Master Thesis Proposal: Design and Implementations of IoT Server and APIs

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Background

Internet-of-Things (IoT) has attracted enormous attention from both research society and industry. IoT aims to connect “the next billion (devices)” to the digital world, and most of the devices will be machines. The data produced by IoT is becoming valuable resources for individuals, business developers, and city administrations. Therefore, a complete IoT platform requires a cloud platform to 1) manage the data, 2) perform complex analysis based on large amount of data, and 3) provide access of information for applications. In the GreenIoT project, an IoT testbed will be implemented in the city of Uppsala. The devices connected to the testbed are environmental sensors, which measure the air quality of urban environment. The goal of this thesis is to design and implement a server and APIs for the GreenIoT testbed.

The System Architecture and Data Flows

A functional block diagram (example) of the Uppsala University server is illustrated in Figure 1. The server is located in the local UU cloud infrastructure. The data from sensor networks will be published to the server in JSON format via MQTT (a protocol designed for M2M communications). The applications will query the data (raw or processed) via HTTP connections to the server.

![Block Diagram](image)

Figure 1: A functional block diagram for the IoT server.

Tasks

1. Design and implement interfaces to support queries from applications.
2. Design algorithms to pre-process sensor data, for instance: i) infer unobserved air pollution values in both time and space domains; ii) calculate statistical information from the data.
3. Creativities are highly encouraged in this thesis. Feel free to propose and implement your cool ideas (databases design and management, data mining, communication delay evaluation, etc.).