Sustainable Core Networks in 5G with Performance Guarantees

With the advent of 5G cellular networks, more stringent types of traffic, pertaining to applications like augmented reality, virtual reality, and online gaming, are being served nowadays. However, this comes with an increased energy consumption on both the user’s and network side, challenging this way the sustainability of cellular networks. Furthermore, the in-network computing aspect exacerbates things even further in that direction.

Hence, it is very important to provide end-to-end sustainability, i.e., minimize the energy consumption in the network while maintaining performance guarantees, such as the maximum latency each flow should experience. This can be done, for example, depending on the traffic load in the network, and in order to keep the energy usage at low levels, the operator can decide to shut off certain network components, like User Plane Functions (UPFs) or edge clouds, and reassign the tasks to other entities.

In this thesis, the focus will be on the core network. The aforementioned decisions will come up as solutions to optimization problems. To that end, the student will formulate optimization problems and solve them either analytically or using an optimization solver (e.g., Gurobi). The other part would be conducting realistic simulations and showing the improvements with our approach.

Prerequisites

- Basic understanding of 5G Core Networks and Mobile Edge Computing (MEC).
- Experience with mathematical formulation of optimization problems.
- Programming experience with Python and Gurobi.

Advisors

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