Abstract

Nowadays there is a significant increase in decentralized power generation utilizing renewable energy sources. With this, distribution automation systems (i.e. grid control and monitoring functionalities) are also becoming decentralized to support the next generation of power systems. Since this automation architecture greatly relies on Information and Communication Technology (ICT) infrastructure, it is exposed to cyber-attacks. Therefore, research for a resilient design of grid distribution automation is required.

This thesis contributes to this by proposing a novel approach of performing secure and distributed migration of grid control functionalities between substation automation units (SAUs) by utilizing blockchain technology and related concepts such as smart contracts.

At first, it is explained how smart contract can improve the grid automation resiliency. Then an algorithm is proposed for the migration of control functions between SAUs, which is implemented via smart contract. Furthermore, the Hyperledger Composer (along with Hyperledger Fabric) framework is used for building the blockchain application. Lastly, the working functionality of blockchain application is tested and performance evaluation is performed.