

“Metcalf’s Law – Interoperability and the Smart Grid,” posted by Andres Carvallo, 11 Oct 2011

Several times during the past 18 months, people have asked questions regarding standards and interoperability. In one particular instance, a panelist offered the following: “Standards? That’s yesterday’s news. Now that NIST has published the 1.0 framework, everything is resolved.”

Ah, if only this were the case. The “NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 1.0” is just the beginning—not the end—of the smart grid interoperability and standards journey. Many questions remain unanswered:

- With this framework, what are the ramifications for how the smart grid gets designed?
- Which vendors will adopt any of these standards, and which of the standards will they adopt?
- How will this NIST framework change how smart grid technology is developed and deployed?
- Why do standards and interoperability matter so much anyway?

I can assure you that:

1. Adopting standards-based technologies with the goal of deploying interoperable systems is easy to talk about but difficult to achieve,
2. Not all standards implementations behave equally, and not all play an equal role in the smart grid build out, and
3. It’s what standards enable via interoperability—what benefits they confer to the overall smart grid ecosystem—that really matters.

I’ve been exhorting my industry friends and colleagues to think about the smart grid more as a collection of networks; after all, lots of networks already exist in the grid. The smart grid challenge is about connecting these networks (and, in the case of the last mile of meters, connecting devices for the first time) into a scalable, reliable, real-time network of networks.

I think it also must be an all-Internet Protocol (IP) network, too. Without standards and interoperability, this level of connectivity isn’t cost-effectively possible.

At Austin Energy, our chosen standards to integrate our smart grid were based on application integration—layer 7 at the Open System Interconnection (OSI) Model. So we chose Web Services (SOAP, WSDL and XML) as core standards to leverage and ensure the most interoperability possible among applications and middleware.

I wish that instead of integrating at the application layer only, we also could have integrated at the networking management layers (OSI layers 2, 3 and 4) with a standards-based network management system for smart grid devices.

The potential payoff of a network of networks is mighty enticing. A fully connected, real-time, interoperable smart grid network would offer utilities (and their customers) many powerful benefits, such as:

- A unified view into grid operations and activities (e.g., true electric device interoperability and data integration),
- A means to respond more quickly and efficiently to unplanned events, such as outages, and restoration via self-healing technologies,

- With insights from experience and analysis, the ability to proactively manage and predict usage and load (e.g., predictive conditioning and management),
- More effective, targeted interactions with end customers regarding their energy consumption and preferences (e.g., time-of-use pricing, dynamic demand management programs, etc.), and
- A means to incorporate centrally generated renewables such as wind, solar and biomass and distributed energy such as electric vehicles and solar photovoltaics into the existing grid.

Why is it so hard to implement interoperable technologies?

Not all standards behave equally. Standards are like architectural blueprints; they're important guidelines, but contractors build the houses. So, too, it is with standards. How they are instantiated into technology will depend on the preferences, inclinations and limitations of the builders or vendors. NIST has laid down important, specific and pragmatic smart grid interoperability guidelines. It's time for vendors to respond with equally thoughtful guideline interpretations in proven, tested, interoperable products.

How can my utility industry friends and colleagues be sure they've selected the right smart grid build out contractors?

- Metcalfe's Law applies when it comes to the smart grid. Pay attention to the network effect of key standards and their implementations. Look at how and where customers and vendors are coalescing because they signal a proven, interoperable technology. Networking giant Cisco Systems, for example, built its multibillion-dollar Internet business based on steadfast support of all-IP technology. It pledges to do the same in the smart grid, so choosing products and technologies that are part of Cisco's partner ecosystem and investments is probably safe.
- The best standards have been formed with significant utility input. **IEC CIM 61968-9**, the interoperability standard for distribution management interfaces (including meter reading), was developed and vetted in a multiyear process through the governance of the International Electrotechnical Commission (IEC), with ample contributions and oversight by participating utilities. This standard is essential in enabling application integration across vendors and technologies. Vendors that implemented this standard with active deployments also are likely to be safe for utilities.
- Selective deployment of standards doesn't deliver pervasive interoperability. If a vendor has implemented standards in only a portion of its solution, in only a finite number of devices or in only certain applications, then buyer beware. This vendor is merely paying lip service to standards adherence. Building standards into a diversity of devices, networks and software applications is difficult and time-consuming, but unless products are engineered this way, they won't deliver necessary return on investment to end customers. IP-based isn't the same as all-IP; the former refers to a proprietary networking technology, and the latter refers to the ubiquitous standard used throughout the Internet backbone.

To borrow a baseball metaphor, when it comes to smart grid standards, we still are in the early innings.