



New System Reduces Fort Bragg Energy Bill by \$1.8m



maintenance (O&M) unit, and the information technology (IT) department.

The workgroup needed to implement the UMCS in accordance with the requirements specified in the government's Unified Facility Guide Specifications (UFGS) 23-09-23 and UFGS 25-10-10. These specifications, available at the Whole Building Design Guide website (www.wbdg.org), provide Department of Defense direction for deploying base-wide monitoring and control, and direct digital control (DDC) systems based on the open LONWORKS® technology. The workgroup also needed to address various highly technical and administratively challenging integration issues for the many existing systems that were out of compliance with these specifications.

The Utility Monitoring and Control System (UMCS) at the U.S. Army's Fort Bragg near Fayetteville, North Carolina, winner of the LONMARK International 2010 Multi-Vendor Project of the Year for large campus integration, is a successful implementation of interoperability of systems from eleven different vendors. The project is also significant for its scale, given Fort Bragg's 2500 buildings with over 25 million square feet (MSF).

The UMCS was conceived in 2006 by the Fort Bragg Directorate of Public Works (DPW) with ongoing coordination and assistance from the U.S. Army Corps of Engineers Savannah District, Huntsville Engineering and Support Center, and the U.S. Army Engineer Research and Development Center's Construction Engineering Research Laboratory.

The Challenge

The challenge was two-fold: the sheer scale of the effort and the need for strict compliance with various government regulations. To oversee the UMCS project, the Fort Bragg DPW created a workgroup with leadership provided by Jennifer McKenzie, Energy Manager at Fort Bragg, along with representation from DPW's mechanical and construction inspection staff, the operations and

To help ensure the success of the project, the workgroup created an "Implementation Guide" containing a wealth of useful information in support of the Fort Bragg open system goals, including local points of contact, a comprehensive UMCS description, the open system specification requirements for different types of applications, a complete system integration process, operation and maintenance (O&M) processes, a detailed design guide, definition of terms, etc.

The Solution

The project follows the LONMARK "Two-Tier" specification model where the DDC control system and the front end monitoring and control integration are separated into two separate specifications, enabling competitive bidding at both layers and reducing the "proprietary lock-in" model. The actual implementation began in 2008 with the award of a contract to Johnson Controls for the installation of a UMCS front-end operator workstation. The goal was to provide a supervisory monitoring and control station in accordance with open-systems guidance developed by the U.S. Army Corps of Engineers. The workstation currently supports 79 buildings with over 2.1 MSF, and contracts have been awarded to for another 278 buildings with 8.8 MSF.

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The Fort Bragg building automation system uses a Johnson Controls LCS-8520 for its UMCS. The LCS-8520 is a PC-based automation engine that provides for base-wide, large-scale facility monitoring, control and management. At the enterprise level, communications between the UMCS and building systems are “LON-over-IP” (ANSI/CEA-709.1 over IP per ANSI/CEA-852) and the building IP interface is a simple ANSI/CEA-852 router. All building-level communications are ANSI/CEA 709.1-b with exclusive use of TP/FT-10 network media. The system is based on Echelon's LONWORKS Network Services (LNS) with Johnson Controls' Metasys Extended Architecture front-end monitoring and control software. All components meet or exceed the US Army Corps requirements for an open LONWORKS system.

The LONWORKS technology enabled Fort Bragg to create an open, flat-architecture building automation system capable of supporting a wide range of solutions from multiple vendors. The multi-vendor LNS databases are managed and maintained through use of Johnson Controls' LN-Builder software and Echelon's LONMAKER® software. To date, Fort Bragg's UMCS employs systems from these eleven vendors:

- ABB: Variable frequency drives
- Continental Control Systems: Wattnode energy meters
- Distech: HVAC Controls
- Echelon: Lon-to-IP router and LONMAKER software
- Field Server: Bridge to legacy HVAC controls
- Gesytec: EasyLON IP Interface
- Honeywell: HVAC controls and EBI interface via L-proxy server
- Johnson Controls: HVAC controls and LN-Builder software
- Loytec: Lon-to-IP router and Protocol Analyzer
- Trane: HVAC controls and chiller
- York: Chiller

The UMCS currently supports several critical systems and applications, including: a large scale metering capability; a multitude of HVAC AHUs; a monitoring interface with several central plants; a LONWORKS interface to a number of building-level chillers and boilers; several ground source heat pumps; and a solar domestic hot water system. Fort Bragg has also awarded contracts for lighting systems and a photovoltaic project, both using LonWorks technology.

The UMCS manager oversees the LONWORKS system architecture of the base-wide deployment and ensures that all of the building systems delivered to Fort Bragg can be mapped into the open Web-based graphical user interface. The system specifications call for

LONMARK certified devices; the vast majority of the installed devices meet this requirement, although exceptions are permitted—most notably in the case of programmable controllers. The manager also works directly with the IT department on any computer and security related issues pertaining to the UMCS.

The Results

The UMCS project has earned Fort Bragg the prestigious Certificate of Networthiness (CoN) from the Army's Network Command for its ability to satisfy the Army's strict information assurance requirements. Sensitive details must be omitted here, but this nomination recognizes the determination of Fort Bragg to overcome all obstacles in pursuit of its vision to achieve a base-wide, open, multi-vendor monitoring and control system.

The system has evolved and matured to the point where Fort Bragg contractors understand that LNS plug-ins are preferred based on the simplification of system management that these provide, along with the broad commercial-off-the-shelf availability of LONWORKS devices with LNS plug-ins. The LNS plug-in approach supports Fort Bragg's desire to simplify system installation, operation and maintenance. The plug-in approach also allows a standard LNS network configuration and management tool to be used to integrate multiple LNS devices from multiple vendors.

Fort Bragg continues to expand the UMCS through the addition of new systems and applications, as well as through the integration of selected pre-existing, stand-alone LONWORKS systems. According to McKenzie, “This system is a great tool. It allows us to track resources, helps with O&M, and in general allows us to be much more proactive where we had been being reactive.”

Fort Bragg expects the Utility Monitoring and Control System will reduce electrical/gas energy consumption by 120,650 MBTU per year with a corresponding annual energy cost savings of \$1.8M, and will reduced carbon dioxide emissions in excess of 30 million tons per year.

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