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Innovative Energy Solutions

Is DNP 3.0 the Right Standard for You?

By Danny Johnson

"We are integrating devices and pulling data from sources that we never thought we would, and one to two years from now we might be pulling data from devices that we haven't even thought of yet."

This statement, made recently by a manager at a Midwestern investor-owned electric utility, could very well be at the crux of the current ongoing debate over utility communications protocols. Senior utility managers no longer see supervisory control and data acquisition (SCADA), distribution automation, and substation automation merely as tools for operating their transmission and distribution network more efficiently. These systems are now seen as critical sources of data that are key to competitive operation of their utility.

One of the hurdles that lies in the path to this information-rich promised land is that much of the data's origin is in proprietary, or at least non-standardized, protocols. One solution that has emerged in recent years to solve this problem is the Distributed Network Protocol, or DNP3. The development of DNP3 has been a comprehensive effort to achieve open, standards-based interconnectivity between substation computers, remote terminal units (RTUs), intelligent electronic devices (IEDs) and master stations for the electric utility industry. Utility surveys indicate that DNP3 is now the

TXU Utilities has utilized DNP3 on its Alliance Airport Distribution Automation Project for switchgear RTUs, data concentrators and graphical user interface communications.

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leading choice for utility managers contemplating their integrated futures, and many already consider DNP3 to be the defacto standard.

GE Harris Energy Control Systems Canada Ltd. (originally Westronic, Inc.) developed DNP3 in the early 1990s. At the end of 1993, ownership of the protocol specifications, along with responsibility for defining further DNP specifications, was turned over to the DNP User Group, then a grass-roots collection of utilities and vendors from around the world that were using the protocol. The DNP User Group has now grown to over 300 members and supports a very effective technical committee, Web site (**www.dnp.org**) and promotional programs.

The DNP User Group Technical Committee is leading the protocol's evolution. Comprised of utility users as well as vendors that offer products with DNP3 implementations, there is a balance in its evolution that reflects the industry's needs for interoperability, longevity, and upgradeability in a standard communications protocol. Preserving compatibility as the protocol evolves is one of the Group's highest priorities.

The Committee's efforts have yielded a number of technical bulletins progressing DNP's functions, as well as the "Recommended Protocol Subset" document, the "IED Test Procedure" document and the "DNP over LAN/WAN; User Group Approved Method" document.

The group is now working on a formalized program that verifies DNP implementations on a vendor's equipment. Independent companies are setting up services that will test a vendor's DNP implementation against a standardized test procedure and verify compliance to the recommended protocol implementation rules. What does this mean for the utility user? It means a significant reduction in time and dollars when implementing a system that utilizes IEDs from various vendors because there is now a certain degree of implied compatibility among the various devices.

The commercial availability of PC-based protocol test sets, DNP source code, DNP training courses and technical support programs have all contributed to DNP being implemented on literally thousands of products from hundreds of vendors. DNP is now utilized by utilities in thousands of substations and pole top applications around the world.

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Exactly what is DNP3?

DNP3 is based on the early work of the International Electrotechnical Commission (IEC) Technical Committee 57 (TC-57) that resulted in the IEC 60870-5 protocol that is in use in many regions of the world, predominantly Europe. DNP3 and IEC 60870-5 are both part of the IEEE Standard 1379 which was recently upgraded from a Trial Recommended Practice to a Full Recommend Practice.

In addition, the use of DNP3 is not limited to serial wire connections within a substation or from a substation to a SCADA master using a modem and phone lines. DNP's functionality contributes to the protocol's widespread use in substation local area networks using TCP/IP Ethernet, on corporate frame relay networks, fiber optic systems, standard or CDPD cellular systems as well as many licensed or unlicensed radio systems.

The DNP/UCA Quandary

Today, DNP3 is often viewed as a competitor to the Utility Communications Architecture, or UCA/MMS, a protocol being developed by EPRI for the utility industry. This competitive scenario is not necessarily the case, as each has its own strengths and weaknesses. For instance, there is a very large installed base of utilities that are already using DNP3 successfully across their systems in a multitude of devices.

UCA/MMS, on the other hand, is primarily being utilized on a trial basis with few operational sites. However UCA/MMS is a more technically comprehensive solution that inherently supports advanced device-based object models and self-description. DNP3 has the potential to support these functions and the DNP Technical Committee has work items identified to address these questions. (For a thorough review of UCA, see the March 2000 and April 2000 issues of *Utility Automation*, which feature a two part series on UCA.)

Profiles exist that enable the two protocols to coexist on the same physical LAN. DNP3 and UCA/MMS can use the same lower level protocols (e.g. TCP/IP) enabling them to travel over the same communications channels. However, different client applications would need to be developed to "read" the data. The possibility of translating one data type to the other also exists through the use of a protocol converter.

In comparing the two protocols, one executive at a leading SCADA vendor recently commented that he views DNP3 as a tactical protocol, whereas UCA/MMS is really more of a strategic architecture. In expanding on this comment, he noted that DNP is fine for meeting today's immediate needs, and it will probably work well into the future; UCA/MMS, once completed, will have a sounder enterprise computing framework.

In a comment that is echoed across the utility industry, one manager at a large municipal utility summed up his feelings on DNP3 this way: "In a nutshell, DNP is very versatile and ready to go now. At the rate at which we need to integrate devices, this versatility and speed are key." ■

Danny Johnson is a Telecommunications Engineer at Southwestern Power Administration in Tulsa, Okla. He is a founding member of the DNP User Group and continues to serve as the group's chairman. To learn more about DNP3 and the DNP User Group, log onto **www.dnp.org**.