Software for Phasor Technology: Cell Topology

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Agenda

• **Software for Phasor Technology**
  – Need
  – Solution

• **ReLab’s Products**
  – IEEE C37.118 OPC Drivers
  – Software Logic Controller
  – ClearView SCADA
  – OPC Server

• **Implementations**
  – Boulder CO – partial
  – Guatemala - Full
Software for Phasor Technology

• **Need**
  – Fast, efficient, interoperable, expandable and inexpensive implementation of Synchrophasors for automated grid control
  – Upgrading of existing control systems to take advantage of Synchrophasors rather than replacing the control system
  – Low cost-of-ownership with fast return-on-investment

• **Solution**
  – Software that collects information from PMU at fast data rates, is reliable, is interoperable and is simple to implement
  – Software that is easily integrated into an existing control system
  – Simple implementation
  – Ability to work with other systems such as fault monitors, MRP, EMS
Software for Phasor Technology

2.1 System Topology

From other Level 1 Cells

To Level 3 Cells

Data from up to 64 x 64 PMUs can be collected at this level

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Complete Software Synchrophasor Solutions

Synchrophasor System Software Topology

Synchrophasor WAM Solution
Functionality of Synchrophasor Solution

- **Phasor Communication**
  - Industry accepted OPC Interface
  - Full compliance with IEEE C37.118 standard
  - High performance & reliability
  - Scalable solution
  - Flexible (interface to SCADA & IED)

*RLSYNC and/or RLSYNCPDC with RLSLC provides fully functional software only Phasor Network Implementation*

- **Synchrophasor Data Management**
  - Situation Awareness
  - Supervisory Control
  - Alarm/Data Monitoring
  - Analysis and Prediction

- **Phasor Data Analysis**
  - Oscillography
  - Historical data trending
  - Phasor Display Chart
  - Alarm Displays
PMU Visualization Examples

Data Monitoring

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Data Visualization

Phasor Display Chart

Real-Time & Historical Trending
Implementation: Boulder Co

- **Client:** Accenture and Xcel Energy
- **Objective:** Accenture to develop an analytics engine inside the substation fence that would collect data, process it and in some cases send it centrally to further support other capabilities
- **Requirements**
  - Fast data transmission with time stamp from the PMU
  - Interoperable software components that are easy to implement
- **Components**
  - Synchrophasors placed on the distribution feeder
  - ReLab’s C37.118 OPC Server and Driver
  - Customized Analytics Module (built by Accenture)
- **ReLab’s Contribution**
  - RLSYNC was an “out of the box” solution to pull data from PMUs in the field to the Analytics Module
  - ReLab’s service was a key component in configuring the PMUs and bring them up with the communication quickly
- **Benefits of Analytics Module using C37.118**
  - Analysis of Substation and Feeder Sensors
    - Calculating fault information (classification, severity, location, etc.)
  - Improved Grid Operation
  - Increased Asset Life
  - Decreased O&M
- **Status:**
  - Project complete, Analytics module up and running
  - System is configured and ready for implementation of phasor as an element of the control scheme
Implementation: Guatemala

- **Objective:** Implement a country wide Synchrophasor network that is compatible with existing SCADA system and does not require additional hardware other than PMU

- **Requirements**
  - Fast data transmission with time stamp from the PMU
  - Interoperable software components that are easy to implement
  - Complete solution from single vendor with lowest cost and fastest implementation

- **Components**
  - ClearView Server and Client
  - RLSYNC
  - RLSLC

- **ReLab’s Contribution**
  - Software to for PMU Network
  - Software for data analysis and visualization
  - SCADA System for PMU Network
  - Support for software configuration

- **Benefits of Analytics Module using C37.118**
  - Analysis of Substation and Feeder Sensors
    - Calculating fault information (classification, severity, location, etc.)
  - Improved Grid Operation
  - Increased Asset Life
  - Decreased O&M

- **Status:**
  - Project is in initial phase with software implementation to start in 2010
  - Software has been purchased and is getting configured.
Software Platform

SCADA
- ClearView SCADA
- Monitoring
- Decision
- Control
- Data Logging
- Reporting

Logic & Integration
- Software Logic Controller
- MODBUS Server
- SDKs and Tools

User Interface
- ClearView Client
- OPC, RLSLC Console

Communication
- OPC Server
- SEL-OPC
- MODBUS
- IEC 61850
- RLSYNC
- Serial-TCP/IP Converter
- Serial, TCP/IP Virtual Ports

IED’s, PLC’s, DCS’s, Smart Sensors and …..

Legend:
- GUI
- Servers
- Interfaces
- Drivers

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Summary

• Phasor have become a necessary element for system protection, repair and Smart Grid Implementation

• A simple, straight forward and low cost method of implementation is required to gain full benefit of these devices
  – Collection of data at rates near 60 frame/second
  – No special communication or conversion hardware
  – Access to the information by other systems such as Fault Identification, Analytic Models, IED

• The Cell Model address the needs of the market to implement Phasor to their full capability
  – Easy to implement
    • Meets standard
      • Only computers and software required
  – Scaleable
  – Interoperable
  – Low cost-of-ownership with fast return-on-investment