Karlsruhe Institute of Technology

HoreKa

Institute for Automation and Applied Informatics (IAI)

ENERGY LAB 2.0

Master Thesis

Distributed Powerflow with High Performance Computing

Solving the power flow problem in a distributed fashion empowers different grid operators to compute the overall grid state without having to share grid models - this is a practical problem to which industry does not have off-the-shelf answers. To end this, we provide Open Source Matlab code for “Rapid Prototyping for Distributed Power Flow (rapidPF)”: a fully matpower-compatible software that allows to generate Matpower case files for distributed power flow problems, and solve the problems by using a distributed optimization algorithm, i.e., the Augmented Lagrangian based Alternating Direction Inexact Newton method (ALADIN). Our previous research shows that the ALADIN algorithm has a locally quadratic convergence rate and is of great potential for handling large-scale systems. In this master thesis, the algorithm for distributed load flow calculation shall be implemented on the HoreKa computing cluster.

Tasks:

- Analysis of the rapidPF code
- Evaluation and Benchmarking on a Matlab Server
- Investigation of the possibilities for HPC code porting considering GPUs
- Parallelization of the rapidPF algorithm and comparative analysis

Qualification:

- Energy systems especially power grids and optimization methods
- Very good programming skills in Python, Matlab and ideally GPGPU
- Profound knowledge in programming with HPC systems (MPI, OpenMP)

We offer:

- Excellent support from the ESA and OC group at IAI
- Access to HoreKa cluster within the ESA-HPC project

If you are interested in the topic, please contact:

Hüseyin Çakmak (cakmak@kit.edu)
Xinliang Dai (xinliang.dai@kit.edu)

Earliest start: As of Now!

Kontakt: Dr. Hüseyin K. Çakmak
Arbeitsgruppe Energiesystemanalyse (ESA)
E-Mail: hueseyin.cakmak@kit.edu

Institute for Automation und Applied Informatics (IAI)
Karlsruhe Institute of Technology, Campus North
Hermann-von-Helmholtz-Platz 1
76344 Eggenstein-Leopoldshafen