Cell Site Remote Management

A Major Issue Facing Cellular Carriers Today

Currently, cellular providers deploy Mobile Switching Centers (MSC) to support packetized cellular voice and data traffic, which is transported into the MSC from cell sites containing Base Transceiver Stations (BTS). The BTS, or cell sites, are spread out across a given geographic footprint.

These cell sites can be very close together in high-density urban areas such as New York, Los Angeles, or Chicago. It is more typical to see an MSC deployed at the center of a major urban area that has a large suburban area with even larger rural districts surrounding the city. Cities such as Orlando, Memphis, and Denver reflect this type of cell site deployment. There are also some areas, such as Montana and Wyoming, which have very large rural areas. In these states, a cell site could be located very far from the MSC.

Managing these cell sites is a major challenge to any cellular carrier. When trouble occurs, a technician is dispatched to the site to diagnose and repair the problem. In metropolitan areas where distances may not be a factor, it still can take considerable time to navigate urban traffic congestion and reach a cell site. In rural areas, the distance that a technician needs to drive can be a major factor. In any case, the round trip time it takes to reach a site and return is costly and lengthens the time it takes to repair an outage. Since the problem area may be unknown until the technician reaches the site, a trip to the parts depot may be required, further increasing the time it takes to repair an outage. In addition, since many cell sites use leased transport facilities from a local IOC, the problem may not even be with the cellular carrier's equipment, resulting in further delays and a wasted trip to the cell site. Substantial savings could be achieved if the true cause of the failure could have been identified before the technician left his work station or home (if the alarm condition occurred after hours.)

The Solution to the Problem

TelStrat's PUMA (Platform for Unified Management Access)offers a solution to this problem. By deploying PUMA at the cell site, technicians can access critical components to evaluate the exact cause of an outage or alarm ***without driving to the site***. The PUMA product provides remote access to both traditional serial and Ethernet TCP/IP based network elements as well as contact closures, voltage and current generating network elements.

PUMA allows cellular network operators to quickly analyze the problem area, identify the component at fault, determine whether the problem is with its equipment or with the local IOC, and dramatically reduce the cost associated with an outage while reducing MTTR. In fact, PUMA has been proven to substantially reduce the number of trips required to correct a failure and can often be shown to pay for itself in less than one year.

TelStrat's PUMA platform is the most powerful and flexible product on the market today, providing a secure, browser-based, vendor agnostic, **single point of access and management** of all remote network elements in a cellular carrier's network.

The PUMA platform allows up to 512 simultaneous users to perform Operations, Administration, Maintenance, and Provisioning (OAM&P) of remote network elements all by accessing a single IP address.

PUMA unifies the management of access network elements. The PUMA platform allows real-time access, information, and control of every network element, whether local or at the most remote deployment. Using a secure IP, serial, or aircard connection, the PUMA platform lets cellular technicians, maintenance engineers, and NOC personnel configure, troubleshoot, and manage all of the network elements located at every cell site, all from a single IP address.

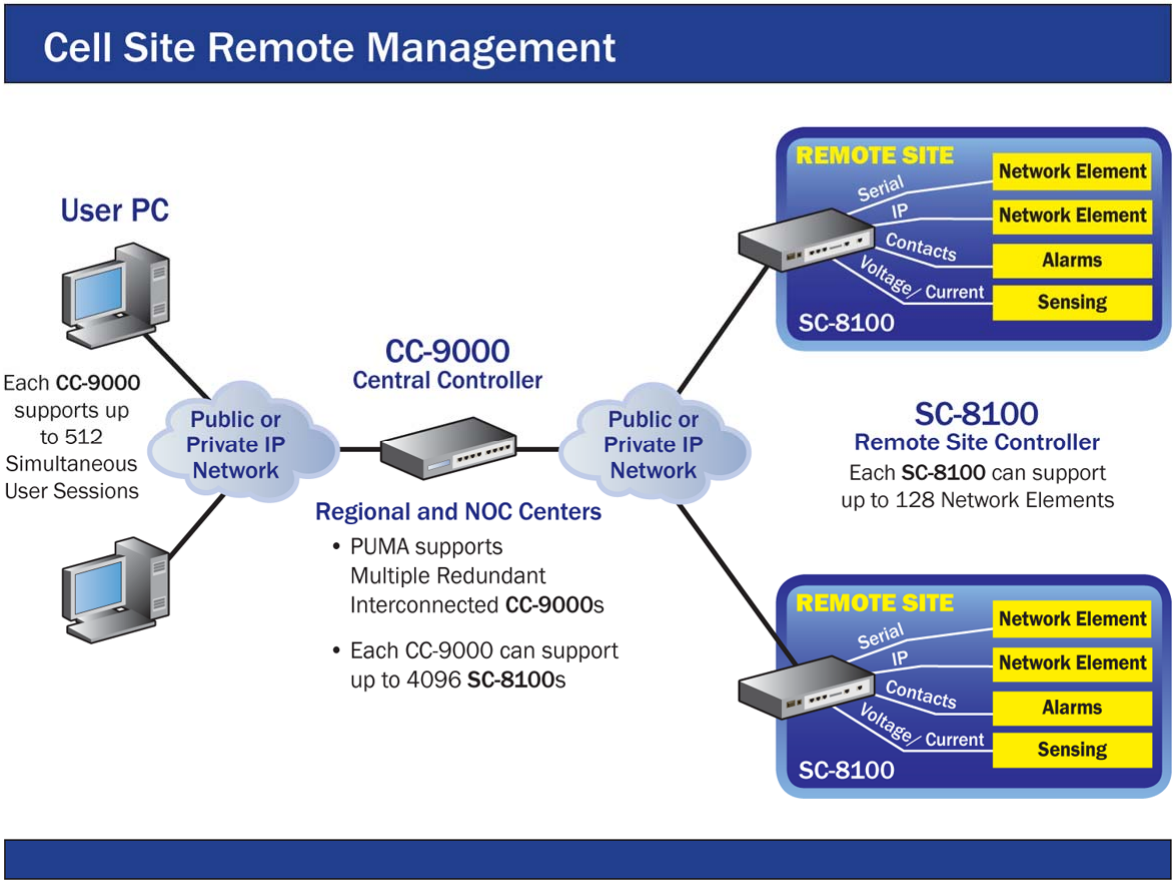
With the PUMA, cellular service providers can centrally manage and provision services dynamically at every cell site. With PUMA, technicians can now remotely test, diagnose, and troubleshoot equipment before dispatching field personnel. This resolves network issues faster, reduces expensive truck rolls, and helps cellular service providers anticipate events and prevent service disruptions.

The TelStrat PUMA system consists of two elements:

- One or more Central Controllers (CC-9000)
- A Site Controller (SC-8100) at each cell site.

The CC-9000 serves as PUMA's central command center, communicating directly with each SC-8100 Site Controller, and focusing the power of remote SC-8100 units into a single, unified point of network status information and network element management. Multiple CC-9000's can be located in regional centers or management offices, as well as at NOC centers.

The SC-8100's are located at each cell site. The SC-8100 provides physical connections to all remote network elements, whether by serial or IP (Ethernet) connections, normally open or normally closed alarm monitoring inputs, form C relay outputs, or analog inputs (0-10V or 4-20 ma). (See Network Diagram below.) Each SC-8100 can support up to 128 individual network elements, and each CC-9000 can support up to 4,096 SC-8100's, and up to 500 simultaneous users.



Benefits of Deploying PUMA Remote Management Products

Transport Management

There are several applications where the PUMA products have provided substantial benefit to cellular carriers. First, a major source of outages come from T1 and transport related issues. When a transport issue occurs, the MSC receives an alarm from the affected BTS. The transport provider is called and a trouble ticket is issued. The transport provider runs his diagnostic tests, usually a loop to the NIU at the site. If the NIU loops, he closes the ticket with a "no trouble found" action code.

The burden is now on the cellular carrier to dispatch a technician to the site to determine the root cause of the problem. Once at the site, the technician can plug into the BTS and analyze the diagnostic information. He can put the transport interface into loopback and call the carrier to determine if the loopback is visible at the Central Office. If it isn't, the transport provider is then willing to dispatch a technician to repair the problem.

This scenario changes radically with the introduction of the PUMA platform. Armed with a connection into the cell site, the cell technician can place the affected transport interface into loopback without traveling to the site. The transport provider can then determine whether or not he can see the loopback. If not, the transport provider will dispatch his technician to repair the problem. The cellular carrier has now saved twice: once in saving the cost of sending a cell tech to the site for diagnostic purposes, and again by reducing the amount of time it takes to get the BTS back up and fully operational.

Microwave Management

A second scenario occurs in diagnosing problems that come up in microwave transport. Cellular carriers will deploy microwave in areas that are underserved by transport carriers, or in areas where the cost of installing microwave is less than the cost of deploying transport carrier services.

Most microwave radios offer excellent diagnostic capabilities. The trick is providing a technician with access to this diagnostic capability. When trouble occurs, the technician must drive to the nearest site where access to the microwave network is available, plug into the microwave radio, and run diagnostics. Further, the source of the problem is not always apparent. Is the problem associated with the transmission at site A or the signal reception at site B? It may take more than one trip to find out.

In some cases, the problem may originate in one of the microwave site's ancillary pieces of equipment, such as a multiplexer. If so, the source of the problem may not be visible from the microwave's internal diagnostics. The technician would have to plug his laptop into the multiplexer to check out any problems that may originate within the MUX.

Installing PUMA SC-8100 into a microwave network will enable cell techs to diagnose the exact cause and location of the problem without having to travel to the affected site. And when a trip to repair the problem is necessary, the cell tech will be dispatched to the correct site with foreknowledge of how to repair the problem. Again, this significantly reduces the time it takes to diagnose and repair an outage.

Multiple Trips

When an outage occurs, a technician must be dispatched to a site to diagnose the reason for the problem. Once the reason for the problem is found, it is not unusual for the tech to not have the right spares on hand to make the repairs. This means he has to make a trip back to the MSC to get the needed parts, and then drive back to the site to fix the problem.

With PUMA, the technician can remotely diagnose the problem and make one trip to the site with the correct parts in hand. This eliminates the need for a diagnostic trip and reduces the outage by several hours.

RET Controllers

Some carriers have deployed antennae which have the capability to be aimed via Remote Control Units (RCU). The SC-8100 contains an optional AISG v2 compliant RET controller, allowing antenna tilts to be performed and monitored remotely from anywhere on the network. Again, this saves the cellular operator from dispatching a tech to the site to aim the antennae. For cell sites with a RET controller already installed, PUMA can provide the same level of access to the RET controller as it does for all other network elements at the cell site, allowing remote antenna aiming without the need to travel to the cell site.

Power Amplifiers

Multi-Channel Power Amplifiers (MCPA) controls the signal strength to the antenna. If there is a question about the status of an MCPA, a technician is dispatched to plug into the unit and obtain the current values. With PUMA, these values can be read and changed by a technician from anywhere on the network.

Value Proposition

The PUMA platform provides a cellular carrier with two substantial benefits: a substantial reduction in the number of truck rolls needed to operate a given cellular network and a reduction in the length of an outage when one occurs. Any operator that is under pressure to reduce costs and improve network availability will find the PUMA platform to be a welcome addition to his OAM&P capabilities.

In Summary, the PUMA Platform provides the following functions:

- Network element monitoring, configuration, and maintenance, resulting in a significant reduction of site visits
- Fault Identification and “smarter” truck rolls
- Remote network element provisioning
- Network element inventory management
- PUMA Network Address Translation (NAT) provides better use of ports and IP addresses
- Network element configuration backup and restoration
- Network element operating software upgrades and downloads
- Vendor software application hosting
- Security features to prevent unauthorized access to network elements
- Activity logs by user, network element, and time of day, assisting in problem identification and corrective action

- Network element polling and alarm generation
- Management reports
- Alarm aggregation, contact closures, voltage and current sensing
- Handling of TL-1 and SNMP messages
- Integrated RET controller for cell site antenna tilt control
- Video camera site monitoring
- On site storage of events on the SC-8100 in the event of communication failure with the CC-9000

All implemented in a single 1RU rack mounted package