nutai

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Data Collector User Manual

www.nutai.com

Overview

Overview

Introduction

What is Data Collector?

Data Collector is an app for the Siemens Industrial Edge ecosystem that allows you to extract data from UR collaborative robots using the RTDE protocol.

Using this software you can capture all the robot's available variables: positions, accelerations, currents, forces, inputs, outputs, states, etc.

Suitable applications:

- Data extraction
- Predictive maintenance
- Data modeling
- Variable display
- Data history
- Dashboards

Overview

Requirements

Requirements needed[1] to use this app satisfactorily:

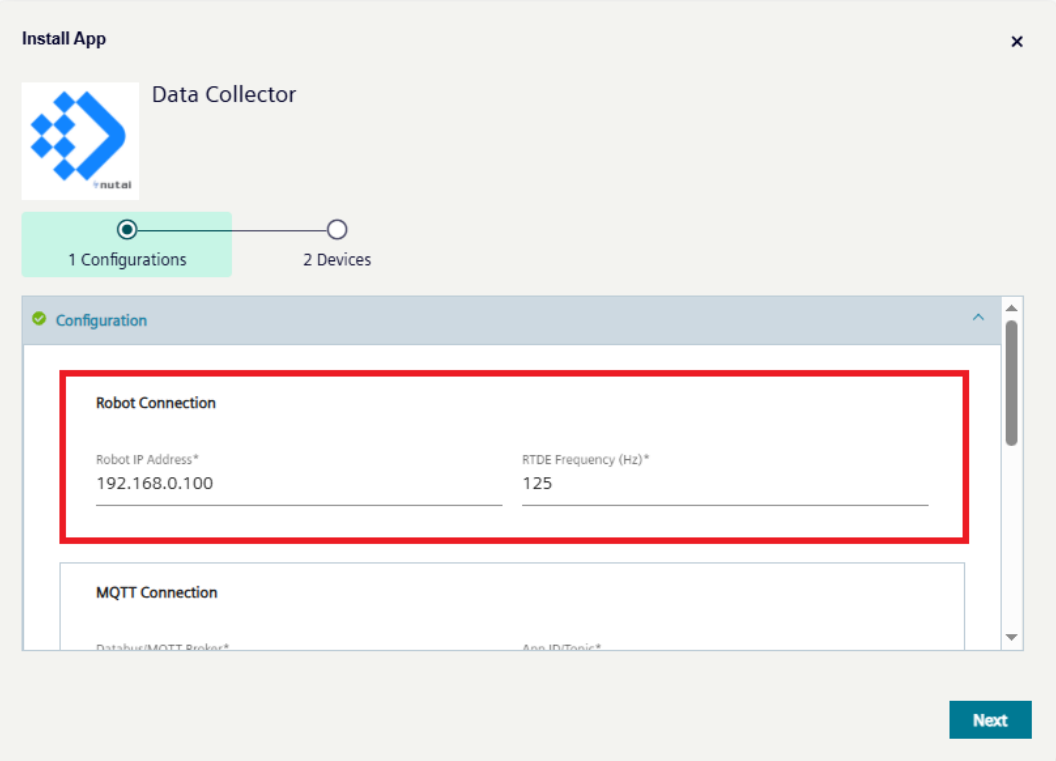
- Processor: 500 MHz
- Memory: 15MB
- Disk space: 300 MB

[1] These requirements are approximate as they depend on the number of variables to be acquired, as well as the configured acquisition frequency.

Overview

Deployment

First of all, in the *Robot Connection* section the parameters of the RTDE connection with the robot from which you want to extract information will be configured.



Deployment

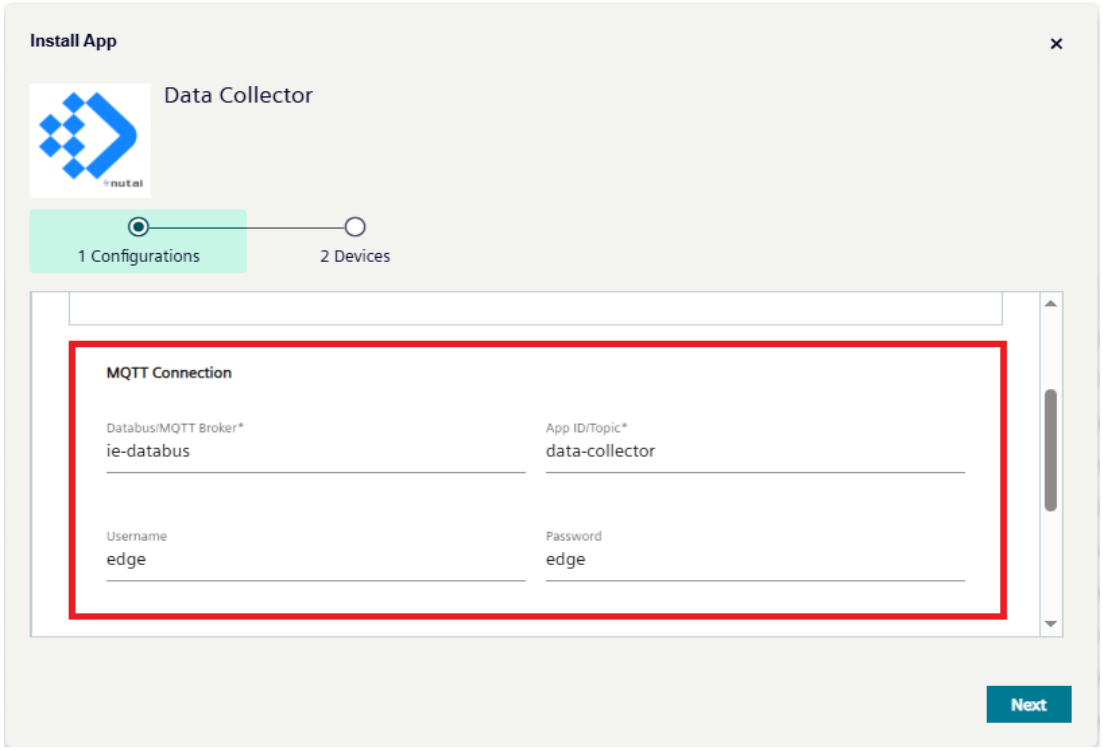
The parameters to configure in this section are the following:

- **IP Address**
  IP address of the robot from which you want to extract information. The robot and your IED device must be configured in the same network range.

- **Frequency**
  Acquisition frequency (`1..500` Hz) of the variables to be acquired using the Universal Robots RTDE protocol. The actual maximum frequency is 500 Hz for e-Series robots and 125 Hz for CB-Series robots.

Deployment

Secondly, in the *MQTT Connection* section, the parameters of the connection with the MQTT broker where the acquired data will be published are configured.



Deployment

The parameters to configure in this section are the following:

- **Broker**
  Hostname or IP address of the MQTT to connect. This can be the internal IED broker (Databus) or any other broker on the local network or in the cloud.

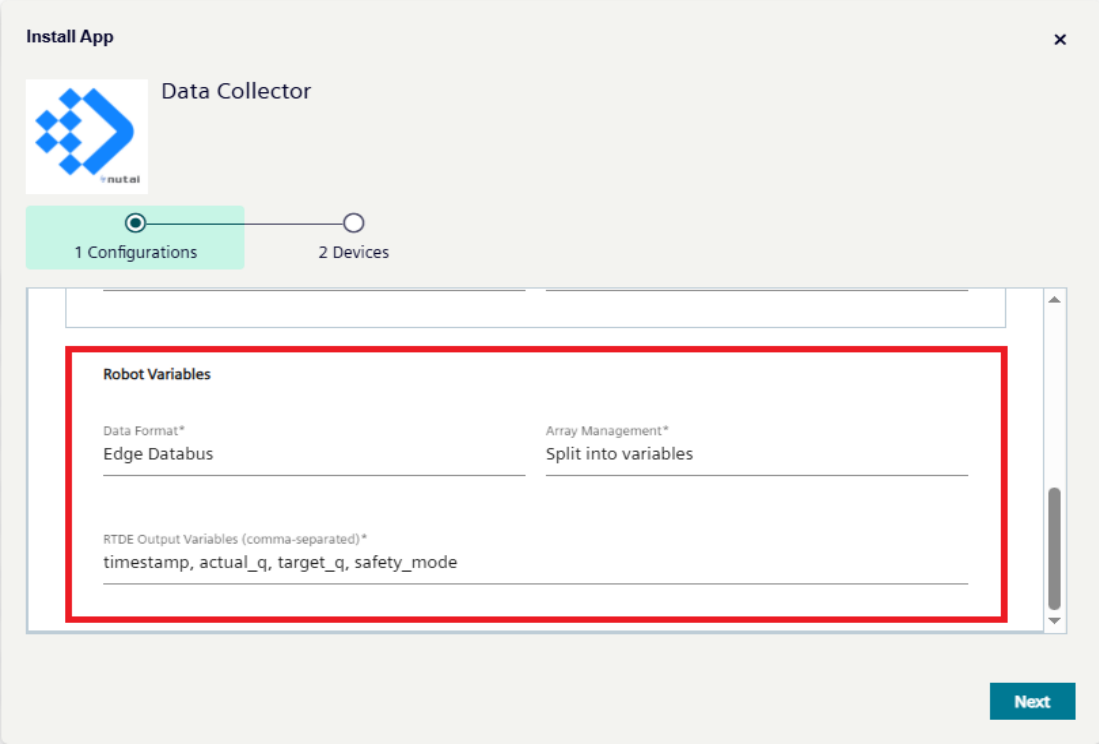
- **Topic**
  Name of the topic to publish in the broker, or app identifier in the case where the data output format is configured as *Edge Databus*.

- **User** (optional)
  Authentication username in the MQTT broker.

- **Password** (optional)
  Authentication key for the previously entered user.

Deployment

Thirdly, in the *Robot Variables* section the variables to be acquired are configured, as well as some of their format characteristics.



Deployment

The parameters to configure in this section are the following:

- **Data Format**
  Format for publishing the acquired data in the MQTT broker. You can find more details in the following slides.

- **Array Management**
  Management of array type variables. Options: split into sub variables (`var_i`) or keep the array structure ([ ]).

- **Output Variables**
  List of the output RTDE variables that you want to acquire, separated by commas. If any variable entered is invalid, the app will skip its acquisition.

Deployment

There are two output data formats:

1. **Edge Databus**: the data will keep the *General Common Payload Format* defined by Siemens for its Industrial Edge ecosystem.

   It is recommended that you choose this format if you need to access the data from other Siemens Edge applications such as *IIH Essentials* or *Performance Insight*.

   Example of format output:

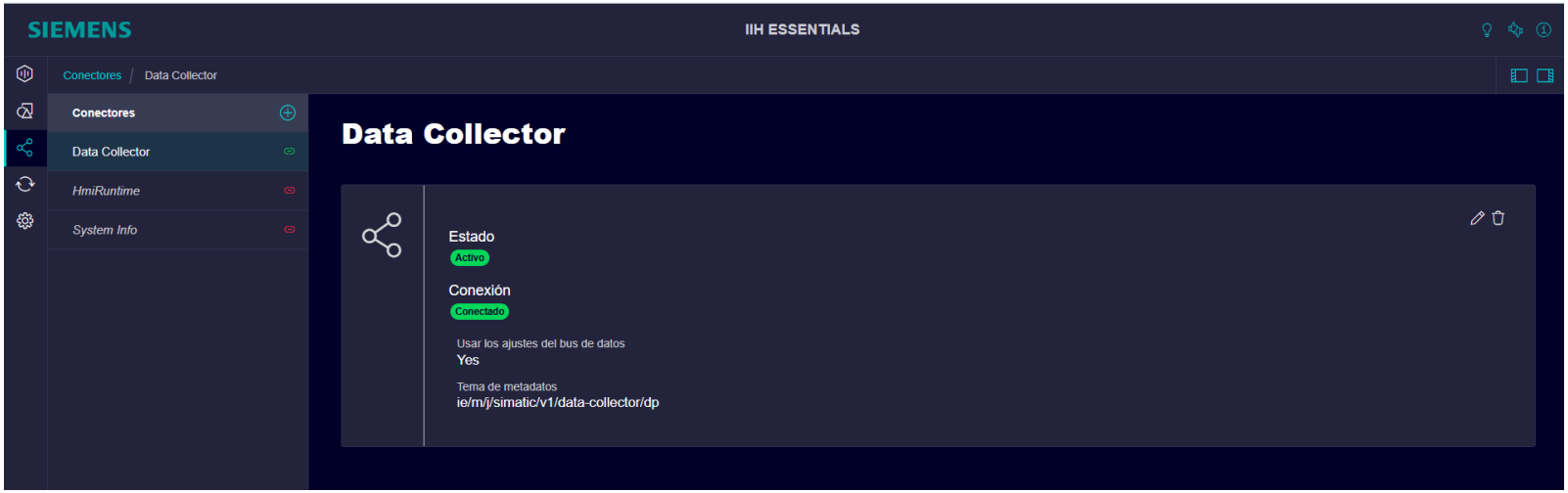
```
"seq": 856413,
    "vals": [{
            "id": "52074206",
            "ts": "2025-01-16T13:10:41.428963Z",
            "qc": 3,
            "val": 88682.516
        }, {
            "id": "9347705",
            "ts": "2025-01-16T13:10:41.428963Z",
            "qc": 3,
            "val": 6.282103538513184
        },
[…]
```

Deployment

There are two output data formats:

1. **Edge Databus**: the data will keep the *General Common Payload Format* defined by Siemens for its Industrial Edge ecosystem.

   By selecting this format, you will be able to configure the connector in *IIH Essentials*:

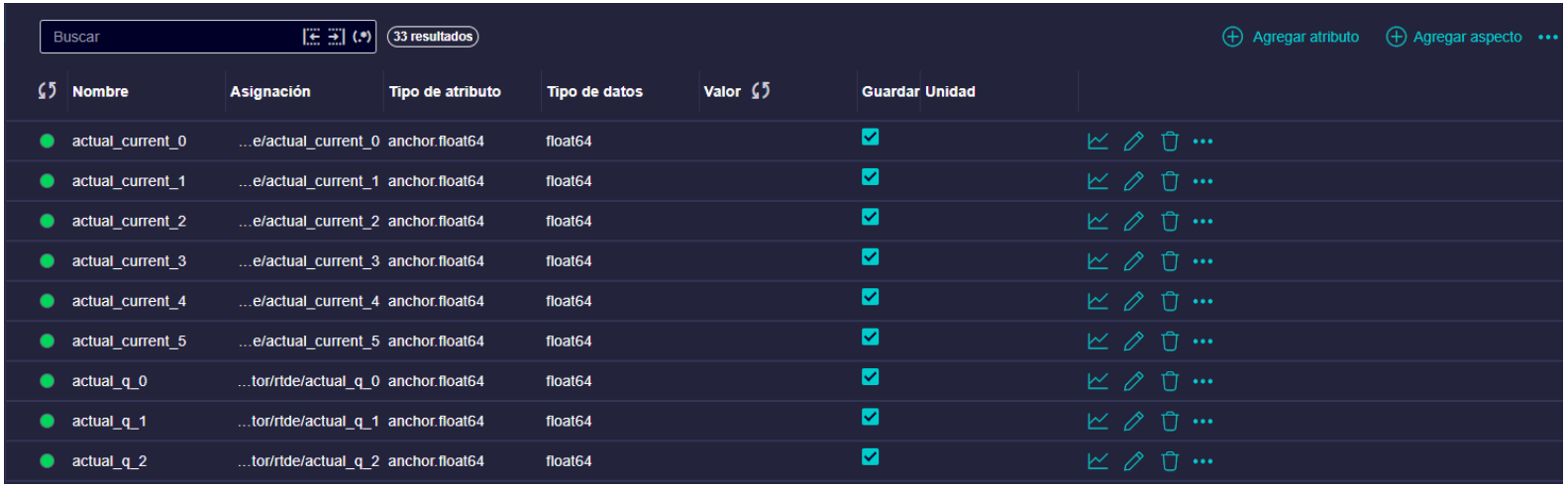


Deployment

There are two output data formats:

1. **Edge Databus**: the data will keep the *General Common Payload Format* defined by Siemens for its Industrial Edge ecosystem.

   With the connector configured, you will be able to access the acquired variables:



Nombre	Asignación	Tipo de atributo	Tipo de datos	Valor	Guardar	Unidad
actual_current_0	...e/actual_current_0	anchor.float64	float64		☑	
actual_current_1	...e/actual_current_1	anchor.float64	float64		☑	
actual_current_2	...e/actual_current_2	anchor.float64	float64		☑	
actual_current_3	...e/actual_current_3	anchor.float64	float64		☑	
actual_current_4	...e/actual_current_4	anchor.float64	float64		☑	
actual_current_5	...e/actual_current_5	anchor.float64	float64		☑	
actual_q_0	...tor/rtde/actual_q_0	anchor.float64	float64		☑	
actual_q_1	...tor/rtde/actual_q_1	anchor.float64	float64		☑	
actual_q_2	...tor/rtde/actual_q_2	anchor.float64	float64		☑	

Deployment

There are two output data formats:

2. **Standard JSON**: the data will keep a generic format in JSON.

   It is recommended to choose this format if you do not require access to the data from other Siemens Edge applications and prefer to use a simpler format.

   Example of format output:


```
{
    "timestamp": 89118.178,
    "actual_q": [6.2821035385131, -1.57420315498011, -2.8888568817383, -1.825336597485, 3.15438242698975, 3.13578104972936],
    "target_q": [6.2821273803094, -1.5742098370016, -2.88887476108154, -1.82534231207484, 3.15437125966797, 3.13581609795215],
    "safety_status": 1
}
```

Overview

FAQ

Where can I check the list of RTDE variables?

FAQ

You can consult the updated list of variables available for the RTDE (*Real-Time Data Exchange*) protocol from the official guide published by Universal Robots:

Name	Type	Comment	Introduced in version
timestamp	DOUBLE	Time elapsed since the controller was started [s]	
target_q	VECTOR6D	Target joint positions	
target_qd	VECTOR6D	Target joint velocities	
target_qdd	VECTOR6D	Target joint accelerations	
target_current	VECTOR6D	Target joint currents	
target_moment	VECTOR6D	Target joint moments (torques)	

Note that some variables are only available from certain robot software versions — `5.x.x` for e-Series models and `3.x.x` for CB-Series models—, as well as others are exclusive to e-Series.

FAQ

Is it possible to add my own variables to RTDE?

FAQ

Although it is not possible to add variables to RTDE beyond those specified in the official guide published by Universal Robots, some of the variables are available for general user purposes.

These general purpose variables can be used from the robot program or from another external RTDE connection, thus allowing additional information accessible from the RTDE protocol to be incorporated.

Some of the variables available for this use are the following:

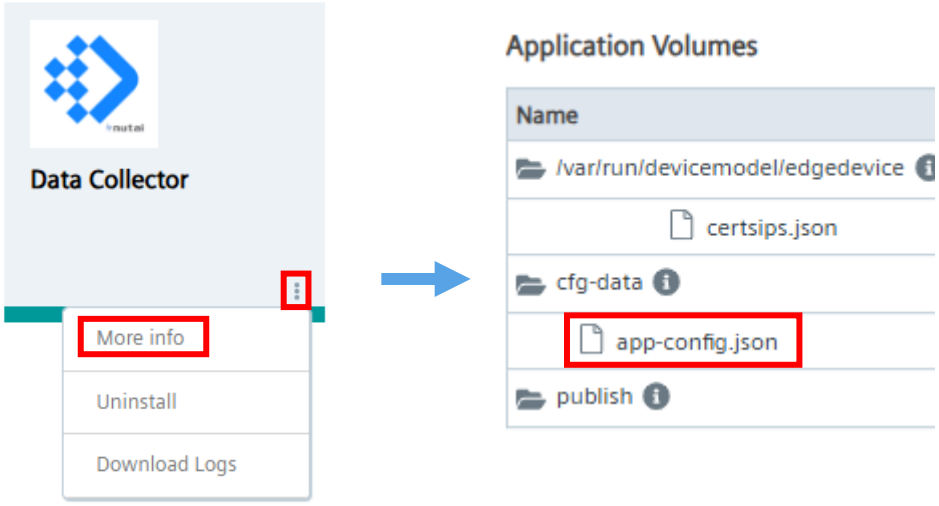
- `output_bit_register_{64..127}`: boolean type variables
- `output_int_register_{0..47}`: integer type variables
- `output_double_register_{0..47}`: double type variables

FAQ

How can I verify the deployed configuration?

FAQ

To verify the configuration deployed to a device, access the application details from the IED access and download the *app-config.json* file:

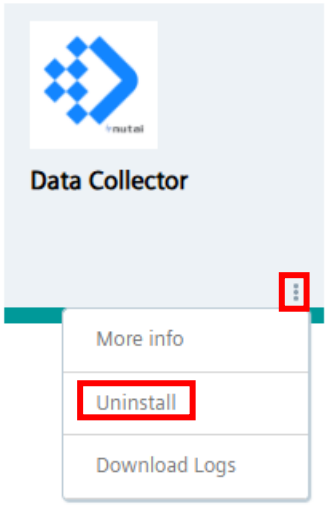


FAQ

How can I download the app log record?

FAQ

To obtain the log record of the deployed app —where you can check possible connection errors, for example—, download it from the IED access:




```
{"log":"2024-01-16 11:16:29,582 - root - INFO - read_rtde_conf_variables(458) - Robot variables configuration
{"log":"2024-01-16 11:16:29,699 - root - INFO - mqtt_on_connect(129) - MQTT connection success: ie-databus\n"
{"log":"2024-01-16 11:16:29,699 - root - INFO - mqtt_publish_metadata(309) - MQTT published metadata topic ie
{"log":"2024-01-16 11:16:29,700 - root - INFO - mqtt_publish_statusdata(334) - MQTT published statusdata topi
{"log":"2024-01-16 11:16:30,101 - root - INFO - rtde_connect(403) - RTDE connection success: 172.26.0.228\n",
{"log":"2024-01-16 11:16:30,102 - rtde - INFO - get_controller_version(129) - Controller version: 5.14.5.0\n"
{"log":"2024-01-16 11:16:30,103 - rtde - INFO - send_start(186) - RTDE synchronization started\n","stream":"s
```

Overview

Support

For further information, please contact:

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