8 for more information.

UDP Port Number

UDP Port Numbers

The following UDP port numbers are reserved with the Internet Assigned Numbers Authority (IANA) for use with the EtherNet/IP encapsulation protocol:

Table 2-2.2 UDP Port Numbers

Port Number	Description
44818 (0xAF12)	Used for non-secure encapsulation messages and secure and non-secure UCMM and Class 3 explicit messages.
2221 (0x08AD)	Used in conjunction with DTLS to provide a secure transport for Forward_Open/Forward_Close, CIP Transport Class 0/1 message using the Common Packet Format. Refer to Volume 8 for more information.
2222 (0x08AE)	Used for CIP Transport Class 0/1 message using the Common Packet Format. See Chapter 3.

- · Check the PLC Device Log for further information.
- Check the Adapter 'Status' page.
- Check the Adapter 'Log' Page.
- Check the used network settings:
 - Are the settings consistent in Ethernet and EtherNet_IP_Adapter, e.g. are they on the same subnet?
- Execute a scan on the EtherNet_IP_Scanner²⁰²(by mouse context menu).

5.3.4.2 The Scanner doesn't connect to Adapter(s)

- · Follow the points listed in the "General suggestions".
- Take a closer look at the problem reported under the Adapter 'Status' page:



• Execute a scan on the EtherNet_IP_Scanner²⁰³(by mouse context menu).

²⁰² https://content.helpme-codesys.com/en/CODESYS%20EtherNetIP/_enic_cmd_scan_for_devices.html 203 https://content.helpme-codesys.com/en/CODESYS%20EtherNetIP/_enic_cmd_scan_for_devices.html

• For test, disable the electronic keying "Check match"

5.3.4.3 Adapter doesn't accept connection from Scanner

- Follow the points listed in the "General suggestions".
- Export EDS File (in TAB General) and use this EDS File for the configuration on the Scanner side.
- Take a closer look at the problem reported under the Adapter 'Status' page:

Comparison of the second	EtherNet_IP_Adapter	
EtherNet_IP_Adapter.ServiceCycle MainTack (IEC-Tacks)	General	EtherNet/IP Adapter :
PLC_PRG	Tags	Last diagnostic message
Comparison of the second	Log	Diag String: 'Adapter running.'
	EtherNet/IP Adapter Parameters	
	EtherNet/IP Adapter I/O Mapping	
	EtherNet/IP Adapter IEC Objects	
	Status	
	Information	
		<
	<	>



5.3.4.3.1 FAQ:

EtherNet/IP Scanner not working after reboot.

Follow the points listed in the "General suggestions" (special, see the plc logger for more information).

5.3.4.3.1.1 Error Example:



The Scanner is trying to load parameters before the EtherNet/IP adapter has successfully established a connection.

5.3.4.3.1.2 Workaround:

The user can try to restart the EIP via the application. See the following to implement the Functionblock "Reconfigure" from CAA Device Diagnosis²⁰⁴ (Namespace default DED) in a Program Call:

5.4 CODESYS Ethernet Adapter - FAQ (EN)

5.4.1 Ethernet Adapter

Change IP address with IEC-Code. Can be done with CAA-Device Diagnosis: See Forge Example²⁰⁵

5.4.1.1 Step-by-step guide

1. Preset the option in the Config file

```
[SysSocket]
Adapter.0.Name="eth1"
Adapter.0.EnableSetIpAndMask=1
```

2. Enable diagnosis for devices (see OLH: PLC-Settings- Activate diagnostics for devices²⁰⁶)

 $206\ https://content.helpme-codesys.com/en/CODESYS\% 20 Development\% 20 System/_cds_edt_device_plc_settings.html$

²⁰⁴ https://content.helpme-codesys.com/en/libs/CAA%20Device%20Diagnosis/Current/CAA-Device-Diagnosis/fld-CAA-Device-Diagnosis.html

²⁰⁵ https://forge.codesys.com/prj/codesys-example/caa-device-diag/home/Home/

3. Implement Functionblock Reconfigure from CAA Device Diagnosis²⁰⁷ (Namespace default DED) in a Program Call:

IEC-Code: Declaration

```
VAR
 xlnit
                    : BOOL;
 xEnableEthernet
                          : BOOL;
 xEnableEtherNet_IP_Adapter : BOOL;
 reconfig
                      : DED.Reconfigure;
  strInterfaceName
                           : WSTRING := "Internal";
  arlPAddress
                        : ARRAY[0..3] OF BYTE := [192,168,1,44];
  arSubnetmask
                          : ARRAY[0..3] OF BYTE := [255,255,255,0];
                        : ARRAY[0..3] OF BYTE := [0,0,0,0];
  arGateway
                            : BOOL;
 xSetInterfaceName
 xSetIP
                     : BOOL;
END_VAR
```

IEC-Code: Implementation

(*

```
Ethernet = Name in device tree from Ethernet Adapter
EtherNet_IP_Adapter = Name in device tree from EtherNet_IP_Adapter
*)
```

```
IF NOT xInit THEN

xEnableEthernet := Ethernet.Enable;

xEnableEtherNet_IP_Adapter := EtherNet_IP_Adapter.Enable;

xInit := TRUE;

END_IF
```

IF NOT reconfig.xExecute THEN IF xEnableEthernet <> Ethernet.Enable THEN Ethernet.Enable := xEnableEthernet; reconfig.xExecute := TRUE; reconfig.itfNode := Ethernet; ELSIF xEnableEtherNet_IP_Adapter <> EtherNet_IP_Adapter.Enable THEN EtherNet_IP_Adapter.Enable := xEnableEtherNet_IP_Adapter;

²⁰⁷ https://content.helpme-codesys.com/en/libs/CAA%20Device%20Diagnosis/Current/CAA-Device-Diagnosis/fld-CAA-Device-Diagnosis.html

```
reconfig.xExecute := TRUE;
    reconfig.itfNode := EtherNet_IP_Adapter;
  END_IF
END_IF
reconfig();
IF NOT reconfig.xBusy THEN
  reconfig(xExecute := FALSE);
END_IF
//for setting the Interface name you need to disable the device with reconfigure
IF xSetInterfaceName THEN
  EtherNet.UpdateConfiguredInterfaceName(strInterfaceName);
  xSetInterfaceName := FALSE;
END_IF
//for setting the IP address you need to disable the device with reconfigure
IF xSetIP THEN
  Ethernet.UpdateConfiguredIPSettings(arIPAddress, arSubnetmask, arGateway);
  xSetIP := FALSE;
END_IF
```

5.5 CODESYS KNX - FAQ (EN)

5.5.1 KNX: Integrating a CODESYS Controller

The CODESYS controller supports only one IP-based link.

5.5.1.1 Hardware

- 1x ABB power supply: SV/S 30.640.5.1
- 1x ABB IP interface: IPR/S 3.1.1
- 1x ABB switch actuator: SA/S 4.6.2.1
- 1x Gira button BA 2f 1 point: 5161 30

5.5.1.2 Requirements for ETS

The ETS is available in Version 5.6.5 Build 1109.

- · Installation of the product files (*.knxprod) for the devices listed above
- Installation of the product file KNX_CDS_Gateway.knxprod for the CODESYS controller The file is located in the CODESYS KNX-Package (<installation path>\CODESYS KNX\<version>\ETS5\KNX_CDS_Gateway.knxprod).

Catalog 🔻						
📩 Import 🏦 Export 🗠 🖓 Download	⇒ 3S-Smart	Software Solutions GmbH	 Controller 			
🚖 Favorites 🔹	Security	Manufacturer *	Name	Order Numb	Medium Type	Application
Device Templates]	3S-Smart Software Solutions GmbH	CODESYS KNX	2303000232	IP	PLC Application
Previously used						
Manufacturers						
4 🔳 3S-Smart Software Solutions GmbH						
Controller					15	
🛄 Controller						

· IP interface specified as communication interface



- Installation and activation of the "DcaCodeSys" plug-in. The file is located in the CODESYS KNX Package (<installations path>\CODESYS KNX\<version>\ETS5\DcaCodeSys.etsapp).
- Installation and activation of the "Compatibility Mode App"



· A physical address has been assigned to the devices listed in hardware.

Switch actuators

🕎 Buildings	· N	Number *	Name	Object Function	Description	Group Address	Length	C R	w	ΓU	Data Type	Priority
Dynamic Folders	■ ‡ 0		General	In Operation			1 bit	C R	- T	-	boolean	Low
▲ 📾 MvBuilding	■‡ 10)	Output A	Switch	Switch Channel A Switch	0/0/1, 0/1/0	1 bit	c -	W -	-	switch, switch	Low
4 III Floor1	∎‡ 29	9	Output A	Status Switch	Switch Channel A State	0/0/2	1 bit	C R	- T	-	switch	Low
	■ ‡ 30	D	Output B	Switch	Switch Channel B Switch	0/0/3, 0/1/0	1 bit	C - 1	W -	-	switch, switch	Low
A 1 Room01.06	∎‡ 49	9	Output B	Status Switch	Switch Channel B State	0/0/4	1 bit	C R	- T	-	switch	Low
I.1.0 IPR/S3.1.1 IP Router, MDRC	■‡ 50	D	Output C	Switch	Switch Channel C Switch	0/0/5, 0/1/0	1 bit	c - 1	W -	-	switch, switch	Low
1.1.6 SV/S30.640.5.1 Power Supply, Diagnosis, MDRC	∎‡ 69	9	Output C	Status Switch	Switch Channel C State	0/0/6	1 bit	C R	- T	-	switch	Low
1.1.7 SA/S4.6.2.1 Switch Actuator 4f.6A.M.MDRC	■‡ 70	0	Output D	Switch	Switch Channel D Switch	0/0/7, 0/1/0	1 bit	c - 1	W -	-	switch, switch	Low
1.1.8 2-g water-prot surf-mnt push-butn bus coup 1-pt op	■\$ 89	9	Output D	Status Switch	Switch Channel D State	0/0/8	1 bit	C R	- T	-	switch	Low

Button

🔲 Buildings 🔹	Nu	mber *	Name	Object Function	Description	Group Address	Lengt	C	۲ w	τι	J Data Type	Priority
Dynamic Folders	.		Button 1	Switching	Switch Channel A Switch	0/0/1	1 bit	C R	W	τu	1-bit, 1-bit	Low
▲ 📾 MyBuilding	# 2 1	1	Button 2	Switching	All Channels Off	0/1/0	1 bit	C R	W	τu	1-bit, 1-bit	Low
4 🔚 Floor1												
4 💭 Room01.06												
I.1.0 IPR/S3.1.1 IP Router, MDRC												
I.1.6 SV/S30.640.5.1 Power Supply, Diagnosis, MDRC												
I.1.7 SA/S4.6.2.1 Switch Actuator,4f,6A,M,MDRC												
🕨 🚛 1.1.8 2-g water-prot surf-mnt push-butn bus coup 1-pt op												

5.5.1.3 Preparing the CODESYS controller

- Make sure that the controller supports KNX links.
- In Version 3.5 SP14 and later, the Control SL products support the KNX stack (no components have to be added).

This does not apply to CODESYS Control WIN (the KNX component has to be added in CODESYSControl.cfg).

• Insert the components in the CODESYSControl.cfg file:

[ComponentManager] Component.X=CmpKNXStack.dll

5.5.1.4 Preparation in the CODESYS project

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network Scan.

KNX_SupportEquipment.project* - CODESYS			<u> </u>	
File Edit View Project Build Online Debug Tools Window	Help BACNet			
🎦 😂 📓 🎯 い つ 🐇 ங 🗈 🗙 構 🌿 🐴 🌿 🎙	🖹 🛅 • 📑 🛗 l 😂 🚿 🕠 🕞 💼	🎗 [@ % 4 % 5 + 0 ∰ ₹ 🎶		
Devices 👻 🕂 🗙	· Device X			
KNX_SupportEquipment Device (CODESYS Control Win V3)	Communication Settings	Scan network) Gateway 👻 Device 👻		_
B B PLC Logic				
- O Application	Applications			
Library Manager LC_PRG (PRG)	Backup and Restore			
Task Configuration AminTask (IEC-Tasks)	Files	Gatawa		
··他 PLC_PRG	Log	Gateway-1	 [0301, A000, 034A] (active) 	-
	PLC Settings	IP-Address: localhost	Device Name: KERNTPC	
	PLC Shell	Port	Device Address:	
	Users and Groups	1217	Target ID:	
	Symbol Rights		0000 0001	
	Task Deployment		Target Type: 4096	
	Status		Target Vendor: 35 - Smart Software Solutions GmbH	
	Information		Target Version: 3.5.13.10	

• Insert an *Ethernet* adapter into the device tree and specify the interface to be used.

If a target system has not been defined yet, then the error message "Gateway not configured" is displayed.

KNX_SupportEquipment.project* - CODESYS	A A		
<u>Eile Edit Vi</u> ew <u>P</u> roject <u>B</u> uild <u>O</u> nline <u>D</u> ebug <u>T</u> ools <u>W</u> indov	v <u>H</u> elp B <u>A</u> CNet		
🎦 🚔 📕 🎒 い つ 湯 ங 亀 🗙 🗛 🌿 🍕	🖹 🛅 - 🕞 🏙 🧐 💚 🕞 📲	⊀ ÇI 91 dı - 1	\$
Devices 🗸 🗸 🗙	Device Ethernet X		
Image: With State S	General Status	Interface:	92 . 168 . 0 . 1
PLC_PRG (PRG)	Ethernet Device I/O Mapping	Subnet Mask 2	255 . 255 . 255 . 0
= ∰ Task Configuration = ∲ MainTask (IEC-Tasks)	Ethernet Device IEC Objects	Default Gateway Adjust Operating Sy	0 . 0 . 0 . 0
마렌 PLC_PRG	Information		

• Insert a KNX below the Ethernet adapter in the device tree.

KNX_SupportEquipment.project* - CODESYS		
Elle Edit View Project Build Online Debug Iools Window	/ Help BACNet	ଝ।(ੋ≣ ੬≣ ਵ≣ \$ \$ \$ \$
Devices VIX_SupportEquipment	Device G Ethernet X	
Device (CODESYS Control Win V3) Device	General	Interface: AN-Verbindung IP Address 192 . 168 . 99 . 74
Library Manager	Ethernet Device I/O Mapping	Subnet Mask 255 . 255 . 248 . 0 Default Gateway 192 . 168 . 100 . 1
insk Configuration insk (IEC-Tasks) □ - ∰ PLC_PRG	Ethernet Device IEC Objects	Adjust Operating System Settings
🖻 - 📆 Ethernet (Ethernet)		

• On the *General* tab, you can define any number of inputs.

In the following, two input channels for receiving the telegrams of the button and one output channel for switching the actuator have been created:

KNX_SupportEquipment.project* - CODESYS		_				
Eile Edit View Project Build Online Debug Tools Window	w <u>H</u> elp B <u>A</u> CNet					
🎦 🚔 🛃 🍏 い つ み 🏦 🛍 🗙 構 🌿 🐴 🌿 🎚	🛅 🛅 + 📑 🏙 👒 🧐 🕞 🍵	🚜 ÇE 92 de +	18			
Devices 👻 🕂 🗙	Device Ethernet	MX X				
KVX_SupportEquipment The second sec	General	Add 🖉 Edit 🗙	Delete Export to ETS Imp	ort CSV Export CSV		
B-BL PLC Logic	General		C 01: 11	0.011.15.11	-	DDT
	KNX I/O Mapping	Channel Number	Group Object Name	Group Object Function	туре	DPT
Library Manager		1	ReceiveOnOff	From the switch	Input	DPT 1.*
	KNX IEC Objects	2	ReceiveOffOnly	From the Switch	Input	DPT 1.*
		3	SendOnOff	To switch channel B	Output	DPT 1.*
MainTask (IEC-Tasks)	Status					
	Information					
Eventer (colener)						

The KNX connection is limited to a total of 1000 inputs and outputs.

• You export this configuration to an XML format that can be read by the ETS.

Device Ethernet	👔 KNX 🗙				
General	🕂 Add 📝 Edit 🗙	Delete Export to ETS Import	CSV Export CSV		
KNV 1/0 Manazina	Channel Number	Group Object Name	Group Object Function	Туре	DPT
Kix t/o Mapping	1	ReceiveOnOff	From the switch	Input	DPT 1.*
KNX IEC Objects	2	ReceiveOffOnly	From the Switch	Input	DPT 1.*
	3	SendOnOff	To switch channel B	Output	DPT 1.*

In the I/O mapping, data areas are created automatically for each channel.

In addition, two data points have been created, allowing the physical address to be assigned from the ETS software:

Device 🖬 Ethernet	KNX X							
General	Find		Filter	Show all	•	🕆 Add FB 🕯	for IO chanr	nel → Go to instance
KNY I/O Mapping	Variable	Mapping	Cha	nnel	Address	Туре	Unit	Description
Kitk t/o happing	• • *•		Prog	ram LED Status	%IX0.0	BOOL		Program LED Status
KNX IEC Objects	* @		Prog	ram Button	%QX0.0	BOOL		Program Button
	۰۰۰ 👋		1 - R	eceiveOnOff - From the switch	%IB1		DPT 1.*	
Status	🗎 - 🍢		Cont	rol 1 - ReceiveOnOff - From the switch	%QB1	BYTE		
	😟 🦄		2 - R	eceiveOffOnly - From the Switch	%IB3		DPT 1.*	
Information	🗎 - ^K ø		Cont	rol 2 - ReceiveOffOnly - From the Switch	%QB2	BYTE		
	<u>نه</u> ۲		3 - S	endOnOff - To switch channel B	%QB3		DPT 1.*	

5.5.1.5 Integrating the CODESYS device in the ETS

• The controller can be added to the ETS project by means of the catalog.

Assign a physical address to the device:

Buildings 🔻								^ 🗆 🗡	R Propert	es	>
🕂 Add Devices I 🔹 🗶 Delete 🔮 Download I 🔹 🕦 Info 🍷 🐒 Rese	et 🐇 Unload 🔹 🚔 Print						Searc	h 🔎	0		6
Buildings	 Address * 	Room	Description	Application Program	Adr Prg Par Grp Cfg	Manufacturer	Order Nurr	Product	Settings	Comments	Information
Dynamic Folders	10.1	Room01.06		PLC Application		3S-Smart Software Sol.	. 23030000 (ODESYS KNX	Name		
4 🕅 Myßuilding	1.1.0	Room01.06		IP Router/2.0	🛇 🛇	ABB	2CDG 110 1I	PR/S3.1.1 IP Router,MDRC	CODESYS KND	(
A B Floor	11.6	Room01.06		Power Supply, Diagnosis, 640mA/1.1	⊘ ⊘	ABB	2CDG 110 15	V/S30.640.5.1 Power Supply, Diag	Individual Ad	drare	
	11.7	Room01.06		Switch 4f 6M/3.2b	00000	ABB	2CDG 110 15	A/S4.6.2.1 Switch Actuator,4f,6A,1	individual rea	10	A
4 [j] Room01.06	1.1.8	Room01.06		Switching, dim., venet. blind, value, scene 10F	00000	GIRA Giersiepen	5161.30 2	-g water-prot surf-mnt push-but		10 1	• Park
I.0.1 CODESYS KNX									Description		
II.1.0 IPR/S3.1.1 IP Router, MDRC											
1.1.6 SV/S30.640.5.1 Power Supply, Diagnosis, MDRC											
II.1.7 SA/S4.6.2.1 Switch Actuator,4f,6A,M,MDRC											

• On the DCA tab, the configuration previously exported in CODESYS can be read into the ETS.

Buildings 🔻		
🕂 Add Devices 🔹 🗙 Delete 🔮 Download 🔹 🕕 Info 👻 👥 Rese	- 🖗 Unload 🖛 🚔 Print	
Buildings	• •	
Dynamic Folders		
▲ 🎒 MyBuilding		
4 🔚 Floor1		
4 💭 Room01.06	Lond Conferencia	
1.0.1 CODESYS KNX	Loss Comparation	
1.1.0 IPR/S3.1.1 IP Router, MDRC		
I.1.6 SV/S30.640.5.1 Power Supply, Diagnosis, MDRC		
I.1.7 SA/S4.6.2.1 Switch Actuator,4f,6A,M,MDRC		
1.1.8 2-g water-prot surf-mnt push-butn bus coup 1-pt op		Version: 010.10
🔆 Trades	Group Objects / Parameter / DCA	

• After the import, the inputs and outputs created in CODESYS can be connected with group addresses.

Buildings 🔻												
🕂 Add Devices 🖙 🗙 Delete 👲 Download 🖙 🚯 Info 👻 🐒 Reset 🤌	Unload 🔹 🚔	Print										
🔲 Buildings 🗸 🖍	Number	Name	Object Function	Description	Group Address	Length	с	R	ΥТ	U	Data Type	Priority
Dynamic Folders	■ ‡ 1	ReceiveOnOff	From the switch	Switch Channel A Switch	0/0/1	1 bit	C -	- W	т	U 1	l-bit	Low
▲ 🎒 MyBuilding	■‡ 2	ReceiveOffOnly	From the Switch	All Channels Off	0/1/0	1 bit	C ·	- W	Т	U 1	l-bit	Low
A Floor1	1	SendOnOff	To switch channel B	Switch Channel B Switch	0/0/3	1 bit	C	R -	Т	- 1	l-bit	Low
▲ 💭 Room01.06												
DI 1.0.1 CODESYS KNX												
1.1.0 IPR/S3.1.1 IP Router, MDRC						3						
I.1.6 SV/S30.640.5.1 Power Supply, Diagnosis, MDRC												
I.1.7 SA/S4.6.2.1 Switch Actuator,4f,6A,M,MDRC												
1.1.8 2-g water-prot surf-mnt push-butn bus coup 1-pt op												

5.5.1.6 Transferring the ETS configuration to the controller

• As with any other device, the physical address must also be assigned to the CODESYS controller.

Therefore the data point must be set after the request in the ETS:

KNX_SupportEquipment.project* -	CODESYS	-	-			-		x		-		-					
Ele Edit View Broject Build (aline Debug Iools ∭indow He	p B&CNet							che >	(🖬					a a		
1월 📽 🔜 1월 16 🔿 🐰 🗞	🛍 🗙 1 🗛 😘 🐴 😘 1 📾 1 🐮	• 🕆 🖽	0; 08	 <!--!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!</td--><td>1712</td><td></td><td></td><td></td><td></td><td>23</td><td></td><td> 🖸 🗄</td><td>Suchen</td><td></td><td></td><td>4</td><td>III 🗊 S</td>	1712					23		🖸 🗄	Suchen			4	III 🗊 S
										- 1		• •	- Concile	_		-	
Devices 💌 🕸 🗙	Device Ethernet							-	_		and the second		familiar di ser		CONTRACT A RECEIPTION OF AD		
🗏 🎒 KNX_SupportEquipment 💌		<u> </u>						- 1									
B G [] Device [connected] (Ct	General	The b	us is not run	ing. The shown values are perhaps not actual													
Application (run	KNX I/O Mapping	Find		Filter Show all				- N					^ □	×	Properties		
👔 Library Manag				THE SHOW BE								Search		ρ	P Find and Replace		
- PLC_PRG (PRI	KNX IEC Objects	Variable	Mapping	Channel	Address	Type	Current Value	P						-	 Induite Replace 		
😑 🧱 Task Configur	Status	2		Program LED Status	%D(0.0	BOOL	TRUE			Adr Prg	Par Grp Cfg		Manufacturer	01	Workspaces		
🖻 🗇 MainTask				Program Button	%QX0.0	BOOL	TRUE						3S-Smart Software Sol		O Todo Itoms		
- @ PLC_F	Information			1 - ReceiveOnOff - From the switch	%81					⊘ -	📀		ABB	201	O TOGO REINS		
😑 😏 😭 Ethernet (Ethernet				Control 1 - ReceiveOnOff - From the switch	%Q81	BYTE	0			⊘ -	📀		ABB	201	Pending Operations		
▲ 🗐 KPKK (KPK)		8.9		2 - ReceiveOffOnly - From the Switch	%IB3					$\odot \odot ($	000		ABB	201			
		8-14		Control 2 - ReceiveOffOnly - From the Switch	%QB2	BYTE	0		ene 10F	000	000		GIRA Giersiepen	516	Active		History
		8-14		3 - SendOnOff - To switch channel B	%QB3										S Cancel all		
															-		
															1.0.1 CODESYS KNX (Room01.06)		
																-	
		1												1	Please press programming button		
								_							 Download(Phy: Addr.): Downloadir 	0	

If this is done promptly, then the assignment of the physical address is documented in the ETS.

Buildings	*	Address *	Room	Description	Application Program	Ad	Ir Prg Par Grp Cfg	Manufacturer	Or	Workspaces
Dynamic Folders	1	1.0.1	Room01.06		PLC Application	0	📀	3S-Smart Software Sol	230	O To do home
4 🌆 MyBuilding	1	1.1.0	Room01.06		IP Router/2.0	0	🔗	ABB	201	O Todo Items
A 🕮 Floort		11.6	Room01.06		Power Supply, Diagnosis, 640mA/1.1	ø	🤣	ABB	2CI	Pending Operations
	- 1	1.1.7	Room01.06		Switch 4f 6M/3.2b	0	0000	ABB	201	Andina
A INT KOOMUTUD	- 1	1.1.8	Room01.06		Switching, dim., venet. blind, value, scene 10F	. 📀	0000	GIRA Giersiepen	516	Active
1.0.1 CODESYS KNX										Clear History
I.1.0 IPR/S3.1.1 IP Router, MDRC										
1.1.6 SV/S30.640.5.1 Power Supply, Diagnosis, MDRC									0	1.0.1 CODESYS KNX
III 117 SA/S4 6 21 Switch Actuator AF6A M MDRC									1	 Downroad(Pny, Addr.): Finished

Because the controller does not have a valid program yet, it must still be downloaded from the ETS.

1.0.1	Room01.06	PLC Application	00000	3S-Smart Software S	jol 2
1.1.0	Room01.06	IP Router/2.0	⊘ ⊘	ABB	2
1.1.6	Room01.06	Power Supply, Diagnosis, 640mA/1.1		ABB	2
1.1.7	Room01.06	Switch 4f 6M/3.2b	00000	ABB	2
1.1.8	Room01.06	Switching, dim., venet. blind, value, scene 1	10F 🛇 🛇 🛇 🛇 🛇	GIRA Giersiepen	5

evices • # X	Device 🔐 Ethernet	KNX X		_						
Device [connected] (CODESYS Control Win V3)	General	Find	Filter Show all	• •	Add FB for	IO channel *	Go to instance			
PLC Logic	KNX I/O Mapping	Variable	Mapping Channel	Address	Туре	Current Value	Prepared Value	Unit	Description	
- O Application [run]	have yo happing	- *	Program LED Status	%DX0.0	BOOL	FALSE			Program LED Status	
Dorary Manager	KNX IEC Objects	- 50	Program Button	%QX0.0	BOOL	FALSE			Program Button	
PLC_PRG (PRG)		9-10	1 - ReceiveOnOff - From the switch	%181				DPT 1.*		
Ask Configuration	Status	8-14	Statusbyte	96181	BYTE	56			Status will be cleared in the next cycle	
- go Harrisk (EC-1895)		-*•	UpdateFlag	%IX1.3	BOOL	TRUE				
Corpect Pice	Information	- **	ValueChanged	%IX1.4	BOOL	TRUE				
G (ill yay (and)		- *	ValueValid	%IX1.5	BOOL	TRUE	_			
C m we wey		- 🍫	Value	%IX2.0	BOG	TRUE	Received f	rom t	he switch	
		- B- *	Control 1 - ReceiveOnOff - From the switch	%Q81	BYTE					
		÷-*•	2 - ReceiveOffOnly - From the Switch	%183				DPT 1.*		
		- * •	Control 2 - ReceiveOffOnly - From the Switch	%Q82	BYTE	0				
		- *	3 - SendOnOff - To switch channel 8	%Q83				DPT 1.*		
			Lą.						Reset mapping Always update variable	es Canadical 2 (devore in bus circle tank)
		Bus cycle options Bus cycle task	Map to existing variable t bus cycle setting v						Annaya uputake namaon	 Cholden 2 (anicity if Los Lyde coxy)

Likewise, the actuator (channel B) can be switched by means of I/O mapping.

Devices v 4 X	Ethernet 🔐 Device	PLC_PRG								
KOC_SupportEquipment Sec. 9 Device [connected] (CODESYS Control Win V3)	General	Find		Filter Show all	- +	Add FB for	r IO channel + Go to in	stance		
PLC Logic	KNY 1/0 Managing	Variable	Mapping	Channel	Address	Туре	Current Value	Prepared Value	Unit	Description
= O Application [run]	Kitik go Happing	- *		Program LED Status	%D(0.0	BOOL	FALSE			Program LED Status
	KNX IEC Objects	- **		Program Button	%QX0.0	BOOL	FALSE			Program Button
Task Configuration		· · · · ·		1 - ReceiveOnOff - From the switch	%IB1				DPT 1.*	
E St MainTack (IEC-Tacks)	Status	(i) - *		Control 1 - ReceiveOnOff - From the switch	%Q81	BYTE	0			
- All pic pps		B- 🍫		2 - ReceiveOffOnly - From the Switch	%IB3				DPT 1.*	
Ethernet (Ethernet)	Information	÷.**		Control 2 - ReceiveOffOnly - From the Switch	%Q82	BYTE	0			
		8- •		3 - SendOnOff - To switch channel B	%Q83				DPT 1.*	
- mineral and		B-10		Trigger/Disable Cyclic,send on change	%Q83	BYTE	0			false -> true send once/true disable object
		* ø		Value	%QX4.0	BOOL	TRUE			

5.6 CODESYS Modbus - FAQ (EN)

5.6.1 Connecting to a WAGO Controller via Modbus (TCP)

5.6.1.1 Hardware

- 1x WAGO fieldbus coupler 750-352/000-001
- 1x digital input terminal 750-401
- 1x digital output terminal 750-504
- 1x end terminal 750-600

5.6.1.2 Requirements for the WAGO controller

- Assign the IP address (for example with the tool WAGO Ethernet Settings).
- Activate Modbus protocol (TCP) (for example with the tool WAGO Ethernet Settings \rightarrow Protocol).
- Get the manual for the fieldbus coupler.

5.6.1.3 Requirements for CODESYS

• Create a standard project and define your device (for example CODESYS Control Win V3).

Scan the network and select the device.



• In the device tree, add an *Ethernet adapter*, a *Modbus_TCP_Master*, and a *Modbus_TCP_Slave*.



5.6.1.4 Settings on the Ethernet adapter

• 5.6.1.4.1 Tab General

Define the network interface to be used.

If a target system is not defined yet, then the error message "Gateway not configured" is displayed.



5.6.1.5 Settings on Modbus_TCP_Master

• 5.6.1.5.1 Tab General

Activate the automatic establishment of a connection after interruption.

Devices	ч ×	Device PLC_PRG	Ethernet Modbus_TCP_Master X	6
□ □ □ □ ModbusWagoPLC				
Device (CODESYS Control Win V3)		General	Modbus-TCP	MODDUC
PLC Logic			Response Timeout (ms) 1000	MUDBO2
🖹 💮 Application		ModbusTCPMaster I/O Mapping		
🗌 📶 Library Manager			Socket Timeout (ms) 10	
PLC_PRG (PRG)		ModbusTCPMaster Parameters	✓ Auto-reconnect	
🖃 🎆 Task Configuration		Chathan		
🖻 🍪 MainTask		Status		
PLC_PRG		Information		
🖻 🔟 Ethernet (Ethernet)				
Modbus_TCP_Master (Modbus TCP)	laster)			
Modbus_TCP_Slave (Modbus TC	P Slave)		-	

5.6.1.6 Settings on Modbus_TCP_Slave

• 5.6.1.6.1 Tab General

Specify the *IP address* of the WAGO controller and leave the *Unit ID* blank. For Modbus via TCP/IP, the slave is identified by means of the IP address.

Devices 👻 🕂	×	Device PLC_PRG	Ethernet Modbus_	TCP_Master Modbus_TC	P_Slave 🗙
ModbusWagoPLC					
Device (CODESYS Control Win V3)		General	Modbus-TCP		
🖻 🗐 PLC Logic					MODRUS
🖹 🔘 Application		Modbus Slave Channel	Slave IP Address:	192 . 168 . 99 . 179	
👘 📶 Library Manager			Unit-ID [1247]		
PLC_PRG (PRG)		Modbus Slave Init	December Transit (ma)	1000	
🗏 🌃 Task Configuration		Ma dhuaTCDClaus Dasaa ahaa	Response Timeout (his)	1000	
😑 🍪 MainTask		Modbus ICPSiave Parameters	Port	502	
PLC_PRG		ModbusTCPSlave I/O Mapping			
🖻 🔟 Ethernet (Ethernet)		incode the state state state			
🖮 🗃 Modbus_TCP_Master (Modbus TCP Mas	ter)	Status			
Modbus_TCP_Slave (Modbus TCP S	ave)				
		Information			
1					

• 5.6.1.6.2 Tab Modbus Slave Channel

Create a channel for reading the input adapter:

dbusChannel			
Channel			
Name	Channel 0		
Access Type	Read Colls (Function Code 1)	•	
Trigger	Cyclic Cycle Time (ms	:) 100	
Comment			
READ Register			
Offset		•	
Length	1		
Error Handling	Keep last Value 👻		
WRITE Register			
Offset			
Length	1		
	QK	Cance	el

Create a channel for switching the contacts of the output adapter:

Channel	la l		
Name	Channel 1		
Access Type	Write Multiple Registers (Function	on Code 16)	•
Trigger	Rising edge 🔹 🔻	Cycle Time (ms)	100
Comment			
READ Register			
Offset	0x0000		-
Length	0		
Error Handling	Keep last Value 👻		
WRITE Register			
Offset	0x0000		•
Length	1		

Devices 👻 👎 🗙	Device PLC_PRG	1	Ethernet	Modbus_TCP_Master Modbu	us_TCP_Slave X						
- ModbusWagoPLC		_									
Device (CODESYS Control Win V3)	General		Name	Access Type	Trigger	READ Offset	Length	Error Handling	WRITE Offset	Length	Comment
PLC Logic			0 Channel 0	Read Coils (Function Code 01)	Cyclic, t#100ms	16#0000	1	Keep last Value			
Application	Modbus Slave Channel		1 Channel 1	Write Multiple Registers (Function Code 16)	Rising edge				16#0000	1	
Library Manager DLC_PRG (PRG)	Modbus Slave Init										
□ - 🧱 Task Configuration □ - 🥸 MainTask	ModbusTCPSlave Parameters										
PLC_PRG	ModbusTCPSlave I/O Mapping										
Modbus_TCP_Master (Modbus TCP Master)	Status										

• 5.6.1.6.3 Tab Modbus TCP Slave I/O Mapping

So that the Modbus addresses are updated even without variable mapping, you have to activate this explicitly:

Devices v # X	Device 📄 PLC_PRG	😭 Ethernet 🛛 🔐 Modbus	_TCP_Master	Modbus_TCP_S	ave X			-
Modbusiviagovic: Provide (CODESYS Control Win V3)	General	Find	Filter Sh	w all			•	
PLC Logic Application	Modbus Slave Channel	Variable	Mapping Channe	Address	Туре	Unit	Description	
Library Manager Dic page (bpc)	Modbus Slave Init		Channel	0 %DX0.0 1 %GX0.0	BET		0x0000 Trigger Variable	
Task Configuration	ModbusTCPSlave Parameters	8-**	Channel	1 %QW1	WORD		0x0000	
= ∰ Ethernet (Ethernet)	ModbusTCPSlave I/O Mapping	1						
Modbus_TCP_Master (Modbus TCP Master)	Status							
	Information							
								Departmention there address address of the second state
		IEC Objects						Provide molephing Annalysis advance versioners (Endoted 2 (annalysis) data cybe (ask)
		Variable	Mapping Type					
		- @ Modbus_TCP_Slave	Nodbus'	CPSlave				
		🍫 – Create new variable	🍾 = Map to exist	ng variable				

5.6.1.7 Download the project to the controller and start it

5.6.2 Modbus master slave communication over Ethernet

5.6.2.1 Hardware

- Raspberry Pi B xy as the Modbus master
- CODESYS Control Win V3 as the Modbus slave

5.6.2.2 Requirements for the Modbus master

- Create a "standard project" and select "CODESYS Control for Raspberry Pi SL" as the device.
- Define the target system via Network search.

ModbusMaster.project* - CODESYS				N
Ele Edit View Project Build Online Debug Tools Wind	ow <u>H</u> elp			3
🎦 🚅 📕 🎒 い つ よ 階 絶 × 1 🛤 🎼 巻	a • 🖆 🛗 I 🧐 🧐 🕞 🗉 🔏 I I	[표역= 1표 왕 수 元 분		
Devices 👻 🕂 🗙	Ethernet Device X			
- ModbusMaster		Const Machine La Constant		
Device (CODESYS Control for Raspberry Pi SL)	Communication Settings	Scan Network Dateway • Device •		
	Applications			
Library Manager		•		
PLC_PRG (PRG)	Backup and Restore			
Task Configuration	Files	· · · · · · · · · · · · · · · · · · ·	•	
- B PLC PRG	1	Gateway	-	
💷 🚮 Ethernet (Ethernet)	LOG	Gateway-1	-	301.A000.03C6] (active) -
Modbus_TCP_Master (Modbus TCP Master)	PLC Settings	IP-Address:	De	evice Name:
Modbus_TCP_Slave (Modbus TCP Slave)	DLC Shall	localhost	Th	K_raspbeny
- à I2C	PLC Silei	Port: 1217	De	evice Address:
SPI	Users and Groups			
GPIOs_A_B (GPIOs A/B)	Task Deployment		00	00 0010
Comerca device	Tusk beproyment		Та	rget Type:
K <empty> (<empty>)</empty></empty>	Status		41	02
	Information		Ta 35	rget Vendor: - Smart Software Solutions GmbH
			Ta 3.	rget Version: 5.10.20

• Insert an Ethernet adapter, a Modbus_TCP_Master and a Modbus_TCP_Slave in the device tree.



• Adapt the "PLC_PRG" as follows:



5.6.2.3 Requirements for the Modbus slave

- Create a "standard project" and select "CODESYS Control Win V3" as the device.
- Define the target system via Network search (see Modbus master).
- Insert an Ethernet adapter and a Modbus_TCP_Slave_Device in the device tree.



- 5.6.2.4 Setting on the Ethernet adapter (master and slave)
 - Determine which interface is to be used.

If no target system is determined, an error message appears, "Gateway not configured"

ModbusMaster.project - CODESYS			
Elle Edit View Project Build Online Debug Tools Wir	idow <u>H</u> elp		
1911年日1月1日日本時間×1月15日日	5 - F1 🕮 1 😋 🕫 认 🗕 💐	10= m += 8	¢ ∰ ≓
		• • • • = - •	1 · · · · pane · · ·
Devices _ U Y	(The rationant and The Parties		
B- ModbusMaster	Device		
Device (CODESYS Control for Raspberry Pi SL)	General		\frown
🗏 🗐 PLC Logic		Interface:	
🖹 🔘 Application	Ethernet Device Parameters	Use Operating 9	System Settings
Library Manager	Statue	Change Operati	ng System Settings
PLC_PRG (PRG)	Status	C change operation	ng system settings
Task Configuration	Ethernet Device I/O Mapping	IP Address	192 . 168 . 0 . 1
		Subnet Mask	255 . 255 . 255 . 0
Ethernet (Ethernet)	Information	Default Cateway	0 0 0 0
General Modbus_TCP_Master (Modbus TCP Master)		Derdalt Outerray	0.0.0.0
Modbus_TCP_Slave (Modbus TCP Slave)		_	
SoftMotion General Axis Pool			
2 I ² C			
GPIOS A D (GPIOS A/D)			
Camera device			
<pre>C <empty> (<empty>)</empty></empty></pre>			
1	11		

5.6.2.5 Setting on the Modbus_TCP_Slave (master)

5.6.2.5.1 Tab 'General'

- Enter the IP address of the slave device (in this case the CODESYS Control Win V3)
- Issue a unique ID for the Modbus configuration

ModbusMaster.project* - CODESYS						
Ble Edit View Broject Build Online Debug Tools Win	ndow Help					
●●■●○○よりも×145日		이 안 한 것 않는 것 같아.				
Devices v 0 x	Bhernet Device	👔 PLC_PRG 🍸 Modbus_TOP_Master 🗡	Modbus_TCP_Slave x 👔 Library Manager			-
B 🕜 AlochusHester	Count					
B-ML PICLOSIS CONDUCTS CONDUCTS (CONDUCTS CONDUCTS CONDUC	Colora	Modeus-TOP				
B () Application	Nodbus Slave Channel	Slave IP Address: 192 . 168 . 5	9.88			
Library Manager	Nodbus Slave Init	Unit-ID [1.247]				
ini 🧱 Task Configuration ini 🛞 MainTask	ModbusTCPSlave Parameters	Port 502				
PLC_PRG Ethernet (Ethernet)	NodbusTCPSlave 3/0 Mapping		₽.			
Hodbus_TOP_Master (Nodbus TOP Master) Modbus_TOP_Slave (Nodbus TOP Slave)	Satus					
 SoftMotion General Axis Pool 	Suformation					
- 3 PC						
E GPIOS A 8 (GPIOS A/8)						
> Drewire						
🖷 🔥 Camera device						
Compty> (<empty>)</empty>						
	Messages - Total 0 error(s), 1 warning(s),	0 message(s)				* 9 X
	Build	 O error(s) 1 warning(s) 	0 message(s) ×			
	Description		Project	Object	Position	
	Build started: Application: Device	a. Application				
	typify code	has an effect. In this the intent?	Made addresses	R.C. MC Device: N.C. Levice Analysism)	Line 1. Column 1 (Same)	
	Countie counciete 0 errors, 1 warning	ris in errett is the the mell?	Photo Sector	PLU_PAN (Lense- PLU Logic) Application)	rue r'owner r fedel	
		-				
SP Devices (7) IST IS						
				Institute O 0 0 1 Pr	eromale:	0

5.6.2.5.2 Tab 'Channel'

Create an input register (counter that is sent by the Modbus slave device) – cyclic update every 100 ms.

channel			
Name	Channel 0		
Access Type	Read Input Registers (Function C	(ode 4)	-
Trigger	Cyclic • C	ycle Time (ms)	100
Comment			
READ Register			
Offset			
Length	1		
Error Handling	Keep last Value 👻		
WRITE Register			
Offset			
Length	1		

• Create an output register for writing your own counter.

ModbusChannel	₽ L	23
Channel		
Name	Channel 1	
Access Type	Write Multiple Registers (Function Code 16)	
Trigger 🤇	Rising edge Citle Time (ms) 100	
Comment		
READ Register		
Offset	-	
Length	1	
Error Handling	Keep last Value 👻	
WRITE Register		
Offset	-	
Length	We have just 1 word counter	
	QK Cance	

Devices - 0 V	(77) Design X (7) Design		You water and store 1998		An							
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5.6.2.5.3 I/O mapping

• Assign input and output variables.

The setting of the option "Enabled 1" is necessary, since the variable "xExec" is not used in any task and writing would therefore not work.

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5.6.2.6

Settings on the Modbus_TCP_Slave_Device (slave)

5.6.2.6.1 Tab 'General'

• Activate monitoring of the communication.

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The unit ID must not be used for Modbus TCP! This is only used for TCP/RTU gateways.

The unit ID is only used for forwarding (gateway) to a Modbus Serial Bus.

For TCP/IP, the MODBUS-Server is addressed by means of the IP address. In this case, the MODBUS unit ID is not used (the value 0xFF has to be used).

For a serial connection, the Modbus devices are addressed with unit IDs from 1 to 247 (0 is used for broadcast addresses).

5.6.2.6.2 Tab 'I/O mapping'

• Assign input and output variables.

* # X	HodbusTCP_Slave_Device	x B Ethernet B Device D PLC_PRG								
abusSilve Device (CODESYS Control Win V3)	General	Find Filter	Show all			*				
H PLC Logic	Modbus TCP Slave Device I/O	Variable	Mapping	Channel	Address	Туре	Unit	Description		
A Linear Manager	Mapping	8.9		Inputs	%EW0	ARRAY (09) OF WORD		Nodous Holding Registers		
	Modbus TCP Slave Device	Application.PLC_PRG.udiSlaveReceive		Inputs[0]	NUMO	WORD				
Tark Configuration		8.4		Inputs[1]	%EW1	WORD				
R. C. MainTark	Information	* *		Inputs[2]	%2W2	WORD				
dit alc pag		8.9		Inputs[3]	%/2W3	WORD				
Ethernet (Pthernet)				Inputs[4]	%@W4	WORD				
ModusTCP, Sive Device ModusTCP Sive Device)		**		Inputs[5]	%2W5	WORD				
		1.1.1.1		Inputs[6]	%EW6	WORD				
		P *		Inputs(7)	%2W7	WORD				
		* *		Inputs[8]	%2W8	WORD				
		8-14		Inputs[9]	%6W9	WORD				
		8		Outputs	%QW0	ARRAY [09] OF WORD		Nodbus Input Registers		
		Application.PLC_PRG.udiSlaveSend		Outputs[0]	*40440	WORD				
		+ *		Outputs[1]	16QW1	WORD				
		* *		Outputs[2]	%QW2	WORD				
		8.9		Outputs[3]	%QW3	WORD				
		**		Outputs[4]	%QW4	WORD				
		* *		Outputs[5]	%QW5	WORD				
		8.5		Outputs[6]	%QW6	WORD				
		* *		Outputs[7]	%QW7	WORD				
		8-14		Outputs[8]	%QW8	WORD				
		8.9		Outputs(9)	%QW9	WORD				
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		IEC ONArts								
		Variable Magning Type								
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		🍫 – Create new variable 🌱 🍹 – Mapito ex	isting variable							
		Due cycle optione								

5.6.2.7 Downloading and starting the projects

5.6.2.7.1 Master

• Load the application to the controller.

v V X	Ethernet 🔂 Device	PLC_PRG Modbus_TOP_Master) 🗑 Modi	us_TCP_Slave	x 💼 Lbrar	y Manager				
G Device [connected] (CDDESYS Control for Respherry PI SL)	General	Find Filt	ir Show all			*				
	Nodbus Sleve Channel Nodbus Sleve Brit Nodbus TCPSJeve Parameters Nodbus TCPSJeve 3/0 Happing Satur Jaformation	Veniati * V kędnator, KC, PRG, Matatrikowe * V kędnator, KC, PRG, Matatrikowe * V kędnator, KC, PRG, Matatrikowe * V kędnator, KC, PRG, Watatrikowe * Veniational (KC, PRG, Watatrikowe)	Mapping To To	Channel Channel 0 Channel 1 Channel 1 Channel 1 Dannel 1 D	Address NaWO NG0000 NG0V1 NG0V1 NG0V5	Type ARRAY (00) OF WORD BIT ARRAY (00) OF WORD WORD	Current Value 587 FASS 177	Prepared Value Unit	Description Read Trout Registers Tropper Vaukble Write Multiple Registers Guodoo	
S & Camera device C <empty> (<empty>)</empty></empty>										
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5.6.2.7.2 Slave

• Load the application to the controller

The value changes only after transmission has been triggered manually in the master.

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5.6.3 Modbus RTU: Dynamic Configuration

When a Modbus COM port device is inserted in the tree, only static assignment of the parameters is possible.

If it is necessary for the assignment to be dynamic, then the **complete** handling must be implemented in the IEC code

Please note that the I/O Manager does not synchronize the different processes in the dynamic configuration.

This can cause the update behavior of the variables to differ from the static configuration, especially if it is accessed from several tasks.

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

 ModbusWithoutConfiguration.project* - CODESYS 				
<u>File Edit View Project Build Online Debug Tools Win</u>	dow <u>H</u> elp			
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ModbusWithoutConfiguration	Communication Continues	Scap petwork Galeway - Devi	ice •	
Device (CODESYS Control Win V3)	Communication Settings	occurrent of the second of the	nu -	
Application	Applications			
Library Manager	Backup and Restore		•	: .
PLC_PRG (PRG)				
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DIC_PRG	Log		Gateway	
		Ga	teway-1 👻	[0301.A000.034A] (active)
	PLC Settings	IP-A	Address: albost	Device Name: KERNTPC
	PLC Shell	Ded	*	Davisa é désara
	11	121	7	0301.A000.034A
	Users and Groups			Target ID:
	Access Rights			0000 0001
	Task Deployment			Target Type: 4096
	rusk beproyment			Target Vendor:
	Status			3S - Smart Software Solutions GmbH
	Information			Target Version:
				2.3.12.0

- Open the *Library Manager* and add the *Netzwork* library.
 - IoDrvModbus
 - SysCom
 - SysTypes2 Interfaces

Device Ibrary Manager 🗙							
🏝 Add library 🗙 Delete library 🛛 🖆 Properties 🙃 Details 🛛 🐺 Placeholders 🛛 🎁 Library repository							
Name	Namespace	Effective version					
SLicense = 3SLicense, 3.5.12.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.12.0					
🛱 👓 📾 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0					
IoDrvModbus = IoDrvModbus, 3.5.12.0 (3S - Smart Software Solutions GmbH)	IoDrvModbus	3.5.12.0 0					
🖬 👓 📾 IoStandard = IoStandard, 3.5.10.0 (System)	IoStandard	3.5.10.0					
Standard = Standard, 3.5.12.0 (System)	Standard	3.5.12.0					
I SysCom = SysCom, 3.5.5.0 (System)	SysCom	3.5.5.0					
→ Image: SysTypes2 Interfaces, * (System)	SysTypes	3.5.4.0					

• Adapt the POU PLC_PRG as follows:

Declaration

VAR		
xComPortOpen	: BOOL;	
xComPortError	: BOOL;	
rtsResult	: RTS_IEC_RESULT;	
stComPortSettings	: SysCom.ComSettings;	
hComPort	: RTS_IEC_HANDLE;	
awReadBuffer	: ARRAY[031] OF WORD;	//note: adjsut to your
requirements, max. is 12	8 Modbus Registers	
awWriteBuffer	: ARRAY[031] OF WORD;	
xExec	: BOOL;	
fbModbusRequest	: IoDrvModbus.ModbusRequest2;	
eComError	: IoDrvModbus.MB_ErrorCodes;	
END_VAR		

Implementierung

```
IF(NOT xComPortOpen AND NOT xComPortError) THEN
    stComPortSettings.sPort := 3;
    stComPortSettings.byStopBits := 1;
    stComPortSettings.byParity := 0;
                                                 //EVEN:=2, ODD:=1 or NONE:=0*
    stComPortSettings.byParity := 0; //EVEN:=2, ODD:=1 or NONE:=0*
stComPortSettings.ulBaudRate := 19200; //1200, 2400, 4800, ..., 115000
bps
    stComPortSettings.ulTimeout := 0;
    stComPortSettings.ulBufferSize := 256;
                                              //Equals max size of Modbus packet
    hComPort := SysCom.SysComOpen2( pSettings := ADR(stComPortSettings),
pSettingsEx := 0, pResult := ADR(rtsResult));
    xComPortError := (hComPort = RTS_INVALID_HANDLE OR rtsResult <> 0);
    xComPortOpen := NOT xComPortError;
END_IF
IF(xComPortOpen) THEN
    //apply new command
    fbModbusRequest.modbusCommand.uiFunctionCode := 23;
                                                           //Reda/Write
Multiple Register
    fbModbusRequest.modbusCommand.uiReadOffset := 0;
    fbModbusRequest.modbusCommand.uiReadLen := 2;
    fbModbusRequest.modbusCommand.uiWriteOffset := 0;
    fbModbusRequest.modbusCommand.uiWriteLen := 2;
    fbModbusRequest.pRecvData := ADR(awReadBuffer);
    fbModbusRequest.pSendData := ADR(awWriteBuffer);
    fbModbusRequest.tResponseTimeout := T#500MS;
    //note: if different tasks access the IO-Buffers then use some intermediate
buffers
            that are thread safe (use e.g mutex or semaphore) before calling the
    11
FB
    fbModbusRequest(
        hComPort := hComPort,
        xExecute := xExec,
        usiSlaveAddr := 2,
        byModbusError => eComError);
    IF(fbModbusRequest.xDone) THEN
        //here you get valid data
        IF(awWriteBuffer[0] = awReadBuffer[0]) THEN
        END_IF
    ELSIF(fbModbusRequest.xError) THEN
        IF(eComError = MB_ErrorCodes.RESPONSE_TIMEOUT) THEN //no cable
plugged, wrong Com-Port settings ?
            ;
        END_IF
    END_IF
END_IF
```

• Start the project and test the functionality.

5.6.4 Modbus TCP Slave: Dynamic Setting of the IP Address

The Modbus slave from the FAQ Modbus Communikation Master/Slave via Ethernet is used here.

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

Modbus_UpdateGeneralSetting.project* - CODESYS				
<u>File Edit View Project Build Online Debug Tools Windo</u>	ow <u>H</u> elp			
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Devices - I M				
Modhus UndateGeneralSetting	Device X PLC_PRG			
	Communication Settings	Scan network Gateway - Device -		
	Applications			
Library Manager			•	
PLC_PRG (PRG)	Backup and Restore			
E 🔀 Task Configuration	Ciles.		inclusion (inclusion)	
🖻 🍪 MainTask	rites			• •
PLC_PRG	Log		Gateway	`
		Gateway-1	•	[0301.A000.034A] (active)
	PLC Settings	IP-Address:		Device Name:
		lo calhost		KERNTPC
	PLC Shell	Port:		Device Address:
	Lisers and Groups	1217		0301.A000.034A
				Target ID:
	Access Rights			0000 0001
				Target Type:
	Task Deployment			4096
	Charles			Target Vendor:
	Status			35 - Smart Sortware Solutions GmbH
	Information			Target Version:
				3.3.12.0

• Insert an *Ethernet* adapter in the device tree and specify the interface to be used.

If a target system is not defined yet, then the error message "Gateway not configured" is displayed.

Modbus_UpdateGeneralSetting.project* - CODESYS				
File Edit View Project Build Online Debug Tools Wind	dow <u>H</u> elp			
12 🚔 🖬 🕘 🗠 🗠 👌 🛍 🎕 🗙 🖬 🍪	🛱 🛅 - 👔 🎬 🐝 💖 🕟 📊	🌂 (= f= t= t= \$ \$ \$ \$		
Devices 👻 🕂 🗙	Device PLC_PRG	Ethernet X		
Modbus_UpdateGeneralSetting				
🖮 🕤 Device (CODESYS Control Win V3)	General			
🗐 🗐 PLC Logic		Interface:		
🖹 💮 Application	Ethernet Device Parameters	IP Address 192 . 168 . 0 . 1		
🔤 🎁 Library Manager		Subnet Mask 255 255 0		
PLC_PRG (PRG)	Status	255 7 255 7 255 7 0		
🖃 🎆 Task Configuration	Etherant Davies I/O Magazina	Default Gateway 0 . 0 . 0 . 0		
🖮 🍪 MainTask	Ethemet Device I/O Mapping	Adjust Operating System Settings		
PLC_PRG	Information			
Ethernet (Ethernet)				

- Insert a Modbus TCP Master below the Ethernet adapter in the device tree.
- Insert a Modbus TCP Slave below the Modbus TCP Master in the device tree.

Modbus_UpdateGeneralSetting.project - CODESYS				
Eile Edit View Project Build Online Debug Tools Window	<u>H</u> elp			
11 ≤ 5 ∞			I9≣ °≣ *I\$ Φ ⊼ !	≓ ' */∠
Devices 👻 🕂 🖓	<	PLC_PRG Device	Modbus_TCP_Slave 🗙	
Modbus_UpdateGeneralSetting	•			
Device (CODESYS Control Win V3)		General	Modbus-TCP	
PLC Logic		Modbus Slave Channel	Slave IP Address:	192 . 168 . 99 . 2
Library Manager		Modhua Clava Init	Response Timeout (ms):	1000
PLC_PRG (PRG)		Houbus Blave Inc	Port:	502
I Task Configuration		ModbusTCPSlave Parameters		
PLC_PRG		ModbusTCPSlave I/O Mapping		
🖹 🚮 Ethernet (Ethernet)		houbuster slave go happing		
Modbus_TCP_Master (Modbus TCP Master)		Status		
Modbus_TCP_Slave (Modbus TCP Slave)				
		Information		
l				

Pay attention that the address is the same as for the Modbus Slave Device.

• Adapt the POU *PLC_PRG* as follows:

Declaration

```
VAR

xUpdate : BOOL;

sIp : STRING;

udiResult : UDINT;

abyNewIp : ARRAY [0..3] OF BYTE := [192,168,99,198]; // Insert here

the correct IP-Address of the Modbus_Slave_Device

END_VAR
```

Implementation

```
sIp :=
IoDrvEthernet.IPARRAY_TO_IPSTRING(Modbus_TCP_Slave.ComSettings.ipAddress);
Modbus_TCP_Slave.xConfirmError := FALSE;
IF xUpdate THEN
    xUpdate := FALSE;
    udiResult := Modbus_TCP_Slave.UpdateCommunicationSettings(ipAddress :=
    abyNewIp, uiPort := 502);
    Modbus_TCP_Slave.xConfirmError := TRUE;
END_IF
```

• After starting the project, a connection cannot be established.

Modbus_UpdateGeneralSetting.project* - CODESYS								
Eile Edit View Project Build Qnline Debug Iools Window Help								
🎦 🖆 📓 🌐 い つ 🐇 ங 🕲 × 🏘 🌿 🏙 🌿 🐽 🧆 ۶ 🌾 🦄 🖷	3 🏠	• 💼 📾 👒 🖡 📲 📽 (通知語語) おしか (麗) 書 (ふ)						
Devices 💦 👻	џ х	PLC_PRG X PLC_PRG X Modbus_TCP_Slave						
Modbus_UpdateGeneralSetting		Device-Application.PLC_PRG						
😑 😏 🚮 Device [connected] (CODESYS Control Win V3)								
E B PLC Logic		Expression	Туре	Value	Prepared value			
🖹 🔘 Application [run]		🔷 xUpdate	BOOL	FALSE				
- 📶 Library Manager		🛊 slp	STRING <	192.168.99.2				
PLC_PRG (PRG)		🛊 udiResult	UDINT	0				
🖻 🌃 Task Configuration		🗏 🗳 abyNewIp	ARRAY [03] OF BYTE					
🖻 🍪 MainTask		ø abyNewIp[0]	BYTE	192				
H PLC PRG		ø abyNewIp[1]	BYTE	168				
Ethernet (Ethernet)		ø abyNewIp[2]	BYTE	99				
B G Machine, TCP_Master (Modbus TCP Master)		ø abyNewIp[3]	BYTE	198				
▲ Modbus_CP_Slave (Modbus TCP Slave)			_ ▼					
		1 ■ sIp <mark>_ 192.168.99 </mark>						
		<pre>2 Modbus_TCP_Slave.xConfirmErrorFALSE := FALSE;</pre>						
		a Ir xupdate Alse THEN						
		• xupusterrer: = falls; udification : Medaus TCD Slave UndersCommunicationSettings(s)ddaess := shullerIn u(Inert := 50));						
		Nodbus TCP Slaw Proof Proof Start - TOURS - TOURS - TOURS - ANNEXED - ANNEXED - Solar - Solar - TOURS - TOU						
		RND TE						

• Set the variable *xUpdate* to *TRUE* so that the new IP address is passed.

Modbus UpdateGeneralSetting.project* - CODESYS					
Ele Edit View Project Build Online Debug Tools Window Help		N			
12 ☞ 目目目 ! ○ ○ ※ № ◎ × 単 % 単 % ▲ 外 >	* * 🖷 🛅 • 🕤 🕮	비영행→■ペ[티데남백왕悼 룼 루 ◇			
Devices	→ ∓ × /	PLC_PRG X Device Modbus_TCP_Slave			
Modbus_UpdateGeneralSetting		Device.Application.PLC_PRG			
Operation of the second s	Ex	aression	Type	Value	Prepared value
B B PLC Logic		@ xUpdate	BOOL	FALSE	
Library Mapager		🛊 sIp	STRING <	'192.168.99.198'	
PLC_PRG (PRG)		ø udiResult	UDINT	0	
= 📓 Task Configuration		ø abyNewIp	ARRAY [03] OF BYTE		
🖻 🍪 MainTask		ø abyNewIp[0]	BYTE	192	
PLC_PRG		ø abyNewIp[1]	BYTE	168	
Ethernet (Ethernet)		ø abyNewIp[2]	BYTE	99	
 Sector of the sector of the sec		apywewtp[5]	BTIE	190	
U III roddo U Sare (rodda (U Sare)	8	<pre>1 0 17 102458 > 1 > 10DrvEthree.IPARAX_ID_IES 2 Modbus_TCP_Slave.XConfirmError/FAULE := FALSE; 3 1F XUpdate/FAULE ':= FALSE; 4 SUpdate/FAULE ':= FALSE; 5 xUpdate/FAULE ':= FALSE; 5 xUdiRealt(5 := FALSE; 6 udiRealt(5 := FALSE; 7 Modbus_TCP_Slave.XConfirmErrorFAULE := TRUE 8 ZND_FF</pre>	TRING(Modbug_TCP_Slave.ComSettings.ipAddress) ateCommunicationSettings(ipAddress := abyNewIp C;	; p, uiPort := 502);	

Resetting to an invalid IP address is not possible. The Modbus component has to be deactivated first. This is done by means of the "Enable" property, which is available only after activating the device diagnostics.

5.6.5 Modbus TCP Slave: Using the "Application" Channel Trigger

The Modbus slave from the FAQ Modbus Communikation Master/Slave via Ethernet is used here.

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.



• Insert an *Ethernet* adapter in the device tree and specify the interface to be used.

If a target system is not defined yet, then the error message "Gateway not configured" is displayed. Modbus_ChannelConfApplication.project* - CODESYS <u>File Edit View Project Build Online Debug Tools Window Help</u> 🎦 🚔 🔚 | 🎒 | 🗢 🖙 🐇 🐚 🔄 🕌 🏰 🏰 🏰 🎬 | 🖄 + 🗗 | 🎬 | 🧐 💖 🕥 🕞 📲 🤻 | 📜 📬 🖆 🌾 | 🕋 | 👘 | 👘 | Devices **4 х** Device 🛉 Ethernet 🗙 Modbus_ChannelConfApplication • □ m Device (CODESYS Control Win V3) General Interface: PLC Logic Ethernet Device Parameters Application IP Address 192 . 168 . 0 . 1 🎁 Library Manager Subnet Mask 255 . 255 . 255 . 0 Status PLC_PRG (PRG) Default Gateway . 0 . 0 . 0 0 Task Configuration Ethernet Device I/O Mapping 🖮 🍪 MainTask Adjust Operating System Settings PLC_PRG Information Ethernet (Ethernet)

- Insert a Modbus TCP Master below the Ethernet adapter in the device tree.
- Insert a Modbus TCP Slave below the Modbus TCP Master in the device tree.



· Insert it in the Modbus Slave Channel tab and set the properties as follows:
Channel		
Name	Channel 0	
Access Type	Write Multiple Registers (Function Code	16) 🔹
Trigger	Application Cycle Tit	me (ms) 100
Comment		
READ Register		
Offset	0x0000	
Length	0	
Error Handling	Keep last Value 👻	
WRITE Register		
Offset	0x0000	•
Length	1	

• Adapt the POU *PLC_PRG* as follows:

Declaration

VAR			
-		Deel	
xExec	:	BOOL;	
wMasterSend	:	WORD := 100;	
mbChannel	:	ModbusChannel;	
END_VAR		,	

Implementation

```
mbChannel(slave := Modbus_TCP_Slave, xExecute := xExec);
```

• Assign the variable *wMasterSend* to the output *Channel 0[0]* in the tab *ModbusTCPSlave I/O Mapping*.

Modbus_ChannelConfApplication.project* - CODESYS Ele Edit View Project Build Online Debug Tools W	indow Help				-			-		
Devices v 4 X	Device Ethernet	Modbus_TCP_Slave X PLC_PRG								
Modous_ChannelContrappication Device (CODESYS Control Win V3)	General	Find	ter Show all			•				
E Dec Logic	Modbus Slave Channel	Variable	Mapping (Channel	Address	Type	Unit	Description		
Library Manager	Modbus Slave Init	Application.PLC_PRG.wMasterSend	*	Channel 0 Channel 0[0]	%QW0 %QW0	WORD		0x0000		
Task Configuration	ModbusTCPSlave Parameters									
	ModbusTCPSlave I/O Mapping									
Contract (contract)	Status									
	Information					к				

General	Find	Filter	Show all			- 🕂 Add FB for IO Channe	el → G	Go to Instance
Modbus Slave Channel	Variable		Mapping	Channel	Address	Туре	Unit	Description
				Channel 0	%QW0	ARRAY [00] OF WORD		Write Multiple Regis
Modbus Slave Init	E - Applicatio	n.PLC_PRG.wMasterSend	2	Channel 0[0]	%QW0	WORD		0x0000
Charles								
Information								
Information								
Information	<			Parat Manning	Alwayawa	data yari shi sa Tauki da Guu	hur and	

• Start the project and set the variable *xExecute* to *TRUE* so that the new value is passed to the slave.

 $^{208\} https://content.helpme-codesys.com/en/CODESYS\% 20 Development\% 20 System/_cds_device_fieldbus_devices_io_driver.html$

5.7 CODESYS PROFINET - FAQ (EN)

5.7.1 How to enable MRP (media redundancy protocol)



The MRP is more related to the slaves (and used switches). \rightarrow make sure that the Profinet Slave does support this option!

5.7.1.1 How to:

- · Add all the slaves to the PN-Controller
- Open the PN-Controller and open the Tab 'Topology'.
- Configure the connected ports, so that a ring topology is set.
- Open the TAB Media Redundancy, and set the MRP configuration for the slaves / controller

5.7.1.2 Hint:

A dual-port device (e.g. for MRP or a so-called 'daisy chain') can be implemented with special dual-port (bridge) Ethernet chipsets, but this requires adjustments to the runtime system by the OEM.

https://content.helpme-codesys.com/en/CODESYS%20PROFINET/_pnio_media_redundancy.html

²⁰⁹ http://profinet.com

See also

 Our Codesys Online Help (OLH)²¹⁰ on Media Redundancy²¹¹ in general, and Controller, Media Redundancy²¹² in particular.

5.8 EtherCAT / Ethernet IP / Profinet connection guide

5.8.1 Example steps for EtherCAT / Ethernet IP / Profinet connection via a Codesys Control WinV3:

The following example addresses the EtherCAT The step for the fieldbuses Ethernet/IP or Profinet are quite similar to this.

- 1. Install WinPcap (see under https://www.winpcap.org/install²¹³).
 - Here, the 4.1.3 version is mandatory at the moment (2022/23, until the use/release of Codesys version 3.5.19.0²¹⁴).
 - Npcap could be use too (see https://npcap.com²¹⁵).

Use the Codesys Device Repository²¹⁶ to Install any needed Slave Device Description²¹⁷ Files (from an .XML or .EDS files) in advance to enable the "Scan for device" for this the slaves in a later step.

- 2. Create a default Codesys Project²¹⁸, with f.e. a Codesys Control WinV3 PLC²¹⁹.
- 3. Add the needed fieldbus master in the device tree within the project. **DeviceTree PLC 'Add Device...'**

²¹⁰ https://www.helpme-codesys.com/

²¹¹ https://content.helpme-codesys.com/en/CODESYS%20PROFINET/_pnio_media_redundancy.html

²¹² https://content.helpme-codesys.com/en/CODESYS%20PROFINET/_pnio_edt_mrp.html

²¹³ https://www.winpcap.org/install/

²¹⁴ https://store.codesys.com/de/codesys.html

²¹⁵ https://npcap.com/

²¹⁶ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_device_repository.html

²¹⁷ https://content.helpme-codesys.com/en/CODESYS%20Package%20Designer/pd_devicedescription.html

 $^{218\} https://content.helpme-codesys.com/en/CODESYS\% 20 Development\% 20 System/_cds_tutorial_refrigerator_control.html$

²¹⁹ https://content.helpme-codesys.com/en/CODESYS%20Control/_rtsl_start_runtime.html

Use the mouse context menu on the PLC Device, select "Add Device..."

Select and add the "Master" device

- 4. Browse on the "Master" for the MAC ID²²⁰.
- 5. Download the application onto the PLC, and log in.
- 6. Performed a "Scan for device²²¹" to find the connected slaves. **DeviceTree "Master" 'Scan for Device...'**

Use the mouse context menu on the "Master" in the DeviceTree

²²⁰ https://content.helpme-codesys.com/en/CODESYS%20EtherCAT/_ecat_edt_master_master.html 221 https://content.helpme-codesys.com/en/CODESYS%20PROFIBUS/_pbdp_cmd_scan_devices.html



If the scan is not successful, make sure that you have installed the slave in the Device Repository²²².

Otherwise, perform the installation of the needed Slave Device Description²²³ Files (from an .XML or .EDS files) within the Codesys Device Repository²²⁴.

 $^{222\,}https://content.helpme-codesys.com/en/CODESYS\% 20 Development\% 20 System/_cds_cmd_device_repository.html and a start of the start$

 $^{223\,}https://content.helpme-codesys.com/en/CODESYS\% 20 Package\% 20 Designer/pd_devicedescription.html \\$

 $^{224\,}https://content.helpme-codesys.com/en/CODESYS\% 20 Development\% 20 System/_cds_cmd_device_repository.html and a standard sta$

- 7. Go offline with the PLC.
- 8. Execute a new download to the PLC, including the newly found slaves.
- 9. Restart/Login to the PLC again. **Expected result**

The setup should now work as expected, and process data are exchanged.

5.8.2 Profinet and Ethernet/IP Example

Here, the same steps as previously described are necessary.

Difference from the previous procedure

The exception here is to start with adding an Ethernet Adapter as a first step:



See also our OnlineHelp²²⁵for:

- EtherCAT Master²²⁶
- Ethernet/IP²²⁷
- PROFINET Controller²²⁸

If a realtime capable PLC is need, the switch to a Control RTE must be made, see CODESYS Store, Control RTE²²⁹. We also offer Linux based IPC plc's too, see CODESYS Store, Linux SL²³⁰.

227 https://content.helpme-codesys.com/en/CODESYS%20EtherNetIP/_enic_edt_target_settings.html

²²⁵ https://www.helpme-codesys.com/

²²⁶ https://content.helpme-codesys.com/en/CODESYS%20EtherCAT/_ecat_edt_master_master.html

 $^{{\}tt 228 \ https://content.helpme-codesys.com/en/CODESYS\% 20 PROFINET/_pnio_f_master.html}$

 $^{{\}tt 229 https://store.codesys.com/de/catalogsearch/result/?q=Control+RTE}$

²³⁰ https://store.codesys.com/de/codesys-control-for-linux-sl-bundle.html

For Realtime capabilities on Linux, you need to pay attention to this FAQ article here.²³¹

Fore more Information, there is also a good CODESYS community on CODESYS Forge²³².

5.9 I/O variables not updating

5.9.1 Problem

 $\ensuremath{\mathsf{I/O}}$ Variables mapped from an $\ensuremath{\mathsf{I/O}}$ device do not change value. Before SP17

values are greyed

General	The bus is not running. The shown values are perhaps not actual									
Modbus Slave Channel	Find Filter Show all • 🖶 Add FB for IO Channel + Go to Instance									
Modbus Slave Init	Variable	Mapping	Channel	Address	Туре	Cur	Prepar	Unit	Description	
Me dhue TCDClave Darameters	□ □ □		Channel 0	%QB0	ARRAY [00] OF BYTE				Write Single Coll	
Hoddus ICPSiave Parameters	🖹 - 🍫		Channel 0[0]	%QB0	BYTE				Write Single Coil	
ModburTCPSlave I/O Mapping	Application.GVL	. 🍞	Bit0	%QX0.0	BOOL				0x003E	
ModbusTCPSlave IEC Objects Status							C2			
Information			R	leset Mapping	Always update variab	les Use	parent devi	ce setting	9	
	🍫 = Create new variable	🍫 = M	ap to existing var	iable						

From SP17

Since SP17, some clearer hints are given:

- the value is shown as "not updated"
- · a tooltip explains why

²³¹ https://faq.codesys.com/pages/viewpage.action?pageId=122748972 232 https://forge.codesys.com/forge/talk/

PIOs Parameters	Find			Filter Show	iow all 👻 🕂 Add FB for IO Channel					
PIOs I/O Mapping	Variable	Mapping	Channel digital inputs (Address %ID0	Type DWORD	Current Value Not updated	Prepared Value	Unit	Description	^
PIOs IEC Objects	- *		Bit4	%IX0.4	BOOL	Not updated				
			Bit5	%IX0.5	BOOL	Not updated				
atus	- *		Bit6	%IX0.6	BOOL	Not updated				
			Bit12	%IX1.4	BOOL	Not updated				
ormation	- *		Bit13	%IX1.5	BOOL	Not updated				
			Bit16	%IX2.0	BOOL	Not updated				
	- *		Bit17	ue is not bei	noor na undated k	Moture it is not use	d in code nor the	o cottin	a "Abways undate y	ariables" is er
			Bit18	/01/2.2	BOOL	Jecause it is not use	a in code, nor the	settin	g Annays update v	
	- *		Bit19	%IX2.3	BOOL	Not updated				
	¥		Bit20	%IX2.4	BOOL	Not updated				
	***		Bit21	%IX2.5	BOOL	Not updated				~
				Reset Ma	pping A	lways update variabl	es Use parent de	evice se	tting	~
	Bus Cycle Bus cycle	te new variable Options task Use i	[∞] = Ma	p to existing tting v	variable Recreate	e required tasks				

5.9.2 Solution

By default, a variable is shown with the actual value only if the variable is used in a task.

Your options are either:

- use in your code, those IO variables you are interested in
- Set the "Always update variables" setting for this IO to "Enabled 1 (use bus cycle if not used in any task)"
- Set the "Always update variables" setting for this IO to Use parent device setting, and set "Enabled 1 (use bus cycle if not used in any task)" in a parent device.

Note

The "Always update variables" setting is on the "<Name> I/O Mapping" tab for most devices.

For the PLC Controller devices, it is on the "PLC Settings" tab.

Device X		
Communication Settings	Application for I/O handling	Application V
Applications	PLC Settings	
Backup and Restore	Behavior for outputs in stop	Keep current values V
Files	Always update variables	Enabled 1 (use bus cycle task if not used in any task) \lor
Log	Bus Cycle Options	and the second sec
PLC Settings		<unspeanea> V</unspeanea>

5.9.3 Result

GPIOs Parameters	Find	Find Filter Show all					
GPIOs I/O Mapping	Variable	Mapping	Channel	Address	Туре	Current Value	Prepared Value
or ros yo mapping	📮		digital inputs (GPIO0GPIO31)	%ID0	DWORD	268468719	
SPIOs IEC Objects	- *>		Bit4	%IX0.4	BOOL	FALSE	
			Bit5	%IX0.5	BOOL	TRUE	
tatus	🍫		Bit6	%IX0.6	BOOL	TRUE	
			Bit12	%IX1.4	BOOL	FALSE	
formation			Bit13	%IX1.5	BOOL	FALSE	
			Bit16	%IX2.0	BOOL	FALSE	
	🍫		Bit17	%IX2.1	BOOL	FALSE	
			Bit18	%IX2.2	BOOL	FALSE	
	* >		Bit19	%IX2.3	BOOL	FALSE	
	Sus Cycle Op Bus Cycle ta	new variable tions sk Use p	Reset Mapping Alw	ays update var able Recreate requ	iables Enab	led 1 (use bus cycle task if r	not used in any task)

Related articles

Report problems and error messages to CODESYS²³³

Some new things to look out for in CODESYS SP18²³⁴

²³³ https://faq.codesys.com/display/CDSFAQ/Report+problems+and+error+messages+to+CODESYS

²³⁴ https://faq.codesys.com/display/CDSFAQ/Some+new+things+to+look+out+for+in+CODESYS+SP18

Linux realtime / performance / network - draft²³⁵

Installation 4.1.0.0 fails for Control for Linux SL²³⁶

CODESYS Control for Linux SL: Retains²³⁷

5.10 Multicore Systems and Fieldbuses

All fieldbuses work with single as well as multicore systems. Each fieldbus itself only runs on one core, i.e. nothing is parallelized and divided among several cores.

5.10.1 Single Core:

In each fieldbus, the bus cycle task should handle the bus.

All other tasks, if they also need data from the fieldbus, should not reach the bus, because this either produces chaos or requires synchronization/exclusive accesses, which can completely disrupts the real-time and the synchronization between bus and bus cycle task.

In some cases, the user can optionally do more (enable a second frame in EtherCAT for other tasks), but these are exceptions, and the programmer have to know what you are doing.

5.10.2 Multicore (MC)²³⁸:

The use of one fieldbus on multiple cores would only disrupt the whole System here more.

Because now the second bus cycle task can run simultaneously to the first bus cycle task, just on another core.

So this will result in even more chaos and/or even more braking/restraining synchronization on the system.

Implementation of a MC use of field busses

In case of several EtherCAT, Modbus etc. masters, each master could be assigned to a specific task. Masters, to put each master specifically on a single core. But this is a lot of effort in implementation in relation to the hardly existing demand from manufacturers or customers.

 $[\]tt 235\,https://faq.codesys.com/pages/viewpage.action?pageId=122748972$

²³⁶ https://faq.codesys.com/display/CDSFAQ/Installation+4.1.0.0+fails+for+Control+for+Linux+SL

²³⁷ https://faq.codesys.com/display/CDSFAQ/CODESYS+Control+for+Linux+SL%3A+Retains

²³⁸ https://www.codesys.com/products/codesys-runtime/multicore.html

Therefore, this implementation is not being pursued at this time.

5.10.3 Possible remedies that can be made in projects

It is possible to distribute several fieldbuses on several cores by the programmer.

Or the user can place an existing visualization in the project on an additional core and thus distribute the load in the system or on the core.

6 CODESYS Libraries - FAQ (EN)

6.1 AWS IoT Core Client - FAQ (EN)

6.1.1 AWS IoT Core Client - getting started

See our CODESYS Store product: AWS IoT Core Client²³⁹

6.1.1.1 How to get started

- 1. Install the "Security Agent²⁴⁰" Addon form our CODESYS Store²⁴¹
- 2. Choose from this list, an openssl binary to install:

https://wiki.openssl.org/index.php/Binaries - The first entry has worked well in tests

3. Go to aws.amazon.com²⁴² and sign up

Read all the docs with Amazon!

 Register a Device in the Registry

> Create and Activate a Device Certificate

Create an AWS IoT Core Policy

Attach an AWS IoT Core Policy to a Device Certificate

Attach a Certificate to a Thing

We follow slightly different steps.

²³⁹ https://store.codesys.com/en/aws-iot-core-client-configurable.html

²⁴⁰ https://store.codesys.com/en/codesys-security-agent.html

²⁴¹ http://store.codesys.com/

²⁴² http://aws.amazon.com/

- 4. Click "All Services" and IOT Core
- 5. Click "Manage"
- 6. Click "Register a Thing"
- 7. Click "Create a single Thing" and name it e.g. "jackicpi3lcd"
- 8. Create a type "CODESYS" / "Things connected with CODESYS"

Don't bother with group, skip all the optional things and hit "next"

- 9. Create the "Thing" without Certificate, and hit "Done"
- 10. Open your "Thing" and go to "Interact"
- Copy the rest API endpoint under HTTPS, e.g. "xxxxxxxxxxx-ats.iot.us-east-2.amazonaws.com²⁴³"
- Go back to the main menu of AWS loT, Under Menu "Secure > Policies", press "Create new policy".

Your account ID is different from the URL in the Rest API mentioned above! It is given as the default Resource when you create a policy.

13. Name it *LetJackPubAndSub*

- 14. You want to be able to connect with a client ID, publish the topic and the last will, Subscribe to the topic, and then, once subscribed, you also want to receive messages from the topic.
- 15. Action = *iot:Connect*
- Resource ARN = arn:aws:iot:<AWS Region>:<AccountID, not same as Rest API URL>:client/ jackicpi3lcd
- 17. Effect = Allow
- 18. Click Add Statement
- 19. Action = *iot:Publish*
- 20. Resource ARN = arn:aws:iot:<AWS Region>:<AccountID, not same as Rest API URL>:topic/hello/aws, arn:aws:iot:<AWS Region>:<AccountID, not same as Rest API URL>:topic/jackicpi3lcd/lastwill
- 21. Effect = Allow

²⁴³ http://xxxxxxxxxxats.iot.us-east-2.amazonaws.com

- 22. Click Add Statement
- 23. Action = *iot:Subscribe*
- 24. Resource ARN = arn:aws:iot:<AWS Region>:<AccountID, not same as Rest API URL>:topicfilter/hello/ aws
- 25. Effect = Allow
- 26. Click Add Statement
- 27. Action = iot.Receive
- 28. Resource ARN = arn:aws:iot:<AWS Region>:<AccountID, not same as Rest API URL>:topic/hello/aws
- 29. Effect = Allow

30. Click Create

Example:

Version 19 updated Feb 24, 2020 2:56:02 PM +0100

Edit policy document

```
{
  "Version": "2012-10-17",
  "Statement": [
   {
     "Effect": "Allow",
     "Action": "iot:Connect",
      "Resource": "arn:aws:iot:us-east-2:11111111111111client/jackicpi3lcd"
   },
    {
     "Effect": "Allow",
     "Action": "iot:Publish",
     "Resource": [
        "arn:aws:iot:us-east-2:1111111111111:topic/hello/aws",
       "arn:aws:iot:us-east-2:111111111111:topic/jackicpi3lcd/lastwill"
     ]
   },
    {
     "Effect": "Allow",
      "Action": "iot:Subscribe",
      "Resource": "arn:aws:iot:us-east-2:1111111111111:topicfilter/hello/aws"
   },
   {
     "Effect": "Allow",
      "Action": "iot:Receive",
      "Resource": "arn:aws:iot:us-east-2:1111111111111:topic/hello/aws"
   }
 ]
}
```

31.

32. CODESYS IDE: Run the installed example from e.g. C:\Users\<USERNAME>\AWS IoT Core Client\<VERSION>\AWS_IoT_Core_Client_Example.project 33. Right click the Device in Device Tree, select "Update Device...", then select your target PLC, before hitting OK

Important step for every example project!

- 34. Under the Application called AWSPubSub, Open the PLC_PRG and change these settings in the screenshot below to match the previously created "**Thing**"
 - a. Change the two instances of 'Device2' to 'jackicpi3lcd'
 - b. Change the Hostname to the one you copied from the interact tab



		AWSIoTClient_0
Connect to AWS IoT Core Broker		AWS_IOT.AWSIoTClient
	_	xEnable
	-	uiKeepAlive
'Device2'		sClientId
'xxxxxxxxx.iot.eu-central-1.amazonaws.com'		sHostname xConnected
	-	uiPort
"device2/lastwill"		wsWillTopic
ADR(wsLastWillMessage)		pbWillMessage
SIZEOF(wsLastWillMessage)		uiWillMessageSize

C.

- 35. Download and run
- 36. Open the visualization and select "*xEnable*" for the AWSIoTClient.

It will NOT show that it is xConnectedToBroker, because we haven't configured the permissions yet.

 Open the PLC shell: Device -> PLC-Shell (OLH)²⁴⁴

38. Specify cert-getapplist

- -> A component with the specified device name and a number is displayed. You want the one that says "*jackicpi3lcd*"
- 39. Specify *cert-createcsr <number>* and use the number from the previous step.

²⁴⁴ https://help.codesys.com/webapp/_cds_edt_redundancy_plc_shell;product=codesys;version=3.5.17.0

The creation of the CSR file can take several seconds.

A corresponding message is displayed in the device log (Device -> Log (OLH)²⁴⁵) after it has been created.

- 40. Open (Device -> Files (OLH)²⁴⁶) and copy the CSR file from the cert/export directory to the local file system.
- 41. Example:

Device						×
Communication Settings	Host Location		• 🖿 🗙 🔶	Runtime Location	Cert/export	- 🖻 X 🐼 ^
Applications	Name	Size	Modified	Name	Size	Modified
Backup and Restore	D:\			cr	801 bytes	17 C. 200 C.
Files				-		
Log	P:\					
PLC Settings	U:\ V:\					
PLC Shell	Z:\					
Users and Groups			r	>>		
Access Rights						
Symbol Rights				<<		~

42. Open a command prompt and type something like:

openssl.exe req -in "D:/prj/WIP/AWS IOT CORE/6_jackicpi3lcd.csr" -inform der -out "D:/prj/WIP/AWS IOT CORE/jackicpi3lcd.csr"

- 43. Go back to the AWS management console
- 44. Open your "Thing" and go to the security console
- 45. Hit "View other options"
- 46. Hit "create with csr"
- 47. Use the output from the above openssl command ("jackicpi3lcd.csr")
- 48. Hit "Upload File". If it doesn't say successful after 10 seconds, you've grabbed the wrong file.
- 49. Download the certificate it gives you

Depending on your browser, will actually save as .txt for some reason.

50. Hit the link to download a root certificate. Grab Amazon root ca1, Root CA3, and startfield Root CA Certificates.

²⁴⁵ https://help.codesys.com/webapp/_cds_edt_device_log;product=codesys;version=3.5.17.0 246 https://help.codesys.com/webapp/_cds_edt_device_files;product=codesys;version=3.5.17.0

- 51. Press Activate.
- 52. Press Attach a policy
- 53. Select the policy you created earlier
- 54. Now it won't have added the certificate to the thing for some reason..
- 55. Go back to the main menu and select Secure > Certificates, select the new one you made.
- 56. Actions > Activate
- 57. Actions > Attach Thing > *jackicpi3lcd* > Attach
- 58. So now if you go to Manage > Thing > jackicpi3lcd, it should have a certificate under security. If you click that it should have a policy under Policies, and the certificate should have the word "ACTIVE".

Example:

59.

Thi	ings > jackicpi3lcd		Ce	rtificates > e	524f4b75d43	12c19e36
	THING jackicpi3lcd codesys			certificate e524f4	b75d43	312c19e36706e64
	Detail	Certificates		ACTIVE		
J.	Security	Create certificate View ot				
	Thing groups			Details		Policies
	Billing Groups			Policies		
	Shadow	e524f4b75d4312c19e	ю.	-		Letter LD. LA. JC. L
	Interact			Things		LetjackPubAndSub

- 60. Go back to the CODESYS IDE now.
- 61. Security screen > Devices²⁴⁷ > Hit Refresh > Click on "Own Certificates"
- 62. Press the button just to the left of Owned certificates that looks like a PLC with a green downwards arrow.
- 63. Example:

Transfer the selected certificate to the PLC

²⁴⁷ https://help.codesys.com/webapp/_csa_dlg_security_screen_devices;product=codesys_security_agent;version=1.2.0.0

- 64. Change the file filter to all files. Change the extension of the file you downloaded from .txt to .crt, then select it and hit open.
- 65. Go to trusted certificates folder now, and install all three root certificates (same button) from Amazon.Again, changing the filter if needed.
- 66. Cold reset the controller to take the new certificates.
- 67. Open the visualization, turn on *xEnable* again for *AWSIoTClient*. You should get a green "connected to broker" lamp.
- 68. Turn on *xEnable* the *AWSIoTSubscribe*
- 69. Enable the AWSIoTPublish
- 70. Now you should get the values, everything is good! The topic and payload you send via Publish should be seen in the *PLC_PRG.AWSIoTSubscribe_0*
- 71. Example:



6.2 IIoT Libraries SL (EN)

6.2.1 IIoT-Cloud FAQ's:

Q1: Is it possible to transfer files to the cloud via the functions provided by the CODESYS IIoT Library?

A1: The content of files can be transfer via MQTT or HTTPS. Our libraries transport byte arrays or WSTRRINGs.

Q2: How exactly is there to proceed?

A2: You have to load the file and send it as a byte array via MQTT.

On the remote station you can store the received bytes as a file again.

In case of HTTPS (transports WSTGRINGs) you have to encode the binary data Base64 before and decode it again when receiving.

Q3: Is there a SFTP module to transfer files from an external server into the Edge-Controller?

A3: At the moment there is no SFTP module.

See also

- Our Codesys Online Help (OLH)²⁴⁸ Website
- Our Store Products for IIoT²⁴⁹

6.2.1.1 Other related articles

- See our CODESYS Store product: IIoT Libraries SL²⁵⁰
- Our CODESYS Online Help²⁵¹
- Our Codesys Store ²⁵²
- Basic information to the Codesys Development System (Codesys Homepage)²⁵³
- Codesys Engineering²⁵⁴, for professional IEC 61131-3 applications for technicians and software engineers
- OLH: The Online-help introduction for the Codesys Development System (IDE)²⁵⁵

251 https://www.helpme-codesys.com/

²⁴⁸ https://help.codesys.com/

 $^{{\}tt 249\,https://store.codesys.com/de/catalogsearch/result/?q{\tt =IIoT}$

²⁵⁰ https://store.codesys.com/de/iiot-libraries-sl.html

²⁵² https://store.codesys.com/en/

²⁵³ https://www.codesys.com/products/codesys-engineering/development-system.html

²⁵⁴ https://www.codesys.com/products/codesys-engineering.html

²⁵⁵ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_development_system.html

• The Codesys Online Help (OLH)²⁵⁶ Website (pre SP18 link)

6.3 IIoT Libraries SL - FAQ (EN)

6.3.1 Google Cloud IoT Core Client SL - getting started

The software package "IIoT Libraries SL" contains libraries for IIoT communication, and libraries for reading and writing of data structures.



6.3.1.1 How to get started

The CODESYS documentation does not serve as a tutorial for setting up and administering a Google Cloud IoT service.

For details about that , you must read the Google Cloud IoT documentation.

- Install the IIoT package from CODESYS Installer or the CODESYS Store: IIoT Libraries SL (DE)²⁵⁷/ (EN)²⁵⁸/(US)²⁵⁹
- 2. After the Install, please read the datasheet from the installation folder: f.e. C:\Users\<USERNAME>\IIoT Libraries SL\<version>\DataSheets\en\Google Cloud IoT Core Client SL_en.pdf

This datasheet gives an overview of the steps required to get started. For more detail on how to use Google's Google Cloud IoT Core tools, you need to follow Step 3.

²⁵⁶ https://help.codesys.com/

²⁵⁷ https://store.codesys.com/iiot-libraries-sl.html

²⁵⁸ https://us.store.codesys.com/iiot-libraries-sl.html

²⁵⁹ https://us.store.codesys.com/iiot-libraries-sl.html

- 3. Read the Google Cloud IoT Core documentation [link]²⁶⁰.
- Run the example from
 e.g. C:\Users\<USERNAME>\Google Cloud IoT Core Client SL\<version>\Google Cloud IoT Core Client SL Example.project
- 5. With the MQTT sample application, you must enter all the info (see picture, green boxes) from your Google Cloud account:



- Execute the "Execute" button (see image, red box button).
- Now you can use the four functions above.
- The correct JSON you should enter, you have to get from the Google Cloud IoT documentation.
- JSON Utilities SL, which is also included in the IIoT Libraries SL bundle, may help you in handling JSON. See its example at C:\Users\<USERNAME>\JSON Utilities SL\<version>\JSON Utilities SL
 Example.project

²⁶⁰ https://cloud.google.com/iot/docs/

7 CODESYS Scripting - FAQ (EN)

7.1 Script example: Set I/O variable names

7.1.1 Preparatory work:

7.1.1.1 In Codesys

• Use a preferably current Codesys IDE version

From Codesys version SP18 on forward, install the Codesys Scripting add-on and the Codesys Modbus add-on via the Codesys installer²⁶¹

- Create a standard project with a Codesys WinV3 PLC²⁶²
- use 'Add Device²⁶³' to add an Ethernet Adapter²⁶⁴, append underneath a Modbus TCP Master²⁶⁵, append underneath a Modbus TCP Slave²⁶⁶

7.1.1.2 in Python

- Create a Python Script with the name, for example: device_change_io_mapping.py.
- Include the following code into the script:

```
#
#
# Methods
#
def printDevParams(parmSet):
    for param in parmSet:
        print("param id={} name={}".format(param.id, param.name))
```

²⁶¹ https://content.helpme-codesys.com/en/CODESYS%20Installer/index.html

²⁶² https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_creating_standard_project.html

²⁶³ https://content.helpme-codesys.com/en/CODESYS%20Test%20Manager/_tm_test_action_devices_adddevice.html

²⁶⁴ https://content.helpme-codesys.com/en/CODESYS%20Ethernet%20Adapter/_enad_start_page.html 265 https://content.helpme-codesys.com/en/CODESYS%20Modbus/_mod_edt_master_tcp.html

²⁶⁶ https://content.helpme.codesys.com/cn/CODESYS%20Modbus/_mod_edt_haster_top.html

 $^{{\}tt 266\ https://content.helpme-codesys.com/en/CODESYS\%20Modbus/_mod_edt_slave_tcp.html}$

```
printData(param, "")
def printData(data, indent):
    print("{}data identifier={} bit_size={}".format(indent, data.identifier,
data.bit_size))
   if data.is_mappable_io:
        io = data.io_mapping
        print("{}variable={}".format(indent, io.variable))
        if io.default_variable != None:
            print("{}default_variable={}".format(indent, io.default_variable))
    if data.has_sub_elements:
        for subData in data:
            printData(subData, indent + "--")
#
# Main program
#
#note: the variables to be assigned to the io mapping must be declared in the codesys
program and correspond to the variables used in the script
       in this example: "Application.PLC_PRG.wValue"
#
       the variable "byPins" can be used as global variable
#
proj = projects.primary
found = proj.find('Modbus_TCP_Slave', True)
assert(found, 'No Modbus slave found')
slave = found[0]
params = slave.device_parameters
# Show device parameters
if len(params) > 0:
    printDevParams(params)
# Show host parameters of the connectors
for conn in slave.connectors:
    print("connector={} id={}".format(conn.interface, conn.connector_id))
    parms = conn.host_parameters
    if len(parms) > 0:
        printDevParams(parms)
connector = slave.connectors.by_id(1)
assert(connector, 'No connector with specified id found')
params = connector.host_parameters
channel_list=[]
for test in params:
    if test.io_mapping:
        print(test)
        channel_list.append(test)
```

```
io = channel_list[0].io_mapping
io.variable = "byPins"
if io.mapping_creates_variable:
    print("variable will be created")
io = channel_list[1].io_mapping
io.variable = "Application.PLC_PRG.wValue"
if io.maps_to_existing_variable:
    print("variable is mapped to existing one")
```

7.1.2 Use / execute

- Open the preliminarily created Codesys Project.
- Execute the script device_change_io_mapping via the Command: Scripting Execute Script File²⁶⁷.

>>> The Channel 0 and Channel 1 are mapped.

The variables to be assigned to the IO-mapping must be declared in the Codesys program and correspond to the variables used in the script. In this example: "Application.PLC_PRG.wValue" the variable "byPins" can be used as global variable Otherwise, the assignment does not apply and the Codesys project cannot be translated or even downloaded without errors

Please note that the given code examples are only intended to illustrate possible structures. The examples do not claim to be complete or error-free.

²⁶⁷ https://content.helpme-codesys.com/en/CODESYS%20Scripting/_cds_cmd_execute_script_file.html

7.2 Script example: Set online path

7.2.1 Preparatory work:

7.2.1.1 In Codesys

Use a preferably current Codesys IDE version

From Codesys version SP18 on forward, install the Codesys Scripting add-on via the Codesys installer²⁶⁸

Create a standard project with a Codesys WinV3 PLC²⁶⁹

7.2.1.2 in Python

- Create a Python Script with the name, for example: scan_and_download.py.
- Include the following code into the script:

```
GatewayName = '<Name Gateway>'
TargetName = '<Name in Scan>'
DeviceName = '<Name in Device Tree>'
#find DeviceName in the Device Tree; has to be unique
found = projects.primary.find(DeviceName, False)
print('found "{}" in device tree'.format (DeviceName))
assert(found and len(found) == 1, 'No or more than one device found')
dev = found[0]
# set the selected Gateway for scan
gw = online.gateways[GatewayName]
# execute scan
print ('start scan for devices')
targets = gw.perform_network_scan()
# check if TargetName is in Scan result, only 1 is expected
```

²⁶⁸ https://content.helpme-codesys.com/en/CODESYS%20Installer/index.html

²⁶⁹ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_creating_standard_project.html

```
matchingTarget = None
for target in targets:
    if target.device_name == TargetName:
        print("Name: {} Addr: {}".format(target.device_name, target.address))
        matchingTarget = target;
        break
# set the commuication path with scanned device
if matchingTarget:
    print('Set communication path of device ')
    dev.set_gateway_and_device_name(gw, target.device_name)
    # or
    # dev.set_gateway_and_address(gw, target.address)
else:
    assert('No matching target found')
# or set the communication path with IP
#IPAddress = '<IP Address PLC xxx.xxx.xxx.xxx<'</pre>
#dev.set_gateway_and_ip_address(gw, IPAddress)
# create online application
onlineApp = online.create_online_application()
print ('login with download application')
onlineApp.login(OnlineChangeOption.Never, True)
print ('create boot application ')
onlineApp.create_boot_application()
print ('logout')
onlineApp.logout()
```

7.2.2 Use / execute

- Open the preliminarily created Codesys Project.
- Execute the script scan_and_download.py via the Command: Scripting Execute Script File²⁷⁰.

The execution will be reported in the Script Messages. For communication path and login, no user / password is set.

Please note that the given code examples are only intended to illustrate possible structures. The examples do not claim to be complete or error-free.

270 https://content.helpme-codesys.com/en/CODESYS%20Scripting/_cds_cmd_execute_script_file.html

7.3 Script example: Status information and Ethernet statistics in an PN controller

7.3.1 How to:

Read out status information and the Ethernet statistics in the PN controller via scripting engine?

7.3.1.1 Forge example on login and monitoring a variable

See our Forge example using 'read_value()': Login and monitor variable²⁷¹

7.3.1.2 Read Status

You can access the statistics with this snippet:

IEC-Code VAR a : POINTER TO IoDrvProfinet.DriverDiagV4; param_a: POINTER TO IoStandard.IoConfigParameter; END_VAR

IEC-Code

7.3.1.3 PNIO Status

The SlaveStatus for the PNIO can be read out with:

SlaveName.xRunning

²⁷¹ https://forge.codesys.com/tol/scripting/snippets/14/

• or SlaveName.PNIOStatus

See our Onlinehelp: PROFINET Diagnosis - PNIO Status (Error Code)²⁷²

²⁷² https://content.helpme-codesys.com/en/CODESYS%20PROFINET/_pnio_diagnosis_pnio_state.html

8 CODESYS SoftMotion - FAQ (EN)

8.1 Difference of fEditor and fTable in SMC_CAMTable* (SM3_Basic Library)

If the Cam table is stored as a point array (byType = 1 or 2), then these values could be used to define a scaling of the range of values of the table to values used by MC_CamIn.

The master values are only scaled for non-equidistant tables, **byType = 2**. The CODESYS Cam-Editor will set the **fTable*** values equal to the **fEditor*** values, so no scaling is done.

Example:

See the Example >>²⁷³

See also

- Our Codesys Online Help (OLH)²⁷⁴ Website
- OLH: SoftMotion SM3_Basic Library²⁷⁵
- OLH: The Codesys Components of CODESYS SoftMotion²⁷⁶
- OLH: CAMs²⁷⁷, defining Switch Points in CAMs²⁷⁸ via Tappets and definition of a SoftMotion Cam²⁷⁹
- Our Softmotion Store Elements²⁸⁰
- User requests under Forge SoftMotion²⁸¹

274 https://help.codesys.com/

 $^{{\}tt 273 https://faq.codesys.com/pages/viewpage.action?pageld=112525393}$

 $^{275\,}https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/fld-SM3_Basic.html$

²⁷⁶ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_components.html

²⁷⁷ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_f_cam.html

²⁷⁸ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cam_defining_tappets.html

²⁷⁹ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cam_definition_softmotion_cam.html

²⁸⁰ https://store.codesys.com/catalogsearch/result/?q=SoftMotion

²⁸¹ https://forge.codesys.com/search/?q=SoftMotion

8.2 DXF: File Import, 'Maximum gap size'

AutoCAD DXF (Drawing Interchange Format, or Drawing Exchange Format) is a CAD data file format developed by Autodesk for enabling data interoperability between AutoCAD and other programs. Codesys can import DXF files.

The current DXF standard (u19.1.01) by AutoCad is supported with the restrictions, see the OnlineHelp on Command: Import from DXF File²⁸².

8.2.1 Maximum gap size

This specifies the distance up to which the endpoints of elements in the DXF file are considered as "contiguous".

The default is 0.001 units.

8.2.1.1 A technical exposition:

- If two points of different geometry elements are separated by no more than this set 'Maximum gap size' threshold, the two geometry elements are considered as one contiguous element.
- If these geometry elements are selected as consecutive elements during the sorting phase, then, the end position of the first element is shifted so, that this position exactly matches the start position of the second geometry element.

Only for ellipses this is not supported yet, here a gap remains which is filled by a G0 element.

The largest value for 'Maximum gap size' can be set to 1.

With large values for 'Maximum gap size', it can come to inaccuracies with the import procedure! In the process, nonadjacent endpoints can then be shifted onto each other and lead to an incorrect representation.

The user will be asked in advance via a dialog if the current object is not empty.

After confirmation, the selected layers are imported and overwrite the existing program.

²⁸² https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cmd_cnc_dxf_import.html

8.3 Error diagnostics: Meaning of an value for wCommunicationState > 1000

With the use of the IoConfig_Globals.drivename.**wCommunicationState** errors that have a values > 1000 can occur.

These are often not immediately obvious, which errors are hidden behind it.

These numbers (>1000) come from the fact that in our state-machine, in a certain state an error has occurs.

Then the **"known state +1000**" is copied into **wCommunicationState**. Thus it can be determined in which step/state the error has occurred.

See also

- Our Codesys Online Help (OLH)²⁸³ Website
- OLH: "wCommunicationState"
 ²⁸⁴
- OLH: CODESYS SoftMotionLight Drive Configuration²⁸⁵
- OLH: The Codesys Components of CODESYS SoftMotion²⁸⁶

8.4 Error diagnostics: SMC_AXIS_GROUP_FOLLOW_SETVALUE

Internally, SoftMotion is using the function block SMC_FollowSetValues to preset the set values for each axis.

If one of the blocks returns an error, the axis group returns the error SMC_AXIS_GROUP_FOLLOW_SETVALUE.

Possible causes (error of SMC_FollowSetValues):

- SMC_AXIS_NOT_READY_FOR_MOTION
- SMC_WRONG_CONTROLLER_MODE
- SMC_REGULATOR_OR_START_NOT_SET
- SMC_MSI_INVALID_EXECUTION_ORDER
- SMC_AXIS_ERROR_DURING_MOTION

In many cases, the cause of SMC_AXIS_GROUP_FOLLOW_SETVALUES is an axle error. In this case, more information about the error should be in the log.

Also, the error is most likely preceded by another error.

²⁸³ https://www.helpme-codesys.com/

²⁸⁴ https://www.helpme-codesys.com/search.html?id=&tx_solr%5Bq%5D=wCommunicationState

 $^{285\,}https://content.helpme-codesys.com/en/CODESYS\%20SoftMotion\%20Light/_sm_light_driveconfiguration.html$

²⁸⁶ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_components.html

8.5 Generic CiA 402 drive: MC_Power.Status output stays FALSE

8.5.1 Example:

bRegulatorRealState²⁸⁷=TRUE bDriveStartRealState²⁸⁸=TRUE The status- and control-word are correct The drive can be moved via MC_MoveVelocity²⁸⁹

8.5.2 Question:

With all the existing Example outputs of the system setup, why does the *MC_Power*.Status²⁹⁰ output stay **FALSE**?

8.5.3 Answer:

The generic CiA 402 axis requires the following bits in the status word in order to be ready for motion:

- Bit 0 (ready to switch on)
- Bit 1 (switched on)
- Bit 2 (operation enabled)
- Bit 5 (quick stop)
- Bit 12 (first bit of operation mode specific)

Bit 12 is not always set by every drive and therefore can prevent the axis to report Axis.SMC3_AxisReadyForMotion()=**TRUE**.

This, in the end, will cause MC_Power.Status²⁹¹ to stay FALSE.

8.5.4 Workaround

The generic Axis can be tweaked, so that Bit 12 is not needed in position mode:

- Set _bCheckBit12InPositionMode²⁹² of the generic drive to FALSE.
- With this setting, the axis will report Axis.SMC3_AxisReadyForMotion²⁹³()=TRUE and therefore also MC_Power²⁹⁴ will work.

288 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cmd_add_softmotion_cia402_axis.html

289 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/Movement/MC_MoveVelocity.html

- 290 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/MC_Power.html 291 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/MC_Power.html
- 292 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cmd_add_softmotion_cia402_axis.html 293 https://www.helpme-codesys.com/search.html?L=1&id=888&tx_solr%5Bq%5D=SMC3_AxisReadyForMotion

²⁸⁷ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cmd_add_softmotion_cia402_axis.html

²⁹⁴ https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/MC_Power.html
8.6 Import a CAM from csv file

There is no CODESYS example how to specifically read cam tables from CSV files.

Codesys allows the use of the CSV utility to read CSV files. This is available in the CODESYS Store under CSV Utility²⁹⁵.

Our Online Help shows documents on how to create CAM tables programmatically, to find under Softmotion - CAM Data Structure (OLH)²⁹⁶

See also

- Our Codesys Online Help (OLH)²⁹⁷ Website
- OLH: Softmotion CAMs²⁹⁸
- Store: CSV Utility²⁹⁹
- Our Codesys Store Examples³⁰⁰
- User requests under Forge SoftMotion³⁰¹

8.7 Remark on the 'table' units under SMC_CAMTable* (SM3_Basic Library)

The values in the table array are represented in table units.

SMC_CAMTable_LREAL_128_1 (STRUCT)

TYPE SMC_CAMTable_LREAL_128_1 : STRUCT

This STRUCT represents an equidistant curve table

- The table can handle 128 elements of type LREAL
 - There is a array of slave positions. The slave positions related to the start and end position of the master must be enclosed.
 - Storing of the master values in Table is scaled to the range [fEditorMasterMin, fEditorMasterMax] in SoftMotion units.
 - Storing of the slave values in Table is scaled to the range [fEditorSlaveMin, fEditorSLaverMax] in SoftMotion units.
 - Storing of the master values in Table is scaled to the range [fTableMasterMin, fTableMasterMax] in table units.
 - Storing of the slave values in Table is scaled to the range [fTableSlaveMin , fTableSlaveMax] in table units.

²⁹⁵ https://store.codesys.com/en/csv-utility-configurable.html

²⁹⁶ https://help.codesys.com/webapp/_sm_cam_data_structure;product=codesys_softmotion;version=4.10.0.0 297 https://help.codesys.com/

²⁹⁸ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_f_cam.html

²⁹⁹ https://store.codesys.com/en/csv-utility-configurable.html

³⁰⁰ https://store.codesys.com/en/examples.html?product_list_mode=grid

³⁰¹ https://forge.codesys.com/search/?q=SoftMotion

The application requires 'SoftMotion units' and therefore the values from the Table array get converted to 'SoftMotion units'.

If the Cam table is stored as a point array (byType = 1 or 2), then the values **fEditor*Min**, **fEditor*Max**, **fTable*Min** and **fTable*Max** could be used, to define a scaling of the range of values of the table to values used by MC_CamIn³⁰² (OLH).

Note:

The master values are only scaled for non-equidistant tables, byType = 2. The CODESYS Cam-Editor will set the **fTable* values** equal to the **fEditor* values**, so no scaling is done.

Example:

See the Example >>³⁰³

See also

- Our Codesys Online Help (OLH)³⁰⁴ Website
- OLH: SoftMotion SM3_Basic Library³⁰⁵
- OLH: The Codesys Components of CODESYS SoftMotion³⁰⁶
- OLH: CAMs³⁰⁷, defining Switch Points in CAMs³⁰⁸ via Tappets and definition of a SoftMotion Cam³⁰⁹
- Our Softmotion Store Elements³¹⁰
- User requests under Forge SoftMotion³¹¹

³⁰² https://help.codesys.com/webapp/srbYuZZix5-pgJJQ2Y8rgvkSFLs%2FMC_CamIn;product=SM3_Basic;version=4.9.0.0 303 https://faq.codesys.com/pages/viewpage.action?pageId=112525393

³⁰⁴ https://help.codesys.com/

³⁰⁵ https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/fld-SM3_Basic.html

³⁰⁶ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_components.html

³⁰⁷ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_f_cam.html

³⁰⁸ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cam_defining_tappets.html

³⁰⁹ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cam_definition_softmotion_cam.html

³¹⁰ https://store.codesys.com/catalogsearch/result/?q=SoftMotion

³¹¹ https://forge.codesys.com/search/?q=SoftMotion

8.8 Scale and Shift Example for fTable and fEditor under SMC_CAMTable* (SM3_Basic Library):

Example: fEditorMasterMin = 2, fEditorMasterMax = 4
Here the master positions in the Cam-table will be shifted by 2 units:
fEditorMasterMin - (fTableMasterMin * scale) = 2 units.
and scaled by a factor of two:
(fEditorMasterMax - fEditorMasterMin) / (fTableMasterMax - fTableMasterMin) = 2
A master position of 0 in Table units results in a master value of 2 in SoftMotion units. A master position of 0.5 in Table units results in a master value of 3 in SoftMotion units.

See also

- Our Codesys Online Help (OLH)³¹² Website
- OLH: SoftMotion SM3_Basic Library³¹³
- OLH: The Codesys Components of CODESYS SoftMotion³¹⁴
- OLH: CAMs³¹⁵, defining Switch Points in CAMs³¹⁶ via Tappets and definition of a SoftMotion Cam³¹⁷
- Our Softmotion Store Elements³¹⁸
- User requests under Forge SoftMotion³¹⁹

8.9 SoftMotion CNC with strange, jumpy, abrupt movements

To approach an analysis, check here the following points in your project:

³¹² https://help.codesys.com/

³¹³ https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/fld-SM3_Basic.html

³¹⁴ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_components.html

³¹⁵ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_f_cam.html

³¹⁶ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cam_defining_tappets.html

³¹⁷ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cam_definition_softmotion_cam.html

³¹⁸ https://store.codesys.com/catalogsearch/result/?q=SoftMotion

³¹⁹ https://forge.codesys.com/search/?q=SoftMotion

- Has the project connected the *bStopIpo*³²⁰output of the SMC_ControlAxisByPos³²¹ blocks with the bEmergency_Stop³²² input of SMC_Interpolator³²³ (that as recommended by us)?
- Is the *bAvoidGaps*³²⁴input of SMC_ControlAxisByPos³²⁵ set to TRUE?
- During the jerky motion, does the *bStopIpo*³²⁶input keep switching to TRUE and FALSE, and back?

If all this is answered with Yes, then the given maximum speed (Velocity [u/s]) of the axes does not fit!

8.9.1 Reason:

- SMC_ControlAxisByPos³²⁷ is using this speed to check, if there is a jump in the axis position.
- When there is a jump, the SMC_Interpolator³²⁸ is stopped via the bEmergency_Stop³²⁹ input, and the jump will be closed.
- After that, the System starts again to process the movement.
- So if this shutdown follows directly one after the other, it produces a jerky, jumpy motion pattern.

8.9.2 Solution

The maximum axis speed must then be configured right.

- This may have to be adjusted for each axis depending on the structure used in the project.

See also Codesys Online Help for the Drive general Tab - 'Common'³³⁰.

See also

- Our Codesys Online Help (OLH)³³¹ Website
- Basic information to the Codesys Development System (Codesys Homepage)³³²
- OLH: Interrupt of a single axis movement³³³
- OLH: The Codesys Components of CODESYS SoftMotion³³⁴

333 https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_interrupt_single_axis_movement.html

³²⁰ https://help.codesys.com/webapp/to3Mr10rJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0 321 https://help.codesys.com/webapp/to3Mr10rJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0 322 https://help.codesys.com/webapp/bPMATdcpjQHpU-Tjf9fo0w80GUo%2FSMC_Interpolator;product=SM3_CNC;version=4.11.0.0 323 https://help.codesys.com/webapp/to3Mr10rJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0 324 https://help.codesys.com/webapp/to3Mr10rJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0 325 https://help.codesys.com/webapp/to3Mr10rJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0 326 https://help.codesys.com/webapp/to3Mr10rJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0 327 https://help.codesys.com/webapp/to3Mr10rJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0 328 https://help.codesys.com/webapp/to3Mr10rJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0 329 https://help.codesys.com/webapp/to3Mr10rJKOCizH70KxbQaLuxnU%2FSMC_ControlAxisByPos;product=SM3_CNC;version=4.11.0.0 329 https://help.codesys.com/webapp/bPMATdcpjQHpU-Tjf9fo0w80GUo%2FSMC_Interpolator;product=SM3_CNC;version=4.11.0.0 329 https://help.codesys.com/webapp/bPMATdcpjQHpU-Tjf9fo0w80GUo%2FSMC_Interpolator;product=SM3_CNC;version=4.11.0.0 330 https://help.codesys.com/webapp/bPMATdcpjQHpU-Tjf9fo0w80GUo%2FSMC_Interpolator;product=SM3_CNC;version=4.11.0.0 330 https://help.codesys.com/webapp/sm_edt_drive_general;product=codesys_softmotion;version=4.11.0.0

³³² https://www.codesys.com/products/codesys-engineering/development-system.html

³³⁴ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_components.html

OLH: Our Diagnosis in case of Performance Problems under SoftMotion³³⁵

8.10 SoftMotion limitations for CAM, Tappets and CNC Programmes

There are sometimes questions about limiting, maximum number of certain SM elements. Here is a brief summary:

<u>CAMs</u>

How many CAMs can I program/create in CODESYS? Are there any other limitations? Total or single number of lines/polynomials?

8.10.1 <u>Tappets</u>

How many tappets are possible per cam?

8.10.2 CNC-PRGs:

How many CNC programs can I manage/create max. in the project? Are there other limits in the individual CNCs?

8.10.3 Assessment

There are no hard limits in all of the elements. They are only indirectly limited by the available memory on the uses system.

There are, however, restrictions on the use of tappets in certain function blocks (FB):

- For SMC_CamRegister³³⁶ the total number is capped at **512 tappets**.
- For SMC_ReadCam³³⁷ there is a limit of max. **128 tappets** and max. **128 segments**.
- With MC_CamIn³³⁸only **3 tappets** can switch simultaneously per PLC cycle (see output *MC_CamIn.Tappets*.).

See also

- Our Codesys Online Help (OLH)³³⁹ Website
- Basic information to the Codesys Development System (Codesys Homepage)³⁴⁰

³³⁵ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_diagnosis_performance.html

³³⁶ https://help.codesys.com/webapp/gjjw9jXoHTNOJkKn8vz-a0VhExl%2FSMC_CamRegister;product=SM3_Basic;version=4.10.0.0 337 https://help.codesys.com/webapp/gjjw9jXoHTNOJkKn8vz-a0VhExl%2FSMC_ReadCAM;product=SM3_Basic;version=4.10.0.0 338 https://help.codesys.com/webapp/srbYuZZix5-pgJJQ2Y8rgvkSFLs%2FMC_CamIn;product=SM3_Basic;version=4.10.0.0 339 https://www.helpme-codesys.com/

³⁴⁰ https://www.codesys.com/products/codesys-engineering/development-system.html

- OLH: for CNC³⁴¹, CAMs³⁴², and Defining Switch Points in CAMs³⁴³ via Tappets
- OLH: Diagnosis in case of Performance Problems under SoftMotion³⁴⁴

8.11 SoftMotion Task error: "SMC_FB_CALLED_FROM_WRONG_TASK"

8.11.1 Example:

In a project (created with SoftMotion version 4.12.0.0 Add-on) the SoftMotion Function Block f.e.g: SMC_ChangeGearingRatio³⁴⁵is called from any arbitrary Task. This was working without problems.

When updating to SoftMotion version 4.13.0.0³⁴⁶ the error "SMC_FB_CALLED_FROM_WRONG_TASK" will be shown.

8.11.2 Questions:

- Why is there now an error displayed, when old projects could be compiled and downloaded without errors?
- Does the FB have to be called from a specific Task with the new SoftMotion version?
- Is the call from any arbitrary Task (under older SoftMotion versions like 4.12.0.0) an error in the project/process flow, and should this be corrected retroactively?

8.11.3 Assessment and Explanation

Function Blocks that use an axis or axis groups, may only be called from the respective Bus-Task! Up to SoftMotion version 4.13.0.0, this was not controlled, so that errors could occur in applications that were difficult to track and understand.

Therefore, with the new version, we have included an error to directly point out this problem.

8.11.3.1

The problem explained with the above given example:

- Let's assume a project has a SingleCore CPU with 2 Tasks.
- The first task is the bus task with a high priority (in this Task, the AXIS_REF_SM3 is called implicitly).
- The second Task has a lower priority than the first and calls the block SMC_ChangeGearingRatio.

 $^{341\} https://content.helpme-codesys.com/en/CODESYS\%20SoftMotion/_sm_f_cnc.html$

 $^{342\} https://content.helpme-codesys.com/en/CODESYS\%20SoftMotion/_sm_f_cam.html$

³⁴³ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_cam_defining_tappets.html

 $^{344\} https://content.helpme-codesys.com/en/CODESYS\%20SoftMotion/_sm_diagnosis_performance.html$

³⁴⁵ https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/SMC_ChangeGearingRatio.html

³⁴⁶ https://store.codesys.com/de/codesys-softmotion-sl-bundle.html

- The Task with the higher priority can interrupt the Task with the lower priority.
- SMC_ChangeGearingRatio accesses several values of the AXIS_REF_SM3 axis.
- If the input variables SMC_ChangeGearingRatio³⁴⁷.dwRatioTechUnitsDenom or SMC_ChangeGearingRatio³⁴⁸.iRatioTechUnitsNum are changed, the following axis values are written, for example:
 - AXIS_REF_SM3³⁴⁹.fScalefactor
 - AXIS_REF_SM3³⁵⁰.fFactorVel
 - AXIS_REF_SM3³⁵¹.fFactorAcc
 - AXIS_REF_SM3³⁵².fFactorJerk
 - AXIS_REF_SM3³⁵³.dwRatioTechUnitsDenom
 - AXIS_REF_SM3³⁵⁴.iRatioTechUnitsNum
- Assuming now that SMC_ChangeGearingRatio³⁵⁵ is executed, and writes the axis values listed above.
- Then the second Task can be interrupted in the middle of processing SMC_ChangeGearingRatio³⁵⁶ by the bus Task.
 - For example, the variables AXIS_REF_SM3³⁵⁷.fScalefactor and AXIS_REF_SM3³⁵⁸.fFactorVel have already been updated, but the others still have the old value!
- Then, AXIS_REF_SM3³⁵⁹, which is now called in the bus task, works with both new and old values!
- · This is therefore an inconsistent state, which can lead to undefined errors!

Recommendation

To prevent these inconsistent states, all blocks that work with axes or axis groups must be called from the respective bus task.

We therefore recommend that you adapt your application accordingly.

³⁴⁷ https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/ SMC_ChangeGearingRatio.html

³⁴⁸ https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/ SMC_ChangeGearingRatio.html

³⁴⁹ https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
350 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
351 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
352 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
353 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
353 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
354 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
355 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
354 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
355 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html
355 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/
SMC_ChangeGearingRatio.html

³⁵⁶ https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/ SMC_ChangeGearingRatio.html

³⁵⁷ https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html 358 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html 359 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/DriveInterface/AXIS_REF/AXIS_REF_SM3.html 358 https://content.helpme-codesys.com/en/libs/SM3_Basic/DriveInterface/AXIS_REF/AXI

This also means, with knowledge of the possible problems/misbehavior, it is recommended to upgrade applications of existing projects under the old SoftMotion versions appropriately!

See also

- Our Codesys Online Help (OLH)³⁶⁰ Website
- Basic information to the Codesys Development System (Codesys Homepage)³⁶¹
- OLH: Diagnosis in case of Performance Problems under SoftMotion³⁶²

8.12 Version difference in the operation of Axis.nAxisState

8.12.1 Question

In the real axis states of EtherCAT between f.e. SM4.10 and SM4.6.3, there is a difference in the operation of Axis.nAxisState when MC_Power³⁶³ is turned from OFF to ON.

8.12.1.1 Setup Examples:

- Old behavior: SoftMotion v4.6.3.0 : Axis.nAxisState=power_off→stopping→standstill
- New Behavior: SoftMotion v4.10.0.0 : Axis.nAxisState=power_off \rightarrow standstill \rightarrow stopping \rightarrow standstill

8.12.2 Change Description

The "new behavior" (power off --> standstill --> stopping --> standstill) was introduced with a bug fix in SoftMotion version >=4.7.0.0.

Before this version, MC_Power directly set the axis state from 'power off' to 'stopping'.

Now MC_Power³⁶⁴ sets the axis state to 'standstill' and the transition to 'stopping'. This is only executed if the drive is also switched on (Bit 2 in the status word).

The bits of the status and control word should be described in the documentation of the used drive, as they might differ from the CiA 402 standard.

³⁶⁰ https://www.helpme-codesys.com/

³⁶¹ https://www.codesys.com/products/codesys-engineering/development-system.html

³⁶² https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_diagnosis_performance.html

³⁶³ https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/MC_Power.html 364 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/MC_Power.html

8.12.3 Axis States Description

Please see the following axis states (also, OLH: Axis Group States³⁶⁵):

- power_off
- errorstop
- stopping
- standstill
- discrete_motion
- continuous_motion
- synchronized_motion
- homing

8.12.4 Behavior in question

When starting the MC_Power by the settings:

```
Enable = TRUE
bRegulatorOn = TRUE
bDriveStart = TRUE,
```

then the axis is not disabled anymore (it is not in the 'power_off' state).

The previous behavior (before the bug fix in SM v4.7.0.0) was, that the axis directly made a transition to stopping.

But this was not correct, because " Why should the drive be stopping when the regulator is not on (i.e. the drive is not switched on)? "

In this more or less undefined state, SoftMotion will use 'standstill' first until sure that we are in state stopping.

- When known, that the regulator of the drive is on (drive is switched on) but the drive has not enabled the operation yet (NOT (bDriveStart³⁶⁶AND bDriveStartRealState)), then the drive switches into state 'stopping'.
- When then the drive is actually started (switched on and operation enabled), the state 'standstill' is entered again.
- So there is a difference between the first and the second standstill during MC_Power³⁶⁷.

To judge whether an axis is ready to move, the MC_Power.Status³⁶⁸ output can be used.

³⁶⁵ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_robotics_state_machine.html

³⁶⁶ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_special_use_cases.html

³⁶⁷ https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/MC_Power.html 368 https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/POUs/AdministrativeConfiguration/MC_Power.html

See also

- Our Codesys Online Help (OLH)³⁶⁹ Website
- OLH: SoftMotion SM3_Basic Library³⁷⁰
- OLH: The Codesys Components of CODESYS SoftMotion³⁷¹
- OLH: Drive Control, Standard Use Cases³⁷²

³⁶⁹ https://help.codesys.com/

³⁷⁰ https://content.helpme-codesys.com/en/libs/SM3_Basic/Current/SM3_Basic/fld-SM3_Basic.html

³⁷¹ https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_components.html

³⁷² https://content.helpme-codesys.com/en/CODESYS%20SoftMotion/_sm_special_use_cases.html

9 CODESYS Visualization - FAQ (EN)

9.1 Access to Text Lists from the IEC Code

The requirement for programmatic access to text lists is that a visualization is present in the project.

· Example of a text list:



• Open the Library Manager and add the TextListUtils library.



Both of the functions **GetText** and **GetTextW** are differentiated only by the data type that is processed.

If Unicode characters, such as Russian or Chinese, are used in the project, then you have to work with the **WSTRING** type.

Please note that the use of Unicode characters has to be activated explicitly in the visualization manager

Devices	MyTextList Visualization Manager × Settings Dialog settings Default Hotkeys Visualizations Visuali	etting
□-1995 Task Configuration □-1996 MainTask □-1991 PLC_PRG	Style settings Selected style: Flat style, 3.5.9.0 (3S-Smart Software Solutions GmbH) V Display all versions (for experts only)	8
VISU_TASK VISUElems.Visu_Prg MyTextList	Preview: Button Headline	
Visualization	Radiobutton [0,INDEX] [1,INDEX] [2,INDEX]	

• The language first has to be determined in the code before the text is read. This is done here by means of the variable *udiLanguage* which can be changed from the visu, for example by means of a combo box.

Devices 👻 🛪 🗙	PLC_PRG 🗙 🔄 MyTextList 🗃 Visualization 🖓 Visualization Manager 🎁 Library Manager	Device				
= 🕤 Untitled3	Device.Application.PLC_PRG					
= 🤤 🛗 Device [connected] (CODESYS Control Win V3 x64)	Surgeries	Tumo	Value	Dreep productive	Address	Comment
E PLC Logic	Expression	type	value	Frepareu value	Address	comment
Application [run]	ø udiLanguage	UDINT	2			
- 🎁 Library Manager	I SID	STRING	'1'			
PLC_PRG (PRG)	sTextList	STRING	'mytextlist'			
a 🙀 Task Configuration	wsResult	WSTRING	"Моя вторая запись"			
🖹 🎲 MainTask	retVal	RETURNVALUES	ERR_OK			
-⊕] PLC_PRG						
B 🕸 VISU_TASK						
- B VisuElems.Visu_Prg	E 1 CASE udiLanguage 2 OF					
MyTextList	= 2 0: // English					
🖻 🔂 Visualization Manager	3 CmpDynamicText.DynamicTextChangeLanguage (stLanguage := 'Default');					
🙆 WebVisu	Configuration Cast Dynamic Text Changel anguage (still anguage in idea));					
- 🕘 Visualization	B 6 2: // Russian					
	7 O CmpDynamicText.DynamicTextChangeLanguage(stLanguage := 'ru');					
	B 8 3: // Chinese					
	9 CmpDynamicText.DynamicTextChangeLanguage (stLanguage := 'ch');					
	10 END_CASE					
	11 • retVal ERR_OK := TLU.GetTextW(pwsText := ADR(wsResult Momentary), diSize := SIZE	EOF(wsResult Moment	pas ▶), sTextList :=	sTextList mytext	si , sTextIn	dex := sID '1' ;RETURN

9.2 Debugging Visu Exception

How to debugging a Visu Exception if there is an Visu exception shown in the Visualization:



9.2.1 Step-by-step guide

Use the following Option:

- 1. Execute Tools -> Customize 'Add command..' Category "Online" Stop execution on handled exception

If then the exception occurs, the IEC code where this happens can be analyzed (see also OLH: PLC Log³⁷³).

When the error occurs from one of the CODESYS visualization elements, this then must be investigated. In this case, please contact us and send us a full project archive

(with an Callstack and a Coredump, which was created together with the associated project) and please set/add the compiler-define **VISU_NO_EXCEPTION_HANDLING** under the 'Application' - 'Properties' - 'Build' Tab:



For more forms of contact us, please see our Codesys Support and Product Information³⁷⁴.

If you need technical support, please purchase a Support Ticket³⁷⁵ in the CODESYS Store.

- Please note that certain products in the CODESYS Store already include a Support Ticket.
- More detailed information will be given to you when you buy the products or will be sent to the purchaser and can be accessed there.

³⁷³ https://help.codesys.com/webapp/_cds_edt_device_log;product=codesys;version=3.5.17.0

³⁷⁴ https://www.codesys.com/support-training/codesys-support.html

³⁷⁵ https://store.codesys.com/en/codesys-support-ticket.html

To report **software bugs**, or if you have a question concerning the products in the CODESYS Store, click on the "My Question³⁷⁶" button next to the shopping cart symbol in the **CODESYS Store**³⁷⁷.

See also

- Our Codesys Online Help (OLH)³⁷⁸ Website
- OLH³⁷⁹: How to 'Analyzing Errors with Core Dump'³⁸⁰ and how to 'Create a Core Dump'³⁸¹ in the first place
- OLH: the PLC Log³⁸² and how to Reading the PLC Log³⁸³
- How to Report problems and error messages to CODESYS³⁸⁴

9.3 How to: Disable the Microsoft Windows Edge gestures when using a Visualisation

9.3.1 Application example

With a TargetVisu and a touch panel (with a Visu application online) is running, the user can switch the Window screen on/off by sliding it to the right or left screen side.

This should be avoided sometimes, so an option is needed to prevent access to the Windows OS/Tabs from the Visu application.

This issue is about the task view and the Windows notification center that pops up when the user swipes in from the right or left screen side.

It is not a Codesys related feature, and currently, this can only be disabled via the registry, and is not a Codesys related feature.

See for more Information on this topic here: Superuser.com³⁸⁵

³⁷⁶ https://store.codesys.com/en/contact

³⁷⁷ https://store.codesys.com/en/

³⁷⁸ https://help.codesys.com/

³⁷⁹ https://help.codesys.com/

³⁸⁰ https://help.codesys.com/webapp/_cds_using_core_dump;product=codesys;version=3.5.17.0

 $^{381\} https://help.codesys.com/webapp/_cds_cmd_create_core_dump; product=codesys; version=3.5.17.0$

³⁸² https://help.codesys.com/webapp/_cds_edt_device_log;product=codesys;version=3.5.17.0

 $^{383\} https://help.codesys.com/webapp/_cds_reading_plc_log; product=codesys; version=3.5.17.0$

 $^{384\,}https://faq.codesys.com/display/CDSFAQ/Report+problems+and+error+messages+to+CODESYS$

³⁸⁵ https://superuser.com/questions/1036762/how-to-disable-windows-10-touchscreen-gestures):

9.3.2 Exception from the web

There are two ways to deactivate this Microsoft Windows Edge feature.

9.3.2.1 1. Windows 'Group Policy Editor'

The official way to disable touchscreen gestures is via the 'Group Policy Editor' within the Windows System.

Windows Home Edition users cannot change this setting, out of the box! The 'Group Policy Editor' is included with Windows 10 Home - it is just not unpacked and installed.

If needed, please consult your IT department, or refer to trusted websites that describe how to reinstall the editor without damage - only via installation packages located on your system!

The 'Group Policy Editor' is called via the program file Gpedit.msc .

This can be done with the keys Windows + " R " (command prompt) and using "Gpedit.msc" there.

Group Policy Editor (Gpedit.msc)

```
gpedit.msc
Local Computer Policy
Computer Configuration
Administrative templates
Windows Components
EdgeUI
Allow edge swipe = Disabled
```

9.3.2.2

2. Windows Registry changes

To "Completely Disable Action Center in Windows 10" use:

Registry

HKEY_CURRENT_USER\Software\Policies\Microsoft\Windows\Explorer

create new DWORD DisableNotificationCenter=1

To "Disable New Action Center Sidebar and Restore Previous UI" use:

Registry

```
HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\ImmersiveShell
UseActionCenterExperience DWORD= 0 ( default = 1)
```

Deactivating all touch screen hand gestures, also works in kiosk mode".

9.4 Including an Interface (Example "IKeyEventHandler")

9.4.1 Requirement

- Create a "Standard project" and select "CODESYS ControlWin V3" as the device.
- Add a "Visualization" to the application.

A "Visualization Manger" is added to the project automatically. Add the library "VisuElemBase" as a top-level library in the "Library Manager".

Devices 👻 🕂 🗙	Device 🕘 Visualization 📄 PLC_PRG 🎢 Library Manager 🗙		
S KeyEventHandler	Add library 🗙 Delete library 🖙 Properties 🙃 Details 🔄 Placeholders 👘 Library reposit	torv	
Device (CODESYS Control Win V3)			
E IL PLC Logic	Name	Namespace	Effective version
🖹 🧔 Application	■ ···· • ISLicense = 3SLicense, 3.5.10.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.10.0
- 🎁 Library Manager	🕒 🕬 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0
PLC_PRG (PRG)	IoStandard = IoStandard, 3.5.10.0 (System)	IoStandard	3.5.10.0
Task Configuration	Standard = Standard, 3.5.9.0 (System)	Standard	3.5.9.0
🖨 🍪 MainTask	System_VisuElem3DPath = VisuElem3DPath, 3.5.10.0 (System)	VisuElem3DPath	3.5.10.0
PLC_PRG	System_VisuElemBase = VisuElemBase, 3.5.11.0 (System)	VisuElemBase	3.5.11.0
🖹 🍪 VISU_TASK	System_VisuElemCamDisplayer = VisuElemCamDisplayer, 3.5.10.0 (System)	VisuElemCamDisplayer	3.5.10.0
VisuElems.Visu Pro			
Visualization Manager	🖻 🗊 VisuElemBase, 3.5.11.0 (System)		
TargetVisu	🖲 🧰 Private Implementation		
MebVisu	🗈 🚞 Project Information		
Visualization	🖲 🧰 Public Parts		

• Define the target system by means of the Network scan.



9.4.2 Creating the EventHandler

· Create a new FB named "EventHandler" and implement the interface "IKeyEventHandler".

Add POU
Create a new POU (Program Organization Unit)
Name: EventHandler
[ype
© Function Block
Egtends: Roomtype1
Access specifien
Method implementation language: Structured Text (ST)
Eunction Eetum type:
Implementation [anguage: Structured Text (ST)
Add Cancel

The method "HandleKeyEvent" is created automatically with the FB:



• Add an output variable of type "UDINT" to the EventHandler:

Declaration

```
FUNCTION_BLOCK EventHandler IMPLEMENTS IKeyEventHandler
VAR_INPUT
END_VAR
VAR_OUTPUT
    udiKeyDownCount : UDINT;
END_VAR
VAR
END_VAR
```

· Edit the method "HandleKeyEvent" so that the counter is incremented only when a key is pressed:

Declaration

```
{warning 'add method implementation '}
(* This method will be called after a key event is released.
RETURN:
TRUE - When the handler has handled this event and it should not be handled by
someone else
FALSE - When the event is not handled by this handler*)
METHOD HandleKeyEvent : BOOL
```

```
VAR_INPUT
    (* The event type. The value is true if a key up event was released.*)
   bKeyUpEvent
                 : BOOL;
   (* The key code*)
   dwKey
           : DWORD;
   (* The modifiers. Possible values are:
VISU_KEYMOD_SHIFT :
                               DWORD := 1;
                                DWORD := 2;
VISU_KEYMOD_ALT :
VISU_KEYMOD_CTRL :
                                 DWORD := 4;*)
   dwModifiers : DWORD;
    (* A pointer to the client structure were tje event was released*)
   pClient : POINTER TO VisuStructClientData;
END_VAR
```

Implementation

```
IF bKeyUpEvent THEN
    THIS^.udiKeyDownCount := THIS^.udiKeyDownCount + 1;
END_IF
```

9.4.3 Instantiating the Eventhandler

• Create an FB instance in PLC_PRG, as well as a variable for reading the current value:

Declaration

```
PROGRAM PLC_PRG
VAR
instEvHandler : EventHandler;
udiCurValue : UDINT;
END_VAR
```

Implementation

udiCurValue := instEvHandler.udiKeyDownCount;

9.4.4 Assigning the EventHandler to the visualization

Versions < V3.5.SP10

In old versions, the following approach is not possible, because the assignment of a program from the visualization manager was not possible: For these versions, an initialization must take place in the program code.

- Create a new POU of type "Program" and name it "Visulnit" for example.
- Write the following program code:

Declaration

PROGRAM VisuInit VAR END_VAR

Implementation

VisuElems.VisuElemBase.g_VisuEventManager.SetKeyEventHandler(PLC_PRG.instEvHandler);

· Assign the program in the "Visualization Manager".

Devices 👻 🤻	×	👸 Visualization Manager 🗙
E A KeyEvent		🛎 Settings 🛋 Dalog settings 🗔 Default Hotkeys 📇 Visualizations 😫 User management 🏫 Font settings
E g) Device (CODEN'S Central Win V3) E g) PLC Logic ■ PLC PRC Logic ■ PLC PRC PRC PRC PLC PRC PRC PRC ■ PLC PRC PRC ■ PLC PRC PRC ■ PLC PRC ■		Besting: Use Current/su variable Style setting: Selected style: Selected style: Paradobutton Radiobutton External Issees Issees Isse

9.4.5 Downloading and starting the project

- Download the project to the controller and start the application.
- The visualization starts automatically.

Click the visualization window to make sure that it is the active window.

• The variable "udiCurValue" is incremented by one each time a key is pressed on the keyboard.



9.5 Knowhow: Images with SVG file format

9.5.1 Basics

The Scalable Vector Graphics (SVG)³⁸⁶support in Codesys is platform dependent. Typically, SVGs are

- · partially supported on Linux only the TinySVG vector image format is correctly usable,
- fully supported on Windows,
- and not supported at all on Windows CE.

Also, if the device does not support SVG, we implicitly convert SVG images to a supported format when downloading them to the controller.

Default File path for Images within a project, on the PLC/controller: \$PlcLogic\$/\$visu\$/

9.5.2 Scaling Issues

There are some cases where e.g. in the target at least SVG images are displayed, but behave strangely (e.g. when scaling).

Then SVGs are used that do not comply with the TinySVG format, but are required by the platform to work correctly.

³⁸⁶ https://en.wikipedia.org/wiki/SVG

This can result in subsequent restrictions:

- The images are rendered and saved as .png (this would be seen in the controller file system).
- The size of the rendered image results from the largest static usage created in the project.
- · Therefore, the created .png images might have received an unwanted scaling.
- These images may be displayed blurred in the Target Visu depending on the relative size in contrast to the projected usage (largest static usage).

9.5.3 Known handling problems, using SVG Images

If you encounter a rendering problem with SVGs, you have a few ways to work around it, or check why they can't be rendered:

9.5.3.1 Use the latest versions

Please check if you are using the latest version of the Codesys Visualization Profile³⁸⁷ or CODESYS Visualization (Add-on, package)³⁸⁸, corresponding supported by your runtime version. Depending on the version of your Codesys installation, you can check this via the Package Manager³⁸⁹ or the Codesys Installer³⁹⁰.

9.5.3.2 PLC Error message: SVG Imageformat disabled by build option

The error message may look like this:

```
**** ERROR: SVG Imageformat disabled by build option
```

```
!!!! Warning: Image=<image>$PlcLogic$/$visu$/xxxxx.svg</image> not loaded
```

This log message in the PLC/controller usually occurs when the SVG feature is not active in the build of the RTV (Remote Target Visu) element of the Runtime, and therefore cannot no rendering SVGs at all. With other words, the PLC/controller basically does not support the feature - it was not built in.

In this case, you can:

- · Redesign your project and do not use SVGs
- · contact the PLC/controller manufacturer and ask for a possible update,
- Try to work around with the 'Transfer both svg images and converted images' Option

9.5.3.3 Visualization Manager, Tab: Advanced Settings

Use of the 'Transfer both svg images and converted image³⁹¹s' Option in the Visualization Manager - Advanced Settings:

• The option is visible only if both a WebVisu and a TargetVisu exist.

³⁸⁷ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_dlg_project_settings_visualzation_profile.html 388 https://content.helpme-codesys.com/en/CODESYS%20Visualization/_visu_start_page.html

³⁸⁹ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_package_manager.html 390 https://content.helpme-codesys.com/en/CODESYS%20Installer/index.html

³⁹¹ https://content.helpme-codesys.com/en/CODESYS%20Visualization/_visu_manager_advanced_settings.html

- The option handles only images in SVG format.
- The option is also available if the device description of the TargetVisu controller does not support the SVG (full) format.
- If the device supports SVG (full), the option is grayed out. No need for conversion.

The main use case for this option is using a PLC with both,

- TargetVisualization, with no SVG or only TinySVG support
- WebVisualization
- A PLC, that does have enough memory to hold both types of images.

For such PLCs, the optimal and best display/look when using SVK images would not be possible in the Webvisu so. The option makes this possible.

9.5.3.4 Windows RTE

In the Codesys RTE, it can happen that SVG are not displayed there in the TargetVisu, if the folder "SVGRenderer32" with the SVGRenderer.dll are not in the RTE folder on the target system.

9.5.3.5 RemoteTargetvisu

In this case, the following error is usually displayed:

"Loading the DLL SVGRenderer failed. SVG Graphics cannot be displayed"

This behavior occurs when f.e.g. only the RemoteTargetvisu.exe is copied out of the GatewayPLC folder and then used.

The corresponding SVGRenderer.dll is not found. This DLL is expected, parallel to the EXE file, in the same folder.

9.6 RemoteTargetVisu: Reading the Client Name

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

Ele Edit View Project Build Online Debug	Iools Window Help 6 Ma Mail I III - Cîi I IIII I Q	03 → = ≪ 1(3 <3 <3 +3 8	¢ 🛒 🐳 🤣	
Devices - 4 ×	Device X	Scan network Sateway - Device	•	
Device (could in with vs)	Applications			
LDD ary Manager IDD ary Manager I	Backup and Restore			
□·》 Mani lask □ 但 PLC_PRG	Log	Gatew	Gateway	[034A] (active)
	PLC Settings PLC Shell	IP-Ad localho	dress: ost	Device Name: KERNTPC
	Users and Groups	Port: 1217		Device Address: 034A Target ID:
	Access Rights			0000 0001 Target Type: 4095
	Status			Target Vendor: CODESYS GmbH
	Information			Target Version: 3.5.12.20

• Open the *Library Manager* and add the following library: *VisuUtils*

Device Usualization Concentrargetvisualization VISU_TASK Concentrargetvisualization					
Name	Namespace	Effective version			
🗑 👓 🚥 System_VisuElemTrace = VisuElemTrace, 3.5.12.0 (System)	VisuElemTrace	3.5.12.0			
🗑 🚥 System_VisuElemXYChart = VisuElemXYChart, 3.5.12.0 (System)	VisuElemXYChart	3.5.12.0			
🗑 🗝 🚾 system_visuinputs = visuinputs, 3.5.12.0 (system)	visuinputs	3.5.12.0			
🗒 🚥 System_VisuNativeControl = VisuNativeControl, 3.5.12.0 (System)	VisuNativeControl	3.5.12.0			
H	VU	3.5.12.0			

• Insert a visualization in the device tree.

Then the Visualization Manager is inserted with the visu types TargetVisu and WebVisu. Delete both of these are add a *RemoteTargetvisualization*. Then assign the Visualization to it as the start page.

In addition, a VISU_TASK is also created automatically.

File Edit View Project Build Online Debug Tools Window Help Perices Perices Perice (CODESYS Control Win V3) MainTask Perice (PRG) Perice (PRG) Perice (PRG) Perice (PRG) Perice (PRG) Perice (PRG) Perice (PRG) Perice (PRG) Perice (PRG) Perice (PRG) </th <th>RTV_StationName.project - CODESYS</th> <th></th> <th></th> <th></th>	RTV_StationName.project - CODESYS			
Devices # X # ATV_StationVane # ATV_StationVane # Device (CODESYS Control Win V3) # Device (CODESY Control Win V3) <	File Edit View Project Build Online Debug Id	ools <u>W</u> indow <u>H</u> elp		
Devices # X	🎦 🛎 🖬 🕌 🗠 🗠 🌾 🛍 😫	🐴 🚰 🛯 🔚 🖓 🕤 🛯 🛗 👒 🧐	🕞 🖬 🔧 l 🖓 🖛	4⊒ +≣ \$ ¢ "
Devices P X RTV_StationName Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) Image: Device (CODESYS Control Win V3) Image: Control Win V3) <td></td> <td></td> <td></td> <td></td>				
RT/_Station/kame Device (CODESYS Control Win V3) Device (CODESY Control Win V3) <t< td=""><td>Devices v 🕈 🗸</td><td>🗿 RemoteTargetvisualization 🗙</td><td>Device</td><td></td></t<>	Devices v 🕈 🗸	🗿 RemoteTargetvisualization 🗙	Device	
RemoteTargetvisualization		Start Visualization:	Visualization	

• Create a new FB named FB_Iteration and implement the VU.IVisualizationClientIteration interface.

Add POU	X
Create a new PO	니ટ U (Program Organization Unit)
Name:	
FB_Iteration	
Type	
Program	
Function Block	
Extends:	F8_1
✓ Implements:	fsualizationClientEteration
Access specifier:	
	-
Method implement	tation language:
Structured Text (S	T) -
Function	
Return type:	
Implementation language	je:
Structured Text (ST)	-
	Add Cancel

The following methods are created automatically with the FB:

EndIteration HandleClient StartIteration



• Adapt the FB_Iteration function block as follows:

Declaration

FUNCTION_BLOCK FB_Iteration IMPLEMENTS VU.IVisualizationClientIteration
VAR_INPUT
END_VAR
VAR_OUTPUT
END_VAR
VAR
sRtvName1 : STRING;
END_VAR

• Adapt the HandleClient method as follows:

Declaration

```
(* This method will be called for each client that is currently within the list
of active visualization clients.
.. note:: Please remark that this method will be called from VISU_TASK*)
METHOD HandleClient
VAR_INPUT
    (* The object representing the according client. Will not be 0.*)
    itfClient : VU.IVisualizationClient;
END_VAR
```

Implementation

```
IF itfClient.ClientType = VU.VisuClientType.RemoteTargetVisualization THEN
    sRtvName1 := itfClient.GetClientName();
END_IF
```

Adapt the POU PLC_PRG as follows:

Declaration

```
VAR
fbIteration : FB_Iteration;
fbIterateClients : VU.FbIterateClients;
END_VAR
```

Implementation

```
fbIterateClients(xExecute:=TRUE, itfClientFilter:=VU.Globals.AllClients,
itfIterationCallback:=fbIteration);
IF fbIterateClients.xDone THEN
    fbIterateClients(xExecute:=FALSE, itfClientFilter:=VU.Globals.AllClients,
itfIterationCallback:=fbIteration);
END_IF
```

· Load the project to the controller and start it.

RTV_StationName.project - CODESYS	-			-	-				
Ele Edit View Broject Build Online Debug Tools Window Help									T
◎産員 ● ○○米陶◎米 画情報ない 本外外外国 物・自由 ◎ダ		에 �� �� 응 [이 房] ㅠ	17/						
Devices v 0	K (iii Denin	a Val Veralization Val	RemoteTercebinuelization	AD VIOL TASK	1 brany Managar	(a) FB Iteration (a) FB	Iteration HandleClient	The property the	FR Iteration Endite
= 🖓 RTV Stationhame	-		Remote renget house book	Ch upolinou			the death in the decident		To provo domicinate -
Device [connected] (CODESYS Control Win V3)	Device.Ap	pplication.PLC_PRG							
B-DP PLC Logic	Expression		Type	Value		Prepared value	Address	Comment	B
🖹 🔘 Application (run)	😑 🌵 fblte	ration	FB_Iteration	1					
Library Manager	1 S	RtvName1	STRING						
😑 🔳 FB_tteration (FB)	🗷 🤣 fbite	rateClients	VU.FbIterat	eClients					
EndIteration									
HandleClient									
Di Startiteration									
PLC_PRG (PRG)									
🖷 🔯 Task Configuration									
🗏 😂 MainTask					~ V				
-@) PLC_PRG	10	fbIterateClients (xExecute	TRUE :- TRUE, itfClient	Filter:-VU.Globals.	AllClients, itfIteratic	onCallback:-fbIteration);			
B 🕼 VISU_TASK		fbIterateClients(xEve	CUTA TOUSFALSE info	lientEilter:=WI Glo	hale AllClients itflts	rationCallback.=fbIterati	on) -		
di VisuElens.Visu_Prg	4 6 5	END IFRETURN	oute need - chaoby 2020.						
Wsualzation Manager									
RemoteTargetvisualization									
1 🖳 Visualization									

• Open the *targetvisuremote.cfg* file and add the following entries to the *CmpVisuHandlerRemote* section:

[CmpVisuHandlerRemote] VisuClient.Name=CodesysRemoteClient1

• After the remote target visu is started, the specified name is shown in the project:

RTV_StationName.project - CODESYS			and the second second					
Elle Edit <u>Vi</u> ew Project Build <u>Online Debug Tools Window H</u> elp								
19 2 日日 いっぷ 時 63×144 第45 14 14 14 14 14 14 14 14 14 14 14 14 14	🖬 • 👘 🛗 🔍 📽 🖓 🖡 📲 🛠 💷 9	: 역 12 양 [호] 房 [글	10					
Devices		Visualization	RemoteTargetvisualization	S VISU TASK	Library Manager	FB Iteration	TRA B	B Iteration.Hande
RTV_StationName	Device App	lication.PLC_PRG					200	-
Device [connected] (CODESYS Control Win V3)	Exercise		Tune	Value		Drop	ared value	Address
B B PLC Logic	Expression	tion	Type ED Thuster	value		Fieb	areu value	Address
= O Application [run]		vName1	STRING	CodesysRemo	teClient1			
EDitary Manager	🗏 🧶 fbitera	teClients	VU.FbIterateClients					
HandleClient								
StartIteration								
PLC_PRG (PRG)				3				
E 🔀 Task Configuration								
- 😂 MainTask	<							
- @ PLC_PRG	1 0 f)IterateClients(xExecute	TRUE :- TRUE, itfClientFilte:	-VU.Globals.A	llClients, itfItera	tionCallback:-fbIt	ceration);	
B Visue Flame View Pro	8 2 8 1	fbIterateClients.xDone	ALSE THEN	ilter-WI Glob	ale AllClience inf	TrerationCallback:	-fhīterat	ion).
Subjection Manager	4 0 23	D IFRETURN	dec moe reader referrent	11001-0010100	distrationes, for		-10100100	,,
RemoteTargetvisualization								
Wsualization								

9.7 Script Error Warning in Codesys

_	rror	23
	An error has occurred in the script on this page.	
Line:	277	
Char:	5	
Error:	'_elq' is undefined	
Code:	0	
URL:	http://	
	Do you want to continue running scripts on this page?	
	<u>Y</u> es <u>N</u> o	
1975		
スクリプト	I7-	>
🖹 スクリプト	I7-)
📄 スクリプト	エラー	2
 スクリプト ライン: 	エラー ・ このページのスクリプトでエラーが発生しました。	;
 スクリプト ライン: 文字: 	Iラ- このページのスクリプトでIラーが発生しました。 149 46	;
 スクリプト ライン: 文字: エラー: 	Iラ- このページのスクリプトでIラーが発生しました。 149 46 構文Iラーです。	;
 スクリプト ライン: 文字: エラー: コード: 	Iラ- このページのスクリプトでIラーが発生しました。 149 46 横文Iラーです。 0	;
 スクリプト ライン: 文字: エラー: コード: URL: 	Iラ- このページのスクリプトでIラーが発生しました。 149 46 構文Iラーです。 0 http://	;
スクリプト ライン: 文字: コード URL:	Iラ- このページのスクリプトでIラーが発生しました。 149 46 構文Iラーです。 0 http://	;
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 ライン: ライン: 文字: エラー: リード: URL: 	Iラ- このページのスクリプトでIラーが発生しました。 149 46 構文Iラーです。 0 http:// このページのスクリプトを実行し続けますか?	;
 ヨンクリプト ライン: 文字: コード: URL: 	Iラ- このページのスクリプトでエラーが発生しました。 149 46 横文エラーです。 0 http:// このページのスクリプトを実行し続けますか? はい(Y) いいえ(N	

Such scripting errors can be shown when:

• Operator is using a separate, customized start page in Codesys,

• as a WebBowser Scripting Error (when f.e. using a Visual "web Browser" element to show a webserver of another device)

9.7.1 Background information

Some tips from the internet:

The WebBrowser-Control for Windows Forms³⁹² used within Codesys, offers only extremely few configuration possibilities.

The embedded browser behaves normally like an Internet Explorer 6 or IE 7, for "compatibility reasons", and there is no reasonable possibility for the application to influence this.

The HTML page itself, can inform the browser (with suitable Meta tag's) that the browser should be rendering the side like in a newer IE version.

So, the Website must be changed so that it supports the Codesys browser.

See: https://stackoverflow.com/questions/4655662/how-to-ignore-script-errors-in-webbrowser/ 27705241

"...

First you need to know that the webbrowser control is using IE7 as its base (i.e. the older version of Internet Explorer) so the scripts which you are running now are compatible with the modern age browsers and thus the error. First of all, if you'll put:

<meta http-equiv="X-UA-Compatible" content="IE=edge"/>

inside your section of the page, it will render with the IE version installed on the machine instead of the default IE 7 Hope this Helps!

..."

9.7.1.1 FAQ:

Is it possible to switch this scripting of?

Is it possible to switch off this scripting debugging in Codesys like in an Internet Explorer instance?

9.7.1.1.1

Please see here:

https://devblogs.microsoft.com/premier-developer/controlling-webbrowser-control-compatibility/

³⁹² https://msdn.microsoft.com/en-us/library/system.windows.forms.webbrowser%28v=vs.100%29.aspx

https://msdn.microsoft.com/en-us/library/jj676915%28v=vs.85%29.aspx http://stackoverflow.com/questions/4097593/how-to-put-the-webbrowser-control-into-ie9-into-standards

9.8 Setting the update time of the Visu 'Update rate' and the 'VISU_TASK'

9.8.1 Basic questions:

- What is the fastest possible update time of values in e.g. WebVisu?
- Is there a general empirical value for the update time of 'VISU_TASK'?
- · How does the system behave if the update time is set to 'only' 50 ms?
- Are higher refresh time over 200ms useful to reduce system load?

9.8.2 **Answers**:

Basically, the limiting values for the CODESYS visualization are always depends on the used system itself.

The standard update times of 150-200ms in the target settings (WebVisu, TargetVisu) under the 'Update rate', and 100ms in the task processing of the 'VISU_TASK':

Start visualization		Start visualization	
Jame of .htm file	webvisu	Update rate (ms)	200
	Use as default page	opoure race (mby	200
Ipdate rate (ms)	200	Carling Onlines	Show Used Visualization
efault communication buffer size	50000	Eivad Isotropic	Anisatropic
	Show Used Visualizations	Use scaling options for dialog	s Anisotropic
Scaling Options		V Use automatically detected cli	ent size
○ Fixed ○ Isotropic	Anisotropic	spic	
Use scaling options for dialogs	5	Client width	2000
Client width	1280	Chent width	2000
Client height	1024	Client height	2000
Presentation Options		Presentation Options	
Antialiased drawing		Antialiased drawing	
Input Handling Options		Default Text Input	
Default text input with	Touchscreen \lor	Input with	Keyboard
			ne yoodi a
Handle touch as mouse events	5		-
Handle touch as mouse events VISU_TASK X	5		-
Handle touch as mouse events VISU_TASK X Infiguration Priority (031): 31	5	Task group IEC-Tasks	•
Handle touch as mouse events VISU_TASK × Infiguration Priority (031): 31 Type	5	Task group IEC-Tasks	• •
Handle touch as mouse events VISU_TASK X nfiguration Priority (031): 31 Type (:) Cyclic	s Interval (e.c. t#200ms) 100	Task group IEC-Tasks	
Handle touch as mouse events VISU_TASK X nfiguration riority (031): 31 Type C Cyclic	s Interval (e.g. t#200ms) 100	Task group IEC-Tasks	•
Handle touch as mouse events VISU_TASK X nfiguration virority (031): 31 Type Cyclic Watchdog	s Interval (e.g. t#200ms) 100	Task group IEC-Tasks	~
Handle touch as mouse events VISU_TASK X nfiguration virority (031): 31 Type Cyclic Vatchdog Enable	s Interval (e.g. t#200ms) 100	Task group IEC-Tasks	
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Handle touch as mouse events VISU_TASK × Infiguration Type Cyclic Matchdog Enable Time (e.g. t#200ms) Saacilikuba	s Interval (e.g. t#200ms) 100	Task group IEC-Tasks	
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Handle touch as mouse events VISU_TASK X Infiguration Viority (031): 31 Type Cyclic Denable Time (e.g. t#200ms) Sensitivity	s Interval (e.g. t#200ms) 100	Task group IEC-Tasks ms	
Handle touch as mouse events VISU_TASK × Infiguration Type Cyclic Enable Time (e.g. t#200ms) Sensitivity Add Call × Remove Call	s Interval (e.g. t#200ms) 100	Task group IEC-Tasks	
Handle touch as mouse events VISU_TASK × Infiguration Viority (031): 31 Type Cyclic Watchdog Enable Time (e.g. t#200ms) Sensitivity Add Call × Remove Call POUL	s Interval (e.g. t#200ms) 100 Change Call & Move Up & Move Dow	Task group IEC-Tasks ms	
Handle touch as mouse events VISU_TASK × Infiguration Viority (031): 31 Type Cyclic Matchdog Enable Time (e.g. t#200ms) Sensitivity Add Call × Remove Call POU Du	s Interval (e.g. t#200ms) To Change Call Move Up Move Dow Comment	Task group IEC-Tasks ms n _→ Open POU	
Handle touch as mouse events VISU_TASK × Infiguration Priority (031): 31 Type Cyclic Matchdog Enable Time (e.g. t#200ms) Sensitivity Add Call × Remove Call POU VisuElems.Visu_Prg	s Interval (e.g. t#200ms) TO Change Call Move Up Move Dow Comment	Task group IEC-Tasks ms n → Open POU	

9.8.3 Explanation of the 'Visu-Update Task' rates:

The interaction of the values is as follows:

The **visible update rate** (without inputs) = **MAX** (cycle time of the VISU-TASK + update rate of the target).

If the VISU-TASK runs fast enough and inputs are pending (e.g. mouse movements), there may be faster updates here.

The default settings (update rate of 200ms, VISU_TASK of 100ms) are a compromise resulting from the following considerations:

- In the Codesys visualization it is so that the VISU_TASK can run theoretically arbitrarily fast.
- In fact it is only calculated if there is a "request" of a client.
- Corresponding requests arise on the one hand for cyclic updating of the visualization (redrawing of the visualization), or when inputs are executed in the visualization.
- The rate at which cyclic updates occur is configured with this property for Target and WebVisu.

- For cyclic updates an update rate of 200ms is normally sufficient. With the double rate of the VISU_TASK a sufficiently fast reaction to inputs is usually also possible.
- With the double rate of the VISU_TASK, a sufficiently fast reaction to inputs is usually also possible.

9.8.4 To the combination of 'Update rate' and 'VISU_TASK':

- A (numerically) smaller update rate leads to a higher load of the controller because the visualization must be calculated more often.
- A (numerically) smaller cycle time of the VISU_TASK allows a faster reaction to inputs. As long as no inputs are pending, the load on the system does not increase (if the update rate remains constant).

See also

- Our Codesys Online Help (OLH)³⁹³ Website
- How to Debugging a Visu Exception³⁹⁴
- How to Report problems and error messages to CODESYS³⁹⁵

9.9 Trace and memory requirements

Error message

When downloading the trace, the Runtime may generate the error message: **Communication error : NoMemory (#0x000011)**

9.9.1 Questions

- How and where is the memory requirement calculated?
- · Can the maximum available memory size be configured?

9.9.2 Answers:

The memory size required for the trace in the runtime is calculated when configuring the trace in the CODESYS IDE and then sent to the controller with a service when downloading the trace.

393 https://help.codesys.com/

³⁹⁴ https://faq.codesys.com/display/CDSFAQ/Debugging+a+Visu+Exception

³⁹⁵ https://faq.codesys.com/display/CDSFAQ/Report+problems+and+error+messages+to+CODESYS

Trace Record Trace	Record Settings Enable Trigger Trigger variable Trigger edge P Advanced Trace Settings	
Presentation (diagrams) Time axis Diagram 1 Y axis	T Measure in every n-th cycle 1 20ms T Recommended runtime buffer size (samples) 101 2s R Override runtime buffer size 101 2s C Trace editor buffer size per variable (samples) 10001 3m20s OK Cancel	×
Add Variable	Resolution ms ~ Automatic restart Advanced Reset Display settings	

The runtime then allocates the necessary memory dynamically on the heap.

This is done in the TraceMgrRecordAdd function with the following code:

TraceMgrRecordAdd pRecord->ulBufferSize = pPacket->ulBufferEntries * pRecord->ulEntrySize; pRecord->pBuffer = (TraceRecordEntry*)CAL_SysMemAllocData(COMPONENT_NAME, pRecord->ulBufferSize, &Result); The value for ulBufferentries is communicated to the runtime by the CODESYS IDE in the

TAG_TRACE_PACKET_BUFFERENTRIES tag of the online service SRV_TRACE_PACKET_CREATE.

A direct configuration of the size of the memory available for the trace is therefore not possible. Only the size of the heap can be changed.

9.10 Unresolved references after update visualization

9.10.1 Unresolved reference: 'USERMGRUSERGETPROPERTY'

9.10.1.1 Question

Why I get unresolved references on download after update the visu profile in the application.

9.10.1.2 Solution

Set the placeholder for the CmpUserMgr Implementation to Empty.

9.10.1.3 Reference

Since Visu Addon verison 4.2.0.0 the User Management for Runtime and Visualization are interconnected

9.11 Visu, Alarm Management: Formatting the Time Stamp

- · Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.



• Insert an Alarm configuration in the device tree.

Here, the *Error*, *Info and Warning alarm classes* are created automatically, as well as the *AlarmStorage object*. In addition, another *AlarmManagerTask* is created.



Moreover, the AlarmManager library is added to the Library Manager:

Device III Library Manager 🗙						
🔁 Add library 🔀 Delete library 🛛 🚰 Properties 💿 Details 🛛 🔄 Placeholders 🛛 🎁 Library repository						
Name	Namespace	Effective version				
3SLicense = 3SLicense, 3.5. 14.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.14.0				
🖬 📲 AlarmManager = AlarmManager, 3.5.14.0 (Intern)	AlarmManager	3.5.14.0				
🗑 🗝 📾 BreakpointLogging = Breakpoint Logging Functions, 3.5.5.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.5.0				
🖬 📲 IoStandard = IoStandard, 3.5.13.0 (System)	IoStandard	3.5.13.0				
Standard = Standard, 3.5.14.0 (System)	Standard	3.5.14.0				

• Edit the PLC_PRG POU as follows:

Declaration

Implementation

```
AlarmManager.g_sDateFormat := sDateFormat;
AlarmManager.g_sTimeFormat := sTimeFormat;
```

 Insert a visualization in the device tree. Then the Visualization Manager is inserted automatically with the TargetVisu and WebVisu visualization types. In addition, another VISU_TASK is created.



• In the Visualization, set an element of type Alarm Table and configure the element as follows:


Properties	
🛛 Filter 🔹 🔤 🖏 Sort by	y ≠ 🛃 Sort order ≠ 🔲 Advanced
Property	Value
Element name	GenElemInst_2
Type of element	Alarm table
Datasource	clocal application>
 Alarm configuration 	
Columns	and Create ne
Column	
= [0]	× Delete
Colum	
Lise te.	
Width	150
Type o.	Time stamp
Text al.	Centered
 Color se 	ha
· [1]	× Delete
+ Position	
 Text properties 	
Font	Default
 Font color 	Fontcolor
 Selection 	
* Movement	
Rotation	
Interior rotation	
Invisible	

• Insert an alarm group in the Alarm configuration and configure an alarm as follows:

Devices 👻 🕂 🗙	Device	Library Manager	PLC_PRG III Visualizatio	n 🔥 AlarmGroup 🗙				
🖃 🎒 AlrmMgmt_TimestampFormat 💽	1							
Device (CODESYS Control Win V3)	Textlist:	AlarmGroup	🗕 Archiving: 🏹 (no	one)	 Deactivation: 	£		
🖻 📳 PLC Logic		1						
🖻 🧔 Application	ID	Observation type	Details	Deactivation	Class	Message	Min. pend. time	Latc
Alarm Configuration	0	10 Digital	PLC_PRG.xDemoAlarm = TRUE		🛛 🖄 Info	demo message		
- A Error		Click here to add a new alarm	Click here to add a new alarm					
- 🔼 Info								
- 🖄 Warning								
AlarmGroup								
AlarmStorage								
AlarmGroup								
👘 Library Manager								
PLC_PRG (PRG)								
= 🧱 Task Configuration								
😑 🍪 AlarmManagerTask (IEC-Tasks)								
AlarmManager Alarm Prg	•		m					•
💷 🍪 MainTask (IEC-Tasks)	Digital							
DIC PRG	Expression	PLC_PRG.xDemoAlarm			JE			
C (TACK (TACK (TACK								

• Start the project and set the variablexDemoAlarm to TRUE.

0 08.03.2019 09:11:37 demo message

Now, if you change the formatting of the constants, the default will be accepted when the alarm is triggered **again**.

The 'yyyy/MM/dd' and 'HH:mm tt' specifications result in a rotated date and a time display without seconds in English style.

Devices		+ ↓ ×		1	Device 👔	Library Ma	nager /) PLC_	PRG X	Uisu	ualiza
🖃 📋 Alrm	Mgmt_TimestampFormat			Dev	ice Application P			_	_	_	
🖻 - 😏 💽	Device [connected] (CODESYS Contr	ol Win V3)		Det		cc_rite	-				
÷] ↓ PLC Logic		Ex	pres	sion		Туре		Value		Ρ
	🖹 💮 Application [run]			9	xDemoAlarm		BOOL		TRUE		
	Alarm Configuration				sDateFormat		STRING		'уууу/ММ	1/dd'	
	Error				sTimeFormat		STRING		'HH:mm t	tt'	
	A . c										
	N										
	Timestamp 🗟 🗸		_	_	Message						
0	2019/03/08 09:03 AM				demo messa	ge					

Milliseconds can be specified with "ms":

	Timestamp 🔹	Message
0	12.03.2019 09:14:25:436	demo message

9.12 Visu, Alarm Management: Get 'Group' and 'Class' names from Alarm Storage Data

When you read the AlarmStorage³⁹⁶, you can get Static Informed about the alarms through this method call:

Declaration

```
METHOD AlarmRead
VAR_INPUT
/// A 0-based index of the row read from TblAlarm
diWhichRow : DINT;
/// An AlarmStorageStaticData variable, containing data of the alarm
staticData : AlarmStorageStaticData;
END_VAR
```

The staticData here contains:

- udiAlarmGroupId
- udiAlarmClassId

Use the following code to get the group name or class name:

³⁹⁶ https://help.codesys.com/webapp/_cds_obj_alarm_storage;product=codesys;version=3.5.13.0

Declaration

```
_itfAlarmClass : IAlarmClass;
_itfAlarmGroup : IAlarmGroup;
_sClass : STRING;
_sGroup : STRING;
```

Implementation

```
_itfAlarmClass := g_AlarmHandler.g_inst.FindAlarmClass(staticData.udiAlarmClassId);
IF (_itfAlarmClass <> 0) THEN
    _sClass := _itfAlarmClass.GetName();
END_IF
_itfAlarmGroup := g_AlarmHandler.g_inst.FindAlarmGroup(staticData.udiAlarmGroupId);
IF (_itfAlarmGroup <> 0) THEN
    _sGroup := _itfAlarmGroup.GetName();
END_IF
```

See also

- Our Codesys Online Help (OLH)³⁹⁷ Website
- Basic information to the Codesys Development System (Codesys Homepage)³⁹⁸
- OLH³⁹⁹: The Online-help introduction for the Codesys Development System (IDE)⁴⁰⁰
- OLH: Alarm Configuration⁴⁰¹, 'Alarm class' Objects⁴⁰² and 'Alarm group' Objects⁴⁰³

9.13 Visu, Linux: Multitouch problems on Targets

9.13.1 Problem

The MultiTouch no longer works on a Linux Taget.

On newer Linux PLCs with a Target Visualization, it can happen that the MultiTouch functions are no longer completely or incorrectly executed as expected.

³⁹⁷ https://help.codesys.com/

³⁹⁸ https://www.codesys.com/products/codesys-engineering/development-system.html

³⁹⁹ https://help.codesys.com/

 $^{400\} https://help.codesys.com/webapp/_cds_f_development_system_introduction; product=codesys; version=3.5.17.0$

⁴⁰¹ https://help.codesys.com/webapp/_cds_obj_alarm_configuration;product=codesys;version=3.5.13.0

⁴⁰² https://help.codesys.com/webapp/_cds_obj_alarm_class;product=codesys;version=3.5.13.0

⁴⁰³ https://help.codesys.com/webapp/_cds_obj_alarm_group;product=codesys;version=3.5.13.0

For a Codesys code and application example, go to our Codesys Store: MultiTouch Example⁴⁰⁴

9.13.2 Solution

In the PLC ".cfg" configuration file, the MultiTouch option must be activated and configured as follows: **[CmpTargetVisu]**

Touchsupport=6

On Windows Runtime based platforms, the option is not needed because here the detection is automatic, but on Linux platforms it can be a problem.

9.13.3 Related Information:

9.13.3.1 #define CMPTARGETVISU_KEY_TOUCHSUPPORT "Touchsupport"

Setting affecting the way the support of touch/multi-touch features is detected. The following values are possible at the moment:

- o 0: No touch support at all
- o 1: Derive touch support from the according operating system window
- o 2: Explicitly activate single touch support
- o 6: Explicitly activate multi touch support (includes single touch in fact)

Visu: Dialogs with and without directly passing variables ({attribute 'VAR_IN_OUT_AS_POINTER'})⁴⁰⁵

Visu: Using Events of the User Management (Login/Logout)⁴⁰⁶

Setting the update time of the Visu 'Update rate' and the 'VISU_TASK'407

⁴⁰⁴ https://store.codesys.com/en/catalogsearch/result/?q=multitouch

⁴⁰⁵ https://faq.codesys.com/pages/viewpage.action?pageId=26247186

 $^{406\} https://faq.codesys.com/pages/viewpage.action?pageId=22118438$

⁴⁰⁷ https://faq.codesys.com/pages/viewpage.action?pageId=112525371

Debugging a Visu Exception⁴⁰⁸

Working with color variables⁴⁰⁹

Visu: Using a Table as an Input Element⁴¹⁰

9.14 Visu: Dialogs with and without directly passing variables ({attribute 'VAR_IN_OUT_AS_POINTER'})

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

DialogInOutAsPointer.project - CODESYS		-	-	_
File Edit View Project Build Online Debug	<u>T</u> ools <u>W</u> indow <u>H</u> elp			
🎦 🚅 🔚 🕌 🗠 🗠 🐇 ங 🛍 🗙 🖬 🎕	á 🐴 🌿 i 📾 i 🛅 - 💣 i 🛗 i 🥰	(i) → = ≪1(2 ≤ ± ±	응 후 [號] 흑 [핫	
Devices 👻 🕂 🗙	Device X			
🗏 🔄 DialogInOutAsPointer 💽		\frown		
Device (CODESYS Control Win V3)	Communication Settings	Scan network Sateway - Dev	vice -	
PLC Logic	Annitiantinan			
= Q Application	Applications			
Ubrary Manager	Backup and Restore		<u> </u>	
Task Configuration				
🖹 🗳 MainTask	Files			··· ()
PLC_PRG	Log		Gateway	•
		Ga	teway-1	[0001.A000.034A] (active)
	PLC Settings	IP-	Address:	Device Name:
	RLC Shall	loc	alhost	KERNIPC
	PEC Silei	Por	17	Device Address:
	Users and Groups	121		
				Target ID: 0000 0001
	Access Rights			Target Tuger
	Task Deployment			4096
				Target Vendor:
	Status			CODESYS GmbH
	Information			Target Version:
				3.5.12.40

Create and edit an FB named FB_Sample as follows:

Declaration

⁴⁰⁸ https://faq.codesys.com/display/CDSFAQ/Debugging+a+Visu+Exception

⁴⁰⁹ https://faq.codesys.com/display/CDSFAQ/Working+with+color+variables

⁴¹⁰ https://faq.codesys.com/display/CDSFAQ/Visu%3A+Using+a+Table+as+an+Input+Element

```
FUNCTION_BLOCK FB_Sample
VAR_INPUT
    byInstanz : BYTE;
END_VAR
VAR
VAR
udiCount : UDINT;
    xReset : BOOL;
    udiValue : UDINT;
    sText : STRING := 'Input something';
END_VAR
VAR CONSTANT
    c_udiOffset : UDINT := 10000;
END_VAR
```

Implementation

```
udiCount := udiCount+1;
udiValue := byInstanz * c_udiOffset + udiCount;
IF udiValue >= (byInstanz+1) * c_udiOffset THEN
    udiValue := byInstanz * c_udiOffset;
END_IF
IF xReset THEN
    udiCount := 0;
END_IF
```

• Edit the PLC_PRG POU as follows:

Declaration

```
PROGRAM PLC_PRG
VAR
fbSample1 : FB_Sample := (byInstanz := 1);
END_VAR
```

Implementation

fbSample1();

· Insert a visualization in the device tree.

Then the *Visualization Manager* is inserted automatically with the visu types *TargetVisu* and *WebVisu*. In addition, a *VISU_TASK* is also created automatically.



Create an additional visualization named *dlgSample*.
 From the context menu, open and set the properties dialog of the page as follows:

Properties - dlg5	ample [Devi	ce: PLC Logic: A /sualization Bui	application]	×
Use visuali Visualio Dialog Numpa Dialog Use au	zation as: cation d/Keypad/Di is opaque tomatic detec clude backor	alog for input co ted visualization	nfiguration	La Ca
Use sp Visualizatio Width: Interna	ecified visual n size: 300	ization size Height:	500	
		ок	Can	cel Apply

• From the Visualization/Interface Editor, open and edit the interface editor as follows:



Set a rectangle on the page for displaying the counter value and edit the properties as follows:

Device FB_Sample PLC_PRG	Properties	
🖽 Interface Editor 🔲 Hotkeys Configuration 🔢 Elementlist	🍸 Filter 🔹 💕 Sort by 👻 🛓 S	iort order 👻 🗹 <u>A</u> dvanced
I VAR_IN_OUT	Property	Value
<pre>2 instFB_Sample : FB_Sample;</pre>	Element name	GenElemInst_2
3 END_VAR	Type of element	Text field
	Text ID	577
	Position	_
	x	40
	Y	15
100 %	Width	270
	Height	30
	Colors	
Count: %u	Element look	
	Shadow type	From style
	Texts	
	Text	Count: %u
E	Tooltip	
	+ Text properties	
	 Text variables 	
	Text variable	instFB_Sample.udiValue
	Tooltip variable	
	± Dynamic texts	
	Font variables	
*0	± Colorvariables	
	State variables	
	 Selection and caret configur. 	
	± Inputconfiguration	

Copy the element and edit the properties as follows:

FB_Sample PLC_PRG	Properties	
Interface Editor Hotkeys Configuration Elementist	🐨 Filter 🔹 🔧 Sort by 🔹 🤶 So	rt order 👻 Advanced
E 1 VAR IN OUT	Property	Value
2 instFB_Sample : FB_Sample;	Element name	GenElemInst_10
3 END_VAR	Type of element	Text field
	Text ID	338
	E Position	—
	x	40
	Y	55
100 % 🕵	Width	270
A 7	Height	30
O surt N u	Colors	
Count. %u	Element look	
	Shadow type	From style
765	l= Texts	
	lext	765
E	Toot properties	
	Text variables	
	Text variable	instFB_Sample.sText
le la	Tooltin variable	
	Dynamic texts	
	+ Font variables	
	Colorvariables	
	State variables	
	E Selection and caret configur	
	Inputconfiguration	
	OnDialogClosed	Configure
	 OnMouseClick 	Configure
	Write a Variable	🎾 Variable : , InputType : Default, Min : , Max : , DialogTitle : , Use text output variable : True, Format :
	OnMouseDown	Configure

Set an additional rectangle element and edit the properties as follows:

/ j Device) j FB_Sample) j PLC_PRG) @ ▼	Properties	
🖽 Interface Editor 🛄 Hotkeys Configuration 🔢 Elementlist	🛛 🖓 Filter 🔹 🎼 Sort by 🔹 🤶	Sort order 👻 Advanced
I VAR IN OUT	Property	Value
<pre>2 instFB_Sample : FB_Sample;</pre>	Element name	GenElemInst_12
3 END_VAR	Text ID	364
	Type of element	Rectangle
	Position	_
	x	40
	Y	100
100 %	Width	130
A V	Height	40
	Angle	0
Count: %u	Center	
	Colors	
%s	Use gradient color	
B	Gradient setting	linear, Black, White
a l	Element look	
	 Texts 	_
	Text	OK
	Tooltip	
	* Text properties	
-	* Absolute movement	
2	 Relative movement 	
	* Text variables	
	 Dynamic texts 	
	* Font variables	
	* Colorvariables	
	* Lookvariables	
	* State variables	
	 Inputconfiguration 	
	OnDialogClosed	Configure
	 OnMouseClick 	Configure
	Close Dialog	Close Dialog : dlgSample, Result : OK

Copy the rectangle and edit the properties as follows:



• In order to display the current value of the FB and call the dialog, we edit the *Visualization* page. Set a rectangle and edit the properties as follows:



The line break between the *Open Dialog* text and the variable formatting %*u* is made with the key combination [*Ctrl*] + [*Return*].

When assigning the input configuration, you also have to set the following properties in the dialog:

Close Dialog Open Dialog Change the language Change shown Visualization	👂 Open Dialog	Open Dialog Dialog:
Execute command Switch Framewaalization Write a Vandle Write a Vandle Execute ST-Code Toggle a vandle Fiele transfer Fiele transfer	~	Persmeter Type Value Persmeter in case of result Update ** and ** parameter in case of result Use Value None Ø Conce

Set an additional rectangle on the page and edit the properties as follows:

E Device	iempi 🕶	Properties	
~ *		🖓 Filter 🔹 👫 Sort by 🔹 🛓	Sort order 🔹 🗹 Advanced
Open Dialog:		Property	Value
A		Element name	GenElemInst_6
		Text ID	338
		Type of element	Rectangle
		- Position	
		x	10
		Y	60
	=	Width	130
		Height	30
		Angle	0
		* Center	
		* Colors	
		Use gradient color	
		Gradient setting	linear, Black, White
		* Element look	
		Texts	
		Text	%4
		Tooltip	
		* Text properties	
		Absolute movement	
		Relative movement	
		Text variables	
		Text variable	PLC_PRG/bSample1.sText
		Tooltip variable	

Load the project to the controller and start it.
 Now when you open the dialog, you notice that the values in the dialog do not change, or an adjustment of the text is not passed to the variable until the dialog is closed:

Open Dialog: 10531
Inputsomething

Count: 10136				
Hello World				
ОК	Cancel			

• In order for changes between variables and dialog elements to be passed directly, the attribute VAR_IN_OUT_AS_POINTER must be added to the interface of the dialog, where by uppercase/ lowercase must be taken into account:

<u>_</u>	Devic	e FB_Sam	ple	; 🔒	Visualization	 dlgSample	×
🖽 I	nterfac	e Editor 🔲 Hotkey	s Configuration 🛛 🎫 E	ementlist			
8	1	VAR IN OUT					
	2	{attribute	VAR IN OUT AS	POINTER'}	}		
	3	instFB_Sam	ple : FB_Sam	ple;			
	4	END_VAR					
						 100	0 %
			<i>b</i>				
		Cour	at: 0/.u				
		Cour	II. 70U				
	%s						
		I	1				
		OK	Cancel				

After adding the attribute, you must execute *Build/Clean all* again and then download the program to the controller again.

Now the values should be updated "Online":



Count: 17463				
Hello World				
OK Cancel				

9.15 Visu: Disabling an Entry for WebVisualizations Only

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the *Network scan*.

WebVisu_DeactiveInput.project* - CODESYS	-		
File Edit View Project Build Online Debug To	ols Window Help Automation	Server BACNet	
自 🚔 📓 ゆ 🖙 🎄 🛍 🗙 桷 🌿 🎂 🌿 川	에 케 챔 🖺 🛅 🗂 🛗	🥵 얘 🖡 📲 🕊 🎼 왜 달 백 왕 🛯 🖝 🗐 🐨 👘	
Devices v 4 X	Device X		
WebVisu_DeactiveInput WebVisu_DeactiveInput Device (CODESYS Control Win V3)	Communication Settings	Scan network	
i≕ ∰i PLC Logic i≕ ② Application	Applications		
Library Manager LC_PRG (PRG)	Backup and Restore		
B-124 Task Configuration B-25 MainTask (IEC-Tasks)	Files		····
··셴 PLC_PRG	Log	Gateway-1	▼ [0B4A] (active)
	PLC Settings	IP-Address: localhost	Device Name: KERNTPC
	PLC Shell	Port 1217	Device Address: 084A
	Users and Groups		Target ID:
	Access Rights		0000 0001
	Symbol Rights		4096
	Task Deployment		Target Vendor: 35 - Smart Software Solutions GmbH
	Status		Target Version: 3.5.14.10
	Information		

• Edit the PLC_PRG POU as follows:

Declaration

VAR udiCnt : UDINT; END_VAR

Implementation

// Nothing to implement

Create a new POU IsWebVisu (type: function).
 The return value is type BOOL and the implementation language is ST.



• Edit the IsWebVisu POU as follows:

Declaration

VAR pClientData : POINTER TO VisuElems.VisuStructClientData; END_VAR

Implementation

```
IsWebVisu := TRUE;
pClientData := VisuElems.CurrentVisuClient;
IF pClientData <> 0 THEN
        IsWebVisu := pClientData^.GlobalData.ClientType =
VisuElems.VisuElemBase.Visu_ClientType.WebVisualization;
END_IF
```

• Insert a visualization in the device tree.

Then the *Visualization Manager* is inserted automatically with the visu types *TargetVisu and WebVisu*. *In addition, a VISU_TASK is also created automatically.*



• In the Visualization, set a Rectangle element and configure the element as follows:

	Device 🖉 📳	Visualization	×	PLC_PRG	IsWebVisu
	Coun	r: %u			
0	8				
nivelies					
Viniter + 1 K Sort by	• 💱 Sort order • 🖃 Advanced				
Property	Value				
Element name	Gentlex0xst_2				
Text ID	29				
Pasition	Hecorge				
x					
¥	26				
Width	230				
Height	89				
Angle	0				
Center					
Line markent color		1			
Gradent setting	inear, Black, White				
Clement look					
 Texts 					
Text	Counter: No				
Teolitp					
Absolute movement					
Relative movement					
 Text variables 					
Text variable	PLC_PRG-adickt				
Tooltp variable					
Dynamic tests					
 rest variables Colory ariables 					
 Lookvariables 					
 State variables 					
Invisible					
Deactivate inputs	Invited/Vau()				
a short a barran					
OrDalogClosed	configure				
- Official City	contigue	PC uniform a tr			
stread STO	 Propresentation (C) 	The second second of the			

Download the project to the controller and start it. The counter is incremented only when you click the rectanle in the *TargetVisu*. The rectangle is disabled (gray) in the *WebVisu*.



9.16 Visu: Fonts

See also our help on Visualization Manager - Tab: Font Settings⁴¹¹

This tab provides settings for adapting the font and its size in the visualization according to the language.

The settings apply to all visualizations of the application, including the Visualization Manager.

9.16.1 Using "different" fonts, then those available in Codesys (Visu Editor)

Here basically applies, the font used must be present and installed where it is to be displayed.

CODESYS does not copy any fonts shown within the Visu Editor in Offline/Edit Mode, onto the Controller/Device.

The fonts must therefore be present AND installed on the system - the system, which should also display this font.

This also applies to WebVisu representations that are displayed via a browser. Because the browser (and thus the WebVisu displaying the visu) use these installed fonts from there.

9.16.2 Fonts selected in the Visu Editor

Normally, the specified font in the Visu Editor is used. If this specified font is not found, a "Matching Font" from the "Font Family" will be used.

This is managed by the Graphic API. The font is searched by name, style and size. If this matches exactly, the font will be used.

9.16.3 Setting the correct Font in the Visu Editor

Use the correct font name, not the file name that may be is assigned to the data file.

 $^{411\} https://content.helpme-codesys.com/en/CODESYS\%20V is ualization/_visu_obj_manager_font_settings.html$

Be aware:

Multiple metadata may be stored in the font files, which will show you different names when using different programs.

When checking for the correct font name, go through the standard OS process to display the file. f.e. on Windows: C:\Windows\Fonts ...

A Bodoni MT Fett Kursiv (TrueType)			\times
Drucken nstallieren			
Schriftname: Bodoni MT Version: Version 2.10			^
Digital signiert, Iruelype Konturen abcdefghiiklmnoparstuvvxxxz ABCDEFGHLIKLMNOPORSTUVWXYZ			
1234567890.:,; ' " (!?) +-*/=			
12 Franz jagt im komplett verwahrlosten Taxi quer durch Bayern. 1234567890 18 Franz jagt im komplett verwahrlosten Taxi quer durch Bayern. 1234567890			
24 Franz jagt im komplett verwahrlosten Taxi quer durch Bayern. 12	2345	678	39
» Franz jagt im komplett verwahrlosten Taxi	qu	er	•
" Franz jagt im komplett verwahrle	0S	te	21
" Franz jagt im komplett ver	` u	VC	r
Franz iagt im komplet	, 	1) .

9.16.4 Eastern languages (Japanese/Korean/Chinese) support in TargetVisu application

The font must be compatible with the used Qt and must be copied to the right place. This place varies - depending on what is set within the Qt where to search.

Otherwise, the appropriate font must still be specified in the programming system in the device description. This is always commented out as an example in the template.

9.16.5 Font location under Linux

```
$ cd /usr/share/fonts/
cmap truetype type1 X11
```

9.16.6 Installing Fonts in Targetvisu Linux

example	
sudo apt-get installreinstall ttf-mscorefonts-installer	

9.16.7 Missing fonts in Visu-Properties selection list

For example, if the font "Arial Unicode MS" is missing from the Fonts' selection box of the Visu-Properties, this may be because this checkbox is Windows active:

Control Panel + All Control Panel Items + Fonts + F	ont settings	× P
File Edit View Tools Help		-
	Font settings Show and hide fonts (These settings might not apply to all of your programs) Windows can hide fonts that are not designed for your input language settings. If you choose this option, only fonts that are designed for your language settings will be listed in your programs. Im Hide fonts black on language settings Image: The form of the language settings Installation settings To save space on your computer, you can choose to install a shortcut to a font file instead of the file stell. The font file becomes unavailable, you might not be able to use the font. C allow fonts to be installed using a shortcut (advanced) Hip me choose font settings	
	ОК	

9.16.8 Why does the runtime (e.g. Linux) not regulate this?

The runtime itself does not care about fonts at all. The name and size of the font, used in the target visualization, is there passed to the Qt Font class. That's all.

Qt then takes care of finding a suitable font and chooses a default font, if the specified one is not found.

In Qt itself, there are many ways to configure where fonts are searched. You can do this at compile time, use environment variables, etc.

This depends mainly on how Qt is configured. So there is no default way.

When Qt is running on the X server, the X server will manage the fonts.

9.17 Visu: Performance FAQ: limiting number of Visu-Elements or Objekts

The following is a list of questions on visualization topics in relation to the general performance viewpoints. Especially those related to the maximum number of visualizations, visual elements, displayable elements and objects in relation to the system performance.

- Critical programming practices for visualization performance
- Number of frame objects used in a project
- Number of all objects displayed at the same time
- Number of objects shown on a single visualization screen (even if elements are hidden)
- Number of variables used within one ore more Visu frame elements
- Number of inputs for visualization frames

9.17.1 General problem description of the factual situation

The mere number of "only" Visu Elements (or used frames, etc.) does not allow a correct statement concerning performance.

That is because the performance depends on many more factors than the sheer number of shown objects. For example:

- The performance of the PLC, and hence the remaining performance besides the IEC tasks.
- The used kind of the Visu Elements:
 e. g. using 10000 static rectangles in comparison to 150 tables in a visualization, which update themselves constantly is a huge difference on the performance, and cannot be compared.
- The computational effort for the system due to used 'images':
 - Is scaling for images or Visu Elements need?
 - Is there transparency active fore some object?
- The available memory capacity (for visualization files, as for example bitmaps).
- the complexity of the visualization: for example, the number of the objects, interlocking visualizations ('Frame in Frame' visualizations), complicate elements, etc.

Unfortunately, this topic does not allow a more specific statement to be generalized.

The above points can serve as a guide to what to consider when implementing a larger and more complex visualization to prevent problems in advance.

Our experience has shown that serious drops in performance can only be expected from a considerable visualization size and scope in the project. Projects in the size of a building or industrial plant visualization should in most cases not be affected.

Inhalt nach Stichwort Es ist kein Inhalt mit den angegebenen Stichworten vorhanden

9.18 Visu: Trace recording history

With a trace, you can follow the value progression of variables on the control, similar to a digital scanning oscilloscope.

At runtime of an application with trace, all instructions are first executed within the task cycle. Then the data acquisition starts and the values are saved with a time stamp.

The time stamp is relative and refers to the start time of the data acquisition.

The data results in a discrete-time signal, the course of which CODESYS displays in the trace editor.

For more Information on the Trace Visu Element, see our OnlineHelp on Displaying Data Graphs with Trace⁴¹².

Reset a trace recording

 $^{412\} https://content.helpme-codesys.com/en/CODESYS\%20V is ualization/_visu_struct_display_data_progress_with_trace.html and the struct_display_data_progress_with_trace.html and the struct_data_progress_with_trace.html and the struct_data_progress_with_trace.html and the struct_data_progress_wit$

9.18.1 Q: Can a trace recording history be reset?

9.18.2 A: No, the trace cannot be reset.

It is designed to continues to run. You can start and stop the trace, but there is no reset.

See also: Visu: Deleting a trend recording history⁴¹³

9.19 Visu: Trend - FAQ (EN)

9.19.1 Visu, Trend: Behaviour of trend data during a project update

9.19.1.1 Question:

How can updates of the software be installed at the customer's site, without losing existing data, e.g. already recorded trend data?

Example: In the use case, that only the files of the PLC program are to be exchanged on the controller.

9.19.1.2 Assessment

- Updating the boot application without updating CODESYS/visualization will work, as the database format does not change here.
 Modifications to the trend can also work, but do not have to.
- When updating CODESYS/Visualization, keeping the trend data will usually work. Codesys tries to keep the database formats unchanged.
- However, there have been cases in the past where we have had to extend the format for new features, and this cannot be ruled out in the future.
 When downloading with CODESYS, we then also automatically update the trend database.
 This mechanism does not apply to a pure update of the boot application.

⁴¹³ https://faq.codesys.com/display/CDSFAQ/Visu%3A+Deleting+a+trend+recording+history

If there are problems with such an update, this should already be noticeable during a test run (try out the trend, check the log for strange messages).

9.19.2 Visu: Deleting a trend recording history

The trend can be reset as described with the "Deleting the trend recording history" section under the OnlineHelp Side: Programming a Trend Visualization⁴¹⁴



9.20 Visu: Using a Table as an Input Element

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the *Network scan*.



• Create a structure named st_Demo. with the elements Name and Status:

⁴¹⁴ https://content.helpme-codesys.com/en/CODESYS%20Visualization/_visu_trend_programming.html 415 https://faq.codesys.com/display/CDSFAQ/Visu%3A+Trace+recording+history

TableAsControl.project* - CODESYS				
<u>File Edit View Project Build Online Debug</u>	<u>T</u> ools <u>W</u> indow <u>H</u> elp			
🎦 🚔 🔚 🕌 🗠 🗠 🐇 🛍 🛍 🗙 🕌 🌿	🌿 ab 🍬 🎋 🎋 📾 🛅 - 📑 🕮 🧐			
Devices 👻 🕈 🗙	💮 Device 🔌 st_Demo 🗙			
TableAsControl	1 TYPE st_Demo :			
Device (CODESYS Control Win V3)	E 2 STRUCT			
	3 Name : STRING;			
	4 Status : BOOL;			
Application	5 END_STRUCT			
* st_Demo (STRUCT)	6 END_TYPE			
👘 Library Manager	7			
PLC_PRG (PRG)				
🖻 🌃 Task Configuration				
🖹 🗳 MainTask				
- ● PLC_PRG				

Insert a visualization in the device tree.
 Then the Visualization Manager is inserted with the visu types TargetVisu and WebVisu.
 In addition, a VISU_TASK is also created automatically.



Adapt the POU PLC_PRG as follows:

Declaration

```
VAR

astDemo : ARRAY [0..2] OF st_DEMO := [(Name := 'Item 1', Status :=

FALSE),

(Name := 'Item 2', Status :=

FALSE)];

iRow : INT;

END_VAR
```

Implementation

// no implementation

• In the Visualization, set an element of type Table and configure the element as follows:



• Start the project and open the internal visualization. The value is negated by clicking the corresponding cell in the *Status* column:



9.20.1 As an extension, the texts replaced by symbols as follows:

• Insert an Image pool and configure it as follows:

TableAsControl.project* - CODESYS					
<u>File Edit View Project Imagepool Build Online</u>	<u>D</u> ebug <u>T</u> ools <u>W</u> indow	<u>H</u> elp			
1 🖆 🚰 📑 🗠 🗠 🐰 🗈 🗈 🗙 🖊 🎼	🐴 🛀 i 🛍 i 🛅 - 🖆	🎬 🧐 🧐 🕞 🔳	🖋 ÇE 🖓 de 📲 🗧	3 0 📰 🛒 🗸	
Devices 👻 🕂 🗙	Visualization	ImagePool 🗙			
TableAsControl	ID	File name	Image	Link type	
Device (CODESYS Control Win V3)	FALSE	Red.png		Embedded	
	TRUE	Green.png		Embedded	
Application					
Library Manager					
PLC_PRG (PRG)					

• Adapt the *Table* image element as follows:

Properties	
IV Filter ▼ +\$ Sort by ▼ ∯↓Sort order ▼ ⊠ Ar	dvanced
Property	Value
Element name	Gentleninst_2
Type of element	Table
Data array	PLC_PRG.astDemo
Max. array index	
- Columna	
Column	
= [0]	2
Column header	Name
Width	100
Intage column	2 C
 Image configuration 	
Text alignment of headine	Centered
Use template	V.
Text alignment of the headine fr	
* Template	
= [1]	2
Column header	State
Width	40
Invage column	
 Image configuration 	
Text alignment of headine	Centered
Use template	2 C
Text alignment of the headine fr	
* Template	
Show row header	2
Show column header	2 C
Row height	20

• Download the change to the controller.



9.21 Visu: Using Events of the User Management (Login/Logout)

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

VisuLoginLogoutEvents.project* - CODESYS		-	-	-	
<u>File Edit View Project Build Online Debug Tool</u>	s <u>W</u> indow <u>H</u> elp B <u>A</u> CNet				
🛅 🛎 🔚 🎒 🗠 🗠 🎖 🖻 🖻 🗙 🕍 🕼	🌢 🌿 🛗 ዀ - 💣 🔠 🥰 🤇	8 🕞 🗉 📽 l Cal Parley P	≣\$ ¢ ≋ \$ ∿		
Devices v 4 X	Device X				
VisuLoginLogoutEvents	C	Sam anturali	Davias -		
Device (CODESYS Control Win V3)	Communication Settings	Scannetwork Oneway •	Device +		
Application	Applications				
Library Manager			•		
PLC_PRG (PRG)	Backup and Restore				
Task Configuration	Files				•••
			Gateway		
	Log		Gateway-1	•	[0301.A000.034A] (active)
	PLC Settings		IP-Address:		Device Name:
	PLC Shell		lo calhost		KERNTPC
			Port:		Device Address:
	Users and Groups		1217		0.001.4000.0044
	Access Rights				Target ID: 0000 0001
					Target Type:
	Task Deployment				4096
	Status				Target Vendor: CODESYS GmbH
					Target Version:
	Information				3.5.12.20

• Insert a visualization in the device tree.

Then the *Visualization Manager* is inserted automatically with the visu types *TargetVisu* and *WebVisu*. In addition, a *VISU_TASK* is also created automatically.



Create a user management in the Visualization Manager with the default groups and users.

VisuLoginLogoutEvents.project - CODESYS	
<u>File Edit View Project Build Online Debug To</u>	ols <u>W</u> indow <u>H</u> elp B <u>A</u> CNet
🎦 😂 📑 I 🎒 I 🗠 🖂 🖻 🛍 🗙 I 🛤 😘	🍓 🌿 📭 🛅 • 👔 🎬 🛯 🦃 🥨 🕞 📲 💘 🗊 🗐 🖆 🏷 🗛 🛒 🗮 💐
Devices - P X	🔐 Device 🖉 Visualization Manager 🗙 🚇 Visualization
VisuLoginLogoutEvents	🖶 Settings 🖶 Dialog settings 🗔 Default Hotkeys 🖶 Visualizations 😫 User management 🖣
Device (CODESYS Control Win V3)	
PLC Logic	Create empty user Create user management with
Application	Inanagement default groups and uses
Library Manager	
PLC_PRG (PRG)	
🖃 🌃 Task Configuration	
🗎 🍪 MainTask	
PLC_PRG	
🖃 🍪 VISU_TASK	
VisuElems.Visu_Prg	
😑 🙀 Visualization Manager	
TargetVisu	
WebVisu	
Jisualization	

Then adapt the passwords of the users:



 Create a new FB named FB_UserMgmtEventHandler and implement the VisuElems.IUserMgmtEventHandler interface.

Add POU		
Create a new POU (Program Organization Unit)		
Name:		
FB_UserMgmt		
Туре		
Program		
Function Block		
Extends: FB_1		
Implements: 3.JUserMgntEventHandler		
Access specifier:		
•		
Method implementation language:		
Structured Text (ST)		
© Function		
Return type:		
Implementation language:		
Structured Text (ST)		
Add Cancel		

The following methods are created automatically with the FB: HandleLogin HandleLoginFailed HandleLogout HandlePasswordChange



• Adapt the FB_UserMgmtEventHandler function block as follows:

Declaration

```
FUNCTION_BLOCK FB_UserMgmtEventHandler IMPLEMENTS
VisuElems.IUserMgmtEventHandler
VAR_INPUT
END_VAR
VAR_OUTPUT
END_VAR
VAR
    udiHandleLogin : UDINT;
    udiHandleLogout : UDINT;
END_VAR
```

• Adapt the HandleLogin method as follows:

Declaration

```
(* This method will be called when a login to the visu user management is
performed
  :return:
  TRUE - When the handler has handled this event and it should not be handled by
someone else
  FALSE - When the event is not handled by this handler*)
METHOD HandleLogin : BOOL
VAR_INPUT
    (* A pointer to the client structure were the event occurred.
  The name of the user, that logged in, is stored in
pClient . POINTER TO VisuElems.VisuStructClientData;
END_VAR
```

Implementation

```
udiHandleLogin := udiHandleLogin + 1;
```

- Proceed in the same way with the *HandleLogout* method.
- Make sure that the VisuElems prefix is also used in the HandleLoginFailed and HandlePasswordChange methods; and that the line "{warning 'add method implementation '}" is deleted.
- Adapt the POU PLC_PRG as follows:

Declaration

```
VAR
fbUserMgmtEventHandler : FB_UserMgmtEventHandler;
END_VAR
```

• Assign the EventHandler to the visualization as follows.

Versions < V3.5.SP10

In old versions, the following approach is not possible, because the assignment of a program from the visualization manager was not possible.

For these versions, an initialization must take place in the program code.

Create a new POU of type "Program". Name it *Visulnit*, for example, and adapt the program code as follows:

Declaration

PROGRAM VisuInit VAR END_VAR

Implementation

VisuElems.Visu_Globals.g_VisuEventManager.SetUserMgmtEventHandler(PLC_PRG.fbUser
MgmtEventHandler);

Assign the Visulnit program to your project as the start procedure within the Visualization Manager:



• Open the Visualization, add a box, and assign the following properties to it:



• Repeat the steps as for a button for logging out.

Load the project to the controller and start it.
 The variables are increased at each successful "Login" and "Logout".

Login: 1		
Logout: 1	Login	
	User name: Password:	Admin
		Ok Cancel

9.22 VISU Dialogs - FAQ (EN)

9.22.1 Creating and using your own dialog - (EN)

The standard dialogs are available in an open library and can therefore be edited. In the following example, the color of a login dialog is to be adjusted.

9.22.1.1 Creating and using your own dialog

 Open the existing library. This can be found in the directory "<CODESYS installation directory>\3S CODESYS\CODESYS\Projects\Visu\Dialogs\VisuUserMgmtDialogs.library". Save the project under a different name (in this example 'DemoVisuUserMgmtDialogs.library'). During the saving procedure you will be informed that the library is marked as release.

CODESYS	
0	This project cannot currently be saved because it is marked as 'Released' in the Project Information. Do you want to remove this flag? - Click 'Yes' to remove the 'Released' flag and save the project. - Click 'No' to keep the 'Released' flag. The project will not the saved.
	<u>J</u> a <u>N</u> ein

- Confirm this dialog with Yes.
- Modify the dialog, e.g. header and color.

UserMgmtLogin 🗙			
Hello World: Login			
User name:	%s		
Password:	****		
	Ok Cancel		

 Open the project information dialog (Menu Project\Project Information) and modify the title and standard namespace.

File Summary Properties Statistics Licensina Signina			
<u>C</u> ompany:	System		
<u>⊤</u> itle:	DemoVisuUserMgmtDialogs		
<u>V</u> ersion:	3.5.10.0		
Library Categories:	Intern Visu		
Default namespace:	DemoDialogs		
<u>A</u> uthor:	3S-Smart Software Solutions GmbH		
Description:	This library contains example dialogs for the visualization user management functionality.		
The fields in bold letters are used to identify a library.			
Automatically generate 'Library Information' POUs			
	OK Cancel		

• Save and install the new library.



9.22.1.2 Using the new dialog

- Create a test project.
- Insert the object "Visualization" under the application.
- Insert a user management via the visualization manager.
- · Create a user.
- The project must now be closed and opened again. The standard dialogs are now available.

👔 Library Manager 🕘 Visualization 🖓 Visualization Manager 🗙		
Settings 💷 Default Hotkeys 🚇 Visualizations 🥵 User management Font settings		
General settings	Settings for user management	dialogs
Use unicode strings	Logindialog	VisuUserManagement.VUM_Login 👻
Use Currentvisu variable	Change password dialog	VisuUserManagement.VUM_ChangePassword
Style settings	Change configuration dialog	VisuUserManagement.VUM_UserManagement
Selected style: Basic style, 3.5.9.0 (35-5mart Sortware Solutions GmoH)		
• Insert the new library via the library manager.

Devices 👻 🗸	ф X	👔 Library Manager 🗙 👸 Visualization Manager 🕘 Visualization	
Christed 495	-	🏝 Add library 🗙 Delete library 📑 Properties 💿 Details 🛤 Placeholders 🎁 Library repository	
Device (CODESYS Control Win V3)		Name	Namespace
🖻 🗐 PLC Logic			Y
Application	_	Add Library	~
- 🎁 Library Manager			8 ITA
PLC_PRG (PRG)	_	visuusermgmtd	
🖹 🎯 Task Configuration		Match Library	
🖷 🥩 MainTask		VisuUserMgmtDialogManagerListener VisuUserMgmt	
– 믠 PLC_PRG		→ [©] <mark>VisuUserMgmtD</mark> ialogs	
Southern Street			

• Make your dialog available in the visualization manager (tab "Visualizations").

Dlg.project* - CODESYS				
Eile Edit View Project Build Online Debug	To	ols <u>W</u> indow <u>H</u> elp		
	2.5	🖾 🔚 • 🕞 🎮 🞯 🐨 🖕 🛶	। (ब का का का 201	○ 悪 =
	100		14	
Devices 🗸 🗸	Ě	Library Manager 🔒 Visualizati	on 🛛 🕌 Visualizatio	on Manager 🗙
In Druise (CODERVE Control Win V2)	•	😬 Settings 🔲 Default Hotkeys 💾 Visual	izations 🤮 User manage	ement 🕤 Font settings
Build Bill Closes		Name	TargetVisu, WebVisu	Number of instances
		Default behaviour		
- Application		 Visualizations 		
		Visualization		
Task Configuration		Dialogs		
🗏 😒 MainTask		E {} DemoDialogs		
PLC PRG		UserMgmtChangePassword		1
= 🕸 VISU_TASK		I UserMamtConfia		1
VisuElems. Visu_Prg		🕘 UserMgmtLogin	Image: A start and a start	1
🖃 🍓 Visualization Manager		VisuUserManagement		
TargetVisu		VUM_ChangePassword		1
- 🧑 WebVisu		UIM_Login		1
Visualization		VUM_UserManagement		1
		() VisuDialogs		
		FileOpenSave		1
		de Keypad		1
		di Login		1
		H Numpad		1
		NumpadExtended		1
		TextinputWithLimits		1

- Close and open the visualization manager.
- Your dialog is then available.



9.22.2 Use Customize keypad or numpad inputs from VisuDialogs

In Codesys it is possible to customize the keypad or numpad elements with the use of the open "VisuDialogs.library.

This library can also be downloaded via our forge, CODESYS Examples: VisuDialogs⁴¹⁶

The lib "Library Manager" can be found (per default installation) here:

C:\Program Files (x86)\3S CODESYS\CODESYS\Projects\Visu\Dialogs\VisuDialogs.library

9.22.2.1 Steps:

- Open the Library with Codesys
- The dialogs in the library can be easily customized (color, font, size, etc.).
- After the customization, the user has to save/install the library into the Codesys Library Repository (Command: Save Project and Install in the Library Repository⁴¹⁷)

Best practice:

Save the modified library under a new name and do not overwrite the existing default library!

Open the Project Information⁴¹⁸ (Menu Project\Project Information) and modify the entries for 'Title', as well as the 'Default namespace'/'Placeholder' name - depending on the used Codesys Version!

⁴¹⁶ https://forge.codesys.com/prj/codesys-example/visudialogs/home/Home/

⁴¹⁷ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/ _cds_cmd_save_project_and_save_into_library_repository.html

⁴¹⁸ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_obj_project_information.html

<u>C</u> ompany	System
<u>T</u> itle	VisuDialogs_MyTest
Version	3.5.9.1 Released
Library Categories	Intern Visu
De <u>f</u> ault namespace	
<u>P</u> laceholder	VisuDialogs_MyTest
<u>A</u> uthor	3S-Smart Software Solutions GmbH
<u>D</u> escription	This library contains standard dialogs.
The fields in bold lett Automatically generate	ters are used to identify a library. 'Library Information' POUs

- Add the new library to a project (Adding a Library to the Repository⁴¹⁹, then use the Command: Add Library in the Library Manger within the project⁴²⁰)
- Select the new Dialogs in the Visualization Manager⁴²¹ from the Tab: Dialog Settings⁴²² "Settings for Default Text Input".

⁴¹⁹ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_adding_libraries_to_repository.html

⁴²⁰ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_cmd_add_library.html

⁴²¹ https://content.helpme-codesys.com/en/CODESYS%20Visualization/_visu_obj_manager.html

 $^{422\,}https://content.helpme-codesys.com/en/CODESYS\%20V is ualization/_visu_obj_manager_dialog_settings.html$

Settings Dialog Settings Default	Hotkeys 🕘 Visualizations 😫 User Management	Pont Settings	Advanced Settings
Numpad	VisuDialogs MyTest Numpad	~	
Kana d		-	
кеурад	VisuDialogs_MyTest.Keypad	~	
Use text input with limits	VisuDialogs.Numpad		
- Global Position Settings for Numpad / Keynad	VisuDialogs.NumpadExtended		
Centered	VisuDialogs_MyTest.Keypad		
	VisuDialogs_MyTest.Numpad VisuDialogs_MyTest.NumpadExtended		
O Open centered on element	VisuDialogs_MyTest.TextinputWithLimits		
 Open next to element 			
 Open at specific position 			
х			
Y			
Settings for User Management Dialogs			
Logindialog		\sim	
Change password dialog			
		~	
Change configuration dialog		\sim	
Settings for Opening and Closing a Dialog			
Transition time (ms)	200		
Settings for Modal Dialogs			
Use a background color			

9.23 WebVisu: Reading the IP Address of the Client

- Create a "Standard project" and select CODESYS Control Win V3 as the device.
- Define the target system by means of the Network scan.

WebVisu_Read_ClientIpAddr.project* - CODESYS			
Eile Edit View Project Build Online Debug Tools Window Help			
🎦 🚅 📕 🚭 🗠 🗠 询 🏗 🗙 🐜 🍇 🏷 🏙 🏙 🕇 🗎	웹 🞯 🖗 📊 📲 💐 💷 1월	11型	
Devices v 4 X	Device X		
P WebVisu_Read_ClientIpAddr			
E Device (CODESYS Control Win V3)	Communication Settings Scan network Sateway	Device	
E-B PLC Logic	1. N. W.		
- O Application	Applications		
Library Manager	Backup and Restore		
PLC_PRG (PRG)			
	Files		• •
PLC PRG		Gateway	
	Log	Gateway-1	[034A] (active)
	PLC Settings	IP-Address:	Device Name:
		localhost	KERNTPC
	PLC Shell	Ports	Device Address:
	Harry and Courses	1217	034A
	osers and groups		Target ID:
	Access Rights		0000 0001
			Target Type:
	Task Deployment		4096
	Status		Target Vendor:
	Status		35 - Smart Sortware Solutions GMDH
	Information		Target Version: 3.5.12.0
			J.J.12.V

· Insert a visualization in the device tree.

Then the *Visualization Manager* is inserted with the visu types *TargetVisuand WebVisu*. In addition, a *Visu_Task* is also created automatically.



9.23.1 As of SP17:

 Open the Library Manager and add the following libraries: VisuUtils

👔 Device 🕘 Visualization 🎢 Library Manager 🗙							
🗄 Add Library 🗙 Delete Library 🖙 Properties 🗃 Details 🔄 Placeholders 🎁 Library Repository 🕕 Icon Legend 😑 Summary							
Name	Namespace	Effective Version					
🗄 🖬 System_VisuElemTextEditor = VisuElemTextEditor, 3.5.17.0 (System)	VisuElemTextEditor	3.5.17.0					
🖷 💼 System_VisuElemTrace = VisuElemTrace, 3.5.17.0 (System)	VisuElemTrace	3.5.17.0					
🛱 🖷 🚹 System_VisuElemXYChart = VisuElemXYChart, 3.5.17.0 (System)	VisuElemXYChart	3.5.17.0					
🕮 💼 system_visuinputs = visuinputs, 3.5.17.0 (system)	visuinputs	3.5.17.0					
🗄 🖬 System_VisuNativeControl = VisuNativeControl, 3.5.17.0 (System)	VisuNativeControl	3.5.17.0					
🗄 🚹 VisuUtils = Visu Utils, 3.5.17.0 (System)	VU	3.5.17.0					

• Create a new FB named FB_Iteration and implement the interface VU.IVisualizationClientIteration.

Add POU X
Create a new POU (Program Organization Unit)
Name
FB_Iteration
Type Program @Function Nock
Extends
Pinal Abstract Access specifier
~
Structured Text (ST)
Function Return type
Implementation language Structured Text (ST) ~
Add Cancel

The following methods are created automatically with the FB: EndIteration HandleClient StartIteration

• Adapt the FB_Iteration function block as follows:

Declaration

```
FUNCTION_BLOCK FB_Iteration IMPLEMENTS VU.IVisualizationClientIteration
VAR CONSTANT
    c_MaxClients : __XINT := 5;
END_VAR
VAR
__iIndex : __XINT;
    asIpAddresses : ARRAY [0..c_MaxClients-1] OF STRING;
END_VAR
```

• Adapt the EndIteration method as follows:

Declaration

```
METHOD EndIteration
VAR
_iCounter : __XINT;
END_VAR
```

Implementation

• Adapt the HandleClient method as follows:

Implementation

```
IF _iIndex <= (c_MaxClients - 1) THEN
    asIpAddresses[_iIndex] := itfClient.GetIPv4Address();
    _iIndex := _iIndex + 1;
END_IF</pre>
```

• Adapt the StartIteration method as follows:

Implementation

_iIndex := 0;

• Adapt the POU *PLC_PRG* as follows:

Declaration

```
VAR
fbIteration : FB_Iteration;
fbIterateClients : VU.FbIterateClients;
xIterate : BOOL;
END_VAR
```

Implementation

```
fbIterateClients(xExecute := xIterate, itfClientFilter :=
VU.Globals.OnlyWebVisu, itfIterationCallback := fbIteration);
IF fbIterateClients.xDone THEN
    xIterate := FALSE;
END_IF
```

- Start the project and insert the variable PLC_PRG.fblteration in the watch list.
- Open a browser and type in the following address: http://localhost:8080/webvisu.htm
- Set the PLC_PRG.xlterate variable to TRUE.

Devices 👻 🖣 🗙	💮 Device 🚇 Visualization 🎁 Library I	Manager 📑 F	B_Iteration PLC_PRG X	FB_Iteration.EndIter	ation					
B WebVisu_Read_ClientIpAddr	Device.Application.PLC_PRG									
Ocycle [connected] (CODESYS Control Win V3) Ocycle [In PLC Logic Ocycle [In PLC Log	Expression	T	Type Value B_Iteration	Prepared value	Address	Comment				
Library Manager FB_Iteration (FB)		VB	U.FbIterateClients							
Handleclient										
PLC_PRG (PRG) State Configuration	<pre>1 fblterateClients(xExecuteFALSE := 2 3 IF fblterateClients.xDoneFALSE 1</pre>	= xIterate FAUSE,	itfClientFilter := VU.Glob	als.OnlyWebVisu, itf	IterationCallbac	<pre>:k := fbIteration);</pre>				
· · · · · · · · · · · · · · · · · · ·	4 xIterate FALSE := FALSE; 5 END_IP 6 RETURN									
Visualization Manager	Watch 1									
Visualization	Expression	Application	Type FB Iteration	Value	Prepared va	lue Execution point				
	¢ c MaxClients	DevicerApplication	DINT	G 5		Cyclic Monitoring				
	🔷 _iIndex		DINT	1		Cyclic Monitoring				
	😑 < asIpAddresses		ARRAY [0(c_MaxClients - 1)] OF	STRING		Cyclic Monitoring				
	asIpAddresses[0]		STRING	'127.0.0.1'		Cyclic Monitoring				
	asIpAddresses[1]		STRING			Cyclic Monitoring				
	asIpAddresses[2]		STRING			Cyclic Monitoring				
	asIpAddresses[3]		STRING			Cyclic Monitoring				
1	asIpAddresses[4]		STRING			Cyclic Monitoring				

9.23.2 Up to SP16:

• Create a new POU named *ClientInfo* and call it from *Visu_Task*.

The call of the *ClientInfo* POU must originate from the Visu_Task because only then is the required client handle passed.

Ele Edit View Project Build Online Debug Tools W	ndow Help
월 📽 📕 🖨 I 🗠 ~ 및 4월 10 ~ ~ 및 4월 10 ~ ~ 및 4월 14 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) 4 ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4) ~ (4)	· □ · □ · □ · □ · □ · □ · · · · · · · ·
Perices	VISU_TASK X
Webvisu_kead_clientipAddr Webvisu_kead_clientipAddr	Configuration
Device (coopers a control win vs)	Priority (031): 31 Task G
- 🎁 Library Manager	Туре
ClientInfo (PRG)	Cyclic Interval (e.g. t#200ms): 100
PLC_PRG (PRG)	
= 🔛 Task Configuration	Watchdog
□\$ MainTask □∰ PLC_PRG	Enable
🖹 🕸 VISU_TASK	Time (e.g. t#200ms):
- 셴 VisuElems.Visu_Prg - 셴 ClientInfo	Sensitivity:
🖻 🛃 Visualization Manager	
🙆 WebVisu	🖡 Add Call 🖌 Remove Call 🍞 Change Call 🖈 Move Up 🔮 Move Down 📑 Open POU
Visualization	
	POU Comment
	VisuElems.Visu_Prg
	ClientInfo

• Adapt the ClientInfo POU as follows:

Declaration

VAR			
	pClient	:	<pre>POINTER TO VisuElems.VisuElemBase.VisuStructClientData;</pre>
	helper	:	VisuElems.VisuFbClientTagDataHelper;
	s1	:	STRING;
END	_VAR		

Implementierung

```
VisuElems.g_ClientManager.BeginIteration();
WHILE (pClient := VisuElems.VisuElemBase.g_ClientManager.GetNextClient()) <> 0 D0
    IF pClient^.GlobalData.ClientType =
VisuElems.VisuElemBase.Visu_ClientType.WebVisualization THEN
        helper(pClientData := pClient);
        s1 := helper.stIPv4;
    END_IF
END_WHILE
```

- WebVisu_Read_ClientIpAddr.project* CODESYS Ele Edit View Project Build Online Debug Tools Window Help 箇房間後での※問題×1株装構装161/4%%%161箇・61間1%%、■≪1025555161気1目や A X
 Device Visualization
 Device Application.ClientInfo ClientInfo 🗙 📄 PLC_PRG WebVisu_Read_Client[pAddr
 Type
 Value

 POINTER TO VisuEle...
 16#0000000

 VisuElems.VisuFbClie...
 *

 STRING
 *
 Expression Prepared value Add PLC Logic Application [run] P Client
 P pClient
 P plient
 P s1 Library Manager
 ClientInfo (PRG)
 PLC PRG (PRG) PLC_PRG (PRG) Task Configuration MainTask VisuElems.g_ClientManager.BeginIteration() ٢ THEN VISU_TASK UsuElems.Visu_Prg ClientInfo ion Mana Target 100 % Last build: 😋 0 🕐 0 Precompile: 🧹 🔒 Ln 2 Col 1 Ch 1 RUN Program loaded Program unchanged Project user: (nobody) INS
- Start the project and set a breakpoint in line 6 of the *ClientInfo* POU.

- Open a browser and type in the following address: http://localhost:8080/webvisu.htm
- After the client has connected, execution is halted at the breakpoint and the IP address can be read.

WebVisu_Read_ClientIpAddr.project* - CODESYS										x
Ele Edit View Project Build Online Debug Tools V	Vindov	w Help								₹
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Devices 🗸 🗸 🗙		🗃 Device 🕘 Visualization 😵 VISU_TASK	ClientInfo 🗙	PLC_PRG						-
WebVisu_Read_ClientIpAddr		Device.Application.ClientInfo								
= 😏 🔟 Device [connected] (CODESYS Control Win V3)	Ex	pression	Туре	Value	Prepared value	Address	Comment			1
Application [halt on breakpoint]	۰	pClient	POINTER TO VisuEle	16#05123288						
Library Manager	۰	🖗 helper	VisuElems.VisuFbClie							
ClientInfo (PRG)		🎓 s1 :	STRING	-						
PLC_PRG (PRG)		1 VisuElems.g ClientManager.BeginIteratio	on ();	_ ▼						
Task Configuration		2								
		3 WHILE (pClient 16#05123288 := VisuElems.)	VisuElemBase.g_C	lientManager.	GetNextClient())	<> 0 DO			1	
E-S VISU_TASK	11°	5 helper (pClientData 16#05123288) :	= pClient 18#05123	3288);	tempase.visu_ciit	encrype.webvis	ualizacion	•	1 man	
VisuElems.Visu_Prg		6 🗢 👘 si 👘 := helper.stIP	127.0.0.1	1						
- 셴 ClientInfo		7 END IF	\sim							
Visualization Manager		· CRD_WAILBREIDEN								
Iargetvisu Webvicu										
									100 %	6 🙊
Device user: Anonymous Last build: 😋 0 😗 0	Prec	compile: 🗸 🔓 HALT ON BP Program loa	ded	Program un	changed	Project use	er: (nobody)	INS	Ln 6 Col 9 Ch 3	Ø

The information is available only for web clients. A TargetVisu connected to the controller does not contain this information.

9.24 Workaround: Webserver and Webvisu Certificate issues with recent Browser versions (2023)



9.24.1 Browser error massage: NET::ERR_CERT_INVALID

A website error with the error message NET::ERR_CERT_INVALID is usually due to an invalid SSL/TLS certificate.

This error can occur if the certificate has expired, if it was not issued by a trusted authority, or if the hostname in the certificate does not match the hostname in the URL.

Recent Chrome / Edge versions do no longer accept the certificates that are generated automatically by the runtime system for the secure Codesys WebServer/WebVisu connection. Till a fix can be rolled out as widely as possible, via a Codesys setup or add-on, a workaround is needed.

9.24.2 Workaround

The user can create the following certificates for the web-visualization them selfe, under a Windows PowerShell⁴²³ command:

MS_Powershell, Code-Example

```
# (change Password / COMPUTERNAME entries)
$cert = New-SelfSignedCertificate
       -DnsName "COMPUTERNAME" `
        -CertStoreLocation "cert:\CurrentUser\My" `
        -Type Custom
        -FriendlyName "COMPUTERNAME" `
        -TextExtension @("2.5.29.37={text}1.3.6.1.5.5.7.3.1") `
        -KeySpec KeyExchange `
        -NotAfter (Get-Date).AddYears(+1)
$thumbprint = $cert.Thumbprint
$password = ConvertTo-SecureString `
             -String "1234" `
             -Force
             -AsPlainText
Export-PfxCertificate `
        -cert "cert:\CurrentUser\my\$thumbprint" `
        -FilePath "D:\cert.pfx"
        -Password $password
```

After that, load the new certificate onto the controller via the security manager. See for more Information:

- Security Screen⁴²⁴
- Security for CODESYS WebVisu⁴²⁵

9.25 Working with color variables

In CODESYS the transparency is transferred as a byte in addition to the color values (RGB).

A simple example shows the allocation:

⁴²³ https://learn.microsoft.com/en-us/powershell/scripting/overview?view=powershell-7.3

 $^{424\,}https://content.helpme-codesys.com/en/CODESYS\%20Development\%20System/_cds_cmd_cyber_screen.html and a standard sta$

⁴²⁵ https://content.helpme-codesys.com/en/CODESYS%20Development%20System/_cds_sec_webvisu.html

Devices 👻 🔻 🛪	Visualization PLC_PRG X 🕤 Device					
E 3 Farbwerte	Device Application.PLC_PRG					
= 😳 🗊 Device [connected] (CODESYS Control Win V3)	Consider the second sec	T	Malua	Description		6
🖻 🗐 PLC Logic	Expression	туре	value	Prepared value	Address	Comment
🖹 🔘 Application [run]	byTransparency	BYTE	16#FF			
- 📶 Library Manager	byRed	BYTE	16#B6			
PLC_PRG (PRG)	byGreen	BYTE	16#6A			
= 🧱 Task Configuration	byBlue	BYTE	16#2F			
😑 🍪 MainTask	diColor	DINT	16#FFB66A2F			
PLC_PRG						
E- 🕼 VISU_TASK						
UsuElems.Visu_Prg	1 diColor 16#EEB6642E := SHL (byTrangpa	renov 16#FE 241 +	SHL (byRed 16#R6	16) + SHL (hyGree	n 16#64 81 + by	Blue 16#2E
😑 🛃 Visualisierungsmanager	2	remoj mart (rei / r	our (office love)	10/ / 010(0]0100		Dade total
- 🚰 TargetVisu	3					
- 🥵 WebVisu	4					
Visualization	5 BETURN					

Here, the input bytes are set with sliders and the resulting color value is transferred to the rectangle:

