

LTE-signal repeater for fjeld environment

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Information Technology, Hardware and Product design

Introduction

The subject of this project was to make a proof-of-concept of a LTE-signal repeater system for Finnish Lapland environment.

The idea was to design two stations (“Up” and “Down”) that form a Wifi-bridge and thus Wifi would be available on a fringe area, so that in order to make an emergency call one wouldn’t have to travel for many kilometres to get reception.



FIGURE 1. The entirety of “Up” -station

Architecture

The “Up” station receives the LTE-signal from the nearest radio tower. The signal goes through a router and is then transmitted to the “Down” station through a Wifi-bridge formed by the Nanobeams. From the Nanobeam at the “Down” station the signal goes to a Mesh modem, where the Wifi-signal is broadcasted around the immediate area.

Both stations have their own power supplies which consist of a battery and a solar panel.

Methods

We were given a suggestion for the parts used by the employer. We made sure everything would work the way they are intended to and that the requirements were met. Then we made a test strategy, assembled the stations and did a field test with the set up.

Project management

We had some challenges due to the Coronavirus outbreak, but despite not being able to use a professional work space we were able to finish the project almost in time. One Nanobeam broke right before testing, so the finishing of the project got delayed by a week.

Results

The connection between the Nanobeams was of a “good” quality in the field test environment, where the distance between the stations was about 500 m; the RSSI was measured -70 dBm.

The measured download and upload speeds were steadily 40 Mbps and 30 Mbps respectively.

The measured energy consumption matched with the estimates made beforehand.

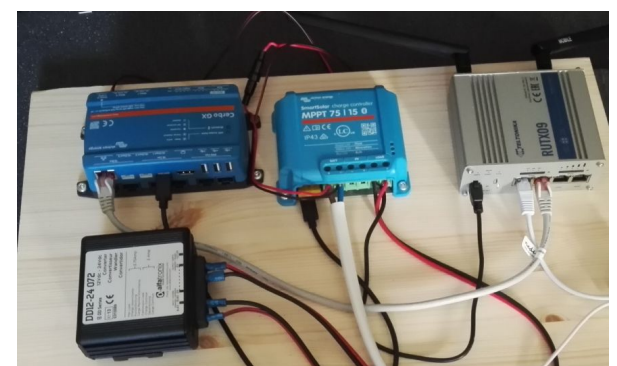


FIGURE 2. Inside of the “Up” station box

Conclusions

Based on the test results, in theory the establishment should be suitable for the real conditions, where the distance between the stations is 3 km; the RSSI goes down only about 6 dBm.