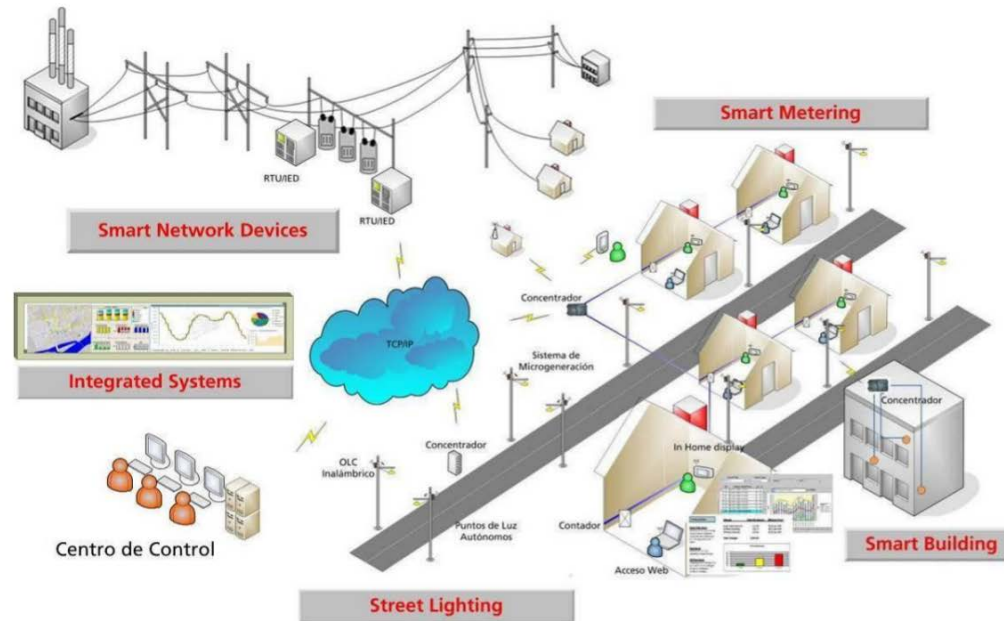




Certifiable, Scalable, and Attack-resilient Submodular Control Framework for Smart Grid Stability

- Linda Bushnell, Radha Poovendran, Daniel Kirschen, Andrew Clark
- University of Washington, Worcester Polytechnic Institute
- <http://www.ee.washington.edu/people/linda-bushnell/>
- LB2@uw.edu
- CNS-1544173

Description



Smart Grid as societal-level CPS

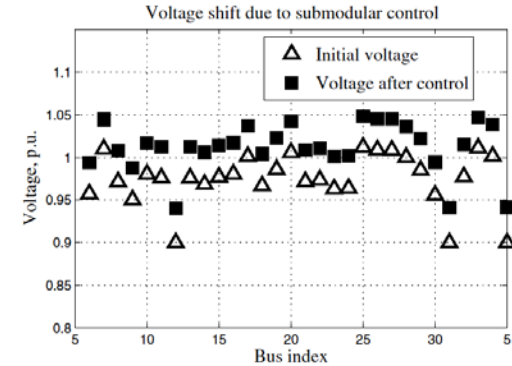
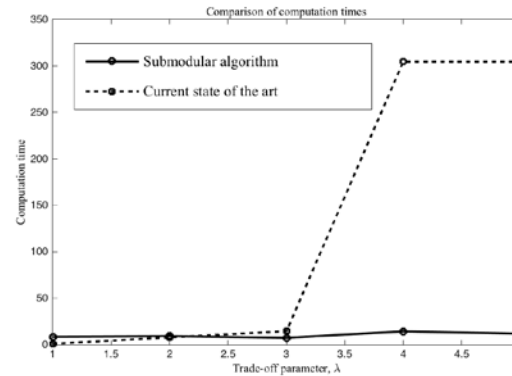
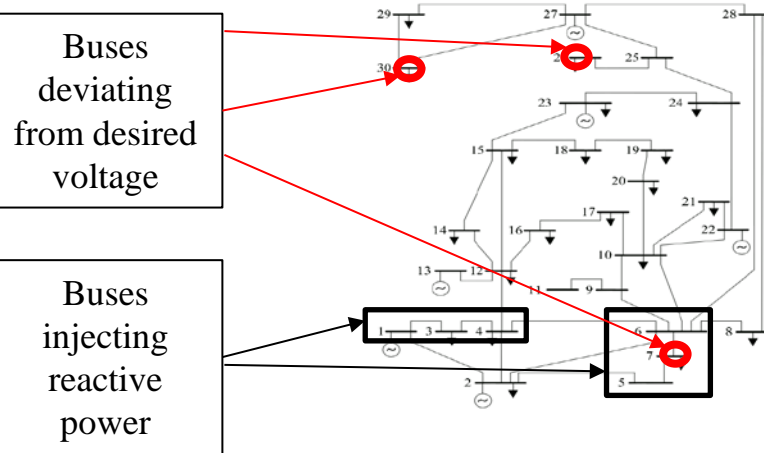
Focus: (1) Load voltage stability, (2) rotor angle small-signal stability, (3) transient stability

Research challenge: Ensuring stability with increasing demands and volatile renewable energy sources via scalable algorithms

Our approach: Discrete set optimization framework

Result: Computationally efficient algorithms with stability guarantees

Findings



- 1) Voltage stability: 20 fold reduction in time to compute reactive power injections on IEEE 30-bus network compared to current state of the art
- 2) Small-signal stability: Reduction in number of generators needed to ensure stability on IEEE 39 bus network
- 3) Transient stability: Achieved generation-load imbalance within $\frac{1}{4}$ of optimal solution on IEEE 39-bus network