Latency and Reliability Guarantees in Multi-domain Networks

One of the aspects not covered by 5G networks are multi-domain networks, comprising one or more campus networks. There are private networks, including the Radio Access Network and Core Network, not owned by the cellular operators like within a university, hospital, etc. There will be scenarios in which the transmitter is within a different campus network from the receiver, and the data would have to traverse networks operated by different entities.

Given the different operators managing the “transmitter” and “receiver” networks, providing any end-to-end performance guarantees in terms of latency and reliability can pose significant challenges in multi-domain networks. For example, if there is a maximum latency that a packet can tolerate in the communication cycle between the transmitter and receiver, the former experiencing given channel conditions would require a given amount of RAN resources to meet that latency. The receiver, on the other end of the communication path, will most probably experience different channel conditions. Therefore, it will require a different amount of resources to satisfy the end-to-end latency requirement. Finding an optimal resource allocation approach across different networks that would lead to latency and reliability guarantees in a multi-domain network will be the topic of this thesis.

The approach used to solve these problems will rely on queueing theory. A good knowledge of any programming language is required.

Supervisor: Dr. Fidan Mehmeti