

## NFC and EnOcean Energy Harvesting – the Perfect Duo for the IoT

*In the Internet of Things (IoT), billions to trillions of sensors deliver the data needed for intelligent control and digitization of buildings. EnOcean's energy harvesting technology enables wireless sensors offering the requested flexibility and maintenance-freedom for deeply connected IoT systems. However, each of these sensory devices needs to be parameterized and put into operation according to individual demands and environments. Up to now, in many cases energy harvesting solutions do not offer bi-directional communications to support such commissioning processes. This brings Near Field Communication (NFC) into play as the ideal addition to EnOcean self-powered sensor and switch modules.*



This whitepaper provides an overview of how NFC can help improve EnOcean-based self-powered products and identifies recommended onboarding methods. It shows individual features which will be introduced to the complete EnOcean portfolio in the long-term future to unlock the great potential of energy harvesting wireless technology.

**Until further notice, currently available EnOcean devices support the following features** (product roadmap until March 2020):

- **Write and read** parameters:
  - For security operation – AES key (write only), secure mode
  - To configure EEP profiles – outgoing EEP profile
  - Transmission timing – wake up time and retransmission time
  - Thresholds and other sensor configuration parameters
- Enable to **leave a custom note** inside the product – up to 112 characters
- Enable to **trigger teach-in telegrams** via the NFC interface
- Enable to **start light test** to check if light conditions are sufficient for energy harvesting operation
- Configure **energy behavior**
  - Set the module into *transport mode*
  - Change the **Product ID** of the device
  - Change the **NFC Pin** of the device
  - Configure **reporting** of the “**Signal Telegrams**” (light conditions, energy storage, back up battery status)
  - Configure the **behavior** of **onboard LED**

## Why NFC?

Near Field Communication is a short-range, one-to-one wireless communication for simplified transactions, data exchange, pairing and wireless connections between two devices. The transmission needs close proximity of less than 10 cm, which ensures strong data privacy. There are two communication modes, which are of interest for energy harvesting:

1. **Read/Write** for data reading from NFC-enabled objects
2. **Peer-to-Peer** for data exchange <sup>1</sup>

## Why NFC for EnOcean?

NFC is a low-power standard using energy harvesting technology for communication. The energy is harvested from the RF field of the NFC reader to power the NFC transponder (tag), enabling connectivity for Internet of Things (IoT) devices.<sup>1</sup> These IoT devices can also be self-powered switches and sensors enabled by the EnOcean technology. As NFC has its own source of harvested power, it does not require the primary energy (operation of the switch module or light) to operate the functionality of an EnOcean device. This allows a seamless integration into EnOcean modules without constraints but with many additional benefits.

<sup>1</sup> NXP Semiconductors N.V. “NFC for embedded applications”, 2014



The NFC basic functions allow several different settings of NFC-integrating EnOcean modules. Therefore, self-powered switch and sensor modules with an NFC interface can be put into operation and commissioned very easily – even in the packaging – using NFC readers or NFC-enabled smart phones and tablets. The capabilities include:

1. **Read out** the clear product identification including all specific parameters like IDs, link tables, tags, functionalities and preconfigured settings. For example, whether a PTM switch module was configured for one or double rocker switches.
2. **Write** the product ID including all characteristics, e.g. switch design and function to the integrated NFC tag.
3. **Power** the EnOcean radio chip via NFC to send and receive EnOcean telegrams via the NFC tool on a smart phone.
4. **Update** the application firmware.

### Advantages for IoT players

NFC capabilities integrated into EnOcean energy harvesting products is a future-proof next step in the rapidly evolving IoT market. Here, deeply connected intelligent systems build the basis for digitized building areas and services. A major success factor of such digitization projects is the easy commissioning and programming of thousands of sensing devices in a building delivering the data needed for individual and demand-based optimization processes. This addresses several players involved in the IoT value chain:

#### 1. Benefits for OEM product manufacturers

- All products that integrate NFC-enabled EnOcean modules **can be configured and adapted** according to the **individual customer demand prior to delivery**.

As a result, OEMs only need to **stock the basic product** and make **certain settings**, e.g. parameters and frequency, just before it is shipped. This saves storage costs while OEMs can more quickly respond to individual customer requests, such as setting EnOcean Equipment Profiles (EEP) or configuring security mode.

- **The development of an NFC tool is simple** and can easily be added to an existing commissioning app or developed as stand-alone tool.

EnOcean's basic App for installers can configure the following NFC-enabled devices:

1. Multisensor
2. PTM Next Generation
3. Motion Detector

It offers an intuitive handling and facilitates the device commissioning (e.g. changing the NFC PIN or initiating a light test). The App will be available from spring 2020 in the app stores for Android and iOS.

## 2. Benefits for OEM customers

- For IoT projects, **all specific parameters needed for an individually planned system can be set beforehand** which significantly facilitates the integrator's and installer's work while saving valuable project time simultaneously.

In addition, installers can set several configurations needed for a specific project by just using the NFC app on their smartphone. **NFC configuration** is therefore a clear **leading edge** of an OEM's product portfolio in a highly competitive market.

- **Specific product information** can be written in the NFC tag of an EnOcean product, e.g. the switch design (single or double rocker) and icons on the rocker (lighting or shutter control).
- NFC allows **off-site and off-power commissioning**, meaning that link tables, security codes and any other parameters of line-powered devices can be changed, even when the device itself is actually not powered and packed in a box, allowing changes of pre-configured product packages.
- The **smartphone** becomes an **easy to handle onboarding tool** (including the teach-in) for EnOcean products. It powers the integrated NFC tag to send all configuration details from a switch or sensor to the receiver.
- When installing pre-configured and teach-in packages, the installer can **read relevant project information in the NFC memory**, e.g. a device's placement and function. The sensors onboarding can be done easily by putting an NFC-enabled smartphone close to the product, even before the unpacking.
- A smartphone app can **verify the radio link quality** between a battery-free switch and the receiver via the NFC interface. Installers only need to put the smartphone close to the switch for sending an EnOcean telegram. The app shows all details on the data transmission immediately, which can be used for the documentation and approval of installations.
- **Commissioning information** (link tables, security codes and other parameters) can also be **written onsite** depending on device and application (e.g. actual light level in a room) Installers can change runtime parameters of unidirectional energy harvesting wireless sensors on site to adapt it to the specific application. This includes for example time settings or threshold values.
- **Energy harvesting devices** that are almost discharged, due to long storage periods or a covered solar cell, for example, can be **recharged via NFC**.
- Installers can **update software and firmware** of the sensory devices and the receivers on site via NFC using a smartphone or NFC reader.

## 3. Benefits for end users

- Sensors and switches integrating an **NFC tag, store all information on the service provider** who set up the system including contact details and URL.

The user can **read out** these details **via** his **smartphone** and contact the installer if needed. Thus, each switch and sensor contains the **installer's digital business card** and improves the customer service.

- **Energy harvesting devices** which are not in use during a certain period of time, e.g. heating valve actuators during summer time, can be **woken up for operation** via NFC.
- The information in the NFC tag of line-powered and energy harvesting devices can be used for the **visualization of statistics** and **error diagnosis**.

#### NFC and EnOcean – Key Benefits at a Glance:

1. **NFC-enabled devices (sensors & switches), which had no configuration at all, can now be adjusted for the application and tuned in performance.**
2. **Smartphones can now talk to EnOcean devices directly without a gateway.**
3. **Anybody can configure EnOcean devices using an NFC-enabled smartphone or NFC reader.**

#### EnOcean support for OEMs

For more details on EnOcean's NFC-enabled product portfolio and the availability and programming of an NFC tool for EnOcean devices, please visit [www.enocean.com](http://www.enocean.com) or contact [support@enocean.com](mailto:support@enocean.com).



Product manufacturers can label NFC-integrating devices using the "N-Mark" by the NFC Forum. The N-Mark Usage Guidelines are available at [https://nfc-forum.org/wp-content/uploads/2016/10/NFC\\_NMark\\_Guidebook\\_9.16.pdf](https://nfc-forum.org/wp-content/uploads/2016/10/NFC_NMark_Guidebook_9.16.pdf).

More information at <https://nfc-forum.org/nfc-toolkit/>

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