

RANGE EXTENSION WITH ENOCEAN - Concept design of extending range with EnOcean networks



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1. INTRODUCTION

In this document we want to describe what general options are available for range extension of EnOcean Radio Protocol. We will focus on three use cases:

- Range extension through repeater – available in standard Products (i.e. TCM 310 [7])
- Range extension through Sender ID replacement “Active Repeaters” – concept description. For assistance in developing contact EnOcean Support [9].
- Idea of EnOcean routers – concept description. For assistance in developing contact EnOcean Support [9].

2. RANGE EXTENSION THROUGH REPEATERS

Standard EnOcean repeaters are plug & play and because no teach-in is needed they are very easy to operate and to install. But as a result of this simple operation on the one hand and provision of highest system reliability on the other hand the standard EnOcean repeaters are limited to chains of maximum two repeating levels. For details on repeater functionality and configuration please read the EnOcean Radio Protocol specification [2].

The typical in-door range of 30 meter [1] can be tripled to 90 meters. You can refer to the figure below for a visualisation.



Figure 1 Range without repeaters



Figure 2 Range extension through repeaters

Using more than 5 repeater devices that all have radio contact will overload the radio channel with repeated telegrams which will result in collisions and telegram losses.

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Figure 3 Not allowed repeater configuration

You can configure a standard TCM 300 [6] or a TCM 310 [7] module to be a repeater additionally to its original functionality. The configuration is available through HW interface (pin configuration) or through the UART interface (using ESP 3 Commands). Please see modules User manuals for details.

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3. RANGE EXTENSION THROUGH SENDER ID REPLACEMENT – ACTIVE REPEATERS

If you require a longer range than two repeaters can provide it is recommended to use gateways to translate the signal to a backbone system. Then use the back bone for longer range information transport.

In special cases the radio range can be extended by using „active repeaters“. Passive repeaters repeat the original telegram with no changes. Active repeaters change the telegram by entering a different Sender ID and so enable to repeat the telegram by another two repeaters.

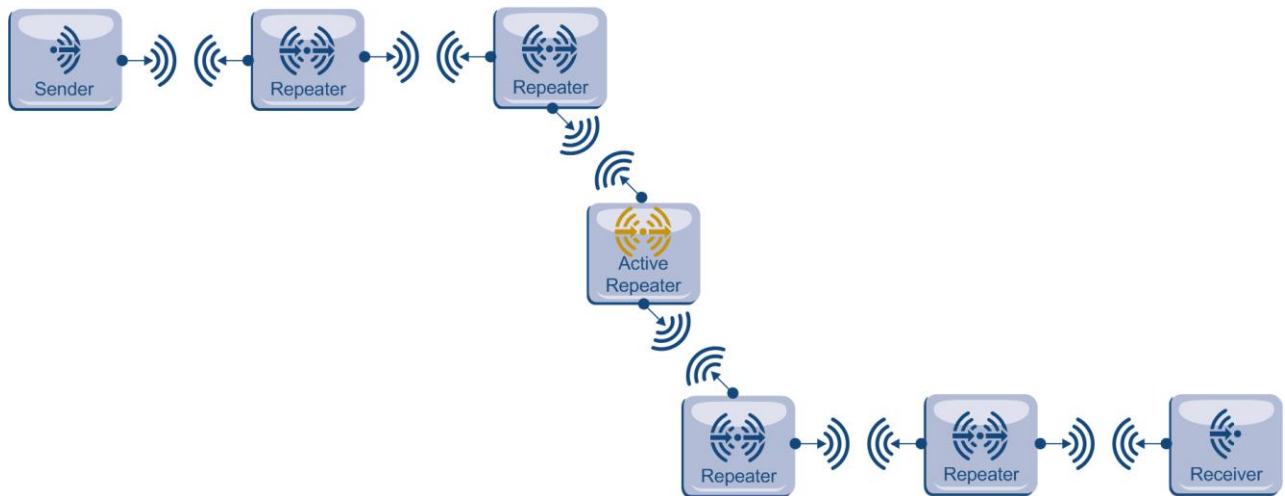


Figure 4 Range extension through active repeaters

In this scenario a teach-in has to be performed. The sender has to be taught to the active repeater and the active repeater to the receiver. Telegrams repeated by the active repeater will keep the data content so the receiver is still recognizing them as valid data telegrams.

The active repeater uses a sender ID based on his Base IDs. Since one device can transmit with 127 different IDs [3] –starting from Base ID - the active repeater can handle in this way up to 127 devices.

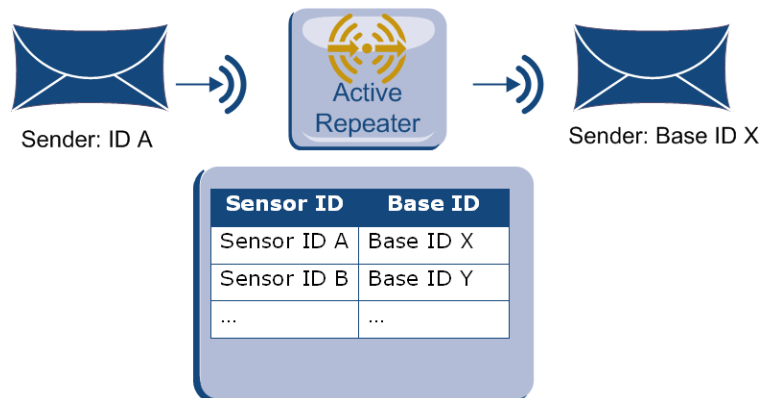


Figure 5 Active repeater translation

Active repeaters from BSC-BIER [8] route the radio signals of all EnOcean transmitters as described above. They offer also the possibility to declare a routing table and / or specify a

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route. The active repeater firmware is currently not available from EnOcean as standard firmware.

4. IDEA OF ENOCEAN ROUTERS

Routers are active network nodes that have knowledge of the network set up. The router routes a received telegram only if the router self is part of the route to the target device. Here we present one possible approaches in developing a net with routers. Given parameters of different networks, maybe another routing approach is more suitable to achieve optimal performance.

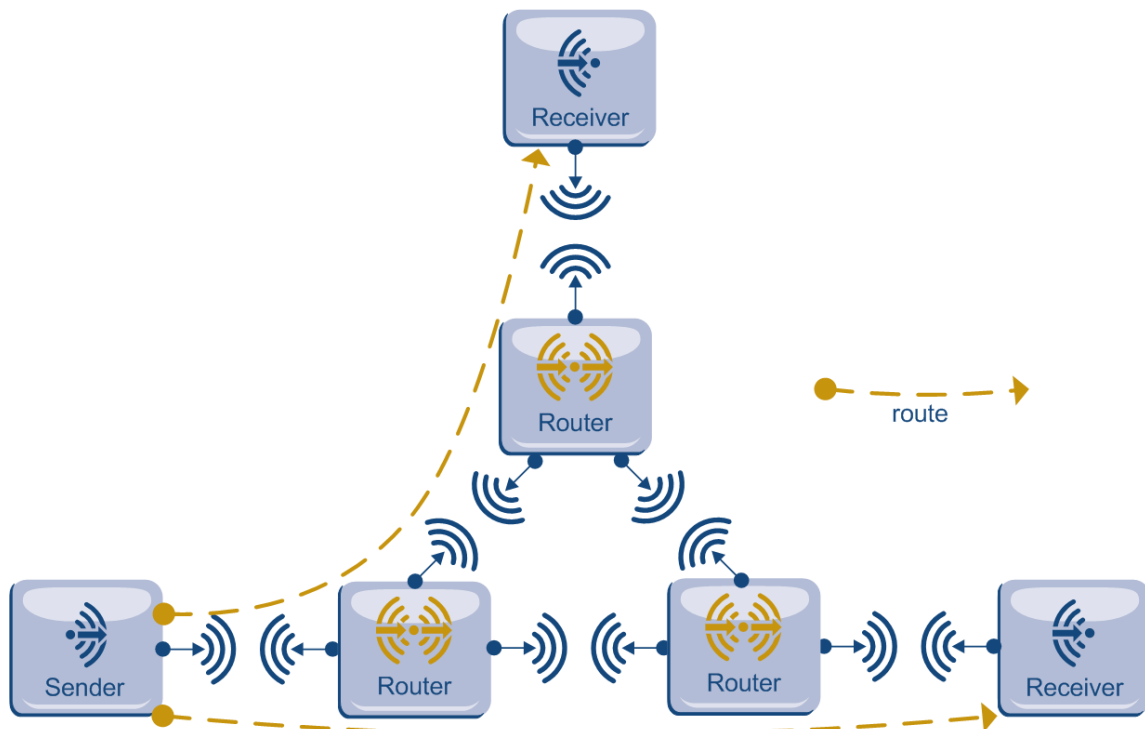


Figure 6 Net with routers

Basic approach is following:

1. Router recognizes the Destination ID and Sender ID of the telegram.
2. Based on the IDs router looks up its routing table and decides if the telegram should be routed or not.
3. Router enters its Sender ID into the Sender field.
 - a. If the router is the first in routing he moves the original Sender ID to a separate data field so the original Sender ID gets preserved.

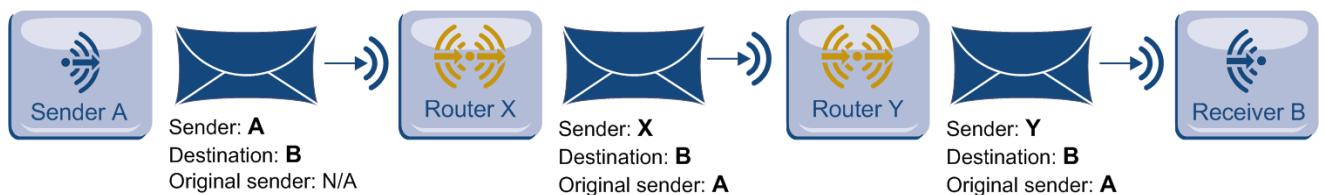


Figure 7 Route visualisation

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It is recommended to use a "hop count" or "time to live" field to prevent routing loops. To embed into a telegram this field and Original sender field you can use the MSC Telegram [2] [5] .

The algorithm of building routes and routing table exchange between routers is beyond the scope of this document. A suitable algorithm depends on the use case of the application and network structure. As the bandwidth of EnOcean Radio Protocol is optimized for low power consumption please consider early stage IP routing algorithms or simple algorithms for your approach [4]. A possible approach is also to use static routing with predefined routes.

The routers firmware is currently not available from EnOcean as standard firmware. For assistance in developing an routing mechanism contact EnOcean Support [9].

REFERENCES

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<http://www.enocean.com/application-notes/>
- [2] EnOcean Radio Protocol
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support@enocean.com

Disclaimer

The information provided in this document describes typical features of the EnOcean radio system and should not be misunderstood as specified operating characteristics. No liability is assumed for errors and / or omissions. We reserve the right to make changes without prior notice. For the latest documentation visit the EnOcean website at www.enocean.com.