Karlsruhe Institute of Technology

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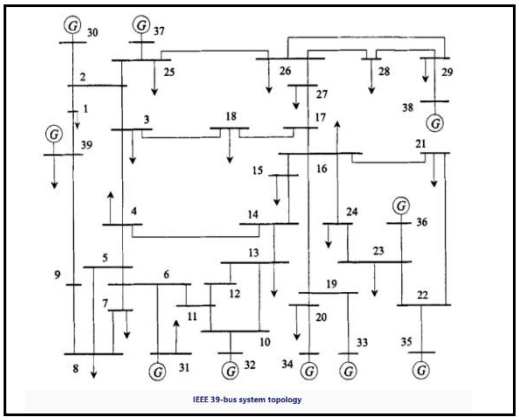
KASTEL

Project / Bachelor's Thesis / Master's Thesis
Determining GNSS spoofing impacts on the energy grid
KASTEL Security Lab Energy

Scientific Title: Impact Analysis of Time Manipulation Attacks on the energy Grid

Welcome to the Secure Energy Systems (SES) Research Group! The highlighted objective of "Secure Energy Systems (SES)" working group is about the cyber-physical security of energy systems. The working topics cover a broad range from hardware to the communication structure in Smart Grids (SGs).

The emergence of renewable energy sources implies a volatility -in particular on the distribution grid- which is addressed by increasing digitization and data analysis. Phasor Measurement Units (PMUs) measure the time shift between voltages (so-called phase angles) at different positions in the grid. To make use of these measurements, time accuracy of few micro seconds is required which is normally provided by GNSS synchronized receiver clocks. It has been shown, that time manipulations of using GNSS spoofing is possible and hence the reported phase angles can be changed. The aim of this thesis is to evaluate the impact on state estimation using simulations with different false data injections. Different state estimation algorithms and several IEEE model networks will be used to determine the state estimation error. Additionally, simple bad data detection schemes will be addressed.



We offer

- Interesting tasks with the possibility of contributing to scientific publications
- Close supervision

Requirements

- Student in Computer Science or electrical engineering
- Motivated to work with Matlab simulation of networks (matrix representation of state estimation)
- Completed Energy Informatics lecture/seminar

Tasks - The proposed thesis consists of the following **main tasks**

- Familiarization: State estimation algorithms, Phasor measurements
- Test Cases: setting up simulation framework, applying existing state estimation algorithms, running experiments on different models with different underlying measurements due to time attacks
- Analysis: obtaining the computed estimated state and compute numerical deviations, investigating circumstances in which the attack can be most dangerous

We are happy to answer any questions you might have. If you are interested, contact us via email to sine.canbolat@kit.edu and clemens.fruboese@kit.edu including current transcript of records and a resume/CV. **A prior HiWi time can be arranged to get more familiarization with the topic.**

Contact Data

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