Emerging Communication Technologies: The Power of Meter Data Unification and Synchronization of Advanced Metering Infrastructure (Part 1)

by Maureen Coveney

Modern utilities have largely embraced technology in order to successfully tackle today's challenges: balancing electrical supply and demand to growing communities while being environmentally aware and responsible. Many utilities are embracing smart grids; and smart meters based on improved communications technology and advanced metering infrastructure (AMI) devices.

AMI relies on smart meters, meter data aggregation and information transmission to the back office to support both customer-focused and administrative applications. These include billing, customer service, and real-time product offerings, like green programs; critical infrastructure protection applications for, example, demand response programs; and operational and planning applications, such as load forecasting using primarily historical load profiles and current weather conditions.

Today's AMI challenge

To date, AMI too often involves costly and time-consuming initiatives to move and reorganize crucial processes and data to suit new technology. Thus far, utilities have only been able to implement various components of the technology in a piecemeal fashion.

This issue is not surprising if you examine the physical profile of a utility. The average utility owns property, plants or substations, equipment, and sometimes fuel transportation assets valued in the hundreds of millions or, more likely, billions of dollars. That can comprise thousands of megawatts of generating capacity, thousands of miles of transmission lines and many more thousands of miles of distribution lines, delivering energy to large commercial and industrial customers and residential customers —millions of customers over thousands of square miles of territory served.

When you consider this physical profile, the result is a very complex information technology profile. Due to the wide geographical range of asset locations and varying asset types, utilities rely upon many systems and devices that collect data and monitor this infrastructure. They also require data hubs to aggregate data and transfer that aggregated information on to enterprise systems of record. Somewhere along the way, these utilities deliver information to their internal stakeholders, through hundreds or thousands of desktops or kiosks. The bottom line is that the physical environment is a mirror into the information infrastructure needs of a utility.

Meanwhile, utilities must be cognizant of the ability of their infrastructure to scale, while ensuring that their backend systems do not become a bottleneck, failing to provide synchronous integration to AMI technology. If the architecture does not accommodate synchronous integration, the utility is forced to build out new business functionality, causing unnecessary data replication and backend application functionality replication, increasing overall cost.

The good news is that AMI is on the verge of evolution.

Tomorrow's AMI approach

Watch for a new trend: Rather than approaching AMI from the meter and then dealing with integration with the back office, utilities will find they are able to have a seamless integration by approaching AMI from the back office. When the back office is considered from the beginning, utilities are able to ensure that the architecture for the communication network is robust enough to handle the large amount of traffic and data that is anticipated for AMI-enabled applications.

This new approach to architecture integration involves a function called Meter Data Unification and Synchronization (MDUS). MDUS integrates and synchronizes a technical (meter communication architecture) and a commercial (back office) infrastructure, providing a holistic and unified view of the processes and the data handled through several different AMI Systems. This solution acts as a gateway to a central system, presenting aggregated and validated meter information to the back office as if there was only one AMI system in use. This synchronization of all the AMI systems, inclusive of issued data, meter reading data, work order data, point of service data, and event data, ensures that all steps of the end-to-end processes between the meter and the backend systems work together smoothly without replicating the systems of record in another middleware system. This reduces a utility's total cost of ownership for AMI infrastructure.

The MDUS not only unifies and synchronizes meter data from the various AMI systems in use across the utility's physical network, it also detects events that have occurred in the AMI network and manages commands from the back office. Events might include meter or equipment failure or tampering, while commands would include meter connection or disconnection.

To execute these activities seamlessly, and still protect the utility's investment in its information technology infrastructure, the MDUS must employ the latest integration techniques, namely an enterprise services oriented architecture and robust message handling. An enterprise services oriented architecture integrates people, information and business processes across organizational and technological boundaries through the use of abstracted enterprise application objects and enterprise web services. These capabilities help reduce a utility's total cost of ownership associated with AMI enablement and provide a foundational platform to manage change and spur innovation.

Finally, one should not underestimate how well "beginning with the end in mind" serves AMI enablement. Promoting the back office from an afterthought to the forefront of an AMI solution assures accurate and timely billing, reduced service response times, and a higher quality customer experience overall. But let us consider the market perspective, specifically, that of the deregulated environment. In the deregulated market, enterprises responsible for the meter and the meter reading are separate from those that “own” the customers and the commercial supply contracts. For these utilities especially, putting the back office first is a requirement, as it guarantees that they will interact with meter data through the enterprise system of record for customer information and contract data (usually referred to as the Customer Information System or the Customer Relationship and Billing System), rather than an intermediary system that duplicates back office functionality and unnecessarily complicates downstream business processes.

The power of AMI's future

Employing a unification and synchronization process, utilities will find that they not only save time and money, avoid the need to revamp major business processes and minimize the risk of errors, but they also move beyond a siloed approach and seamlessly connect AMI with business applications. A major benefit is the ability to simplify operations though automation. For example, a failing meter can signal the software to automatically generate a service order.

Another benefit is the ability to improve customer satisfaction. Consider the way integrated AMI technology will enhance call center operations. With easy access to real-time data, call center staff will be able to quickly and easily resolve queries with faster and smarter responses. Additionally, self-service portals may be employed to provide customers secure access to personal account data to help educate them about their energy use.

Perhaps the most significant benefit is the ability to have integrated demand-response participation. With this technology and customer participation, utilities can use automatic controls to curtail energy use at peak times, helping reduce customers’ bills and conserve energy. This is environmentally friendly, efficient and reduces the need to build new facilities. Outcomes like these illustrate the true promise and potential of AMI technology--a technology that ultimately benefits the consumer, the environment, and the power grid itself.

Potential Applications of Unified and Synchronized AMI

- There are endless possibilities for potential applications that could be derived from unified, synchronized AMI. Here are just a few creative examples:
- The ability to use meter data to locate an outage and restore service, as well as to identify opportunities to optimize the distribution network.
- The ability to use meter data to detect tampering or theft at a customer site, or to use in identifying and prioritizing asset management initiatives across the network.
- The ability to track data and identify patterns of customer usage against specific weather conditions and provide customers the ability to receive an automated alert on their usage, along with helpful conservation tips.
- With AMI technology, a strategic technical and commercial approach, and imagination, today’s utilities will be prepared to take on a whole new way of improving their businesses tomorrow.

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