Master Thesis – Understanding Carrier Aggregation Combinations

Background
To increase the data-rate in LTE (Long Term Evolution – 4th generation of mobile networks) a mobile phone can aggregate data from multiple carriers (for example different frequencies). This is called carrier aggregation.

There are very many possible combinations to consider when selecting carriers for aggregation (and we will probably only get more combinations in the future). Evaluating all of the combinations might be too time consuming, but a simple solution which selects the best carrier one at a time might not find the combination with highest performance.

In order to properly evaluate the way to select carriers, complex simulations are needed to consider several realistic deployments with several bands, their bandwidths, their antennas, different types of UEs, throughput based on propagation, and so on.

However, one of the issues with carrier aggregation is understanding the problem in itself. Which combinations are possible? Which are not? Would a simple solution lock in on a less useful solution very quickly or would it come close to the full search solution?

Thesis Description
The goal of the master thesis is twofold. The first part is to visualize the possible carrier aggregation combinations in realistic deployments. The second part is to develop and evaluate algorithms for selecting carrier aggregation combinations. A well-performing algorithm should find the combination with highest performance (e.g. maximum bandwidth) and scale well with many possible combinations (low time complexity).

Qualifications
Valuable skills are:

- Knowledge in Python, MATLAB or similar
- Knowledge in graph algorithms, network algorithms and time complexity evaluation is beneficial
- Understanding of telecommunications, wireless communications and cellular networks
- Good communication skills in English

Extent
1-2 students, 30hp each

Contact Persons
Linnea Faxén
+46 72 594 87 36
linnea.faxen@ericsson.com

Ove Linnell
+46 10 711 51 36
ove.linnell@ericsson.com
Location
Ericsson AB Mjärdevi, Linköping

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Contact Persons
Linnea Faxén
+46 72 594 87 36
linnea.faxen@ericsson.com

Ove Linnell
+46 10 711 51 36
ove.linnell@ericsson.com