



TRANSFORMING GRID OPERATION AND PLANNING

Future Power Grid Initiative Newsletter

April/May 2012

This month, researchers from FPGI expanded their networks to NERC, ISOs and universities across the country and received additional grid data for testing their research projects.

HIGHLIGHTS & ACHIEVEMENTS

This April, the team around Focus Area three's Ning Lu has expanded its working relationship with a leading independent system operator. ISO New England supplied the team with power system data that the researchers will now analyze for irregularities and abnormal patterns in support of their development of the MDART, or Multi Layer Data Driven Advanced Reasoning Tool for Smart Grid Integrated Information Systems. Additionally, the team developed a prototype reasoner based on data quality and integrity check scenarios. Focus Area three teams have also outlined a path to integrating the three research projects.

Focus Area two's Peter Hui travelled to Portland, Oregon to give a talk at Oregon State University about his formal, automata-based model for verifying real-time properties. The talk outlined the work towards an automation-based system for formal verification of real-time properties in a parallel system. Peter illustrated the background of the computational models used; including timed variants of both traditional finite-state automata and omega-automata. Peter made additional faculty contacts and met with a potential summer intern.

Gariann Gelston and Angela Dalton from Focus Area Three were invited to talk at the NERC ORS meeting at Duke Energy in Charlotte, North Carolina on May 8th. They provided an overview of their web-based interactive multi-organizational power grid decision making process. Gariann and Angela invited participants of the subcommittee meeting to use the site and gathered feedback to inform their research.

Upcoming Papers

- Ning Lu, Pengwei Du, Xinxin Guo, Greitzer, FL. "Smart Meter Data Analysis," submitted to the IEEE Transmission and Distribution conference and Exposition 2012, Orlando, FL, USA, 2012. May
- Yan Liu, Wei Jiang, Shuangshuang Jin, Mark Rice, Yousu Chen. "Distributing Power Grid State Estimation on HPC Clusters: a system architecture prototype," Submitted to IPDPS 2012, PNNL-SA-83180. May
- Selim Ciraci, Oreste Villa, "Ser++: An Automatic Framework for Object Serialization Code Generation", submitted to Compsac 2012. July
- Ning Lu, Pengwei Du, Frank Greitzer, Xinxin Guo, Ryan Hohimer, Yekaterina Pomiak, "A Multi-layer, Data-driven Advanced Reasoning Tool for Intelligent Data Mining and Analysis for Smart Grids," submitted to the 2012 IEEE PES General Meeting, San Diego, CA, USA, 2012. July
- Shuangshuang Jin, Yousu Chen, Mark Rice, Yan Liu, Ian Gorton, "A Testbed for Deploying Distributed State Estimation in Power Grid," Submitted to IEEE PES General meeting 2012, PNNL-SA-84535.
- Tom Ferryman, David Haglin, Maria Vlachopoulou, Jian Yin, Chao Shen, Frank Tuffner, Guang Lin, Ning Zhou, and Jianzhong Tong, "Net Interchange Schedule Forecasting of Electric Power Exchange for RTO/ISOs," Submitted to IEEE PES General meeting 2012. PNNL-SA-84231.

FPGI FOCUS AREAS

Focus Area One addresses data networking and management issues, and enables the digital infrastructure for the future grid. This focus area will address the gaps in networking and real-time data management by developing advanced algorithms and software tools and techniques. **Focus Area Leads:** Bora Akyol (bora@pnnl.gov) and Phil Craig (philip.craig@pnnl.gov)

Focus Area Two targets research in the areas of advanced mathematical models, next-generation simulation and analytics capabilities for the power grid. Projects in Focus Area Two will use high-throughput data streams produced by projects in Focus Area One and integrate them with sophisticated mathematical models to conduct large-scale power grid simulation and analysis. Focus Area Two strives to advance the state-of-the-art in modeling

and simulation in order to achieve much higher fidelity situational awareness and global comprehension for power grid stability, efficiency and flexibility. **Focus Area Leads:** Daniel Chavarria (daniel.chavarria@pnnl.gov), Tom Ferryman (tom.ferryman@pnnl.gov), and Ning Zhou (ning.zhou@pnnl.gov)

Focus Area Three aims to convert large amounts of model and sensor data into information and knowledge to support decisions in grid operation, planning, and policymaking. This area concentrates on the development of coordinated visualization interfaces and decision support capabilities in a modular, extensible software environment that can be used for both real-time grid operations as well as long-term planning. **Focus Area Leads:** Bill Pike (william.pike@pnnl.gov) and Paul Whitney (paul.whitney@pnnl.gov)

ABOUT FPGI

The Future Power Grid Initiative (FPGI) will deliver next-generation concepts and tools for grid operation and planning and ensure a more secure, efficient and reliable future grid. Building on the Electricity Infrastructure Operations Center (EIOC), the Pacific Northwest National Laboratory's (PNNL) national electric grid research facility, the FPGI will advance the science and develop the technologies necessary for meeting the nation's expectations for a highly reliable and efficient electric grid, reducing carbon emissions and our dependence on foreign oil.

Contact

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