A cost-effective and versatile sensor data platform for monitoring and analysis of building services - DTU Orbit (11/08/2019)

Conventional building management systems are costly to install in existing buildings. Building services fail, which results in a cascade of incorrect responses, or occupants and administrators misuse systems. A possible way to reduce the installation costs is to use wireless sensor networks (WSN) to monitor and control building services. Monitoring of building services provides several challenges. Access to the sensor nodes is intermittent and often requires coordination with building administrators or occupants, so the sensor nodes need sufficient battery power to last several months or years.

In this paper we describe a low-power low-cost generic sensor platform that can be configured to sense several variables at each node only by adding the sensors. With the platform, we are able to deploy a high-resolution monitoring system to identify and correct faults with sufficient battery power to last several years. The paper describes the developed hardware and software package that is used to sense data, transmit them, store them and visualize. The hardware components are without import restrictions to the European Union and all the software is free and open-source. All the choices are discussed and explained in the paper.

One major challenge is that the wireless network must transmit through building materials, such as concrete. Our development weighed the advantages of a low-bandwidth, long-range protocol like LoRaWAN against the advantages of a high-bandwidth, short-range protocol like Nordic nRF24L01+ or Zigbee, which may require several repeaters. Another challenge that was handled is security and encryption.

As such, the platform focuses on digital sensors that meet performance criteria, such as power consumption, stability, precision and accuracy.

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