Bachelor's Thesis

Network Planning for the Future Railway Communications
This work thesis focuses on the exploration of networks enabling train control and on-board data communications. Today, low bandwidth networks such as GSM, providing less than 200 Kbps are being used to transmit train control information. Moreover, despite trains may use multiple on-board technologies to provide users with an internet connection (e.g., repeaters, access points), they fail in their attempt as these connections are characterized by having low throughputs (less than 2 Mbps) and frequent service interruptions.

This thesis aims at the development of a network planning solution enabling future applications in train mobility scenario such as: Automatic Train Operation (ATO) [1,2,3], leveraging cloud technologies and meeting bandwidth requirements of data-hungry end-users' applications. Here special attention will be given to the planning of the access network composed of Access Points (APs) and (edge) data centers along their connection to the core network for the German inter-city railway system. It is expected of the student to find solutions to the following questions:

- Where to place network components such as APs and (edge) data centers?
- How to interconnect the network components?

Given:

- Trains mobility patterns
- Service requirements in terms of bandwidth, delay, and reliability levels.
- Mobile network operators
- Core network

The results from this master's thesis can be useful to get an insight on requirements for Smart Transportation Systems, that may in turn be useful for cementing the basis of other scenarios such as: Autonomous Driving and Tele-Operated Driving.


Prerequisites

Basic knowledge in:

- Radio Access Networks
- Channel estimation
- Integer Linear Programming (ILP)
- Programming skills (Python)

Advisors

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