Master Thesis –
Personal Hot-Spots in Rural 5G networks

Background
The 5th generation new radio (5G NR) network is designed to deliver unprecedented levels of capacity, transmission rates, and reliability. The focus on 5G NR development has so far been on relatively short-range communication using high frequency bands (e.g. millimeter wave-length) where lots of spectrum is available. For extremely long-range communication (e.g. in rural areas) high frequency bands are less suitable due to the high signal attenuation.

Area coverage in rural areas is fundamentally limited by the deployment cost for the operator. One way to enable increased coverage in rural areas is to allow end users to deploy their own personal, mobile and local hot-spot nodes that connect to the cellular network. A personal rural hot-spot can make use of higher transmission power and have better antennas than what normal user terminals can be equipped with. In this master thesis work you will study the network impact of such enhanced end user equipment. For example, how much larger distance between base stations can be used in the network if we assume that high data rates are only provided to personal hot-spots while normal user terminals are only served with a much lower data rate? And how much can the energy consumption in the network be decreased if we dimension the network deployment for advanced and high power personal rural hot-spot nodes rather than normal user terminals? Is it more cost efficient to deploy the network with very advanced and high gain antennas in the base stations than to enhance the radio signal close to the user with a local hot-spot?

Thesis Description
The master thesis involves performing a literature survey on rural coverage solutions, implementation of relevant methods and models in a system simulator and to generate and analyze system simulation results.

Qualifications
This thesis aims at Master of Science (civilingenjör) students in electrical engineering, computer science, or computer engineering. This thesis requires good programming skills in Matlab, Java, Python, or C++, to perform the evaluations on the routing algorithms. Background in telecommunication is preferred.

Extent
This position is for one student. Scope is for 30 university credits (Swedish högskolepoäng).

Location
Ericsson AB Mjärdevi, Linköping

Preferred Starting Date
Spring 2019

Keywords
Routing algorithms, 5G, NR, Integrated Access and wireless Backhaul

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