Master Thesis - Application-Level Impacts of Dual-Connectivity

Background
Designing networks that strive to optimize end-users’ Quality of Experience (QoE) is extremely important. Of all the traffic carried over the Internet today, video streaming services account for around 60% of the downstream data volume. Owing to the expected increase in adoption of on-demand, live, augmented, and virtual reality streaming services, this share is only expected to surge in the near future. This thesis will investigate how Dual-Connectivity (DC) could be optimized for video streaming services, in terms of providing the users with the best possible QoE. As 5G will initially be deployed using EN-DC (E-UTRAN-NR-DC), understanding its impact on streaming services is extremely important.

Thesis Description
This thesis will characterize the impact of dual-connectivity, and the different optimizations that can be performed specifically for video streaming clients. It is well known that video streaming clients exhibit specific characteristics and network demands that are atypical of any other service on the Internet today. The main research questions for which the benefits and the associated cost will be characterized are:

- Characterize EN-DC (i.e., Secondary Node (SN) addition/removal during streaming) behavior in live 5G network comparing mid-band and high-band SN addition and performance
- Under what streaming-specific scenarios should dual-connectivity be used with streaming clients?
- Several providers/operators limit streaming clients to a certain bandwidth (thresholds that limit viewer’s video quality). Characterize and propose policies for clients that are capped/not capped, what heuristics or policies should be used?
- How should the network behave when there are poor/degrading radio conditions?
- Compare behavior in different locations, e.g., Line-of-sight (LOS), weak LOS and non-LOS (NLOS)
- Dual-connectivity’s impact on bandwidth boosting (temporary removal of caps for higher data rate)?

Qualifications
This project is aimed at students in computer science, electrical engineering, computer engineering, or similar. Background in wireless communication with good analytical skills is preferred.

Extent
1-2 students, 30hp each

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Keywords
Python, Matlab, C++, Java, Mobile Telecommunication, Optimization, Modelling.

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