Open Thesis / Project

Evaluating the Performance of BLE Mesh in the D-Cube Testbed

Thesis Type

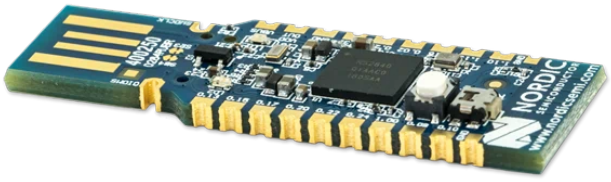
Master Project / Master Thesis

Motivation

Since its introduction, Bluetooth Low Energy (BLE) has become ubiquitous in the Internet of Things (IoT) context, as it enables a dependable short-range wireless communication despite the limited energy expenditure. BLE radios are nowadays indeed embedded in IoT devices such as smartphones, home assistants, light bulbs, door locks, and connected health products, just to name a few.

Whilst the classical BLE protocol targets networks with a star topology, a standard based on BLE that allows for many-to-many communication over a Bluetooth radio (BLE mesh) has recently emerged. Although BLE mesh is particularly attractive for industrial solutions and several IoT applications, its performance has rarely been benchmarked and compared to that of other mesh solutions such as those based on IEEE 802.15.4.

Our goal is hence to perform a systematic study of the performance of BLE mesh solutions. To do this, we can make use of our D-Cube testbed, a large-scale installation at ITI that represents the state-of-the-art in testing infrastructures for low-power networked embedded systems.



Goals and Tasks

Within this context, the student can explore several directions and perform different tasks, such as:

- Getting familiar with experimentation on our D-Cube testbed and on how to measure key performance metrics of BLE communication;
- Getting familiar with BLE mesh and its internals, exposing parameters that may strongly affect its communication performance;
- Compare the performance of BLE mesh with BlueFlood and other solutions based on IEEE 802.15.4;
- Improve the performance of BLE mesh based on experimental observations.

Target Group

- Students of ICE/Telematics;
- Students of Computer Science;
- Students of Electrical Engineering.

Required Prior Knowledge

- Knowledge of networked embedded systems;
- Excellent C programming skills;
- Experience with embedded platforms is a plus.

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