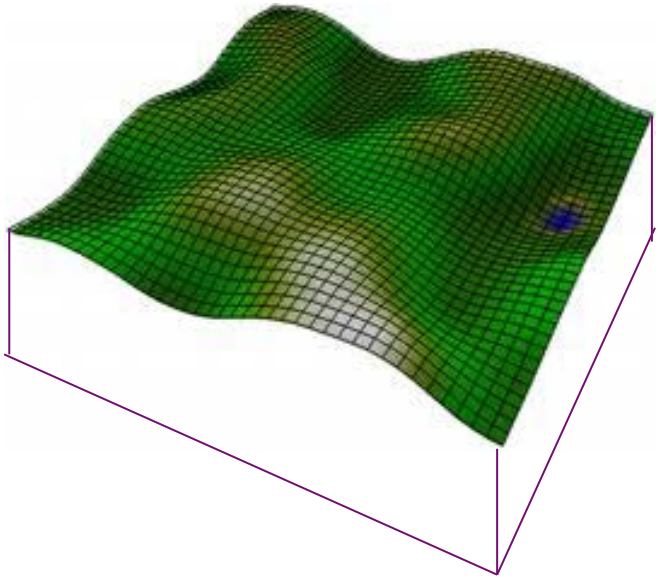
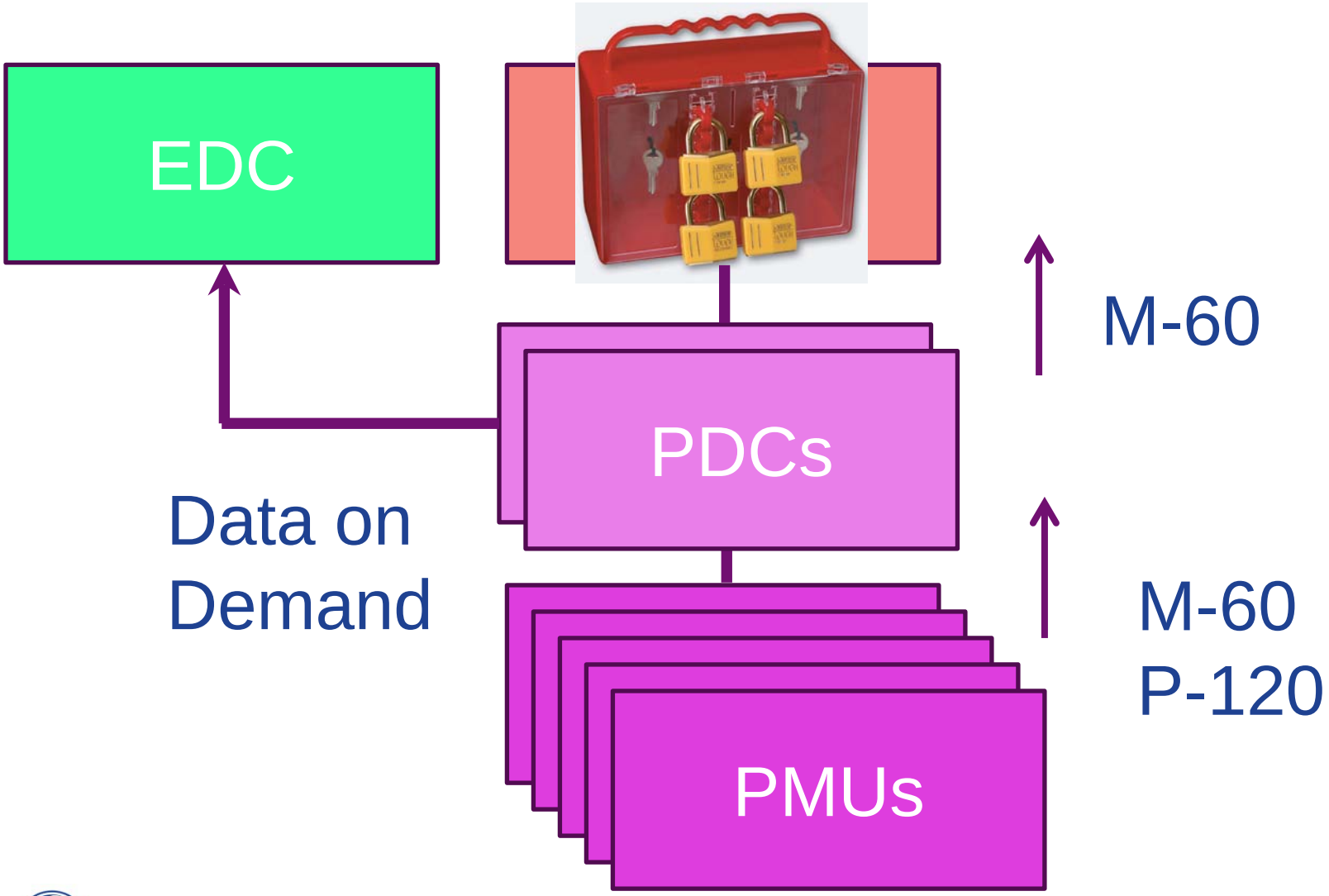
Engineering Data Concentrator (EDC) for Synchrophasors

The Engineer's Sandbox



imagination at work

Typical Synchrophasor Data Path



EDC Functions

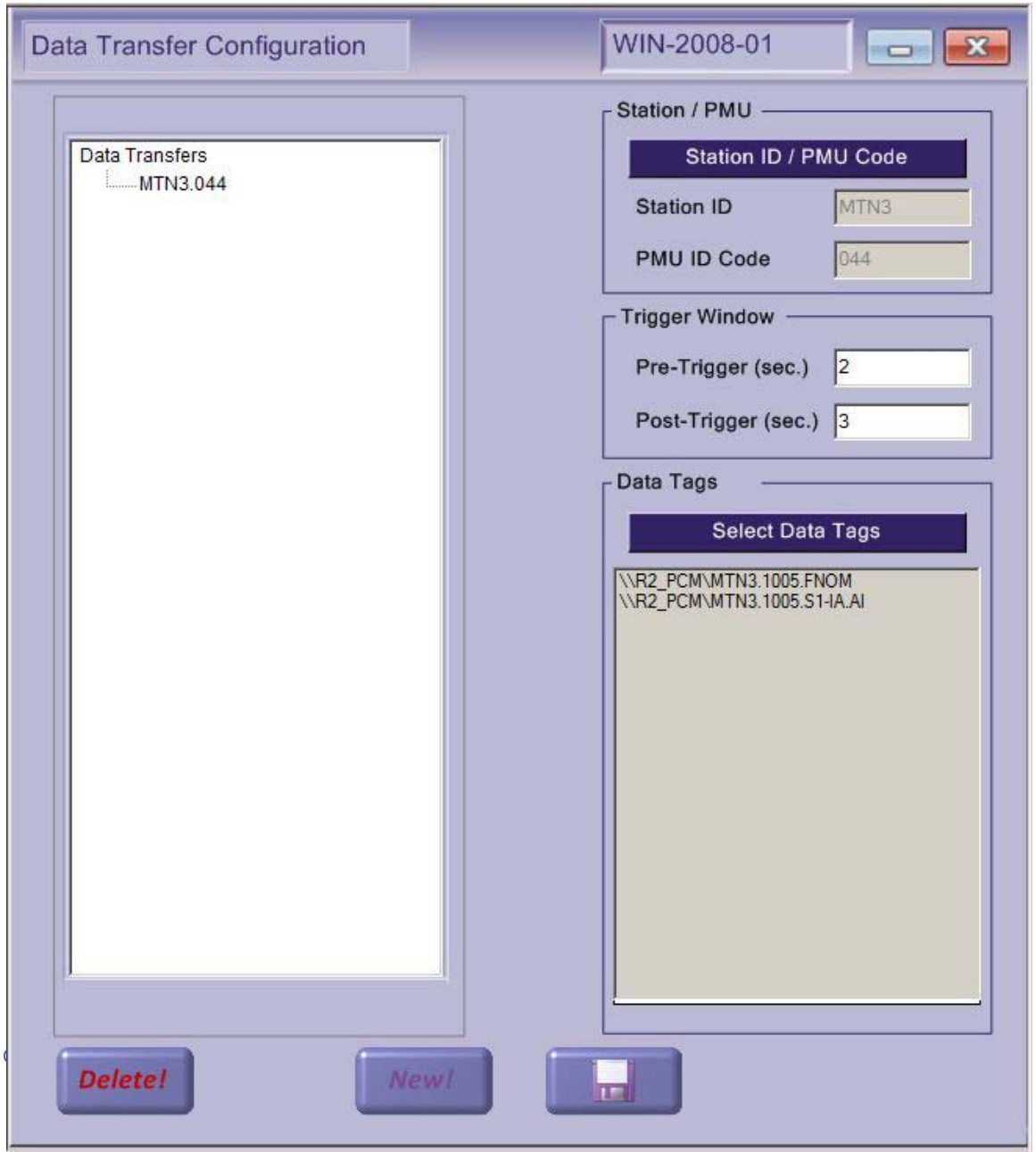
- Auto collection of Evented Data
- Hi-resolution Data retrieval (e.g. – 120 measurements/sec)
- User-defined Data requests
- Real-time data
- Analytic execution

Evented Data (Per Synchrophasor Std.)

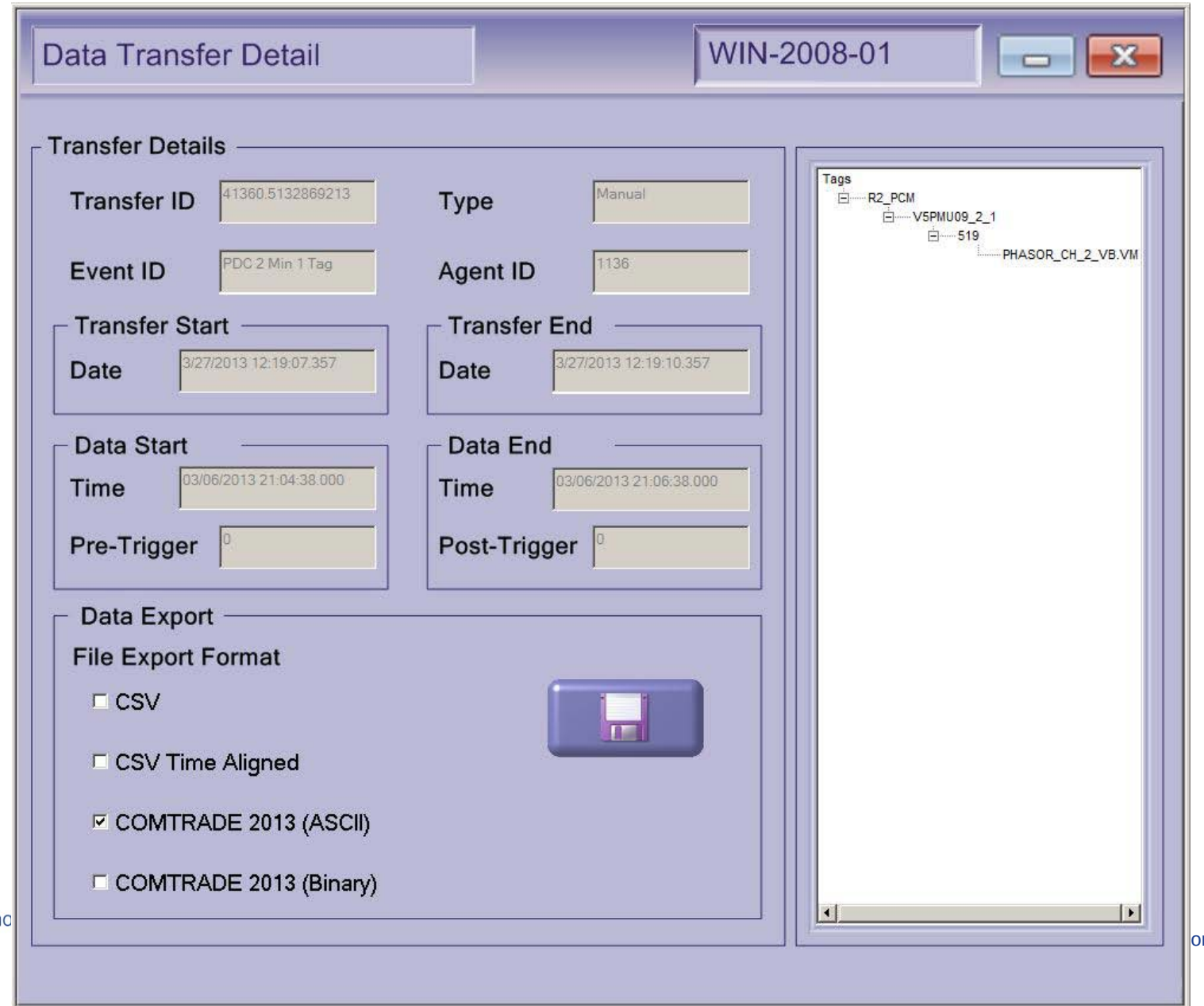
- Over/Under Voltage
- Over/Under Frequency
- Over Current
- Over-Power
- User Defined Triggers (e.g. – Line Out)

Implements NERC PRC-002 for Disturbance Monitoring and Reporting

Event Data Capture Selection



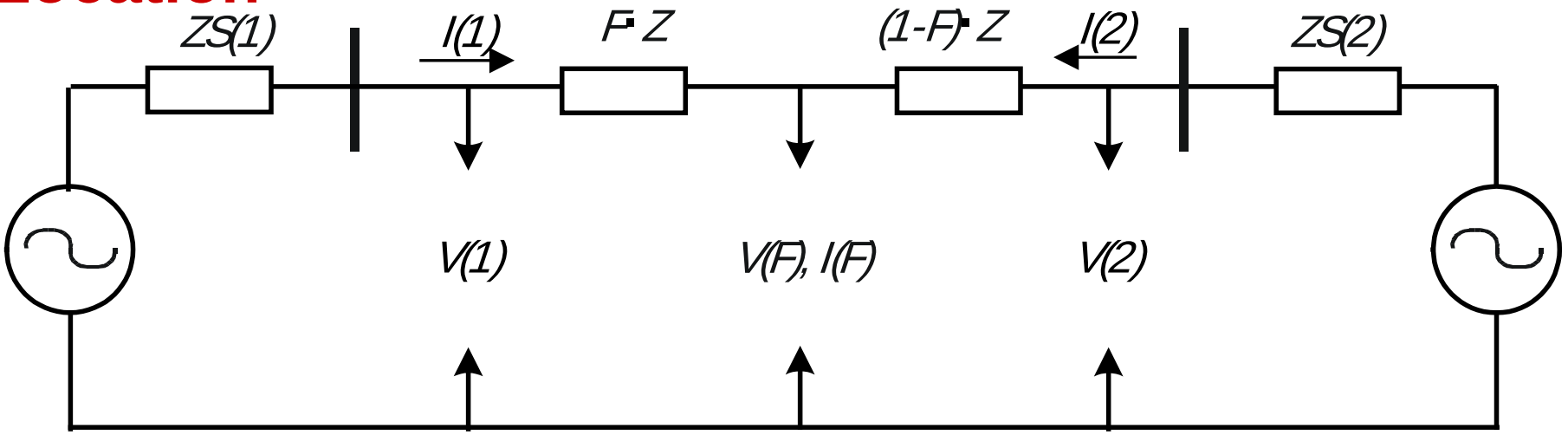
Data Transfer Report



Focused Captures:

- Event & Line Out:
  - Capture Synchrophasors from both ends of the line for Fault Calculation – X seconds before the trigger and Y seconds after the trigger

Synchrophasor-Enabled Double Ended Fault Location



The composite signal is created using Clarke transform in such a way that regardless of the fault type, there is a disturbance in the composite signals.

$$V = \frac{2 \cdot VA - VB - VC}{3}$$

imagination at work

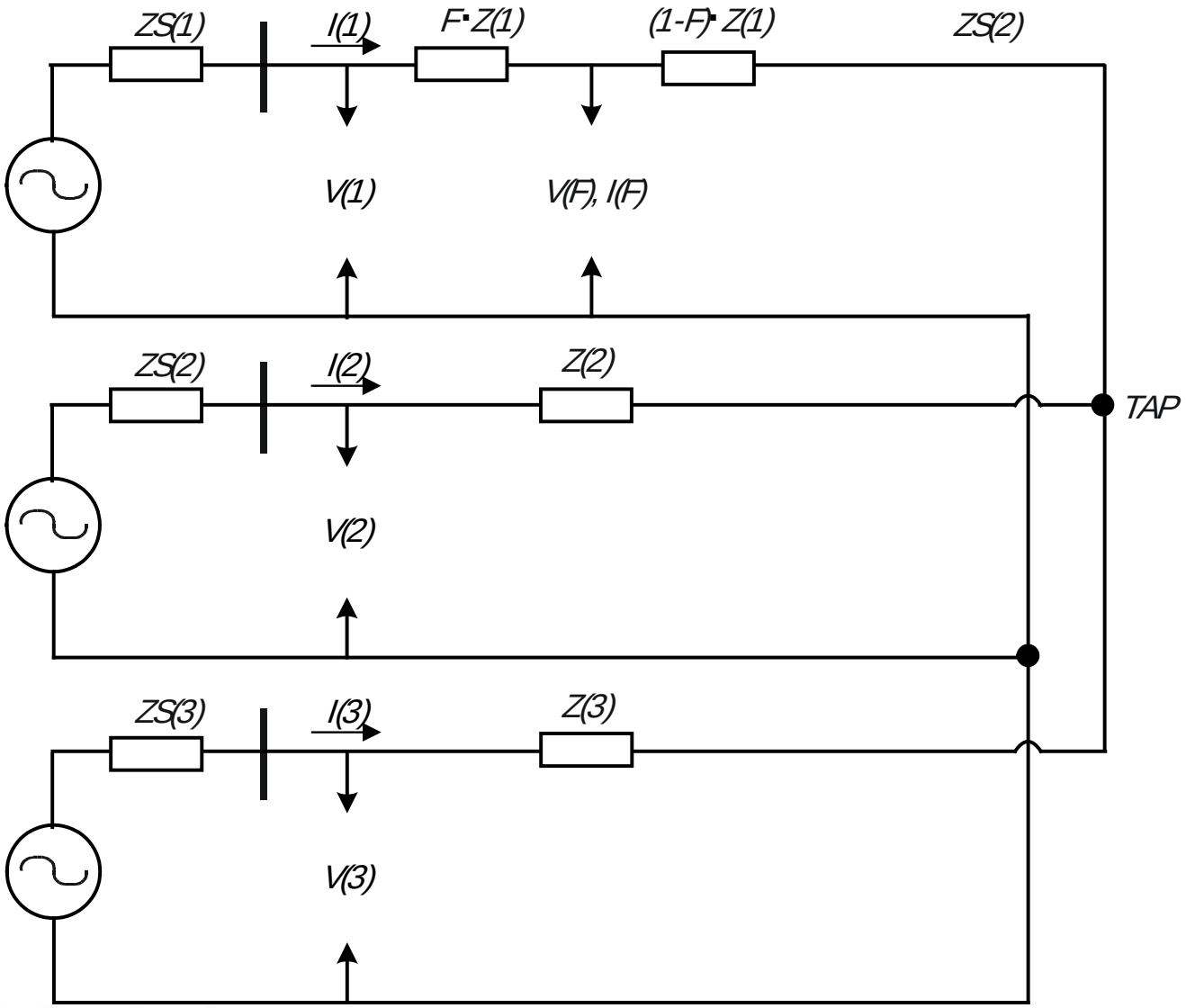
New Double-Ended Fault Location Algorithm

The fractional fault location is given by:

$$F = \mathrm{Real}\left[\frac{\frac{V(1)-V(2)}{Z}+I(2)}{I(1)+I(2)}\right]$$

- **Takes advantage of redundancy in the data.**
  - **more equations than unknowns**
  - **least mean squares fit is used**
  - **Calculation is independent of:**
    - **faulted phase**
    - **fault type**
    - **fault resistance**
    - **zero-sequence (ground current) coupling**

Three Terminal Fault Location



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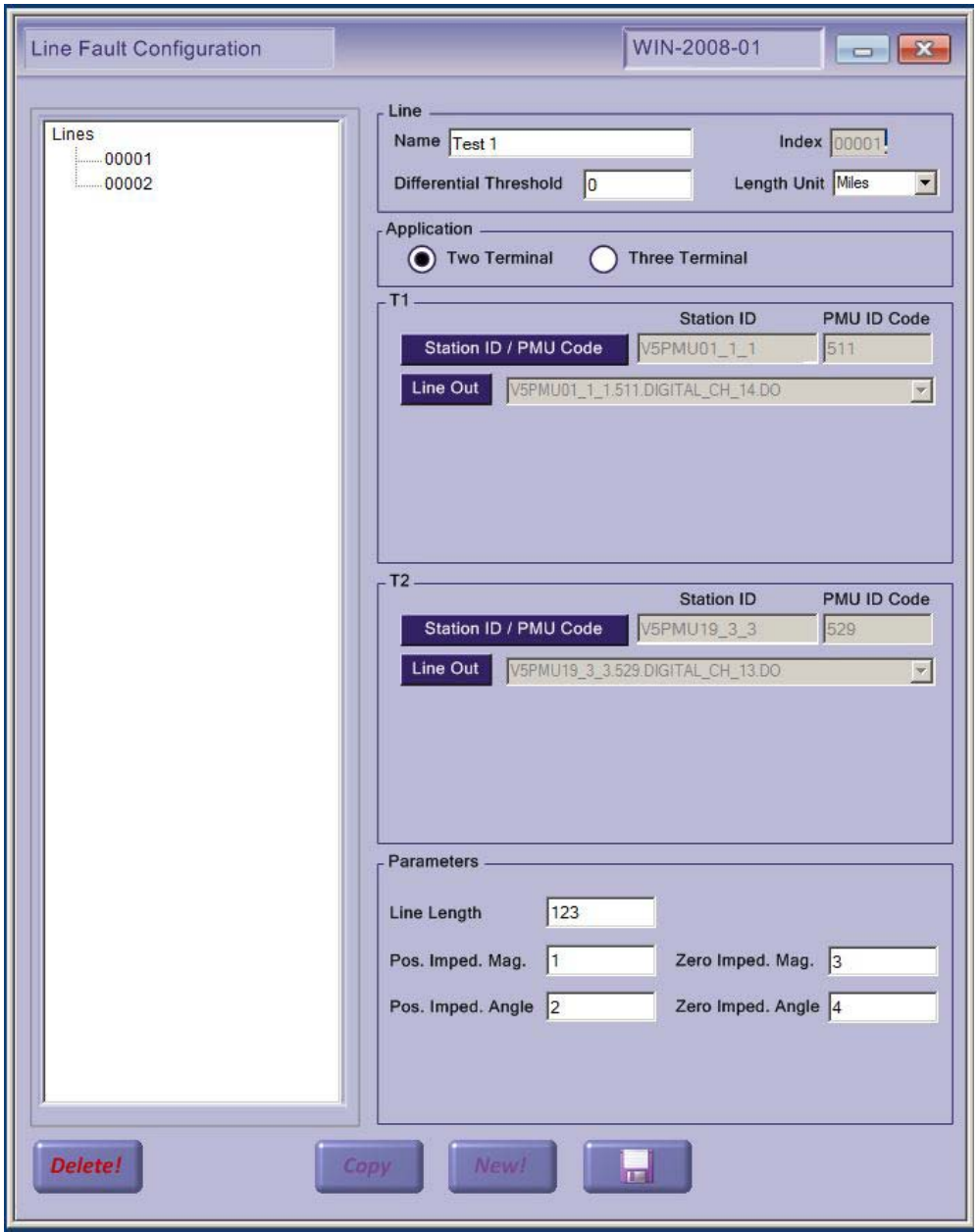
Distance from Terminal To Tap Computed

Line Fault Parameter Configuration



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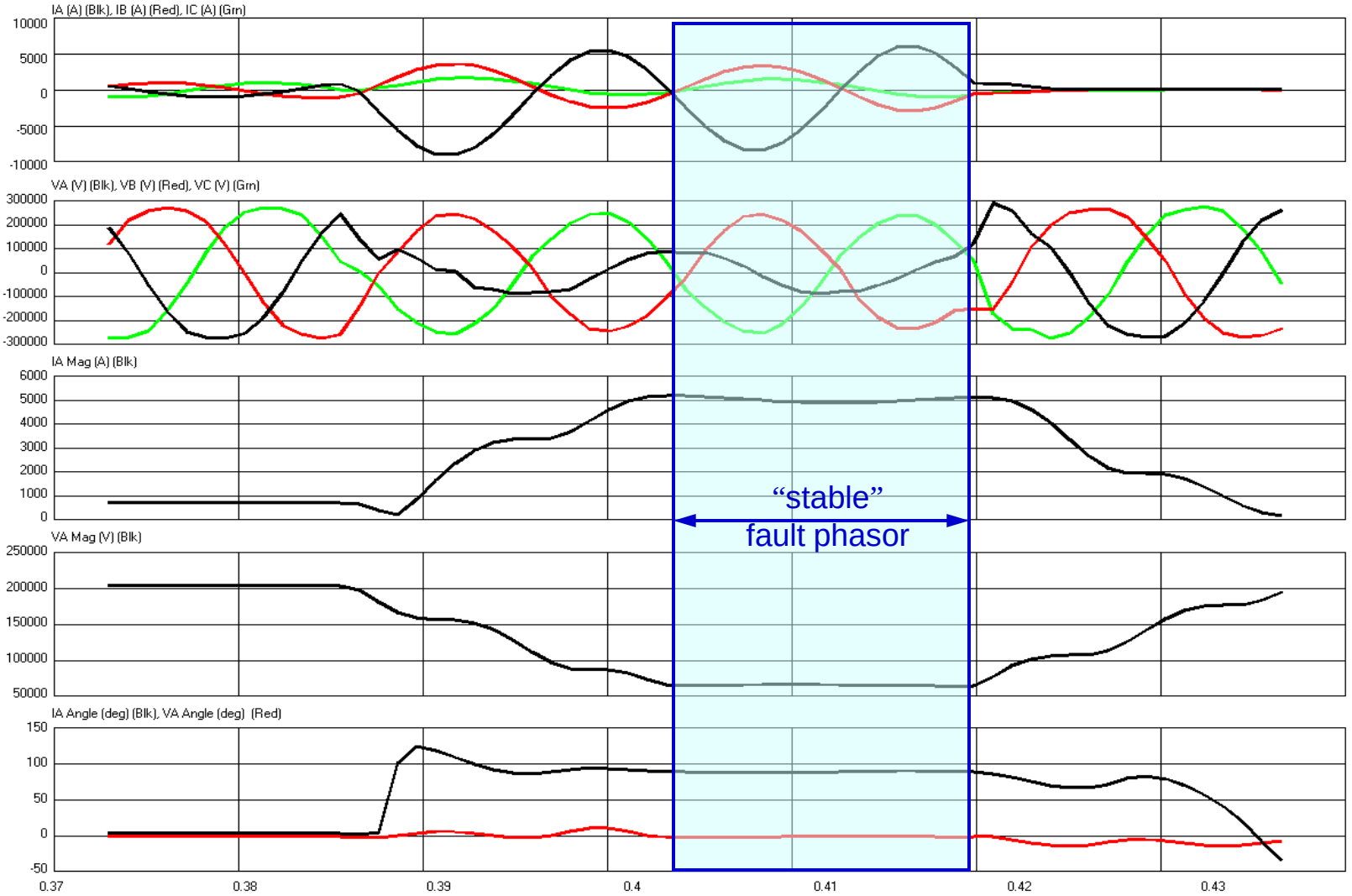
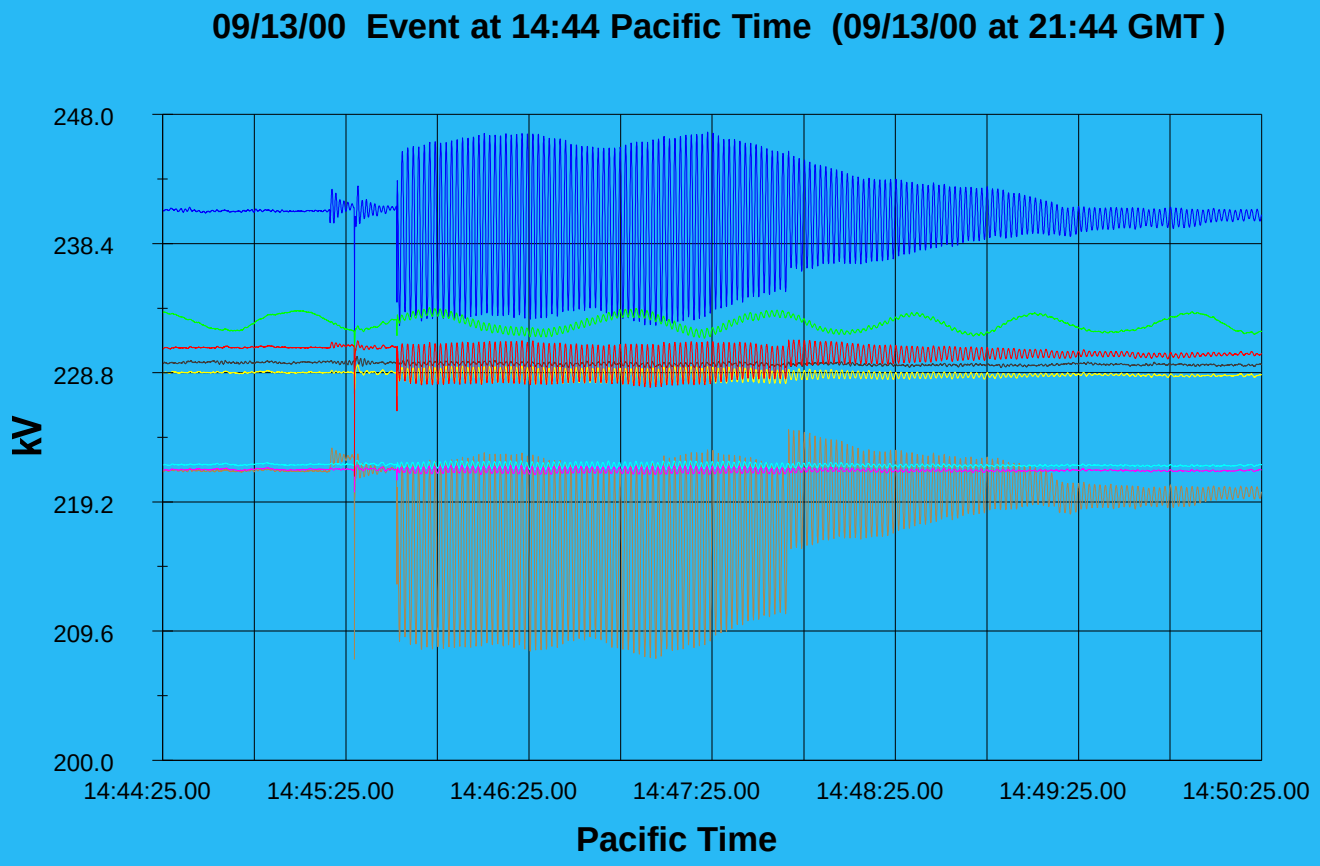
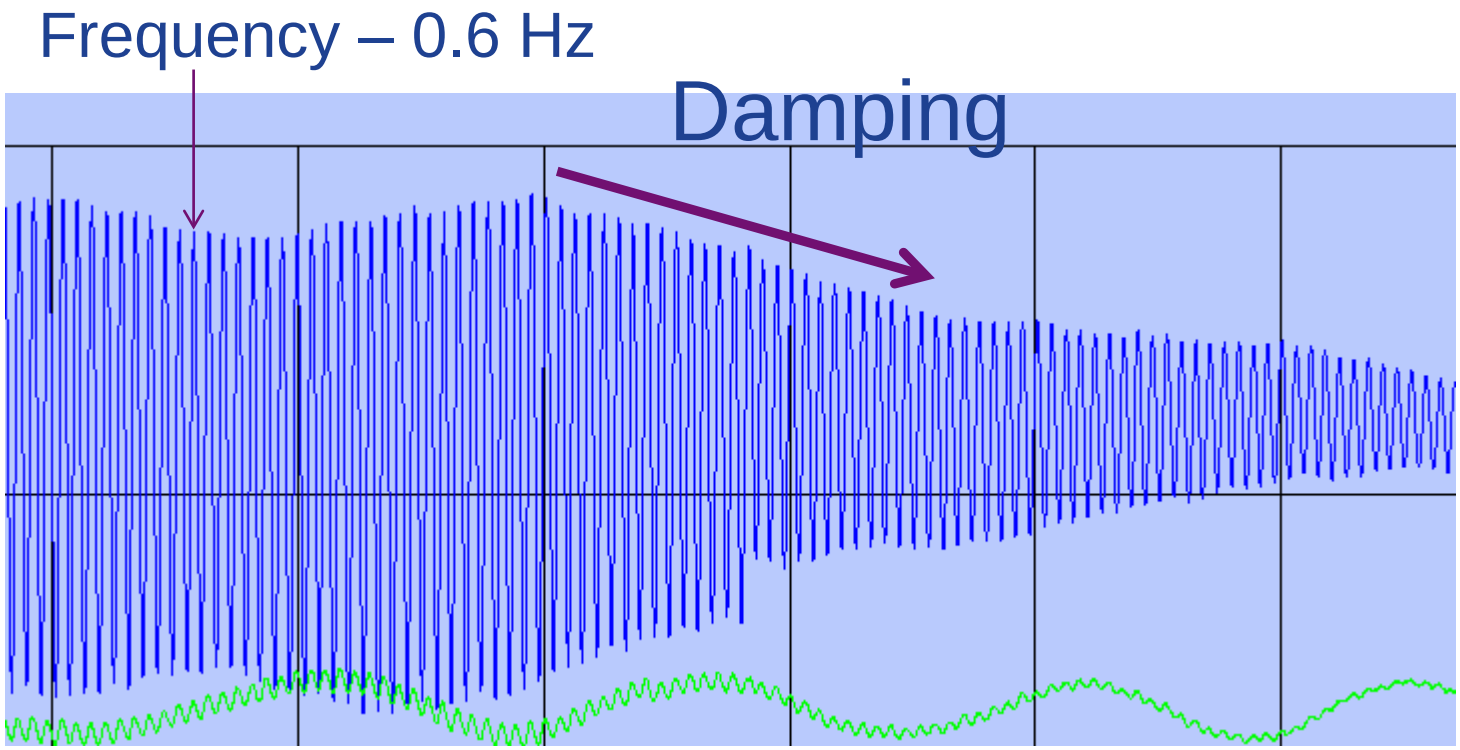
Real-life fault: stable fault phasor time



Small Signal Oscillation Detection and Analysis



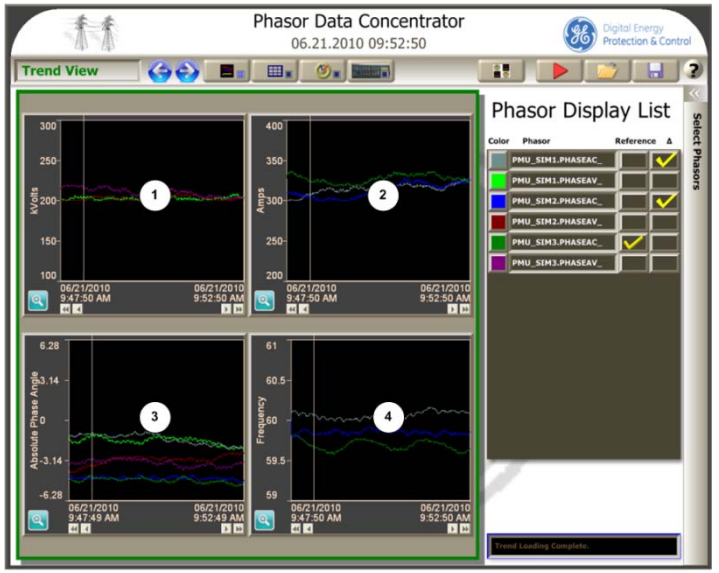
SSOD Measured Quantities: Frequency, Phase, and Damping



Live Data ON DEMAND – Client Controlled

Select:

- PDC
- PMU
- Data Item
- View Mode
  - Strip Chart
  - Polar Plot



Summary

- A need has been identified for hosting and testing ancillary applications with Synchrophasors
- An Engineering Data Concentrator has been developed to provide a “sandbox” for hosting existing and future engineering applications