GMD GIC INL DTRA SANDAQ

*(**S**ARA **A**lfred **N**ode **D**ata **Aq**uisition)*

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INL GMD Workshop

August 2013

Distribution A: Approved for public release; distribution is unlimited.

Outline

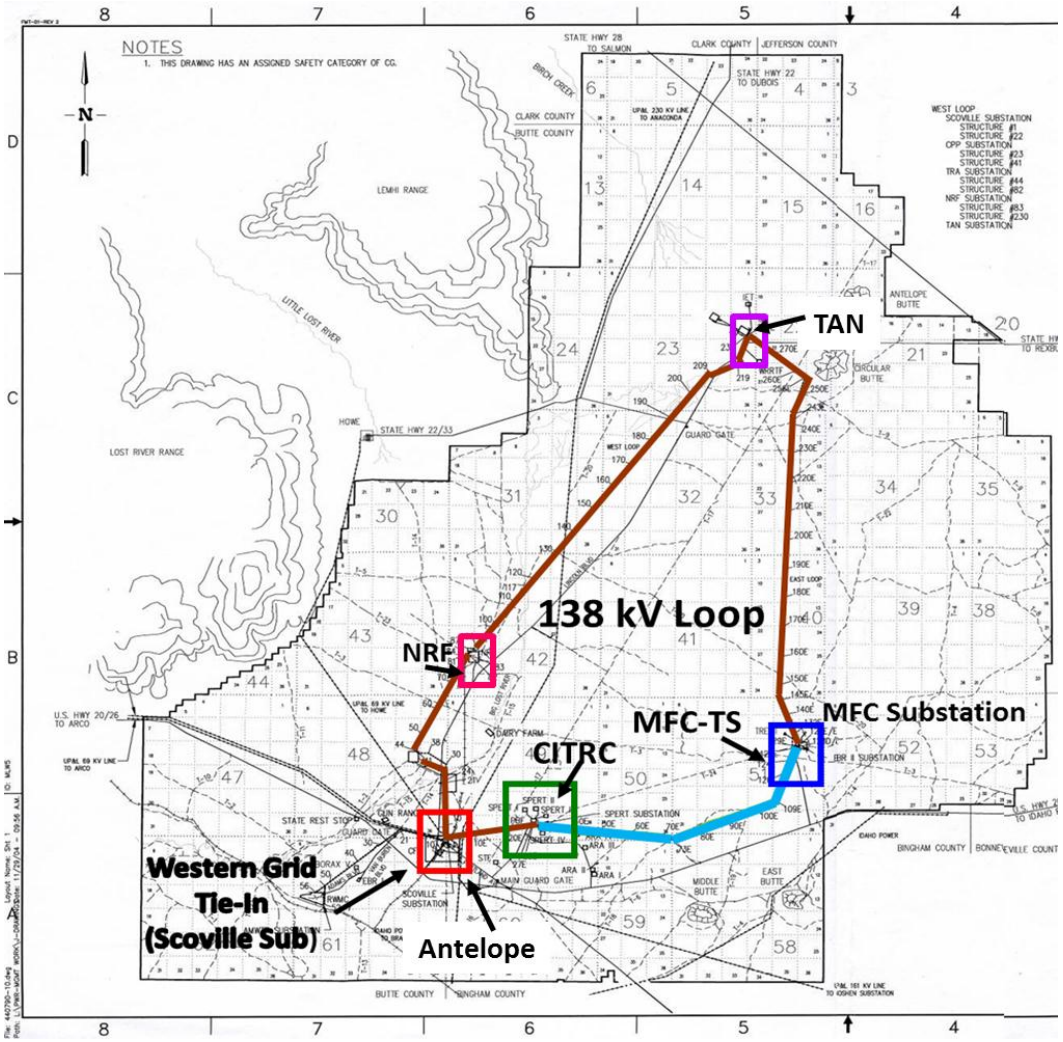
- General Description
- Acquisition Hardware
  - Probes/Sensors
  - SANDAQ
  - RAID
- Software
  - Continuous DAS
  - SANBeacon
  - RAID Eraser
- Data Review

SANDAQ General Description

- Stand Alone Operation
  - 24/7 Acquisition and Monitoring
  - Redundant Data Storage-Local/Raid
  - UPS Protected
- Data Acquisition
  - National Instruments PCI-6143
  - 20 kSamples/Sec
  - 24 Channels per SANDAQ Unit
  - Field and Current Measurements
- System Monitoring and Alert Programs
  - SANDAQ Connectivity and Data Acquisition
  - Raid Capacity Monitoring and Automated Data Deletion
  - UPS Battery Lifetime Monitoring

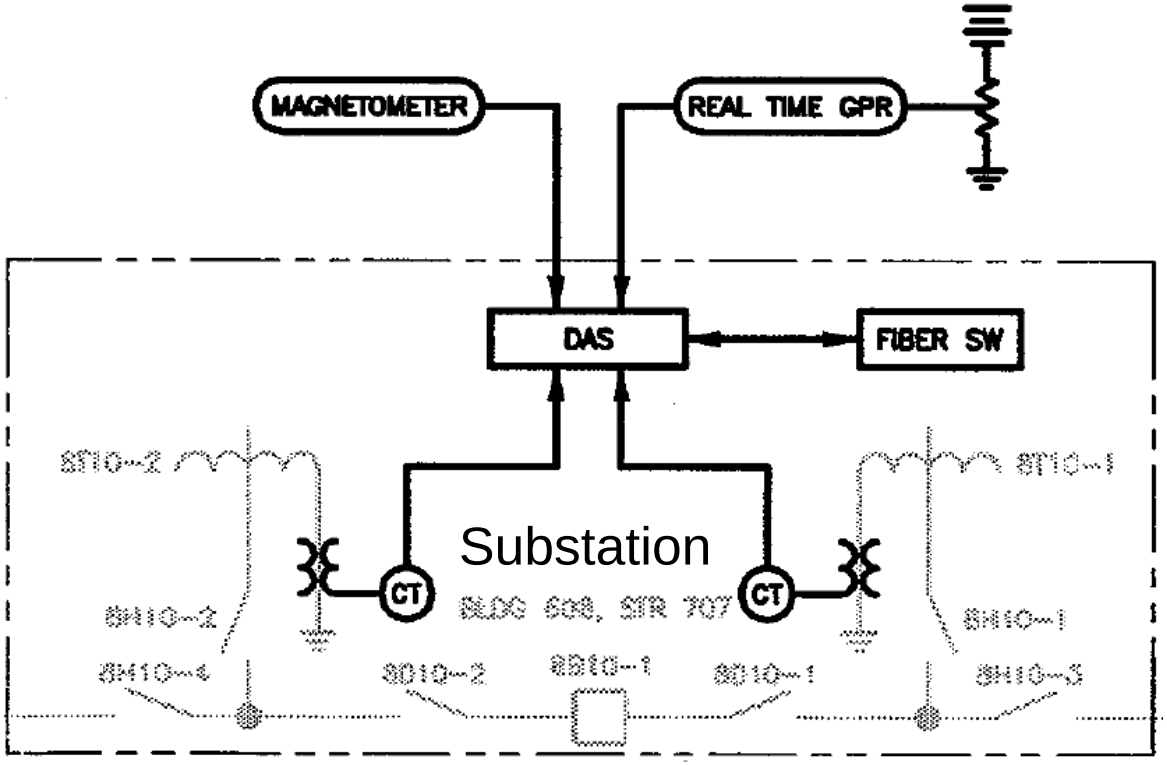
INL GMD SANDAQ Locations

- INL 138 kV Loop
- 5 Substation Locations
  - Scoville
  - CITRC
  - MFC
  - TAN
  - NRF



INL GMD Sample Substation Layout

- CTs at Transformer Ground Locations
- Magnetometer ~600 m from substations
- Fiber Connectivity to all Substations



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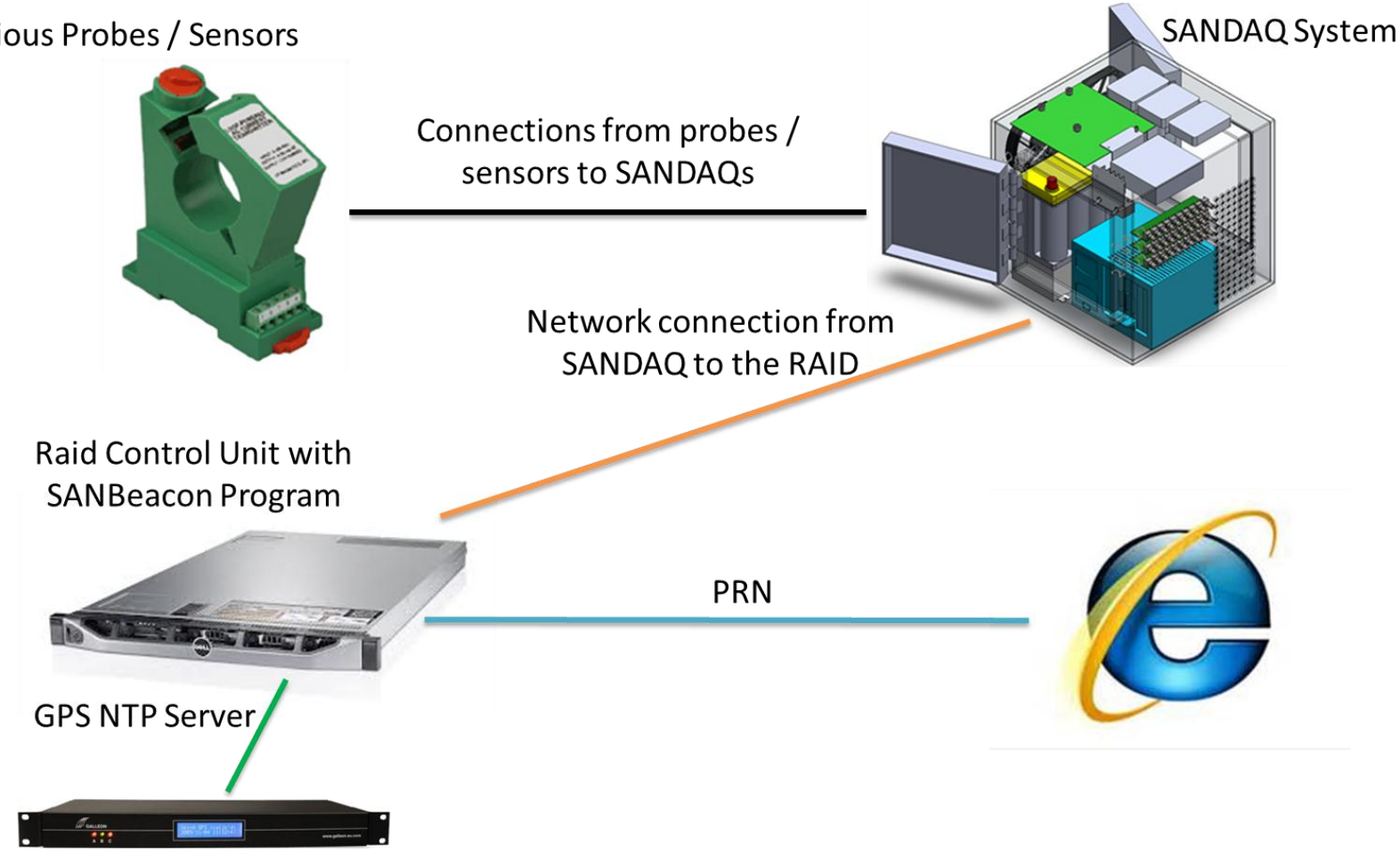
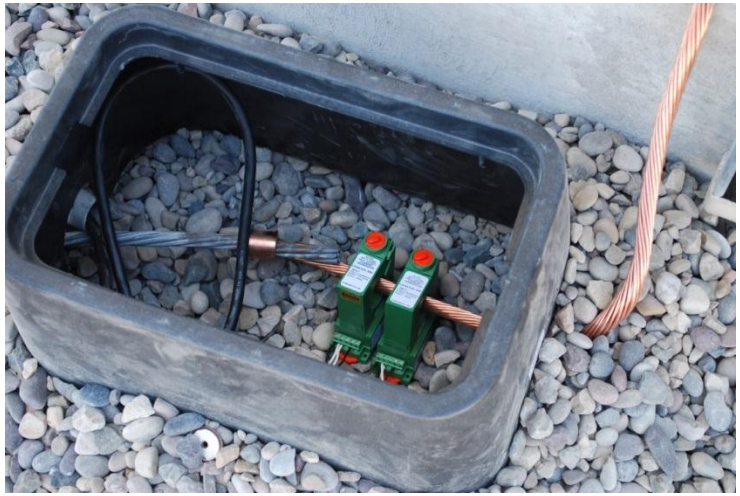
INL-GMD Monitoring Overview



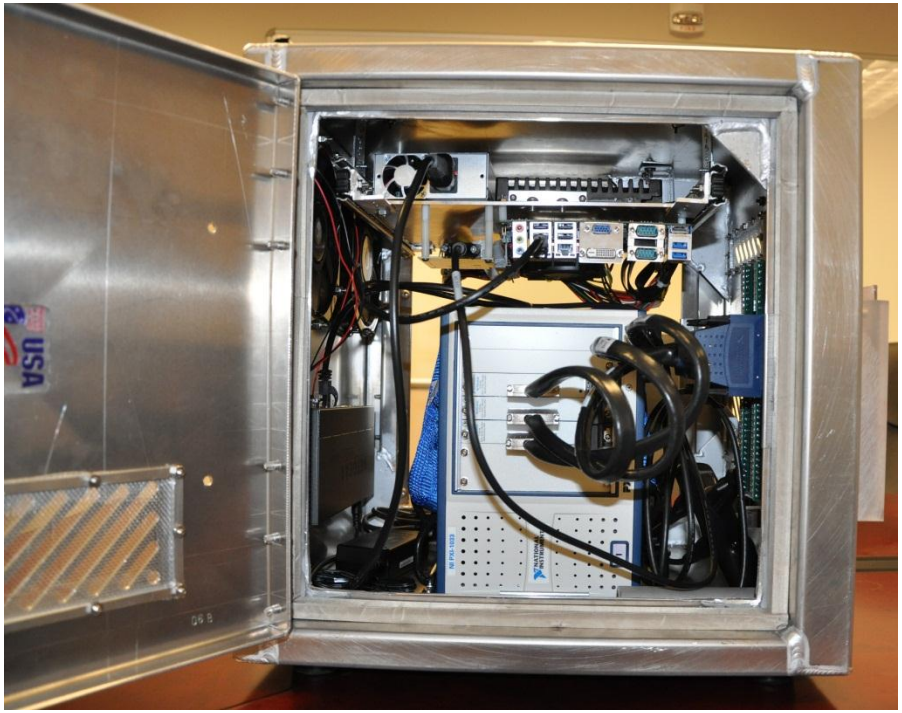
INL-GMD Field and Current Monitoring

- Field Sensors
  - Flux-gate Magnetometer
  - Potential for additional magnetic field sensors
- Current Probes
  - 0-100 A and 0-300 A CTs
  - Transformer Ground Instrumentation
  - Protective Housing



INL GMD SANDAQ

- Electromagnetically Shielded Enclosure
- Filtered 120 V Power
- Filtered E-net
- 24 Analog Channels
  - Static Range ±5 V
  - 16 bits
  - Max of 25 kSamples/sec
- External UPS Protection
  - 4-5 hours
- Adjustable Temperature Control Fans
- Fiber Isolation
- GPS Synchronized
- 1 TB Local Data Storage
- Ruggedized Computer



Sixth Generation SARA DAS

INL GMD RAID Control Unit

- 6 TB of Remote Data Storage
  - Redundant Storage for all SANDAQs
    - > 3.3 GB of Data per Channel per Day
    - > 42 Channels = >30 Days of Data Storage
  - USB 2.0 ~ 8hr/TB Data Retrieval (if manual download)
- Centralized Communication to all Remote SANDAQs
- GPS Time Server with Automated Time Synch to SANDAQS
- Capacity Monitoring
- Automated Data Deletion
  - Midnight Everyday after Capacity Threshold Exceeded

General SANDAQ Family Features

- Alternative PCI / PXIe Cards
  - Up to 32 Analog Channels in the same F3 package
  - Inclusion of Digital Channels for Triggering/Time Fiducials
  - Up to 2 M Samples/sec Max Capability
  - Up to 24 Bits
  - Dynamic Range Available
    - > ±0.1 V up to ±10 V
- Internal Battery vice UPS
  - 1 hour Backup

Fifth Generation SARA DAS

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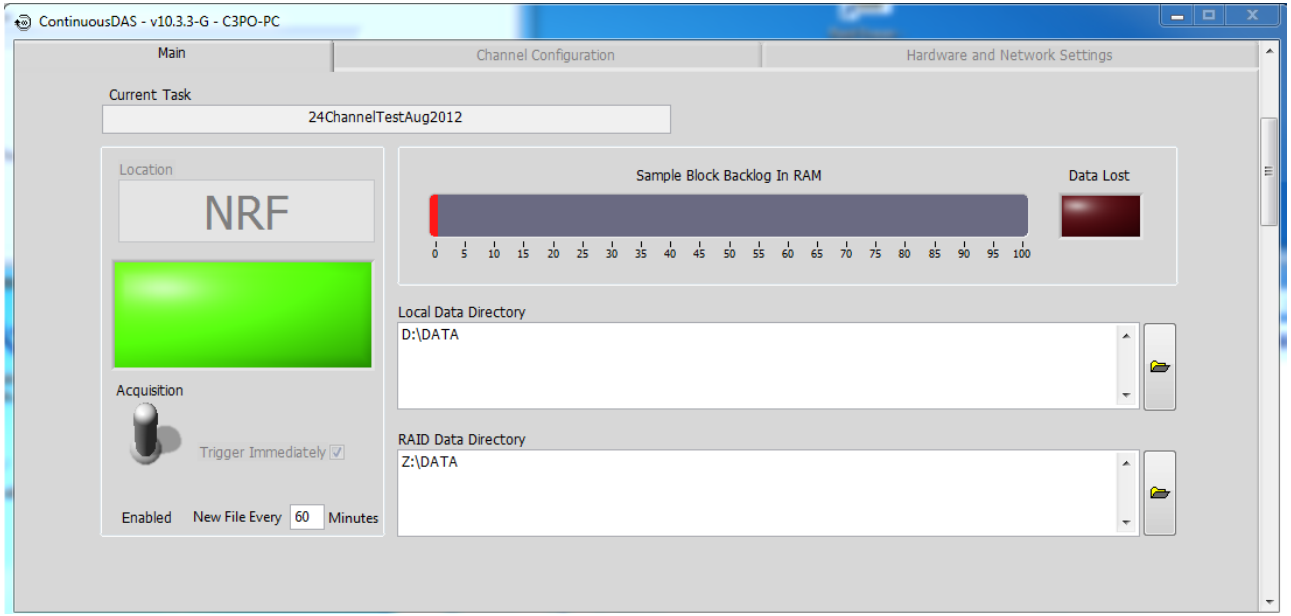
  - Probes/Sensors
  - SANDAQ
  - RAID
- Software
  - Continuous DAS
  - SANBeacon
  - RAID Eraser
- Data Review

DAS Software Setup Screen

- Continuous DAS Software
  - Installed Locally at the SANDAQ
  - Manages Channel Configuration
  - Manages Hardware and Network Configurations
  - Displays Locally or Remotely at the RAID or other SANDAQs



Continuous DAS Features

Channel Configuration

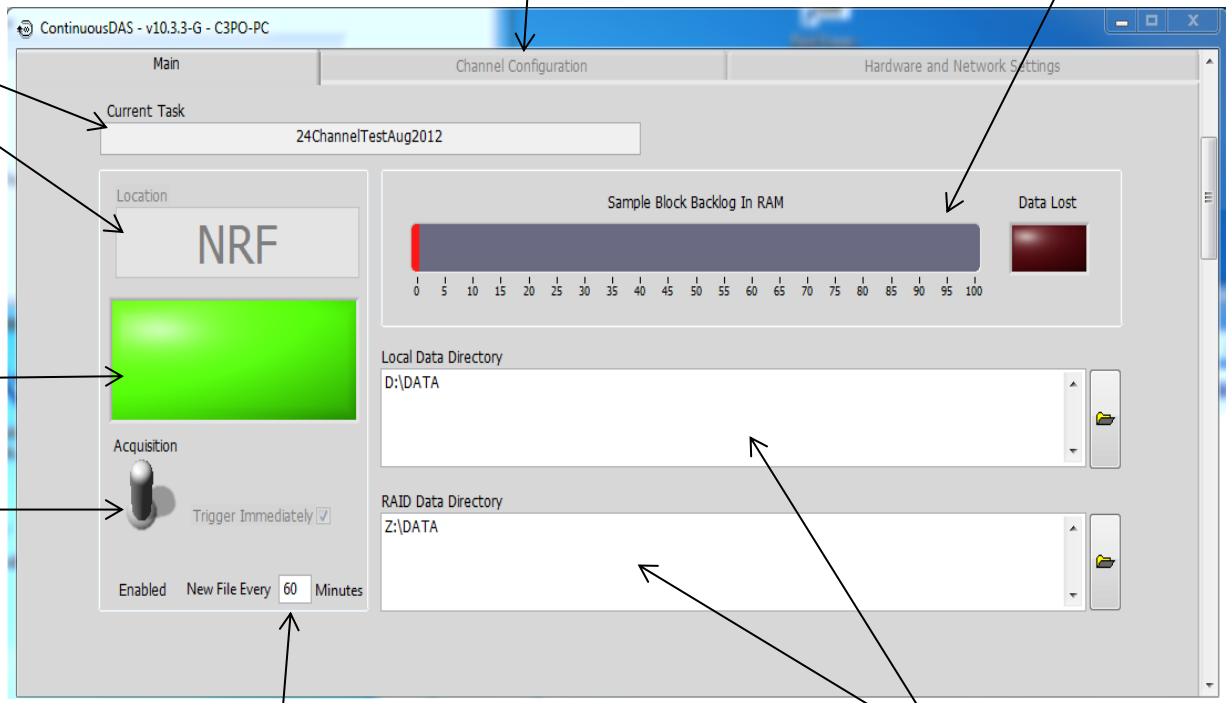
Sampling Rate

Sensor Location/Type

Input Range

Unique Task and Location Names

Local RAM Capacity Monitor



Data Acquisition Indicator
Dark=Off
Green Light=Acquiring

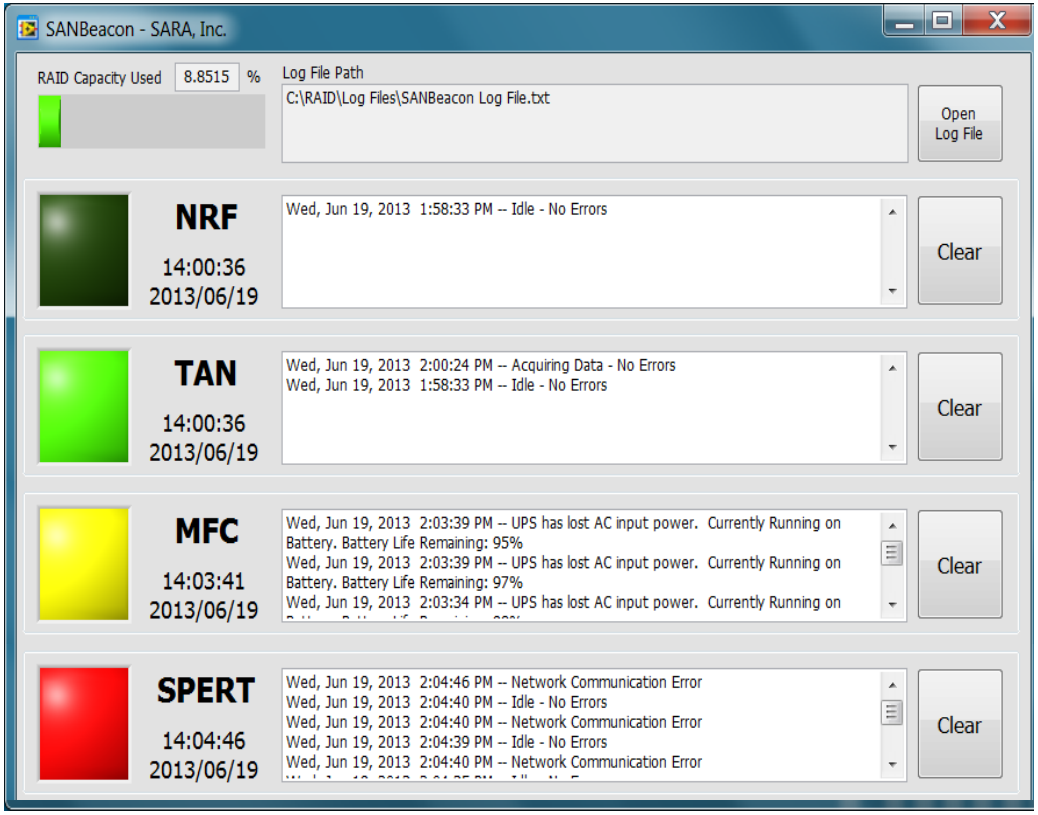
Acquisition
Toggle Switch

File Duration Selection
(Default File Length=60 min)

Local and RAID Directory Mapping

SANBeacon System Monitor

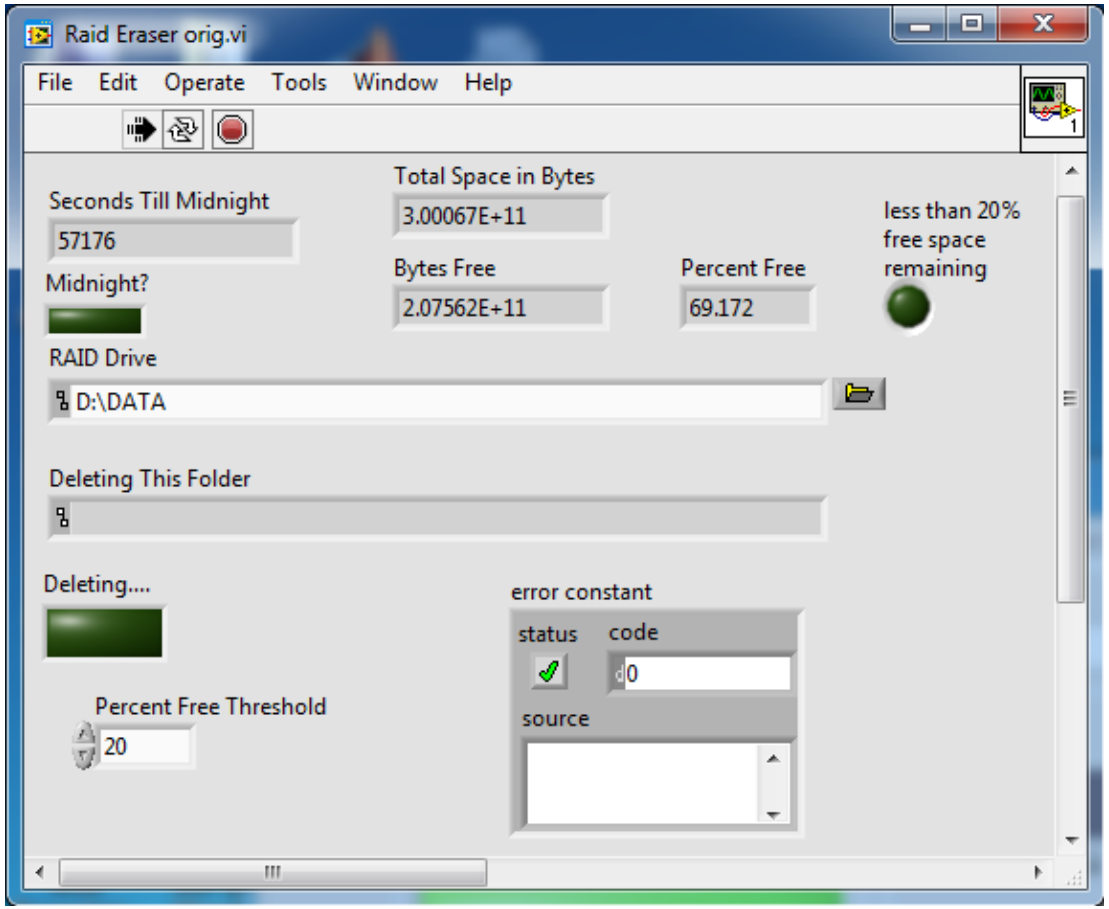
- Runs on the RAID
  - Status Reporting
    - > RAID Capacity
    - > Time code reporting
    - > Network errors
  - UPS Diagnostics
    - > Status
    - > Battery life



- Dark Green=Comm Link Good-Data not Acquiring
- Green=Comm Link Good-Data Acquiring
- Yellow=System Requires Attention-Data Acquiring
- Red=Network Comm Error-Data not Acquiring

SANDAQ RAID Eraser

- Resident Background Program on the SANDAQs and RAID
  - Monitors RAID Capacity
    - > Total Capacity
    - > Bytes Free
    - > Percentage Free
  - Performs Automatic Data Deletion
    - > Begins after Capacity Threshold Exceeded
    - > Occurs Daily at Midnight
  - Adjustable Threshold Setting
    - > Default at 20%
    - > Indicator Light



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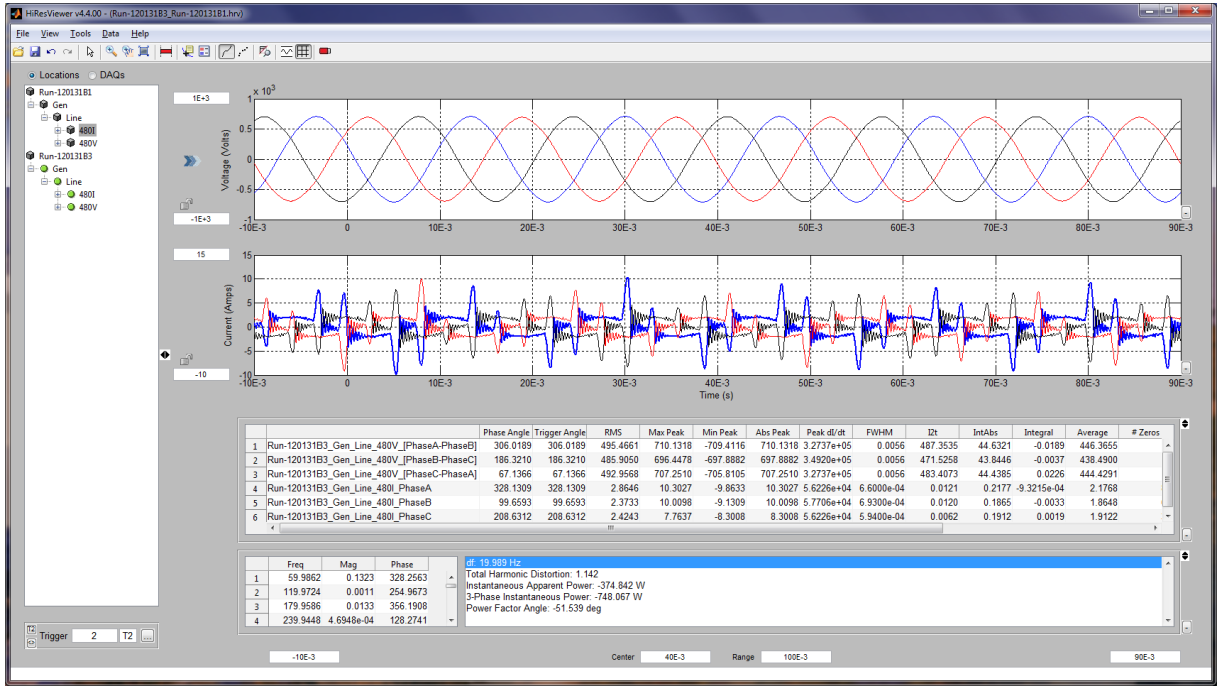
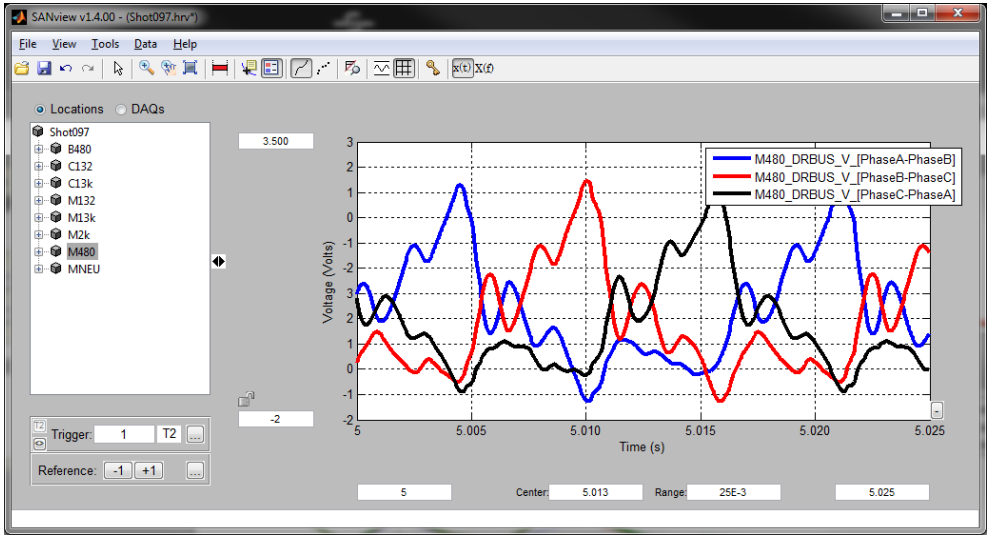
SANView

- SANDAQ Data Viewer
- Power Quality Visualization
- Data Analysis
- Customizable Plots and Displays



SANview Key Features

- Data Review
  - Import and View Multiple Files Simultaneously
    - > Multiple Channels from Multiple SANDAQs
  - Intuitive Tree-View
  - Advanced Data Analysis
  - Zoom/Pan Options
- Data Export and Plotting
  - .TXT, .CSV
  - Various Image File Formats
  - Customizable Print Options
  - Annotations



Overall Summary

- SANDAQ is a Stand Alone Operation
  - 24/7 Acquisition and Monitoring
  - Redundant Data Storage-Local/Raid
  - UPS Protected
- INL SANDAQs Acquire up to 24 channels of data
  - 20 kSamples/sec at 16 bit resolution
  - Field and Current Measurements
- System Monitoring and Alert Programs
  - Continuous DAS, SANBeacon, and RAID Eraser
- SANview Provides Data Review and Export
- Initial Installation at INL June 26, 2013