BECKHOFF New Automation Technology

Manual | EN

TF3520

TwinCAT 3 | Analytics Storage Provider

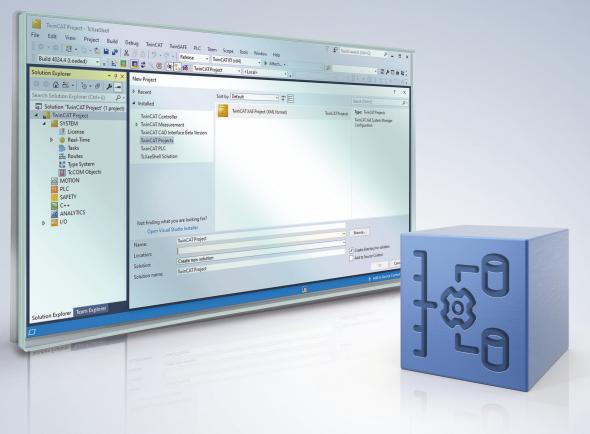


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1 Foreword

1.1 Notes on the documentation

This description is intended exclusively for trained specialists in control and automation technology who are familiar with the applicable national standards.

The documentation and the following notes and explanations must be complied with when installing and commissioning the components.

The trained specialists must always use the current valid documentation.

The trained specialists must ensure that the application and use of the products described is in line with all safety requirements, including all relevant laws, regulations, guidelines, and standards.

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The documentation has been compiled with care. The products described are, however, constantly under development.

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1.2 For your safety

Safety regulations

Read the following explanations for your safety.

Always observe and follow product-specific safety instructions, which you may find at the appropriate places in this document.

Exclusion of liability

All the components are supplied in particular hardware and software configurations which are appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

Personnel qualification

This description is only intended for trained specialists in control, automation, and drive technology who are familiar with the applicable national standards.

Signal words

The signal words used in the documentation are classified below. In order to prevent injury and damage to persons and property, read and follow the safety and warning notices.

Personal injury warnings

Hazard with high risk of death or serious injury.

WARNING

Hazard with medium risk of death or serious injury.

There is a low-risk hazard that could result in medium or minor injury.

Warning of damage to property or environment

NOTICE

The environment, equipment, or data may be damaged.

Information on handling the product

This information includes, for example: recommendations for action, assistance or further information on the product.

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2 Overview

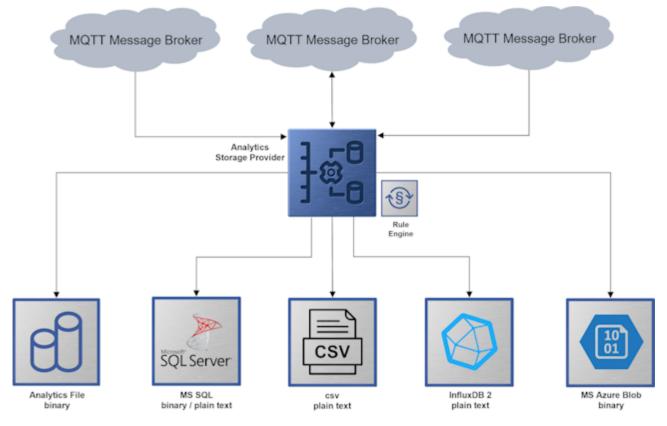
With the TwinCAT Analytics Storage Provider, Beckhoff offers a way to continuously store high-resolution data in a binary format or in plain text. The decisive factor is that the user does not have to worry about data storage. The storage provider takes care of this automatically. The configuration is done with a few clicks in engineering. Complex SQL commands are not necessary. Classic databases can be used, but also binary blob stores.

Components

- TwinCAT Analytics Storage Provider service: A Windows service that manages the communication.
- TwinCAT Analytics Storage Provider PLC Library: A TwinCAT 3 PLC library with functions for controlling the storage provider from a PLC application.
- TwinCAT Analytics Storage Provider Client: A console application with functions for controlling the Storage Provider via the command line.
- TwinCAT Analytics Storage Provider Configurator: An engineering application for configuring the various data sinks and data sources.
- TwinCAT Analytics Storage Provider Manager: An engineering application for managing the recorded data and controlling the Storage Provider.

Principle of operation

The Analytics Storage Provider receives and sends data via MQTT communication protocol. For this purpose, it is connected to a native MQTT message broker in the network and on the other side to the corresponding data sink.



Supported databases/storage

- TwinCAT Analytics Binary File [▶ 48]
- Microsoft SQL (binary format / plain text [▶ 49])
- <u>CSV file [) 51]</u>
- <u>InfluxDB [▶ 52]</u>

• Microsoft Azure Blob [• 53]

3 Installation

3.1 System requirements

The requirements of the Service and the PLC library of the Analytics Storage Provider can be found in the following tables. It is also possible to install both on one system as well.

Technical data Service	TF3520 TwinCAT 3 Analytics Storage Provider		
Target System	Windows 10, TwinCAT/BSD		
.NET Framework	.Net 4.5.1 or higher		
Min. TwinCAT version	3.1.4022.25		
Min. TwinCAT level	TC1000 TwinCAT 3 ADS		
Technical data Library	TF3520 TwinCAT 3 Analytics Storage Provider		
Target System	Windows 10, TwinCAT/BSD		
Min. TwinCAT version	3.1.4022.29		
Min. TwinCAT level	TC1200 TwinCAT 3 PLC		

3.2 Installation

Setup installation (TwinCAT 3.1 Build 4024)

The following section describes how to install the TwinCAT 3 function for Windows-based operating systems.

- ✓ The TwinCAT 3 function setup file was downloaded from the Beckhoff website.
- 1. Run the setup file as administrator. To do this, select the **Run As Admin** command in the context menu of the file.
 - \Rightarrow The installation dialog opens.
- 2. Accept the end user licensing agreement and click Next.

License Agreement Please read the following license agreement carefully.	
Software Usage Agreement for Beckhoff Software Products § 1 Subject Matter of this Agreement (1) Licensor grants Licensee a non-transferable, non-exclusive right to use the data processing applications specified in Appendix 1 hereto (hereinafter called "Software") under the conditions specified hereinafter. (2) The Software shall be delivered to Licensee on machine-readable recording media as specified in Appendix 1, on which it is recorded as an object program in an executable status. One copy of the user documentation shall be part of the application and it shall be delivered to Licensee in printed form, or also on a machine-readable recording medium or online. The form the user documentation is delivered in is specified in Appendix 1. The Software and the documentation are hereinafter called "License Materials".	
I accept the terms in the license agreement Print I do not accept the terms in the license agreement	
InstallShield < Back Next > Cancel	-

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3. Enter your user data.

₽		X
Customer Information		
Please enter your information.		
<u>U</u> ser Name:		
Max Mustermann		
Organization:		
Mustermann Inc.		
InstallShield		
	< Back N	ext > Cancel

4. If you want to install the full version of the TwinCAT 3 function, select **Complete** as the installation type. If you want to install the TwinCAT 3 function components separately, select **Custom**.

<mark>⊮</mark>	
Setup Type Choose the set	up type that best suits your needs.
Please select a	setup type.
Complete	All program features will be installed to all installed TwinCAT 3 versions on your system. (Requires the most disk space.)
Custom	Choose which program features you want installed and to which TwinCAT 3 version they will be installed. Recommended for advanced users.
InstallShield	< Back Next > Cancel

5. Click **Next**, then **Install** to start the installation.

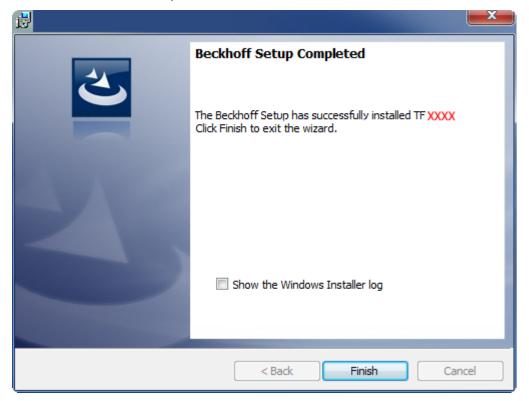
	×
Ready to Install the Program The wizard is ready to begin installation.	5
Click Install to begin the installation.	
If you want to review or change any of your installation settings, click Back. Click Cancel exit the wizard.	to
InstallShield	
< Back Install Cano	:el

⇒ A dialog box informs you that the TwinCAT system must be stopped to proceed with the installation.

6. Confirm the dialog with Yes.

TwinCAT Server Installation	83)
TwinCAT system has to be stopped before proceeding with installation. Should TwinCAT be stopped?	
Yes No	

7. Click Finish to exit the setup.



⇒ The TwinCAT 3 function has been installed successfully.

3.3 Installation under TwinCAT4026

TwinCAT Package Manager

If you are using TwinCAT 3.1 Build 4026 (and higher) on the Microsoft Windows operating system, you can install this function via the TwinCAT Package Manager, see <u>Installation documentation</u>.

Normally you install the function via the corresponding workload; however, you can also install the packages contained in the workload individually. This documentation briefly describes the installation process via the workload.

Command line program TcPkg

You can use the TcPkg Command Line Interface (CLI) to display the available workloads on the system:

tcpkg list TF3520

You can use the following command to install the Workload of the TF3520 TC3 Analytics Storage Provider function.

```
tcpkg install TF3520.AnalyticsStorageProvider.XAE
tcpkg install TF3520.AnalyticsStorageProvider.XAR
```

TwinCAT Package Manager UI

You can use the **U**ser Interface (UI) to display all available workloads and install them if required. To do this, follow the corresponding instructions in the interface.

3.4 Licensing

The TwinCAT 3 function can be activated as a full version or as a 7-day test version. Both license types can be activated via the TwinCAT 3 development environment (XAE).

Licensing the full version of a TwinCAT 3 Function

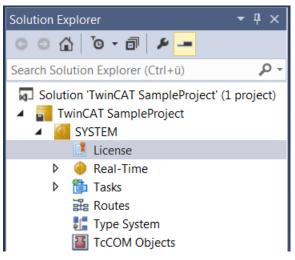
A description of the procedure to license a full version can be found in the Beckhoff Information System in the documentation "<u>TwinCAT 3 Licensing</u>".

Licensing the 7-day test version of a TwinCAT 3 Function



A 7-day test version cannot be enabled for a TwinCAT 3 license dongle.

- 1. Start the TwinCAT 3 development environment (XAE).
- 2. Open an existing TwinCAT 3 project or create a new project.
- 3. If you want to activate the license for a remote device, set the desired target system. To do this, select the target system from the **Choose Target System** drop-down list in the toolbar.
 - ⇒ The licensing settings always refer to the selected target system. When the project is activated on the target system, the corresponding TwinCAT 3 licenses are automatically copied to this system.
- 4. In the Solution Explorer, double-click License in the SYSTEM subtree.



- ⇒ The TwinCAT 3 license manager opens.
- 5. Open the **Manage Licenses** tab. In the **Add License** column, check the check box for the license you want to add to your project (e.g. "TF4100 TC3 Controller Toolbox").

Order Information (Runtime) Manage Licenses Project Licenses Online License						ne Licenses
	Disable automa					
	Order No	License			Add	d License
	TF3601	TC3 Condi	tion Monitoring	g Level 2		cpu license
	TF3650	TC3 Power	Monitoring			cpu license
	TF3680 TC3 Filter TF3800 TC3 Machine Learning Inference Engine					cpu license
				erence Engine		cpu license
	TF3810	TC3 Neura	I Network Infer	ence Engine		cpu license
	TF3900	TC3 Solar-	Position-Algori	thm		cpu license
	TF4100 TC3 Controller Toolbox			$\overline{}$	cpu license	
	TF4110 TC3 Temperature-Controller			cpu license		
	TF4500 TC3 Speech				cpu license	
	TF4500 TC3 Speech				cpu license	

- 6. Open the Order Information (Runtime) tab.
 - ⇒ In the tabular overview of licenses, the previously selected license is displayed with the status "missing".

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7. Click 7-Day Trial License... to activate the 7-day trial license.

Order Information (Runtime)	Manage Licenses	Project Licenses	Online Licenses	1
License Device Tan	get (Hardware Id)		~ Add	I
System Id:		Platfo	om:	
2DB25408-B4CD-81DF-	5488-6A3D9B49EF1	19 othe	r (91)	\sim
License Request				
Provider: Beckhoff	Automation	~	Generate File	
License Id:		Customer Id:		
Comment:				
License Activation				
7 Days Trial Li	License	Response File		

⇒ A dialog box opens, prompting you to enter the security code displayed in the dialog.

Enter Security Code						
Please type the following 5 characters: OK						
	Cancel					

- 8. Enter the code exactly as it is displayed and confirm the entry.
- 9. Confirm the subsequent dialog, which indicates the successful activation.
 - ⇒ In the tabular overview of licenses, the license status now indicates the expiry date of the license.
- 10. Restart the TwinCAT system.
- \Rightarrow The 7-day trial version is enabled.

3.5 Installing the TwinCAT/BSD

The TwinCAT 3 Analytics Storage Provider Server is available as a package for TwinCAT/BSD in the package repository. Under the package name "TF3520 Analytics Storage Provider" it can be installed via the following command:

doas pkg install TF3520-Analytics-Storage-Provider

Further information about the <u>Package Server</u> can be found in the Embedded PC section of the TwinCAT/ BSD manual.

After a system restart or restart of TwinCAT, the TwinCAT 3 Analytics Storage Provider Server is also started and can be configured by a client via MQTT.



MQTT port enabling

To use the Analytics Storage Provider and <u>Console Configurator/Client [> 99]</u> under TwinCAT/ BSD, the corresponding MQTT port must be enabled for communication. For more info see: <u>Port</u> <u>enabling under TwinCAT/BSD</u>

After installation, the Client.dll for the console is located under the path /usr/local/etc/TwinCAT/Functions/ TF3520-Analytics-Storage-Provider/Client. The Analytics Storage Provider service can be started by the following command if the license is activated:

doas service TcAnalyticsStorageProvider start

4 Analytics Workflow - First Steps

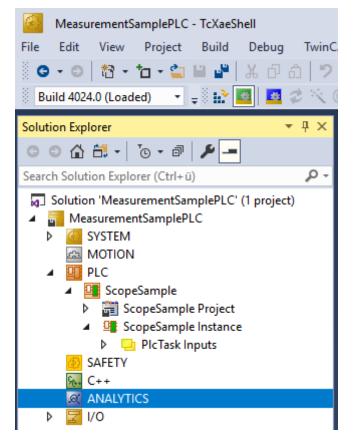
This step by step documentation presents the complete TwinCAT Analytics workflow. From the data acquisition over the communication and historizing up to the evaluation and analysis of the data and to the presentation of the data in web-based dashboard.

4.1 Recording data from the machine

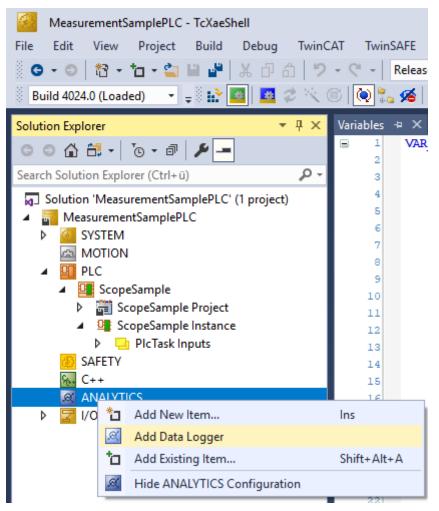
On the machine side is the Analytics Logger the recorder of process data from the machine image, PLC, NC and so on. The Logger is working in the real-time context of TwinCAT.

The TwinCAT Analytics Logger is installed with TwinCAT XAE and XAR. The Logger can act as MQTT Client to communicate the recorded data to a native MQTT Message Broker or store the data in the same data format in a local binary file. By the usage as MQTT Client the Logger is able to bypass short disconnects to the Message Broker with a ring buffer functionality. You can configure a ring buffer as well for the local binary file storage.

• To configure the Analytics Logger you have to navigate in your existing TwinCAT Project to the Analytics tree node



• Right click on this node and click on "Add Data Logger" to add one new instance to your configuration



• For configuring the base settings, please double click on the new tree item

MeasurementSamplePLC - TcXaeShell File Edit View Project Build Debug TwinCAT TwinSAFE PLC Team Scope Tools Window Help Image: Im								
Solution Explorer A MeasurementSamplePLC +> × Variables MAIN C C C C C C								
Search Solution Explorer (Ctrl+ü)	Name	Value	CS	Туре				
 Solution 'MeasurementSamplePLC' (1 project) MeasurementSamplePLC 	Data Format	ANALYTICS FORMAT FILE		ANALYTICS FORMAT				
WeasurementsamplePEC SYSTEM	Data Compression			ANALYTICS COMPRESSION				
MOTION	Max. Compression Compare Width			ANALYTICS COMPRESSION WIDTH				
A 🛄 PLC	MOTT Host Name	127.0.0.1		STRING(80)				
ScopeSample	MQTT Tcp Port	1883 DefaultMainTopic		UINT				
ScopeSample Project	MQTT Main Topic			STRING(255)				
 ScopeSample Instance PicTask Inputs 	MQTT Client ID			STRING(80)				
SAFETY	MOTT User Name			STRING(255)				
😡 C++	MQTT Password			STRING(200)				
ANALYTICS			3111110(00)					
A general description of the second descr								
Þ 🔽 I/O								

You can make your specific Analytics Logger settings

-Data Format: Binary file or MQTT stream

-FILE format: Analytics Logger stores the data in local binary files and all other settings are not necessary anymore. The files will be stored in C:\TwinCAT\3.1\Boot\Analytics.

-BINARY: Data will be sent to the configured MQTT Message Broker. You can have multiple Logger in one TwinCAT project to communicate data to different MQTT Message Broker.

-Data Compression: on (default) or off

-Max Compression: mode of the compression

-MQTT host name

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-MQTT Tcp port

-MQTT main topic for own hierarchical levels to keep the identification easy

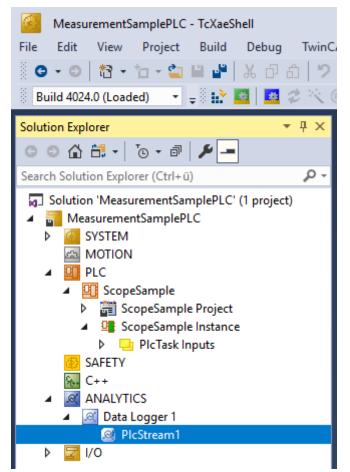
-MQTT Client ID should be unique in the network

-MQTT username

-MQTT password to make authentication at the message broker

-At the TLS (Transport Layer Security) tab, security settings can be configured. TLS is a secure communication channel between client and server. By the usage of certificates, the TCP port 8883 is exclusively reserved for MQTT over TLS. Analytics Logger is supporting the modes CA Certificates, CA Certificates & Client Certificate and Preshared Key (PSK) mode.

• If variables in your PLC application are marked in the declaration with the attribute {attribute 'TcAnalytics'} they will be shown automatically as a stream below the Data Logger tree node.



An additional device stream will be shown if your configuration provides an EtherCAT Process Image.

· In the stream a Selection tab is available to choose the variables that should be recorded

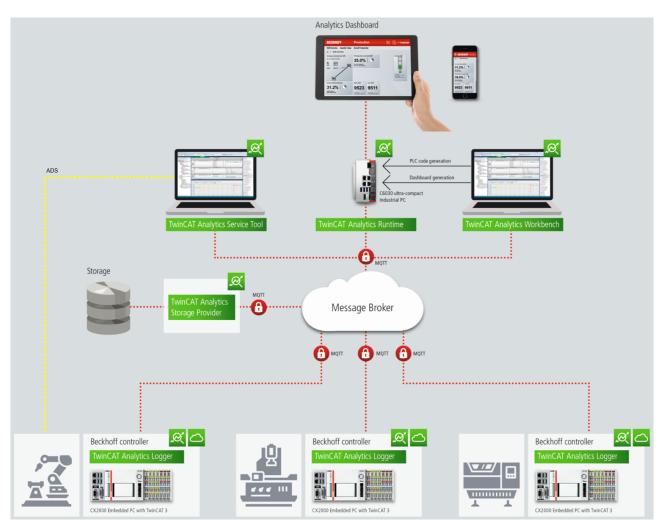
🖁 🕒 🗢 🗧 📩 🖕 🔛 🖉 🖁 🕹 🗗 白ーク	AT TwinSAFE PLC Team Scope Tools Window Help • • • Release • TwinCAT RT (x64) • • Attach • • • • • • • • • • • • • • • • • • • •
Solution Explorer 🔹 👎 🗙	MeasurementSamplePLC + X Variables MAIN
G O A A T · Sor a P / P - Search Solution Explorer (Ctrl+ü)	Online Selection Data Handling
 Solution 'MeasurementSamplePLC' (1 project) MeasurementSamplePLC SYSTEM MOTION PLC ScopeSample ScopeSample Project ScopeSample Instance SAFETY C++ ANALYTICS Data Logger 1 VO 	Stream Source: ScopeSample.ScopeSample Instance.PlcTask PlcTask Inputs MAIN b TerminalIn PlcTask Internal Variables fAM Variables fPeak Variables fPeak Variables fPsix Variables fSusternal Variables fSusterna Variables fSusterna Variables fSine Variables fSine Variables fStairs Variables fTriangular

• Finally it is possible to change the package size for the frames or to configure the ring buffer for disconnects and file in the Data Handling tab.

MeasurementSamplePLC - TcXaeShell				
File Edit View Project Build Debug TwinC	AT TwinSAFE PLC Team Scope Tools Window Help			
🕒 🖸 🕶 🖸 🗧 🏜 🚰 👗 🗗 台 🎾 🤊	- C - Release - TwinCAT RT (x64) - Attach			
🔋 Build 4024.0 (Loaded) 🛛 👻 📮 👬 🌆 🛛 🧟 🖄 🤇	🗑 🍖 🐔 MeasurementSamplePLC 🔹 <local> 🔹 🛫</local>			
Solution Explorer 👻 🖣 🗙	MeasurementSamplePLC 🗢 🗙 Variables MAIN			
© © 🏠 🛱 • To • 🗗 🌶 🗕	Online Selection Data Handling			
Search Solution Explorer (Ctrl+ü)	Data Size: (Bytes)			
 Solution 'MeasurementSamplePLC' (1 project) MeasurementSamplePLC 	Max ADS Buffer: 32 🔹 3 (KB) 32 ms			
▶ General System	Max File Size: 256 🗧 577 (KB) 8.192 s			
	Sampling Divider: 1			
ScopeSample	Autostart Stream: 🔽			
GropeSample Project ScopeSample Instance	Ring Buffer			
SAFETY	File Count: 2 1153 (KB) 16.384 s			
 K++ ▲ ANALYTICS ▲ Ø Data Logger 1 	Queue messages when disconnected			
.≪ PlcStream1	Store in file			
Þ 물 I/O	Queue Size: 0 🔶 (KB)			

4.2 Communication

Currently, the Analytics workflow is fully mappable via MQTT. The engineering tools can also access the data of the machines via ADS and carry out analyzes.



If you choose for the IoT communication protocol MQTT you have to setup a native MQTT Message Broker somewhere in the network (VM in a cloud system is also possible). This Message Broker provides a decoupling of the different applications in the Analytics Workflow.

4.3 Historicize data

After the TwinCAT Analytics Storage Provider has been installed, the service running in the background can be configured. You will find the TwinCAT Analytics.StorageProvider.Configurator application in the folder *C:* *TwinCAT\Functions\TF3520-Analytics-StorageProvider\Tools.*

TwinCAT Analytics Storage Provider Configuration Analytics Storage Provider MainTopic: Beckhoff/ TwinCAT Analytics StorageProvider ("MyDevice") Comment: Messagebroker Settings Set connection settings for message broker Storage Type: AnalyticsFile Ŧ Analytics Folder Connectionstring: \\beckhoff.com\dfs\UserHomeDir\PascalD\Storage Additional Properties Logging Trace to EventLog Additional Debug Log Analytics Storage Provider Windows Service Start Stop Automatic Stopped Ŧ Cancel Save Config OK

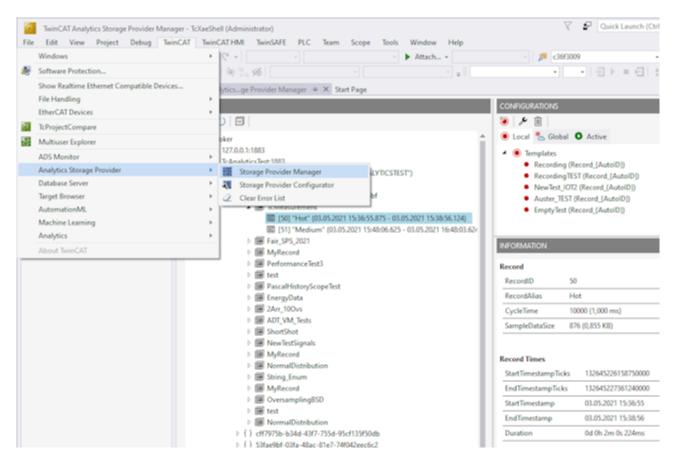
The main part of the topic can be defined in the configuration as well as the comment, which is used for identification if more than one Storage Provider is registered with the message broker.

You can make the message broker settings and decide on a storage type:

- Analytics File (binary file)
- CSV file
- Microsoft SQL (binary / plain text)
- InlfuxDB (plain text)
- Microsoft Azure Blob (Azure Cloud required)

At last you can save the configuration and start the service. The next step is to configure the specific recording. For this you should select the **Storage Provider Manager** in your development environment.

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With the Storage Provider Recorder recording definitions can be created, started and managed. In addition, it is possible to manage the data memories of individual Analytics Storage Providers. All important properties of the found Analytics Storage Providers and historized data are clearly displayed.

/ERVIEW	CONFIGURATIONS
Broker	Pipelines Live Status
 Broker 4 🛃 tcanalyticstest:1883 	
▷ 2 TwinCAT Analytics StorageProvider ("TCANALYTICSTEST")	Enfigurations MachineCenterData (Record_(AutoID))
TwinCAT Analytics StorageProvider ("Lucas-VM")	Recording (Record_(AutoID))
🕑 🥂 TwinCAT Analytics StorageProvider ("Local Hardware Test ASP")	RecMitManuel (Record_(AutoID))
🕑 🕂 TwinCAT Analytics StorageProvider ("Beckhoff_ASP_Instance42")	JustSpindleSpeed (Record_{AutoID})
🕨 🕂 TwinCAT Analytics StorageProvider ("RuleEngineDev-pre177")	A ReleasePipeline
 TwinCAT Analytics StorageProvider ("PASCALD-NB06") 	⊿ φ ⁶ / ₆ Rule (1)
MyNewCsvStore	DownsampledRecording (Record_{AutoID})
Aly File Store	
 () MultiStreams 	INFORMATION
 MachineCenterData [10] "Record 1" (20.08.2024 11:24:58.106 - 20.08.2024 11:27:58.137) 	
DownsampledRecording	Record
V 2 TwinCAT Analytics StorageProvider ("RuleEngineDev-pre4")	RecordID 10
🗠 🥰 ManuelA_VM4026_Test	RecordAlias Record_1
🔺 🛃 messagebroker2.beckhoff-cloud.com:8883	CvcleTime 10000 (1.000 ms)
🖻 🕂 New Measurement TwinCAT Analytics StorageProvider ("EC2AMAZ-7TI4E4E")	SampleDataSize 120 (0.117 KB)
V A TwinCAT Analytics StorageProvider ("CP-221DB2")	
Ø Z LOCAL CP-36AE1E (New Storage Provider)	Record Times
▷ 🥂 Test_ASP_PascalD ▷ 🥂 MaxW_Analy_StorageProvider ("EC2AMAZ-V708D9N")	StartTimestampTicks 133686194981060000
	EndTimestampTicks 133686196781370000
🚽 mb-energy01.beckhoff-cloud.com:8883	StartTimestamp 8/20/2024 11:24:58 AM
	EndTimestamp 8/20/2024 11:27:58 AM
	Duration 0d 0h 3m 0s 003ms
	Recording
	RecordName Record_1
	ASP_Topic Beckhoff/TcAnalyticsStorageProvider/617c5c9b-b9e1-43fd-acf8-af2d461ad
	Topic MachiningCenter/PlcStream3
	TopicAlias MachineCenterData {Storage: Aly File Store}
	Layout 72b78fcd-8d9c-7779-28f4-c637532ab35b

Toolbar Manager window ("OVERVIEW")

OVERVIEW				
넝	<u>×</u> 9	\heartsuit		0
1	2	3	4	5

1	Add new broker
2	Remove selected broker
3	Refresh display
4	Collapse all nodes
5	View switch between dark/light mode

Function Manager window ("OVERVIEW")

First assign a **RecorderAlias**. This helps to group the started recordings and to find its self started ones again.

After that, one or more brokers can be set up. This is done via the already known input mask for MQTT connection properties.

🚟 TF3520 Analytics Storage Provider Manager

OVERVIEW		CONFIGURATIO
경 🐉 🕐 🗐 💿		ا 🖌 🧕 🍯
 ▲ Broker ▲ 3 127.0.0.1:1883 ▲ 3 Measureme ▶ New Ar ▲ 1 New CS 	Connection Settings × Broker: 172.17.24.195 User: TestUser Pwd: ••••• Port: 1883	 Local Templation Reconnection Reconnection Reconnection New
 { } 53fa 4 { } cff79 4	CA: Pwd: Pwd:	INFORMATION Record RecordID
 ▷ ▷ ☑ TcAnalyticsTest: ▷ ☑ TwinCAT Ar 	Kev: Check Config OK	RecordAlias CycleTime SampleDataSiz Record Times
		StartTimestam

Once a connection to the broker could be established, all Analytics Storage Providers connected to it will be listed.

"Storage" status

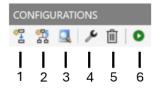
- 🔺 🗅 Broker
 - 4 🛃 127.0.0.1:1883
 - 🔺 🕂 Measurement

1 - 🕨 📒 New AnalyticsFile Stor

- 2 🔋 New CSV Store
- 3 🚦 New InfluxDB Store
- 4 🔒 New MsSQL Plain Store
- 5 🔋 New MsSQL Binary Store
- 6 🚦 New AzureBlob Store

1	Storage Online
2	Storage Offline
3	Storage starts
4	Storage starts with error. Still trying to start it
5	Storage is shut down
6	Storage is in the error state

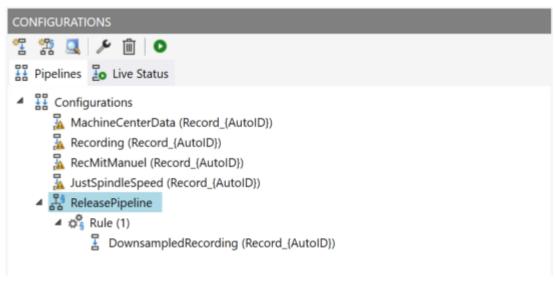
Toolbar Manager window ("CONFIGURATIONS")



1	Create a new pipeline
2	Create a new pipeline with Rule Engine
3	Open Target Browser for connecting simple pipelines
4	Edit a selected pipeline
5	Delete a selected pipeline
6	Start a selected pipeline

Function Manager window ("CONFIGURATIONS")

The window is divided into two tabs. Pipelines and Live Status. Under Pipelines you will find the configurations of your pipelines. You can define new pipelines from here. Edit existing. Delete or start.



To create a new simple pipeline, click the "Create new pipeline" button. The following dialog opens.

TF3520 Analytics Storage Provider Manager $ imes$			
TestSignals/StreamFast			
Recording Alias	Record Name		
Recording_TestSignals	Record_{AutoID}		
Record Duration	Ringbuffer Days Hours Minute	s	
0 Days 0 Hours 10 Minutes	None ~ 0 0 0		
● Store Subset of Symbols ○ Store whole process image			
Variables.fAM	LREAL	^	
Variables.fGrowSlow	LREAL		
Variables.fPeak	LREAL		
Variables.fPulse	LREAL		
Variables.fRampOnEvent	LREAL		
Variables.fSawtooth	LREAL		
Variables.fSine	LREAL		
Variables.fSquare	LREAL		
Variables.fStairs	LREAL	\sim	
	Cancel	ОК	

You can now drag and drop the symbols you want to record from the Target Browser into the dialog. You also assign a Recording Alias and a Record Name.

Various placeholders are available for the Record Name:

"{AutoID}"	
"{Topic}"	
"{SystemID}"	
"{Layout}" "{CycleTime}" "{SampleSize}"	
"{CycleTime}"	
"{SampleSize}"	
"{RecordStart}"	

You can also configure recording names and a duration (otherwise the recording will run endlessly until it is stopped manually). A ring buffer can be set according to storage space or time.

The entries are confirmed with **OK** and a new local recording definition is created.

It is now possible to start this definition directly via the toolbar or the context menu.

		CONFIGURATIONS	
		学 黎 🔍 🗡 面 💿	
		E Pipelines Live Status	
0	 Start RuleEngine Pipeline Start RuleEngine Pipeline Configurations MachineCenterData (Record_[AutoID]) Recording (Record_[AutoID]) RecMitManuel (Record_[AutoID]) Recederation (AutoID)) Recederation (Record_[AutoID]) ReleasePipeline ReleasePipeline 		
مر ≣	Edit Delete	DownsampledRecording (Record_(AutoID))	

However, it is also possible to make the definition globally accessible. This can be done via the context menu with the entry **Publish Recording**.

The following dialog then opens:

TF3520 Analytics Storage	Provider Manager		\times
Select the specific Items	s for your Recording:		
Storage Provider:	TwinCAT Analytics StorageProvider ("	PASCALD-NB06	")
Storage:	Aly File Store		
Data Messaage Broker:	Measurement Broker of tcanalyticstes	st	
I	Disable topic check.		
		Cancel	ОК

Here you can now select the desired Analytics Storage Provider via which the definition is to be published. In addition, the definition is assigned a Storage and a Data Broker of the selected Analytics Storage Provider. After the selection, the recording definition is confirmed with **OK** and published to the selected Analytics Storage Provider. This means that it can be found by any Storage Provider Manager that is connected to the MQTT Broker.

After starting a pipeline, the view automatically jumps to the second tab, the Live Status.



All active recordings from all users are listed here. The recordings can be ended in this tab and it is also possible to jump to the resulting record.

Use historized data

After and also during recording, you can select the historical data as input for your analysis in Target Browser. In the Target Browser, you will find a new control on the right side for the historical data. There you can select the timespan for your data.

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TwinCAT Analytics Storage Provider R. File Edit View Project Debug O O O Image: Storage Provider R. Build 4024.44 (Default) - - - Image: Storage Provider R.	TwinCAT TwinCAT HMI Twi	nSAFE PLC	Tea <u>m</u> Scop		(indow <u>H</u> elp Attach ↓ ↓ ↓		♥ ₽ Quick Launch (Ctrl+Q) ₽ = ■ > > = □ × > > > > > > = - > <t< th=""></t<>
Solution Explorer Team Explorer	☐ ☐ AnalyticsFile {	RecorderAlias: 1 ons 1f.demo.beckho is StorageProvid ien_TestSignals (istore 3506-aa2e-a7fc-1 ning_Center "Record_1" (18. "Record_2" (18.0 "Record_2" (18.0	inal_{AutolD}) iff-cloud-instar er ("EC2AMAZ- Record_Signal_ 64089718415b 04.2023 11:26:34 04.2023 11:57:33	nces.com:8883 -B4P9R7B") -{AutoID}) [AUTC 4.140 - 18.04.202 5.867 - 18.04.202	- ISTART] 3 11:36:34.145) 3 12:07:35.870)	Topi Topi Layo Syst Syst Reco	icAlias Machining_Center out 9c16bc6f-eT2-f47c-0b8d-2eaeb14b4328 temID aedf8c92-6306-aa2e-a7fc-64089718415b ordingAlias Record_3 ation dress Hülshorstweg 20, 33415 Verl
Target Browser TcAnalytics File TcScope File	Enter Filter				Case S	Sensitive	÷ ↓ × Filter Editor∗ ▼ ×γ
ADS TcDBSrv TMC TcAnalytics TMC TcAnalytics ↓ ↓ 172.17.62.145 ↓ 172.17.62.145 ↓ localhost ↓ ↓ addf8:02-6306-aa2e-a7fc-640897 ↓ → Live Data ↓ ↓ Live Data		MotorCurrent Type BOOL BOOL BOOL BOOL LREAL LREAL	Size 0 0 1 1 1 8 8 0 0 0 0	Category Struct Struct Struct Primitive Primitive Primitive Primitive Struct Struct	Full-Name Machinin Machinin Machinin Machinin Machinin Machinin Machinin Machinin Machinin Machinin		 ■ Inite Edució 1 1 1 1 1 2013 ■ This Week ecord. 3 (>15 m) [2023-04-18 12:13:33.824] StartTime EndTime C, 2023-04-18 12:21:37.626
Output Cross Reference List Error List							4

4.4 Importing/converting Analytics Files

In the following it is assumed that you have installed TwinCAT under "C:/TwinCAT". Otherwise, you must adjust the specified paths accordingly.

You can import recordings from the Analytics Logger stored in Analytics File Format (*Analytics.tas, Analytics- <Date>.tay*) into the Storage Provider. In general, you can convert data saved by the Storage Provider as an Analytics File into other formats. Analytics File is always the source format.

To do this, perform the following steps:

1. Save the folder with the Analytics Files in your Storage Provider location By default, here: C:\TwinCAT\Functions\TF3520-Analytics-StorageProvider\Storage\Analytics StorageProvider (create the folders manually if they do not exist)

🔄 🛃 🥃 MyData						- 🗆	\times
File Home Share View							^ (
Image: A constraint of Quick access Copy Paste Paste	Move Copy to * Cop	New item ▼ Lasy access ▼ folder	Properties	Select all Select none			
Clipboard	Organize	New	Open	Select			
← → · ↑ . « TF3520-Analytics-Stora	ageProvider > Storage > Analytic	s StorageProvider > MyD	ata	VO Search M	yData		
		A Name	^				
🖌 🖈 Quick access		Name		Date modified	Туре	Size	
		Analytics.tas	5	26.07.2018 11:41	TAS File	6 KB	
Desktop		Analytics-20	s)18-07-26T10-51-09.tay	26.07.2018 11:41 26.07.2018 11:51	TAS File TAY File	6 KB 3.561 KB	
Desktop		Analytics-20					
— •		Analytics-20	018-07-26T10-51-09.tay	26.07.2018 11:51	TAY File	3.561 KB	
Windows (C:)		Analytics-20	018-07-26T10-51-09.tay 018-07-26T10-51-26.tay	26.07.2018 11:51 26.07.2018 11:51	TAY File TAY File	3.561 KB 3.561 KB	
Windows (C:)		Analytics-20 Analytics-20 Analytics-20 Analytics-20 Analytics-20 Analytics-20)18-07-26T10-51-09.tay)18-07-26T10-51-26.tay)18-07-26T10-51-42.tay	26.07.2018 11:51 26.07.2018 11:51 26.07.2018 11:52	TAY File TAY File TAY File	3.561 KB 3.561 KB 3.561 KB	
 Windows (C:) temp_old temp GAC_MSIL 		Analytics-20 Analytics-20 Analytics-20 Analytics-20 Analytics-20 Analytics-20 Analytics-20	118-07-26T10-51-09.tay 118-07-26T10-51-26.tay 118-07-26T10-51-42.tay 118-07-26T10-51-42.tay	26.07.2018 11:51 26.07.2018 11:51 26.07.2018 11:52 26.07.2018 11:52	TAY File TAY File TAY File TAY File	3.561 KB 3.561 KB 3.561 KB 3.561 KB	
 Windows (C:) temp_old temp 		Analytics-20 Analytics-20 Analytics-20 Analytics-20 Analytics-20 Analytics-20 Analytics-20 Analytics-20 Analytics-20	118-07-26T10-51-09.tay 118-07-26T10-51-26.tay 118-07-26T10-51-42.tay 118-07-26T10-51-59.tay 118-07-26T10-52-15.tay	26.07.2018 11:51 26.07.2018 11:51 26.07.2018 11:52 26.07.2018 11:52 26.07.2018 11:52	TAY File TAY File TAY File TAY File TAY File	3.561 KB 3.561 KB 3.561 KB 3.561 KB 3.561 KB	

- 2. Open *TwinCAT*.*Analytics*.*StorageProvider*.*Configurator*.*exe*. The program can be found under the path C:\TwinCAT\Functions\TF3520-Analytics-StorageProvider\Tools
- 3. Select the Storage into which the Analytics File is to be imported and press the **DataImport** button.

STORAGE CONFIGURATIONS		
AnalyticsFile Store AnalyticsFile (0bc0552e-b3a1-4d80-81bb-08eb77bf6fd1)	÷	ſ Î
New CSV Store CSVFile (2d2ed6fe-9961-481a-a784-02e083b0fde2)	÷	<u>с</u>
New MsSQL Plain Store MsSQL_Plain (4a6d6d3b-0f10-4683-9591-72349c3f6825)	÷	<u>р</u>
New MsSQL Binary Store MsSQL (5bb93c95-ac89-4aac-89a0-09b4a27f0f59)	÷	<u>р</u>
New AzureBlob Store AzureBlob (87e3f30b-25b9-4952-9f41-800e762adce7)	÷	۵ Ü
		+

4. Then select the path to the Analytics File in the DataImport dialog and enter all other known parameters for this recording.

TF3520 Analytics St	orage Provider Data Import - To "New AnalyticsFile Store"			\times
AnalyticsFile				
Analytics File: C:	TwinCAT\3.1\Boot\Analytics\0DACDE8C-9EA6-200E-A043-B692EE317030)		
\checkmark	Unknown AlyFile			
۲	Copy data to storage 🔿 Move data to storage			
Record Info		Location		
Topic:	AnalyticsStorageProvider/UnknownAnalyticsFile	Address:		
Recording Alias:	Unknown	Latitude:	0.0	
Record Name:	Record	Longitude:	0.0	
SystemID:	53FAE9BF-03FA-48AC-81E7-74F042EEC6C2			
SystemID Alias:	Unknown AnalyticsFile			
		С	ancel	ОК

5. Press **OK** and the data import begins.

Data Import - Progress	; X	
Stor	ring	
()	
Start data import f	rom Analytics File	
Cancel	Close	

 \Rightarrow Now you can see your imported data in the <u>TwinCAT Target Browser</u> [> <u>95</u>].

⇒ You may have to wait a short time or restart your Storage Provider.

4.5 Analyse data

- ✓ Open your TwinCAT Engineering environment to start the data analysis.
- 1. Open Visual Studio® > File > New > Project...
- 2. Select the Analytics project template from TwinCAT Measurement.

New Project						?	\times
▶ Recent		Sort by:	Default 👻		Search (Ctrl+E)		ρ-
 Installed 		o—● A∩JIII.	Empty Measurement Project	TwinCAT Measurement	Type: TwinCAT Measuremen		
 TwinCAT Measure Analytics Wor Bode Plot 		2	Measurement Wizard	TwinCAT Measurement	Creates a Measurement Proje Analytics Project	ct with	a new
FilterDesigner Scope			YT Scope Project	TwinCAT Measurement			
TwinCAT Projects	;		XY Scope Project	TwinCAT Measurement			
TwinCAT Connect TcXaeShell Solution			YT NC Scope Project	TwinCAT Measurement			
	011		Digital Scope Project	TwinCAT Measurement			
			SingleBar Scope Project	TwinCAT Measurement			
			ArrayBar Scope Project	TwinCAT Measurement			
		Ŕ	Analytics Project	TwinCAT Measurement			
		₩ B	Bode Plot	TwinCAT Measurement			
Not finding what ye	ou are looking for?	Ř	Filter Designer Project	TwinCAT Measurement			
Open Visual S	-						
<u>N</u> ame:	TwinCAT Measurem	ent Proje	ct1				
Location:	C:\Users\Document	s\TcXaeSI	hell	•	<u>B</u> rowse		
Solution name:	TwinCAT Measurem	ent Proje	ct1		 Create <u>directory</u> for solution Add to Source Control 		
					ОК	Can	cel

The new project is displayed in the Solution Explorer. After clicking the Analytics Project tree node element a start window opens where you can select your first action. From here you can add a network, open the Toolbox, open the Target Browser or open the Analytics Storage Provider Recorder. In the following steps you will perform all these actions.

TwinCAT Measurement Project10 - TcXaeShell		🗸 🛃 Quick Launch (Ctrl+Q) 🛛 🖌 🗖 🗙
File Edit View Project Build Debug TwinCAT T	winSAFE PLC Team Scope Tools Window Help	
0 - 0 数 - 1 - 1 日 📲 👗 印 白 フ - C	- Debug - TwinCAT CE7 (ARMV7) - 🕨 Attach 📁 - 🗊 🖉 🗐 🗰 🎎 🛞 🖸 - 👷 🖧 🚫 👷	
Build 4024.0 (Loaded) • 📲 🔛 🔟 🖾 🖉 🔨 🌀 🎕		
	Analytics Project 👻 🗙	 Toolbox → ^a ×
○ ○ ☆ # - `o - Ø ፆ -		Search Toolbox P - Threshold String Classificator 1Ch
Search Solution Explorer (Ctrl+ü)		State Histogram 1Ch
G Solution 'TwinCAT Measurement Project10' (1 project)	TE3500 TwinCAT Analytics Workbench	Bandwidth Classificator 1Ch
WinCAT Measurement Project10 Amahdics Project	Vorbench-Dr. cdbdfe77-e2b27523d997	Time Based Envelope 1Ch
Analytics Project	Workbenchildredu eduber - ezubieter - szac-uszci asztadási	Histogram 1Ch
Inputs		Bandwidth Classificator 3Ch
	add a Network.	Curve Sketcher 1Ch
	Add a Network or select an existing from the Solution Explorer to open the Network editor tab.	Section Timer 1Ch
		▲ Analytics - Compare
	open the Toolbox.	N Pointer
	Drag Analytics-Functions to a Network editor and configure or extend a project.	Numerical Compare 1Ch
	add referenced Score.	Numerical Compare 2Ch
	uou reperance Jougnal. Create a new TC3 Scope file, which contains all Analytics variables to show them.	& Logic Operation Counter
	Create a new iCS Scope rile, which contains an analytics variables to show mem.	*X Detect String Change 1Ch
	open the Target Browser.	xX String Compare 1Ch
	Drag Analytics variables from the Target Browser to the inputs of the Analytics-Functions to add an InputStream to the project.	xX String Compare 2Ch
		#+ Multiplexer
	open the Analytics Storage Provider Recorder.	Analytics - Math
	Use the Analytics Storage Provider Recorder to manage connections to a Storage Provider and configure records.	N Pointer
		Integrator 1Ch
	deploy Runtime	1 Math Operation
	Once an Analysis is designed and tested in the Workbench, autogenerated code can be compiled and deployed to an Analytics-Runtime-System.	Tik Slope Analysis ICn
	First Steps.	Analytics - Training Base
	I as utpose Launch the documentation to get detailed information about how to start into TwinCAT Analytics.	 Pointer
		Time Based Teach Path 1Ch
		Analytics - XTS
		Pointer
		 XTS Distance Integrator 1Ch
		XTS Velocity Analysis 1Ch
		 XTS Acceleration Analysis 1Ch
		▲ Analytics - WT
		Pointer
		WT Turbulence 1Ch
		Analytics - XY Path Analysis Pointer
		Pointer X0' XY Gate Monitor 2Ch
		XY XY Gate Monitor 2Ch XY Shape Monitor Circle 2Ch
Solution Explorer Team Explorer		XY Shape Monitor Circle 2Ch
Target Browser Cross Reference List Error List Output		
T Ready		↑ Add to Source Control ◆ //

3. It makes sense to open the **Toolbox** of Visual Studio® first. There you will find all the algorithms supported by TwinCAT Analytics. Algorithms need to be grouped and organized into networks. Right-click **Analytics Project** to add a new network, or add a network using the start page. The first network is always generated by default.

2 TwinCAT Measurement Projectio - ToCaeShell	V 🗗 Quick Launch (Ctrl+Q)
Eile Edit View Project Build Debug TwinCAT TwinSAFE PLC Team Scope Iools Window Help	
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Solution TwinCAT Measurement ProjectI0 (project) dividing TwinCAT Measurement ProjectI0 (project)	Analytics - Compare
	Pointer
Network 1	Numerical Compare 1Ch
Inputs	Numerical Compare 2Ch
	& Logic Operation Counter
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	Time Based Teach Path 1Ch
	 Analytics - XTS
	Ne Pointer
	XY Shape Monitor Rectangle 2Ch
	XY Shape Monitor Triangle 2Ch
	▲ General
	Networks Networks
Solution Explorer Team Explorer WB-ID: c0bd6e77-e2b6-4e67-e32ac-b927s523d997	an item onto this text to add it to the toolbox.
Target Browser Cross Reference List Error List Output	
	↑ Add to Source Control +

- 4. When you click on the network, an editor opens. Now you can drag and drop the desired algorithm into the editor interface.
- After selecting the algorithm, you need to connect input variables to the modules (algorithm). To do this, open the Target Browser.
 TwinCAT > Target Browser > Target Browser

		TwinCAT Measurement Project10 - TcXaeShell	
	File	Edit View Project Build Debug TwinCAT TwinS/	AFE PLC Team Scope Tools Window
	æ	Software Protection	Debug - TwinCAT CE7 (ARMV7) - >
		Show Realtime Ethernet Compatible Devices 🧔 👰	
ſ		File Handling	work 1 😐 🗙 Analytics Project
ł		EtherCAT Devices	Montel P & Anolytics Hoject
	Ø	TcProjectCompare	
		Database Server +	
		Target Browser	arget Browser
		Analytics 🕨 🖉 Cl	lear Error List
		Filter Designer	
		About TwinCAT	

6. Now select the **TcAnalytics** or **TcAnalyticsFile** tab in the Target Browser. Continue with the tab **TcAnalytics** (MQTT).

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7. Click the icon highlighted in green in the toolbar of this Analytics extension. A window opens in which you can specify the connectivity data of your message broker.

Target Br	owser					Conn	ection Settings			×
ADS	TcDBSrv	TcAnalytics	TcAnalytics File	OpcUa	Enter Filter					
jag xg	0 / 0					Broker:		MyBroker		
	tcanalyticste	t		Ŧ	Name	User:		Pwd:	Port:	1883
_			pe.cloudapp.azure.co	m		🗌 Certifi	icate			
•	127.0.0.1									
						CA:				
						Cert:				Pwd:
						Kev:				
						Check (Config	[Cancel	ОК
Target Br	rowser Cros	s Reference List	Error List Output		21					

- 8. Select your MQTT Analytics client (TwinCAT Analytics Logger, TwinCAT IoT Data Agent or Beckhoff EK9160). There is a unique ID for each control. This ID is displayed in the Target Browser.
- 9. Clicking on the **gear icon**, you will get to the Machine Administration page. Here you can assign a system alias name that will be displayed in the Target Browser instead of the ID.

Machine Administration								-	
역 책 이 행									
Source	Customer	SystemID	System Alias	Online	Position	Topic Alias	Description		
• 172.17.62.145			•			•		∧ Columns ✓ Source	
TwinCAT Analytics Logger	MA Laser	3db95703-29fb-d99e-eb13-017b54677bb0	LaserPrintZG15	True				Custo	
TwinCAT Analytics Logger	MA Laser	3db95703-29fb-d99e-eb13-017b54677bb0	LaserPrintZG15	True	Laserstr. 13, 40597 Düsseldorf		MP4 Steel Laser Data	✓ System	
TwinCAT Analytics Logger	MA Laser	3db95703-29fb-d99e-eb13-017b54677bb0	LaserPrintZG15	True				Syster Broke	
TwinCAT Analytics Logger	Fertig Motors	8d1ba1d7-d295-fc94-d182-09bdae66c062		False				✓ Onlin	e
TwinCAT Analytics Logger	Fertig Motors	8d1ba1d7-d295-fc94-d182-09bdae66c062		False				✓ Positi ✓ Descr	
TwinCAT Analytics PLC DataLogger		7acc072f-428f-8745-c7d4-a24eb4f33d9c		False				Topic	
TwinCAT Analytics TEST Logger	Beckhoff	91c6eab3-1abb-5593-3651-1426874cf91f		True	Hülshorstweg 20, 33415 Verl			Topic	Alias
TwinCAT Analytics Storage Provider		c9682ee6-b654-0881-2375-de8123db1beb		True		RetroFit			
TwinCAT Analytics Storage Provider		7acc072f-428f-8745-c7d4-a24eb4f33d9c		True		AnalyticsSolution Results 1		Grouping	
TwinCAT Analytics Storage Provider		7fb4f250-c130-7d7e-0a26-71ed8cee9340		True		CloudControl		Custo	
TwinCAT Analytics Storage Provider		3db95703-29fb-d99e-eb13-017b54677bb0	LaserPrintZG15	True				System	
TwinCAT Analytics Storage Provider		3db95703-29fb-d99e-eb13-017b54677bb0	LaserPrintZG15	True		TestSignals whole Image		Syster	
TwinCAT Analytics Storage Provider		c5ee6cfd-4f14-5f45-dce4-7524715a9ae3		True		DataAgent Test		Onlin	e
TwinCAT Analytics Storage Provider		3f8a342a-6fac-3e76-6172-e7b5f62c0eb0		True		Bigl40 FavValues		Positi	
TwinCAT Analytics Storage Provider		a313c550-7537-0617-827d-c6930e90d931		True		EK Test2		Descr	
TwinCAT Analytics Storage Provider		d180ddde-afea-78d2-9ac1-65101d008687		True		NewMachineApp		Topic	Alias
TwinCAT Analytics Storage Provider		3db95703-29fb-d99e-eb13-017b54677bb0	LaserPrintZG15	True		LongTerm			
TwinCAT Analytics Storage Provider		3db95703-29fb-d99e-eb13-017b54677bb0	LaserPrintZG15	True		MyFavoriteData			
TwinCAT Analytics Storage Provider		56cfbec6-3ab5-c1cc-1a1d-e6f4da86adf0		True		EdgeComputingTc2			
TwinCAT Analytics Storage Provider		56cfbec6-3ab5-c1cc-1a1d-e6f4da86adf0		True		EdgeComputingTc3		~	

10. In the next step, you can choose between live data and historical data for each MQTT Analytics client. In this case, the historical data is provided by the TwinCAT Analytics Storage Provider.

TwinCAT Measurement Project10 - TcXaeShell								7 5	Quick Launch (Ctrl+Q)
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Analytics Project	T I	T							Edge Counter OnOff 2Ch
Edge Counter 1Ch_1	_					Last Event	01/01/2000 01:00:00.000	J	Event Timing Analysis 1Ch
Threshold Classificator 1Ch_1			Th	reshold Classificator 1Ch				≪ G V)	Event Timing Analysis 2Ch
 Inputs 	Input		× 0	Level OK / Warning:	2350	Class	NotInitialized		Timing Analysis 1Ch
 Example 1.00ms Example 2.00ms 		- 1	U.S.	-					S Lifecycle Analysis 1Ch
TimeLine @ tcanalyticstest: TestSignals/Stre				Level Warning / Alarm:	2500	Last Event Warni	01/01/2000 01:00:00.000		Lifetime Analysis 1Ch
👔 Variables./Pulse @ tcanalyticstest: TestSigna						Last Event Alarm	01/01/2000 01:00:00.000		Min Max Avg 1Ch
	<u> </u>								Min Max Avg Interval 1Ch
									Moving Average 1Ch
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									1 Time Clock 1Ch
									Continuous Piece Counter 1Ch
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									 Analytics - Classification
		1							le Pointer
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4 · · · · · · · · · · · · · · · · · · ·		1							Threshold String Classificator 1Ch
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14 M 0 / 0	Variables > fPulse >	-							
🔺 👄 tcanalyticstest	A Name				iubitems Unit		et Attributes (Instance) Attrib		Â
A 🚽 LaserPrint-HTZ3	Balager Square Balager Stairs		Array Variable Array Variable		10	4896 2976	none none		
→ Live Data			Array Variable Array Variable		10	2976	none none		
TestSignals/StreamFastCompressed_Wdth8	W bEdge		Primitive Variable		10	3350	none none		
TestSignals/StreamFastCompressed_Wdth32	W bMattEvent		Primitive Variable		,	336	none none		
TestSignals/StreamFast	68 fAM		Primitive Variable		,	544	none none		
Historical Data	64 fGrowSlov		Primitive Variable)	416	none none		
8d1ba1d7-d295-fc94-d182-09bdae66c062	@ fPeak		Primitive Variable			608	none none		
c9682ee6-b654-0881-2375-de8123db1beb	@ fPulse	LREAL 8	Primitive Variable	i.f)	672	none none	2	
7acc072f-428f-8745-c7d4-a24eb4f33d9c	→ → → → → → → → → → → → →	LREAL 8	Primitive Variable	.f)	352	none none		
Target Browser Cross Reference List Error List Output									
Ready									🛧 Add to Source Control 🔺 🔬

- BECKHOFF
- 11. You can drag and drop the variables into the inputs of the specific algorithm. In most algorithms, conditions such as thresholds, time intervals, logical operators etc. can be specified. These settings are made in the middle of each module.

Solution Explorer 🔹 🕂 🗙	Network 1*	😐 🗙 Analytics I	Project*					-
○ ○ 🏠 📩 - ⁷ ○ - @ 🗲 🗕				Networks				\bigtriangledown
Search Solution Explorer (Ctrl+ü)				Edge Counter 1Ch1				& G ∇)
 Solution 'TwinCAT Measurement Project10' (1 project) TwinCAT Measurement Project10 		Input	Variables.fPulse @ tcanalyticstest: TestSi ~ EMPTY	Threshold Edge	_ 1	Edge	FALSE	
Analytics Project						Count	0	
Network 1 Edge Counter 1Ch 1						Last Event	01/01/2000 01:00:00.000	
Threshold Classificator 1Ch_1		•		Th eshold Classificator 1	Chi			<i>∝</i> ⊂ ⊽
∡ [™] Min Max Avg Interval 1Ch_1		Input	Count @ Edge Counter 1Ch_1 v 0	Level OK / Warning:		Class	NotInitialized	
 Inputs tcanalyticstest: TestSignals/StreamFast [1.00ms] 	0			Level Warning / Ala	rm: 2500	Last Event Warni	01/01/2000 01:00:00.000	
TimeLine @ tcanalyticstest: TestSignals/Stre Variables.fGrowSlow @ tcanalyticstest: TestSignals/Street:						Last Event Alarm	01/01/2000 01:00:00.000	
Variables.fOrdwslow @ tcanalyticstest: TestSigna				Mn Max Avg Interval 10	561			
		Input	Variables.fGrowSlow @ tcanalyticstest: T 🕤 0	Interval	Minutes ~ 1	Min	0	
						Max	0	
	<u>ح</u>					Avg	0	
	1					Time Min	01/01/2000 01:00:00.000	
						Time Max	01/01/2000 01:00:00.000	
						Current Interval	00:00:00:000	
				-				
<			2ac-b927a523d997					

⇒ Finally, your first Analytics Project is complete. To start the analysis, click Start Analytics. To stop the analysis, click Stop Analytics.

TwinCAT Measurement Project10 - TcXaeShell File Edit View Project Build Debug TwinCAT Ti •	Debug	LC Team Scope - TwinCAT CE7 (- الم		· [문 = 린 : ? :	▶ ■ ▲ ▲ ◎ > ■ ○ ▲ ▲	Stop Analytics	7 5
Solution Explorer	Network 1*	+ X Analytics Projec	t.	'25.2	7 MB' received (1.58 M Networks	∕IB/s)			▼ ▼
Solution TwinCAT Measurement Project10 (1 project) TwinCAT Measurement Project10 Mahytics Project Network 1 Fage Counter 1Ch_1	Ţ	Input 1	ariables.fPulse @ tcanalyticstest: TestSi 🔗	1	Edge Counter 1Ch1 Threshold Edge	j 1	Edge Count Last Event	False 16 18/11/2019 15:41:59.635	& C, ∇
Threshold Classificator 1Ch_1	(The second sec			Thr	eshold Classificator 10	Ch1			~ ⊂ ⊽)
		Input C	Count @ Edge Counter 1Ch_1	16	Level OK / Warning:	2350	Class	1	
 Eanalyticstest: TestSignals/StreamFast [1.00ms 	00				Level Warning / Alar	rm: 2500	Last Event Warni	01/01/2000 01:00:00.000	(
TimeLine @ tcanalyticstest: TestSignals/Stre Variables.fGrowSlow @ tcanalyticstest: TestS							Last Event Alarm	01/01/2000 01:00:00.000	
👔 Variables.fPulse 🕲 tcanalyticstest: TestSigna				Mi	n Max Avg Interval 1C	h1			&∕ ⊊ ⊘
		Input V	'ariables.fGrowSlow @ tcanalyticstest: T 🕤	56274	Interval	Minutes ~ 1	Min	0	
							Max	0	
	ァ						Avg	0	
	\checkmark						Time Min	01/01/2000 01:00:00.000	
							Time Max	01/01/2000 01:00:00.000	
							Current Interval	00:00:00:000	

⇒ Before starting the analysis or during runtime, you can click the Add Reference Scope button. This will automatically create a Scope configuration that matches your Analytics project.

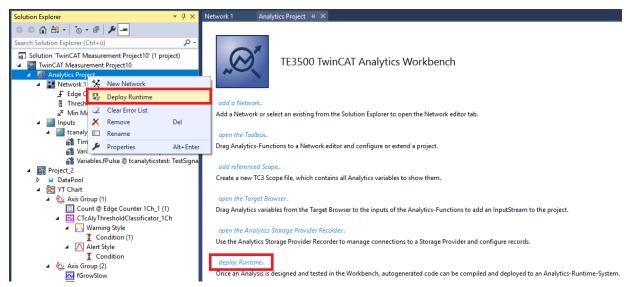
TwinCAT Measurement Project10 - TcXaeShell									7 8
<u>File Edit View Project Build D</u> ebug TwinCAT T	fwinSAFE P	LC Tea <u>m</u> Scope <u>T</u> ools <u>V</u>	<u>√</u> indow <u>H</u> elp						
◎ • ◎ 🏦 • 🖆 • 🚔 💾 🖓 🕹 🗇 . ◎	- Debug	 TwinCAT CE7 (ARMV7) 	- 🕨 Attach	- 🎜		- 10	ه 📾 🖓 🖌 ا	🗴 🖸 📲 📮 🖉 🖉 🖕	
🔋 Build 4024.0 (Loaded) 🔹 🚽 🔛 🔟 🖉 🔍 🔘 🍳	2.96				• • - - - - - -	- * ?	t ⊨ Ö 🖆		
Solution Explorer - T ×	Network 15								-
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Search Solution Explorer (Ctrl+ü)							Last Event	18/11/2019 15:51:44.635	^
Solution 'TwinCAT Measurement Project10' (1 project) TwinCAT Measurement Project10								10/11/2015 15:51:44:055	
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A Metwork 1		Input Count @ Edg	e Counter 1Ch_1 Y 60	0	Level OK / Warning:	420	Class	3	
Edge Counter 1Ch_1	00				Level Warning / Alarm:	450	Last Event Warni	18/11/2019 15:48:44.636	
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🖌 📑 tcanalyticstest: TestSignals/StreamFast [1.00ms		Input Variables.fGro	wSlow @ tcanalyticstest: T 💉 56	277	Interval Minutes	× 1	Min	56273	00 G V
TimeLine @ tcanalyticstest: TestSignals/Stre		input innoicinoic	in the contribution of the		Windes		Max		
Variables.fGrowSlow @ tcanalyticstest: TestS Variables.fPulse @ tcanalyticstest: TestSigna								56279	
 Project_2 							Avg	56276	
🕨 🚔 DataPool	∎¥						Time Min	18/11/2019 15:51:12.913	
A 🔀 YT Chart							Time Max	18/11/2019 15:51:19.313	
 Axis Group (1) Count @ Edge Counter 1Ch_1 (1) 							Current Interval	00:00:00:000	
CTcAlyThresholdClassificator_1Ch		6e77-e2b6-4e67-a2ac-b927a523d997							
 Warning Style 	_								
Condition (1) Alert Style	Project_2* +								-
I Condition	YT Chart								4 Þ
🔺 🕵 Axis Group (2)		45.185:000 End: 15:51:45.185:000				, 2019			
fGrowSlow		0.00:01:00.000:000	0.00:06:36.000:000 🍈 🖏	🕂 😳 🕩	🕺 🔒 🕐				
Avg @ Min Max Avg Interval 1Ch_1 (1) Axis Group (3)									A
Fulse	600.0 -	1			1		Ĩ		1
🖌 🕂 Trigger									<u>м</u>
A Last Event Alarm @ Threshold Classificator 1CF	300.0 -								2
 A Last Event Warning Threshold Classificator 1									•
11	56280.0 -	1 r	·····	<u>^</u>	·····		······		
				$\cap \mathbf{R}$	$\sim \sim \sim$	\cap		$\sim \sim$	
	56272.5 -					<u> </u>	\sim		
	30272.3=								
	1.0-								
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4	0.0-			nnnnnn					JÜUUUUU
Solution Explorer Team Explorer	0	:00m 0:06m	0:12m 0:18m	0:24m	0:30m	0:36m	0:42m	0:48m	0:54m 1:00m

⇒ The analysis results can be displayed in the Scope View graphs using drag-and-drop. For example, a mean value can be displayed as a new channel in the view. Timestamps as markers on the X-axes show significant values.

4.6 24h Analytics application

The last major step in the TwinCAT Analytics workflow is the continuous 24-hour machine analysis. It runs in parallel with the machine applications in the field. To make this very easy, the TwinCAT Analytics Workbench can automatically generate PLC code and an HTML5-based dashboard of your Analytics configuration. Both can be downloaded into a TwinCAT Analytics Runtime (TC3 PLC and HMI Server) and provide the same analysis results as the configurator tool in the engineering environment.

✓ First, save your configuration and open the Analytics Deploy Runtime Wizard. This can be done from the context menu in the Analytics Project tree item or from the start page.



1. When the wizard is open, you can click through some tabs. The first one is called Solution. Here you can decide how your Analytics project should be used in the PLC code: As... completely new solution.

part of an existing solution. update of an existing Analytics solution.

Deploy Analytics Runtin	ne	X
Codegeneration: Late	est Version ("Version 2.1")	
Solution TwinCAT PL	LC Target Results HMI Dashboard Visual Studio Summary	
 Create new Soluti 	ion	
Solution Path:	C:\temp\Analytics\Test	
Solution Name:	Production	
Project Name:	MachineAnalysis	
Add to existing So	olution	
Solution Path:		
Project Name:	AnalyticsProject	
Merge to existing	Project (TwinCAT Project Compare)	
Solution Path:		
Project Name:	•	
	Cancel Back Next	

 In the TwinCAT PLC Target tab you can select the ADS target system that runs the TwinCAT Analytics Runtime (TF3550). The created project is immediately executable. For this purpose you can set the Activate PLC Runtime option. In addition, it can be selected that a boot project is created directly.

Deploy Analytics Runtime	X
Codegeneration: Latest Version ("Version 2.1")	
Solution TwinCAT PLC Target Results HMI Dashboard Visual Studio Summary	
Target System: <local> (172.17.251.113.1.1) ▼</local>	lootproject
ADS Port: 851 🛛 Activate	PLC Runtime
Tasks	
"AnalyticsTask": 10 ms	
"AnalyticsHistoricalTask": 10 ms (Generate if historical data sources are available)	
Real-Time	
Available CPU cores (Shared/Isolated) 4 🚔 2 🚔	
AnalyticsTask: Core0 (Shared)	
AnalyticsHistoricalTask: Core5 (Isolated) (If generated)	
	~?
F-6	
	5
Cancel Back	Next

3. Especially for virtual machines, it is important to run the project on isolated cores, which is also an option in this tab. The next tab **Results** is needed only if you have selected the **Stream Results** option in the algorithm properties. If you want to send results, you can decide here in which way (locally in a file/ through MQTT) and which format (binary/JSON) this should be done. This is also generated automatically and executed immediately after activation.

Deploy Analytics Runt	me	X
Codegeneration: La	atest Version ("Version 2.1")	
Solution TwinCAT	PLC Target Results HMI Dashboard Visual Studio Summary	_
🔘 Create no Resu	lts	
Stream Results	to MQTT Broker	
Topic:	Analytics/Analysis/ResultStream	
MQTT Co	nnection Settings Json Format 👻	
Write Results to	Analytics File	
File Path:		
Max File Size:	256 Sample buffer count	
Select Result It	ems CycleTime: User specified cycle time 💌 5000 🚑 ms	
	Cancel Back Next	

Downsampling of the results is possible by specifying a cycle time. The next tab is for the **HMI Dashboard**. A prerequisite for the automatic generation of the dashboard is the selection of HMI Controls for the corresponding algorithms whose results are to be displayed in the dashboard.

Codegeneration: Latest V	ersion ("Version 2.1")	
Solution TwinCAT PLC T	arget Results HMI Dashboard Visual Studio Summary	
HMI generation Settir	gs	
📝 Generate HMI Da	shboard 🛛 🔲 Create only HMI Project (no PLC)	
HMI Project Name:	MachineDiag	
Dashboard Options		
Dashboard Title:	Machine Diagnosis	E
Desktop Height:	864 Desktop Width: 1920	
📝 Generate Reset B	uttons on Dashboard	
🔽 Create Startpage		
Dashboard Styles		_
Dashboard Layout:	Dashboard Sorting:	
Witho	ut Dock Control Type	
	📝 Use custom Background Image	-
	Cancel Back	Next

4. You can choose different options for your Analytics Dashboard, such as a start page with a map, layouts, sorting algorithms, custom colors and logos. If you select multiple languages for the Analytics Controls, a language switching menu will also be generated.

De	ploy Analytics Runtime			×
	Codegeneration: Latest V	/ersion ("Version 2.1	1") 💌	
	Solution TwinCAT PLC 1	arget Results H	HMI Dashboard Visual Studio Summary	_
	Dashboard Styles			•
	Dashboard Layout:		Dashboard Sorting:	
	With	out Dock	Control Type	
			Use custom Background Image	
	Dashboard Theme:	Shiny 🔻	C:\TwinCAT\Functions\TE3500-Anal	
	Select Color:	Header Color	Use custom Logo	
	Control Style:	Flat	No valid file	=
	Languages			
		<mark>hinese</mark> 📄 Belgia alian 📄 Finnisl		•
			Cancel Back Next	

5. Select one of the installed versions of Visual Studio® and, whether the instance should start visibly or just be set up and activated in the background.

Deploy Analytics Runtime
Codegeneration: Latest Version ("Version 2.1")
Solution TwinCAT PLC Target Results HMI Dashboard Visual Studio Summary
TwinCAT XAE Shell ▼ TwinCAT XAE Shell ▼ Visual Studio 2017 ▼
Visual Studio 2017
Cancel Back Next

BECKHOFF

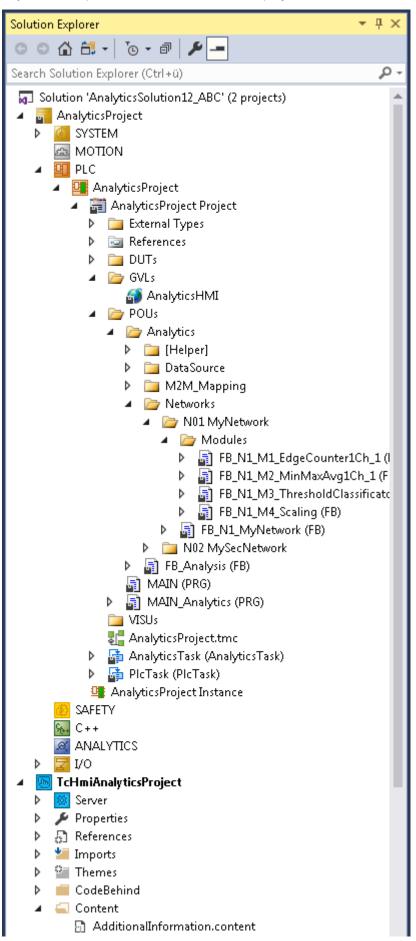
 \Rightarrow At last you can find an overview.

De	eploy Analytics Runtime	
	Codegeneration: Latest Version ("Version 2.1")	
	Solution TwinCAT PLC Target Results HMI Dashboard Visual Studio Summary	
	Solution	
	Mode: "NewSolution"	
	ProjectName: "MachineAnalysis"	
	SolutionName: "Production"	
	Path: "C:\temp\Analytics\Test"	
	WinCAT PLC Target	
	AnalyticsTask => CPU Core: "4"	
	Target: " <local> (172.17.251.113.1.1)"</local>	
	Runtime: "851"	
	AnalyticsTask: "10"	
	Activate Runtime: "True"	
	Create Bootproject: "True"	
	AnalyticsHistoricalTask: "10"	
	AnalyticsHistoricalTask => CPU Core: "5"	
	Shared CPU Cores: "4"	
	Isolated CPU Cores: "2"	
	Results	
	Result cycle time: "10000000"	
	ResultTopic: "Analytics/Analysis/ResultStream"	
	BrokerSettings: " <unconfigured connectionsettings="">"</unconfigured>	
	Cancel Back Deploy	

6. Now you can click the **Deploy** button to start the generation process. The PLC project and the HMI dashboard are now generated.

Deploy	Analytics Runtime		\mathbf{x}
	Message		^
	Activate TwinCAT Configuration Restart TwinCAT Start generating HMI Create TwinCAT HMI Project		
	Cancel	Close	
Deploy	Analytics Runtime		X
Deploy	Analytics Runtime Message		×
Deploy	-		
	Message Restart TwinCAT Start generating HMI Create TwinCAT HMI Project Create HMI Contents Modify HMI template Set theme Import selected languages Set ADS Route Start symbol mappings for: TrafficLight Start symbol mappings for: Average Start symbol mappings for: TrafficLight Start symbol mappings for: SingleValue Create Control: TrafficLight for Status Create control: TrafficLight for Threshold Classificator 1Ch_2	Close	

After the "Deploy Runtime succeeded" message, you will find a new Visual Studio®/XAE shell instance on your desktop. The new Solution and both projects are created.



5 Technical introduction

The basic idea of the TwinCAT Analytics Storage Provider (ASP) is to have a gateway that largely frees the user from configuring a data sink, i.e. a storage or a database. The user does not need to set up his own table structure in a database. He only has to configure which of the supported data sinks he wants to use for storing his data.

Service Management

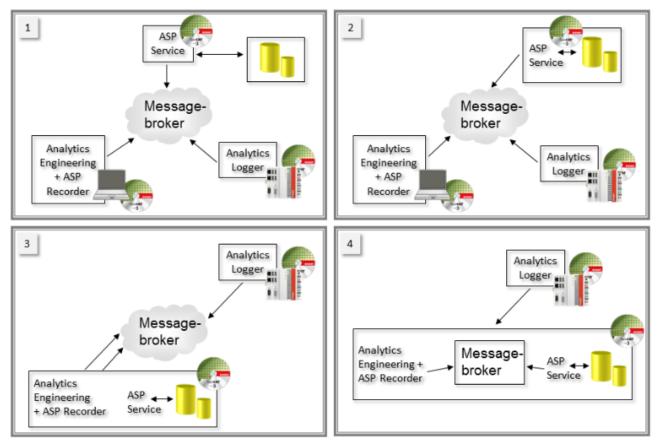
The Analytics Storage Provider service can run anywhere on the network. It is implemented as a Windows service. The service can run on hardware devices, such as industrial PCs or embedded PCs in the local network, and also on virtual machines in the same network, or in a cloud system, for example.

Data Management

The Storage Provider works with the binary format of TwinCAT Analytics. This allows it to receive and store streams from an MQTT message broker and to create and send new streams itself. The user only needs the recorder, which is integrated with the TwinCAT Analytics Workbench or the service tool in his own engineering system. The variables themselves are displayed in the TwinCAT Target Browser. For the Analytics binary format, they are divided into live and historical data. Live data can be used as input to the Analytics Storage Provider. Historical data are the values from the database/storage provided by the Storage Provider.

Topologies

The many degrees of freedom offered by IoT technologies enable different topologies. The following picture shows the most important constellations.



- 1. Each SW package runs on its own HW device or virtual machine.
- 2. The Analytics Storage Provider Windows service runs on the same device as the database/storage.
- 3. Analytics Engineering, Analytics Storage Provider, and database or storage are on the same device. Only the Message Broker and Analytics Logger (data source) run on other devices.

4. In this topology view, only the Analytics Logger runs on its own PC. This may be the case in a machine application. All other tools in the Analytics tool chain reside on one device, including the MQTT message broker.

Topologies with additional ASP clients

Currently, two additional clients are available from the Analytics Storage Provider perspective. A command line based client that allows execution from almost any application. And a PLC library that can also be used to influence the actions of the storage provider.

6 Configuration

The configuration of the Analytics Storage Provider is divided into two main parts. First, you need to configure the service with its stores. This is done in the TwinCAT Analytics Storage Provider Configurator. You must also configure the recordings and pipelines yourself. In other words, which variables should be stored in which stores under which conditions. To do this, go to the TwinCAT Analytics Storage Provider Manager. In this chapter you will also find the supported databases and storages.

6.1 Configurator

You can configure the service with its message brokers and stores in the TwinCAT Analytics Storage Provider Configurator. A distinction is made between a Host Message Broker and various Data Message Brokers. A Host Message Broker can also be a Data Message Broker at the same time. The Host Message Broker is special because this is where the Storage Provider's service registers.

TF3520 Analytics Sto	ige Provider Configurator		- U X
GENERIC CONFIGURATI	NS		
Connectivity			
Provider Alias:	winCAT Analytics StorageProvider ("	Beckhoff_ASP_Instance42")	
Main Topic:	eckhoff/		
Host Message Broker:	Alias: Cloud		Check Connection
	Broker:	TcAnalyticsTest	
	User: Pw		
	Certificate		
Logging		Service	
Additional Debug	Log	Manual 🗸 Start	Stop Running
ADDITIONAL CONFIGU	ATIONS		
🗏 Storages 👌 Data	lessage Broker		
AutoGenerated AnalyticsFile (79	l yStorage Idac1-1f93-4268-902f-d5ea90f58883	3)	🕹 🗅 🛍
			+
			Save OK

6.1.1 Generic Configurations

General settings for the Storage Provider service can be made in the Generic Configurations.

GENERIC CONFIGURATIONS

Provider Alias:

Each Analytics Storage Provider Service has its own GUID for identification. You can enter a provider alias in the general configuration area so that this can be replaced by a meaningful name.

Main Topic:

Basically, you do not have to worry about the topic. However, you can enter the so-called Main Topic here. It describes the first part of the overall topic. Beckhoff-specific additions are then added. This results in a very simple plug-and-play system with TwinCAT Analytics.

Host Message Broker:

The so-called Host Message Broker can be configured here. The Storage Provider Service logs on to this message broker itself and makes its data available. This broker can also be a so-called Data Message Broker, which is used to receive data to the Storage Provider Service. There can only be one Host Broker in the system, but several Data Brokers.

Logging:

Check various logging options.

Service:

Displays the status and default settings for starting the Windows service.

6.1.2 Additional Configurations

The Stores and Data Message Broker of the Storage Provider Services are set under Additional Configurations.

ADDITIONAL CONFIGURATIONS

Storages

The stores that are available to the Analytics Storage Provider Service can be created in the Storages tab. These can be of various types, such as Microsoft SQL® or csv files. New stores can be added in binary or plain text format using the plus sign in the bottom right-hand corner. The configuration of the individual stores is described in this <u>sub-chapter [$\$ 47].</u>

ADDITIONAL CONFIGU	RATIONS				
🗏 Storages 🕹 Data	Message Broker				
AutoGenerated AnalyticsFile (791		902f-d5ea90f58883)		i (1	<u>ا</u> ش
Storage Name:	AutoGenerated A	llyStorage	V [Default St	orage
Max Write Length:	2048		Auto	o Start St	orage
Storage Comment:					
Folder Path:	C:\ProgramData\	Beckhoff\TwinCAT\Functions\TF3520-Analytics-StorageProvider\DefaultSt	orage		
MaxDuration:	120	s			
New MsSQL Plain MsSQL_Plain (00		-0000-000000000000)		i (1	۵ Ū
New InfluxDB Sto InfluxDB_Plain (0		0-0000-00000000000)		i (1	۵ D
					+
			Save	C	Ж

Data Message Broker

1. In the Data Message Broker tab, you can create the message brokers that can provide input data for the Storage Provider in addition to the Host Message Broker.

ADDITION	L CONFIGURATIONS			
🗐 Storag	s 🛃 Data Message Broker			
Clore TcAr	d alyticsTest:1883 (5fbe69b9-3eed-4515-8585-33497f96e333)		61	
Alias:	Cloud		✓ Host M	1B
Broker:	TcAnalyticsTest	c	heck Connection	ו
User:	Pwd: Port: 1883	3		
MyE	rokerSubNetwork1* configured ConnectionSettings> (5430b716-69bd-4917-b526-6eff4a3747be) rokerSubNetwork2*			 前 前
- <ur< td=""><td>configured ConnectionSettings> (7506f7b0-16c6-4b30-9070-f0eb4b123f89)</td><td></td><td></td><td></td></ur<>	configured ConnectionSettings> (7506f7b0-16c6-4b30-9070-f0eb4b123f89)			
				+
		Save	OK	

- 2. The settings can be checked using the Check Connection button.
 - \Rightarrow The result is displayed in the following window:

Check CA certificate 'MyCA.crt' ExpirationDate:03.12.2036 13:09:38 Connect client to broker	Success
Connect client to broker	Success

If you click on **Save**, the settings are saved in the directory *C:\TwinCAT\Functions\TF3520-Analytics-StorageProvider\Configurations*.

6.1.2.1 Databases/Stores

The following overview shows which database connections are supported by which platform.

Database	Win	dows	vs TwinCAT/BSD	
	Local	Remote	Local	Remote
Analytics File	Х	Х	Х	Х
CSV	Х	Х	Х	Х
MS SQL	Х	Х	-	Х
PostgreSQL	Х	Х	-	Х
InfluxDB 2	Х	Х	-	Х
AzureBlob	-	Х	-	Х

6.1.2.1.1 TwinCAT Analytics Binary File

TwinCAT Analytics Binary File is a TwinCAT-specific Storage. Therefore no external software is necessary. You can use this type of storage directly after installing the Analytics Storage Provider. This is the same file that the TwinCAT Analytics Logger provides in its "offline" configuration without MQTT Message Broker.

New AnalyticsFil AnalyticsFile (Obc	÷ 🗅 🛍	
Storage Name:	New AnalyticsFile Store	 Default Storage
Max Write Length:	2048	Auto Start Storage
Storage Comment:	Hot Storage (AlyFile)	
		·
Folder Path:	C:\Temp\Test_AlyFile	
MaxDuration:	120 s	

Fig. 1:

Storage Name:

Assign a descriptive name that describes the purpose of the storage well. It will reappear in various places during configuration in the Manager.

Max Write Length:

The amount of data that is written to the .tay file in one call is specified here.

Storage Comment:

You can enter additional information about the storage here.

File Path:

For the configuration, you must select your preferred folder on the local device on which the Storage Provider is running.

Browse For Folder	×
SourceSafeDoku	*
> 🌗 temp	
D 📕 TFS	
A 📑 TwinCAT	
Þ 퉲 3.1	
🛛 🕒 AdsApi	=
Common32	=
Common64	
CommonComServer	
▶ 🎴 Functions	
D b b Mc	
D b b TcSwitchRuntime	-
Make New Folder	K Cancel

The folder used is displayed in the Connection String window for confirmation.

The folder architecture that is created after the pipeline is started is currently divided into five hierarchical levels:

- 1. System ID (this is a GUID of the system sending the data) can be replaced by the alias name in the Analytics Logger settings or in local engineering by the Machine Administration Page.
- 2. Recording name can be set using the configurator.
- 3. Record name can be set by the configurator and automatically influenced with auto IDs, date, cycle time and other placeholders at runtime.
- 4. Internal ID cannot be changed.
- 5. Layout GUID cannot be changed and corresponds to the data storage of the Analytics Logger.

Max Duration:

This value specifies in seconds how much data is written to a .tay file. After time X, the data is written to a new .tay file. Ring buffers that are configured in the Manager only affect complete .tay files of a current recording.

6.1.2.1.2 Microsoft SQL (binary / plain text)

With Microsoft SQL Server, you have another On-Premises solution for storing the Analytics binary data.

Enter the Connection String for your MS SQL server here.

My MsSQL Plain MsSQL_Plain (00	Store* 000000-0000-0000-00000000000000000000	a 🗅 🛍
Storage Name:	My MsSQL Plain Store	Default Storage
Max Write Length:	1024	Auto Start Storage
Storage Comment:	First MsSQL Plain Store (MyServer)	
Connectionstring:	Data Source=MyServer\SQLEXPRESS; Initial Catalog=TcAlyStorageProviderDB; User Id='/	ASP_User'; Password='***'
		ConnString

Storage Name:

Assign a descriptive name that describes the purpose of the storage well. It will reappear in various places during configuration in the Manager.

Max Write Length:

The amount of data that is saved in a tbl_Data record is specified here.

Storage Comment:

You can enter additional information about the storage here.

Connection String:

Click on the **ConnString** button to open the input mask. Make the configuration settings there, including for remote databases that are accessible via network connections.

📓 MsSQL Con	ectionString $ \Box$ \times	
Server:	MyServer\SQLEXPRESS	
Database:	TcAlyStorageProviderDB	
		1
Username:	ASP_User	
Password:	*****	
	Save Close	
	Save Close	

After starting the storage, communication with the database begins. At this point, the Storage Provider itself creates the four required tables. Each recording configuration is saved in a separate table. As an example, you can see the following screenshot from Microsoft SQL Server Management Studio.

Microsoft SQL Server Management Studio
File Edit View Tools Window Help
ତ 🗸 ତ 🛛 🎦 👻 🏜 📲 📲 📳 New Query 🖨 ଲି ଲି ଲି ଲି ଲି 🖓 🐰
🗧 🚏 🚏 📔 🚽 👘 🚽 👘 🚽 🚏
Object Explorer 🔹 🕂 🗙
Connect 👻 🌹 🎽 🝸 👛 🔸
😑 🔂 MANUELA-NB05\SQLEXPRESS (SQL Server 16.0.4131 - TestUser)
🖃 📕 Databases
🕀 💼 System Databases
🕀 📕 Database Snapshots
🕀 💼 Database Diagrams
🖃 💼 Tables
Graph Tables Graph Tables Image: Analytics.tbl_DataTable Image: A
Analytics.tbl_Location
Analytics.tbl_Record
Analytics.tbl_Storage

The ring buffer functionality for the Microsoft SQL® database can also be set in the Manager.

6.1.2.1.3 CSV file

New CSV Store CSVFile (2d2ed6fe	e-9961-481a-a784-02e083b0fde2)	📥 🗅 🛍
Storage Name:	New CSV Store	Default Storage
Max Write Length:	1048	Auto Start Storage
Storage Comment:	Hot Storage (CSVFile)	
Folder Path:	C:\Users\manuela\Desktop\CSV_Local_Test	
MaxDuration:	3600 s	
Decimalplaces:	2 (use -1 for unspecified)	

Storage Name:

Assign a descriptive name that describes the purpose of the storage well. It will reappear in various places during configuration in the Manager.

Max Write Length:

The amount of data that is written to the .csv file in one call is specified here.

Storage Comment:

You can enter additional information about the storage here.



File Path:

For the configuration, you must select your preferred folder on the local device on which the Storage Provider is running.

Browse For Folder	×
SourceSafeDoku	*
> 📔 temp	
D 📕 TFS	
A 📑 TwinCAT	
Þ 퉬 3.1	
D 🎍 AdsApi	_
Common32	E
🔒 Common64	
Description CommonComServer	
▶ ▶ Functions	
D 🍌 Mc	
D LoswitchRuntime	-
Make New Folder	K Cancel

The folder used is displayed in the Connection String window for confirmation.

Max Duration:

It is also possible to define the timespan to be saved in a CSV file. The decimal places of floating point numbers can also be limited.

Decimalplaces:

The number of decimal places can be set here. The value "-1" stands for unspecified, the value "2" stands for two decimal places, for example.

6.1.2.1.4 InfluxDB

With the support of InfluxDB, you have another on-premises solution for storing Analytics binary data.

New InfluxDB Sto InfluxDB_Plain (aa	re ae02217-13f7-43df-bf52-cbab9e6cf408)	ė h 🖻
Storage Name:	New InfluxDB Store	Default Storage
Max Write Length:	204800	Auto Start Storage
Storage Comment:	First Influx Storage	
Connectionstring:	http://localhost:8086/?org=Beckhoff&bucket=Beckhoff&username=Beckhoff&password	l=***&

Storage Name:

Assign a descriptive name that describes the purpose of the storage well. It will reappear in various places during configuration in the Manager.

Max Write Length:

The amount of data that is written to the Influx in one call is specified here.

Storage Comment:

You can enter additional information about the storage here.

Connection String:

Click on the **ConnString** button to open the input mask. You can make the configuration settings there, including for remote databases that are accessible via network connections. The server should always be specified with the port number.

📓 InfluxDB Con	nectionString		-	×
Server:	http://localhost:8086/	1		
Organisation:	Beckhoff			
Bucket:	ASP_Bucket			
🗌 Use Token Au	thentication			
Username:	ASP_User			
Password:		•••••		
	Save	Close		

After starting the storage, communication with the database begins.

6.1.2.1.5 Microsoft Azure Blob

To use Microsoft Azure Blob Storage, you need a Microsoft Azure Cloud account. There you get also your individual Connection String for the configuration of the TwinCAT Analytics Storage Provider.

New AzureBlob S AzureBlob (87e3f	itore* i30b-25b9-4952-9f41-800e762adce7)	4 9 h 🖻
Storage Name:	New AzureBlob Store	Default Storage
Max Write Length:	284000	Auto Start Storage
Storage Comment:	My Storage (Azure Blob)	
Containername:	analyticsdatastorage	
Connectionstring:	DefaultEndpointsProtocol=https;AccountName=alyspstorage;AccountKey=4 A==;EndpointS	
MaxDuration:	600 s	

Storage Name:

Assign a descriptive name that describes the purpose of the storage well. It will reappear in various places during configuration in the Manager.

Max Write Length:

The amount of data that is written to the blob store in one call is specified here.

Storage Comment:

You can enter additional information about the storage here.

Copy the Connection String into the description field. The storage must be created in Azure itself.

Select Storage accounts (classic).

Microsoft Azure	${\cal P}$ Search resources, services, and ${\cal Q}$	docs	\sim \mathbb{F}	↓ ↔ ↑ ↔ ↓ ↔ ↓ ↔ ↓ ↔ ↓ ↔ ↓ ↔ ↓ ↔ ↓ ↔ ↓ ↔	
«	Home > Storage accounts > C	Create storage acco	ount		
+ Create a resource	Storage accounts	× 🖈 ×	Create storage account		×
i≡ All services	+ Add == Edit columns	••• More			
— 🛨 FAVORITES ————————————————————————————————————		more	Basics Advanced Tags Review	+ create	
🛄 Dashboard	Filter by name		Azure Storage is a Microsoft-managed service	e providing cloud storage that is highly available, secure, durable,	
🗊 Resource groups	NAME 🔍			des Azure Blobs (objects), Azure Data Lake Storage Gen2, Azure Files, your storage account depends on the usage and the options you ch	
All resources			below. Learn more		
🕒 Recent			PROJECT DETAILS		
🔇 App Services			Select the subscription to manage deployed r manage all your resources.	esources and costs. Use resource groups like folders to organize and	I
🕺 Virtual machines (classic)			* Subscription	Visual Studio Professional	\sim
👰 Virtual machines			* Resource group	Default Charges Marth Frances	~
👼 SQL databases			Resource group	Default-Storage-NorthEurope Create new	v
👶 Cloud services (classic)			INSTANCE DETAILS		
💡 Subscriptions				lanager, which supports the latest Azure features. You may choose t	0
🚸 Azure Active Directory			deploy using the classic deployment model in	nstead. Choose classic deployment model	
🕒 Monitor			* Storage account name 🚯		
Security Center			* Location	North Europe	\sim
Oost Management + Billing			Performance 🚯	Standard Premium	
Page Help + support			Account kind 👩	StorageV2 (general purpose v2)	\sim
🌳 Advisor			Destination e		
🚍 Storage accounts (classic)			Replication 🚯	Read-access geo-redundant storage (RA-GRS)	\sim
			Access tier (default) 🕦	🔵 Cool 💿 Hot	
			Review + create Previ	ious Next : Advanced >	

After creating the Storage, you will find the secondary Connection String under **Access keys**. This string must be used in the configuration of the Analytics Storage Provider.

Microsoft Azure	$\mathcal P$ Search resources, services, and docs	>_ t͡Ģ ♀ੋ 戀 ? ☺ muster@beckhoff.co
*	Home > Storage accounts > datastorage	- Access keys
+ Create a resource	datastorage - Access keys	×
i∃ All services	P Search (Ctrl+/) ≪	
— 🛨 FAVORITES ————————————————————————————————————	> Search (Ctn+/)	Use access keys to authenticate your applications when making requests to this Azure storage account. Store your access keys securely - for example, using Azure Key Vault - and don't share them. We recommend regenerating your access keys regularly.
🛄 Dashboard	Overview	You are provided two access keys so that you can maintain connections using one key while regenerating the other.
😭 Resource groups	Activity log	When you regenerate your access keys, you must update any Azure resources and applications that access this storage account to use the new keys. This action will not interrupt access to disks from your virtual machines. Learn more
🗰 All resources	🗳 Access control (IAM)	
🕓 Recent	X Diagnose and solve proble	Storage account name datastorage
🔇 App Services	🦥 Storage Explorer (preview)	~
👰 Virtual machines (classic)	Settings	Primary C2
👰 Virtual machines	📍 Access keys	Key
🗟 SQL databases	S CORS	
👶 Cloud services (classic)	🚔 Configuration	Connection string DefaultEndpointsProtocol=https;AccountName=datastorage,AccountKey=fZlKw2RT9dO1NkQl/ldJNfL3oKcqfL3oKcq
💡 Subscriptions	🔗 Shared access signature	
🚸 Azure Active Directory	Properties	Secondary (2
🕒 Monitor	Locks	Key
📋 Security Center	Blob service	Connection string
0 Cost Management + Billing	Blobs	DefaultEndpointsProtocol=https;AccountName=datastorage,AccountKey=UGdPJ5V8sxTS+wOy75pd5lXWYBI5lXWYB
🎴 Help + support	Custom domain	
🤹 Advisor	Soft delete	
🚍 Storage accounts (classic)	Azure CDN	
	Add Azure Search	
	File service	
	📄 Files 🗸 🗸	

6.1.3 Importing/converting Analytics Files

i

In the following it is assumed that you have installed TwinCAT under "C:/TwinCAT". Otherwise, you must adjust the specified paths accordingly.

You can import recordings from the Analytics Logger stored in Analytics File Format (*Analytics.tas, Analytics- <Date>.tay*) into the Storage Provider. In general, you can convert data saved by the Storage Provider as an Analytics File into other formats. Analytics File is always the source format.

To do this, perform the following steps:

1. Save the folder with the Analytics Files in your Storage Provider location By default, here: C:\TwinCAT\Functions\TF3520-Analytics-StorageProvider\Storage\Analytics StorageProvider (create the folders manually if they do not exist)

File Home Share View						
★ ↓ </th <th>ut Move Copy to v to v</th> <th>Pew item ▼ New item ▼ 1 Easy access ▼ folder</th> <th>Properties</th> <th>Select all Select none</th> <th></th> <th></th>	ut Move Copy to v to v	Pew item ▼ New item ▼ 1 Easy access ▼ folder	Properties	Select all Select none		
Clipboard	Organize	New	Open	Select		
← → × ↑ <mark> </mark>	StorageProvider > Storage > Analyt	tics StorageProvider > Myl	Data ^	✓ ♂ Search M Date modified	yData Type	Size
🖈 Quick access		Analytics.ti	ar.	26.07.2018 11:41	TAS File	512e
Desktop			2018-07-26T10-51-09.tay	26.07.2018 11:51	TAY File	3,561 KB
Windows (C:)			2018-07-26T10-51-26.tay	26.07.2018 11:51	TAY File	3,561 KB
📙 temp_old			2018-07-26T10-51-42.tay	26.07.2018 11:52	TAY File	3.561 KB
temp		Analytics-2	2018-07-26T10-51-59.tay	26.07.2018 11:52	TAY File	3.561 KB
		Analytics-2	2018-07-26T10-52-15.tay	26.07.2018 11:52	TAY File	3.561 KB
GAC_MSIL						
		Analytics-2	2018-07-26T10-52-31.tay	26.07.2018 11:52	TAY File	3.561 KB
GAC_MSIL TE3500-Analytics-Workbench TE2000-HMI-Engineering			2018-07-26T10-52-31.tay 2018-07-26T10-52-48.tay	26.07.2018 11:52 26.07.2018 11:53	TAY File TAY File	3.561 KB 3.561 KB

- 2. Open *TwinCAT*.*Analytics*.*StorageProvider*.*Configurator*.*exe*. The program can be found under the path C:\TwinCAT\Functions\TF3520-Analytics-StorageProvider\Tools
- 3. Select the Storage into which the Analytics File is to be imported and press the **DataImport** button.

TORAGE CONFIGURATIONS					
AnalyticsFile Store (0bc0552e-b3a1-4d80-81bb-08eb77bf6fd1)	÷	ſĿ Ū			
New CSV Store CSVFile (2d2ed6fe-9961-481a-a784-02e083b0fde2)	÷	<u>с</u>			
New MsSQL Plain Store MsSQL_Plain (4a6d6d3b-0f10-4683-9591-72349c3f6825)	÷	<u>е</u>			
New MsSQL Binary Store MsSQL (5bb93c95-ac89-4aac-89a0-09b4a27f0f59)	÷	<u>Ъ</u> Ш			
New AzureBlob Store AzureBlob (87e3f30b-25b9-4952-9f41-800e762adce7)	÷	۵ Ü			
		+			

ī.

4. Then select the path to the Analytics File in the DataImport dialog and enter all other known parameters for this recording.

TF3520 Analytics St	torage Provider Data Import - To "New AnalyticsFile Store"			×
AnalyticsFile				
Analytics File: C:	\TwinCAT\3.1\Boot\Analytics\0DACDE8C-9EA6-200E-A043-B692EE317030)		
\checkmark	Unknown AlyFile			
۲	Copy data to storage 🔿 Move data to storage			
Record Info		Location		
Topic:	AnalyticsStorageProvider/UnknownAnalyticsFile	Address:		
Recording Alias:	Unknown	Latitude:	0.0	
Record Name:	Record	Longitude:	0.0	
SystemID:	53FAE9BF-03FA-48AC-81E7-74F042EEC6C2			
SystemID Alias:	Unknown AnalyticsFile			
		С	ancel	OK

5. Press **OK** and the data import begins.

Data Import - Progress			\times		
Storing					
	0				
Start data import from Analytics File					
Cancel Close					

- ⇒ Now you can see your imported data in the <u>TwinCAT Target Browser</u> [▶ 95].
- ⇒ You may have to wait a short time or restart your Storage Provider.

6.2 Manager

You can define your data pipelines in the TwinCAT Analytics Storage Provider Manager. A pipeline is defined in such a way that you can select the data sources (Data Message Broker) and the symbols available there. Optionally pre-process the data using rules and ultimately store the data in one or more stores. The stores must have been created in the <u>Configurator [45]</u> for this.

VIEW	CONFIGURATIONS
Broker	II Pipelines Io Live Status
→ Broker ↓	4 II Configurations
▷ C TwinCAT Analytics StorageProvider ("TCANALYTICSTEST")	A Sample-Pipeline
🗠 🥂 TwinCAT Analytics StorageProvider ("Lucas-VM")	≥ p ² ₀ sample-ripeine ≥ p ² ₀ Rule (1)
Minimized TwinCAT Analytics StorageProvider ("Local Hardware Test ASP")	▷ 🛱 Rule (2)
 	▲ 문 StandardRule
 AutoGenerated AlyStorage () cff7975b-b34d-43f7-755d-95cf135f50db 	b o ^o s Rule (1)
 () cfr/9/36-6346-437/-7336-93013373086 P III Recording (2) 	Recording (Record_(AutoID))
Employed The Recording (1)	
Recording (3)	▷ d ⁶ / ₄ Rule (2)
Recording (4)	▷ 🛱 Rule (3)
Im StairRecord	
I [30] "Record_1" (21.11.2024 16:20:54.935 - 21.11.2024 17:02:07.369) III [32] "Record_2" (22.11.2024 07:05:56.176 - 22.11.2024 10:30:22.363)	INFORMATION
[32] Record_2 (22.11.2024 01:05:50.170 - 22.11.2024 10:50:22.505) [35] "Record_3" (22.11.2024 10:32:35.123 - 22.11.2024 10:58:38.565)	
Image: A state of the state	Storage
Recording	StorageGuid 7919dac1-1f93-4268-902f-d5ea90f58883
{ } c29ac2d4-76ce-ff44-4d7f-355ffbcca6bf	
	Recording
	ASP_Topic Beckhoff/TcAnalyticsStorageProvider/9b8505fe-3272-490d-bfe9-bb59e29688f8/Historical/Stream
	Topic ff238503-b453-43e6-b1e7-b00657d23e19/2/7919dac1-1f93-4268-902F-d5ea90f58883/6
	TopicAlias StairRecord (Storage: AutoGenerated AlyStorage)
	Layout 4a6918cb-9488-8fe8-cbf0-2063d30c5891
	SystemID cff7975b-b34d-43f7-755d-95cf135f50db
	SystemAlias
	RecordingAlias StairRecord
	RecordingID 6
	Leader -
	Location Address
	Address
	Symbols
	SymbolCount 3
	Symbols
	[0] BaseType: BitOffset:0x00000000 BitSize:0
	[1] BaseType: BitOffset:0x0000000 BitSize:0
	Page 1 Base type. Bitoriset 0x0000000 Bitaizeto
	[2] BaseType: BitOffset0x0000000 BitSize:0

6.2.1 Manager ("Recorder")

The Analytics Storage Provider Recorder is part of the Analytics Engineering setups. Therefore, you can find the recorder in the installation of the TwinCAT Analytics Workbench and the TwinCAT Analytics Service Tool.

With the Storage Provider Recorder recording definitions can be created, started and managed. In addition, it is possible to manage the data memories of individual Analytics Storage Providers. All important properties of the found Analytics Storage Providers and historized data are clearly displayed.

IF3520 Analytics Storage Provider Manager	- 🗆 ×
OVERVIEW	CONFIGURATIONS
생 Ö 🗊 🔿	'물 🥐 🔍
🔺 🔿 Broker	🗄 Pipelines 🚡 Live Status
🔺 🛃 tcanalyticstest:1883	Configurations
TwinCAT Analytics StorageProvider ("TCANALYTICSTEST")	MachineCenterData (Record (AutoID))
🕑 🥰 TwinCAT Analytics StorageProvider ("Lucas-VM")	Recording (Record_(AutoID))
🖻 🕂 TwinCAT Analytics StorageProvider ("Local Hardware Test ASP")	RecMitManuel (Record_(AutoID))
TwinCAT Analytics StorageProvider ("Beckhoff_ASP_Instance42")	JustSpindleSpeed (Record_{AutoID})
TwinCAT Analytics StorageProvider ("RuleEngineDev-pre177")	▲ 【 ¹ ReleasePipeline
 TwinCAT Analytics StorageProvider ("PASCALD-NB06") 	▲ Q ⁰ ₆ Rule (1)
MyNewCsvStore	DownsampledRecording (Record_{AutoID})
Aly File Store	
 A () MultiStreams 	INFORMATION
 A machineCenterData [10] "Record_1" (20.08.2024 11:24:58.106 - 20.08.2024 11:27:58.137) 	
DownsampledRecording	Record
Image: StorageProvider ("RuleEngineDev-pre4")	RecordID 10
▷ Image And A Margins Storage Forder (Raisengine Sev piet)	Record Alias Record 1
messagebroker2.beckhoff-cloud.com:8883	CycleTime 10000 (1.000 ms)
Rew Measurement TwinCAT Analytics StorageProvider ("EC2AMAZ-7TI4E4E")	
TwinCAT Analytics StorageProvider ("CP-221DB2")	SampleDataSize 120 (0.117 KB)
TwinCAT Analytics StorageProvider ("EC2AMAZ-O2TKMDS")	
Electric CP-36AE1E (New Storage Provider)	Record Times
Test_ASP_PascalD	StartTimestampTicks 133686194981060000
🖻 🕂 MaxW_Analy_StorageProvider ("EC2AMAZ-V708D9N")	EndTimestampTicks 133686196781370000
🛃 172.17.30.109:1883 🛃 mb-energy01.beckhoff-cloud.com:8883	
Ca mo-energyo i.becknon-cioua.com.8665	StartTimestamp 8/20/2024 11:24:58 AM
	EndTimestamp 8/20/2024 11:27:58 AM
	Duration 0d 0h 3m 0s 003ms
	Recording
	RecordName Record_1
	ASP_Topic Beckhoff/TcAnalyticsStorageProvider/617c5c9b-b9e1-43fd-acf8-af2d461ad61
	Topic MachiningCenter/PlcStream3
	TopicAlias MachineCenterData (Storage: Aly File Store)
	Layout 72b78fcd-8d9c-7779-28f4-c637532ab35b
Image: Second	

Toolbar Manager window ("OVERVIEW")

OVERVIEW					
抣	<u>×</u> 5	U		0	
1	2	3	4	5	

1 A	Add new broker
2 F	Remove selected broker
3 F	Refresh display
4 (Collapse all nodes
5 \	View switch between dark/light mode

Function Manager window ("OVERVIEW")

First assign a **RecorderAlias**. This helps to group the started recordings and to find its self started ones again.

After that, one or more brokers can be set up. This is done via the already known input mask for MQTT connection properties.

🔢 TF3520 Analytics Storage Provider Manager

OVERVIEW								CONFIGURATIO
생 🕗 🗖 💿								ا 🖌 💽 🍯
🔺 🔿 Broker								🖲 Local 🐁 G
4 🛃 127.0.0.1:1883	🕂 Conn	ection Settings					X	4 🖲 Template
🔺 🕂 Measureme		_						Recor
🖻 📱 New Ar	Broker:			172.17.24.19	95			Record
🔺 📱 New CS	User:	TestUser	Pwd:	•••••	Port:	1883		New1
⊳ { } 53fa								
▲ { } cff79	Certif	icate						
▲ ⊞ ↓								INFORMATION
E	CA:							INFORMATION
📕 New Ms						Pwd:		Record
📕 New Ms	Cert:					PWU		RecordID
🖻 冒 New Az	Kev:							
🔺 🚽 TcAnalyticsTest								RecordAlias
🖻 🕂 TwinCAT Ar	Charlet	C		Г	Cancel	OK		CycleTime
	Check (Loning			Cancel	UK		SampleDataSiz
								Record Times
								StartTimestam

Once a connection to the broker could be established, all Analytics Storage Providers connected to it will be listed.

"Storage" status

- 🔺 🗅 Broker
 - 4 🛃 127.0.0.1:1883
 - 🔺 🕂 Measurement
 - 1 🕒 🚦 New AnalyticsFile Store
 - 2 🚦 New CSV Store
 - 3 🚦 New InfluxDB Store
 - 4 🔒 New MsSQL Plain Store
 - 5 🔋 New MsSQL Binary Store
 - 6 📕 New AzureBlob Store

1	Storage Online
2	Storage Offline
3	Storage starts
4	Storage starts with error. Still trying to start it
5	Storage is shut down
6	Storage is in the error state

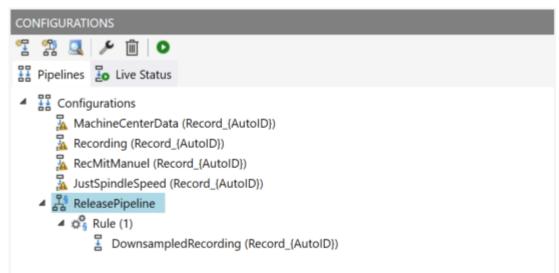
Toolbar Manager window ("CONFIGURATIONS")

CONFIGURATIONS					
*	%		۶	Ŵ	0
I					
1	2	3	4	5	6

1	Create a new pipeline
2	Create a new pipeline with Rule Engine
3	Open Target Browser for connecting simple pipelines
4	Edit a selected pipeline
5	Delete a selected pipeline
6	Start a selected pipeline

Function Manager window ("CONFIGURATIONS")

The window is divided into two tabs. Pipelines and Live Status. Under Pipelines you will find the configurations of your pipelines. You can define new pipelines from here. Edit existing. Delete or start.



To create a new simple pipeline, click the "Create new pipeline" button. The following dialog opens.

TF3520 Analytics Storage Provider Manager		\times
TestSignals/StreamFast		
Recording Alias	Record Name	
Recording_TestSignals	Record_{AutoID}	
Record Duration	Ringbuffer Days Hours Minutes	
0 Days 0 Hours 10 Minutes	None ~ 0 0 0	
Store Subset of Symbols O Store whole process image		
Variables.fAM	LREAL	^
Variables.fGrowSlow	LREAL	
Variables.fPeak	LREAL	
Variables.fPulse	LREAL	
Variables.fRampOnEvent	LREAL	
Variables.fSawtooth	LREAL	
Variables.fSine	LREAL	- 1
Variables.fSquare	LREAL	
Variables.fStairs	LREAL	\sim
	Cancel Ol	<

You can now drag and drop the symbols you want to record from the Target Browser into the dialog. You also assign a Recording Alias and a Record Name.

Various placeholders are available for the Record Name:

"{AutoID}"	
"{Topic}"	
"{SystemID}"	
"{Layout}"	
"{CycleTime}"	
"{SampleSize}"	
"{RecordStart}"	

You can also configure recording names and a duration (otherwise the recording will run endlessly until it is stopped manually). A ring buffer can be set according to storage space or time.

The entries are confirmed with **OK** and a new local recording definition is created.

It is now possible to start this definition directly via the toolbar or the context menu.

	CONFIGURATIONS
	智 器 🔍 🗡 面 💿
	H Pipelines D Live Status
	 Econfigurations MachineCenterData (Record_(AutoID)) Recording (Record_(AutoID)) RecMitManuel (Record_(AutoID)) JustSpindleSpeed (Record_(AutoID)) ReleasePipeline
Start RuleEngine Pipeline	$e = 4 \phi_3^6$ Rule (1)
EditDelete	DownsampledRecording (Record_{AutoID})

However, it is also possible to make the definition globally accessible. This can be done via the context menu with the entry **Publish Recording**.

The following dialog then opens:

TF3520 Analytics Storage Provider Manager						
Select the specific Items for your Recording:						
Storage Provider:	TwinCAT Analytics StorageProvider ("	PASCALD-NB06"	')			
Storage:	Aly File Store					
Data Messaage Broker:	Measurement Broker of tcanalyticstes	st				
	Disable topic check.					
		Cancel	OK			

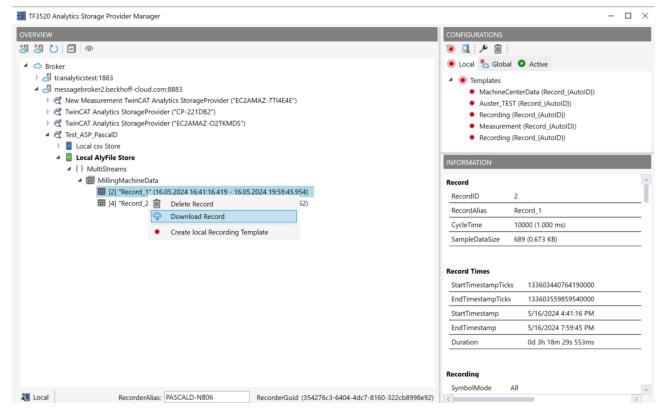
Here you can now select the desired Analytics Storage Provider via which the definition is to be published. In addition, the definition is assigned a Storage and a Data Broker of the selected Analytics Storage Provider. After the selection, the recording definition is confirmed with **OK** and published to the selected Analytics Storage Provider. Storage Provider. This means that it can be found by any Storage Provider Manager that is connected to the MQTT Broker.

After starting a pipeline, the view automatically jumps to the second tab, the Live Status.

CONFIGURATIONS
E Pipelines Live Status
 TwinCAT Analytics StorageProvider ("PASCALD-NB06") Data Broker Pipelines ReleasePipeline
⊿ 🔹 Rule (1)
DownsampledRecording [Aly File Store]

All active recordings from all users are listed here. The recordings can be ended in this tab and it is also possible to jump to the resulting record.

Furthermore, a download function is available in the Manager to download data to your local engineering. Select the corresponding record and start the download via the context menu. Regardless of the store in which the data is stored, it is always saved as an Analytics File on the local engineering system.



In combination with the data import function [> 55] in the Storage Configurator, the Analytics File also serves as a practical exchange format. Both functions can be used to move data from a CSV file to an InfluxDB2, for example, or from a Microsoft SQL® to a CSV file, etc.

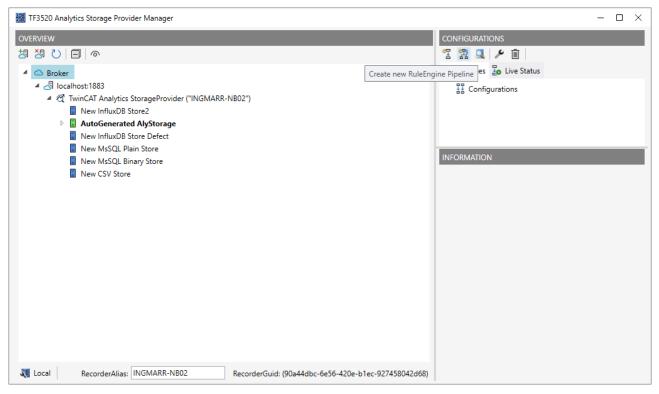
6.2.2 Data handling with Rule Engine

Rule Engine pipelines can be used to automatically map a wide variety of storage scenarios. Data can be collected from multiple MQTT data sources, processed and stored in Recordings. In addition, data from recordings can be read and processed on an event or timer-controlled basis, as well as manually triggered. Possible processing operations include aggregating, filtering and sampling the data sources.

The RuleEngine pipeline function is available from Storage Provider version 3.15. onwards.

6.2.2.1 Configuration

A RuleEngine pipeline is configured graphically in the RuleEngine Pipeline Editor. This can be opened via the Manager.



First, the desired Storage Provider must be selected. A RuleEngine pipeline is developed specifically for a Storage Provider. This cannot be changed subsequently. In the RuleEngine Pipeline Editor, the name of the selected Storage Provider is displayed at the top right.

TF3520 Analytics Storage Provider Manager		×	
▲ Jocalhost:1883 ② TwinCAT Analytics StorageProvider ("INGMARR-N	IB02") Cancel	OK	
	Cancel	OK	
RuleEngine Pipeline Editor Pipeline Alias 5a0fa0c3-4fec-46e5-a440-d7d90db874e1 Storage Pr Toolbox Image: Contract of the second state of the second st	rovider TwinCAT Analytics Sto	orageProvider ("ING	JMARR-NB02")

An alias can be assigned for a RuleEngine pipeline. The alias is freely selectable and can be edited via the text field at the top left of the RuleEngine Pipeline Editor.

📓 RuleEngine Pipe	line Editor	- 0	×
Pipeline Alias	MyRuleEnginePipelineAlias Storage	Provider TwinCAT Analytics StorageProvider ("INGMARR-NB02")	
Toolbox			
#			
¢			
vipeline Status	NotInitalized	Save	

6.2.2.1.1 Adding elements

Various elements can be dragged from the toolbox (left) in the RuleEngine Pipeline Editor into the configuration area (center). The following elements can be used:

MQTT-Source: Corresponds to a data source (e.g. TwinCAT Analytics Logger or TwinCAT IoT Data Agent).

Rule: Pre-processing steps can be defined with a rule.

Recording: Describes a data recording (previously known recording).

I RuleEngine Pipeline Editor	– D X
Pipeline Alias MyRuleEnginePipelineAlias Storage Provider TwinCAT A	nalytics StorageProvider ("INGMARR-NB02")
Toolbox MQTT Source (1) NotInitialized	Recording (1) - Properties Cycle Time Storage Mode Infinite Duration
Rule (1) \$\vert^3\$ NotInitialized Recording (1) Image: The second s	Symbols 0
Pipeline Status NotInitalized	TOT FOILOI OI O

6.2.2.1.2 Linking elements

The added elements can be linked to each other via connections. A connection can be created via the output of an element. The mouse can be used to drag the connection to another element and thus create a link in the data flow. If you release the connector in the free area, a subsequent element is automatically created or a selection of available element types is offered.

🔡 RuleEngine Pipe	line Editor		- 0	×
Pipeline Alias	MyRuleEnginePipelineAlias	Storage Provider TwinCAT Analytics StorageProvider ("INGMARR-NB02")		
Toolbox	MQTT Source (1) NotInitialized Rule (1) of NotInitialized Recording (1) Not_Initialized V			
Pipeline Statu	NotInitalized		Save	

The following connections are possible:

MQTT-Source - Rule:

An MQTT-Source can be used in several rules. In addition, several MQTT-Sources can be used in a rule, provided they run with similar system times. If this is not the case, the editor recognizes this and issues a corresponding warning.

📓 RuleEngine Pipe	eline Editor				- 0	×
Pipeline Alias	MyRuleEnginePipelineAlias	Storage Provider	TwinCAT Analytics Stora	geProvider ("ING	GMARR-NB02")	
Toolbox	Rule (1) Rule (2)	rce (2) nitialized		Rule (2) - Prop Alias Type Nodes Symbols	rerties Rule (2) StreamingDataRule 2 0	
Pipeline Statu	s NotInitalized				Save	

Rule - Recording:

Any number of recordings for saving data can be defined for a rule. However, only data from one rule can flow into a recording. For a recording, any number of rules can be created for further processing of the saved data. Here too, a rule can only accept data from a recording. No subsequent rules can currently be created for recordings with a ring buffer. It is also not possible to combine data from an MQTT-Source and a recording as data sources for a rule.

📓 RuleEngine Pipe	eline Editor			-		х
Pipeline Alias	MyRuleEnginePipelineAlias	Storage Provider TwinCAT Analytics Storag	eProvider ("INGN	IARR-NB02")		
Toolbox	MQTT Source (1) Provide the second s		Rule (3) - Prope Alias Type Nodes			
	Recording (1) Recording (2) Image: Straig straight st		• Rule Trigger	0	(Ø
Pipeline Statu:			10101	Save	9	

MQTT-Source - Recording:

This connection is not possible. A rule must always be inserted as an intermediate connection.

6.2.2.1.3 Viewing properties of the elements

The properties of the selected element can be viewed via the Properties window on the right-hand side of the RuleEngine Pipeline Editor. The properties vary depending on the type.

MQTT source

- Broker: Message broker of the data source.
- Stream: Topic of the data source
- SystemID: System ID of the data source
- Cycle time: Cycle time of the data source
- Symbols: Number and names of the symbols selected at the data source.

I RuleEngine Pipeline Editor	- D X
Pipeline Alias MyRuleEnginePipelineAlias	Storage Provider TwinCAT Analytics StorageProvider ("INGMARR-NB02")
Toolbox	TestSignals/PlcStream3 - Properties
Image: style	Broker TCAnalyticsTest Stream TestSignals/PlcStream3 SystemID c29ac2d4-76ce-ff44-4d7f-35 Cycle Time 1 [ms] Symbols 4 • € Cyclic Data • € TestSignals/PlcStream3 1 [ms] Variables,fCosine (LREAL) Variables,fSine (LREAL) Variables,fSine (LREAL) Variables,fSine (LREAL) Variables,fSine (LREAL) Variables,fSine (LREAL)
Pipeline Status NotInitalized	Save

Rule

- Alias: Alias name of the rule
- **Type**: Type of rule. There are currently StreamingDataRules and BatchDataRules. StreamingDataRules refer to streamed data and run continuously to process the streamed data. BatchDataRules refer to data that has already been saved. These do not run continuously, but are started via triggers. They process a certain amount of stored data and then shut down again.
- Nodes: Number of nodes in a rule.
- Symbols: Number and names of the symbols that are output from the rule.
- RuleTrigger (only for BatchDataRules): Number of configured triggers.

📓 RuleEngine Pipe	eline Editor					-	o x
Pipeline Alias	MyRuleEnginePipelineAlias		Storage Provide	r TwinCAT Analytics	s StorageProvider ("If	NGMARR-NB02")	
Pipeline Alias	MyRuleEnginePipelineAlias]6	Storage Provide	r TwinCAT Analytics	Rule (1) - Pro Alias Type Nodes Symbols ▲ Cyclic Dat ▲ 留 Rule ● 영 D ▲ 丞 Minta 	operties Rule (1) StreamingDataRule 4 16 ta Input emodata/PlcStream1 1 MaxAvg (1) emodata/PlcStream1 5 MAIN.Druckverlust_Avg MAIN.Druckverlust_Mic MAIN.Druckverlust_Mic MAIN.Gewicht_Avg (L. MAIN.Gewicht_Max (L MAIN.Gewicht_Max (L MAIN.Gewicht_Max (L MAIN.Kuehlmitteltemp MAIN.Kuehlmitteltemp MAIN.Kuehlmitteltemp	[ms] [s] g (LREAL) tx (LREAL) n (LREAL) REAL) REAL) REAL) veratur_Avg veratur_Avg veratur_Max
Pipeline Statu:	s NotInitalized					Sav	/e

Recording

- CycleTime: Cycle time of the data recording
- Storage: Name of the data memory
- Mode: Recording mode (Infinite duration or ring buffer)
- Symbols: Number and names of the selected symbols

📓 RuleEngine Pipe	eline Editor					-	- 0 X
Pipeline Alias	MyRuleEnginePipelineAlias	Sto	rage Provider	TwinCAT Analyt	ics StorageProvider ("IN	IGMARR-NB02")	
Toolbox	Demodata/PlcStr Rule (1) Recording (1) Not_Initialized Not_Initialized				Cycle Time Storage Mode Symbols ▲ Cyclic Dat ▲ 曾 Reco M, M,) - Properties 1 [ms] AutoGenerated Infinite Duration 12 a rding (1) 1 [ms] AIN.Druckverlust_Ma AIN.Druckverlust_Ma AIN.Druckverlust_Ma AIN.Gewicht_Avg (L AIN.Gewicht_Max (L AIN.Gewicht_Max (L AIN.Gewicht_Min (L AIN.Kuehlmitteltemp AIN.Kuehlmitteltemp AIN.Kuehlmitteltemp AIN.Kuehlmitteltemp AIN.Seriennummer	g (LREAL) ax (LREAL) in (LREAL) in (LREAL) REAL) LREAL) peratur (LREAL; peratur_Avg (LI peratur_Avg (LI peratur_Max (L.
Pipeline Statu	s NotInitalized						Save

6.2.2.1.4 Editing elements

Editing takes place in a separate window. This can be opened by double-clicking on the element or by clicking the Edit icon in the properties.

📓 RuleEngine Pipe	eline Editor		– o x
Pipeline Alias	MyRuleEnginePipelineAlias	Storage Provider Twi	nCAT Analytics StorageProvider ("INGMARR-NB02")
Pipeline Alias	Demodata/PlcStr Rule (1) s ^o NotInitialized Recording (1) Not_Initialized	Storage Provider Twin	nCAT Analytics StorageProvider ("INGMARR-NB02") Recording (1) - Properties Cycle Time 1 [ms] Edit Single Recording Storage AutoGenerated AlyStorage Mode Infinite Duration Symbols 12 Cyclic Data Cyclic Data Cyclic Data Cyclic Data Cyclic Data Mole AllN.Druckverlust_Avg (LREAL) MAIN.Druckverlust_Max (LREAL) MAIN.Gewicht_Max (LREAL) MAIN.Gewicht_Max (LREAL) MAIN.Gewicht_Max (LREAL) MAIN.Gewicht_Max (LREAL) MAIN.Gewicht_Max (LREAL) MAIN.Sewicht_Max (LREAL) MAIN.Kuehlmitteltemperatur_Avg (MAIN.Kuehlmitteltemperatur_Max MAIN.Kuehlmitte
Pipeline Status	s NotInitalized		

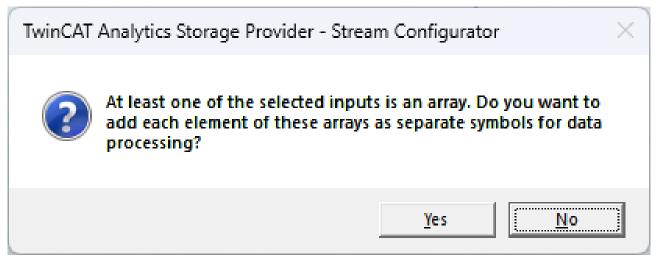
6.2.2.1.4.1 Editing MQTT-Sources

An MQTT-Source is edited in the MQTT Source Configurator. First, a message broker must be selected at Broker. All Data Brokers of the Storage Provider used for the RuleEngine pipeline that have also been added in the Manager can be selected. An MQTT-Stream (Stream) can then be selected based on its topic.

As soon as a stream has been added, the available symbols for the stream are displayed. Individual symbols can be selected using the checkboxes. All displayed symbols can be selected or deselected using the **Select all symbols** and **Clear selection** buttons.

Broker	+	analutio	tost			
broker		analytics	stest			
Stream	TestSi	gnals/Str	reamFast			
Selection	Select all symbols		(Clear selec	tion	
Enter Filter						Aa Abl
Name	Туре	Size	Category	Full-Name	Comment	
🗉 🔲 (=) P_TestSignal_Periodic		0	Struct	P_TestSig		
🗉 🔲 (=) TestValues		0	Struct	TestValues		
🗏 🕢 (=) Variables		0	Struct	Variables		
🗉 🔲 🖗 aBufferAM	ARRAY [110] OF LREAL	80	Array	Variables		
🗉 🔲 🔞 aBufferMulti1	ARRAY [110] OF REAL	40	Array	Variables		
🗉 💌 🖗 aBufferMulti2	ARRAY [110] OF LREAL	80	Array	Variables		
🗉 💌 🖗 aBufferPeak	ARRAY [110] OF LREAL	80	Array	Variables		
🗉 💌 🖗 aBufferPulse	ARRAY [110] OF LREAL	80	Array	Variables		
🗉 🔲 🖗 aBufferSawtooth	ARRAY [110] OF LREAL	80	Array	Variables		
🗉 💌 🖗 aBufferSine	ARRAY [110] OF LREAL	80	Array	Variables		
🗉 🔲 🖗 aBufferSquare	ARRAY [110] OF LREAL	80	Array	Variables		
🗉 🔲 📾 aBufferStairs	ARRAY [110] OF LREAL	80	Array	Variables		
🗉 🔲 🖗 aBufferTriangular	ARRAY [110] OF LREAL	80	Array	Variables		
🔲 🜆 bEdge	BOOL	1	Primitive	Variables		
💌 🌆 bMqttEvent	BOOL	1	Primitive	Variables		
🔲 🚳 fAM	LREAL	8	Primitive	Variables.f		
🔲 🖗 fGrowSlow	LREAL	8	Primitive	Variables.f		1

If the selected symbols include arrays or structures, a user dialog will prompt you to confirm whether the subsymbols should be added as separate symbols when the configuration is saved. If these are added, the subsymbols can be used individually in rules or recordings for processing and saving.



6.2.2.1.4.2 Editing rules

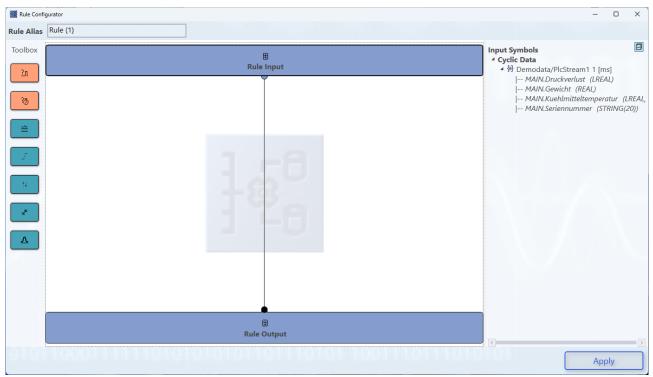
A rule is edited in the Rule Configurator. An alias name can be assigned to a rule at the top left. A rule consists of the following elements:

Rule Input:

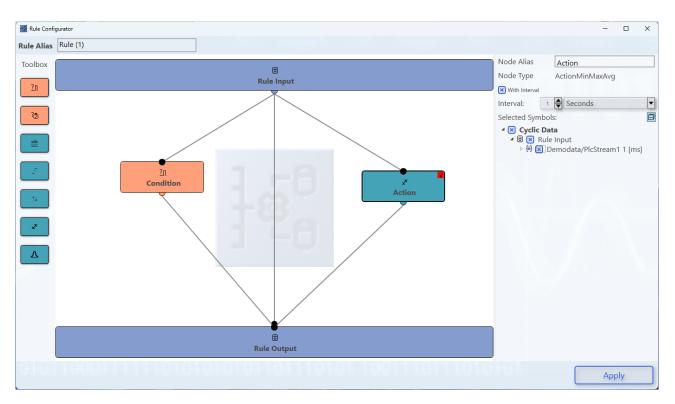
Corresponds to the start point within a rule. All symbols added to the rule are displayed here. For BatchDataRules, the time range for which the data is loaded when the rule is triggered can be selected here.

Rule Output:

Corresponds to the output of the rule. All symbols of the blocks that are connected to the rule output can be selected for subsequent recordings.

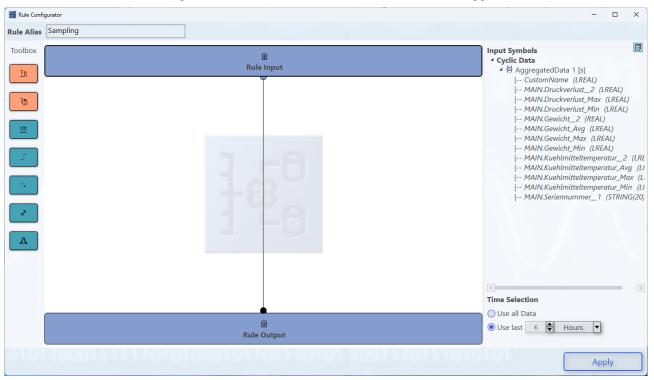


Additional blocks can be added for processing via the toolbox (left). A distinction is made between Condition blocks and Action blocks. Condition blocks serve as filters and enable incoming data to be filtered on a time basis or data basis. Action blocks offer the option of aggregating data (e.g. calculating min/max/avg or other operations). All blocks can be linked to each other with connections.



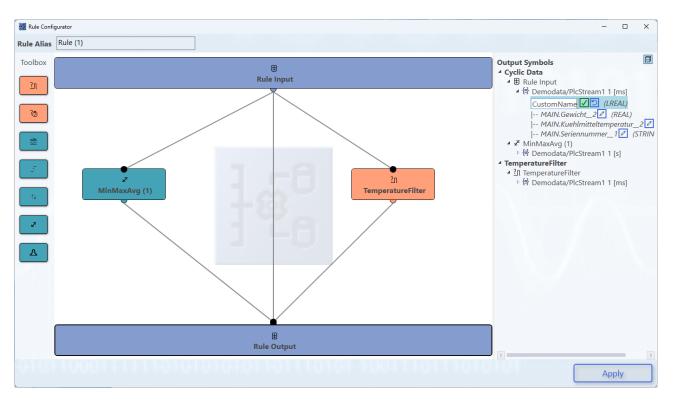
6.2.2.1.4.2.1 Input

Corresponds to the start point within a rule. All symbols added to the rule are displayed here. For BatchDataRules, the time range for which the data is loaded when the rule is triggered can be selected here.



6.2.2.1.4.2.2 Output

Corresponds to the output of the rule. All symbols of the blocks that are connected to the rule output can be selected for subsequent recordings. Variables can be renamed at the output node. To do this, you can click on the Edit icon behind the corresponding variable.



6.2.2.1.4.2.3 Conditions

Condition blocks serve as filters and enable incoming data to be filtered on a time basis or data basis.

6.2.2.1.4.2.3.1 Eventbased

The EventBased-Condition can be used to filter for data within the data where a specific event must have occurred. The following configurations can be made:

- Variable: Selection of the variables to which the condition must apply.
- Operator: Selection of the operator for the condition
- Compare value: Selection of the comparison value
 - Constant value: Comparison with a constant value
 - Variable: Comparison with another variable
 - Previous value: Comparison with the previous value of the selected variable.
- Duration: Selection of how long the data should be forwarded once the condition is fulfilled.
 - As long as condition is fulfilled: The data is forwarded as long as the condition is fulfilled.
 - **Single Flag**: The data is forwarded once when the condition is fulfilled, i.e. as with a rising edge.
 - Alternatively, the data can also be forwarded for a specific time, which can be configured manually.

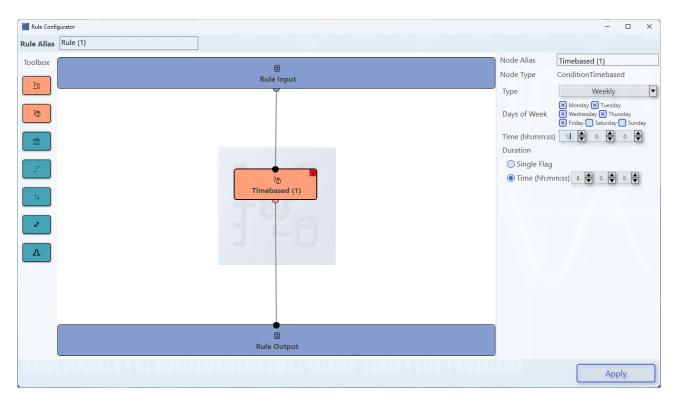
Configuration

📓 Rule Confi	gurator		– o x
Rule Alias	Rule (1)		
Toolbox 2n 70 2t Toolbox 70 Toolbox 70 70 70 70 70 70 70 7	Rule Input	Node Type Co	▼ ition is fulfilled
0101	1000111111010101010101101110101 1001110111010	101	Apply

6.2.2.1.4.2.3.2 Timebased

The Timebased-Condition can be used to filter within the data on a time basis. The time on which this is based is the respective timestamp of the data. The following configurations can be made:

- **Type**: Selection of the type of Timebased Condition. Three types are available
 - Interval: The condition is fulfilled as soon as the interval is reached.
 - Weekly: The condition is fulfilled on certain days of the week at a certain time.
 - Monthly: The condition is fulfilled in certain months on a certain day at a certain time.
- **Duration**: Selection of how long the data should be forwarded once the condition is fulfilled.
 - Single Flag: The data is forwarded once when the condition is fulfilled, i.e. as with a rising edge.
 - **Time**: Alternatively, the data can also be forwarded for a specific time, which can be configured manually.



6.2.2.1.4.2.4 Actions

Action blocks offer the option of aggregating data (e.g. calculating min/max/avg or other operations).

6.2.2.1.4.2.4.1 Downsampling

Configuration of a downsampling of individual variables. The sampling factor indicates the sampling rate. In the Selected Symbols area, you can select the variables to which downsampling is to be applied. If you want to sample all the data in a rule, you can configure this in the corresponding recording.

The following symbols are provided for each selected symbol:

• _	Sampled: Sampled symbol		
📓 Rule Conf	gurator		- 0 ×
Rule Alias	Rule (1)		
Toolbox <u>?</u> л	स्त्रि Rule Input		Downsampling (1) ActionDownsampling
۵ <u>۵</u>		Selected Symbols:	Ð
	a a a bownsampling (1)		nouala/Picstream + [ms]
±×			
	E Rule Output		
01.01	10001111110101010101101101110101 1001110111010		Apply

TF3520

6.2.2.1.4.2.4.2 EdgeCounter

Determines the edges within the data. The Operator Edge and the threshold value to be compared must be configured for this. In the Selected Symbols area, you can select the variables to which the Edge Counter is to be applied.

The following symbols are provided for each selected symbol:

- _Count: Number of edges counted
- _Edge: Boolean whether an edge is detected
- _LastEvent: Timestamp of the last event

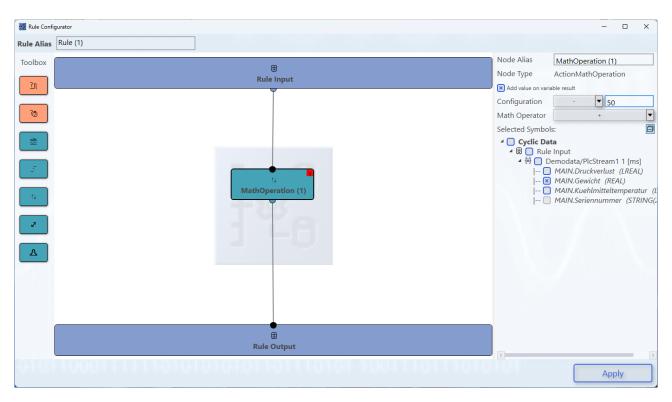
📓 Rule Confi	igurator		– 🗆 X
Rule Alias	Rule (1)		
Toolbox 2n 755 755 755 755 755 755 755 75	Rule Input	Node Type ActionEn Operator Edge Threshold Edge Selected Symbols: Cyclic Data Demodata P Demodata P MAIN.KG P MAIN.KG P MAIN.KG	bunter (1) dgeCounter >= • (PlcStream1 1 [ms]) fucKverlust (IREAL) iewicht (REAL) iewicht (REAL) ieriennummer (STRING(
	Rule Output	<	>
010	10001111110101010101101110101 1001110111010		Apply

6.2.2.1.4.2.4.3 MathOperation

Symbols can be calculated with each other using the MathOperation block. The symbols to be calculated with each other can be selected under **Selected Symbols**. The operator can be selected under **MathOperator**. If the result is to be calculated with an additional constant value, activate the **Add value on variable result** checkbox. In the **Configuration** area, you can configure the operator and the constant value with which the result of the symbols is to be calculated.

The following symbol is provided:

• **Result**: Result of the calculation

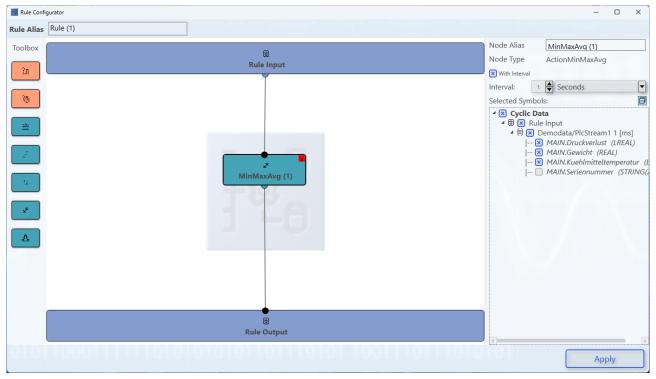


6.2.2.1.4.2.4.4 Min/Max/Avg

Calculation of the minimum/maximum and average value for selected symbols. In the **Selected Symbols** area, you can select the variables for which the values are to be calculated. If you activate the **With Interval** checkbox, you can configure an interval for which the values are to be calculated.

The following symbols are provided for each selected symbol:

- _Min: Minimum of the symbol
- _Max: Maximum of the symbol
- _Avg: Average of the symbol



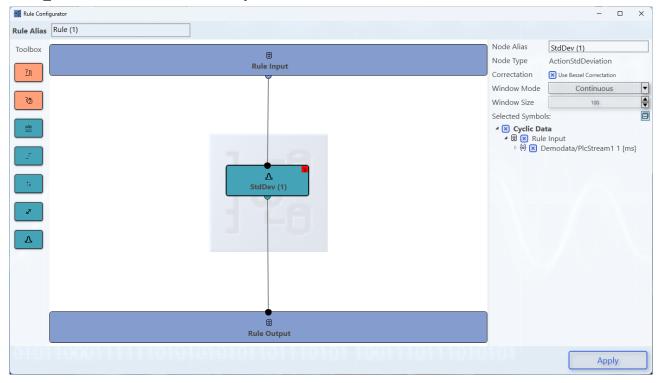
Version: 1.6.0

6.2.2.1.4.2.4.5 StandardDeviation

Calculation of the standard deviation for selected symbols. In the **Selected Symbols** area, you can select the variables for which the values are to be calculated. The calculation of the standard deviation can be configured according to the block.

The following symbols are provided for each selected symbol:

• _**STD**: Standard deviation of the symbol



6.2.2.1.4.2.5 Trigger

Triggers can be configured for a BatchDataRule (based on data from a recording). These triggers allow the rule to start time-based or event-based. A rule can also be triggered manually at any time. The triggers are configured in the Rule Trigger Configurator. This can be opened via the property window of the rule. The time-based and event-based triggers can be configured in the Rule Trigger Configurator. Currently, only time-based or event-based triggers can be used for a rule.

I RuleEngine Pipeline Editor				- 0	×
Pipeline Alias MyRuleEnginePipelineAlias	Storage F	Provider TwinCAT Analytics Storag	geProvider ("ING	MARR-NB02")	
Toolbox			Rule (3) - Prop	erties	
MQTT Source (1)			Alias Type	Rule (3) BatchDataRule	
NotInitialized			Nodes	2	
¢,			Symbols	0	۵
Rule (1)					
v ^e NotInitialized					
	-562				
Recording (1) Rec	ording (2)				
물 Not_Initialized 물	Not_Initialized				
			Rule Trigger		Ø
Rule (2)	e (3)		Trigger	0	ے
စုိ NotInitialized စုိ	NotInitialized				
					_
Pipeline Status NotInitalized				Save	
🔢 Rule Trigger Configurator				- 0	x
Rule Trigger					
		Add Du	unth accord ¹	Frigger	
Add Timebased T	ngger		entbased 7	ingger	
				Save	

6.2.2.1.4.2.5.1 Eventbased

The configuration of an event-based trigger corresponds to an <u>Eventbased-Condition</u> [\blacktriangleright 76] within the rule. The underlying data is the data that is currently being written to the recording that serves as the data source for the rule. It is not possible or necessary to configure the duration. If the trigger condition is fulfilled, the rule runs until the data has been processed accordingly and is then disabled until the next trigger.

📓 Rule Trigger Co	nfigurator		– 🗆 X
Rule Trigger			
• Eventbased	l Trigger 0		x
Variable			•
Operator		==	•
Compare valu	e		
Constant	value		
○ Variable	_		
	Add Timebased Trigger	Add Eventbased Trigg	ger
010110001			

6.2.2.1.4.2.5.2 Timebased

The configuration of a time-based trigger corresponds to a <u>Timebased-Condition [▶ 77]</u> within the rule. The underlying time is the system time of the device on which the Storage Provider is running. It is not possible or necessary to configure the duration. If the trigger condition is fulfilled, the rule runs until the data has been processed accordingly and is then disabled until the next trigger.

📓 Rule Trigger Config	urator				-		×
Rule Trigger							
• Timebased Tr	igger 0						x
Туре			Interv	al			•
Interval	1	Hours					•
Ado	d Timebased	l Trigger		Add Eventba	sed Trigger		
0101100011						6	
						Save	•

6.2.2.1.4.3 Editing recordings

Recordings are edited in the Single Recording Configurator. The following settings are available here:

- Alias: Recording alias
- Storage: Data sink for recording (configured in the Storage Provider Configurator)
- **Record Name**: Name of the record
- Mode: Mode of the record
 - **Infinite Duration**: The record runs as long as the RuleEngine pipeline is running and data is available for the record.
 - **Timebased Ringbugger**: The record runs as long as the RuleEngine pipeline is running and data is available for the record. The data is stored in a time-limited ring buffer.
 - **Databased Ringbugger**: The record runs as long as the RuleEngine pipeline is running and data is available for the record. The data is stored in a ring buffer with a limited storage capacity.
- **Symbols**: Selection of symbols to be saved with the recording. You can choose between cyclic data or data filtered by conditions.
- **CycleTime**: Selection of the cycle time for recording. This selection can only be made if you want to save cyclic (unfiltered) data. You have the option of configuring a cycle time based on the variables or your own cycle time for recording. Note that data will be lost if the cycle time is greater than the minimum cycle time of the data. In this case, a message appears.

📓 Single Recording Config	gurator – 🗆 X	
Single Recording Se	ettings	
Alias	Recording (1)	
Storage	AutoGenerated AlyStorage	
Record Name	Record_{AutoID}	
Mode	Infinite Duration	
Symbols		
▲ 🕏 🔀 Rule ▷ 🖶 🗶 De ▲ 🔲 Temperatu ▲ பி 🔵 Temp	/laxAvg (1) emodata/PlcStream1 1 [s] Input emodata/PlcStream1 1 [ms] u reFilter	
Cycle Time	● Use stream cycletime 1 [ms]	
	◯ Use custom cycletime 1 🚔 Milliseconds 🔻	
010110001111	Apply	

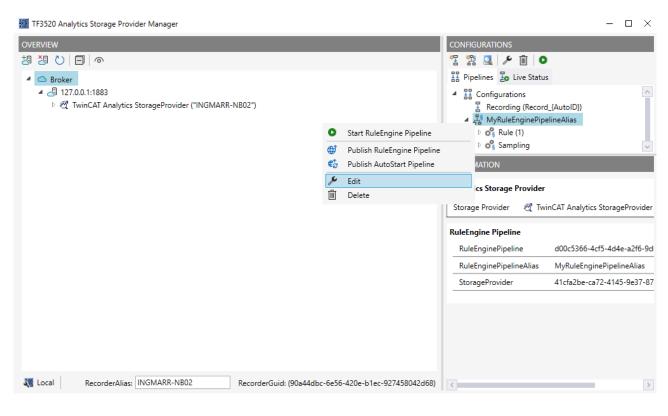
6.2.2.1.5 Saving a RuleEngine pipeline

A configured RuleEngine pipeline can be saved using the **Save** button (bottom right) in the RuleEngine Pipeline Editor. Saving is only possible if the configuration is error-free. Any errors are displayed via a message and the incorrectly configured blocks are highlighted graphically.

📓 RuleEngine Pipe	line Editor		– – ×
Pipeline Alias	MyRuleEnginePipelineAlias	Storage Provider TwinCAT Analytics	s StorageProvider ("INGMARR-NB02")
Toolbox	Demodata/PlcStr		FilteredData - Properties Image: Cycle Time 1 [ms] Storage AutoGenerated AlyStorage Mode Infinite Duration
	Rule (1) NotInitialized Filte Rule Not_Initialized Sampling NotInitialized Not_Initialized Not_Initialized Not_Initialized	redData	Symbols 4 • TemperatureFilter • ∯ FilteredData 1 [ms] [MAIN.Druckverlust_1 (LREAL) [MAIN.Gewicht_1 (REAL) [MAIN.KuehImitteltemperatur_1 (LREAL) [MAIN.Seriennummer (STRING(20))
Pipeline Statu	s NotInitalized	101101110101 10011101	Save
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💐 Local	RecorderAlias: INGMARR-NB02	RecorderGuid: (90a44dbc-6e56-420e-b1ec-927458042d68)	

6.2.2.1.6 Subsequent editing of a RuleEngine pipeline

A RuleEngine pipeline that has been created can be edited and modified by right-clicking **Edit** in the context menu. Please note that existing data can no longer be used in the pipeline if the recordings contained in the pipeline are adjusted.



6.2.2.2 Application

6.2.2.2.1 Starting/stopping a RuleEngine pipeline

A configured RuleEngine pipeline can be started via the Start icon.

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	INFORMATION
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	Storage Provider 🛛 🥂 TwinCAT Analytics StorageProvider
	Pipeline Recording
	RuleEnginePipeline 6ea1ef18-721f-47c4-a106-53cf
	RuleEnginePipelineAlias MyRuleEnginePipelineAlias
	StorageProvider 41cfa2be-ca72-4145-9e37-875
KecorderAlias: INGMARR-NB02 RecorderGuid: (90a44dbc-6e56-420e-b1ec-927458042d68)	< >>

A start is only possible if the Storage Provider is running and the RuleEngine in the Storage Provider is running without errors. The status of the RuleEngine can be read via the information of the respective Storage Provider.

IF3520 Analytics Storage Provider Manager		- 🗆 X
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4 🛃 127.0.0.1:1883	E Configurations	
▷ 🥂 TwinCAT Analytics StorageProvider ("INGMARR-NB02")	INFORMATION	
	Provider	
	Topic Ingma	rR/TcAnalyticsStorageProvider/41cfa2
	Version 1.0.0	
	Name TwinC/	AT Analytics Storage Provider
	Timestamp 20.11.2	2024 13:04:51
	Provider Info	
	ProviderGuid	41cfa2be-ca72-4145-9e37-875851
	DataStoreType	MultiStorageProvider {DefaultStor
	ServiceType	Windows Service
	Comment	TwinCAT Analytics StorageProvide
	DefaultStorage_Guid	2bc8e0c0-f749-4d20-a049-67462
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Incal RecorderAlias: INGMARR-NB02 RecorderGuid: (90a44dbc-6e56-420e-b1ec-927458042d68)	<	>

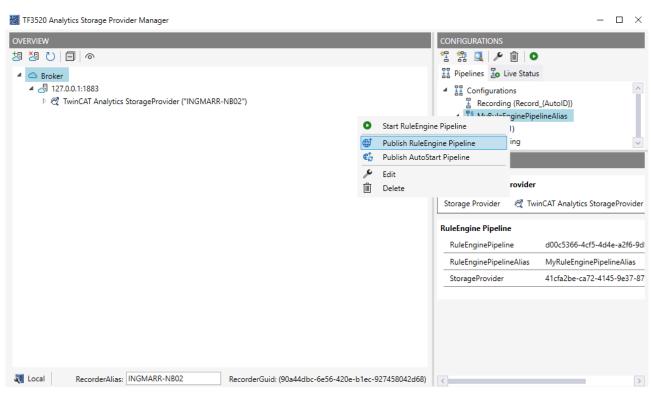
You can view RuleEngine pipelines that have been started in the Live Status tab and stop them there again.

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	INFORMATION Pipeline Recording Alias MyRuleEnginePipelineAlias

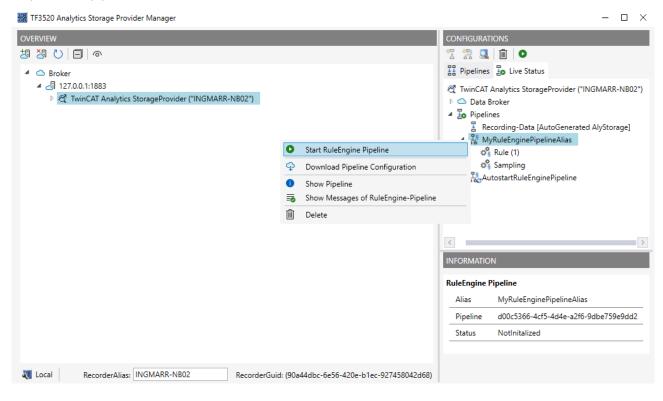
6.2.2.2.2 Publishing RuleEngine pipelines

Locally configured RuleEngine pipelines can be published to the stored Storage Provider. This means that the RuleEngine pipeline is also stored at the Storage Provider and is globally available. Other users can download, edit or start it. To publish, right-click on the locally configured pipeline in the

Publish RuleEngine Pipeline context menu. In addition, RuleEngine pipelines can be published in Autostart mode. This means that the pipelines are started automatically after the Storage Provider Service is started.



All published pipelines can be viewed under Live Status. These can be started, deleted or downloaded.



6.2.2.2.3 RuleEngine pipeline states

A RuleEngine pipeline can have the following states:

7. 62	NotInitalized: The started RuleEngine pipeline was received by the Storage Provider but not processed.
1.S	Initalizing: The RuleEngine pipeline is initialized. The corresponding rules are created.
1.	IsStarting: The RuleEngine pipeline is starting. Included rules are started.
L [§]	Running: The RuleEngine pipeline is running. All rules are at least in the Pending state and there is no error.
18	IsStopping: The RuleEngine pipeline is stopping, all rules are stopping.
19	Stopped: The RuleEngine pipeline is stopped, all rules are stopped.
1 8	Error: There is an error in at least one rule.

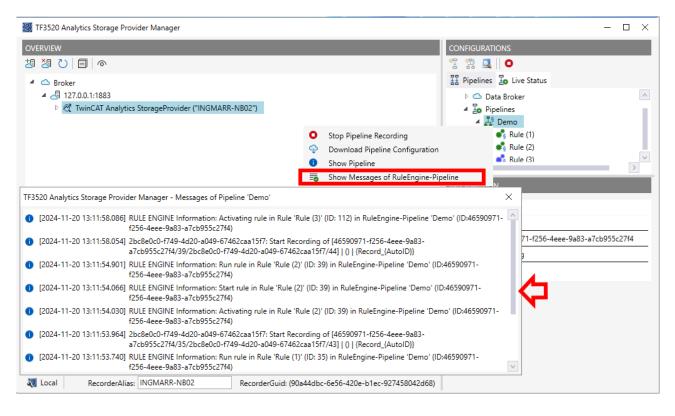
6.2.2.2.4 Rule states

You can also view the state of the rules from the RuleEngine pipeline in the Live Status. A rule has the following states:

¢ §	NotInitialized: The configuration of the rule has been read, but the rule has not yet been processed.
¢ §	Initializing: The rule is initializing. The necessary sources are generated in the RuleEngine.
¢,	Deactivated: The rule is ready for activation. It is not currently running.
o's	Activating: The rule will be activated. Any triggers will be started.
* §	Pending: The rule is activated. Any triggers have been started. The rule can now be triggered manually. StreamingDataRules go directly from the Pending state to the Starting state.
*s	Starting: The rule is starting. The corresponding processing modules are generated and a connection to the data sources is established.
₩ §	Running: The rule runs and processes data.
*	Stopping: The rule is stopping. Stopping is called when the RuleEngine pipeline will be stopped. BatchDataRules also stop when all data has been processed. The rule then switches to the Pending state.
€ [®] §	Deactivating: The rule will be deactivated. It is no longer possible to start up using a trigger.
¢.	Invalid: The rule is in an invalid state and must be restarted.
* §	Error: The rule is in an error state. This can happen, for example, if a data source (Analytics Logger) is not available. In this case, the rule restarts automatically as soon as the data source is available again. For all other errors, the rule must be restarted manually. This can be done via the Storage Provider Manager or the API or PLC library.

6.2.2.2.5 Messages from RuleEngine pipelines

The messages from RuleEngine pipelines provide more detailed information about errors and status information. The messages can be viewed via the context menu of a running RuleEngine pipeline. To do this, click on **Show Messages of RuleEngine-Pipeline**. A window with all available messages opens. If there are no messages in the window, these messages are no longer available. More accurate information can be found in the log from the Storage Provider, if this is activated.



6.2.2.2.6 Triggering and restarting rules

Rules can be triggered or restarted via the RuleEngine Pipeline Editor. The editor must be opened via a running RuleEngine pipeline (**context menu > Show Pipeline**).

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4 🛃 127.0.0.1:1883				ata Broker
▷ 🥂 TwinCAT Analytics StorageProvider ("INGMARR-NB02")			4 🕹 P	
	0	Stop Pipeline Recording		emo Rule (1)
	¢	Download Pipeline Configuration	n	\$ Rule (2)
Let a second	0	Show Pipeline		k Rule (3)
	-0	Show Messages of RuleEngine-	·	7
			INFORMATIC	N
			Pipeline Ree	cording
			Alias	Demo
			Pipeline	46590971-f256-4eee-9a83-a7cb955c27f4
			Status	Running
💐 Local RecorderAlias: INGMARR-NB02 RecorderGuid: (90a44db	ос-бе	56-420e-b1ec-927458042d68)		

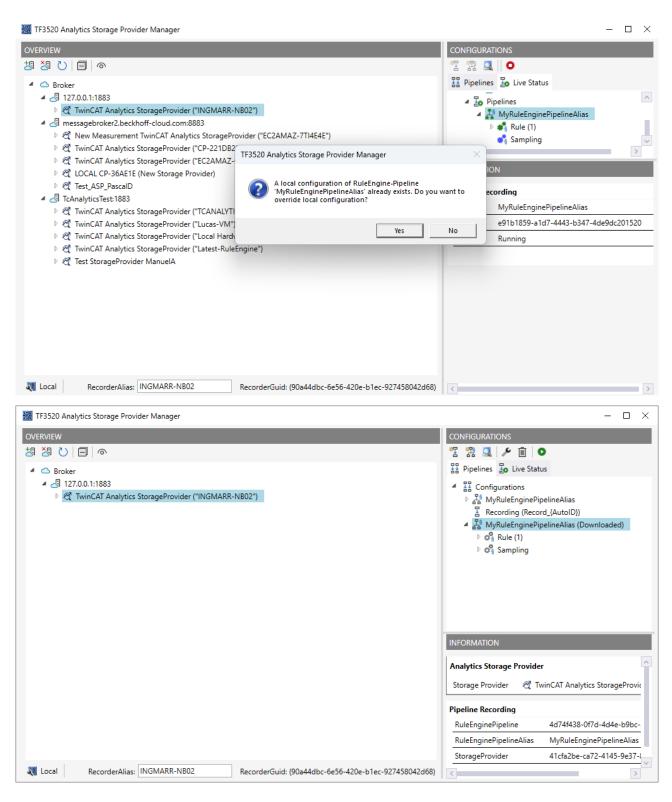
The RuleEngine Pipeline Editor opens in view mode. Processing is not possible there. In view mode, the status of the individual elements can be viewed and the corresponding rule can be triggered or restarted. Triggering is only possible when the rule is in the Pending state. A restart can only be performed if the rule is in an error state or has not been initialized.

📓 RuleEngine Pipe	eline Editor	- 0	×
Pipeline Alias	MyRuleEnginePipelineAlias	Storage Provider TwinCAT Analytics StorageProvider ("INGMARR-NB02")	
		You are in view mode - editing is not possible!	
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Ø.		Nodes 2 Symbols 13	
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	AggregatedData	FilteredData	
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	Sampling		
	🚓 Pending	• Rule Trigger	Ø
ſ	SampledData	Trigger 0	
		Trigger Rule	
	Not_Initialized		
Pipeline Statu	s Running		

6.2.2.2.7 Download RuleEngine pipelines

A copy of a running RuleEngine pipeline can be downloaded to the local manager by **right-clicking > Download**. If a RuleEngine pipeline with the same pipeline ID already exists, you can choose to overwrite it or create a copy with a new pipeline ID.

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			Alias	MyRuleEng	inePipelineAlias	
			Pipeline	fc4a7b9d-5	5106-4a71-9c94-002	a76743276
			Status	Running		
M Local RecorderAlias: INGMARR-NB02 RecorderGuid: (90a44dbc-6e56-4	120e-1	b1ec-927458042d68)	<			>



6.2.2.2.8 RuleEngine error case

If an error occurs within the RuleEngine that it cannot resolve on its own, the RuleEngine is restarted. All existing RuleEngine pipelines are shut down for this purpose. After the RuleEngine is restarted, the RuleEngine pipelines are created again. However, the rules contained therein are not automatically restarted. This must be done <u>manually [>91]</u> using the RuleEngine Pipeline Editor.

IF3520 Analytics Storage Provider Manager	- 🗆 ×
Image: TF3520 Analytics Storage Provider Manager Image: CVERVIEW Image: TF3520 Analytics Storage Provider ("INGMARR-NB02") Image: TF3520 Analytics StorageProvider ("INGMARR-NB02") Image: TF3520 Analytics Storage Provider (Image: TF3520 Analytics Storag	CONFIGURATIONS
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You are in view mode - editing is not possible	
Toolbox Rule (1) Rule (2) of NotInitialized Recording (1) Not_Initialized Rule (3) of NotInitialized Rule (3) of NotInitialized	Rule (1) - Properties Alias Rule (1) Type StreamingDataRule Nodes 2 Symbols 33 • Cyclic Data • ③ Rule Input • ③ Rule Input • ④ TestSignals/PlcStream3 1 [ms]
	Restart Rule
Pipeline Status IsStarting	

For a more detailed description of the error, see the messages or the log of the Storage Provider.

6.2.2.3 Converting old recordings

An existing pipeline (previous recording) can be converted into a RuleEngine by right-clicking **Convert to RuleEngine-Pipeline**. The new configuration opens in the RuleEngine Pipeline Editor and can be edited there.

Configuration

📓 RuleEngine Pipe	line Editor	-		×
Pipeline Alias	RuleEngine Pipeline 'Recording'	Storage Provider TwinCAT Analytics StorageProvider ("INGMARR-NB02")		
Toolbox	MQTT Source NotInitialized Rule (1) NotInitialized Recording Not_Initialized			
Pipeline Statu	NotInitalized	Sa	ve	

6.3 Working with Historical Data

Historical Data can be analysed with the Analytics Workbench or the Analytics Service Tool. To see your recorded data, you need the TwinCAT Target Browser.

Selection of data from the TwinCAT Target Browser

The historical data can be pulled directly from the Target Browser to an input of an analysis algorithm.

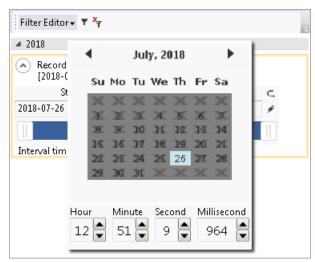
1. First, you need to click **TcAnalytics** in the left corner of Target Browser. There you can see your configured broker, which lists live and historical data from your various devices. This should look like the following figure.

Target Browser									+ ų ×
TcAnalytics TcAnalytics File OpcUa	Enter Filter								
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b 🛃 0503f297-c652-11es-Def6-4311e715af49									
▶ J 3db95703-29fb-d99e-eb13-017b54677bb0									
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2. Go to the historical stream you created and select the recording to be analyzed. All your records are listed in the **Record** window on the right. The last recording is selected by default.

Target Browser												- ù ×
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🗎 Live Data	5 bMillerMovingZ	BOOL	1	Primitive	GVL.bMill	0	0	none	none		₽ 2018-07-26 13:20:06.622	-
🔺 🚅 Historical Data	🜆 bMillerSpindleRotati	BOOL	1	Primitive	GVL.bMill	0	1592	none	none	2018/07/20 12:31:03:304	# 2018+07+20 13:20:00:022	<u> </u>
Anay@cicsFile (183D32AC-188A-00A0-7ADF-A81726A		BOOL	1	Primitive	GVL.bNe	0	2000	none	none		>28 minutes	
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P 2b80d57-89b6-3b77-98ee-f98f5783ad3f P	50 bPickerInHomePosit	BOOL	1	Primitive	GVL.bPick	0	1928	none	none			
b 🚽 0503f297-c652-llea-Def6-4311e715af49	50 bPickerInStorage1Pc		1	Primitive	GVL.bPick	0	1944	none	none			
3db95703-29fb-d99e-eb13-017b54677bb0	🜆 bPickerInStorage2Pc		1	Primitive	GVL.bPick	0	1952	none	none			
-+	🜆 bPickerInStorage3Pc		1	Primitive	GVL.bPick	0	1960	none	none			
	🜆 bPickerInStorage4Pc		1	Primitive	GVL.bPick	0	1968	none	none			
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3. When you record live, the time range of the recording is updated every few seconds. The entire time range of a recording is used by default. You can also edit the start and end time to analyze your desired data area. This can be done with a slider, text fields or in a graphical calendar view. If you click on the symbol to the right of the text fields, the calendar view will be displayed.



4. After these steps, you can drag and drop a symbol to an input of an algorithm just as you do with the symbols of the live data.

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A new input source for your historical stream is then generated and can be displayed in the Solution Explorer of your Visual Studio®. First, the dragged symbol and a timestamp of the current device time are listed under this stream. Also new drawn symbols of this stream are listed there.

Analyse your historical data in the Analytics Configurator

To analyse your historical data press on the Start Analytics button. In contrast to analysing live data, a green progress bar appears. The speed of your analysis depends on your record length, the amount and size of your symbols as well as on your broadband speed to the broker. The analysis stops automatically when the progress bar ends. The results will remain visible.

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Analysis of your historical data in your Analytics Runtime

You can provide the configuration with your historical data to an Analytics Runtime (PLC). In addition to the historical data, the live data is also analyzed. This allows you to switch between them and not lose live data by streaming historical data. The reason for this is that they are separated into two different tasks. The start of the analysis of historical data must be triggered.

i

Computing time for historical data

Unlike the Analytics Configurator, the analysis of historical data in the PLC takes a similar amount of time as the original recording of the data. Depending on the packet size and the set sampling rate, the processing of the data can be shortened compared to the recording. However, cycle overruns due to excessively large packets must be taken into account.

Main differences of the folder structure in the created PLC project:

Solution Explorer
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NOTICE

Implementation of the logic in your TwinCAT HMI

The preparation and writing of values in your PLC are for testing purposes. It is recommended to implement this and other logic in the PLC code with interactions from your TwinCAT HMI application if required.

You can start historical data analysis by triggering **bGetHistoricalData** in **stCtrl_T1**. The cancellation takes place by triggering **bCancelHistoricalData**.

This can be done in the MAIN_Analytics_Historical file as shown in the following figure:

🖌 🖌 AnalyticsProject 🔹 🗸 Local> 🔹 🚽 🚽 AnalyticsPro	oject 👻	- ∃ ▶ ■ €	∜ ି ↑ ⊨ Č) 👛 👛 🙀	÷ C C
MAIN_Analytics_Historical [Online] 👎 🗙					Write values
AnalyticsProject.AnalyticsProject.MAIN_Analytics_Historical					
Expression	Туре	Value	Prepared value	Address	Comment
🗏 🦘 stCtrl_T1	ST_HistoricalDa				
bGetHistoricalData	BOOL	FALSE	TRUE		
bCancelHistoricalData	BOOL	FALSE			
V bError1	BOOL	FALSE			

To switch between live and historical data results for your HMI dashboard, you can set the **bHistorical** symbol in the **AnalyticsHMI** GVL. With this option, you do not need any additional controls to display historical data (of course, you can also use your own controls for historical data). The analysis of the live data is not interrupted by calling up some historical data. After viewing the historical data, you can switch back to the current live results. This change only affects the variables in your GVL.

・ 1 ・ 日 ト ■ 日 : ? : 垣 ひ 台 凶 眞 ひ つ - AnalyticsHMI [Online] → × MAIN_Analytics_Historical [Online] Write values					
AnalyticsProject.AnalyticsProject.AnalyticsHMI					
Expression	Туре	Value	Prepared value	Address	Com
🎒 bHistorical	BOOL	FALSE	TRUE		Switch
bN1_Network1_Reset	BOOL	FALSE			Reset
bN1_M1_EdgeCounter1Ch_1_Reset	BOOL	FALSE			
🗉 🧭 stHMI_N1_Network1	ST_HMI_N1_Network1				HMI S

6.4 Console Configurator/Client

In addition to the <u>graphical configurator</u> and the <u>recorder</u>, the Analytics Storage Provider can also be operated via a console. This means that configuration and access to a Storage Provider can also be performed under TwinCAT/BSD in addition to Windows. In addition, the console application can be used to generate <u>Batch files for control [104]</u> of the Analytics Storage Provider.

After launching the console client, there are four options to choose from:

1	Opens the console Configurator [100] for the local Analytics Storage Provider
2	Opens the Analytics Storage Provider Client [101]
С	Clears the console configurator/client history
q	Closes the console configurator/client

By entering one of the identifiers and confirming with the **[Enter]** key, the corresponding function is executed.

6.4.1 Configurator

In this menu, the local Analytics Storage Provider can be configured. The following additional inputs are available for this purpose:

1	Starts a dialog for configuring the local Analytics Storage Provider
2	Outputs the configuration of the local Analytics Storage Provider
3	Starts a dialog for configuring a Sub Message Broker
4	Returns all Sub Message Broker configurations
5	Specify the Master Sub Message Broker (commands can only be received via this broker)
6	Starts a dialog for configuring a Storage
7	Returns all Storage configurations
8	Specifying the Master Storage
10	Starts the Analytics Storage Provider with the local configuration
11	Stops the local Analytics Storage Provider
12	Displays the status of the Analytics Storage Provider
b	Switches back to the main menu

The configuration parameters are the same as in the graphical <u>configurator of the Analytics Storage</u> <u>Provider</u>. To create the configuration, the configuration parameters are received after entering:

Π.	C:\Tw	rinCAT\Functions\TF3520-Analytics-StorageProvider\Client\TwinCAT.Analytics.StoragePr	×
****		######################################	Â
		Main Menu Local Provider Configurator	
1 2		Create Local Provider Config Read Local Provider Config	
3 4 5		Create Sub Broker Config Read Sub Broker Config Set Master Broker	
6 7 8		Create Storage Config Read Storage Configs Set Master Storage	
10 11 12		Start Local Provider Service Stop Local Provider Service Status Local Provider Service	
b c q		Back to Start Clear Screen Exit Program	
Plea	ase	enter a task:~ \$	
			÷

By pressing the **[ESC]** key, the dialog can be aborted at any time and you can return to the configuration menu.

6.4.2 Client

In the Analytics Storage Provider Client it is possible to connect to an Analytics Storage Provider. This does not necessarily have to run locally on the device, but can also be addressed via an external MQTT broker. Thus, it is not mandatory to configure an Analytics Storage Provider locally to use the client. Recordings can then be started and stopped on a connected Analytics Storage Provider, as well as historical data streams to a configurable MQTT topic.

The following inputs are available for this:

1	Establishes a connection with the MQTT broker from the local configuration and selects the configured Analytics Storage Provider.		
2	Starts a dialog to connect to an MQTT broker.		
3	Closes the connection to the current MQTT broker.		
10	Provides the Analytics Storage Providers that are available under the MQTT broker for selection.		
15	Reads a configuration file from an <u>Analytics Storage Provider Recorder</u> , with the recordings configured in it.		
21	Starts a RuleEngine pipeline.		
22	Stops a RuleEngine pipeline.		
23	Restarts a rule of a RuleEngine pipeline.		
31	Starts a recording.		
32	Stops a recording based on the alias and the MQTT topic.		
33	Starts a historical data stream.		
34	Stops a historical data stream based on the result MQTT topic.		
35	Updates streaming parameters of a running historical data stream.		
36	Checks whether a recording is active.		
40	Stops all active recordings.		
41	Stops all historical data streams.		
50	Deletes recordings that are older than a certain date. Optionally, a data stream can be specified.		

RecorderAlias:Console ASP Client ("INGMARR-NB02") - [dac195f2-0000-0000-0000-c0291056d9c1]
Main Menu Provider Client
1 : Use Local Provider 2 : Connect 3 : Disconnect
10 : Select Provider
15 : Load Config (RecorderSettings)
 21 : Start RuleEngine Pipeline 22 : Stop RuleEngine Pipeline 23 : Restart Rule of RuleEngine Pipeline
31 : Start Pipeline 32 : Stop Pipeline
 33 : Start Historical Stream 34 : Stop Historical Stream 35 : Set Historical Stream Parameter
36 : Is Recording Active
40 : Cancel All Recordings 41 : Cancel All Historical Streams
50 : Delete Recordings older than specific date of an historical stream (optional)
b : Back to Start c : Clear Screen q : Exit Program
Please enter a task:~ \$

Use

To use the Analytics Storage Provider Client, a connection to an MQTT broker must first be established. Entering "2" starts a dialog in which the already configured MQTT brokers are presented for selection. There a new MQTT broker can be configured and connected by entering "0". Then, by entering "10" in the client main menu, an Analytics Storage Provider can be selected, which is available under the MQTT broker. Alternatively, by entering "1" in the client main menu, a connection to the MQTT broker and Analytics Storage Provider can be established directly from the local configuration file.

After the connection is successfully established, information about the connected MQTT broker and the selected Analytics Storage Provider is displayed in the prompter display before the prompt:

[TcAnalyticsTest : ASP TcBSD (CX-5AC79C)] Please enter a task:~ \$

(MQTT broker: Analytics Storage Provider)

To start recordings, a dialog is started by entering "31". It is possible to start a recording that has already been created, provided that recordings have already been configured or read in via a recorder configuration file. In addition to the listed recordings, a new recording can also be configured and started by entering "0":



RecorderAlias:Console ASP Client ("MARCT-NB01") - [ffca662c-0000-0000-80d643e8d241] ← 1
Main Menu Provider Client
1 : Use Local Provider 2 : Connect 3 : Disconnect
10 : Select Provider
20 : Load Config (RecorderSettings)
31 :Start Recording32 :Stop Recording33 :Start Historical Stream34 :Stop Historical Stream35 :Set Historical Stream Parameter36 :Is Recording Active
40 : Cancel All Recordings 41 : Cancel All Historical Streams
b : Back to Start c : Clear Screen q : Exit Program
<pre>[TcAnalyticsTest : ASP TcBSD (CX-5AC79C)] Please enter a task:~ \$ 31 Recordings: (0) - [Create new recording] (1) - "TcBSD_ASP_Recording" (ASP_Record) (2) - "TcBSD_ASP_Alias" (TcBSD_Record) [TcAnalyticsTest : ASP TcBSD (CX-5AC79C)] Please choose id from record config:~ \$ 0</pre>
<pre>[TcAnalyticsTest : ASP TcBSD (CX-5AC79C)] Please enter topic:~ \$ TestSignals/StreamFast [TcAnalyticsTest : ASP TcBSD (CX-5AC79C)] Please enter recording alias:~ \$ ASP_Recording [TcAnalyticsTest : ASP TcBSD (CX-5AC79C)] Please enter recordname:~ \$ AnalyticsSP_Record [TcAnalyticsTest : ASP TcBSD (CX-5AC79C)] Please enter duration in minutes:~ \$ 120 [TcAnalyticsTest : ASP TcBSD (CX-5AC79C)] Please enter ringbuffer [None TimeBased DataBased]:~ \$ None [TcAnalyticsTest : ASP TcBSD (CX-5AC79C)] Please enter dataFormat [Bin Json]:~ \$ Bin [TcAnalyticsTest : ASP TcBSD (CX-5AC79C)] Please enter recording mode [All Subset]:~ \$ All Recording command "ASP_Recording" send to Provider. Recording "ASP_Recording" is running.</pre>

The configuration parameters correspond to the known parameters from the graphical <u>Analytics Storage</u> <u>Provider Recorder</u>. The default values can be deleted if necessary and replaced by individual entries. With the **recording mode** after the input "Subset" a subset of the symbolism can be defined by the recording data. Immediately after configuration, a command to start recording is sent to the connected Analytics Storage Provider. Running recordings can be stopped by entering "32". They are referenced by the MQTT topic from which the data comes and by the recording alias. If a recording is to be stopped by another client, the corresponding **Recorder Guid** must also be specified. The **Recorder Guid** is displayed together with the **Recorder Alias** above the input options in the client main menu (red 1).

Recording configurations created in the console client are not persisted. So after closing the client, the list of recording configurations is no longer available. Therefore, reading recorder configuration files (enter "20" in the client main menu) can be very helpful. The configuration file of a recorder is stored on Windows systems under the path *C*:*Users**** *AppData**Roaming**Beckhoff**TwinCAT Analytics Storage Provider* (replace *** with the corresponding user).

The historized data of the Analytics Storage Provider can be transmitted as a data stream to a definable result MQTT topic via the input "33". This also starts a dialog in which a previously configured data stream can be started. By entering "0", a new historical data stream can also be configured:



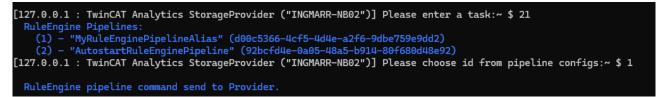
1 : 2 : 3 :	
10 :	Select Provider
20 :	Load Config (RecorderSettings)
31 : 32 : 33 : 34 : 35 : 36 :	Stop Recording Start Historical Stream Stop Historical Stream Set Historical Stream Parameter
40 : 41 :	
b : c : q :	Clear Screen
GetHi (0) (1) (2)	LyticsTest : ASP TCBSD (CX-5AC79C)] Please enter a task:~ \$ 33 Lstorical Cmds:) - [Create new GetHistorical cmd]) - "RecordID:29 Topic:TestSignals/StreamFast") - "RecordID:39 Topic:TestSignals/StreamFast" LyticsTest : ASP TCBSD (CX-5AC79C)] Please choose id from cmd:~ \$ 0
TCAnal [TCAnal [TCAnal [TCAnal [TCAnal [TCAnal [TCAnal [TCAnal [TCAnal [TCAnal	<pre>lyticsTest : ASP TCBSD (CX-5AC79C)] Please enter systemID:~ \$ cff7975b-b34d-43f7-755d-95cf135f50db lyticsTest : ASP TCBSD (CX-5AC79C)] Please enter topic:~ \$ TestSignals/StreamFast lyticsTest : ASP TCBSD (CX-5AC79C)] Please enter symbol layout:~ \$ 52a5066f-3c94-d853-f02b-bce62b4a6dea lyticsTest : ASP TCBSD (CX-5AC79C)] Please enter record id:~ \$ 1 lyticsTest : ASP TCBSD (CX-5AC79C)] Please enter start time in ns:~ \$ 13331821883950000 lyticsTest : ASP TCBSD (CX-5AC79C)] Please enter end time in ns:~ \$ 133318220040054000 lyticsTest : ASP TCBSD (CX-5AC79C)] Please enter maxSampleCnt default:~ \$ 5000 lyticsTest : ASP TCBSD (CX-5AC79C)] Please enter user sampletime default:~ \$ -1 lyticsTest : ASP TCBSD (CX-5AC79C)] Please enter outputFormat [Bin]Json]:~ \$ Bin lyticsTest : ASP TCBSD (CX-5AC79C)] Please enter result topic:~ \$ TCBSD_AnalyticsSP_ResultTopic lyticsTest : ASP TCBSD (CX-5AC79C)] Please enter symbol mode [All Subset]:~ \$ All lstoricalStream command for "TCBSD AnalyticsSP_ResultTopic" send to Provider.</pre>

The parameters define a historized recording, whereby the parameter **result topic** defines the MQTT topic to which the data is to be streamed. After configuration, a command to start the historical stream is automatically sent to the Analytics Storage Provider.

By entering "35" in the client main menu, the parameters of an active historical stream can be adjusted. The historical stream is referenced by its result MQTT topic. The parameters can be used, for example, to adjust the speed or packet size of the data stream while it is running. Canceling a historical data stream is possible by entering "34" and specifying the result MQTT topic.

RuleEngine pipelines

It is also possible to start RuleEngine pipelines that have already been published. The entry "21" must be made for this. The appropriate RuleEngine pipeline can then be selected. RuleEngine pipelines can also be stopped (input "22"). It is also possible to restart individual rules (input "23").



6.4.3 Batch files for control

The console client can be used to create batch files to control the Analytics Storage Provider. Some parameters are provided for this purpose:

-Help / -H / -?

Returns a description of all parameters

Parameters for the configuration settings:

-CreateASPConfig	Create a new Analytics Storage Provider settings XML
-MainTopic <maintopic></maintopic>	Analytics Storage Provider Main Topic
-Comment <comment></comment>	Analytics Storage Provider comment
-EventLogTrace <true false></true false>	Trace to the event log
-DebugLog <true false></true false>	Additional DebugLog
-StorageType <type></type>	Storage type (ANALYTICSFILE, AZURESQL, AZUREBLOB)
-StorageConnString <connstring></connstring>	Connection string or path to memory
-TlsType <tls1.0 tls1.1 tls1.2></tls1.0 tls1.1 tls1.2>	TIs type (for AzureBlob)
-MaxDuration <duration (sec)=""></duration>	Maximum duration of a TAY file
-MaxWriteLen <writelen (bytes)=""></writelen>	Maximum length of a data packet

Configuration parameters:

-LocalProvider	Use the connection settings of the locally installed Analytics Storage Provider
-ConfigFile <path></path>	Use all configurations from the configuration file of an Analytics Storage Provider Recorder window
-ProviderGuid <guid></guid>	Provider of the Analytics Storage Provider to be used
-ConfigCmdID <id></id>	ID number of the preconfigured recording in the configuration file
-ConfigCmdAlias <alias></alias>	Alias of the preconfigured recording in the configuration file

Connection parameters:

-Broker /-Host <hostname></hostname>	Host name or IP address of the broker used
-Port <port></port>	Broker port (default value: 1883)
-User <username></username>	Username for the connection
-Password / -Pwd <password></password>	Password for the connection
-CA <path></path>	Path to the CA certificate for the connection
-Cert <path></path>	Path to the certificate for the connection
-Key_Cert <path></path>	Path to the key file for the connection
-Key_Pwd <password></password>	Password for the key file for the connection

Function parameters:

-StartRecord	Sends a StartRecord command
-StopRecord	Sends a StopRecord command
-IsRecordingActive	Checks whether a recording is currently running
-GetHistorical	Sends a GetHistoricalData command
-StopHistorical	Sends a StopHistoricalData command
-UpdateHistorical	Sends a HistoricalUpdate command
-CancelAllRec	Sends a Cancel command to all active recordings
-CancelAllHist	Sends a Cancel command to all active historical data streams
-StartPipeline	Sends a StartRuleEngine pipeline command
-StopPipeline	Sends a StopRuleEngine pipeline command
-RestartRule	Sends a RestartRule command
-DeleteRecordingsOlderThan	Deletes recordings whose end time is older than a specified timestamp. Optionally, the topic of the historical stream can also be specified. Only the active historical streams are taken into account.

Recording start/stop parameters:

-Alias <alias></alias>	Alias name of the recording
-RecName <record></record>	Alias name of the data set
-Topic <topic></topic>	Topic to be included
-DataFormat <bin json></bin json>	Data format of the live data stream
-Duration <seconds></seconds>	Recording duration
-Ringbuffer <none timebased databased></none timebased databased>	Ring buffer mode (default value: Default)
-RinbufferPara <minutes mb=""></minutes>	Parameters for the ring buffer (in seconds or megabytes)
-Mode <all subset></all subset>	Mode of recording. Takes all symbols and a subset of the symbols.
-Symbols / -Sym <symbol1,symbol2></symbol1,symbol2>	List of symbol subset as comma-separated list.
-RecorderGuid <guid></guid>	Guid of the Analytics Storage Provider Recorder window.
-Storage <guid></guid>	Guid from storage where to write.
-SubBroker <guid></guid>	Guid from the Sub Broker from which the data is to be recorded.

Historical data stream start/stop parameters:

-SystemID <systemid guid=""></systemid>	System ID of the recorded data set.
-Topic <topic></topic>	Topic of the recorded data set.
-Layout <layout guid=""></layout>	Layout of the recorded data set.
-RecordID <id></id>	ID of the data set to be streamed.
-StartTime <time ns=""></time>	Start time of the data set to be streamed in nanoseconds.
-EndTime <time ns=""></time>	End time of the data set to be streamed in nanoseconds.
-MaxSamples <samples></samples>	Maximum number of samples (default value: 5000)
-UsrSampleTime <ms></ms>	Sampling rate. (Default value: -1; sampling rate of the recording)
-DataFormat <bin json></bin json>	Data format of the data stream.
-ResultTopic <topic></topic>	Result MQTT topic to which the data will be streamed.
-Mode <all subset></all subset>	Streaming mode. Streams all or a subset of the symbols.
-Symbols / -Sym <symbol1,symbol2></symbol1,symbol2>	List of symbol subset as comma-separated list.

Historical data stream update parameters:

-MaxSamples <samples></samples>	Maximum number of samples (default value: 5000)
-UsrSampleTime <ms></ms>	Sampling rate. (Default value: -1; sampling rate of the recording)
-MaxPackSize <samples></samples>	Maximum message size in kilobytes
-SendDuration <ms></ms>	Waiting time between sending messages in milliseconds.
-ResultTopic <topic></topic>	Result MQTT topic to which the data will be streamed.

RuleEngine pipeline parameter:

- PipelineGuid <guid></guid>	Guid of the RuleEngine pipeline.
- RuleID <id></id>	ID of the rule within a RuleEngine pipeline.

Delete recordings Parameter:

- DateTimeOlderThan <datetime></datetime>	Timestamp in the format "yyyy-MM-dd hh:mm".
	Any recording with an end time older than this timestamp will be deleted.
- HistoricalStreamTopic <topic></topic>	Topic of the historical stream (optional).

Command line samples:

Create configuration:

```
TwinCAT.Analytics.StorageProvider.Client
-CreateASPConfig
-MainTopic Beckhoff/ASPTest
-Comment Analytics Storage Provider (Test)
-EventLogTrace False
-DebugLog False
-StorageType ANALYTICSFILE
-StorageConnString C:\TwinCAT\Functions\TF3520-Analytics-StorageProvider\Storage
-MaxDuration 120
-MaxWriteLen 2048
-Broker 172.17.62.135
-Port 1883
-User tcanalytics
-Pwd 123
```

Start recording with local Analytics Storage Provider:

```
TwinCAT.Analytics.StorageProvider.Client
    -localprovider
    -startrecord
        -alias cmdTest
        -recname cmdRec1
        -topic TestSignals/TestStream
        -dataformat Bin
        -Duration 30
        -mode Subset
        -Symbols Variables.fCosine,Variables.fSine
```

Start configuration file of a recording:

```
TwinCAT.Analytics.StorageProvider.Client
    -ConfigFile "C:
\Users\User\AppData\Roaming\Beckhoff\TwinCAT Analytics Storage Provider\TcAnalyticsStorageProvider_R
ecorder.xml"
    -ProviderGuid 76141a7f-e580-4281-99d8-1b8a75ca014d
    -startrecord
    -ConfigCmdAlias cmdTest
```

Check recording status

```
TwinCAT.Analytics.StorageProvider.Client

-Broker 172.17.62.135

-Port 1883

-User tcanalytics

-Pwd 123

-ProviderGuid 76141a7f-e580-4281-99d8-1b8a75ca014d

-IsRecordingActive

-alias cmdTest

-recorderGuid a8e171d2-712d-bd8e-da15-7eef28b71ad2
```

Stop all recordings:

```
TwinCAT.Analytics.StorageProvider.Client

-Broker 172.17.62.135

-Port 1883

-User tcanalytics

-Pwd 123

-ProviderGuid 76141a7f-e580-4281-99d8-1b8a75ca014d

-CancelAllRec
```

Start historical data stream:

```
TwinCAT.Analytics.StorageProvider.Client
    -localprovider
    -GetHistorical
    -systemID c29ac2d4-76ce-ff44-4d7f-355ffbcca6bf
    -layout 9a8e171d-712d-bd8e-da15-7eef28b71ad2
    -topic TestSignals/TestStream
    -recordID 1
    -startTime 132696863612730000
    -endTime 132696864177720000
    -maxSamples 5000
    -usrSampleTime -1
    -resultTopic TestSignals/TestStream/123
    -dataformat Bin
    -mode Subset -symbols Variables.fSine
```

Start RuleEngine pipeline:

```
TwinCAT.Analytics.StorageProvider.Client
-localprovider
-StartPipeline
-PipelineGuid d00c5366-4cf5-4d4e-a2f6-9dbe759e9dd2
```

Stop RuleEngine pipeline:

```
TwinCAT.Analytics.StorageProvider.Client
-localprovider
-StopPipeline
-PipelineGuid d00c5366-4cf5-4d4e-a2f6-9dbe759e9dd2
```

Start a special rule of a RuleEngine pipeline:

```
TwinCAT.Analytics.StorageProvider.Client
-localprovider
-RestartRule
-PipelineGuid d00c5366-4cf5-4d4e-a2f6-9dbe759e9dd2
-RuleID 2
```

Delete old recordings:

```
TwinCAT.Analytics.StorageProvider.Client
    -localprovider
    -DeleteRecordingsOlderThan
        -DateTimeOlderThan yyyy-MM-dd 00:00
        - HistoricalStreamTopic Beckhoff /TcAnalyticsStorageProvider/41cfa2be-
ca72-4145-9e37-875851502aa6/Historical/Stream 65
```

7 PLC API

7.1 Function blocks

- 7.1.1 Topic Architecture
- 7.1.1.1 Commands

7.1.1.1.1 T_ALY_SPCancel_Cmd

eCancelType E_CancelType arrParameter ARRAY [099] OF T MaxString		T_ALY_SPCancel_Cmd		
	 eCancelType 	E_CancelType		
	-arrParameter	ARRAY [099] OF T_MaxString		

Syntax

Definition:

Inheritence hierarchy

T_ALY_JsonPayload [129]

T_ALY_SPCancel_Cmd

🔁 Inputs

Name	Туре	Description
eCancelType	E CancelType [▶ 141]	
arrParameter	ARRAY [099] OF T_MaxString	

🔹 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include
TwinCAT v3.1.4022.25	PC or CX (x64, x86, Arm®)	Tc3_AnalyticsStorageProvider

7.1.1.1.2 T_ALY_SPGetHistorical_Cmd

	T_ALY_SPGetHistorical_Cmd
_	sTopic T_MaxString
	sLayout GUID
_	eMode E_SymbolMode
_	eOutputFormat E_RawDataFormat
_	nMaxSampleCount UDINT
_	nUserSampleTime DINT
_	nRecordID DINT
_	nStartTimestamp LINT
_	nEndTimestamp LINT
	sResultTopic T_MaxString
_	arrSymbols ARRAY [0255] OF T_ALY_Symbol

Syntax

Definition:

```
FUNCTION_BLOCK T_ALY_SPGetHistorical_Cmd EXTENDS T_ALY_JsonPayload
VAR_INPUT
sTopic : T_MaxString;
sLayout : GUID;
eMode : E_SymbolMode := E_SymbolMode.All;
eOutputFormat : E_RawDataFormat := E_RawDataFormat.Bin;
nMaxSampleCount : UDINT := 3000;
nUserSampleTime : DINT := -1;
nRecordID : DINT;
nStartTimestamp : LINT;
nEndTimestamp : LINT;
sResultTopic : T_MaxString;
arrSymbol : ARRAY [0..255] OF T_ALY_Symbol;
END VAR
```

Inheritence hierarchy

T ALY JsonPayload [129]

T_ALY_SPGetHistorical_Cmd

🔁 Inputs

Name	Туре	Description
sTopic	T_MaxString	Topic name of the recorded Live Stream
sLayout	GUID	Layout GUID of the recording
eMode	E_SymbolMode [145]	Get all symbols or only a subset
eOutputFormat	E_RawDataFormat [▶ 142]	Format of the returned data (actually only "Bin" supported)
nMaxSampleCount	UDINT	Max count of samples in one payload packet
nUserSampleTime	DINT	Sampletime in milliseconds of the returned stream. (-1 use the recorded sampletime)
nRecordID	DINT	Number of the record
nStartTimestamp	LINT	StartTime
nEndTimestamp	LINT	EndTime
sResultTopic	T_MaxString	Topicname of the result stream.
arrSymbol	ARRAY [0255] OF <u>T ALY Symbol</u> [▶ <u>127]</u>	If SymbolMode is Subset, only the list of this symbols will be returned

🔹 Methods

TwinCAT v3.1.4022.25

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [<u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [<u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include

PC or CX (x64, x86, Arm®)

7.1.1.1.3 T_ALY_SPReadStreamRecords_Cmd

	T_ALY_SPReadStreamRecords_Cmd
_	sStreamTopic STRING(255)
_	sStreamSystemID GUID
_	sStreamLayout GUID
_	nRecordStartIndex DINT
	nMaxRecordCount DINT
_	sResultTopic T_MaxString

Tc3_AnalyticsStorageProvider

Syntax

Definition:

```
FUNCTION_BLOCK T_ALY_SPReadStreamRecords_Cmd EXTENDS T_ALY_JsonPayload
VAR_INPUT
    sStreamTopic : STRING(255);
    sStreamSystemID : GUID;
    sStreamLayout : GUID;
    nRecordStartIndex : DINT;
    nMaxRecordCount : DINT;
    sResultTopic : T_MaxString;
END_VAR
```

Inheritance hierarchy

T ALY JsonPayload [129]

T_ALY_SPReadStreamRecords_Cmd

🔁 Inputs

Name	Туре	Description
sStreamTopic	STRING(255)	Topic name of the recorded live stream.
sStreamSystemID	GUID	SystemID of the target system from where the live stream was sent
sStreamLayout	GUID	Layout GUID of the recording
nRecordStartIndex	DINT	Start index of the first record to be read.
nMaxRecordCount	DINT	Total number of records to be read.
sResultTopic	T_MaxString	Topic name of the result stream

🔹 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [<u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include
TwinCAT v3.1.4022.25	PC or CX (x64, x86, Arm®)	Tc3_AnalyticsStorageProvider

7.1.1.1.4 T_ALY_SPRecordData_Cmd

T_ALY_SPRecordData_Cmd
sAlias T_MaxString
eRecording E_RecordMode
-sTopic T_MaxString
eDataFormat E_RawDataFormat
eRingBufferMode E_RingBufferMode
-eMode E_SymbolMode

Syntax

Definition:

```
FUNCTION_BLOCK T_ALY_SPRecordData_Cmd EXTENDS T_ALY_JsonPayload
VAR_INPUT
sAlias : T_MaxString;
sRecordName : T_MaxString;
eRecording : E_RecordMode;
sRecorder : GUID;
sRecorderAlias : T_MaxString;
eDataFormat : E_RawDataFormat;
nDuration : DINT;
eRingBufferMode : E_RingBufferMode;
nRingBufferParameter : DINT;
eMode : E_SymbolMode;
sSymbolLayout : GUID;
arrSymbols : ARRAY [0..255] OF T_ALY_Symbol;
END_VAR
```

Inheritence hierarchy

T_ALY_JsonPayload [129]

T_ALY_SPRecordData_Cmd

🔻 Inputs

Name	Туре	Description
sAlias	T_MaxString	Alias name for the Recording
sRecordName	T_MaxString	Name for this record
eRecording	E_RecordMode [143]	Start or Stop the recording
sRecorder	GUID	Individual GUID of the recorder
sRecorderAlias	T_MaxString	Alias name for the recorder
sTopic	T_MaxString	Topic name of the live stream
eDataFormat	E_RawDataFormat [▶_142]	Store data format. (actually only Binary format is supported)
nDuration	DINT	Duration in minutes of the recording. (-1 unlimited)
eRingBufferMode	E_RingBufferMode [▶ 144]	Ringbuffer modus
nRingBufferParameter	DINT	TimeBased => Parameter in minutes
		DataBased => Parameter in Megabytes
eMode	E_SymbolMode [145]	Record all symbols or only a subset
sSymbolLayout	GUID	
arrSymbols	ARRAY [0255] OF <u>T ALY Symbol</u> [▶ <u>127]</u>	If SymbolMode is Subset, only the list of this symbols will be recorded

🔹 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include
TwinCAT v3.1.4022.25	PC or CX (x64, x86, Arm®)	Tc3_AnalyticsStorageProvider

7.1.1.1.5 T_ALY_SPReloadHistoricalStreams_Cmd

	T_ALY_SPReloadHistoricalStreams_Cmd
-eReload	Type E_ReloadType
-arrParan	neter ARRAY[09] OF ARRAY[01] OF T_MaxString

Syntax

Inheritance hierarchy

T_ALY_JsonPayload [] 129]

T_ALY_SPReloadHistoricalStreams_Cmd

🐔 Inputs

Name	Туре	Description
eReloadType	E_ReloadType [▶ 144]	Update mode selection
arrParameter	ARRAY [09] OF ARRAY [01] OF T_MaxString	Additional parameters

🔹 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include
TwinCAT v3.1.4022.25	PC or CX (x64, x86, Arm®)	Tc3_AnalyticsStorageProvider

7.1.1.1.6 T_ALY_SPSetGetHistoricalDataState_Cmd

```
T_ALY_SPSetGetHistoricalDataState_Cmd

= sResultTopic T_MaxString

= eState E_SetGetHistoricalDataState

= nSendDuration_ms DINT

= nRestartTimestamp LINT

= nMaxSampleCount UDINT

= nMaxPackageSize_KB DINT

= nUserSampleTime LINT
```

Syntax

```
FUNCTION_BLOCK T_ALY_SPSetGetHistoricalDataState_Cmd EXTENDS T_ALY_JsonPayload
VAR_INPUT
sResultTopic : T_MaxString;
eState : E_SetGetHistoricalDataState;
nSendDuration_ms : DINT;
```

```
BECKHOFF
```

```
nRestartTimestamp : LINT;
nMaxSampleCount : UDINT;
nMaxPackageSize_KB: DINT;
nUserSampleTime : LINT;
vAr
```

END_VAR

Inheritance hierarchy

T_ALY_JsonPayload [129]

T_ALY_SPSetGetHistoricalDataState_Cmd

🐔 Inputs

Name	Туре	Description
sResultTopic	T_MaxString	Topic name of the result stream (used like a handle).
eSta.te	E SetGetHistoricalDataState [144]	Historical stream state
nSendDuration_ms	DINT	Waiting time between sending the individual packages
nRestartTimestamp	LINT	Timestamp at which the result stream is continued.
nMaxSampleCount	UDINT	Maximum number of entries in a package
nMaxPackageSize_KB	DINT	Maximum size of a package
nUserSampleTime	LINT	Sample time in milliseconds of the returned stream (-1 uses the recorded sample time).

🔹 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include
TwinCAT v3.1.4022.25	PC or CX (x64, x86, Arm®)	Tc3_AnalyticsStorageProvider

7.1.1.1.7 T_ALY_SPStorageCtrl_Cmd

	T_ALY_SPStorageCtrl_Cmd
_	eCtrlMode E_ControlMode
-	sStorageGuid GUID

Syntax

```
PLC API
```

```
FUNCTION_BLOCK T_ALY_SPStorageCtrl_Cmd EXTENDS T_ALY_JsonPayload
VAR_INPUT
        eCtrlMode : E_ControlMode;
        sStorageGuid : GUID;
END VAR
```

Inheritence hierarchy

T_ALY_JsonPayload [] 129]

T_ALY_SPRecordData_Cmd

🐔 Inputs

Name	Туре	Description
eCtrlMode	I	Start, stop, etc. of the Storage.
sStorageGuid		Individual GUID of the Storage.

🔹 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include

Deven		raiget plationin	r Lo indianes to include
TwinC	AT v3.1.4022.25	PC or CX (x64, x86, Arm®)	Tc3_AnalyticsStorageProvider

7.1.1.1.8 T_ALY_SPRuleEnginePipeline_Cmd

```
T_ALY_SPRuleEnginePipeline_Cmd

— sRuleEnginePipeline GUID

— eCmdType E_PipelineCmdType

— sRecorder GUID

— sRecorderAlias T_MaxString
```

Syntax

Definition:

```
FUNCTION_BLOCK T_ALY_SPRecordData_Cmd EXTENDS T_ALY_JsonPayload
VAR_INPUT
    sRuleEnginePipeline : GUID;
    eCmdType : E_PipelineCmdType;
    sRecorder : GUID;
    sRecorderAlias : T_MaxString;
END_VAR
```

Inheritance hierarchy

T ALY JsonPayload [129]

T_ALY_SPRuleEnginePipeline_Cmd

🐔 Inputs

Name	Туре	Description
sRuleEnginePipeline	GUID	Individual GUID of the RuleEngine pipeline.
eCmdType	E PipelineCmdType [> 146]	Start or Stop the recording.
sRecorder	GUID	Individual GUID of the recorder.
sRecorderAlias	T_MaxString	Alias name for the recorder.

🔹 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T ALY JsonPayload</u> [<u>] 129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include
TwinCAT v3.1.4022.25	PC or CX (x64, x86, Arm®)	Tc3_AnalyticsStorageProvider

7.1.1.2 Descriptions

7.1.1.2.1 T_ALY_HistoricalStream_Desc

T_ALY_HistoricalStream_Desc
STRING(255) sSource
STRING(255) sStreamTopic
STRING(255) sStreamAlias
GUID sStreamSystemID
GUID sLayout
UDINT nCycleTime
UDINT nDataSize
ARRAY[0cMaxRecordCount] OF T_RecordTimestamps arrRecords
And Planta action of the Antional State of the State of t

Syntax

Definition:

```
FUNCTION_BLOCK T_ALY_HistoricalStream_Desc EXTENDS T_ALY_JsonPayload
VAR_OUTPUT
    sSource : STRING(255);
    sStreamTopic : STRING(255);
    sStreamAlias : STRING(255);
    sStreamSystemID : GUID;
    sLayout : GUID;
    nCycleTime: UDINT;
    nDataSize : UDINT;
    arrRecords : ARRAY [0..cMaxRecordCount] OF T_RecordTimestamps;
END_VAR
```

Inheritance hierarchy

T_ALY_JsonPayload [▶ 129]

T_ALY_HistoricalStream_Desc

Outputs

Name	Туре	Description
sSource	STRING(255)	Data source name
sStreamTopic	STRING(255)	Topic name of the recorded stream
sStreamAlias	STRING(255)	Alias name of the stream
sStreamSystemID	GUID	SystemID GUID of the stream
sLayout	GUID	Layout GUID of the recording
nCycleTime	UDINT	Cycle time of the recording
nDataSize	UDINT	Data size of an entry of the recording
arrRecords	ARRAY [0cMaxRecordCount] OF <u>T_RecordTimestamps [} 128]</u>	Timestamp of the various recordings

Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T ALY JsonPayload</u> $[\blacktriangleright 129]$	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include
TwinCAT v3.1.4022.25	PC or CX (x64, x86, Arm®)	Tc3_AnalyticsStorageProvider

7.1.1.2.2 T_ALY_SPInstance_Desc

T_ALY_SPInstance_Desc	
DATE_AND_TIME dtTimestamp	_
BOOL bOnline	_
STRING sName	_
STRING sVersion	_
T_ALY_SPInstanceInfo stInfo-	_
	DATE_AND_TIME dtTimestamp BOOL bOnline STRING sName STRING sVersion

Syntax

Definition:

FUNCTION_BLOCK T_ALY_SPInstance_Desc EXTENDS T_ALY_JsonPayload VAR_OUTPUT dtTimestamp : DATE_AND_TIME; bOnline : BOOL; sName : STRING; sVersion : STRING; stInfo : T_ALY_SPInstanceInfo; END_VAR

Inheritance hierarchy

T_ALY_JsonPayload [] 129]

T_ALY_SPInstance_Desc

Outputs

Name	Туре	Description
dtTimestamp	DATE_AND_TIME	Start time of the Storage Provider Service
bOnline	BOOL	Indicates whether the service is online.
sName	STRING	IoT Device name "TwinCAT Analytics Storage Provider"
sVersion	STRING	Version of the Storage Provider
stInfo	T ALY SPInstanceInfo [124]	Detailed description of the Storage Provider

🔹 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include
TwinCAT v3.1.4022.25	PC or CX (x64, x86, Arm®)	Tc3_AnalyticsStorageProvider

7.1.1.2.3 T_ALY_SPRecordData_Desc

T_ALY_SPRecordData_Desc	
	GUID sRecordDataGuid
	LINT nStartTimestamp
	E_RecordingState eStatus
	LINT nRecordID
	T_ALY_SPRecordData_Cmd stRecord

Syntax

Definition:

```
FUNCTION_BLOCK T_ALY_SPRecordData_Desc EXTENDS T_ALY_JsonPayload
VAR_OUTPUT
sRecordDataGuid : GUID;
nStartTimestamp : LINT;
eStatus : E_RecordingState;
nRecordID : LINT;
stRecord : T_ALY_SPRecordData_Cmd;
END_VAR
```

Inheritance hierarchy

T_ALY_JsonPayload [129]

T_ALY_SPRecordData_Desc

Outputs

Name	Туре	Description
sRecordDataGuid	GUID	GUID "Key" to identify the recording
nStartTimestamp	LINT	Start time of the recording.
eStatus	E RecordingState [143]	Recording state
nRecordID	LINT	Recording ID
stRecord	T ALY SPRecordData Cmd [113]	Associated recording command

🐳 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Get JSON payload as string.
Development Environment	Torgot plotform	PLC librarias to include

Development Environment	Target platform	PLC libraries to include
TwinCAT v3.1.4022.25	PC or CX (x64, x86, Arm®)	Tc3_AnalyticsStorageProvider

7.1.1.2.4 T_ALY_SPRecording_Desc

T_ALY_SPRecording_Desc	
ARRAY [099] OF T_ALY_SPRecordData_Desc arrRecordings	-

Syntax

Definition:

Inheritance hierarchy

T_ALY_JsonPayload [129]

T_ALY_SPRecording_Desc

Name	Туре	Description
aRecordings	ARRAY [099] OF	List of all current recordings
	T_ALY_SPRecordData_Desc [▶ 120]	

🔹 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include

PC or CX (x64, x86, Arm®)

7.1.1.3 Info

TwinCAT v3.1.4022.25

7.1.1.3.1 T_ALY_ReadStreamRecord_Info

T_ALY_ReadStreamRecord_Info
DINT nRecordCountAll
DINT nRecordCount
ARRAY [0cMaxRecordCount] OF T_RecordTimestamps arrRecords

Syntax

Definition:

Inheritance hierarchy

T_ALY_JsonPayload [129]

T_ALY_ReadStreamRecord_Info

Name	Туре	Description
nRecordCountAll	UDINT	Number of all existing records
nRecordCount	UDINT	Number of records read out
arrRecords	ARRAY [0cMaxRecordCount] OF	Timestamp of the records read
	T_RecordTimestamps [128]	out

🐳 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [<u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include

PC or CX (x64, x86, Arm®)

7.1.1.4 SubTypes

TwinCAT v3.1.4022.25

7.1.1.4.1 T_ALY_SPDataStorageInfo

T_ALY_SPDataStorageInfo
T_ALY_SPStorageInfo stStorage
E_StorageState eStatus -
STRING(255) sStatusMessage

Syntax

Definition:

```
FUNCTION_BLOCK T_ALY_SPDataStorageInfo EXTENDS T_ALY_JsonPayload
VAR_OUTPUT
stStorage : T_ALY_SPStorageInfo;
eStatus : E_StorageState;
sStatusMessage : STRING(255);
END_VAR
```

Inheritance hierarchy

T_ALY_JsonPayload [129]

T_ALY_SPDataStorageInfo

Name	Туре	Description
stStorage	T_ALY_SPStorageInfo [125]	Detailed Storage information
eStatus	E_StorageState [145]	Status of the Storage
sStatusMessage	STRING(255)	Storage status message

🔹 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include
TwinCAT v3.1.4022.25	PC or CX (x64, x86, Arm®)	Tc3_AnalyticsStorageProvider

7.1.1.4.2 T_ALY_SPInstanceInfo

T_ALY_SPInstanceInfo
GUID sProviderGuid
STRING sServiceType
STRING(255) sDataStoreType
STRING(255) sComment
GUID sDefaultStorageGuid
ARRAY [049] OF T_ALY_SPDataStorageInfo arrDataStorages

Syntax

Definition:

```
FUNCTION_BLOCK T_ALY_SPInstanceInfo EXTENDS T_ALY_JsonPayload
VAR_OUTPUT
sProviderGuid : GUID;
sServiceType : STRING;
sDataStoreType : STRING(255);
sComment : STRING(255);
sDefaultStorageGuid : GUID;
arrDataStorages : ARRAY [0..49] OF T_ALY_SPDataStorageInfo;
END VAR
```

Inheritance hierarchy

T_ALY_JsonPayload [129]

T_ALY_SPInstanceInfo

Name	Туре	Description
sProviderGuid	GUID	Individual GUID of a Storage Provider instance
sServiceType	STRING	Service type
sDataStoreType	STRING(255)	Storage type
sComment	STRING(255)	Comment on the Storage Provider instance
sDefaultStorageGuid	GUID	Storage GUID of the Standard Storage
arrDataStorages	ARRAY [049] OF	List of configured Storages
	T_ALY_SPDataStorageInfo [123]	

🐳 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [<u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include

PC or CX (x64, x86, Arm®)

7.1.1.4.3 T_ALY_SPStorageInfo

T_ALY_SPStorageInfo
GUID sStorageGuid
STRING sStorageName
E_DataStorageType eDataStorageType
STRING(255) sComment

Syntax

Definition:

FUNCTION_BLOCK T_ALY_SPStorageInfo EXTENDS T_ALY_JsonPayload VAR_OUTPUT sStorageGuid : GUID; sStorageName : STRING; eDataStorageType : E_DataStorageType; sComment : STRING(255);

```
END_VAR
```

Inheritance hierarchy

TwinCAT v3.1.4022.25

T_ALY_JsonPayload [129]

T_ALY_SPStorageInfo

Name	Туре	Description
sStorageGuid	GUID	Individual GUID of a Storage
sStorageName	STRING	Name of the Storage
eDataStorageType	E_DataStorageType [▶ 142]	Storage type
sComment	STRING(255)	Comment on Storage

🕸 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T_ALY_JsonPayload</u> [<u>129]</u>	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include

PC or CX (x64, x86, Arm®)

7.1.1.4.4 T_ALY_SPSubBrokerInfo

T_ALY_SPSubBrokerInfo
STRING(255) sAlias
GUID sBrokerGuid
STRING(255) sBrokerHost
DINT nBrokerPort
BOOL bSecure

Syntax

Definition:

```
FUNCTION_BLOCK T_ALY_SPSubBrokerInfo EXTENDS T_ALY_JsonPayload VAR_OUTPUT
```

sAlias	: STRING(255);
sBrokerGuid	: GUID;
sBrokerHost	: STRING(255);
nBrokerPort	: DINT;
bSecure	: BOOL;
END_VAR	

Inheritance hierarchy

TwinCAT v3.1.4022.25

T ALY JsonPayload [129]

T_ALY_SPSubBrokerInfo

Name	Туре	Description
sAlias	STRING(255)	Alias name of the broker configuration
sBrokerGuid	GUID	Individual GUID of the broker configuration
sBrokerHost	STRING(255)	Broker Host Name
nBrokerPort	DINT	Broker port
bSecure	BOOL	TRUE if communication is established via certificates.

🐳 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include

PC or CX (x64, x86, Arm®)

7.1.1.4.5 T_ALY_Symbol

TwinCAT v3.1.4022.25

T_ALY_Symbol	
-	
 sName T_MaxString	
 sBaseType T_MaxString	
 nBitOffset UDINT	
 nBitSize UDINT	

Syntax

Definition:

```
FUNCTION_BLOCK T_ALY_Symbol EXTENDS T_ALY_JsonPayload
VAR_INPUT
sName : T_MaxString;
sBaseType : T_MaxString;
nBitOffset : UDINT;
nBitSize : UDINT;
END_VAR
```

Inheritence hierarchy

T ALY JsonPayload [129]

T_ALY_Symbol

🐔 Inputs

Name	Туре	Description
sName	T_MaxString	Name of the symbol
sBaseType	T_MaxString	DataType of the symbol
nBitOffset	UDINT	BitOffset of the symbol
nBitSize	UDINT	BitSize of the symbol

🔹 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include

PC or CX (x64, x86, Arm®)

7.1.1.4.6 T_RecordTimestamps

T_RecordTimestamps	
DINT nRecordID-	-
STRING(255) sAlias	-
LINT nStartTimestamp -	⊢
LINT nEndTimestamp	\vdash

Syntax

Definition:

```
FUNCTION_BLOCK T_RecordTimestamps EXTENDS T_ALY_JsonPayload
VAR_OUTPUT
    nRecordID : DINT;
    sAlias : STRING(255);
    nStartTimestamp : LINT;
    nEndTimestamp : LINT;
```

END_VAR

Inheritance hierarchy

TwinCAT v3.1.4022.25

T_ALY_JsonPayload [129]

T_RecordTimestamps

Name	Туре	Description
nRecordID	DINT	Recording number
sAlias	STRING(255)	Alias name of the recording
nStartTimestamp	LINT	Start timestamp of the recording
nEndTimestamp	LINT	End timestamp of the recording

🔹 Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶_129]	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include
TwinCAT v3.1.4022.25	PC or CX (x64, x86, Arm®)	Tc3_AnalyticsStorageProvider

7.1.1.5 Base Types

7.1.1.5.1 T_ALY_JsonPayload

T_ALY_JsonPayload

Syntax

Definition:

FUNCTION_BLOCK INTERNAL T_ALY_JsonPayload

Methods

Name	Definition location	Description
Reset		Reset all values in the payload FB.
Init_JsonValue	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON object.
Init_String	Inherited from <u>T_ALY_JsonPayload</u> [▶ <u>129]</u>	Initialization of the FB with JSON string.
GetJsonLength	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Get the length of the JSON payload.
GetJsonString	Inherited from <u>T ALY JsonPayload</u> [▶ <u>129]</u>	Get JSON payload as string.
Development Environment	Target platform	PLC libraries to include
TwinCAT v3.1.4022.25	PC or CX (x64, x86, Arm®)	Tc3_AnalyticsStorageProvider

7.1.2 FB_ALY_StorageProvider

	FB_ALY_StorageProvider
 stConfig ST_ALY_SP_Config	BOOL bBusy -
	BOOL bError
	I_TcMessage ipResultMessage
	ETcIotMqttClientState eConnectionState -

The FB_ALY_StorageProvider is a client FB for communication with a Storage Provider instance. The FB provides methods to trigger historical data or start/stop recordings.

Syntax

Definition:

```
FUNCTION_BLOCK FB_ALY_StorageProvider
VAR_INPUT
stConfig : ST_ALY_SP_Config;
END_VAR
VAR_OUTPUT
bBusy : BOOL;
bError : BOOL;
ipResultMessage : I_TcMessage;
eConnectionState : ETcIotMqttClientState;
END_VAR
```

🐔 Inputs

Name	Туре	Description
stConfig	ST_ALY_SP_Config_[▶_140]	Structure for the configuration of the FB.

Name	Туре	Description
bBusy	BOOL	TRUE as soon as a method of the function block is active.
bError	BOOL	Becomes TRUE when an error situation occurs.
ipResultMessage	I_TcMessage	Message interface of the TwinCAT 3 EventLogger, which provides further information about the return value.
eConnectionState	ETclotMqttClientState	Specifies the state of the connection between client and broker as an enumeration ETclotMqttClientState.

🔹 Methods

Name	Definition location	Description
<u>Call [▶ 131]</u>	Local	Method for background communication with the TwinCAT driver. The method must be called cyclically.
<u>Cancel [▶ 131]</u>	Local	Method for aborting activities of the TwinCAT Analytics Storage Provider.
GetHistoricalData [132]	Local	Method for requesting historical data.
GetInstanceInfo [132]	Local	Method for receiving the instance information of the Storage Provider.
GetRecordingInfoByAlias [▶_133]	Local	Method for receiving recording information.
GetRecordingInfoByKey [133]	Local	Method for receiving recording information.
ReadHistoricalStreams [▶ 134]	Local	Method for reading all historical streams.
ReadStreamRecords [134]	Local	Method for reading all records of a historical stream.
ReadSubBroker [135]	Local	Method for reading all declared message brokers.
ResetCommunication [136]	Local	Method to reset the MQTT connection to the broker.
RestartPipelineRule [136]	Loca	Restarts a rule of a pipeline.
SendCommand [136]	Local	Generic method for sending various commands.
SetHistoricalDataState [▶ 137]	Local	Method for setting various parameters of a historical stream.
StartPipeline [137]	Local	Starts recording a live MQTT binary stream.
StartRecord [138]	Local	Starts recording a live MQTT binary stream.
StartRecordEx [138]	Local	Starts recording a live MQTT binary stream.
StopPipeline [139]	Local	Stops the selected recording.
StopRecord [139]	Local	Stops the selected recording.
StorageControlling [140]	Local	Method for controlling the declared storages.

Development Environment	Target platform	PLC libraries to include	
TwinCAT v3.1.4022.25	PC or CX (x64, x86, Arm®)	Tc3_AnalyticsStorageProvider	

7.1.2.1 Call



Syntax

METHOD Call : BOOL

Return value

Name	Туре	Description
Call	BOOL	

7.1.2.2 Cancel

Cancel	
 stCmd REFERENCE TO T_ALY_SPCancel_Cmd	BOOL Cancel

J

Syntax

```
METHOD Cancel : BOOL
VAR_INPUT
stCmd : REFERENCE TO T_ALY_SPCancel_Cmd;
END_VAR
```

🐔 Inputs

Name	Туре	Description
stCmd	T_ALY_SPCancel_Cmd [109]	JSON command to cancel operations of the TwinCAT Analytics Storage Provider.

Return value

Name	Туре	Description
Cancel	BOOL	Is TRUE if done

7.1.2.3 GetHistoricalData

GetHistoricalData	
 stCmd REFERENCE TO T_ALY_SPGetHistorical_Cmd BOOL	GetHistoricalData —

Syntax

```
METHOD GetHistoricalData : BOOL
VAR_INPUT
stCmd : REFERENCE TO T_ALY_SPHistorical_Cmd;
END VAR
```

🔁 Inputs

Name	Туре	Description
-	T_ALY_SPGetHistorical_Cmd [▶_110]	JSON command to get historical data from TwinCAT Analytics Storage Provider.

Return value

Name	Туре	Description
GetHistoricalData	BOOL	Is TRUE if done

7.1.2.4 GetInstanceInfo

	GetInstanceInfo	
_	-tTimeout TIME BOOL GetInstar	iceInfo —
—	stInstanceInfo T_ALY_SPInstance_Desc	

```
METHOD GetInstanceInfo : BOOL
VAR_INPUT
tTimeout : TIME;
stInstanceInfo : T_ALY_SPInstance_Desc;
END_VAR
```

🐔 Inputs

Name	Туре	Description
tTimeout	TIME	Duration until the procedure is aborted.
stInstanceInfo	T_ALY_SPInstance_Desc [▶ 119]	JSON description of the Storage Provider instance.

Return value

Name	Туре	Description
GetInstanceInfo	BOOL	Is TRUE when completed

7.1.2.5 GetRecordingInfoByAlias

	GetRecordingInfoByAlias			
_	sRecordingAlias	STRING(255)	BOOL GetRecordingInfoByAlias	-
_	tTimeout TIME			
_	stRecordingInfo	T_ALY_SPRecordData_Desc		

Syntax

```
METHOD GetRecordingInfoByAlias : BOOL
VAR_INPUT
sRecordingAlias : STRING(255);
tTimeout : TIME;
stRecordingInfo : T_ALY_SPRecordData_Desc;
END_VAR
```

🔁 Inputs

Name	Туре	Description
sRecordingAlias	STRING(255)	Search criterion "Alias"
tTimeout		Duration until the procedure is aborted.
stRecordingInfo	T_ALY_SPRecordData_Desc [▶ 120]	JSON description of the recording.

Return value

Name	Туре	Description
GetRecordingInfoByAlias	BOOL	Is TRUE when completed

7.1.2.6 GetRecordingInfoByKey

		GetRecordingInfoByKey		
	sRecordDataKey	GUID	BOOL GetRecordingInfoByKey	\vdash
_	tTimeout TIME			
	stRecordingInfo	T_ALY_SPRecordData_Desc		

```
METHOD GetRecordingInfoByKey : BOOL
VAR_INPUT
sRecordDataKey : GUID;
tTimeout : TIME;
stRecordingInfo : T_ALY_SPRecordData_Desc;
END_VAR
```

🐔 Inputs

Name	Туре	Description
sRecordDataKey	GUID	Search criterion "RecordDataKey"
tTimeout	TIME	Duration until the procedure is aborted.
stRecordingInfo	T_ALY_SPRecordData_Desc [▶ <u>120</u>] JSON description of the recording.

Return value

Name	Туре	Description
GetRecordingInfoByKey	BOOL	Is TRUE when completed

7.1.2.7 ReadHistoricalStreams

	ReadHistoricalStreams		
_	tSearchDuration TIME	BOOL ReadHistoricalStreams -	_
_	aHistoricalStreams POINTER TO T_ALY_HistoricalStream_Desc	INT nStreamCount -	-

Syntax

🐔 Inputs

Name	Туре	Description
tSearchDuration	TIME	Time period in which to wait for feedback.
aHistoricalStreams		Description of the different historical streams

Return value

Name	Туре	Description
ReadHistoricalStreams	BOOL	Is TRUE when completed
nStreamCount	INT	Number of streams read out

7.1.2.8 ReadStreamRecords

```
METHOD ReadStreamRecords : BOOL
VAR_INPUT
stCmd : REFERENCE TO T_ALY_SPReadStreamRecords_Cmd;
tSearchTimeout : TIME := TIME#5s0ms;
```

🐔 Inputs

Name	Туре	Description
stCmd	REFERENCE TO <u>T ALY SPReadStreamRecords Cmd</u> [<u>111]</u>	JSON command to get recordings of a historical stream from TwinCAT Analytics Storage Provider.
tSearchTimeout	TIME	Waiting time for the response.
aStreamRecords	POINTER TO <u>T_RecordTimestamps</u> [<u>] 128]</u>	Recordings read out

Return value

Name	Туре	Description
ReadStreamRecords	BOOL	Is TRUE when completed
nRecordCount	DINT	Number of records read out

7.1.2.9 ReadSubBroker

		ReadSubBroker		
	tSearchDuration	TIME	BOOL ReadSubBroker	_
_	aSubBrokerInfos	POINTER TO T_ALY_SPSubBrokerInfo	<i>INT</i> nBrokerCount-	_

Syntax

```
METHOD ReadSubBroker : BOOL
VAR_INPUT
tSearchDuration : TIME;
aSubBrokerInfos : POINTER TO T_ALY_SPSubBrokerInfo;
nBrokerCount : INT;
END_VAR
```

🔁 Inputs

Name	Туре	Description
tSearchDuration	TIME	Duration until the search is completed
aSubBrokerInfo	POINTER TO	Address to an array in which the
	T_ALY_SPSubBrokerInfo [126]	broker information found is stored.
nBrokerCount	INT	Number of brokers found

Return value

Name	Туре	Description
ReadSubBroker	BOOL	Is TRUE when completed

7.1.2.10 ResetCommunication



Syntax

METHOD ResetCommunication : BOOL VAR_INPUT

END_VAR

Return value

Name	Туре	Description
ResetCommunication	BOOL	Is TRUE when completed

7.1.2.11 RestartPipelineRule

	RestartPipelineRule	
_	stCmd REFERENCE TO T_ALY_SPRuleEnginePipeline_Cmd	BOOL RestartPipelineRule
_	nRuleId DINT	

Syntax

```
METHOD RestartPipelineRule : BOOL
VAR_INPUT
stCmd : REFERENCE TO T_ALY_SPRuleEnginePipeline_Cmd;
nRuleId : DINT;
END_VAR
```

🐔 Inputs

Name	Туре	Description
stCmd	REFERENCE TO	JSON command to start the
	T ALY SPRuleEnginePipeline Cmd	recording a live stream.
	[▶ <u>117]</u>	
nRuleld	DINT	ID of the rule to be restarted.

Return value

Name	Туре	Description
RestartPipelineRule	BOOL	Is TRUE when completed.

7.1.2.12 SendCommand



Syntax

METH	IOD	Ser	dC	Con	nmanc	: h	BOOL	
VAR	INE	PUT						
	stC	Cmd	:	I_	ALY	SPO	Command	;t
END	VAF	ξ						

🐔 Inputs

Name	Туре	Description
stCmd	I_ALY_SPCommand	JSON command to interact with the TwinCAT Analytics Storage Provider.

Return value

Name	Туре	Description
SendCommand	BOOL	Is TRUE when completed

7.1.2.13 SetHistoricalDataState

	SetHistoricalDataState	
_	stCmd REFERENCE TO T_ALY_SPSetGetHistoricalDataState_Cmd	BOOL SetHistoricalDataState

Syntax

```
METHOD SetHistoricalDataState : BOOL
VAR_INPUT
stCmd : REFERENCE TO T_ALY_SPGetSetHistoricalDataState_Cmd;
END_VAR
```

🐔 Inputs

Name	Туре	Description
stCmd	REFERENCE TO <u>T ALY SPGetSetHistoricalDataState</u> <u>Cmd [] 115]</u>	JSON command to set parameters of a started historical stream from the TwinCAT Analytics Storage Provider.

Return value

Name	Туре	Description
SetHistoricalDataState	BOOL	Is TRUE when completed

7.1.2.14 StartPipeline

	StartPipeline	
_	stCmd REFERENCE TO T_ALY_SPRuleEnginePipeline_Cmd BOOL StartPipeline	F

```
METHOD StartPipeline : BOOL
VAR_INPUT
stCmd : REFERENCE TO T_ALY_SPRuleEnginePipeline_Cmd;
END_VAR
```

🐔 Inputs

Name	Туре	Description
stCmd	REFERENCE TO <u>T ALY SPRuleEnginePipeline_Cmd</u> [<u>117]</u>	JSON command to start the recording a live stream.

Return value

Name	Туре	Description
StartPipeline	BOOL	Is TRUE when completed.

7.1.2.15 StartRecord

	StartRecord	
_	stCmd REFERENCE TO T_ALY_SPRecordData_Cmd BOC	٤ StartRecord -

Syntax

```
METHOD StartRecord : BOOL
VAR_INPUT
    stCmd : REFERENCE TO T_ALY_SPRecordData_Cmd;
END_VAR
```

🐔 Inputs

Name	Туре	Description
stCmd	REFERENCE TO	JSON command to start the
	T_ALY_SPRecordData_Cmd [▶_113]	recording a live stream.

Return value

Name	Туре	Description
StartRecord	BOOL	Is TRUE if done

7.1.2.16 StartRecordEx



In contrast to the <u>StartRecord [> 138]</u> method, a RecordDataKey can be specified here. This key makes it easier to find the recording you have started in order to check the status of the recording. The <u>GetRecordingInfoByKey [> 133]</u> method can be used to retrieve the recording information.

```
METHOD StartRecordEx : BOOL
VAR_INPUT
stCmd : REFERENCE TO T_ALY_SPRecordData_Cmd;
sRecordDataKey : GUID;
END VAR
```

🐔 Inputs

Name	Туре	Description
stCmd	REFERENCE TO T ALY SPRecordData Cmd [113]	JSON command to start the recording a live stream.
sRecordDataKey	GUID	Guid "Key" to identify the recording that has been started.

Return value

Name	Туре	Description
StartRecordEx	BOOL	Is TRUE when completed

7.1.2.17 StopPipeline

```
        StopPipeline

        —stCmd
        REFERENCE TO T_ALY_SPRuleEnginePipeline_Cmd
        BOOL
        StopPipeline
```

Syntax

METHOD StopPipeline : BOOL VAR_INPUT stCmd : REFERENCE TO T_ALY_SPRuleEnginePipeline_Cmd; END_VAR

🖻 Inputs

Name	Туре	Description
stCmd	REFERENCE TO <u>T ALY SPRuleEnginePipeline_Cmd</u> [▶_117]	JSON command to stop recording of a live stream.

Return value

Name	Туре	Description
StopPipeline	BOOL	Is TRUE when completed.

7.1.2.18 StopRecord

[StopRecord	
-	stCmd REFERENCE TO T_ALY_SPRecordData_Cmd	BOOL StopRecord -
l		

Syntax

```
METHOD StopRecord : BOOL
VAR_INPUT
stCmd : REFERENCE TO T_ALY_SPRecordData_Cmd;
END_VAR
```

🐔 Inputs

Name	Туре	Description
stCmd	REFERENCE TO	JSON command to stop recording
	T_ALY_SPRecordData_Cmd [▶ 113]	of a live stream.

Return value

Name	Туре	Description
StopRecord	BOOL	Is TRUE when completed.

7.1.2.19 StorageControlling

```
        StorageControlling

        stCmd
        REFERENCE TO T_ALY_SPStorageCtrl_Cmd
        BOOL
        StorageControlling
```

Syntax

```
METHOD StorageControlling : BOOL
VAR_INPUT
stCmd : REFERENCE TO T_ALY_SPStorageCtrl_Cmd;
END_VAR
```

🐔 Inputs

Name	Туре	Description
stCmd	REFERENCE TO	JSON command to control the
	T_ALY_SPStorageCtrl_Cmd [▶ 116]	storages.

Return value

Name	Туре	Description
StorageControlling	BOOL	Is TRUE when completed

7.2 Data types

7.2.1 ST_ALY_SP_Config

Syntax

Definition:

```
TYPE ST_Msg :

STRUCT

SMainTopic : T_MaxString;

sProviderGuid : GUID;

stConnSettings : ST_ConnectionSettings

END_STRUCT

END_TYPE
```

Parameter

Name	Туре	Descriptiom
sMainTopic	T_MaxString	The main topic where the TwinCAT Analytics Storage Provider is located on the message broker
sProviderGuid	GUID	The individual GUID of the TwinCAT Analytics Storage Provider Instance
stConnSettings	ST ConnectionSettings [▶ 141]	MQTT connection settings to connect with the message broker

7.2.2 ST_ConnectionSettings

Syntax

Definition:

```
TYPE ST_ConnectionSettings :
STRUCT
sHostName : T_MaxString;
nHostPort : UINT := 1883;
sUserId : T_MaxString;
sPassword : T_MaxString;
bWithCertificate : BOOL := BOOL;
sCA : T_MaxString;
sCert : T_MaxString;
sKey : T_MaxString;
sKeyPwd : T_MaxString;
END_STRUCT
END_TYPE
```

Parameter

Name	Туре	Descriptiom
sHostName	T_MaxString	sHostName can be specified as name or as IP address. If no information is provided, the local host is used.
nHostPort	UINT	The host port can be specified here. The default is 1883.
sUserId	T_MaxString	Optionally, a user name can be specified.
sPassword	T_MaxString	A password for the user name can be entered here.
bWithCertificate	BOOL	If TRUE the certificates will be used for communication
sCA	T_MaxString	Certificate of the certificate authority (CA)
sCert	T_MaxString	Client certificate to be used for authentication at the broker
sKey	T_MaxString	Private key of the client
sKeyPwd	T_MaxString	Password of the private key, if applicable

7.2.3 E_CancelType

Syntax

Definition:

```
TYPE E_CancelType :
(
    HistoricalData := 0,
    AllRecordData
) INT;
END_TYPE
```

Parameter

Name	Descriptiom
HistoricalData	Canceled the selected historical data stream
AllRecordData	Canceled all running recordings

7.2.4 E_ControlMode

Syntax

```
Definition:
```

```
TYPE E_ControlMode :
(
    Start := 0,
    Stop
    DeleteSettings
) INT;
END TYPE
```

Parameters

Name	Description
Start	Starting the "Storage" is triggered.
Stop	Stopping the "Storage" is triggered.
	"Storage" configuration should be deleted (only works if the "Storage" is not online).

7.2.5 E_DataStorageType

Syntax

Definition:

```
TYPE E_DataStorageType :

(

Empty := 0,

AnalyticsFile

AzureBlob

MsSQL_Binary

InfluxDB

MsSQL_Plain

CSVFile

)INT;

END_TYPE
```

Parameters

Name	Description
Empty	Unknown "Storage" type
AnalytticsFile	Analytics File (TwinCAT Analytics own data format)
AzureBlob	Microsoft Azure Blob
MsSQL_Binary	Microsoft SQL Server (data in binary format)
InfluxDB	Influx 2.x database
MsSQL_Plain	Microsoft SQL Server (data in plain text)
CSVFile	CSV file

7.2.6 E_RawDataFormat

Syntax

```
TYPE E_RawDataFormat :
(
Bin := 0,
Json
)INT;
END TYPE
```

Parameter

Name	Descriptiom
Bin	Analytics Binary Stream Format
Json	TwinCAT Json Format (actually not supported)

7.2.7 E_RecordingState

Syntax

Definition:

```
TYPE E_RecordingState :
(
    Not_Initialized := 0,
    Initializing
    RecordingCanceled
    Running
    Running_QueueHyst
    Stopping_ReceivingDataStopped
    RecordingDone
    WaitingForData
    Error
) INT;
END_TYPE
```

Parameters

Name	Description
Not_Initialized	Recording triggered. Waits for input data description for initialization.
Initialized	Recording successfully initialized.
RecordingCanceled	Recording canceled.
Running	Recording running. Input data is saved.
Running_QueueHyst	Recording running. Input data cannot be saved fast enough. Data loss!
Stopping_ReceivingDataStopped	Recording is stopped.
RecordingDone	Recording is done.
WaitingForData	Recording running. No data arrives from the Analytics Logger.
Error	An error has occurred during recording.

7.2.8 E_RecordMode

Syntax

Definition:

```
TYPE E_RecordMode :
(
Start := 0,
Stop
)INT;
END_TYPE
```

Parameter

Name	Descriptiom
Start	Starts the recording of the configured record
Stop	Stops the recording

7.2.9 E_ReloadType

Syntax

Definition:

```
TYPE E_ReloadType :
(
All := 0,
Specific
)INT;
END TYPE
```

Parameters

Name	Description
All	All records are read in again.
Specific	Only one specific record will be reread.

7.2.10 E_RingBufferMode

Syntax

Definition:

```
TYPE E_RingBufferMode:
(
None := 0,
TimeBased,
DataBased
)INT;
END_TYPE
```

Parameter

Name	Descriptiom
None	Recording without ringbuffer mode
TimeBased	Ringbuffer based on a given time periode
DataBased	Ringbuffer based on a given max data size

7.2.11 E_SetGetHistoricalDataState

Syntax

```
TYPE E_SetGetHistoricalDataState :

(

Pause,

Continue_,

Restart,

Stop,

Update

) INT;

END_TYPE
```

BECKHOFF

Parameters

Name	Description
Break	Playback of the recording is paused.
Continue_	Playback of the recording continues.
Restart	Playback of the recording is restarted.
Stop	Playback of the recording is stopped.
Update	Parameters for playing the recording are updated.

7.2.12 E_StorageState

Syntax

```
Definition:
```

```
TYPE E_StorageState :
(
    unknown := 0,
    error
    starting
    online
    shuttingDownt
    offline
) INT;
END_TYPE
```

Parameters

Name	Description
Unknown	Status of the "Storage" is unknown
	"Storage" is in the error state. No more requests will be processed.
Starting	The "Storage" starts up and connects.
Online	The "Storage" is running and ready for requests.
ShuttingDown	The "Storage" is shut down.
Offline	The "Storage" is off and cannot be reached.

7.2.13 E_SymbolMode

Syntax

Definition:

```
TYPE E_SymbolMode :
(
All := 0,
Subset
)INT;
END_TYPE
```

Parameter

Name	Descriptiom
All	All symbols of the stream will be used
Subset	Only a subset of symbols will be used

7.2.14 E_PipelineCmdType

Syntax

Definition:

```
TYPE E_PipelineCmdType :
(
    RestartRule := 5,
    Start := 6,
    Stop := 7
) INT;
END_TYPE
```

Parameters

Name	Description
RestartRule	Restarts a specific rule of a RuleEnginePipeline.
Start	Starts a RuleEnginePipeline
Stop	Stops a RuleEnginePipeline

8 Samples

8.1 PLC Client

This PLC sample shows the use of the TwinCAT Analytics Storage Provider library. The sample code shows reading and writing. For the sample to work coherently, both the use of the Analytics Logger for sending measured data to an MQTT Message Broker and the import of historical data via the Analytics Stream Helper are shown.

The basis is an appropriately set up native MQTT Message Broker and an Analytics Storage Provider service.

The PLC sample shows the following steps:

- 1. Analytics Logger: stream of variables from a Global Variable List to a MQTT Message Broker.
- 2. Analytics Storage Provider: starting and stopping stores and recordings, as well as reading recordings and historical data.
- 3. Analytics Stream Helper: receiving the historical data from the Analytics Storage Provider and mapping the data into a Global Variable List for the historical data.

Analytics Storage Provider GUID Glossary

When using the Storage Provider, various GUIDs occur that are required to identify services and data. The following describes where the GUIDs come from, what purpose they serve and where they can be viewed if necessary.

The analytics data stream sent by the Analytics Logger is basically described by three parameters:

- 1. **Topic** [STRING] Where is the data sent to?
- 2. **TwinCAT SystemID** [GUID] From which TwinCAT system is the data sent?
- LayoutID / Symbol Info ID [GUID] What does the data look like? The GUID is a hash of the symbol information.



The above parameters are required to identify recordings at the Storage Provider.

Several Storage Providers can be connected to an MQTT Message Broker. Two parameters are required to identify a Storage Provider.

- 1. MainTopic [STRING](Where are the data/services provided?)
- 2. ProviderGuid [GUID](Unique identifier of the service)

RecorderGuid is used to recognize who has started a recording at the Storage Provider. This GUID is automatically generated at each Storage Provider Manager or client and attached to the StartRecord commands. In the PLC, this can be freely assigned at the StartRecord command.

From version 3.2.14, three additional GUIDs can be specified on the StartRecord command.

1. Storage [GUID]

This GUID specifies the storage in which the data is to be saved. The GUID is generated automatically in the Analytics Storage Provider Configurator. It can be read there or in the Analytics Storage Provider Manager. If no GUID is specified, the Master Storage is used.

2. SubBroker/DataBroker [GUID]

This GUID specifies the data broker from which the Analytics Stream is to be received. The Analytics Storage Provider offers the option of recording from several message brokers. The GUID is generated automatically in the Analytics Storage Provider Configurator. It can be read there or in the Analytics Storage Provider Manager. If no GUID is specified, the Master Data Broker is used.

3. DataKey [GUID]

The DataKey can be used to find, read and monitor recordings in progress. This DataKey can be freely selected in the PLC. If no DataKey is specified, a DataKey is automatically generated by the Storage Provider.

The following screenshots contain the parameters and GUIDs described above.

Topic / TwinCAT system ID / Layout (System Info ID)

🗱 TF3520 Analytics Storage Provider Manager		- 🗆 ×
 TF3520 Analytics Storage Provider Manager OVERVIEW O O Broker TcAnalyticsTest:1883 TcAnalyticsTest:1883 TcAnalyticsTest:1883 TcAnalyticsTest:1883 New AzureBlob Store New Assurement New AssureBlob Store New MsSQL Plain Store New MsSQL Plain Store Stae013c-722e-685a-213a-37a11a5827c7 TestValues New MsSQL Binary Store New InfluxDB Store 	 Test 15 Recordi 	・ 面 obal • Active
	Recording ASP_Topic	GSW/DebugAlySP/TcAnalyticsStorageProvider/d6
	Торіс	ASP/TestValues/PlcStream1
	TopicAlias	TestValues {Storage: New AnalyticsFile Store}
	Layout	8164ae1d-7f2b-0795-9e77-ee23dcef9b02
	SystemID	54ae013c-722e-685a-213a-37a11a5827c7
	SystemAlias	
	RecordingAlias	TestValues
	RecordingID	1
💐 Local RecorderGuid: (c0570343-378e-4206-94f3-34b1539d0435)	<	>

Storage Provider MainTopic / ProviderGuid / RecorderGuid

IF3520 Analytics Storage Provider Manager	-	
OVERVIEW	CONFIGURATIONS	
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🔺 🗅 Broker	🖲 Local 🐁 Global 💿 Active	
CAnalyticsTest:1883	 Templates 	1
 4 3 127.0.0.1:1883 User:TestUser 4 2 Measurement 	 Test Recording 3 (Record_{AutoID}) 	
Measurement New AzureBlob Store	 Test 150 Variables (Record_{AutoID}) Record_ing TESTARC (Record_11) 	
New MsSQL Plain Store	 Recording_TESTABC (Record_11) Recording_Ring_Time (Record_{AutoID}) 	
New AnalyticsFile Store New MsSQL Binary Store New InfluxDB Store	INFORMATION	
	Provider	
	Topic GSW/Analytics SP/TcAnalyticsStorageProvider/d	67d1
	Version 1.0.0	
	Name TwinCAT Analytics Storage Provider	
	Timestamp 08.10.2024 10:38:20	
	Provider Info	05.0
	ProviderGuid d67d1631-b890-4c5b-b5e0-1384549b	
	DataStoreType MultiStorageProvider {DefaultStorage:	4149
	ServiceType Windows Service	
	Comment Measurement	
	DefaultStorage_Guid 41491d21-7d6e-48fb-8145-11b12ab30)a5e
The contended and the contende	1539d0435)	

Storage GUID

IF3520 Analytics Storage Provider Manager

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 IcAnalyticsTest:1883 I27.0.0.1:1883 User:TestUser Measurement New AzureBlob Store New MsSQL Plain Store New AnalyticsFile Store New MsSQL Binary Store 	 Templates Test Recording 3 (Record_{AutoID}) Test 150 Variables (Record_{AutoID}) Recording_TESTABC (Record_11) Recording_Ring_Time (Record_{AutoID})
New InfluxDB Store	Storage
	StorageName New AnalyticsFile Store
	StorageType AnalyticsFile
	Comment
	StorageGuid 41491d21-7d6e-48fb-8145-11b12ab30a5e

Data Broker GUID

🜃 TF3520 Analytics Storage Provider Manager

OVERVIEW	CONFIGURATIONS		
a 🛛 🗌 🗐	۱		
🔺 🗅 Broker	🖲 Local 🌯 Global 🔹 Active		
TcAnalyticsTest:1883	🔺 🥂 Measurement		
4 🔄 127.0.0.1:1883 User:TestUser	 Configurations 		
🔺 🕂 Measurement	🛃 DataBroker		
New AzureBlob Store	🛃 Nicolas_Broker		
New MsSQL Plain Store	LocalBroker		
New AnalyticsFile Store			
New MsSQL Binary Store			
New InfluxDB Store	Remote Broker		
	BrokerGuid 2d7b6394-500e-4dc2-8f81-2e800a12c7be		
	Alias LocalBroker		
	Broker 127.0.0.1 : 1883		
	TopicList		

Sample code architecture

All relevant parts of the configuration and the program code are marked in the following picture:

Solution 'TcALYStorageProviderSample' (1 project) TcALYStorageProviderSample	
A Garage System	
Real-Time	
Tasks	
Routes	
I Type System	
TcCOM Objects	Characteritation
Object1 (StreamHelper)	StreamHelper
A MOTION	
🔺 🛄 PLC	
Untitled1	
🔺 🗃 Untitled1 Project	
External Types	
References	
🔺 🗁 DUTs	
a☆☆ E_StorageProviderCtrl (ENUM)	
🔺 🧁 GVLs	
a 🚮 GVL	Variables Live / Historical
କ୍ଷ୍ମି GVL_Hist	
🔺 🍙 POUs	
 Create Cmds 	
F_CreateAlySPGetHistCmd (FUN)	Storage Provider Command
F_CreateAlySPReadRecordsCmd (FUN)	Helper Functions
F_CreateAlySPStartRecordCmd (FUN)	
A REAL AND A REAL	
A_ValueCreator	MAIN Programs
MAIN_Historical (PRG)	
VISUs	
apple Historical_Task (Historical_Task)	
PIcTask (PIcTask) Untitled1.tmc	
Untitled Instance	
SAFETY	
SAFETY Sh. C++	
ANALYTICS	
 ANALYTICS Analytics Data Logger 1 	
a Data Logger 1	Analytics Logger
Instraides	. 20

Stream Helper

For receiving the historical data sent by the Analytics Storage Provider via MQTT.

Variable Live/Historical

The GVL is for the live data and the GVL_Hist is for the historical data.

Storage Provider Command Helper Functions

These Helper Functions generate the commands for communication with the Storage Provider Service in JSON format.

MAIN program

The Main program invokes communication to the Analytics Storage Provider. The Main Historical program implements the mapping of historical data from the Stream Helper into the GVL_Hist.

Analytics Logger

Sends the variables of the GVL to an MQTT Message Broker.

Sample Start

NOTICE

Too little router memory can lead to system crashes

Increase the router memory in the real-time settings to 256 MB. It is also recommended to increase the maximum stack size of the global task configuration to 512 KB.

Before the sample can be started, you must set the MQTT Message Broker you are using in three different places.

Analytics Stream Helper:

Name	Value	CS	Туре	PTCID
MQTT				
Host Name	172.17.62.145		STRING(80)	0x020201.
TcpPort	1883		UINT	0x020201
Topic Prefix	_AlySPTest/ResultValues		STRING(255)	0x020300
Client ID			STRING(80)	0x020201
Username			STRING(80)	0x020201
Password			STRING(80)	0x020201
Max Handles	100		UDINT	0x020300
Fifo Exponent	8		UDINT	0x020300
Sender System Id			STRING(80)	0x020300
CaFile			STRING(255)	0x020201
CertFile			STRING(255)	0x020201
KeyFile			STRING(255)	0x020201
KeyPw			STRING(255)	0x020201
CrlFile			STRING(255)	0x020201
Pskld			STRING(255)	0x020201
PskPwd			STRING(255)	0x020201
Insecure	FALSE	-	BOOL	0x020201
Version			STRING(255)	0x020201

Analytics Logger:

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Context Parameter (Init) Data Area TLS Time Source

Name	Value	CS	Туре	PTCID
Data Format	ANALYTICS_FORMAT_MQTT_BINARY		ANALYTICS_FORMAT	0x02020114
Data Compression	ANALYTICS_COMPRESSION_RL	-	ANALYTICS_COMPRESS	0x02030027
Max. Compression Compare Width	ANALYTICS_COMP_WIDTH_8	_	ANALYTICS_COMPRESS	0x0203003
MQTT Host Name	172.17.62.145		STRING(80)	0x0202011
MQTT Tcp Port	1883		UINT	0x0202010
MQTT Main Topic	AlySPTest		STRING(255)	0x0203000
MQTT Client ID			STRING(80)	0x0202010
MQTT User Name			STRING(255)	0x0202010
MQTT Password			STRING(80)	0x0202010

MAIN program:

MA	IAIN 🗢 🗙				
	28	VAR			
	29		nState: INT;		
	30				
8	31		<pre>fbALY_StorageProvider: FB_ALY_StorageProvider := (stConfig := (sMainTopic := 'GSW/Analytics SP',</pre>		
	32 33		<pre>sProviderGuid := STRING_TO_GUID('d67d1631-b890-4c5b-b5e0-1384549b05e2'), stConnSettings := (sHostName := '172.17.64.145',</pre>		
-	34		succentrates := (anosciame := listic-success), succentrates := 'TestUser', sPassword := '123',		
	35		SClientId := 'PLCClient'));		
	36				
	37		<pre>sLiveStreamTopic: T_MaxString := 'AlySPTest/TestValues';</pre>		
	38		sRecordingAlias: T_MaxString := 'PLC Recording';		
	39		<pre>sRecordName: T_MaxString := 'TestValueRec_{AutoID}';</pre>		
	40				
	41		stStorageCtrlGmd: T_ALY_SPStorageCtrl_Cmd;		
	42 43		stStartCmd: T_ALY_SPRecordData_Cmd; stStopCmd: T_ALY_SPRecordData_Cmd;		
	44		streaterordsfmd: T_LLY_SPReadStreamRecords_Cmd;		
	45		stGetHistDataCmd: T_LLY_SPGetHistorical Cmd;		
	46				
	47		<pre>sDataKey: GUID := STRING_T0_GUID('12345678-ABCD-1234-ABCD-123456789ABC');</pre>		
L.	48	END	VAR		

You must then change the sMainTopic and the sProviderGUID for the FB_ALY_StorageProvider. This can be found as described above in this document.

MAI	N ≁¤	\sim	
	28	VAR	
	29		nState: INT;
	30		
	31		fbALY_StorageProvider: FB_ALY_StorageProvider := (stConfig := (sMainTopic := 'GSW/Analytics SP',
	32		sProviderGuid := STRING_TO_GUID(<mark>'d67d1631-b890-4c5b-b5e0-1384549b05e2'</mark>),
	33		stConnSettings := (sHostName := '172.17.64.145',
	34		<pre>sUserID := 'IestUser', sPassword := '123',</pre>
	35		<pre>sClientId := 'PLCClient')));</pre>
	36		
	37		sLiveStreamTopic: T_MaxString := 'AlySPTest/TestValues';
	38		<pre>sRecordingAlias: T_MaxString := 'PLC Recording';</pre>
	39		sRecordName: T_MaxString := 'TestValueRec_{AutoID}';
	40		
	41		stStorageCtrlCmd: T_ALY_SPStorageCtrl_Cmd;
	42		stStartCmd: T_ALY_SPRecordData_Cmd;
	43		stStopCmd: T_ALY_SPRecordData_Cmd;
	44		stReadRecordsCmd: T_ALY_SPReadStreamRecords_Cmd;
	45		stGetHistDataCmd: T_ALY_SPGetHistorical_Cmd;
	46		
	47	_	<pre>sDataKey: GUID := STRING_TO_GUID('12345678-ABCD-1234-ABCD-123456789ABC');</pre>
P	48	END	VAR

Now go to the MAIN program to control the sample. With the enum eCtrl you can set the action you would like to perform. The available options are:

- ReadASPDescription (also contains the storage description)
- ReadDataBroker
- StartStorage
- ShutdownStorage
- StartRecord
- StopRecord
- IsRecordingRunning
- ReadHistoricalStreams

- ReadRecords
- GetHistorical

With a rising edge at the variable bExecute the action selected in the enum is executed. If you have made more than one record, you can see this in the array aRecordInfo. With the index it is then possible to select the different records. The timespans are also displayed, you could theoretically still adjust these within the timespan. To do this, you would need to modify the logic of the sample in the helper function F_CreateAlySPGetHistCmd accordingly.

The Storage Provider Recorder GUID selected in the document above can optionally be set in the PLC in the F_CreateAlySPStartRecordCmd function. Theoretically, it can be any GUID, it is only used to identify the recorder.

Download: https://infosys.beckhoff.com/content/1033/tf3500_tc3_analytics_logger/Resources/ 11270100747.zip

9 Appendix

9.1 Glossary

The following table explains key terms in connection with the Storage Provider.

Name	Function	Unique identifier (automatically gener- ated)	Descriptive parame- ters (configurable by the user)
Storage Provider Configurator	Software tool for configuring the local Storage Provider.		
Storage Provider	Software tool for working with the Storage Provider. This can be used to start, stop and		
Manager	manage data recordings. The Storage Provider Manager can be used for both the local and the remote Storage Provider.		
Storage Provider CLI Client	Command line tool for interactions with the Storage Provider.		
Storage Provider PLC library	PLC library for interactions with the Storage Provider.		
Storage Provider	Software application for historicizing data such as from the Analytics Logger. Both the acquisition of the data to be stored and the provision of stored data is carried out via MQTT. The Storage Provider can be operated under Windows and FreeBSD®.	ProviderGuid	ProviderAlias
Storage	Data sink of a Storage Provider (e.g. MS SQL or CSV).	StorageGuid	StorageAlias
Message Broker	MQTT message broker via which data can be transmitted using the MQTT protocol.		
HostBroker	Central message broker on which the Storage Provider provides information and receives commands.	BrokerGuid	BrokerAlias
DataBroker	Additional message broker from which the Storage Provider can obtain data to be recorded.	BrokerGuid	BrokerAlias
Pipeline	Description of a data flow. Components are data sources (Input Sources), processing steps (Rules) and data storage (Recordings).	PipelineGuid	PipelineAlias (can be set before starting the pipeline)
RuleEngine	Processing unit within the Storage Provider.		
Rule	Processing rule within a pipeline that is used for filtering, aggregating and sampling data.	RuleID	RuleAlias
Recording	Recording configuration for data. This includes which data should be recorded in which storage.	RecordingID	RecordingAlias (can be set before starting the pipeline)
Record	Data recording based on a defined recording configuration (Recording).	RecordID, additionally RecordDataKey if recording is running	RecordAlias (can be set before starting the pipeline)
Input Source	Data source for a pipeline. This can be an MQTT livestream or a HistoricalStream.		
LiveStream	Data from the Analytics Logger, IoT Data Agent or EK9160.		
HistoricalStre am	MQTT data stream from the Storage Provider, which contains all information about a recording and the associated records. One HistoricalStream is generated per recording.	HistStreamID	HistStreamAlias - this corresponds to the RecordingAlias

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Name		(automatically gener-	Descriptive parame- ters (configurable by the user)
Recorder	Identification of the client that communicates with the provider. It is provided when the pipeline is started in order to be able to trace who started the pipeline.	RecorderGuid	RecorderAlias

9.2 FAQ - frequently asked questions and answers

In this section frequently asked questions are answered, in order to facilitate your work with the TwinCAT Analytics Storage Provider (ASP). If you have any further questions, please contact our support team at support@beckhoff.com.

- 1. How can I manage the table schema of MS SQL with ASP? [▶ 157]
- 2. Can I control the Storage Provider in a programmable way? [157]
- 3. Is it also possible to save results from the Analytics Runtime? [157]
- 4. Are open source software components used in TwinCAT Measurement products? [> 157]
- 5. What factors influence the data throughput of the storage provider? [157]

How can I manage the table schema of MS SQL with ASP?

You don't have to worry about the table schema. This is done completely by the Analytics Storage Provider. You only have to specify on which database server the data should be stored. If you want to see data in your own table structure, you have to stream the data into a TwinCAT Analytics Runtime and have the TwinCAT Database Server write the data in your structure.

Can I control the Storage Provider in a programmable way?

Yes, via the PLC interface for the TwinCAT Storage Provider. You can start/stop recordings or retrieve historical data (raw data or result data).

Is it also possible to save results from the Analytics Runtime?

Yes, this is possible. For this purpose, you can choose to send the results to an MQTT Message Broker when generating the Analytics Runtime from the Analytics Workbench configurator. This data stream can be captured by the Storage Provider.

Are open source software components used in TwinCAT Measurement products?

Yes, various open source components are used.

Please see the information on the page <u>Third-party components [158]</u>.

What factors influence the data throughput of the storage provider?

The data throughput depends on many influencing variables. Primarily of system and network resources. An overview:

- System properties (CPU, RAM)
- Writing speed and quality of the storage medium (SSD)
- Network properties
- Complexity of symbolism (data type, structures, arrays, etc.)
- Mode of historization (total symbolism allows higher throughput, a subset may be more costly depending on its size)
- Compression level of the stream (the stronger the compression, the higher the system load)
- The size of a sample
- Total size of a data packet (number of samples per packet)
- The number of parallel recordings that the storage provider manages



Third-party components 9.3

This software contains third-party components. Please refer to the license file provided in the following folder for further information: C:\Program Files(x86)\Beckhoff\Legal\TwinCAT-XAR-AnalyticsStorageProvider

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