Distribution Management System-Control Center for Electric Utility

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Kanata Hydro is a Canadian municipal electric utility located in suburban Ottawa, Ontario that supplies electric power to more than 13,000 customers. They distribute electric power through their Medium Voltage (MV) distribution grid at 12-28kV levels. Kanata Hydro purchases the electricity that they distribute from Ontario Hydro. The power is delivered to Kanata Hydro via another MV distribution network at the 44kV level.

The Challenge

Kanata Hydro had a need for a Distribution Automation (DA) system that would optimally suit the size and complexity of their operations. The initial pilot project was awarded to ABB, who offered the MicroSCADA Distribution Management System (DMS), MOSCAD RTUs and Motorola radio communications. The first phase of the system called for the automation of Kanata's five existing distribution substations. The subsequent phases of this system will involve a large number of MV sectionalizer switches, and about twenty transformer substations located throughout Kanata's distribution grid.

Communication between the MicroSCADA Master Control Center (MCC) for DMS and the MOSCAD RTUs is via a DARCOM Multiple Address System (MAS) at 900 MHz. The data network utilizes the Motorola Data Link Communications (MDLC) protocol.

ABB MicroSCADA

The MicroSCADA is a member of ABB's SPIDER SCADA control center family and is intended for controlling small to medium size DMS systems. The SPIDER reflects ABB's concept for Energy Management Systems (EMS) and performs transmission network monitoring on the High Voltage (HV) levels, load management and substation control.

The MicroSCADA is a modern software package which is capable of running on several different hardware platforms and operating systems. The low-tier DMS is based on a single IBM 486 compatible PC, running UNIX operating system. The high-tier DMS control center is based on a DEC ALPHA platform running an Open VMS or OSF/1 operating system. It provides a wide range of advanced network analysis functions and management application software.

MicroTopology, is an integrated part of the MicroSCADA. It forms a graphic distribution network information system for management, calculations, reports and statistics of medium voltage distribution networks. The main feature of the MicroTopology is the Automated Mapping/Facility Management (AM/FM) function, based on a relational database.

Motorola's MDLC-ACP Gateway

In order to provide an integrated connection between the ABB MicroSCADA, which utilizes the Application Communication Protocol (ACP) and the MOSCAD RTUs, ABB and Motorola software engineers teamed together and defined the MDLC-ACP Interface (See Figure). The ACP is an ABB originated protocol running over TCP/IP, and the MDLC to TCP/IP Gateway enables its connection via radio. The Gateway provides data exchange between the substation RTUs and the MicroSCADA control center via radio channels. The Gateway

greatly enhanced the overall capability of the ABB MicroSCADA as a powerful and versatile control center for DMS. Since the Gateway supports a client/server architecture, it provides services to the client processes running in the DMS system. The ACP protocol allows the MicroSCADA software (client) to exchange information with the MDLC-ACP Gateway computer (server) to access the MOSCAD system. It also enables the Micro-SCADA to perform the following functions:

- Polling data from the MOSCAD RTUs (polling requests are initiated within the MicroSCADA)
- Receiving a data burst from the MOSCAD RTUs (contention).
- Sending commands to the MOSCAD RTUs and downloading parameters to the MOSCAD RTU's local process.
- Providing time synchronization in the MOSCAD RTUs.
- Supporting redundant MDLC-ACP Gateways connected on the same TCP/IP network.

The MDLC-ACP Gateway manages the requests for data and commands that it receives from the MicroSCADA control center. It also forwards the "report by exception" message in a form of data bursts, which are sent from the MOSCAD RTUs to the MicroSCADA control center.

Data exchange between the MicroSCADA (client) and the MDLC-ACP Gateway (server) is carried out, using "peer-to-peer" communication @ 10Mbps over the Ethernet LAN. The MDLC-ACP Gateway supports simultaneous communication with up to four MicroSCADA computers and each one can establish four connections at the same time. Using the MicroSCADA type DMS and MOSCAD RTUs, Kanata Hydro is now on its way towards building a powerful DMS system. With the ABB and Motorola support their system can be expanded to match the needs of Kanata Hydro for tomorrow and the years to come.

ABB's MicroSCADA and Motorola MDLC – ACP Gateway – a great team for distribution management system!