Smart Grid Solution

A Machfu Case Study

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MACHFU

A Flexible Solution for Improving Asset Life of Legacy Utility Systems

According to the U.S. Energy Information Administration, major U.S. electric utilities spend $51 billion annually on electricity distribution systems, largely to upgrade aging equipment on their distribution system and to install smart meters. These investments are part of a broader trend toward a national smart grid that leverages new technologies to optimize electrical grid performance and minimize downtime.

A recent survey published by SAS of some 200 U.S. utilities dives deeper into the progress toward an autonomous grid, looking specifically at the use of industrial internet of things (IIoT) technologies and machine learning to aid the transition to a smart grid. The survey found that 43 percent of utilities are already using IoT for outage management, while another 24 percent plan to use it within the next three years. The utilities already using IoT report the technology helps them:

- Identify outages faster and sometimes predict them before they happen;
- Prevent outages from happening at all or fix them faster than before; and,
- Reduce downtime and improve reliability at a lower cost.

While a fully autonomous grid is still a thing of the future, electric utilities are clearly headed in that direction.

A Sample Application

Traditionally, electric utilities have largely relied on faulted circuit indicators (FCIs) to detect and locate outages within their systems. This approach has its roots in what is now considered aging technologies. These older grid systems have fallen behind in large part because they were only updated every few decades. As a result, the electric utility industry is built on an infrastructure dominated by legacy and proprietary systems. Modern technologies in communication are built on open standards-based paradigms that facilitate moving to a modern smart grid. Standards based protocols and platforms help the grid stay up to date with software updates rather than having to send field service crew to change hardware.

Eaton's GridAdvisor™ Series II sensor is a fault detection sensor that is used on existing grid infrastructure and is designed to quickly and accurately indicate and locate both permanent and momentary faults. The GridAdvisor Series II sensor has both a 3G and Bluetooth radio built into it. As the 3G network sunsets, the sensor can continue to operate until end of life with a Machfu application gateway. The gateway allows the GridAdvisor Series II sensor to connect over the Bluetooth link and then transport data over the LTE network. The smart sensor then continues to help electric utilities improve reliability while reducing operating and maintenance costs. Connecting legacy equipment to smart grid applications allows electric utilities to:

- **Push Data in Real Time** – Relying on centralized polling of data causes significant latency and limited ability to scale. IIoT gateways poll data locally and create data models that can communicate with traditional SCADA systems as well as cloud-based solutions to take advantage of modern web services.
- **Leverage Cellular Infrastructure** – IIoT gateways allow grid monitoring devices to take advantage of cellular connectivity, forming secure connections with multiple backend or cloud systems.
- **Enhance Sensing with Low Power Sensors** – New standards based low power field area networking sensors are easy to install and scavenge power from the power line. IIoT gateways convert the sensor data to legacy protocols such as DNP3 or new modern cloud-based systems.

- **Leverage the Cloud** – As distributed grids become increasingly complex with many more devices to manage, IIoT gateways are able to connect to cloud-based infrastructure and share real-time data and analytics with cloud-based applications.
- **Enhanced Grid Security** – Legacy grid monitoring systems when IP networked are vulnerable to cyberattack and lack robust cybersecurity capabilities because the legacy protocols were not designed with modern security in mind. IIoT gateways can minimize security risks using the latest security methodologies and update and patch security features to adapt to ever-changing cybersecurity threats.

MACHGateway + GridAdvisor Sensor Enhance Grid Monitoring

Integrating the MACHGateway with GridAdvisor sensor allows electric utilities to connect a smart network of outage detecting sensors to existing SCADA systems. Utilities have the option to connect to a private SCADA radio over a serial or ethernet port, or with the embedded LTE cellular radio. This solution also connects sensor data to cloud applications for providing web services thereby reducing maintenance costs and enabling predictive analytics.

How it works:

- The MACHGateway polls the GridAdvisor sensor as a DNP3 master over Bluetooth
- The DNP3 data is mirrored in a device model, pushing messages or polling data via the embedded cellular modem, serial or ethernet port
- Data can be integrated with the cloud via the cellular connection
- The gateway enclosure includes additional protection and the space to mount a radio or other network interface
- Secure authenticated TLS or IPSec tunnel can be applied to all networked interfaces

Authors:

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Chief Executive Officer, Machfu

Prakash Chakravarthi is the CEO of Machfu and provides the vision and leadership for the development of Industrial Internet of Things solutions. Machfu's mission is simplifying connectivity from edge to enterprise. Prior to founding Machfu, Prakash founded multiple IoT and M2M businesses including Eka Systems a Smart Grid connectivity company that was acquired by Cooper Industries. His strong business and technical background enable him to uniquely build technically diverse and executionoriented teams with deep expertise to rapidly and effectively de ne, create and deliversolutions and products in the evolving IoT space. Prakash has a Ph.D. in Communication Systems from Syracuse University and an Executive MBA from MIT.

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John has 20 years of experience and subject-matter expertise in developing innovative solutions for Utility, Oil & Gas, Water/Waste Water, Traffic, Rail, Heavy Industrial and Commercial markets. He is credited multiple patents associated with the application of communication technologies in the industrial scape and actively participates in the SGIP and IEEE802. Previous positions include Wireless Center of Excellence Leader for GE Digital Energy and VP of Engineering for MDS.

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