Adaptive server control for a low-latency application over the cellular network

Master Thesis @ Ericsson

Background

With the introduction of the 5G and 6G networks, we will see a new paradigm of applications such as massive multi-player cloud gaming, XR gaming, and remote-controlled robotics to name a few. This new class of applications will require a low and predictable end-to-end latency to ensure a good quality-of-service.

To achieve this, we are investigating a solution within our mobile networks called L4S (low latency, low loss, scalable throughput). This will allow us quickly detect when there is a congested traffic scenario in the mobile network (for instance if too many applications are sending too much traffic) and react to it.

Whenever a congested scenario is detected, our L4S-solution will send a congestion-signal to the application servers. The idea is then that the application servers should adapt their traffic rate so that the congested scenario (and thus also a high latency) can be avoided. This will in turn ensure that the applications receive a predictable and low end-to-end latency.

The remaining question, and the focus of this thesis work, is then how these "L4S application servers" should be designed and controlled.

Objective

This master thesis work is about investigating how a "L4S application server" should be designed and controlled. To do this, we suggest an approach where the work includes:

- *Deriving a high-level mathematical model of the end-to-end system,*
- *Design a controller for the "L4S application server",*
- *Investigate how latency, throughput, and other design choices, affect the stability and controllability of the system,*
- *Implement a simulation of the system in Matlab (or other simulation tools) to test and verify the design choices as well as to compare with other state-of-the-art solutions.*

Qualifications

We are searching for two students that are focused, creative, and knowledgeable in control theory, signal processing, and programing. Preferably the students should have some experience in Matlab and Simulink or similar simulation framework (such as Julia / Java / etc).

For more information please contact

Victor Millnert
Phone +46730956617
E-mail: victor.millnert@ericsson.com