

## MASTER'S THESIS

### Handover in Dynamic Mobile Base Station Scenarios

#### 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.

This approach creates new problems that need to be solved. One of these problems is to find an algorithm that decides how handovers are managed: User equipment (UE) needs to connect to some base station, but now has various options. Is it beneficial to connect to the mobile base station that is passing by, or is a connection to the core network better?

In previous work, this issue has been studied for passengers of busses [1]. However, UEs outside the bus were not able to connect to this mobile base station. While this work considered LTE for the connection from UEs to the mobile base station, we want to study the feasibility of such an approach using 5G.

#### Thesis Goals

The goal of this thesis is to create simulations in OMNeT++ using Veins and simu5G in order to find out how handovers of User Equipment can be handled efficiently in the context of mobile base stations. An algorithm that decides which base station is the best to connect to should be developed.

#### Milestones

- Enable the usage of mobile base stations in simu5G and Veins
- Define metrics that can be used to determine the handover performance
- Design an algorithm that makes decisions for handovers
- Create a simulation in a simple scenario where vehicles operate as MoBS that UEs can connect to
- Use a realistic scenario
- Evaluate the results and discuss the feasibility of the approach

#### Required knowledge (or willing to learn)

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

#### References

- [1] A. Mastro Simone and D. Panno. New challenge: Moving network based on mmwave technology for 5g era. In *2015 International Conference on Computer, Information and Telecommunication Systems (CITS)*, pages 1–5, 2015.