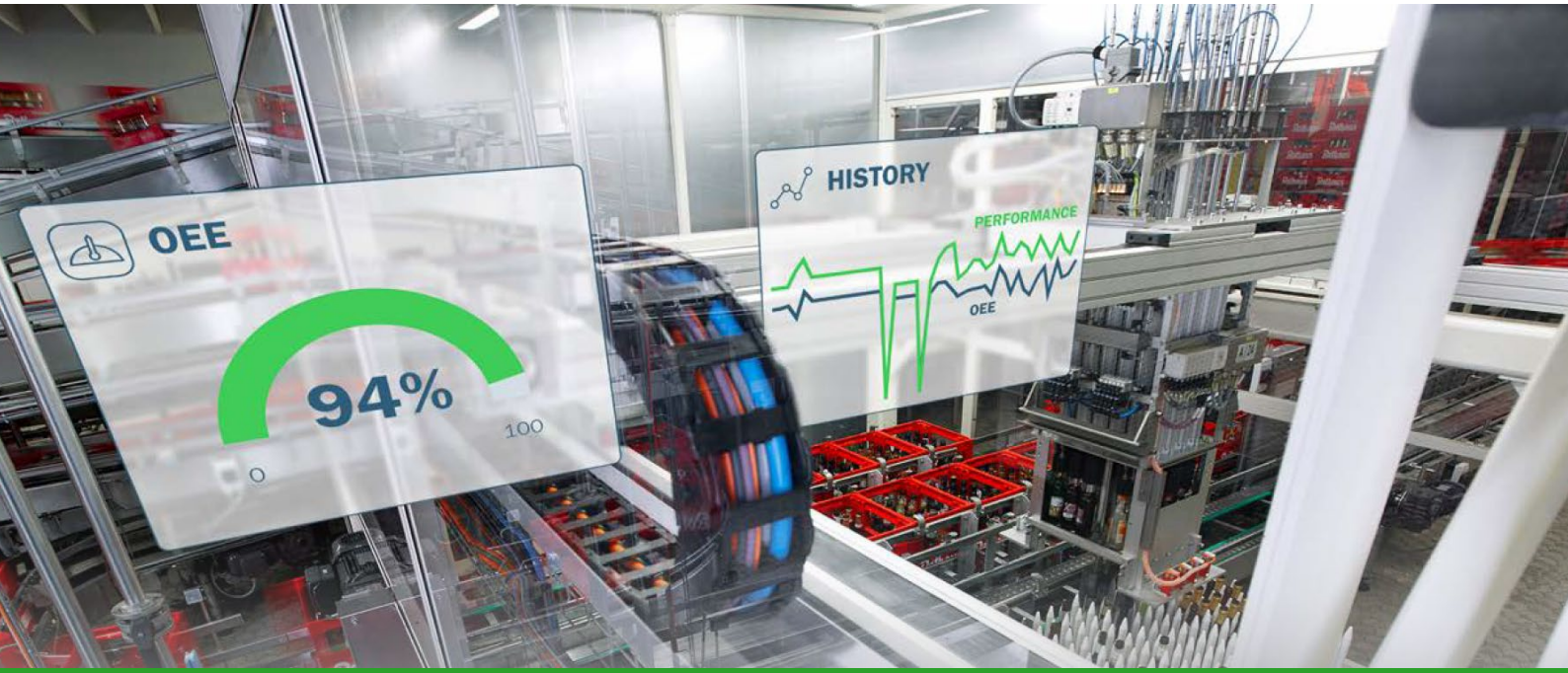
# CUSTOMER CASES

# THE MMN SOLUTION

## WHERE OT MEETS IT




September 2020

MMN
MANAGED MACHINE NETWORK

# The MMN Solution

## Where OT meets IT in a safe and managed environment

**The Managed Machine Network connects machines to the Cloud by creating a unique network of machines. Where every connected device such as an PLC or HMI can be accessed real-time bi-directional from a central location called a Deployment in the Cloud.**

Engineers can connect to this deployment to perform ad-hoc maintenance but the real power of MMN lies in the automated processes in the deployment.

In this deployment you can add Cloud services such as a Dashboard, Gateway, MQTT, SQL, FTP and many other.

This document will explain how MMN works and present five customer cases that are already or will be solved with MMN.

## Customer Case 1

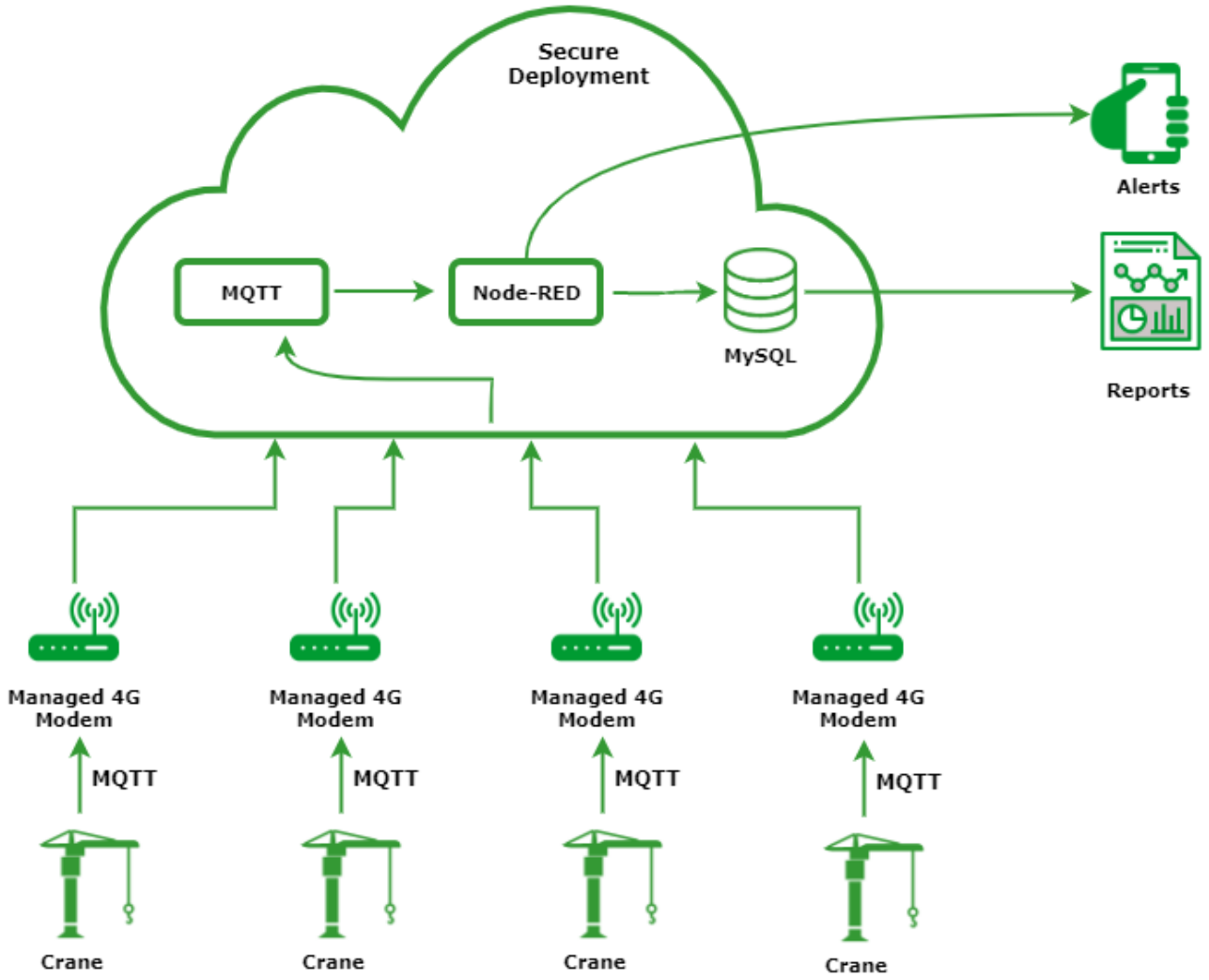
# Logging of all crane activities in the Cloud

**The customer wants to log all operations of cranes in the Cloud. They want to store and analyse all movement and actions to make sure that cranes are not used incorrectly. If an accident happens the data cannot be manipulated or destroyed.**

### Solution

The MMN network creates a secure connection from the cranes to the deployment in the Cloud. In the Cloud a MQTT server receives all messages from the PLC. A Node-RED gateway accesses the MQTT queue, analyses the messages and sends them to a MySQL Database.

## Overview




### Crane

- MMN Managed 4G Modem.
- PLC that support MQTT and sends all movement/handling to the deployment.

### Deployment

- MQTT Server: to receive all handling messages.
- Node-RED server: subscribes to the message queue to retrieve all messages from the cranes. Messages are analysed to see if immediate action is required and all messages are sent to the database. A confirmation MQTT message is send to the crane if a message has been received and processed.
- The database is MySQL Server.

## Customer Case 2

# Fleet dashboard of financial information stored in HMI's

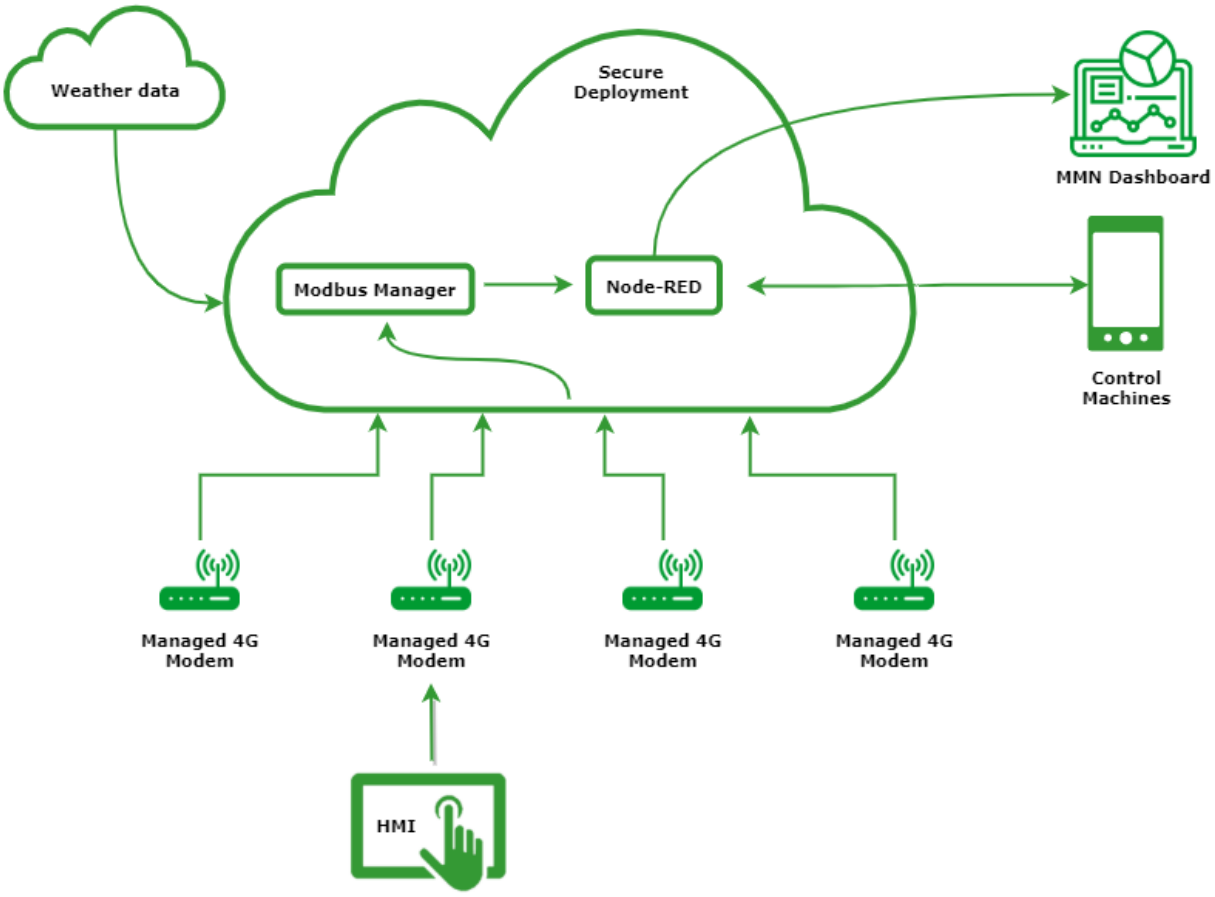
**This customer has several locations with carwash squares. Every location has an HMI that stores financial information of all transactions. They want this information to be available in a cloud dashboard that supports fleet management to compare the different locations.**

The customer wants to control PLC's in the deployment from a mobile phone. When a client of the customer calls that he is unable to complete the carwash session the customer wants to reset the machine and increase the credit of another carwash square so the client can continue his/her carwash session.

### Solution

The MMN network creates a secure connection from each location to the deployment in the Cloud. MMN created a Node-RED server with a plug-in called the Modbus Manager. The Modbus Manager retrieves information from the HMI's and PLC's and sends it to a dashboard that supports fleet management. The Node-RED internal web-server is used to control each machine on the carwash squares to reset or increase credits on the.

## Overview




### Carwash locations

- MMN Managed 4G Modem per location. Each location has 10 or more carwash squares.
- HMI with support for Modbus TCP

### Deployment

- Node-RED Server: retrieves all financial information every minute and sends it to the MMN dashboard.
- Modbus Manager: this Node-RED plug-in created by MMN enables you to retrieve modbus values by entering the IP-address and Modbus address of the device. It automatically retrieves this information every minute (can be specified) and sends it forward.
- MMN Dashboard: a fleet management solution. It provides the customer insight into the financials of all connected machines like washing machines, vacuum cleaners and other devices.
- A webpage designed for use on a mobile phone controls the carwash squares. This enables the customer to select a carwash square to reset or increase the credit.
- Node-RED can connect to any Cloud service. We can add weather overlay information in the dashboard to see how the weather influences the financials of this organization.

## Customer Case 3

# Large scale updating of PLC's

**The customer is developing a solution for the agriculture. Estimates are that this solution is going to be implemented on a very large scale; probably about 8000 sites. Each site will have PLC's and other equipment that needs to be monitored and updated with the latest PLC program.**

The PLC program is subject to many changes and is still under development while machines are already located on the farms. There needs to be a solution where data can be gathered and multiple machines can be updated at once.

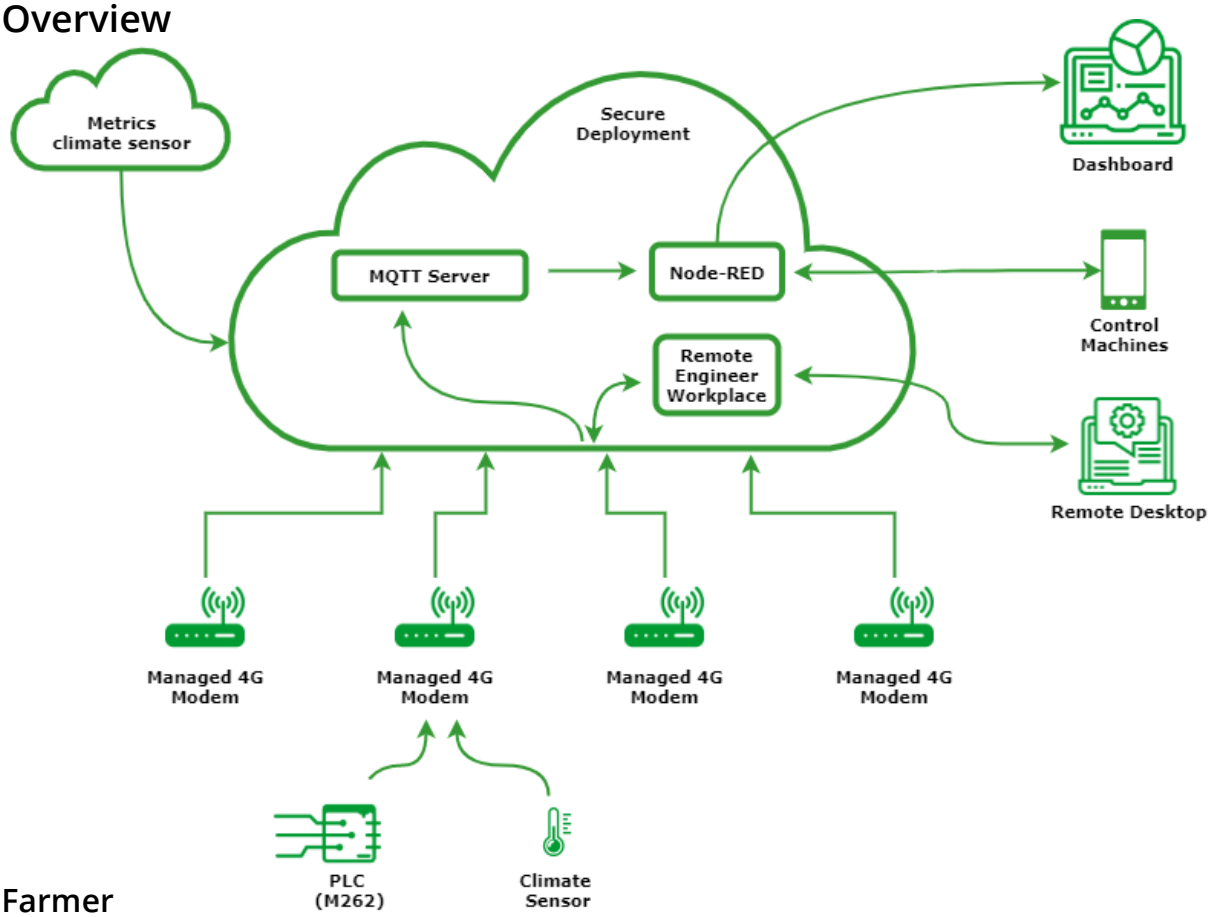
The clients of the customer are farmers. They want to have access to the dashboard on their TV/mobile phone and they want alerting if thresholds have been reached. All power to the machine and motors is connected through TeSys Island and needs to be controlled from the Cloud.

**Solution**

Every farmer has a MMN Managed 4G Modem connected to the machine PLC's and other equipment. A Schneider M262 PLC with support for JSON and MQTT gathers all information and instructions and sends it forward.
The Node-RED server acts like a gateway and gathers all the data via MQTT. TeSys Island is also implemented in this solution and can be monitored and controlled remotely via MMN.

Node-RED supports the business model as it requires a module architecture with new sensors and devices that will further extend the scope of the solution in the future. Node-RED has support for almost any IOT solution. Manufacturers have started making modules for Node-RED themselves that can be added to this solution easily.

## Overview




## Farmer

- MMN Managed 4G Modem per farm. Each location has 20 or more connected devices like PLC's, TeSys HMI's and Frequency controllers.
- M262 PLC with JSON and MQTT support.
- Climate sensors that report directly to the Cloud.

## Deployment

- MQTT Server: stores all messages send from and to every farm.
- Node-RED server: has many roles here. It communicates with the farms and all devices at the sites with MQTT.
- MMN dashboard: a fleet management solution. It provides the customer insight into the status of every machine at the farms all in one dashboard. Every farmer has his own login to see only their own farm.
- Node-RED server with a webpage designed for mobile phones. This enables the OEM'er start/stop systems at the farm from a remote location.
- Remote Engineer Workplace in the Cloud: an Engineer Windows Workstation in the Cloud which is directly connected to the Machine Network. It enables the engineer to start a multi PLC update script to update multiple devices at the same time. User interaction is not required as the script can be started at night when the machine is in a standby mode.

### Outside the deployment

- Climate metrics provide an weather overlay in the dashboard.

## Customer Case 4

# Change recipes on the fly

**The OEM builds machines that compress materials. Depending on the required product the recipe needs to be changed. The OEM wants to be able to change this recipe from a remote location and monitor the machine for energy used and other machine metrics.**

The OEM wants to give clients access to the following levels of security: **Offline** (no access), **Readonly** (only machine statistics) and **Write** (change the recipe).

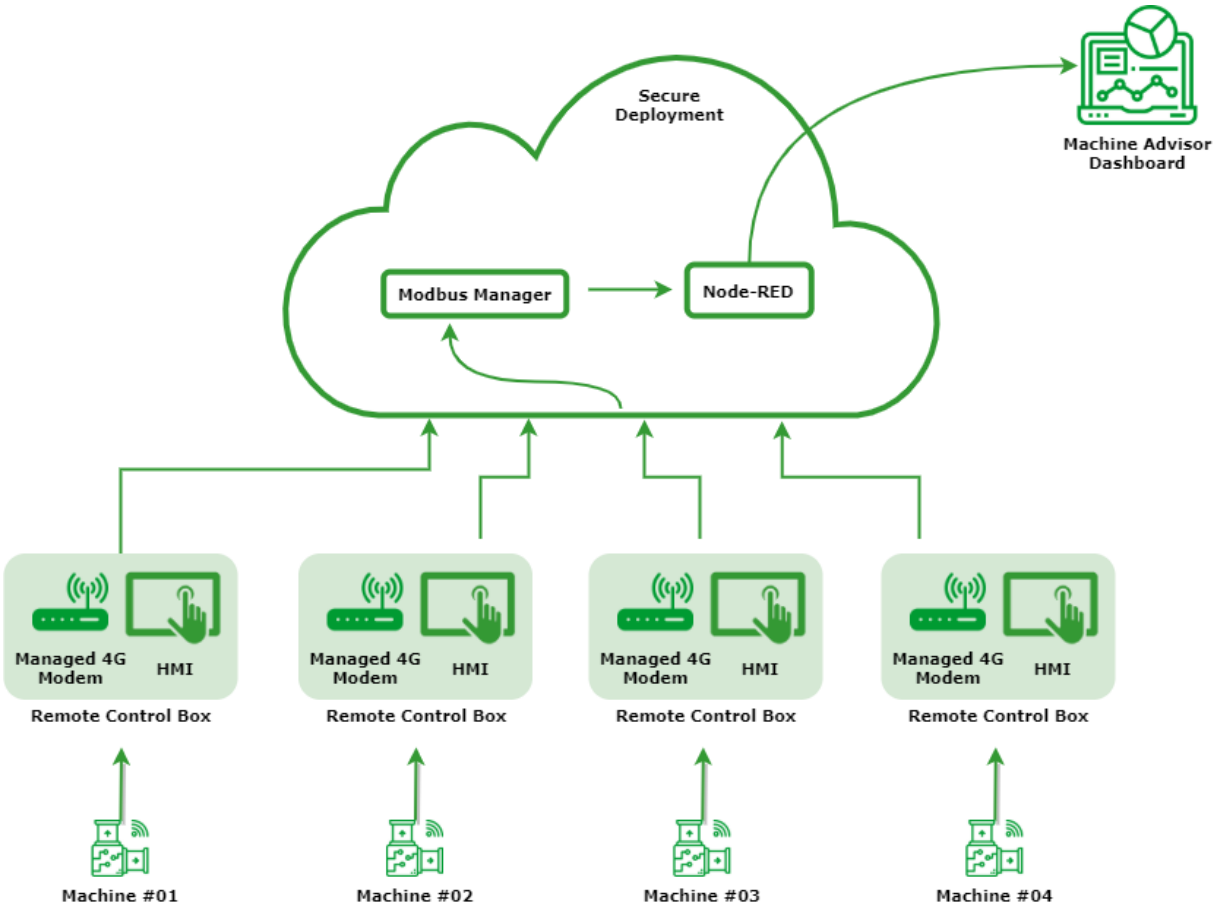
**Solution**

Every client of the OEM has a MMN Managed 4G Modem connected to the machine inside a small Remote Support Box. In this box the level of security can be specified easily with a click of a button on the HMI. Access can be given for limited time (i.e. one hour).

The Remote Support Box can connect to the existing machine and has several connectivity options for all the different machines the OEM has created. The Proface HMI retrieves all data from the local environment and supports almost any protocol since 1980. The information is stored inside the HMI and the MMN Modbus Manager in Node-RED retrieves these metrics only if access is granted by the client of the OEM.

Machine Advisor shows all machine metrics in a Cloud dashboard.

## Overview




### Remote Control Box

- MMN Managed 4G Modem per machine.
- HMI with buttons to allow access to the machine metrics and recipe.

### Deployment

- Node-RED server: runs inside the deployment and has access to all machines if allowed. It retrieves all the information via Modbus TCP.
- Modbus Manager: can connect to any HMI and gathers all Modbus values and sends it to Machine Advisor

### Outside the Deployment

- Ecostuxure Machine Advisor is a machine dashboard solution from Schneider Electric. Machine metrics are automatically gathered by Node-RED from all sites and sends it to Machine Advisor.

## Customer Case 5

# Automating control from sensors in the Cloud

**The OEM builds pumping machines to manage groundwater levels. The ground metrics are gathered by a separate sensor that sends the metrics directly to a database in the Cloud via 4G.**

The OEM wants a solution where the sensor data in the Cloud can be retrieved automatically and can be used to control the pumping machine so that manual interaction is no longer required.

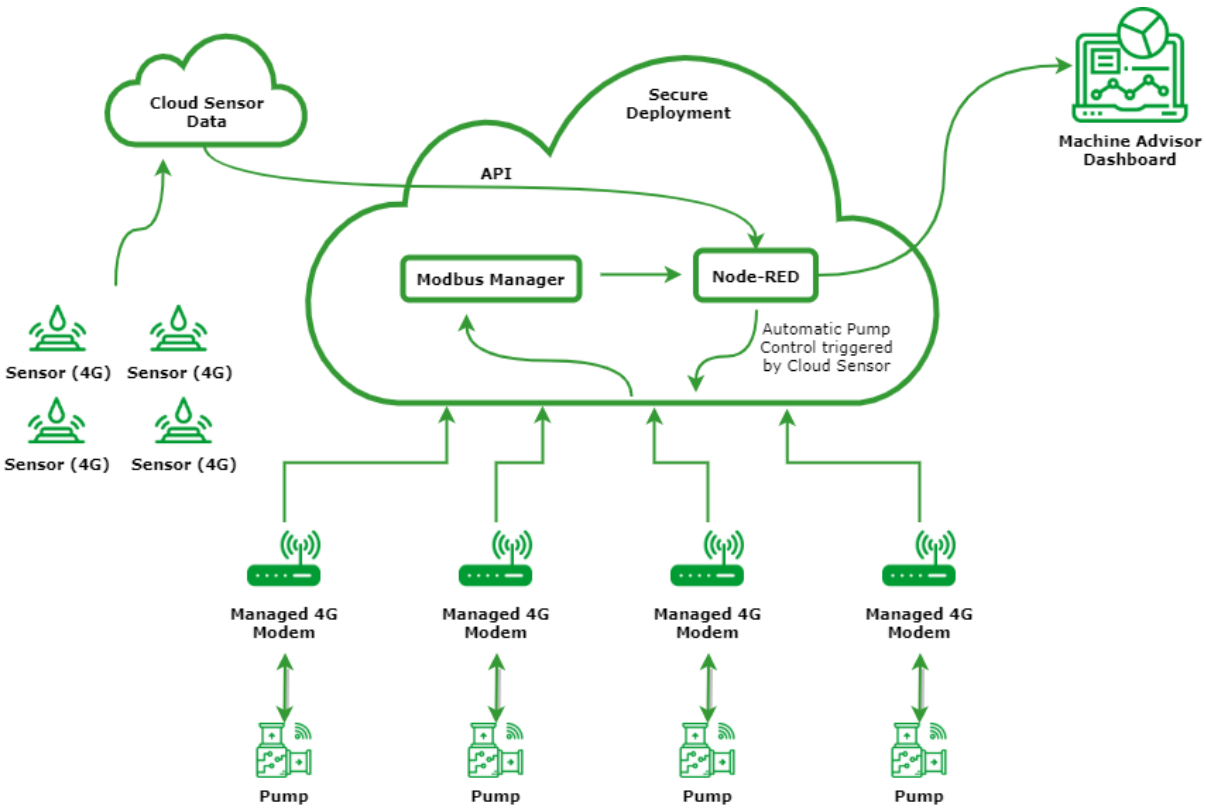
The machine needs to be monitored in the MMN network.

### Solution

The Node-RED server gathers the information from the Ground Sensor Database in the Cloud. The data is analysed by Node-RED. If the sensor metrics indicate that the water level is to high the pump will be activated via Modbus.

The operator only monitors the automatic process and no longer needs to activate pumps manually. Monitoring is done via Machine Advisor.

## Overview




### Pumping Machine

- MMN Managed 4G Modem per machine.
- PLC that supports Modbus TCP

### Deployment

- Node-RED server:  exports all metric to Machine Advisor. Pumps are automatically activated if the sensors in the Cloud detect a high-water level. This was a manual process before MMN.
- Modbus Manager: gathers all machine (pump) data.

### Outside the Deployment

- Ecostuxure Machine Advisor is the Cloud Dashboard solution that gives the operator insight into the machine metrics and sensor data.

# Explanatory

### 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.

### MQTT

MQTT is an OASIS standard messaging protocol for the Internet of Things (IoT). It is designed as an extremely lightweight publish/subscribe messaging transport software that is ideal for connecting remote devices with a small code footprint and minimal network bandwidth. MQTT today is used in a wide variety of industries, such as automotive, manufacturing, telecommunications, oil and gas, etcetera.

### MySQL

MySQL Database Service is a fully managed database service to deploy Cloud native applications using the world's most popular open source database. Over 2000 ISVs, OEMs, and VARs rely on MySQL as their products' embedded database to make their applications, hardware and appliances more competitive, bring them to market faster and lower their cost of goods sold.

### Modbus Manager

The Modbus Manager is a Node-RED plug-in that can gather machine metrics from a central location in the deployment via Modbus TCP. The metrics can be sent to any Cloud dashboard or any other system that can analyze the metrics to create alarms and/or reports.

**API**

An application programming interface (API) is a computing interface which defines interactions between multiple software intermediaries. It defines the kinds of calls or requests that can be made, how to make them, the data formats that should be used, the conventions to follow, etcetera. It can also provide extension mechanisms so that users can extend existing functionality in various ways and to varying degrees. In short, it is a method that allows you to retrieve data from external sources.