



Project Title

CPS: TTP Option: Synergy: Collaborative Research: Hardening Network Infrastructures for Fast, Resilient and Cost-Optimal Wide-Area Control of Power Systems

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Description

Research Challenges for Wide-Area Control of Large Power Grids

- Time-scale for computation

Real-time computing

Fast numerical algorithms

- Communication constraints and threats

Multi-cast, Routing

Large inter-area delays

Privacy of control gains

DoS attacks

- Control

Ensure sparsity

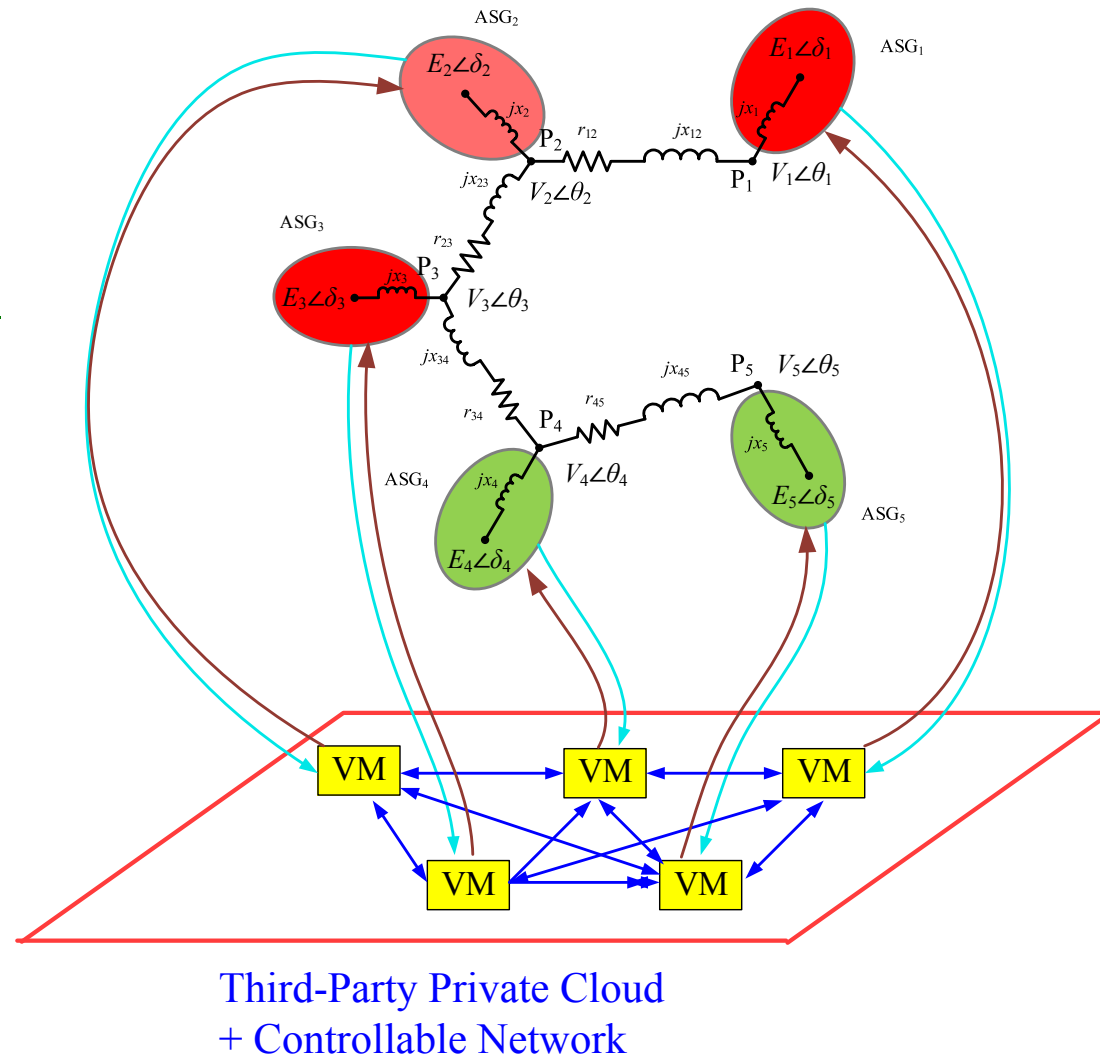
Accommodate delays

Maintain privacy

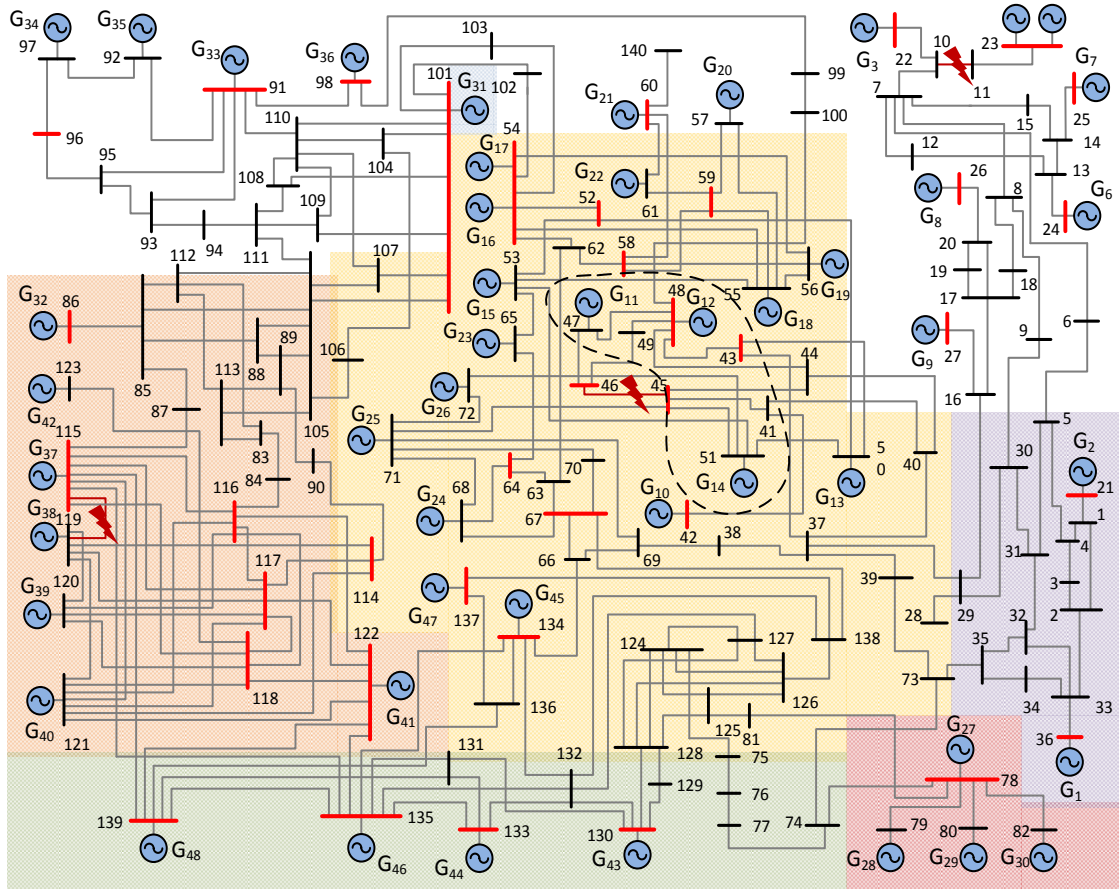
Use distributed computation

Utilize output measurements

Close the loop between cloud networks and the US power grid



Findings



- Physical topology of the grid often exhibit strong clustering structure
- This structure can be used for sparsification of communication graph
- As much as 70% sparsity can be obtained for only a 5% loss in closed-loop performance
- Structural information changes with location and intensity of disturbances. So will the communication graph.

For more info about our CPS smart grid testbed at NCSU, please see [project website!](#)