

Integrated Learning Environment for Cyber Security of Smart Grid

PIs: Weichao Wang (UNCC), Wenzhan Song, Yi Pan (GSU), and Le Xie (Texas A&M)

<http://webpages.uncc.edu/wwang22/Research/projects/SmartGrid/index-smartgrid.html>

1. Objectives

- Develop an integrated simulation framework of smart grids for security education;
- Design and implement a suite of course modules and hands-on exercises;
- Contribute to the establishment of an education and training pipeline for information security workforce in future power industry;

2. Motivations

- More than ten university level critical infrastructure research centers have been established; however, the corresponding education programs fall behind in many aspects;
- A serious challenge to the training of qualified workforce to fill tens of thousands of positions in the fast evolving smart grid industry;

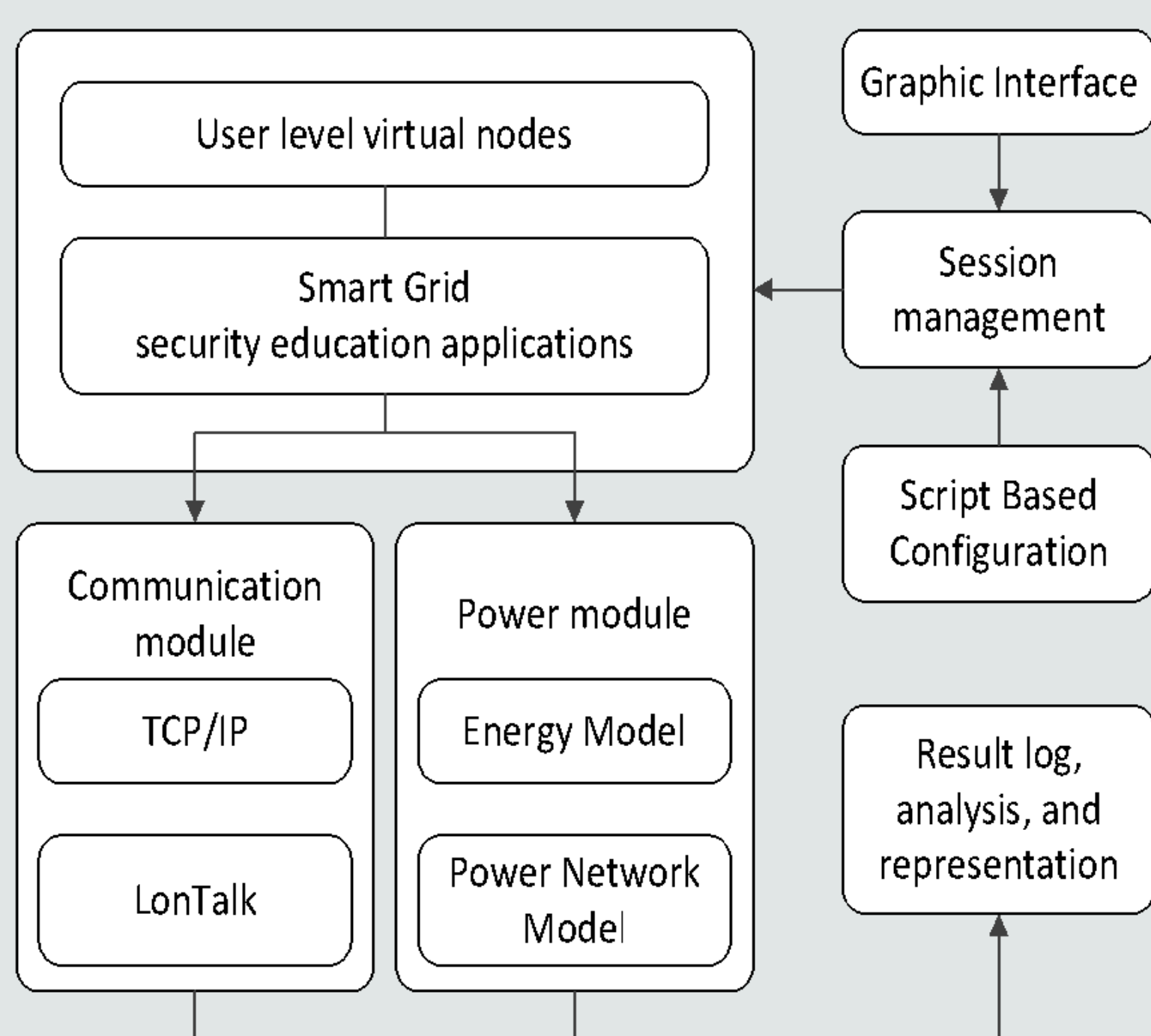
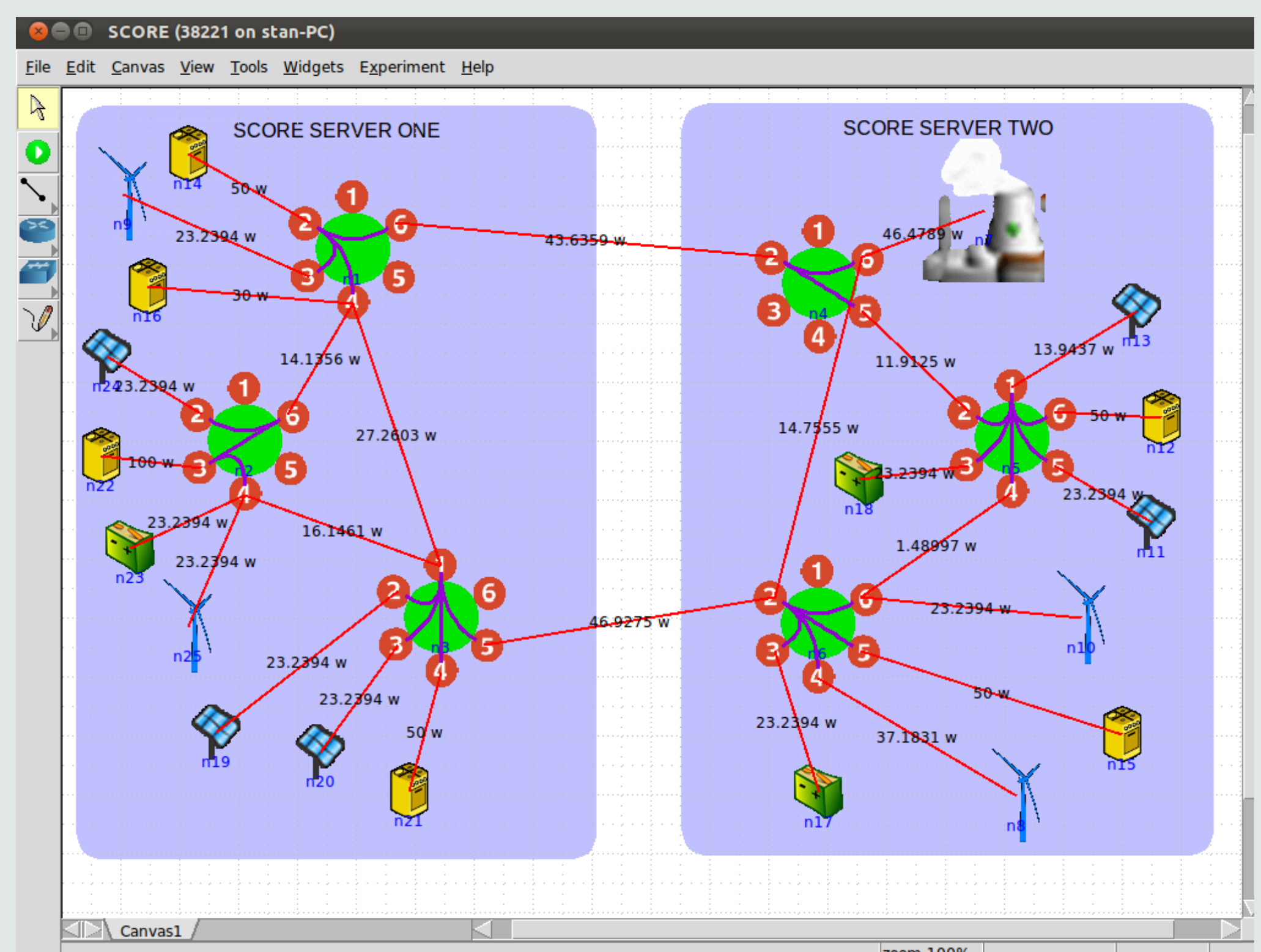


Figure 1. Architecture of the simulation environment.



3. Materials and Adoption

- Three course modules on “Basics of Smart Grid Security”, “Data Security in Smart Grids”, and “Network Security in Smart Grids” are developed;
- Course modules are adopted by “Principles of Information Security and Privacy” (UNCC) and “Network Security” (GSU)

4. Evaluation Results

- About 90 students participate in the evaluation in two years at two universities;
- Evaluation instruments include surveys, interviews, and tests;
- Both self-efficacy and self-regulated learning behaviors are assessed;

	Self-Efficacy (Pre)	Self-Efficacy (post)	Self-Regulation
Average (deviation)	2.92 (1.00)	3.60 (0.66)	3.87 (0.58)

	Pre	Post	t-test
Attack on Grid stability	3.00 (1.15)	3.76 (1.06)	3.87 (0.58)
DDoS attack on Grid	3.10 (1.25)	3.35 (1.10)	2.34