optimize! softing

CONFIGURATION GUIDE

How to Use *PRTG* for Condition Montoring with *SIMATIC S7* Controllers

data FEED®

Industrial

Table of Contents

1. Preliminary Remarks

This configuration guide provides a step-by-step guide for setting up a condition monitoring solution for *SIMATIC S7* controllers. It includes a Softing Industrial gateway product as well as the Paessler *PRTG* Network Monitor product.

The overall architecture is shown in the following diagram.

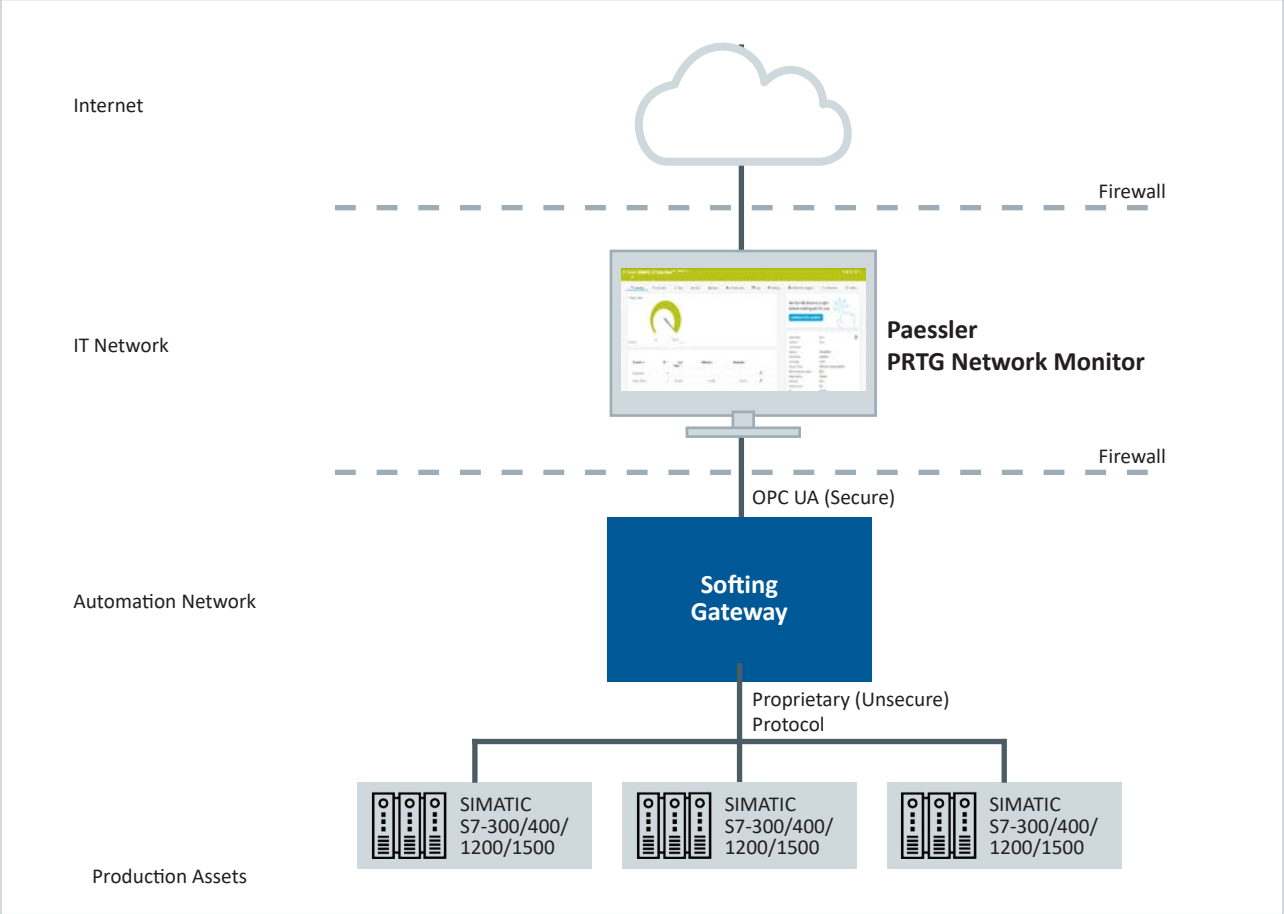


Figure:
Condition Monitoring Solution Architecture

Here the data integration is performed by the Softing gateway: It accesses the production data as collected by the *SIMATIC S7* controllers via a proprietary and unsecure protocol and provides an OPC UA interface for a simple and secure exchange of this data. The OPC UA sensors of *PRTG* are especially targeted to industrial environments and allow to implement an IIoT (Industrial Internet of Things) condition monitoring application by reading controller data via the Softing gateway.

The presented scenarios describe the individual configuration steps necessary to set up *PRTG* condition monitoring for the Softing gateway products ***uaGate SI***, ***dataFEED OPC Suite*** or ***edgeConnector Siemens***. The resulting application will allow to monitor the value of the data item *DB_5.Timer_10ms*, the gateway as well as the controller status and the controller certificate.

NOTE:

The described condition monitoring solution requires:

- One *SIMATIC S7* controller
- Availability of Softing hardware or software gateway
- *PRTG* Network Monitor installation
- In addition the free-of-charge ***dataFEED OPC UA Demo Client*** product is used to provide the required information for accessing individual gateway data items.

NOTE:

Additional information regarding the used Softing gateways can be found at the according product web pages.

- ***uaGate SI:*** https://industrial.softing.com/products/gateways/gateways-for-access-of-controller-data/uagate-si.html
- ***dataFEED OPC UA Suite Extended***: https://industrial.softing.com/products/opc-opc-ua-software-platform/opc-server-middleware/datafeed-opc-suite-extended.html
- ***dataFEED OPC UA Suite Base***: https://industrial.softing.com/products/opc-opc-ua-software-platform/opc-server-middleware/datafeed-opc-suite-base.html
- ***edgeConnector Siemens:*** https://industrial.softing.com/products/docker/edgeconnector-siemens.html

NOTE:

All showcased Softing products (as well as further OPC UA compatible Softing products) can be integrated in the *PRTG* monitoring application. *PRTG* allows managing entire factory floors or sites with a higher number of OPC UA Servers (whether hardware gateway, software or container application).

2. Setting Up *SIMATIC S7* Condition Monitoring Using *uaGate SI*

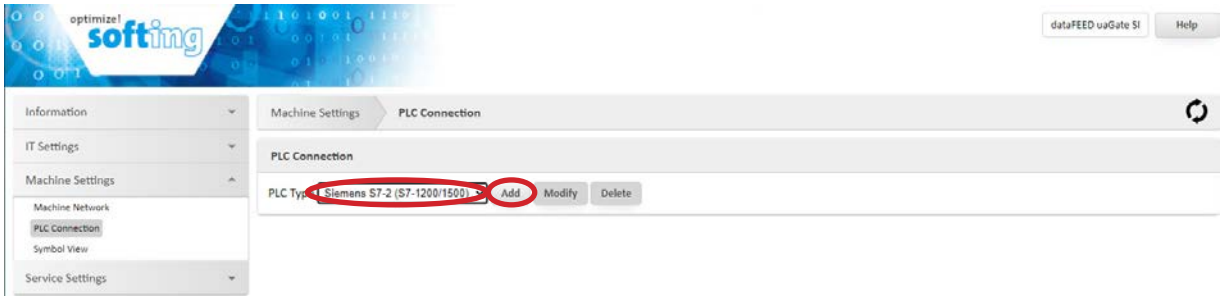
uaGate SI is a Softing hardware gateway, providing access to Siemens *SIMATIC S7 300/400/1200/1500* controllers. It enables integration of this data via the OPC UA and MQTT standards. Physically separated Ethernet interfaces bundled with individual configuration rights for the automation and IT networks protect against unauthorized access.

2.1 Configure *uaGate SI* for Accessing *SIMATIC S7* Data

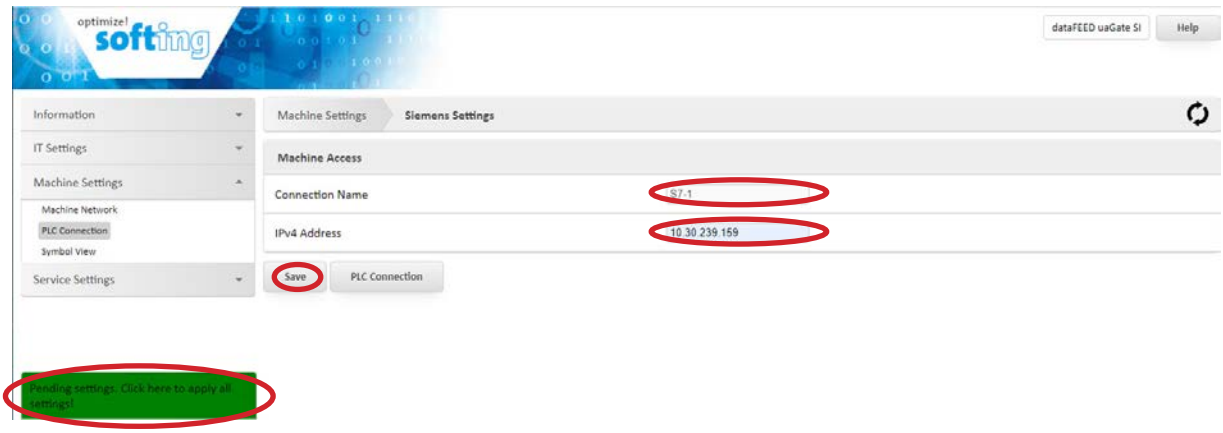
- Ensure that the *SIMATIC S7* controller is running and that ***uaGate SI*** is properly installed with its *MACHINE* and *IT* networks connected
- Start ***uaGate SI*** configuration by entering its IP address in the connected Internet browser
- Enter username and password

  NOTE:
  The default username is ***administrator***, the default password is *administrator*.

- Navigate to *Machine Settings/PLC Connection*



- Select appropriate *PLC Type*
- Press ***Add*** button



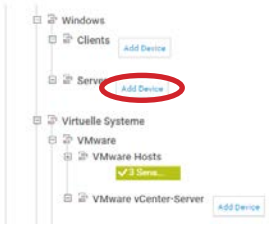
- Enter unique *Connection Name*
- Enter *IPv4 Address* of *SIMATIC S7*
- Press *Save* button
- Press green P*ending settings* button at bottom left to apply all settings

NOTE:
uaGate SI only supports connecting one *SIMATIC S7* controller.

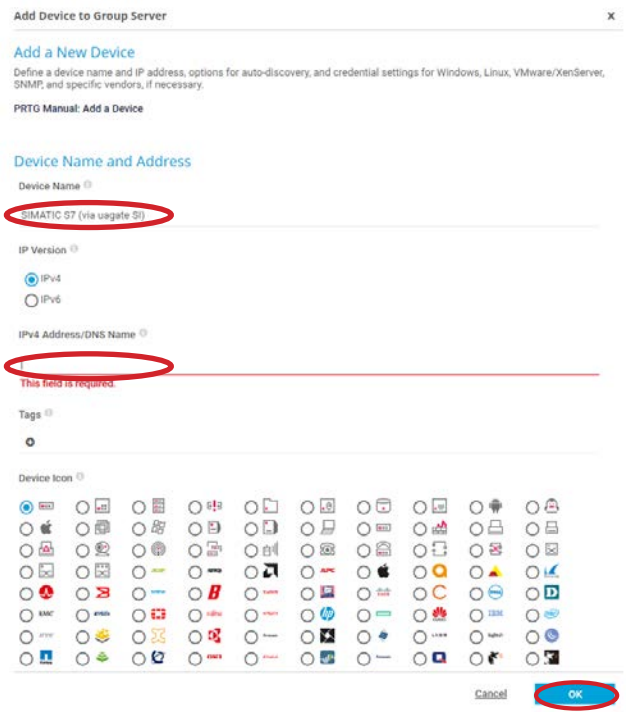
2.2 Configure *PRTG* for Accessing *uaGate SI* Data

- Start *PRTG*, select *Devices* menu item and select a device group

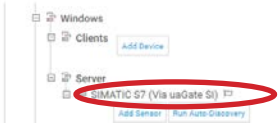
NOTE:
See Paessler website https://www.paessler.com/support/how-to/device-tree for more information regarding setting up a device tree.



Click *Add Device* link



- Enter *Device Name*
- Enter *IPv4 Address* of ***uaGate SI***
- Press *OK* button

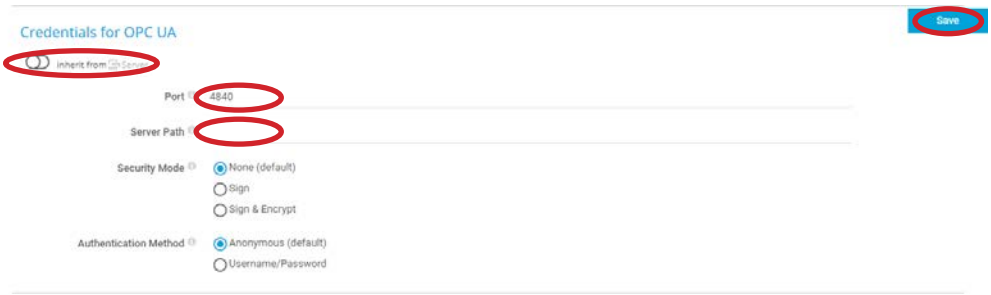


- Click on name of added device

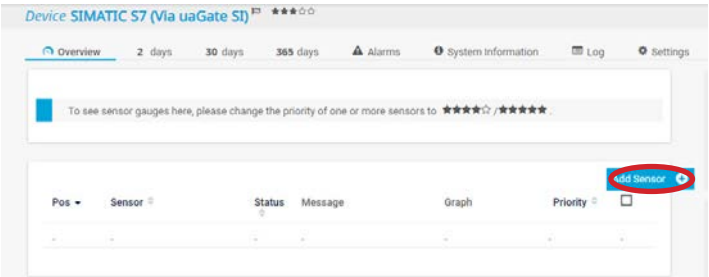
- In ***uaGate SI*** configuration, navigate to *IT Settings/OPC UA Sensor*

- Copy IPv4 adress and port number

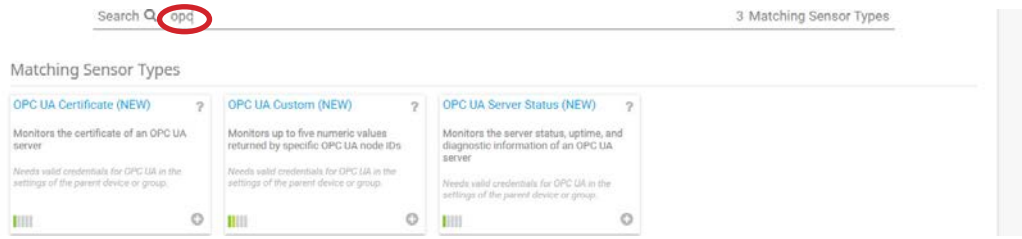
- In PRTG, select Settings menu item and scroll down to Credentials for OPC UA section



- Make sure the *inherit from* switch is deactivated
- Enter port number from ***uaGate SI*** configuration in *Port* field
- Enter IPv4 address from ***uaGate SI*** configuration in *Server Path* field
- Press *Save* button
- Select *Overview* menu item for added device



Press *Add Sensor* button



- Enter *opc* in *Search* field

  NOTE:

  PRTG supports three types of OPC UA sensors:

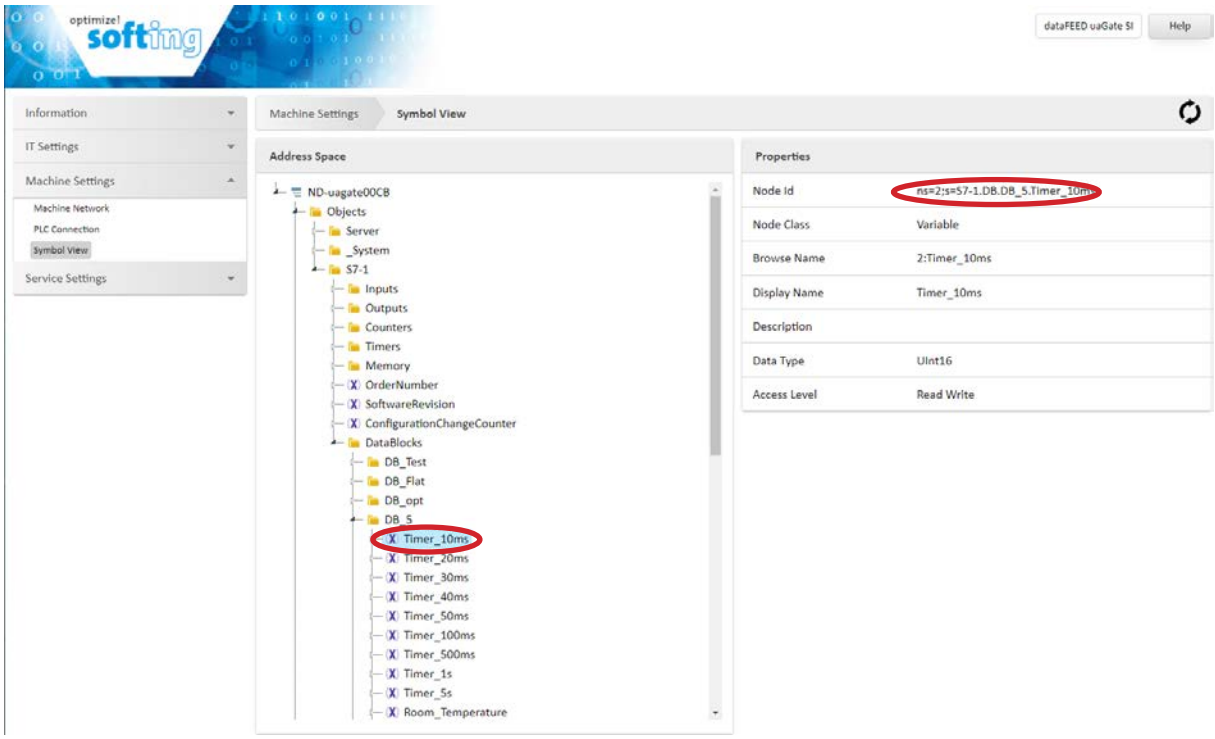
  - *OPC UA Custom* for monitoring the numeric value of data items via the OPC UA protocol
  - *OPC UA Server Status* for monitoring the status and diagnostic information of an OPC UA Server
  - *OPC UA Certification* for monitoring the certification of an OPC UA Server

  NOTE:

  In following this configuration guide describes the selection and usage of all three types of *PRTG* OPC UA sensors for working with the ***uaGate SI*** gateway.

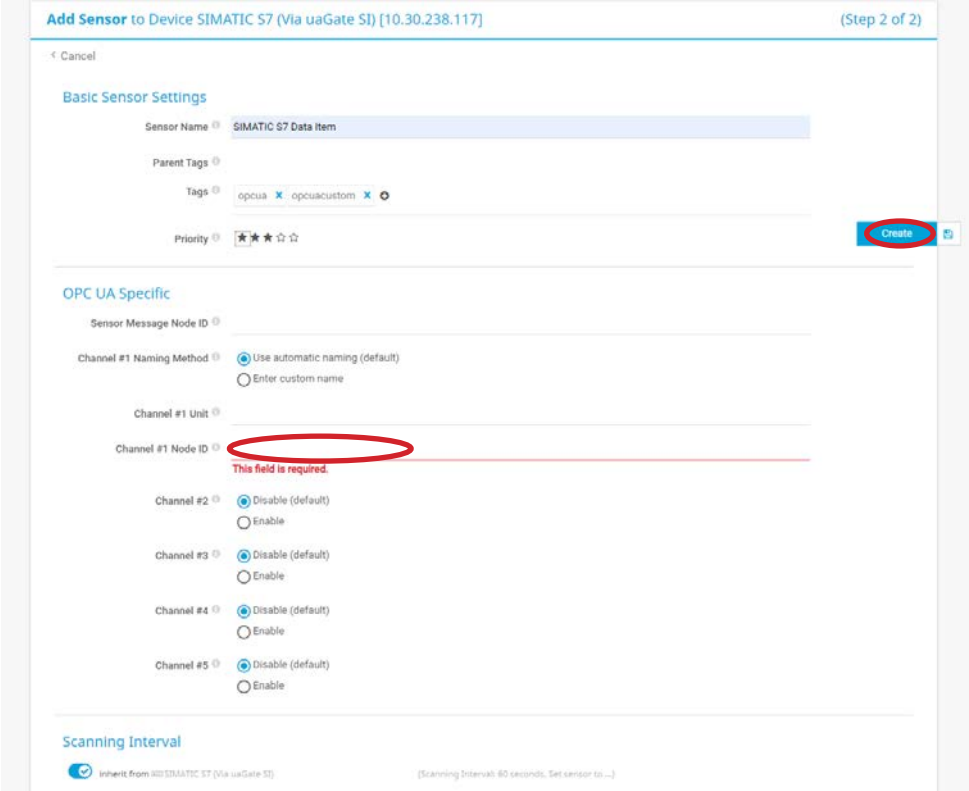
2.2.1 Monitor Data Item Value in *PRTG*

- In *PRTG*, select *OPC UA Custom* sensor
- In ***uaGate SI*** configuration, navigate to *Machine Settings/Symbol View*

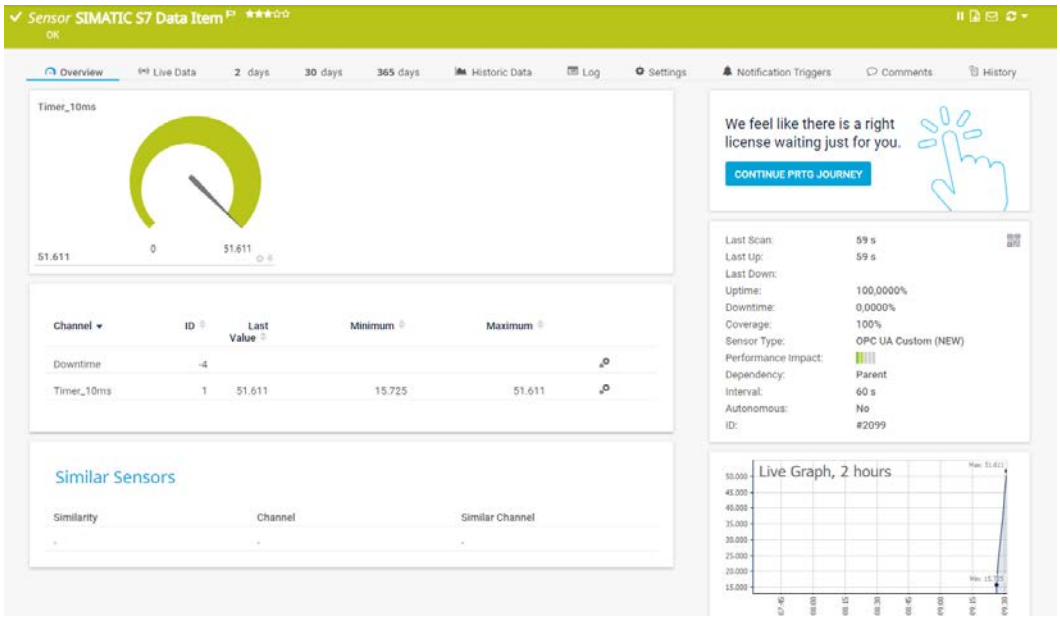


- Select *DB_5.Timer_10ms* in *Adress Space* tree view
- Copy *Node Id* in *Properties* area

- Continue in *PRTG*



- Enter node ID from ***uaGate SI*** configuration in *Channel #1 Node Id* field
- Press *Create* button
- Click added sensor



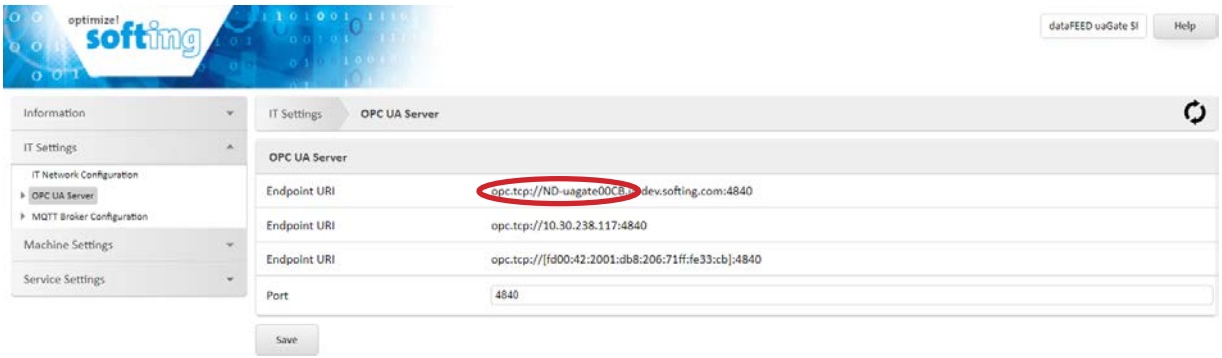
The value of the *DB_5.Timer_10ms* data item is shown in the *PRTG* dashboard.

2.2.2 Monitor *SIMATIC S7* Controller Status in *PRTG*

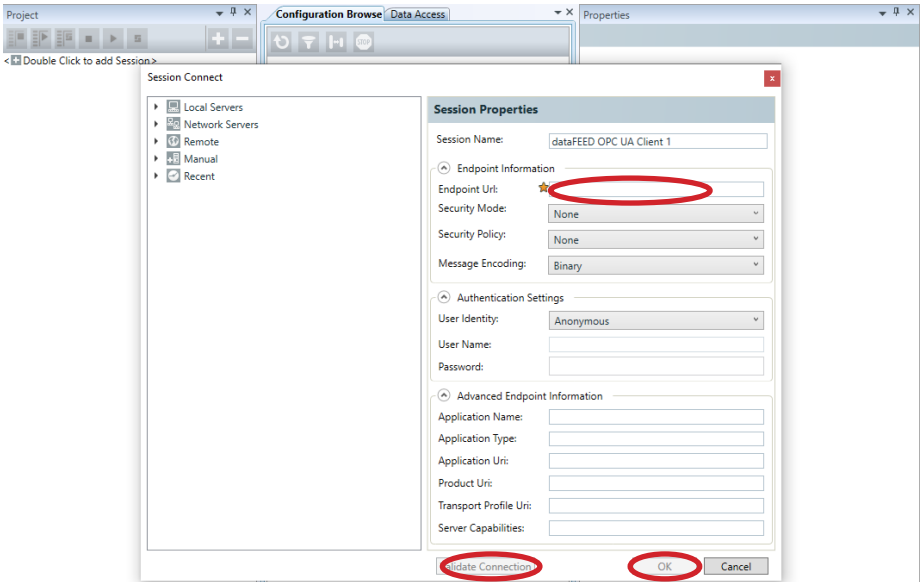
NOTE:

Acessing the diagnostic information of an OPC UA Server requires the *Objects/Server/ServerDiagnostics/EnabledFlag* node to be set to *TRUE*. This node is automatically set to *FALSE* after each start of the OPC UA Server.

- In *PRTG*, select *OPC UA Custom* sensor
- In ***uaGate SI*** configuration, navigate to *IT Settings/OPC UA Sensor*

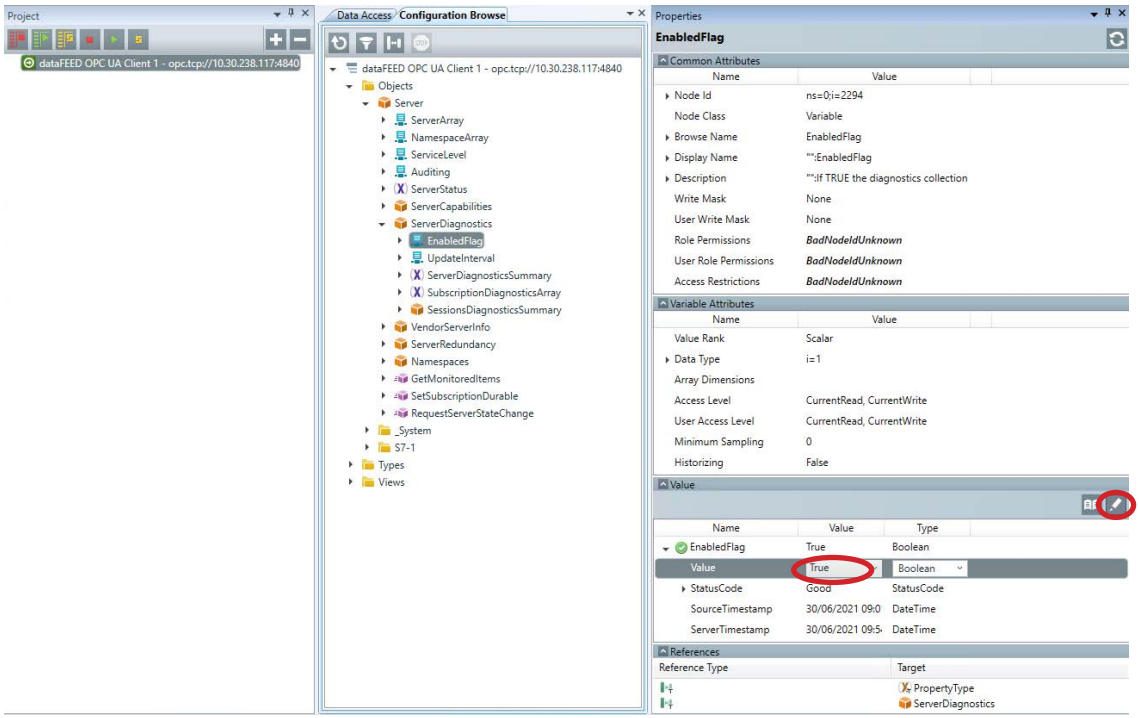


- Copy *Endpoint URI*
- Start ***dataFEED OPC UA Demo Client***
- Create a new session by double-clicking at *Project* root

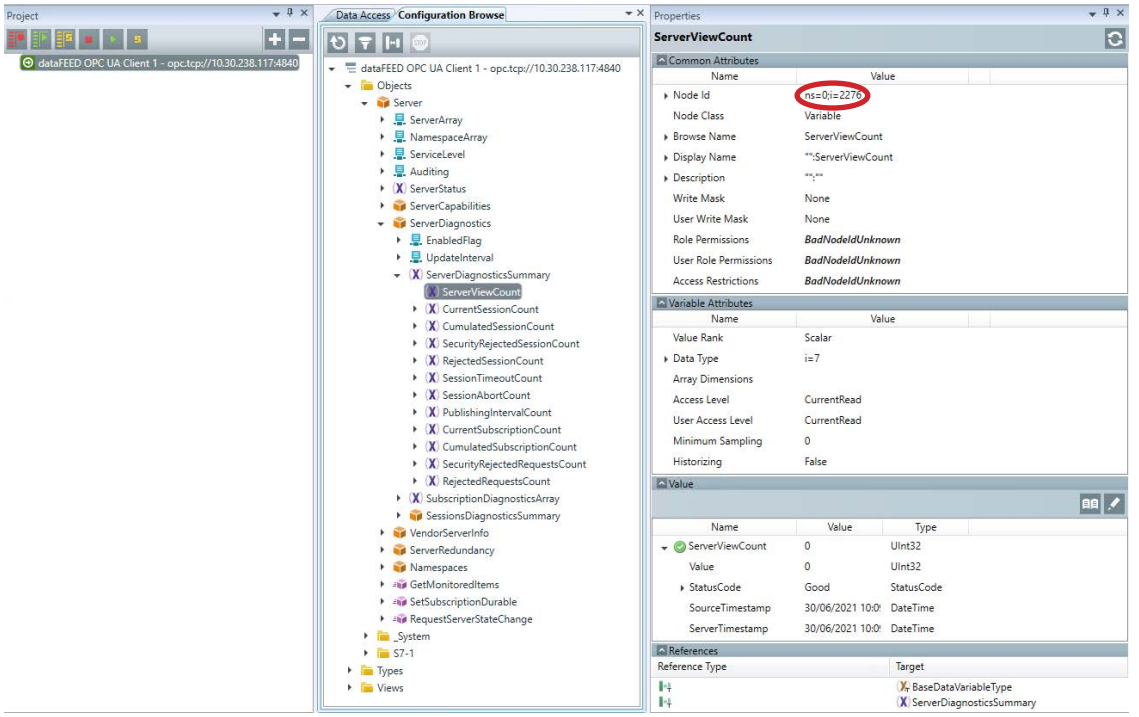


- Enter endpoint Url from ***uaGate SI*** configuration in *Endpoint Url* field
- Press *Validate Connection* button to validate that the connection to ***uaGate SI*** is working
- Press *OK* button

- Expand *Configuration Browse* tree and select *Objects/Server/ServerDiagnostics/EnabledFlag* node

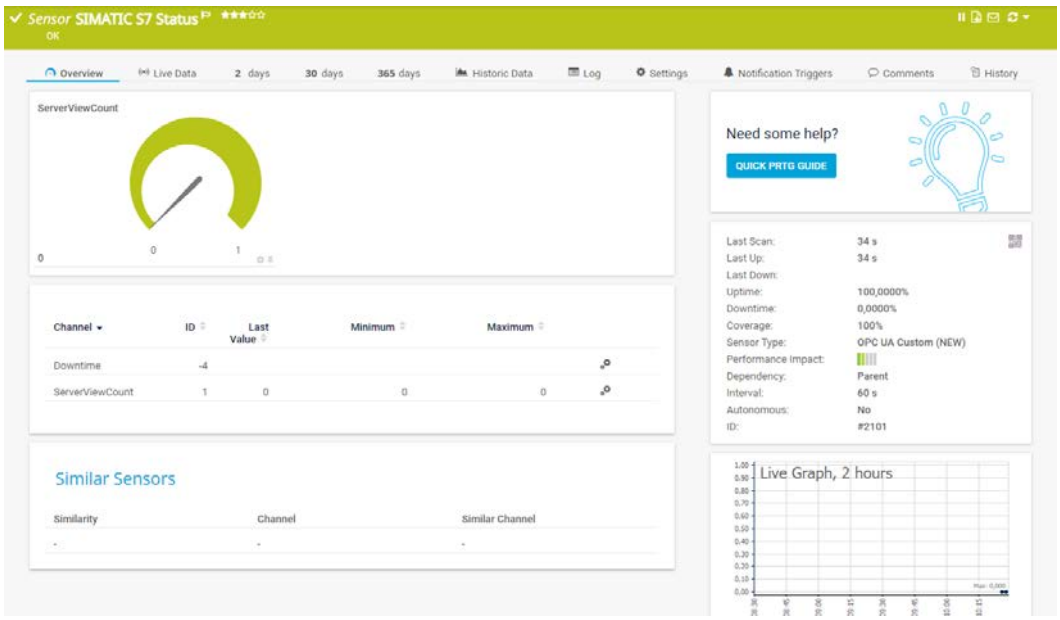


- Set value of *Objects/Server/ServerDiagnostics/EnabledFlag* node to *TRUE*
- Press *Write* button
- In *Configuration Browse* tree, select any interesting controller diagnostics information for monitoring, e.g. *Objects/Server/ServerDiagnostics/ServerDiagnosticSummary/ServerViewCount* node



- Copy *Node Id*

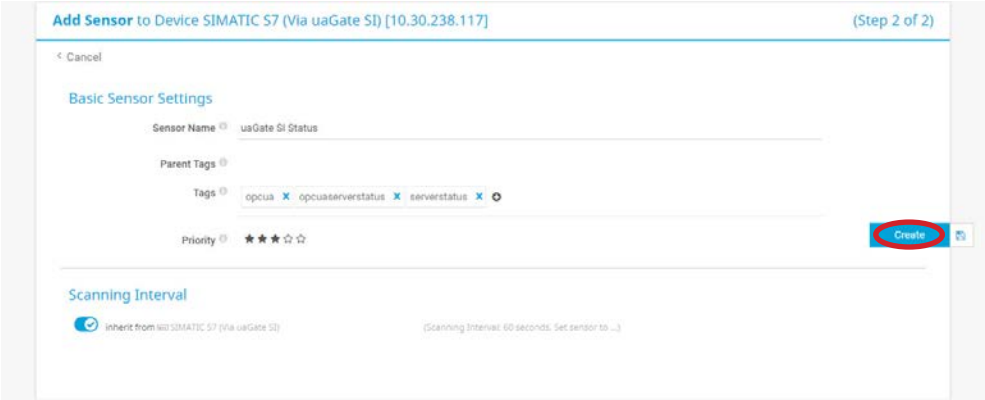
- In *PRTG*, enter node ID from ***dataFEED OPC UA Demo Client*** configuration in *Channel #1 Node Id* field
- Press *Create* button
- Click added sensor



The *SIMATIC S7* controller status is shown in the *PRTG* dashboard.

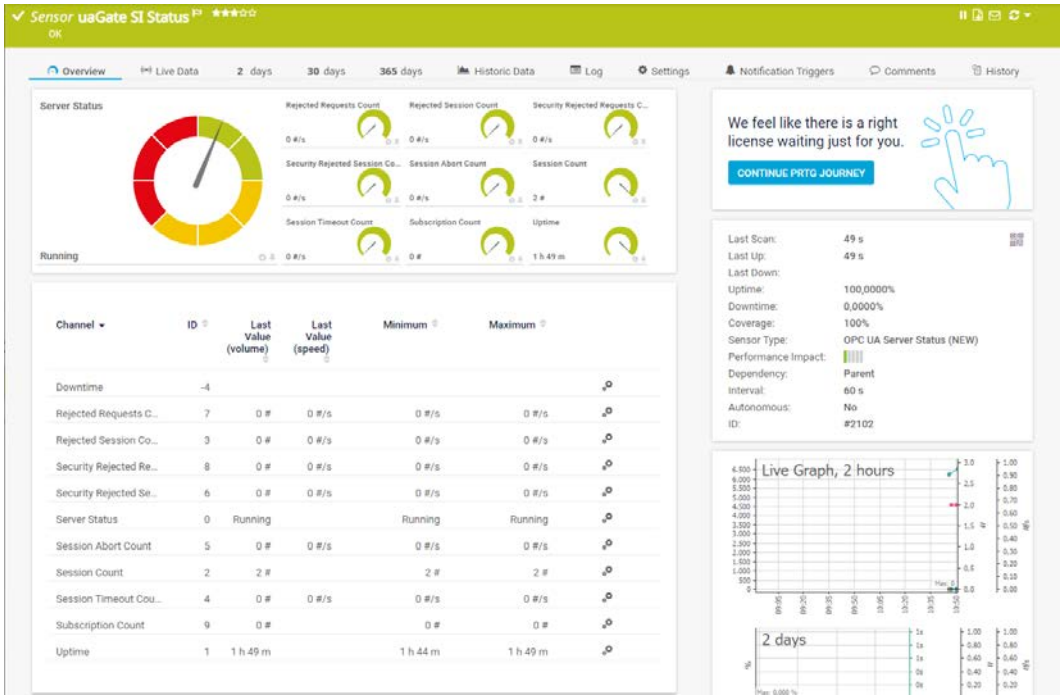
2.2.3 Monitor *uaGate SI* Status in *PRTG*

- In *PRTG*, select *OPC UA Status* sensor



Press *Create* button

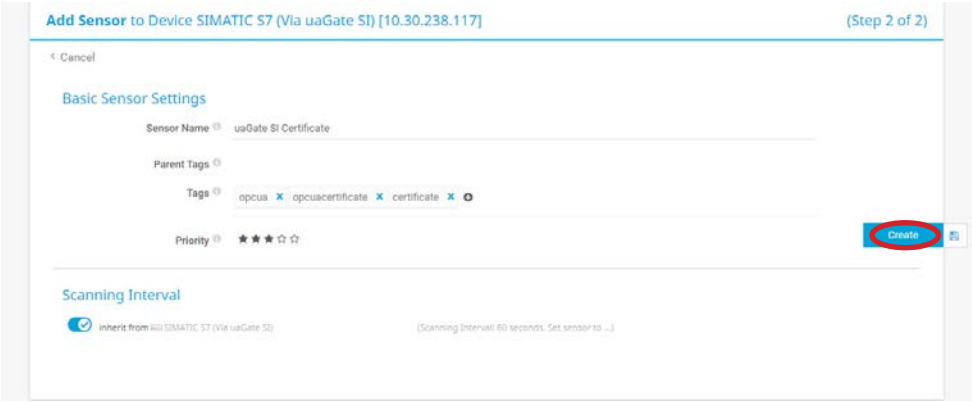
Click added sensor



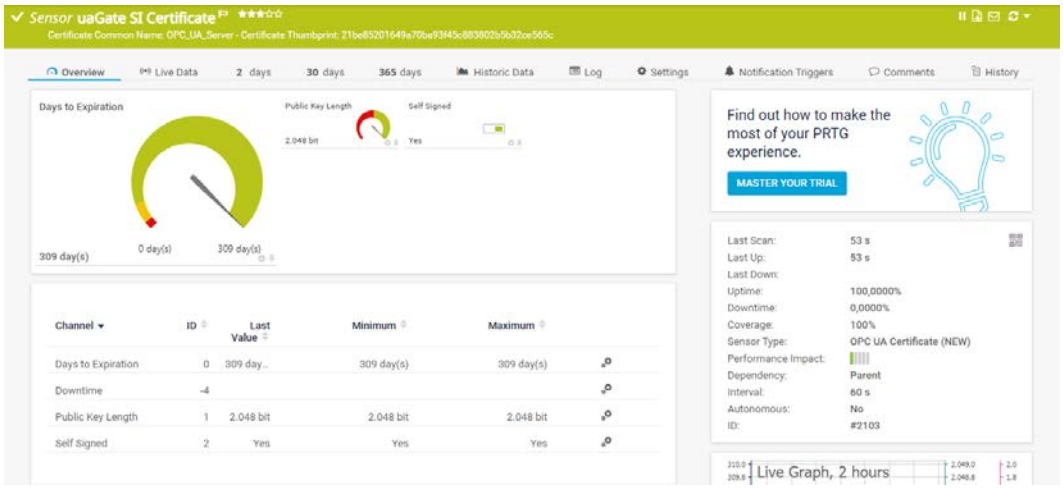
The ***uaGate SI*** status is shown in the *PRTG* dashboard.

2.2.4 Monitor *uaGate SI* Certification Information in *PRTG*

- In *PRTG*, select *OPC UA Certificate* sensor



- Press *Create* button
- Click added sensor



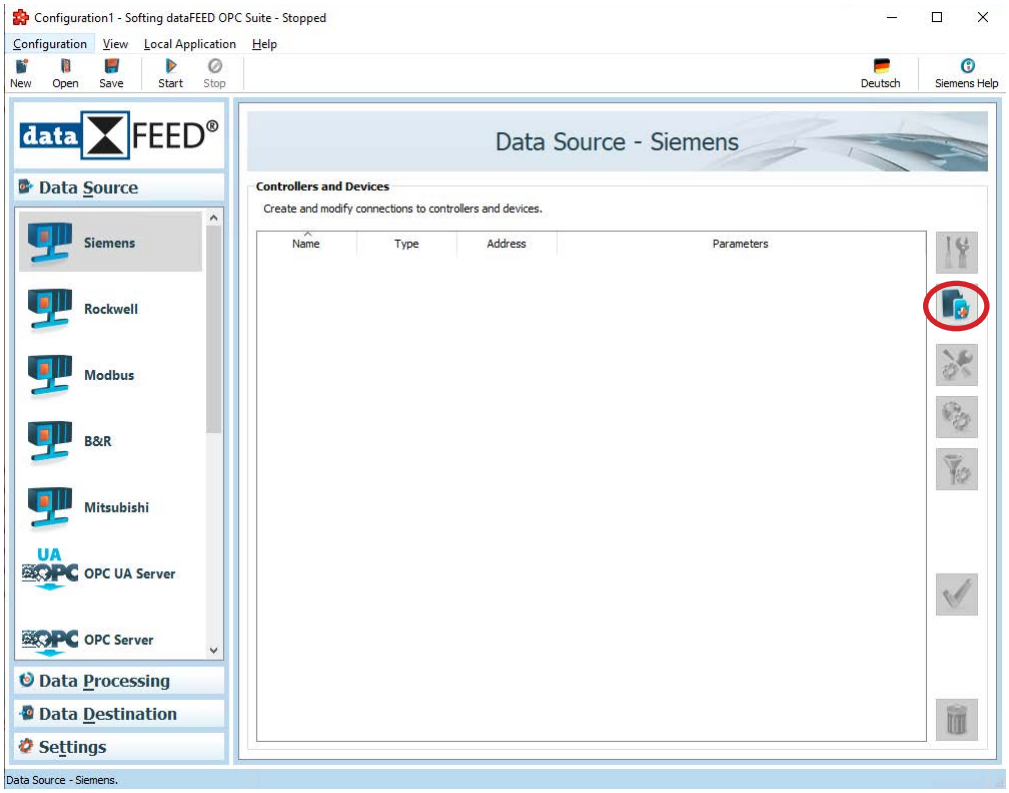
The ***uaGate SI*** certifation information is shown in the *PRTG* dashboard.

3. Setting Up *SIMATIC S7* Condition Monitoring Using *dataFEED OPC Suite*

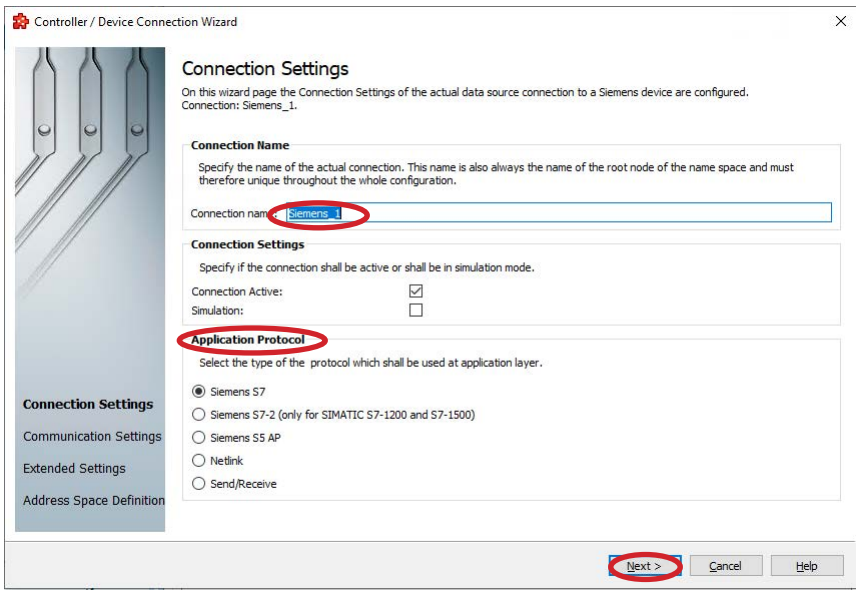
dataFEED OPC Suite is Softing's bestselling software gateway combining OPC data integration and IoT cloud connectivity in a single product. Via its integrated OPC UA Server including Store And Forward functionality it provides a secure and reliable access to PLCs of all leading manufacturers, including Siemens *SIMATIC S7* controllers. Besides an extensive OPC UA support ***dataFEED OPC Suite*** also provides the MQTT and REST standards for implementing cloud or big data applications. It allows to perform powerful data preprocessing and integrates the storage of production data in files or databases.

3.1 Configure *dataFEED OPC Suite* for Accessing *SIMATIC S7* Data

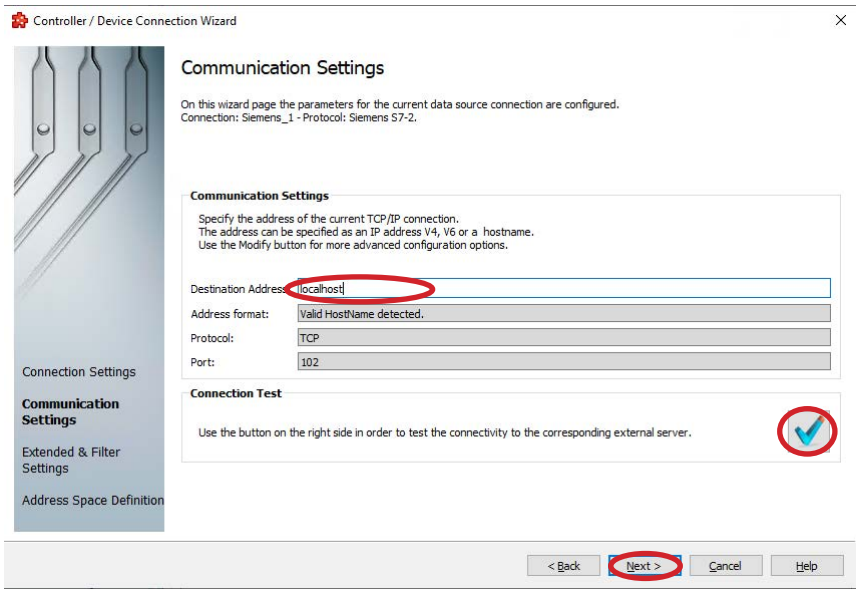
- Ensure that the *SIMATIC S7* controller is running and that ***dataFEED OPC Suite*** is properly installed
- Start ***dataFEED OPC Suite*** configurator
- Navigate to *Data Source/Siemens*



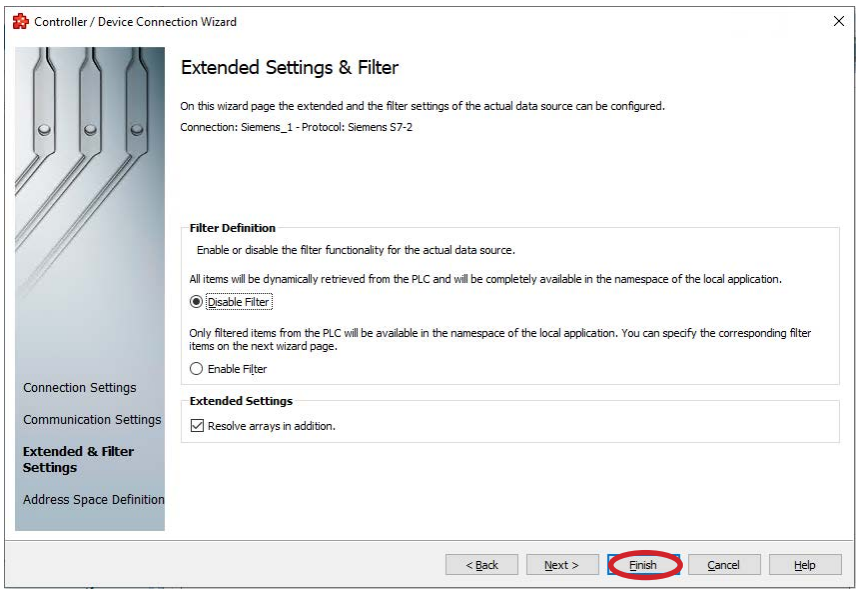
- Press  (*Add a new data source*) button



- Enter unique connection name in *Conenction name* field
- Select *Application Protocol* to be used for accessing *SIMATIC S7*
- Press *Next >* button

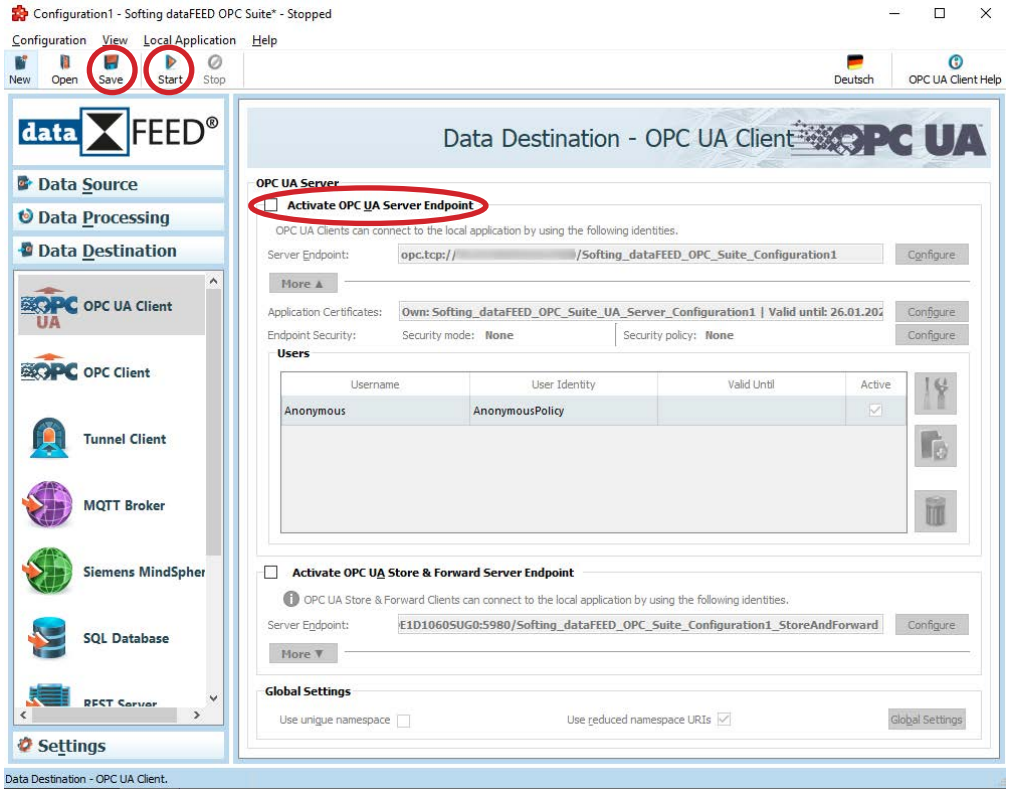


- Enter *SIMATIC S7* IP address in *Destination Address* field
- Press  (Execute connection test) button
- Press *Next >* button upon successful connection test



Press *Finish* button

Navigate to *Data Destination/OPC UA Client*



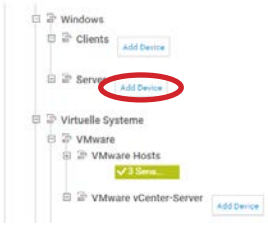
- Enable *Activate OPC UA Server Endpoint* checkbox
- Press Save (*Save*) button to store ***dataFEED OPC Suite*** configuration
- Press Start (*Start*) button to start ***dataFEED OPC Suite***

3.2 Configure *PRTG* for Accessing *dataFEED OPC Suite* Data

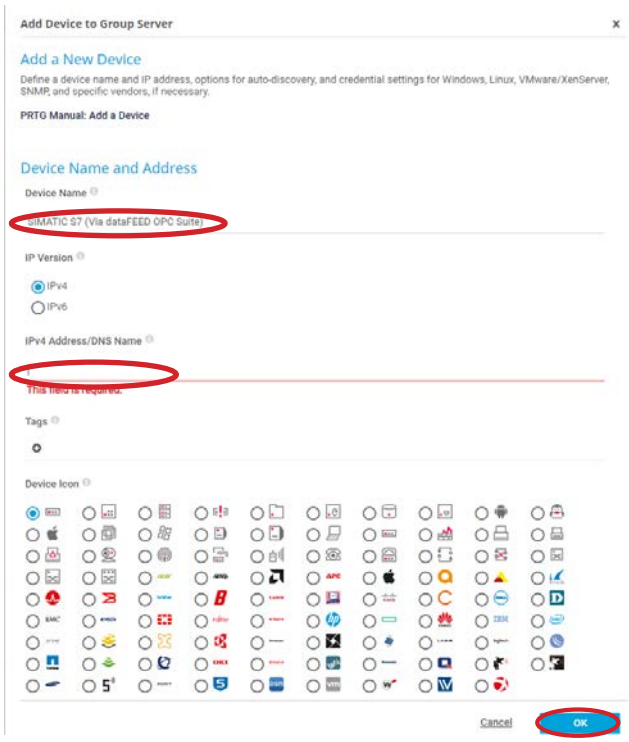
- Start *PRTG*, select *Devices* menu item and select a device group

  NOTE:

  See Paessler website https://www.paessler.com/support/how-to/device-tree for more information regarding setting up a device tree.

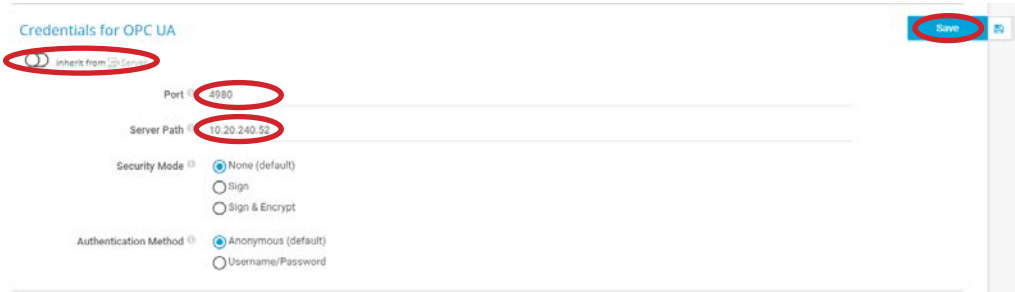


- Click *Add Device* link



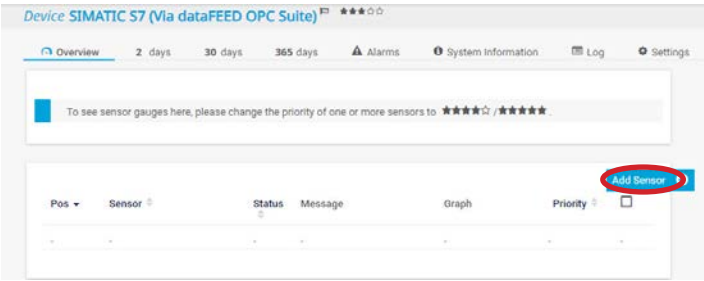
- Enter *Device Name*
- Enter *IPv4 Address* of host computer running ***dataFEED OPC Suite***
- Press *OK* button

- Click on name of added device
- Select *Settings* menu item and scroll down to *Credentials for OPC UA* section

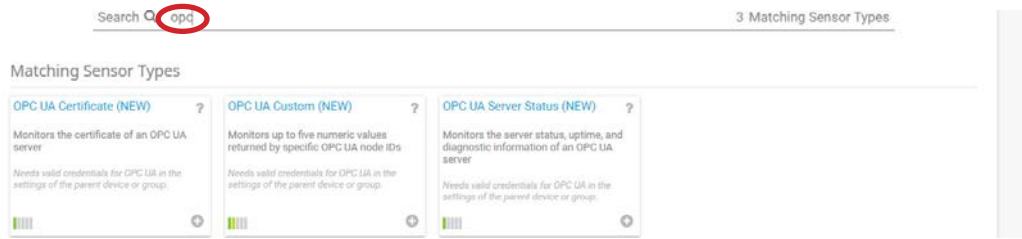


- Make sure the *inherit from* switch is deactivated
- Enter port number assigned by ***dataFEED OPC Suite*** in *Port* field
  (see generated server endpoint at *Data Destination/OPC UA Client* page)

  NOTE:
  The default ***dataFEED OPC Suite*** port number is *4980*.
- Enter IP address of host computer running ***dataFEED OPC Suite*** in *Server Path* field
- Press *Save* button
- Select *Overview* menu item for added device



- Press *Add Sensor* button

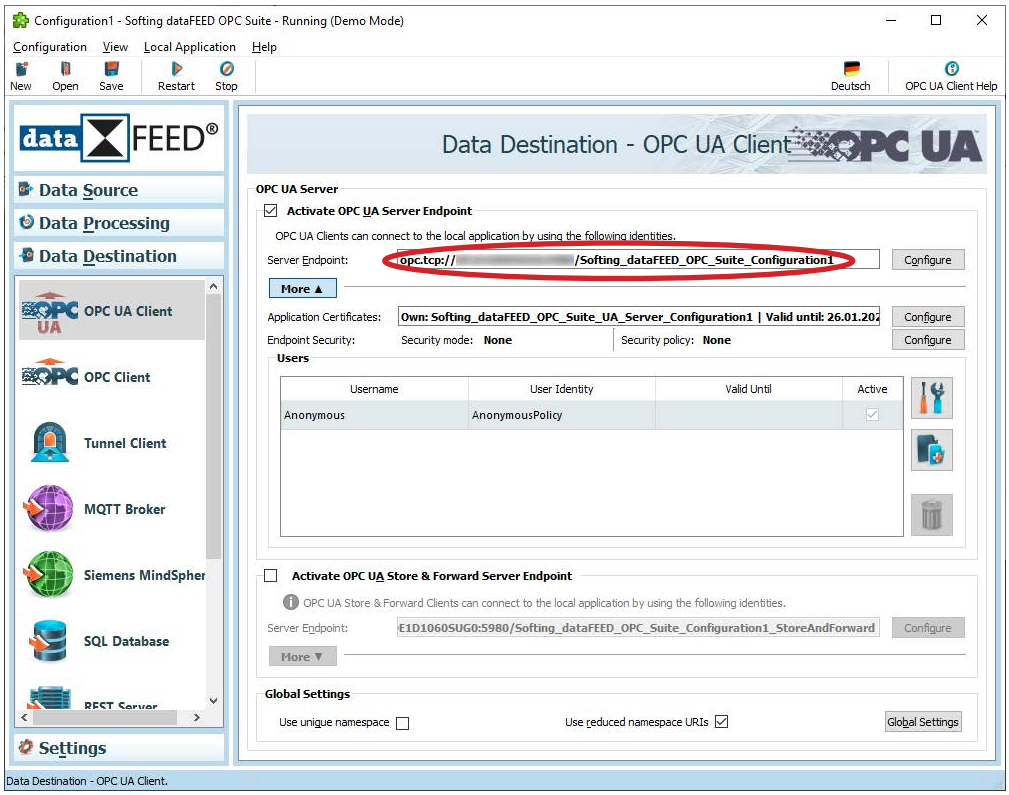


- Enter *opc* in *Search* field

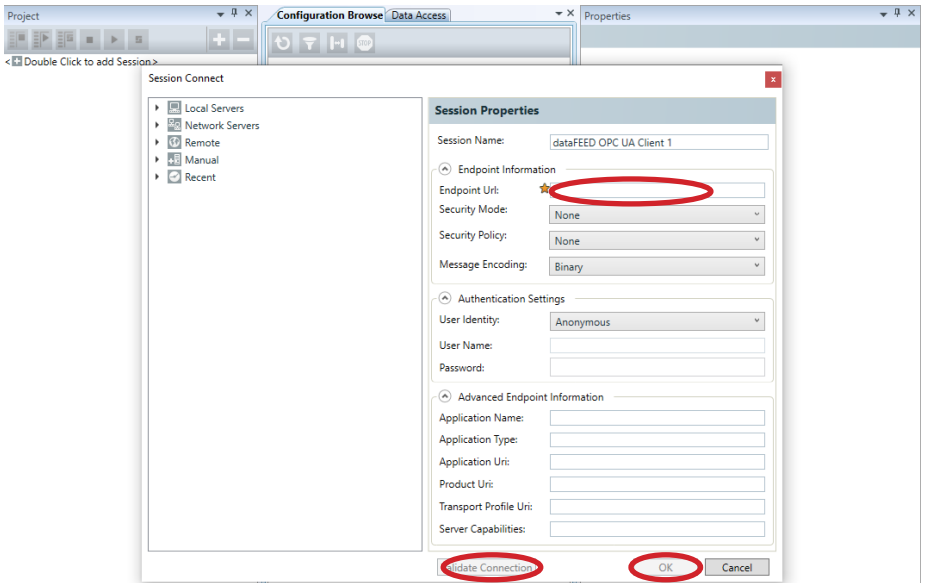
  NOTE:
  PRTG supports three types of OPC UA sensors:
  - *OPC UA Custom* for monitoring the numeric value of data items via the OPC UA protocol
  - *OPC UA Server Status* for monitoring the status and diagnostic information of an OPC UA Server
  - *OPC UA Certification* for monitoring the certification of an OPC UA Server

  NOTE:
  In following this configuration guide describes the selection and usage of all three types of *PRTG* OPC UA sensors for working with ***dataFEED OPC Suite***.

- In ***dataFEED OPC Suite*** configurator, navigate to *Data Destination/OPC UA Client*



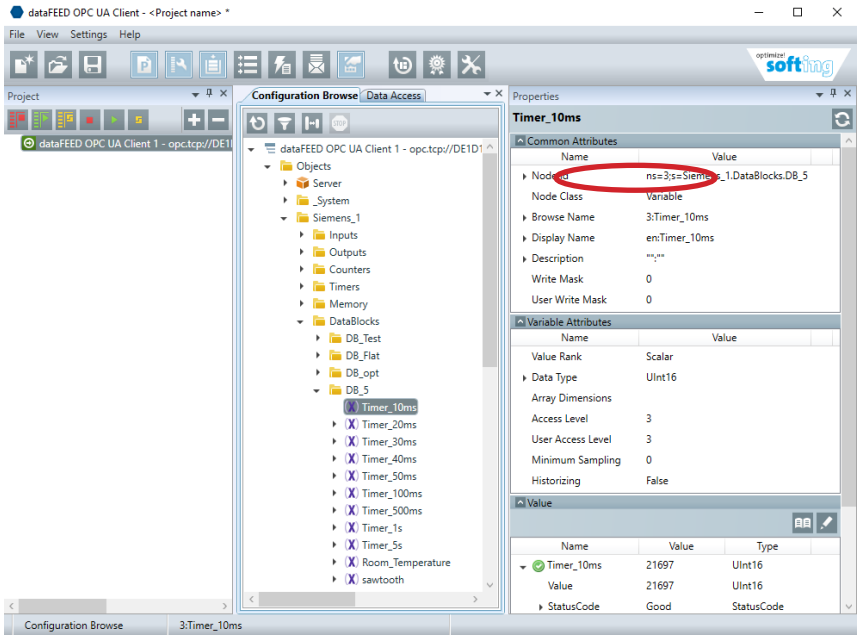
- Copy *Server Endpoint*
- Start ***dataFEED OPC UA Demo Client***
- Create a new session by double-clicking at *Project* root



- Enter endpoint Url from ***dataFEED OPC Suite*** configurator in *Endpoint Url* field
- Press *Validate Connection* button to validate that the connection to ***dataFEED OPC Suite*** is working
- Press *OK* button

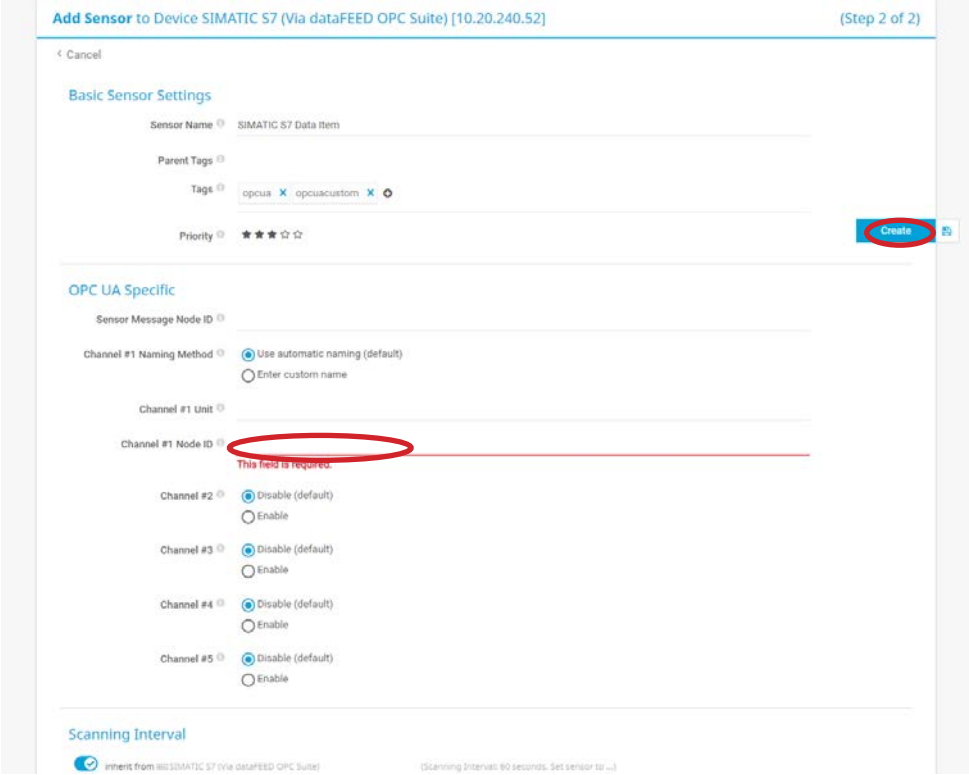
3.2.1 Monitor Data Item Value in *PRTG*

- In *PRTG*, select *OPC UA Custom sensor*
- In ***dataFEED OPC UA Demo Client***, expand *Configuration Browse* tree and select *DB_5.Timer_10ms*

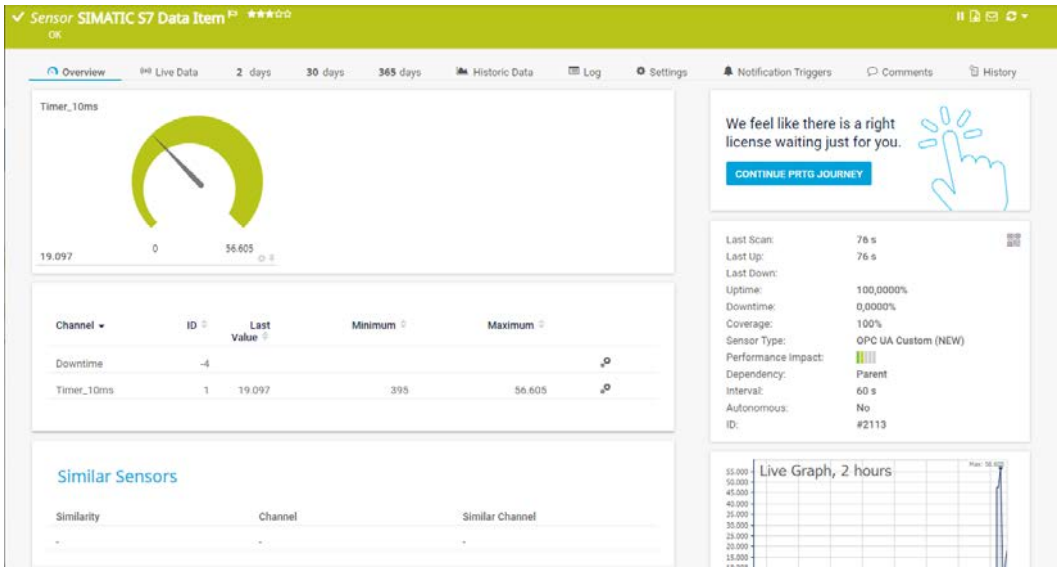


- Copy *Node Id* in *Properties* area

- Continue in *PRTG*



- Enter node ID from ***dataFEED OPC UA Demo Client*** in *Channel #1 Node Id* field
- Press *Create* button
- Click added sensor



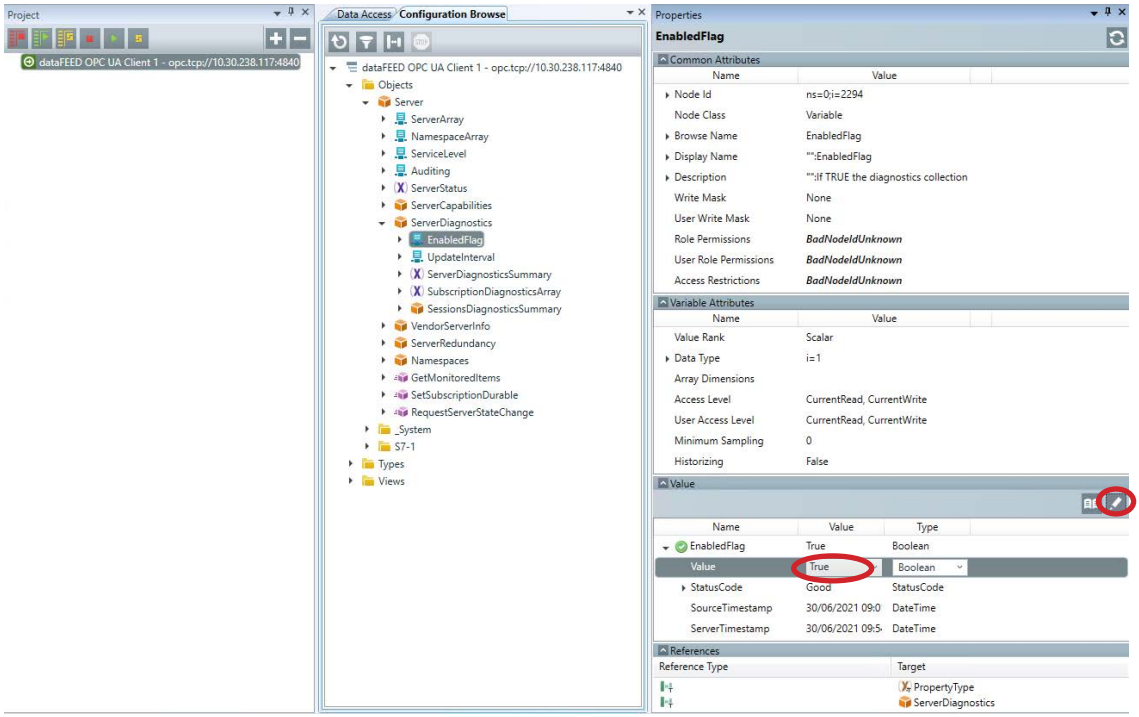
The value of the *DB_5.Timer_10ms* data item is shown in the *PRTG* dashboard.

3.2.2 Monitor *SIMATIC S7* Controller Status in *PRTG*

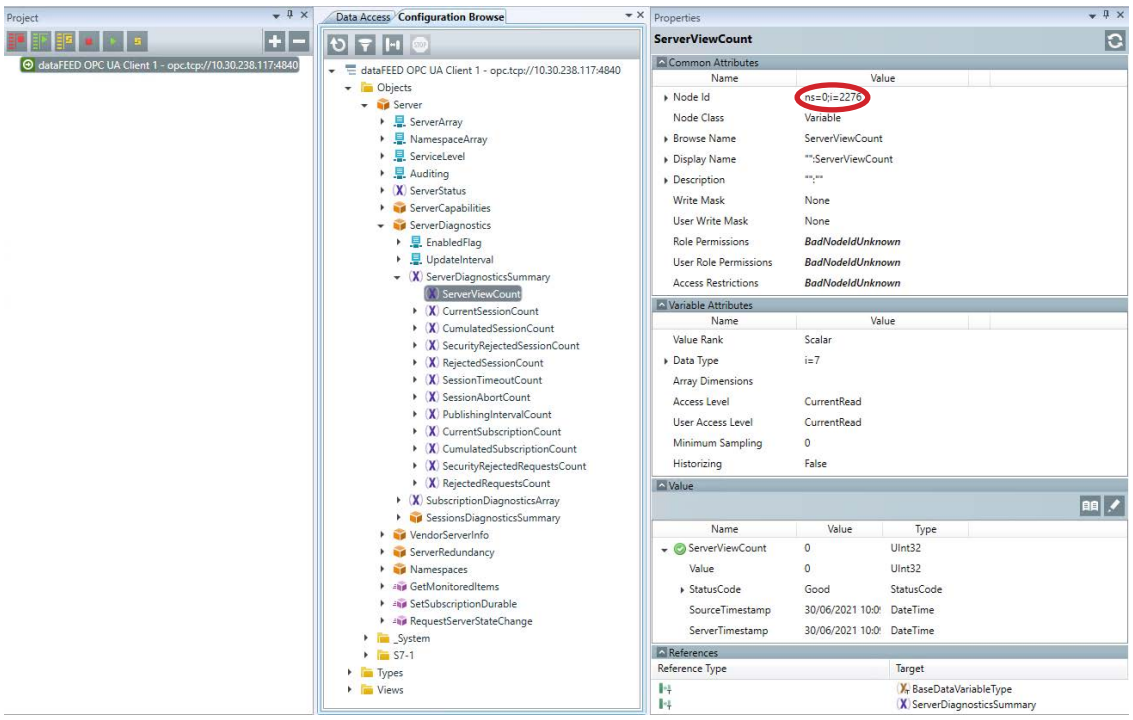
NOTE:

Acessing the diagnostic information of an OPC UA Server requires the *Objects/Server/ServerDiagnostics/EnabledFlag* node to be set to *TRUE*. This node is automatically set to *FALSE* after each start of the OPC UA Server.

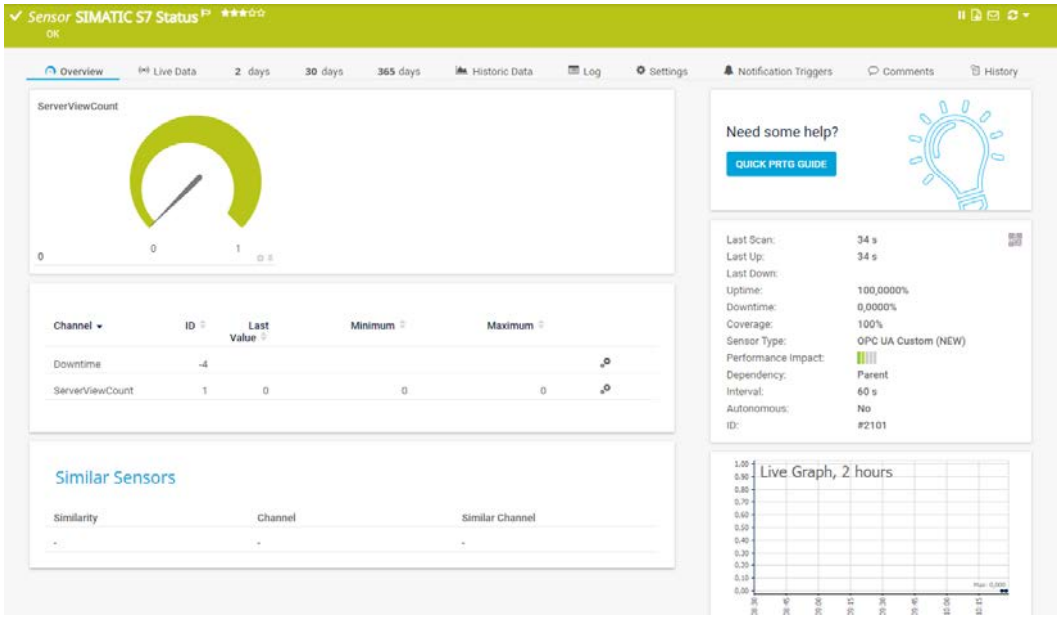
- In *PRTG*, select *OPC UA Custom* sensor
- In ***dataFEED OPC UA Demo Client***, select *Objects/Server/ServerDiagnostics/EnabledFlag* node in *Configuration Browse* tree



- Set value of *Objects/Server/ServerDiagnostics/EnabledFlag* node to *TRUE*
- Press *Write* button
- In *Configuration Browse* tree, select any interesting controller diagnostics information for monitoring, e.g. *Objects/Server/ServerDiagnostics/ServerDiagnosticSummary/ServerViewCount* node



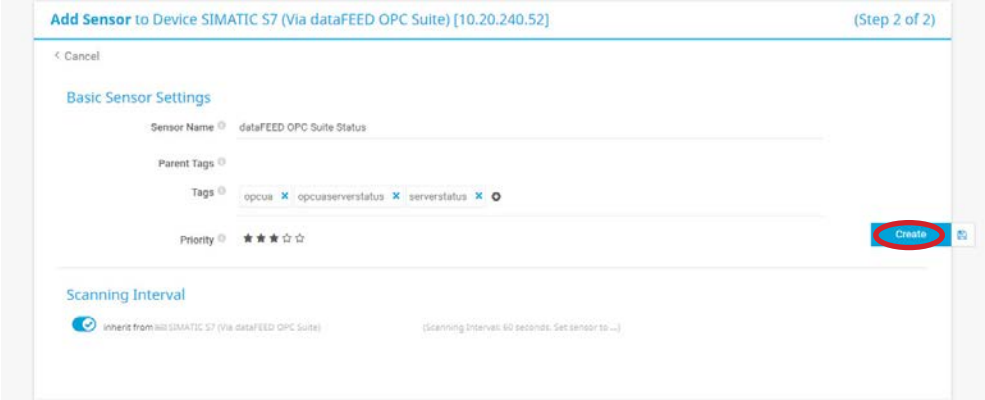
- Copy *Node Id*
- In *PRTG*, enter node ID from ***dataFEED OPC UA Demo Client*** configuration in *Channel #1 Node Id* field
- Press *Create* button
- Click added sensor



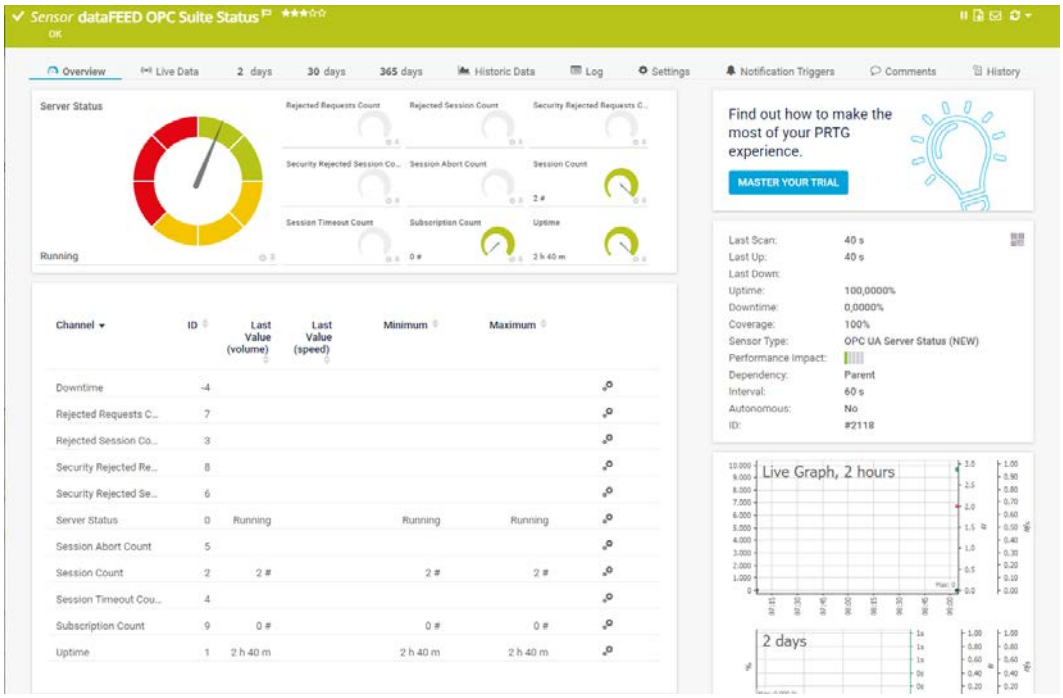
The *SIMATIC S7* controller status is shown in the *PRTG* dashboard.

3.2.3 Monitor *dataFEED OPC Suite* Status in *PRTG*

- In *PRTG*, select *OPC UA Status sensor*



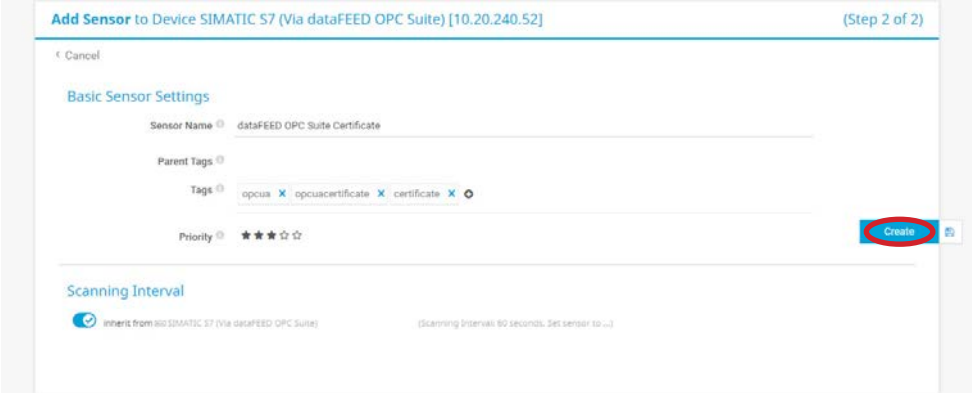
- Press *Create* button
- Click added sensor



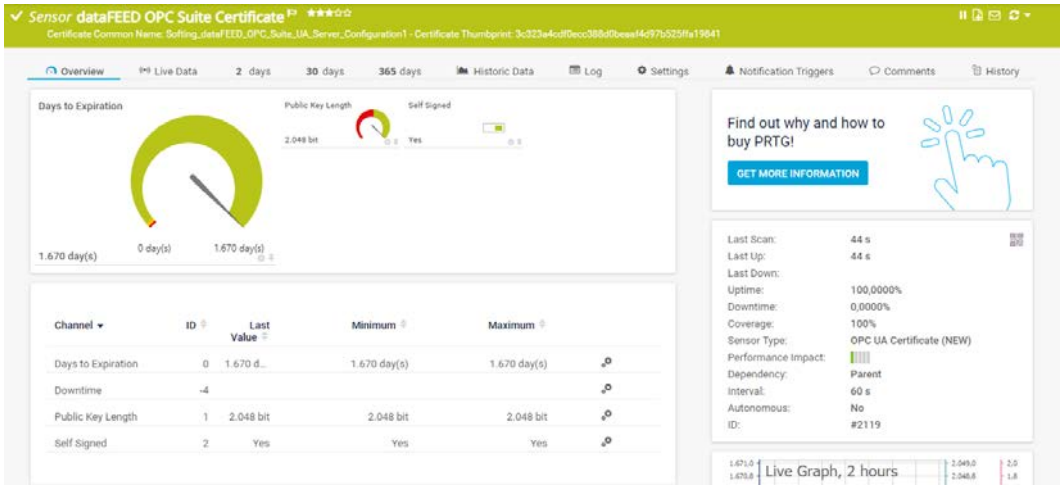
The ***dataFEED OPC Suite*** status is shown in the *PRTG* dashboard.

3.2.4 Monitor *dataFEED OPC Suite* Certification Information in *PRTG*

- In *PRTG*, select *OPC UA Certificate sensor*



- Press *Create* button
- Click added sensor



The ***dataFEED OPC Suite*** certification information is shown in the *PRTG* dashboard.

4. Setting Up *SIMATIC S7* Condition Monitoring Using *edgeConnector Siemens*

edgeConnector Siemens is Softing's container technolgy software gateway for connecting SIMATIC S7 controllers to IIoT applications . It provides OPC UA and MQTT interfaces combined with flexible deployment options for higher-level applications. It supports local as well as remote configuration and includes fine-tuned security settings.

4.1 Configure *edgeConnector Siemens* for Accessing *SIMATIC S7* Data

- Ensure that the *SIMATIC S7* controller is running and that *Docker Engine* is properly installed
- Proceed as described in following for deploying and starting ***edgeConnector Siemens*** at a Windows 10 system
  - Start *Docker Engine*
  - Pull latest ***edgeConnector Siemens*** docker image by entering

    ```
    docker image pull softingindustrial/edgeconnector-siemens:latest
    ```

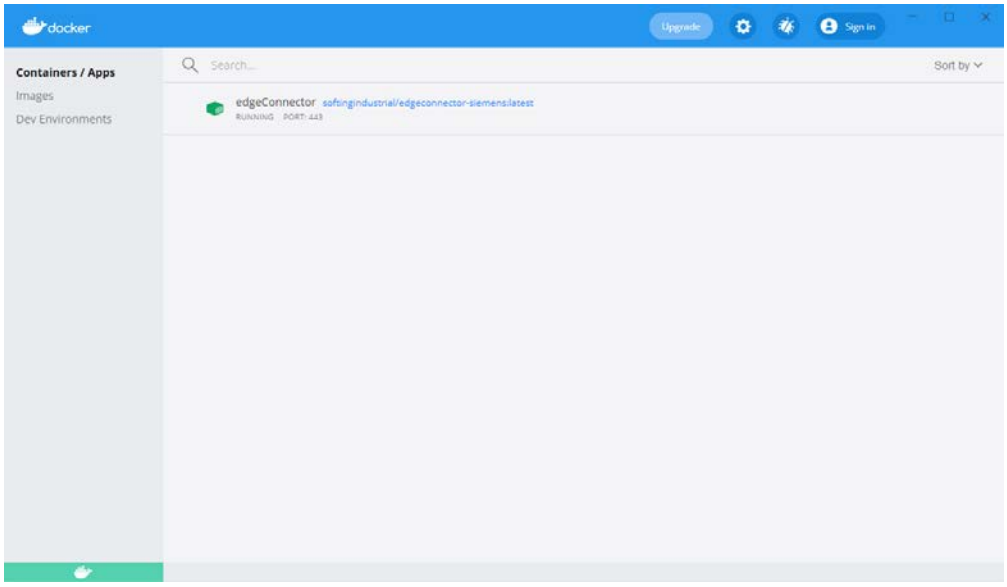
    in command-line terminal (e.g. PowerShell)
  - Start ***edgeConnector Siemens*** by entering

    ```
    docker container run -p 443:443 -p 8099:8099 -p 4897:4897 --name
    edgeConnector softingindustrial/edgeconnector-siemens:latest
    ```

    in command-line terminal

    NOTE:

    The command shown above starts ***edgeConnector Siemens*** with a 1:1 mapping of the default ports to the host machine.
- Open *Docker Desktop*



Docker Desktop shows that ***edgeConnector Siemens*** is running.

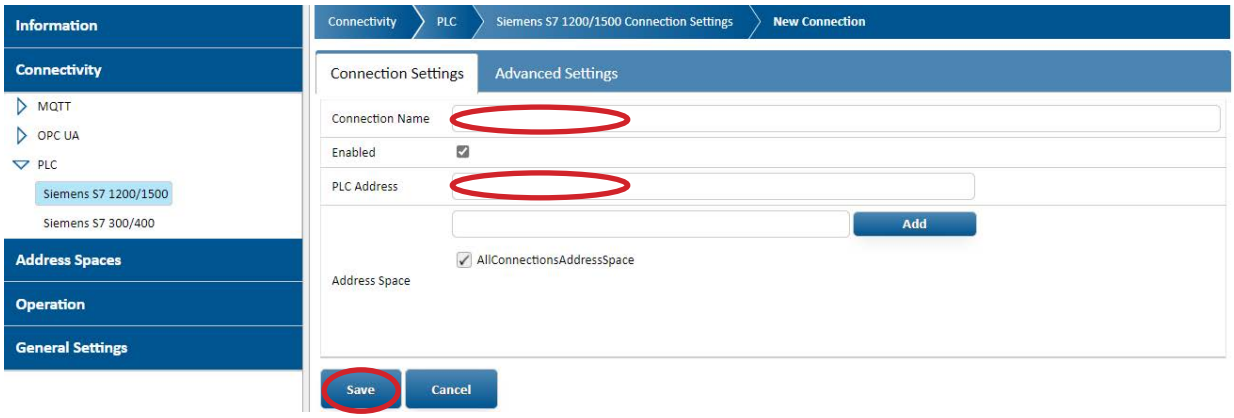
- Open ***edgeConnector Siemens*** by entering *localhost:8099* in the connected Internet browser
- Enter username and password

  NOTE:

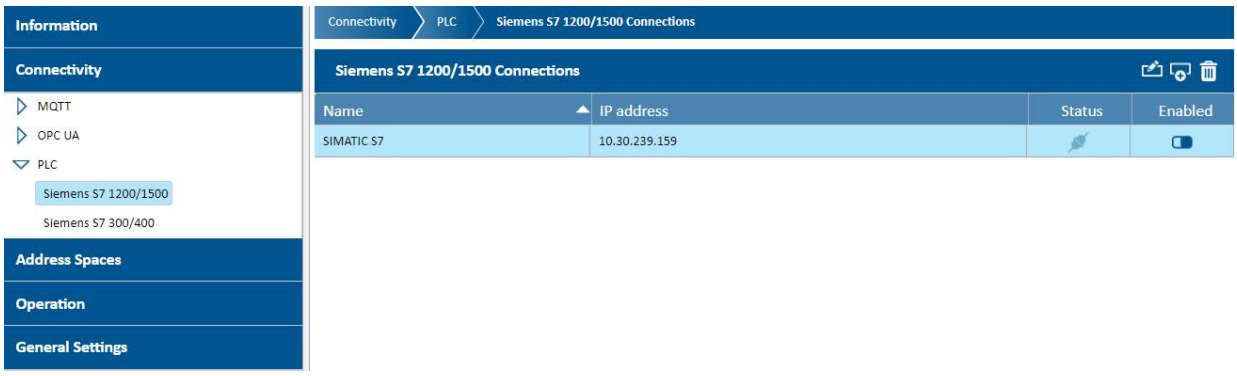
  The default username is *admin*, the default password is *admin*.

- Navigate to *Connectivity/PLC*

- Click  (*Add Connection*) menu symbol



- Enter unique *Connection Name*
- Enter *PLC Address* of *SIMATIC S7*
- Press *Save* button



NOTE:

edgeConnector Siemens allows to connect up to 20 *SIMATIC S7* controllers within one application.

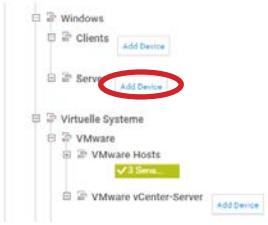
- If ***edgeConnector Siemens*** is not running (see status information at top)
  - Navigate to *Operation/Status*
  - Press *Start* button

4.2 Configure *PRTG* for Accessing *edgeConnector Siemens* Data

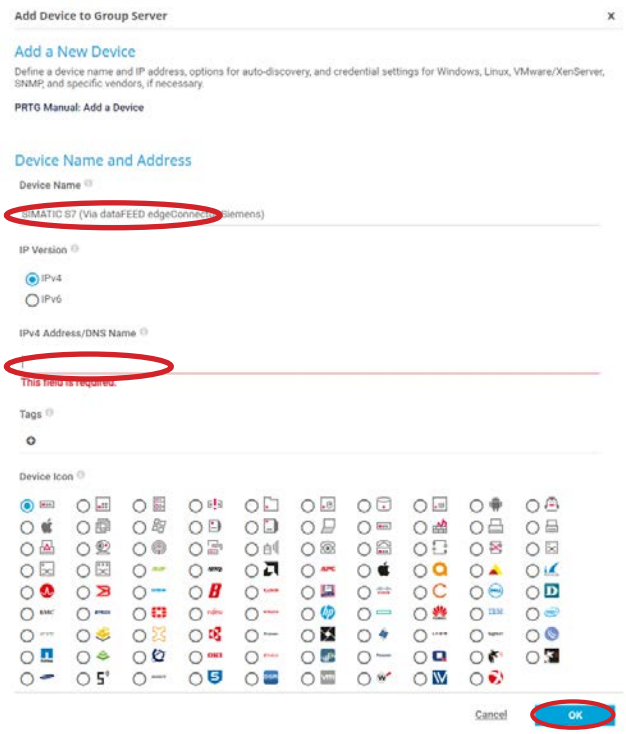
- Start *PRTG*, select *Devices* menu item and select a device group

  NOTE:

  See Paessler website https://www.paessler.com/support/how-to/device-tree for more information regarding setting up a device tree.

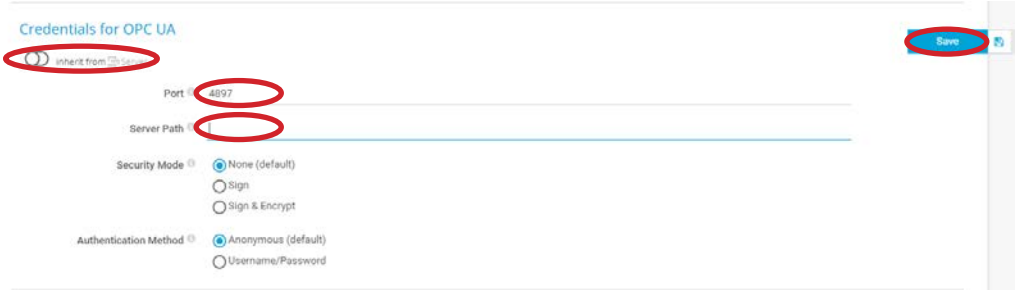


- Click *Add Device* link

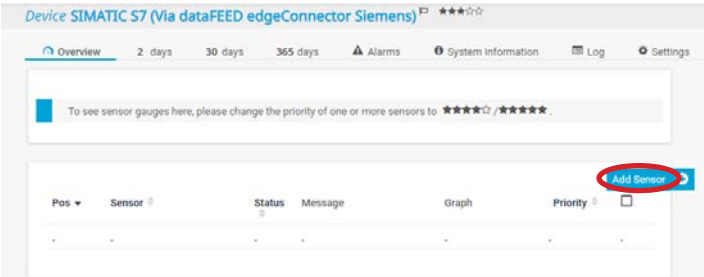


- Enter *Device Name*
- Enter *IPv4 Address* of host computer running ***edgeConnector Siemens***
- Press *OK* button

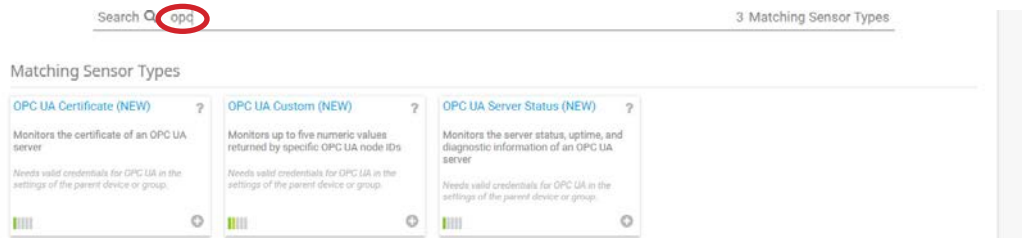
- Click on name of added device
- Select *Settings* menu item and scroll down to *Credentials for OPC UA* section



- Make sure the *inherit from* switch is deactivated
- Enter *4897* in *Port* field
- Enter IP address of host computer running ***edgeConnector Siemens*** in *Server Path* field
- Press *Save* button
- Select *Overview* menu item for added device



- Press *Add Sensor* button



- Enter *opc* in *Search* field

  NOTE:

  PRTG supports three types of OPC UA sensors:

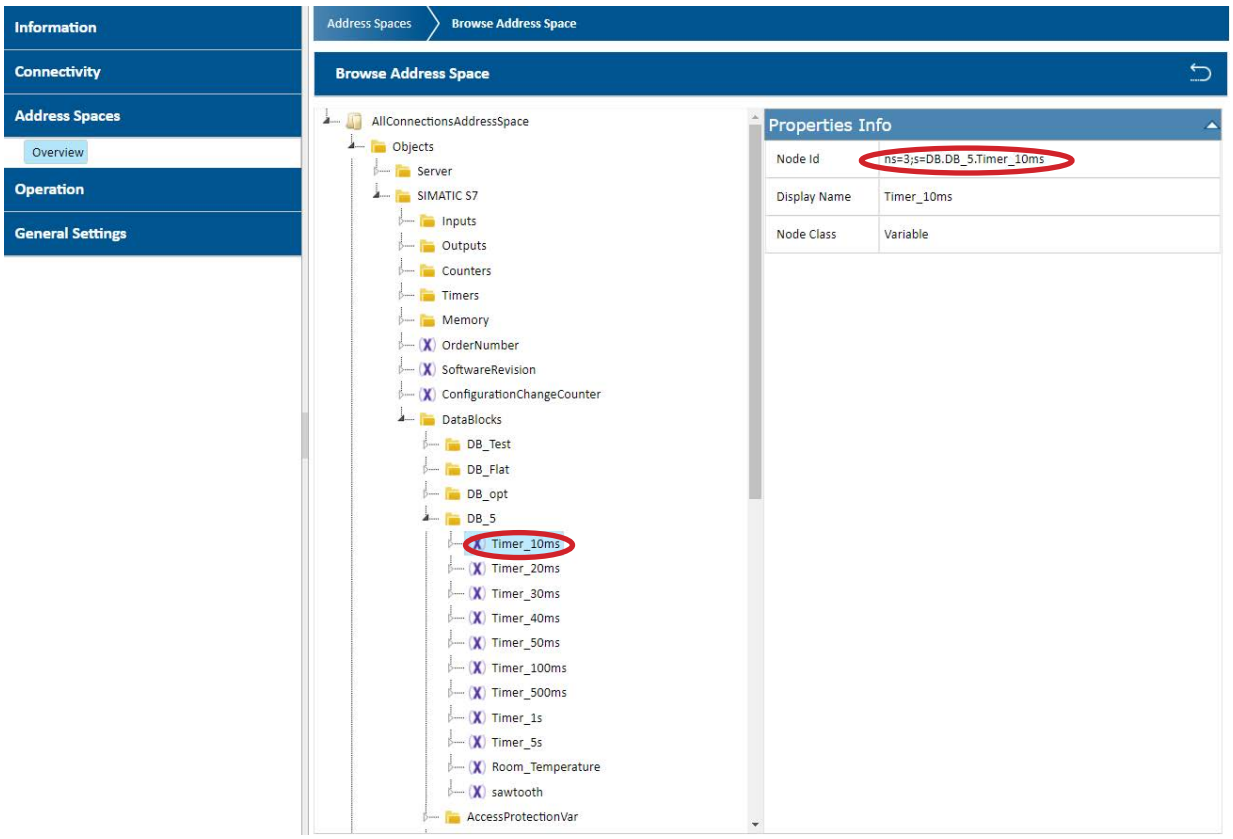
  - *OPC UA Custom* for monitoring the numeric value of data items via the OPC UA protocol
  - *OPC UA Server Status* for monitoring the status and diagnostic information of an OPC UA Server
  - *OPC UA Certification* for monitoring the certification of an OPC UA Server

  NOTE:

  In following this configuration guide describes the selection and usage of all three types of *PRTG* OPC UA sensors for working with ***edgeConnector Siemens***.

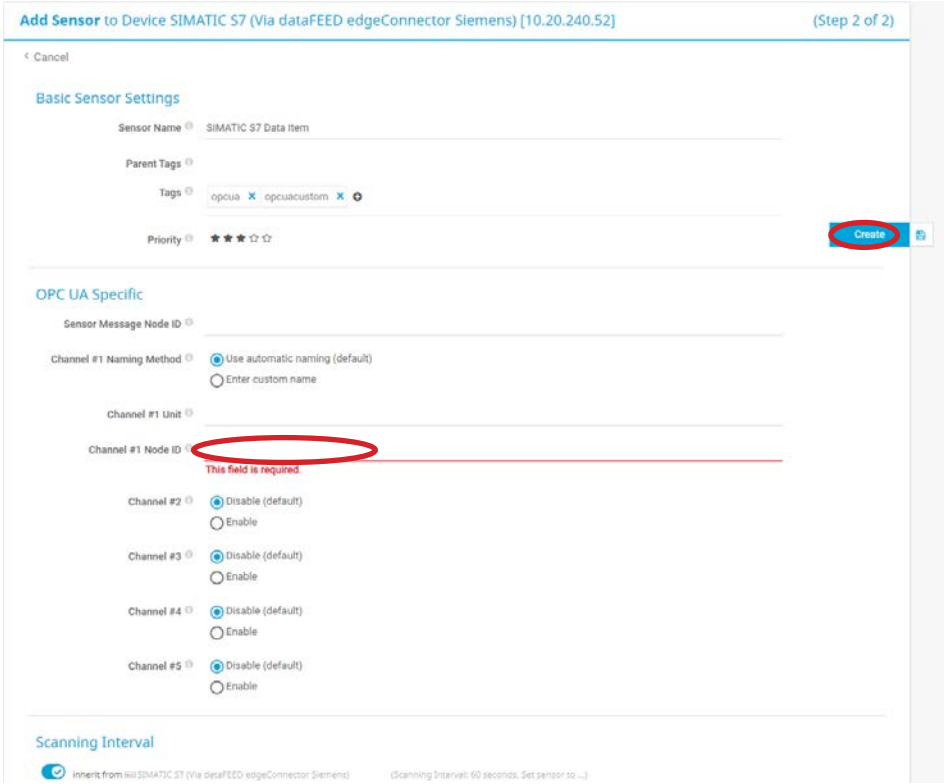
4.2.1 Monitor Data Item Value in *PRTG*

- In *PRTG*, select *OPC UA Custom sensor*
- In ***edgeConnector Siemens***, navigate to *Adress Spaces/Overview*
- Click (*Browse Address Space*) menu symbol of appropriate address space

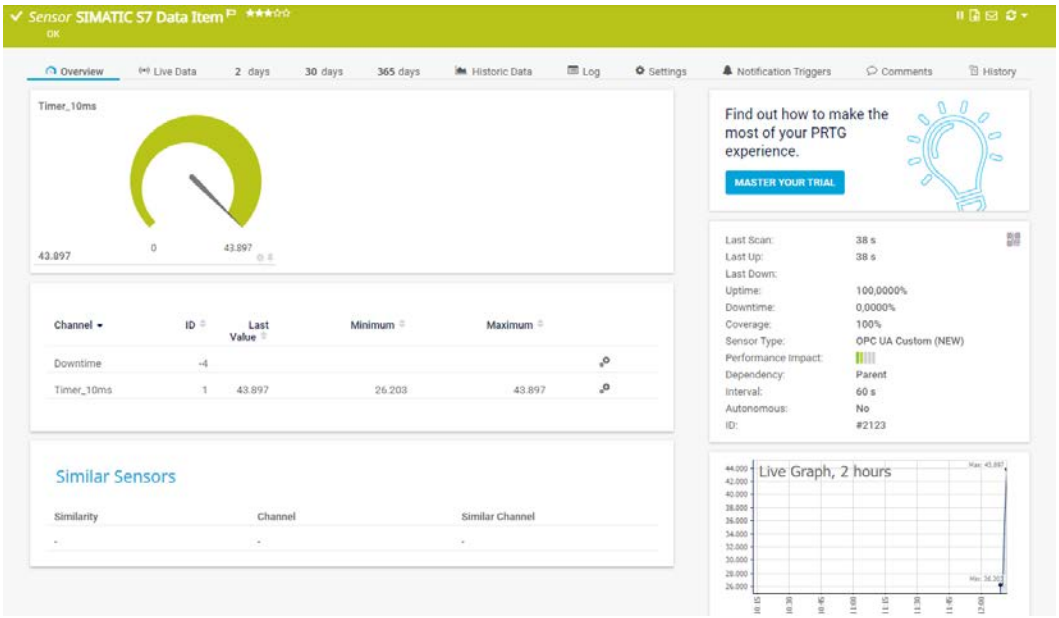


- Select *DB_5.Timer_10ms* in *Adress Space* tree view
- Copy *Node Id* in *Properties* area

- Continue in *PRTG*



- Enter node ID from ***edgeConnector Siemens*** configuration in *Channel #1 Node Id* field
- Press Create button
- Click added sensor



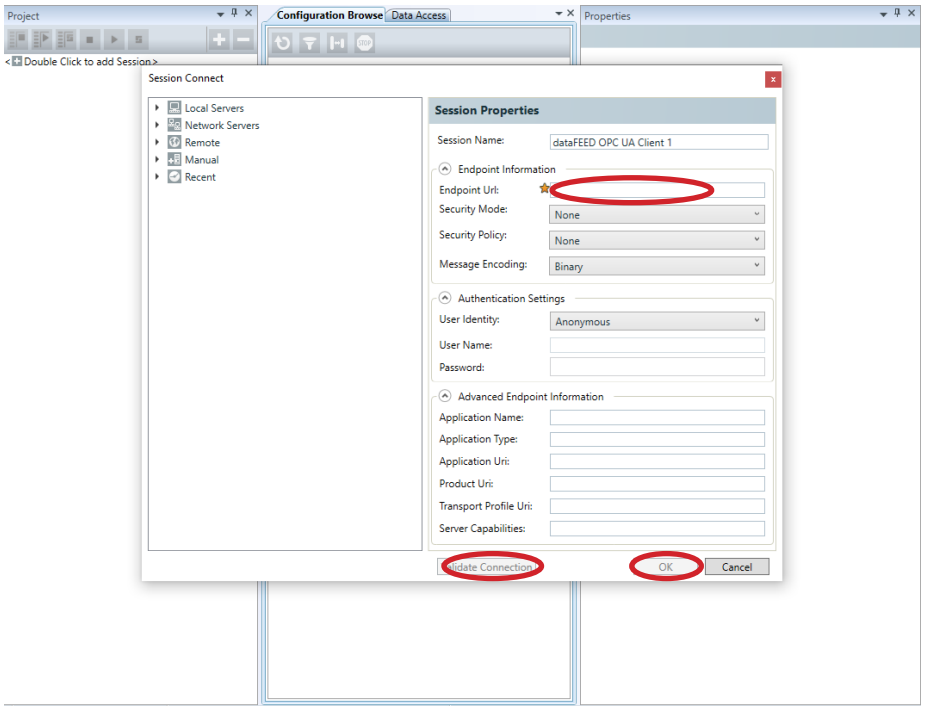
The value of the *DB_5.Timer_10ms* data item is shown in the *PRTG* dashboard.

4.2.2 Monitor *SIMATIC S7* Controller Status in *PRTG*

NOTE:

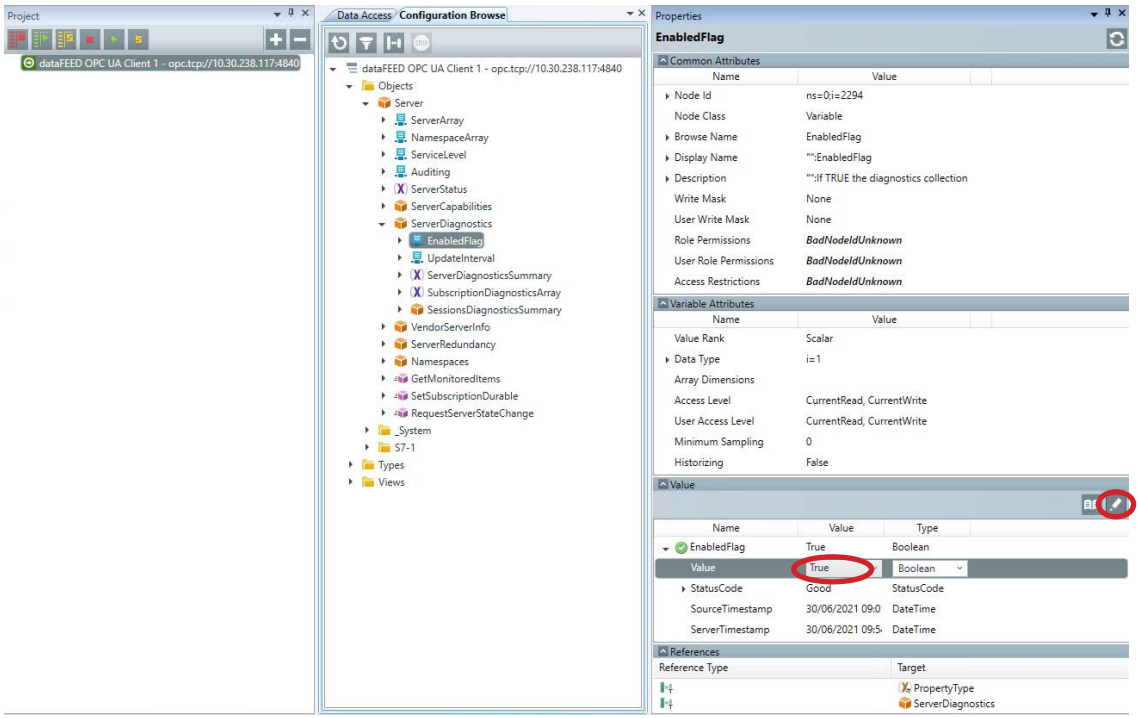
Acessing the diagnostic information of an OPC UA Server requires the *Objects/Server/ServerDiagnostics/EnabledFlag* node to be set to *TRUE*. This node is automatically set to *FALSE* after each start of the OPC UA Server.

- In *PRTG*, select *OPC UA Custom* sensor
- Start ***dataFEED OPC UA Demo Client***
- Create a new session by double-clicking at *Project* root

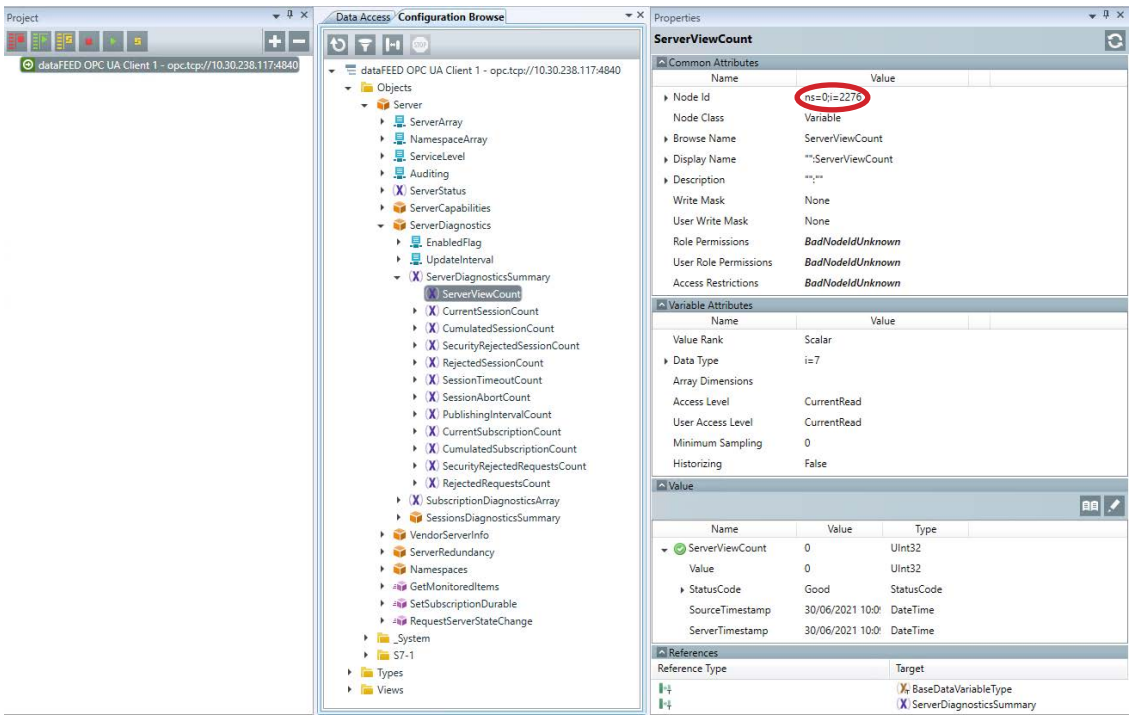


- Enter *opc.tcp://<IP Address>:4897* in *Endpoint Url* field
- Press *Validate Connection* button to validate that the connection to ***dataFEED OPC Suite*** is working
- Press *OK* button

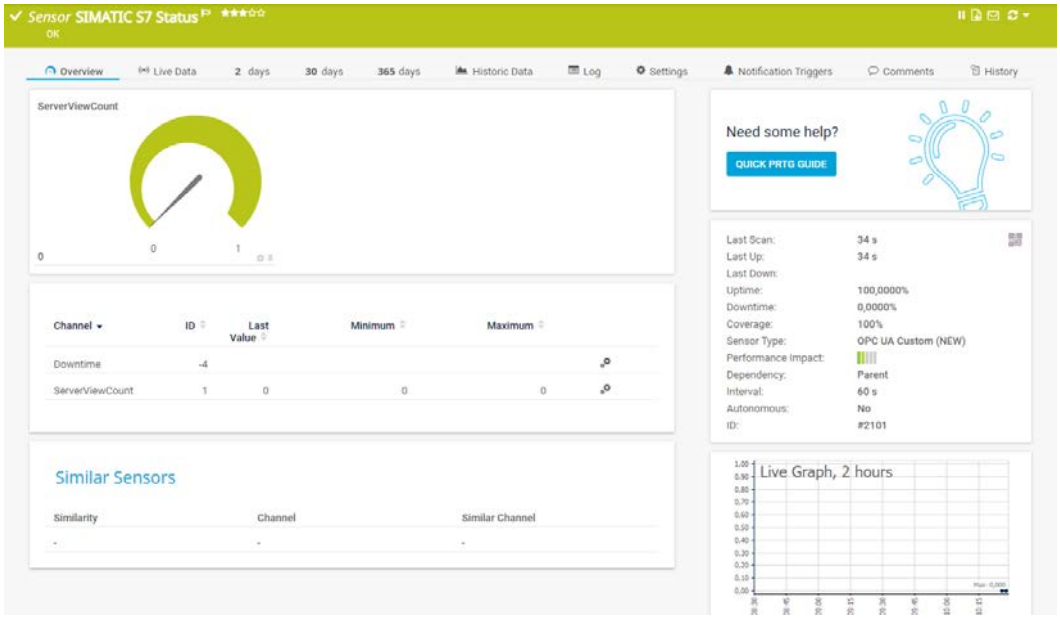
- Select *Objects/Server/ServerDiagnostics/EnabledFlag* node in *Configuration Browse* tree



- Set value of *Objects/Server/ServerDiagnostics/EnabledFlag* node to *TRUE*
- Press *Write* button
- In *Configuration Browse* tree, select any interesting controller diagnostics information for monitoring, e.g. *Objects/Server/ServerDiagnostics/ServerDiagnosticSummary/ServerViewCount* node



- Copy *Node Id*
- In *PRTG*, enter node ID from ***dataFEED OPC UA Demo Client*** configuration in *Channel #1 Node Id* field
- Press *Create* button
- Click added sensor

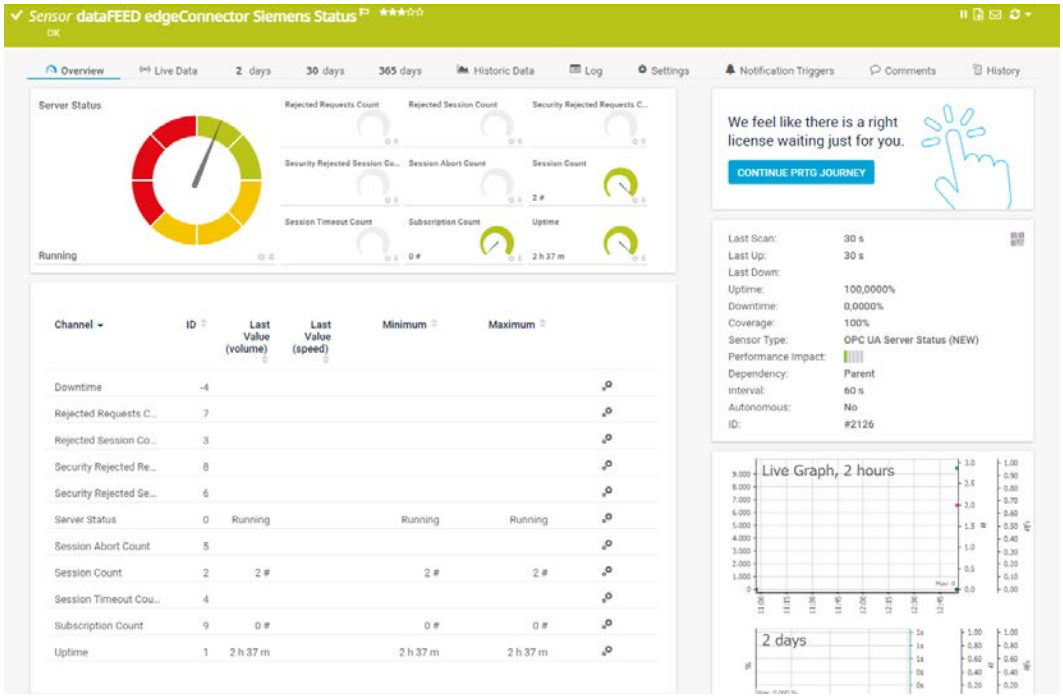


The *SIMATIC S7* controller status is shown in the *PRTG* dashboard.

4.2.3 Monitor *edgeConnector Siemens* Status in *PRTG*

- In *PRTG*, select *OPC UA Status sensor*

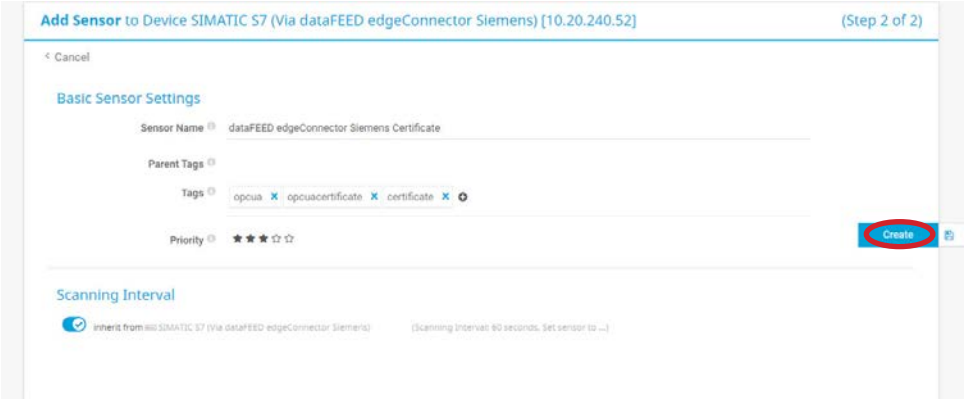
- Press *Create* button
- Click added sensor



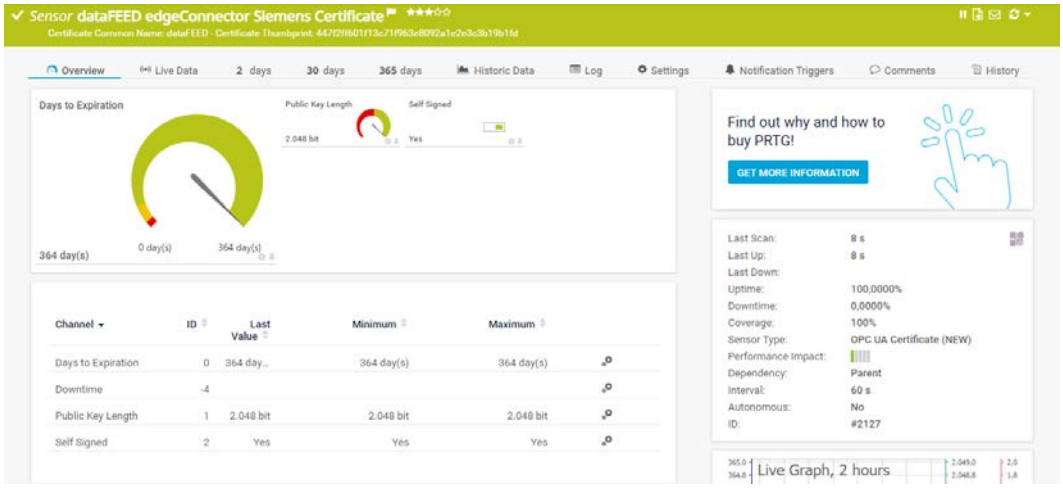
The ***edgeConnector Siemens*** status is shown in the *PRTG* dashboard.

4.2.4 Monitor *edgeConnector Siemens* Certification Information in *PRTG*

- In *PRTG*, select *OPC UA Certificate sensor*



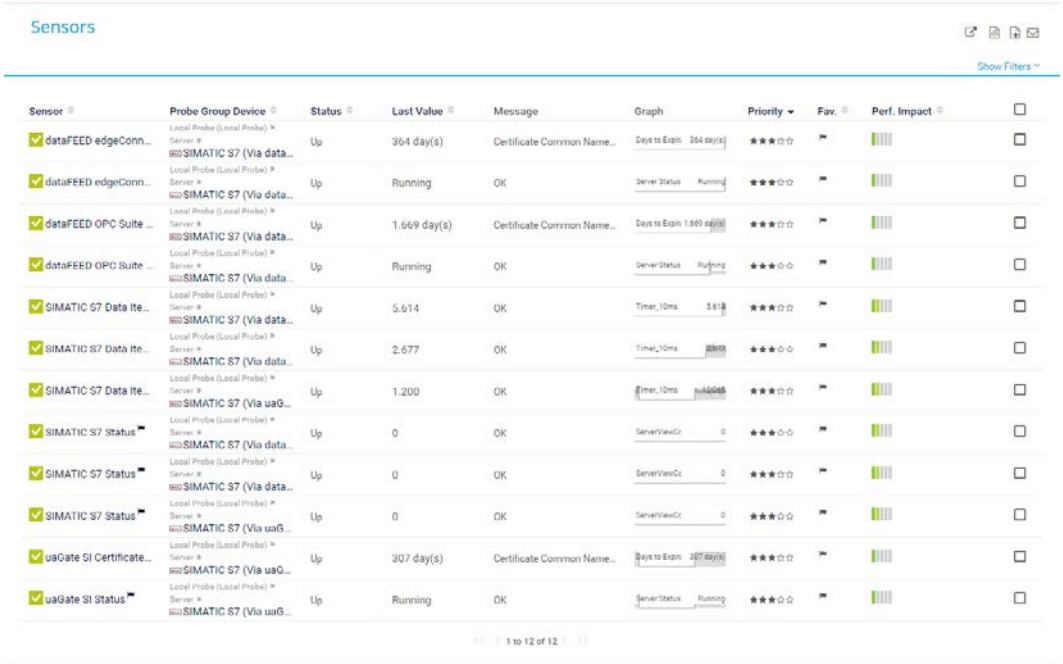
- Press *Create* button
- Click added sensor



The ***edgeConnector Siemens*** certification information is shown in the *PRTG* dashboard.

5. Monitor Individual *SIMATIC S7* Values in *PRTG*

- Mark the different created *SIMATIC S7* sensors as Favorite sensors for creating an *PRTG* overview screen, which shows the individual *SIMATIC S7* values as read via the Softing gateway



NOTE:

The given URLs have last been checked on Feb 17, 2022.

optimize!
softing

https://industrial.softing.com