EnOcean IoT Connector – intelligent data transformation

Data lays the foundation for applications in the Internet of Things (IoT). It is collected by billions to trillions of sensors for intelligent control and the digitization of buildings. EnOcean's energy harvesting sensors collect data in a maintenance-free way. In order for the data to be pushed into the cloud to enable IoT applications, an IT infrastructure is needed. However, one concern that is often raised is how the data finds its way from sensor to where it is needed in an easy and secure way. Also, there needs to be assured that no third party has access to the collected data. This brings the EnOcean IoT Connector into play as the ideal solution to translate EnOcean sensor data into ready-to-use data for IoT applications and data driven businesses. The IoT Connector is a software that is available as a Docker container image (a container is a standard unit of software) and can be deployed anywhere.

This whitepaper provides an overview on how the EnOcean IoT Connector helps to set up IoT applications, providing maintenance-free data and securing total control for the customer over their data. No additional hardware costs are involved when already existing infrastructure is used in the smart building.

Why EnOcean IoT data?

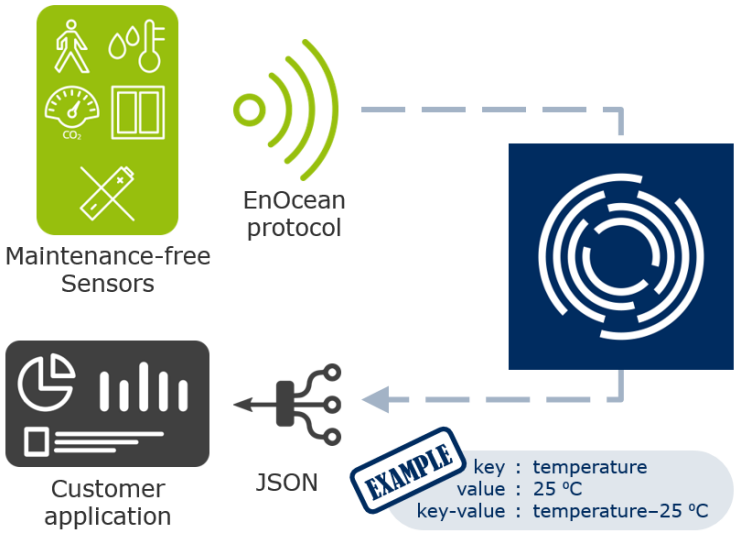
Energy harvesting sensors from EnOcean gain their energy from their surroundings – from movement, light and temperature. These sensors are used for building automation and especially for IoT applications. One advantage of this technology is the fact that these devices don't need batteries or wires to function, making them maintenance-free. Also, they can be placed flexibly in the room – exactly where the data needs to be collected.

Wireless sensors are a fundamental part in the world of the IoT. They are the devices that collect and transmit raw data in IoT systems. All requirements of the IoT are met by wireless (ease of installation and scaling), self-powered (maintenance-free, zero cost of operation) sensors that can be accessed via Internet Protocol (IP). EnOcean's energy harvesting wireless sensors that use ambient energy as a power source enable unlimited data capturing where cables or batteries fail.

Ready-to-use data with the EnOcean IoT Connector

IoT applications in smart buildings can only be implemented when the required data for analysis and visualization are available. In order for the data to be used in IoT applications it needs to be brought into the right format. The EnOcean wireless sensors use the EnOcean Protocol to communicate, providing all necessary information and values for the customer to build the IoT application. The EnOcean Protocol is designed to run with ultra-low power, meaning that it's extremely optimized and compressed to work with energy harvesting technology. Algorithms are needed to unravel the data and to make it available for the customer applications in the right form. Customer applications consume IoT data in a „key-value pair" format, like JSON. A key-value pair consists of related elements: a key, which is a constant that defines the dataset (e.g. temperature, humidity, ventilation), and a value, which is a variable that belongs to the dataset (e.g. 20 °C, 80 %, level 1/2/3).

One key feature of the IoT Connector software is that it decodes the IoT data from EnOcean Protocol and translates it into ready-to-use data in JSON format to be used in the actual application.



EnOcean protocol:

- Highly optimized for maintenance-free sensors
- Post processing algorithms required to decode IoT data

Customer application:

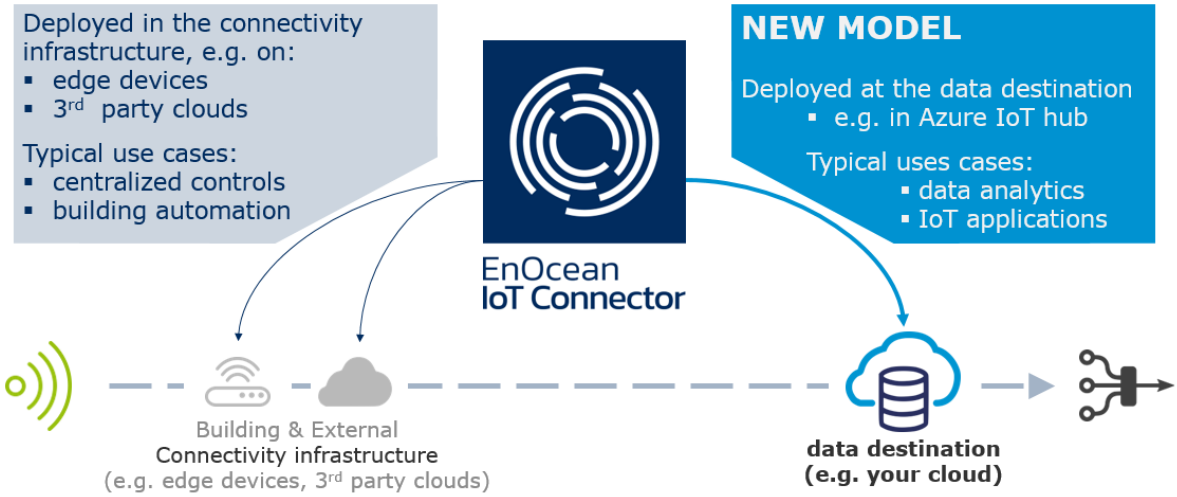
- Consumes IoT data in „Key-Value pairs" format e.g. JSON

The EnOcean IoT Connector does the transformation and much more.

IoT Connector deployment

The IoT Connector enables the visualization and analysis of data collected by maintenance-free sensors in customer-made dashboards. The container can run at different locations, using building and external connectivity infrastructure (typical model) or at the final data destination (new model):

- **Typical model:** The IoT Connector is deployed at the already existing connectivity infrastructure. This can be edge devices or third-party clouds. Typical use cases are centralized controls such as lighting and building automation.
- **New model:** The data is processed at the final destination like a cloud or server from the customer. For example, this could be the Microsoft Azure cloud. Typical use cases are data analytics and IoT applications. One key advantage is that the **customer has total control over the data flow**. With this new model there is **no third party or third storage location involved when transferring the data from sensor to cloud**. The customer decides what happens with his/her data, whether it's visualized, deleted or archived.
  - ➔ The IoT Connector is a containerized application and available for download at the Azure Marketplace, including all software updates
  - ➔ Thanks to use of cloud computing the local infrastructure is being relieved
  - ➔ The IoT Connector supports the creation of new data-heavy applications, stimulating ideas from customers for new products



Easy integration of EnOcean products

The EnOcean IoT Connector is the ideal connecting piece between maintenance-free IoT data and IoT application, making the integration of EnOcean products easier than ever before.

- **Bidirectional operation:** The IoT Connector decodes and encodes the EnOcean Protocol
- **End-to-end encryption:** AES 128 encryption TLS/SSL
- **Maintenance-free data:** The IoT Connector supervises sensor health information
  - Are telegrams being transmitted in the defined intervals?
  - Is the radio signal strength sufficient to send a protocol?

- Is the harvested energy currently stored in the sensor sufficient for operation?

- **Easy adoption by IoT**: JSON data is exchanged with MQTT client or Azure IoT Hub
- **Implementation of JSON data:** EnOcean over IP schema specified by the EnOcean Alliance
- **Sensor onboarding:** EnOcean sensors can quickly be installed and commissioned via direct calls of the Management API, over a web interface or with the app EnOcean Tool (available for iOS and Android) for sensors that have a built-in Near Field Communication (NFC) interface

Leverage existing building infrastructure

An easy and cost-effective way to incorporate the EnOcean IoT Connector into IoT applications is by using the already existing IT infrastructure. The infrastructure can easily be upgraded to send EnOcean IoT data with an EnOcean USB stick that is inserted into a Wi-Fi® access point. Data from existing EnOcean buildings can directly be forwarded to the IoT Connector in raw format (ESP3 – EnOcean Serial Protocol 3). One example are access points from Aruba, a Hewlett Packard Enterprise company. These access points support the EnOcean USB stick without need for additional software. The Aruba access points talk directly to the IoT Connector running in the cloud, so no additional gateways are needed. With this complete scenario, customers have exclusive control over the data flow.

Key benefits of the EnOcean IoT Connector:

- **No middleman** between customer and data – **total control** over the data flow
- Data is not converted externally but **directly at the data destination**
- **No dependencies** – data is run exclusively at customer's destination
- **Trust and security:** data is not forwarded to third parties or service provider
- **EnOcean sensor data (EEPs) and sensor health status ready to use for analysis and dashboards** – "key-value pairs" representation in JSON
- IoT Connector is **bidirectional**: It **can encode and decode the EnOcean Protocol**
- IoT Connector **provides additional sensor health monitoring**
- **Instant deployment and updates** on premises or in the cloud – with use of a container with Azure Marketplace
- IoT Connector can be **deployed in existing or new IoT projects**
- **IoT Connector can run anywhere:** its **technical conditions and implementations** are what **make the new model possible** in the first place; there is no comparable product in the EnOcean world
- Lowest connectivity costs – **leverage existing building infrastructure and cloud computing**
- The IoT Connector **doesn't determine the IoT application but it provides the data** for it
- EnOcean **wireless sensors can easily be integrated** into already existing systems
- **Proof of concepts (POCs) can be deployed in no time**, making it easy to build scalable (low-cost and quick to deploy) products

EnOcean support for system integrators

For more details on EnOcean's IoT Connector and how to install the software, please visit www.enocean.com/iot-connector or contact the IoT Connector product manager Marian Hönsch via e-mail at marian.honsch@enocean.com.