

APPLICATION NOTE

AC500 V3 AND OPC UA CONFIGURATION AND HANDLING



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1 Introduction

1.1 Scope of the document

New generation of AC500 PLC's (V3) support OPC UA as a new Communication Opportunity. This document describes how to configure the AC500 to enable this protocol an also to work with UaExpert as an OPC UA Client.

1.2 Compatibility

The application example explained in this document have been used with the below engineering system versions. They should also work with other versions, nevertheless some small adaptations may be necessary, for future versions.

- AC500 V3 PLC
- Automation Builder 2.2.0 or newer
- Automation Builder 2.5.0 or newer (working with Alarms forward to OPC UA, Using OPC UA Client as Tech Preview)

1.3 Overview



AC500 V3 with OPC UA Server

2 General

2.1 AC500 OPC UA Features

OPC UA server can be added as an Object below the Ethernet Interfaces ETH1 or ETH2. Then you can access the variable interface of the controller via a client. At the same time, communication can be protected by means of encryption.

The CODESYS OPC UA server supports the following features:

- Browsing of data types and variables
- Standard read/write services
- Notification for value changes: subscription and monitored item services
- Encrypted communication according to "OPC UA standard (profile: Basic256SHA256)"
- Imaging of the IEC application according to "OPC UA Information Model for IEC 61131-3"
- Supported profile: Micro Embedded Device Server Profile
- Sending of Events according to the OPC UA standard

2.2 Key Figures for OPC UA Server

	PM5032	PM5052	PM5072	PM5630	PM5650	PM567x
No of Tags	125	250	1000	3000	10000	30000
No of Clients	5	5	10	10	20	50
Min. Sample Rate (ms)	1000	1000	1000	500	100	50
Queue Size	50	50	50	50	50	50

This figures always must be used in the context of the Application

- CPU/PLC Load
- Task Cycle Times
- Publishing Interval

2.3 Operation Modes

Different Modes are possible with OPC UA

Polling

- With a defined interval, the objects will be continuously updated
- Create higher load then Subscription
- Recommended only for a few Symbols

Subscription

- Updated objects depending on the Publishing Interval and Filters
- Method to reduce Load
- Different Intervals
- Filter possible

Pub/Sub not yet supported

Further Descriptions are referencing to Subscriptions

2.3.1 Subscription

Client defines a group of Symbols with

Publishing Intervall	Interval, in which server publish Data to Client
Sampling Intervall	Interval for sampling (and storing) Data at Server and send in each Publishing Interval
Queue Size	Array of Data to save Data if sampling Interval is faster than Publish- ing Interval
Data Change Filter	Can be used to reduce traffic from Server to Client. Criteria are Change of Data, Change of Status, Change of Time Stamp. (AC500 is fix configured for Change of Data and Change of Status)



2.4 Recommendations for Using OPC UA

- Define only Variables you need as Symbols
- Do not configure Publishing Intervals to small (increase load)
- Use different Subscriptions with different Publishing Intervals in order to decrease load
- Do not use Sampling intervals faster than Publishing Interval as long as AC500 OPC UA Server don 't support Queue Size different from 1
- Be careful: Setting "O"at Sampling Interval at Client will be interpreted in Server as "as fast as possible ", (see table in chapter 2.2) at AC500 and create a high load.

3 Basic Communication

3.1 Preparing AC500 Project

- Create a new project in Automation Builder 2.1 or newer. Choose AC500 V3 PLC (PM5630, PM5650, PM5670 or PM5675)
- Add OPC UA Server to the Ethernet Port you want to use



- Declare some variables of different types in the PLC_PRG program.
- Add a "Symbol configuration" object below the application.
- Activate the option "Support OPC UA Features" in the dialog "Add symbol configuration".



- Open the symbol configuration in the editor.
- Click "Build".
- The variables are displayed in a tree structure.

• Activate the variables that you want to change with an OPC UA client. Specify the access rights.



• Download the project to the controller.

3.2 Assign PLC Name

Depending on the application it could be necessary, that the PLC get a dedicated name instead of the default name

Double Click to the OPC UA server



Set this parameter to True

All PM3572_UA_AB23.project* - Automation Builder 2.3 - Premium File Edit View Project Build Online Debug Tools Window 한 교 및 금 수 · · · · · · · · · · · · · · · · · ·	Help BACNet IEC61850 ▶ ■ ○ ● ○		- 0	× ₹
Devices	🔹 🛪 📝 👔 Library Manager	Synbol Configuration 👔 R.C.,IRG 👔 OP.C.,U.R., Server 🍸 IP-Configuration 🖉 IP.C.,AC500_V3 🗙		
 (a) Construction of the second second	Communication Settings P.C Settings P.C Settings P.C Settings P.G Settings CO-Variable Settings CO-Variable Settings CO-Variable Settings CO-Variable Settings CO-Variable Settings Setting P.G Settings P.G Set	Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spectremote. Spect	Pestion	
Sevices 🕜 POUs				
		Last build: 💿 0 😗 O Precomple 🗸 🥳 Project us er	r: (nobody)	0

Choose "Rename Active Device"

Change Device	Name					\times
Device name						
Current	PM5670					
New	PM5670				~	
			_			_
			0	К	Cancel	

- Define new Name and OK
- Name will be transferred to PLC

3.3 Configure OPC UA Test client UaExpert

The OPC UA client "UaExpert" is freely accessible software that you can download from the Internet. Using this client, you can connect to the AC500 OPC UA server. The following description refers to this pro- gram. Other OPC UA clients work in the same way.

 Start 	UaExpert
---------------------------	----------

Unified Automation UaExpert - The OPC Unified Architecture Client - NewProject



Add server

Add Server	?	^
onfiguration Name		
Discovery Advanced		
Endpoint Filter: No Filter		•
✓		
> 🔮 Microsoft Terminal Services		
Microsoft Windows Network Meh Client Network		
Reverse Discovery		
Souther the second s		
 Custom Discovery 		
< Double click to Add Server >		
Authentication Settings		
Authentication Settings Authentication Settings Justice Settings	Store	
Authentication Settings Authentication Settings Anonymous Username Password	Store	
Authentication Settings Authentication Settings Anonymous Username Password Certificate] Store	
Authentication Settings Authentication Settings Anonymous Username Password Certificate Private Key] Store	
Authentication Settings Anonymous Username Password Certificate Private Key] Store	
Authentication Settings Authentication Settings] Store	
Authentication Settings Authentication Settings	Store	

Add server

Enter URL		?	×
Enter the URL of a compute	r with discovery	service r	unning:
ape. ap. // 1921100.0170.46	ОК	Can	icel

• Fill in the TCP/IP Address of AC500 and Port 4840 (Default Port)

Add Server ?	X Add Server	?	×
Configuration Name PM5670 Discovery Advanced	Configuration Name PM5570 Discovery Advanced		
Endpoint Filter: No Filter	Server Information Endpoint UH opc.tcp://192.168.0.70:4840 Reverse Connect Security Settings Security Policy None Authentication Settings Authentication Settings Username Password Certificate Private Key Session Settings Session Settings	• • • • • • • • • • • • • • • • • • •	
Authentication Settings Anonymous Username Password Certificate Private Key			
Connect Automatically	Connect Automatically	Cance	el

- Take care also to the Advanced Tab
- OK
- Server will be automatically connected

Unified Automation UaExpert - The OPC Unified Architecture	re Client - NewProject*					
File View Server Document Settings Help						
🗋 🥔 🕞 🗭 💽 🔶 🗕 🗞 🗙 🔧	🤰 🖹 🖹 🔛					
Project 🗗 🗙	Data Access View					
 Project Servers PM5670 Documents Data Access View 	# Server	Node Id	Display Name	Value	Datatype	iou
Address Space 🗗 🗙						
😏 No Highlight 🔹 👻						
Root Clipects Clipec						

• Open the Project tree in Address Space Window



• Drag and drop the need Symbols to "Data Access View"

Unified Automation UaExpert - The OPC Unified Arch File View Server Document Settings Help	itecture Cl	ient - NewProject*							
🗋 🥔 🕞 🛃 💽 🔶 🛋 🗙	4 2	8 🛛 🖵							
Project	5 × Da	ta Access View							
 ♥ Project ♥ Servers ♥ PM5670 ♥ Documents ♥ Doly Access View 	# 1 2 3	Server PMS570 PMS570 PMS570 PMS570	Node Id NS4 String Ivari NS4 String Ivari	Display Name bTest3 rTest2 wTest1	Value true 501598 54224	Datatype Boolean Float Uint 16	iource Timestem 014127.075 014155.052 014155.052 0142500.277	Server Timestamp 01:41:27:075 01:41:59:025 01:42:00.277	Statuscode Good Good
Address Space	5 ×								
No Highlight No Highlight No t DeviceSet Seconces Acson PMSoc-2ETH Acson PMSoc-2ETH Application DeviceRevision DeviceRevision DeviceRevision AndraGaWas PervisionConter Porgams Po									

3.4 Change Subscription or Sampling Rate

Publishing and Sampling Intervals configured in UAexpert

Right Mouse Click on an Item in "Data Access View"

Add custom node
Subscription Settings Set Publishing Mode
Monitored Item Settings Set Monitoring Mode

Subscription Settings	? ×
Publishing Interval:	1000 ≑
Life Time Count:	2400 🗘
Max Keep Alive Count:	10 হ
Max Notifications Per Publish:	0
Priority:	0
Show count values	Show counts as ms
0	Cancel

Life Time Count:

Number of Publishing Intervals in which Client must send Publish requests to the Server. After this period without request from Client, subscription in Server will be deleted

Max Keep Alive Count:

If there are no new data to send, Server can skip an Publish Interval. After the Alive Count, Server must send, even if there are no new data.

Monitored Item Set	tings	? <mark>x</mark>
Sampling Interval:	1000,00	×
Queue Size:	1	
Discard Oldest:		
Data Change Trigger:	Status/Value	v
Deadband Type:	None	~
Deadband Value:	0,00	A Ţ
	ОК	Cancel

4 Certificate based Communication with anonymous Account

4.1 Create certificate at AC500

Prerequisite: Battery is inserted, and Clock is set to actual Time

To work with encrypted communication with certificates the first step is to create a certificate for OPCUA Server.

PM5bix_OPCUA_User_add_Tab_a.p	roject" - Automation Builder										Gr 1972
jie Edit Yew Project Build Q	nline <u>D</u> ebug <u>T</u> ools <u>W</u> indow <u>H</u>	Help									₹
B ⊯≣ @ ∽ ~ A \$		#10 0	0								
rvices	Symbol Configuration	- PLC_	AC500_V3 x								
PM56ix_OPCU4_User_add_ = PLC_AC500_V3 (PM5670-3E	Communication Settings										_
PLC Logic	PLC Settings										
Lbrary Manager	Version information										
Symbol Configured	Statistics										
IO_Bus (I/O-Bus)	Files										
* 💼 Extension_Bus (Extens	Log										
	PLC Shell										
	Users and Groups										
	Access Rights										
	Symbol Rights										
	PM5670-2ETH Hardware										
	PM5670-2ETH Parameters										
	Task Deployment										
	Applications										
	Backup and Restore										
	Status										
ages - Total 0 error(s), 4 warning(s),	10 message(s)	(a) (b) 2									* ÷ X
ription	- Control	(S) V 2 We	anning(s) 0 mess	solicity V &			 	 Project	Object	Position	
ze of generated code: 443694 bytes	2										
Size of global data: 49125 bytes											
fotal allocated memory size for code a	and data: 512952 bytes										
Memory area 0 contains Data, Input,	Output, Code and Nonsafe Data: size	ne: 8388608 t	bytes, highest used as	ddress: \$12952, largest	t contiguous memory ga	ap: 7875656 bytes (93 %)					
Remory area 1 contains Memory: size	e: 524288 bytes, highest used addres	ss: 524288, k	largest contiguous mer	mory gap: 0 bytes (0 %)	6)						
Suid complete - 0 errors, 2 warnings	: ready for download!										
Messages - Total 0 error(s), 4 warni	ng(s), 10 message(s)										
											_

• Double Click to Security Screen Button

Struct_2 T PLC_AC500	_V3	PLC_PRG	♦ Struct_3	Pt s	ymbol Configuration 🛛 🖓 Security Screen 🗙
User	Φ	Information		1	Information
Project	1	PLC_AC500_V3 Own Certificates		×	OPC UA Server
Devices		Trusted Certificates			CmpMQTTClient (not available)
		Unstrusted Certificates			Encrypted Application (not available)
		Quarantined Certificates			Web Server (not available)
					Encrypted Communication (not available)
 If the Information 	Wine	dows are empty push	Refresh But	tton	¢

- Go to Devices
- Select PLC_AC500_V3
- Go to the Right Window and select "OPC UA server (not available)" and push the upper Button (Create a new certificate on this device)

Struct_2 PLC_AC500	_V3	PLC_PRG	Struct_1	Struct_3	n a s	ymbol Configura	ation 🛛 🖓 Security Screen	x		
User	Φ	Information			1	Information	1	Issued for	Issued by	•
Project	1	PLC_AC500	_V3		\times		UA Server (not available)			
		🔳 Own Ce	ertificates		10.1	IoDrv	/FTPServer (not available)			
Devices		Trusted	d Certificates			CmpM	MQTTClient (not available)			
		🚺 Unstrus	sted Certificates			Encry	pted Application (not available)			
		📜 Quaran	tined Certificates			Web S	Server (not available)			
						Encry	pted Communication (not available)			
		Certificate Set	ungs			^				
		Key length (b	it)	4096		~				
		Validity perio	d (days)	365	ок	Cancel				

- Choose 4096 as Key Length and push OK
- Creation lasts about 2-3 Minutes

~	10_V3	PLC_PRG	Struct_3	Symbol Config	ration 🥂 🖓 Security Screen :	×			
User Project Devices	<pre> Inf</pre>	PLC_AC500_V3 Own Certificates Trusted Certificates Unstrusted Certificates		Informatic Informatic Informatic Informatic Informatic	n CUA Server rvFTPServer (not available) MQTTClient (not available) rypted Application (not available)	Issued for OPCUAServer@PM5675-2ETH	Issued by OPCUAServer@PM5675-2ETH	Valid from 24.11.2020 15:28:18	Valid until 24.11.2021 1
Logout									
2									
Cycle Pow Login 500,04projet - Automation Builder 23 - For Eff. Vere Project Build Online	mium Debug Tools	Window Help BACNet ECS1850] ○ 07 5							- σ

🖉 Security Screen 🗙 📄 PLC	PRG	P. Symbol Configuration	JA_Server		PLC_AC500_V3				
User	¢	Information		11	Information	Issued for	Issued by	Valid from	Valid until
- G	1	= 1 PLC_AC500_V3		X	PC UA Server	OPCUAServer@PM5670	OPCUAServer@PM5670	03.08.2018 10:07:16	31.07.2028 10:07:16
Project		Own Certificates			IoDrvFTPServer (not available)				
Devices		Trusted Certificates			Encrypted Application (not available)				
bunds		Unstrusted Certificates			Web Server (not available)				
		Quarantined Certificates			Encrypted Communication (not available)				

• Upload the Certificate to your PC

4.2 Create certificate at UaExpert and download to AC500

A new Server Configuration is necessary

Add Server
Configuration Name
Discovery Advanced
Endpoint Filter: No Filter
 Local Local Network Microsoft Terminal Services Microsoft Windows Network Web Client Network Custom Discovery
I ← Couble click to Add Server >
Authentication Settings
Anonymous
Username Password Store
Certificate
Connect Automatically OK Cancel

Add server

Enter URL	?	×
Enter the URL of a computer with discove	ery service i	running:
opc.tcp://192.168.0.70:4840		~
ОК	Car	ncel

Mdd Server	?	×
Configuration Name PM5670		
Discovery Advanced		
Endpoint Filter: No Filter		•
 Local Local Network Microsoft Terminal Services Microsoft Windows Network Web Client Network Web Client Network Reverse Discovery Custom Discovery Couble click to Add Server > Opt.tcp://192.168.0.70:4840 Recently Used 		
Authentication Settings Anonymous 		
O Password	Store	
Certificate .		
Connect Automatically	Can	cel

• Switch to Advanced

_				
	Server Settings - PM56	70	?	×
	Configuration			
	Configuration Name	PM5670		
	Server Information			_
	Endpoint Url	opc.tcp://192.168.0.70:4840		
	Reverse Connect			
	Security Settings			
	Security Policy	Basic256Sha256		-
	Message Security Mode	Sign & Encrypt		-
	Authentication Settings			
	Anonymous			
	Username		Store	e
	O Password			
	Certificate			_
	O Private Key			
	Session Settings			_
	Session Name			
		OK	Cance	el

- UAexpert Setting
- Manage Certificates



• Create a Certificate in UAexpert

Number	Valid From	Next Update	Organization	OrganizationUnit
1				
•	Π	1		4
	II		polication Certificate	Open Certificate Locatio

New Application I	Instance Certificate			×	
Subject:					
Common Name:	LIaExpert@ACP3				
Organization:	ABB Automation Prod	ucts GmbH			
- Organization Unit:				**	
Locality:	Heidelberg				
State:	Baden			~	
Country:	DE				
	(Two letter code, e.g.	DE, US,)			
OPC UA Information	1				
Application URI: u	rn:DE-L-0235700:Unifi	edAutomation:UaExpert			
Domain Namora	DE-L-0235700				
Domain Names:				✓	
ID Addresses					
IF Addresses.				*	
Certificate Settings					
DSA Key Strength	4096 hite - Signa	ture Algorithm:	Certificate Validity		
Password protect	ct private key		continuate validity: 5 fear		
Password:	cc private key			*	
Password (repeat)					
Manage Ce Trusted Is	ertificates	suers			? <mark>x</mark>
Manage Ce Trusted Is Certificates	ertificates suers TLS Is	ssuers			8 ×
Manage Ce Trusted Is Certificates	ertificates	suers	Valid From	Valid To	2 X
Manage Ce Trusted Is Certificates Status	ertificates suers TLS Is	ssuers Name MatrikanOPC IIA	Valid From	Valid To	Organization
Manage Ce Trusted Is Certificates Status Y Truster	ertificates suers TLS Is d	ssuers Name MatrikonOPC UA Matrikon Industri	Valid From 12.08.2015 15: 17.03.2016 17:	Valid To 12.08.2025 15.03.2026	? × Organization
Manage Ce Trusted Is Certificates Status Status Trusted Own C	ertificates suers TLS Is d d Certificate	Name MatrikonOPC UA Matrikon Industri UaExpert@ACP3	Valid From 12.08.2015 15: 17.03.2016 17: 03.08.2018 09:	Valid To 12.08.2025 15.03.2026 02.08.2023	Organization ABB Automatio
Manage Ce Trusted Is Certificates Status Truster Own C	ertificates suers TLS Is d d Certificate	suers Name MatrikonOPC UA Matrikon Industri UaExpert@ACP3	Valid From 12.08.2015 15: 17.03.2016 17: 03.08.2018 09:	Valid To 12.08.2025 15.03.2026 02.08.2023	Organization ABB Automatio
Manage Ce Trusted Is Certificates Status Truster Own C	ertificates suers TLS Is d d Certificate	ssuers Name MatrikonOPC UA Matrikon Industri UaExpert@ACP3	Valid From 12.08.2015 15: 17.03.2016 17: 03.08.2018 09:	Valid To 12.08.2025 15.03.2026 02.08.2023	Organization ABB Automatio
Manage Ce Trusted Is Certificates Status Trustee Trustee Own C	ertificates suers TLS Is d d certificate III evocation Lists	Name MatrikonOPC UA Matrikon Industri UaExpert@ACP3	Valid From 12.08.2015 15: 17.03.2016 17: 03.08.2018 09:	Valid To 12.08.2025 15.03.2026 02.08.2023	Organization ABB Automatio
Manage Ce Trusted Is Certificates Status Truster Own C	ertificates suers TLS Is d d Certificate III evocation Lists Valid From	n Next Update	Valid From 12.08.2015 15: 17.03.2016 17: 03.08.2018 09: e Organiza	Valid To 12.08.2025 15.03.2026 02.08.2023 tion Org	Organization ABB Automatio
Manage Ce Trusted Is Certificates Status Trusted Own C Certificate Re Number	ertificates suers TLS Is d d d Certificate III evocation Lists Valid From	Name MatrikonOPC UA Matrikon Industri UaExpert@ACP3	Valid From 12.08.2015 15: 17.03.2016 17: 03.08.2018 09: e Organizat	Valid To 12.08.2025 15.03.2026 02.08.2023 tion Org	Organization ABB Automatio
Manage Ce Trusted Is Certificates Status Trusted Trusted Own C Certificate Re Number Certificate Re Certificate Re	ertificates suers TLS Is d d d Certificate III evocation Lists Valid From oplication Certific	Name MatrikonOPC UA Matrikon Industri UaExpert@ACP3	Valid From 12.08.2015 15: 17.03.2016 17: 03.08.2018 09: e Organization w Application Certif	Valid To 12.08.2025 15.03.2026 02.08.2023 tion Org	Organization ABB Automatio

• Copy this Certificate to your PC

• Download to AC500

Security Screen 🗙 📄 PLC	PRG	Symbol Configuration	OPC_UA_Server	1	PLC_AC500_V3	THE COM1_C	Inline_Access			
User	Φ	Information		E#	Information	Issued for	Issued by	Valid from	Valid until	Thumbprint
Project	1	PLC_AC500_V3 Own Certificates		×	2	UaExpert@ACP3	UaExpert@ACP3	03.08.2018 09:45:42	02.08.2023 09:45:42	FECFEE 16C37E33DA 1C48C53595F7E46F5AF
Devices		Trusted Certificates								
		Quarantined Certificates								

• Connect

Certificate Validation		? ×
Validating the certificate of ser	ver 'OPCUAServer@PM5670' returned an error:	
BadCertificateChainInco	mplete	
Certificate Chain		
Name	Trust Status	
OPCUAServer@PM5670	Trusted	
Certificate Details		
Errors		
Error unab	e to get local issuer certificate [BadCertificateChainInco	mplete]
Error unab	e to get certificate CRL [BadCertificateRevocationUnkno	ownl
Error unab	e to verify the first certificate [BadCertificateChainIncon	npletel
Subject		
Common Name OPCI	JAServer@PM5670	
Organization		
OrganizationUnit		-
Locality		-
State		
Country		
DomainComponent		
Issuer		
Common Name OPCU	JAServer@PM5670	
Organization		
OrganizationUnit		
Locality		
State		
Country		
DomainComponent		
Validity		
Valid From Fr 3.	lug 10:07:16 2018	
Valid To Mo 3	. Jul 10:07:16 2028	
Info		
Carriel Numelson 0		
	Trust	Server Certificate
Accept the server certificate temport	ararily for this session Continue	e Cancel

• Accept and Continue

Conn	ect Error
	Error 'BadCertificateHostNameInvalid' was returned during CreateSession, press 'Ignore' to suppress the error and continue connecting.
	Ignore Abort

- Push Ignore
- Check in UAexpert
- Settings
- Manage Certificates

📕 Mana	age Certi	ficates				? <mark>X</mark>
Trusted	Issu	ers TLS Issuers				
Certif	icates					
Stat	us	Name		Valid From	Valid To	Organiz
	Tructed	MatrikonOPC IIA V	Vrapper for COM	12.08.2015.15	12.08.2025	organiz
	Trusted	Matrikon Industrial	UA Gateway for M	17.03.2015.17	15.03.2025	
1	Trusted	OPCUAServer@PM	15670	03.08.2018 10:	31.07.2028	
	Own	UaExpert@ACP3		03.08.2018 09:	02.08.2023	ABB Aut
<	icato Dou	III				4
Cerui	w	ocation Lists]]
Nun	nber	Valid From	Next Update	Organization	Organizatio	nUnit
•	Copy Appl	III ication Certificate To.	Create new Applic	ation Certificate	Open Certifica	• Ite Location
					(ОК

5 User-management-based communication

User Management gives the opportunity to have different rights for different user groups, e.g. a user group Operator is able to see all Values in a HMI system and give some commands to the process behind. Another user group Maintenance have the same rights but in addition the group has the Right to change Parameter which have influence to the function of the process or machine.

To avoid reading of username and password from the Network it is recommended to use encrypted communication when inserting username and password.



Working with AC500 V3 and Automation Builder V2 enables a couple of opportunities:

Automation Builder

- Encryption of a project
- Working with User Groups and Users within one Project

AC500 PLC

- General User management for one PLC (mostly Login)
- Encrypted Communication for Login
- OPCUA Server (different symbol sets for different User Groups, different rights on symbols for different Groups)
- Encrypted Communication between OPCUA Client and Server
- ٠

5.1 Certificates

See also Chapter 4

5.2 Create and configure User Management at AC500



- Push the refresh Button
- You will be asked for a Username and Password
- Insert "Administrator" for Username and Password
- Then you will be asked for a new Password
- After doing this you get a Default user management System
- Be aware, that with a activated User Management always User Name and Password is needed to connect to PLC.

5.2.1 Create User Groups and User





Add Grou	p 💌
Name:	OPCUA_1
Group	members:
Gro	oupAdministrator
🔽 Gro	oupDeveloper
Gro	bup Everyone

Push "Add.." in Users Area

Add User	
Name:	User_1
Default group:	OPCUA_1
Password:	
Confirm password:	
Password strength:	Very weak Vide password
	Password can be changed by user
	Password must be changed at first login
	OK Cancel

Fill in User Name and Password

Devices 👻 🕂 🗙	Symbol Configuration	Library Manager PLC_PRG TO PLC_AC500_V3 X OPC_UA_Server
PM56xx_OPCUA_User_add_Tab	Communication Sottings	C
E-ELCLODIC V3 [connected] (PM5670-2ETH)	Communication Settings	Surphyseized model All changes are immediately developed at the device
B Q Application	PLC Settings	Users
Ubrary Manager	Version information	B-S. Administrator
Symbol Configuration	Statistics	* SUser_2
Task	Files	
IO_Bus (I/O-Bus)	Log	
COM_1 (COM 1)	PLC Shell	
CAN Serial Con (CAA Serial Com)	Users and Groups	
Ethernet (Ethernet)	Access Rights	
NetConfig (NetConfig) OPC_UA_Server (OPC UA Server)	Symbol Rights	
ETH2 (IP Settings)	PM5670-2ETH Hardware	Groups
Protocols (Client Protocols)	PM5670-2ETH Parameters	⊕ Signature ⊕ Signature ⊕ Signature Developer
Slot_1	Task Deployment	Second Seco
	Applications	St OPCUA_2
	Backup and Restore	Watch

Be sure that the Refresh Button is activated, because all the User, User Groups and Access Rights will be transferred directly to PLC and will be saved only directly in PLC.

Actual PLC User can be seen in the Headline of the Dialog.

As long as no Power Cycle is made at PLC and Automation Builder was not closed and reopened you can connect without inserting Username and Password (same User).

To change User please use Menu Online

Datei Maschine Anzeige Eing	gabe Geräte Hilfe
ABB PM56xx_OPCUA_User.project - A	Automation Builder
<u>File E</u> dit <u>V</u> iew <u>P</u> roject <u>B</u> uild	<u>Online</u> <u>Debug</u> <u>Tools</u> <u>W</u> indow <u>H</u> elp
🎦 🚔 🔚 🎒 Io a 🔥 🖞	Og Login [PLC_AC500_V3] Alt+F8
	Ctrl+F8 Logout [PLC_AC500_V3] Ctrl+F8
Devices	Create boot application [PLC_AC500_V3]
PM56xx_OPCUA_User	S Logoff current <u>d</u> evice user
🖹 🗐 PLC_AC500_V3 (PM5670-2	Download
⊟ I BLC Logic	outra diama
🖹 🚫 Application	Online Cha <u>ng</u> e
📲 📶 Library Manag	Source download to connected device
PLC_PRG (PRG)	Download Manager
	Reset warm [PLC_AC500_V3]
🖻 🔣 Task Configura	
🖻 🗇 Task	Reset cold [PLC_AC500_V3]
PLC_P	Reset origin [PLC_AC500_V3]
IO_Bus	<u>V</u> irtual Mode

Next time you want Login, you will asked for User Name and Password

5.3 Create different "Symbol Sets"



Add Symbol Configuration to Application

Push "Build" Button

Enable Symbol Sets

PM56xx OPCUA_User.project* - Automation Buil	der			
Elle Edit View Project Build Online Debug	Tools Window Help			
1	±i05 08 ⊾ = i	>	0	
Devices V X	PLC_PRG	5)	ymbol Configuration 🗙	
PM56xx_OPCUA_User	📉 View 👻 🚻 Build	🔒 S	ettings 🔻 Tools 👻	
PLC_AC500_V3 (PM5670-2ETH - TB5620-2ET	default	\checkmark	Support OPC UA features	Configure Symbol Rights
	Channed symbol and an	<þ	Include Comments in XML	
Library Manager	Changed symbol conligu		Include Node Flags in XML	
	Symbols			Vembers Comment
	🗷 🔲 📄 Constants		Configure comments and attributes	
Task Configuration	🖲 📄 📑 IoConfig_Gld		Configure synchronisation with IEC tasks	
🖃 😒 Task	🖲 🥅 📄 PLC_PRG		Optimized Layout 🔹	
PLC PRG				
IO_Bus			Enable direct I/O Access	
🗏 🕷 🚃 Interfaces			Include call information in XML	
COM_1 (COM 1)		\checkmark	Enable Symbol Sets	
🛱 💭 CAA_SerialCom (CAA SerialCon	· ·			_
CAN (<empty>)</empty>				
Ethernet				
🖃 🗊 ETH1 (IP Settings)				
MetConfig (NetConfig)				
OPC_UA_Server (OPC UA Se				
ETH2 (IP Settings)				
NetConfig_1 (NetConfig)				
Protocols (Client Protocols)				
Extension_Bus				
Slot_1 (<empty>)</empty>				
Slot_2 (<empty>)</empty>				

Rename Symbol Set "Default" to "User_1" by pushing Button and fill in Name

Image: Constants Image: Config_Globals Imag	Symbols	Access Rights	Maximal	Attribute	Type	Members	Comment	
In Config_Globals PLC_PRG Rename the selected Symbol Set Symbol-Set Name User_1	Constants	-						
Rename the selected Symbol Set Symbol-Set Name User_1	🔲 📄 IoConfig_Globals							
Rename the selected Symbol Set Symbol-Set Name User_1	E PLC_PRG							
Rename the selected Symbol Set Symbol-Set Name User_1								
Rename the selected Symbol Set Symbol-Set Name User_1								
Rename the selected Symbol Set Symbol-Set Name User_1								
Rename the selected Symbol Set Symbol-Set Name								
Rename the selected Symbol Set Symbol-Set Name User_1								
Rename the selected Symbol Set Symbol-Set Name								
Rename the selected Symbol Set Symbol-Set Name User_1								
Symbol-Set Name User_1		_						
Symbol-Set Name User_1		Rena	ame the selec	ted Symbol S	Set			
		Renz	ame the selec	ted Symbol S	Set			
		Rena	ame the selec	ted Symbol S e <mark>User_</mark>	Set			
		Rena	ame the selec	ted Symbol S e <mark>User_</mark>	õet 1			
		Rena	ame the selec	tted Symbol S e <mark>User_</mark>	Set			
		Rena	ame the selec	ted Symbol S e <mark>User_</mark>	Set			

Select symbols for Symbol Set "User_1"

Devices 🗸 🗸 🗙	Symbol Configuration	Library Mar	nager	PLC_PRG	
PM56xx_OPCUA_User_add_Tab	N View • (#) Build 🕞 Setting	s · Tools ·			
PLC_AC500_V3 (PM5670-2ETH)					
E PLC Logic	User_1			• • C	ľ
Application	Changed symbol configuration will	be transferred with	n the next dow	nload or onlir	e change
Application Applicati	changed symbol configuration will Symbol: + a Constants + b Config.Global = b Config.Global = c C C Config.Global = c C C Config.Global = c C C C Config.Global = c C C C C C C C C C C C C C C C C C C	be transferred with Access Rights	A the next dow Maximal	nload or onlin	word Word Word Word Word Word Word Word W
	🦳 🛷 Testcounter_8	*	* *		WORD
	V festcounter_9	*	ъ		WORD

Add 2. Symbol Set "User_2" by pushing Button "+" and fill in Name

Select Symbols for Symbol Set "User_2"

📉 View 👻 🔛 Build 🛛 🔒 Setting	gs 🔹 Tools 👻							
User_2			- + (] 🖉	× Confi	gure Symbol Ri	ghts	
Changed symbol configuration will	hanged symbol configuration will be transferred with the next download or online change							
Symbols	Access Rights	Maximal	Attribute	Туре	Members	Comment		
🖲 🔲 📄 Constants								
🖲 🔲 📄 IoConfig_Globals								
🖃 🔲 📄 PLC_PRG								
Testcounter_1		*		WORD				
Testcounter_10		*		WORD				
🐨 📝 🛷 Testcounter_11		*		WORD				
🐨 📝 Ø Testcounter_12	*	*		WORD				
🐨 📝 Ø Testcounter_13	*	Star 1		WORD				
V festcounter_14	St.	Star 1		WORD				
V festcounter_15	*	Star 1		WORD				
🐨 📝 🔷 Testcounter_16	*	*		WORD				
🐨 📝 💡 Testcounter_17	*	*		WORD				
🤍 🖗 Testcounter_18	*	*		WORD				
🐨 📝 Ø Testcounter_19	*	*		WORD				
Testcounter_2	_	*		WORD				
V Pestcounter_20	*	*		WORD				
Testcounter_3		*		WORD				
Testcounter_4		*		WORD				
Testcounter_5		*		WORD				
Testcounter_6		*		WORD				
Testcounter_7		*		WORD				
Testcounter_8		*		WORD				
🦳 📄 🔷 Testcounter_9		*		WORD				

5.4 Match Symbol Sets with User

• Select Symbol Rights

PLC_AC500_V3 [connect Cor	munication Settings	nistrator		
PLC Logic Application [run] PLC PLC	Settings To get started, either connect to a d	levice to upload its configuration or load a configuration from disc.	Rights:	
PLC_PRG (PRG)	on information		Groups	Access
State Symbol Configur	stics			
IO_Bus (I/O-Bus) Interfaces (Interfa				
Extension_Bus (Ext Log				
PLC	shell			
Use	s and Groups			
Acc	ss Rights			
Syn	pol Rights			
PMS	70-2ETH Hardware			
PMS	i70-2ETH Parameters			
Tas	Deployment			
App	ications			
Bac	up and Restore			
Stat	s			

Push Refresh Button

Give Access Rights for the different Symbol Sets to the User Groups

🖉 Security Screen	Symbol Configuration PLC_AC500_V3 X		
Version information		Groups	Access
	User_1	Administrator	-
Statistics	user_2	Developer	-
		Everyone	-
Files		OPCUA_1	÷
100		OPCUA_2	-
LUG		Service	-
PLC Shell		Watch	-
Users and Groups			
Access Rights			
Currh al Diabha			
Symbol Rights			

Do the same for User_2

5.5 Give Access Rights to the User Groups

Select Symbol Rights

٠

Communication Settings	📀 😂 🛃 Device user: Administrator							
PLC Settings	Synchronized mode: All changes are immediately downloaded to the device. Objects		Rights					
Version information	- Runtime objects	^		Add/R	Modify	View	Execute	
Statistics			Administrator Developer		+		+	
Files	⇒ Pictogic ⇒ Application C MiddleTetraneFinite		Everyone OPCUA_1		+	+	+	
Log	⇒ ⇒ ⇒		OPCUA_2 Service		+	+	+	
PLC Shell	— →bacuparestore		Watch		-	dla	-	
Users and Groups	Green sections Connections Connections Connections Connections							
Access Rights								
Symbol Rights	B → X509							
PM5675-2ETH Hardware	CreateSelfSignedCertificate DestateSelfSignedCertificate							
CPU-Parameters Parameters	 → ExportCertificate 							

• Modify is important, if you want to right Data from Client to PLC

5.6 Connect with UaExpert

Configuration of UaExpert is the same as with Anonymous Account

OPC UA Client can now connect with different Users

🔡 Unified Automation UaExpert - The OPC Unified A	rchitecture Client - Us	er_1	NO.				
File View Server Document Settings Help			3				
🗋 🥟 🕞 🗭 🧿 💠 🖚 🔅	(🔌 🤔 🖹	8 🗇					
Project 🗗 🗙	Data Access View						
4 📁 Project	# Server	Node Id	Display Name	Value	Datatype	iource Timestamp	Server Timestam
A Servers	1	NS4 String var NS4 String var	Testcounter_10		Null	0001-01-01T00:	0001-01-01T00:
4 Documents	3	NS4 String var	Testcounter_12		Null	0001-01-01T00:	0001-01-01T00:
Data Access View	4	NS4 String var	Testcounter_13		Null	0001-01-01 T00: 0001-01-01 T00:	0001-01-01100:
2	6	NS4 String var	Testcounter_15		Null	0001-01-01T00:	0001-01-01T00:
	7	NS4 String var	Testcounter_16		Null	0001-01-01T00:	0001-01-01100:
	9	NS4IString[var]	Testcounter 18		Null	0001-01-01T00:	0001-01-01T00:
	10	NS4 String var	Testcounter_19		Null	0001-01-01T00:	0001-01-01T00:
	11	NS4 String var	Testcounter_20		Null	0001-01-01T00:	0001-01-01T00:
Address Space & X					Enter user creco Please enter the u to the server ": Username: User Password:	dentials	
				L			

A window appears

Conn	ect Error
	Error 'BadCertificateHostNameInvalid' was returned during CreateSession, press 'Ignore' to suppress the error and continue connecting.
	Ignore Abort

Push Ignore

ų.	File View Server Document Settings Help							
1	🗋 💋 🕞 🗭 🧿 🔶 🗢 🔅	(🔌 🚨 🖹	8 👄					
	Project 🗗 🗙	Data Access View						
	🔺 🇊 Project	# Server	Node Id	Display Name	Value	Datatype	Jource Timestame Server Timestam	r Statuscode
×	Gervers Documents Data Access View	1 2 3 4 5 6 6 7 8 9 9 10	NS4String var NS4String var	Testcounter 10 Testcounter 10 Testcounter 20 Testcounter 2 Testcounter 3 Testcounter 4 Testcounter 6 Testcounter 6 Testcounter 7 Testcounter 7 Testcounter 8 Testcounter 9	45280 4552 45920 9184 13776 13858 22960 227552 32144 36735 41328	Uint16 Uint16 Uint16 Uint16 Uint16 Uint16 Uint16 Uint16 Uint16 Uint16 Uint16 Uint16 Uint16	2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107 2018-11-07107	Good Good Good Good Good Good Good Good
	Address Sance							
	No Highlight							
	Poot A							

6 Events with OPC UA

6.1 Create/program events at AC500

The CODESYS OPC UA server provides the capability of sending standard OPC UA events

- Create a new project with a PM56xx controller
- Add an "Alarm configuration" object below the application
- Add an *"Alarm class"* object below the *"Alarm configuration"*. Specify a name, for example Event

PMS650_LIA_Event_AB23		Advouledgement							
Image: Contract Co	Priority U	Acknowledgemen	method A	ox ~					
🖻 🗃 🕅 🕅 LC Logic	Archiving	-							
🖻 🔘 Application		Acknowledge	eparately						
🖻 🛅 Alarm_Configuration	Natification Actions								
- 🕭 Error	Nouncation Actions								
Event Event	Action	Activate Co	firm Details	1	Deactivation				
- 🕭 Info	Click here to add a		Click he	ere to add a new notification a.					
- 💩 Warning									
- 🔁 AlarmStorage									
- 🎷 Library Manager									
PLC_PRG (PRG)									
🖻 í Task Configuration	Details								
🗟 🥵 AlarmManagerTask									
AlarmManager.Alarm_Prg									
😑 🥵 Task									
- @] PLC_PRG									
- 🔜 10_Bus									
😑 🛍 👝 Interfaces									
COM_1 (COM 1)									
CAA_SerialCom (CAA SerialCom)									
CAN (<empty>)</empty>									
Ethernet	Barris Barris for the	Webb Internet							
🗏 🗊 ETH1 (IP Settings)	Display Options for Ala	rm Table/Alarm ban	er .						
 MetConfig (NetConfig) 	State	Fo	ıt	Back	ground Color	Bitmap	Transparent	Transparent Color	
😑 🗊 ETH2 (IP Settings)	Normal								
MetConfig_1 (NetConfig)	Active								
Protocols (Client Protocols)									
🖹 🕷 🗊 Extension_Bus									
K Slot 1 (<empty>)</empty>									

- Select the acknowledgement method "REP"
- Add an *"Alarm group"* object below the *"Alarm configuration"*. Specify a name, for example

ApplicationEvent.

.

B) PM5650_LM_Exemt_A823	• ^	Textist 🕕	ApplicationEvent	✓ Archivir	ig 🍖(none)		✓ Deactivatio	0		
⇔ 🗐 PLC Logic 😑 😳 Application 😽		ID	Observation Type	Details	Deactivation	Class	Message	Min. Pend. Time	Latch Var 1	Latch Var 2
E 🧟 Alam_Configuration			Click liere to add a liew alarm	CHOK HERE LO ADO A HEW AIATHI						
- 💩 Eient - 💩 Info										
- 💩 Warning - 💩 ApplicationEvent										
- 10 Library Manager - 11 PLC PRG (PRG)		<								>

- The new alarm group opens in the editor
- Add Events and change the following parameters:

- 🖄 Event 💌	^ Textlist	ApplicationEvent	~ Arch	ving 酸(none)		~ Deactiv	ration		
Marning	ID	Observation Type	Details	Deactivation	Class	Message	Min. Pend. Time	Latch Var 1	Latch Var 2
- MarmStorage	0	🗲 Event			📥 Event	Messagel	n/a		
ApplicationEvent	1	🞸 Event			📥 Info	<latch1></latch1>	n/a	PLC_PRG.simpleEve	
Library Manager	2	🗲 Event			🐴 Warning	<latch1></latch1>	n/a	PLC_PRG.simpleEve	
PLC_PRG (PRG)	3	🞸 Event			🕭 Error	<latch1></latch1>	n/a	PLC_PRG.simpleEve	
= 🧱 Task Configuration		Click here to add a new alarm	Click here to add a new alarm						
Se AlarmManagerTask AlarmManager.Alarm_Prg									
⊟ 🥵 Task PLC_PRG	<								T

- Add an "Visualization" object below the "Application"
- Add a "Symbol configuration" object below the application

Symbols	Access Rights	Maximal	Attribute	Туре	Members	Comment
🖃 🐨 📄 Constants						
🛛 📝 🔌 CompilerVersion	*	*		VERSION		the compiler version as defined in the build options (not OEM Customized Version!
🛛 📝 🔌 RuntimeVersion	*	**		VERSION		the runtime version number as defined by the device description.
🖲 🥅 📄 IoConfig_Globals						
🖻 🔲 📄 PLC_PRG						
- 📃 🧇 Alarm1		St.		BOOL		
- 📄 🧇 Alarm2		See		BOOL		
- 🔽 🛷 Counter1	*	St.		WORD		
🐨 📝 🛷 Eventbool	St.	St.		BOOL		
🔲 🛷 TBool		St.		BOOL		
🔷 myMapping		St.		customMapping		
🔤 🛷 simpleEvents		St.		SimpleEvent		
🔤 🛷 xChangeMapping		St.		BOOL		

- Add the library CmpOPCUAProviderAlarmConfiguration to the library manager
 - When the library is added, it connects automatically as a client to the alarm configuration and sends the events to the OPC UA server



Define FB SimpleEvent with the different Trigger Methods

-	
1	METHOD TriggerError
2	VAR INPUT
3	error:STRING;
4	END VAR
5	
_	
ī	message := error:
2	Alarmmanager, AlarmGlobals.g AlarmHandler.RaiseEvent (Alm AlarmConfiguration Alarmgroup IDs.ID ApplicationEvent, Alm ApplicationEvent Alarm IDs.ID 3);
_	
1	METHOD TriggerError
2	VAR INPUT
3	error:STRING;
4	END VAR
5	-
ī	message := error;
2	Alarmmanager.AlarmGlobals.g AlarmHandler.RaiseEvent(Alm AlarmConfiguration Alarmgroup IDs.ID ApplicationEvent, Alm ApplicationEvent Alarm IDs.ID 3);
1	🗟 BLC DBC V 🗟 SimpleEvent V SimpleEvent TriggerError V SimpleEvent TriggerError V SimpleEvent TriggerWarping 🗙 V SimpleEvent TriggerWarping Marping Marping Marping to V



Define FB CustomMapping with Method •

File E	dit View	Project	Build	Online	Debug	Tools	Window	Help	BACNet	IEC61850															
1 🚔	l 🚳 🗠	⊂× ∰	\$§ ∭	M M	湾 島	i i 🛍	OŞ Oğ	> ≡	0.00																
Devices							•	φ X	MapPriority	FINCTION	Library I	Manager		Event		Appli	cationEven	it 👔	Appl	icationEver	nt []	🚺 Li	brary Mani	iger Mann	IP.
- T	PLC AC500	_2 (<empty V3 1 (PM56</empty 	>) 570-2ETH	- TB5620-2	ETH)			• ^	2	VAR_INPU	T	K Custo	mappi	ng mer	LISPISIA I .	5 Calpor	FCOAFIO	JUCIAL	armeoni	iguraci	on.icus	COMPL	armitoop	coanapp	Jung
Ē	PLC Logi	c							3	END_VAR															
	😑 🔘 Apr	lication							5	END_VAR	01														
		Alarm_Cont	iguration						6	VAR															
		🛆 Event							8	END_VAR															
		A Info							1												_	,			
		Applicat) lionEvent																						
		AlarmSt	orage																						
	L.	Applicat	tionEvent																						
		Library Man	ager																						
	e <mark>-B</mark>	CustomMap	ping (FB)																						
		MapPric	rity																						
	Simple	Event			Cin	nleEv	ent Tr	inner	Error	- M	à	Sime	JoEv	ent T	Trioge	rInfr		ЪИ							
	Jamma			IM		IPICE V	enc.n	iggei	LITUI		M	Jimp		cinc. i	ngge										
1	METH	JD Ma	ipPr:	lori	су :	ODTI	NT																		
2	VAR_	INPU	r																						
3		5	Seve:	rityi	Aları	n	: USI	NT;																	
4	END Y	VAR																							
5	_																								
1	MapP:	riori	ty	:= Se	ever:	ityA:	larm;																		

 In the Program (for example, POU PLC_PRG), add a program call for triggering the event alarm

7	PLC_PRG 🗙 📄 SimpleEvent 🦳 SimpleEvent.TriggerError 🕅 SimpleEvent.TriggerInfo 🕅 S								
1	PROGRAM PLC PRG								
2	VAR								
з	simpleEvents : SimpleEvent;								
4	myMapping : customMapping;								
5	xChangeMapping : BOOL;								
e									
7	Eventbool: BOOL;								
8	TBool:BOOL;								
9	Counter1: WORD;								
LO	Alarm1: BOOL;								
11	Alarm2: BOOL;								
L2	END_VAR								
1	IF xChangeMapping THEN								
2	CmpOPCILProviderAlarmConfiguration.SetCustomMapping(mvMapping):								
3	xChangeMapping := FALSE;								
4	END IF								
5	simpleEvents():								
6	IF Counter1>1000 THEN								
7	<pre>simpleEvents.TriggerInfo('Hallo Welt');</pre>								
8	Counterl :=0;								
9	end if								
LO	-								
11	IF Alarml THEN								
12	<pre>simpleEvents.TriggerWarning('5010');</pre>								
L3	Alarml :=FALSE;								
L4	END IF								
L5	-								
LG	IF Alarm2 THEN								
L7	<pre>simpleEvents.TriggerError('5020');</pre>								
LS	Alarm2 :=FALSE;								
19	END_IF								
20									
21	Counterl :=Counterl+1;								
22	Eventbool :=TBool;								

• Send the project to the controller and start it

6.2 Monitoring of events with the OPC UA client "UaExpert"

- Start the "UaExpert" Program
- Click *"Server Add"*
 - The *"Add server"* dialog opens.

Server Settings - PMSt	570	ſ					
onfiguration							
onfiguration Name	PM5670						
Server Information							
Endpoint Url	opc.tcp://192.168.0.70:4840						
Reverse Connect							
Security Settings							
Security Policy	None	-					
Message Security Mode	None	-					
Anonymous Username Password		Store					
Certificate							
C Ditanta Kan							
Private Key							
Private Key Session Settings							

- Click *"Server Connect"*
- An object tree is shown in the *"Address Space"* view
- Click "Documents Add"

Project 🗗 🗙	Da	ta Access V
 Project Servers PM5670 Documents 	# 1 2	Ser PM5670 PM5670
Add Document	?	×
Event View Description:		•
This document type can be used to subscribe to even of the UA server. It supports the selection of event fir acknowledge and confirm alarms. It also supports rea historical event data for a given time period.	ts and elds an ding of	alarms d can
License Type: Runtime License There are no functional limitations.		
Address Sp	Car	ncel
Add	Car	icei

- The *"*Add documents" dialog opens
- Select the "Document Type" "Event View"
- Expand the object "Objects DeviceSet PM5670" in the "Address Space" view
- Select the object PM5670in "Address Space" and drag it to the "Event View"
- The events are displayed

Unified Automation UsExpert - The OPC Unified Architecture Client - Events_2*									
Project B X	Data ACCESS VIEW LIVER LIVER								
 ♥ Project ♥ Servers ♥ Documents ♥ Documents ♥ Data Access View ♥ Event View 	Configuration Server/Object ♥ MS670 / PM5670-2ETH ● ■ ⑤ simpleEvents ■ ⑤ conditionType ■ ⑥ ⑥ ⑥ ▲ AuditEventType ■ ⑧ ⑧ ⑧ ⑧								
	04:28:59.835 068 PM5670 / PM56 Application Hallo Welt BaseEventType								
Address Space	04:29:37.035 PM5670 / PM56 Application 5010 BaseEventType								
G No Highlight									
Root ∧ ✓ Objects ✓ ✓ Ø DeviceSet ✓ ✓ Ø DeviceSet ✓ ✓ Ø Application ✓									
 Resources Application 	Details								
	Name Value								

The described example for the Events is available from Technical Support.

7 Alarms with OPC UA

7.1 Create Alarms at AC500

The CODESYS OPC UA server provides the capability of sending Alarms from the CODESYS Alarm System via OPC UA Server

- Create a new or expand a project with a PM56xx controller
- Add "OPC UA Server"
- Add "Symbol Configuration"
 - Select the Variables related to the Alarms in the Sysmbol onfiguration
- Add an *"Alarm configuration"* object below the application
- Add an *"Alarm Group"* object below the *"Alarm configuration"*. Specify a name, for example Alarm Group, a Textlist for the Alarms will be also automatically created.

ABB PM	5650	UA_Clie	ent_	B151a.p	roject	t - Auto	omat	tion	Build	er 2.5	5 - Pr	em	ium							
File	Edi	t Vie	w	Proje	t B	Build	On	line	De	ebug	То	ools	Window	н	lelp					
1	H	9	s)	⊂ 4	6 🖓		Ъ	뛗	省	Ē.	Ap	plic	cation [OPC_	UA_S	Server	_Alarms: I	PLC Logic	- 🏙) (CŞ	Qğ - F
Devices							-	д	×	je	$\overline{\mathcal{A}}$	Μ	AlarmGroup	×	r e	Symbol (Configurati	on	Пр	LC_PRG
	PM56	50_UA_	Clier	nt_B151	3		_	-	~											
	1	PC_UA_	Ser	ver_Alar	ms (PM	45650-3	2ETH	- TB	5	Te	xt list		AlarmGrou	up						~
	<u>-</u>	PLC L	ogic								, ,		Obsenva	tion	Tune		Detail	-		
			\ppl	lication						0	·		01 Digita	ıl	ype		(PLC_P	RG.BAla	rm) = (T	RUE)
			33 / /	Marm_Co	nfigura	ation				ľ			Click here	e to a	add a	new alarm	Click h	ere to ad	ld a new	/ alarm
			1	Info		2														
			1	🔥 Warr	ing	-0														
				Ad	d obje	ect belo	ow:/	Alarn	n_Co	nfigu	uratio	'n								×
		_	-)biect (path:														
		÷.))iag	DPC U	JA Sen	ver A	larms	Plc	Loaic	:\Appl	licat	ion\Alarm Cor	nfiaur	ation					
					-	-	_			-			-	-						
			in 1	ibra (Object i	name:														
			Î P			_							Search object	0.000						_
			t <mark>e</mark> s	Sym	egones	8						<u> </u>	Search object	Tidille	c					
			1	asl	Gene	eric obje	ects						Name	5	Short [Description	Version	Order N	lumber	
			-		·· visua	alization							Alarm Clas	ss						
		6	3										Alarm Gro	up						
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				·····																
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	-6		us '	-1																
	÷	j Interf	face	s																
		K C	OM	(<																
		с при	AN	(<₽																
		≕ricta E ≣…≣	ther	TH																
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		= [Ц) Е	тн	Rese	t filter										Add	object		Close	
			1.1	A Net	antin .	2 (1)-10	ontic	-	_		Tabal			-		l'and in a sine		the second		0004 5



• Add an Alarm to the Alarm Group

Text list	AlarmGroup	~ Ar	chiving 🔞 (none)		✓ Dea	activation			
ID	Observation Type	Details	Deactivation	Class	Message	Min. Pend. Time	Latch Var 1	Latch Var 2	Higher F
0	91 Digital	(PLC_PRG.BAlarm) = (TRUE)		Error	Bool Alarm				
	Click here to add a new alarm	Click here to add a new alan							
<									>

• Add Library "CmpOPCUAProviderAlarmConfiguration, 3.5.17.0" to Library Manager

OPC_UA_Server_Alarms (PM5650-2ETH - TB5620-2ETH)	Name	Namernare	Effective Version
= 1 PLC Logic		Namespace	Lifective version
😑 🔘 Application	SLicense = 3SLicense, 3.5.17.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.17.0
🖹 📆 Alarm_Configuration	AC500_DiagCpu = DiagCpu, 1.2.1.2 (AB8)	AC500_DiagCpu	1.2.1.2
- 🙆 Error	AC500_DiagIoBus = DiagIoBus, 1.2.1.1 (ABB)	AC500_DiagIoBus	1.2.1.1
- \Lambda Info	AC500_DiagTypes = DiagTypes, 1.2.5.4 (ABB)	AC500_DiagTypes	1.2.5.4
- A Warning	AC500_Ethernet = Ethernet, 1.3.0.4 (ABB)	AC500_Ethernet	1.3.0.4
AlarmGroup	AC500_Io = Io, 1.2.2.3 (ABB)	AC500_Io	1.2.2.3
AlamStorage	AC500_IoDrvEthernet = IoDrvEthernet, 1.0.1.3 (ABB)	AC500_IoDrvEthernet	1.0.1.3
AlarmGroup	#- 📒 AC500_Pm = Pm, 1.2.6.3 (ABB)	AC500_Pm	1.2.6.3
E Diagnosis	🖲 🗈 AlarmManager = AlarmManager, 3.5.17.0 (Intern)	AlarmManager	3.5.17.0
Dian 10 But	BreakpointLogging = Breakpoint Logging Functions, 3.5.17.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.17.0
Diag V3 PLC	CmpOPCUAProviderAlarmConfiguration, 3.5.17.0 (System)	CmpOPCUAProviderAlarmConfiguration	3.5.17.0
Library Mapager	IecVarAccess = IecVarAccess, 3.5.17.0 (System)	IecVarAccessLibrary	3.5.17.0
	IoStandard = IoStandard, 3.5.17.0 (System)	IoStandard	3.5.17.0
Sumbol Configuration	💼 Standard = Standard, 3.5.17.0 (System)	Standard	3.5.17.0
B - 1996 Task Configuration	🖲 📴 System_VisuElem3DPath = VisuElem3DPath, 3.5.17.0 (System)	VisuElem3DPath	3.5.17.0
AlamMananerTask	🕸 📘 System_VisuElemCamDisplayer = VisuElemCamDisplayer, 3.5.17.0 (System)	VisuElemCamDisplayer	3.5.17.0
AlarmManager Alarm Pro	🕮 🔽 System_VisuElemMeter = VisuElemMeter, 3.5.17.0 (System)	VisuElemMeter	3.5.17.0
B-dR Task	System_VisuElems = VisuElems, 3.5.17.0 (System)	VisuElems	3.5.17.0
- dB1 PLC PRG	System_VisuElemsAlarm = VisuElemsAlarm, 3.5.17.0 (System)	VisuElemsAlarm	3.5.17.0
	🕸 🔽 System_VisuElemsDateTime = VisuElemsDateTime, 3.5.17.0 (System)	VisuElemsDateTime	3.5.17.0
B VisiFlems Visi Pro	System_VisuElemsSpecialControls = VisuElemsSpecialControls, 3.5.17.0 (System)	VisuElemsSpecialControls	3.5.17.0
SignalizationManager	System_VisuElemsWinControls = VisuElemsWinControls, 3.5.17.0 (System)	VisuElemsWinControls	3.5.17.0
WebVisu	🛎 – 📘 System_VisuElemTextEditor = VisuElemTextEditor, 3.5. 17.0 (System)	VisuElemTextEditor	3.5.17.0
- @ T_Alarm	System_VisuElemTrace = VisuElemTrace, 3.5.17.0 (System)	VisuElemTrace	3.5.17.0 🗸

- When the library is added, it connects automatically as a client to the alarm configuration and sends the Alarms to the OPC UA server
- To check the Alarms at first in the PLC with OPC server it might be helpful to add a Visu. Only for this the next steps incl. Chapter 7.2 are necessary.
- Add "VisualizationManager" object below the "Application"
- Add an "Visualization" object below the "Application" eg T_Alarm



- Insert "AlarmManager" object from Visualization Toolbox into the "T_Alarm Visu"

7.2 Check Alarms at Alarm Manager in Visu

- Set e.g. an Alarm to "True" in your Application
- Alarm must be visible in the Visu



7.3 Monitoring of Alarms with the OPC UA client "UaExpert"

- Start the "UaExpert" Program
- Click "Server Add"
 - The "Add server" dialog opens.

Server Settings - PM565	50	?	\times					
Configuration								
Configuration Name	PM5650							
Sorver Information								
Server Information			_					
Reverse Connect	opc.tcp://192.168.0.50:4840							
Security Settings								
Security Policy	None	~	1					
Message Security Mode	None		1					
Authentication Settings								
Anonymous								
Username		Store	2					
Password								
Certificate								
Private Key								
Session Settings								
Session Name								
	OK	Cance	el					

- Click *"Server Connect"*
- An object tree is shown in the "Address Space" view
- Click *"Documents Add"*

Project	8 ×	Da	ta Access Vi
✓ Ø Pro ✓ Ø	oject Servers APM5670 Documents	# 1 2	Ser PM5670 PM5670
	Add Document	?	×
	Document Type:		_
	Description:		-
	This document type can be used to subscribe to event of the UA server. It supports the selection of event fie acknowledge and confirm alarms. It also supports reac historical event data for a given time period.	s and Ids an ling of	alarms d can
	License Type: Runtime License There are no functional limitations.		
Address Sp	Add	Car	ncel

- The "Add documents" dialog opens
- Select the "Document Type" "Event View"

• Expand the object "Objects DeviceSet PM5650" in the "Address Space" view



÷

• Select the object Server in "Address Space" and drag it to the "Event View/Configuration"

Data Access View Event View		8
Configuration		▲
Server/Object		
> PM5650 / Server		
	Apply	
I he Alarms are displayed		

🗾 Unified Automation UaExpert - The OPC Unified Architecture Client - PM5650_Alarms*									
File View Server Document Settings Help	File View Server Document Settings Help								
🗋 💋 🕞 🗭 🧿 💠 📼 🗞 👂	× 🔍 🙎 😠 🗵 🗖								
Project 🗗 🗙	Data Access View Event View								
 ✓ Project ✓ Ø Servers ◇ PM5675 ◇ PM5650 ✓ Ø Documents 	Configuration Server/Object > PM5650 / Server								
🗊 Data Access View									
	Events								
	Events Alarms Event History								
	G A C R								
	A C Time Severity Server/Object SourceName Message ConditionName Active								
	✓ ▲ 08:49:56.570 96:49:56.570 96:70 PM:5650 / Server Application Bool Alarm AlarmGroup.0 Active								
New York									
Address space B' X									
Vio Highlight	4								
V Diactr									
> 📥 DeviceSet									
> 🗸 DeviceTopology									
> 💑 NetworkSet									
> 💑 Server	Detais								
> Uigure									
r 🛄 mana	Name Value								

8 AC500 V3 as an OPC UA Client

8.1 Overview

AC500 V3 with OPC UA Client



AC500 V3 with OPC UA Server

With Release of Automation builder 2.5 an OPC UA Client as Tech Preview is available

8.2 Append and configure OPC UA Client at AC500 V3

OPC UA Client enable AC500 communicate with other AC500 V3 or third party devices via the Standard Protocol OPC UA

OPC UA Client can be activated by adding the Client in the Configuration Tree or as a second opportunity to use the Library.

Using Library provide more opportunities, but need more knowledge about OPC UA. Adding to the tree is a quick and easy solution.

In this document we start with adding an OPC UAClient to the tree.

- Create a new or expand a project with a PM56xx controller
- Add "Data Source Manager" at Application



A DatasourcesTask will be automatically attached to the Task Configuration



• Add "Data Source Manager" at Application

☐		AC500_DiagCpu = Dia AC500_DiagIoBus = D	, 3.5.17.0 (35 - Sm gCpu, 1.2.1.3 (ABB iagIoBus, 1.2.1.2 (art Sottware Solutio 3) (ABB)	INS GMDH)		
Data Sources Manager	Add object below :	Data Sources Manage	er				×
 □ PLC_PRG (PRG) □ 2 ask Configuration □ DatasourcesTask □ Datasources.Datasources_PRG □ 2 Task 	Object path: PLC_AC500_V3_1 Object name:	NPIC Logic Application	DatasourcesMana <u>c</u>	jer			
	Categories	~	Search object na	me			
	Generic objects		Name	Short Description	Version	Order Number	

You will be ask

- to connect and browse a running OPC UA Server or
- open a CODESYS V3 Project (Symbol File)

Add	Data Source	×
R	The data source object can be used to attach another data source to the current PLC.	
Na	me	
Da	tasource	
Se	ect data source type	
cc	DESYS ApplicationV3	~
CC	DESYS ApplicationV3	
OP	C UA Server	

start with connecting to a running Server

🖷 Initialize (Data Source Wiz	ard - Provider sett	ings			-		×
Initialize t Set the com	the Data Sou	rce ^{meters}						
Server URI Information Online Offline	<mark>opc.tcp://192.</mark> Model Source http://opcfou	168.0.70:4840	15/07/2020 (opd	founc 🗸				
Security Message Se Security Pol	curity Mode licy	None None		~				
			Cancel	< Back	Next	>	Finis	h

AB connects to the Server and show available Symbols

📲 Initialize Data Source Wizard - Browse data items 🦳 🗕						×
Initialize the Data Choose the data items	Source					
Variables	Access right	Maximal access right	Туре			

Select the needed Symbols

📲 Initialize Data Source Wizard - Browse dat		- 🗆	×	
Initialize the Data Source Choose the data items				•
Variables Variables Variables Variables Variables Variables Variables Variables Variables Variables Variables AC500_PM56xx_2ETH Variables Var	Access right	Maximal access right	Туре	
OPC_UA_list OPC_UA_li	14 14 14 14 14 14 14	50 50 50 50 50	BOOL UINT UINT UINT UINT UINT	
✓ Insert the items structured				
	Cancel	< Back Nex	t >	Finish

Finish

• Objects for the Server will be automatically append below Data Source



• Needed Libraries will be inserted to Library Manager

1	Library Manager 🗙 🖅 Datasource		
🗄 Add	l Library 🗙 Delete Library 🛛 🖆 Properties 👘 Details 🛛 🐺 Placeholders 🖉 Library Repository	🕕 Icon Legend 📋 S	Summary
Name		Namespace	Effective Version
E	3SLicense = 3SLicense, 3.5.17.0 (3S - Smart Software Solutions GmbH)	_3S_LICENSE	3.5.17.0
🖻 📒	AC500_DiagCpu = DiagCpu, 1.2.1.3 (ABB)	AC500_DiagCpu	1.2.1.3
•	AC500_DiagIoBus = DiagIoBus, 1.2.1.2 (ABB)	AC500_DiagIoBus	1.2.1.2
🖻 📒	AC500_DiagTypes = DiagTypes, 1.2.5.5 (ABB)	AC500_DiagTypes	1.2.5.5
B 🕒	AC500_Ethernet = Ethernet, 1.3.0.7 (ABB)	AC500_Ethernet	1.3.0.7
	AC500_Io = Io, 1.2.2.5 (ABB)	AC500_Io	1.2.2.5
• <u> </u>	AC500_IoDrvEthernet = IoDrvEthernet, 1.0.1.4 (ABB)	AC500_IoDrvEthernet	1.0.1.4
_ ۱	AC500_Pm = Pm, 1.2.6.7 (ABB)	AC500_Pm	1.2.6.7
€ 🗄	BreakpointLogging = Breakpoint Logging Functions, 3.5.17.0 (3S - Smart Software Solutions GmbH)	BPLog	3.5.17.0
🖲 🖻	DatasourceAppV3 = Datasource ApplicationV3 Access, 3.5.17.0 (3S - Smart Software Solutions GmbH)	DatasourceAppV3	3.5.17.0
÷- 🖸	DatasourceOpcUa = Datasource OpcUa, 3.5.17.0 (3S - Smart Software Solutions GmbH)	DatasourceOpcUa	3.5.17.0
🖲 🗄	Datasources = Datasources, 3.5.17.0 (3S - Smart Software Solutions GmbH)	Datasources	3.5.17.0
••••	IoStandard = IoStandard, 3.5.17.0 (System)	IoStandard	3.5.17.0
i 🜔	Standard = Standard, 3.5.17.0 (System)	Standard	3.5.17.0

• Mark Variables for "Update Always"

ABB Projec	t1.project* - Automation Builder 2.5 - Premium							
File	Edit View Project Build Online Debug Tool	s Window Help						
ia 🚅 I	📕 🗗 🗠 🖓 🎊 📗 🦄 🖓 🖓 🖓 Appli	cation [PLC AC500 V3: PLC Logic]	1 🕮 1 OS OS	i = 1 ⇒ 0 0)			
								_
Devices	- 4 ×	Library Manager 🛛 🗤 🔤 D	atasource X					
= 🗿 P	oject1	Variables Type Mappings Communic	ation General and	Diagnosis				
	PLC_AC500_V3 (PM5650-2ETH - TB5620-2ETH)	🖓 Update variables						
	PLC Logic	Local variable	Access right	Update always	Create or Map	Type mapping	Remote variable	T
	Application	DeviceSet	N		¥.	DeviceSet	DeviceSet	
	Datasource	AC500 PM56xx 2ETH	50		*	AC500 PM56xx 2ETH	AC500 PM56xx 2ETH	1
	DataSources Objects	Resources	540			Resources	Resources	
	Diagnosis	Application	540			Application	Application	
	Library Manager	GlobalVars	N			GlobalVars	GlobalVars	
	PLC_PRG (PRG)	⊟ GVL	5			GVL	GVL	
	🖻 🔣 Task Configuration	Test1	54p			UINT	Test1	
	🖶 🍪 DatasourcesTask	Test2	N			UINT	Test2	
	Datasources.Datasources_PRG	Test3	N			UINT	Test3	
	🖻 🍪 Task	Test4	5 (b)			UINT	Test4	
	PLC_PRG	Test5	N			UINT	Test5	
	IO_Bus							
E	interfaces							
	COM (<empty>)</empty>							

8.3 Check Values Online

- Download Project
- Go Online

AND PM5650 UA Client B167.project - Automation Bui	ilder 2.5 - Premium		
File Edit View Project Build Online	Dabug Toole Window Halo		
🗐 🖙 📕 🚭 요 여 🖓 🖓 🕷 🧃 🤺	■ P語 Application (PLC_AC500_V3: PLC Logic) ・ 語 95 99 ト ■ 9 ● ● ●		
Devices 👻 🕂 🗙	👔 Library Manager 📄 PLC_AC500_V3 📄 OPC_UA_Server_Alarms 🐙 Datasource 🖓 Datasource 🗡 🍒 Datasource 🗙		
🗏 🔮 Task 🔍 🔹 🔺	PLC AC500 V3.Application.Datasource		
PLC_PRG	Composing	Time	Value
E 🕸 VISU_TASK		DeviceCat	value
UsuElems.Visu_Prg		ACEOD DMEEnay 2ETH	
🖲 📸 VisualizationManager		Recourses	
T_Alarm		Application	
IO_Bus		GlobalVars	
* Interfaces	= 🐠 OPC_UA_list	OPC UA list	
* N Extension_Bus	🗟 🏚 A_Word	ARRAY [0999] OF	
PLC_AC500_V3 (PM5650-2ETH - 1856.	🐠 TBool	BOOL	TRUE
Application (mus)	🐠 Tword1	UINT	41213
B Data Sources Manager	🚸 Tword2	UINT	16890
Datasource	I word3	UINT	58103
DataSources Objects	Tword4	UINT	33780
AC500_PM56xx_2ETH	I words	UINT	9457
Application (STRUCT)			
💡 DeviceSet (STRUCT)			
OPC_UA_list (STRUCT)			
e ⁹ Resources (STRUCT)			
😁 🍖 🍎 Datasource			
🚽 😸 DatasourceConstants			

Values from Server will be displayed

8.4 Take Symbols from a CODESYS Project

• At Adding Datasource "CODESYS Application V3"



Select the Project



This Initialize Data Source Wizard - Browse data items							
Initialize the Data Source	œ				_		
Choose the data items							
Variables	Access right	Maximal access right	Туре				
🖳 🔲 PLC_PRG							
🖲 🔲 📄 loConfig_Globals							
🖻 📄 📄 OPC_UA_list							
- 🔲 < Tword1		5th	WORD				
🕅 < Tword2		5 1 0	WORD				
🖳 🔷 Tword3		5th	WORD				
🖳 < Tword4		5 1 0	WORD				
📃 < Tword5		5 1 0	WORD				
🖳 🛷 TBool		*	BOOL				
😐 🔲 📄 A_Word							

Select the Symbols

Objects will be added in Tree



• Going Online is similar like connecting to a running Server

8.5 Using Library

This procedure is not part of this note





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