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SUMMARY

DTE Energy Co.®

DTE Energy®

INDUSTRY

Power and Utilities

BUSINESS VALUE

- Industrial Internet of Things (IIoT)
- Sensors
- OT-IT Integration
- Fault Location
- Reducing customer outage minutes
- Real-time fault mapping
- Fault Detection

PI SYSTEM™ COMPONENTS

- PI Server™
  - Asset Framework (AF)
  - Notifications
- PI Interface for DNP™
- PI Cloud Connect™
- PI to PI Interface™

PARTNERS

esri

DTE Improves Distribution Reliability with Smart Fault Indicators

DTE Energy Co. is a diversified energy company involved in the development and management of energy-related businesses and services. DTE Electric is the 12th largest utility in the United States, serving approximately 2.1 million customers with approximately $5 billion in revenue and $17 billion in assets. In their presentation, Cameron Sherding, Sr. Software Engineer in the Distributed Resources System Operation Center (DRSOC), and Mark Blaszkiewicz, IT Manager described how DTE combined sensors, Esri ArcGIS and the PI System to reduce customer outage minutes across their distribution system.

Blaszkiewicz opened the presentation by describing DTE Electric's history with the PI System. "On the distribution side we have approximately 7,600 square miles of service area, 671 distribution substations, 12 service centers, and a little over 46,000 miles of power lines." In 1997, DTE "started with a [PI System] pilot at [a] coal-fired generation station. [Afterward] the PI [System] quickly spread throughout all of our generation facilities." Over time, DTE's PI System expanded to their nuclear facility, electric distribution, AMI, wind generation, compressor stations for their gas utility, and finally, they "started using PI Cloud Connect to connect our wind generation sites to our service provider."

BUILDING THE BUSINESS CASE FOR DATA-DRIVEN FAULT LOCATION

Sherding introduced the smart indicator program saying, "like every electric utility, DTE is actively working to reduce customer outage minutes on our distribution system. We're doing that through fault locating...which boils down to quickly isolating locations and source of faults to minimize restoration times." Faults occur for many reasons like "trees falling on power lines during a storm, an animal getting into the equipment, or just your typical cable and equipment failures that occur over time. In each case, you see a large spike in current, usually followed by an outage;" however, getting customers back online is not an efficient process. Sherding pointed to a key challenge. "In the past, when a circuit has faulted [and produced] an outage, a crew would be dispatched to the head of the circuit, and they would just patrol the line to try to locate the source of the fault. You can imagine, with some longer circuits that could take quite a while." Sherding summarized, "The business challenge here was to determine where to send crews during an outage...The goal is to visualize [sensor] data in real time...to minimize patrol times and reduce the customer outage minutes."

CREATING A SMARTER FAULT INDICATOR SYSTEM

To create value, DTE had to address two key challenges:

1. Integrating data from different types of sensors with multiple back-end systems

2. Allowing crews to visualize real-time sensor data in the field.

"For fault locating, sensors are installed out in the field," Sherding explained. "We actually utilize two different sensor manufacturers...Each of these talks through a proprietary head end system that's running back at our Distributed Resources System Operation Center (DRSOC) primarily using cellular" as well as some Wi-Fi sensors that communicate with a mesh network. "Both of those systems expose a DNP slave interface which allows us to utilize the PI Interface for DNP™ to grab the data and pull it back into the PI System."

To make data actionable, DTE has two sets of Notifications (see figure below.) Sherding explained, "we have an Asset Framework [AF] model that we built to represent the sensors and the sensor locations." The DRSOC PI System generates "e-mail and SMS alerts [to notify crews] when faults occur." The DRSOC and DO PI Servers are connected by the PI to PI Interface™. Sherding continued, "Mapping...is also a big part of the project. [It] allows our crews and field personnel to view the data on their mobile devices." When events occur, the corporate Distribution Operations PI System generates XML notifications that get pushed on our enterprise service to calculate the location of the fault for display in our [Esri] GIS system.

PI System Solution Architecture
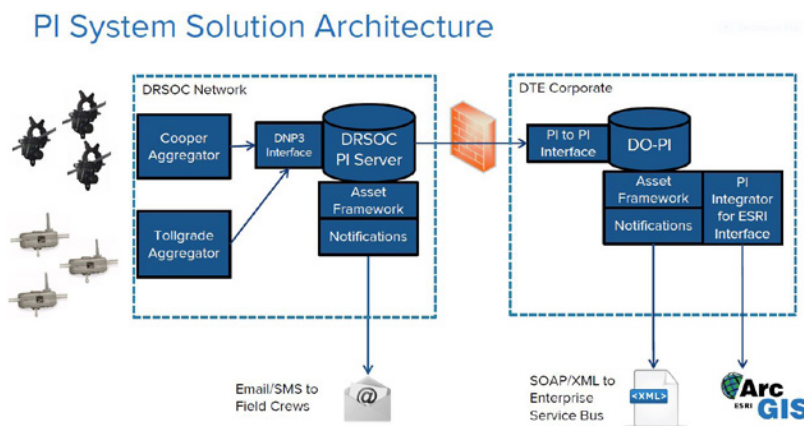
> "I've been hearing a lot about this Internet of Things. This is a good example of that... putting out these low-cost sensors, incorporating them into the PI System. Although it's not four-second SCADA data, it give[s] a lot of value to the company."
>
> Cameron Sherding - Sr. Software Engineer

Operationalizing data, Benefits and future plans

Sherding concluded his talk by giving an example. "We had a circuit-level outage. Based on the previous circuit history, [we] would have treated this as a cable fault." In this case, "the overhead supervisor received the emails and SMSs that we had set up." As part of the process, "they were able... to pull up the [ArcGIS] map and take a look," he said. "The map includes not only our fault indicator data but..our AMI data as well. There were several AMI meters that were reporting outage at the same time. From the fault indicators, the crew could clearly see which section of the circuit was impacted by the fault, and they were able to dispatch a crew to the right location, right away. According to them, they were able to make a determination within five minutes of the outage where to send the crew and to do the restore before repair."

"In terms of benefits, it's hard to put a dollar value on outage minutes. It's kind of the holy grail of figuring out a financial value." Sherding estimated that currently, DTE has around 800 sensors, "and we're probably going to double that in the next three months." Looking forward, he added, "in terms of saving outage minutes, we're expecting to eliminate at least 500,000 customer outage minutes annually."

Sherding, C. Blaszkiewicz, M. Improving Distribution Reliability with Smart Fault Indicators and PI System. Oct. 2015. Web 05, March 2016
http://www.osisoft.com/Templates/item-abstract.aspx?id=12380