SIEMENS

Industrial Edge

App
Data Service Development Kit for Industrial Edge V1.5

Application Manual

11/2022; V1.5
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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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Legal information

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

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 Development Kit 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.

1.4 Application example - Legal information

Use of application examples

Application examples illustrate the solution of automation tasks through an interaction of several components in the form of text, graphics and/or software modules. The application examples are a free service by Siemens AG and/or a subsidiary of Siemens AG ("Siemens"). They are non-binding and make no claim to completeness or functionality regarding configuration and equipment. The application examples merely offer help with typical tasks; they do not constitute customer-specific solutions. You yourself are responsible for the proper and safe operation of the products in accordance with applicable regulations and must also check the function of the respective application example and customize it for your system.

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Disclaimer of liability

Siemens shall not assume any liability, for any legal reason whatsoever, including, without limitation, liability for the usability, availability, completeness and freedom from defects of the application examples as well as for related information, configuration and performance data and any damage caused thereby. This shall not apply in cases of mandatory liability, for example under the German Product Liability Act, or in cases of intent, gross negligence, or culpable loss of life, bodily injury or damage to health, non-compliance with a guarantee, fraudulent non-disclosure of a defect, or culpable breach of material contractual obligations. Claims for damages arising from a breach of material contractual obligations shall however be limited to the foreseeable damage typical of the type of agreement, unless liability arises from intent or gross negligence or is based on loss of life, bodily injury or damage to health. The foregoing provisions do not imply any change in the burden of proof to your detriment. You shall indemnify Siemens against existing or future claims of third parties in this connection except where Siemens is mandatorily liable.

By using the application examples you acknowledge that Siemens cannot be held liable for any damage beyond the liability provisions described.

Other information

Siemens reserves the right to make changes to the application examples at any time without notice. In case of discrepancies between the suggestions in the application examples and other Siemens publications such as catalogs, the content of the other documentation shall have precedence.

The Siemens terms of use Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/en/) shall also apply.

Application example

For additional information on the use of the application example, please visit: Application example (Page 23).

System requirements

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

Software requirements

The following services must be installed:

- Docker Desktop (tested with version 20.10.2)
- NodeJS (tested with version 12.18)
  Is required to run the examples.

Introduction to the Data Service Development Kit 3

3.1 Function overview

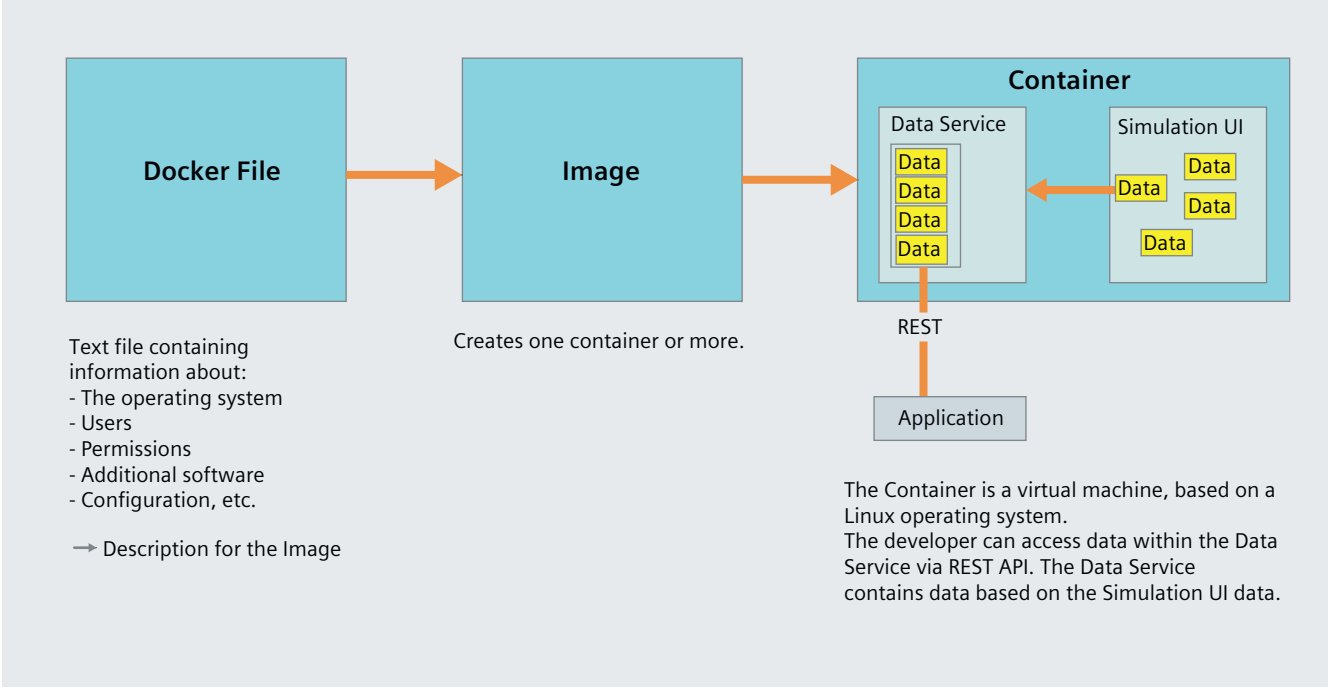
Description

Using the Data Service Development Kit app, you can develop your own apps based on the Data Service and integrate them into the Industrial Edge Management (IEM) System.

- By default, the data is kept for a maximum of one week.
- Max 20 GB data memory

Docker

Docker simplifies the deployment of apps because defined programs and environments can be transferred to another system with minimal effort.



Explanation of terms

- **Docker file:**
  A text file that describes an image with various commands. These are processed during execution and a single layer is created for each command.
- **Image:**
  A memory dump of a container. The image itself consists of several layers that are read-only and thus cannot be modified. Several containers can always be started from one image.
- **Container:**
  The active instance of an image is referred to as container. This means that the container is currently running and is busy. The container is automatically terminated as soon as the container is not running a program or is finished with its job. As a rule, one application runs per container.
- **Repository:**
  A repository is a set of images of the same name with different tags, mostly versions.

See also

OpenAPI specification (Page 25)

Application example (Page 23)

3.2 Getting Started

Description

You can find a Getting Started for using the Edge app Development Kit here:

See also

Getting Started - Development Kit (https://github.com/industrial-edge/data-service-development-kit-getting-started)

Downloading the Dev Kit bundle

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Description

You can download the Data Service Development Kit bundle to your computer from the GitHub or the DockerHub. The link to this is also provided in the SIOS entry.

Dev Kit bundle in GitHub (https://github.com/industrial-edge/data-service-development-kit)

Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/de/view/109792717)

The bundle includes the following components:

- Docker file: docker-compose.yml
- "docs" folder:
  Here you will find, for example, the user documentation for the Data Service and Dev Kit as well as the routes (OpenAPI) for the Data Service.
- OpenAPI specification (Page 25)
- "examples" folder:
  Here you will find application examples, for instance.
  Application example (Page 23)

The image is loaded from the Docker Hub:

- Docker image
  - Data simulator
  - MQTT Broker
  - Data Service (with external interface (REST API) for non-Siemens applications)

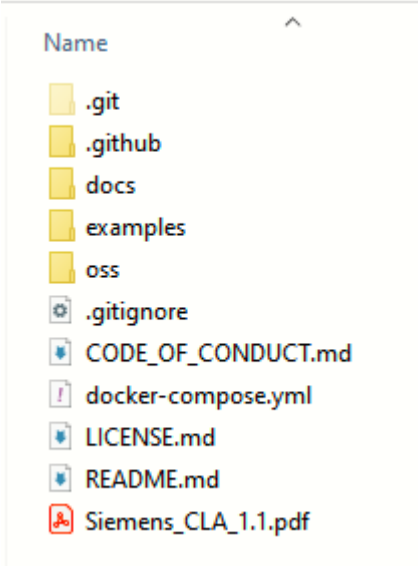
Procedure

To download the Dev Kit bundle, follow these steps:

1. In the SIOS entry, click on the link to GitHub under "Data Service Development Kit on GitHub".
2. Download the bundle as ZIP folder or copy the repository to the desired drive with the command "git clone <URL>".

Result

The following files are downloaded in the bundle:



Start Docker Container

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Requirement

- You have downloaded the Data Service Development Kit bundle onto your computer.
- The Docker Desktop app must be started.

Procedure

To start the Docker container, follow these steps:

1. Open the folder into which you have downloaded the Dev Kit bundle.
2. Right-click to open the shortcut menu and select, for example, Git Bash Here.
3. Enter the following command: `docker-compose up`
   All service images are downloaded from Docker Hub and launched as defined in the "docker-compose.yml" file. This file specifies which of the services run together, address, communication, etc.

Result

The Docker containers for the Data Service Development Kit have been started.

See also

Siemens Industry Online Support (https://support.industry.siemens.com/cs/ww/de/view/109792717)

Use simulation UI

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Requirement

The Docker containers have been started.

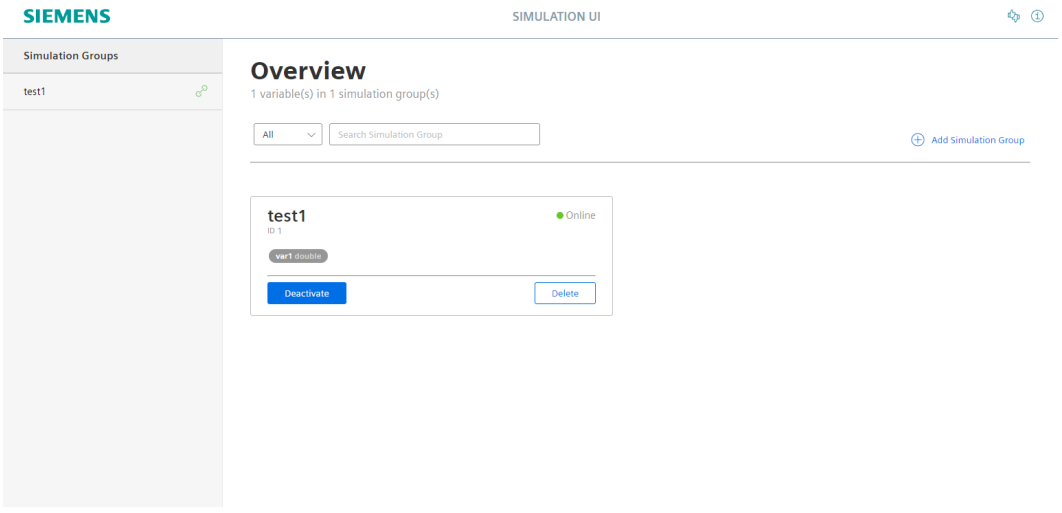
Description

Using the Simulation UI, you can create variables and transfer them to the Data Service via a simulation.

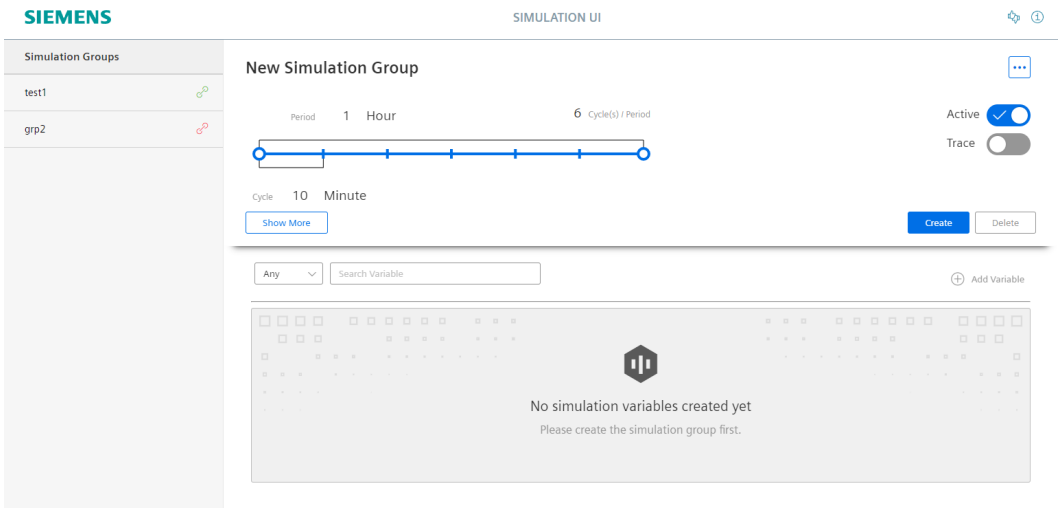
Procedure

To create variables and transfer them into the Data Service, follow these steps:

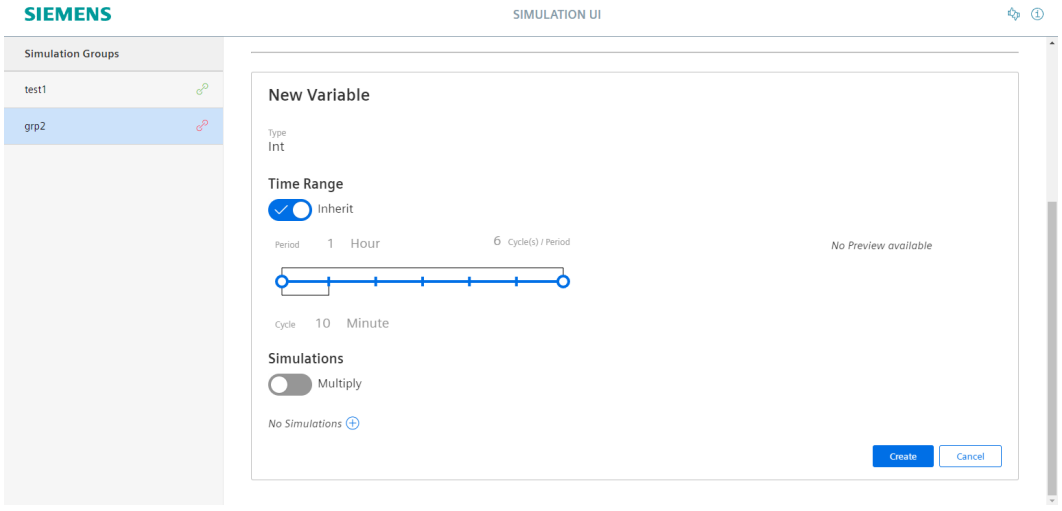
1. Open a browser.
2. Start the Simulation UI by entering the following address in the browser: `http://localhost:4519` or use the container IP 4519.
3. Click "Add Simulation Group":



4. Enter the following information:
   - Name
   - Period: The period is the length of the repeating pattern.
   - Cycle: The cycle is the frequency of how often the values are generated/written.

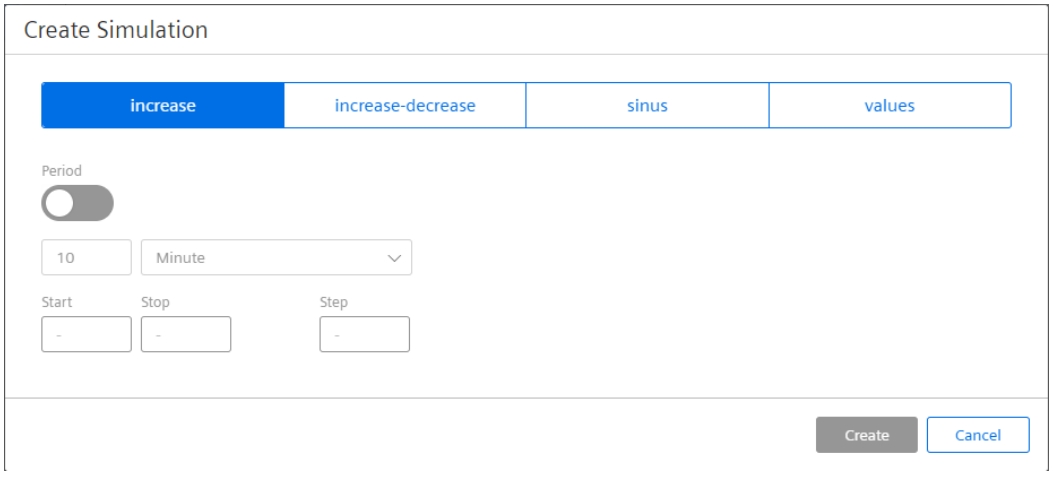


5. Activate the simulation group.
6. Click "Create".
7. Click "Add variable".
8. Enter the following information:
   - Name
   - Data type



9. Click on the ⊕ icon to add a simulation.

10. Select a simulation type, such as a sine curved with an amplitude and a zero point.



11. Click "Create".
12. Now, open the Data Service. You can find additional information here: Using Data Service (Page 21)

Using Data Service

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Requirement

The Simulation UI has been prepared.

Description

You can select the "Simulation Connector" adapter and the corresponding simulated tags in the Data Service.

Procedure

To open the Data Service, follow these steps:

1. Open a browser.
2. To start the Data Service, enter the following address: `http://localhost:4203` or use the container IP 4203.
3. Add a new tag.
4. Select the Simulation Connector and the created tag.
   The connection of the Simulation Connector is preconfigured (active and online).
5. Click "Add variable".
   The simulated data are saved in this tag.

Note

Container IP

Access via the container IP is obtained by entering `docker inspect` in the command line.

Limitations

Note

Data retention

By default, the data is kept one week. This cannot be changed.

Note

Adapter

The adapter cannot be created, modified or deleted.

Application example

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Description

This application example is intended to show you how to grant access to the "Data Service" to your own apps.

You will create a user, request a token and get the assets, tags and time series data from the app.

You must carry out the following steps beforehand:

Build and execute

The application example can be launched both locally and via Docker.

Follow the steps below to start the application example **via Docker**:

1. Open the command line in the folder with the "package.json" file and enter the following command:

   – `docker-compose up`

Follow the steps below to start the application example **locally**:

1. Open the command line in the folder with the "package.json" file and enter the following commands:

- `npm install` (The necessary NodeJS modules are downloaded.)
- `npm run build`
- `npm run start`

Note

Execution of the example

The application example is configured to run via Docker. For local execution, the Data Service URL ("`.\client\dataservice-client.ts`" line 17) must be changed to "`http://localhost:4203`".

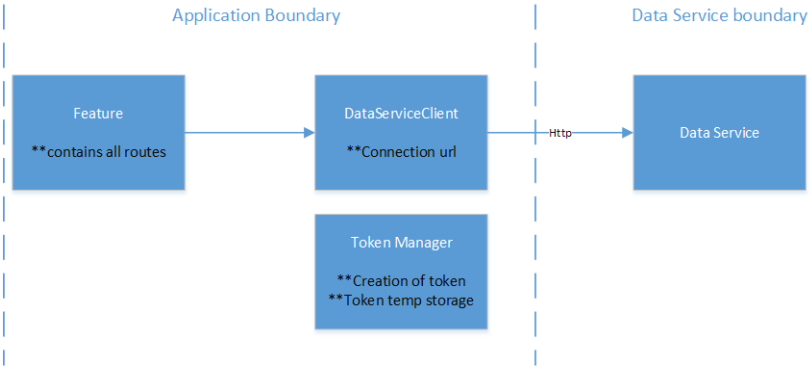
The app is started in the browser with the local host "`https://localhost:5200`".

Requirement

The Data Service app should be executed and the Configuration UI should be running; otherwise, an incorrect connection is provided when accessing the routes below.

Logical view

The logical representation is divided as follows:



- Feature: The routes are provided here and most of the integration for the token and communication with the client is done in this class.
- Token manager: With each call, the token is retrieved from the data service. However, it is advisable to store temporarily until the time it expires (30 minutes). The request to re-save from the token should ideally occur after each expiration.
- Data Service client: This class helps to configure the Data Service URL and establish the connection. The authorization headers for the http request are also managed here.

Creating users and token management

An app can require a user to access the data service. This user provides a token that can be used to make calls to the Data Service. The lifetime of the token is 30 minutes if the user is available during this lifetime. For user creation and token management please use the feature (/User/create) and the token manager class (getAuthorizationToken()).

Assets, tags and time series information

The same token mentioned above can be used to perform any operation in the Data Service. The tokens that do not expire are retrieved and added to the request header to retrieve a list of all or each of the required assets and tags. To call up time series information, the "getTimeSeries" method is provided in the feature.

OpenAPI specification

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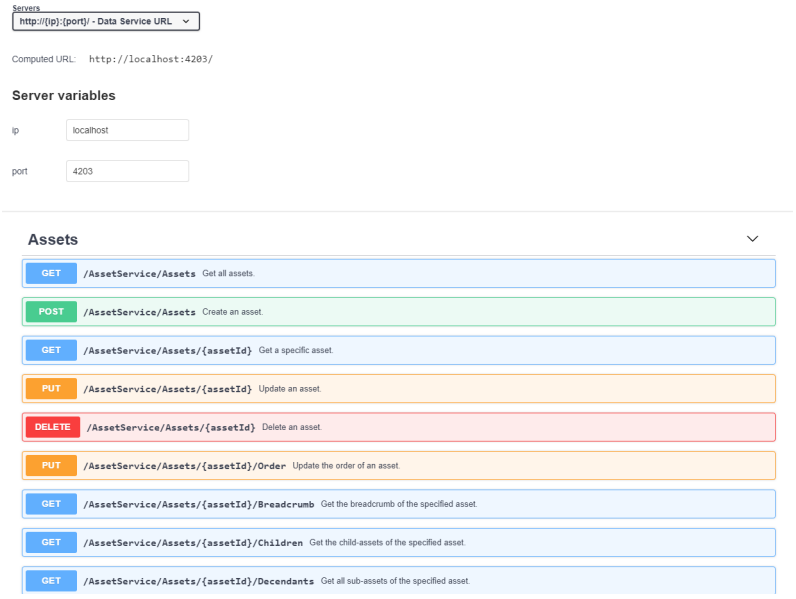
Description

The OpenAPI specification is a standard for describing REST-compliant application programming interfaces (API).

You will find the routes for the Data Service in the following file: data-service-api-specification.html

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="UTF-8">
    <title>Data Service API Definition</title>
    <link rel="stylesheet" type="text/css" href="./src/swagger-ui.css" />
    <link rel="icon" type="image/png" href="./src/favicon.png" />
    <style>
      html
      {
        box-sizing: border-box;
        overflow: -moz-scrollbars-vertical;
        overflow-y: scroll;
      }

      *,
      *:before,
      *:after
      {
        box-sizing: inherit;
      }

      body
      {
        margin:0;
        background: #fafafa;
      }
    </style>
  </head>

  <body>
    <div id="swagger-ui"></div>

    <script src="./src/swagger-ui-bundle.js" charset="UTF-8"> </script>
    <script src="./src/swagger-ui-standalone-preset.js" charset="UTF-8"> </script>
    <script src="./src/spec.openapi.js" charset="UTF-8"> </script>
    <script>
    window.onload = function() {
      // Begin Swagger UI call region
      const ui = SwaggerUIBundle({
        spec: specData(),
        dom_id: '#swagger-ui',
        deepLinking: true,
        presets: [
          SwaggerUIBundle.presets.apis,
          SwaggerUIStandalonePreset
        ],
        plugins: [
          SwaggerUIBundle.plugins.DownloadUrl
```

View in browser:



Requirement

The OpenAPI of the Data Service is available in the Inudstrial 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
```

The Data Service is available there under this URL:

`http://edgeappdataservice:4203`

Procedure

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

1. Get a token that will not expire using the "getAuthorizationToken()" method.
2. You can then retrieve information, for example, by calling the "getTimeSeries" method.
3. Additional routes can be found in the OpenAPI.

Note

Quality of values

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.

Publishing user-developed app in the IEM

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Description

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