Master Thesis – Enhanced radio scheduling for eXtended Reality (XR) applications in 5G and beyond-5G networks

Background

Extended Reality (XR), which includes Cloud Gaming (CG) and Augmented/Virtual/Mixed Reality (AR/VR/MR) applications, is a key use case for 5G and beyond-5G systems. In order to satisfy XR requirements in terms of high throughput and low latency, while also reducing the energy consumption of consumer devices, several challenges are yet to be addressed. In particular, XR applications require the transmission of multiple size-varying and quasi-periodic data flows (e.g., video, audio, control/signaling, and pose traffic) in both downlink and uplink, thus calling for significant improvements in the scheduling and resource allocation mechanisms currently used at the radio access level.

Thesis Description

This thesis will explore the possibility of proposing and validating, analytically and/or by simulation, enhanced mechanisms for scheduling and resource allocation in 5G and beyond-5G radio access networks, aiming at meeting the quality of service/experience required by XR services. The first step will be to perform a comparison between existing mechanisms for scheduling and resource allocation in 5G New Radio, such as dynamic scheduling, semi-persistent scheduling, and configured granting, under different XR traffic scenarios and conditions (e.g., in terms of network load and infrastructure deployment). The comparison will form the basis for the derivation of enhanced mechanisms tailored on XR use cases, e.g., an optimal combination of the above solutions. The use of machine learning and artificial intelligence schemes will also be considered (e.g., for traffic prediction), in order to further optimize the proposed schemes.

Qualifications

Knowledge of mobile communication systems (4G, LTE, 5G NR), knowledge of programming languages (Matlab, Python), preferred knowledge of network simulators (e.g., ns-3, OMNeT++), preferred knowledge of Machine and Deep Learning schemes (e.g., Reinforcement Learning)

Supervisor

Giuseppe Caso, Ericsson Research
Anna Brunstrom, Karlstad University

Location

TBD