

Development of the Software Interface for the TUM Smart Energy Systems Laboratory

Motivation and Background

In the CoSES Research Laboratory at TU Munich we investigate advanced thermal-electric sector coupling techniques, using optimizer tools to efficiently distribute energy among various resources. The key feature of our laboratory is an experimental microgrid that seamlessly integrates electrical, thermal, and communication networks.

One of the challenges we face is implementing new optimization strategies within our LabVIEW/VeriStand framework. This system is important for managing the physical hardware in our lab but integrating new strategies into it can be a complex and time-consuming task.

To streamline this process and facilitate the rapid testing of future optimization strategies, we are in need of a robust communication interface. Such an interface would allow software controllers to directly interact with LabVIEW, and consequently, with the real hardware in the lab. The implementation of this interface will significantly enhance our lab's capacity to manage and conduct real-time experiments in thermal and electrical energy coupling. This advancement is not just a technical improvement, but an essential step in advancing our research capabilities.

Tasks and Milestones

The objective of this work is to design and implement a communication bridge between external smart energy management applications and our LabVIEW/VeriStand control layer, which orchestrates the lab's physical equipment. The following tasks and milestones are proposed:

1. Examine relevant communication protocols, such as the OPC UA standard used for industrial settings and analyze requirements for the interface
2. Conceptualize and develop a communication interface between LabVIEW and external applications with an automation in setup and documentation
3. Ensure the interface's functionality through automated testing and thoroughly document each development phase
4. (Optionally) Develop a synchronization tool to coordinate when which data points are sent / received for online control

Requirements

- Strong programming skills and extensive knowledge of communication protocols
- System integration knowledge, preferable with LabVIEW environments
- Familiarity with energy systems and experience with LabVIEW and NI VeriStand platforms are beneficial
- Strong problem-solving skills and the ability to work independently in a structured manner

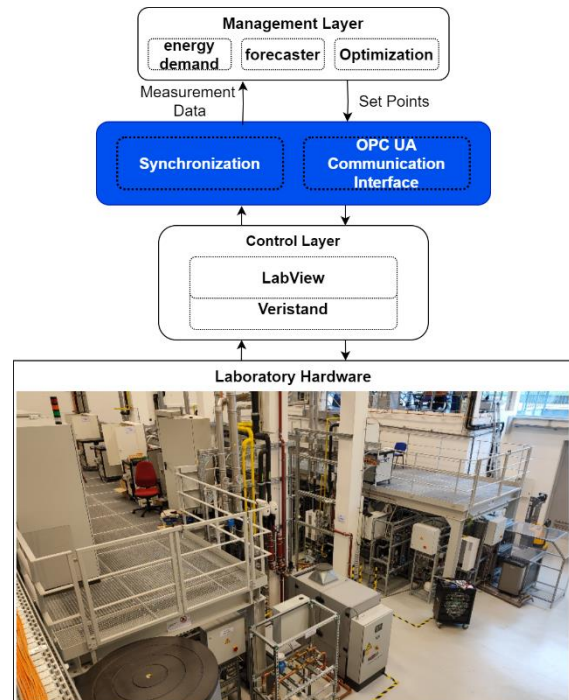


Figure 1: Overall communication structure of the laboratory. The interface to be developed is shown in blue.

Application

If you are interested in working on this or a related topic, please contact Ulrich Ludolfinger or Saltanat Kuntuarova and state your motivation as well as your relevant prior knowledge and qualifications.

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