FINLEY ENGINEERING
INTEGRITY INTO EVERYTHING

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THE ENERNET: THE CONVERGENCE OF THE ENERGY GRID AND THE INTERNET

PART II - CHALLENGES

As noted in Part I of this whitepaper, in order to effectively manage the massive and complex communication needs of the modern electric grid and all of its components, it will be important for utilities to have access to a robust, reliable, interoperable, broadband, nationwide digital telecommunications network that can handle literally tens of billions points of monitoring and control in real time.

The information network capable of handling this digital information blizzard must be ubiquitous, self-healing, and have sufficient speed and capacity to monitor and manage billions of intelligent electronic devices within the grid and inside consumers' homes and businesses.

According to Steve Collier, director, smart grid strategies, for Milsoft Utility Solutions, the Internet, both wired and wireless, is already nearly ubiquitous and has proven to be able to handle millions of times more data than anyone originally expected. "It's the only communication network that can support a smart, self-healing power grid that will involve monitoring and managing billions of intelligent electronic devices distributed throughout the grid from generation through transmission and distribution systems into consumers' homes and businesses," he said.

The resulting interaction of the electric grid and the Internet is being referred to as the "Enernet."

However, despite the seemingly unlimited opportunities and benefits of the Enernet for the utility industry and its customers, there are a number of very important concerns and challenges that must be met before the Enernet can reach its full potential.

CONTROL

One of the most important challenges relates to control. Electric utilities and the Internet, while they have some similarities, also have some structural and fundamental differences.

For example, the electric utility is a cost-plus franchised monopoly business that has been around for over 100 years and hasn't fundamentally changed its mode of business or its structure for the transmission and distribution of energy during that time period. The Internet, on the other hand, is a highly-competitive, rapidly-changing technology that has been around just over 25 years.

"Utilities are accustomed to owning and controlling all parts of their infrastructure, in large part because they are required to serve customers reliability," said Milsoft's Collier.

As such, the challenge for utilities will be: Who will control the Enernet? And will utilities be able to maintain enough control over it to make sure it achieves its purposes?

INFORMATION SECURITY

Information security of the Enernet is another significant concern for utilities. Given the problems that already exist with the cybersecurity of the nation's electric grid, the introduction of the Enernet can cause these problems to explode, if not addressed properly. That is, the more we become dependent on such a system, the more opportunity there is for those who would choose to do evil to do so.

This challenge, according to Collier, can be met. "The issue of customer data privacy is important, and I don't diminish or denigrate utilities for being concerned about it," he said. "However, the entire world's banking industry and many other national and global industries rely on the Internet for commerce with their customers." While the cybersecurity problem is real, noted Collier, these industries have shown that it can be addressed successfully with appropriate technologies and business practices.

COMMUNICATION STANDARDS

Of course, for the Enernet to work properly, standards must be in place so that all of the components and participating entities can communicate with each other.

An IEEE committee, called the P2413 Working Group and created in mid-2014, is in the process of trying to create a standard ("Standard for an Architectural Framework for the Internet of Things") for the "Internet of Things" in general, covering the interoperability among connected devices and related applications in home automation, industrial systems, telematics, and all other sectors that are expected to be involved with the "Internet of Things" in the coming years.

The Working Group does not want to replace existing "Internet of Things" groups, but rather wants to create a standard architecture so that "Internet of Things" systems for all industries can work together, including the Enernet (one element of the "Internet of Things") for the utility

industry. "They need a place where they can come together and move forward as a scalable, unified platform," said Oleg Loginov, chair of the P2413 Working Group. "That type of unification can be enabled only by a global standard."

However, the current scenario poses at least three challenges for the utility industry.

One relates to agreement, or lack of agreement, on what the communication standards should be. I recall sitting in on a presentation earlier this spring on the Enernet, and the speaker made the comment, "I don't know that I can get 70 engineers to agree on what time the sun is going to rise tomorrow morning much less to agree on a complex set of communication standards."

A second challenge is ensuring a standard that is relevant to the utility industry in specific. The P2413 Working Group is "covering the waterfront" in terms of stakeholders. The list includes (in alphabetical order): appliance providers, application developers, automation equipment providers, city authorities, consumer equipment providers, consumers, facility management, hospitals and doctors, ICT infrastructure providers, insurance companies, logistics companies, manufacturing industries, public transportation companies, regulators, retail stores, and utilities.

A third challenge is keeping the "Internet of Things" standard updated. That is, besides the challenge of creating the initial standard, an ongoing challenge will be to continue to revise the standard as the rate of change of the "Internet of Things" continues to increase. It might take three to five years to develop the initial standard, but, by that time, the standard will already likely be obsolete.

INTEROPERABILITY AND COMMUNICATION NETWORKS

The interoperability of the network relates back to the communication standards discussed above, to make sure that all of the segments are communicating properly and adequately with each other. Adding to this challenge is the fact that we will be bringing more and more complex systems on-line. Again, there needs to be a common communication thread among all of these interacting segments.

As utilities become more reliant on communication networks and become more interconnected, the question arises, "Who's minding the store?" To some degree, we have been able to do this over the years in the transmission arena with the creation of the Regional Transmission Organizations (RTOs). But when we are connecting it down to things like, "I have a consumer device that is communicating back to the grid," it is clear that there will be billions, maybe even trillions, of moving parts that have to operate in a coordinated manner.

Furthermore, a large portion of our country is currently deemed by various standards as being underserved. Getting the Enernet into these areas would involve engaging in a lot of complex data transfers, data networks, and communication networks in areas that don't even have adequate cell coverage yet, much less high-speed and wide bandwidth.

There is also the question of whether these will be public networks or private networks. This leads to the next challenge: Who will be willing to make the investment?

INVESTMENT

Of course, everything comes back to finances. For example, we are currently working with some clients, conducting feasibility studies for them on communications networks, which can be very expensive in terms of the investment required, even to bring these networks up to a current level of adequacy, much less looking toward future requirements.

What is available from the entertainment industry that consumers are demanding is making it even more expensive and challenging, because of the increased bandwidth requirements. It used to be High-Definition (HD). Now it is 4HDTV and 8HDTV.

Is there a private entity large enough to pull this off? The "Googles" of the world might be able to make a pretty good play. However, Google may not be interested in getting adequate communication networks out to the hinterlands, because there isn't enough economic incentive to do so.

In terms of the public entity option, funding is likely to be a challenge. For example, our roads and bridges are falling apart around us, so the question arises as to whether there will be the budget available to spend money on communication networks, when there are so many other significant competing needs.

PERSPECTIVE

In sum, the Enernet offers a significant number of benefits and opportunities for electric utilities to continue to move into the 21st Century. However, unless the challenges that exist are addressed, progress will be fraught with problems.

In Part III, we will look at what Finley Engineering, which has long-term expertise both on the electric utility side and the communication network side, can "bring to the table."

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