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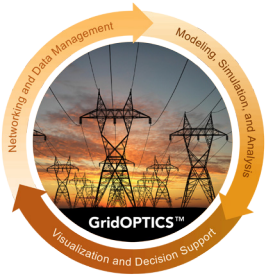


Shared Perspectives: Actionable Visualization Tool for Power Grid Situation Awareness

OBJECTIVE

Sustainable, efficient power grid operations rely heavily upon real-time information transparency and wide area situation awareness (SA) for all organizations in the power grid. This research addresses the fundamental need for greater SA through actionable visualization tools that:

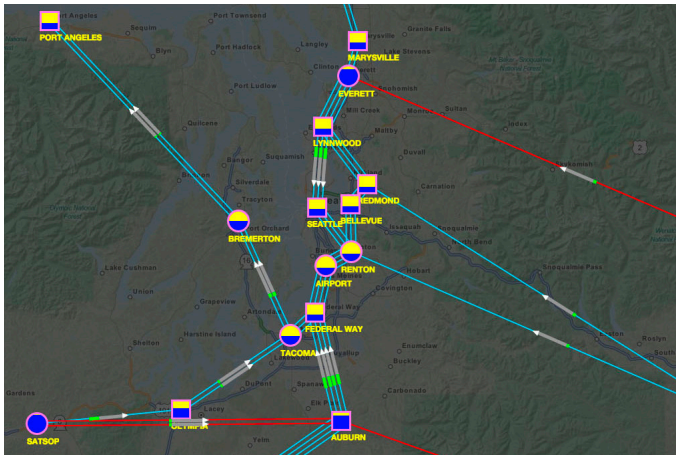
- increase the effectiveness of communication between organizations
- support inter-organizational planning and problem solving efforts
- integrate information from domains external to the power industry (e.g., weather) with power grid information so that organizations have a better awareness of events that can impact grid stability.

APPROACH

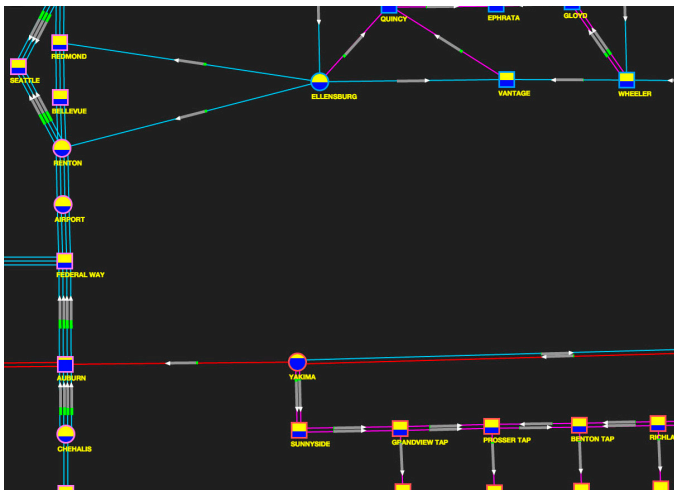
This effort supports the need for external SA through:

- design of a new visual communication mechanism that allows organizations to securely and flexibly share information across organizational boundaries
- development of new visual analytic strategies that incorporate germane information from domains outside of the power grid: e.g., weather, political/social, cyber, etc.
- development of an extensible front-end software architecture that readily supports integration of new, multi-type information from multiple sources (e.g., other power organizations).

This integrated functionality is supported through a new application called “Shared Perspectives” (SP), which is based on a scalable web architecture that supports a highly interactive collection of visualization components. SP results



This GIS-based image of the Shared Perspectives interface depicts the state of three fictional utilities that are working to solve a standing phase angle event



This schematic-based image of the Shared Perspectives interface depicts the state of three fictional utilities that are working to solve a standing phase angle event

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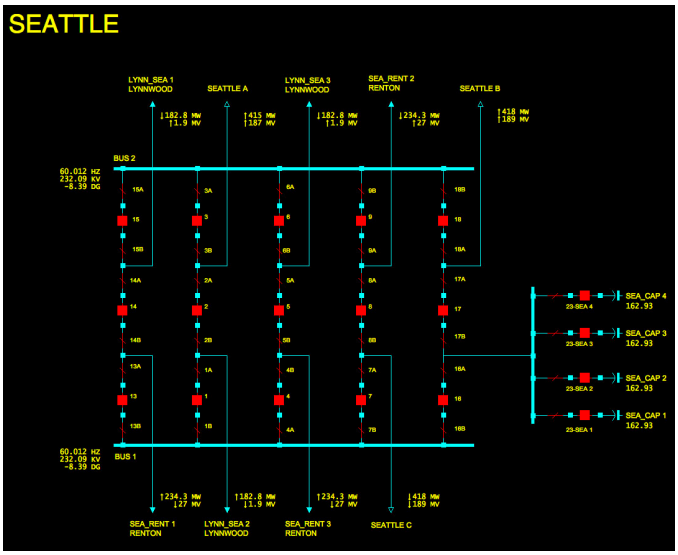
in a more reliable grid from the standpoint of real-time operators and planners, based on wide-area situational awareness across multiple infrastructure, public service and safety domains, leading to quicker and more confident decisions and actions. The SP application was developed through Pacific Northwest National Laboratory's Future Power Grid Initiative (FPGI) and is part of the GridOPTICS™ tool suite.

IMPACT

Operators communicating across organizations often depend (exclusively) on telephones to create a foundation of common understanding. For non-critical situations, this communication medium is sufficient. During critical and complex events, however, relying exclusively on verbal communication can result in miscommunications that lead to incorrect assumptions about events and even disastrous consequences. The tools developed through this research effort have and will continue to:

- broaden the conduit of communication between organizations through a common, shared visual perspective
- allow organizations to flexibly build a common understanding of events through the secure sharing of information and visualizations.

Improved communications were evident in a 2014 two-day user study that evaluated the SP application on two different scenarios: Scenario A—a standing phase angle scenario, and Scenario B—an islanding restoration scenario. On the study's first day, participants were allowed to use the SP tools on Scenario B but not on Scenario A. On day two, a different set of participants performed the same tasks but under inverse instructions. Analysis of data gathered from the user study indicates that when the SP application was used in real-life scenarios, both sets of participants reduced their response times and demonstrated increased situation awareness in comparison to scenarios where SP was not available.



This image depicts a view of a substation that is being monitored in the Shared Perspectives interface

ABOUT GRIDOPTICS™

The Grid Operation and Planning Technology Integrated Capabilities Suite (GridOPTICS™) is the core product of Pacific Northwest National Laboratory's Future Power Grid Initiative which concluded in 2015. GridOPTICS™ tools are designed to securely collect and manage data in real time, use data to drive modeling and simulation, and convert large volumes of data to actionable information. GridOPTICS™ concepts and tools show and analyze grid performance at an unprecedented speed, scale, and resolution and support operational and policy decision-making for the grid of the future. A key emphasis is on transitioning GridOPTICS™ tools to open-source status, supported in their future development and use by a "community" including PNNL, other national labs, academia, vendors, and utilities.

For more information, please visit the GridOPTICS™ website or contact:

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