

Node-RED – SE Modbus Basic Nodes User Manual

05/2020

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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:

- installation and uninstallation of SE Modbus nodes.
- configuration of the nodes.
- usage of the nodes.
- limitations.

Validity Note

This document has been updated with the release of SE Modbus Basic nodes V2.0.0.

Related Documents

Title of Documentation	Reference Number
Node-RED - SE Machine Advisor - User Manual	<i>EIO0000004100</i>

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

Part I

Introduction

Chapter 1

Overview

General Information

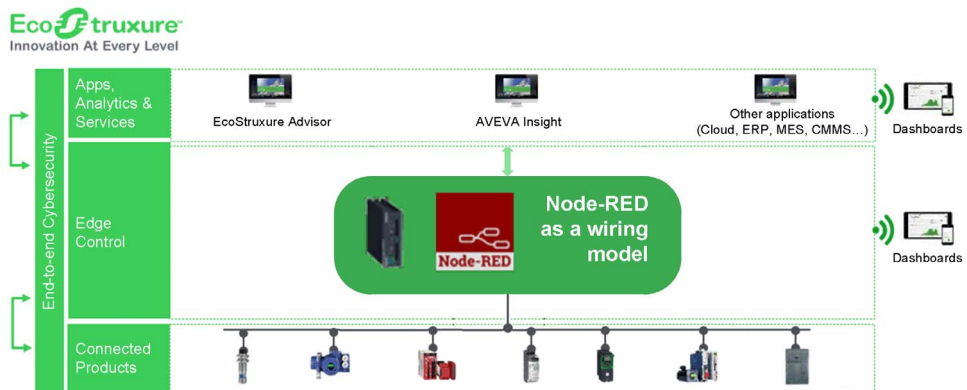
IIoT (Industrial Internet of Things)

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



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 the data to the cloud for processing and waiting for the analytical results, edge control devices push their data, thus saving bandwidth and enabling more 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:** access to our strong L3 support team experts and the available technical documentation.

Apps, Analytics and Services

SE Modbus nodes are developed by Schneider to simplify the Node-RED flows for use cases that require connectivity with the cloud applications. The web page included with this node also provides the means to specify the data to be retrieved from the PLC and to define the polling rate. The data from the node data is collected and sent further to the web based applications through the connected publishing node.

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 plugs itself on top of your current 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	<i>Reference HMIBSCEA53D1L0T HMIBSC with ARM, Linux</i>
Magelis HMIBMI	<i>Reference HMIBMIEA5DD110L HMIBMI with Intel Atom</i>

Magelis Edge Box	Reference
Magelis HMIBMO	<i>Reference HMIBMOMA5DD1E01: HMIBMO with Intel Atom</i>

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	<i>Reference HMIBMPHI74D4801 HMIBMP with 4 expansion slots. Intel Core I7</i>
Magelis HMIBMU	<i>Reference HMIBMUSI29D2801 HMIBMU with 2 expansion slots. Intel Celeron</i>

SE Modbus Nodes

Modbus

Modbus Protocol is a messaging structure developed by Modicon that provides a common language for devices and equipment to communicate with each other. Modbus is a standard, open and most widely-used network protocol in industrial automation.

SE Modbus Basic nodes package consists of the following nodes:

- SE Modbus Read node ([*see page 38*](#))
- SE Modbus Write node ([*see page 45*](#))

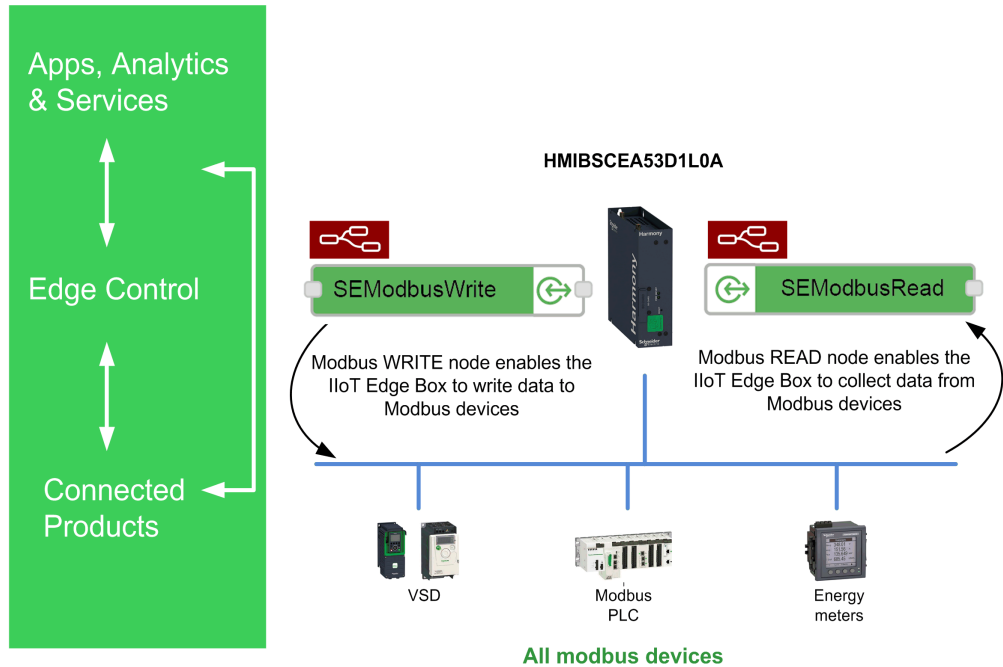
SE Modbus Read and SE Modbus Write nodes are connecting nodes that read data from and write data into devices supporting modbus protocol (for instance: PLC, VSD (Variable Speed Drives), Energy meter and more).

The output will be in CMS (Common Message Structure) format ([*see page 62*](#)) irrespective of the input format. This CMS format makes Schneider node plug and play. The user does not have to configure intermediate nodes with Schneider nodes in a complete end-to-end Schneider data flow.

SE Modbus Nodes Integration in Ecostruxure™ Architecture

SE Modbus nodes are connecting nodes that use standard Modbus protocols to connect to the device. The data in the connecting node can be connected to any data publishing node, such as EcoStruxure Machine Advisor, SE Aveva Insight node and more.

The following figure is an example of SE Modbus nodes in Ecostruxure™.



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 Modbus nodes have the following limitations:

1. Node-RED application is supported in any browser with V8 engine or similar (for instance; Google chrome V73.0, Firefox V66.0). Refer README for future version support.
2. Node-RED web page is only available in English, irrespective of the system language.
3. SE Modbus nodes on the HMIBSC Edge box only support Modbus TCP/IP protocol, even though the node offers options for serial communication. Modbus Serial communication with HMIBSC Box can not be established using modbus serial cable due to unavailability of a driver supporting the Linux platform.
4. Modbus protocol limitations to read data from a modbus device are as follows:
 - **Read Coil Status:** 2000
 - **Read Input Status:** 2000

- **Read Holding Registers:** 125
 - **Read Input Registers:** 125
5. Modbus protocol limitations to write data from a modbus device are as follows:
 - **Force Single Coil:** 1
 - **Preset Single Register:** 1
 - **Force Multiple Coils:** 1968
 - **Preset Multiple Registers:** 123
 6. Node-RED Editor Debug window shows maximum 1000 register values only.
 7. When the user wants to do the offline installation, the internet should be disabled. It takes longer to install if the internet is enabled.
 8. For optimum performance, in one Edge Box, consider deploying 4 SE Modbus Read node (125 holding registers / 2000 coils per node) along with publishing nodes. This will enable overall 500 tags to be read.

Part II

Installation and Uninstallation SE Modbus Nodes

What Is in This Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
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3	Installing SE Modbus Nodes – Linux Platform	21
4	Uninstalling SE Modbus Nodes - Linux Platform	29

Chapter 2

Prerequisites

System Requirements

Operating System

SE Modbus nodes V2.0.0 support 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 Modbus nodes are supported for **Magelis HMIBSC** only. Other **Magelis Edge Box** and **Magelis iPC** will be supported in future versions of the node.

IloT 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

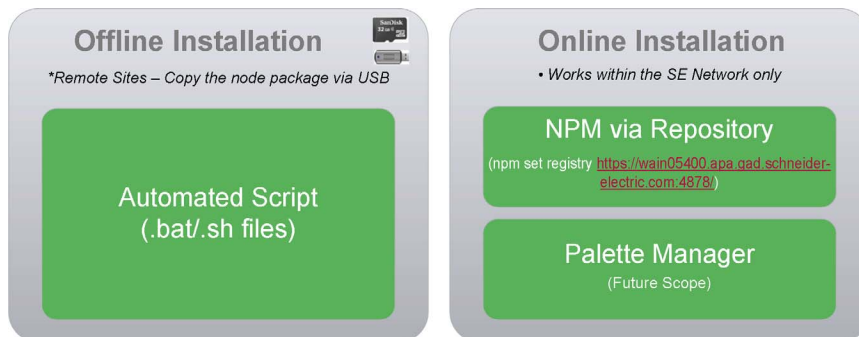
Software Requirements

- Node.js V10.15.3
- Node-RED server V0.20.7
- Npm (Node package manager) V6.4.1
- Supported browser: Node-RED application is supported in any browser with V8 engine or similar (for instance: Google chrome V73.0, Firefox V66.0)

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

Accessing SE Modbus Nodes

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



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

- Install the node - Offline (*see page 22*)
- Install the node - Online (*see page 25*)

Chapter 3

Installing SE Modbus Nodes – Linux Platform

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Installing SE Modbus Nodes - Offline Installation Mode	22
Installing SE Modbus Nodes - Online Installation Mode	25

Installing SE Modbus Nodes - Offline Installation Mode

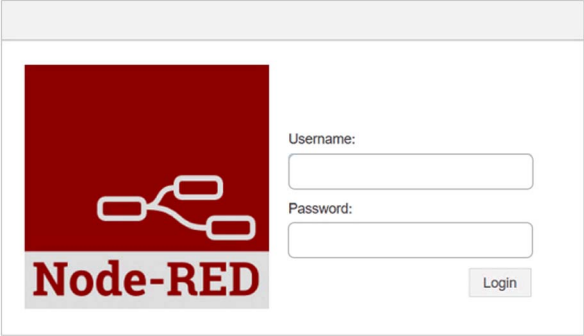
The Linux based Edge Boxes (for example, HMIBSC) have in-built Node-RED-as-a-Service. This means Node.js, Node-Red and python are pre-installed in the OS image.

The SE Modbus nodes are installed by the user from the portable disk.

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

Step	Action
1	Download the Modbus_V2.0.0_Offline.zip file from the link given below: https://schneider-electric.box.com/s/xsmgvjhjo4km8jwlsn8qyprqb0gy8bv6
2	Extract the downloaded file Modbus_V2.0.0_Offline.zip and transfer the extracted folder (Modbus_V2.0.0_Offline) into a portable disk. Example: Pendrive.
3	Connect the portable device to IIoT Edge Box.
4	• Navigate to the directory of the portable device (for instance, <code>cd mount/media/<disk name></code>) and press Enter. • Type <code>cd Modbus_V2.0.0_Offline</code> and press Enter to go to the directory where the offline files for SE Modbus nodes are placed. <pre>root@hmibsc:~/mount/sda1/Modbus_V2.0.0_Offline ls se-node-red-modbus_offline_install.sh -</pre>
5	Type <code>sh se-node-red-modbus_offline_install.sh</code> and press Enter to install the SE Modbus nodes. Press any key to read the Terms & Conditions. <pre>root@hmibsc:~/mount/sda1/Modbus_V2.0.0_Offline ls se-node-red-modbus_offline_install.sh root@hmibsc:~/mount/sda1/Modbus_V2.0.0_Offline# sh se-node-red-modbus_offline_install.sh Please wait ... Please read the Terms & Conditions carefully! press any key to continue ... -</pre> NOTE: Press any key to continue until the result appears below. Result: Do you agree to our Terms & Conditions? (yes/no):.

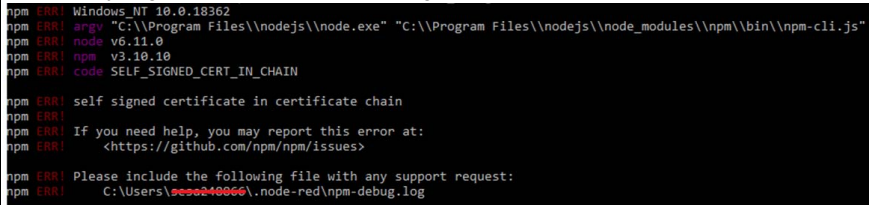
Step	Action
6	Type <code>yes</code> and press Enter to agree the terms and conditions and install SE Modbus nodes. <pre> in both cases, for the sole and restricted purpose of exercising the concurrent use license right granted to You under said Corporate License within the limits set forth hereinabove. 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): Please wait ... Successfully copied se-node-red-modbus files Running: cd /home/root/se-node-red-modbus && npm link Done: cd /home/root/se-node-red-modbus && npm link se-node-red-modbus installed successfully! Please restart node-red root@hmibsc:~/mount/sda1/Modbus_V2.0.0_Offline </pre> Result: se-node-red-modbus installed successfully. Please restart node-red by rebooting Magelis HMIBSC Edge box. NOTE: If you type <code>no</code>, the installation is cancelled.

Step	Action
7	Open a browser from system (laptop or desktop) connected in same network as the Linux Edge box: - Go to <code>https://<ip address>:1880</code> NOTE: To know your ip address, type <code>ifconfig</code> in your Linux edge box. <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> - Login window appears. Use your Node-RED login credentials to operate Linux Edge box through your system (laptop or desktop).  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.

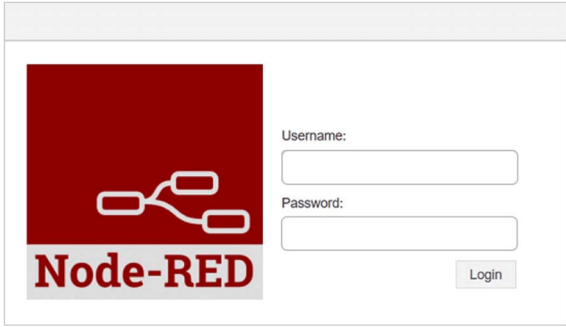
Installing SE Modbus Nodes - Online Installation Mode

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 Modbus nodes 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> Note: If set proxy null command is not working, remove proxy for respective types as follows: ● <code>npm config rm proxy</code> ● <code>npm config rm http-proxy</code> ● <code>npm config rm https-proxy</code>
3	Type <code>npm install se-node-red-modbus</code> and press Enter . NOTE: If you get the error as shown in image below:  Then, type the text given below in the terminal and press Enter, and run the installation command again. <pre>npm set strict-ssl false</pre> NOTE: Press any key to continue until the result appears. Result: Do you agree to our Terms & Conditions? (yes/no):.

Step	Action
4	Type yes and press Enter to agree the terms and conditions and install SE Modbus nodes. 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): Result: Installation is successfully completed. NOTE: If you type no, the installation is cancelled.
5	Restart Node-RED application by rebooting Magelis HMIBSC Edge box.

Step	Action
6	Open a browser from system (laptop or desktop) connected in same network as the Linux Edge box: - Go to <code>https://<ip address>:1880</code> NOTE: To know your ip address, type <code>ifconfig</code> in your Linux edge box. <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> - Login window appears. Use your Node-RED login credentials to operate Linux Edge box through your system (laptop or desktop).  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.

Chapter 4

Uninstalling SE Modbus Nodes - Linux Platform

What Is in This Chapter?

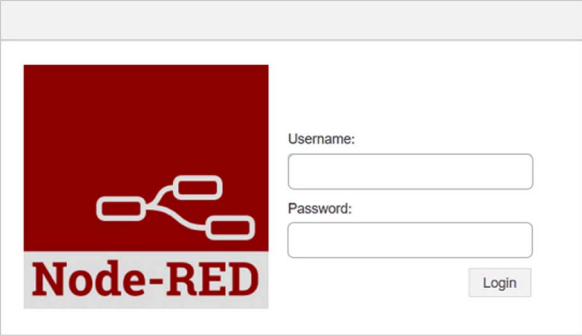
This chapter contains the following topics:

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Uninstalling SE Modbus Nodes - Offline Uninstallation Mode

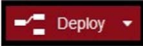
The below procedure is applicable for the Edge Boxes running on Linux Yocto (for example, HMIBSC):

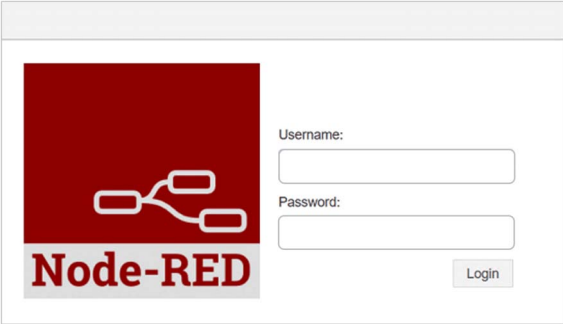
Step	Action
1	Type ls and press Enter. <pre>root@hmibsc:~# ls se-node-red-modbus_offline_uninstall.sh _</pre> Result: Installed nodes appears.
2	Type sh se-node-red-modbus_offline_uninstall.sh and press Enter to uninstall SE Modbus nodes. <pre>root@hmibsc:~# ls se-node-red-modbus_offline_uninstall.sh root@hmibsc:~# sh se-node-red-modbus_offline_uninstall.sh Running: cd /home/root/se-node-red-modbus && npm unlink Done: cd /home/root/se-node-red-modbus && npm unlink Running: cd /home/root && rm -rf se-node-red-modbus Done: cd /home/root && rm -rf se-node-red-modbus root@hmibsc:~#</pre> Result: SE Modbus nodes are uninstalled successfully.
3	Restart node-red by rebooting Magelis HMIBSC Edge box.

Step	Action
4	Open a browser from system (laptop or desktop) connected in same network as the Linux Edge box: - Go to <code>https://<ip address>:1880</code> NOTE: To know your ip address, type <code>ifconfig</code> in your Linux edge box. <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> - Login window appears. Use your Node-RED login credentials to operate Linux Edge box through your system (laptop or desktop).  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.

Uninstalling SE Modbus Nodes - Online Uninstallation Mode

This procedure explains how to uninstall the SE Modbus nodes:

Step	Action
1	From the browser where Node-RED server is running, delete the SE Modbus nodes 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-modbus</code> .
5	Press Enter to uninstall the SE Modbus nodes. Result: SE Modbus nodes are successfully uninstalled.
6	Restart Node-RED application by rebooting Magelis HMIBSC Edge box.

Step	Action
7	To check if your node is uninstalled follow the steps below - Open a browser from system (laptop or desktop) connected in same network as the Linux Edge box: - Go to <code>https://<ip address>:1880</code> NOTE: To know your ip address, type <code>ifconfig</code> in your Linux edge box. <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> - Login window appears. Use your Node-RED login credentials to operate Linux Edge box through your system (laptop or desktop). A screenshot of the Node-RED login interface. It features a red square logo with a white circuit-like pattern and the text 'Node-RED' in white. To the right of the logo are two input fields labeled 'Username:' and 'Password:', and a 'Login' button at the bottom right. 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.

Part III

SE Modbus Nodes

What Is in This Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
5	About SE Modbus Nodes	37
6	Launching SE Modbus Nodes	53
7	Usage of SE Modbus Nodes	57

Chapter 5

About SE Modbus Nodes

Overview

This chapter describes information about SE Modbus Read and SE Modbus Write nodes.

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
5.1	SE Modbus Read Node	38
5.2	SE Modbus Write Node	45

Section 5.1

SE Modbus Read Node

What Is in This Section?

This section contains the following topics:

Topic	Page
Introduction	39
Configuring SE Modbus Read Node	40

Introduction

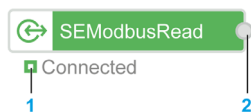
Overview

SE Modbus Read node reads the data from modbus devices using modbus TCP or modbus Serial communication protocol. The node reads one or multiple register values at specified poll interval. The output of SE Modbus Read node is in CMS format ([see page 62](#)).

NOTE: Modbus Serial communication with HMIBSC Box cannot be established using modbus serial cable due to the unavailability of the driver in the Linux platform.

Node Description

SE Modbus Read node consists of:



Item number	Item name	Description
1	Connection status	Indicates the following connection status: ● Connecting: Node is connecting to any modbus device. ● Connected: Node is connected to the device. ● Success: Data from Modbus device read successfully. ● Error: Indicates when the node detects an error. ● ConfigError: Node is not configured properly.
2	Output	Generated CMS is passed as an output

Configuring SE Modbus Read Node

Configure SE Modbus Read node properties

Double-click SE Modbus Read node. The **Properties** screen of the node appears.

The screenshot shows the 'Edit SModbusRead node' dialog box. At the top, there are three buttons: 'Delete', 'Cancel', and 'Done'. Below these is a tab labeled 'Properties'. The 'Properties' tab contains several configuration fields: 'Name' is 'SModbusRead'; 'FC' is a dropdown menu showing 'FC 1: Read Coil Status'; 'Address' is a text field with '0:65535'; 'Quantity' is a text field with '1-2000' and an 'Add Tag' button; 'Poll Rate' is a text field with '1' and a dropdown menu showing 'second(s)'; 'Unit ID' is a text field with '1'; 'Server' is a dropdown menu showing 'Add new SE_Modbus-Client...' and an edit icon; 'Logging' is a dropdown menu showing 'Enable'; and 'Level' is a dropdown menu showing 'Alert only'.

Parameters	Description
FC	Select the required function code from the list: ● FC 1: Read Coil Status ● FC 2: Read Input Status ● FC 3: Read Holding Registers ● FC 4: Read Input Registers NOTE: The FC (Function Code) defines the memory area to read the data.
Address	Type the address to be read. The address should be between 0...65535. For example: 125 NOTE: An address is a location where data is stored.
Quantity	Type the value to be read starting from the address configured in previous step. NOTE: The value for FC 1 and FC 2 should be between 1...2000. The value for FC 3 and FC 4 should be between 1...125.

Parameters	Description
Add Tag	Click to add the tag name and type (int , boolean and float32) for corresponding register. For more information (see page 41).
Poll Rate	Select the frequency at which data has to be read.
Unit ID	Type the modbus device address of SE Modbus Read Serial and TCP (Optional) devices. NOTE: Unit ID is the device Id of serial device.
Server	 Click  icon to configure the parameters of the selected server (modbus device) types given below: • TCP (see page 42) • Serial (Not applicable for HMIBSC Edge box.)
Logging	Logging is used to read the data. 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. The log files will be saved in the path given below: <Installed Node Directory>/nodes/log/ For instance the location will be: • Offline installation ○ <User Directory>/se-node-red-modbus/nodes/log/ • Online installation ○ <User Directory>/node-red/node_modules/se-node-red-modbus/nodes/log/
Level	Select the logging level from the list: • All Events Error, info, debug messages are logged • Alerts Only Error messages are logged NOTE: By default, Alerts Only is selected.

Add Tag Properties

The Modbus device reads all the variables. Each variable has its own special register address. Users can add tags / variables to the add tag properties using the register address to monitor specific register address variables.

By clicking **Add Tag** option the window given below appears. Here you can add the details of the tags that you wish to read.

The screenshot shows a 'Properties' window with a 'Back' button and a green 'Save Tags' button. Below these are five rows of tag configuration. Each row consists of a small icon, an address (500, 501, 502, 503, 504), a text input field labeled 'Tag', and a dropdown menu currently showing 'INT'.

Parameters	Description
Tag field	Type the tag name.
Data type of tag	Select any one of the following data type: ● INT - 16 bit and occupies 1 register address only. ● BOOLEAN - 16 bit and occupies 1 register address only. ● FLOAT32 - 32 bit and occupies 2 registers address.
Save Tags	Click Save Tags to save the tags information.

TCP Properties

NOTE: TCP and Serial are mutually exclusive. If the user wants to connect to a Modbus TCP device, only then follow these steps.

Edit SEModbusRead node > Add new SE_Modbus-Client config node

Cancel

Add

Properties

Name

modbus

Type

TCT

Host

127.0.0.1

Port

502

TCT Type

DEFAULT

Timeout (ms)

10000

Reconnect timeout (ms)

2000

Queue commands

Enable

Queue delay (ms)

100

0 nodes use this config

On all flows

If the user wants to connect to a modbus **TCP** device, follow these steps:

Parameters	Description
Host	Type the IP address Each host has a host number that, together with a network identity, forms its own unique IP address.
Port	Type the port number. The TCP port is a 16 bit number, 1... 65535, used to identify the services or processes being used in networking communications. Specific port numbers are often used for the purpose of identifying specific services. TCP port 502 is used by convention under the Modbus protocol.

Parameters	Description
TCP Type	Select the TCP Type from the drop-down list: ● DEFAULT ● RTU-BUFFERED A remote terminal unit (RTU) is a microprocessor-controlled electronic device that interfaces objects in the physical world to a distributed control system or SCADA by transmitting telemetry data to a master system, and by using messages from the master supervisory system to control connected objects.
Timeout	When the idle Timeout is set, if there is no communication to the device for the specified period of time (in seconds), the connection will be closed. By default, the delay time is 10000 ms.
Reconnect timeout	Timeout controls how long transmitted data may remain unacknowledged before a connection is forcefully closed. Set the reconnect time out for reconnecting the node. By default, the reconnect time is 2000 ms.
Queue commands	Select the required option from the drop-down list: ● Enable: This option stores incoming commands and sends them with delay. ● Disable: This option turns off the queue delay. By default, the Queue commands is Enable .
Queue delay	Set the time interval to delay sending the commands from queue. By default, the queue delay is 100 ms.

Section 5.2

SE Modbus Write Node

What Is in This Section?

This section contains the following topics:

Topic	Page
Introduction	46
Configuring SE Modbus Write Node	47

Introduction

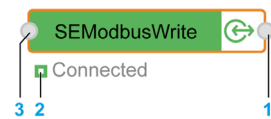
Overview

SE Modbus Write node writes the data to modbus devices using the modbus TCP or modbus serial communication protocol. The node writes into one or multiple register values in the device.

NOTE: Modbus Serial communication with HMIBSC Box cannot be established using modbus serial cable due to the unavailability of the driver in the Linux platform.

Node Description

SE Modbus Write node consists of:



Item number	Item name	Description
1	Output	You can connect the output to any connection node or debug node.
2	Connection status	Indicates the following connection status: ● Connecting: Node is connecting to any modbus device. ● Connected: Node is connected to the device. ● Success: Data to Modbus device written successfully. ● Error: Indicates when the node detects an error. ● ConfigError: Node is not configured properly.
3	Input	Inject data/values from inject node for the configured parameters.

Configuring SE Modbus Write Node

Configuring SE Modbus Write Node

Double-click SE Modbus Write node. The **Properties** screen of the node appears.

Edit SEmodbusWrite node

Delete

Cancel

Done

⚙️ Properties

🔍 Name

SEModbusWrite

☰ Type

FC 5: Force Single Coil

▼

📌 Address

0-65535

📌 Quantity

1

Add Tag

📌 Unit ID

1

📌 Server

modbus@127.0.0.1:Port:502

▼

⚙️ Logging

Enable

▼

⚙️ Level

Alert only

▼

Parameters	Description
Type	Select the required function code from the drop-down list: ● FC 5: Force Single Coil ● FC 6: Preset Single Register ● FC 15: Force Multiple Coils ● FC 16: Preset Multiple Registers NOTE: The FC (Function Code) defines the memory area to write the data.
Address	Type the text in the address field that is to be written. The address has to be between 0...65535. NOTE: An address is a location where data is stored.

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47

Parameters	Description
Quantity	Type the value in quantity field that is to be written starting from the address configured in above step. The value for FC 5 and FC 6 should be 1 The value for FC 15 should be between 1...1968 The value for FC 16 should be between 1...123
Add Tag	Click to add the tag name and type (INT , FLOAT32 and BOOLEAN) for corresponding register. For more information (see page 48).
Server	 Click  icon to configure the parameters of the selected server types given below: • TCP (see page 49) • Serial (Not applicable for HMIBSC Edge box.)
Logging	Logging is used to write the data. 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. The log files will be saved in the path given below: <Installed Node Directory>/nodes/log/ For instance the location will be: • Offline installation ○ <User Directory>/se-node-red-modbus/nodes/log/ • Online installation ○ <User Directory>/node_modules/se-node-red-modbus/nodes/log/
Level	Select the logging level from the drop-down list: • All events • Alerts only NOTE: By default, Alerts only is selected.

Add Tag Properties

The node writes the variables into the device. Each variable has its own special register address. Users can add tags / variables to the add tag properties using the register address to monitor specific register address variables.

By clicking **Add Tag** option the window given below appears. Here you can add the details of the tags that you wish to write.

Edit SModbusWrite node

Delete

Cancel

Done

⚙ Properties

⚙

📄

🖼

Back

Save Tags

🖱 500

Tag

INT ▼

🖱 501

Tag

INT ▼

🖱 502

Tag

INT ▼

🖱 503

Tag

INT ▼

🖱 504

Tag

INT ▼

Parameters	Description
Tag field	Type the tag name.
Data type of tag	Select any one of the following data type: ● INT - 16 bit and occupies 1 register address only. ● BOOLEAN - 16 bit and occupies 1 register address only. ● FLOAT32 - 32 bit and occupies 2 registers address.
Save Tags	Click Save Tags to save the tags information.

TCP Properties

NOTE: TCP and Serial are mutually exclusive. If the user wants to connect to a Modbus TCP device, only then follow these steps.

Edit SEmodbusWrite node > **Edit SE_Modbus-Client node**

Delete

Cancel

Update

⚙ Properties

⚙ 📄 ▼

🔍 Name

modbus

📖 Type

TCP ▼

📖 Host

127.0.0.1

📖 Port

502

📖 TCP Type

DEFAULT ▼

⌚ Timeout (ms)

10000

⌚ Reconnect timeout (ms)

2000

🔁 Queue commands

Enable ▼

⌚ Queue delay (ms)

100

If the user wants to connect to a modbus **TCP** device, follow these steps:

Parameters	Description
Unit ID	Type the modbus device address of SE Modbus Write Serial and TCP (Optional) devices.
Host	Type the IP address Each host has a host number that, together with a network identity, forms its own unique IP address.

Parameters	Description
Port	Type the port number. The TCP port is a 16 bit number, 1... 65535, used to identify the services or processes being used in networking communications. Specific port numbers are often used for the purpose of identifying specific services. TCP port 502 is used by convention under the Modbus protocol.
TCP Type	Select the TCP Type from the drop-down list: • DEFAULT • TELNET • C701 • RTU-BUFFERED A remote terminal unit (RTU) is a microprocessor-controlled electronic device that interfaces objects in the physical world to a distributed control system or SCADA by transmitting telemetry data to a master system, and by using messages from the master supervisory system to control connected objects.
Timeout (ms)	When the idle Timeout is set, if there is no communication to the device for the specified period of time (in seconds), the connection will be closed. By default, the delay time is 10000 ms.
Reconnect timeout (ms)	Timeout controls how long transmitted data may remain unacknowledged before a connection is forcefully closed. Set the reconnect time out for reconnecting the node. By default, the reconnect time is 2000 ms.
Queue commands	Select the required option from the drop-down list: • Enable: This option stores incoming commands and sends them with delay. • Disable: This option turns off the queue delay.
Queue delay (ms)	Set the time interval to delay sending the commands from queue. By default, the queue delay is 100 ms.

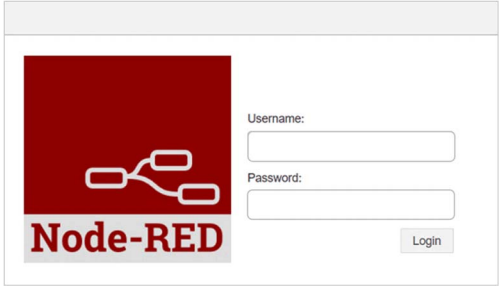
Chapter 6

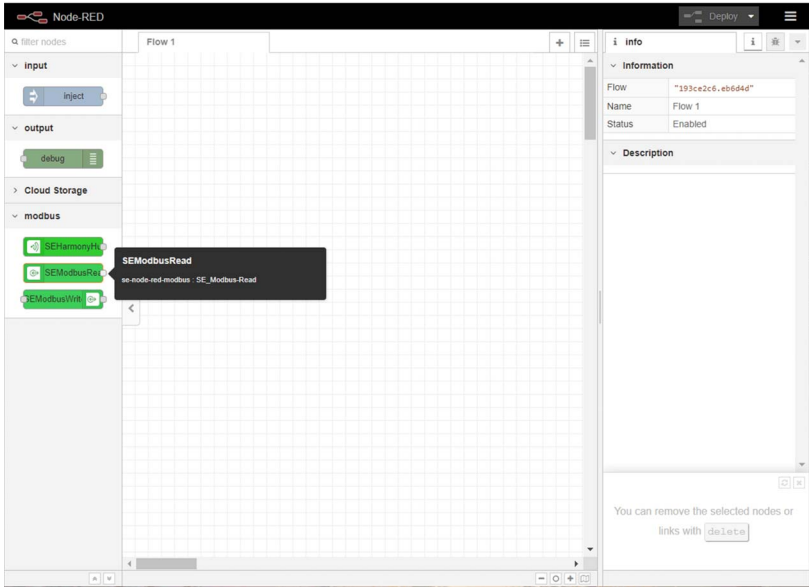
Launching SE Modbus Nodes

Launching Node-RED and SE Modbus Nodes - Linux Platform

Node-RED

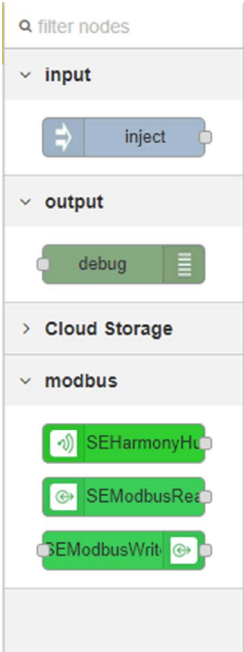
Follow the steps given below to launch Node-RED server:

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. 

Step	Action
4	 Result: Node-RED editor appears.

SE Modbus Nodes

Follow the steps given below to launch SE Modbus Nodes:

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

Chapter 7

Usage of SE Modbus Nodes

What Is in This Chapter?

This chapter contains the following topics:

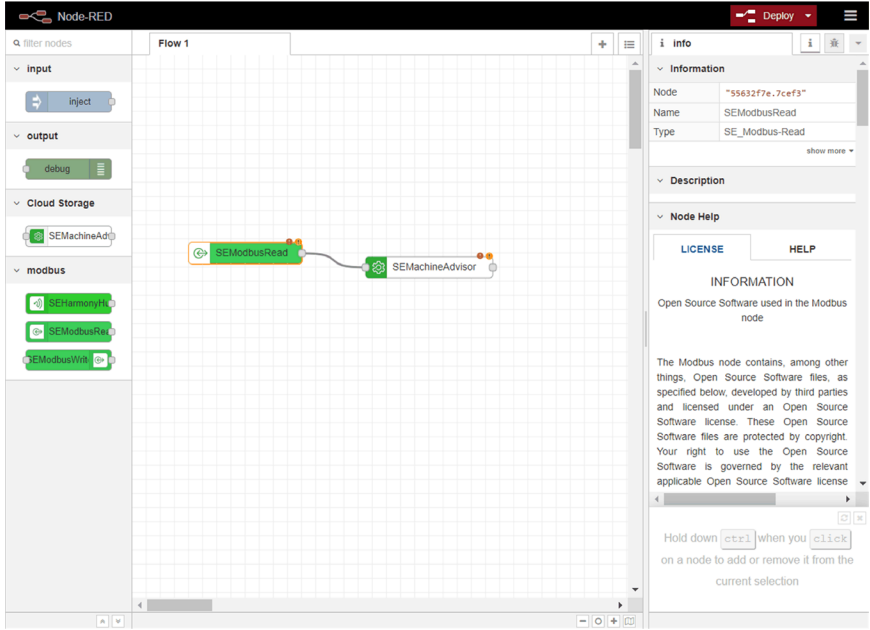
Topic	Page
Usage of SE Modbus Nodes (SE Modbus Read Node and SE Modbus Write Node)	58
Common Message Structure (CMS)	62

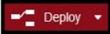
Usage of SE Modbus Nodes (SE Modbus Read Node and SE Modbus Write Node)

Usage of SE Modbus Read node

The user needs to connect to a modbus device, to collect the data to be read and send it to any publishing nodes (for example, SE Machine Advisor node).

The procedure for the use of SE Modbus Read node is given below:

Step	Action
1	Launch Node-RED server (<i>see page 53</i>).
2	Launch SE Modbus Read node (<i>see page 55</i>) and SE Machine Advisor (<i>see Node-RED - SE Machine Advisor Node, User Manual</i>).
3	Connect the two nodes by joining the output of SE Modbus Read and input of SE Machine Advisor as shown below: 
4	Double-click SE Modbus Read node. Result: Edit SEModbusRead node opens.
5	Configure SE Modbus Read node (<i>see page 40</i>). Result: SE Modbus Read reads the data from device and sends as an input to SE Machine Advisor node.
6	Double-click SE Machine Advisor node. Result: Edit SEMachineAdvisor node opens.

Step	Action
7	Configure SE Machine Advisor node (<i>see Node-RED - SE Machine Advisor Node, User Manual</i>).
8	Click Done and Deploy  to save the changes. Result: Nodes status changes to Connected. Result: The data is fetched at a frequency specified in the Poll Rate (<i>see page 40</i>) of SE Modbus Read. At the same frequency, data in the CMS format is sent as an input to SE Machine Advisor to push it to EcoStruxure Machine Advisor cloud.

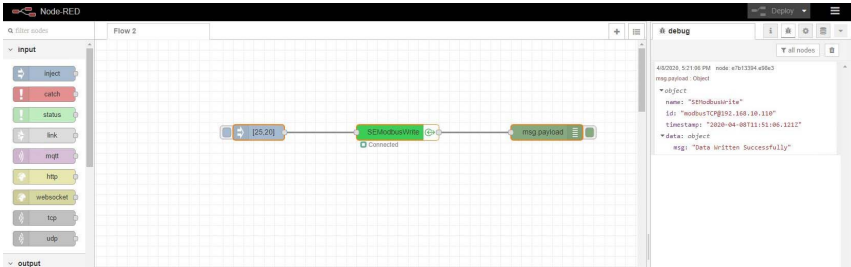
Usage of SE Modbus Write node

The user needs an inject node to provide input data to the SE Modbus Write node. This enables the user to write the data into any modbus device configured. The user may need a debug node to view the node output.

The procedure for SE Modbus Write node usage is given below:

Step	Action
1	Launch Node-RED server (<i>see page 53</i>).
2	Drag and drop the inject and debug nodes from the palette.
3	Launch SE Modbus Write node (<i>see page 55</i>).
4	Connect all three nodes in the flow.
5	Double-click inject node. Result: Edit inject node opens.

Step	Action
6	Configuring the Inject Node Select payload as JSON from the drop down and click  . Example of payloads injected from the Inject node: Default payload (payload type - number) A number in case of single write register. 28 Default payload (payload type - JSON) A number array in case of multiple write registers. [28, 48] Custom payload (payload type - JSON) An object with containing value key of number in case of single write register. <pre>{ "value": 98, "unitid":1, "fc":16, "address":3, "quantity":1 }</pre> An object with containing value key of number array in case of multiple write registers. <pre>{ "value":[4, 78], "unitid":1, "fc":16, "address":3, "quantity":2 }</pre> Click Done. Select the required option from the drop down to set the poll rate and click Done: ● none ● interval ● interval between times ● at a specific time
7	Double-click SE Modbus Write node. Result: Edit SEModbusWrite node opens.
8	Configure SE Modbus Write node (see page 47).

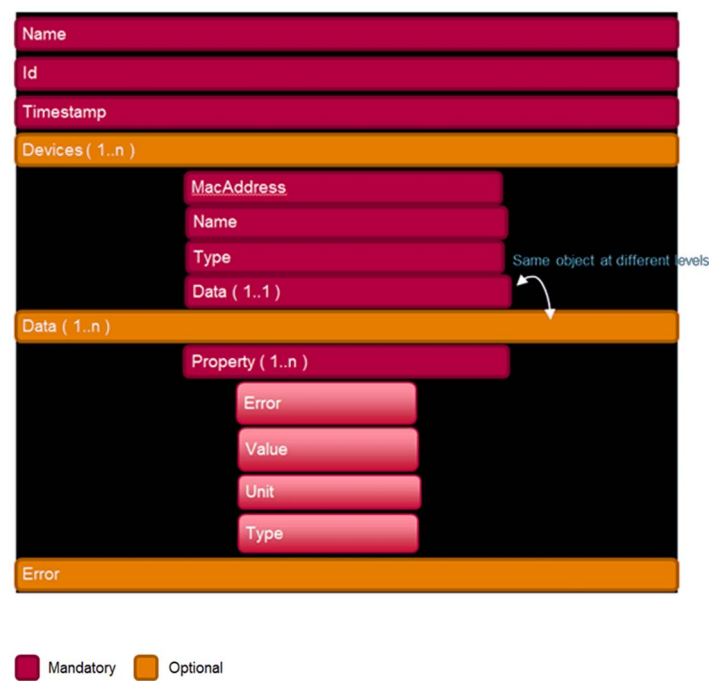
Step	Action
9	Click Done and Deploy  to save the changes.  Result: Node status changes to Connected. Result: The data obtained from the inject node will be written to the modbus device whenever the user clicks on the debug node (cyclical operations can be performed on the basis of the inject poll rate). <pre>{name: "SEModbusWrite", id: "modbusTCP@192.168.10.110", timestamp: "2020-03- 17T06:46:32.325Z", error: object}</pre>

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 of the device.
Timestamp	The exact time at which the read or write operation is performed by the node.
Devices	Applicable for modbus devices. All nested objects containing one or many Device objects.

Field	Description
Data	Object at root level and as a composite inside devices object. It contains at least one property object.
Error	Error at the root level, not tied to any parameter. ● 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 (value) is mandatory. Mapped to the parameter details. It contains Error, Value, Unit, Type.
Error	Local error pertaining to the parameter. ● Scenario 1: No Radio (at a sensor level) ● Scenario 2: Parameter Read Error encountered. (e.g.: FF, FFFF, FFFFFFFF) ○ 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: One device connected directly through SE Modbus Read node output:

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

Part IV

Cyber Security

Chapter 8

Cyber Security

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.