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Research Project:
»Automated Creation of Containernet Infrastructures«

As part of digitization in energy systems, more and more systems are being interconnected and replaced by IP-based communication. In the field of energy supply, this affects a large number of technical processes that are to be monitored and controlled in a decentralized manner. The use of suitable communication devices offers a number of advantages, such as improved monitoring and better integration of processes into higher-level systems for network operation management, but also some disadvantages, such as a higher risk for overall IT security. The aim is to take a holistic view of the interaction between the network and the electrical grid without physical mapping, using a virtualization approach with the most accurate mapping of reality as a tool. A first coupled approach consisting of a real-time electrical grid simulation and a container-based virtualized network infrastructure using IEC 61850 services has already been developed. Within the approach, the Containernet tool is used, which is based on Mininet and uses Software-Defined-Network (SDN) approaches in combination with container-based virtualization using Docker to map the substation functionalities. This approach can be used to map existing infrastructures into a virtualized infrastructure with integration of the real communication paths. IEC 61850 related substations consists of a data model using XML based Substation Configuration Language (SCL) with different description files. The Substation Configuration Description (SCD) files defines the integrated Intelligent Electronic Devices (IEDs) and their communication behavior.

Within this research project, an approach for an automated creation of Python based Containernet configuration on basis of SCD files will be developed with respect to possible different configuration descriptions.
The starting point for the scientific investigation of the topic is a comprehensive literature research to determine the current state of science and technology on the following points:

- Container-based virtualization using Docker
- Network Function Virtualization (NFV) using Mininet and Containernet
- IEC 61850 related SCL format
- Conversion of XML Files to Python Scripts

Based on the research, a first converting approach with respect to necessary extracted information from the substation configuration should be developed to create Containernet Configuration files.

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