Wireless Network and Computer/Communications Lab
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BACHELOR/ MASTER'S THESIS

Influence of Mobile Base Stations on Network Performance

Background

The demand for fast cellular connections is growing enormously with the ever-increasing amount of devices that exchange data. While the network traffic is highly dynamic and dependent on the time of day, the conventional network infrastructure is not: Base stations are mounted in fixed places, not allowing for any quick and temporary scalability. If the network gets too congested, it can't perform as desired anymore, resulting in lost transmitted messages. Reliable and fast transmission of messages is a requirement in order to enable safety-related use cases, for example autonomous driving or assistance systems such as cooperative awareness and the transmission of high-quality video streams in real time.

A naive solution would be to increase the amount of base stations. While this would improve the capacity and the coverage, it would be very expensive for network providers to install and operate the additional base stations. A more flexible approach is to mount base stations on vehicles. Doing so, the amount of base stations increases with the amount of vehicles that are currently participating in traffic, dynamically increasing the network's capacity when required.

Thesis Goals

The goal of this thesis is to create simulations in OMNeT++ using Veins and simu5G in order to find out how mobile base stations influence the overall network performance. In order to answer this, a parameter study is required in which the percentage of vehicles carrying base stations is varied. To conduct this story, the option to have mobile 5G base stations in Veins needs to be implemented. Metrics to quantify the network performance need to be determined. First, an idealized scenario (freeway) is supposed to be used. Additionally, a more realistic scenario should be used. The percentage of vehicles equipped with mobile base stations should be variable, ranging from 0 % (no mobile base stations) to 100 % (mobile base stations on all vehicles).

Milestones

- Enable the usage of mobile base stations in simu5G and Veins
- Define metrics that can be used to determine the network performance for this use case
- Create a simulation in a simple scenario where vehicles can operate as MoBS
- Use a realistic scenario
- Evaluate the results and discuss the feasibility of the approach for different percentages of vehicles operating as MoBS

Required knowledge (or willing to learn)

- Good programming skills (C++)
- Experience using OMNeT++, Veins
- Ideally, experience using Simu5G, INET (not a must, but helpful)

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