Open Thesis / Project

Comparing the Performance of Devices using Bluetooth Low Energy v4 and v5

Thesis Type
Bachelor Thesis / Master Project / Master Thesis

Motivation
Bluetooth Low Energy (BLE) is among the most ubiquitous low-power wireless technologies in the rapidly growing Internet of Things (IoT). Due to the increasing number of devices and the vast number of potential IoT applications (e.g., in smart cities, smart buildings, and connected health), wireless communication requirements are constantly changing and standards are being adapted accordingly. Devices compliant to the latest BLE specification (BLE v5.x) can enjoy longer transmission ranges and higher throughput compared to those using BLE v4.x. Furthermore, a direction finding (Angle-of-Arrival (AoA)/Angle-of-Departure (AoD)) feature was added in BLE v5.x, and many others. Since retrofitting devices can be both complex and costly, the industry is interested in evaluating how beneficial would it be to upgrade their products to the latest BLE specification. Therefore, our aim is to evaluate key performance metrics such as communication range, data throughput, and distance/direction measurement accuracy of BLE v5 in real-world scenarios, and compare them to BLE v4. **This topic is offered in the context of an industrial cooperation with CISC Semiconductors GmbH**.

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

- Getting familiar with BLE and the main differences between BLE v4 and v5;
- Performing experiments on low-power wireless devices to evaluate and compare key performance metrics such as communication range, throughput, and direction finding accuracy;
- Evaluating the advantages of upgrading industrial products from BLE v4 to v5 for different IoT applications.

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 and real-time operating systems (e.g., Contiki, Contiki-NG, or Zephyr) is of advantage.

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