Master Thesis

Scaling of coupled energy system simulations with High-Performance Computing

Motivation:

In order to counteract the effects of climate change, new strategies must be developed to ensure a secure energy supply. An essential way to test these in advance is to carry out simulations. Simulation software therefore plays a major role in designing the energy systems of the future.

The Energy Systems Analysis (ESA) group is conducting research into a software framework for co-simulation, among other things. A co-simulation allows different energy domains (e.g. electricity, heat, gas) to be coupled together in one simulation.

For a high scalability of the co-simulation, the execution on a computing cluster is necessary. For this purpose, the existing software architecture is to be adapted to the HoreKa HPC system as part of this master's thesis.

Tasks:

- Data exchange in a co-simulation with MPI
- Development of a hierarchical co-simulation approach
- Investigation of the scalability of coupled energy system simulation using a generic co-simulation model example
- Analysis of the runtime behavior

Expected knowledge and skills:

- Studies in computer science
- Programming languages: Python, Java
- Knowledge in parallel computing (Unix, Jobs, MPI)
- Basic knowledge of energy systems and corresponding software is an advantage
- Independent and results-oriented way of working

We offer:

- Excellent supervision by the multidisciplinary working group Energy Systems Analysis (ESA) at IAI, KIT-CN
- A training period of up to 2 months is possible
- Thesis language German or English

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