Analysis and Evaluation of Bluetooth Mesh

Introduction

As we focus in this course in Next Generation Networks, our group would like to concentrate on a rising technology: Bluetooth Mesh Networking. The official Bluetooth webpage states:

> "Bluetooth mesh networking enables many-to-many (m:m) device communications and is optimized for creating large-scale device networks. It is ideally suited for building automation, sensor network, asset tracking, and other IoT solutions that require tens, hundreds or thousands of devices to communicate with one another."
>
> (https://www.bluetooth.com/learn-about-bluetooth/bluetooth-technology/topology-options/le-mesh/mesh-faq/)

Not only it is related to our NGN course but also represents a fundamental standard in the Internet of Things (IoT) world.

Analysis

Our project aims at understanding how to Bluetooth standard works combined with a meshed used of the network. Moreover, we want to create an application to show and test the actual capabilities of the technology. Therefore, the work does not only focus on presenting the topic but also on applying at it our own ideas. In our case it will be a simple chat environment that enables the communication between two devices and their bridge. Finally, an evaluation in form of a network analysis will enlighten the hidden workflow of the standard.

Scenario

As described in the previous paragraph we will create our own environment. Three devices constellate the meshed network. On the edges two smartphones/laptops/tablets will send and receive signals from the bridge located in between of these two, represented by a microcontroller like Arduino (with BLE module) or Raspberry Pi.

Smartphone 1 ------- Arduino/Rasp Pi ------- Smartphone 2

On the application level we will develop a chat between the two Smartphones. The bridge will regulate and pass the messages to the receiver, creating a meshed service via Bluetooth. This scenario can be also extended to more devices.

Workflow

Our initial intention is to study how Bluetooth Mesh works and how to establish a simple network. This will require a study period followed by a home-test with devices like smartphones and laptops. We'll probably deliver this part all of us individually, due to the COVID crisis.

Anamah, Fischer, Parmigiani

Secondly, we will apply our new knowledge for the configuration of the bridge (Arduino or Raspberry) and the creation of the meshed network. This part can be completed after receiving or purchasing the hardware.

Meanwhile the chat application will take shape and will be adapted to the Bluetooth Mesh requirements. In this part we still have to define the environment we are going to use and the related servers, protocols and coding language.

Finally, once the concepts show its first results, we will be able to perform and network analysis, showing how the hops between the devices work and the role of the central bridge.

Tasks Division

As we are in the middle of the Coronavirus crisis, our workplan remains mostly uncertain. Below we will describe a possible and meaningful scenario that involves the use of hardware and the chance of meeting all together to perform analysis and evaluation.

1) Study and Analysis of Bluetooth Mesh - All together, everyone from home

2) Configuration and creation of the Bluetooth Mesh Network of the single devices - Alessandro

3) Chat Application - Theodor

4) Network Analysis – Samuel

Notice that it is just an initial proposal and that we will probably cooperate on the different tasks to help each other and learn as much as possible.