

Node-RED – SE Harmony Hub Node User Manual

04/2020

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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 Harmony Hub node.
- configuration of the node.
- usage of the node.
- limitations.

Validity Note

This document has been updated with the release of SE Harmony Hub node V1.0.0.

Related Documents

Title of Documentation	Reference Number
Node-RED - SE Aveva Insight Node - User Manual	<u>EIO0000004102</u>
Harmony XB5R ZBRN1/ZBRN2 User Manual	<u>EIO0000001177</u>

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

Chapter 1

Overview

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
General Information	12
Installation of NSSM	20

General Information

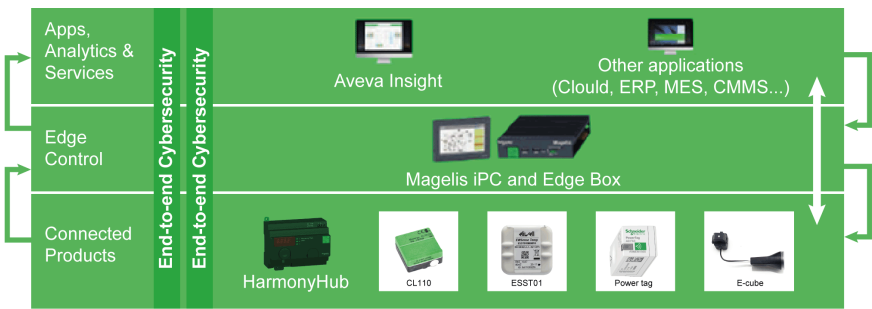
IIoT (Industrial Internet of Things)

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 has selected Node-RED as the technology to deliver basic connectivity through tested, validated and documented nodes.



Connected Products

The secondary sensing vision is to integrate an additional layer of non-intrusive sensors mostly for installed base machines. The aim is to transform standard brownfield asset into connected asset. It means adding an additional layer of sensors and transferring data from connected devices to the upper levels. Predictive maintenance, energy saving, MES or CMMS are the typical apps integrated with these 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 (*see page 116*).
- **Expert support:** access to our strong L3 support team experts and the available technical documentation.

Apps, Analytics and Services

SE Harmony Hub node is a specific node created by Schneider to simplify the Node-RED flows for several typical use cases. This node helps ease the commissioning process to pair the products connected to their Harmony Hub gateway. The web page included with this node also provides the means to specify the data to be retrieved by the channel and to define the polling rate.

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 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>

Harmony Hub

The Harmony Hub converts radio frequency inputs to the Modbus TCP/IP and Serial protocol and acts as an equipment that collects data from wireless sensors (up to 60 sensors per Harmony Hub gateway). This offer allows for more flexibility and simplicity of installation thanks to the connected battery-free devices.



Harmony Hub ZBRN1

Sensors

The secondary sensor ecosystem in Schneider Electric is as described below. The Harmony Hub gateway supports the type of sensors listed below.

Sensor	Description
Temperature and Humidity sensor - CL110  The image shows a green and black rectangular sensor. The top green part has 'Easergy CL110' and 'PN: 130729' printed on it. The bottom black part has 'Schneider Electric' and 'IC: 21245-130729' printed on it. There is a small white circular component on the right side.	The Easergy CL110 is a battery-powered and wireless contact thermal and humidity sensor using the ZigBee Green Power 2.4 GHz protocol. The accuracy of the thermal measurement is $\pm 1^{\circ}\text{C}$ and the humidity measurement is around 2%.
ESST01  The image shows a white, rectangular sensor with rounded corners. It has a label with 'eliwell' in a stylized font, 'EWSense Temp', 'ESST01B0810', and 'EN12830.5.C.1.-30/+20°C'. There is also a QR code and some smaller text including 'B65 1337', '8042', '25-17', and 'ID: 0xFFC00259'.	ESST01 sensors are wireless sensors with batteries measuring temperature values.
Energy meter - Power tag  The image shows a white, rectangular sensor. It has the 'Schneider Electric' logo, 'PowerTag', 'A9 F63', and 'A9MEM1560' printed on it. There is a small green square with a white signal icon and a QR code at the bottom.	Power tag sensor is a compact, the smallest wireless energy sensor on the market, which ensures that it can be mounted to any existing board, as there is almost no room on the DIN rail. It reduces installation time by up to 90%, saves space, and reduces cable errors. Take advantage of full load control and quickly determine if the load is not working on the circuit breaker or on the PowerTag[®] load itself. Providing real-time energy and power measurements, this wireless power sensor gives you the ability to track your properties.

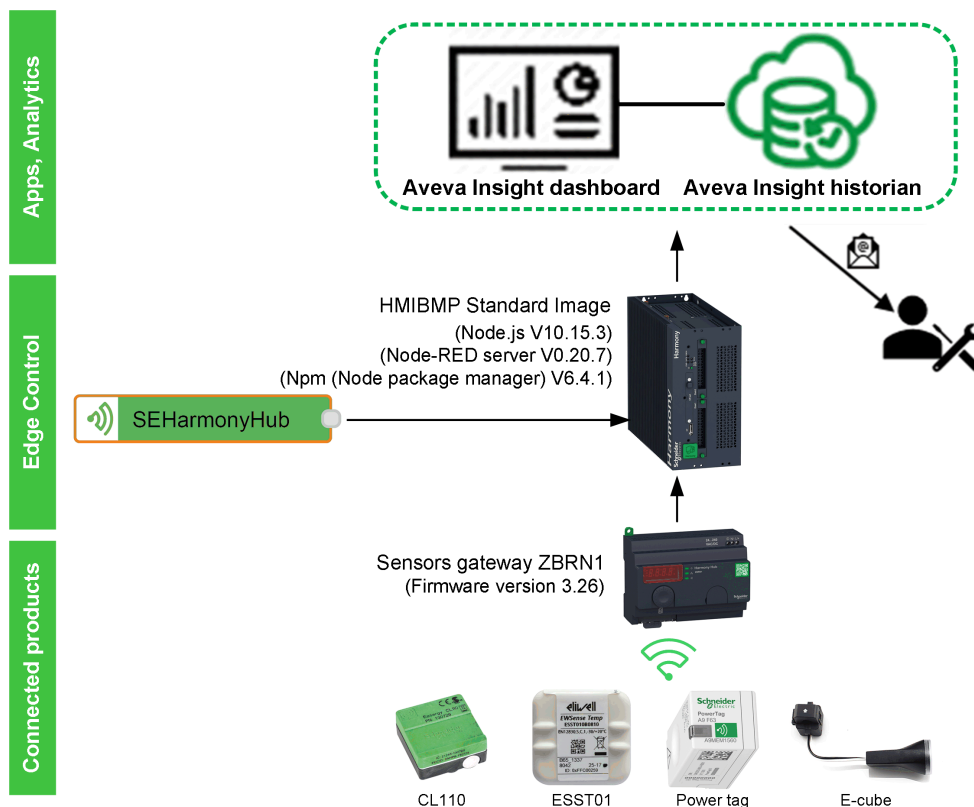
Sensor	Description
Energy Estimator - E-cube 	The E-Cube sensor is self-powered by the current going through the process. It tests and memorizes the energy consumption before submitting it to the Zigbee Gateway.

SE Harmony Hub Node Integration in Ecostruxure™ Architecture

Harmony Hub gateway collects physical signals from secondary sensor ecosystem.
SE Harmony Hub node is a data collection node that connects to the Harmony Hub gateway, collects data that may be eventually published to any data publishing node.



The following figure shows integration of SE Harmony Hub node in Ecostruxure™:



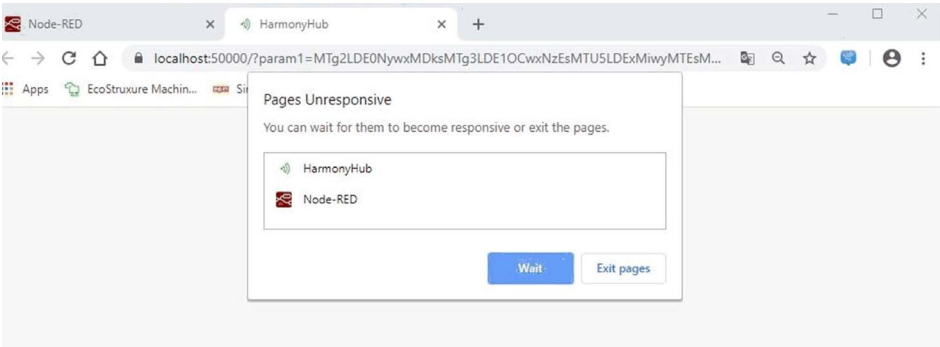
Key Points for SE Harmony Hub Node

- You can pair up to 60 sensors with the Harmony Hub gateway ([see page 14](#)).
- Poll rate allowed is minimum of 5 seconds to maximum of 24 hours.
- SPS sensors are not supported. However, the user can pair from the HMI gateway and the user can still see it on the web page, but the values are not available.

Best Practices for Node-RED

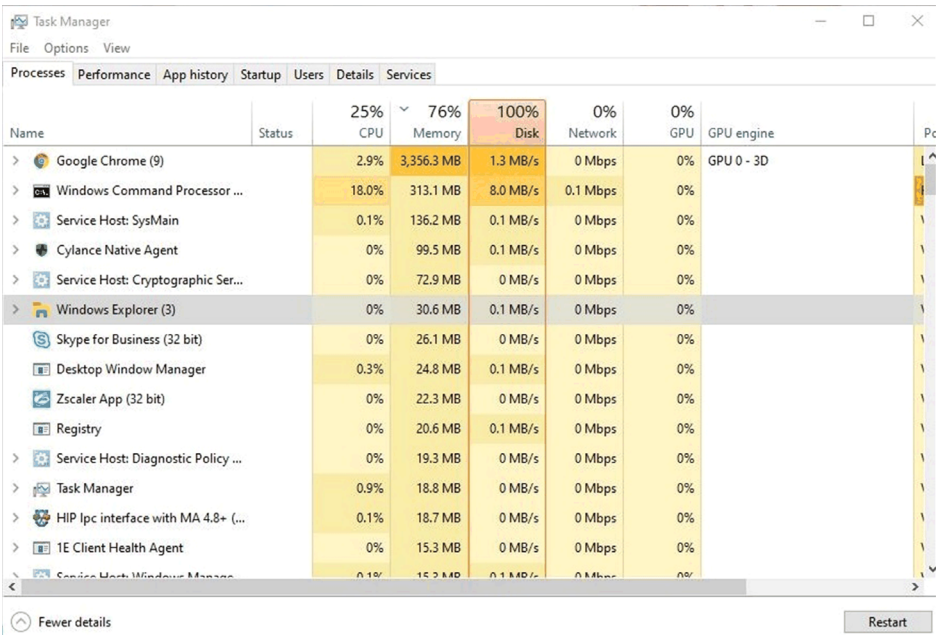
1. Running Node-RED as a service on Windows using NSSM ([see page 20](#)).
2. Use Browsers Wisely
When more web pages are accessed in the browser, Node-RED server may not be responsive to the program. Remove unused web pages in the browser to prevent this.

If Node-RED application is not responsive, you can see the below messages on your browser.



3. Stop Unused Services

Stop unused services that consume more memory displayed in **Task Manager**.



NOTE: Memory consumption can be observed by using **Task Manager**.

Limitations

The SE Harmony Hub node has the following limitations:

1. Operating system anything less than Windows 10 is not supported.
2. 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.
3. Node-RED web page is only available in English, irrespective of the system language.
4. SE Harmony Hub node will not work on Node.js® unstable versions and 6.x.x, 8.x.x and 12.x.x versions.
5. SE Harmony Hub node should work on Node.js V10.15.3 and Node-RED 0.20.7 version only. Refer README for future version support.
6. If the user removes the sensor using the HMI of Harmony Hub gateway, the pairing status of the sensor will continue to show as Paired on the web page, unless the node is re-deployed.
7. The SE Harmony Hub serial gateway with firmware version 3.26 is disconnected if the queue control delay is increased to 200 ms on the node configuration page.
8. If two nodes are connected to the same gateway, one node would not receive a response from the gateway because the node stays in the connected state and does not start the process. This is a limitation of the firmware.
9. When you launch a Node-RED server, it takes time to get started, in order to avoid this refer to **Commissioning of Node-RED procedure** (steps 11...14) ([see page 48](#)).
10. In SE Harmony Hub V1.0.0 node, the lowest poll rate possible is 5 seconds. If 35 or more sensors are paired, it is recommended to keep the poll rate to 10 seconds or higher to avoid data loss.
11. Harmony Hub web page application has minimum screen resolution supported for 1360 x 768 pixel and if you go below this resolution, scrollbar will appear.
12. When the user wants to do the offline installation, the internet should be disabled. It takes longer to install if the internet is enabled.
13. SE Harmony Hub V1.0.0 node, SPS (push button) is not supported. Refer README for future version support.
14. It is not possible to rename the sensors already paired, the user has to delete and add sensors.
15. During pairing of sensors with gateway below operations are not recommended:
 - Do not perform any deployment in the Node-RED environment.
 - Do not refresh Harmony Hub web page.

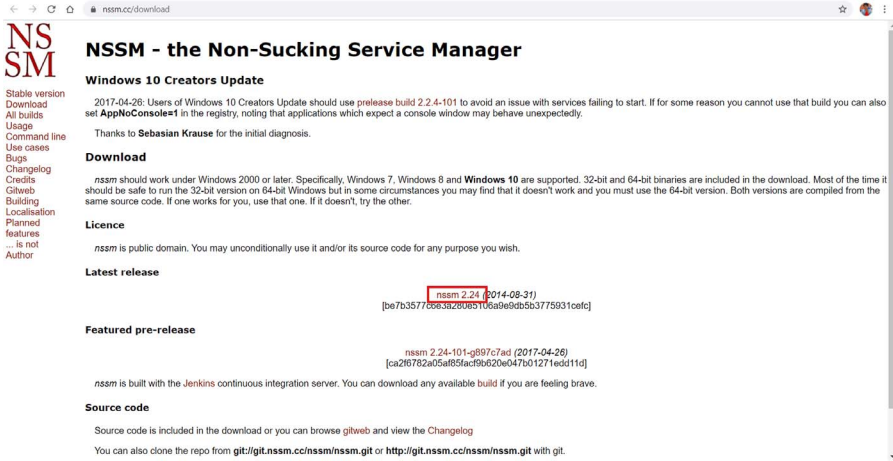
Installation of NSSM

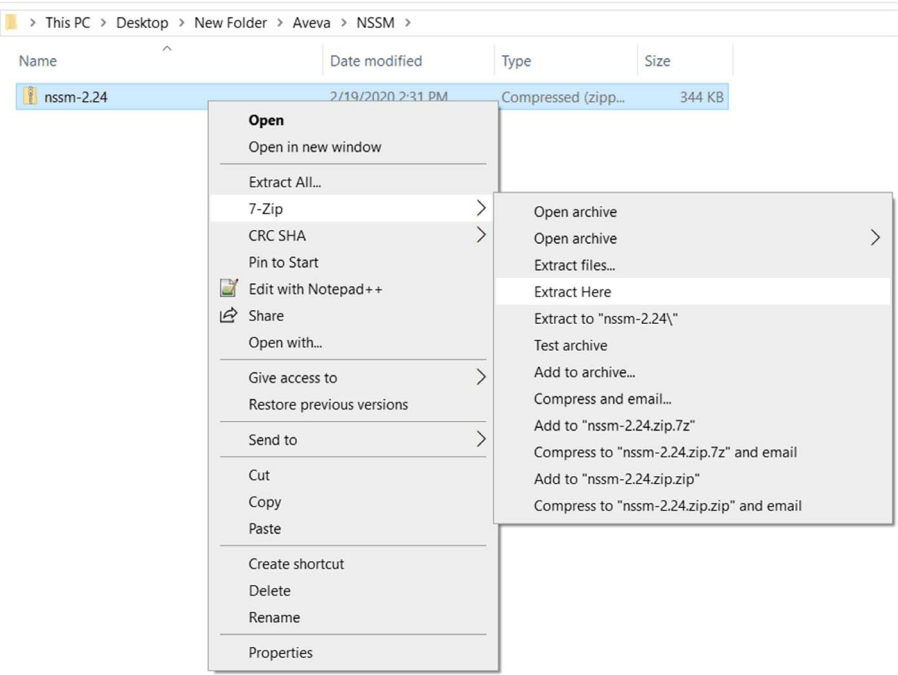
Running Node-RED as a service on Windows Using NSSM

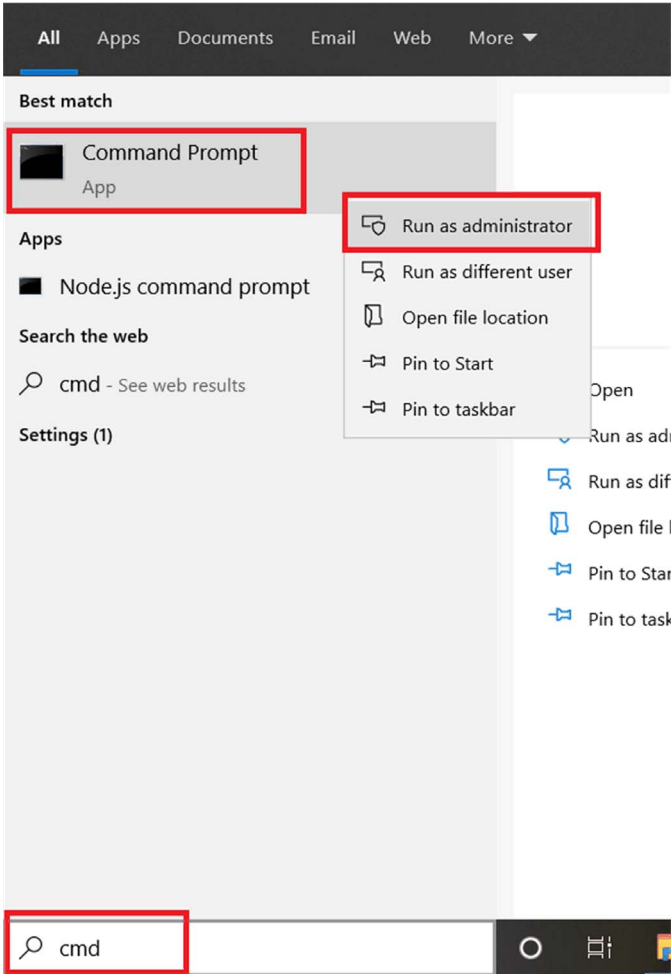
You need to install NSSM (Non-Sucking Service Manager) to open Node-RED server directly from the web page.

NOTE: Installation of NSSM is applicable for Windows platform only.

The following procedure shows the installation of NSSM:

Step	Action
1	Download the <code>nssm-2.24.zip</code> file from the link given below: https://nssm.cc/download NOTE: Make sure unzip software is available in your device, if not available, download it from the given link: https://www.7-zip.org/download.html
2	Click nssm 2.24 link. 

Step	Action
3	Right-click the downloaded <code>nssm-2.24.zip</code> file and select 7-Zip → Extract Here.  The screenshot shows a Windows File Explorer window with the address bar set to <code>> This PC > Desktop > New Folder > Aveva > NSSM ></code>. The file list contains one item, <code>nssm-2.24</code>, which is selected. The file's date modified is <code>2/19/2020 2:31 PM</code>, its type is <code>Compressed (zip...</code>, and its size is <code>344 KB</code>. A right-click context menu is open over the file. The menu includes options like Open, Open in new window, Extract All..., 7-Zip (which is highlighted), CRC SHA, Pin to Start, Edit with Notepad++, Share, Open with..., Give access to, Restore previous versions, Send to, Cut, Copy, Paste, Create shortcut, Delete, Rename, and Properties. A sub-menu for 7-Zip is also open, showing options like Open archive, Open archive, Extract files..., Extract Here (which is highlighted), Extract to "nssm-2.24\", Test archive, Add to archive..., Compress and email..., Add to "nssm-2.24.zip.7z", Compress to "nssm-2.24.zip.7z" and email, Add to "nssm-2.24.zip.zip", and Compress to "nssm-2.24.zip.zip" and email. Result: The selected file is unzipped.

Step	Action
4	Type <code>cmd</code> in search bar and right-click Command Prompt → Run as administrator.  Result: Command Prompt opens.
5	Copy the location of the folder you downloaded. For example: <code>C:\Users\SESAXXXXXX\Desktop\New Folder\Aveva\NSSM\nssm-2.24\win64</code> NOTE: Use your device name in the text above instead of SESAXXXXXX.

Step	Action
6	Navigate to the location where NSSM is installed. Paste in the command prompt adding <code>cd</code> . For example: <code>cd C:\Users\SESAXXXXXX\Desktop\New Folder\Aveva\NSSM\nssm-2.24\win64</code>
7	Type <code>nssm install Node-RED "c:\Users\SESAXXXXXX\AppData\Roaming\npm\node-red.cmd"</code> and press Enter Result: Service "Node-RED" installed successfully.
8	Type <code>nssm set Node-RED AppDirectory "c:\Users\SESAXXXXXX\.node-red"</code> and press Enter . Result: Set parameter "AppDirectory" for service "Node-RED".
9	Type <code>nssm set Node-RED AppParameters "-u c:\Users\SESAXXXXXX\.node-red > c:\temp\node-red.log"</code> and press Enter . Result: Set parameter "AppParameters" for service "Node-RED".
10	Type <code>nssm set Node-RED Description "A wiring tool for the Internet of Things"</code> and press Enter . Result: Set parameter "Description" for service "Node-RED".

```

Administrator: Command Prompt
Microsoft Windows [Version 10.0.18362.628]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>cd C:\Users\SESAXXXXXX\Desktop\New Folder\Aveva\NSSM\nssm-2.24\win64

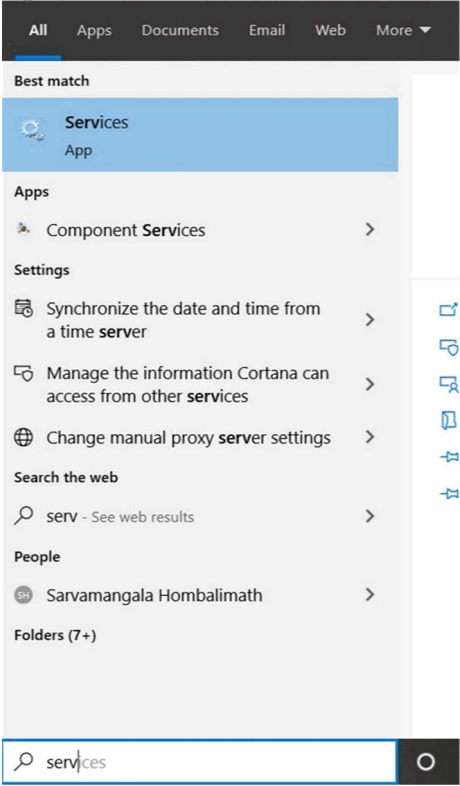
C:\Users\SESAXXXXXX\Desktop\New Folder\Aveva\NSSM\nssm-2.24\win64>nssm install Node-RED "c:\Users\SESAXXXXXX\AppData\Roaming\npm\node-red.cmd"
Service "Node-RED" installed successfully!

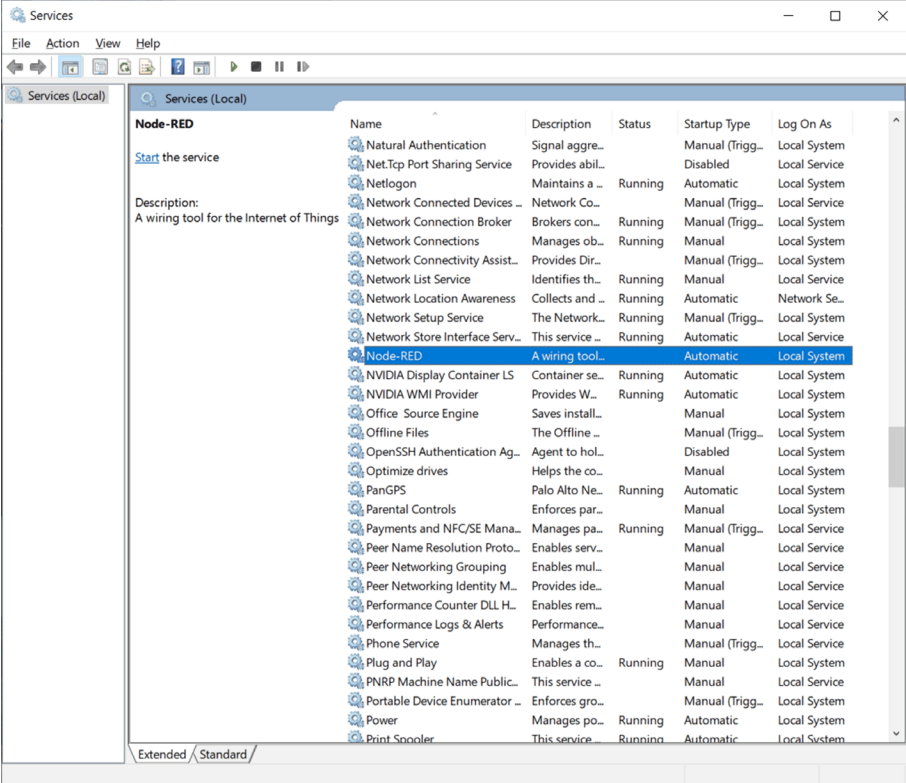
C:\Users\SESAXXXXXX\Desktop\New Folder\Aveva\NSSM\nssm-2.24\win64>nssm set Node-RED AppDirectory "c:\Users\SESAXXXXXX\.node-red"
Set parameter "AppDirectory" for service "Node-RED".

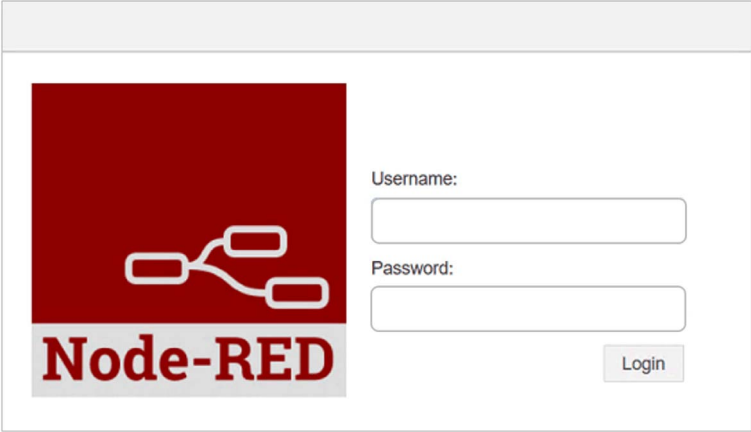
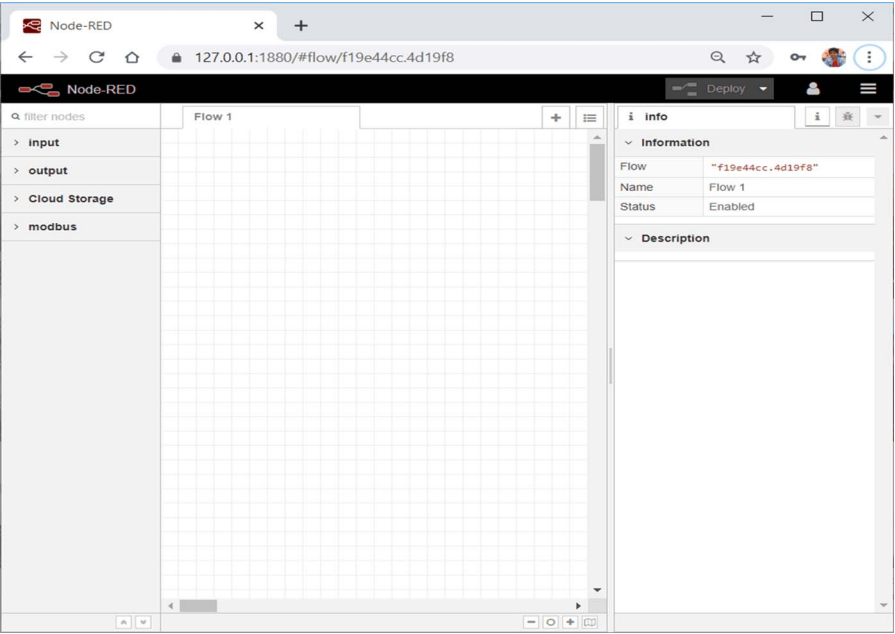
C:\Users\SESAXXXXXX\Desktop\New Folder\Aveva\NSSM\nssm-2.24\win64>nssm set Node-RED AppParameters "-u c:\Users\SESAXXXXXX\.node-red > c:\temp\node-red.log"
Set parameter "AppParameters" for service "Node-RED".

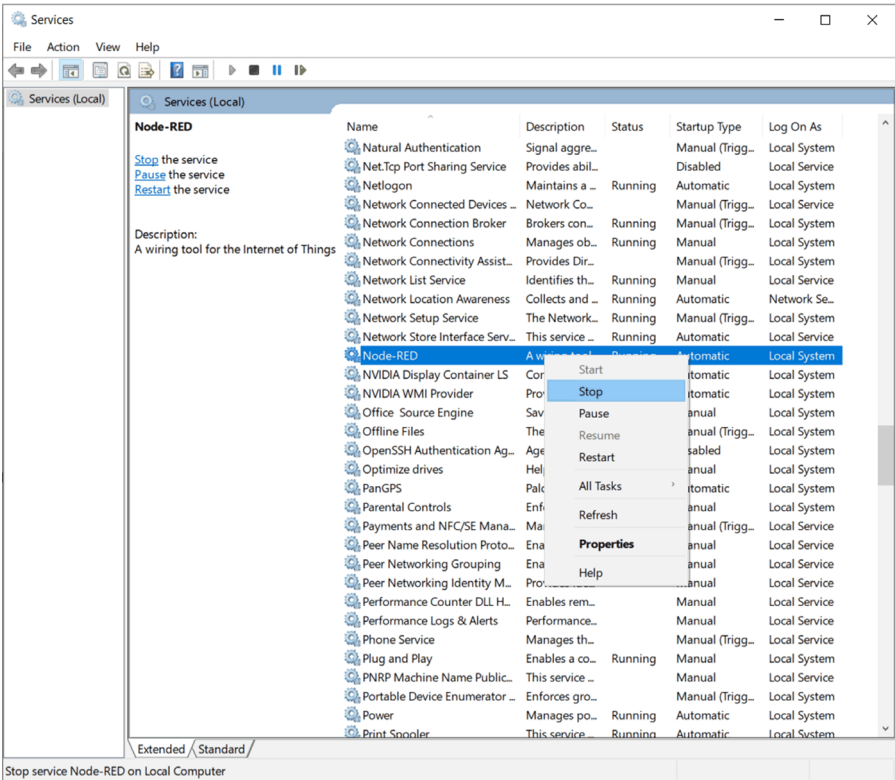
C:\Users\SESAXXXXXX\Desktop\New Folder\Aveva\NSSM\nssm-2.24\win64>nssm set Node-RED Description "A wiring tool for the Internet of Things"
Set parameter "Description" for service "Node-RED".

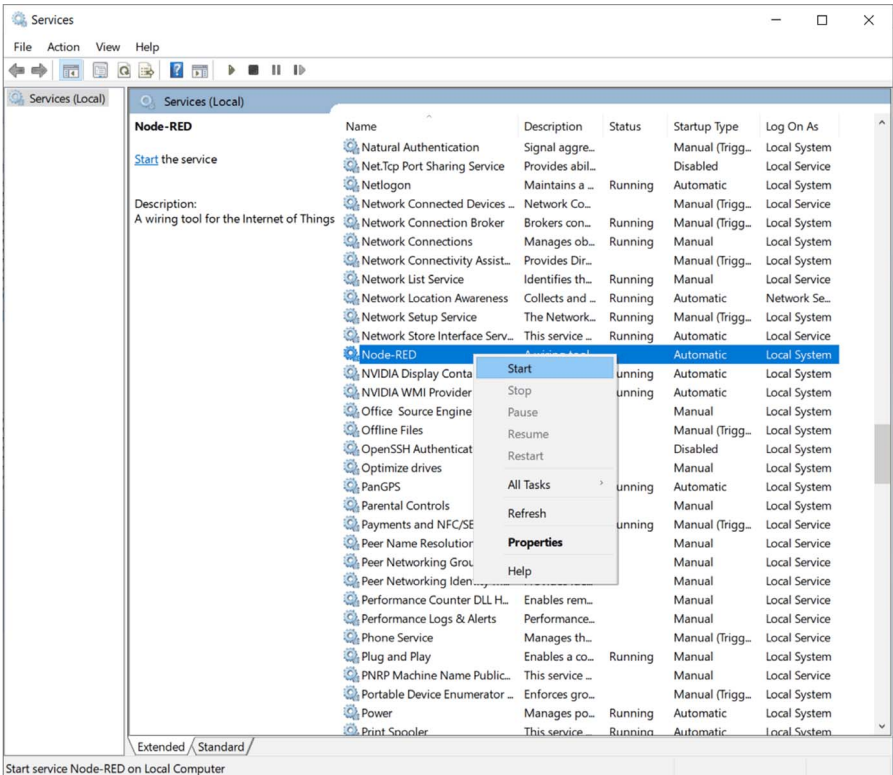
C:\Users\SESAXXXXXX\Desktop\New Folder\Aveva\NSSM\nssm-2.24\win64>
  
```

Step	Action
11	Type Services in search bar and click Services.  The screenshot shows the Windows search interface. At the top, there's a navigation bar with 'All', 'Apps', 'Documents', 'Email', 'Web', and 'More'. Below this, the search results are categorized. The 'Best match' section highlights the 'Services' app. Other sections include 'Apps' (with 'Component Services'), 'Settings' (with several system settings related to time, Cortana, and proxy), 'Search the web' (with a result for 'serv'), 'People' (with a contact named Sarvamangala Hombalimath), and 'Folders (7+)'. At the bottom, the search bar contains the text 'servces'. Result: Services window appears.

Step	Action
12	The screenshot shows the Windows Services console window. The title bar reads 'Services'. The menu bar includes 'File', 'Action', 'View', and 'Help'. Below the menu bar is a toolbar with various icons. The left pane shows 'Services (Local)' selected. The right pane displays a list of services with columns: Name, Description, Status, Startup Type, and Log On As. The 'Node-RED' service is highlighted in blue. Its description is 'A wiring tool for the Internet of Things'. The status is 'Running', the startup type is 'Automatic', and it is configured to 'Log On As' 'Local System'. Other services listed include Natural Authentication, Net.Tcp Port Sharing Service, Netlogon, Network Connected Devices, Network Connection Broker, Network Connections, Network Connectivity Assist..., Network List Service, Network Location Awareness, Network Setup Service, Network Store Interface Serv..., NVIDIA Display Container LS, NVIDIA WMI Provider, Office Source Engine, Offline Files, OpenSSH Authentication Ag..., Optimize drives, PanGPS, Parental Controls, Payments and NFC/SE Mana..., Peer Name Resolution Proto..., Peer Networking Grouping, Peer Networking Identity M..., Performance Counter DLL H..., Performance Logs & Alerts, Phone Service, Plug and Play, PNRP Machine Name Public..., Portable Device Enumerator ..., Power, and Print Spooler. At the bottom of the list, there are tabs for 'Extended' and 'Standard'.
13	Restart your computer.

Step	Action
14	Type the https://127.0.0.1:1880/ in a supported browser. Type the Username and Password in related fields and click Login. The image shows the Node-RED login page. On the left is a red square with a white Node-RED logo and the text "Node-RED" in red. To the right of the logo are two input fields: "Username:" and "Password:". Below the "Password:" field is a "Login" button. Result: Node-RED factory editor appears.
15	The image shows the Node-RED factory editor interface in a web browser. The browser address bar shows "127.0.0.1:1880/#flow/f19e44cc.4d19f8". The interface has a dark header with the Node-RED logo and a "Deploy" button. On the left is a sidebar with a search bar and a list of node categories: "Input", "output", "Cloud Storage", and "modbus". The main area is a grid for building flows. On the right is an "Info" panel with sections for "Information" (Flow, Name, Status) and "Description".

Step	Action																																																																																																																																																																					
16	When you install/uninstall any node in your system, Stop using Node-RED in Services.  The screenshot shows the Windows Services console window titled 'Services'. The 'Services (Local)' list on the left includes 'Node-RED'. The main pane displays a table of services. The 'Node-RED' service is selected, and a right-click context menu is open over it. The menu options include 'Start', 'Stop', 'Pause', 'Restart', 'All Tasks', 'Refresh', and 'Properties'. The 'Stop' option is highlighted. The table below shows the details of the services listed in the console. <table><tr><th>Name</th><th>Description</th><th>Status</th><th>Startup Type</th><th>Log On As</th></tr><tr><td>Natural Authentication</td><td>Signal aggre...</td><td></td><td>Manual (Trigg...</td><td>Local System</td></tr><tr><td>Net.Tcp Port Sharing Service</td><td>Provides abil...</td><td>Disabled</td><td></td><td>Local Service</td></tr><tr><td>Netlogon</td><td>Maintains a ...</td><td>Running</td><td>Automatic</td><td>Local System</td></tr><tr><td>Network Connected Devices ...</td><td>Network Co...</td><td></td><td>Manual (Trigg...</td><td>Local Service</td></tr><tr><td>Network Connection Broker</td><td>Brokers con...</td><td>Running</td><td>Manual (Trigg...</td><td>Local System</td></tr><tr><td>Network Connections</td><td>Manages ob...</td><td>Running</td><td>Manual</td><td>Local System</td></tr><tr><td>Network Connectivity Assist...</td><td>Provides Dir...</td><td></td><td>Manual (Trigg...</td><td>Local Service</td></tr><tr><td>Network List Service</td><td>Identifies th...</td><td>Running</td><td>Manual</td><td>Local Service</td></tr><tr><td>Network Location Awareness</td><td>Collects and ...</td><td>Running</td><td>Automatic</td><td>Network Se...</td></tr><tr><td>Network Setup Service</td><td>The Network...</td><td>Running</td><td>Manual (Trigg...</td><td>Local System</td></tr><tr><td>Network Store Interface Serv...</td><td>This service ...</td><td>Running</td><td>Automatic</td><td>Local Service</td></tr><tr><td>Node-RED</td><td>A wiring tool for the Internet of Things</td><td>Running</td><td>Automatic</td><td>Local System</td></tr><tr><td>NVIDIA Display Container LS</td><td>Cor...</td><td>Start</td><td>Automatic</td><td>Local System</td></tr><tr><td>NVIDIA WMI Provider</td><td>Pro...</td><td>Stop</td><td>Automatic</td><td>Local System</td></tr><tr><td>Office Source Engine</td><td>Sav...</td><td>Pause</td><td>Manual</td><td>Local System</td></tr><tr><td>Offline Files</td><td>The...</td><td>Resume</td><td>Manual (Trigg...</td><td>Local System</td></tr><tr><td>OpenSSH Authentication Ag...</td><td>Age...</td><td>Restart</td><td>Disabled</td><td>Local System</td></tr><tr><td>Optimize drives</td><td>Hel...</td><td></td><td>Manual</td><td>Local System</td></tr><tr><td>PanGPS</td><td>Palc...</td><td>All Tasks</td><td>Automatic</td><td>Local System</td></tr><tr><td>Parental Controls</td><td>Enf...</td><td>Refresh</td><td>Manual</td><td>Local System</td></tr><tr><td>Payments and NFC/SE Mana...</td><td>Ma...</td><td>Properties</td><td>Manual (Trigg...</td><td>Local Service</td></tr><tr><td>Peer Name Resolution Proto...</td><td>Ena...</td><td>Help</td><td>Manual</td><td>Local Service</td></tr><tr><td>Peer Networking Grouping</td><td>Ena...</td><td></td><td>Manual</td><td>Local Service</td></tr><tr><td>Peer Networking Identity M...</td><td>Pro...</td><td></td><td>Manual</td><td>Local Service</td></tr><tr><td>Performance Counter DLL H...</td><td>Enables rem...</td><td></td><td>Manual</td><td>Local Service</td></tr><tr><td>Performance Logs & Alerts</td><td>Performance...</td><td></td><td>Manual</td><td>Local Service</td></tr><tr><td>Phone Service</td><td>Manages th...</td><td></td><td>Manual (Trigg...</td><td>Local Service</td></tr><tr><td>Plug and Play</td><td>Enables a co...</td><td>Running</td><td>Manual</td><td>Local System</td></tr><tr><td>PNRP Machine Name Public...</td><td>This service ...</td><td></td><td>Manual</td><td>Local Service</td></tr><tr><td>Portable Device Enumerator ...</td><td>Enforces gro...</td><td></td><td>Manual (Trigg...</td><td>Local System</td></tr><tr><td>Power</td><td>Manages po...</td><td>Running</td><td>Automatic</td><td>Local System</td></tr><tr><td>Print Spooler</td><td>This service ...</td><td>Running</td><td>Automatic</td><td>Local System</td></tr></table>	Name	Description	Status	Startup Type	Log On As	Natural Authentication	Signal aggre...		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17	Once installation/uninstallation process is completed in your system, Start Node-RED in Services to launch Node-RED application.  The screenshot shows the Windows Services console window. The 'Services (Local)' list on the right contains various system services. 'Node-RED' is highlighted in blue. A right-click context menu is open over 'Node-RED', showing options: Start, Stop, Pause, Resume, Restart, All Tasks, Refresh, Properties, and Help. The 'Start' option is highlighted in blue. The left pane shows 'Node-RED' with a link to 'Start the service' and a description: 'A wiring tool for the Internet of Things'. The bottom status bar indicates 'Start service Node-RED on Local Computer'. <table><tr><th>Name</th><th>Description</th><th>Status</th><th>Startup Type</th><th>Log On As</th></tr><tr><td>Natural Authentication</td><td>Signal aggre...</td><td></td><td>Manual (Trigg...</td><td>Local System</td></tr><tr><td>Net.Tcp Port Sharing Service</td><td>Provides abil...</td><td></td><td>Disabled</td><td>Local Service</td></tr><tr><td>Netlogon</td><td>Maintains a ...</td><td>Running</td><td>Automatic</td><td>Local System</td></tr><tr><td>Network Connected Devices ...</td><td>Network Co...</td><td></td><td>Manual (Trigg...</td><td>Local Service</td></tr><tr><td>Network Connection Broker</td><td>Brokers con...</td><td>Running</td><td>Manual (Trigg...</td><td>Local System</td></tr><tr><td>Network Connections</td><td>Manages ob...</td><td>Running</td><td>Manual</td><td>Local System</td></tr><tr><td>Network Connectivity Assist...</td><td>Provides Dir...</td><td></td><td>Manual (Trigg...</td><td>Local System</td></tr><tr><td>Network List Service</td><td>Identifies th...</td><td>Running</td><td>Manual</td><td>Local Service</td></tr><tr><td>Network Location Awareness</td><td>Collects and ...</td><td>Running</td><td>Automatic</td><td>Network Se...</td></tr><tr><td>Network Setup Service</td><td>The Network...</td><td>Running</td><td>Manual (Trigg...</td><td>Local System</td></tr><tr><td>Network Store Interface Serv...</td><td>This service...</td><td>Running</td><td>Automatic</td><td>Local Service</td></tr><tr><td>Node-RED</td><td></td><td></td><td>Automatic</td><td>Local System</td></tr><tr><td>NVIDIA Display Conta...</td><td></td><td>unning</td><td>Automatic</td><td>Local System</td></tr><tr><td>NVIDIA WMI Provider</td><td></td><td>unning</td><td>Automatic</td><td>Local System</td></tr><tr><td>Office Source Engine</td><td></td><td></td><td>Manual</td><td>Local System</td></tr><tr><td>Offline Files</td><td></td><td></td><td>Manual (Trigg...</td><td>Local System</td></tr><tr><td>OpenSSH Authenticat...</td><td></td><td></td><td>Disabled</td><td>Local System</td></tr><tr><td>Optimize drives</td><td></td><td></td><td>Manual</td><td>Local System</td></tr><tr><td>PanGPS</td><td></td><td>unning</td><td>Automatic</td><td>Local System</td></tr><tr><td>Parental Controls</td><td></td><td></td><td>Manual</td><td>Local System</td></tr><tr><td>Payments and NFC/SE</td><td></td><td>unning</td><td>Manual (Trigg...</td><td>Local Service</td></tr><tr><td>Peer Name Resolution</td><td></td><td></td><td>Manual</td><td>Local Service</td></tr><tr><td>Peer Networking Grou...</td><td></td><td></td><td>Manual</td><td>Local Service</td></tr><tr><td>Peer Networking Ident...</td><td></td><td></td><td>Manual</td><td>Local Service</td></tr><tr><td>Performance Counter DLL H...</td><td>Enables rem...</td><td></td><td>Manual</td><td>Local Service</td></tr><tr><td>Performance Logs & Alerts</td><td>Performance...</td><td></td><td>Manual</td><td>Local Service</td></tr><tr><td>Phone Service</td><td>Manages th...</td><td></td><td>Manual (Trigg...</td><td>Local Service</td></tr><tr><td>Plug and Play</td><td>Enables a co...</td><td>Running</td><td>Manual</td><td>Local System</td></tr><tr><td>PNRP Machine Name Public...</td><td>This service ...</td><td></td><td>Manual</td><td>Local Service</td></tr><tr><td>Portable Device Enumerator ...</td><td>Enforces gro...</td><td></td><td>Manual (Trigg...</td><td>Local System</td></tr><tr><td>Power</td><td>Manages po...</td><td>Running</td><td>Automatic</td><td>Local System</td></tr><tr><td>Print Spooler</td><td>This service...</td><td>Running</td><td>Automatic</td><td>Local System</td></tr></table>	Name	Description	Status	Startup Type	Log On As	Natural Authentication	Signal aggre...		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To disable Node-RED as a service follow the steps given below:

- Navigate to NSSM folder in command prompt.
- Type `nssm remove <service-name>` confirm and press **Enter**.

Part II

Installation and Uninstallation - SE Harmony Hub Node

What Is in This Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
2	Prerequisites	31
3	Installation and uninstallation of SE Harmony Hub Node - Windows Platform	33
4	Installation and uninstallation of SE Harmony Hub Node - Linux Platform	77

Chapter 2

Prerequisites

System Requirements

Operating System

The SE Harmony Hub node V1.0.0 is supported on the following operating systems:

- Microsoft Windows 10
 - Standard Image and IIoT One Image (RC7 and above)

NOTE: Magelis HMIBMP - User has to install the Node.js, Node-RED and Python software in the **Magelis HMIBMP** box (Standard Image) manually.

- Linux Linaro - V1.00.010 and above
 - IIoT One Image (V1.00.010 and above)

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

Hardware Requirements

NOTE: The SE Harmony Hub node is supported in **Magelis HMIBMP** and **Magelis HMIBSC** only. Other **Magelis Edge Box** and **Magelis iPC** will be supported in future versions of the node.

IIoT Edge Box	PC hardware	Specification
Magelis HMIBMP	Processor	Reference HMIBMPHI74D4801 HMIBMP with 4 expansion slots, Intel Core I7
	RAM	8 GB
	Hard disk space	500 GB HDD
	Operating system	Microsoft Windows 10
Magelis HMIBSC	Processor	Reference HMIBSCA53D1L0T HMIBSC with ARM
	Hard disk space	eMMC and TPM for hardware encryption
	Operating system	Linux Yocto

Software Requirements

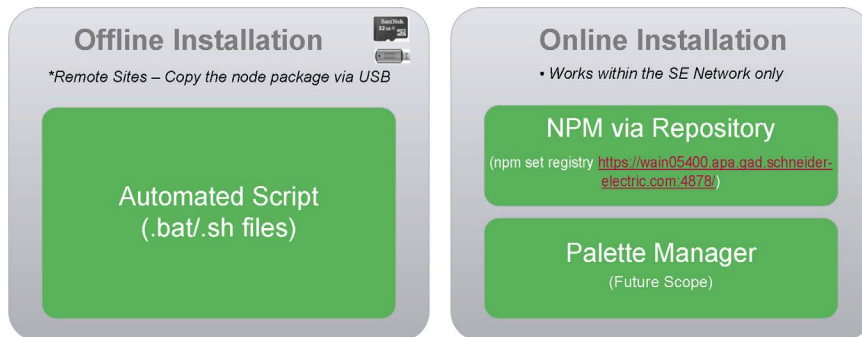
- Node.js V10.15.3 (*see page 35*)
- Node-RED server V0.20.7 (*see page 42*)
- Npm (Node package manager) V6.4.1

- Python V2.7 (online installation mode only) (*see page 44*)
- 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 the SE Harmony Hub Node

You can perform two modes of installation (online/offline) on either of the platforms:



Each installation mode can be performed on either of the two platforms.:

- Install the node - Windows platform (*see page 77*)
- Install the node - Linux platform (*see page 67*)

Chapter 3

Installation and uninstallation of SE Harmony Hub Node - Windows Platform

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
3.1	Installing SE Harmony Hub node - Windows Platform	34
3.2	Uninstalling SE Harmony Hub node - Windows Platform	70

Section 3.1

Installing SE Harmony Hub node - Windows Platform

What Is in This Section?

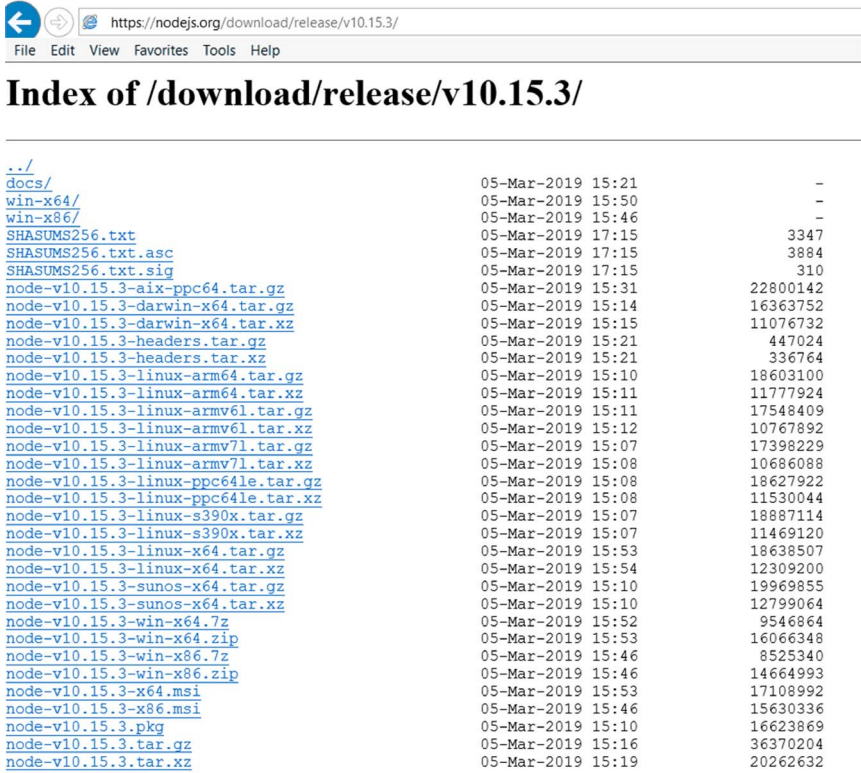
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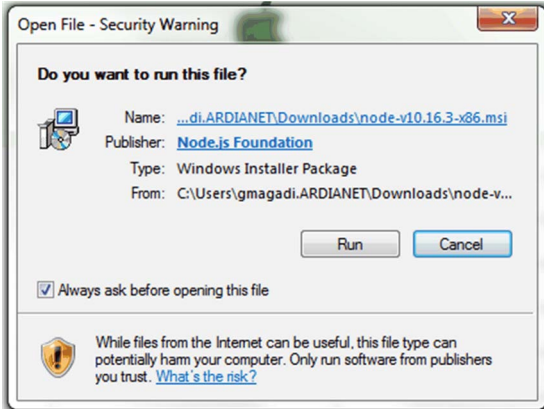
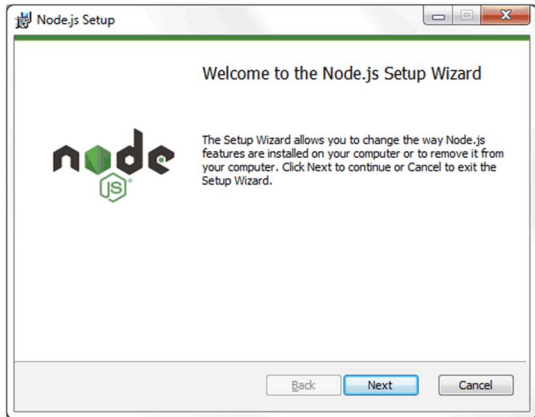
Topic	Page
Installing Node.js	35
Installing Node-RED	42
Installing Python	44
Commissioning of Node-RED server	48
Installing SE Harmony Hub Node - Offline Installation Mode	64
Installing SE Harmony Hub Node - Online Installation Mode	67

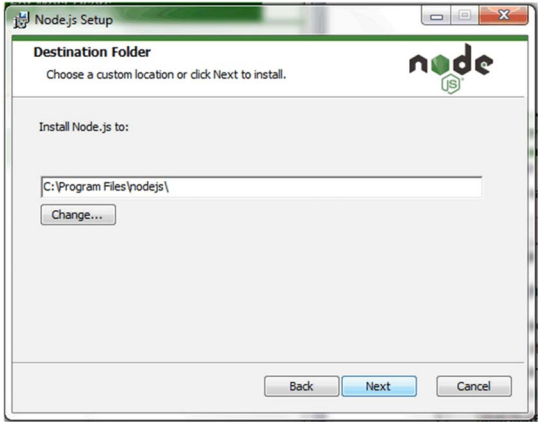
Installing Node.js

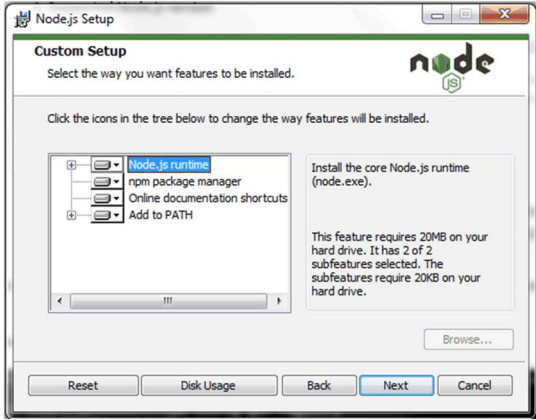
This table shows the installation procedure for Node.js:

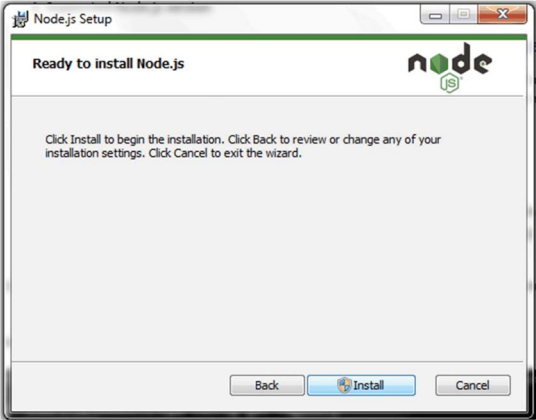
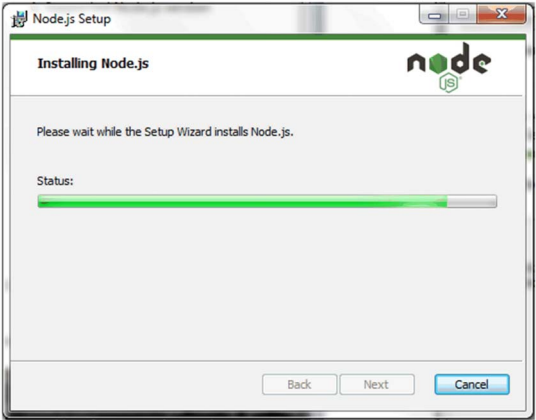
Step	Action																			
1	Open the Node.js® for Windows from the below link: https://nodejs.org/en/download/ https://nodejs.org/en/download/ node HOME ABOUT DOWNLOADS DOCS GET INVOLVED SECURITY NEWS FOUNDATION Downloads Latest LTS Version: 10.16.3 (includes npm 6.9.0) Download the Node.js source code or a pre-built installer for your platform, and start developing today. LTS Recommended For Most Users Current Latest Features Windows Installer node-v10.16.3-x86.msi macOS Installer node-v10.16.3.pkg Source Code node-v10.16.3.tar.gz Windows Installer (.msi) Windows Binary (.zip) macOS Installer (.pkg) macOS Binary (.tar.gz) Linux Binaries (x64) Linux Binaries (ARM) Source Code Additional Platforms SmartOS Binaries Docker Image Linux on Power Systems <table><tr><td>32-bit</td><td>64-bit</td></tr><tr><td>32-bit</td><td>64-bit</td></tr><tr><td colspan="2">64-bit</td></tr><tr><td colspan="2">64-bit</td></tr><tr><td colspan="2">64-bit</td></tr><tr><td>ARMv6</td><td>ARMv7</td><td>ARMv8</td></tr><tr><td colspan="3">node-v10.16.3.tar.gz</td></tr></table><table><tr><td>64-bit</td></tr><tr><td>Official Node.js Docker Image</td></tr><tr><td>64-bit</td></tr></table>	32-bit	64-bit	32-bit	64-bit	64-bit		64-bit		64-bit		ARMv6	ARMv7	ARMv8	node-v10.16.3.tar.gz			64-bit	Official Node.js Docker Image	64-bit
32-bit	64-bit																			
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ARMv6	ARMv7	ARMv8																		
node-v10.16.3.tar.gz																				
64-bit																				
Official Node.js Docker Image																				
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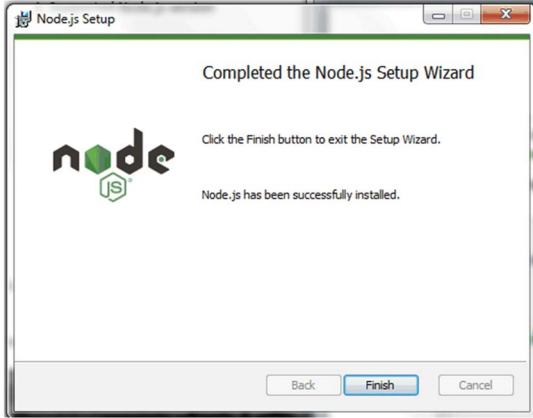
Step	Action
2	Use the node-v10.15.3-x64.msi version. Download the Node.js® from the link given below: https://nodejs.org/download/release/v10.15.3/  ../ docs/ win-x64/ win-x86/ SHASUMS256.txt SHASUMS256.txt.asc SHASUMS256.txt.sig node-v10.15.3-aix-ppc64.tar.gz node-v10.15.3-darwin-x64.tar.gz node-v10.15.3-darwin-x64.tar.xz node-v10.15.3-headers.tar.gz node-v10.15.3-headers.tar.xz node-v10.15.3-linux-arm64.tar.gz node-v10.15.3-linux-arm64.tar.xz node-v10.15.3-linux-armv6l.tar.gz node-v10.15.3-linux-armv6l.tar.xz node-v10.15.3-linux-armv7l.tar.gz node-v10.15.3-linux-armv7l.tar.xz node-v10.15.3-linux-ppc64le.tar.gz node-v10.15.3-linux-ppc64le.tar.xz node-v10.15.3-linux-s390x.tar.gz node-v10.15.3-linux-s390x.tar.xz node-v10.15.3-linux-x64.tar.gz node-v10.15.3-linux-x64.tar.xz node-v10.15.3-sunos-x64.tar.gz node-v10.15.3-sunos-x64.tar.xz node-v10.15.3-win-x64.7z node-v10.15.3-win-x64.zip node-v10.15.3-win-x86.7z node-v10.15.3-win-x86.zip node-v10.15.3-x64.msi node-v10.15.3-x86.msi node-v10.15.3.pkg node-v10.15.3.tar.gz node-v10.15.3.tar.xz 05-Mar-2019 15:21 - 05-Mar-2019 15:50 - 05-Mar-2019 15:46 - 05-Mar-2019 17:15 3347 05-Mar-2019 17:15 3884 05-Mar-2019 17:15 310 05-Mar-2019 15:31 22800142 05-Mar-2019 15:14 16363752 05-Mar-2019 15:15 11076732 05-Mar-2019 15:21 447024 05-Mar-2019 15:21 336764 05-Mar-2019 15:10 18603100 05-Mar-2019 15:11 11777924 05-Mar-2019 15:11 17548409 05-Mar-2019 15:12 10767892 05-Mar-2019 15:07 17398229 05-Mar-2019 15:08 10686088 05-Mar-2019 15:08 18627922 05-Mar-2019 15:08 11530044 05-Mar-2019 15:07 18887114 05-Mar-2019 15:07 11469120 05-Mar-2019 15:53 18638507 05-Mar-2019 15:54 12309200 05-Mar-2019 15:10 19969855 05-Mar-2019 15:10 12799064 05-Mar-2019 15:52 9546864 05-Mar-2019 15:53 16066348 05-Mar-2019 15:46 8525340 05-Mar-2019 15:46 14664993 05-Mar-2019 15:53 17108992 05-Mar-2019 15:46 15630336 05-Mar-2019 15:10 16623869 05-Mar-2019 15:16 36370204 05-Mar-2019 15:19 20262632
3	Select node-v10.15.3-x64.msi for download.
4	Double-click the downloaded file to start the installation process. Result: Open File dialog box appears.

Step	Action
5	Click Run.  The dialog box is titled "Open File - Security Warning". It asks "Do you want to run this file?". It shows the file name as "...di.ARDIANET\Downloads\node-v10.16.3-x86.msi", the publisher as "Node.js Foundation", and the type as "Windows Installer Package". It also shows the source path. There are "Run" and "Cancel" buttons. A checkbox "Always ask before opening this file" is checked. A warning icon and text at the bottom state: "While files from the Internet can be useful, this file type can potentially harm your computer. Only run software from publishers you trust. What's the risk?" Result: Node.js Setup Wizard dialog box appears.
6	Click Next.  The dialog box is titled "Node.js Setup". It says "Welcome to the Node.js Setup Wizard". It features the Node.js logo. The text reads: "The Setup Wizard allows you to change the way Node.js features are installed on your computer or to remove it from your computer. Click Next to continue or Cancel to exit the Setup Wizard." There are "Back", "Next", and "Cancel" buttons at the bottom. Result: End-User License Agreement dialog box appears.

Step	Action
7	Select I accept the terms in the License Agreement and click Next. 
8	Click Next. 

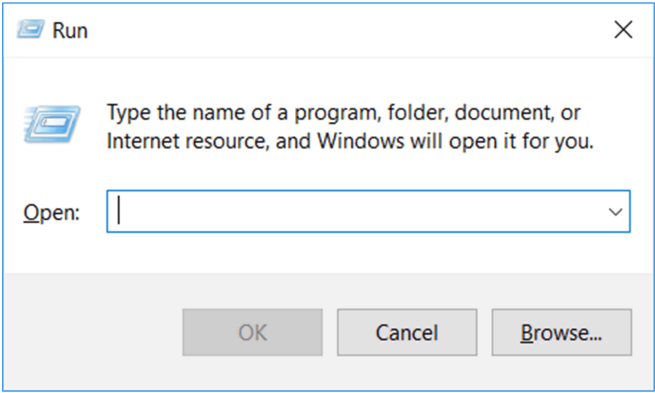
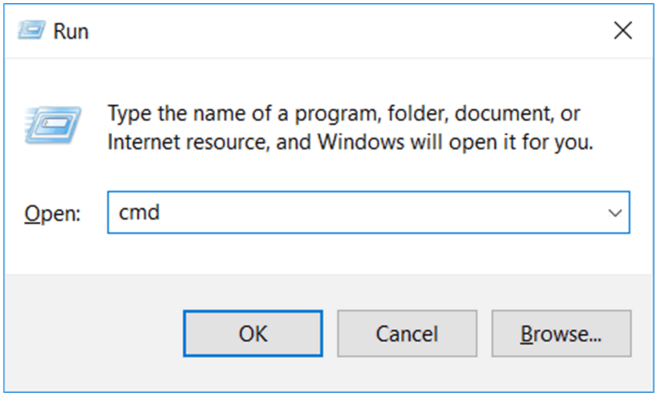
Step	Action
9	Click Next. 

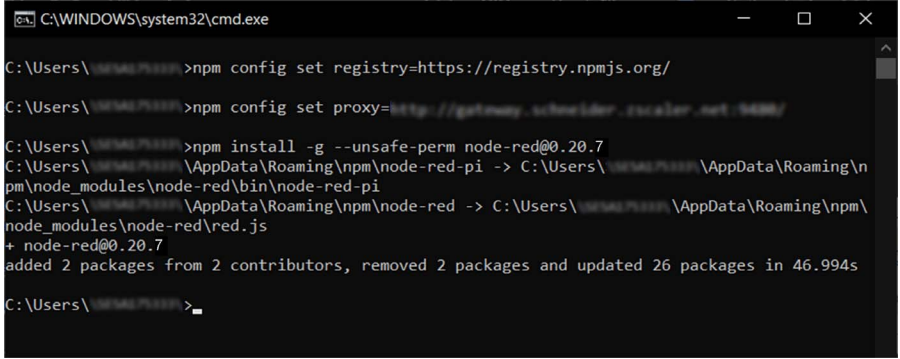
Step	Action
10	Click Install.  The screenshot shows the 'Node.js Setup' window with the title 'Ready to install Node.js'. It features the Node.js logo in the top right. The main text reads: 'Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.' At the bottom, there are three buttons: 'Back', 'Install' (highlighted in blue), and 'Cancel'.  The screenshot shows the 'Node.js Setup' window with the title 'Installing Node.js'. It features the Node.js logo in the top right. The main text reads: 'Please wait while the Setup Wizard installs Node.js.' Below this is a 'Status:' label followed by a green progress bar that is approximately 75% full. At the bottom, there are three buttons: 'Back', 'Next', and 'Cancel' (highlighted in blue).

Step	Action
11	Click Finish. 
12	Node.js installation is completed.

Installing Node-RED

This table shows the installation procedure for Node-RED:

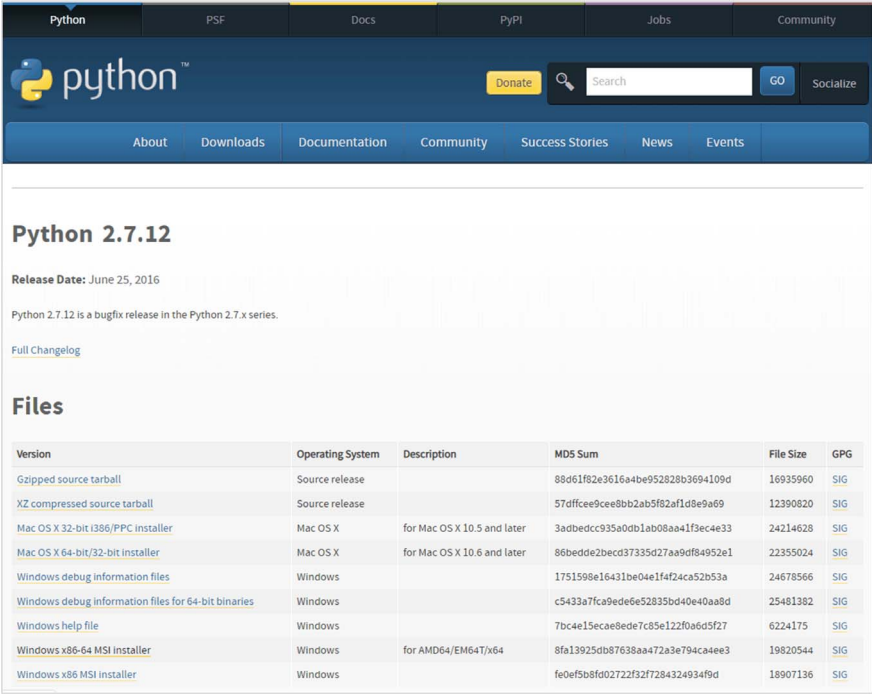
Step	Action
1	Click  and type Run in the search bar and press Enter. 
2	Type the <code>cmd</code> in the Run dialog box and press OK.  Result: Command prompt window appears.
3	With Schneider network connected, type the text given below in the command prompt and press Enter. <pre>npm config set registry=https://registry.npmjs.org/</pre>

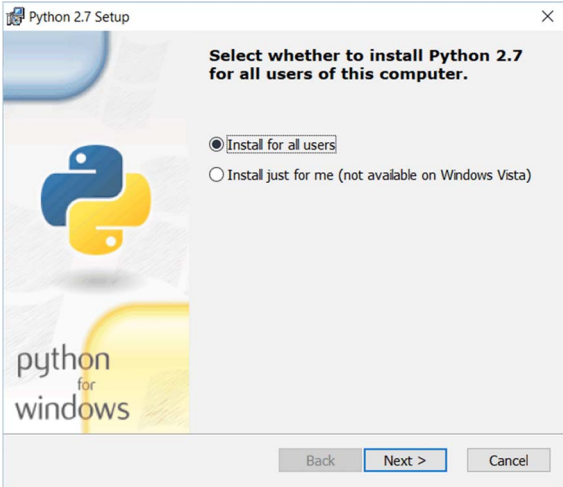
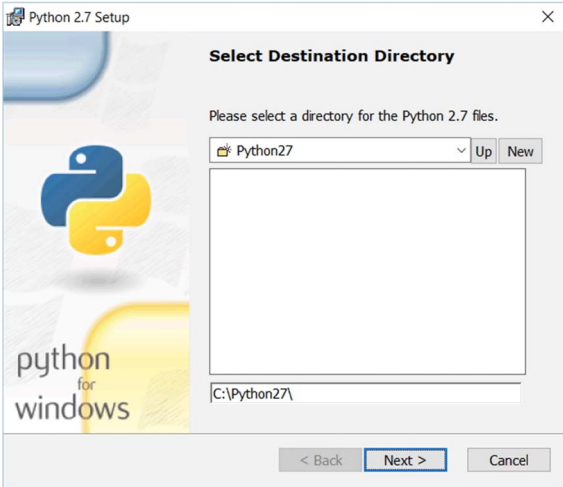
Step	Action
4	Type the valid proxy with respect to your organization or country (for instance, <code>http://yourproxy:XXXX/</code>) and press Enter . <code>npm config set proxy=http://yourproxy:XXXX/</code>
5	Type <code>npm install -g --unsafe-perm node-red@0.20.7</code> and press Enter . 
6	Node-RED application is installed.

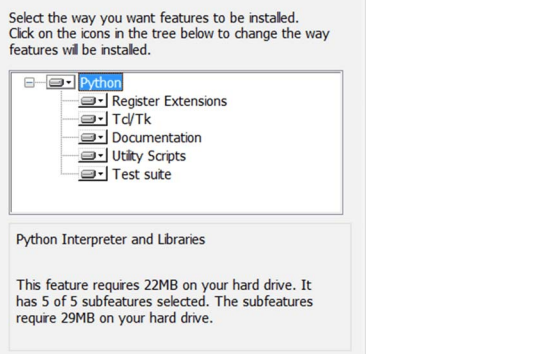
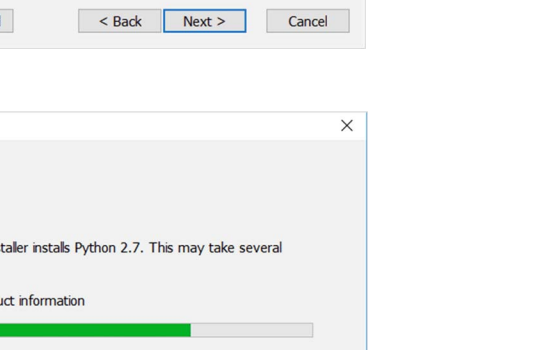
Installing Python

NOTE: Python installation is applicable only for online installation mode in Windows platform.

This table shows the installation procedure for Python:

Step	Action
1	Download python 2.7.x version from the link given below: https://www.python.org/downloads/release/python-2712/
2	Click the Windows x86-64 MSI to download the file. 
3	Downloaded file name: python-2.7.12.amd64.
4	Double-click the downloaded file to install python software.

Step	Action
5	Select Install for all users and click Next 
6	Click Next 

Step	Action
7	Click Next  

Step	Action
8	Click Finish  Result: Python installation is completed.

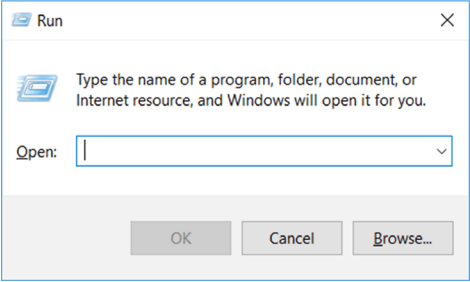
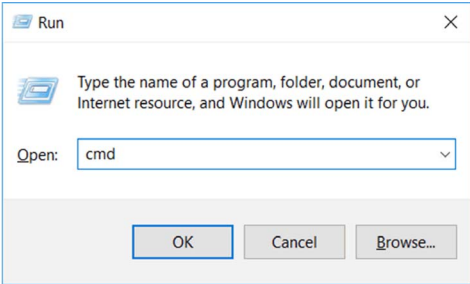
Commissioning of Node-RED server

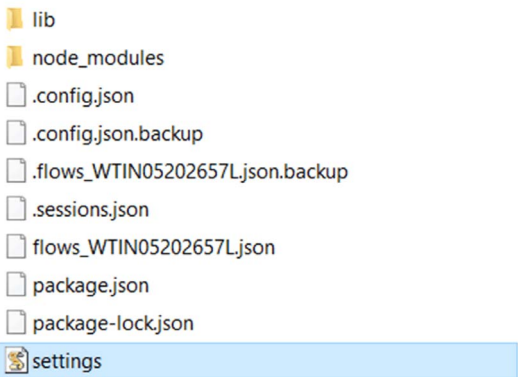
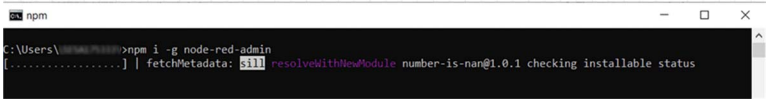
Overview

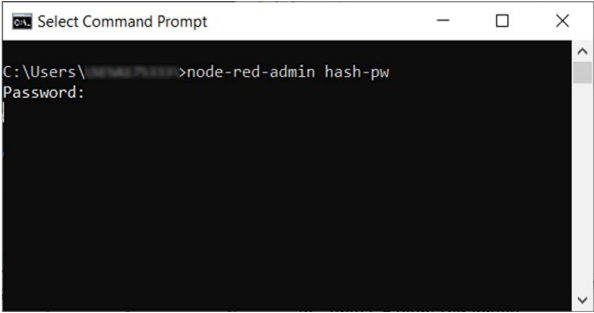
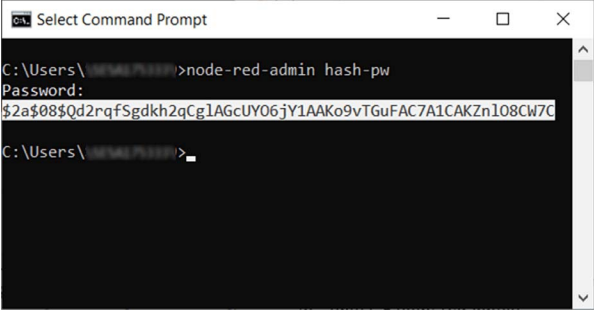
Before enabling login credentials you need to install the Node-RED software. It has to be a secured platform to be compliant with cybersecurity.

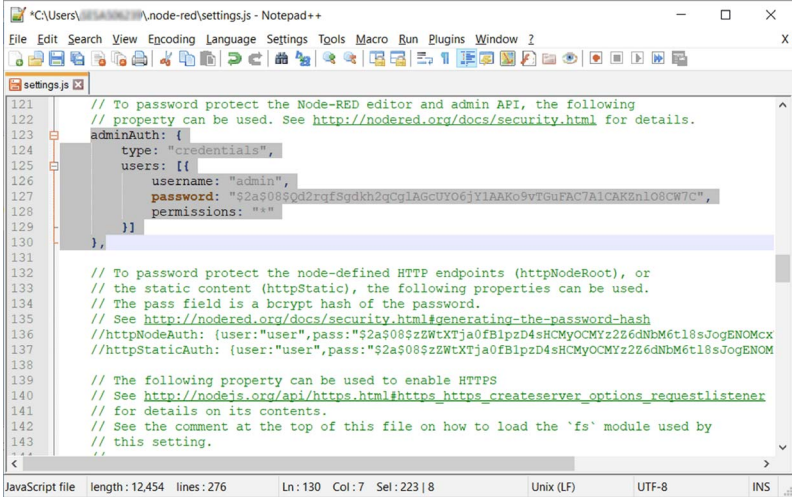
Securing Node-RED - Enable Login Credentials

The following steps explain the enabling of user authentication when accessing the Node-RED Editor.

Step	Action
1	Click  and type Run in the search bar and press Enter. 
2	Type the <code>cmd</code> in the run dialog box and click OK.  Result: Command prompt window appears.
3	Type <code>npm config set registry https://registry.npmjs.org</code> in the command prompt and press Enter.

Step	Action
4	Type <code>npm set proxy http://yourproxy:XXXX/</code> in the command prompt and press Enter . NOTE: Type the valid proxy with respect to your organization or country.
5	Type <code>node-red</code> in the command prompt and press Enter . Result: <code>.node-red</code> folder is created in Local Disk (C:)/Users/SESAXXXXXX/.
6	In <code>.node-red</code> folder open <code>settings.js</code> file in the Notepad++. NOTE: Download Notepad++ software if not available in your windows system. 
7	Type <code>npm i -g node-red-admin</code> in the command prompt and press Enter .  Result: Node-RED admin is installed globally.

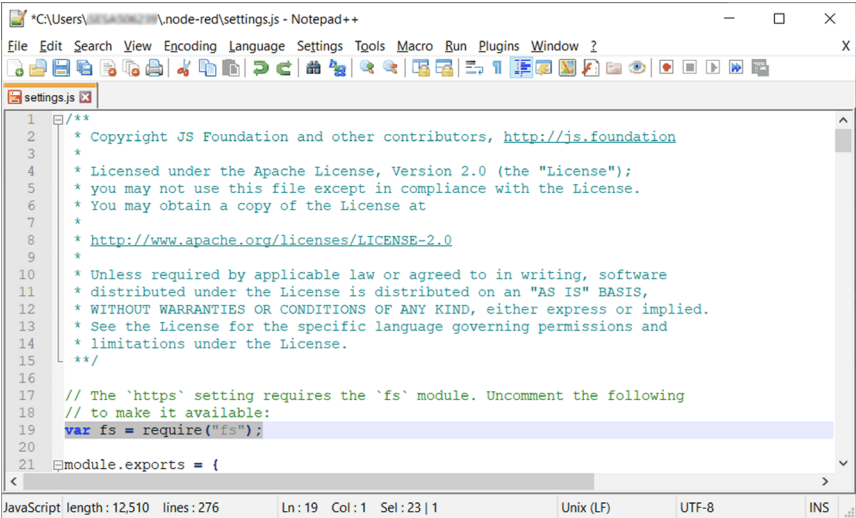
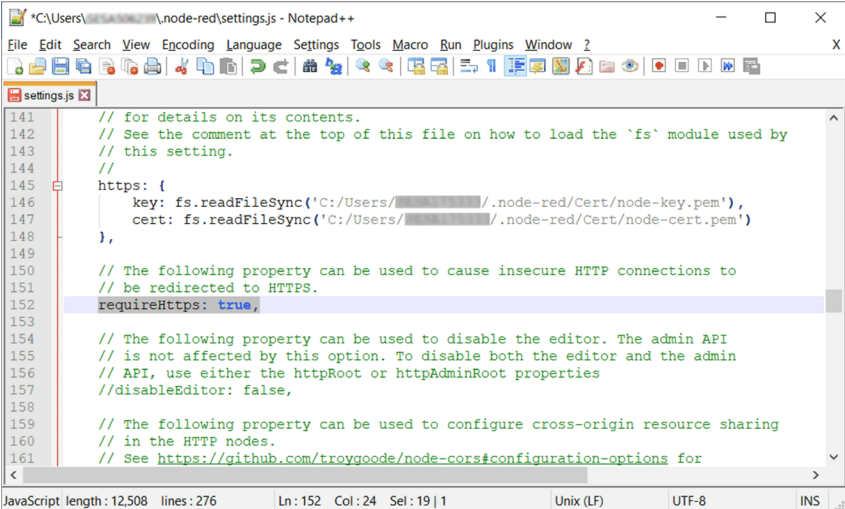
Step	Action
8	Type <code>node-red-admin hash-pw</code> in the command prompt and press Enter. 
9	Type the Password and press Enter.  Result: The password is encrypted.

Step	Action
10	Copy the encrypted text (password), search for <code>adminAuth</code> in <code>settings.js</code> file and paste encrypted text as password. Uncomment (remove <code>//</code>) <code>adminAuth</code> credential details.  <pre> 121 // To password protect the Node-RED editor and admin API, the following 122 // property can be used. See http://nodered.org/docs/security.html for details. 123 adminAuth: { 124 type: "credentials", 125 users: [{ 126 username: "admin", 127 password: "\$2a\$08\$Qd2rqfSgdkh2qCgiAGcUYO6jYIAAKo9vTGufAC7A1CAKEn108CW7C", 128 permissions: "" 129 }] 130 }, 131 132 // To password protect the node-defined HTTP endpoints (httpNodeRoot), or 133 // the static content (httpStatic), the following properties can be used. 134 // The pass field is a bcrypt hash of the password. 135 // See http://nodered.org/docs/security.html#generating-the-password-hash 136 //httpNodeAuth: {user:"user",pass:"\$2a\$08\$zZWtXtja0fBlpzD4sHcMyOCMyz2Z6dNbm6t18sJogENOMcx 137 //httpStaticAuth: {user:"user",pass:"\$2a\$08\$zZWtXtja0fBlpzD4sHcMyOCMyz2Z6dNbm6t18sJogENOM 138 139 // The following property can be used to enable HTTPS 140 // See http://nodejs.org/api/https.html#https_https_createserver_options_requestlistener 141 // for details on its contents. 142 // See the comment at the top of this file on how to load the 'fs' module used by 143 // this setting. 144 145 </pre>

Securing Node-RED - Enabling SSL

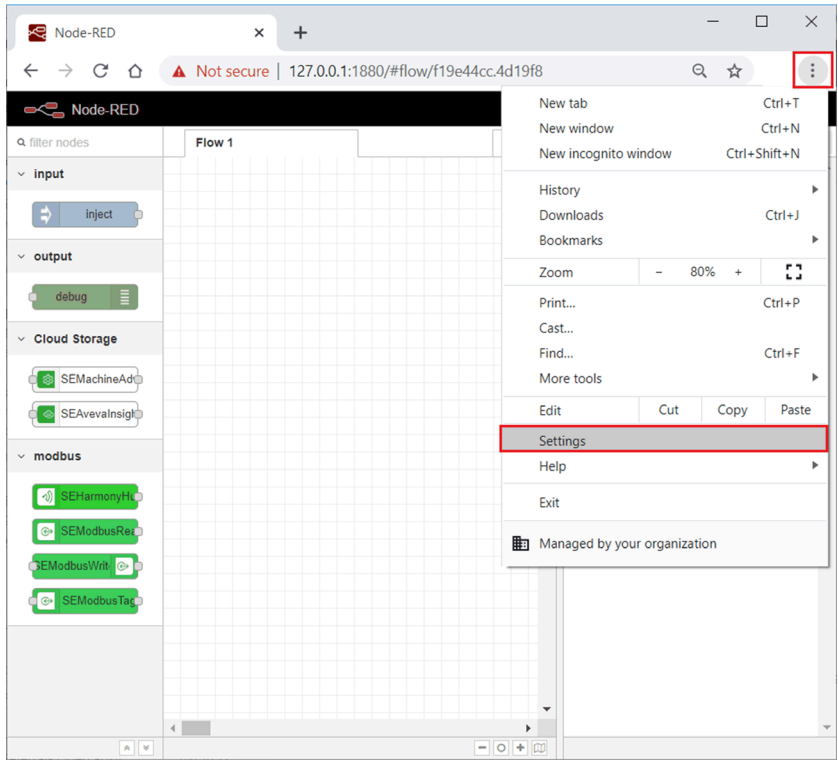
Follow the steps below to enable SSL (Secure Socket Layer) on Node-RED - Editor:

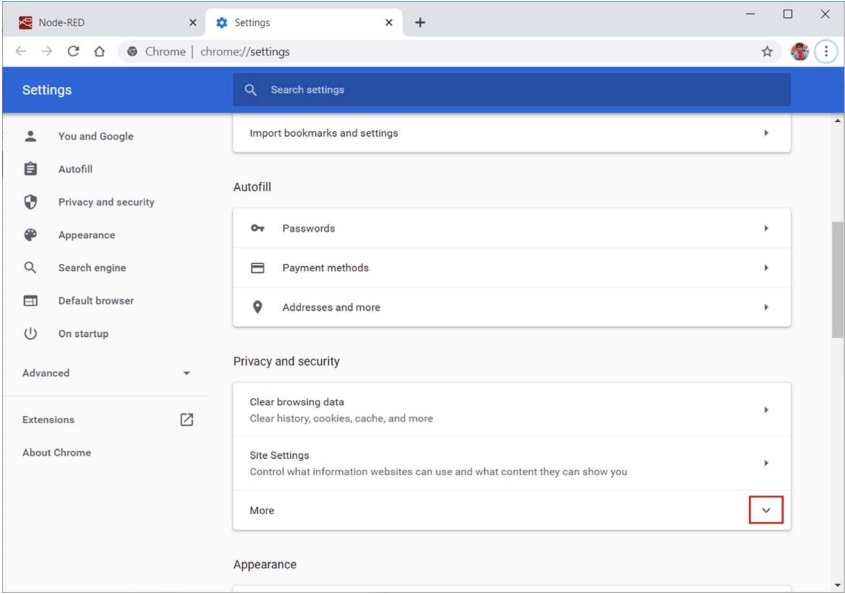
Step	Action
1	Create a new folder called Cert in <code>.node-red</code> folder. For instance, <code>C:/Users/SESAXXXXXX/.node-red</code>
2	Copy the SSL certificate files (for instance, <code>node-key.pem</code> and <code>node-cert.pem</code>) and paste them in the path given below: For instance, <code>C:/Users/SESAXXXXXX/.node-red/Cert</code>
3	Open <code>settings.js</code> file in Notepad++. The <code>settings.js</code> file will be located in the path given below: <code>C:/Users/SESAXXXXXX/.node-red/</code>

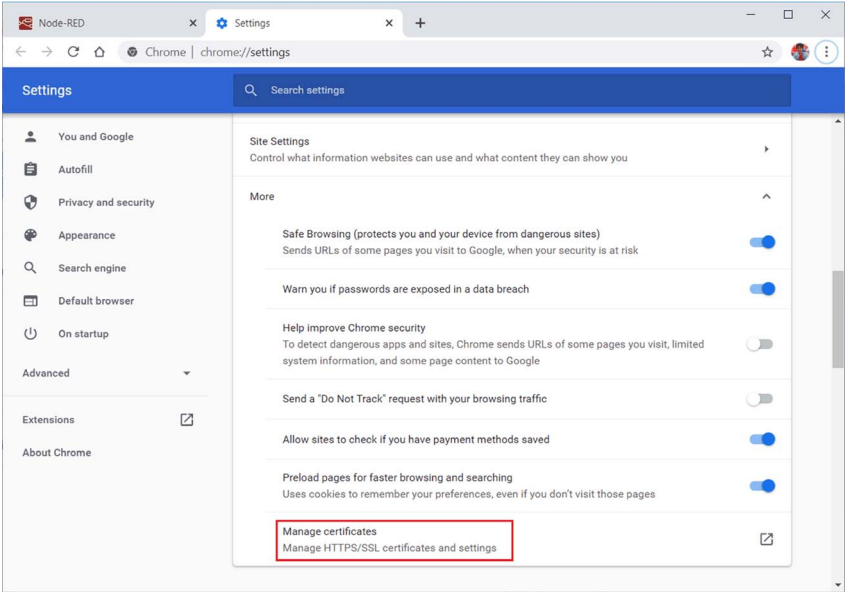
Step	Action
4	Search for the <code>var fs</code> and uncomment (remove <code>//</code>) the statement.  The screenshot shows a Notepad++ window titled '*C:\Users\...\.node-red\settings.js - Notepad++'. The file 'settings.js' is open, and the line <code>var fs = require('fs');</code> at line 19 is highlighted. The status bar at the bottom indicates 'JavaScript length: 12,510 lines: 276 Ln: 19 Col: 1 Sel: 23 1'.
5	Search for <code>https</code> in <code>settings.js</code> file and edit the key and cert files path and uncomment (remove <code>//</code>) <code>https details</code>. Search for the <code>requireHttps</code> and uncomment (remove <code>//</code>) the statement.  The screenshot shows the same Notepad++ window, but now the line <code>requireHttps: true,</code> at line 152 is highlighted. The status bar at the bottom indicates 'JavaScript length: 12,508 lines: 276 Ln: 152 Col: 24 Sel: 19 1'.

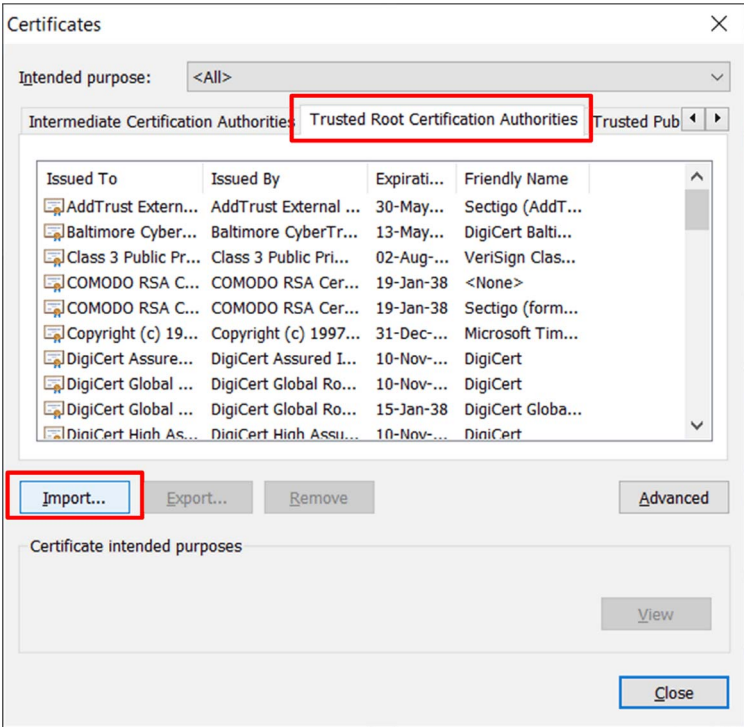
Step	Action
6	Save the settings.js file and close.
7	Restart the node-red server.

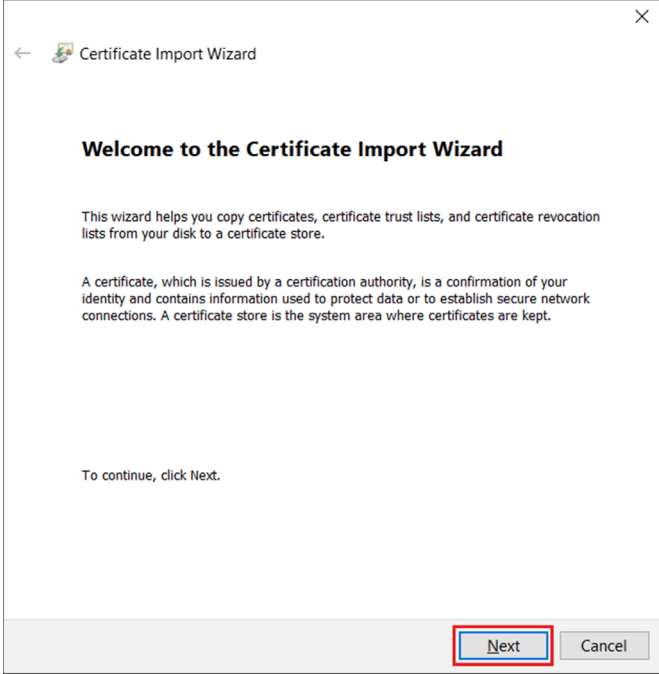
If your Node-RED server (<https://127.0.0.1:1880/>) is showing Not-secure then follow the steps given below to make the server secure:

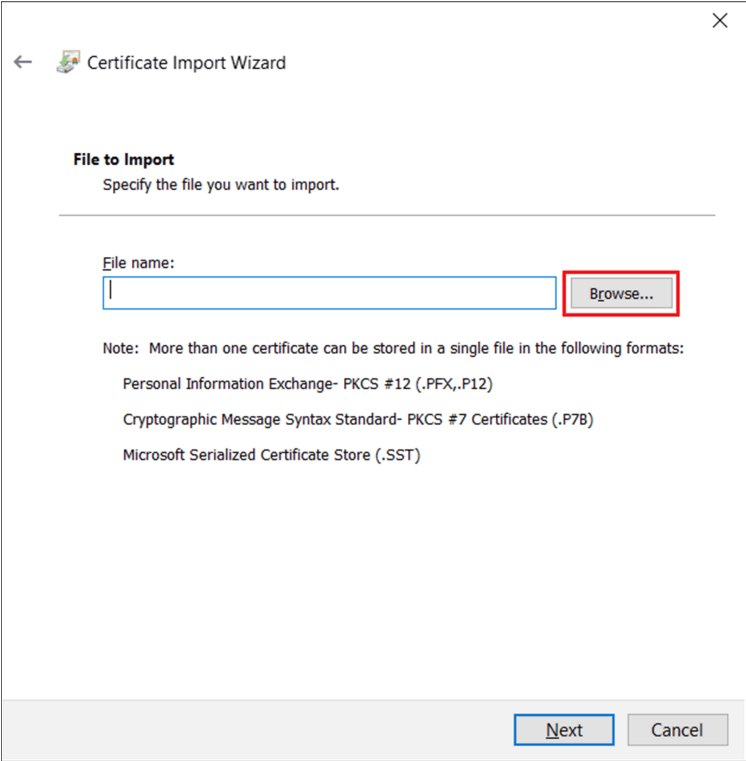
Step	Action
1	Open Node-RED application in a specified browser. Click Kebab Menu → Settings as shown in the image below.  The screenshot shows the Node-RED web interface in a browser. The address bar shows 'Not secure 127.0.0.1:1880/#flow/f19e44cc.4d19f8'. The left sidebar contains a 'filter nodes' search bar and several category menus: 'input' (with 'inject'), 'output' (with 'debug'), 'Cloud Storage' (with 'SEMachineAd' and 'SEAvealnsigt'), and 'modbus' (with 'SEHarmonyH', 'SEModbusRe', 'SEModbusWrit', and 'SEModbusTas'). The main workspace shows 'Flow 1' with a grid. On the right, a Kebab menu is open, displaying options like 'New tab', 'New window', 'History', 'Downloads', 'Bookmarks', 'Zoom', 'Print...', 'Cast...', 'Find...', 'More tools', 'Edit', 'Cut', 'Copy', 'Paste', 'Settings' (highlighted with a red box), 'Help', 'Exit', and 'Managed by your organization'. Result: Settings window appears.

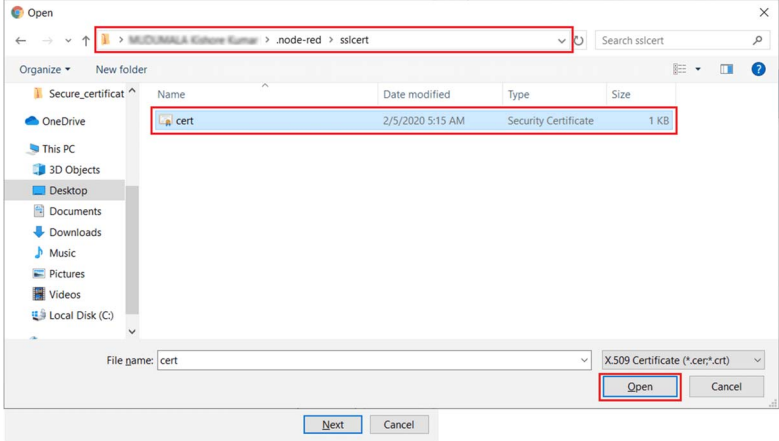
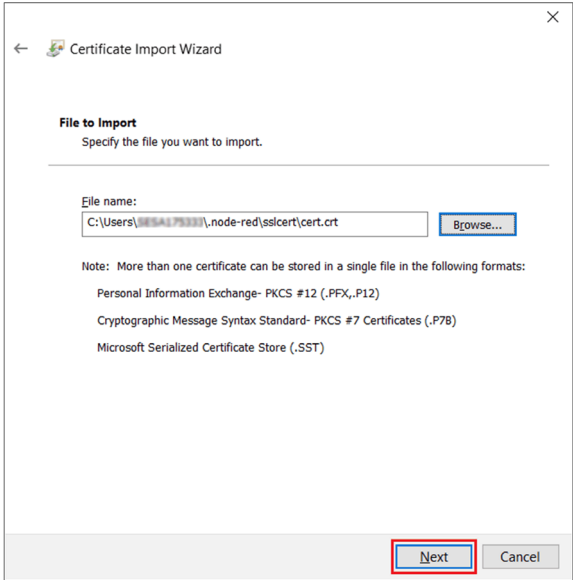
Step	Action
2	Click More drop-down. A screenshot of the Google Chrome Settings application. The browser window has two tabs: 'Node-RED' and 'Settings'. The address bar shows 'chrome://settings'. The left sidebar contains categories: 'You and Google', 'Autofill', 'Privacy and security', 'Appearance', 'Search engine', 'Default browser', 'On startup', 'Advanced', 'Extensions', and 'About Chrome'. The 'Privacy and security' section is expanded, showing 'Clear browsing data', 'Site Settings', and a 'More' link with a downward arrow. A red rectangle highlights the 'More' drop-down arrow. Other sections like 'Autofill' and 'Appearance' are partially visible.

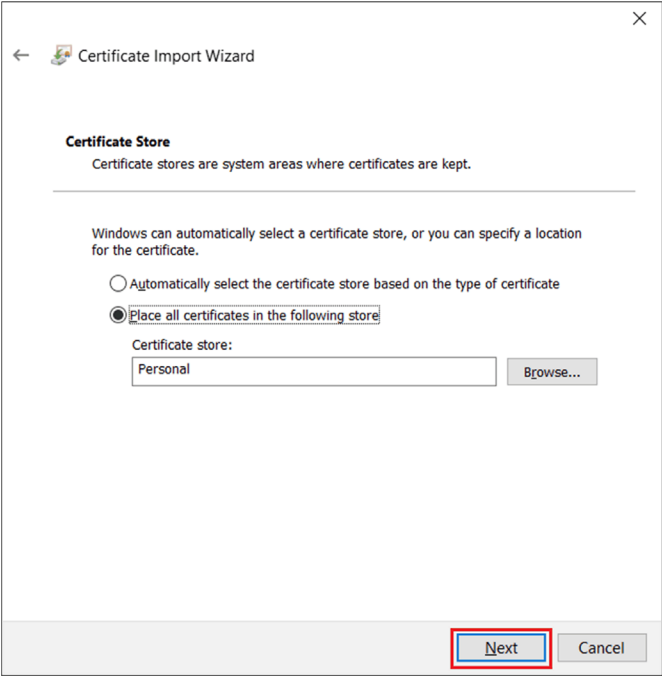
Step	Action
3	Click Manage certificates. A screenshot of the Chrome browser's settings page. The address bar shows 'chrome://settings'. The left sidebar contains categories like 'You and Google', 'Autofill', 'Privacy and security', 'Appearance', 'Search engine', 'Default browser', 'On startup', 'Advanced', 'Extensions', and 'About Chrome'. The 'Advanced' section is expanded, showing 'Site Settings', 'More', and 'Manage certificates'. The 'Manage certificates' option is highlighted with a red rectangular box. The 'More' section is also expanded, showing various security and privacy settings with toggle switches.

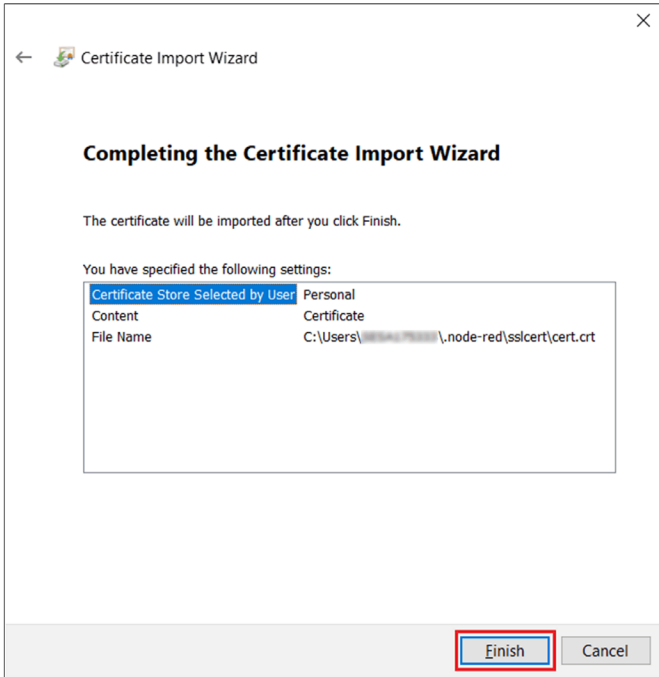
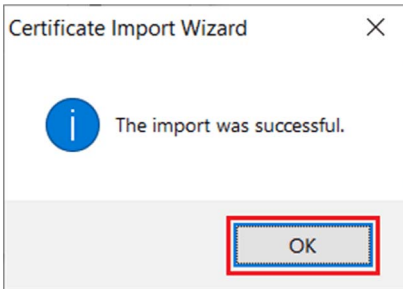
Step	Action																																												
4	Click Trusted Root Certification Authorities and Import...  The screenshot shows the 'Certificates' window with the 'Trusted Root Certification Authorities' tab selected. The 'Import...' button is highlighted with a red box. The table below lists the certificates in the store. <table><tr><th>Issued To</th><th>Issued By</th><th>Expirati...</th><th>Friendly Name</th></tr><tr><td>AddTrust Extern...</td><td>AddTrust External ...</td><td>30-May...</td><td>Sectigo (AddT...</td></tr><tr><td>Baltimore Cyber...</td><td>Baltimore CyberTr...</td><td>13-May...</td><td>DigiCert Balti...</td></tr><tr><td>Class 3 Public Pr...</td><td>Class 3 Public Pri...</td><td>02-Aug...</td><td>VeriSign Clas...</td></tr><tr><td>COMODO RSA C...</td><td>COMODO RSA Cer...</td><td>19-Jan-38</td><td><None></td></tr><tr><td>COMODO RSA C...</td><td>COMODO RSA Cer...</td><td>19-Jan-38</td><td>Sectigo (form...</td></tr><tr><td>Copyright (c) 19...</td><td>Copyright (c) 1997...</td><td>31-Dec...</td><td>Microsoft Tim...</td></tr><tr><td>DigiCert Assure...</td><td>DigiCert Assured I...</td><td>10-Nov...</td><td>DigiCert</td></tr><tr><td>DigiCert Global ...</td><td>DigiCert Global Ro...</td><td>10-Nov...</td><td>DigiCert</td></tr><tr><td>DigiCert Global ...</td><td>DigiCert Global Ro...</td><td>15-Jan-38</td><td>DigiCert Globa...</td></tr><tr><td>DiniCert Hinh As...</td><td>DiniCert Hinh Assu...</td><td>10-Nov...</td><td>DiniCert</td></tr></table>	Issued To	Issued By	Expirati...	Friendly Name	AddTrust Extern...	AddTrust External ...	30-May...	Sectigo (AddT...	Baltimore Cyber...	Baltimore CyberTr...	13-May...	DigiCert Balti...	Class 3 Public Pr...	Class 3 Public Pri...	02-Aug...	VeriSign Clas...	COMODO RSA C...	COMODO RSA Cer...	19-Jan-38	<None>	COMODO RSA C...	COMODO RSA Cer...	19-Jan-38	Sectigo (form...	Copyright (c) 19...	Copyright (c) 1997...	31-Dec...	Microsoft Tim...	DigiCert Assure...	DigiCert Assured I...	10-Nov...	DigiCert	DigiCert Global ...	DigiCert Global Ro...	10-Nov...	DigiCert	DigiCert Global ...	DigiCert Global Ro...	15-Jan-38	DigiCert Globa...	DiniCert Hinh As...	DiniCert Hinh Assu...	10-Nov...	DiniCert
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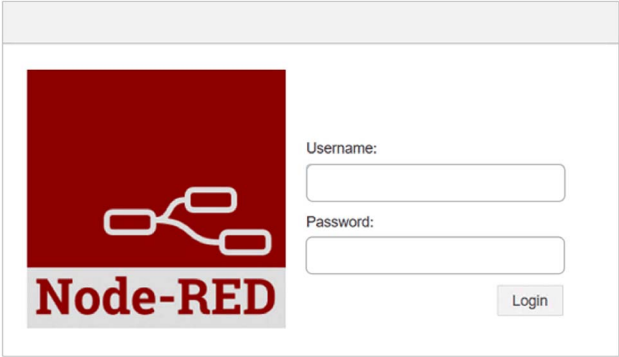
Step	Action
5	Click Next. 

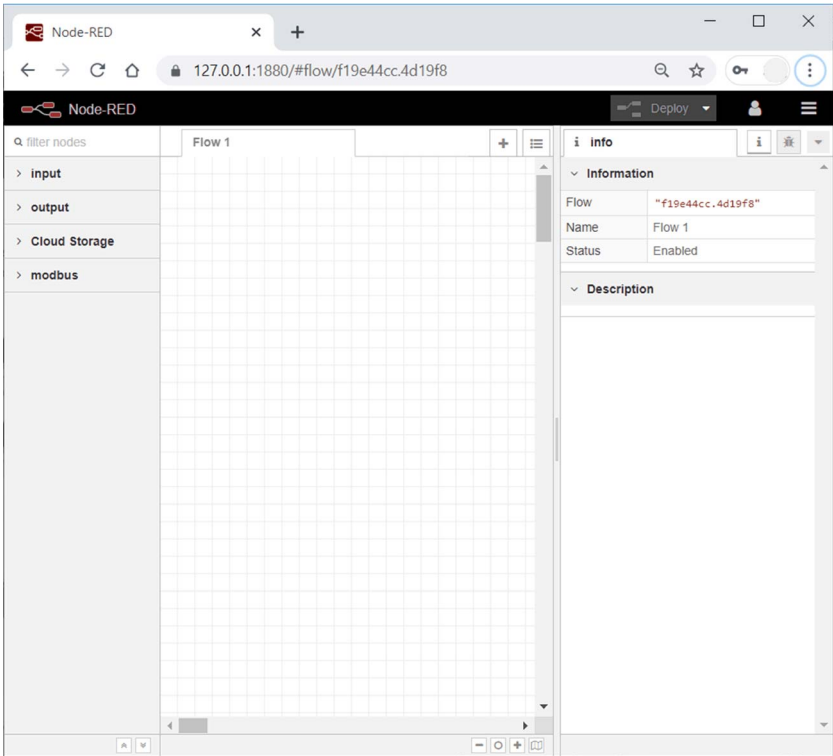
Step	Action
6	Click Browse... The image shows a Windows 'Certificate Import Wizard' dialog box. At the top, there is a title bar with a back arrow, a small icon, and the text 'Certificate Import Wizard', followed by a close button (X). Below the title bar, the section 'File to Import' is displayed with the instruction 'Specify the file you want to import.' A horizontal line separates this from the 'File name:' section, which contains a text input field and a 'Browse...' button. The 'Browse...' button is highlighted with a red rectangular box. Below the input field, a 'Note' states: 'More than one certificate can be stored in a single file in the following formats:'. This is followed by three bullet points: 'Personal Information Exchange- PKCS #12 (.PFX,.P12)', 'Cryptographic Message Syntax Standard- PKCS #7 Certificates (.P7B)', and 'Microsoft Serialized Certificate Store (.SST)'. At the bottom right of the dialog, there are two buttons: 'Next' (highlighted with a blue rectangular box) and 'Cancel'.

Step	Action
7	Select the location of the certificates which are available in the .node-red folder. Select cert and click Open. For example, C:/Users/SESAXXXXXX/.node-red/sslcert  The screenshot shows a Windows File Explorer window titled 'Open'. The address bar shows the path 'C:\Users\SESAXXXXXX\.node-red\sslcert'. The left sidebar shows the 'Local Disk (C:)' selected. The main pane shows a table with columns 'Name', 'Date modified', 'Type', and 'Size'. A single file named 'cert' is listed, with a date modified of '2/5/2020 5:15 AM', type of 'Security Certificate', and size of '1 KB'. The 'cert' file is selected. At the bottom, the 'File name' field contains 'cert' and the file type is set to 'X.509 Certificate (*.cer;*.crt)'. The 'Open' button is highlighted with a red box.
8	Click Next.  The screenshot shows the 'Certificate Import Wizard' window. The 'File to Import' section is active, with the instruction 'Specify the file you want to import.' Below this, the 'File name' field contains the path 'C:\Users\SESAXXXXXX\.node-red\sslcert\cert.crt'. A 'Browse...' button is next to the field. Below the field, a note states: 'Note: More than one certificate can be stored in a single file in the following formats: Personal Information Exchange- PKCS #12 (.PFX,.P12), Cryptographic Message Syntax Standard- PKCS #7 Certificates (.P7B), Microsoft Serialized Certificate Store (.SST)'. At the bottom, the 'Next' button is highlighted with a red box.

Step	Action
9	Click Next. 

Step	Action
10	Click Finish.  The screenshot shows a Windows dialog box titled 'Certificate Import Wizard'. It has a back arrow and a close button (X) in the top left. The main text says 'Completing the Certificate Import Wizard'. Below that, it says 'The certificate will be imported after you click Finish.' and 'You have specified the following settings:'. A table-like structure shows the settings: 'Certificate Store Selected by User' is 'Personal', 'Content' is 'Certificate', and 'File Name' is 'C:\Users\...\.node-red\sslcert\cert.crt'. At the bottom right, the 'Finish' button is highlighted with a red rectangle, and the 'Cancel' button is next to it.
11	Click OK.  The screenshot shows a smaller Windows dialog box titled 'Certificate Import Wizard' with a close button (X) in the top right. It contains an information icon (i) and the text 'The import was successful.' At the bottom, the 'OK' button is highlighted with a red rectangle.
12	Reload the browser, and restart your computer if required.

Step	Action
13	Copy https://127.0.0.1:1880/ and paste the link in a supported browser. Type the Username and Password in related fields and click Login. 

Step	Action
14	Secured Node-RED application is launched successfully. 

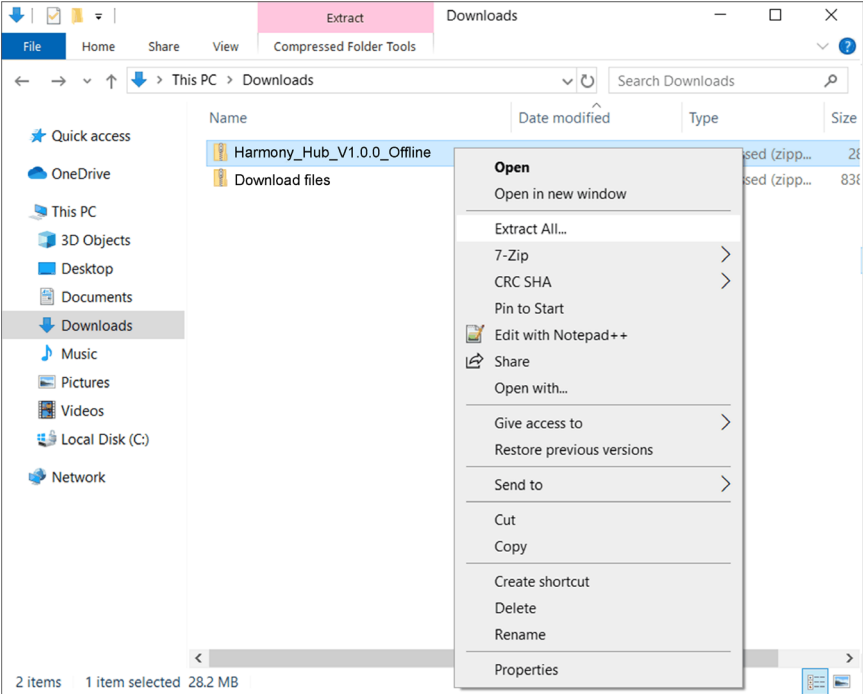
Installing SE Harmony Hub Node - Offline Installation Mode

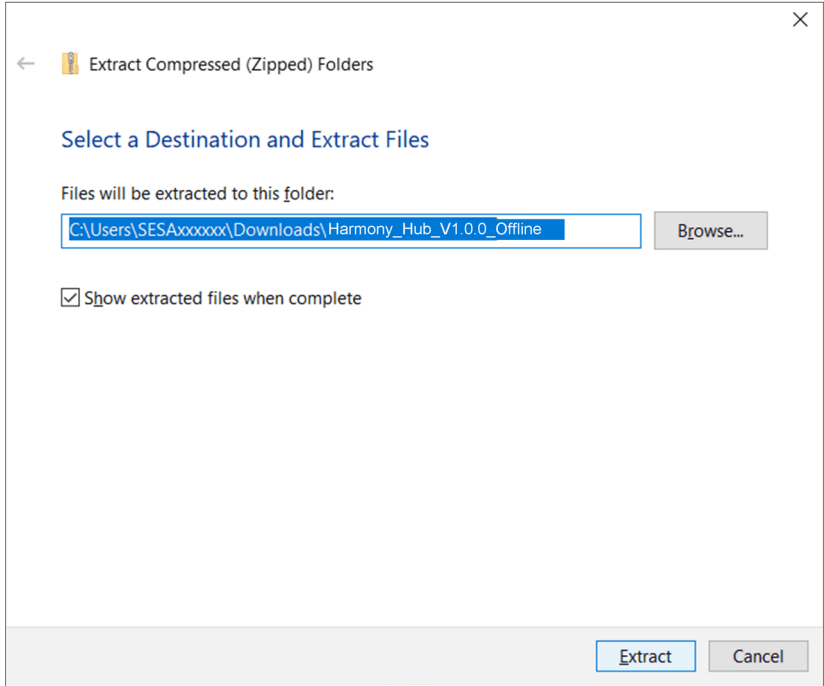
Overview

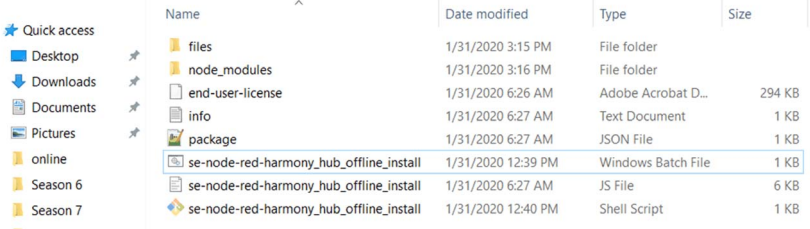
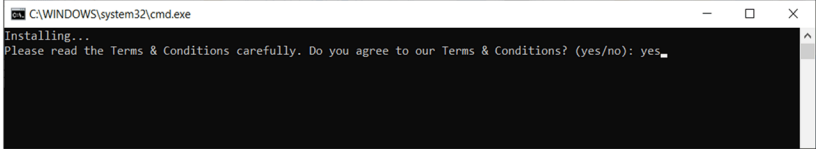
You should install the software below in your system before proceeding with the offline installation mode:

- Node.js (*see page 35*)
- Node-RED (*see page 42*)

Installing SE Harmony Hub Node

Step	Action
1	Download the <code>Harmony_Hub_V1.0.0_Offline.Zip</code> file from the link given below: https://schneider-electric.box.com/s/xsmgvjhjo4km8jwlsn8qyprgb0gy8bv6 NOTE: Make sure unzip software is available in your device, if not available, download it from the given link: https://www.7-zip.org/download.html
2	Right click the downloaded <code>Harmony_Hub_V1.0.0_Offline</code> file and select Extract All...  Result: The selected file is unzipped.

Step	Action
3	Click Extract.  The screenshot shows a Windows dialog box titled 'Extract Compressed (Zipped) Folders'. It has a back arrow icon and a close 'X' button in the top right. The main heading is 'Select a Destination and Extract Files'. Below this, it says 'Files will be extracted to this folder:' followed by a text box containing the path 'C:\Users\SESxxxxxx\Downloads\Harmony_Hub_V1.0.0_Offline' and a 'Browse...' button. There is a checked checkbox labeled 'Show extracted files when complete'. At the bottom right, there are 'Extract' and 'Cancel' buttons. Result: The selected file is unzipped.

Step	Action
4	Open <code>Harmony_Hub_V1.0.0_Offline</code> folder. Double click on the <code>se-node-red-harmony_hub_offline_install.bat</code> file for installing node.  Result: The below license document and statement appears: ● EULA (End User Licensing Agreement) document will appear in PDF format. Read it carefully and go back to command prompt window. ● Please read the Terms & Conditions carefully. Do you agree to our Terms & Conditions? (yes/no):
5	Type <code>yes</code> and press Enter to agree the terms and conditions and install SE Harmony Hub node.  Result: SE Harmony Hub node is successfully installed. NOTE: The node package is saved in the User folder (for example: <code>C:\Users\SESAXXXXXX\Harmony_Hub_V1.0.0_Offline</code>). NOTE: If you type <code>no</code>, the installation is canceled.
6	Launch SE Harmony Hub node (<i>see page 97</i>).

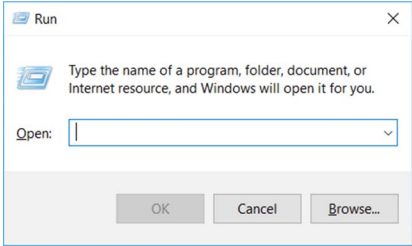
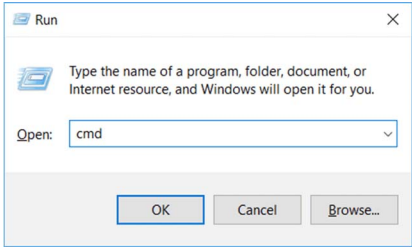
Installing SE Harmony Hub Node - Online Installation Mode

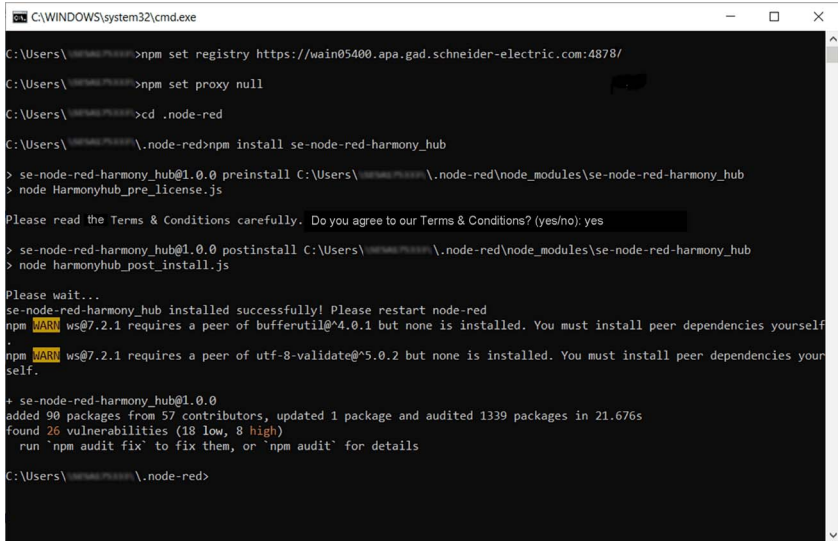
Overview

You should install the software below in your system before proceeding with the online installation mode:

- Node.js (*see page 35*)
- Node-RED (*see page 42*)
- Python v2.7.x (*see page 44*)

Installing SE Harmony Hub Node

Step	Action
1	Click  and type Run in the search bar and press Enter.  Result: Run dialog box appears.
2	Type the cmd in the Run dialog box and click OK.  Result: Command prompt window appears.
3	Type the below text in the command prompt and press Enter: <pre>npm set registry https://wain05400.apa.gad.schneider-electric.com:4878/</pre>

Step	Action
4	Type the text given below in the command prompt: <pre>npm set proxy null</pre> Note: If set proxy null command is not working, remove proxy for respective types as follows: ● npm config rm proxy ● npm config rm http-proxy ● npm config rm https-proxy
5	Press Enter .
6	Type the text given below in the command prompt: <pre>cd .node-red</pre>
7	Press Enter .
8	Type <code>npm install se-node-red-harmony_hub</code> and press Enter to install SE Harmony Hub node. Result: The below license document and statement appears: ● EULA (End User Licensing Agreement) document will appear in PDF format. Read it carefully and go back to command prompt window. ● Please read the Terms & Conditions carefully. Do you agree to our Terms & Conditions? (yes/no):
9	Type yes and press Enter to agree the terms and conditions and install SE Harmony Hub node.  Result: Installation is successfully completed. NOTE: If you type no, the installation is canceled.
10	To launch SE Harmony Hub node (see page 97), refer the node usage section.

NOTE: The online installation process sometimes does not work with in Schneider Network, due to Schneider proxy issue. If you face proxy issue, follow the offline installation process as a workaround (*see page 64*).

Section 3.2

Uninstalling SE Harmony Hub node - Windows Platform

What Is in This Section?

This section contains the following topics:

Topic	Page
Uninstalling SE Harmony Hub Node - Offline Uninstallation Mode	71
Uninstalling SE Harmony Hub Node - Online Uninstallation Mode	73

Uninstalling SE Harmony Hub Node - Offline Uninstallation Mode

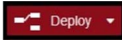
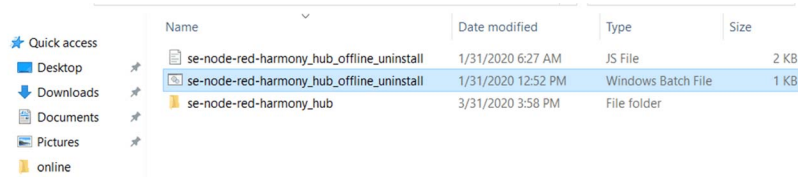
NOTICE

LOSS OF DATA

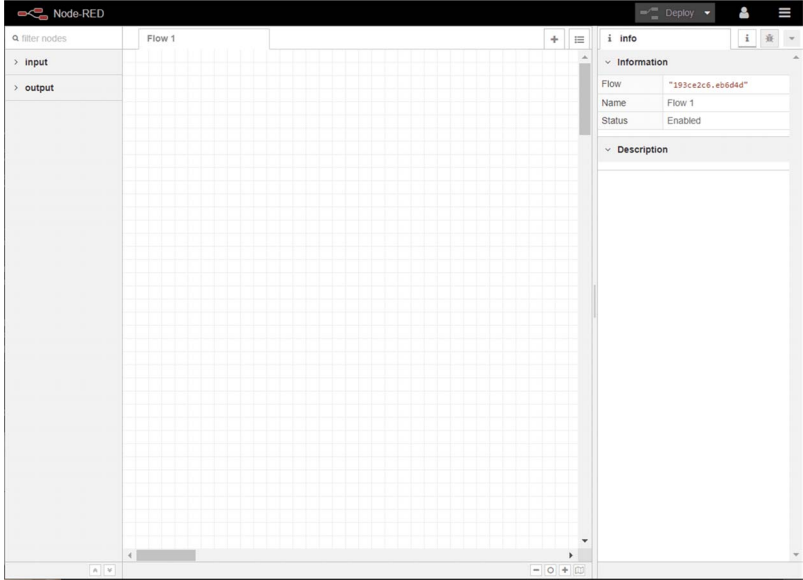
Backup the data before uninstalling SE Harmony Hub node.

Failure to follow these instructions can result in equipment damage.

This procedure explains how to uninstall SE Harmony Hub node:

Step	Action																
1	Delete SE Harmony Hub node from the flow.																
2	Click  and Logout from Node-RED application.																
3	Stop the Node-RED server running in the command prompt window.																
4	Open users folder. For example: C:\Users\SESAXXXXXX																
5	Double click se-node-red-harmony_hub_offline_uninstall.bat file to uninstall SE Harmony Hub node. <table><thead><tr><th>Name</th><th>Date modified</th><th>Type</th><th>Size</th></tr></thead><tbody><tr><td>se-node-red-harmony_hub_offline_uninstall</td><td>1/31/2020 6:27 AM</td><td>JS File</td><td>2 KB</td></tr><tr><td>se-node-red-harmony_hub_offline_uninstall</td><td>1/31/2020 12:52 PM</td><td>Windows Batch File</td><td>1 KB</td></tr><tr><td>se-node-red-harmony_hub</td><td>3/31/2020 3:58 PM</td><td>File folder</td><td></td></tr></tbody></table>	Name	Date modified	Type	Size	se-node-red-harmony_hub_offline_uninstall	1/31/2020 6:27 AM	JS File	2 KB	se-node-red-harmony_hub_offline_uninstall	1/31/2020 12:52 PM	Windows Batch File	1 KB	se-node-red-harmony_hub	3/31/2020 3:58 PM	File folder	
Name	Date modified	Type	Size														
se-node-red-harmony_hub_offline_uninstall	1/31/2020 6:27 AM	JS File	2 KB														
se-node-red-harmony_hub_offline_uninstall	1/31/2020 12:52 PM	Windows Batch File	1 KB														
se-node-red-harmony_hub	3/31/2020 3:58 PM	File folder															

Result: SE Harmony Hub node is uninstalled.

Step	Action
6	To restart Node-RED server, follow the steps: 1. Type <code>node-red</code> in the command prompt and press Enter. Result: Node-RED server starts. 2. Copy the IP address (https://127.0.0.1:1880/) in which the Node-RED server is running. 3. Open a browser. 4. Paste the IP address in the URL field in the browser and press Enter. 5. Type the Username and Password in related fields and click login. Result: Node-RED factory window reappears. 

Uninstalling SE Harmony Hub Node - Online Uninstallation Mode

NOTE: You can uninstall SE Harmony Hub node using the command prompt.

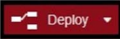
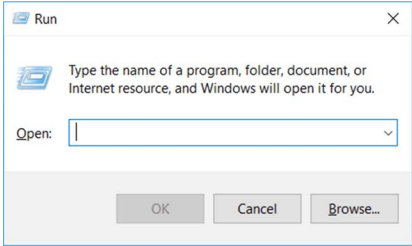
NOTICE

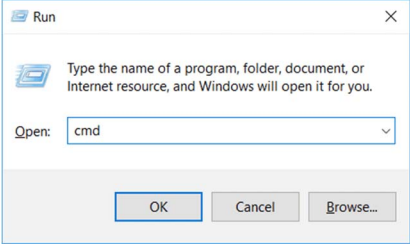
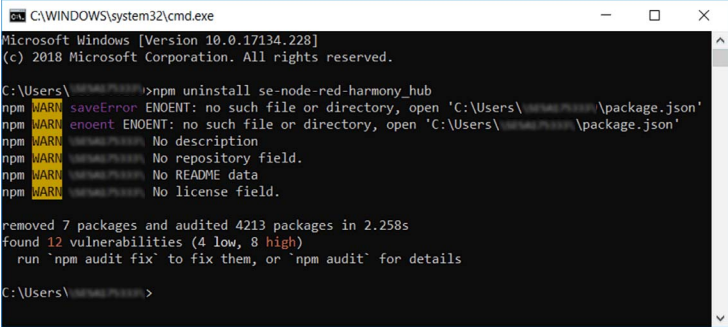
LOSS OF DATA

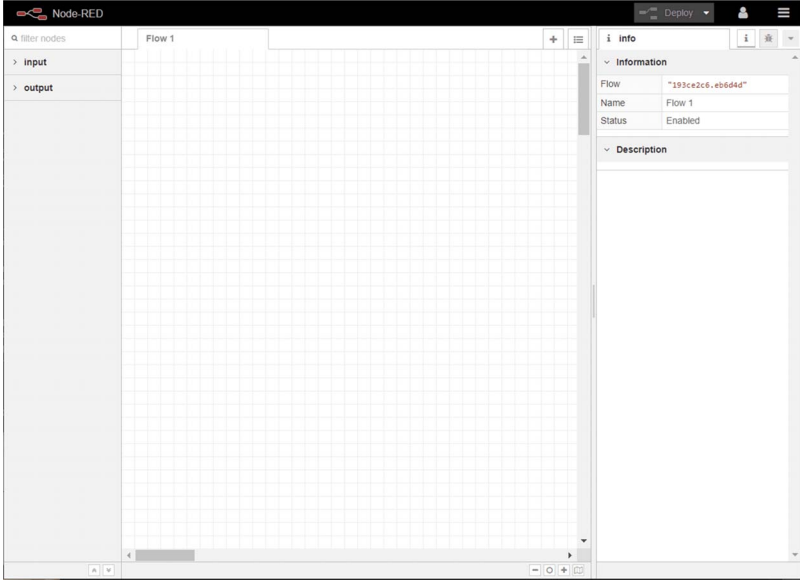
Backup the data before uninstalling SE Harmony Hub node.

Failure to follow these instructions can result in equipment damage.

This procedure explains how to uninstall SE Harmony Hub node:

Step	Action
1	Delete SE Harmony Hub node from the flow.
2	Click  and Logout from Node-RED application.
3	Stop Node-RED server running in the command prompt window.
4	Click  and type Run in the search bar and press Enter.  Result: Run dialog box appears.

Step	Action
5	Type cmd in the Run dialog box and click OK.  Result: Command prompt window appears.
6	Type cd .node-red and press Enter.
7	Type npm uninstall se-node-red-harmony_hub.
8	Press Enter.  Result: SE Harmony Hub node is uninstalled.

Step	Action
9	To restart Node-RED server, follow the steps: 1. Type <code>node-red</code> in the command prompt and press Enter. Result: Node-RED server starts. 2. Copy the IP address (https://127.0.0.1:1880/) in which the Node-RED server is running. 3. Open a browser. 4. Paste the IP address in the URL field in the browser and press Enter. 5. Type the Username and Password in related fields and click login. Result: Node-RED factory window reappears.  The screenshot shows the Node-RED web interface in a browser. The main workspace is titled 'Flow 1' and contains a grid. On the left, there is a 'filter nodes' search bar and two expandable lists: 'input' and 'output'. On the right, the 'Info' sidebar is open, displaying details for the current flow. The 'Information' section shows: Flow: '193ce2c6-eb6d8d', Name: 'Flow 1', and Status: 'Enabled'. The 'Description' section is currently empty.

Chapter 4

Installation and uninstallation of SE Harmony Hub Node - Linux Platform

NOTE: Linux version of SE Harmony Hub node will be supported in the future updates.

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

Hardware requirements for Linux - Linaro - V1.00.010

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

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
4.1	Installing SE Harmony Hub Node – Linux Platform	78
4.2	Uninstalling SE Harmony Hub Node - Linux Platform	85

Section 4.1

Installing SE Harmony Hub Node – Linux Platform

What Is in This Section?

This section contains the following topics:

Topic	Page
Installing SE Harmony Hub Node – Offline Installation Mode	79
Installing SE Harmony Hub Node - Online Installation Mode	82

Installing SE Harmony Hub Node – Offline Installation Mode

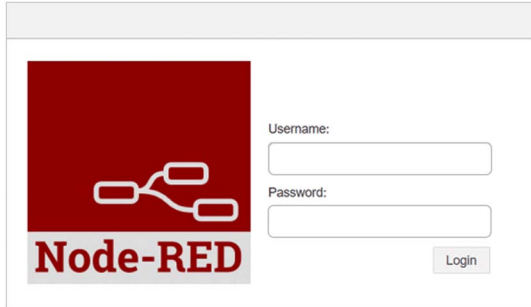
The Linux based Edge Boxes (for example, HMIBSC) have in-built Node-RED-as-a-Service. This provides Node.js, Node-RED and python are pre-installed in the OS image.

The SE Harmony Hub node is 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 Harmony_Hub_V1.0.0_Offline.Zip file from the link given below: https://schneider-electric.box.com/s/xsmqvihjo4km8jwlsn8qyprqb0gy8bv6
2	Extract the downloaded file Harmony_Hub_V1.0.0_Offline.Zip and transfer the extracted folder (Harmony_Hub_V1.0.0_Offline) into a portable disk. Example: Pendrive.
3	Connect the potable 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 Harmony_Hub_V1.0.0_Offline</code> and press Enter to go to the directory where the offline files for SE Harmony Hub node are placed.
5	Type <code>sh se-node-red-harmony_hub_offline_install.sh</code> and press Enter to install the SE Harmony Hub node. Result: Please read the Terms & Conditions carefully! press any key to continue... statement appears.
6	Press any key to read the Terms & Conditions. <pre> root@hmibsc:~/mount/sda1/Harmony_Hub_V1.0.0_Offline se-node-red-harmony_hub_offline_install.sh root@hmibsc:~/mount/sda1/Harmony_Hub# sh se-node-red-harmony_hub_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):.
7	Read the entire license document and press any key to continue... at the end of each page. Result: Do you agree to our Terms & Conditions? (yes/no):.

Step	Action
8	Type yes and press Enter to agree the terms and conditions and install SE Harmony Hub node. 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-harmony_hub files Running: cd /home/root/se-node-red-harmony_hub && npm link Done: cd /home/root/se-node-red-harmony_hub && npm link se-node-red-harmony_hub installed successfully! Please restart node-red root@hmibsc:~/mount/sda1/Harmony_Hub_V1.0.0_Offline Result: se-node-red-harmony_hub installed successfully. Please restart node-red by rebooting Magelis HMIBSC Edge box. NOTE: If you type no, the installation is canceled.

Step	Action
9	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).  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.

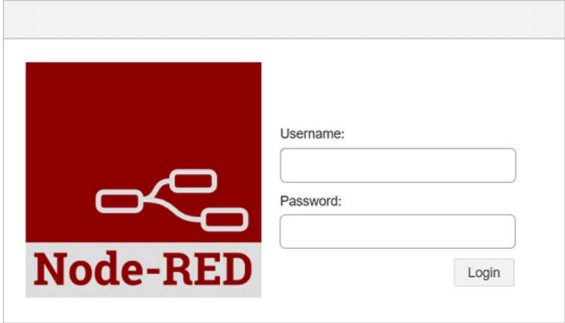
Installing SE Harmony Hub Node - Online Installation Mode

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 Harmony Hub node follow the steps given below:

Step	Action
1	Type the text given below in the terminal and press Enter : <code>npm set registry https://wain05400.apa.gad.schneider-electric.com:4878/</code>
2	Type the text given below in the terminal and press Enter : <code>npm set proxy null</code> 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-harmony_hub</code> and press Enter . NOTE: Press any key to continue until the result appears. Result: <code>Do you agree to our Terms & Conditions? (yes/no):.</code>

Step	Action
4	Type yes and press Enter to agree the terms and conditions and install SE Harmony Hub node. 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.

Section 4.2

Uninstalling SE Harmony Hub Node - Linux Platform

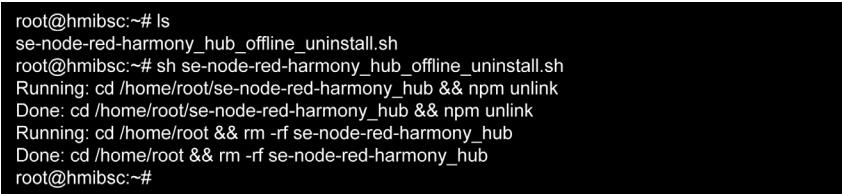
What Is in This Section?

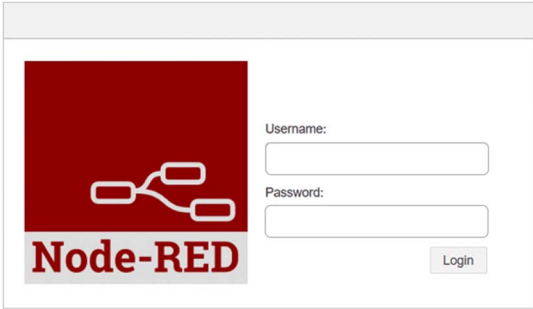
This section contains the following topics:

Topic	Page
Uninstalling SE Harmony Hub Node - Offline Uninstallation Mode	86
Uninstalling SE Harmony Hub Node - Online Uninstallation Mode	88

Uninstalling SE Harmony Hub Node - Offline Uninstallation Mode

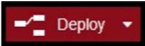
The below procedure is applicable for the Edge Boxes running on Linux Yocto (for example, HMIBSC):

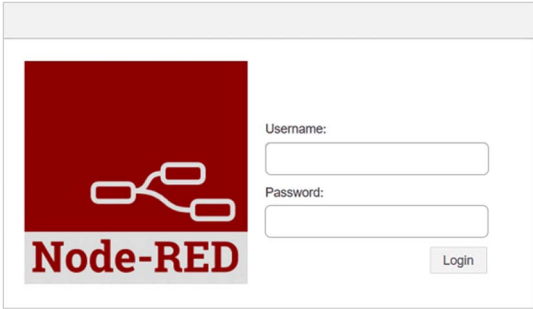
Step	Action
1	Type <code>ls</code> and press Enter . Result: Installed nodes appears.
2	Type <code>sh se-node-red-harmony_hub_offline_uninstall.sh</code> and press Enter to uninstall the SE Harmony Hub node.  <pre>root@hmibsc:~# ls se-node-red-harmony_hub_offline_uninstall.sh root@hmibsc:~# sh se-node-red-harmony_hub_offline_uninstall.sh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

Step	Action
3	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).  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 Harmony Hub Node - Online Uninstallation Mode

This procedure explains how to uninstall the SE Harmony Hub node:

Step	Action
1	From the browser where Node-RED server is running, delete the SE Harmony Hub 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-harmony_hub</code> .
5	Press Enter to uninstall the SE Harmony Hub node. Result: SE Harmony Hub node is 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).  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

Node Usage

What Is in This Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
5	About SE Harmony Hub Node	93
6	SE Harmony Hub Node Configuration	101
7	Context Monitoring Use Case	115

Chapter 5

About SE Harmony Hub Node

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Introduction	94
Launching the Node-RED Server and SE Harmony Hub Node	97

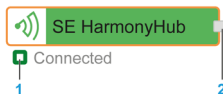
Introduction

Overview

SE Harmony Hub node is a data collecting node using Modbus communication protocol (TCP or Serial). SE Harmony Hub node is connected to the Harmony Hub gateway which retrieves sensors data which are commissioned and connected wirelessly to the gateway. SE Harmony Hub Node extracts the sensors data from the gateway and displays it on the web page to monitor the latest data at the specified time intervals. The data from sensors will be in Common Message Structure (CMS) format (*see page 120*).

Node Description

SE Harmony Hub node consists of one node that reads from the connected devices:



Item number	Item name	Description
1	Connection status	Indicates the following connection status: ● Connecting: Node is connecting to the Harmony Hub gateway. ● Connected: Node is connected to the gateway. ● Success: Data is read from the gateway successfully. ● Error: Indicates when the node detects an error. ● ConfigError: Parameters are not configured properly. ● Read Error: Error in reading data from gateway.
2	Output	Generated CMS is passed as an output.

Types of Sensors and respective parameters

You can use the sensors and the respective parameters below to connect to the node:

- E3 sensor (Electrical Energy Estimator)
 - RSSI
 - Sensor Type
 - Timeout
 - Timestamp
 - Temperature
 - Current
 - Apparent Power
 - Active Power
 - Apparent Energy

- Corrected Apparent Energy
- Active Energy
- CL110 sensor (thermal monitoring)
 - RSSI
 - Sensor Type
 - Timeout
 - Timestamp
 - Battery
- ESST01 sensor (Radio probes sensors - thermal monitoring)
 - RSSI
 - Sensor Type
 - Timeout
 - Timestamp
 - Battery
 - Temperature
- S1 sensor (generic ZigBee Green Power sensor)
 - RSSI
 - Sensor Type
 - Timeout
 - Timestamp
 - Battery
 - Temperature
 - Energy
 - Unit of Measure
 - Power Phase A
 - Power Phase B
 - Power Phase C
 - Current Phase A
 - Current Phase B
 - Current Phase C
 - Voltage Phase A
 - Voltage Phase B
 - Voltage Phase C
 - CO2 Level
 - CO Level
 - Illuminance
 - Pressure
 - Flow
 - Humidity
 - Occupancy
 - State

RSSI (Received Signal Strength Indicator)

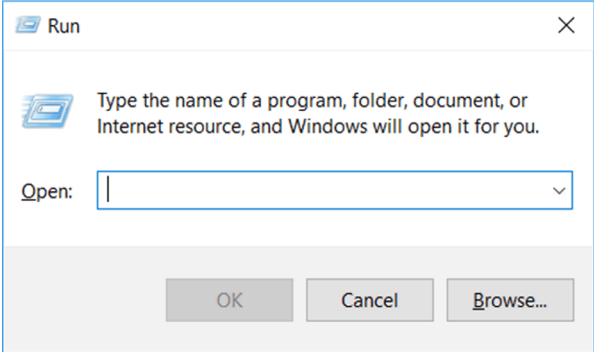
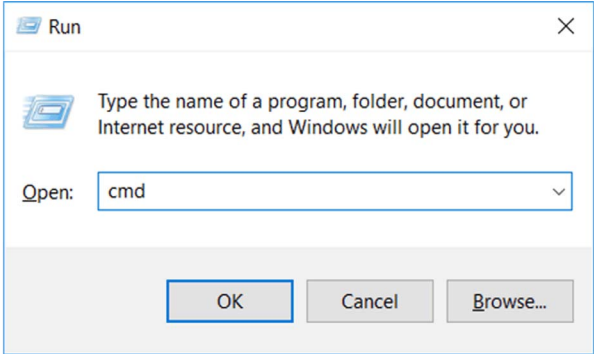
The **RSSI** signals strength are given below:

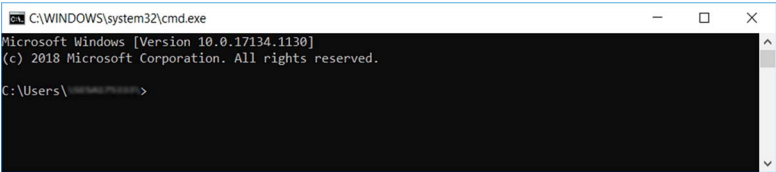
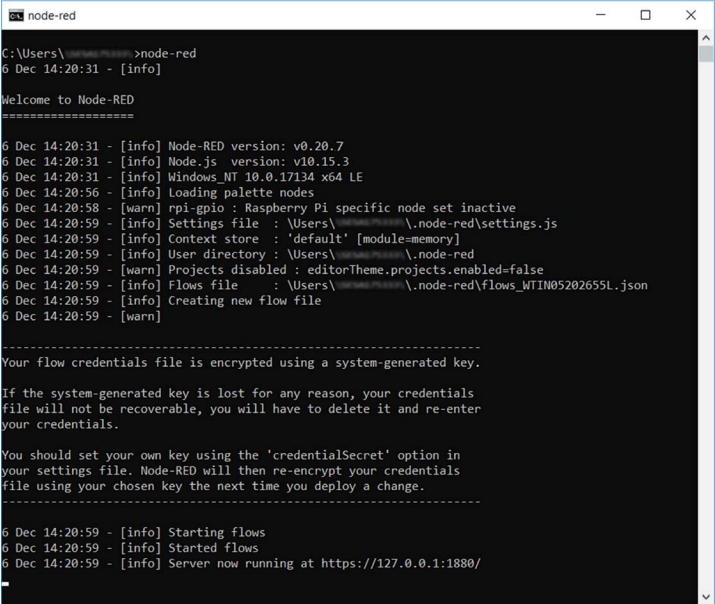
- **High:** If the **RSSI** signal strength is between -10...-70 dbm then signal is high and the signal strength indicate 4 green bars.
- **Medium:** If the **RSSI** signal strength is between -70...-80 dbm then signal is medium and the signal strength indicate 3 orange bars.
- **Low:** If the **RSSI** signal is between -80...-100 dbm then the signal is slow and the signal strength indicate 1 red bars.

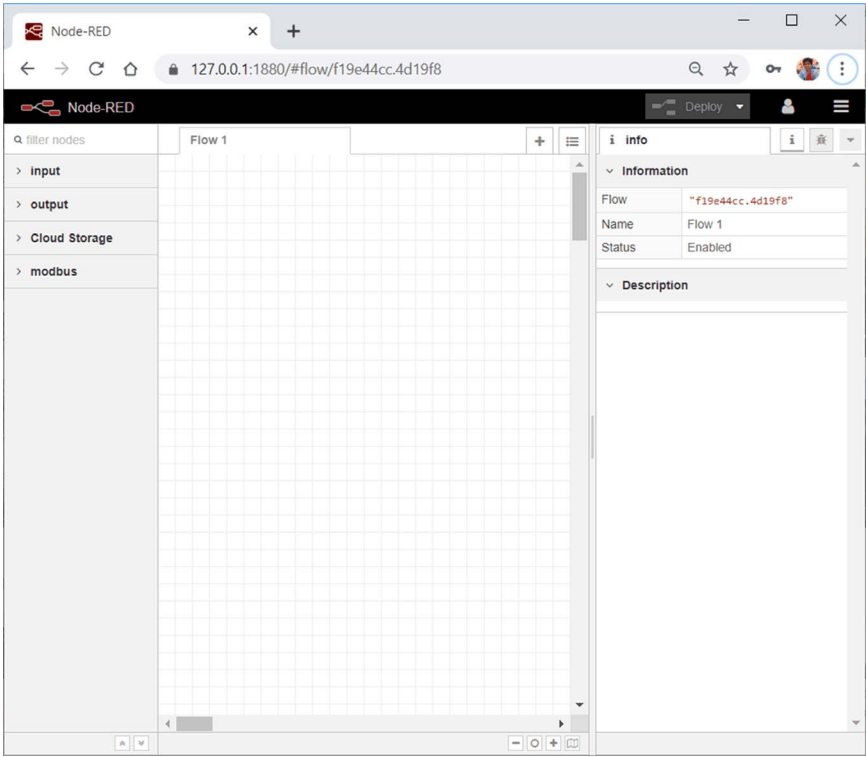
Launching the Node-RED Server and SE Harmony Hub Node

Node-RED

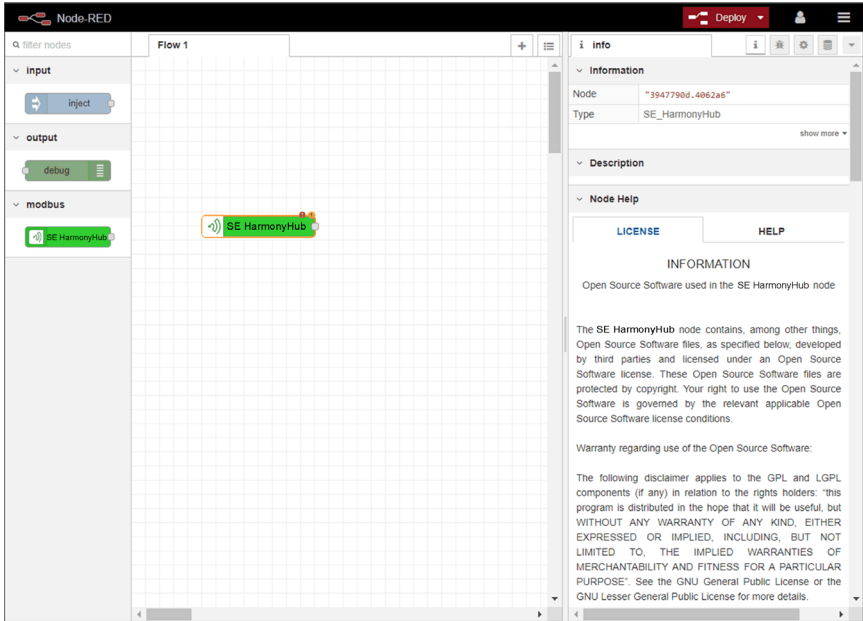
After the Node-RED and SE Harmony Hub node are installed, launch the Node-RED server.

Step	Action
1	Click  button, type Run in the search bar and press Enter 
2	Type the <code>cmd</code> in the Run dialog box and click OK.  Result: Command prompt window appears.

Step	Action
3	Type <code>node-red</code> in the command prompt and press Enter.  A screenshot of a Windows command prompt window. The title bar reads 'C:\WINDOWS\system32\cmd.exe'. The window content shows the Microsoft Windows logo, version information (Version 10.0.17134.1130), and copyright notice (© 2018 Microsoft Corporation). The current directory is 'C:\Users\user>'. The prompt is waiting for input.
4	Node-RED server now running at https://127.0.0.1:1880/  A screenshot of a terminal window titled 'node-red'. It shows the command 'node-red' being executed in a Windows command prompt. The output includes a welcome message, version information (Node-RED v0.20.7, Node.js v10.15.3), and various system messages about settings, context store, user directory, projects, flows file, and creating a new flow file. It also displays a warning about the flow credentials file being encrypted with a system-generated key. Finally, it shows the server starting and running at 'https://127.0.0.1:1880/'.

Step	Action
5	Copy the URL in which the Node-RED server is running (https://127.0.0.1:1880/) and open the link in a supported browser. Type the Username and Password in related fields and click Login. 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. Result: Node-RED factory window appears.
6	A screenshot of the Node-RED web editor in a browser. The browser's address bar shows '127.0.0.1:1880/#flow/f19e44cc.4d19f8'. The interface includes a left sidebar with a 'filter nodes' search bar and categories like 'Input', 'output', 'Cloud Storage', and 'modbus'. The main workspace is a grid labeled 'Flow 1'. On the right, an 'info' panel shows details for the current flow, including its ID 'f19e44cc.4d19f8', name 'Flow 1', and status 'Enabled'. Result: Node-RED editor appears.

SE Harmony Hub Node

Step	Action
1	In the Node-RED window, use the scroll bar to find the SE Harmony Hub node on the left side. NOTE: Alternatively, you can also search from the Filter Nodes search option available at the left side node palette area.  Result: In modbus category, the SE Harmony Hub node is available. NOTE: SE Harmony Hub 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 the SE Harmony Hub node on a flow page.

Chapter 6

SE Harmony Hub Node Configuration

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Configuring SE Harmony Hub node	102
Launching SE Harmony Hub Node Web Page	108

Configuring SE Harmony Hub node

Double-click on the SE Harmony Hub node. The configuration screen of the node appears:

Edit SEHarmonyHub node

Delete

Cancel

Done

⚙ Properties

⚙

📄

🖨

Schneider Electric

📁 Name

Name

🌐 Server

HarmonyHub

▼

✎

🔍 Logging

Enable

▼

🔍 Level

Alerts Only

▼

Harmony Hub Web

Note: Use Upload/Download feature to retain channel names BEFORE -
1.Deleting the node which may result in loss of channel names
2.Operating the node in a new system with the same gateway

📄 Download
Sensor Names

Download File

📄 Upload
Sensor Names

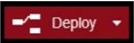
Browse ...

No file selected!

Parameters	Description
Name	Type the name to be displayed on the node.
Server	Click  icon to configure the parameters of the selected server type. For TCP and Serial, refer to the below tables. NOTE: Do not use the same Gateway (server configuration) for multiple nodes.

102

EIO0000004103 04/2020

Parameters	Description
Logging	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-harmony_hub/nodes/log/ ● Online installation ○ <User Directory>/node-red/node_modules/se-node-red-harmony_hub/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.
Harmony Hub Web	Click Done and Deploy  to save the changes. NOTE: Once configure settings are saved Harmony Hub Web will be enabled. Click Harmony Hub Web to navigate to the web page to commission the channels and to get the data from Zigbee sensors.
Download Sensor Names	Click Download File to download the data of sensor paired to the Harmony Hub gateway. NOTE: The channel names cannot be changed in downloaded file as the data is encrypted.
Upload Sensor Names	Click Browse... and select the respective file to be uploaded and the data appears in the Harmony Hub Web page. The file contains channel names of the sensors which are paired. NOTE: Whenever we upload a file, all the channel names will be replaced by the corresponding names in the uploaded file.

Server type: **TCP** properties

Edit SEHarmonyHub node > Edit SEHarmonyHub-Client node

Delete Cancel Update

Properties

Schneider Electric

Name HarmonyHub

Type TCP

Unit ID 248

Host 127.0.0.1

Port 502

TCP Type DEFAULT

Timeout (ms) 1000

Reconnect-Timeout (ms) 2000

Queue delay (ms) 100

Server configuration for **TCP** connection:

Parameters	Description
Unit ID	Type the slave address of the Serial (TCP: 248 non editable) device.
Host	Type the slave address.
Port	Type the port number.
TCP Type	Select the TCP Type from the drop-down list: ● Default ● RTU-BUFFERD
Timeout	Set the timeout for ModbusRTU command. By default, the time duration for connecting is 1000 ms.
Reconnect timeout	Set the reconnect time out for reconnecting the node. By default, the reconnect time is 2000 ms.
Queue delay (ms)	Set the time interval to delay sending the commands from queue. By default, the queue delay is 100 ms.

Server type: **Serial** Properties

Edit SEHarmonyHub node > Edit SEHarmonyHub-Client node

Delete
Cancel
Update

Properties

Schneider Electric

Name
HarmonyHub

Type
Serial

Unit ID
248

Serial port
/dev/ttyUSB

Serial type
RTU

Baud rate
19200

Data Bits
8

Stop Bits
1

Parity
None

Connection delay (ms)
100

Timeout (ms)
1000

Reconnect-Timeout (ms)
2000

Queue delay (ms)
100

Server configuration for **Serial** connection:

Parameters	Description
Serial Port	Click Search button /dev/ttyUSB)

Parameters	Description
Serial Type	Select the required option from the drop-down list: ● RTU ● RTU-BUFFERD
Baud rate	Select the suitable option from the drop-down list: ● 115200 ● 57600 ● 38400 ● 19200 ● 9600 ● 4800 ● 2400 ● 1200 ● 300 ● 110 ● 75 NOTE: Based on the rate selected, the information is transferred in a communication channel.
Data Bits	Select the suitable option from the drop-down list: ● 8 ● 7 ● 6 ● 5 NOTE: Based on the bit selected, the information is transferred in a communication channel.
Stop Bits	Select the suitable option from the drop-down list: ● 1 ● 1.5 ● 2
Parity	Select the suitable parity bit from the drop-down list: ● None ● Even ● Mark ● Odd ● Space
Connection delay (ms)	Type the delay time for sending data after reconnection. By default, the value is 100 ms.
Timeout (ms)	Set the timeout for ModbusRTU command. By default, the delay time is 1000 ms.
Reconnect-Timeout (ms)	Set the reconnect time out for reconnecting the node. By default, the reconnect time is 2000 ms.

Parameters	Description
Queue delay (ms)	Set the time interval to delay sending the commands from queue. By default, the queue delay is 100 ms.

Launching SE Harmony Hub Node Web Page

Click **Harmony Hub Web** to navigate to the web page, when it is enabled (tab colour turns green).

Edit SEHarmonyHub node

Delete

Cancel

Done

Properties

Schneider Electric

Name

Name

Server

HarmonyHub

Note: Do not use the same Gateway (server configuration) for multiple nodes

Logging

Enable

Level

Alerts Only

Harmony Hub Web

Note: Use Upload/Download feature to retain channel names BEFORE -
1.Deleting the node which may result in loss of channel names
2.Operating the node in a new system with the same gateway

Download

Sensor Names

Download File

Upload

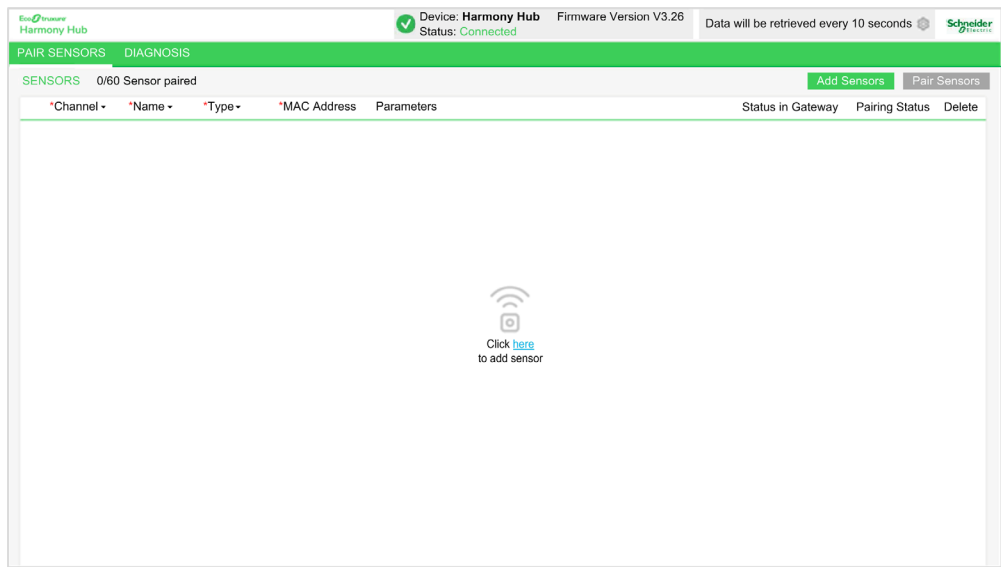
Sensor Names

Browse ...

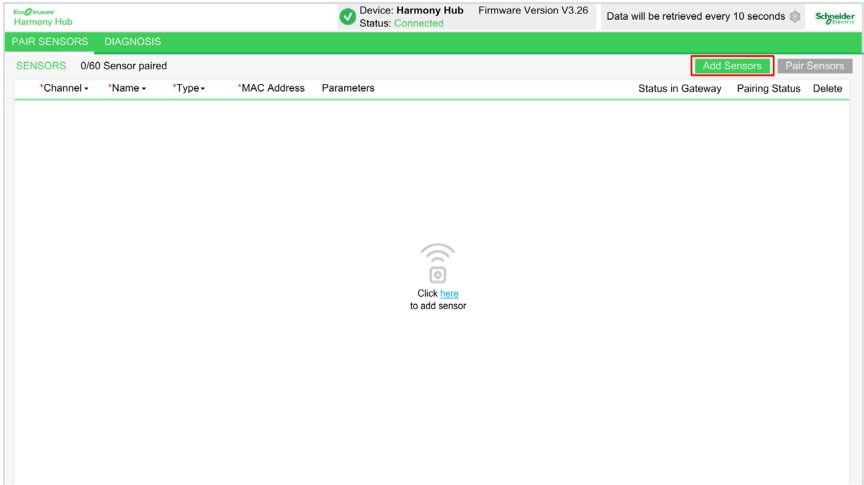
No file selected!

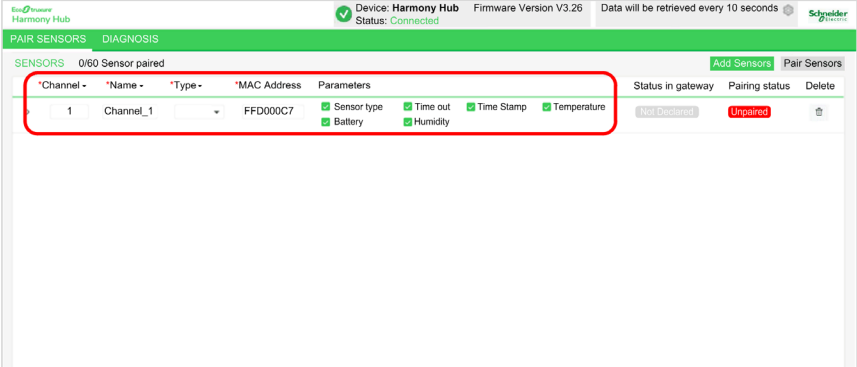
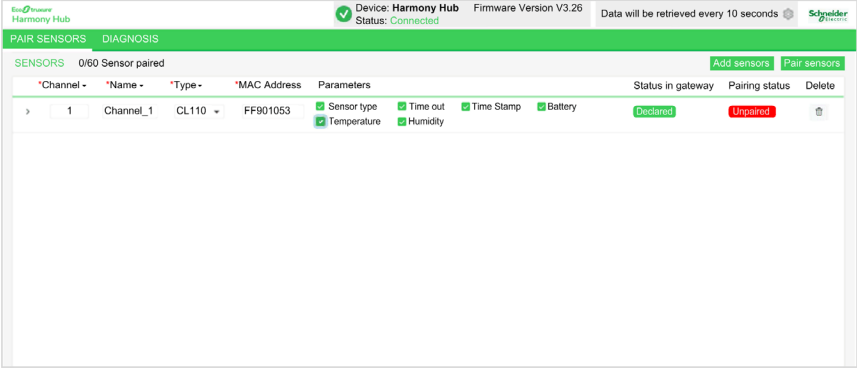
The **SE Harmony Hub Node** web page appears where you can add and pair the sensors to be monitored. You can monitor maximum 60 sensors at a time. Make sure that the sensor is not paired to any other device.

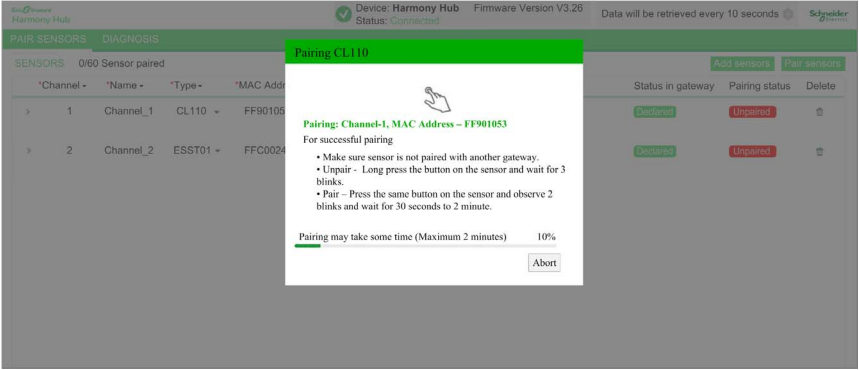
The following figure shows **SE Harmony Hub Node** web page:

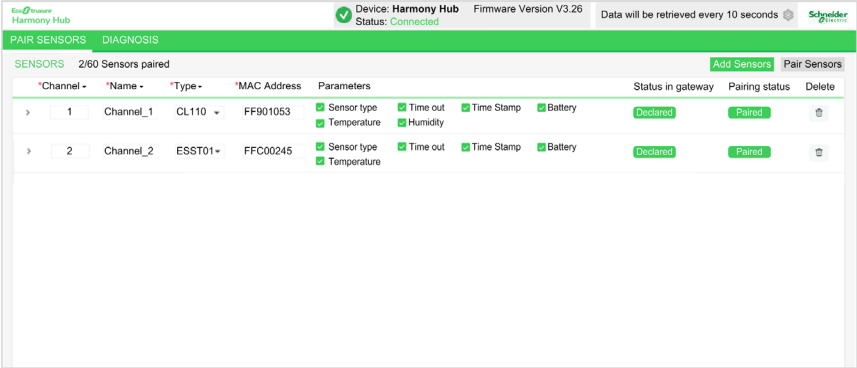


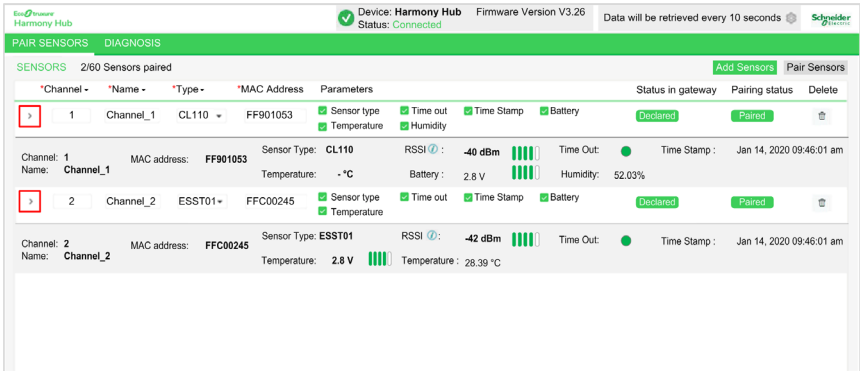
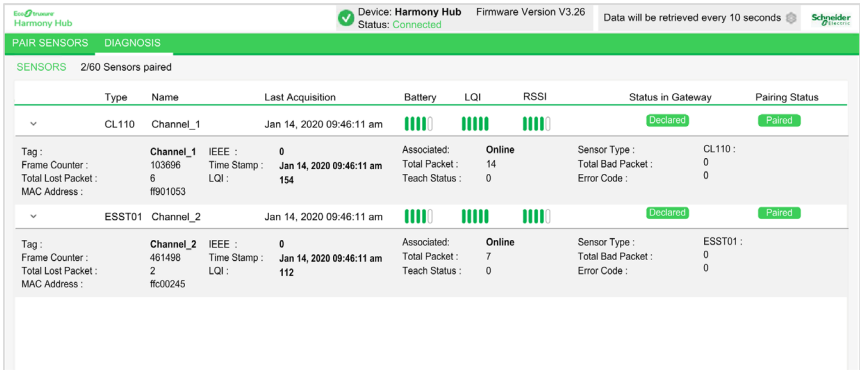
The table shows procedure to pair the sensors (CL110 and ESST01) in Harmony Hub gateway:

Step	Action
1	Click Add Sensors. 

Step	Action
2	Declare the sensors in the required fields: ● Channel ● Name ● Type ● MAC Address ● Select the parameters NOTE: To declare the sensor, you have to select atleast one parameter. 
3	Check if the Status in gateway is changed to Declared. 
4	You can add multiple sensors by clicking Add Sensors.

Step	Action
5	Click Pair sensors. The screenshot shows the 'PAIR SENSORS' tab in the SE Harmony Hub interface. A modal window titled 'Pairing CL110' is open, displaying instructions for successful pairing: 'Make sure sensor is not paired with another gateway.', 'Unpair - Long press the button on the sensor and wait for 3 blinks.', and 'Pair - Press the same button on the sensor and observe 2 blinks and wait for 30 seconds to 2 minute.' A progress bar at the bottom indicates 'Pairing may take some time (Maximum 2 minutes)' and is currently at 10%. An 'Abort' button is visible at the bottom right of the modal. In the background, a table lists sensors with columns for Channel, Name, Type, and MAC Address. Two sensors are listed: Channel 1 (Channel_1, CL110, FF90105) and Channel 2 (Channel_2, ESST01, FFC0024). NOTE: The sensor takes maximum 120 seconds to connect to the SE Harmony Hub node. You can pair maximum 60 sensors at a time. NOTE: While pairing single sensor, you can not abort the process. For multiple sensors, if you want to abort, the pairing for the on-going sensor is completed and the process stops.

Step	Action
6	To pair CL110 and ESST01 sensors to Harmony Hub gateway, follow the step given below: ● Press the highlighted button till three LED flashes to reset the sensor. ● Press highlighted button till two LED flashes to start pairing process. ● Within 120 seconds, the sensor will be paired to the gateway.  CL110  ESST01 Result: Pairing status is changed to Paired. NOTE: To pair other sensors (Power tag, E-cube) you need not wait for LED blinks.
7	The data for the selected sensor parameters are received from the gateway and the data is converted to Common Message Structure (CMS) format (see page 120). 

Step	Action
8	Expand highlighted option to monitor the selected parameters.  Result: Once the sensor is paired, all parameters are displayed.
9	Click DIAGNOSIS tab to diagnose the paired sensors. For example: 

Chapter 7

Context Monitoring Use Case

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Context Monitoring	116
SE Harmony Hub Node Usage	118
Common Message Structure (CMS)	120

Context Monitoring

Overview

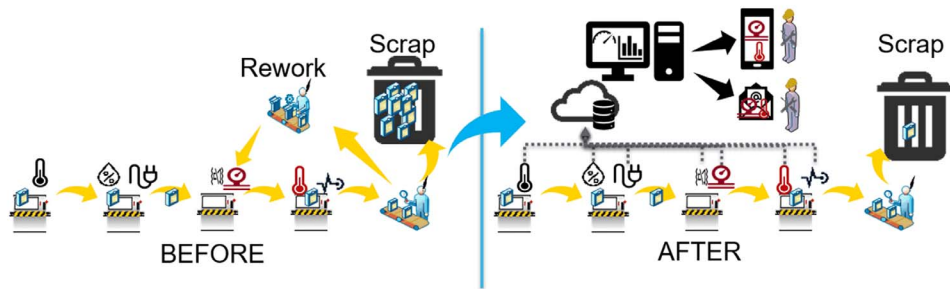
Imagine a production line in a plant with several devices that are subjected to drift. Such device drifts include scraps and rework. This means waste of time, waste of money and sometimes loss of consumers if they are not delivered on time and at a good quality standard.

Our value proposition is to provide a solution for monitoring process parameters from upstream to downstream. To do so, the solution proposed is as follows:

- Collects secondary sensing process parameters (wireless Zigbee sensors), hence the use of the SE Harmony Hub node.
- Use alert system to prevent quality issues based on supplier specifications or people experience.

SE Aveva Insight node collects data in CMS format ([see page 120](#)) from collection node (SE Harmony Hub), converts it into SE Aveva Insight data format and pushes the data to the Aveva Insight cloud. Enable the **SET ALERT** function in Aveva Insight cloud to receive the data in specific time intervals.

The following figure shows the context monitoring use case with before/after situation:



Context Monitoring Use Case

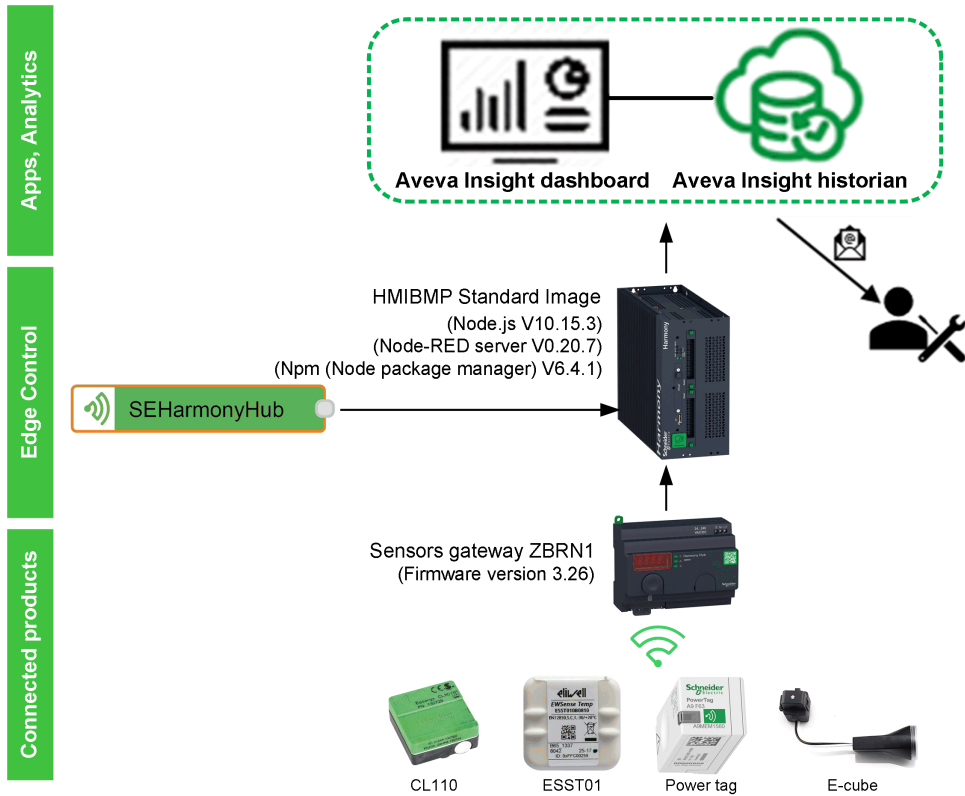
The pain is reduced by using a collection node (SE Harmony Hub) and a publishing node (SE Aveva Insight).

Below given are the steps performed by Engineers:

- **Automation Engineer:**
 - installs node.
 - installs sensors on the machine to be monitored and pair them to Harmony Hub gateway.
 - creates data flow.
- **Maintenance Engineer:**
 - creates an account in AVEVA Insight.
 - creates dashboard in AVEVA Insight.

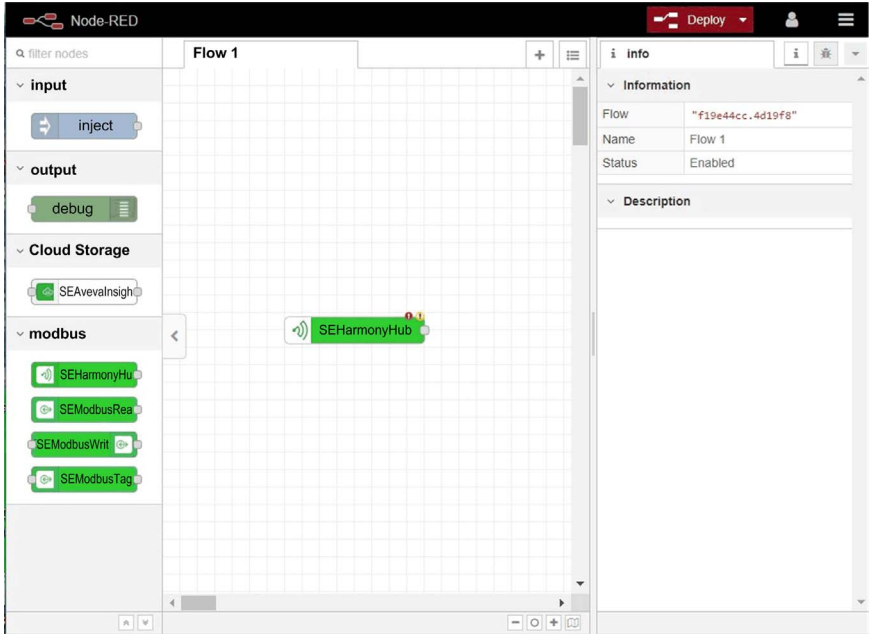
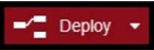
- logs in AVEVA Insight and configures the threshold for the collected variables.
- activate alerts triggering.

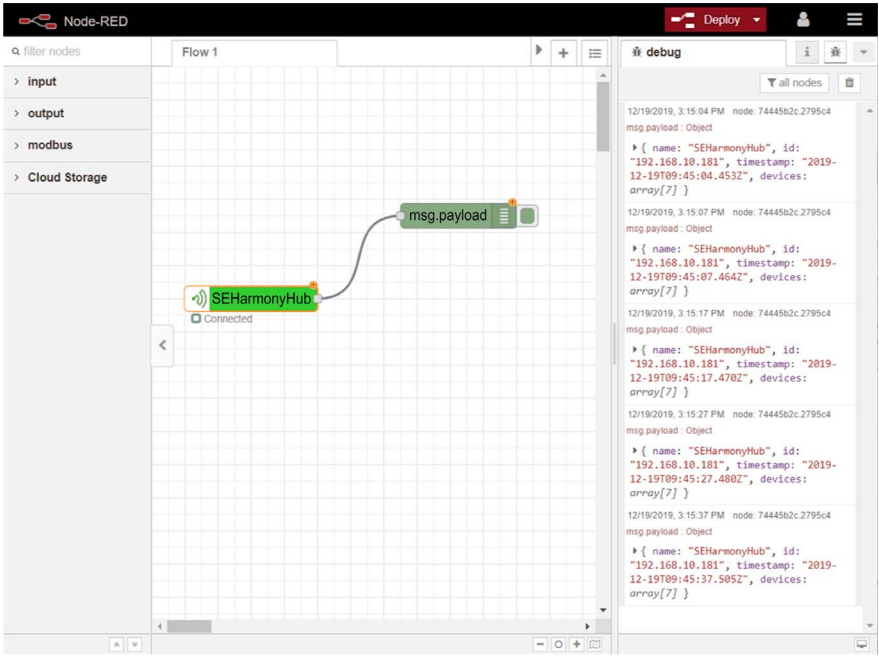
The following figure shows an architecture of context monitoring use case:



SE Harmony Hub Node Usage

The procedure for SE Harmony Hub node usage is given below:

Step	Action
1	Launch the Node-RED server and SE Harmony Hub node (<i>see page 97</i>).
2	Drag and drop the SE Harmony Hub node on the flow as shown below: 
3	Double-click SE Harmony Hub node. Result: Edit SEHarmonyHub node opens.
4	Configure SE Harmony Hub node (<i>see page 102</i>) and click Harmony Hub Web. Result: Harmony Hub Web landing page appears in new tab.
5	Launch the Harmony Hub Web page (<i>see page 97</i>).
6	Click Done and Deploy  to save the changes. Result: The nodes status changes to Connected.
7	Once the sensors are paired in Harmony Hub Web page, the node output data is available in Common Message Structure (CMS) format (<i>see page 120</i>) which is pushed to publishing node.

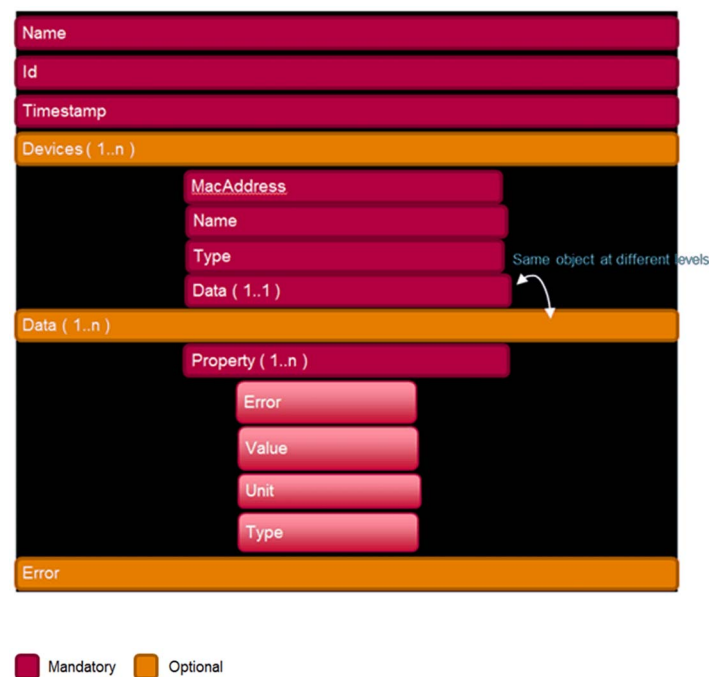
Step	Action
8	Below is an example to push the data of SE Harmony Hub node to the debug node.  The screenshot shows the Node-RED web interface. On the left, the 'input' category is selected in the palette. The main workspace contains a flow with two nodes: 'SEHarmonyHub' (a green node with a speaker icon) and 'msg.payload' (a green node with a document icon). They are connected by a wire. The 'SEHarmonyHub' node has a 'Connected' status indicator. On the right, the 'debug' console is open, showing a list of messages. Each message is an object with the following structure: { name: 'SEHarmonyHub', id: '192.168.10.181', timestamp: '2019-12-19T09:45:04.453Z', devices: array[7] }. The messages are timestamped with the date and time of the capture.

Common Message Structure (CMS)

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

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

The following is the CMS structure:

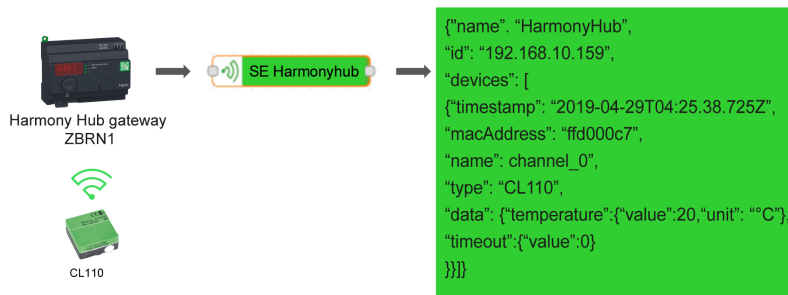


Field	Description
Name	Name of the node.
Id	Unique Identifier of the device.
Timestamp	The exact time at which the read or write operation is performed by the node.
Devices	Applicable for Harmony Hub sensor. All nested objects consists of one or many Device objects.

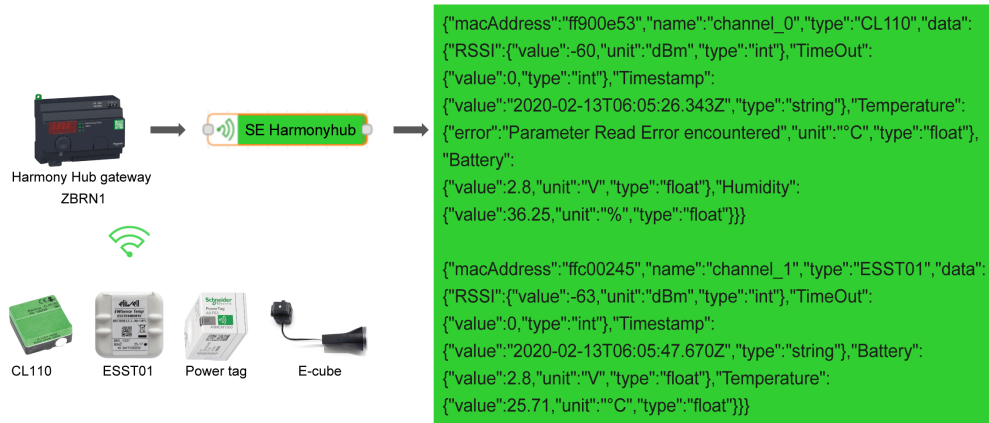
Field	Description
Data	Object at root level and as a composite inside devices object. It contains at least one property object.
Error	Detected error at the root level, not tied to any parameter. ● Scenario 1: Gateway disconnected. ● Scenario 2: Gateway timed out. ● Scenario 3: Modbus port not opened. ● Scenario 4: Gateway connected. Read Error encountered.
Property	If data object exists, then atleast one property (value) is mandatory. This is mapped to the parameter details. It contains Error, Value, Unit, Type.
Error	Local detected 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 input data:

Example 1: One gateway (**associated with one sensor**) is connected directly through SE Harmony Hub node.



Example 2: One gateway (**associated with multiple sensors**) is connected directly through SE Harmony Hub node.



NOTE: Here we have shown SE Harmony Hub node output for two sensors only. Output may vary if you use multiple sensors paired to Harmony Hub gateway.

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 (*see page 48*). 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.