Monitoring a Cellular Network System in Argentina

The Challenge

Movicom, a local company, installed and operates the cellular phone system for Buenos Aires, the capitol and commercial center of Argentina. As such, Movicom must give continuous, no-fail service; any fault in the system must be instantly located and repaired.

The cellular system consists of two Control Centers and 150 cell sites (NAMPS), varying from 200 channels per cell to very small cells. Since providing reliable service is so critical, the company wanted to monitor all the auxiliary equipment at each cell. Should a problem arise, it could be instantaneously located and the operator at the Control Center would receive exact, real-time information as to its nature, its urgency, whether a technician should be dispatched, and what spare parts should be taken.

Movicom found the existing environmental alarm monitoring inputs, that are built into the cellular equipment (16 to 24 points in a typical site), to be inadequate for its needs for the following reasons:

- 16 to 24 alarms are insufficient to make an accurate analysis of the problem at a site. The technician lacks the data to determine the full nature and urgency of the problem. As a result, he treats every alarm as urgent and he may have to visit the site twice – once for diagnosis and a second time to bring the correct spare parts and tools.
- The operator wants to monitor critical analog values from the central control room in order to diagnose a problem before it becomes critical, i.e., site temperature, Tx Forward and Return Power, Back-Up Battery Voltage, etc. The built-in alarm capabilities of the cellular system cannot monitor analog values.
- Built-in alarms are transmitted to the Control Center via the same communication equipment that is being monitored, such as microwave, multiplexers, etc. Should this equipment fail, the operator would have no way of knowing what is wrong at the site.

Motorola’s Solution

Motorola installed its communication monitoring system that connects the two existing regional Control Centers to MOSCAD RTUs, installed at every one of the cellular sites. The system uses the standard MOSCAD MDLC (seven-layer/OSI) communication protocol in order to transfer data from the RTUs via MDLC-to-TCP/IP gateway (MCP/T), to a customized Telecommunication Management Software package that was installed by a software house (TTI). Since the MDLC protocol can encapsulate other protocols, the operator can easily access the internal alarms of remote cellular devices (using the dial-in feature of the cellular controller as well as the physical alarms connected to each MOSCAD RTU). To achieve the coverage required by Movicom, each of the RTUs is equipped with a built-in simplex radio that is linked by a UHF "overlay" system to the Control Centers. When an alarm is activated, the RTU generates a burst transmission directly to the Control Center, giving the operator real-time information about the status of each device at the site. In some cases, when there is no direct RF path between an RTU and the central, the store & forward option of the MOSCAD is used to relay the information via other sites.

The reasons that Movicom did not use the cellular microwave service channel for monitoring the system are: (a) should the microwave equipment fail, the operator would have no way of knowing what is wrong at the site, (b) the microwave equipment was supplied by several vendors, each having its own service channel protocol. Using the existing system communication channels would have added 25% to the price of the monitoring system.

The following equipment is monitored by the MOSCAD at each site:

- Power Supplies (220 VAC to 48 and 27.6 VDC) – Movicom uses power supplies from four different vendors and may have from one to 10 power supplies at an individual site. Each power supply has approximately five alarms: Low Voltage, High Voltage, Fault, No Power, No Output Current. Since the power supplies' parts are very complicated and bulky, it is essential that the technician knows exactly what to bring with him to the site in case of failure. MOSCAD RTUs supply all the data the technician needs to make a repair in the shortest amount of time.
- Generators and Power Switch-Over Panels – The operator can remotely monitor and control the generator (for routine periodic maintenance) and the power switch-over panel, that switches between AC power and the local generator. AC inputs are monitored for three-phase voltage and current analog measurement.
- Microwave Equipment – Movicom uses microwave systems from three different vendors: NEC (Japan), Siemens (Italian), and AWA (Australian). The equipment is monitored via parallel interface for various alarms (each type of microwave equipment has its own set of alarms), such as: Automatic Gain Control (AGC), Automatic Frequency Control (AFC), Power Output alarm, etc. In some vendors' microwave equipment, the same interface connector might also have analog values that represent several parameters of the microwave, such as, power output, receiver signal strength, etc. In these cases, those outputs are monitored as well. MOSCAD is also capable of interfacing to the serial interface port of the newer microwave equipment.
- MUX Alarms – Two alarms per device: Urgent Alarm and Non-Urgent Alarm.
- Channel Bank (PCM) Alarms – Two alarms per device: Urgent Alarm and Non-Urgent Alarm.
- General Alarms – A typical site may output up to 20 general alarms and analog readings, such as: fire (multiple zones), security and intrusion (multiple zones), air conditioning and temperature (analog measurements and alarms), generator fuel level (analog), antenna tower warning light, etc.

Movicom also uses the cellular controller's dial-up function to monitor and make parameter changes to each cellular site via the MOSCAD RTUs. Using the MOSCAD system in-terminal emulation mode offers distinct advantages over the EMX and cellular system built-in channels: (a) each site does not need a dedicated modem; (b) remote dial-up terminal response via the MOSCAD is appreciably faster than via EMX; (c) the operator can use this feature even when the microwave link is down.

SÍ!, SÍ!, Cellular users love Movicom’s reliable service.