

Node-RED - SE Machine Advisor Node User Manual

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book



At a Glance

Document Scope

This document describes the Node-RED installation and configuration for communication between the IIOT Edge Box and EcoStruxure Machine Advisor application through HTTPs or MQTTs protocol.

This document also describes:

- installation and uninstallation of SE Machine Advisor node.
- configuration of the node.
- usage of the node.
- limitations.

Validity Note

This document has been updated with the release of SE Machine Advisor node V2.0.0.

Related Documents

Title of Documentation	Reference Number
Node-RED - SE Modbus Nodes - User Manual	EIO0000004101

You can download these technical publications and other technical information from our website at <https://spiceportal.schneider-electric.com/web/industrial-automation-products-campus/ecostruxure-plant-data-expert>. See launch book where all the marketing aspects are detailed on IAP Campus Portal.

Part I

Introduction

Introduction

Chapter 1

General Information

General Information

IIoT (Industrial Internet of Things)

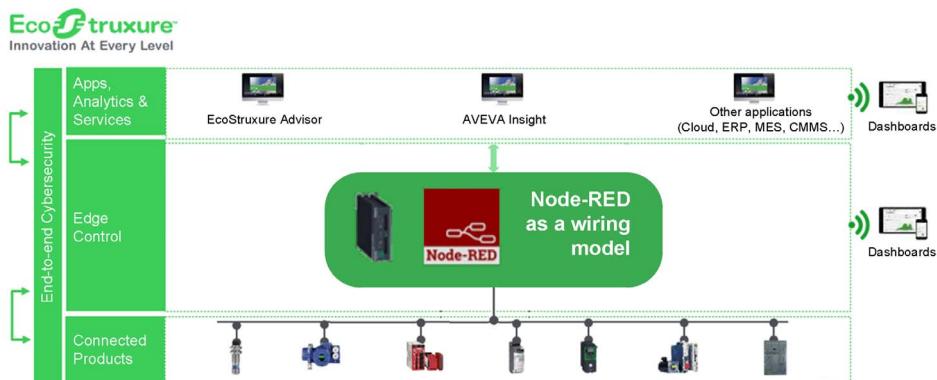
IoT is a network of intelligent computers, devices, and objects that collect and share huge amounts of data. IIoT is the use of Internet of Things (IoT) technologies in manufacturing. With Industrial Internet of Things (IIoT), the device itself will be seamlessly wired to the business systems.

Operational Technology (OT) is a category of hardware and software that monitors and controls the physical devices. Due to increasing trend towards convergence of IT (Information Technology) and OT (Operational Technology), the plant managers in charge of operational technology are more efficient being remote.

Node-RED in EcoStruxure™

Node-RED is an IoT wiring tool to connect services through a user-friendly graphical interface. Schneider Electric has selected Node-RED as the technology to deliver basic connectivity through tested, validated and documented nodes.

The following figure shows the integration of SE Machine Advisor node in Ecostruxure™:





Connected Products

Modbus is a non-proprietary communication protocol used for programmable controller networks that fall under application level, that is, level 7 of OSI Model. Originally designed for Modicon (Schneider Electric) PLCs, it has become widely used by many PLC manufacturers and industrial networks.

The aim is to transform standard brownfield asset into connected asset. In this case, the data is exchanged from the lowest layer of connected devices through the Edge layer further up to the Apps, Analytics and Services. Predictive maintenance, MES or CMMS are the typical apps integrated in this kind of solution.

Edge Control

Edge control provides connectivity for OT and IT systems and data processing right next to the machines. Instead of sending data to the cloud for processing and waiting for the analytical results, edge control devices collect and process data next to the machines. Then, those devices push their data to the cloud, thus saving bandwidth and enabling increased responsiveness. Magelis iPC and Magelis Edge Box offer smart application design and engineering to leverage asset performance with end-to-end cybersecurity.

Schneider Electric provides nodes that are tested, validated, and supported to run with Node-RED on the Magelis iPC and Edge Box.

There are three main advantages of Schneider Electric nodes:

- **Scalability:** easy to add connected devices in a cyber-secure manner.
- **Time to market:** significant reduction in integration time to implement a use case solution.
- **Expert support:** support chain L2 and Experts in the country organisation and L3 as a back up.

Apps, Analytics and Services

Specific nodes have been developed by Schneider to simplify the Node-RED flows for several typical use cases. SE Machine Advisor node collects data from the devices and pushes it to EcoStruxure Machine Advisor cloud application.

Magelis Edge Box

The new Magelis Edge Box meets IIoT challenges at the Edge Control level by enabling secured communication from connected products on the shop floor to the required software and applications on the top floor. The Edge box will complement your application, parallel to the control of your machine application. There is no need to stop or modify your control application (including 3rd party control devices).

Magelis Edge Box types are commercialized, as detailed in the following table:

Magelis Edge Box	Reference
Magelis HMIBSC	Reference HMIBSCEA53D1L0T HMIBSC with ARM, Linux
Magelis HMIBMI	Reference HMIBMIEA5DD110L HMIBMI with Intel Atom
Magelis HMIBMO	Reference HMIBMOMA5DD1E01: HMIBMO with Intel Atom

Magelis iPC

The Magelis iPC is a robust industrial device without a fan or even a hard drive, requiring no maintenance, and designed to run in the machine or plant field, even in harsh environments. New IIoT monitors for the Magelis iPC come tested, validated, and supported in two versions - agent and server.

Magelis iPC Box types are commercialized, as detailed in the following table:

Magelis iPC	Reference
Magelis HMIBMP	Reference HMIBMPHI74D4801 HMIBMP with 4 expansion slots, Intel Core i7
Magelis HMIBMU	Reference HMIBMUSI29D2801 HMIBMU with 2 expansion slots, Intel Celeron

Machine Advisor

EcoStruxure Machine Advisor is the new digital cloud-based services platform. It enables machine builders to provide new services to machine operators for each installed machine in any production site worldwide.

The SE Machine Advisor node is a Schneider Electric publishing node that is installed on the IIoT Edge Box that connects the automation network to the cloud-based EcoStruxure Machine Advisor application. The node receives data from collecting nodes in the data flow such as SE Modbus Basic, SE Harmony Hub and so on. It then pushes the data to EcoStruxure Machine Advisor application.

You should have an account in EcoStruxure Machine Advisor application to push the data.

Best Practice for Node-RED

1. Use Browsers Wisely

When more web pages are accessed in the browser, Node-RED server may not be responsive to the program. Remove unused web pages in the browser to prevent this.

If Node-RED application is not responsive, you will receive a page unresponsive message.

Limitations

SE Machine Advisor node has the following limitations:

1. Node-RED application is supported in any browser with JavaScript V8 engine or similar supported browser (for instance: Google Chrome V73.0 and Firefox V66).
2. Node-RED web page is available in English, irrespective of the system language.
3. If the Store and forward file is deleted, the stored data in the file will be lost as it is not pushed to cloud ([see page 81](#)).
4. When the user wants to do the offline installation, the internet should be disabled. It takes longer to install if the internet is enabled.
5. EcoStruxure Machine Advisor cloud limitation - It will only accept numeric values. The input to SE Machine Advisor node (through collecting nodes) must not contain boolean or string values.

Part II

Installation and Uninstallation - SE Machine Advisor Node

What Is in This Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
2	Prerequisites	17
3	Installing SE Machine Advisor Node – Linux Platform	19
4	Uninstalling SE Machine Advisor Node - Linux Platform	27

Chapter 2

Prerequisites

System Requirements

Operating System

SE Machine Advisor node V2.0.0. supports Linux Yocto (V1.00.010 and above) operating system.

NOTE: The required software like Node.js, Node-RED and Python are pre-installed in **Magelis HMIBSC** box.

Hardware Requirements

NOTE: SE Machine Advisor node is supported for **Magelis HMIBSC** only. Other **Magelis Edge Box** and **Magelis iPC** will be supported in future versions of the node.

IOT Edge Box	PC hardware	Specification
Magelis HMIBSC	Processor	Reference HMIBSCEA53D1L0T HMIBSC with ARM, Linux
	Hard disk space	eMMC and TPM for hardware encryption
	Operating system	Linux Yocto

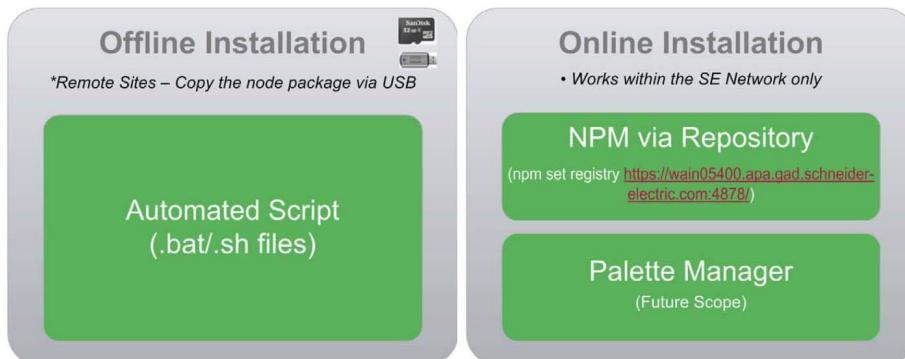
Software Requirements

- Node.js V10.15.3
- Node-RED server V0.20.7
- Npm (Node package manager) V6.4.1
- Supported browser: Any browser with JavaScript V8 engine or similar supported browser (for instance: Google Chrome V73.0 and Firefox V66.)

NOTE: The software versions mentioned above support the SE Nodes installation. Other versions do not support it.

Accessing SE Machine Advisor Node

You can perform two modes of installation (online/offline):



You can perform the nodes installation on the modes given below:

- Install the node - Offline (*see page 20*)
- Install the node - Online (*see page 23*)

Chapter 3

Installing SE Machine Advisor Node – Linux Platform

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Installing SE Machine Advisor Node - Offline Installation Mode	20
Installing SE Machine Advisor Node - Online Installation Mode	23

Installing SE Machine Advisor Node - Offline Installation Mode

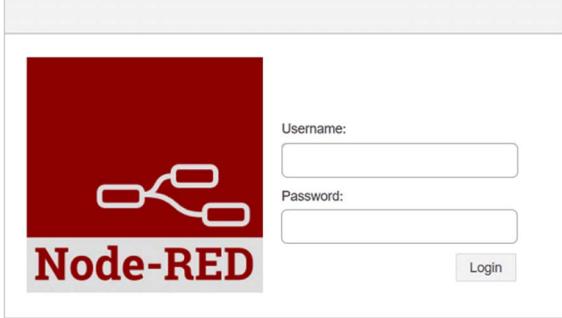
The Linux based Edge Boxes (for example, HMIBSC) have in-built Node-RED-as-a-Service. This provides Node-Red and Node.js are pre-installed in the OS image.

The SE Machine Advisor node is installed by the user from the portable storage device (for instance; pendrive).

The below procedure is applicable for the Edge Boxes running on Linux Yocto (for example, **Magelis HMIBSC**):

Step	Action
1	Download the <code>Machine-Advisor_V2.0.0_Offline.zip</code> file from the link given below: https://schneider-electric.box.com/s/xsmgvjhjo4km8jwlsn8qyprgb0gy8bv6
2	Extract the downloaded file <code>Machine-Advisor_V2.0.0_Offline.zip</code> and transfer the extracted folder (<code>Machine-Advisor_V2.0.0_Offline</code>) into a portable disk. Example: Pendrive.
3	Connect the portable device to IIoT Edge Box.
4	<ul style="list-style-type: none">● Navigate to the directory of the portable device (for instance, <code>cd mount/media/<disk name></code>) and press Enter.● Type <code>cd Machine-Advisor_V2.0.0_Offline</code> and press Enter to go to the directory where the offline files for SE Machine Advisor node are placed. <pre>root@hmibsc:~/mount/sda1/Machine-Advisor_V2.0.0_Offline ls se-node-red-machine_advisor_offline_install.sh -</pre>
5	Type <code>sh se-node-red-machine_advisor_offline_install.sh</code> and press Enter to install the SE Machine Advisor node. Press any key to read the Terms & Conditions. <pre>root@hmibsc:~/mount/sda1/Machine-Advisor_V2.0.0_Offline ls se-node-red-machine_advisor_offline_install.sh root@hmibsc:~/mount/sda1/Machine-Advisor_V2.0.0_Offline# sh se-node-red-machine_advisor_offline_install.sh Please wait ... Please read the Terms & Conditions carefully! press any key to continue ... -</pre> <p>NOTE: Press any key to continue until the result appears below.</p> <p>Result: Do you agree to our Terms & Conditions? (yes/no) :.</p>

Step	Action
6	<p>Type yes and press Enter to agree to the terms and conditions in EULA (End User License Agreement is a legal contract between a software application author or publisher and the user of that application) and install SE Machine Advisor node.</p> <p>In both cases, for the sole and restricted purpose of exercising the concurrent use license right granted to You under said Corporate License within the limits set forth hereinabove. This Appendix forms an integral part of this EULA, and all terms and conditions of this EULA which are not expressly deviated under this Appendix, shall apply to You in accordance with the foregoing in addition to the terms and conditions set forth in this Appendix.</p> <p>As used herein and for the purposes of Corporate Licenses only, the following terms shall have the following meaning :</p> <ul style="list-style-type: none"> -the term ■Group of Companies■ means any company or corporation: a)in which You directly or indirectly own or control the voting rights attached to more than 50% of the issued ordinary share capital. or (ii) control directly or indirectly the appointment of a majority of directors (or equivalent) of its board of directors (or equivalent body); or b)which directly or indirectly (i) owns or controls the voting rights attached to more than 50% of Your issued ordinary share capital, or (ii) controls the appointment of a majority of directors (or equivalent) of Your board of directors (or equivalent body); or c)which is directly or indirectly owned or controlled by the same company or corporation as You in accordance with sub-case b) above. <ul style="list-style-type: none"> -the term ■Authorized Users■ means any end-users at the Sites who use the Software Product; -the term ■Sites■ means Your facility to which Schneider Electric Initially supplied the Software Product as well as all of Your facilities and the facilities of Your Group of Companies, irrespective whether said facilities are located within the same country or several countries. <p>22 Press any key to continue Do you agree to our Terms & Conditions? (yes/no): Please wait ... Successfully copied se-node-red-machine_advisor files Running: cd /home/root/se-node-red-machine_advisor && npm link Done: cd /home/root/se-node-red-machine_advisor && npm link se-node-red-machine_advisor installed successfully! Please restart node-red root@hmibsc:~/mount/sda1/Machine-Advisor_V2.0.0_Offline</p> <p>Result: se-node-red-machine_advisor installed successfully. Please restart node-red by rebooting Magelis HMIBSC Edge box.</p> <p>NOTE: If you type no, the installation is canceled.</p>

Step	Action
7	<p>Open a browser from system (Laptop or Desktop) connected in same network as the Linux Edge box:</p> <ul style="list-style-type: none"> Go to <a href="https://<ip address>:1880">https://<ip address>:1880 <p>NOTE: To know your IP address, type <code>ifconfig</code> in your Linux Edge box.</p> <pre>/home/root\$ ifconfig eth0 Link encap:Ethernet HWaddr 74:FE:48:34:66:93 inet addr:192.168.10.78 Bcast:192.168.255.255 Mask:255.255.0.0 inet6 addr: 2405:204:551b:df7::76fe:48ff:fe34:6693%4804152/64 Scope:Global inet6 addr: fe80::76fe:48ff:fe34:6693%4804152/64 Scope:Link UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1 RX packets:144095435 errors:79654 dropped:40320 overruns:0 frame:39334 TX packets:145389576 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:10131566838 (9.4 GiB) TX bytes:11357314537 (10.5 GiB) eth1 Link encap:Ethernet HWaddr 74:FE:48:34:66:94 UP BROADCAST MULTICAST MTU:1500 Metric:1 RX packets:0 errors:0 dropped:0 overruns:0 frame:0 TX packets:0 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:0 (0.0 B) TX bytes:0 (0.0 B) lo Link encap:Local Loopback inet addr:127.0.0.1 Mask:255.0.0.0 inet6 addr: ::%4804152/128 Scope:Host UP LOOPBACK RUNNING MTU:65536 Metric:1 RX packets:174 errors:0 dropped:0 overruns:0 frame:0 TX packets:174 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1 RX bytes:13456 (13.1 KiB) TX bytes:13456 (13.1 KiB) wlan0 Link encap:Ethernet HWaddr 02:00:16:B1:2F:02 inet addr:192.168.225.250 Bcast:192.168.225.255 Mask:255.255.255.0 inet6 addr: 2405:204:551b:df7::0:16ff:feb1:2f02%4804152/64 Scope:Global inet6 addr: fe80::16ff:feb1:2f02%4804152/64 Scope:Link UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1 RX packets:21598 errors:0 dropped:0 overruns:0 frame:0 TX packets:5230 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:1019306 (995.4 KiB) TX bytes:434633 (424.4 KiB)</pre> <ul style="list-style-type: none"> Login window appears. <p>Note: Use your Node-RED login credentials to operate Linux Edge box through your system.</p>  <p>NOTE: As the browser is not accessible in the Linux Edge box, you can connect to another system (Laptop or Desktop) using the Linux Edge box IP address.</p>

Installing SE Machine Advisor Node - Online Installation Mode

The Linux based Edge Boxes (for example, HMIBSC) have in-built Node-RED-as-a-Service. This means Node.js, Node-Red and python are pre-installed in the OS image.

To install SE Machine Advisor node follow the steps given below:

Step	Action
1	Type the text given below in the terminal and press Enter . <pre>npm set registry https://wain05400.apa.gad.schneider-electric.com:4878/</pre>
2	Type the text given below in the terminal and press Enter : <pre>npm set proxy null</pre> <p>Note: If set proxy null command is not working, remove proxy for respective types as follows:</p> <ul style="list-style-type: none"> ● npm config rm proxy ● npm config rm http-proxy ● npm config rm https-proxy
3	Type <code>npm install se-node-red-machine_advisor</code> and press Enter .

NOTE: If you get the error as shown in image below:

```
npm ERR! Windows_NT 10.0.18362
npm ERR! argv "C:\Program Files\nodejs\node.exe" "C:\Program Files\nodejs\node_modules\npm\bin\npm-cli.js"
npm ERR! node v6.11.0
npm ERR! npm v3.10.10
npm ERR! code SELF_SIGNED_CERT_IN_CHAIN

npm ERR! self signed certificate in certificate chain
npm ERR!
npm ERR! If you need help, you may report this error at:
npm ERR!   <https://github.com/npm/npm/issues>

npm ERR! Please include the following file with any support request:
npm ERR!   C:\Users\.....node-red\npm-debug.log
```

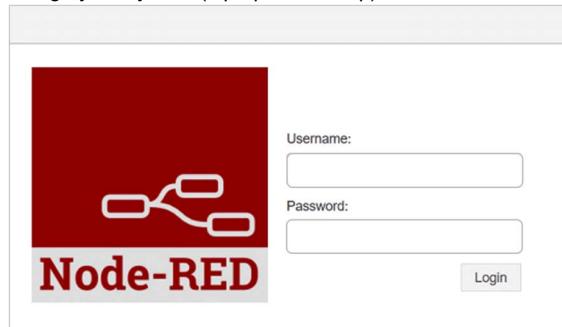
Then, type the text given below in the terminal and press **Enter**, and run the installation command again.

```
npm set strict-ssl false
```

NOTE: Press any key to continue until the result appears.

Result: Do you agree to our Terms & Conditions? (yes/no) :.

Step	Action
4	<p>Type yes and press Enter to agree the terms and conditions in EULA (End User License Agreement is a legal contract between a software application author or publisher and the user of that application) and install SE Machine Advisor node.</p> <p>in both cases, for the sole and restricted purpose of exercising the concurrent use license right granted to You under said Corporate License within the limits set forth hereinabove. This Appendix forms an integral part of this EULA, and all terms and conditions of this EULA which are not expressly deviated under this Appendix, shall apply to You in accordance with the foregoing in addition to the terms and conditions set forth in this Appendix. As used herein and for the purposes of Corporate Licenses only, the following terms shall have the following meaning : -the term ■Group of Companies■ means any company or corporation: a)in which You directly or indirectly own or control the voting rights attached to more than 50% of the issued ordinary share capital, or (ii) control directly or indirectly the appointment of a majority of directors (or equivalent) of its board of directors (or equivalent body); or b)which directly or indirectly (i) owns or controls the voting rights attached to more than 50% of Your issued ordinary share capital, or (ii) controls the appointment of a majority of directors (or equivalent) of Your board of directors (or equivalent body); or c)which is directly or indirectly owned or controlled by the same company or corporation as You in accordance with sub-case b) above. -the term ■Authorized Users■ means any end-users at the Sites who use the Software Product; -the term ■Sites■ means Your facility to which Schneider Electric Initially supplied the Software Product as well as all of Your facilities and the facilities of Your Group of Companies, irrespective whether said facilities are located within the same country or several countries. 22 Press any key to continue Do you agree to our Terms & Conditions? (yes/no):</p> <p>Result: Installation is successfully completed. NOTE: If you type no, the installation is cancelled.</p>
5	Restart Node-RED application by rebooting Magelis HMIBSC Edge box .

Step	Action
6	<p>Open a browser from system (laptop or desktop) connected in same network as the Linux Edge box:</p> <ul style="list-style-type: none"> Go to <a href="https://<ip address>:1880">https://<ip address>:1880 <p>NOTE: To know your ip address, type <code>ifconfig</code> in your Linux edge box.</p> <pre>/home/root\$ ifconfig eth0 Link encap:Ethernet HWaddr 74:FE:48:34:66:93 inet addr:192.168.10.78 Bcast:192.168.255.255 Mask:255.255.0.0 inet6 addr: 2405:204:551b:d6f7:76fe:48ff:fe34:6693%4804152/64 Scope:Global inet6 addr: fe80::76fe:48ff:fe34:6693%4804152/64 Scope:Link UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1 RX packets:144095435 errors:79654 dropped:40320 overruns:0 frame:39334 TX packets:145389576 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:10131566838 (9.4 GiB) TX bytes:11357314537 (10.5 GiB) eth1 Link encap:Ethernet HWaddr 74:FE:48:34:66:94 UP BROADCAST MULTICAST MTU:1500 Metric:1 RX packets:0 errors:0 dropped:0 overruns:0 frame:0 TX packets:0 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:0 (0.0 B) TX bytes:0 (0.0 B) lo Link encap:Local Loopback inet addr:127.0.0.1 Mask:255.0.0.0 inet6 addr: ::1%4804152/128 Scope:Host UP LOOPBACK RUNNING MTU:65536 Metric:1 RX packets:174 errors:0 dropped:0 overruns:0 frame:0 TX packets:174 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1 RX bytes:13456 (13.1 KiB) TX bytes:13456 (13.1 KiB) wlan0 Link encap:Ethernet HWaddr 02:00:16:B1:2F:02 inet addr:192.168.225.250 Bcast:192.168.225.255 Mask:255.255.255.0 inet6 addr: 2405:204:551b:d6f7:0:16ff:feb1:2f02%4804152/64 Scope:Global inet6 addr: fe80::16ff:feb1:2f02%4804152/64 Scope:Link UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1 RX packets:21598 errors:0 dropped:0 overruns:0 frame:0 TX packets:5230 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:1019306 (995.4 KiB) TX bytes:434633 (424.4 KiB)</pre>
	<ul style="list-style-type: none"> Login window appears. Use your Node-RED login credentials to operate Linux Edge box through your system (laptop or desktop).  <p>NOTE: As browser is not available in Linux edge box you can connect to another system (laptop or desktop) using the ip address of Linux Edge box.</p>

Chapter 4

Uninstalling SE Machine Advisor Node - Linux Platform

What Is in This Chapter?

This chapter contains the following topics:

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Uninstalling SE Machine Advisor Node - Online Uninstallation Mode	30

Uninstalling SE Machine Advisor Node - Offline Uninstallation Mode

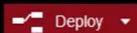
The below procedure is applicable for the Edge Boxes running on Linux Yocto (for example, **HMIBSC**):

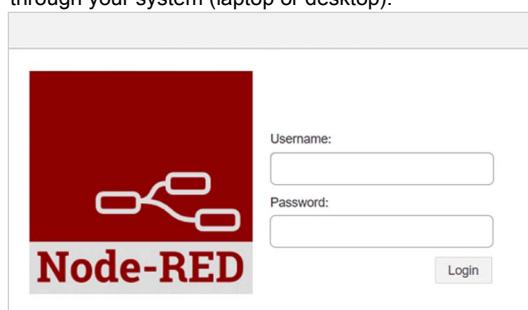
Step	Action
1	<p>Type <code>ls</code> and press Enter.</p> <pre>root@hmibsc:~# ls se-node-red-machine_advisor_offline_uninstall.sh -</pre> <p>Result: Installed nodes appears.</p>
2	<p>Type <code>sh se-node-red-machine_advisor_offline_uninstall.sh</code> and press Enter to uninstall SE Machine Advisor node.</p> <pre>root@hmibsc:~# ls se-node-red-machine_advisor_offline_uninstall.sh root@hmibsc:~# sh se-node-red-machine_advisor_offline_uninstall.sh Running: cd /home/root/se-node-red-machine_advisor && npm unlink Done: cd /home/root/se-node-red-machine_advisor && npm unlink Running: cd /home/root && rm -rf se-node-red-machine_advisor Done: cd /home/root && rm -rf se-node-red-machine_advisor root@hmibsc:~#</pre> <p>NOTE: After uninstallation restart Node-RED by rebooting Magelis HMIBSC Edge box.</p>

Step	Action
3	<p>Open a browser from system (Laptop or Desktop) connected in same network as the Linux Edge box:</p> <ul style="list-style-type: none"> Go to <a href="https://<ip address>:1880">https://<ip address>:1880 <p>NOTE: To know your IP address, type <code>ifconfig</code> in your Linux Edge box.</p> <pre>/home/root\$ ifconfig eth0 Link encap:Ethernet HWaddr 74:FE:48:34:66:93 inet addr:192.168.18.78 Bcast:192.168.255.255 Mask:255.255.0.0 inet6 addr: 2405:204:551b:d6f7:76fe:48ff:fe34:6693%4804152/64 Scope:Global fe80::76fe:48ff:fe34:6693%4804152/64 Scope:Link UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1 RX packets:144095435 errors:79654 dropped:40320 overruns:0 frame:39334 TX packets:145389576 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:10131566838 (9.4 GiB) TX bytes:11357314537 (10.5 GiB) eth1 Link encap:Ethernet HWaddr 74:FE:48:34:66:94 UP BROADCAST MULTICAST MTU:1500 Metric:1 RX packets:0 errors:0 dropped:0 overruns:0 frame:0 TX packets:0 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:0 (0.0 B) TX bytes:0 (0.0 B) lo Link encap:Local Loopback inet addr:127.0.0.1 Mask:255.0.0.0 inet6 addr: ::1%4804152/128 Scope:Host fe80::1%4804152/128 Scope:Link UP LOOPBACK RUNNING MTU:65536 Metric:1 RX packets:174 errors:0 dropped:0 overruns:0 frame:0 TX packets:174 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1 RX bytes:13456 (13.1 KiB) TX bytes:13456 (13.1 KiB) wlan0 Link encap:Ethernet HWaddr 02:00:16:B1:2F:02 inet addr:192.168.225.250 Bcast:192.168.225.255 Mask:255.255.255.0 inet6 addr: 2405:204:551b:d6f7:0:16ff:feb1:2f02%4804152/64 Scope:Global fe80::16ff:feb1:2f02%4804152/64 Scope:Link UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1 RX packets:21598 errors:0 dropped:0 overruns:0 frame:0 TX packets:5230 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:1019306 (995.4 KiB) TX bytes:434633 (424.4 KiB)</pre> <ul style="list-style-type: none"> Login window appears. <p>Note: Use your Node-RED login credentials to operate Linux Edge box through your system.</p>  <p>NOTE: As the browser is not accessible in the Linux Edge box, you can connect to another system (Laptop or Desktop) using the Linux Edge box IP address.</p>

Uninstalling SE Machine Advisor Node - Online Uninstallation Mode

This procedure explains how to uninstall the SE Machine Advisor node:

Step	Action
1	From the browser where Node-RED server is running, delete the SE Machine Advisor node from the flow.
2	Click Deploy  and Logout from the Node-RED application.
3	Go to HMIBSC terminal.
4	Type <code>npm uninstall se-node-red-machine_advisor</code> .
5	Press Enter to uninstall the SE Machine Advisor node. Result: SE Machine Advisor node is successfully uninstalled.
6	Restart Node-RED application by rebooting Magelis HMIBSC Edge box.

Step	Action
7	<p>To check if your node is uninstalled follow the steps below</p> <ul style="list-style-type: none"> ● Open a browser from system (laptop or desktop) connected in same network as the Linux Edge box: ○ Go to <a href="https://<ip address>:1880">https://<ip address>:1880 <p>NOTE: To know your ip address, type <code>ifconfig</code> in your Linux edge box.</p> <pre>/home/root\$ ifconfig eth0 Link encap:Ethernet HWaddr 74:FE:48:34:66:93 inet addr:192.168.10.78 Bcast:192.168.255.255 Mask:255.255.0.0 inet6 addr: 2405:204:551b:d6f7:76fe:48ff:fe34:6693/4804152/64 Scope:Global inet6 addr: fe80::76fe:48ff:fe34:6693%4804152/64 Scope:Link UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1 RX packets:144095435 errors:79654 dropped:40320 overruns:0 frame:39334 TX packets:145389576 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:10131566838 (9.4 GiB) TX bytes:11357314537 (10.5 GiB) eth1 Link encap:Ethernet HWaddr 74:FE:48:34:66:94 UP BROADCAST MULTICAST MTU:1500 Metric:1 RX packets:0 errors:0 dropped:0 overruns:0 frame:0 TX packets:0 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:0 (0.0 B) TX bytes:0 (0.0 B) lo Link encap:Local Loopback inet addr:127.0.0.1 Mask:255.0.0.0 inet6 addr: ::1%4804152/128 Scope:Host UP LOOPBACK RUNNING MTU:65536 Metric:1 RX packets:174 errors:0 dropped:0 overruns:0 frame:0 TX packets:174 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1 RX bytes:13456 (13.1 KiB) TX bytes:13456 (13.1 KiB) wlan0 Link encap:Ethernet HWaddr 02:00:16:B1:2F:02 inet addr:192.168.225.250 Bcast:192.168.225.255 Mask:255.255.255.0 inet6 addr: 2405:204:551b:d6f7:0:16ff:feb1:2f02%4804152/64 Scope:Global inet6 addr: fe80::16ff:feb1:2f02%4804152/64 Scope:Link UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1 RX packets:21598 errors:0 dropped:0 overruns:0 frame:0 TX packets:5230 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:1019306 (995.4 KiB) TX bytes:434633 (424.4 KiB)</pre> <ul style="list-style-type: none"> ○ Login window appears. Use your Node-RED login credentials to operate Linux Edge box through your system (laptop or desktop).  <p>NOTE: As browser is not available in Linux edge box you can connect to another system (laptop or desktop) using the ip address of Linux Edge box.</p>

Part III

Node Usage

What Is in This Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
5	Launching SE Machine Advisor Node	35
6	SE Machine Advisor Node	43
7	Usage of SE Machine Advisor Node	79

Chapter 5

Launching SE Machine Advisor Node

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Introduction	36
Launching Node-RED and SE Machine Advisor Node - Linux Platform	39

Introduction

SE Machine Advisor node is a publishing node that collects data in **CMS** format from collecting node. It converts data to user configurable Tango/Charlie format (*see page 37*) and pushes the data to EcoStruxure Machine Advisor application.

NOTE: You should have EcoStruxure Machine Advisor account to push the data to EcoStruxure Machine Advisor application.

If the user network is behind the firewall, give the **Proxy** address in **Proxy** input field to the node, so that it sends the data to the cloud.

The SE Machine Advisor node supports device node to EcoStruxure Machine Advisor cloud communication using following protocols:

- **HTTPs**
It works in open as well as closed network.
- **MQTTs**
It works in open network only.

SE Machine Advisor node uses one of the transport format given below:

- **HTTPs - Tango data format** (*see page 68*)
- **HTTPs - Charlie data format** (*see page 71*)
- **MQTTs - Tango data format** (*see page 73*)
- **MQTTs - Charlie data format** (*see page 76*)

EcoStruxure Machine Advisor application supports either of the below formats given below:

- **Tango format**
Use this format if address is available.
- **Charlie format**
Use this format for tag or label names.

Node Description

SE Machine Advisor node consists of:



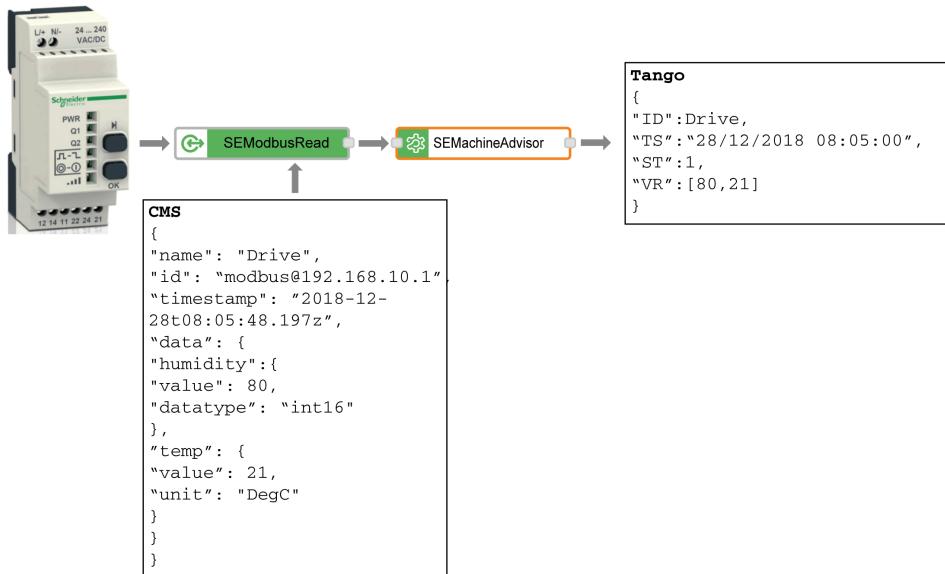
Item number	Item name	Description
1	Link node - Input	Connects SE Machine Advisor node with collecting node.

Item number	Item name	Description
2	Connection status	Indicates the following connection status: <ul style="list-style-type: none">● Success: Data is pushed successfully to EcoStruxure Machine Advisor cloud.● Connected: Node is ready to collect data and push to EcoStruxure Machine Advisor cloud.● Invalid input: Indicates when input data is not in CMS format. The data is not successfully pushed to EcoStruxure Machine Advisor cloud.● Error: Indicates when the server is not responding.● ConfigError: Node is not configured.● Unauthorized: Indicates when the bearer token is incorrect.
2	Link node - Output	Collected data is sent to EcoStruxure Machine Advisor cloud.

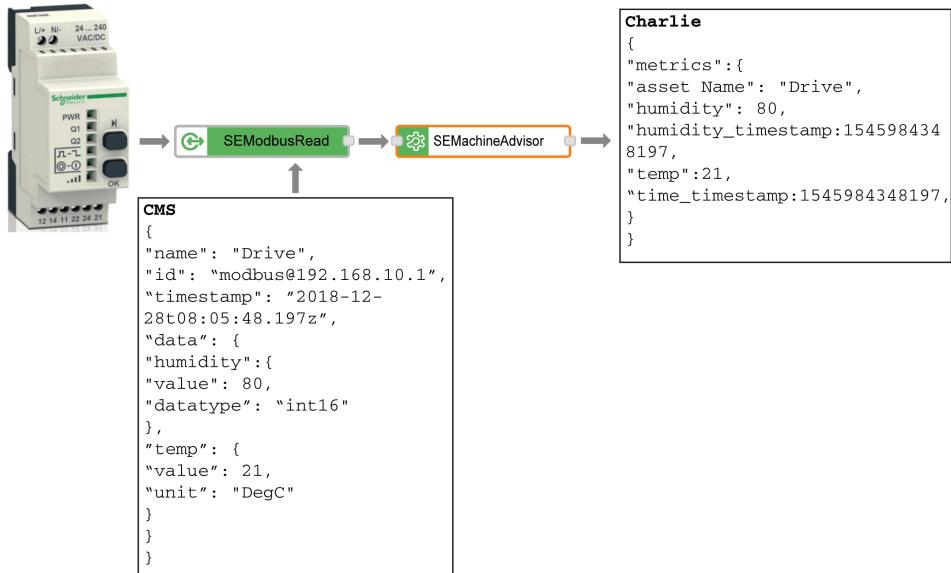
Examples of Data Format

Tango data uses array format. Charlie data uses variable format.

The following graphic is an example of converting CMS input to Tango output data format:



The following graphic is an example of converting CMS input to Charlie output data format:



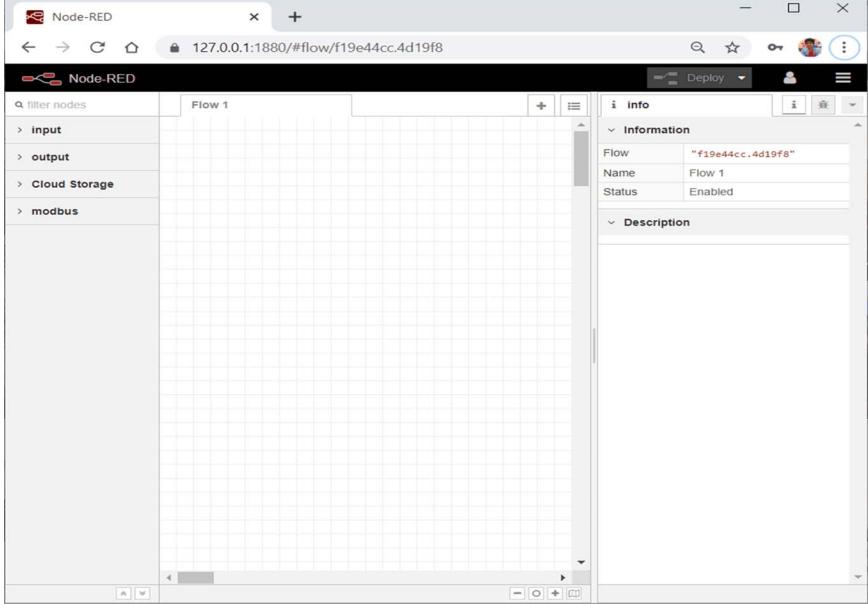
Launching Node-RED and SE Machine Advisor Node - Linux Platform

Node-RED

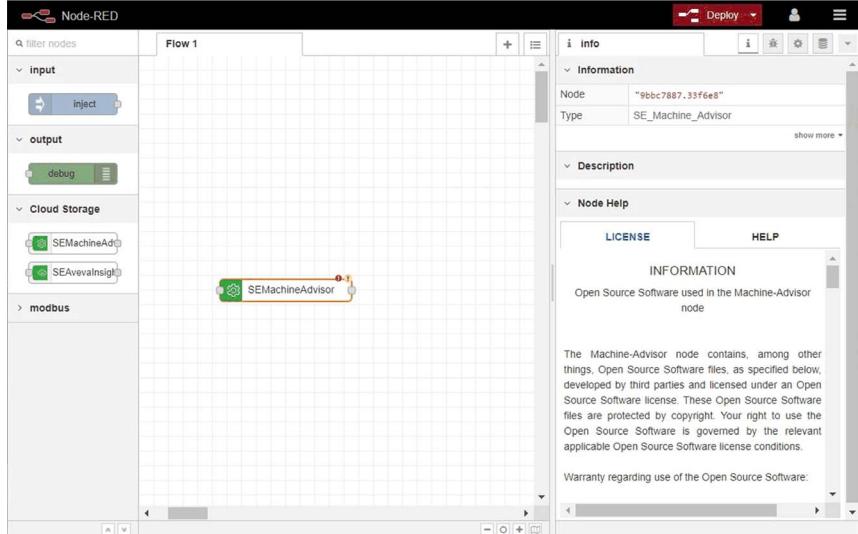
After Node-RED and SE Machine Advisor node are installed, launch Node-RED server.

Step	Action
1	Open a browser from system (Laptop or Desktop) connected in same network as the Linux Edge box.
2	Type <code>https://<ip address>:1880/</code> in the URL field in the browser and press Enter . NOTE: To know your IP address, type <code>ifconfig</code> in your Linux Edge box. Result: Login window appears
3	Use your Node-RED login credentials (Username and Password) to operate Linux Edge box through your system. NOTE: As the browser is not accessible in the Linux Edge box, you can connect to another system (Laptop or Desktop) using the Linux Edge box IP address.  A screenshot of a web browser showing the Node-RED login interface. The page has a red header with the Node-RED logo, which consists of two white nodes connected by a wire. Below the logo, the word "Node-RED" is written in white. On the right side of the header, there are two input fields: one for "Username" and one for "Password". Below these fields is a "Login" button.

Launching SE Machine Advisor Node

Step	Action
4	 <p>Result: Node-RED editor appears.</p>

SE Machine Advisor Node

Step	Action
1	<p>In Node-RED window, use the scroll bar to find SE Machine Advisor node on the left side.</p> <p>NOTE: Alternatively, you can also search from the Filter Nodes search option available at the left side node palette area.</p>  <p>Result: In Cloud Storage category, SE Machine Advisor node is available.</p> <p>NOTE: SE Machine Advisor nodes license information is available in the LICENSE tab. Help manual is available in the HELP tab (right next to LICENSE tab).</p>
2	Drag-and-drop SE Machine Advisor node on a flow page.

Chapter 6

SE Machine Advisor Node

What Is in This Chapter?

This chapter contains the following topics:

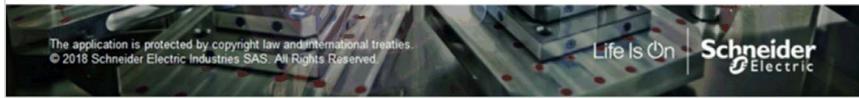
Topic	Page
EcoStruxure Machine Advisor Login Page	44
HTTPs - Tango Data Format Configuration	68
HTTPs - Charlie Data Format Configuration	71
MQTTs - Tango Data Format Configuration	73
MQTTs - Charlie Data Format Configuration	76

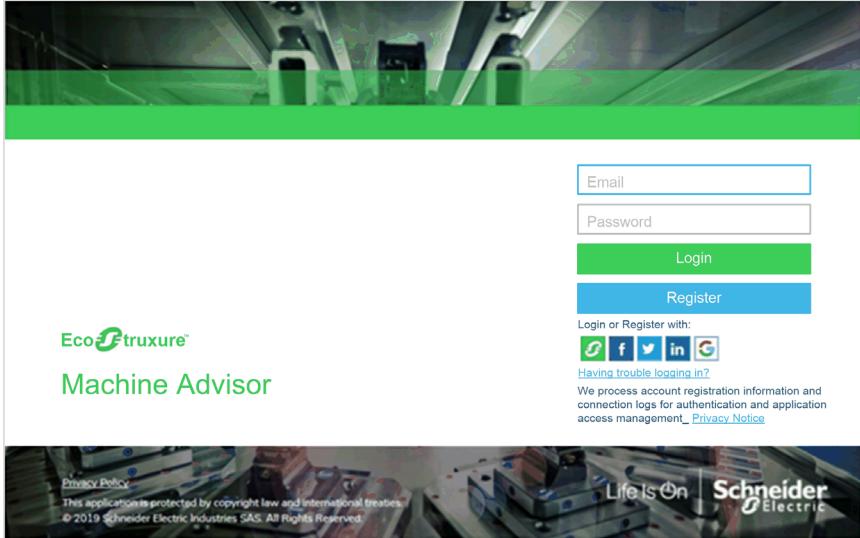
EcoStruxure Machine Advisor Login Page

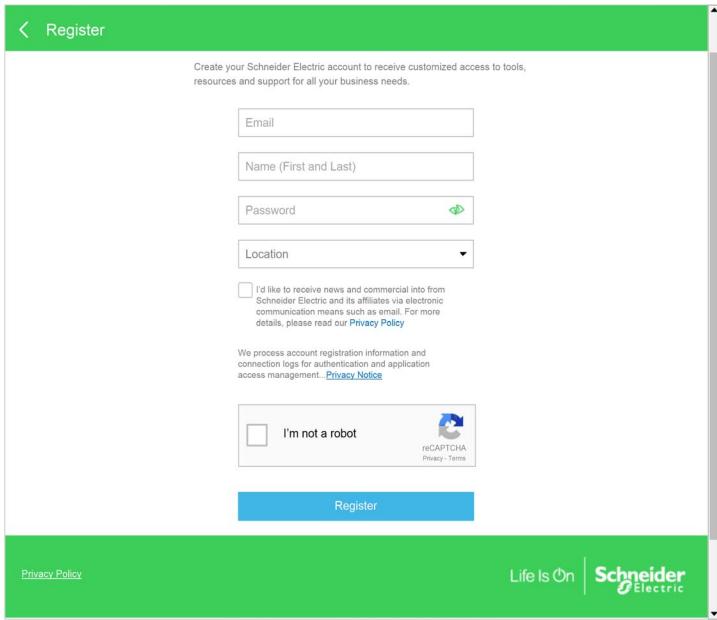
Login to EcoStruxure Machine Advisor web page

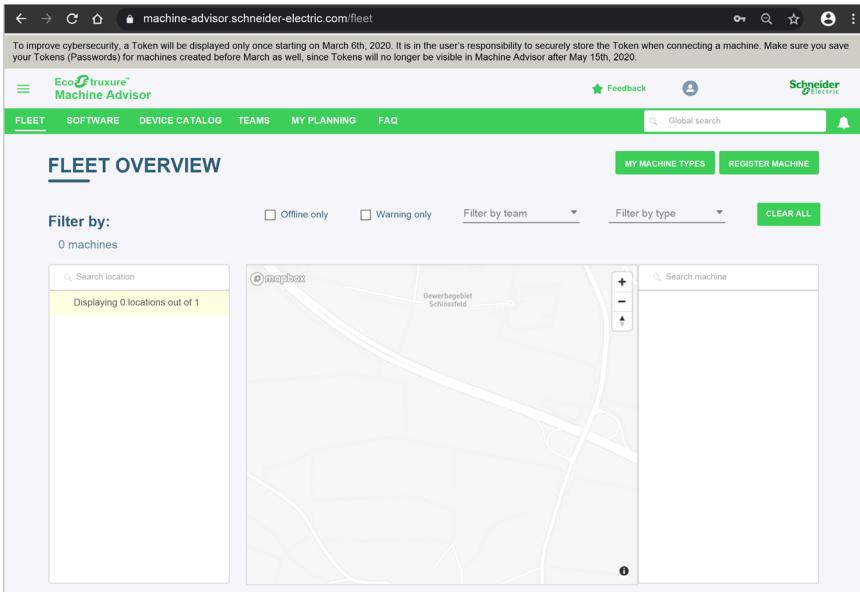
The communication between SE Machine Advisor node and EcoStruxure Machine Advisor cloud is possible when you have EcoStruxure Machine Advisor account. SE Machine Advisor node has to be configured using the authentication token. This token can be obtained from the **Config** page of EcoStruxure Machine Advisor web page.

Accessing EcoStruxure Machine Advisor web page

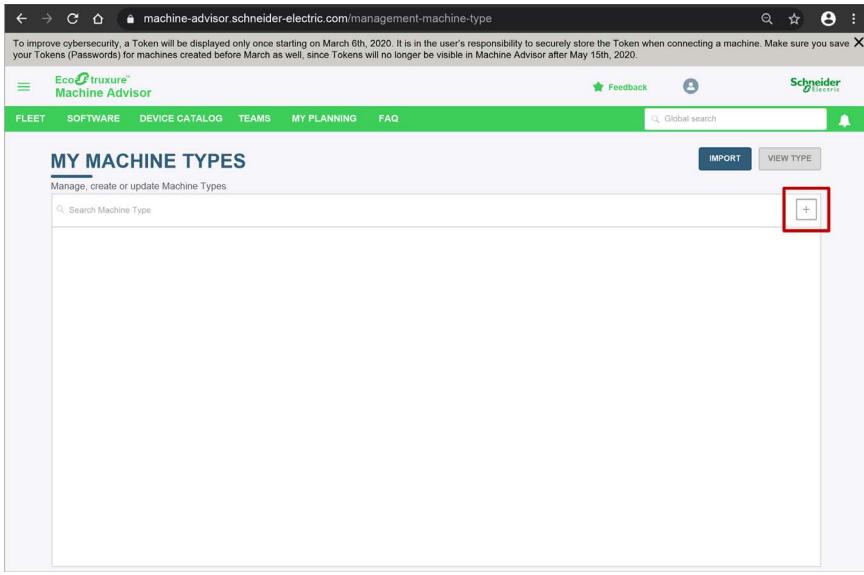
Step	Action
1	<p>Login to EcoStruxure Machine Advisor web page in Chrome/Mozilla browser using the below link:</p> <p>https://machine-advisor.schneider-electric.com</p>
2	<p>Click Join us.</p>  <p>Welcome to</p> <p>Eco<i>Struxure</i>[®] Machine Advisor</p> <p>JOIN US</p> <p>Go to Pricing Simulator</p> 

Step	Action
3	<p>Click Register tab.</p>  <p>EcoStruxure® Machine Advisor</p> <p>Email Password Login Register</p> <p>Login or Register with:  Having trouble logging in?</p> <p>We process account registration information and connection logs for authentication and application access management. Privacy Notice</p> <p>Privacy Policy This application is protected by copyright law and international treaties. © 2019 Schneider Electric Industries SAS. All Rights Reserved.</p> <p>Life Is On Schneider Electric</p>

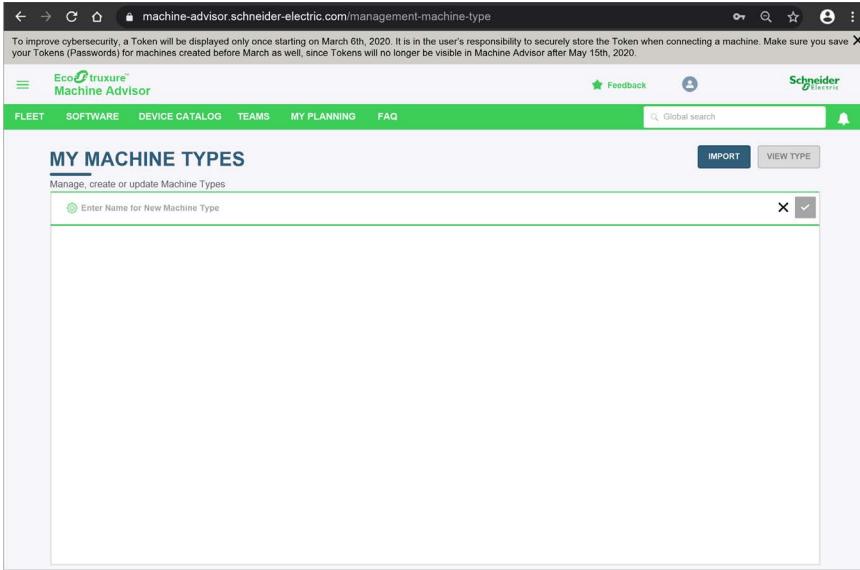
Step	Action
4	<p>Enter your account details and click Register.</p>  <p>Result: EcoStruxure Machine Advisor cloud home page appears.</p>

Step	Action
5	<p>On the home page, click MY MACHINE TYPES.</p> 

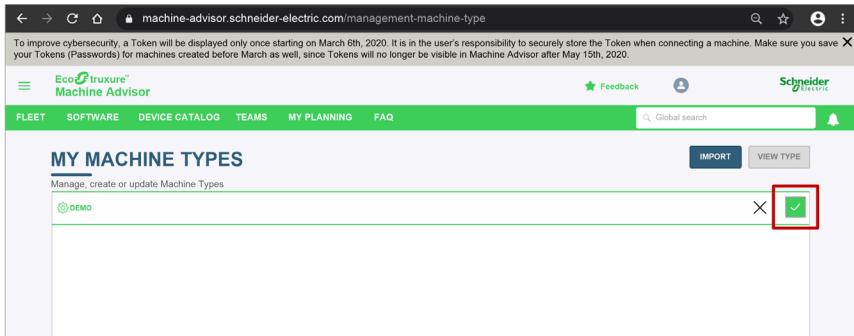
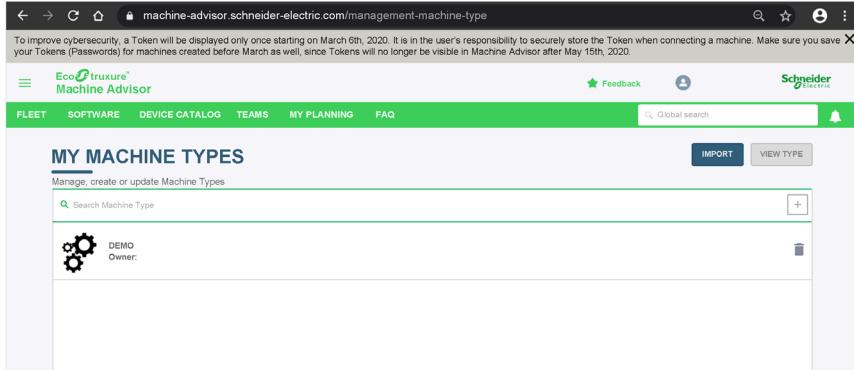
Step	Action
6	To create a new machine, click +.

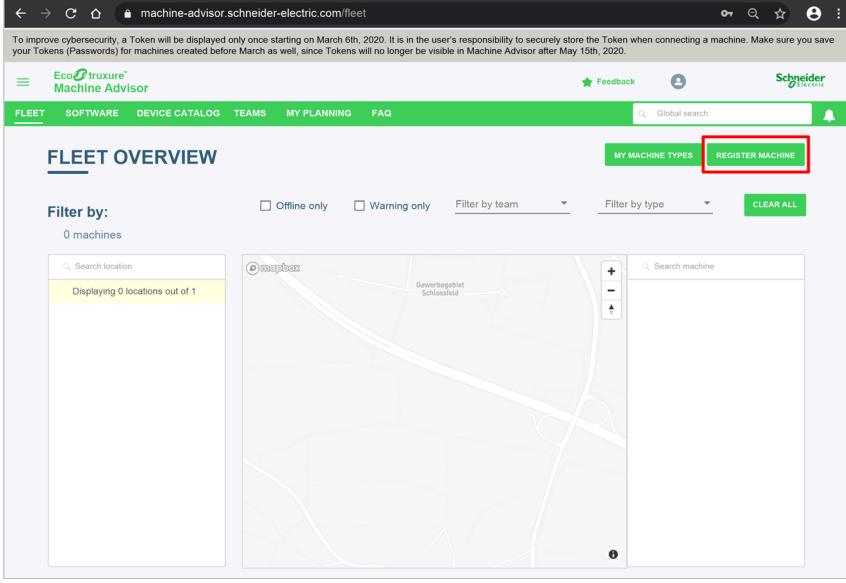


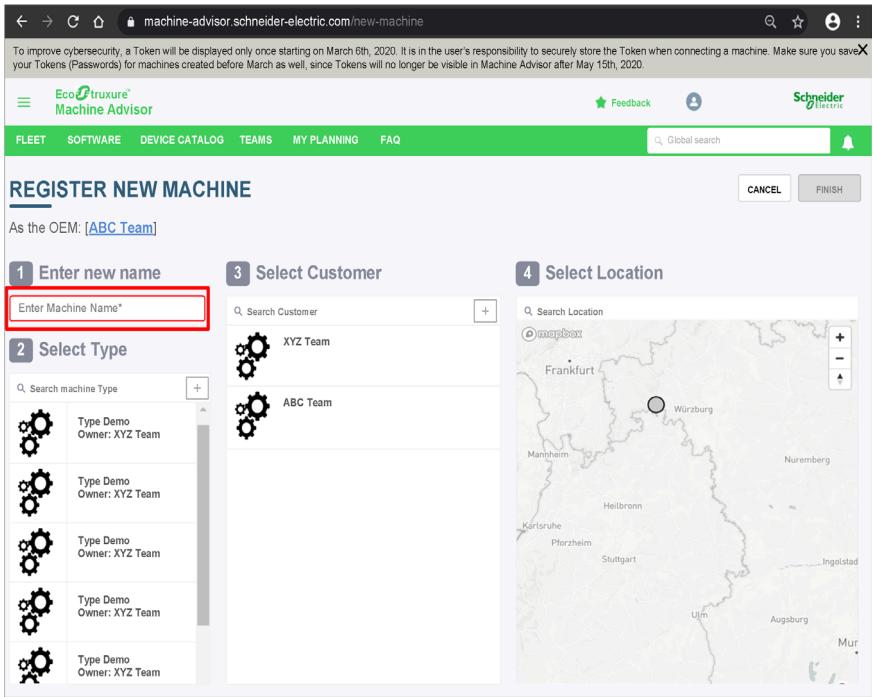
Step	Action
7	Type the name of new machine (for instance, Demo).

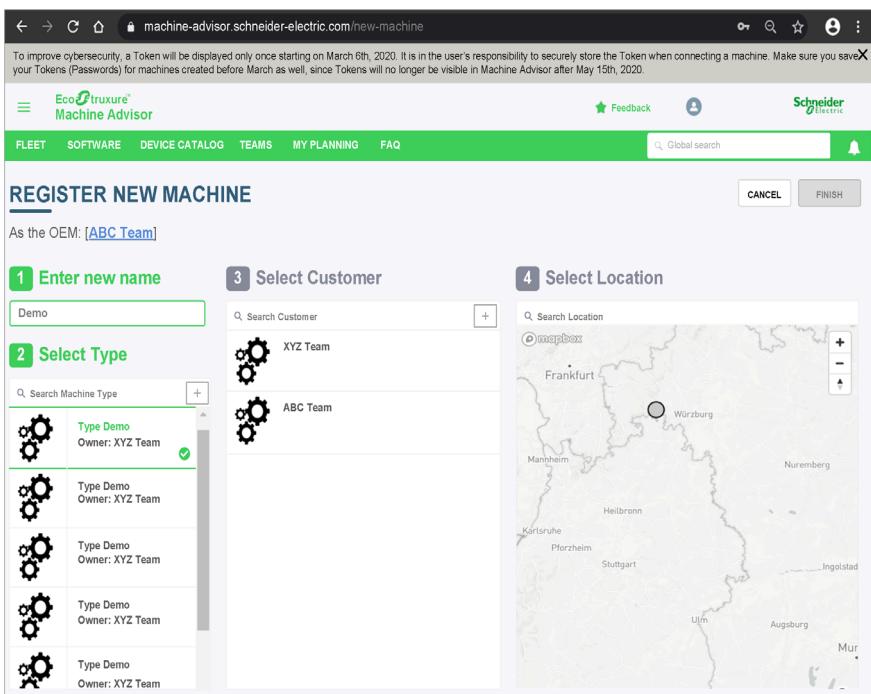


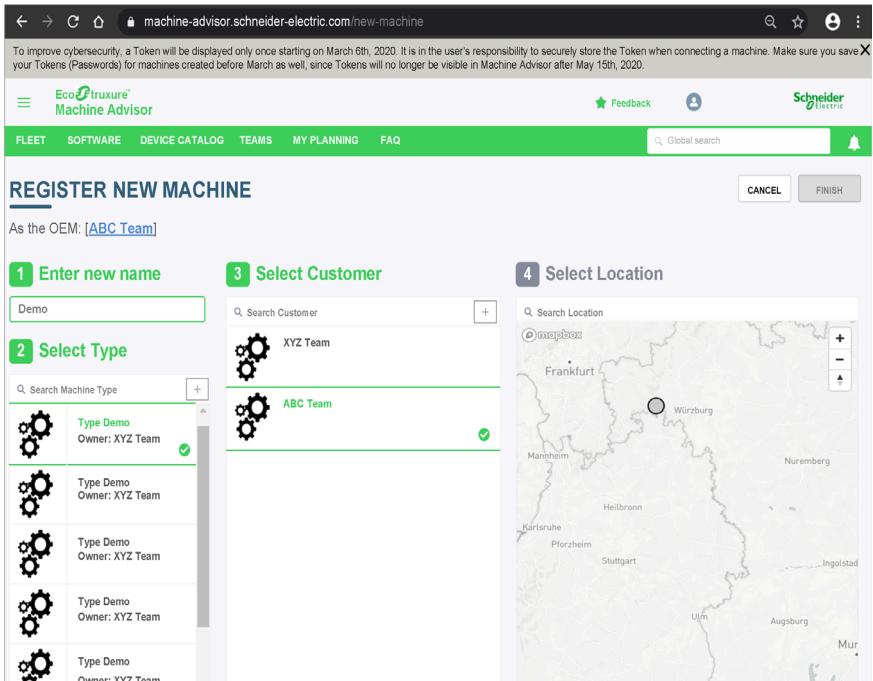
Step	Action
8	Click ✓ and go back to home page.

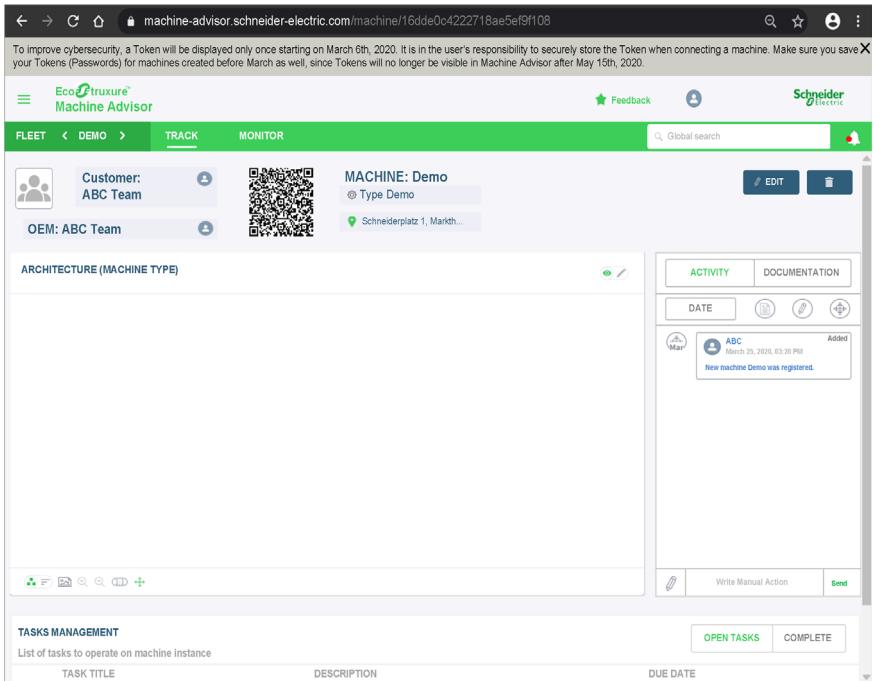
Step	Action
9	<p>On the home page, click REGISTER MACHINE.</p> 

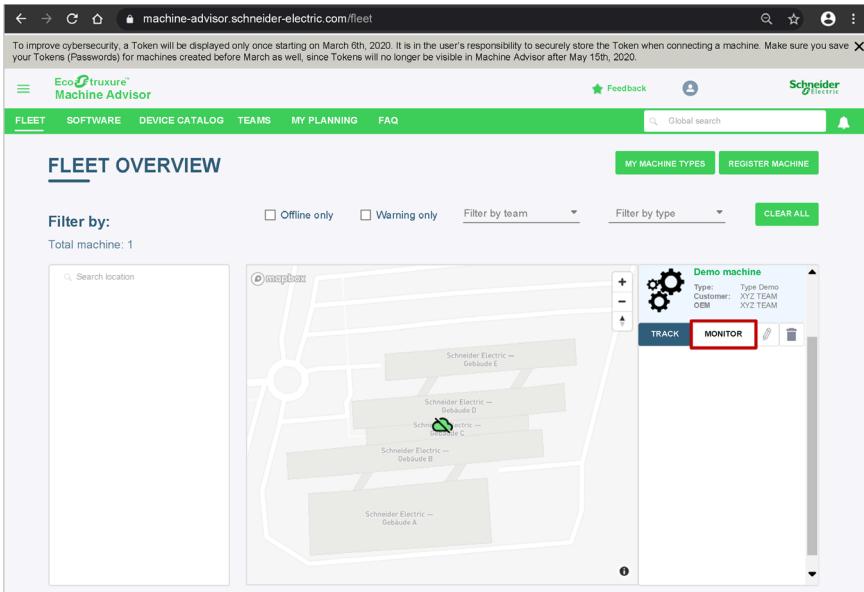
Step	Action
10	<p>Enter the name of your machine (for instance, Demo).</p> 

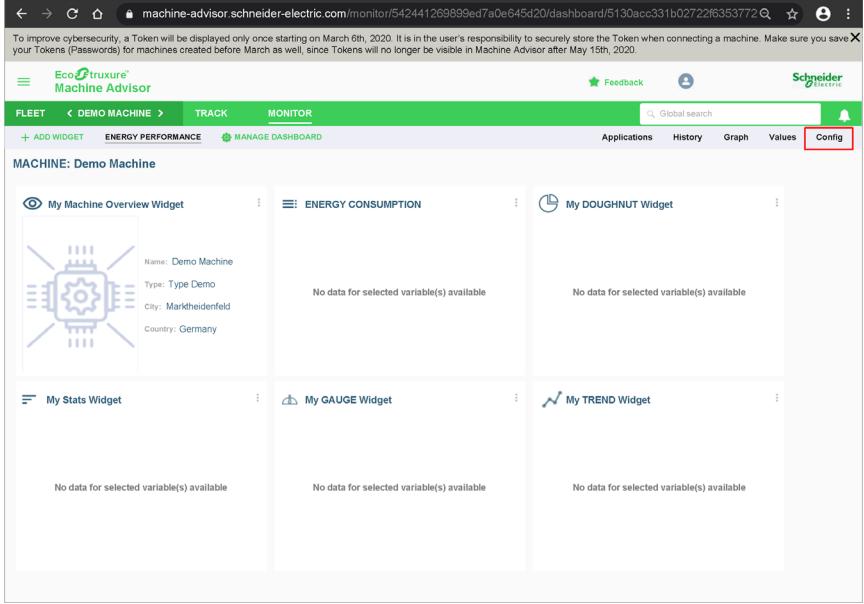
Step	Action
11	<p>Select the type of your machine.</p> 

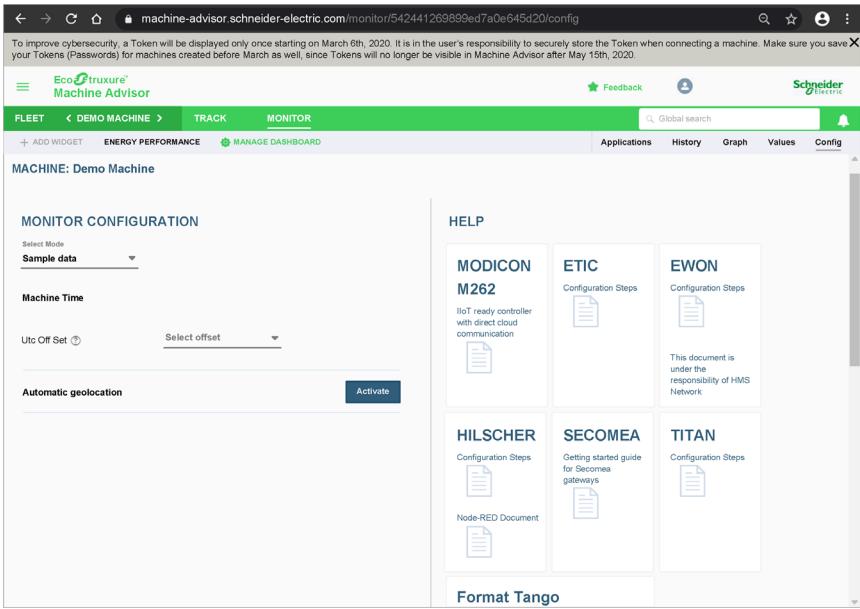
Step	Action
12	Select the customer of your machine. 

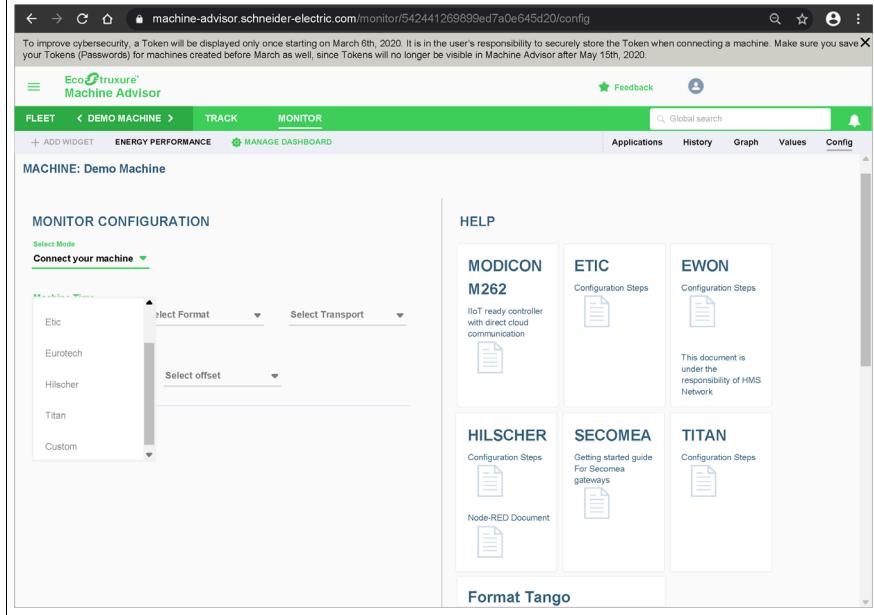
Step	Action
13	<p>Select the location in map where your machine is placed and click FINISH.</p> <p>The screenshot shows the 'REGISTER NEW MACHINE' page. Step 1: 'Enter new name' has 'Demo' entered. Step 2: 'Select Type' shows a list of 'Type Demo' entries, with one selected. Step 3: 'Select Customer' shows a list of 'XYZ Team' and 'ABC Team', with 'ABC Team' selected. Step 4: 'Select Location' shows a map search bar with 'Schneiderplatz 1, Marktheidenfeld, Germany' typed in, and a green dot indicating the selected location.</p>

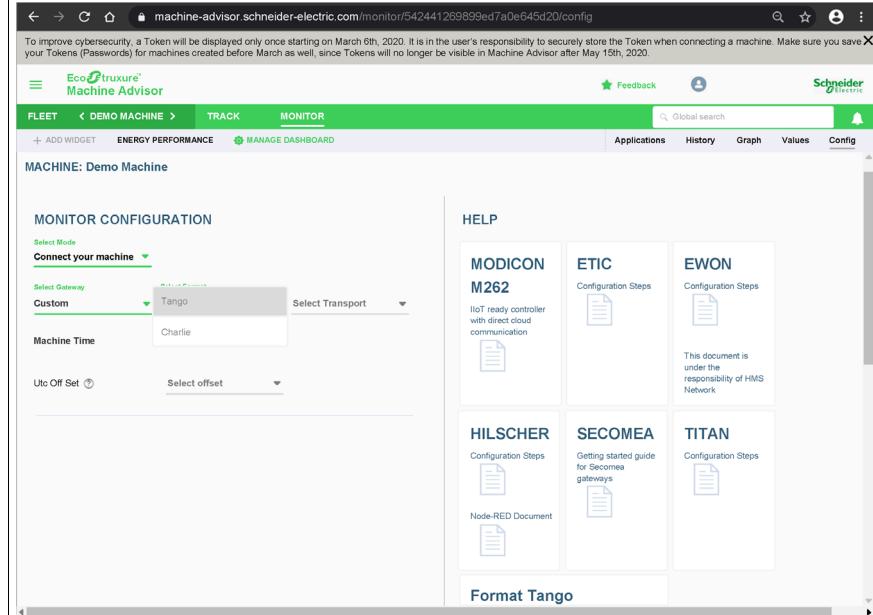
Step	Action
14	<p>Go back to FLEET window.</p> 

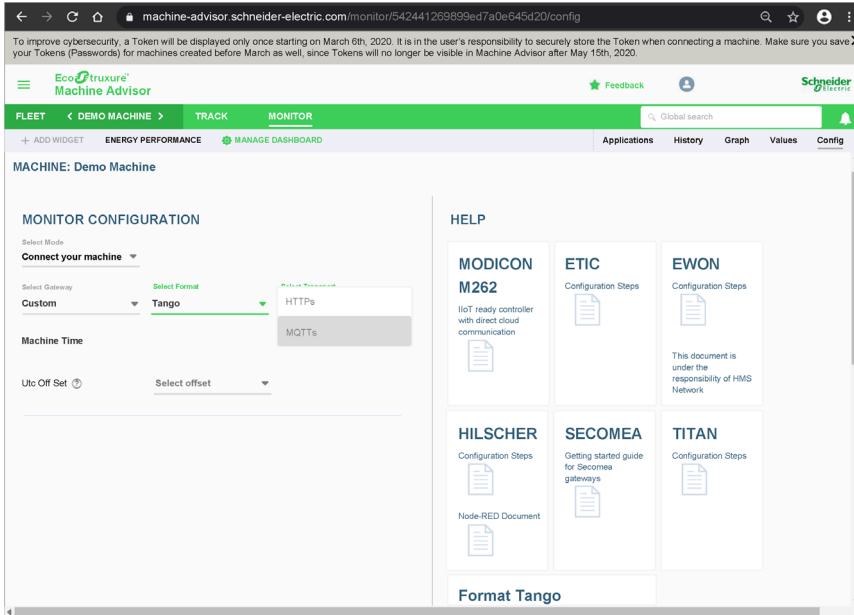
Step	Action
15	<p>Select your machine and click MONITOR.</p>  <p>The screenshot shows the 'FLEET OVERVIEW' section of the EcoStruxure Machine Advisor. On the left, there's a search bar for 'Search location'. In the center is a map of several buildings labeled 'Schneider Electric - Gebäude A' through 'Gebäude E'. On the right, a sidebar displays details for a machine named 'Demo machine' with type 'Demo', customer 'XYZ TEAM', and OEM 'XYZ TEAM'. Below the machine details are buttons for 'TRACK' (disabled), 'MONITOR' (highlighted with a red box), 'Edit', and 'Delete'.</p>

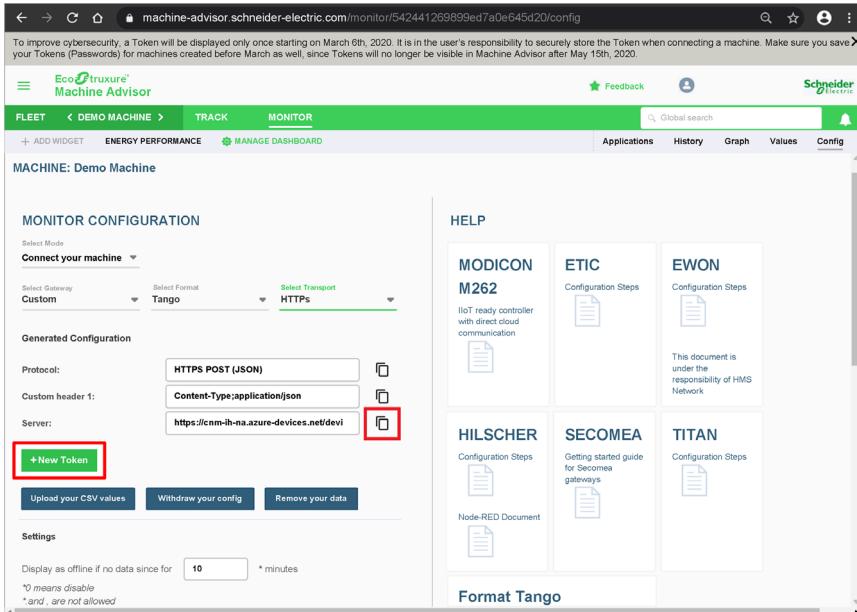
Step	Action
16	<p>Click Config tab.</p> 

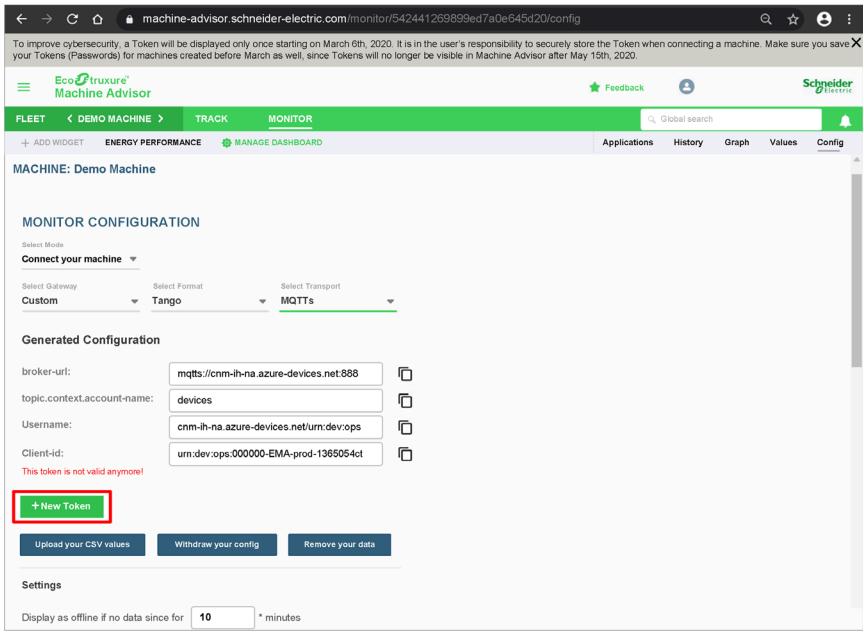
Step	Action
17	<p>Select mode as Connect your machine.</p> 

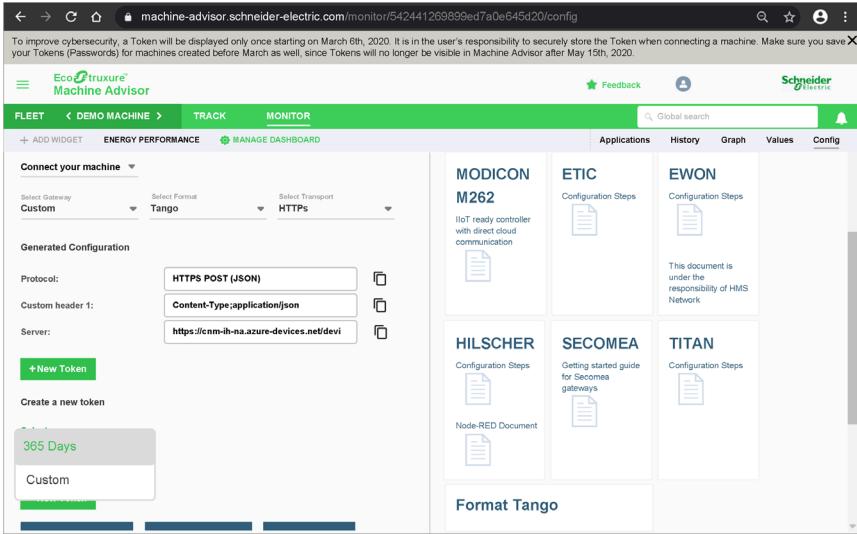
Step	Action
18	<p>Select Magelis or Custom. Other gateways are not applicable.</p> 

Step	Action
19	<p>Select the format from the drop down list given below:</p> <ul style="list-style-type: none"> ● TANGO ● CHARLIE  <p>NOTE: The same format should be selected while configuring SE Machine Advisor node (see page 36).</p>

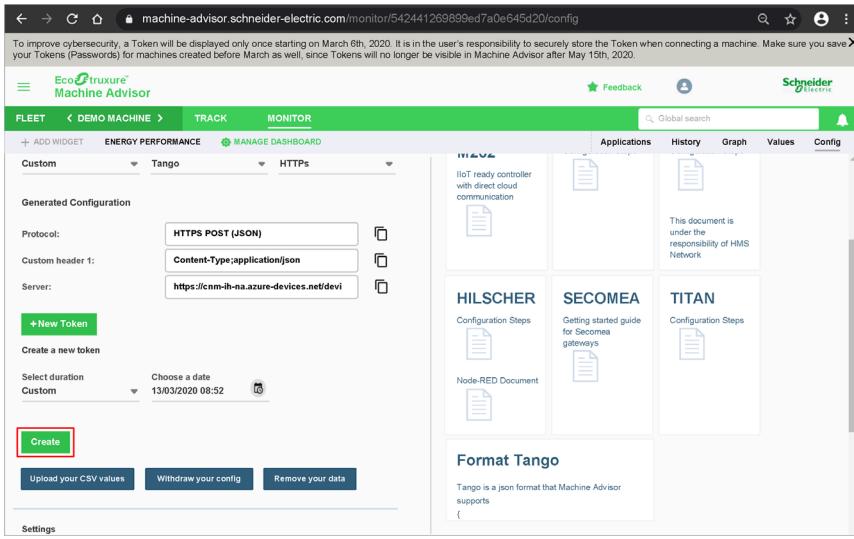
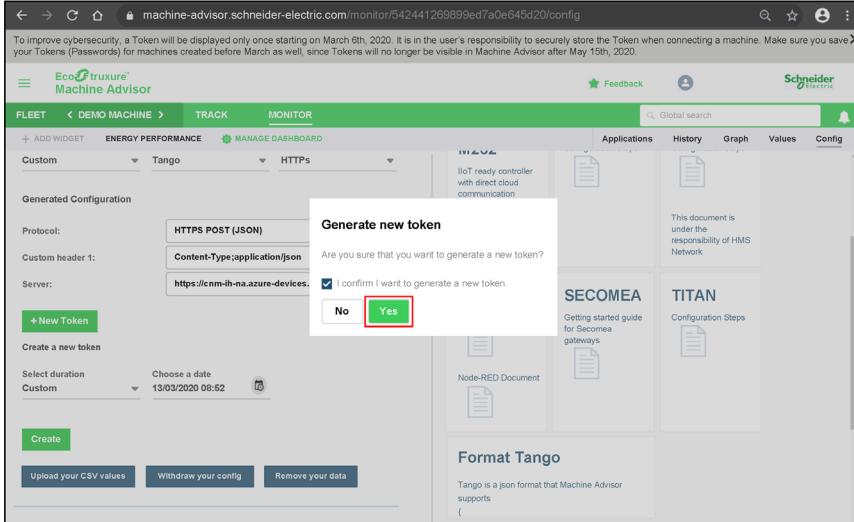
Step	Action
20	<p>Select the required transport protocol from the drop down list given below:</p> <ul style="list-style-type: none"> ● HTTPs ● MQTTs  <p>NOTE: The same protocol should be selected while configuring SE Machine Advisor node (see page 36).</p> <p>Result: The Generated Configuration details are available.</p>

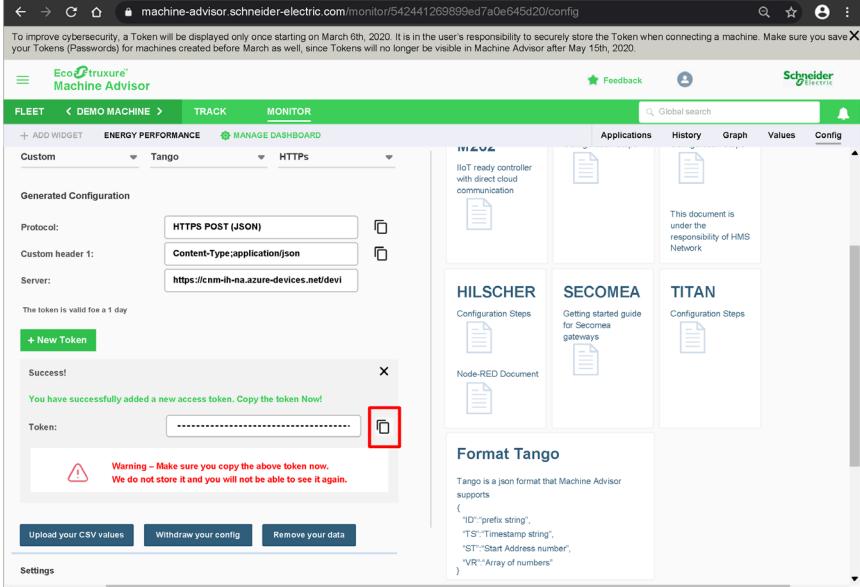
Step	Action
21	<p>Copy the Server and click +New Token. For HTTPs transport,</p>  <p>NOTE: The copied server link should be used while configuring SE Machine Advisor node.</p>

Step	Action
22	<p>For MQTTs transport,</p>  <p>Copy the parameters and click +New Token.</p> <p>NOTE: The copied configuration details should be used while configuring SE Machine Advisor node.</p>

Step	Action
23	<p>Select the Duration from the drop down given below:</p> <ul style="list-style-type: none"> ● 365 days ● Custom  <p>NOTE: Select Custom to set date and time as per your requirement.</p>

SE Machine Advisor Node

Step	Action
24	<p>Click CREATE.</p> 
25	<p>Select I confirm I want to generate a new token. and click Yes.</p> 

Step	Action
26	<p>Copy the Token.</p> <p>NOTE: Make sure you keep the generated token in your system, because the token can not be stored and you will be unable to see it again.</p>  <p>NOTE: The copied token should be used while configuring SE Machine Advisor node.</p>

HTTPs - Tango Data Format Configuration

Description

Double-click SE Machine Advisor node. The **Properties** screen of the node appears.

The screenshot shows the 'Edit SEMachineAdvisor node' dialog box. At the top right are 'Delete', 'Cancel', and 'Done' buttons. Below is a 'Properties' tab with a green header bar labeled 'Schneider Electric'. The configuration fields are:

- Name:** Name
- Transport:** HTTPs (selected)
- Format:** Charlie (disabled), Tango (selected)
- Server:** URL for the Data Source
- Token:** Bearer Token of the DataSource
- Use Proxy:** No
- Prefix string:** M001
- Start Address:** 1
- Logging:** Enable
- Level:** Alert only

HTTPs - Tango data format configuration consists of the following:

Fields	Description
Name	Displays the name of the configuration.
Transport	Click HTTPs . NOTE: For successful communication, this field value should be same as the field value on Config page of EcoStruxure Machine Advisor web page (see page 36).

Fields	Description
Format	<p>Select the Tango format.</p> <p>NOTE: For successful communication, this field value should be same as the field value on Config page of EcoStruxure Machine Advisor web page (<i>see page 36</i>).</p>
Server	<p>Copy this value from EcoStruxure Machine Advisor web page and paste in this field (See step no 15) (<i>see page 44</i>).</p>
Token	<p>Copy this value from EcoStruxure Machine Advisor web page and paste in this field (See step no 18) (<i>see page 44</i>).</p>
Use Proxy	<p>Select the required option from the list:</p> <ul style="list-style-type: none"> ● Yes: If you are in proxy network (for example: Schneider network), you should provide valid proxy. ● No: If you are not in proxy network (for example, Schneider network), you need not provide proxy. <p>NOTE: Proxy acts as a gateway primarily used for network restrictions.</p>
Proxy	<p>Use valid proxy with respect to your organization or country (for instance, http://yourproxy:XXXX).</p> <p>NOTE: This field is enabled if you select Yes in Use Proxy field.</p>
Prefix string	<p>Enter an identifier of the data for pushing the data to the cloud. In case, the prefix string is not available, the device name obtained from the device node is taken as the identifier.</p> <p>NOTE: By default, the value is M001.</p>
Start Address	<p>Enter starting address of the data received as input.</p> <p>NOTE: This field is only for Tango data format.</p>
Logging	<p>Select the Enable or Disable for logging the events. By default, Enable is selected. When enabled, the log events are recorded in the log file.</p> <p>The log files will be saved in the path given below: <Installed Node Directory>/nodes/log/ For instance the location will be:</p> <ul style="list-style-type: none"> ● Offline installation <ul style="list-style-type: none"> ○ <User Directory>/se-node-red-machine_advisor/nodes/log/ ● Online installation <ul style="list-style-type: none"> ○ <User Directory>/.node-red/node_modules/se-node-red-machine_advisor/nodes/log/

Fields	Description
Level	<p>Select the logging level from the list:</p> <ul style="list-style-type: none">● All Events Error, info, debug messages are logged● Alerts Only Error messages are logged <p>NOTE: By default, Alerts Only is selected.</p>

HTTPs - Charlie Data Format Configuration

Description

Double-click SE Machine Advisor node. The **Properties** screen of the node appears.

The screenshot shows the 'Edit SEMachineAdvisor node' dialog box. The 'Properties' tab is selected. The 'Format' section has 'Charlie' highlighted in green. Other tabs shown are 'MQTTs' and 'Tango'. Other configuration fields include Name, Server, Token, Use Proxy, Prefix string, Logging, and Level.

HTTPs - Charlie data format configuration consists of the following:

Fields	Description
Name	Displays the name of the configuration.
Transport	Click HTTPs . NOTE: For successful communication, this field value should be same as the field value on Config page of EcoStruxure Machine Advisor web page (<i>see page 36</i>).

Fields	Description
Format	<p>Select the Charlie format.</p> <p>NOTE: For successful communication, this field value should be same as the field value on Config page of EcoStruxure Machine Advisor web page (see page 36).</p>
Server	<p>Copy this value from EcoStruxure Machine Advisor web page and paste in this field (See step no 15) (see page 44).</p>
Token	<p>Copy this value from EcoStruxure Machine Advisor web page and paste in this field (See step no 18) (see page 44).</p>
Use Proxy	<p>Select the required option from the list:</p> <ul style="list-style-type: none"> ● Yes: If you are in proxy network (for example: Schneider network), you should provide valid proxy. ● No: If you are not in proxy network (for example, Schneider network), you need not provide proxy. <p>NOTE: Proxy acts as a gateway primarily used for network restrictions.</p>
Proxy	<p>Use valid proxy with respect to your organization or country (for instance, <code>http://yourproxy:XXXX/</code>).</p> <p>NOTE: This field is enabled if you select Yes in Use Proxy field.</p>
Prefix string	<p>Enter an identifier of the data for pushing the data to the cloud. In case, the prefix string is not available, the device name obtained from the device node is taken as the identifier.</p> <p>NOTE: By default, the value is M001.</p>
Logging	<p>Select the Enable or Disable for logging the events. By default, Enable is selected. When enabled, the log events are recorded in the log file.</p> <p>The log files will be saved in the path given below: <code><Installed Node Directory>/nodes/log/</code></p> <p>For instance the location will be:</p> <ul style="list-style-type: none"> ● Offline installation <ul style="list-style-type: none"> ○ <code><User Directory>/se-node-red-machine_advisor/nodes/log/</code> ● Online installation <ul style="list-style-type: none"> ○ <code><User Directory>/.node-red/node_modules/se-node-red-machine_advisor/nodes/log/</code>
Level	<p>Select the logging level from the list:</p> <ul style="list-style-type: none"> ● All Events Error, info, debug messages are logged ● Alerts Only Error messages are logged <p>NOTE: By default, Alerts Only is selected.</p>

MQTTs - Tango Data Format Configuration

Description

Double-click SE Machine Advisor node. The **Properties** screen of the node appears.

The screenshot shows the 'Edit SEMachineAdvisor node' dialog box. At the top, there are 'Delete', 'Cancel', and 'Done' buttons. Below them is a 'Properties' tab and a 'Schneider Electric' section header. The configuration fields are:

- Name:** Name (text input)
- Transport:** HTTPS (disabled) and MQTTs (selected)
- Format:** Charlie (disabled) and Tango (selected)
- Broker URL:** URL for the DataSource (text input)
- Topic:** Topic (text input)
- Username:** Username (text input)
- Password:** Password (text input)
- Client Id:** clientId (text input)
- Prefix string:** M001 (text input)
- Start Address:** 1 (text input)
- Logging:** Enable (dropdown menu)
- Level:** Alert only (dropdown menu)

MQTTs - Tango data format configuration consists of the following:

Fields	Description
Name	Displays the name of the configuration.
Transport	Click MQTTs . NOTE: For successful communication, this field value should be same as the field value on Config page of EcoStruxure Machine Advisor web page (<i>see page 36</i>).

Fields	Description
Format	<p>Select the Tango format.</p> <p>NOTE: For successful communication, this field value should be same as the field value on Config page of EcoStruxure Machine Advisor web page (see page 36).</p>
Broker URL	<p>Copy this value from EcoStruxure Machine Advisor web page and paste in this field (See step no 17) (see page 44).</p>
Topic	<p>Copy Topic value from EcoStruxure Machine Advisor web page and paste in this field (See step no 17) (see page 44).</p>
Username	<p>Copy this value from your EcoStruxure Machine Advisor account where data is pushed and paste in this field (See step no 17) (see page 44).</p>
Password	<p>Copy this value from your EcoStruxure Machine Advisor account where data is pushed and paste in this field (See step no 18) (see page 44).</p> <p>NOTE: Paste the generated token as password.</p>
Client Id	<p>Copy this value from your EcoStruxure Machine Advisor account where data is pushed and paste in this field (See step no 17) (see page 44).</p>
Prefix string	<p>Enter an identifier of the data for pushing the data to the cloud. In case, the prefix string is not available, the device name obtained from the device node is taken as the identifier.</p> <p>NOTE: By default, the value is M001.</p>
Start Address	<p>Enter starting address of the data received as input.</p> <p>NOTE: This field is only for Tango data format.</p>
Logging	<p>Select the Enable or Disable for logging the events. By default, Enable is selected. When enabled, the log events are recorded in the log file.</p> <p>The log files will be saved in the path given below: <code><Installed Node Directory>/nodes/log/</code></p> <p>For instance the location will be:</p> <ul style="list-style-type: none"> ● Offline installation <ul style="list-style-type: none"> ○ <code><User Directory>/se-node-red-machine_advisor/nodes/log/</code> ● Online installation <ul style="list-style-type: none"> ○ <code><User Directory>/.node-red/node_modules/se-node-red-machine_advisor/nodes/log/</code>

Fields	Description
Level	<p>Select the logging level from the list:</p> <ul style="list-style-type: none">● All Events Error, info, debug messages are logged● Alerts Only Error messages are logged <p>NOTE: By default, Alerts Only is selected.</p>

MQTTs - Charlie Data Format Configuration

Description

Double-click SE Machine Advisor node. The **Properties** screen of the node appears.

The screenshot shows the 'Edit SEMachineAdvisor node' dialog box. At the top, there are 'Delete', 'Cancel', and 'Done' buttons. Below that is a 'Properties' tab. The main area has a green header bar with the text 'Schneider Electric'. The configuration fields are as follows:

- Name:** Name (text input field)
- Transport:** HTTPS (button) and MQTTs (button, highlighted in green)
- Format:** Charlie (button, highlighted in green) and Tango (button)
- Broker URL:** URL for the DataSource (text input field)
- Topic:** Topic (text input field)
- Username:** Username (text input field)
- Password:** Password (text input field)
- Client Id:** clientId (text input field)
- Prefix string:** M001 (text input field)
- Logging:** Enable (dropdown menu)
- Level:** Alert only (dropdown menu)

MQTTs - Charlie data format configuration consists of the following:

Fields	Description
Name	Displays the name of the configuration.
Transport	<p>Click MQTTs.</p> <p>NOTE: For successful communication, this field value should be same as the field value on Config page of EcoStruxure Machine Advisor web page (see page 36).</p>

Fields	Description
Format	<p>Select the Charlie format.</p> <p>NOTE: For successful communication, this field value should be same as the field value on Config page of EcoStruxure Machine Advisor web page (see page 36).</p>
Broker URL	<p>Copy this value from EcoStruxure Machine Advisor web page and paste in this field (See step no 17) (see page 44).</p>
Topic	<p>Copy Topic value from EcoStruxure Machine Advisor web page and paste in this field (See step no 17) (see page 44).</p>
Username	<p>Copy this value from your EcoStruxure Machine Advisor account where data is pushed and paste in this field (See step no 17) (see page 44).</p>
Password	<p>Copy this value from your EcoStruxure Machine Advisor account where data is pushed and paste in this field (See step no 18) (see page 44).</p> <p>NOTE: Paste the generated token as password.</p>
Client Id	<p>Copy this value from your EcoStruxure Machine Advisor account where data is pushed and paste in this field (See step no 17) (see page 44).</p>
Prefix string	<p>Enter an identifier of the data for pushing the data to the cloud. In case, the prefix string is not available, the device name obtained from the device node is taken as the identifier.</p> <p>NOTE: By default, the value is M001.</p>
Logging	<p>Select the Enable or Disable for logging the events. By default, Enable is selected. When enabled, the log events are recorded in the log file.</p> <p>The log files will be saved in the path given below: <code><Installed Node Directory>/nodes/log/</code></p> <p>For instance the location will be:</p> <ul style="list-style-type: none"> ● Offline installation <ul style="list-style-type: none"> ○ <code><User Directory>/se-node-red-machine_advisor/nodes/log/</code> ● Online installation <ul style="list-style-type: none"> ○ <code><User Directory>/.node-red/node_modules/se-node-red-machine_advisor/nodes/log/</code>
Level	<p>Select the logging level from the list:</p> <ul style="list-style-type: none"> ● All Events Error, info, debug messages are logged ● Alerts Only Error messages are logged <p>NOTE: By default, Alerts Only is selected.</p>

Chapter 7

Usage of SE Machine Advisor Node

What Is in This Chapter?

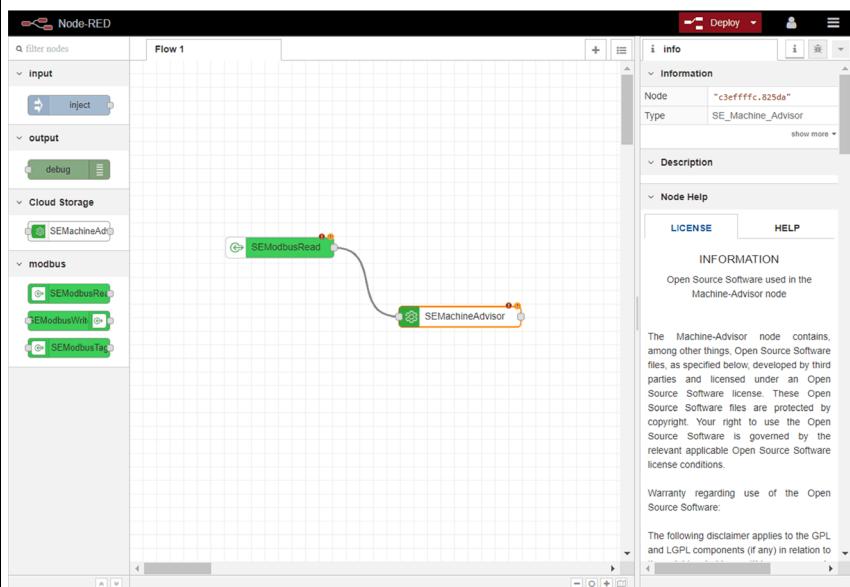
This chapter contains the following topics:

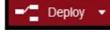
Topic	Page
Usage of SE Machine Advisor Node	80
Troubleshooting	82
Common Message Structure (CMS)	83

Usage of SE Machine Advisor Node

The user needs to connect SE Modbus node as an input to collect data and upload it to the EcoStruxure Machine Advisor cloud.

The procedure for the use of SE Machine Advisor node is given below:

Step	Action
1	Launch Node-RED server and SE Machine Advisor (see page 39) node.
2	Launch SE Modbus Read node (see Node-RED – SE Modbus Basic Nodes, User Manual).
3	Connect two nodes by joining the output of SE Modbus Read with input of SE Machine Advisor as shown below:  <p>The screenshot shows the Node-RED interface with a flow titled 'Flow 1'. On the left, there are three categories: 'Input' (with an 'inject' node), 'output' (with a 'debug' node), and 'modbus' (with four nodes: 'SEMachineAd', 'SEModbusRead', 'SEModbusWrite', and 'SEModbusTls'). A green 'SEModbusRead' node is selected. A wire connects its output port to the input port of an orange 'SEMACHINEADVISOR' node on the right. The top right corner of the interface shows a 'Deploy' button and other status indicators. To the right of the canvas is a detailed node info panel for the 'SEMACHINEADVISOR' node, which includes sections for 'Information', 'Description', and 'Node Help'.</p>
4	Double-click SE Machine Advisor node. Result: Edit SEMachineAdvisor node opens.
5	Configure SE Machine Advisor node (see page 36). NOTE: You need to configure SE Machine Advisor node by copying the required details from EcoStruxure Machine Advisor web page and filling the remaining fields.
6	Double-click SE Modbus Read node. Result: Edit SEModbusRead node opens.

Step	Action
7	Configure SE Modbus Read node (<i>see Node-RED – SE Modbus Basic Nodes, User Manual</i>). NOTE: The Values page of EcoStruxure Machine Advisor application shows the details of the data pushed to the cloud with timestamp.
8	Click Done and Deploy  to save the changes. Result: Nodes status changes to Connected . Result: The data is pushed to the cloud at a frequency defined in the Poll Rate field of SE Modbus Read node.

Communicating Data to the EcoStruxure Machine Advisor Cloud

When SE Machine Advisor node is connected to collecting node it receives the data in the CMS format.

You need to configure SE Machine Advisor node to initiate a communication. This can be done by copying the required details from EcoStruxure Machine Advisor Cloud Login Page (*see page 44*) depending upon the configuration (*see page 36*). EcoStruxure Machine Advisor converts the input data in Tango/ Charlie format and pushes the data to EcoStruxure Machine Advisor cloud.

EcoStruxure Machine Advisor cloud communication gives response status when the data is successfully pushed to the cloud.

```
{
  "StatusCode":204,
  "statusMsg":"Success"
}
```

The status is displayed in **Debug** window located on the right side of Node-RED.

Store and forward mechanism

In case of network interruption, the data is stored locally to a file. Whenever the data is pushed successfully after interruption, the stored data is pushed to the cloud in an iterative manner.

150 records are pushed per iteration. After pushing first iteration successfully and with success acknowledge, next iteration is initiated. The process is continued till the file is emptied and all store and forward files are pushed. Each node creates separate Store and Forward file stored in the node directory. When SE Machine Advisor node is deleted, then corresponding store and forward file is deleted from the directory.

The stored data files will be saved in the path given below:

<Installed Node Directory>/nodes/data/

Troubleshooting

All the error messages are logged in the log file. If you come across with any below problems, try the following solutions:

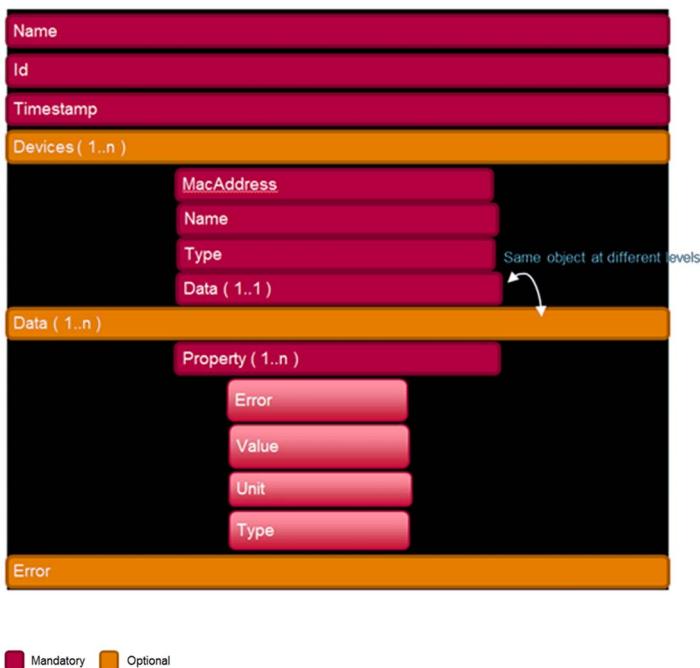
Cause	Response Status	Solution
When the server URL configured is not valid	{ "StatusCode":400, "statusMsg":"Bad Request" }	Enter the valid URL.
When authentication is not valid	{ "StatusCode":401, "statusMsg":"Unauthorized " }	Login with valid credentials.
When unable to reach the server	{ "Error":"Connection Timeout" }	Check for network connectivity. NOTE: In case of network interruption, the data is stored locally in a file. This data is pushed iteratively after connection is restored.
Log events are not captured	-	Verify if the log folder has WRITE permission.
Store and Forward information not captured	-	Verify if the data folder has READ/WRITE permission.

Common Message Structure (CMS)

CMS is standard JSON format between a connecting node and a publishing node to avoid any intermediate functions. JSON is a standard way for representing a JavaScript object as a string. It is commonly used by web APIs to return data.

A Node-RED flow works by passing messages between nodes. All the messages conform to a common message format to simplify the message content navigation. The messages are simple JavaScript objects that can have any set of properties.

The following is the CMS structure:



Field	Description
Name	Name of the node.
Id	Unique Identifier
Timestamp	Time duration for which data was read.
Devices	Applicable for Harmony Hub sensor. All nested objects inside are mandatory if atleast one device object exists.

Field	Description
Data	Object at root level and as a composite inside Devices. It contains at least one property object.
Error	Error at the root level, not tied to any parameter. <ul style="list-style-type: none"> ● Scenario 1: Gateway disconnected. ● Scenario 2: Gateway timed out. ● Scenario 3: Modbus port not opened. ● Scenario 4: Gateway connected. Read Error encountered.
Property	If data object exists, then atleast one property is mandatory. Mapped to the parameter details. It contains Error, Value, Unit, Type.
Error	Local error pertaining to the parameter. <ul style="list-style-type: none"> ● Scenario 1: No Radio (at a sensor level) ● Scenario 2: Parameter Read Error encountered. (e.g.FF, FFFF, FFFFFFFF) <ul style="list-style-type: none"> ○ Value: When mandatory, always in case of success. When optional, in case of error. ○ Unit - optional field ○ Type - optional field

The following graphics are an example of CMS data:

Example 1: One device connected directly through SE Machine Advisor node output:

```
{
  "name": "SEModbusRead",
  "id": "modbusTCP@192.169.10.110",
  "timestamp": "2020-02-27T08:54:57.802Z",
  "data": {
    "speed": {
      "value": 240,
      "type": "int"
    },
    "temperature": {
      "value": 98.5,
      "type": "float32"
    }
  }
}
```

Example 2: One gateway (associated with multiple devices) connected through SE Machine Advisor node output:

```
{  
    "name": "Conveyer",  
    "id": "modbusTCP@192.168.100.10",  
    "data": {  
        "optional": 22  
    },  
    "devices": [  
        {  
            "name": "ecube",  
            "id": "ffd000c7",  
            "timestamp": "2018-12-19T03:28:27.821Z",  
            "data": {  
                "temp12": {  
                    "value": 22,  
                    "unit": "volt",  
                    "datatype": "int16"  
                },  
                "speed11": {  
                    "value": 21,  
                    "unit": "s"  
                }  
            }  
        }  
    ]  
}
```

Part IV

IIoT and Cybersecurity

Chapter 8

IIoT and Cybersecurity

Cybersecurity

Overview

Because of the IIoT design, industrial and control systems are increasingly vulnerable to cyber-attacks for the following reasons:

- Magelis Edge Box and Magelis iPC are commercially available in the market.
- Publishing nodes can be remotely accessible.
- IIoT designs are a strategic location in the industrial processes that is of interest to hackers.

To secure the industrial installation, the following fundamental characteristics should be considered:

- Availability of the system to help ensure that the system remains operational
- Integrity of the data to maintain the integrity of information
- Confidentiality to avoid information disclosure

General Practices

To keep the system as secured as possible, secure the environment where the Box is installed.

Unauthorized persons may gain access to the Magelis iPC and Magelis Edge Box as well as to other devices on the network/fieldbus of the machine and connected networks via insufficiently secure access to the software and networks.

Before creating user login details, cross-check again if it is necessary to give access to others. Users may have one of two permissions (*-full access/read-only access). Admin login and password details must be secured.

To avoid unauthorized access to the Magelis iPC and Magelis Edge Box, you must have the:

- Operating system, libraries, runtime environments, etc. are installed and correctly configured.
- Patch management controls to ensure that all software is kept up-to-date.
- Configuration change management controls.
- Malicious code detection and prevention controls, for example:
 - Anti-virus signature and pattern updates are applied in a timely fashion.
 - Application whitelisting.
- Access control and permission management.
- Backup and restore functionality.
- Area where the Box is placed must be physically protected to keep the device as safe as possible.

- Authentication and authorization enabled for Node-RED environment.
- SSL enabled to secure Node-RED in Windows platform. By default, SSL is enabled to secure Node-RED in the HMIBSC boxes.

Cybersecurity Certification

Schneider Electric developed cybersecurity guidelines based on the following recommendations:

- ISA Secure.