SIEMENS

Edge

Edge app
Data Service for Industrial Edge V1.7

Application Manual

05/2023; V1.7
A5E50591897-AG

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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1.1 Security information

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement - and continuously maintain - a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit:

https://www.siemens.com/industrialsecurity (https://new.siemens.com/global/en/company/topic-areas/future-of-manufacturing/industrial-security.html).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under:

https://www.siemens.com/cert (https://www.siemens.com/cert).

1.2 Note on EU General Data Protection Regulation

Data protection

Siemens observes the principles of data protection, in particular the principle of data minimization (privacy by design). For the Data Service for Industrial Edge product, this means: the product processes/stores the following personal data: The token from Industrial Edge Management to verify authentication.

No private or intimate data is processed or stored.

The above data are required for the login, the billing function and for the internal user administration (administrator can see the role and the status of other users). The storage of data is appropriate and limited to what is necessary, as it is essential to identify the

authorized operators. The data needs to be maintained manually by you and if necessary, these can also be deleted. If you need support, please contact customer support.

The above data will not be stored anonymously or pseudonymized, because the purpose (identification of the operating personnel) cannot be achieved otherwise.

The above data is protected against loss of integrity and confidentiality by state-of-the-art security measures.

1.3 Security Information for Industrial Edge Apps

Security information (assumptions/constraints) for Industrial Edge Apps is as follows:

- Only authorized internal operators will have access to Industrial Edge Device within a secure network using VPN connection.
- Perimeter firewall configuration responsibility lies with the end customer.
- The security guidelines for usage of USB Flash Drives in the shop floor area are applied accordingly.
- Creating users with appropriate access rights upon commissioning is the responsibility of the operator.
- The customer is responsible for configuring the application on the basis of the system requirements and technical capabilities of the documented App according to the Installation / User Manual such that the automation system performance is not impacted.
- The system is installed in an environment ensuring that physical access is limited to authorized maintenance personnel only. Managing unauthorized attachment of removable devices is the responsibility of the operator.
- The platform including hardware, firmware and operating system is securely configured and maintained by the operator.
- The operator is capable of protecting the environment from malware infection.
- Centralized IT security components (Active Directory, Centralized IT Logging Server) are provided and well secured by the operator and are trustworthy.
- The operator personnel accessing the system is well trained in the usage of the system and general information security aspects like password handling, removable media, etc.
- The operator is responsible for the CIA (Confidentiality, Integrity and Availability) of data stored outside the Industrial Edge Device.
- The operator is responsible for configuring the CPUs with appropriate read/write access levels (legitimization), and for configuring the Industrial Edge Apps using appropriate passwords for data collection from CPUs.
- The customer takes care about the time synchronization of Industrial Edge Management and Industrial Edge Device.

What's new in Data Service? 2

2.1 What's new in Data Service V1.7?

All important new features of Data Service are summarized here. You can find more details on individual topics in the documentation.

Bulk API

By adding "/bulk" in the API route, you can create several objects (aspects, assets or variables) simultaneously.

Encrypted backup

Backups can be encrypted with a password when being created. The password has to be entered again when the backup file is uploaded.

Data synchronization

Data can be synchronized automatically with an external data memory. The new tab "Data Destinations" in which you can perform the settings for external data memories is available to this purpose. As soon as this has been defined as the data destination, the synchronization for assets, aspects, variables and aggregations can be set. In Data Service V1.7, Insights Hub is available as a possible data destination.

2.2 What's new in Data Service V1.6?

All important new features of Data Service are summarized here. You can find more details on individual topics in the documentation.

Blob data type

When creating a variable, you can also now select Blob as the data type. Blob data type is a data type for unstructured data that is stored in binary form. It can be used to store data that is not covered by the other supported data types. In contrast to other data types, the Blob data type has the additional optional property "Blob type". This property can be used to define the format of the stored data. We recommend the use of a standardized approach such as MIME types.

You can find more information on MIME types here: MIME types (https://wiki.selfhtml.org/wiki/MIME-Type/%C3%9Cbersicht)

Defining databus credentials centrally

The default databus credentials (broker URL, user name, password) can be defined centrally for all connectors in the Data Service settings. However, these settings can be overwritten with connector-specific settings in the respective connector configurations.

Adding available connectors

SIMATIC connectors and Connectivity Suite connectors can be automatically searched and added with a single click. A manual user-defined connector configuration is not required (but is possible).

Exporting/importing variable data

The data of a variable can be exported to TXT for a selected time period, including existing aggregations. This export file can be imported to any other variable of your choice.

Possible uses:

- Initializing a variable with data
- Backing up/exporting data in a generic format
- Transferring data to another Data Service instance
- ...

Debugging view

In the event of errors, the debugging view provides valuable additional information.

The debugging view can be accessed at "https://<IED_IP>/dataservice/#/debug" and shows information, such as component versions and live logs, that is relevant to Support personnel. Extended logging can be enabled on a functional basis to obtain detailed information when needed.

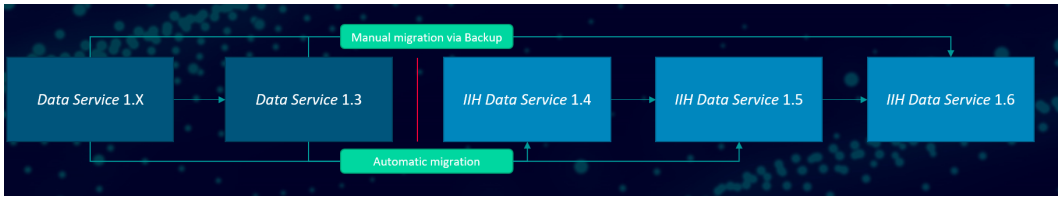
V1.4.0 - Migration cleanup

With Data Service V1.4.0, several technologies were replaced to achieve better performance.

During installation of V1.4.0 or V1.5.0 based on V1.3.0, automatic migration is performed. This assumes, however, that Data Service still contains the previous technologies.

Starting with V1.6.0, this automatic migration is removed in order to clean up the previous technologies. As a result of this, when a version >= V1.6.0 is installed based directly on a version <= V1.3.0, the configuration and data are not migrated. To retain the data in this update scenario, a data backup must be created before the update and restored after the update.

If your starting point is a version >= 1.4.0, the information above does not apply.



Variable and counter configuration in Data Service

The variable configuration has been extended to support an acquisition category including counter configuration. This option was previously available only in the Performance Insight app but has now been moved to Data Service to allow these configurations for precalculated aggregations as well.

Security: Encrypted / secure configuration memory

Sensitive information such as databus credentials is encrypted and secure. Earlier versions of Data Service stored the databus credentials unencrypted in the internal memory. This information was able to be retrieved by downloading the IED file. This has now been corrected.

Aggregations: Improvements to the user interface

Aggregations are no longer explicitly displayed but are accessible via the source variable. (accessible for retention policy, preview, etc.)

Extended error messages and translations in the user interface

Error messages for data backup/restoration and the change to IIH mode have been added. Several missing translations have been added.

Panel performance optimized

The performance of subscriptions on the UCP has been improved.

2.3 What's new in Data Service V1.5?

All important new features of Data Service are summarized here. You can find more details on individual topics in the documentation.

Integration in the IIH (IIH mode)

Automatic integration from standalone Data Service to IIH mode is supported. When switching to IIH mode, the data already configured is retained.

You can find more information on integration here: Integrating Data Service into the IIH (Page 86)

Changing models in IIH mode

All APIs from the Data Service work in both modes (standalone or IIH).

Apps that access APIs that change the model now also work with the Data Service in IIH mode.

Full-screen view for user interface dialogs

The configuration of assets, aspects and variables has been improved by combining all configurations of each of these objects in a full-screen view. Now you can find all configurations for this object in one place.

Enabling/disabling a variable

A variable can be disabled temporarily, i.e. data is no longer stored, without having to delete the variable configuration. Each variable has a check box that indicates whether it is currently storing new values. In IIH mode, this is directly linked to the archive flag of the IIH Configurator.

2.4 What's new in Data Service V1.4?

All important new features of the Data Service are summarized here. For more details on the individual topics, refer to the documentation.

Data Service modes

As of version 1.4, there are two modes for the Data Service:

- Stand-alone Data Service
  All functions including user interface available
- Integrated Data Service in IIH (Industrial Information Hub)
  The Data Service no longer has its own user interface. Data retention for assets and variables can now be set directly in the IIH.

For additional information on the integration in the IIH, click here: Integrating Data Service into the IIH (Page 86)

Connectivity Suite Connectors

The Data Service now supports Connectivity Suite connectors in addition to MQTT connectors.

System information dashboard

In the System Information dashboard, you can view the information from the System Info connector.

You can find additional information here: Display system information (Page 89)

Setting aggregation for variables

When creating a variable, you can set an aggregation and significantly improve performance in the Data Service by pre-calculating the data.

Pre-calculated aggregations are taken into account when querying the data. This decisively shortens the duration of the query. For example, the aggregations API queries the last month with aggregation "Sum".

For this, the aggregation is calculated from the raw data as needed (at 1ms cycle = 2 628 000 000 data points). However, if pre-calculated aggregations have been configured on the variable, the aggregation can be calculated from them (e.g. 1h aggregation configured = 730 data points).

For additional information on creating an aggregation, click here: Creating a variable (Page 55)

General

Performance improvements

Anomaly Detection compatibility

The Anomaly Detection app (V1.0, V1.1 and future versions) is only compatible with the standalone Data Service. When the Data Service is integrated into the IIH, it is no longer compatible with Anomaly Detection.
Only with Data Service V1.5 will Anomaly Detection be compatible in IIH mode.

2.5 What's new in Data Service V1.3?

All important new features of Data Service are summarized here. You can find more details on individual topics in the documentation.

Newly added

- Predefined aspect types
- Creating aspects based on aspect types
- Backing up and restoring data
  You can save the configuration and time series data in the Data Service (connector connections, asset structure, variables, aspects, etc.) and restore it to another IED, for example, or save a backup of your configuration.
  More information is available here:
  Data backup (Page 75)
  Restoring data (Page 76)

- Displaying variable preview as a chart
  - Automatic update
  - Select aggregation
  - Select period

  You can find more information here: Displaying the variable preview (Page 64)
- Better status/debug information
  - Show variable error
  - Show connector errors
  - Show connection status of the variables
- Creating variables without a connector
- Defining the retention policy per variable
  You can find more information here: Defining the retention policy for an individual variable (Page 67)

Improvements

- No more data gap after zooming in the preview chart
- No missing variable information in "Add multiple variables" dialog
- Documentation of the System Info connector

2.6 What's new in Data Service V1.2?

All important new features of the Data Service are summarized here. For more details on the individual topics, refer to the documentation.

Newly added

- New aggregations:
  - StandardDeviation
  - Variance
  - Count (number of data points)
  - First
- Custom connectors
- Adding multiple variables at the same time
- "String" data type is supported

Improvements

- Improved calculation algorithm
- Values with "Bad" quality code are no longer included in the calculation.

Installing Data Service 3

3.1 System requirements

Note the following system requirements for the installation of the Edge Apps.

Software requirements

The following Internet browsers are supported:

- Firefox
- Google Chrome
- Microsoft Edge
- Safari mobile devices

The latest two versions are supported for all browsers. You should preferably use a resolution of 1920x1080.

The app can run on any smart device with an HTML5-enabled browser. Tablets are recommended.

Internet Explorer is no longer supported as of version 11.

Hardware requirements

- A device on which Industrial Edge Management (IEM) is running.
- An Industrial Edge Device (IED) that is compatible with Industrial Edge Management:
  - IED Model: e.g. SIMATIC IPC 227E Nanobox, SIMATIC IPC 427E or Unified Comfort Panel (UCP)
  - Hard disk: At least 10 GB available
  - RAM: 2 GB available RAM
- The Edge Device must be on board the Industrial Edge Management.

IEM, IED, and web browsers must be synchronous in the UTC time zone.

3.2 Buying an app

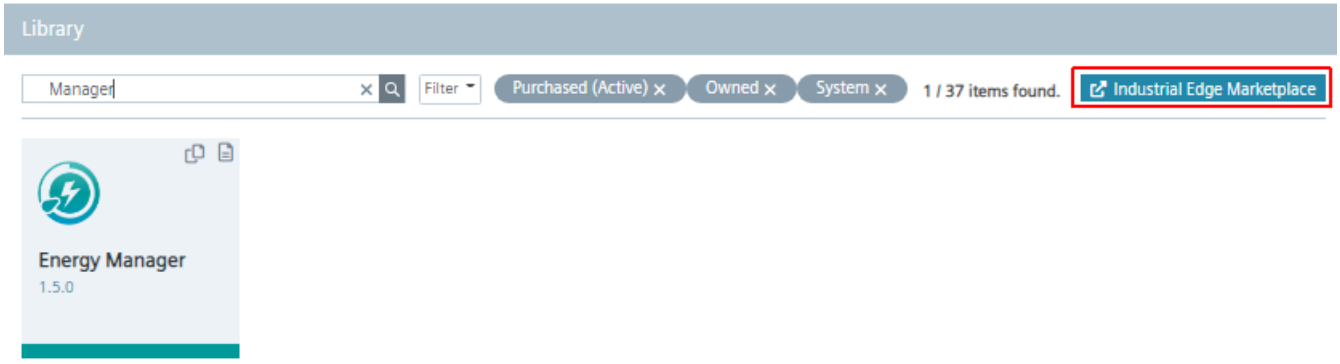
You can use the IE Marketplace to purchase an app or app license. To purchase an app, you need an access code.

Requirement

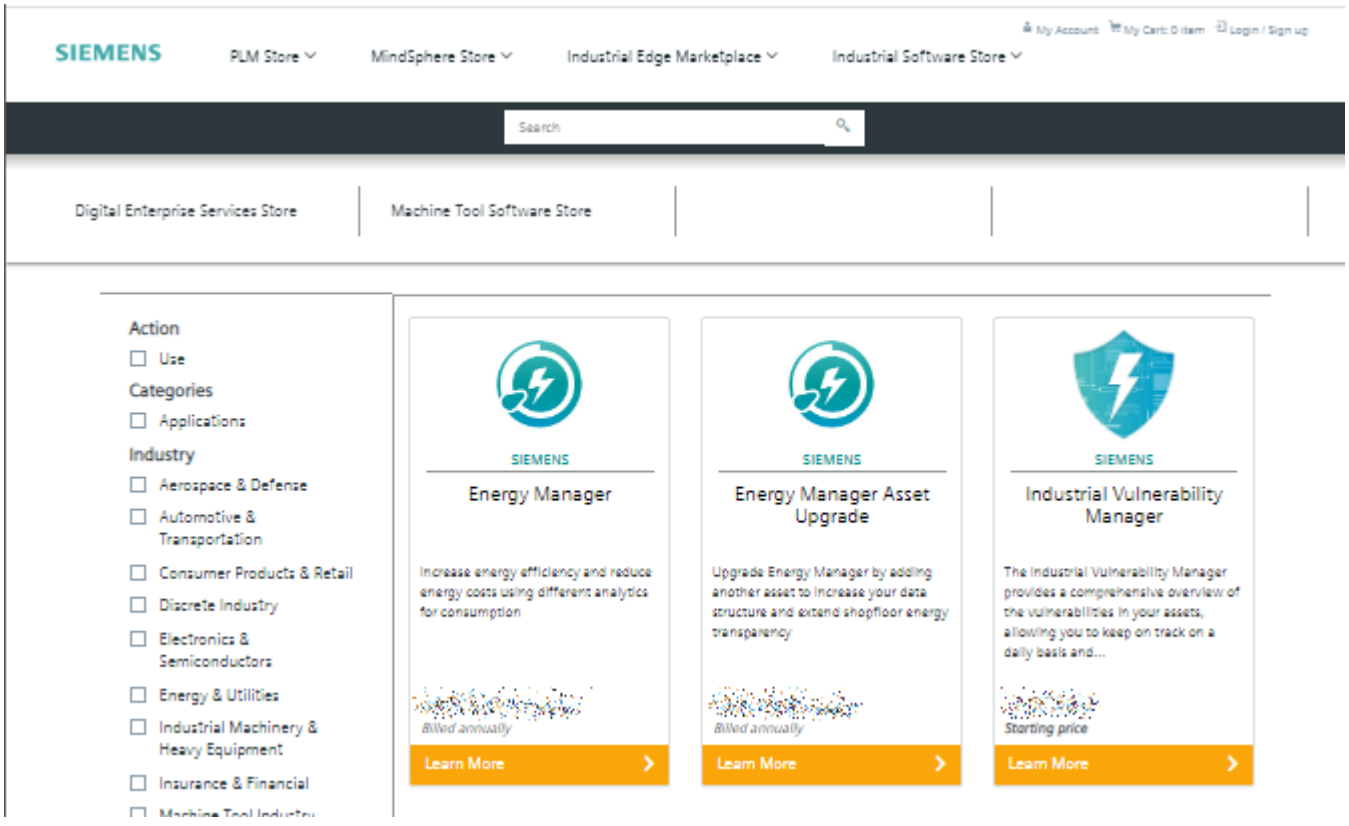
You have received the access code from your regional Siemens contact.

Procedure

1. In the "Library" screen of IE Hub, click "Industrial Edge Marketplace".

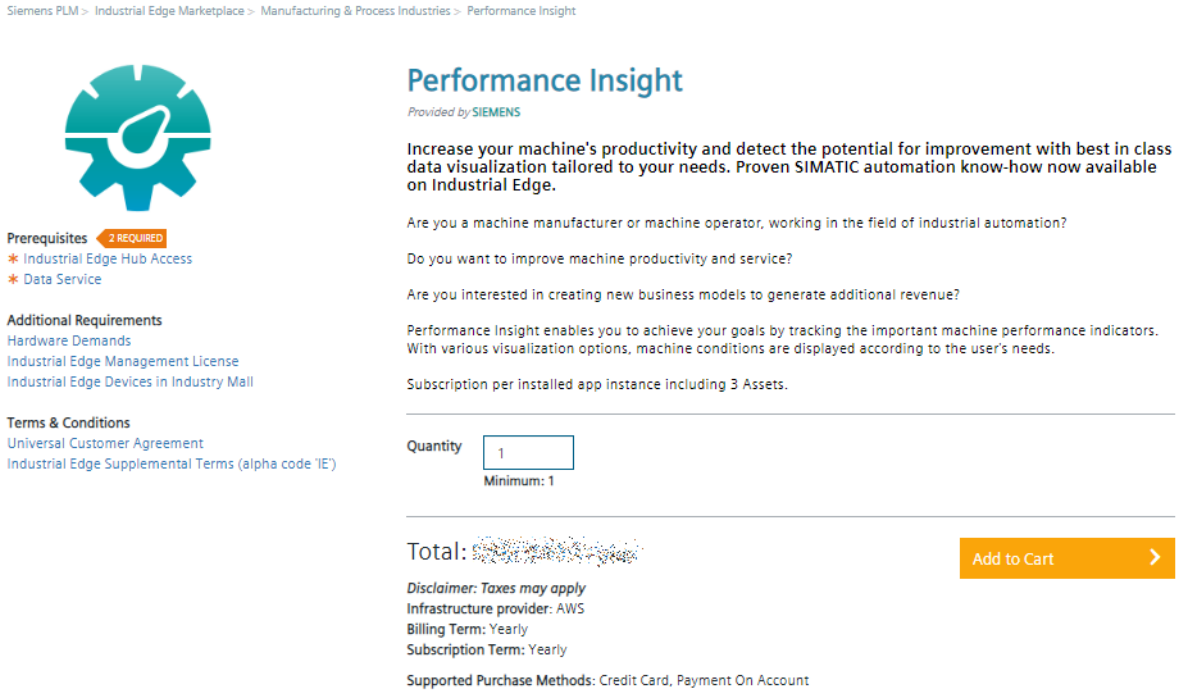


2. Click "Manufacturing & Process Industries".
   The Industrial Edge Marketplace opens.
3. Click the tile of the app you want to buy.

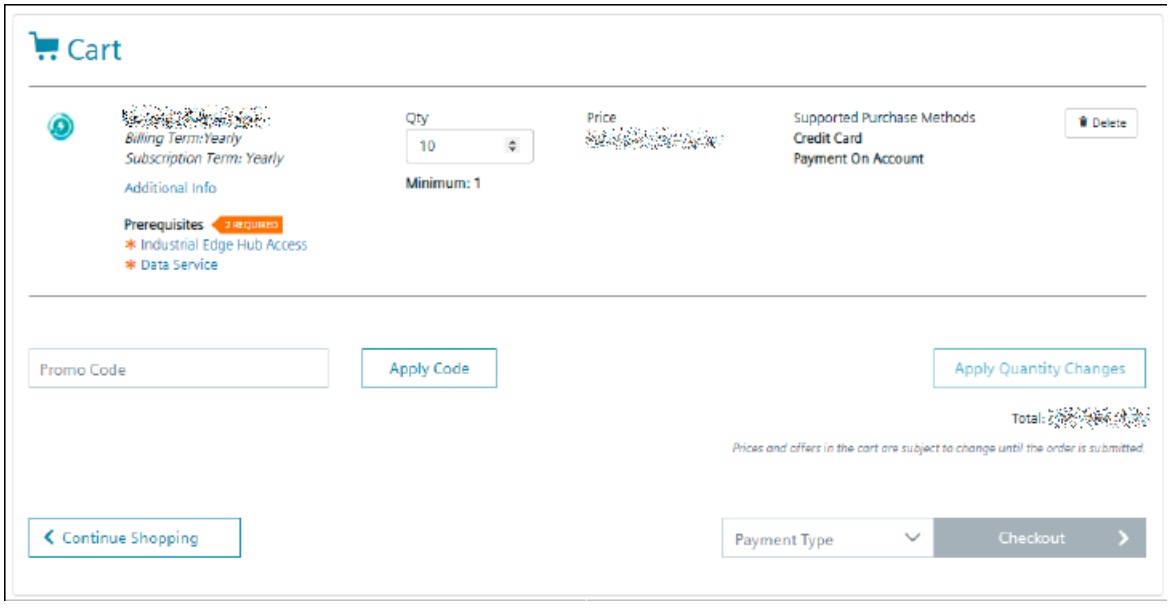


The app description and details are displayed.
On the left-hand side, you can see all the preconditions and requirements that apply to the execution of this app in IEM.
You can purchase all the products you require in one transaction.

4. Enter the number of licenses required in the "Quantity" input field.

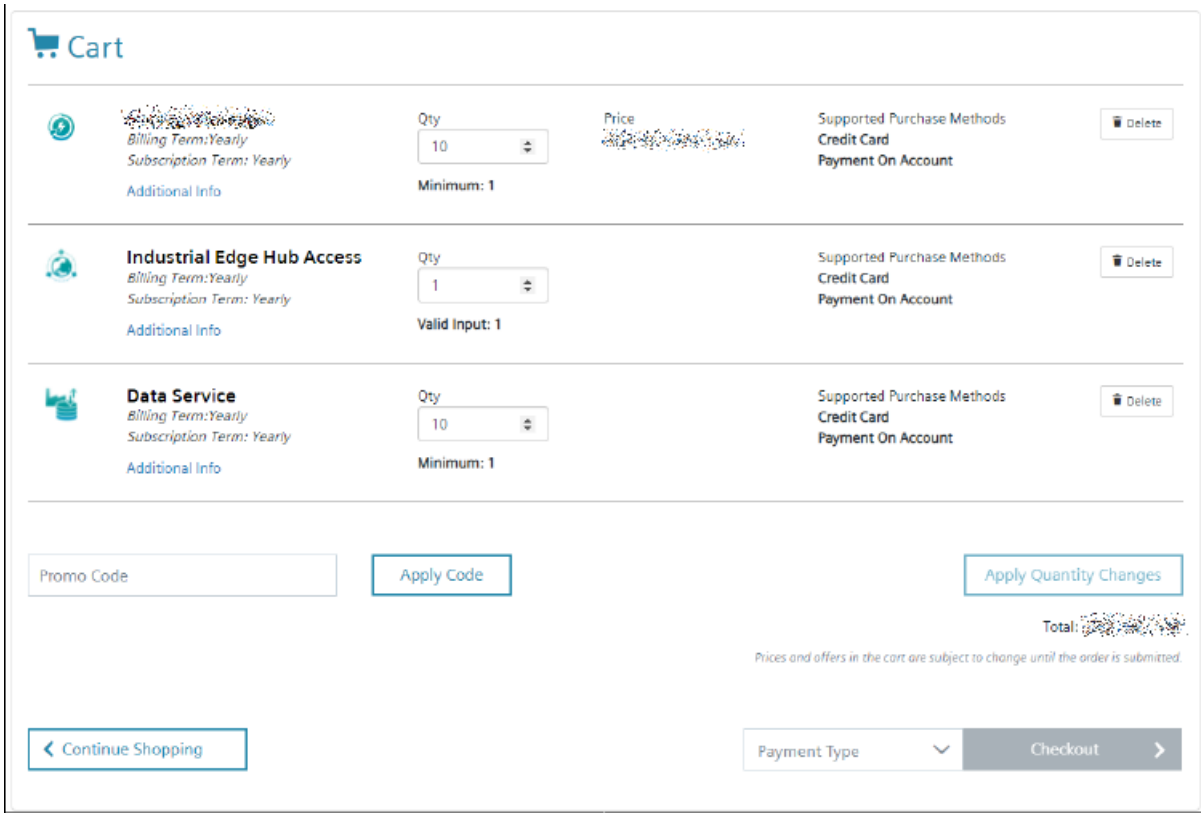


5. Click "Add to Cart".
   The shopping cart is displayed.



6. Enter the received access code.

7. Add other products that are required to use the app to the shopping cart.
   To do this, click on the corresponding links under "Prerequisites" and add all the desired products to the shopping cart in the same way.



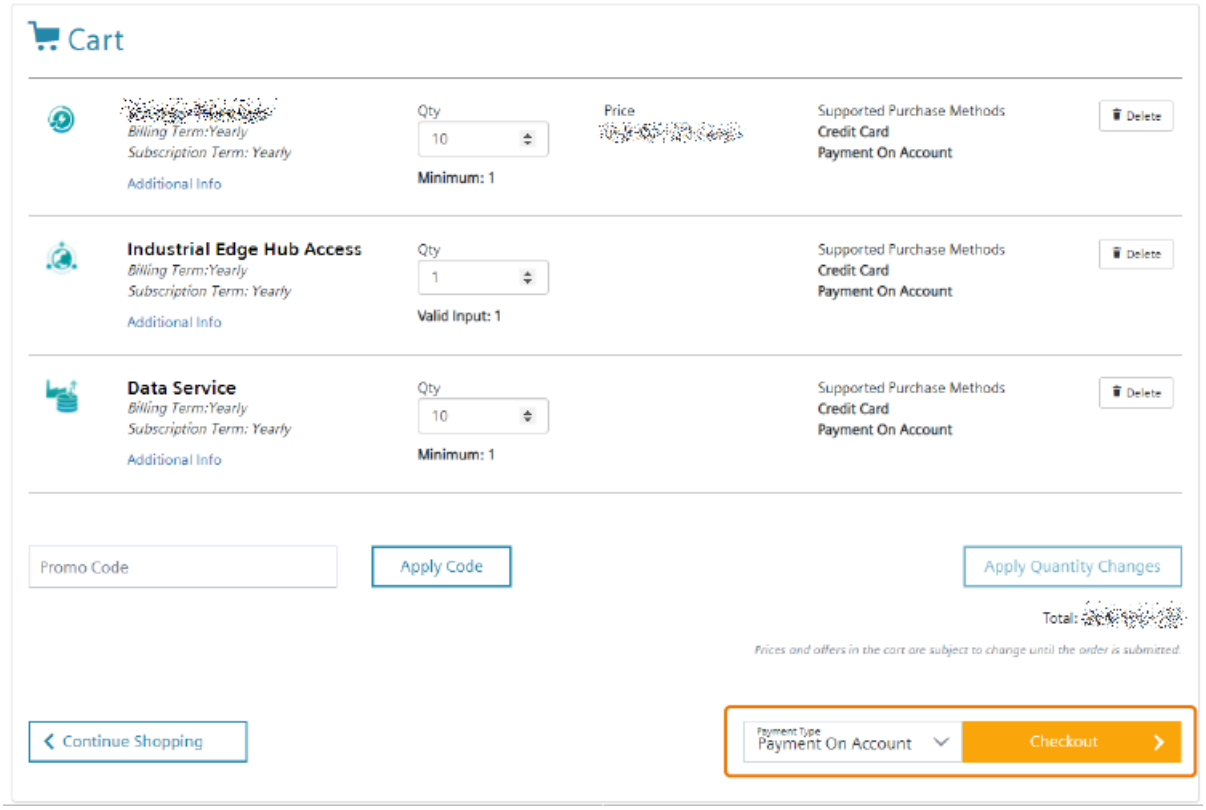
8. Select your preferred payment type from the "Payment type" selection list.
   Only "Credit Card" payment method is available for third-party apps.

9. Check again the information provided.

   Note

   You can edit the number of licenses again. Then click "Apply Quantity Changes".

10. Click "Checkout" and follow the instructions on the screen.

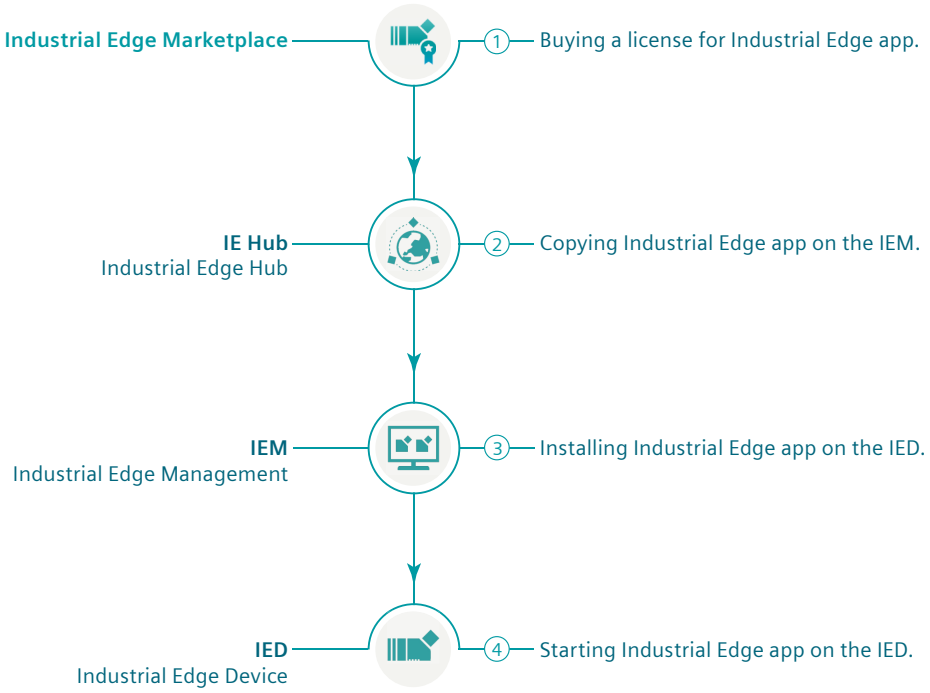


After you purchase the app, it appears in the "Library" section of IE Hub. From here, you can copy the app to your IEM instances. The number of licenses, the license itself and other details are displayed under "Licenses". If necessary, you can purchase additional licenses of the app in question from this location.

3.3 Installing Data Service on an IED via IE Hub

3.3.1 Overview of the installation process

Installation process of an Industrial Edge app on an IED:



3.3.2 Copying the Data Service app from the IE Hub to the IEM catalog

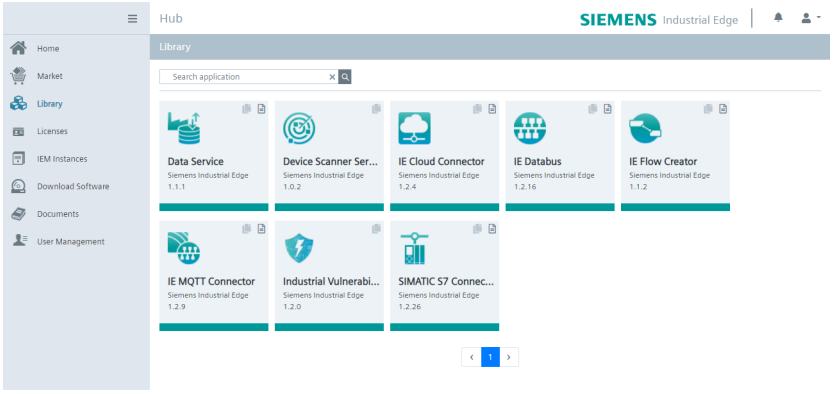
Description

An IEM instance and an Internet connection are required to copy an app into the Industrial Edge Management (IEM) catalog. With this functionality, you can copy the app directly into a catalog of one of your IEM instances.

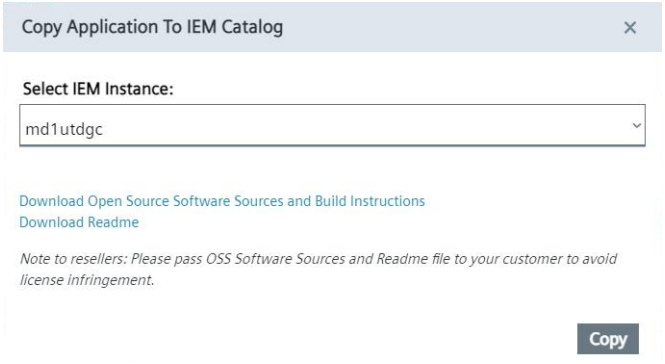
Procedure

To copy an app into the IEM catalog, follow these steps:

1. Open the "Library" tab in the Industrial Edge Hub.



2. Click the icon in the desired app tile.
The "Copy Application to IEM catalog" dialog box opens:



The layout of the dialog box depends on whether the app contains links for Open Source Software (OSS) and for the readme. The relevant file is downloaded when you click on one of the links. If the app does not support these links, the dialog box is shown without links.

3. In the "Select IEM Instance" drop-down list, select the IEM instance to which you want to copy the app.
4. Click "Copy".
The app is copied, and a corresponding job is created. You can follow the status of the job in the status window of the corresponding IEM instance.

User documentation in the IE Hub

In the "Library" tab of the IE Hub, you can jump directly to the Siemens Industry Online Support by using the icon in the tile of an app. There, you can download the user documentation of the respective app.

3.3.3 Installing the Data Service app on the IED

Description

You can install and start the Data Service app in the catalog of the Industrial Edge Management (IEM) instance.

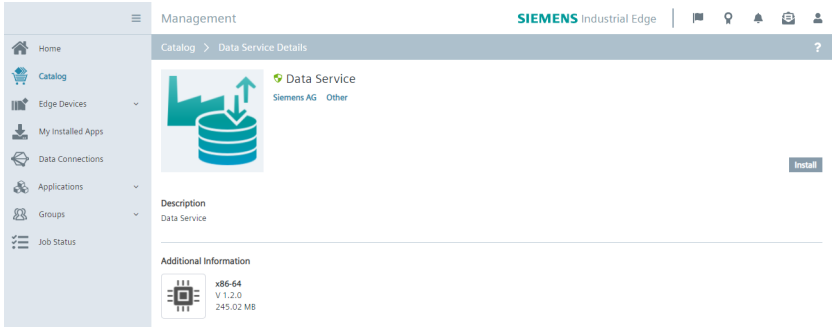
Requirement

- You must be logged into the Industrial Edge Management (IEM).
- The Data Service app was copied to the catalog. You can find more information here: Copying the Data Service app from the IE Hub to the IEM catalog (Page 22)

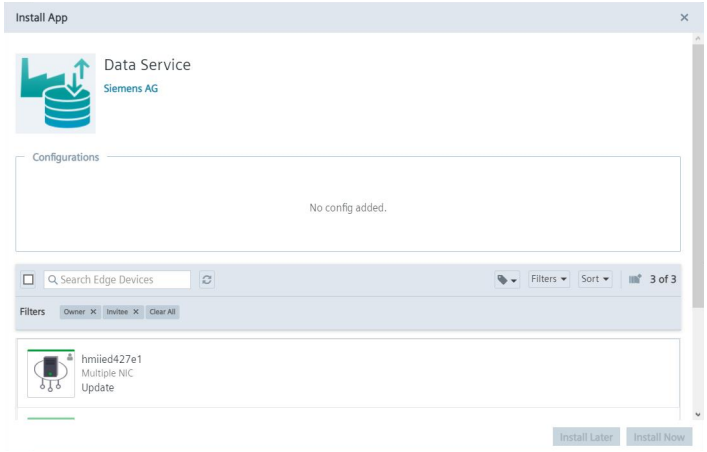
Procedure

To install the Data Service app, follow these steps:

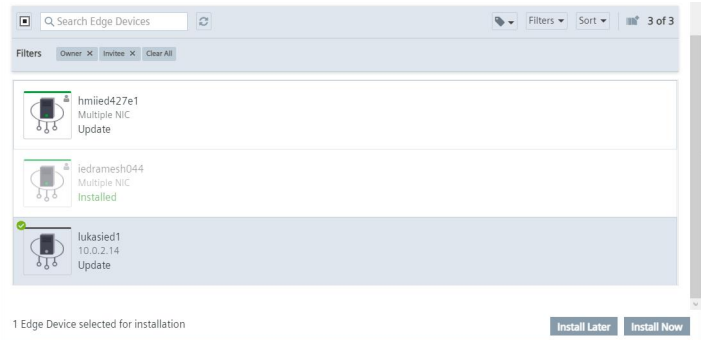
1. Open the "Catalog" tab.
2. Click on the "Data Service" tile.
   The following dialog box opens:



3. Click "Install".
   The "Install App" dialog window is displayed.



4. You can see a table with all associated IEDs. Select one or more IEDs on which you want to install the app:



5. You have two options to continue:
   - Click "Install Later" to schedule the date and time of the installation.
   - Click "Install Now" to install the app immediately.
     When you click "Install Now", you will receive the following message:
6. Click "Allow".
   The installation of the apps is started on the selected IEDs.

Result

The Data Service app is listed in the "My Installed App" tab.

3.3.4 Starting the Data Service app on the IED

After you have installed the Data Service app on the IED, the app is displayed in the "Industrial Edge Management" in the "My Installed Apps" view.

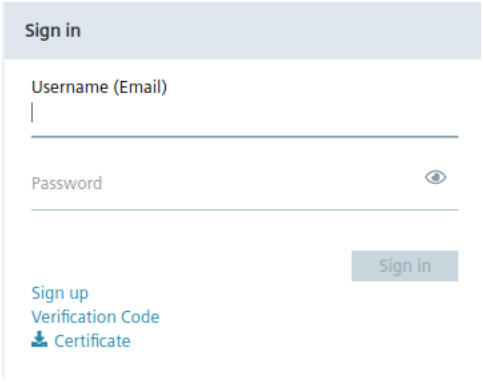
Requirement

The app must be installed on the Industrial Edge Device (IED).

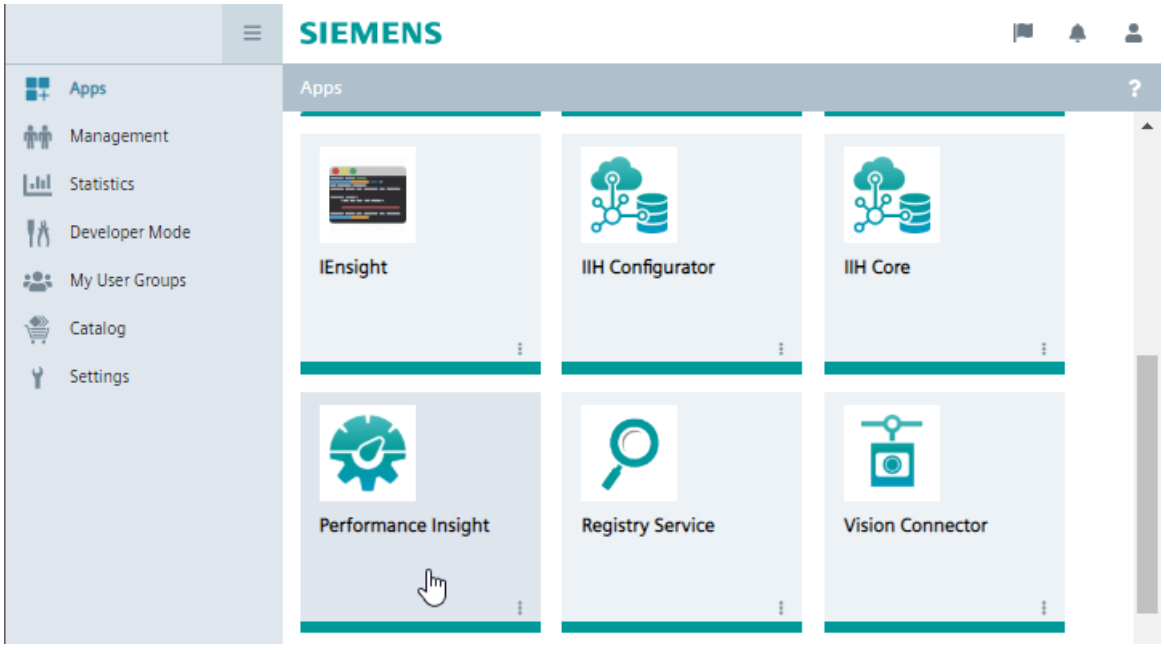
Procedure

To start the Data Service app, follow these steps:

1. Open the start page of the IED by entering the following URL address: "https:\\[IP address of the IED]"
2. Log in with "Username" and "Password":



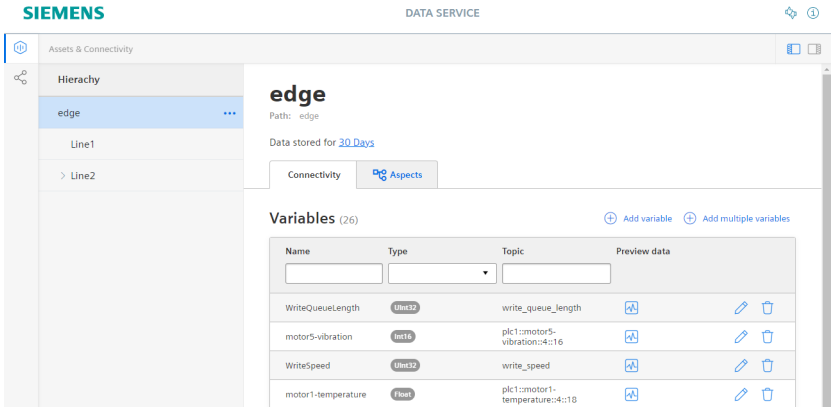
3. Open the "Apps" tab:



4. Click the Data Service tile to open the app in the browser.

Result

The Data Service app opens in the browser:



3.4 Installing the Data Service app on a panel

3.4.1 Downloading and installing the Data Service app

Description

You can install and start the Data Service app on your Unified Comfort Panel (UCP) by downloading the APP files from the Siemens Industry Mall and transferring them to your panel.

Requirement

- You need the APP files of the Data Service app
  With the Data Service app, you model the structure of your industrial process using assets and aspects and create the database for the Performance Insight app, for example.

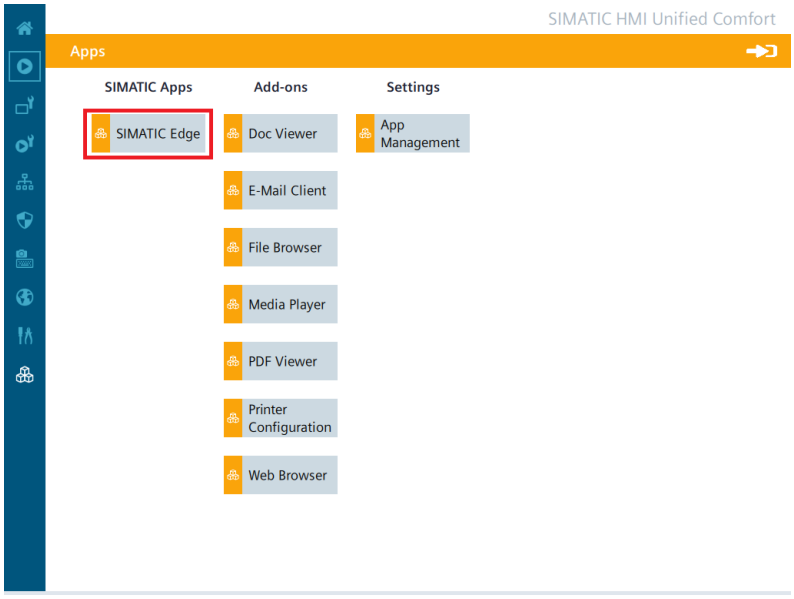
Procedure

To install the Data Service app on your panel, follow these steps:

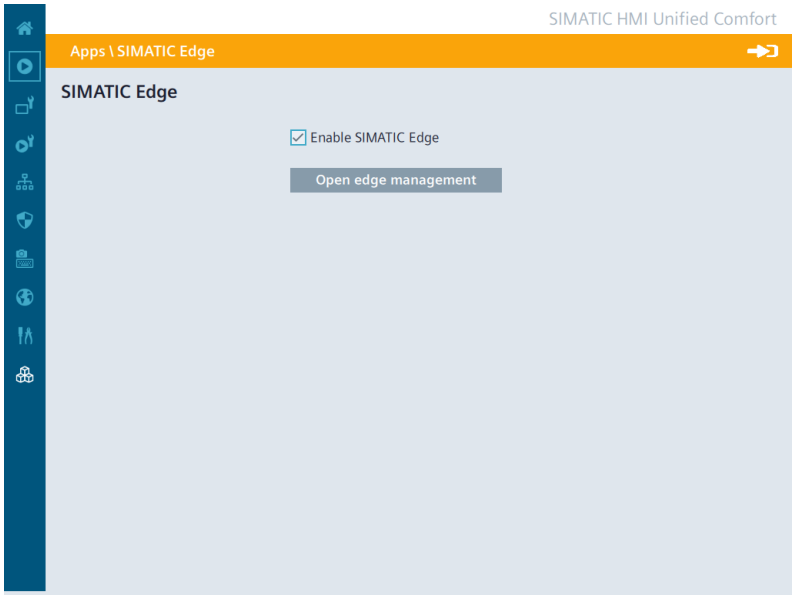
1. Download the app files from the Siemens Industry Online Support (SIOS).
2. Unzip the downloaded ZIP package.
3. Transfer the "DataServicex.x.app" file to your panel, for example, by using a USB flash drive.

4. Click the "Apps" tab or tile on your panel:

5. Click "SIMATIC Edge" under "SIMATIC Apps":

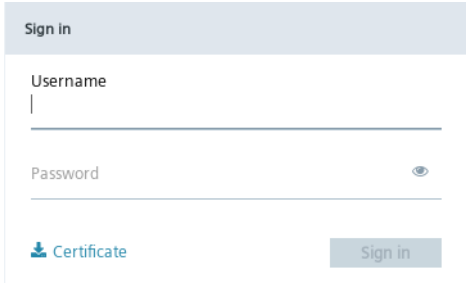


6. Select the "Enable SIMATIC Edge" option and click on "Open edge management":

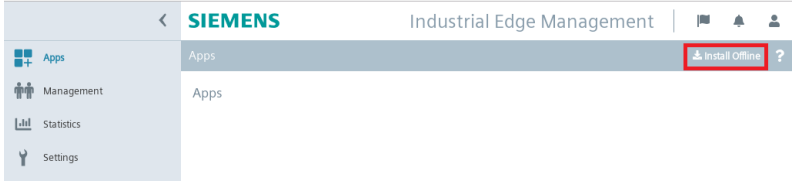


7. Log into the Industrial Edge Management by clicking "Sign in":

8. Log in with "Username" and "Password":



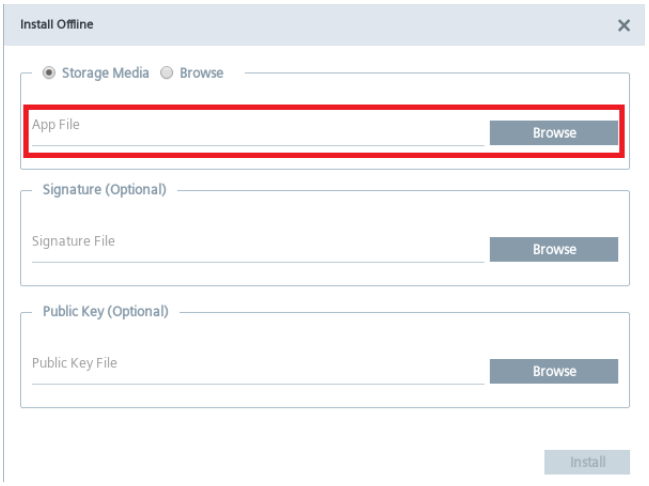
9. Click "Install Offline":



The "Install Offline" window opens.

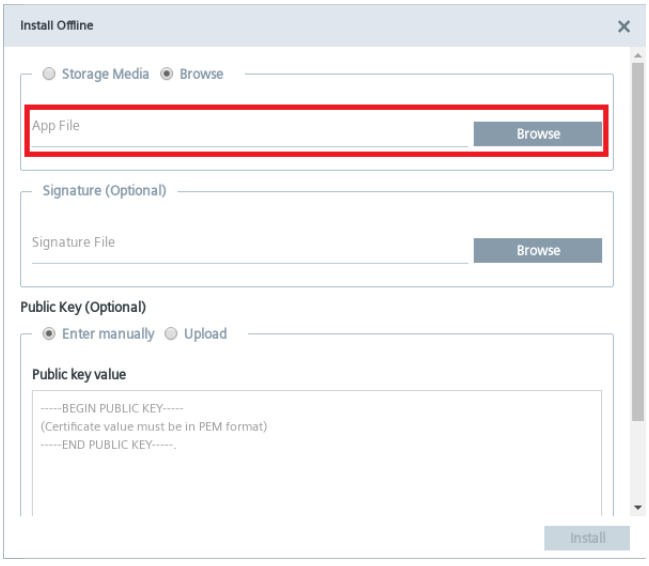
10. You have the following two options for selecting the APP files:

   – If the files on the storage medium, for example a USB stick, then select "Storage Media" and click "Browse" in the "App File" area:



   The storage area on the storage medium opens and you can select the required APP file.

   – If you have copied the files on the storage medium, for example a USB stick, to the system storage on the panel, then select "Browse" and click "Browse" in the "App File" area:



   The system storage of the panel opens and you can select the required APP file.

11. Click "Install".

Result

The Data Service app is installed on the panel:

Introduction to the Data Service

4

4.1 Function overview

Description

With the help of the Data Service app, you connect other apps, such as Performance Insight, to the Databus (MQTT Broker) or a Unified Comfort Panel (Open Pipe). You can group data and store it for a certain time period in Data Service. The Databus receives data directly from the plant with the aid of connectors, such as a SIMATIC S7 Connector.

In Data Service, the metadata topic is read out from the Databus and variables can then be created based on this metadata.

You can model the structure of your industrial process using assets and aspects and divide it into logical units, for example, one asset per machine.

Defining the retention policy for the variable data

By default, all data that is transferred from the connectors to the variables is automatically stored in Data Service for an unlimited amount of time.

The retention policy allows you to define the length of time that data is to be stored for each individual asset level and variable. For example, if you define a period of 10 days, data of the last 10 days is stored in each case and older data is deleted.

If you define a time period at the topmost asset level, it is inherited by all lower-level assets and the variables they contain.

You also have the option of disabling data retention for each variable. This means that the data retention is paused and can be re-enabled again at any time.

Data of the following variables can be stored:

- Variables of MQTT connectors
- Variables of Connectivity Suite connectors
- REST API variables

You can find more information on setting the retention policy here:

Defining the retention policy for an asset (Page 52)

Defining the retention policy for an individual variable (Page 67)

Beta version for the Unified Comfort Panel (UCP)

After expiration of the beta phase of Data Service for the UCP, there is no entitlement to data retention in the full version. User-specific configurations cannot be migrated. All user data stored in Data Service is no longer available after reinstallation.

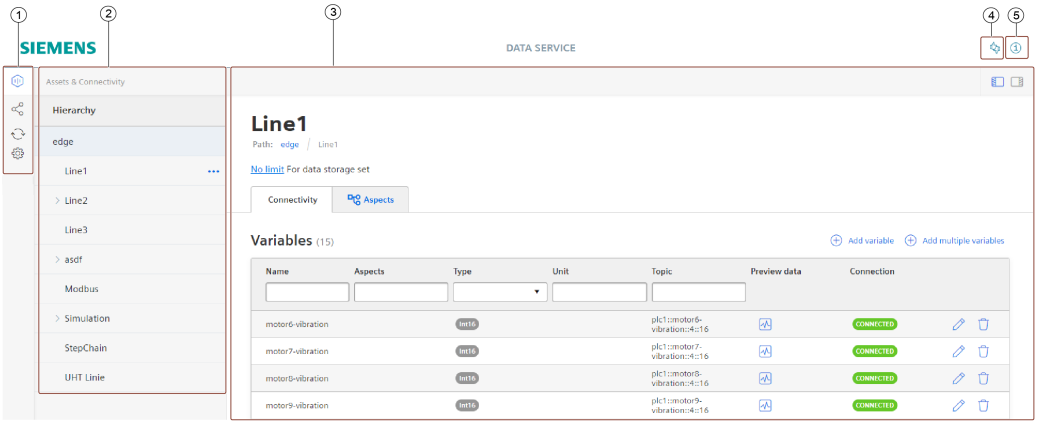
4.2 Structure of the app

Dashboard

The interface of the Data Service app is divided into the following areas:

- (1) Navigation area:
  - Assets & Connectivity
  - Connectors
  - Settings => Backup and restore settings
  - Data destinations => Set up external data memory for data synchronization
- (2) Selection list
- (3) Detail view
- (4) Give feedback
- (5) More information on the Data Service app

You use the Data Service app by selecting an asset in the selection list, for example, and creating, editing and deleting variables in the "Connectivity" tab:



Note

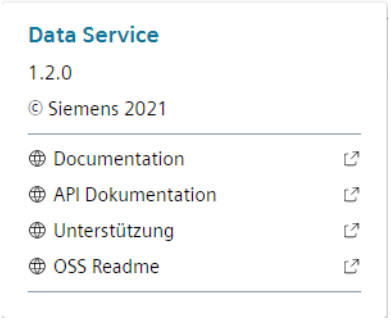
Difference from the view on a panel

On a panel, the topic of the variable is, for example, named as follows:

- plc1::motor4-temperature::4::18 => ElTankLevel

Version of the app

Click on the icon ⓘ in the title bar to view the version, copyright and links to documentation and to Industry Online Support:



4.3 Getting Started

Description

You can find a Getting Started for using the Edge App Data Service here: Getting Started - Data Service (https://github.com/industrial-edge/data-service-getting-started)

You can find a Getting Started for using the Custom Adapter in the Data Service here: Getting Started - Custom Adapter (https://github.com/industrial-edge/how-to-central-data-collection-with-data-service)

4.4 Validity of the documentation

Description

The "Data Service for Industrial Edge" documentation is valid for the installation of the app on an Edge Device as well as on a Unified Comfort Panel (UCP).

The differences are highlighted in the respective sections.

4.5 Overview of additional documentation

Overview

The following table lists additional documents that supplement this description, some of which are available on the Internet.

Documentation	Main contents
Industrial Edge Marketplace (https://www.dex.siemens.com/?selected=edge)	Platform to purchase app licenses
Industrial Edge Hub (https://iehub.eu1.edge.siemens.cloud)	This page describes the functions of the Siemens Industrial Edge platform and the functionalities of the Edge management system. All the documentation for the IE platform can be found under "Documents".
System overview (https://new.siemens.com/global/en/products/automation/topic-areas/industrial-edge/simatic-edge.html)	This page provides an overview of all Edge solutions.
Industrial Edge in 10 minutes (https://cache.industry.siemens.com/dl/dl-media/991/109772991/att_1010695/v1/109772991_V16_Highlights_V2_web/start.htm#!/en/12329)	Web Based Training: Integrate IT in the production with Siemens Industrial Edge
Unified Comfort Panel (https://support.industry.siemens.com/cs/ww/en/view/109795870)	You can find the Unified Comfort Panel manual and a description of the user administration on a UCP here.
Industrial Information Hub (IIH) (https://support.industry.siemens.com/cs/ww/en/view/109803582)	You can find the IIH manual here.

Connecting connectors

5

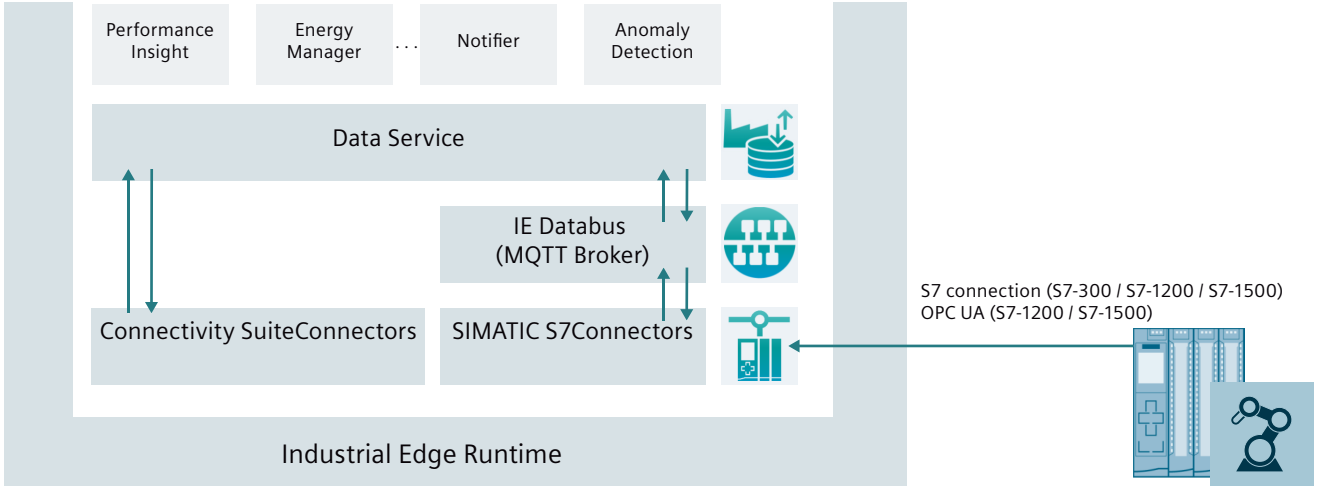
5.1 Introduction to connectors

Description

With the help of connectors, you can, for example, transfer measured value series of selected tags from an automation system to the Industrial Edge Runtime of the respective Industrial Edge Device (IED) and use the data collected in this way in your Industrial Edge apps, such as Performance Insight, for visualization of widgets.

For this purpose, Data Service subscribes the metadata of the SIMATIC S7 Connector, for example, in order to know the possible tags that the connector provides. After reading the metadata, the Data Service offers the available tags when creating a variable. The plant structure created in Data Service is made available with all created variables as a database to other apps.

Depending on which connector you are using, the data is transferred either via the Databus to Data Service or directly via the Connectivity Suite:



Databus settings

Because the connectors often use the same Databus channel, you can define the Databus settings centrally in one place. If a connector deviates from this default setting, you can change the settings individually at the connector.

Connectivity Suite

Connectivity Suite connectors transfer their data directly to Data Service via gRPC.

The following connectors are available by default:

Connector	Documentation in Siemens Industry Online Support
Ethernet IP Connector	Ethernet IP Connector (https://support.industry.siemens.com/cs/ww/en/view/109811396)
HMIRuntime adapter (Unified Comfort Panel)	
Modbus TCP Connector	Modbus TCP Connector (https://support.industry.siemens.com/cs/ww/en/view/109811395)
OPC UA Connector	
PROFINET IO Connector	PROFINET IO Connector (https://support.industry.siemens.com/cs/ww/en/view/109793251)
SIMATIC S7 Connector	SIMATIC S7 Connector (https://support.industry.siemens.com/cs/document/109795606/simatic-s7-connector-configurator-?dti=0&pnid=28189&lc=en-WW)
SIMATIC S7+ Connector	SIMATIC S7+ Connector (https://support.industry.siemens.com/cs/ww/en/view/109808327)
Simulation Connector	
SLMP Connector	SLMP Connector (https://support.industry.siemens.com/cs/ww/en/view/109804360)
System Info Connector	The System Info connector can be used to save metrics (such as CPU load, RAM load, etc.) in the Data Service to monitor it and to have more data available for troubleshooting in the event of an error. You can view the metrics visualization in the system information dashboard: Display system information (Page 89)
UnifiedonEdge	

Variables of the System Info connector

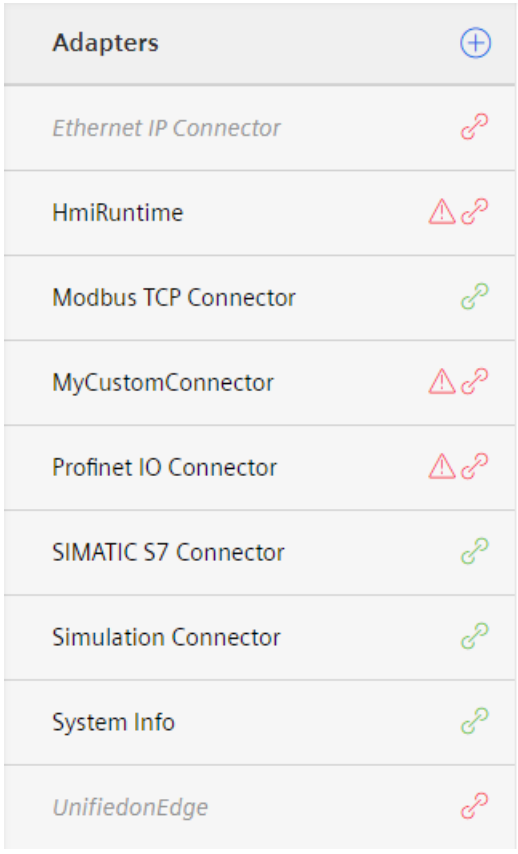
The System Info connector offers the following variables:

Name	Description
CPU statistics	
CPUUsage	The current CPU usage in %. The value range is from 0 to 100.
Heap statistics (RAM usage)	
TotalHeapSize	The RAM (in MB) that is currently reserved by the app.
UsedHeapSize	The RAM (in MB) currently used by the app.
FreeHeapSize	The RAM that is currently available (not reserved by any app).

Name	Description
App status - Database	
DatabaseSize	The currently reserved size (in MB) for the database.

Status and connection of the connectors

You can see from the icons whether a connector is connected or not:



Symbol	Meaning
	The connector is connected to the Databus or the topic. This means metadata has been received via the metadata topic.
	The connector has no connection.
	The connector is connected (status = active), but no metadata is received via the metadata topic.

Adding self-developed connectors

You can use the icon ⊕ to add connectors you have developed yourself.

Note

User name and password

The user name and password must be configured in the MQTT Broker, or in the Databus, and then entered in the connector.

MQTT connector

The Ethernet IP connector, Modbus TCP connector, Profinet IO connector, SIMATIC S7 connector and System Info connectors use the "Message Queue Telemetry Transport" (MQTT) protocol. The connection to the MQTT broker must be configured in the Industrial Edge Databus: Databus (https://support.industry.siemens.com/cs/document/109795600/industrial-edge-databus-configurator?dti=0&lc=en-DE)

More general information about the MQTT protocol can be found here: MQTT.org (mqtt.org)

HMTIRuntime connector (Open Pipe Path)

SIMATIC HMI WinCC Unified Open Pipe is an openness concept based on pipe technology for connecting the Data Service to WinCC Unified RT. Compared to Openness RT (ODK), SIMATIC HMI WinCC Unified Open Pipe provides a limited amount of functionality. As a result, the connection code can be written in any programming language that supports pipe technology. Even batch access to the pipe is possible. The available commands let you communicate with WinCC Unified RT using variables and alarms.

For more information, see the WinCC Unified Open Pipe Manual (https://support.industry.siemens.com/cs/ww/en/view/109778823)

5.2 Defining databus settings centrally

Description

The default databus credentials (broker URL, user name, password) can be defined centrally for all connectors.

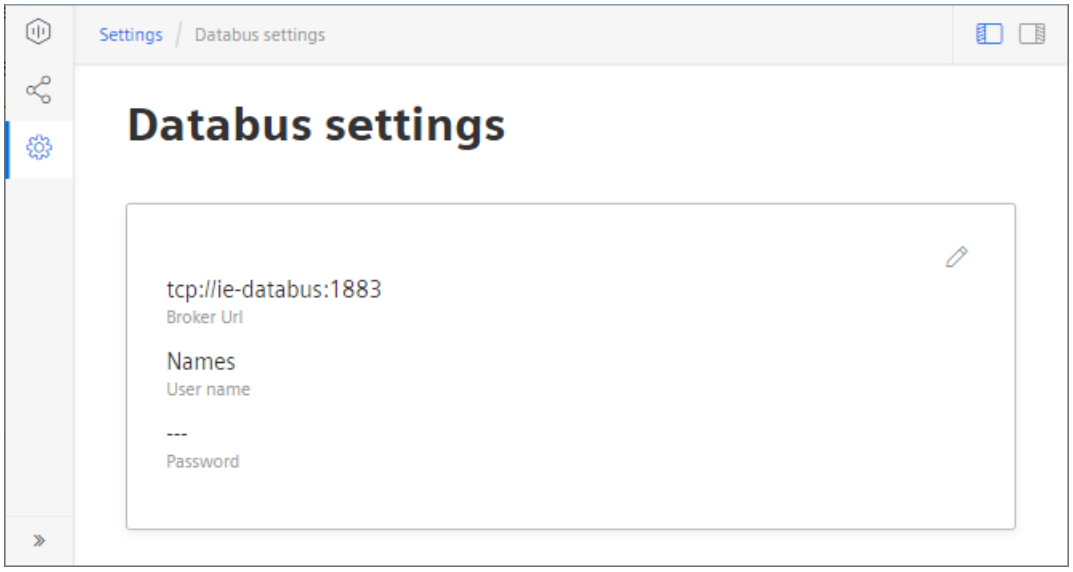
Note

The central settings can be overwritten with connector-specific information in the respective connector configurations.

Procedure

To define the default databus credentials centrally for all connectors, follow these steps:

1. Click on the "Settings" tab.
2. Click on the "Databus settings" tile.
   The following view opens:



3. Click on the icon and edit the databus settings.

Result

The databus settings have been modified centrally and are used for all connectors. You can still change the settings for individual connectors.

5.3 Adding connectors

5.3.1 Adding connectors automatically

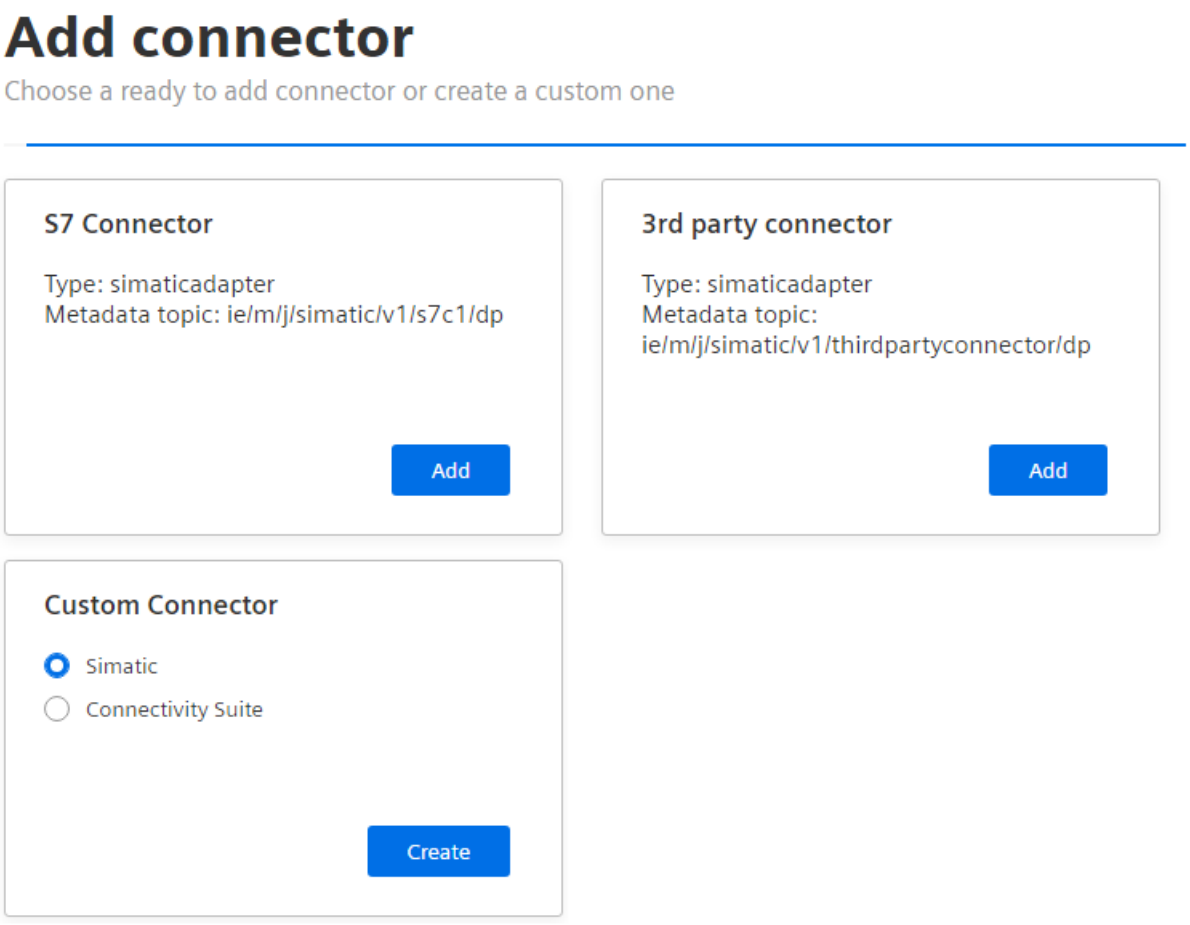
Description

When you create a new connector, all connectors installed on the IED are automatically displayed and can be added with a click. The connector configuration is transferred from the central databus but can be changed as needed.

Procedure

To add a connector, follow these steps:

1. Click on the "Connectors" tab.
2. Click on the icon ⊕.
   The following view opens:



3. Click on the tile of the connector you want to connect.

Result

The connector is automatically added and assumes the default databus settings.

5.3.2 Adding connectors (non-Siemens)

Description

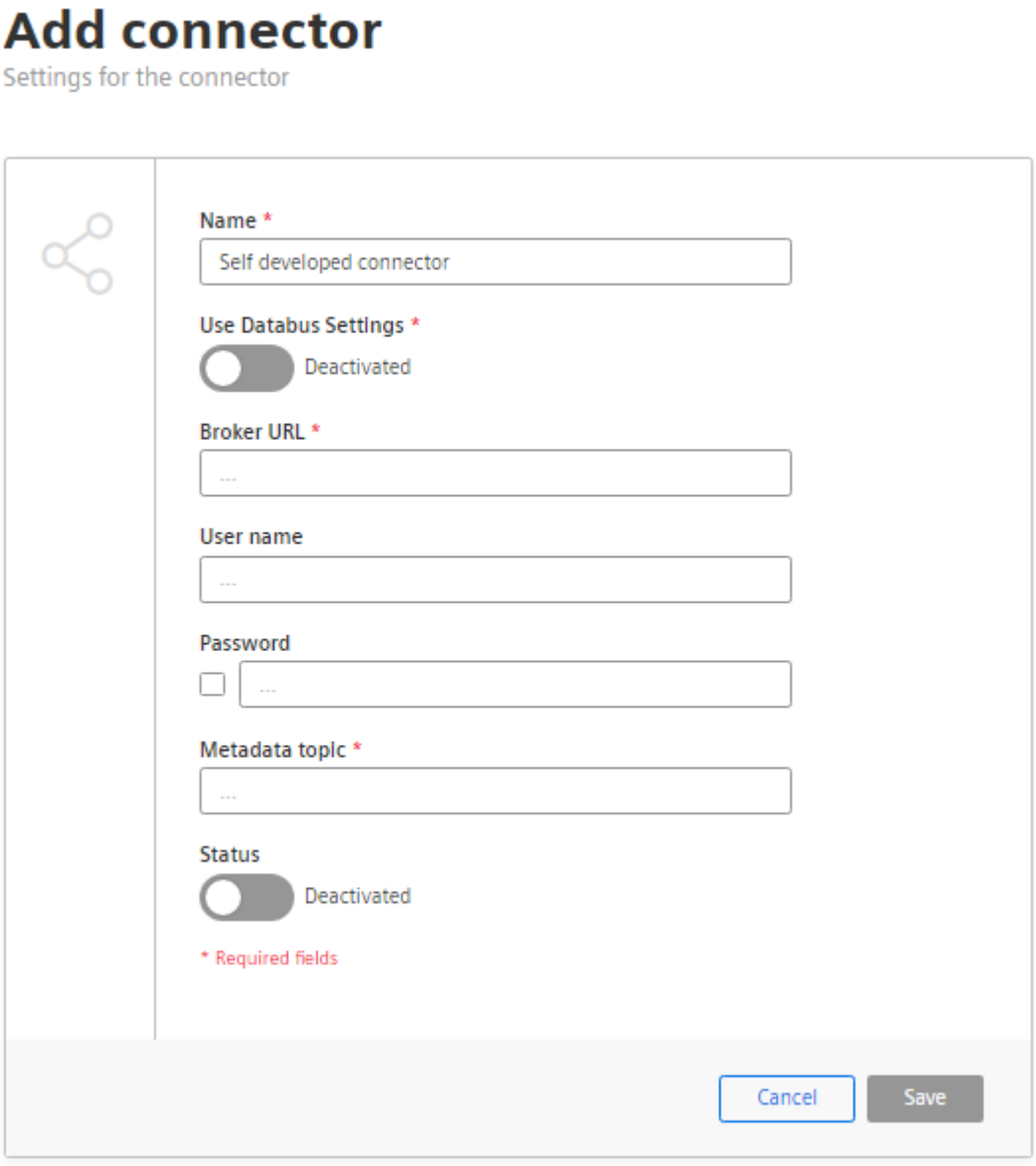
If a connector is not detected automatically, you can manually add and activate it in the "Connectors" tab.

User-developed connectors should be based on the MQTT protocol.

Procedure for adding non-Siemens connectors

To add a connector, follow these steps:

1. Click on the "Connectors" tab.
2. Click on the icon ⊕ and then on "Create".
   The following view opens:



3. Enter the name.
4. Specify whether the centrally defined databus settings are to be applied.
5. Enter the broker URL for the data transfer via the Databus. (MQTT Broker)

6. Enter the user name and password.

Note

User name and password

The user name and password must be configured in the MQTT Broker, or in the Databus, and then entered in the corresponding connector and in Data Service.

7. Enter the metadata topic.
   This is the storage of the metadata; the Data Service needs the information on which tags in which topic are provided by the connector.
   The information must match the topic configured in the connector.
8. Activate the connector and click "Save".

5.3.3 Activating and connecting installed connectors (Siemens connectors)

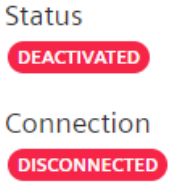
Description

Connectors provided by Siemens are automatically displayed in the list of available connectors as soon as you have installed them.

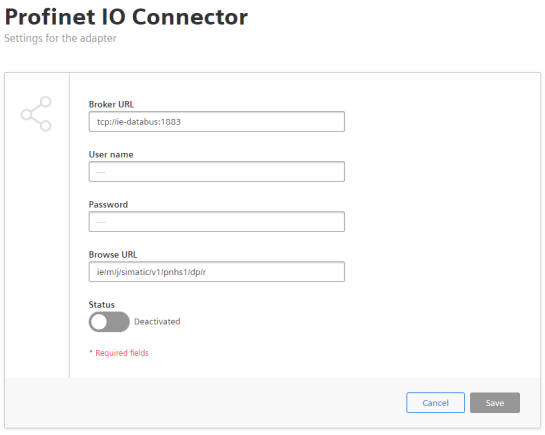
Procedure

To activate a connector and establish the connection, follow these steps:

1. In the navigation bar, click on "Connectors" and select the desired connector.
2. As long as the connector has not yet been activated and connected, the following status is shown:



3. Click on the icon.
   The following view opens:



4. Enter the broker URL for the data transfer via the Databus. (MQTT Broker)
5. Enter the user name and password.

   Note

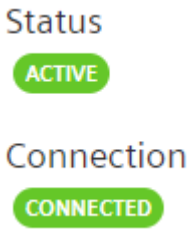
   User name and password

   The user name and password must be configured in the MQTT Broker, or in the Databus, and then entered in the corresponding adapter and in Data Service.

6. Enter the browse URL.
   This is the storage of the metadata; the Data Service needs the information on which tags in which topic are provided by the connector.
   The information in the "Browse URL" field must match the topic that was configured in the connector.
7. For the "Status", move the slider to the right to activate the connector.
8. Click "Save".

Result

The connector is now activated, and the status of the connector is displayed in green:



Once the Data Service has successfully received the connector metadata, the connection turns green, and you can select the appropriate tags when creating variables to save the data.

5.4 Deleting connectors

Description

Self-added non-Siemens connectors can be deleted again. Connectors from Siemens that are installed on the IED cannot be deleted here. They have to be uninstalled.

Procedure

To delete a connector, follow these steps:

1. In the "Connectors" tab, click the desired connector.
2. Click the icon in the upper right-hand corner.
3. Click "Delete".

5.5 Assigning the HMIRuntime connector (Unified Comfort Panel)

Description

SIMATIC HMI WinCC Unified Open Pipe is an openness concept based on pipe technology for connecting the Data Service to WinCC Unified RT. Compared to Openness RT (ODK), SIMATIC HMI WinCC Unified Open Pipe provides a limited amount of functionality. As a result, the connection code can be written in any programming language that supports pipe technology. Even batch access to the pipe is possible. The available commands let you communicate with WinCC Unified RT using variables and alarms.

For more information, see the WinCC Open Pipe documentation (https://support.industry.siemens.com/cs/ww/en/view/109778823).

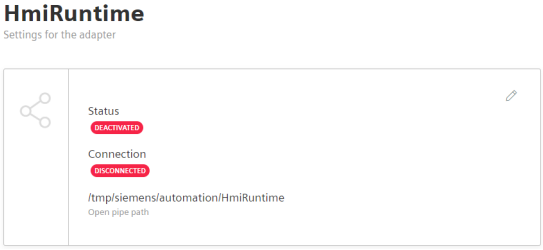
The Data Service connects to the pipe by name:

- Under Windows: "\\.\pipe\HmiRuntime"
- Under Linux: "/tmp/HmiRuntime"

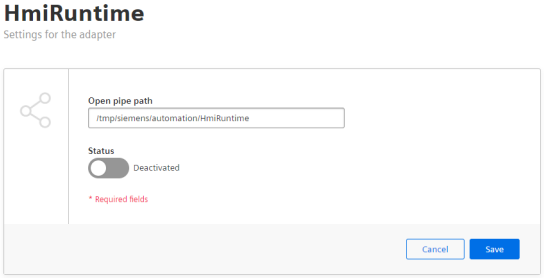
Procedure

To assign an HMIRuntime connector, follow these steps:

1. In the "Connectors" tab, click the HMIRuntime connector:



2. Click on the icon:



3. Enter the corresponding open pipe path.
4. Move the slider to the right to activate the HMIRuntime connector.
5. Click "Save".

Result

As soon as the pipe is open, you can send single-line commands that must end with a line break ("\n" or "\r\n"). The response is returned using the same pipe instance.

Creating a system structure (assets)

6

6.1 Creating assets

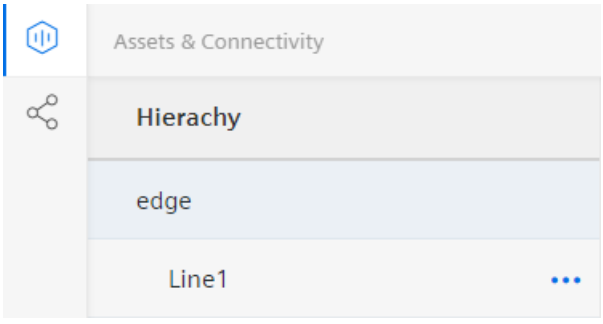
Description

You can use the assets and child assets to recreate your system structure and add the corresponding variables.

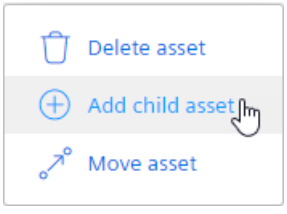
Procedure

To create an asset, follow these steps:

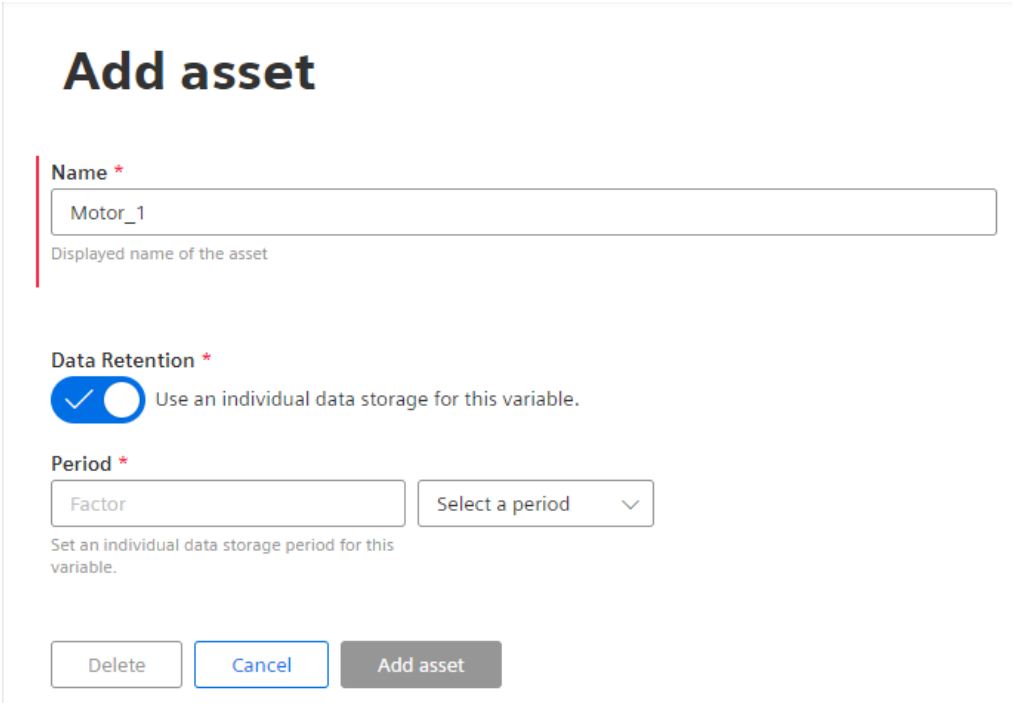
1. Click on the three dots (ellipsis) in the corresponding row:



2. Select "Add child asset" in the selection window that opens:



3. A dialog box is displayed:



4. Fill in the "Name" field of the new asset.
5. Enable the retention policy if you want to define a custom retention period for a child asset.
6. Click "Add asset".

Result

The new asset appears at the correct position in the hierarchy:

Note

Difference from the view on a panel

On a panel, the topic of the variable is, for example, named as follows:

- Variable2 => EITankLevel
- Variable6 => EITemperature

6.2 Moving assets

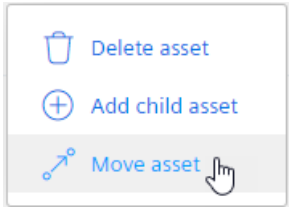
Description

In the "Hierarchy" tab, you can move assets and their child assets in the hierarchy.

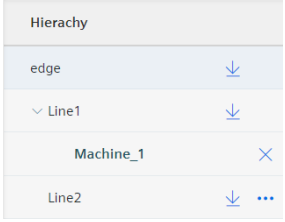
Procedure

To move an asset, follow these steps:

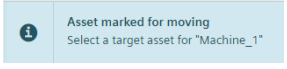
1. Select the asset you want to move. In the example below, "Machine_1".
2. Click on the three dots (ellipsis) in the corresponding row of the selection list.
3. Select "Move asset" in the selection window that opens:



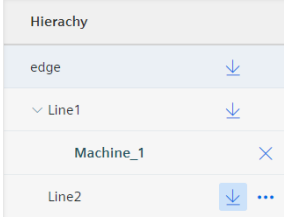
4. All assets to which you can move the selected asset are marked with this blue arrow ↓:



5. A blue information box appears at the bottom left, indicating that the asset can be moved.

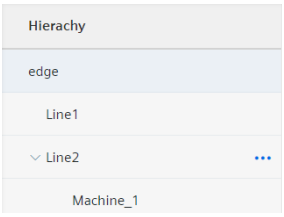


6. Select the target asset and click the blue arrow:



Result

The moved asset is displayed in the desired position:



6.3 Defining the retention policy for an asset

Description

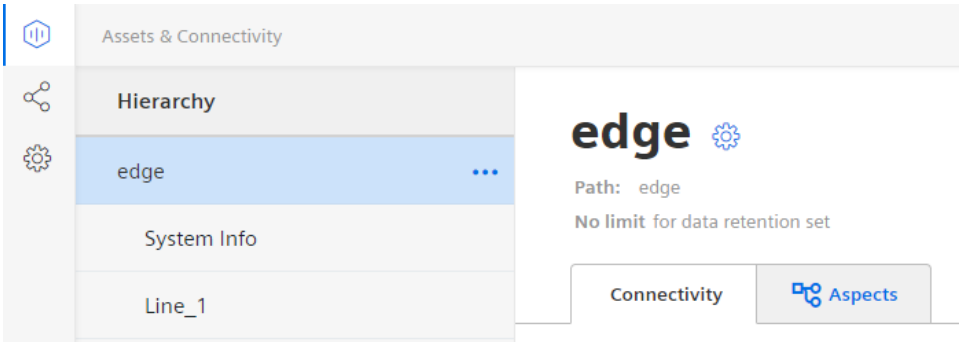
You can define the data retention period for each asset and all the variables it contains. Data is then only stored for the defined length of time. For example, if you define a period of 10 days, data of the last 10 days is stored in each case and older data is deleted.

Data retention is inherited by all child assets including their associated variables, unless you have defined a separate retention policy at the child asset.

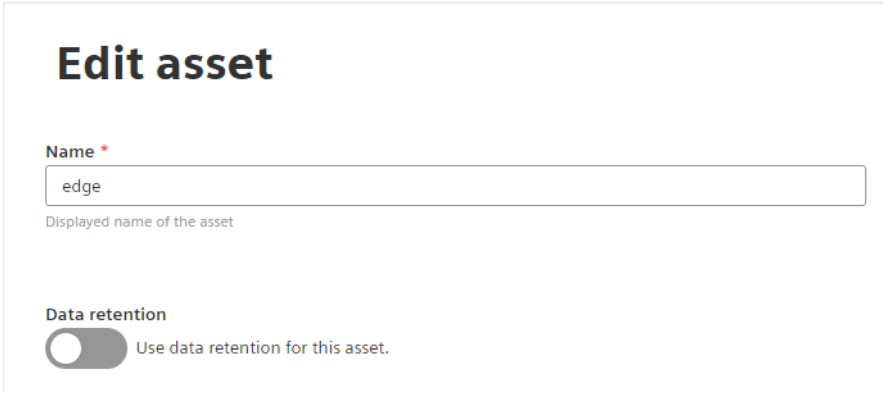
Procedure

To set the time period for the retention policy of an asset, follow these steps:

1. Select the relevant asset:



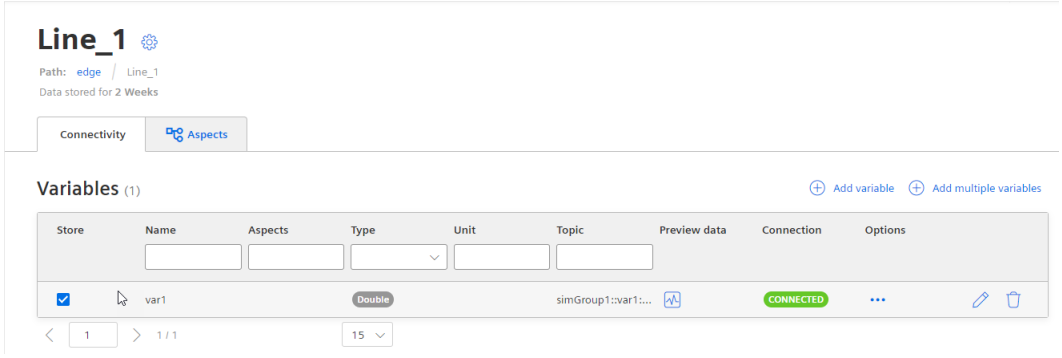
2. Click on the icon next to the asset name.
   The "Edit asset" dialog window is displayed:



3. Activate the "Data retention" option.
4. Select a time period after which the data is to be deleted.
5. Click "Edit asset".

Result

The time period from the retention policy, e.g. 2 weeks, is displayed accordingly at the asset:



Working with variables

7

7.1 Introduction to variables

In Data Service, you create variables that subscribe their data from the tags of connectors or via topics of the Databus. You create the variables at the respective assets and you can also logically group them using aspects.

The variables created in Data Service are then available in other apps, such as Performance Insight.

7.2 Creating a variable

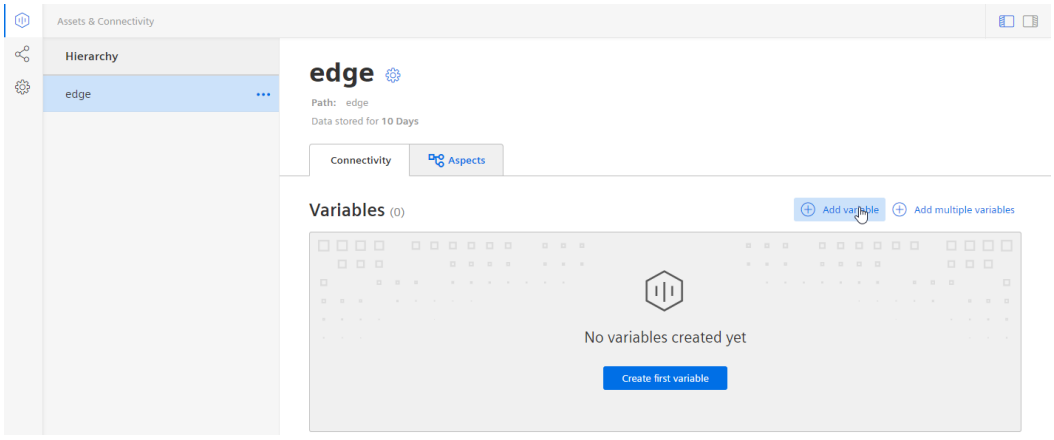
Description

Create a variable based on a tag (data point) from a connector.

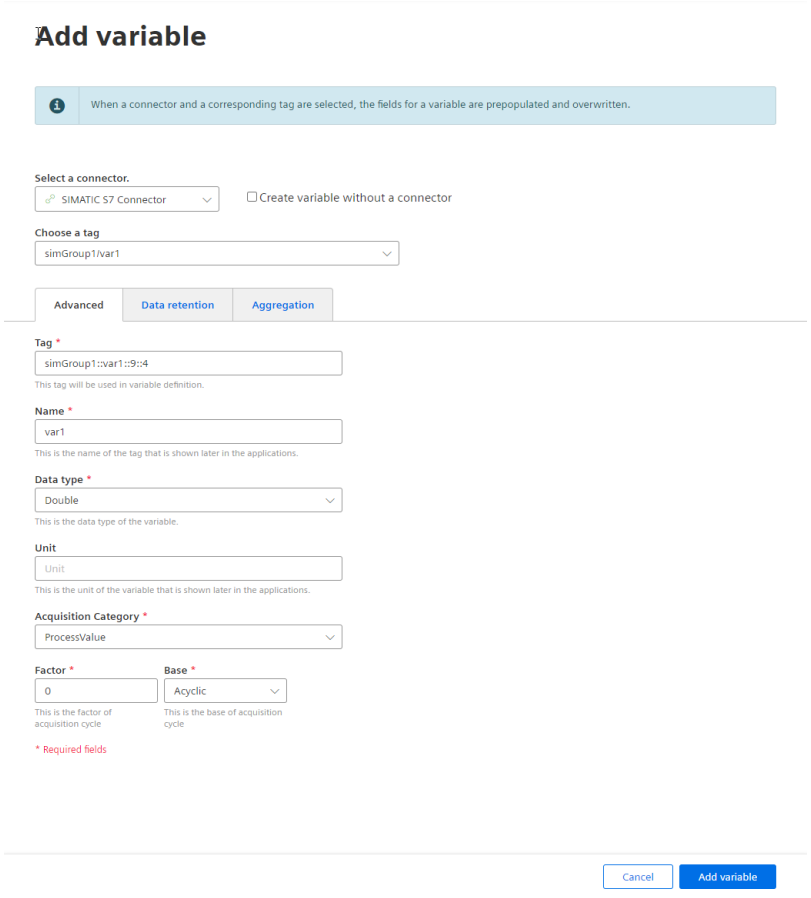
Procedure

To create a variable, follow these steps:

1. Click on the relevant asset at which you want to create a variable:



2. Click "Add variable".
   The dialog window is displayed:



3. Select a connector.
   If no connector is displayed for selection, then you must install and connect the desired connector.
   You can find more information on the connection of a connector here: Activating and connecting installed connectors (Siemens connectors) (Page 45)

   Note

   Creating a variable without a connector

   You can also create a variable without selecting a connector by selecting the "Create variable without a connector" check box.

   Note

   Unified Comfort Panel

   If you have installed Data Service on a UCP, then select the "HMIRuntime" connector.

4. Select a tag.

"Advanced" tab

You define all information for the variable in this tab. The selected tag already has some prefilled data, which was transferred via the metadata from the MQTT Broker. You can still modify the prefilled data as needed.

1. Tag: Contains the topic from which the tag subscribes its data from the MQTT Broker.
2. Name of tag
3. Data type of variable
   You can find more information on supported data types and on implicit conversion here: Supported data types (Page 66)
4. Unit of variable
   You can either accept the transferred unit or specify your own unit.
5. Acquisition category
   You use the acquisition category to define how the value is acquired and its storage frequency.
   The following acquisition categories can be selected:
   - ProcessValue (process value)
   - Power (power value)
   - Energy (consumption value)
   - Flow (flow value)
   - Amount (quantity value)
   - Counter (count value)
     If you select the acquisition category "Counter", you can define additional settings for each counter used.
     You can find more information here: Define the acquisition category "Counter" (Page 94)
   - State (status value)

"Retention policy" tab (Optional)

You define the retention policy for each variable in this tab. As soon as you enable the switch, the inherited retention policy of the asset is no longer used and the individually set time period is used instead.

"Aggregation" tab (optional)

You select one or more aggregations together with their desired calculation cycles for the variable in this tab.

Note

Improving performance

Precalculated aggregations are taken into account when querying the data. This decisively shortens the duration of the query. For example, the aggregations API queries the last month with aggregation "Sum".

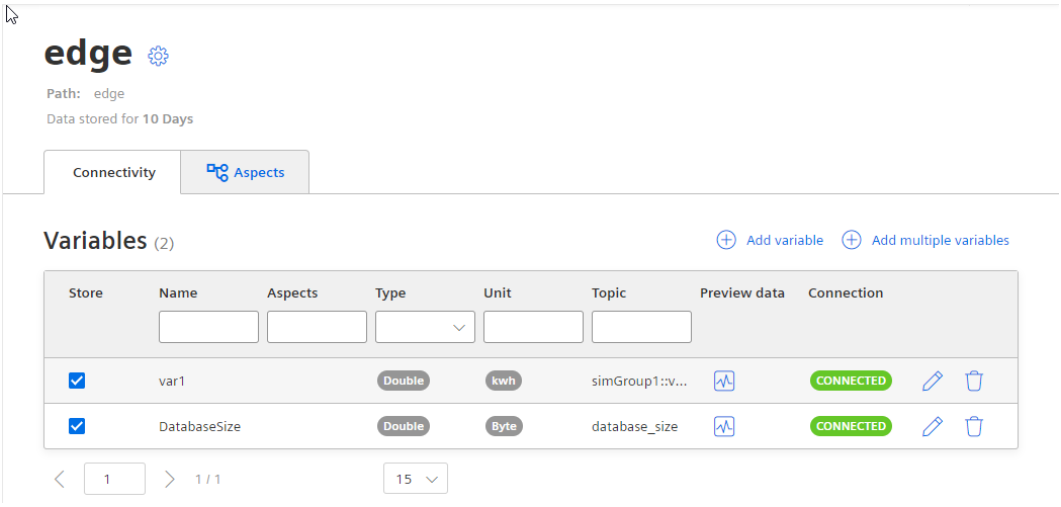
For this, the aggregation is calculated from the raw data as needed (at 1ms cycle = 2 628 000 000 data points). However, if precalculated aggregations have been configured at the variable, the aggregation can be calculated from them (e.g. 1 h aggregation configured = 730 data points).

---

1. Select an aggregation.
   You can find more information on aggregation options here: Description of aggregation functions (Page 92)
2. Click on the icon ⊕ to create the aggregation.
3. Select the desired calculation cycle and click on the icon ⊕ to create it.
4. Enable the "Variable" option if you want to store the calculated values in a sub-variable. With this setting, the name suffix, for example, in Performance Insight, indicates that the values of this variable are precalculated.
   Example: EnergyConsumption_Sum_1_Day
   The raw data values of this variable are summed once daily.
5. Click "Add variable".

Result

The new variables are displayed in the detail view:



In the "Store" column, you can disable data retention for each variable without having to delete the configuration of this variable.

Enabled (default setting): The data of the variable is stored.

Disabled: Starting from the time data retention is disabled, new values are no longer stored. As soon as you enable the option again, new data is stored again.

Note

Difference from the view on a panel

On a panel, the topic of the variable is, for example, named as follows:

- plc1::motor2-vibration::4::16 => EITankLevel

7.2.1 Creating multiple variables at the same time

Description

You can also create multiple variables at the same time.

Note

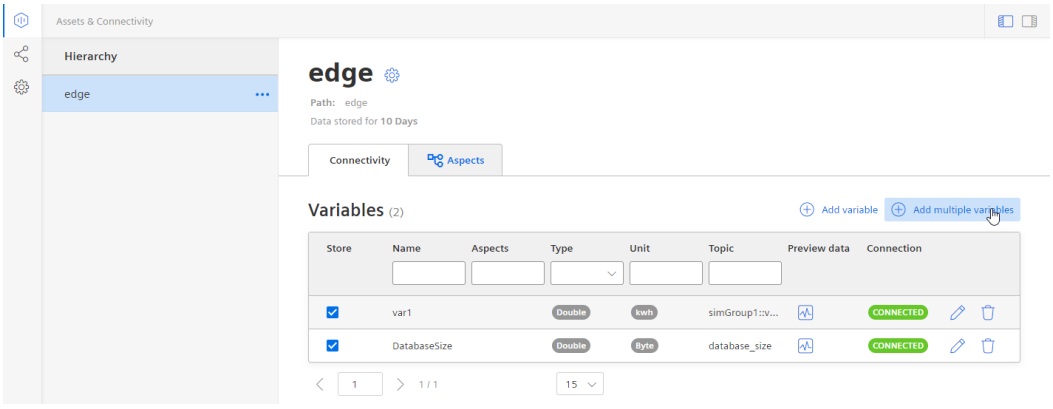
Availability of option

The "Add multiple variables" option is only available when at least one connector has been activated.

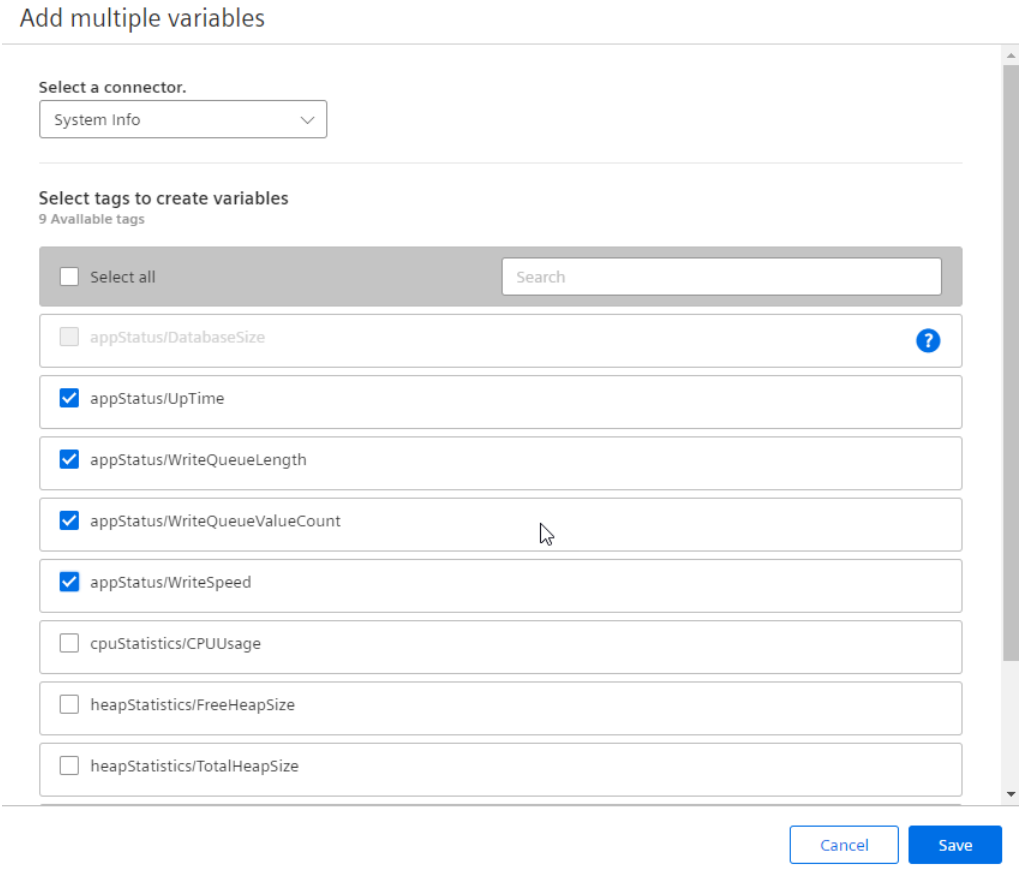
Procedure

To create multiple variables at the same time, follow these steps:

1. Click on the relevant asset at which you want to create the variables:



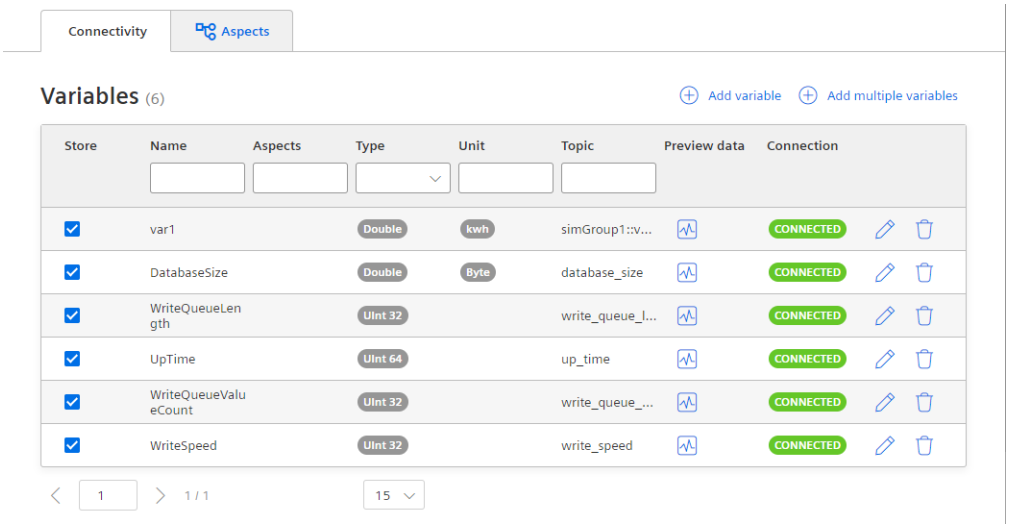
2. Click "Add multiple variables".
   The dialog window is displayed:



3. Select a connector.
   If no connector is displayed for selection, then you must install and connect the desired connector.
   You can find more information on the connection of a connector here: Activating and connecting installed connectors (Siemens connectors) (Page 45)
   All tags provided by the connector are displayed.
4. Either select the desired tags individually or click "Select all".
5. Click "Save".
   A dialog window with all created variables is displayed.
6. Click "Accept".

Result

The newly created variables are displayed in the detail view:



In the "Active" column, you can disable data retention for individual variables without losing the configuration of the variable.

7.2.2 Creating a log variable

Description

The log variable is a special type of variable that is available only when debugging mode is active. This variable collects data and provides it to the debugging view; a set log variable is a prerequisite for logs in the debugging view (Page 90).

Procedure

1. Open the debugging view with "https://<IED_IP>/dataservice/#/debug".
2. Enable debugging mode.
3. Create a new variable with the following settings at an asset of your choice:
   – Connector: "System Info"
   – Tag: "appStatus/Logs"

Result

As soon as the log variable is connected, data is collected for the debugging view.

7.3 Exporting/importing variable data

Description

You can export the data of a variable for a selected time period, including existing aggregations, to a *.txt file and import it into any other variable.

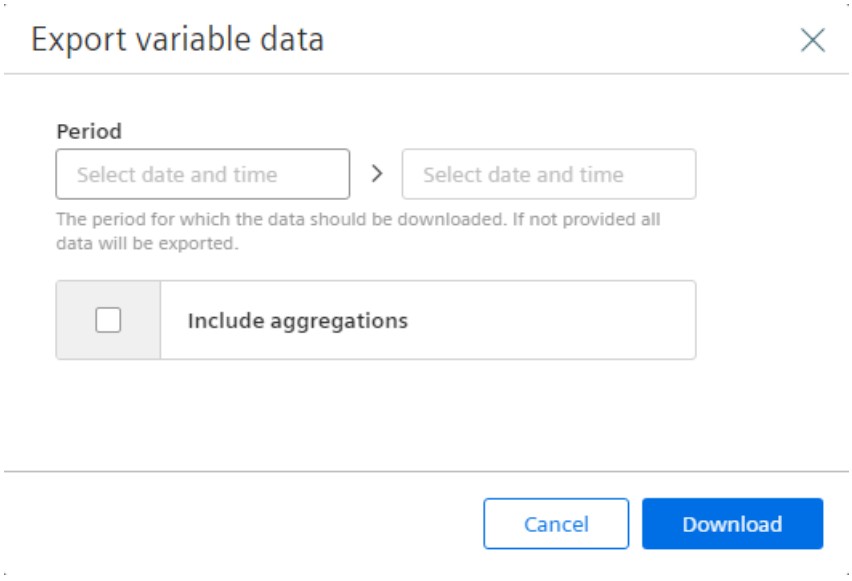
Possible uses:

- Initializing a variable with data
- Backing up/exporting data in a generic format
- Transferring data to another Data Service instance

Procedure for exporting variable data

To export variable data, follow these steps:

1. In the navigation bar, click on "Assets & Connectivity" and select the desired variable.
2. Click on ••• and then click "Export".
   The following dialog window is displayed:

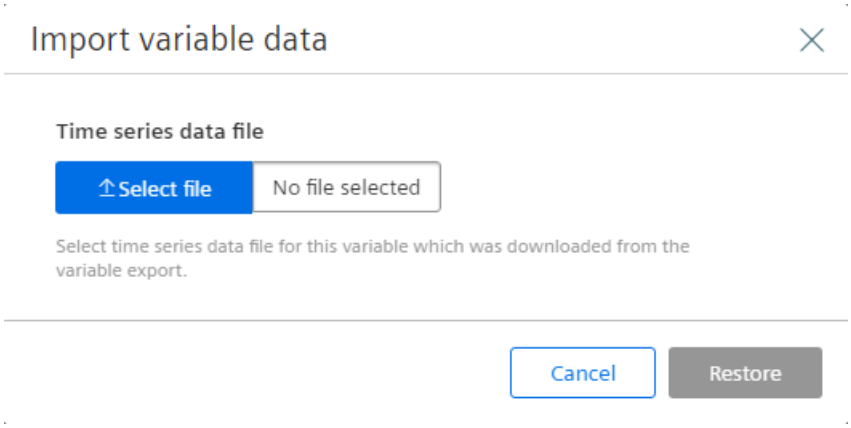


3. Select the period for which you want to export the data of the variable and whether aggregations are to be exported.
4. Click "Export".
   A *.txt file named "dataservice-exported-data.txt" is created and stored in the Download directory of your PC.

Procedure for importing variable data

To import variable data, follow these steps:

1. In the navigation bar, click on "Assets & Connectivity" and select the desired variable.
2. Click on ••• and then click "Import".
   The following dialog window is displayed:



3. Click "Select file" and select the file to be imported.
4. Click "Restore".

Result

The data of the export file is imported into the selected variable.

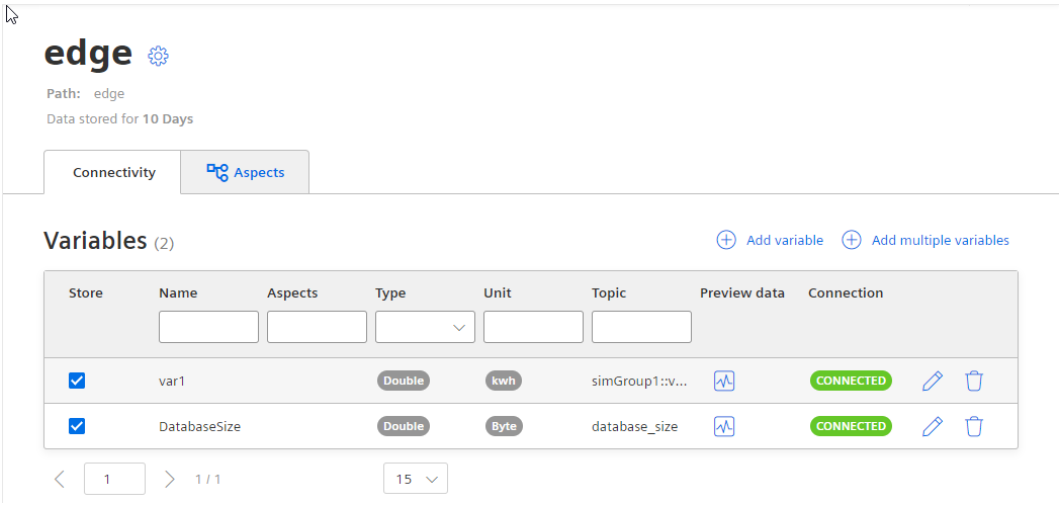
7.4 Displaying the variable preview

Description

Using the variable preview, you can immediately check whether data is being transferred from the Databus.

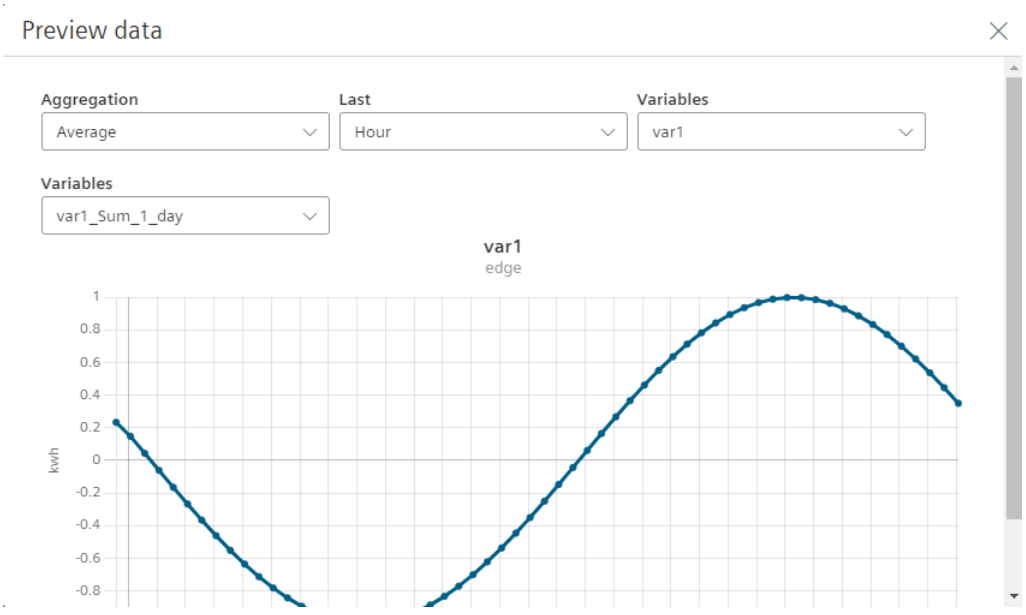
Procedure

To display the preview, click on the icon :



Result

The preview of the variable is displayed:



You can set the period of the preview and whether you want to see the values aggregated.

If you have created one or more aggregations when creating the variable and have enabled the "Variable" function, you can select this variable here individually, e.g. var1_Sum_1_day

7.5 Connection status of the variables

Description

The connection status shows you at a glance whether metadata is being transferred from the Databus (MQTT Broker) for the variable:

Connection status	Explanation
CONNECTED	Metadata is being transferred from the Databus (MQTT Broker).
DISCONNECTED	No metadata is being transferred.

7.6 Supported data types

Description

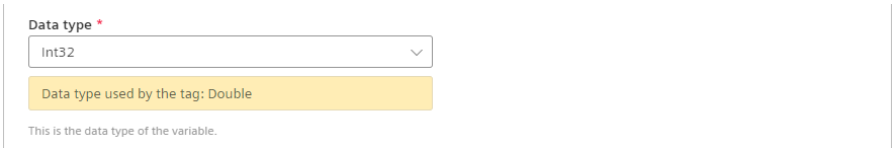
The Data Service offers a set of supported data types. These are identified by keys, e.g. "Int32" "String", etc.

The types of data that are transmitted via the MQTT broker, e.g. from an S7 CPU, are assigned in the Data Service as follows:

Data type assignment		
MQTT data type		**Data Service data type**
Blob	=>	Blob
Bool	=>	Bool
Byte	=>	UInt8
Char	=>	String
DInt	=>	Int32
DWord	=>	UInt32
Int	=>	Int16
LInt	=>	Int64
LReal	=>	Double
LWord	=>	UInt64
Real	=>	Float
SInt	=>	Int8
String	=>	String
TimeSpan	=>	Time
UDInt	=>	UInt32
UInt	=>	UInt16
ULInt	=>	UInt64
USInt	=>	UInt8
Word	=>	UInt16

However, if a connector calls the same data types differently, such as Number instead of Int32 or Text instead of String, these data types are initially unknown to the Data Service. The data types are actually retainable in Data Service, but this is not recognized because the data type is unknown.

For this case, you can select a data type known in the Data Service when adding the variable itself:



The hint tells you the data type of the tag. Select the matching data type in the Data Service.

If the type is incompatible with the data received, an error is displayed.

Note

Changing the data type in the Data Service

By default, the data type for a variable is transmitted or assigned via the metadata. You can change the default data type. Make sure that an implicit conversion is possible. Smaller data type can be converted to larger data type.

Implicit conversion:

It is only possible to implicitly convert the data type from the topic to the Data Service if no data loss occurs.

The following data types are available for selection: Bool, Integer (Signed und Unsigned; integers), Float (REAL; floating-point numbers), Double (LREAL; floating-point numbers), String (string), TimeSpan (time period)

Blob data type

Blob data type is a data type for unstructured data that is stored in binary form. It can be used to store data that is not covered by the other supported data types. In contrast to other data types, the Blob data type has the additional optional property "Blob type". This property can be used to define the format of the stored data. We recommend the use of a standardized approach such as MIME types.

You can find more information on MIME types here: MIME types (https://wiki.selfhtml.org/wiki/MIME-Type/%C3%9Cbersicht)

7.7 Defining the retention policy for an individual variable

Description

If you do not want to apply the time period of the retention policy that you have defined at the asset for individual variables, you can define a separate time period for each individual variable.

Procedure

To define the retention policy for an individual variable, follow these steps:

1. In the detail view, click on the icon in the row of the corresponding variable.
   The "Edit variable" dialog box opens.
2. Under "Retention policy", enable the function "Use an individual retention policy for this variable".
3. Set the desired time period.
4. Click "Edit variable".

Creating aspects and grouping variables

8

8.1 Introduction to aspects

Aspects are a mechanism for data modeling of assets and their variables. Using aspects, you group variables and their associated tags (connectors) or topics (Databus) based on their logical assignment. Example: A machine has an "Energy consumption" aspect that contains the tags "Power", "Current", "Voltage", etc. The aspect is defined in Data Service and its name can be freely selected. An aspect can consist of several variables. Each variable can be assigned to only one aspect within an asset or subasset.

For step time analysis in the Performance Insight app, you can also create aspects based on a predefined aspect type. You can find more information on aspect types here: Adding aspect types for the step time analysis (PI) (Page 71)

8.2 Creating an aspect

Description

Create an aspect and assign variables to it.

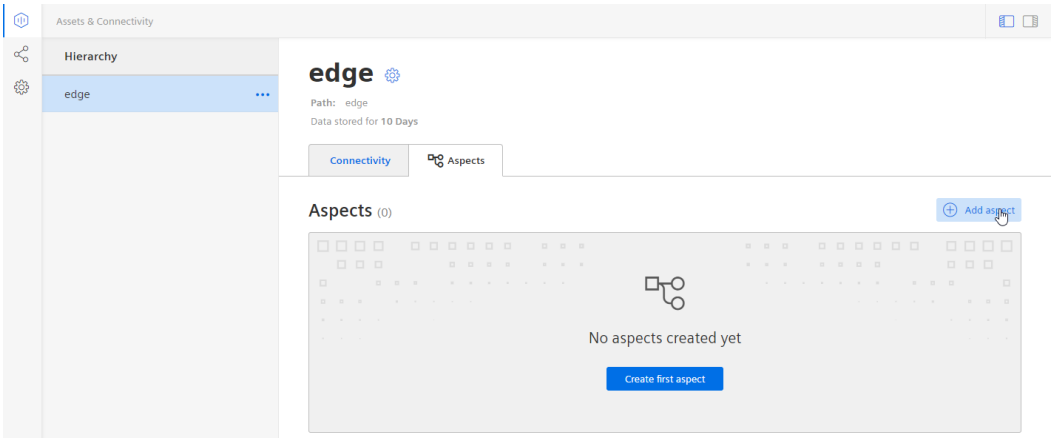
Requirement

At least one variable has been created for the asset.

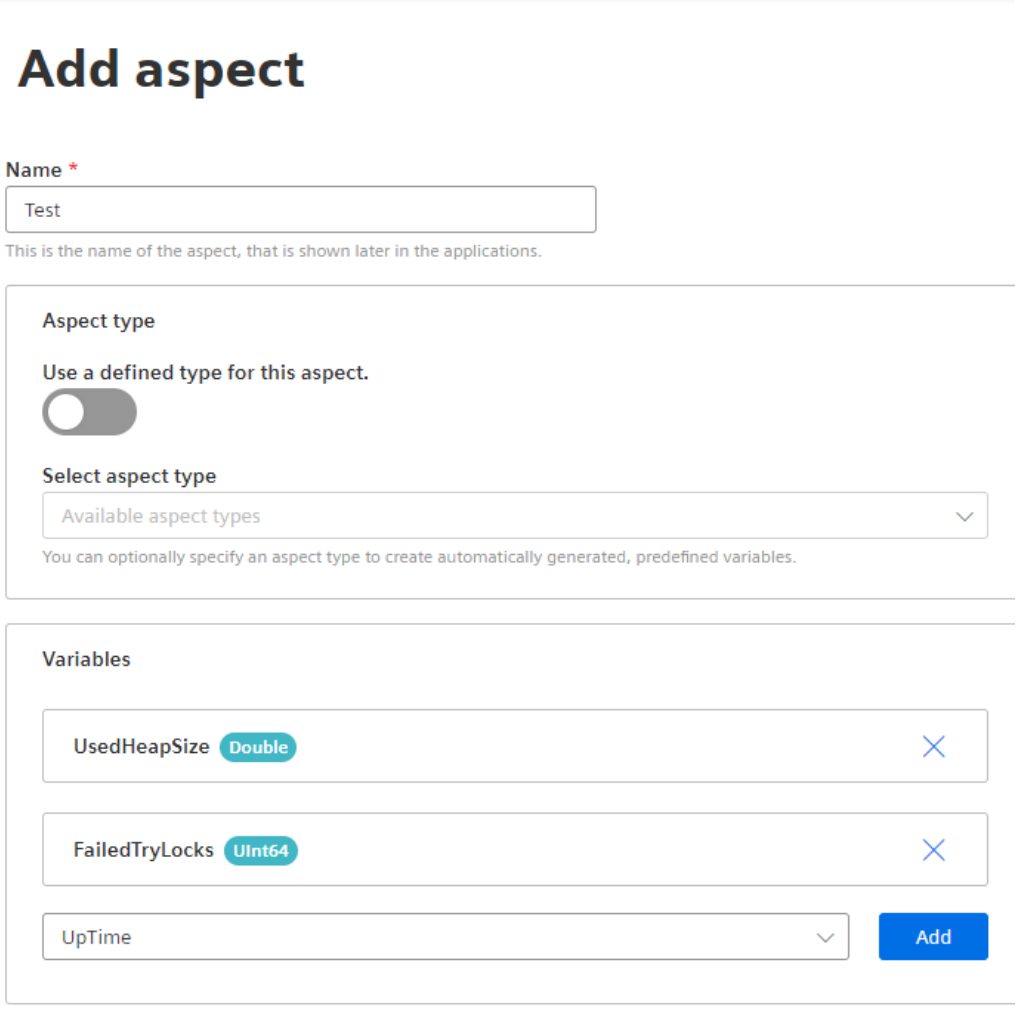
Procedure

To create an aspect, follow these steps:

1. Click on the relevant asset at which you want to create an aspect.
2. Click on the "Aspects" tab in the detail view:



3. Click "Add aspect" or "Create first aspect".
   The dialog window is displayed:



4. Enter a name.
5. Optional: Enable "Use a defined type for this aspect" for use of aspect types.

Note

Selecting aspect types

You only need aspect types if you want to use step time analysis in the Performance Insight app.

To do this, select one of the predefined aspect types from the drop-down list.

6. Add the desired variable by selecting it from the drop-down list and clicking "Add". Each variable can be assigned to only one aspect.

Note

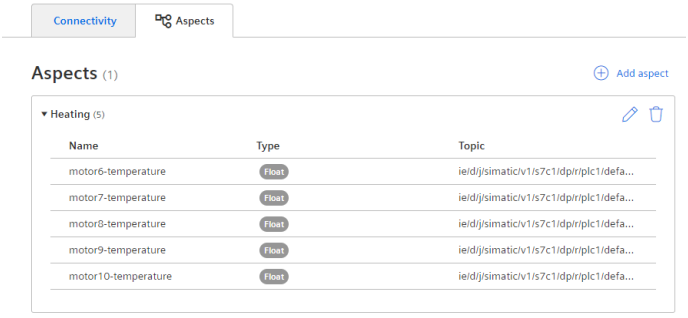
No available variables

If you cannot select any variables, you have not created variables for this asset yet.

7. Click "Add Aspect".

Result

The new aspect "Heating" is displayed in the detail view with all selected variables:



See also

Adding aspect types for the step time analysis (PI) (Page 71)

8.3 Adding aspect types for the step time analysis (PI)

Description

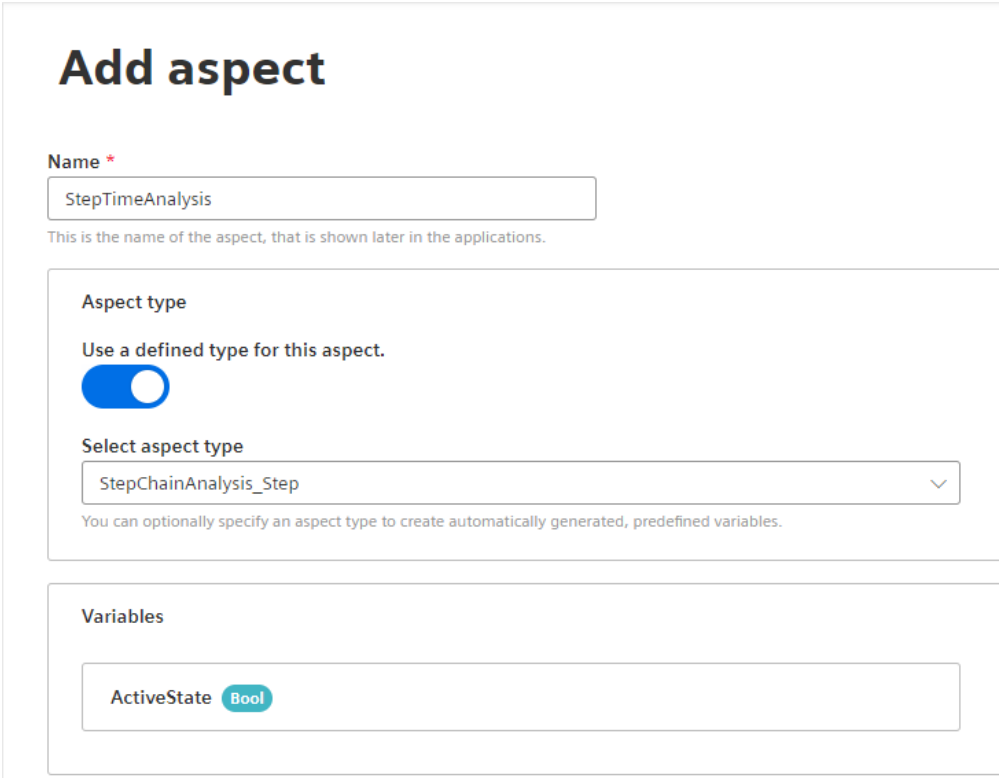
If you want to use step time analysis in the Performance Insight app, you need aspects with predefined aspect types and with permanently assigned variables.

Procedure

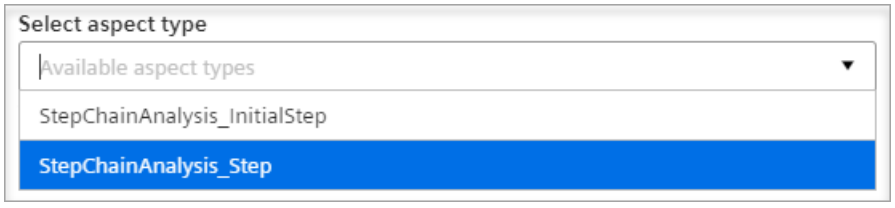
To create an aspect type, follow these steps:

1. Click on the corresponding asset.
2. Click on the "Aspects" tab in the detail view.
3. Click "Add aspect".

4. The dialog window is displayed:

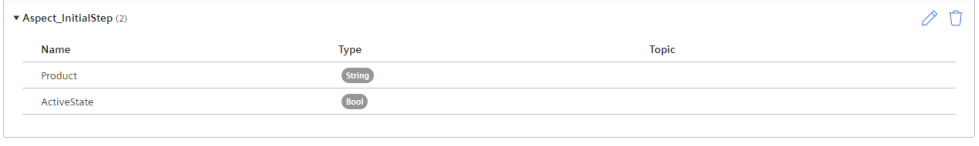


5. Enter a name.
6. Enable the "Use a defined type for this aspect" option.
7. Select one of the two predefined aspect types:



Result

An aspect with the aspect type "StepChainAnalysis_InitialStep" contains two predefined variables:



An aspect with the aspect type "StepChainAnalysis_Step" contains one predefined variable:

Note

Product creation in Performance Insight

When using the aspect type "StepChainAnalysis_InitialStep", a product is created in the automatic dashboard of the step time analysis in Performance Insight. The product name is transmitted via the variable "Product" and can be specified in even more detail in the app using the display name.

8.4 Editing an aspect and changing the assignment of a variable

Description

You can change the assignment of the variables to an aspect.

Note

Aspect types

The assignment of aspect types can no longer be changed.

Note

Difference from the view on a panel

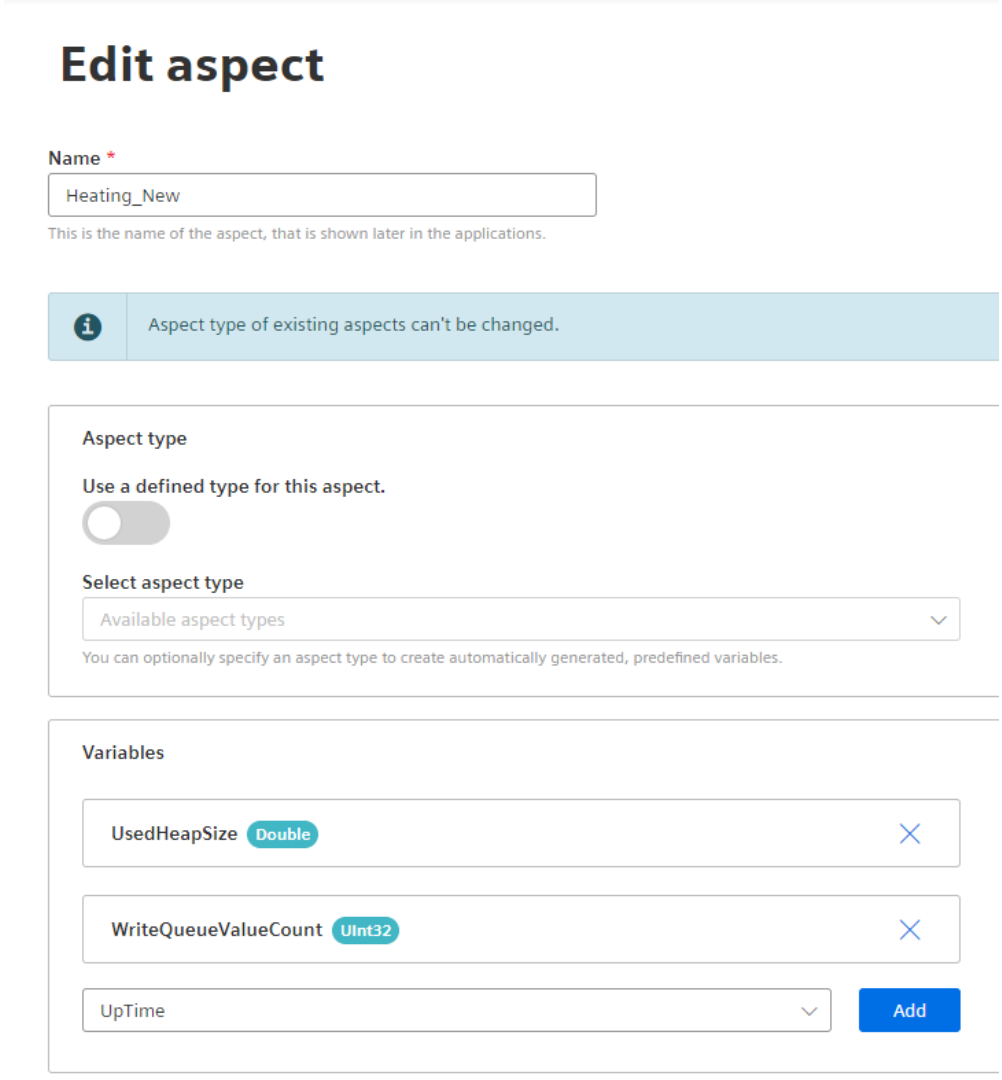
On a panel, the topic of the variable is, for example, named as follows:

- motor6-temperature => EITemperature

Procedure

To assign a variable to another aspect, follow these steps:

1. In the "Aspects" tab, click the icon next to the desired new aspect.
   The "Edit aspect" dialog box is displayed:



2. Select the variable you want to reassign to this aspect and click "Add".
3. Then click the "Edit aspect" button.

Result

The variable was moved from the "Heating" aspect to the "Heating_New" aspect.

Backing up and restoring data

9

9.1 Data backup

Description

You can save the configuration and time series data in the Data Service (connector connections, asset structure, variables, aspects, etc.) and restore it to another IED, for example, or save a backup of your configuration.

Note

Restoring a data backup

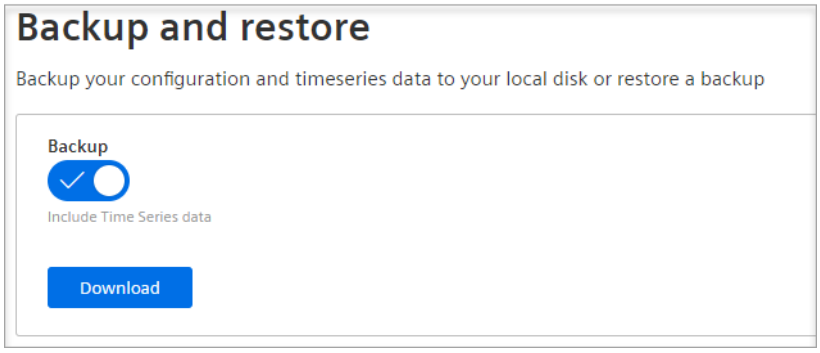
When you restore a backup of your data, only the data that was included at the time of the last data backup is restored. More recent changes made in Data Service after the time of the last backup are lost when the backup is restored.

For this reason, we recommend making regular data backups.

Procedure

Proceed as follows to back up the data:

1. In the navigation bar, click on "Settings > Backup and restore".
2. If you only want to back up the configuration files, click directly on "Download".
3. If you also want to save the time series data, enable the function "Include time series data":



4. Click "Download".

5. The data is downloaded locally (in the Downloads folder):
   – For the configuration data: dataservice-backup-config.json
   – For the time series data: dataservice-backup-data.txt

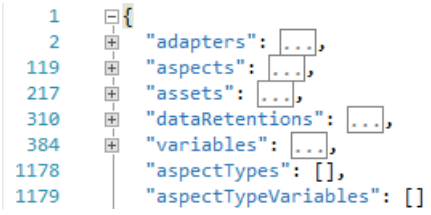
Note
Creation of the time series data file

It may take a bit longer to create the file.

6. To track the creation process of the files, you can enable the developer tools in the browser (F12 or Ctrl + Shift + I) and open the "Network" tab.

Result

The following data, for example, are backed up in the configuration file:



9.2 Restoring data

Description

You can restore a backup of your configuration or the time series data, or you can fill several other IEDs with the configuration of your Data Service, for example, and therefore do not have to set up any new configurations.

Note
Restoring a data backup

When you restore a backup of your data, only the data that was included at the time of the last data backup is restored. More recent changes made in Data Service after the time of the last backup are lost when the backup is restored.

For this reason, we recommend making regular backups of the data.

Requirement

Existing files:

- For the configuration data: dataservice-backup-config.json
- For the time series data: dataservice-backup-data.txt

Procedure

To upload or restore the configuration data, follow these steps:

1. In the navigation bar, click on "Settings > Backup and restore".
2. Under "Restore backup of the configuration", click on "Select file".
   The selection window in the Explorer opens.
3. Select the file (.json) required for the configuration.
4. Click "Open".
   The file name is displayed.
5. Click "Upload configuration" to upload a configuration file.

   Note

   Data is overwritten

   When you confirm the dialog window, the old data is overwritten.

6. Click "Confirm".

Result

The configuration is restored.

Data synchronization 10

In order to set up synchronization with an external storage location and back up your data automatically, define a storage location as the data destination and then define the synchronization for the respective asset, variable, aspect or aggregation. You can set up and define several data destinations so that your data are backed up redundantly.

10.1 Setting up Insights Hub as a synchronization destination

Special features and restrictions

Note

MindSphere has been renamed Insights Hub.

The following special features and restrictions apply when Insights Hub is used as the data destination for data synchronization.

Data prioritization

Live data is synchronized directly with Insights Hub.

If synchronization has not been completed, for example due to a connection error, historical data is synchronized with Insights Hub at the next connection. In this case, historical and live data is synchronized with Insights Hub in parallel. Live data have a higher priority.

Loss of data

If a synchronized variable is moved in Data Service, the data of this variable is lost in Insights Hub. This also applies to the addition or removal of a variable to/from an aspect.

To synchronize data again, modify the start date.

Restrictions

The following restrictions apply for the data upload:

- A maximum of 100 queries per second
- Maximum size of the net data: 128 kb per request
- Maximum of 500 packets per request

Supported regions

Solely the region EU1 is currently supported.

Unidirectional synchronization

Data is always synchronized in one direction – from Data Service to Insights Hub. Synchronization in the other direction – from Insights Hub to Data Service – does not take place.

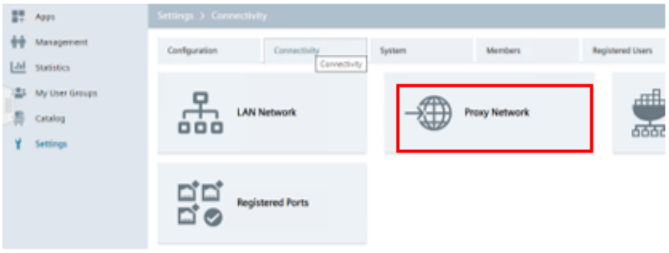
Requirements

- Insights Hub can be accessed via the network.
- For a synchronization with Insights Hub: Data Service is set up as a MQTT client.

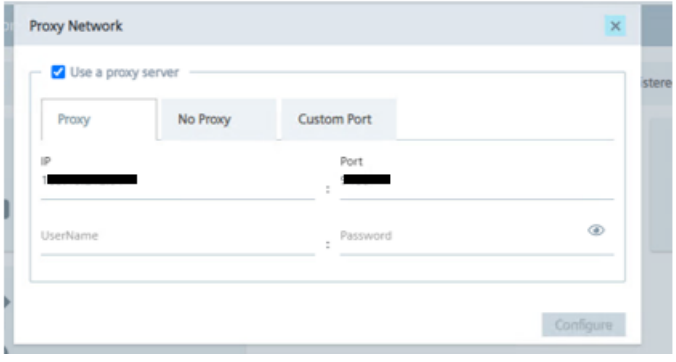
Procedure

To set up Insights Hub as the data destination, first define the data destination and then modify the proxy settings.

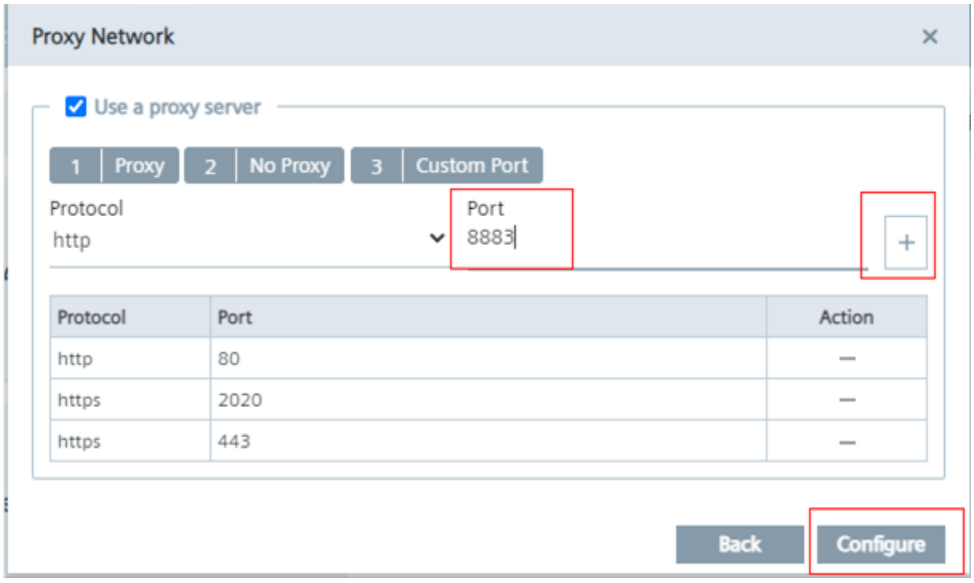
1. In the navigation bar, click "Data Destinations".
2. Add a new data destination by using ⊕.
3. Configure Insights Hub as the data destination in the displayed dialog.
4. Check the port number and note it down.
5. Save your settings by using Save.
6. Open the "Settings > Connectivity" menu in the Industrial Edge Device and click the "Proxy Network" tile.



7. Enter the IP address and port of the proxy in the "Proxy" tab.

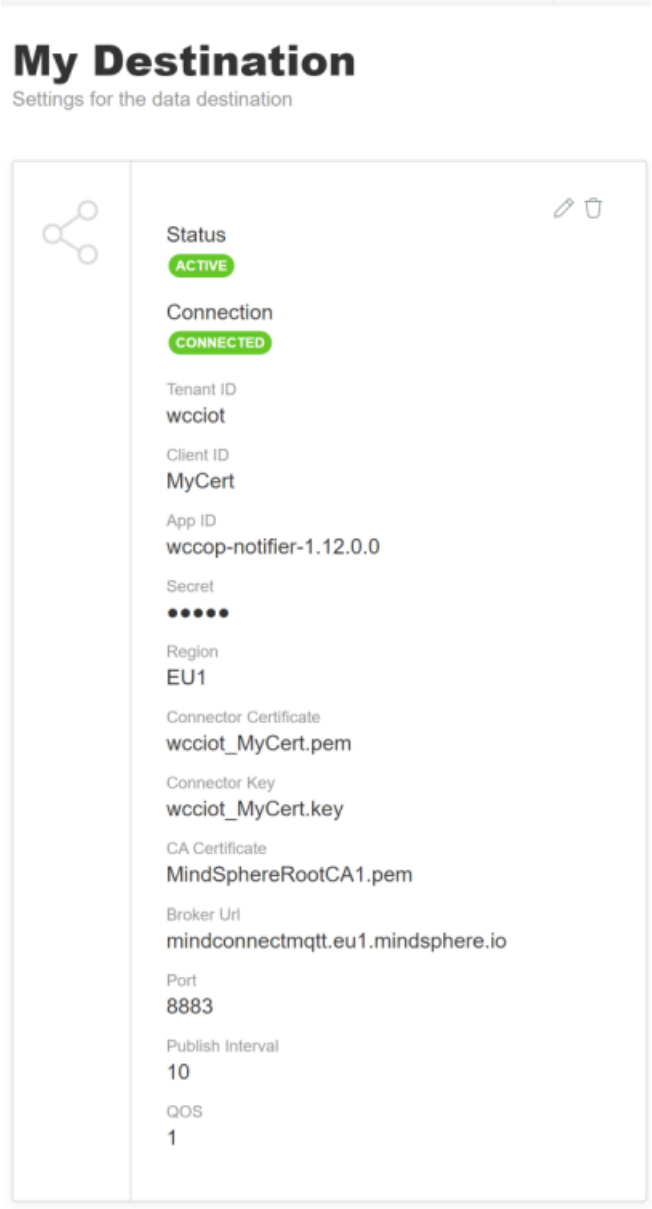


8. In the "Custom Port" tab, select the protocol "http" and enter the port number you noted down.
9. Close the configuration by clicking "Configure".



Result

Insights Hub is available as a data destination and can be specified as the storage location.



10.2 Defining the data synchronization

Description

You can decide for every level (assets, aspects, variables, aggregations) whether data are to be synchronized with one or several external data destinations. A complete synchronization setting always consists of a data destination and the start date as of which data are to be synchronized.

Synchronization settings are inherited to the respective subordinate levels.

Note

Data synchronization on the asset level

Aggregations will no longer be synchronized generally in the next version of Data Service. Instead a function will be implemented to control the granularity of the synchronization.

Please take this account in your project design.

Requirement

At least one data destination has been set up (Page 79).

Procedure

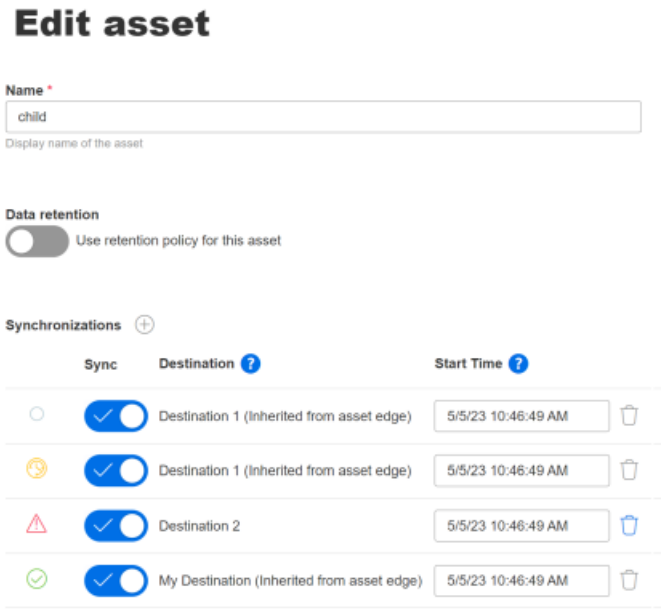
The procedure for setting up data synchronization is the same for assets, aspects, variables, and aggregations. The areas for settings are located at the following points:

- Assets: In the "Synchronizations" section of the respective asset.
- Aspects: In the "Synchronizations" section of the respective aspect.
- Variables: In the "Synchronizations" tab of the respective variable.
- Aggregations: In the "Aggregation" tab of the respective variable, in the "Synchronizations" column.

To define the data synchronization, follow these steps:

1. Select the asset, aspect, variable or aggregation for which you want to set the data synchronization.
2. Depending on your choice, navigate to one of the points mentioned above.

3. Click ⊕.
4. Select the data destination and the start date and activate data synchronization by using the blue slider. The following screenshot shows the settings for the asset level as an example.



Result

The data are synchronized with the selected data destination. The respective synchronization status is indicated by one of the following icons.

The status of a superordinate object is always also the status of the subordinate levels.

Synchronization status	Explanation
	"No synchronization" - The data destination or the data synchronization is deactivated.
	"Synchronization" - The data are synchronized.
	"Error" - Data synchronization could not be completed correctly. Click the icon for more information.
	"Synchronization completed" - All data were synchronized successfully with the external data destination.

Migrate Data Service and integrate it into the IIH Configurator

11

11.1 Migrating Data Service

NOTICE
Anomaly Detection The Anomaly Detection App V1.0 is incompatible with the Data Service V1.4. Update the Anomaly Detection App version from V1.0 to V1.1 before updating the Data Service to V1.4.

Note

Do not omit any version

We recommend that you avoid omitting any version of the Data Service during migration. This will ensure that all data is automatically migrated as well.

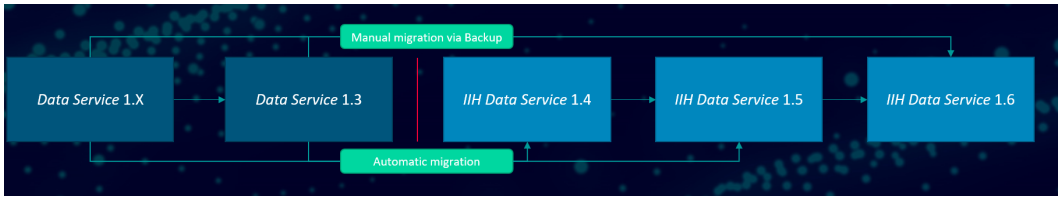
V1.1 > V1.2 > V1.3 > V1.4

Migration from V1.0, V1.1, V1.2 or V 1.3 to V1.6

⚠ WARNING
Loss of data Contact your Support Team if you are using V1.0, V1.1 or V1.2 of Data Service and want to update to V1.6. Since no automatic migration of data takes place, data loss may occur.

If you are using V1.3 of Data Service, a data backup must be created before the update and restored after the update.

If you are using V1.4 or V1.5 of Data Service, an automatic data backup takes place.



11.2 Integrating Data Service into the IIH

Note

Integration Data Service V1.5 in the IIH Configurator

Based on version 1.5, all data, assets and variables of the Data Service are automatically migrated to the IIH Configurator without data loss.

Description

You can integrate the standalone Data Service with its own user interface into the IIH Configurator and use it there.

You can do the integration starting from the Data Service or from the IIH Configurator.

⚠ WARNING

Data is lost with version 1.4

You can already integrate the Data Service into the IIH Configurator with V1.4. However, all data of the Data Service are then lost.

⚠ CAUTION

Undo integration

The integration cannot be undone and data/variables can no longer be stored in Data Service independent of the IIH Configurator afterward.

Requirement

The following apps must also be installed on the IED:

- IIH Configurator
- IIH Core

The green check mark indicates that all necessary apps are installed on the IED:

✓ IIH available

Procedure starting from the Data Service

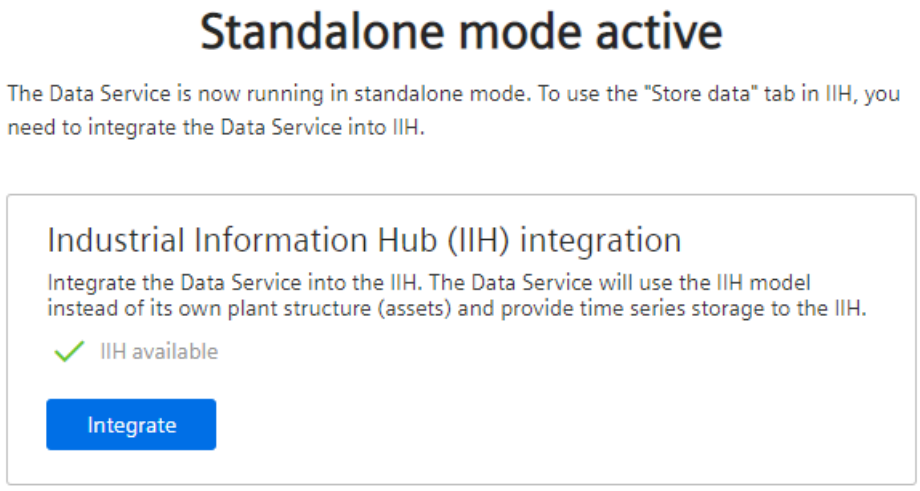
To integrate the Data Service into the IIH Configurator, follow these steps:

1. Open the "Settings".
2. Click "Integrate".

Procedure starting from the IIH Configurator

To integrate the Data Service into the IIH Configurator, follow these steps:

1. Open the "Store data" tab.
   If the Data Service is not yet integrated, you see the following window:



2. Click "Integrate".

Result

The Data Service is now integrated in the IIH Configurator. The integrated Data Service no longer has its own user interface. Switch to the IIH Configurator to create new connectors, assets and variables. You set the data retention in the IIH Configurator in the navigation under "Save data".

The API remains unchanged by the integration into the IIH Configurator. As a result, apps based on it, such as Performance Insight and Notifier, continue to function as usual.

Appendix

12

12.1 Display system information

Description

In the System Information dashboard, you can view various information provided by the System Info connector, such as CPU load, RAM usage, database size and write speed:

Procedure

To display the system information, follow these steps:

1. Open the "Settings". (In the standalone Data Service)
   -or-.
2. In the navigation, click on "Save data > Configuration". (In the integrated Data Service in the IIH)
3. Click "System information".

12.2 Debugging view

Description

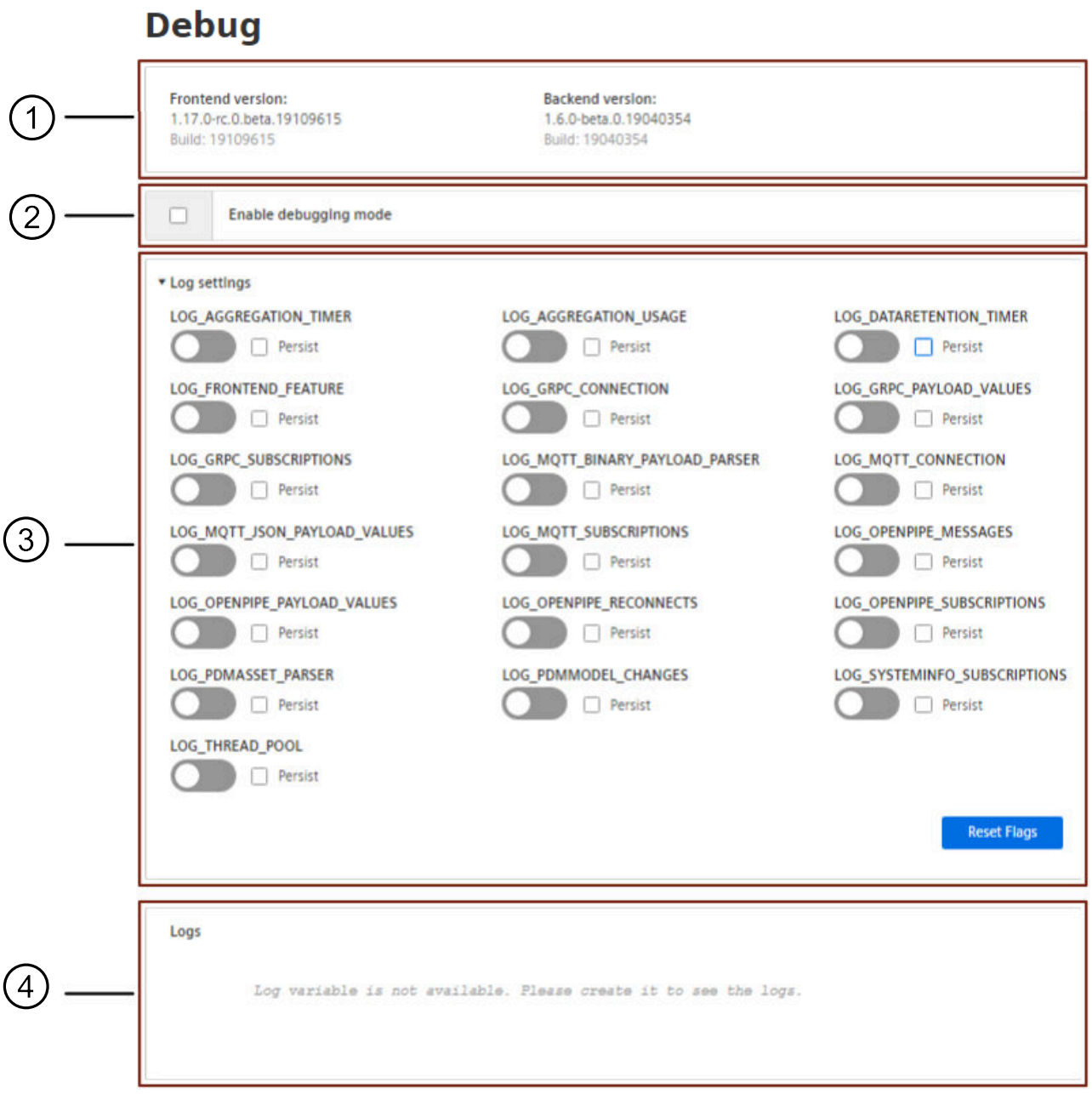
Data Service offers a debugging view for experienced users. It provides additional information in the event of an error and can help with troubleshooting. It shows information that is relevant to Support personnel, such as component versions and live logs. Extended logging can be enabled on a functional basis to obtain detailed information when needed.

The debugging view can be accessed at "https://<IED_IP>/dataservice/#/debug".

The recording of log data requires the creation of a log variable (Page 61).

The user interface of the debugging view is divided into the following areas:

- (1) Information area:
  - Frontend version
  - Backend version
- (2) Enable/disable debugging mode
- (3) Log settings, enable/disable individual logs
- (4) Log view


Debug
1
Frontend version:
1.17.0-rc.0.beta.19109615
Build: 19109615
Backend version:
1.6.0-beta.0.19040354
Build: 19040354
2
Enable debugging mode
3
Log settings
LOG_AGGREGATION_TIMER
Persist
LOG_AGGREGATION_USAGE
Persist
LOG_DATARETENTION_TIMER
Persist
LOG_FRONTEND_FEATURE
Persist
LOG_GRPC_CONNECTION
Persist
LOG_GRPC_PAYLOAD_VALUES
Persist
LOG_GRPC_SUBSCRIPTIONS
Persist
LOG_MQTT_BINARY_PAYLOAD_PARSER
Persist
LOG_MQTT_CONNECTION
Persist
LOG_MQTT_JSON_PAYLOAD_VALUES
Persist
LOG_MQTT_SUBSCRIPTIONS
Persist
LOG_OPENPIPE_MESSAGES
Persist
LOG_OPENPIPE_PAYLOAD_VALUES
Persist
LOG_OPENPIPE_RECONNECTS
Persist
LOG_OPENPIPE_SUBSCRIPTIONS
Persist
LOG_PDMASSET_PARSER
Persist
LOG_PDMMODEL_CHANGES
Persist
LOG_SYSTEMINFO_SUBSCRIPTIONS
Persist
LOG_THREAD_POOL
Persist
Reset Flags
4
Logs
Log variable is not available. Please create it to see the logs.

12.3 Changing the user interface language

Description

You can change the user interface language in the settings of the browser, e.g. Google Chrome. The following languages are available:

- German
- English
- Spanish
- Chinese

Procedure

Proceed as follows to change the user interface language:

1. Open the settings in the browser.
2. Click "Languages".
3. In the Google Chrome browser, click the three dots next to the desired language and enable the "Display Google Chrome in this language" option.
4. Click "Restart".

Result

The Data Service user interface is displayed in the desired language.

12.4 Description of aggregation functions

Description

The following aggregation options are available in Data Service.

Aggregation types

- **Single value aggregations**
  A variable is aggregated by specifying the aggregation method and the calculation period. The result is a value that represents the values of the time period for the respective aggregation.
  Calculation period: from[to], from exclusive, to inclusive
  Example: "I want the sum 'sum' of 'Variable X' from '2022 to 2023' to be calculated." => one value is returned that represents the summed values of the year.
  Use the API "DataService/Calculate" to calculate single value aggregations.
- **Aggregation of multiple values**
  A single-value aggregation can be calculated multiple times for a specific time period. The aggregation of multiple values is defined by the time period and the aggregations of the individual values (consisting of calculation period and aggregation method). The result is multiple values where each value represents the values in this calculation period for the respective aggregation.
  Example: "I want the sum 'sum' of 'Variable X' to be calculated every day 'from 2022 to 2023'." => 365 values are returned, where each value represents the summed values of one day.
  Use the API "DataService/CalculateTrend" to calculate aggregations of multiple values.
- **Precalculated aggregations**
  Aggregations can be planned in such a way that they are performed continuously in the background. The other two aggregation types are calculated on request. This aggregation type enables calculation of aggregations on 'new-value-written'. That reduces the return time of the request and distributes the resource usage according to the written rate values, which prevents the peaks that occur with the other two aggregation types.
  A precalculated aggregation is defined using an aggregation and a desired execution cycle. The result is an additional sub-variable that stores the aggregation of each cycle.
  Example: "I want the sum 'sum' of 'Variable X' to be calculated 'every day'." => A new sub-variable is created in which a new value is stored every day that represents the summed values of the day.

Aggregation methods

Boolean values are interpreted in calculations as numeric values 0 and 1.

- **Sum**
  Returns the sum of the numeric values for the calculation period.
- **Count**
  Returns the number of values within the calculation period.
- **Average**
  Returns the arithmetic average of numeric values for the calculation period.
  All values are weighted the same. The result can be a floating-point number.
- **Min**
  Returns the lowest numeric value within the calculation period.
- **Max**
  Returns the highest numeric value within the calculation period.
- **First**
  Returns the first value within the calculation period.

- **Last**
  Returns the last value within the calculation period.
- **Counter**
  Returns the summed value changes of numeric values within the calculation period.
  With an up counter, only positive value changes are summed. Negative value changes are interpreted as a counter reset.
  In the case of a down counter, positive and negative value changes are summed.
  More precise settings can be made at the variable via the counter settings.
- **Timer**
  Returns the time during which a value was not "false" (FALSE, NULL or empty string).
- **Time weighted average**
  Returns the time-weighted average of numeric values for the calculation period.
  The values are weighted differently, depending on how long they have been present. The longer a value was present, the more it is weighted.
- **Standard deviation**
  Returns the standard deviation of numeric values within the calculation period.
- **Variance**
  Returns the variance of numeric values within the calculation period.

12.5 "Counter" acquisition category

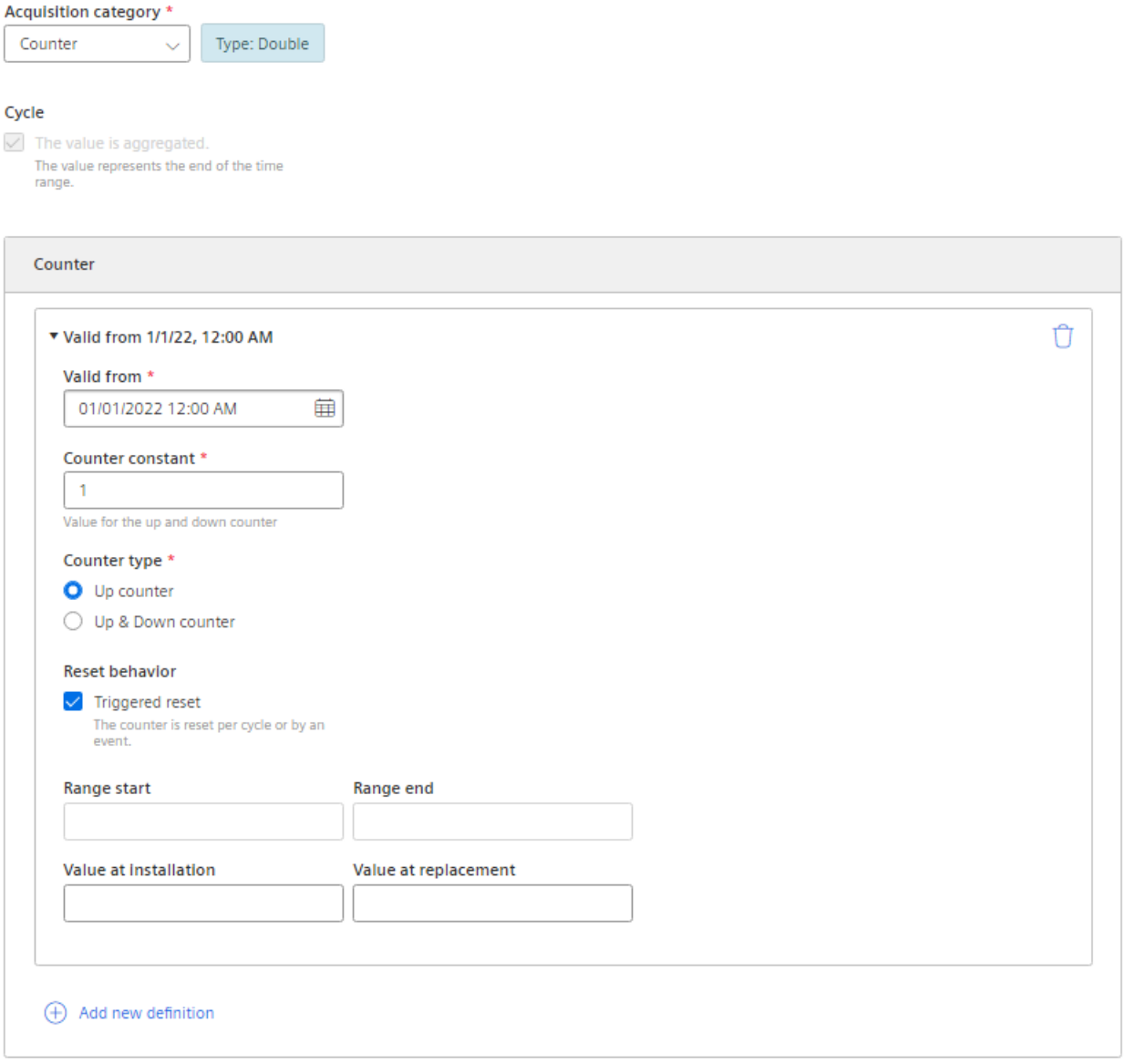
12.5.1 Define the acquisition category "Counter"

Requirement

You have opened a variable for editing.

You have selected the recording category "Counter" in the settings of a variable.

You have added a counter.



Description

You can define properties for each counter:

- Valid from
- Counter constant (value by which the counter is counted up or down, e.g. 1 kWh.)
- Counter type
  - Up counter = The counter can only count up. As soon as a subsequent counter value is less than the current one, it is treated as an overflow and the counter is restarted.
  - Up & Down counter = The counter can count up and down, e.g. a level counter.

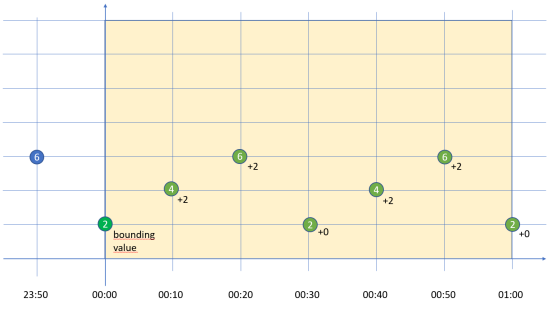
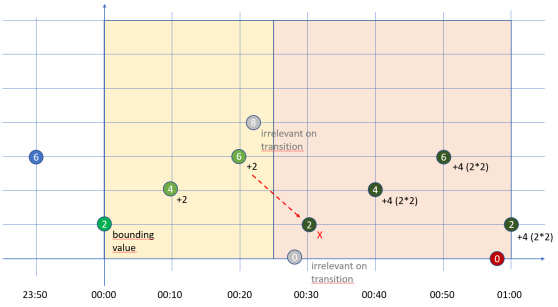
- Reset behavior (Only for an Up counter: You can specify whether the counter is reset daily or by an event, such as a defined overflow limit.)
- Start / End of the limit range
  Overflow limit. If you have not activated the reset behavior, the counter is automatically reset when it reaches the specified count limit.
- Value at installation
  You specify the actual value at which the counter is to start. (If the counter is not to start with the start value of the limit range.)
- Value at replacement of the counter

12.5.2 Counting method of the "Up" counter

Description

Only positive changes in value are recorded. The sum of the positive value changes between two points in time is output in each case. If the value remains the same between two points in time or is reduced, the value is not counted.

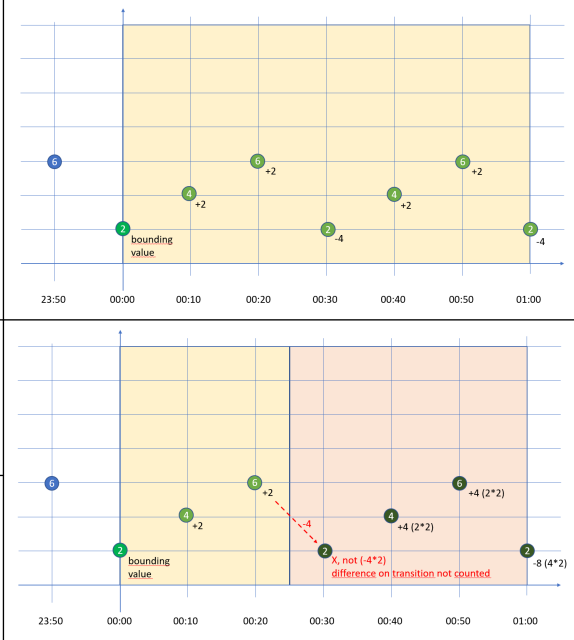
Depending on the settings you select for a counter, you will see different counter values as a result. By default, the "The value is aggregated" function is activated:

<table>
<tr><th>Settings</th><th>Explanation</th></tr>
<tr><td>Start and end of the limit range is not defined.
Result: + 2 + 2 + 0 + 2 + 2 + 0 = 8</td><td> 
</td></tr>
<tr><td colspan="2">When you change the counter, you can define different settings for each counter. This example shows the transition from one counter to the next:
<table>
<tr><td>Counter for the year 2018
00:00 - 00:25
Counter constant: 1
End of the limit range: 8
Result: + 2 + 2 = 4</td><td>Counter for the year 2019
00:25 - 01:00
Counter constant: 2
Start of the limit range: 0
Result: + 4 + 4 + 0 + 4 = 12</td></tr>
<tr><td colspan="2">Final result: 4 + 12 = 16</td></tr>
</table></td><td> 
</td></tr>
</table>

12.5.3 "Up & Down" counting method of the counter

Description

Depending on the settings you select for a counter, you will see different counter values as a result. By default, the "The value is aggregated" function is activated. You cannot define any limit ranges for the "Up & Down" counter.

<table>
<tr><th>Settings</th><th>Explanation</th></tr>
<tr><td>Result: + 2 + 2 - 4 + 2 + 2 - 4 = 0</td><td rowspan="2"> 
</td></tr>
<tr><td>When you change the counter, you can define different settings for each counter. This example shows the transition from one counter to the next:
<table><tr><td>Counter for the year 2018
00:00 - 00:25
Counter constant: 1
Result: + 2 + 2 = 4</td><td>Counter for the year 2019
00:25 - 01:00
Counter constant: 2
Result: + 4 + 4 - 8 = 0</td></tr></table>Final result: 4 + 0 = 4</td></tr>
</table>

12.6 Data Service OpenAPI specification

Description

The Data Service OpenAPI specification is a standard for describing REST-compliant programming interfaces (API). With the OpenAPI, you can connect your user-developed app to the Data Service and access the interfaces of the Data Service.

You can find the routes for the Data Service by clicking the ⓘ icon in the title bar under "API Documentation".

The routes remain stable or compatible for at least 1 year. When a route is changed in such a way that existing interfaces have to be adapted (breaking change), this is announced in the OpenAPI specification in the description of the route (deprecated). You have one year to adapt your routes accordingly.

Requirement

The OpenAPI of the Data Service is available in the Industrial Edge Device-wide Docker network "proxy-redirect".

To communicate with the OpenAPI from the Data Service, an app must define this "external" network with the "bridge" driver:

```
networks:
  proxy-redirect:
    external:
     name: proxy-redirect
    driver: bridge
```

Depending on the environment, the Data Service is available there under this URL:

Edge Box: http://edgeappdataservice:4203

Industrial Edge App Publisher

You can find additional information on how to integrate your custom-developed app in Industrial Edge Management here: Industrial Edge App Publisher (https://support.industry.siemens.com/cs/us/en/view/109780392)

Procedure

Note

For a call of the Data Service API on an IED to be successful, authentication to the IED OS must be in place. For this purpose, a token must be placed in the cookie header of the request ("authToken=<token>;"). You get the token via the IED API or the web login cookie.

To set up a connection to the OpenAPI of the Data Service, follow these steps:

1. Call the routes defined in the API specification with an HTTP client.
   - URL, e.g.: https://<ied-ip>/dataservice/AssetService/Assets
   - HTTP method, e.g.: "GET"
   - HTTP body

12.7 Improving performance

Description

With the following configuration examples, we can ensure the highest possible performance of the Data Service app:

Write performance

The Data Service app supports 5,000 changes per second. Changes means that a write operation takes place in the database. In the worst case, only one value is written per write operation.

The following scenarios are therefor possible:

- 5,000 variables with a write cycle of 1 s (5,000 * 1,000/1,000 = 5,000 changes)
- 500 variables with a write cycle of 100 ms (500 * 1,000/100 = 5,000 changes)
- 50 variables with a write cycle of 10 ms (50 * 1,000/10 = 5,000 changes)
- etc.

If the values are sent from the connector in packets, more data can be processed. For example, a connector sends the values of a variable in packets of 1,000 every second. This means that there is only one write operation per second.

Read performance

The read performance is influenced by many factors. Two examples provide a guide value here:

A variable with a 1 ms write cycle is to be queried over one hour. 1 ms in 1 h = 3.6 million values.

- Aggregated query (e.g. average) = 10 seconds load time
- Raw data query = 30 seconds load time

Database (dashboard configuration in Performance Insight)		
4 counter variables in 1 second resolution		
Widget 1: Chart (diagram)	3 counter variables	No aggregation
Widget 2: Chart (diagram)	3 counter variables	Aggregation: Average
Widget 3: Gauge (pointer diagram)	1st counter variable	Aggregation: Average
Widget 4: Value	2nd counter variable	Aggregation: Average
Widget 5: Heatmap	3rd counter variable	No aggregation

The test runs were performed on a Unified Comfort Panel (UCP) instead (with the minimum hardware equipment).

Load times of the database		
Loading 1 day	10:70 s	777,600 data points
Loading 1 week	58.00 s	5,443,200 data points

Impact of parameters on the test:

Time period		
1 day	10:70 s	777,600 data points
2 days	19:21 s	1,555,200 data points
3 days	28:99 s	2,332,800 data points
4 days	37:09 s	3,110,400 data points
5 days	50:57 s	3,888,000 data points
6 days	61:01 s	4,665,600 data points
7 days	68:00 s	5,443,200 data points
=> Linear influence		

Calculation time period (1 day)		
10 min	11:83 s	777,600 data points
20 min	10:41 s	
30 min	11.03 s	
40 min	11.46 s	
50 min	11.84 s	
60 min	11.68 s	
= has no effect		

Variable cycle (1 day)		
1 s	11.50 s	777,600 data points
2 s	8.50 s	388,800 data points
3 s	4.30 s	259,200 data points
4 s	4.09 s	194,400 data points
5 s	4.23 s	155,520 data points
6 s	3.12 s	129,600 data points
7 s	3.01 s	111,086 data points
8 s	2.52 s	97,200 data points
=> Linear influence		

Aggregation (1 day, all requests use only one specific aggregation)		
Average	3.28 s	777,600 data points
Min	2 s	
Max	2.5 s	
Sum	4 s	
Last	2 s	
Counter	70 s	
Timer	62 s	
=> no influence of the aggregations in the database => major influence of the aggregations in the program code		

12.8 Calculation example for data consumption

Description

You can calculate how many GB of memory are required for which data points.

Note

Validity

This information applies only to retaining the data and reading historical data. It does not apply to reading the live data.

Calculation formula

The calculation formula is made up as follows:

DBSize = Number of variables * ValuePerVariable * Data type size

The data type size results from the addition of:

- Time stamp 8 bytes
- Quality code 2 bytes
- Value
  - Bool 1 byte
  - (U)Int8 1 byte
  - (U)Int16 2 bytes
  - (U)Int32 4 bytes
  - (U)Int64 8 bytes
  - Float 4 bytes
  - Double 8 bytes
  - String, depending on length and contained characters: 1 byte (single character) to 4 bytes (UTF-8) per character

Example

5 millisecond cycle -> 200 values per second

8 hours of storage time -> 200 * (60 * 60 * 8) = 5,760,000 values per variable (5.76 million)

90 Int32 variables -> 14 * 5,760,000 * 90 = 7,257,600,000 bytes = 6,921 MB = 6,759 GB

12.9 Quality codes

Description

The quality code measures the quality of a value when it is transferred from a CPU via the connector to the Data Service.

There are three different types of qualities:

- GOOD
- UNCERTAIN
- BAD

The Data Service saves all values, regardless of the type of quality, and forwards them to other apps. In the respective apps, the values are then taken into account or ignored according to their quality.

If the quality is GOOD or UNCERTAIN, then the values are taken fully into account in the app.

What does it mean if the value has the quality BAD:

- This value is not taken into account when calculating KPIs, e.g. in Performance Insight or Energy Manager.
- The value is also saved when the raw data is saved in an app.

WinCC UA Standard is used to mark the quality of the values.

From bits 6 and 7 you can read out the quality which a value has. From bits 2 to 5 you can get more information about the quality.

Quality bits 6 and 7

Quality code	Quality	Description
0	BAD	The value is not reliable. You can read out the reasons for this from the bits of sub-status.
1	UNCERTAIN	The quality of the value is worse than usual. It might still be possible to use the value. You can read out the reasons for this from the bits of sub-status.
2	GOOD (non-cascade)	The quality of the value is good.
3	GOOD (cascade)	The quality of the value is good and can be used as a control.

BAD + Sub-status bits 2 to 5

Quality code	Quality	Description
0	Non-specific	There is no information available as to why the value is BAD quality.
1	Configuration error	The value is not useful due to some inconsistencies in the configuration.
2	Not connected	The value is not reliable because the connection to the provider, e.g. to the CPU, was terminated.
4	Sensor failure	The value is not meaningful because it cannot be converted.
5	No communication, with last usable value	The value is not meaningful because communication with the data source has failed. However, the last known value is available.
6	No communication, no usable value	The value is not meaningful because communication with the data source failed or was not set up.
7	Out of service	The value is not reliable because the provider is not active.

UNCERTAIN + Sub-status bits 2 to 5

Quality code	Quality	Description
0	Non-specific	There is no information available as to why the value is UNCERTAIN quality.
1	Last usable value	The connection to the data source still exists, but the data source no longer updates the value.

Quality code	Quality	Description
2	Substitute value	A predefined value is used because the value is invalid due to communication problems.
3	Initial value	A predefined value is used.
5	Range violation	The value is outside the specified limits (min/max values)
6	Sub-normal	A value derived from multiple values has less than the required number of good sources.

12.10 Glossary

Description

Term	Explanation
Topic	A topic is subscribed by the Data Service and gets its data from the MQTT Broker.
Tag	A tag is made available by the connector and publishes its data either in the Databus (MQTT Broker) or directly in Data Service (Connectivity Suite).
Asset	An asset is a digital representation of a machine or automation system with one or more automation devices (e.g. PLC). The data that describes an asset is acquired and transmitted. The data is then made available for further processing and evaluation.