Digital Twin of our campus' electricity grid

Studies: BSc Electrical Engineering, BSc Technical Computer Science

We are reviving our ideas of building a digital ecosystem, a digital twin, of our own University of Twente (UT) campus. With "the campus as a living lab", we can collectively conduct research in a Team Science effort and by that collectively make this campus a leading example for cutting-edge technology to make her a better place through various projects that build on top of each other.

As part of the joint efforts, to be executed under the UT's Climate Centre, we wish to develop a digital twin of the electricity grid of the campus. When linked to data sources, such as the UT Energy Dashboard, it allows for detailed analysis of energy behaviour, carbon footprint, awareness, etc. For us as researchers it also allows us to interact with the datasets in real-time more easily, e.g. to test and integrate new control algorithms for distributed systems in reality. One of the examples of the past is the control of electric vehicle charging at our SlimPark facility, the solar carport at the parkinglot next to the Paviljoen building.

Assignment
For this digital twin to work, you will create a model of the UT campus electricity grid. Many properties of the cables are available, e.g., through diagrams and digital models developed by the Campus Facility Management (CFM) of the UT. These grid models need to be integrated in an appropriate simulation tool (also called power-flow simulators), such as the PowerGridModel tool developed by Alliander, but alternatives exist as well. Next, load profiles need to be integrated from the UT's energy data website (https://energydata.utwente.nl).

Research Questions:
- Is it possible to create a live digital twin of the UT campus with available data sources?
- What are the data and processing time limitations of such a live digital twin?

Objectives:
1. Investigate the data sources available for such a digital twin and identify potential shortcomings;
2. Discuss and prioritize needs, objectives, and requirements for the digital twin;
3. Investigate and choose the appropriate grid simulation tool that fits to the objectives and the data;
4. Create a model that takes the live data from a few sources;
5. Demonstrate the simulation;
6. Create documentation that allows others to continue your work;

Work Division
- Investigation: 10%
- Theory: 25%
- Coding: 25%
- Evaluation: 15%

- Writing: 25%

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