

A collage of five Polaroid-style photographs is arranged on a light gray background. The photos show various industrial and energy-related scenes: a wind turbine, a power plant with tall chimneys, a worker in a hard hat near industrial equipment, a large industrial tank, and a close-up of a power plant's internal structure.

# Software for Phasor Technology: Cell Topology

NAPSI Meeting, Chattanooga 10/8/09

Michael Shulim, CEO

ReLab Software, LLC

# 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

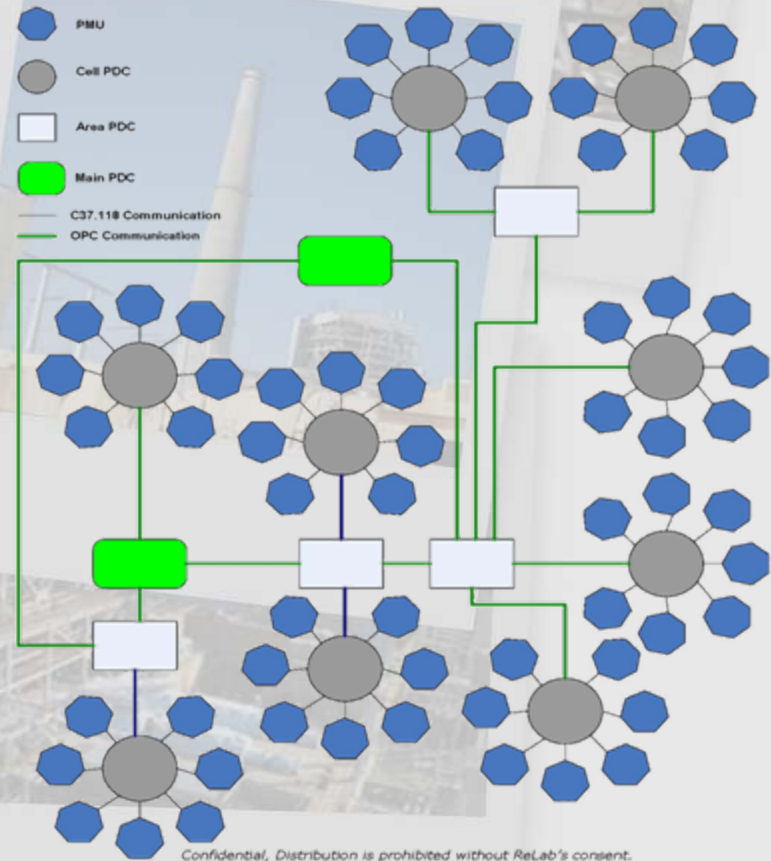
- Fast, efficient, interoperable, expandable and inexpensive implementation of Synchrophasors for automated grid control
- Upgrading of existing control systems to take advantage of Synchrophasors rather than replacing the control system
- Low cost-of-ownership with fast return-on-investment

## • 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

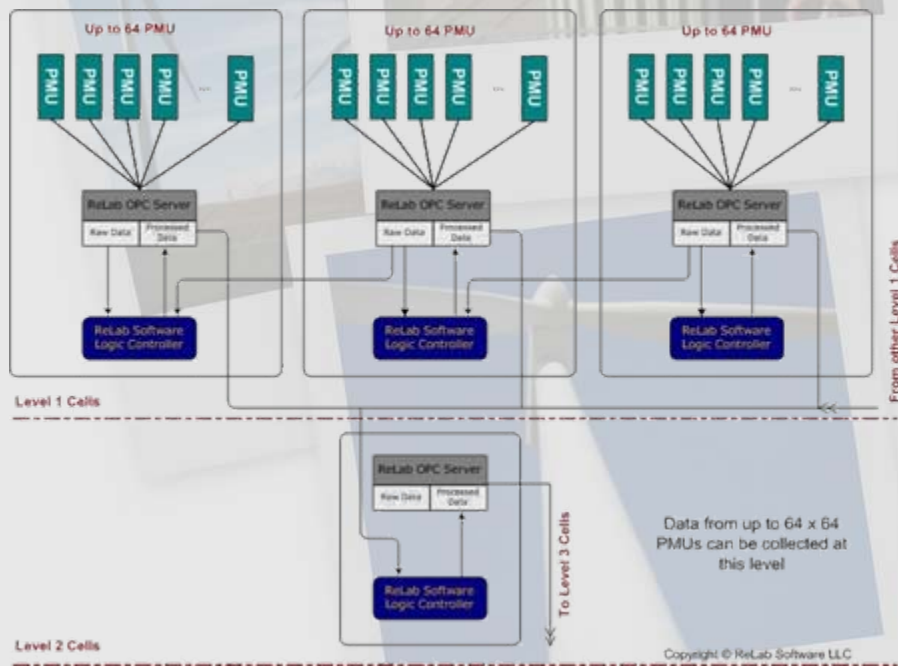
WAM C37.118 OPC Data Distribution & Concentration

### 2.2.1 Cell Concept Topology



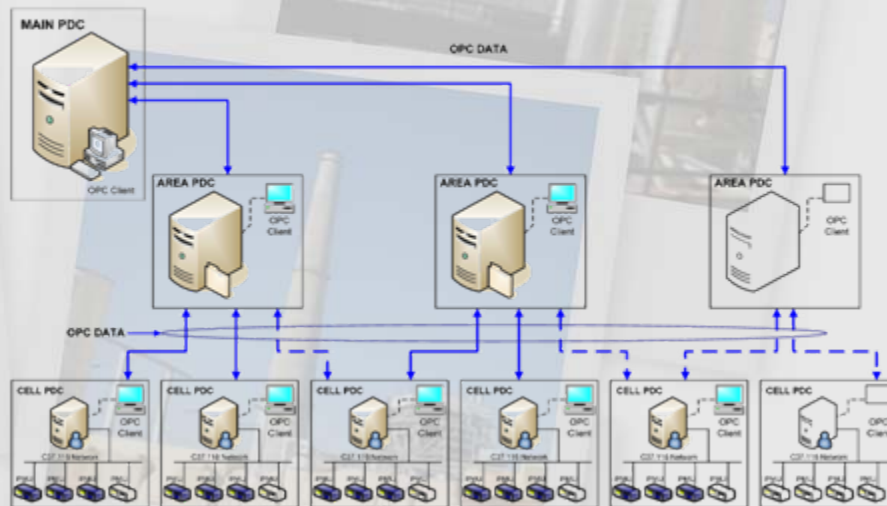
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# Software for Phasor Technology



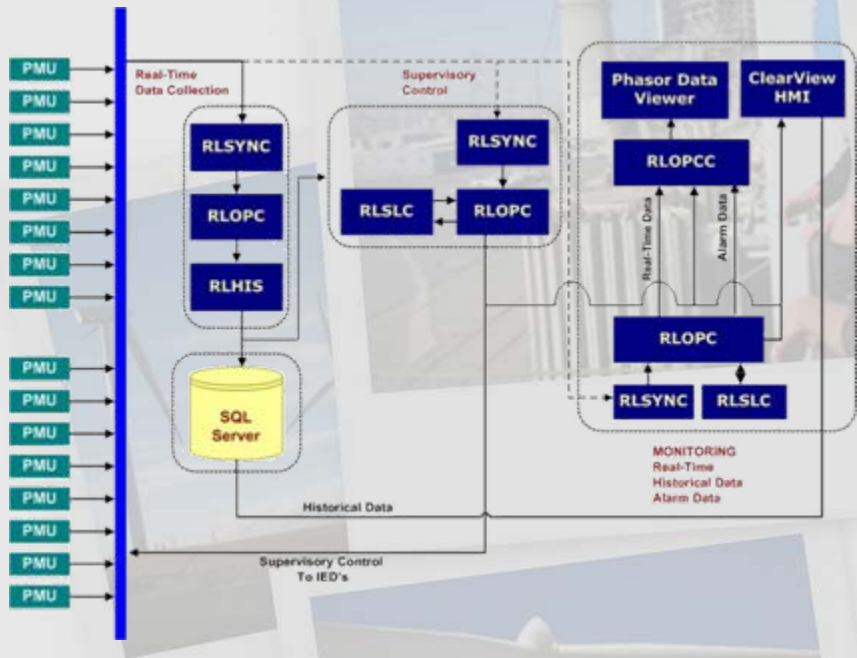
WAM C37.118 OPC Data Distribution & Concentration

## 2.1 System Topology



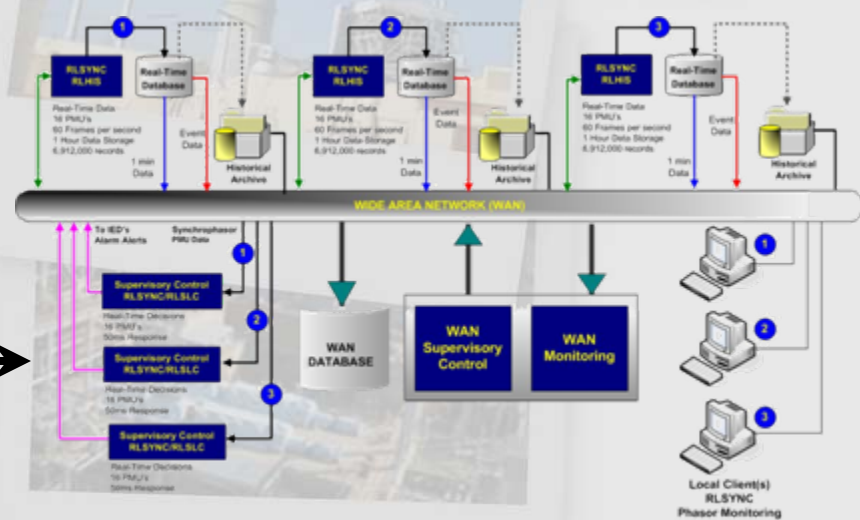
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# Complete Software Synchrophasor Solutions



## 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***

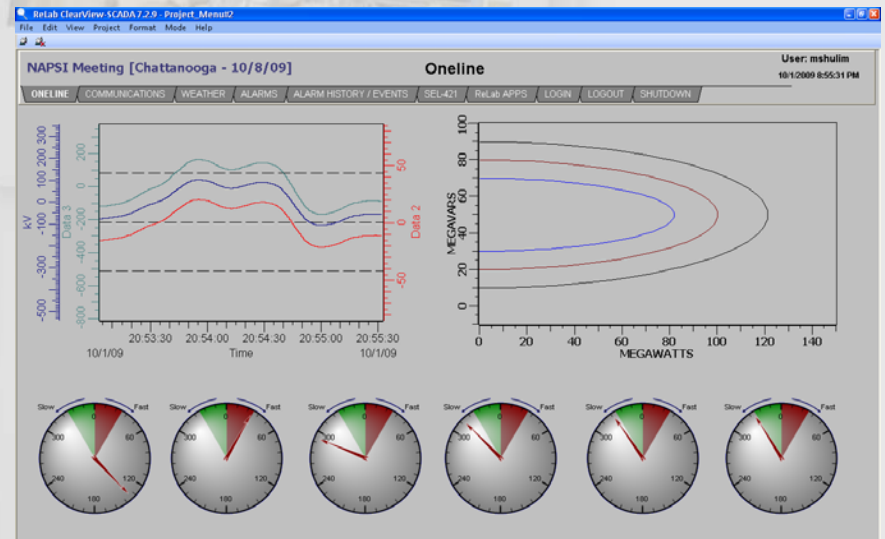
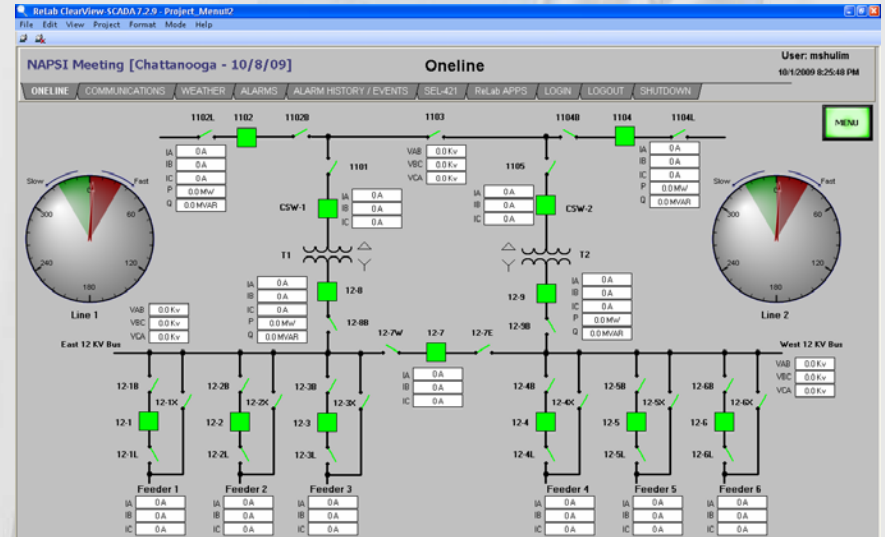
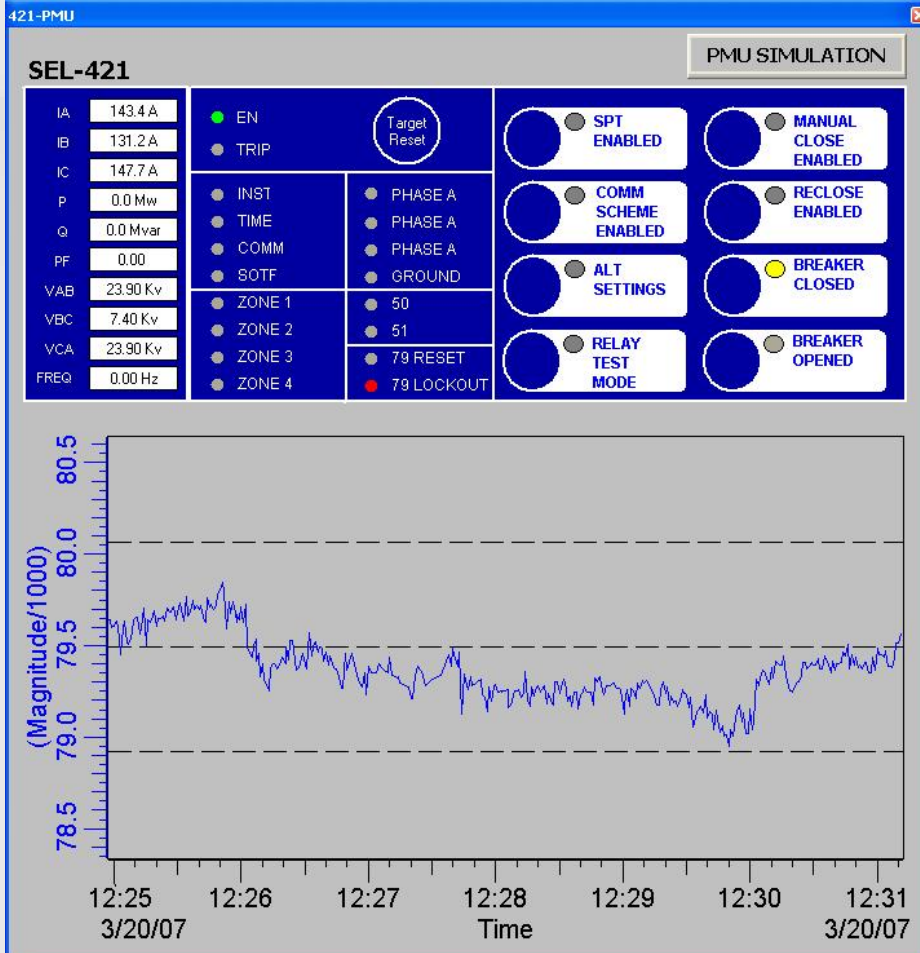
- **Synchrophasor Data Management**

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

- **Phasor Data Analysis**

- Oscillography
- Historical data trending
- Phasor Display Chart
- Alarm Displays

## Data Monitoring



# One Line

**Integrated Control Enclosure Sub**  
**Online**

User: Operator  
 3/20/2007 12:25:05 PM  
NO ALARMS

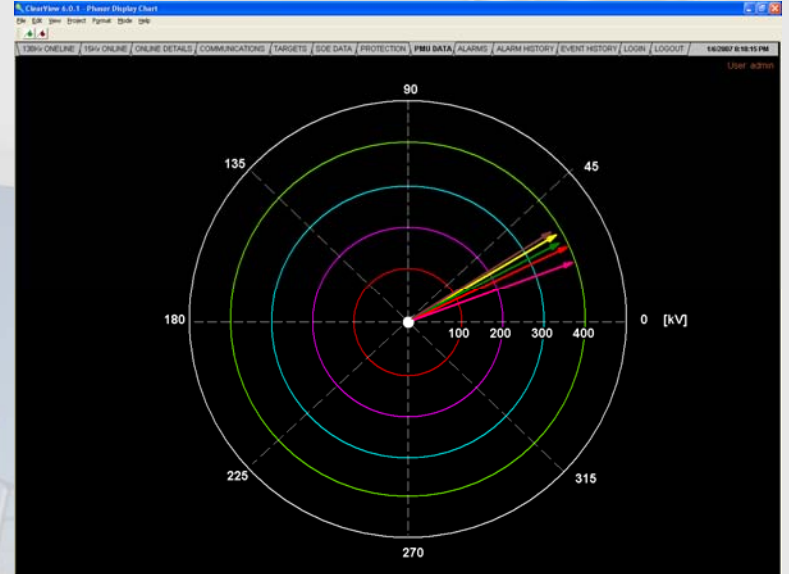
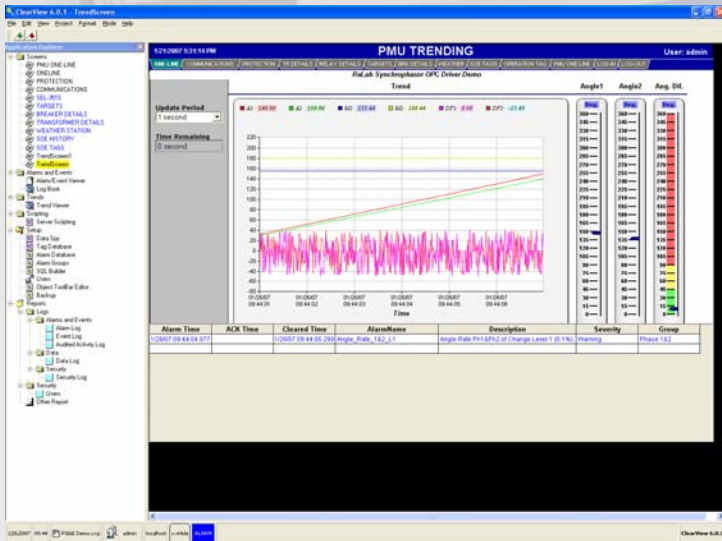
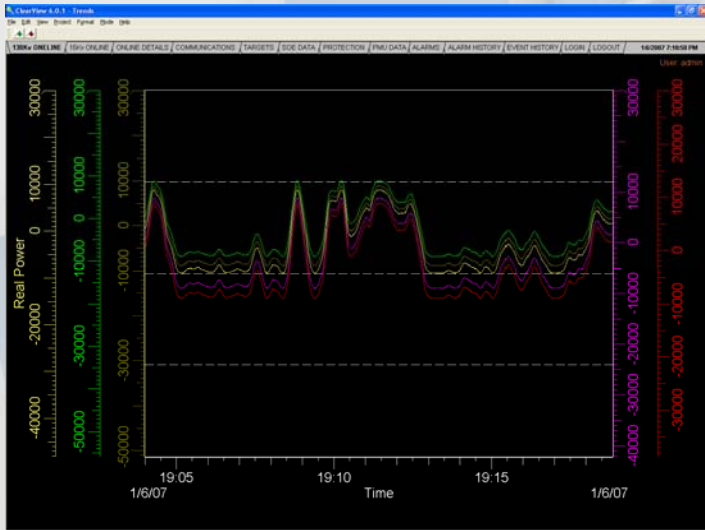
ONELINE
COMMUNICATIONS
WEATHER
ALARMS
ALARM HISTORY / EVENTS
SER
SEL APPS
LOGIN
LOGOUT
SHUTDOWN

Alarm Time	ACK Time	Cleared Time	AlarmName	Description	Severity	Group

ACK ALL



# Data Visualization

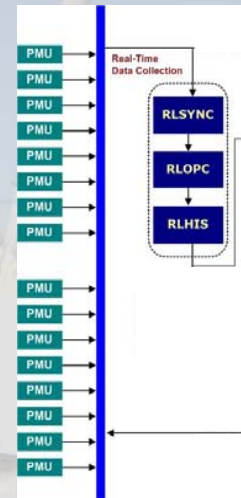


Phasor Display Chart

Real-Time & Historical Trending

# Implementation: Boulder Co

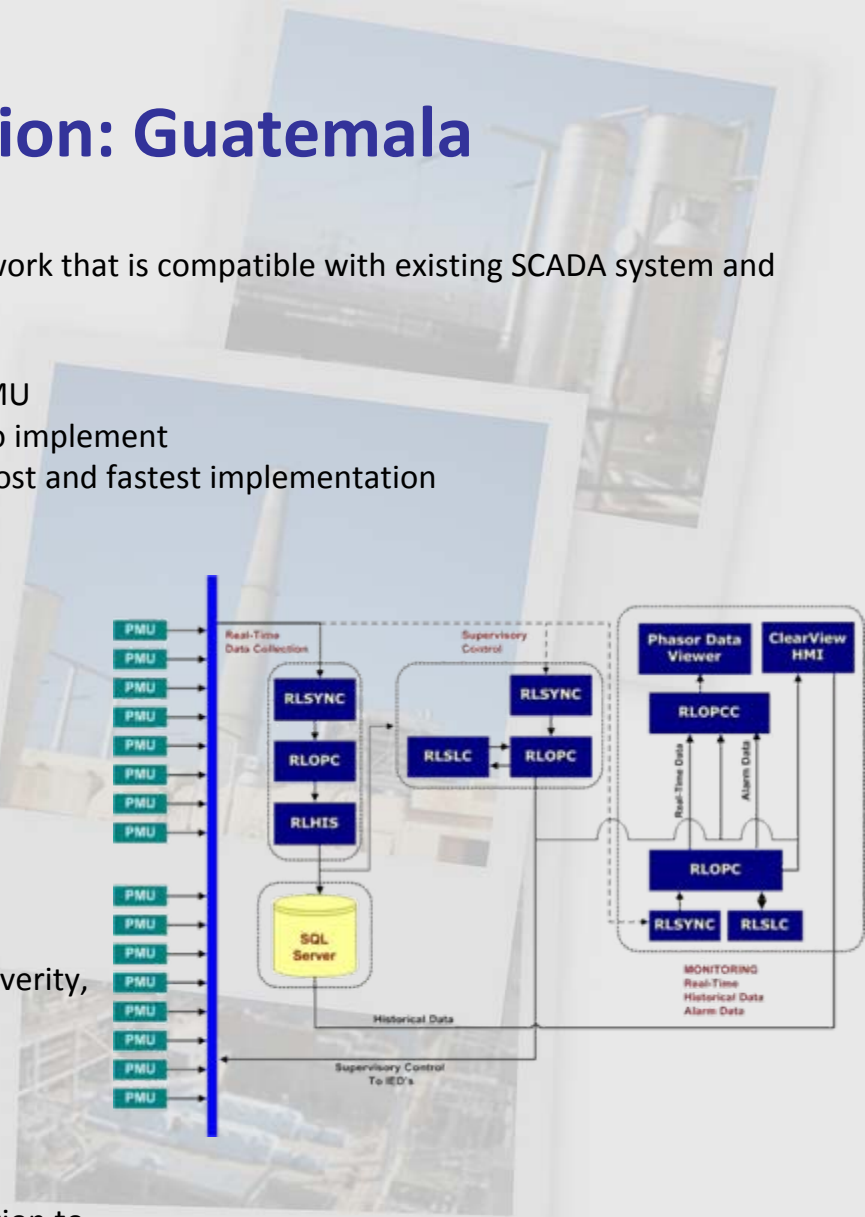
- **Client:** Accenture and Xcel Energy
- **Objective:** Accenture to develop an analytics engine inside the substation fence that would collect data, process it and in some cases send it centrally to further support other capabilities
- **Requirements**
  - Fast data transmission with time stamp from 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



Accenture:  
Advanced  
Analytics Module

# 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

Enterprise Systems, Databases

**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

## 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**