Gr-EnOcean
An OOT for a Commercial IOT Protocol

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Why EnOcean

- EnOcean is a commercial IoT standard targeted for low power/solar powered sensors
- EnOcean protocol is an open standard - documentation is publicly available
- There are integration efforts with Aruba networks to combine the IoT sensor data to backend Wi-Fi access points
- EnOcean has some security being added, so having a base PHY level interface from GNU Radio could be useful
- It seemed like it would be fun

EnOcean Protocol

- There are 2 PHY level protocols for EnOcean
  - Amplitude-shift keying (ASK)
  - Frequency-shift keying (FSK)

- The FSK standard is the current main standard and the only one for which I could acquire sensors

EnOcean Protocol

General Specifications

The following table provides the key parameters for the EnOcean Radio Protocol 2.

Parameter	Min.	Value	Max.	Unit
Frequency Error	-18		-18	kHz
Modulation[1]		FSK		
Frequency Deviation	±55.0	±62.5	±70.0	kHz
Data Rate		125		kbps
Data Rate Tolerance[2]	-30		+30	ppm
PA Ramp-On Time			40	µs
PA Ramp-Off Time			40	µs
Coding		NRZ		
Code for 1		+62.5		kHz
Code for 0		-62.5		kHz

Figure 2

From EnOcean Radio Protocol 2 July 31, 2020

EnOcean Protocol

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EnOcean Frame

3.2 Frame Specification

The data to be transmitted is transmitted in frames. Each frame is preceded by a preamble for bit synchronization and the generation of the data slicing thresholds. After this a synchronization word is transmitted to enable the receiver to synchronize to the data bytes. The first byte transmitted after the synchronization word the length of the Data_PL. Its value is the number of the bytes transmitted in the Data_PL.

A complete frame is shown in the following diagram.

Figure 5

The following table provides the parameters for the frame structure.

Parameter	Value
Endianness	The MSB is transmitted first (Big-Endian).
Preamble	16 bit 0b1010101010101010 (0xAAAA)
Synchronization Word	16 bit 0b1010100100111100 (0xA93C)
Length	1st Byte, containing the number of data bytes.
Data_PL	Bytes containing the transmitted data.
Minimum Number of Data Bytes	1
Maximum Number of Data Bytes[3]	255

Figure 6

From EnOcean Radio Protocol 2 July 31, 2020

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EnOcean Serial

- The serial protocol is in the document
  EnOcean Serial Protocol 3 (ESP3) V1.51 August 12th 2020

- A Python program (EnOcean) can parse the serial protocol into meaningful data
  https://github.com/kipe/enocean

- The radio-based packet format must be modified to the serial interface to be used by the Python EnOcean program

EnOcean Protocol

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Gr-EnOcean

The code is available at

https://github.com/redwiretechnologies/gr-enocean

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Questions

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