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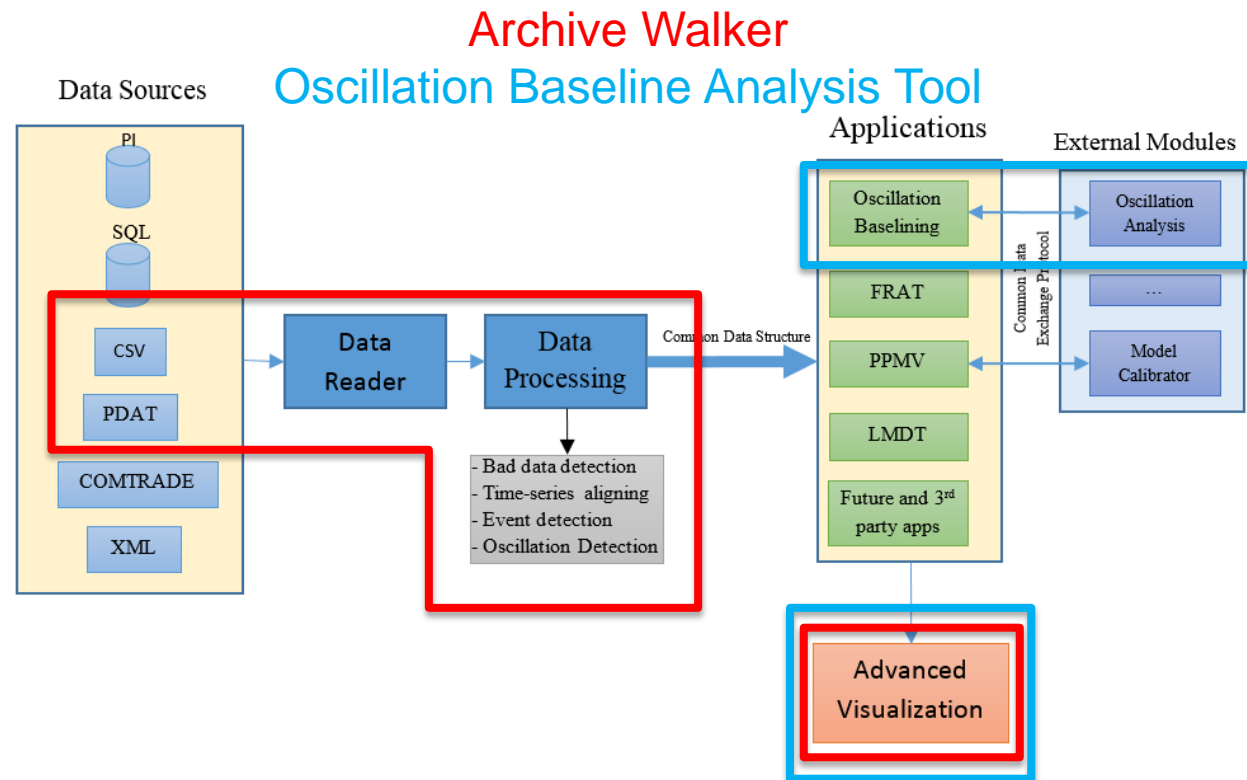
PMU Data Archive Walker and Event Detection Application

FRANK TUFFNER, JIM FOLLUM, TAO FU, AND PAVEL ETINGOV

North American Synchrophasor Initiative (NASPI) Working Group Meeting
Performance, Requirements, Standards, and Verification Task Team
Seattle, Washington – October 19-20, 2016

Open Platform for Engineering Applications

- ▶ Based on Open Source Components
 - Extended WPF Toolkit™
 - OxyPlot
 - Math.NET
- ▶ Create building blocks and solutions for future and 3rd party applications
- ▶ Common data structure and data exchange protocols
- ▶ Support external modules/solvers
 - Oscillation Analysis
 - Model Calibration



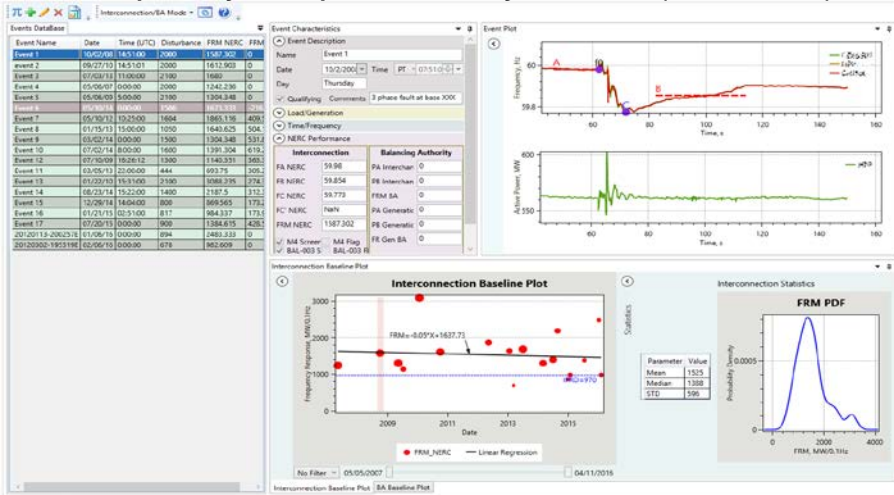
Applications based on the Open Platform for Engineering Applications



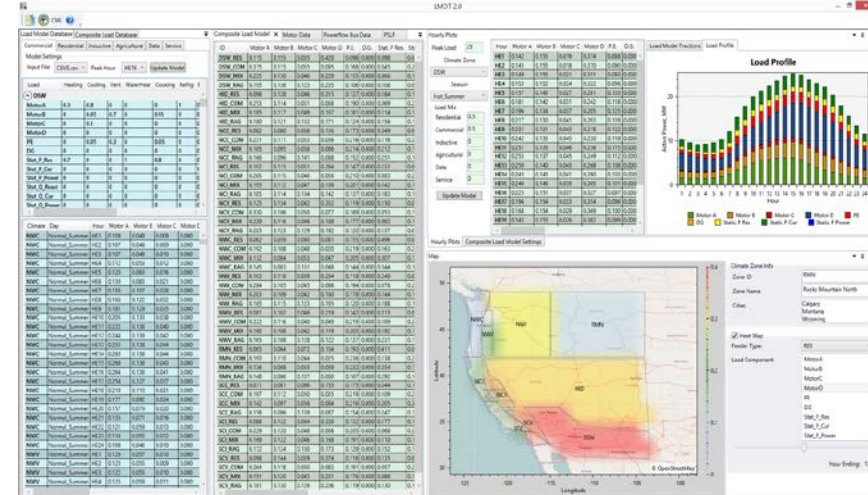
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Frequency Response Analysis Tool (FRAT 2.0)



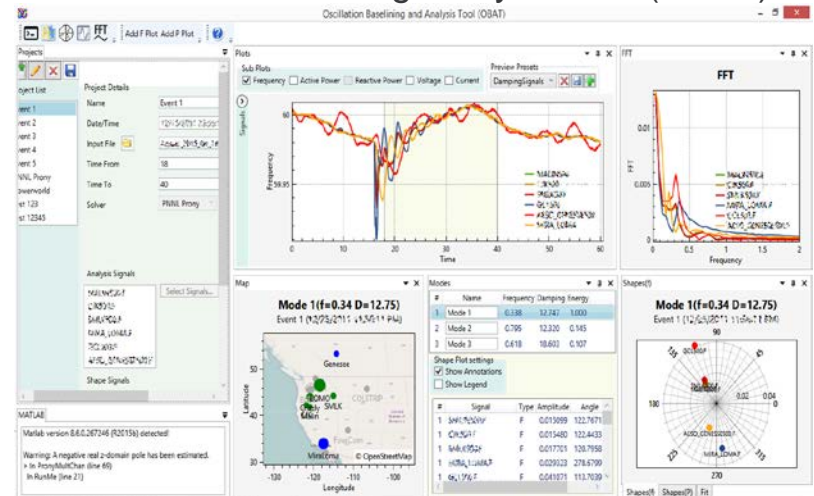
Load Model Data Tool (LMDT 2.0)



Power Plant Model Validation (PPMV 2.0)



Oscillation Baseline Analysis Tool (OBAT)





Archive Walker Project Overview

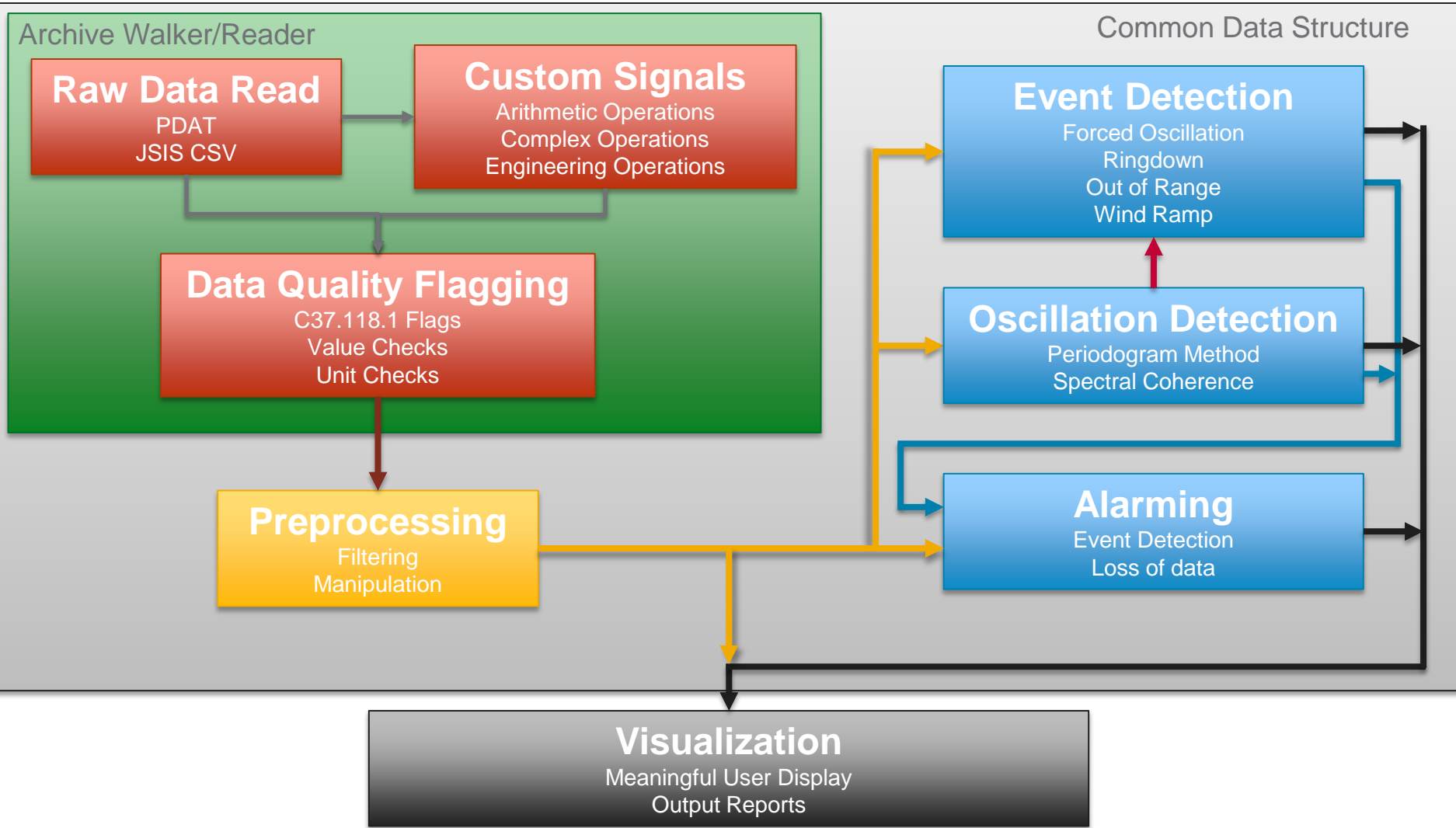
- ▶ Developed at PNNL for the Bonneville Power Administration
- ▶ Archive Walker/Oscillation Detection Software
 - Create a flexible, modular analysis software framework to process PMU data, perform event and oscillation detection, and provide that information to end-users via alarms and visualization.
- ▶ Features
 - Data Input Capabilities
 - Oscillation and Event Detection
 - Intelligence and Visualization
 - Alarming Capabilities
- ▶ Direct ties into other efforts
 - Oscillation Baseline and Analysis Tool
 - Open-source Platform for Engineering Applications

Archive Walker Organization and Data Flow



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Archive Walker/Data Reader

- ▶ Three modes of operation
 - Read over range
 - Near real-time
 - Read over range to become near real-time (hybrid)
- ▶ Principal operations
 - Read in raw data
 - Simple data quality checks and flags
 - Basic signal creation
- ▶ Set up and output to a common data structure
 - Portability across “plug-in” modules
 - Consistency for all applications



Archive Walker/Event Detection

- ▶ Four basic event detection capabilities
 - Forced Oscillation
 - Periodogram method
 - Spectral coherence method
 - Ringdown
 - Energy detector
 - Out-of-Range
 - General limits
 - Voltage specific
 - Frequency specific
 - Wind ramping
- ▶ Extract times of interest out of larger data sets and summarize
- ▶ Export the information in a common format
 - File output for other applications
 - Data format for visualization and further analysis

Archive Walker Current Capabilities and Status

Completed – **Testing** – Future Development

▶ Operational Modes

- Folder of files
- Near real-time mode
- Hybrid mode

▶ Data Reading

- PDAT
- JSIS CSV

▶ Data Quality Checks

▶ Data Operations

- Signal manipulation

▶ Event Detection

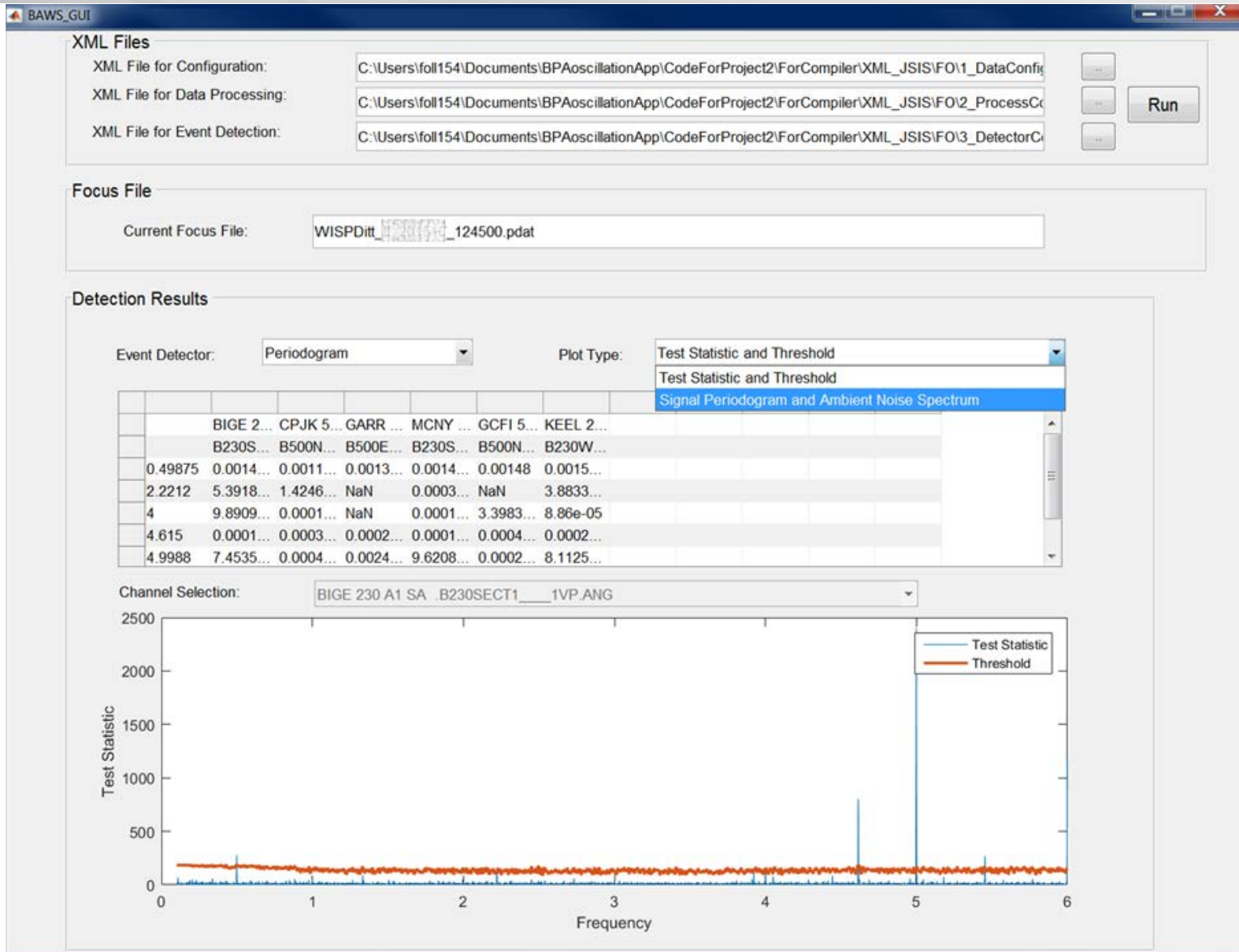
- Forced Oscillation
- Ringdown
- Out of range
- Wind ramping

▶ Output Reporting

- Output data sets
- Reports

▶ Visualization

Initial Demonstration GUI – Periodogram Method for Forced Oscillation Detection





Questions/Additional Information

Questions or discussions?

For further information, please feel free to contact:

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