

Avoiding a “Tower of Babel”

Deregulation compels a co-operative approach in utility communications

By Denise Deveau

Imminent prospects of deregulation and advances in digital technology are set to transform the utility industry’s techniques of substation automation, causing producers and vendors alike to move away from a proprietary approach towards a collaborative effort.

Operational information, traditionally used strictly within a given utility, is now desired by a number of players in various locations, each speaking a different “language”. Mergers and consolidations within the industry are creating demand for new technology applications that allow utilities to communicate on a number of levels - to optimize resources, reduce costs, and increase efficiencies – for gaining a competitive edge. Thus, the path to true competition in a deregulated environment is finding common ground to address a common need: the ability to communicate openly in a common language. Only through the adoption of universally established and well-defined industry standards can the utility industry lead the way. As these standards come closer to reality, the power protection equipment industry too has to respond with new-generation products enabling high-speed relay communications and “inter-control center” data sharing.

Deregulation spawns communications challenges

Fragmentation of the industry in the early stages of deregulation broke up utilities into communications islands, each with its own group of users with their own functions to perform. Independent metering groups found themselves at odds with independent system operators, billing agents, and other users. This complex network of data users posed the need for the utility industry to create a network that would:

- allow the integration, consolidation and dissemination of information both among and within the utilities;
- bring data of different kinds to several user groups; and
- serve a number of simultaneous functions, without jeopardizing the requirements of the individual user groups.

The internet, since it can provide a cost-effective and efficient means to transfer data on available transmission capacity, rate schedules, scheduling, operating constraints, interrupting criteria, etc., has had a major role in facilitating such data-sharing. In addition to that, utilities also face increased demand for improved service across the board. In delivering power, competition is pushing utilities to find ways to minimize outages, provide rate alternatives, maintain operating data archives, and increase power through existing lines. On the financial side, deregulation has brought the need for sharing of accounting data among utilities, ISOs (Independent System Operators), metering firms, billing firms, and independent power producers. Inter-utility billing must be correct and standardized. Standard accounting and record keeping practices have to track revenues, costs, liabilities, and assets. A number of mergers and consolidations within the industry, born of deregulation, in turn require utilities to establish intra-company communication and the integration of data from companies’ control centers, power plants, and substations.

Undertaking this wide-scale integration with different data models and communication protocols would require a substantial investment of resources. However, this is being remedied as the industry is driving vendors and suppliers to adopt a universal standard for data models and communication protocols.

A new direction

The quest for a universal standard – one that could be accepted and adopted by the utility industry and its suppliers on a global scale – has been a long and complex process. Although progress has been slow, the industry is beginning to see the proverbial light at the end of the tunnel.

In 1990, the Electric Power Research Institute (EPRI) introduced the Utility Communications Architecture (UCA). Its purpose was to establish standards for communication protocols that would provide a flexible foundation for open communications in today’s utility environment, while covering the communications demands in the foreseeable future. UCA provides a “network” solution to the interconnection of data sources, similar to the web solution used throughout the world to interconnect computers. Developing the new open communications protocols is a multi-layered process, which Mark Adamiak, Manager of Utility System Integration, GE Power Management, explains in terms of the analogy of building a house. “One has to agree on the foundation, then build the first floor, and finally add the roof.” The “foundation” is the physical layer over which information is to be transferred. The “first floor” is the networking layer used to move data over the network. The “roof” is the application layer that establishes the functions that a user can perform with the data. Figure 1 illustrates this simple model.

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tive. But we can clearly see where we are going. The profile is being built, we know what we want it to do, and vendors are beginning to supply products based on these standards."

Putting the Pieces Together
The accompanying sidebar provides details of the profiles of the three layers. Based on these, the architecture for a complete substation integration system can be created, as shown in Figure 2.

In this architecture, all devices that adhere to the same profile are able to inter-operate. It is recognized, however, that accommodations must be made to integrate legacy devices such as existing relays and meters. The architecture also provides local as well as remote user interfaces and a legacy SCADA (Supervisory Control And Data Acquisition) interface.

A unique aspect of this new architecture is the ability to implement high speed device-to-device communications. In place of interfaces between two devices today needing a physical connection by wires, the next generation control data will be sent as logic signals over a local area network (LAN), as illustrated in Figure 3.

The utility industry's progress towards next-generation communications also calls for the equipment manufacturers to agree up-front to the accepted standard and to provide enabling technologies for this all-important forward initiative. At present, the next generation of Intelligent Electronic Devices (IEDs) based on the proposed UCA standard are coming to market.

"Traditionally, manufacturers of protective relay devices have produced different designs specific to the protection of generation, transmission, distribution, and industrial equipment. Unlike this proprietary approach, the new Universal Relay is capable of providing cost-effective protection for all the sectors of the power system", explains Adamiak of GE Power Management. "The aim of the Universal Relay program from its inception was to provide utilities with a common tool for protection, metering, monitoring, and control across an entire power system."

GE Power Management introduced its Universal Relay platform in 1998 – a family of multi-function scalable devices, based on a universal language to allow for networking in the substation environment. The world's first installations have already begun in South America, China, and the United States.

The Universal Relay allows utilities to realize all the productivity and economic advantages of a truly unified, modular substation solution that can be networked and seamlessly integrated with existing hardware and/or software, regardless of the vendor or communications network. These new generation products are the first of many which will be based on the MMS/Ethernet profile with one of two networking layers in-between to allow for both inter and intranet communications. Their modular architecture, from both a hardware and software perspective, also provides an efficient means for upgrades as new requirements evolve.

With the worldwide adoption of UCA, and the development of protection and control technology that offers the inherent ability to communicate peer-to-peer as well as to a station's interface, the path is now clear for utilities to compete effectively in a deregulated environment.

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