



**Utilities**

**WHITE PAPER**

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## **BREAKING DOWN SILOS: THE VALUE OF A STANDARDS-BASED APPROACH TO SMART METERING AND SMART GRID**



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## Chapter 1

# Standards Drive Value

The value of standards is often taken for granted and sometimes overlooked. If a technology works well, connects easily, solves problems and is reasonably priced, standards are almost always a significant factor. From information technology to electronic design and communication networks, standards have played an invaluable role creating value, ensuring safety and improving performance across many industries.

## Interoperability is Critical

Standards deliver on the promise of interoperability where new devices, applications and enhancements can be added to “plug-and-play” without costly or time-consuming integration. Standards also enable portability and reuse so new products don’t have to be designed from the ground up every time, accelerating time to market and streamlining costs.

Standards foster collaboration, innovation and competition by enabling diverse groups to work from a common foundation instead of in proprietary silos. Standards also improve quality by reducing or eliminating translation and integration work and complying with agreed upon criteria for product performance and operation. The more broadly a standard is shared and supported, the more value it creates.

## Chapter 2

# An Opportunity for Utilities

As utilities throughout the world begin to implement smart metering and smart grid technologies, they find themselves at an opportunistic tipping point in which the industry is transitioning from a proprietary to standards-based network and solution architecture. Industry leaders such as Itron® and Cisco® are driving this critical transformation.

## IPv6: A Proven Foundation

The Internet Protocol (IP) standard has proven itself as a sound networking protocol as media changes over time. For example, IP was first used in laptop modem, then as an Ethernet connection, then 802.11 wireless. Even with the media evolving rapidly, the network addressing never changed. IP, which underpinned the explosion of growth, utilization and innovation with the Internet, is proving itself to be a highly suitable core standard for smart metering and smart grid network architecture. The current standard, IPv4, is increasingly being replaced with IPv6 – the standard for the Internet of Things.

So, why use IP and IPv6 for the utility field area network?

- Proven scalability
  - The IP protocol suite support billions of devices and users on The Internet
- Converges applications
  - Voice, data, video and IoT
- Runs over every link types
  - Ethernet, Wi-Fi, serial, dial-up, cellular, RF and PLC
- Provides layered security models
  - Link layer 802.1x, network (IPSec), transport (TLS/DTLS) and application layers
- Generalizes the availability of trained staff, commissioning support and management tools

In Field Area Networks (FAN), IPv6 is the de-factor standard suite for low-power and lossy networks, such as PLC and RPL mesh networks. Critical feature set, i.e. large address space for millions of nodes and network auto-configuration through dynamic routing make it the foundation for an IP-based architecture.

IPv6 is designed for the field, both for low-power links and lossy, or noisy, networks. It supports critical auto-configuration of both PLC and RF mesh networks, and it provides more than adequate address space.

IP provides a well-established protocol framework that delivers true investment protection and future proof evolution—**real interoperability by design.**

## An Enterprise Network in the Field

Implementing IP beyond the utility's offices means that the field network behaves like an enterprise-class IT network, providing a complete network management to visualize and prioritize traffic, as well as a robust, standardized security model and Quality of Service (QoS) attributes. Within this environment, meters and other grid devices can “plug-and-play” and co-exist on the same network, much like a new computer, printer or phone on a corporate enterprise network or various mobile devices on a cellular network. Ultimately, interoperability is extended beyond metering, applying to all devices on the network.

### Chapter 3

## Itron and Cisco Team Up

To achieve this vision of flexibility and expandability in smart grid networks, Itron has partnered with Cisco, the global leader in networking technology, to bring to market IPv6 architecture for its OpenWay® network. There are four key industry objectives that drive this partnership:

- Reduce industry dependence on network architectures that have proprietary elements and still require vendor-specific integration of devices/applications.
- Deliver true multi-service, multi-application (applications from metering to grid to workforce) capabilities over a common network infrastructure with standardized and robust security that any utility can implement.
- Optimize the total cost of ownership of these networks by spreading the cost over a greater number of grid applications and devices.
- Unleash innovation in the marketplace by building a broad-based ecosystem of leading grid technology companies with diverse product and service offerings.

With more than 15 million OpenWay smart meters installed in North America and initial deployments in both Asia and Latin America, Itron is now bringing its OpenWay network to the European market with specific enhancements designed to address requirements presented by utilities across Europe.

## Chapter 4

# Smart Metering becomes Smart Grid

Though smart metering may be the first application to utilize the communications network, the smart grid will require a continually broadening array of devices and applications running on the same network. If broadly-shared standards are in place, the evolution, growth and success of the smart grid will be achieved at a much lower cost and with much less difficulty.

These devices and applications go far beyond smart meters to include grid sensors, distribution automation equipment, monitoring and control devices for renewable resources, load control devices, in-home energy management devices and smart charging stations for electric vehicles. The ability to utilize a single network infrastructure for this, as well as an established communication standard that can support multiple grid applications and devices, will be critical to smart grid success.

## Next-Gen PLC Performance

Itron and Cisco believe the new IEEE 1901.2 standard, supported by the HomePlug® Alliance's Netricity Powerline Communications (PLC) program and deployed in combination with the latest Internet Engineering Task Force (IETF) technologies for IPv6 based last-mile networks (like RPL and 6LoWPAN), provides the optimal combination of performance, reliability and adaptability for the smart grid future—a future in which multiple devices operate over a common network infrastructure.

Starting in 2009, OFDM-type narrow-band PLC specifications have converged into the singular physical and link layer specification maintained in the IEEE 1901.2 standard. IEEE 1901.2 OFDM is designed for robustness and greater bandwidth, comparing favorably to previous generation PLC specification like IEC61334. Ultimately, it is far better suited for grid-to-utility, utility-to-grid and device-to-device applications. In addition, combining the main-body IEEE 1901.2 specification with the IPv6 technology from Itron and Cisco, robust multi-application communication capability is available for a full range of smart grid applications and use cases.

## Engineered for the Smart Grid

A core design premise of Itron's OpenWay network is the support for applications beyond smart metering. An investment in this network establishes the foundation for a smarter grid. Considering this design goal, Itron's partnership with Cisco and selection of open standards, from the physical media layer to the upper application layer or from the raw bit stream to the software that uses the information, is intended to make this a reality.

At the core of a robust multi-services network lies the ability to assimilate existing utility applications as well as rapidly integrate future applications on the same network without significant custom engineering or effort. For this reason, Itron and Cisco offer a true, end-to-end IP-based architecture for its FAN . This means routers replace stateful concentrators, and broad-based, IETF-developed open IP standards are applied throughout. IP nodes on the network are managed independently and seamlessly from the various applications—whether it be metering, grid, workforce or any other IP-enabled service.


Furthermore, to ensure the ability to incorporate and traffic existing grid application data on the same network, routing is performed, protocol-wise, at the network layer. Leveraging IETF state of the art protocols, for both IP routing—IPv6 routing for low-power and lossy networks (RPL)—and IP adaptation—6LoWPAN, IPv6 adaptation layer over low power network—over RF and PLC mesh networks, this enables data from other devices to be integrated, transported and managed on the same IP network with the same IP tools and IP security, potentially including legacy (serial non-IP) and IPv4 devices through IETF MAP-T (mapping of address and port translation) standard. This approach ensures the lowest cost of integration along with the easiest management, and it negates any application-specific adaptation of routing data between the data link and the network layer.



## Future Ready

Smart metering is a foundational element to the smart grid, but it does not represent the entirety of the smart grid. The modernized grid of the 21st century will encompass a continually expanding portfolio of devices and applications that must function in coordination with each other to deliver the value and outcomes envisioned. For utilities that have yet to adopt standards in support of their smart metering and smart grid initiatives, Itron and Cisco, firmly believe that IP-based network standards and architecture, as deployed over IEEE 1901.2 PLC Mesh and IEEE 802.15.4e/g RF Mesh networks, represents the optimal combination of near-term suitability and future flexibility as business requirements change for utilities across Europe.

Together, these standards will simplify adoption and deployment and optimize total cost of ownership, while greatly mitigating technical risk for smart metering and smart grid deployments.



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