

Managed Machine Network



JUNE 2020

Integration with
Harmony Hub

MMN
MANAGED MACHINE NETWORK

Preface

In this document we will be talking about what Managed Machine Network implies, the Schneider Electric's Harmony Hub ZBRN1 and the Node-RED integration of this system and Managed Machine Network's Modbus Manager followed by a conclusion.

The Harmony Hub is a Base Station for industry standard wireless devices/transmitters. You can connect the Harmony Hub directly to the Cloud to gather data and operate the Harmony Hub to connect to a PLC or other device. In this whitepaper we will describe the steps we took to get a TH110 Wireless temperature sensor in EcoStruxure Machine Advisor. EcoStruxure Machine Advisor is a Cloud dashboard for Small Business Integrators.

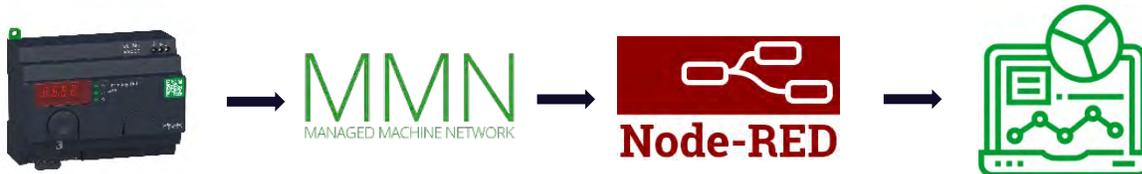


Managed Machine Network

What is Managed Machine Network (MMN)?

Managed Machine Network (MMN) is a network of sites with connected machines through Virtual Private Networks (VPN). This network makes it easy to collect and manage data at a distance. You don't need intricate IT knowledge to install or configure a modem. The modem is automatically provisioned and secured from the Cloud and doesn't have a configuration interface. Connect the modem to power, internet and your machine and start gathering data.

MMN provides simple and efficient solutions for control without the need of a programmable logic controller. MMN enables you to store and show historical data of any device connected.



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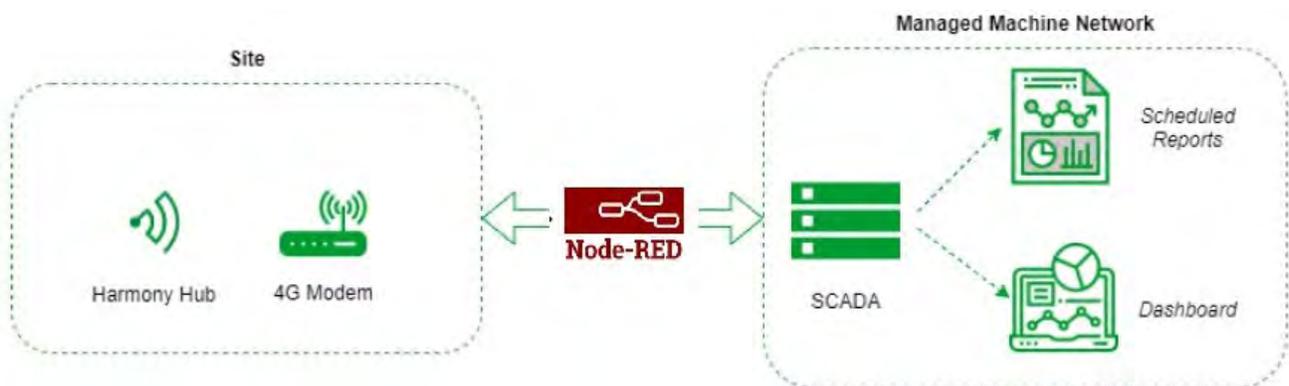
How is Managed Machine Network integrated with the Harmony Hub?

The Managed Machine Network can securely connect with every SCADA solution available. There are many solutions where data can be gathered to start with preventive maintenance. This could be a local SCADA installation as well as a hosted SCADA solution. We can set up a hosted SCADA environment which has access to the Managed Machine Network.

The Managed Machine Network is always active and available for SCADA and IoT solutions to gather and send data via Modbus, OPC/UA, Profinet, Json, MQTT and various other protocols.

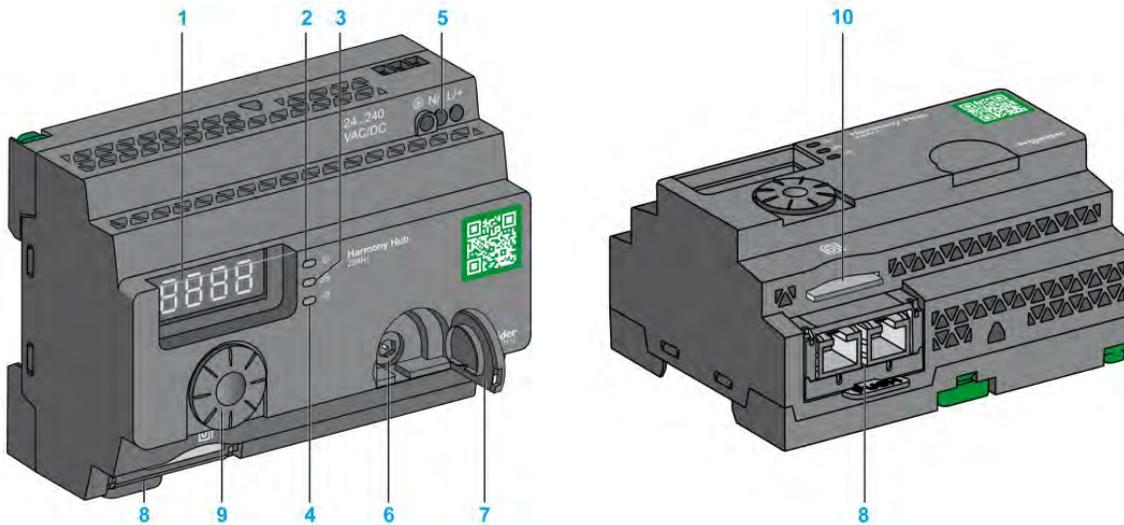
Because MMN has access to all devices at once, a central configuration solution is possible. This means that you don't have to travel to locations where these devices are located.

In conclusion the Harmony Hub requires a stable and secure internet connection for you to connect to a Node-RED server using the Modbus communication protocol. Managed Machine Network provides this stable and secure internet connection.



Harmony Hub Concept

An easy-to-install non-intrusive wireless system which digitizes your production line and provides you with computed data to improve overall equipment efficiency (OEE)



Robustness, built for industrial environment.

Connection through open protocol (Ethernet Modbus/TCP).

Compatible with up to 60 wireless devices.

1. Four 7-segments displays with 5 LEDs
2. Power LED
3. Communication LED
4. Radio signal strength LED
5. Power input terminal block
6. Connector for the optional external antenna
7. Protective plug for the connector for the optional external antenna
8. ZBRCETH Communication module inserted with 2 RJ45 Ethernet connectors
9. Jog dial
10. SD memory card slot

Schneider Electric's TH110

What is the TH110?

The Easergy TH110 thermal sensor is a self-powered sensor using stray magnetic fields made by Electric Schneider. The energy harvester is made with a ferromagnetic core (ribbon) installed around the electrical conductor to monitor passing through a solenoid coil. The stray 50-60Hz magnetic field surrounding electrical conductor induces a voltage on coil terminals.



How do you connect the TH110 to the Harmony Hub?

The Harmony Hub has Identity labels, the TH110 is a thermal monitoring sensor, this sensor uses the **cL** label. Keep in mind that you should only have one sensor from the same type near the Harmony Hub when pairing. When the Harmony Hub is in the **rdy** state, press on the jog dial to navigate to **ConF**. The HMI displays the number of devices already connected. Click, then rotate the jog dial to select a free spot between 0 and 59. Make sure to reset the TH110. Press the jog dial to select type **cL** then press to select **t** for **On Air Teaching**. Wait 30 seconds with the TH110 near the Harmony Hub and the TH110 will now be paired to your Harmony Hub. Double push to get back to the previous menu.

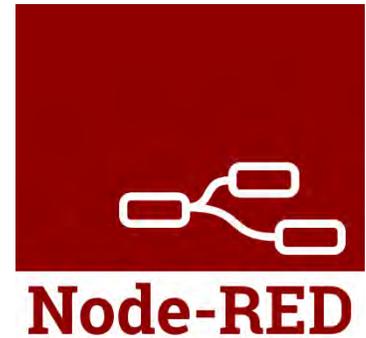
To get a better impression of this product watch the video's below.

https://www.youtube.com/watch?v=zD30_cMW_74

<https://www.youtube.com/watch?v=zhQdq6oIRn8>

<https://www.youtube.com/watch?v=p1MSQbPkXk0>

Node-RED integration



What is Node-RED?

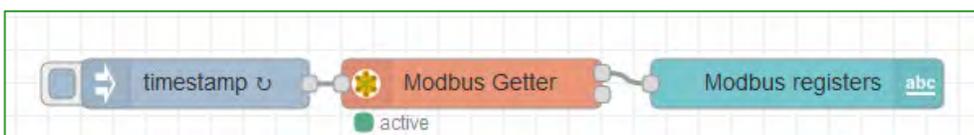
Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways.

It provides a browser-based editor that makes it easy to wire together flows using the wide range of nodes in the palette that can be deployed to its runtime in a single-click.

Manually Configure a Modbus connection

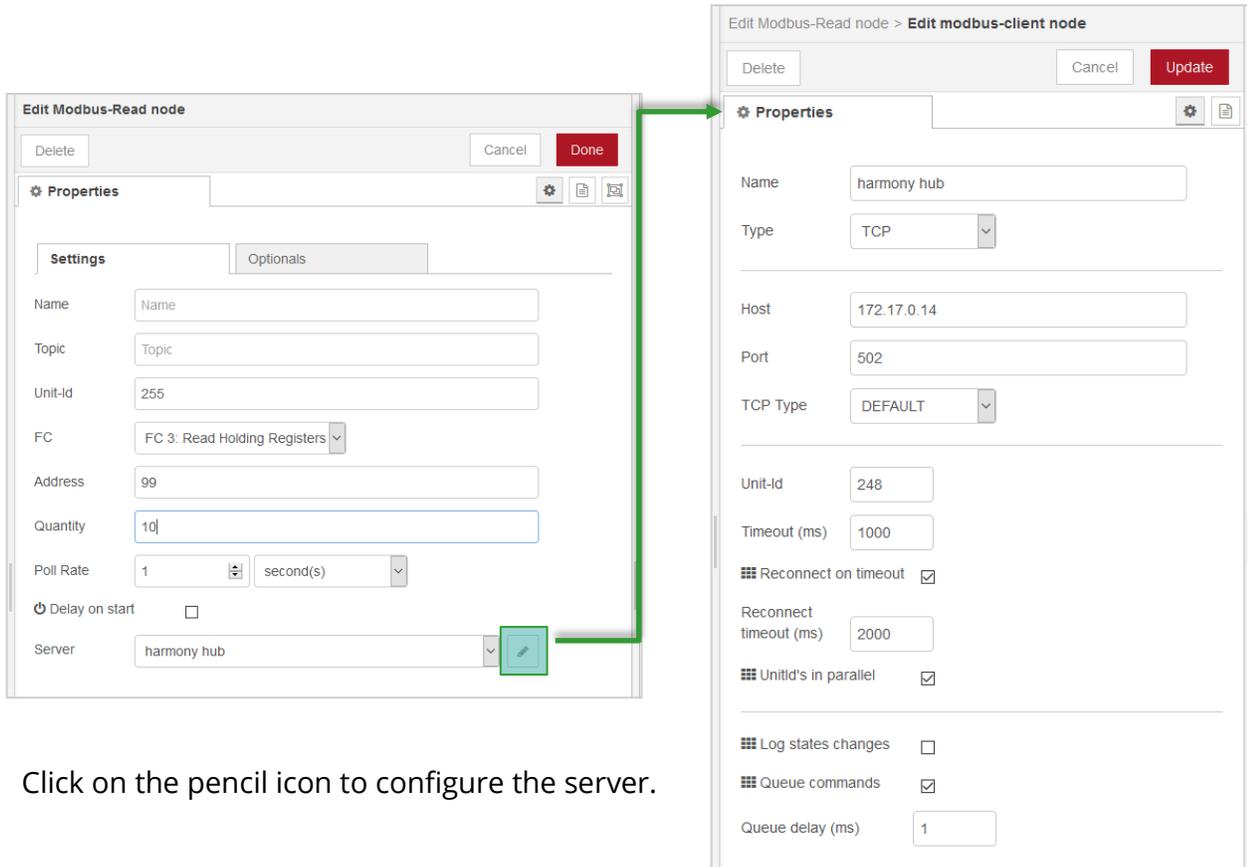
The “node-red-contrib-modbus” palette is needed in order for you to use the Modbus communication protocol in Node-RED.

An example of a Harmony Hub Modbus read/write flow in Node-RED



This simple example get the current temperature from the Harmony Hub and stores it with the current timestamp. You can then send it to any SCADA solution available.

The Modbus-getter node and server configuration shown below



Click on the pencil icon to configure the server.

User Manual [Harmony XB5R - ZBRN1/ZBRN2](#)

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Configure Modbus Manager in Node-RED

MMN has created a free Modbus Manager in Node-RED, for devices connected to the Machine Network using the Modbus TCP protocol. The Modbus Manager provides an easy way to manage modbus addresses and retrieve data.

An example of data in the Modbus Manager

The screenshot displays the Modbus Manager interface. At the top, it says "Modbus Manager" and "Click start to begin reading data and to send it to Machine Advisor. Click to refresh values." Below this are three buttons: "START", "STOP", and "REFRESH". To the right, there is an "Interval" dropdown set to "30 seconds" and a status indicator "Modbus Manager: Running".

Below the controls, it says "Click on a device below to see its values." and shows a table of devices:

IP Address	Label	Location	Created at	Status
172.17.0.130	HMI	Amsterdam	2020-04-07 12:08:06	Disconnected since 2020-5-26 15:15:10
172.26.0.19	Harmony Hub	Amsterdam	2020-05-26 09:45:05	

Below the table are buttons for "ADD", "EDIT", and "DELETE".

Below the device list, it says "Modbus Values" and shows a table of collected data:

id	device_id	modbus_address	unit_id	label	description	last_value	created_at	updated_at
468	12	24	255	TH110	1	21	2020-05-26 09:45:58	2020-05-26 09:45:58

Below the table are buttons for "ADD", "EDIT", and "DELETE".

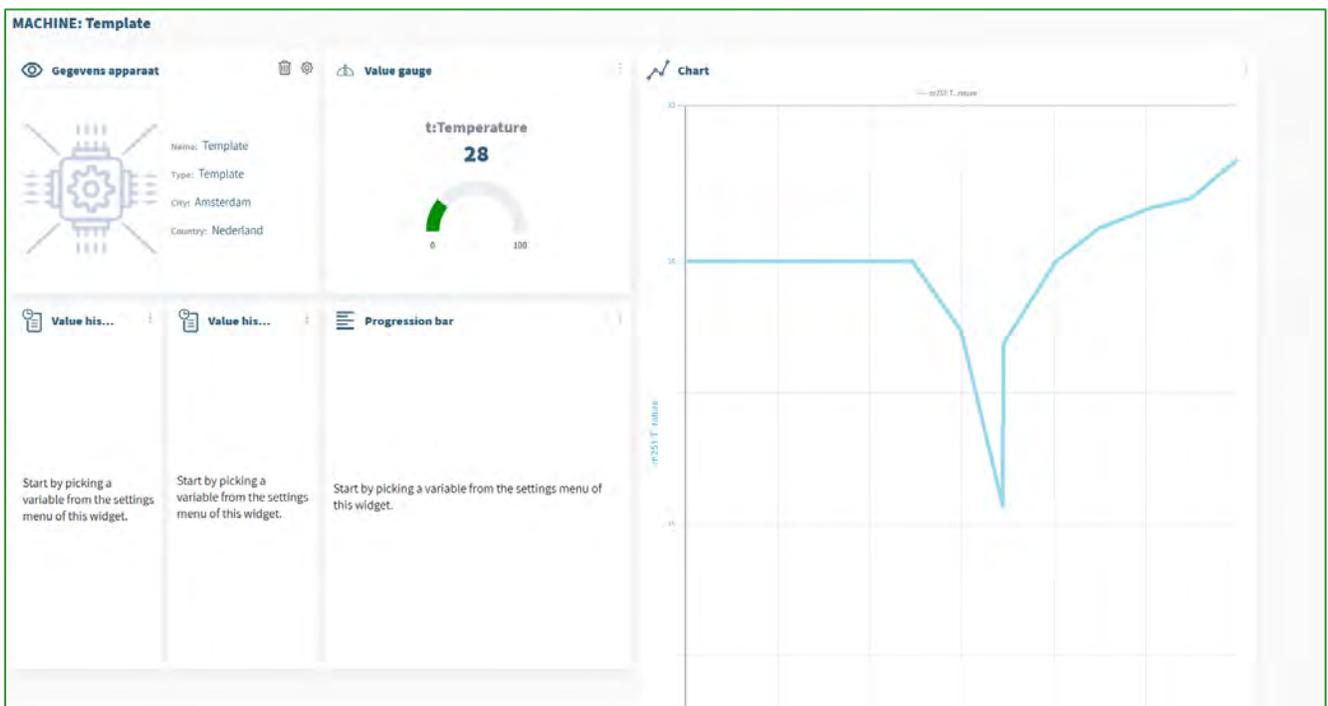
The Modbus Manager needs the IP address of the Harmony Hub to connect. You can then specify the Modbus addresses and label for each value. You can also set a refresh rate with an interval to collect the data.

The Modbus Manager enables you to send the collected values to any Cloud Dashboard. For more information about dashboards visit

<https://machinenetwork.io/>

Machine Advisor

The Modbus Manager can send any received or stored data to Schneider Electric's Machine Advisor. But this is just one example of a dashboard/monitoring solution of which we can send data to. Many solutions can communicate with our manager. Some examples are AVEVA, KaaloT, Grafana, Kibana, Thingsboard etc.



This makes integration with already used dashboard solutions very easy to set-up.

Conclusion

A major complication with collecting data is to securely transfer this data over the internet. MMN uses a secure routed VPN to every connected machine.

There is no historical data and no advanced alarming capabilities with the Harmony Hub. Modbus TCP can be routed over a network but is not encrypted. MMN in combination with Node-RED fills these gaps.

We have successfully connected the Harmony Hub and started gathering data via Modbus TCP over the secure VPN connection. Node-RED acts as the aggregator and can connect to multiple Harmony Hub devices at the same time to gather data. This data can be sent to any SCADA dashboard easily. In this whitepaper we have implemented sending the data to Schneider Electric's EcoStruxure Machine Advisor.

Sources

Managed Machine Network	https://machinenetwork.io/
Schneider Electric	https://www.se.com/us/en/
Harmony XB5R User Manual	https://www.se.com/ww/en/download/document/EIO0000001177/
Node-Red Website	https://nodered.org/
Thermal Sensors Help Detect Faults in Power System	https://www.youtube.com/watch?v=zD30_cMW_74/
How to Install TS TH110	https://www.youtube.com/watch?v=zhQdq6olRn8/
How to Pair TS CT110	https://www.youtube.com/watch?v=p1MSQbPkXk0