Project Partners

- Dominion Virginia Power
- Oklahoma Gas and Electric
- Southwest Power Pool
- Northwestern Energy
- Bonneville Power Administration
- Virginia Tech
- T&D Consulting Engineers
- Grid Protection Alliance
- DOE – Office of Electricity
openECA Project Summary
A better way to connect phasor data to analytics

Objective
To develop an open-source software platform that enables the production use and facilitates the development of analytics that use high-fidelity synchrophasor data

2-Year Project Schedule
October 2015 – September 2017
- Final design – 6/30/16
- Alpha Version – 3/31/17
- Demonstration Begins - 6/30/17
- Version 1.0 released - 9/15/17

Project Status
Project Awarded Sept. 2015

Value of Award
$ 5.0 M
(< 2% funds expended to date)

Prime
Grid Protection Alliance
Business Value to the Industry

- Lowers cost of addition of new production analytic tools
- Simplified end-to-end configuration and change management
- Improved availability of phasor data with greater visibility of phasor data quality
- Robust scalable solution to support phasor data infrastructure of any size
- Complements current phasor data architecture and supports integration with other data sources such as SCADA
Value to Research Community

• Allows research community to focus on development of new techniques and tools and not on learning how to build information interfaces

• Removes barriers to installation of newly developed research tools in production software environments
Development Approach

- **Build upon existing open source solutions** - Leverage GPA’s production-grade open-source code base to create an open source application suite under a permissive license.

- **Develop a standard interface** - Provide a “Common Analytics Interface” (CAI) where “data structures” are made available for subscription.

- **Detect Bad Data Early** - Create a multi-tier bad data detection and correction system with alarming services.

- **Create “3rd Generation” Data Exchange Methods** - Provide secure phasor data exchange using a next-generation version of the Gateway Exchange Protocol.

- **Include Visualization Tools** - Develop a visualization tool optimized for testing and verification of analytic results.

- **Test and Refine** - Test the CAI with 9 provided analytics at five utility partner locations – and seek more demo locations.
Analytics Development is Simplified

Today’s Approach

• “Signal” paradigm
• Use C37.118
  ▪ Socket management
  ▪ Protocol parsing
  ▪ Exception handling
• Local data buffering to support analytic cycle times
• Local configuration management

Using openECA

• Both standard and custom data objects
• An API that provides
  ▪ Hi-performance pub/sub data access using standard messaging (e.g., Zero MQ)
  ▪ Access to meta data services
  ▪ Local data buffering options
• Starter templates provided
  ▪ Matlab
  ▪ F#
  ▪ C#
openECA Architecture

IEEE C37.118

Data Conditioning

Common Analytics Interface

RESULTS

Shared Platform Services
openECA Architecture
Project Provided Analytics

• Real-Time Analytics
  ▪ Oscillation Detection Monitor (ODM)
  ▪ Oscillation Mode Meter (OMM)
  ▪ Topology Estimation
  ▪ PMU Synchroscope

Plus – within the platform
Linear State Estimation

• Control Analytics
  ▪ Regional Volt-Ampere-Reactive (VAR) Control

• Off-Line Analytics
  ▪ Dynamic PMU Transducer Calibration (Automated, Periodic Use Case)
  ▪ Line Parameter Estimation (Ad-Hoc Use Case)
  ▪ Synchronous Machine Parameter Estimation (Research Use Case)
  ▪ Acceleration Trend Relay (ATR) Improvement (Research Use Case)
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