Real-Time-Simulation of Power Grid on OPAL-RT Simulator

Objective:

The Real-Time Simulator tools have high computing technologies with improved performance.The advancement of the software tools like MATLAB/SIMULINK with its Real-Time Workshop (RTW) and Real-Time Windows Target (RTWT), real-time simulators are used extensively for design and improvement of electrical systems.OPAL-RT is a Real-Time Simulator which is used in both industry and academia.

The aim of this project is to simulate a Smart grid (IEEE-14-Bus distribution network) with smart meters in OPAL-RT and will implement privacy preserving streaming algorithm in the smart meters in order to prevent adversaries from compromising energy consumers' personal privacy.

1.Carry the real-time simulation of Smart Grid by means of OPAL-RT with CRO and other hardware.
2.Design the Controller of the Smart Grid which regulates the switch on/off of the generators depending on the load demand. If the load increases , the controller switches on the reserve generator for supplying the increased demand. If there is any fault in the network, the faulty part should be disconnected from the rest of the distribution system for preventing cascading failures of the lines.
3.Observe the performance of the network with the introduction of fault at various locations. The waveforms of voltage, current, active and reactive power are observed in the MATLAB simulation environment and on the CRO.
4.Compute Load Flow Analysis (LFA) of IEEE-14-Bus network using MATLAB/Simulink power-gui load flow tool.
5. Implement privacy preserving streaming algorithm in the smart meters of the Smart grid in order to prevent adversaries from compromising energy consumers' personal privacy.

Evaluation Guidelines:

- Implementation (60%)
- Project Report (20%)
- Project Presentation (20%)

Reference Paper:

Real-time Co-simulation Platform using OPAL-RT and OPNET for Analyzing Smart Grid Performance

Privacy Preserving Smart Meter Streaming Against Information Leakage of Appliance Status

Important link:

https://www.opal-rt.com/power-systems-overview/