Web-based visualizations with PI System

Presented by
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About

• Natural Gas and Electric Utility in Northern and Central California
• 5.1 million customer accounts
• 141,215 miles of distribution electric circuits

• Independent system integrator across all major industries
• Over 300 engineers
• Providing PI System integration services for over two decades
About us:

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Enterprise Agreement (EA)

- PG&E Lines of Businesses using PI System:
  - Transmission, Generation, Distribution
- PI products within Distribution:
  - PI AF Builder, PI Server, PI Interface for UFL
  - Future: PI ProcessBook, PI Coresight, PI DataLink
Enterprise agreement (EA)

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• PG&E Lines of Businesses using PI System:
  – Transmission, Generation, Distribution
• PI products within Distribution:
  – PI Asset Framework (PI AF)
  – PI Server
  – PI Interface for UFL
• Future: PI ProcessBook, PI Coresight, PI DataLink
Background of FLISR

• Fault Location Isolation and Service Restoration (FLISR)
• Grid Automation system to isolate and restore outages through fault detection and real-time load monitoring
• PG&E made an investment to target the 400 worst-performing distribution circuits out of 3000 circuits
• Operators and engineers require more visibility and data access than ever before to manage the grid
• With PI System, PG&E found a great solution to drive data visibility to end users
Distribution Automation

• Fault Location Isolation and Service Restoration (FLISR)
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- Fault Location Isolation and Service Restoration (FLISR)

![Diagram of electricity flow and fault location](image.png)
Distribution Automation

• Fault Location Isolation and Service Restoration (FLISR)
Distribution Automation

• Fault Location Isolation and Service Restoration (FLISR)
Challenges

• Visibility for real-time monitoring of electricity to our customers ➔ $$
• Visibility for long-term system planning and process improvement
• Scalability of data to employees located hundreds of miles apart
Solutions

- PI System to provide real-time data infrastructure
- Integration with DMS, RTSCADA and SQL
- HTML web portal for a “one stop shop” of grid data

**PG&E SCADA System**
- Logs
- Circuit Configuration
- RTSCADA Data Points

**Grid Operators**
- Physically located in a Control Center – can access restricted data

**SQL**

**OSIsoft PI System**

**HTML Intranet Portal**

**Operation Engineers, System Planners**
- Located at different offices – can now access data through the PI System
Solutions

Logs

- Transfer raw event logs from SCADA system to web portal for detailed engineering analysis
- Filter logs based on log syntaxes

Single Line Diagrams

- Generate diagrams dynamically from GIS data
- Review historical snapshots and video playbacks
- Display real-time status and trends for quick operational analysis

Data Graphs

- Display real-time trends for detailed engineering analysis
- Add custom charts to webpage dynamically
- Email custom charts to team members
System Architecture

ODN
- RTSCADA Server 1
- FLISR Server 1
- RTSCADA Server 17
- FLISR Server 17
- RTSCADA & FLISR Logs

DMZ
- dDNA SCADA Concentrator
- PI Interface (RTSCADA)

Utility Intranet
- PI Interface (UFL)
- PI Server
- HTML Portal
- PI AF
- DMS
- UDN Logs Repository

Operation Engineers, System Planners

Grid Operators

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Logs Integration

PG&E SCADA System

- Logs
- Circuit Configuration
- RTSCADA Data Points

Grid Operators

Access to Restricted Data

Operation Engineers, System Planners

Web Portal Data Access

SQL

HTML Intranet Portal
Single Line Diagrams: DMS&PI System

PG&E SCADA System
- Logs
- Circuit Configuration
- RTSCADA Data Points

Grid Operators
Access to Restricted Data

Operation Engineers, System Planners
Web Portal Data Access

DMS
PI AF
HTML Intranet Portal
Single Line Diagrams: DMS&PI System

- Circuit configuration sent to web service
- Web service asks Distribution Management System (DMS) for information about the circuit
- Web service processes and stores pertinent information about circuit and relevant devices in PI AF
  - Automated PI AF hierarchy generation/placement
  - Automated device creation using PI AF Templates
- PI Tags for devices created automatically
Device Management

PI AF Templates

• Created a portal based on PI AF Templates to drive device management
• Provides an interface for creating a consistent naming scheme
• Instrument tag value suggestions based off existing DNA Plus system
Navigation Strategy

PI AF Driven Navigation

- Leveraged PI AF to organize devices and device data
- Filtered PI AF hierarchy is delivered to end user through web portal
- All interactions with the OSIsoft PI System use the PI AF SDK (version 2.5)
- No references to the previous PI SDK
Single Line Creation

Web service integration of GIS data

- Algorithms developed to reduce DMS data to a core connectivity model
- Reduced information stored as PI AF attribute information
- After reduction all requests for display generation are made solely through PI AF SDK to the PI Server
Tag/Point Data: PI-SCADA Integration

PG&E SCADA System
- Logs
- Circuit Configuration
- RTSCADA Data Points

Grid Operators
- dNA Plus
- PI Tags

Access to Restricted Data

Operation Engineers, System Planners

Web Portal Data Access

HTML Intranet Portal
Tag/Point Data: PI-SCADA Integration

- RT SCADA points and data are already flowing to existing dNA Plus historian
  - dNA Plus is going to be phased out
- dNA Plus writes point data to file
- PI UFL Interface is used to write data to the OSIsoft PI System
- In the future, going to use the PI Interface for RT SCADA
Product Demo

• Video Playback
Results

• Immediate Results:
  – Continuous Improvement
    • System Planners identify patterns in data and provide process improvements for installation and management of FLISR automation
  – Quick Outage Response
    • Engineers immediately support restoration of outages as they occur in real time, shaving customer minutes off of outages
Future Plans and Next Steps

• Replace PG&E legacy historian with OSIsoft PI System
  – Enterprise Agreement (EA) with OSIsoft
  – Scale out from 400 FLISR circuits to 3000 electric distribution circuits

• OSIsoft is developing and testing an interface to connect PI System directly to the RTSCADA system (replace UFL)

• Alarms and Notifications
  – Use PI Notifications to alarm and alert users
  – Store Notification history in PI Event Frames

• Dynamic creation of single line for outage boundaries
  – Trigger with PI Event Frames
  – Query DMS for connectivity model
  – Generate single lines for each outage event for engineering analysis

• Use PI ProcessBook and PI Coresight for ad-hoc engineering analyses
Grid Data Visibility

“Through the PI System, PG&E’s engineers have gained visibility to the real-time operational data to allow them to support the operations of the grid and long-term system planning.”

Dan Pinsonneault
PG&E

Business Challenge

- Real-time monitoring of grid automation system
- Long-term planning of grid automation system
- Scalability of data across scattered employee locations

Solution

- PI System implemented as a Real-Time Data Infrastructure
- PI System with multiple existing systems
- Custom HTML portal

Results and Benefits

- Increased collaboration between engineers and grid operators
- Quick response to customer power outages
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THANK YOU