MOSCAD Provides Total Integration at BGE

By Rick Keith, Motorola

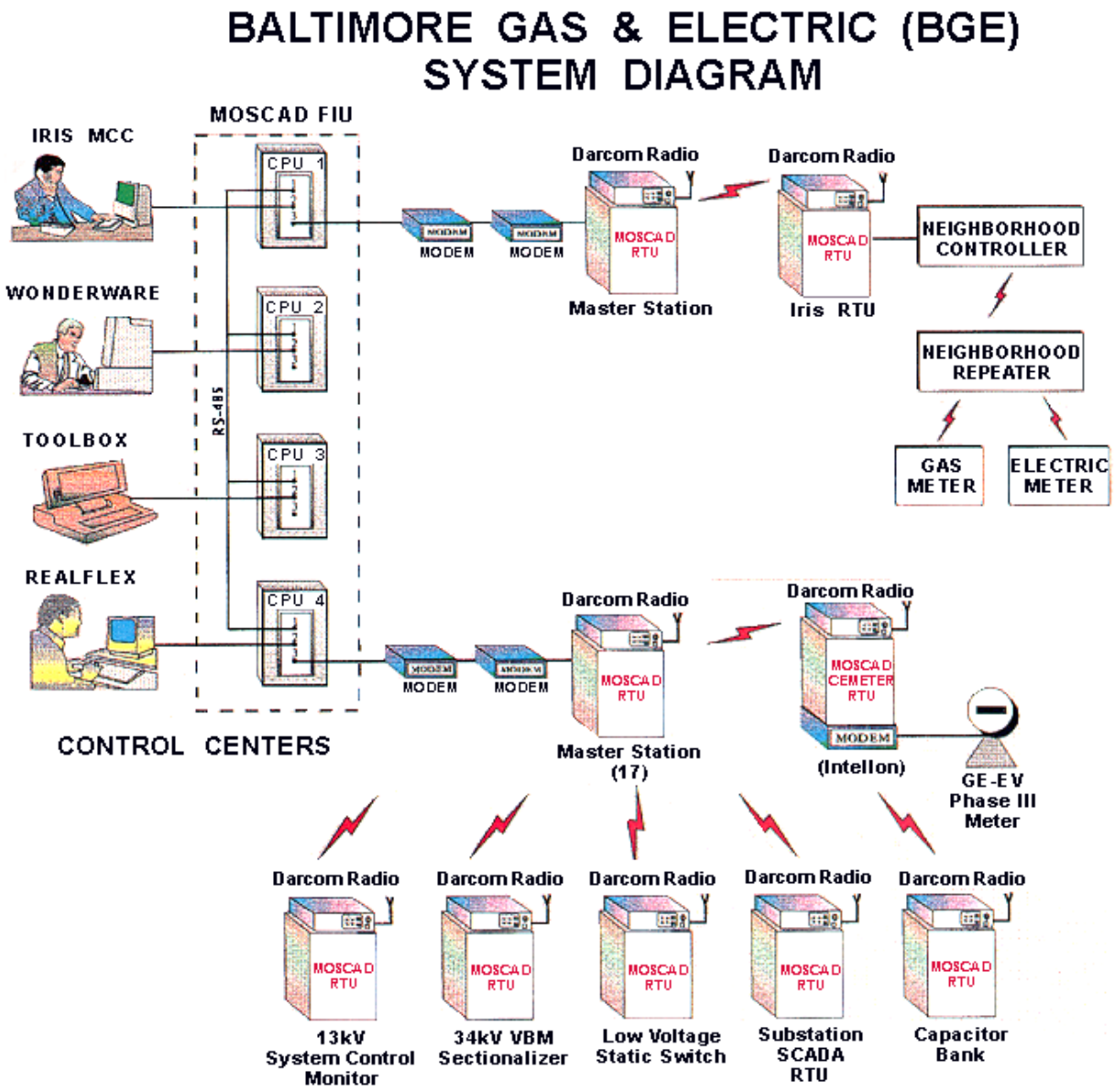
For nearly two centuries, Baltimore Gas and Electric Company (BGE) has powered Central Maryland. With its national reputation for corporate excellence, the company has nourished the growth and expansion of this fast growing area through its reliable and innovative energy services. Over the years, different departments of BGE acquired communication systems to manage and control the specific functions for which they were responsible. BGE embarked on a Motorola initiated design program to develop a single radio communication system. It would satisfy the varied data and communication requirements of their Distribution Automation (DA), Automated Meter Reading (AMR), SCADA, and Capacitor Control subsystems. The task was to support the many different applications that ran on software and hardware from many different vendors. Motorola was selected to provide a data communication system that would satisfy BGE's present and future growth needs.

BGE's Integrated Data Network

Motorola's MOSCAD brought together, into a single integrated package, BGE's residential and industrial metering systems and monitoring and control of its Distribution Automation system. The transmission medium for these functions is the Motorola DARCOM 9000 multiple address station (MAS) radio and microwave WAN, utilizing the Motorola MDLC protocol .This total integrated package is known as BGE's Integrated Data Network or IDN. It consists of seven major parts:

1) 4 Central Processing Unit modules, serving as Field Interface Units (FIUs) performing:
   - RealFlex MODBus Protocol emulation
   - InTouch MODBus Protocol emulation
   - IRIS data encapsulation
   - Diagnostic for MOSCAD network management
2) 17 MOSCAD RTUs with 900 MHz MAS DARCOM master station radios
3) 40 Distribution Automation RTUs
4) IRIS System 2020 residential metering system for gas and electric
5) GE Phase III industrial metering system with CEBus protocol emulation
6) 8 Capacitor Bank RTUs
7) 2 substation SCADA RTUs

(See system diagram on next page)



MOSCAD Field Interface Unit (FIU)

The MOSCAD FIU is the interface between the RF communication network and BGE's IDN. The FIU consists of four CPU modules.

Two CPU 200 modules provide the gateway to both the IRIS System 2020 Master Control Center for all the utility's residential metering applications, and MOSCAD network management, utilizing the programming of ToolBox. The CPU 300 modules provide the interface to both the RealFlex host application processor for the monitor and control of all DA functions, and the connection to InTouch GUI applications via a MODBus driver. InTouch by WonderWare, acts as the operator interface for DA functions, system maintenance and industrial/commercial metering. All these CPUs are tied together using an RS-485 multi-drop connection. All field data arriving at the FIU is broadcast to all four CPUs via the RS-485 link (at 19.2 Kbps)

In this multiple tier system the MOSCAD FIU is responsible for initiating the polling routine by which the MOSCAD Master RTUs poll the DA RTUs. These DA RTUs have the additional capability of contention transmission; a meter may initiate a report of any critical status. The 17 MOSCAD Master Station units establish all message routing between the FIU and all field RTUs. The Master RTUs provide the WAN with reliable communications functionality in handling peer-to-peer communications between field RTUs. The Master RTUs are configured to repeat all transmissions received by any field RTU so all other RTUs will know when the Master is busy and thereby avoid any possible loss of data. The Master RTU, through its store & forward mechanism, can effectively act as an intelligent Network Interface Manager splitting the WAN and the IDN into two separate systems, and manages all traffic between the two.

MOSCAD DA and AMR Systems Control

MOSCAD has achieved complete control of BGE's Distribution Automation system. Utilizing MOSCAD's flexible modular approach to I/O control, the appropriate combination of MOSCAD I/O modules is utilized at each DA RTU site. Remote controls sent from the InTouch and RealFlex control centers to MOSCAD DA RTUs are used to automate eight distribution Capacitor Banks, two Low Voltage StatSwitches, and two 34 kV VBM Sectionalizers. Complete access to all power monitoring data at several substation RTUs is made possible through the MOSCAD AC Analyzer. All of BGE's Residential Automated Meter Reading applications are performed through the operation of IRIS System 2020 protocol. A MOSCAD RTU is responsible for the gateway between the Motorola WAN and the system of Neighborhood Controllers and Neighborhood Repeaters, known as the IRIS System 2020. Controls, sent from the IRIS MCC using its System 2020 protocol ,are passed through the WAN from the FIU to a Master Station and then on to an IRIS/MOSCAD gateway. The IRIS Neighborhood Controller and the Master Station RTU store & forward the System 2020 data as it is received.

BGE utilizes the GE-EV Phase III metering system for its industrial and commercial utility applications. A MOSCAD CPU is used to collect metering information from the GE-EV meter using a 277 VAC phase-to-neutral power line carrier communication (PLCC) as a medium for data. The meter transmits its data through the power line, using the CEBus protocol, to an INTELLON PLCC modem which is connected to a MOSCAD CPU. GE meter data is updated automatically, or manually by the customer, once a day at the InTouch Central via the Motorola WAN.

Wireless Data Transmission

Motorola's installation utilizes BG&E's territory-wide microwave and MAS radio systems to manipulate the data infrastructure. The seamless data radio network supports several data rates and protocols. Data rates change throughout the system, based on communication media capability and protocol requirement. Microwave channels may use 9600 bps while the information system gateway is being designed for a future utilization of 10 Mbps. The system uniquely combines the wide area capabilities of microwave high speed resources with 13 different 900 MHz MAS frequencies at each of 17 different sites for local networking. The initial system installation phase uses a single microwave channel on 17 links to provide a common channel to all of the 17 MAS frequency locations. Later phases will optimize the system by separating the microwave links into different channels that operate simultaneously with parallel 9600 bps rates and fully extend the capabilities by using Motorola MDLC gateway for TCP/IP with Ethernet interface.

BGE's Future Options

Because of Motorola's user-oriented design and unique transparency, no changes were required in BGE departmental operations. In the future, it will remain the decision of Baltimore Gas and Electric to move forward with AMR or DA or SCADA, based on financial and design considerations; the network will not limit them. The network will equally support all the technologies and leave the choice of importance and priorities to the customer and not to the equipment.

MOSCAD ties it together!