

BPA Synchrophasor Archive Strategy

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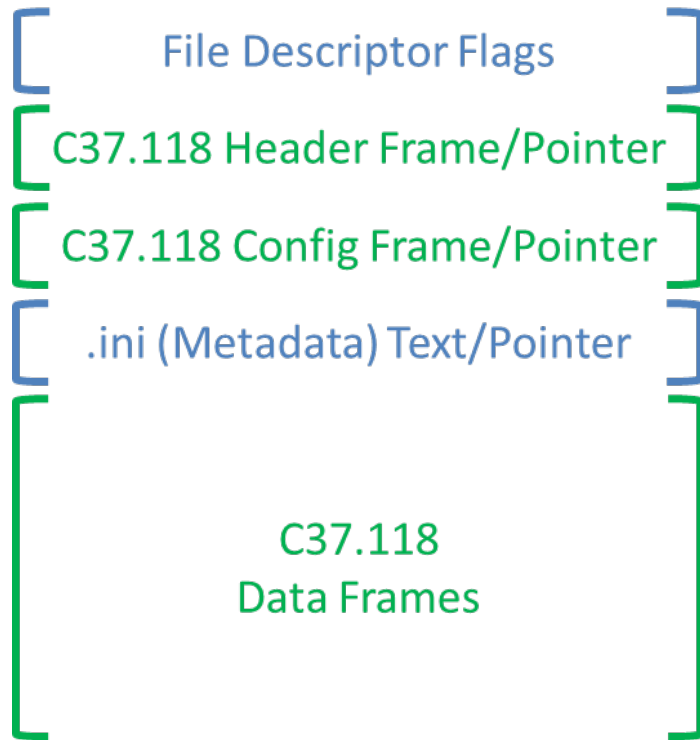
Operational Storage

- Relatively short term archive using PI
- Process Book displays for dispatchers, Data Link applications for planners, etc.
- Real-time event detection and situational awareness tools developed and maintained in-house
- Pro: Platform for custom applications, displays
- Con: Requires full PI infrastructure

Synchrophasor Lab

- Sandbox for development of SP-based applications, post-event analysis, model validation, etc.
- Goal: Store full fidelity (no compression or manipulation) PMU data, including all redundant pairs for >3 years (200 TB)
- Goal: Minimize computational effort required by archive tools
 - If archive software drops packets, they are lost permanently
- Goal: Develop archive and associated tools that are easy to install and distribute
- Solution: Store C37.118 packets as they are received in flat binary files of one-minute duration

Phasor Data (.pdat) Files



■ = Data supplied by PDC
 ■ = Data supplied by user/archiver

- Date/time embedded in file names for quick indexing

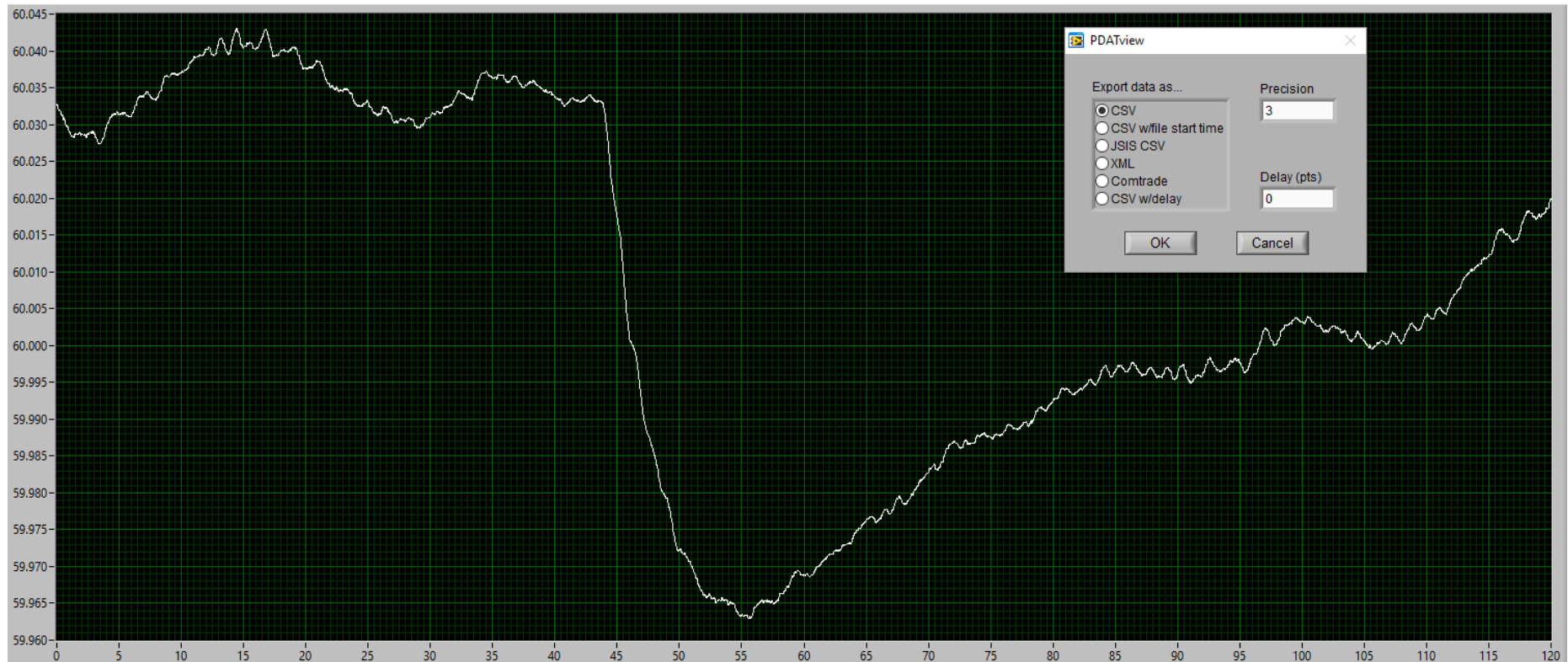


Sychrophasor Lab Tools

- StreamReader – Real time trends of PMU/PDC data streams
- PDAT Archiver – Store raw PMU/PDC streams in long term archive
- PDAT View – Display post-event trends, export signals to .csv or COMTRADE
- StreamPlayer – Replay archived data, for application testing
- Pros: Installation in <1 hour on any PC, freeware
- Cons: Built-in functionality limited to plotting, exporting

Sychrophasor Lab Tools

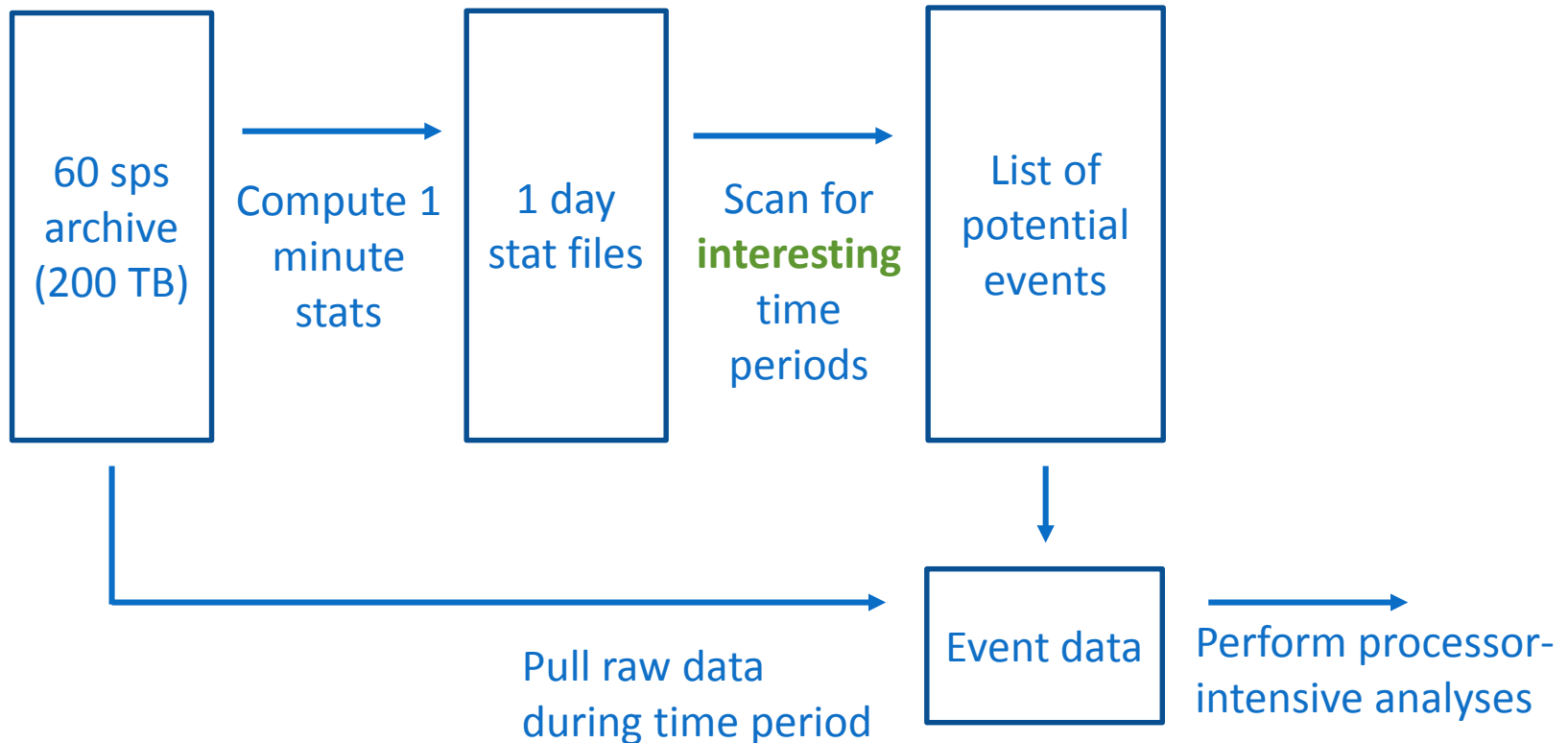
- Plotting and exporting using PDAT View



Indexing/Data Set Reduction

- Store per-minute min, mean, and max of all signals
- Save data for each day as MATLAB .mat file for further analysis
- Goal: quickly scan archived data for potential periods of interest
 - **NOT** stand-alone event detection or alarming
- Perform detailed event detection, classification, and analyses only on periods of interest

Indexing/Data Set Reduction



Challenge: define “interesting” for all measurement types

Indexing/Data Set Reduction

- Phasor magnitude
 - Voltage and current
- Phase angle pairs
 - All combinations of positive sequence voltages
- Frequency
- Rate-of-change-of-frequency (ROCOF)
- Frequency difference pairs
 - All combinations of sites
- MW and MVAR for each current monitored

Indexing/Data Set Reduction

- 2 years of data (2016-2017)
- Raw data: 1,042,354 files, **32.3 TB**
- Reduced data: 726 files, **112 GB**
 - Number of voltages: 560 (3 phase and pos. seq.)
 - Number of currents: 356 (Pos. seq.)
 - Number of phase angle differences: 2415 pairs
 - Number of frequencies: 70 (one per PMU)
 - Number of ROCOF: 70 (one per PMU)
 - Number of frequency differences: 2415 pairs
 - Number of MW/MVAR: 356 each
- Storage “savings”: **>280x**

Contact

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