How to Use PRTG for Condition Monitoring with SIMATIC S7 Controllers
Table of Contents

1. Preliminary Remarks ............................................................................................................................................. 1

2. Setting Up SIMATIC S7 Condition Monitoring Using uaGate SI ........................................................................ 3
   2.1 Configure uaGate SI for Accessing SIMATIC S7 Data ...................................................................................... 3
   2.2 Configure PRTG for Accessing uaGate SI Data ..................................................................................................... 4
      2.2.1 Monitor Data Item Value in PRTG .............................................................................................................. 7
      2.2.2 Monitor SIMATIC S7 Controller Status in PRTG ......................................................................................... 9
      2.2.3 Monitor uaGate SI Status in PRTG ............................................................................................................... 12
      2.2.4 Monitor uaGate SI Certification Information in PRTG ................................................................................. 13

3. Setting Up SIMATIC S7 Condition Monitoring Using dataFEED OPC Suite ......................................................... 14
   3.1 Configure dataFEED OPC Suite for Accessing SIMATIC S7 Data ....................................................................... 14
   3.2 Configure PRTG for Accessing dataFEED OPC Suite Data ................................................................................... 17
      3.2.1 Monitor Data Item Value in PRTG .............................................................................................................. 20
      3.2.2 Monitor SIMATIC S7 Controller Status in PRTG ......................................................................................... 22
      3.2.3 Monitor dataFEED OPC Suite Status in PRTG ........................................................................................... 24
      3.2.4 Monitor dataFEED OPC Suite Certification Information in PRTG ............................................................... 25

4. Setting Up SIMATIC S7 Condition Monitoring Using edgeConnector Siemens ...................................................... 26
   4.1 Configure edgeConnector Siemens for Accessing SIMATIC S7 Data ............................................................... 26
   4.2 Configure PRTG for Accessing edgeConnector Siemens Data ............................................................................... 28
      4.2.1 Monitor Data Item Value in PRTG .............................................................................................................. 30
      4.2.2 Monitor SIMATIC S7 Controller Status in PRTG ......................................................................................... 32
      4.2.3 Monitor edgeConnector Siemens Status in PRTG ...................................................................................... 35
      4.2.4 Monitor edgeConnector Siemens Certification Information in PRTG .......................................................... 36

5. Monitor Individual SIMATIC S7 Values in PRTG .................................................................................................... 37
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.

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

  ![Machine Settings/PLC Connection](image)

- Select appropriate **PLC Type**
- Press **Add** button
Enter unique Connection Name

Enter IPv4 Address of SIMATIC S7

Press Save button

Press green Pending 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](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 address 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 \textit{uaGate SI} configuration in Port field
- Enter IPv4 address from \textit{uaGate SI} configuration in Server Path field
- Press Save button
- Select Overview menu item for added device

Press Add Sensor button

Enter \textit{opc} in Search field

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

\textbf{NOTE:}
In following this configuration guide describes the selection and usage of all three types of \textit{PRTG} OPC UA sensors for working with the \textit{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 Address Space tree view
- Copy Node Id in Properties area
• Continue in PRTG

![Add Sensor to Device SIMATIC S7 (via uaGate SI) [10.39.238.117] (Step 2 of 2)](image)

- 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

![Sensor settings](image)

- Press *Create* button
- Click added sensor

The *uaGate SI* certification 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

![Image of dataFEED OPC Suite configurator]

- Press 📡 (Add a new data source) button
• Enter unique connection name in **Connection 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) button to store dataFEED OPC Suite configuration
- Press (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](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

  ![Overview](image)

• Press Add Sensor button

  ![Add Sensor](image)

• 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**

![Image of dataFEED OPC Suite configurator](image)

• Copy **Server Endpoint**

• Start **dataFEED OPC UA Demo Client**

• Create a new session by double-clicking at **Project root**

![Image of dataFEED OPC UA Demo Client](image)

• 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

![Add Sensor to Device SIMATIC S7 (Via dataFEED OPC UA Demo Client)](image)

• 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:
Accessing 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

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*

![Add Sensor](image)

- 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 technology 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
  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.

  ![Device Configuration Image]

- Click Add Device link

  ![Add Device Screen]

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

  ![Device Details Screen]

- 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

**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 Address Spaces/Overview
- Click (Browse Address Space) menu symbol of appropriate address space

- Select DB_5.Timer_10ms in Address Space tree view
- Copy Node Id in Properties area
• Continue in PRTG

![Image of PRTG configuration settings]

• 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:
Accessing 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 Uri 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

![Configuration Browse tree image]

• 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

![Add Sensor to Device SIMATIC S7 (Via dataFEED edgeConnector Siemens) (10.20.240.52) (Step 2 of 2)](image)

- Press Create button
- Click added sensor

![Sensor dataFEED edgeConnector Siemens Status] (image)

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.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Probe Device</th>
<th>Status</th>
<th>Last Value</th>
<th>Message</th>
<th>Length</th>
<th>Priority</th>
<th>Fax</th>
<th>Prof. Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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