Welcome to the Active Network

Today's Challenges Require a Solution Built for the IoT World

When it comes to how we manage the delivery and use of energy and water, or how we run our cities, there's a lot of opportunity for improvement. Each year in the U.S. alone, nearly $100 billion in energy and water are wasted, stolen, or otherwise lost before reaching the end user. As migration toward urban centers increases, cities are under increasing pressure to manage resources more effectively, and utilize new technology to make the urban landscape more livable, sustainable and economically vibrant. These challenges are significant and the opportunities before us are compelling.

In 2010, for the first time, more than half of the Earth's seven billion people were living in urban areas. By 2025 that number will increase to 60 percent, and will be as high as 80 percent in many Western, economically developed countries, according to a recent article in Forbes. And today's cities are increasingly inhabited by a younger, tech savvy and often "green-thinking" workforce. This confluence of demographics, technology and resource management pressures is animating the Smart Cities movement. There are many opportunities for cities to leverage new technology to drive significant improvements in energy efficiency, water efficiency, transportation and traffic management, refuse collection and recycling diversion, public safety, city services, and other areas.

OPPORTUNITIES ABOUND

Let's start with the power grid. According to the U.S. Energy Information Administration, six to eight percent of the electricity generated at the power plant disappears due to "technical losses" from the lines and equipment that deliver power to the end user while another one to three percent is lost to electricity theft or other "non-technical" losses. In some countries those numbers can reach as high as 30 or 40 percent. Power outage and reliability problems cost the U.S. economy as much as $75 billion in lost productivity annually, according to the Congressional Research Service, (though some research puts the annual cost in the hundreds of billions of dollars). And the power grid is not yet equipped to seamlessly accommodate the rapid growth of distributed energy resources such as PV solar, which surpassed 25GW of installed capacity in the U.S. last year, with total solar installations passing one million sometime in 2016, according to GTM Research.

Our natural gas pipeline and distribution infrastructure presents similar challenges. According to a 2015 study led by Stanford University and supported by the U.S. Department of Energy, invisible gas leaks from aging or damaged pipelines cost consumers billions of dollars per year. These leaks also boost greenhouse gas emissions significantly due to the high carbon intensity of methane (thereby nullifying other carbon emission reduction efforts), and in some instances, these leaks lead to dangerous and even deadly explosions and fires.

In a time when climate change and persistent drought in some areas are pressuring water resources as never before, the typical water utility in the U.S. loses somewhere between 10 and 30 percent of the water it treats and pumps before it ever reaches the end user, according to the American Water Works Association. These losses, which can be much higher in less developed countries or in cities with old infrastructure, are caused mainly by leaky water mains and pipes under the street and increasingly, theft of water. And these losses don't even take into account water lost at the end customer premise due to leaks, running toilets and other sources of waste after passing through the meter. Those leaks alone account for more than one trillion gallons of wasted water each year in the U.S., according to the Environmental Protection Agency.

NOT JUST POSSIBLE; PRACTICAL AND COST-EFFECTIVE

Making our energy and water infrastructure more efficient, more reliable and less wasteful, and making our cities more functional, livable and sustainable is readily achievable if we apply the right technology and approach problems in new ways in the Internet of Things (IoT) age. At Itron we call this the active network. It's much more than smart metering. It encompasses electricity, gas, water and smart cities, and an entirely new frontier of possibility.

The active network leverages significant advancements in Internet of Things (IoT) technology, including distributed intelligence; software-defined communications; multi-application networks; cloud computing; data analytics; and a new generation of battery-powered edge devices and sensors to achieve new and better outcomes that were simply not possible just a few years ago.

These technologies come together in Itron's OpenWay Riva, an IoT solution that delivers new and differentiating value to enable smart utilities and cities. Utility smart metering may often provide the initial impetus for network infrastructure investment, but the benefit stream can be broadened significantly and at a manageable incremental cost with the right building blocks in place. OpenWay Riva brings four key advancements that, applied together, redefine what is possible for smart metering, smart distribution of water, electricity, and gas, and smart city technology infrastructure.

One network, many applications: OpenWay Riva provides utilities and cities with a unified, scalable, multi-purpose IoT communications platform for energy, water and smart cities. This means that once the network is deployed, it's very easy and cost effective to expand the value of the network investment over time. OpenWay Riva's standards-based IPv6 multi-application network, jointly developed by Itron and Cisco, separates the network infrastructure from the devices and applications that run on it. This means that new devices and applications can be added easily to the network, just like a new laptop or a printer would be added to an enterprise-class IT network. It also provides standardized, robust security; state-of-the-art network management tools; and quality of service to dynamically prioritize network traffic based on application and business requirements for an IoT world. All while utilizing a common and existing IT skill set to keep operations simple and support costs under control.

A new way to communicate: The OpenWay Riva IoT solution is the first communications solution to combine multiple communication media – RF wireless, powerline carrier and Wi-Fi – on the same chipset and in the same edge devices. OpenWay Riva-powered devices intelligently select the most appropriate path, data rates and communications mode (e.g. mesh, point-to-point, peer-to-peer, local broadcast) to assure the highest level of communication performance and reliability to support an entirely new portfolio of smart distribution and smart city use cases. We call this Adaptive Communications Technology and it delivers assured connectivity at the highest possible speed.

Not a meter; a grid sensor and computing platform: With a powerful distributed computing platform to analyze data at the edge of the network, OpenWay Riva transforms the smart meter from a consumption measurement device to an advanced grid sensor with metering being one of its many applications. OpenWay Riva embeds the equivalent computing power of a smart phone or desktop computer in every device, enabling real-time analysis of high-resolution data in the field, while eliminating latency and avoiding the loss of data resolution during transfer over the network. OpenWay Riva also provides a robust distributed computing platform architected using open standards to run applications on meters and other edge devices, thereby unleashing a growing ecosystem of new providers to innovate on the platform.

Edge device collaboration: With its ability to support multiple application and communication protocols, OpenWay Riva's distributed computing platform also enables an increasingly diverse ecosystem of field devices, sensors and assets that utilize peer-to-peer communications to share data and collaborate in real time to solve problems at the edge of the network as conditions change. That means a smart meter or sensor can talk directly to a distribution automation controller or to an inverter on a solar panel, or a remote control valve on a gas or water pipeline. This type of self-directed device interaction has always been central to the vision of a smart distribution system, but never possible until now.

WHY DOES ALL THIS MATTER?

Each of these attributes described above represents a signifi cant industry or technology advancement in and of itself. But what really enables the active network, and what sets OpenWay Riva apart from other solutions, is what happens when we start combining these capabilities to enable new use cases.

By combining a unified multi-application network and Adaptive Communications Technology, OpenWay Riva-powered devices are able to utilize peer-to-peer communications to "compare notes" by sharing data in real time with other field devices for local learning, pattern recognition and even inter-device command and control, all critical functionality for enabling smart distribution and smart cities applications.

One of the key trends identified in the latest Itron Resourcefulness Index, an annual survey of utility executives, industry stakeholders and consumers to gauge progress in achieving more effective management of energy and water resources, was that utility executives are very concerned about creating business value from all the new data coming their way. The active network of OpenWay Riva fundamentally changes the approach to data management and analytics by applying intelligence to where the problem is best solved, whether that's in the utility back office, or increasingly, at the edge of the network. This approach utilizes distributed intelligence and analytic capability in field devices to greatly reduce the volume of data that must transit the network while also overcoming the latency challenges and requirements associated with many distribution operations use cases. With the active network, it's less about big data, and much more about the right data.

NATURAL GAS, WATER, SMART CITIES …

Itron has leveraged technology innovations to migrate all our battery-powered gas and water communication modules to the OpenWay Riva network, enabling the realization of all the benefits of Adaptive Communications Technology and the IPv6 architecture. The result is a solution that assures both high performance communication and reliable connectivity in all types of service environments, including the hardest-to-reach areas.

By automatically adjusting modulation schemes, transport speeds or finding alternative paths, the network adapts and continually self-optimizes to ensure that no node or device is left unconnected. No other network available combines multiple communication media in the same device with the intelligence to dynamically optimize both speed and connectivity.

The OpenWay Riva IoT solution can form either mesh or star configurations as the topography requires to provide a single, unified network for main-powered devices (streetlights, electricity meters, distribution automation devices etc.), or battery-powered nodes, such as gas and water meters, and smart city and IoT sensors. In mesh configurations, battery-powered gas and water modules function as "leafs" on the network, sending their data to nearby powered devices, where they are routed to the head end, via RF and PLC communications. The primary benefit of operating as a "leaf" on the mesh is reduced network infrastructure; with gas and water endpoints able to utilize the existing electric infrastructure minimizing the need to add additional network devices, while also strengthening the overall mesh network. The "leaf" functionality also ensures the Itron battery-powered gas and water modules and sensors will deliver a 20-year battery life, under normal operating conditions, eliminating the need to revisit or replace the modules after installation for a very long time.

More importantly, OpenWay Riva's capabilities can also be readily applied to water and natural gas distribution systems to identify potential safety problems early and reduce losses. For gas and water applications, the peer-to-peer communications capability of OpenWay Riva in combination with the distributed computing platform can be used to enable new pipeline safety, system integrity, pressure management, leak detection and loss reduction applications.

For instance, on the gas side, a network of OpenWay Riva-equipped sensors may detect the presence of methane, pipeline corrosion or pressure changes that could lead to unsafe conditions or the possibility of explosion or fire. Using OpenWay Riva's distributed computing power, sensors can analyze data in real time in the field, and using peer-to-peer communications, they can communicate directly with a remotely controlled valve to immediately shut off gas flow to that area or customer premise immediately without the data and command process having to transit the entire network.

For water utilities, connected pressure sensors deployed throughout the water distribution system utilizing OpenWay Riva technology monitor pressure in real time and are able to use the peer-to-peer communications to interact with neighboring sensors to identify pressure changes. If the changes exceed pre-determined thresholds, then the pressure sensors communicate with a pressure reducing valve to make adjustments and correct the pressure level. These capabilities enable water utilities to maintain consistent pressure levels to better ensure good service and reduce stress on its infrastructure, ultimately increasing its useful life and decreasing distribution leaks leading to costly main breaks.

While these utility operations-centered use cases for increased energy and water efficiency represent core applications for the OpenWay Riva IoT solution, there are many other smart city opportunities for both utilities and municipalities to consider. For instance, a city or municipal government could utilize the installed network infrastructure to transform streetlight management. By combining LED lighting with network-based control technology, maintenance and energy costs for street lighting can be reduced by up to 80 percent, while improving public safety and urban ambiance. Adding sensing intelligence to trash receptacles can greatly increase the efficiency of waste management by reducing collection frequency and costs while also improving recycling diversion rates. The network can also be used to monitor and improve traffic flows and parking space management in the city. These are just some examples of what is now possible, but the key to unlocking all the potential future value is to invest in a technology platform that was designed for many purposes; not one sole purpose as many AMI networks have been designed.

IT TAKES AN ECOSYSTEM

The smart grid and the Internet of Things are bigger than any one company, or any one technology. Itron recognizes this, and this recognition guides our approach to the OpenWay Riva technology platform and forms the foundation of our strategic partnership with Cisco. The OpenWay Riva IoT solution has been architected to provide an open application, interoperable environment that enables third-parties to embed OpenWay Riva technology into their devices, or to develop apps to run on the platform. To this end, Itron recently launched its Itron Riva Developer's Network and Itron Idea Labs, to drive new innovation and grow a robust ecosystem of developers and applications for this platform.

A diverse ecosystem of intelligent devices and sensors, analyzing high-resolution data at the edge of the network, communicating and collaborating, making decisions and taking action in real time to transform our energy and water delivery systems, empower consumers and businesses, and make our cities livable and sustainable. This is what we call the active network, and it's what separates the OpenWay Riva IoT solution from other offerings on the market. Indeed, it is these capabilities and the broad potential of the Itron Riva IoT platform that enliven our conversations with utilities, cities, and technology providers when we get together and ask the simple question, "What is now possible?"

Join us in creating a more **resourceful world**.
To learn more visit **itron.com**

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