White Paper

What is Telecom Site Automation?

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Executive Summary

Telecom network operators are faced with new challenges to operating their networks. Expectations are high for network reliability, but at the same time field service staff levels and network budgets for operating the network are decreasing. New tools are emerging that can allow for much greater ability to visualize and control power, security, and environmental systems at remote telecom sites. Telecom site automation is our term for the new solutions that are already being used within forward-looking network operators worldwide.

This paper describes a number of examples of different operators and how they are improving the resilience and cost-efficiency of their network using these new telecom site automation tools.

What is Telecom Site Automation?

Telecom Site Automation is a logical and modern extension of what was once referred to by telecom network operators as remote site management, remote monitoring systems (RMS), or simply “site alarming.”

Not too many years ago there was a general class of products referred to as a remote terminal unit (RTU). These units were primarily used to monitor contact closures from other pieces of equipment like microwave radios or DC rectifiers. Over time these devices became more IP-network oriented as the equipment that the RTU’s monitored also began to become more IP-based.

The Asentria SiteBoss product line is to an RTU as a smart phone is to a flip phone. The SiteBoss is based on an underlying Linux operating system and is significantly more powerful than earlier RTU units. Further, as the drive to find efficiencies in management of remote sites has grown, the SiteBoss has evolved a set of functions, tools and capabilities which reduce the burden of site management and increase the number of sites which a given tech can manage. This collection of capabilities defines a new class of product, a Telecom Site Automation Controller.

Over the past 15+ years, customer requirements and pain points have driven Asentria to interface to all types of equipment found at a communication site. More than forty interface cards have thus evolved and are available to be slotted into a SiteBoss unit to enable it to gather data from and control site devices. A single SiteBoss unit could now easily interface with and control generators, rectifiers, HVAC, RFID door access control systems, cameras, and other systems.

The reasons for undertaking Telecom Site Automation are also clear. Network operators are faced with downward price pressures and a need to do more with fewer resources. There is a need to run the networks less expensively through reductions in use of power and more effective management of sites with fewer site visits. Hurricanes, fires, winter storms and other crisis events have exposed weaknesses in networks, and have shown the need for new strategies to “harden” network sites. Telecom Site Automation can provide valuable benefits in the form of a more resilient and efficient network.

Some examples of Telecom Site Automation are provided here which help lay out our vision of the future of Telecom Site Automation. Simple alarming and other more basic functions are also part of the solutions described below but this document focuses on aspects which provide a strong component of smart Telecom Site Automation.

Cases

The example cases below are representative of what can be done with a SiteBoss, but many other automation solutions are being engineered for customers beyond these examples. All the examples below utilize one of Asentria's SiteBoss Linux-based appliances as the central part of the application.

North American Mobile Network Operator (18,000 sites)

A large wireless operator deployed an Asentria SiteBoss that included a wireless modem and DC power distribution in their nationwide cabinet rollout. The wireless modem enabled out-of-band access to each location. If microwave back haul failed the site could still be communicated with. The DC power distribution panel had switchable circuits, so once troubleshooting occurred the network operations center could reboot problem equipment without a truck roll. This enabled this operator to use a smaller field service force.

Additionally, a problem occurred in winter in the US Midwest where AC grid power was lost and batteries fully discharged, leaving sites in a powered down state. When grid power was restored some equipment was damaged due to the equipment being powered on while still being extremely cold. Using the SiteBoss, a new solution was created that was initially thought of as a shut-down process, but eventually was referred to as “Load Shedding”.

The SiteBoss unit would continuously and autonomously query the rectifier for presence of AC grid power and state of battery charge. If AC power was lost, the SiteBoss would begin taking its decisions at different levels of battery discharge, beginning by switching off equipment that was considered less critical. This saved battery power and extended the run time of the site. Ultimately, once it became clear that the site was likely to run out the batteries completely, the SiteBoss would shut itself off along with the rest of the site. The SiteBoss would shut itself down with its relays in a state prepared for AC power to be restored. Once power was restored to the SiteBoss (which has a wide operating temperature range), it would then power up the site heating equipment. Once the SiteBoss detected that temperature was above a certain level, the SiteBoss would begin to restore to each additional site device in a timed and logical order.

North American Mobile Network Operator (10,000 sites)

After hurricanes in the northeastern United States, a large mobile network operator decided that they needed better and more actionable data regarding generator fuel levels. Initially they were seeking a very small device to just monitor and transmit fuel tank levels (which is a product Asentria can provide). After working with the SiteBoss and seeing its potential for Telecom Site Automation, the SiteBoss evolved into collecting significant data about the generators related to alarming and maintenance. The SiteBoss was then tied to the automatic transfer switch (ATS) to allow centralized control of running the generator network. Asentria provided extensive integration service to make the SiteBoss a single common interface to multiple generator models and makes to enable a single interface to all generators. The SiteBoss is now deployed with diesel, LP, natural gas roof-top generators, and on mobile cell-on-wheels (COW's) or generator-on-a-truck (GOAT's).

This work solved several real-world problems. It is possible to exercise generators prior to a known incoming weather event like a hurricane, identifying problems with generators in the days immediately prior to hurricane landfall. During a crisis the network operation center has visibility into fuel to prioritize re-supply. During non-crisis periods the US Environmental Protection Agency will generate fines for exercising diesel generators during high smog events in urban areas. The SiteBoss managing the ATS allowed for the network operation center to suppress exercising the generators if smog levels were too high. Additionally it was found that the SiteBoss' network corrected clocks allowed for accurate timing of generator exercising, preventing problems where a dumb timer would allow a generator to run outside of approved noise ordinance schedules. The SiteBoss can also collect data on generator run-times, allowing for maintenance cycles to be changed from being based on a time period to service based on actual generator run-time.

(More information on this application is available in our "Managing Generators in a Telecom Network" document).

Middle East Public Safety Network – 300 sites

Public safety networks have somewhat different needs than other networks. Network resiliency is a paramount concern. As part of integration to the generator, and as the operator began to better understand the capabilities of the SiteBoss, a new Telecom Site Automation program was outlined and deployed. The SiteBoss was interfaced to the HVAC system, the generator, and the rectifier. When the site was running on the generator, the site operated similarly to when it was on grid power, with all equipment in operation. When running on batteries, the HVAC system would not operate.

Some sites in a country-wide deployment were in extremely remote and distant locations. In the event of power loss it was of primary importance that the site operate as long as possible until a fix could be implemented. An automation was created so that the SiteBoss would watch site temperature and battery discharge levels from the DC rectifier. The site would operate on batteries as long as state of charge of the batteries was high enough and temperature was low enough. If not, the generator would run until batteries hit a high state of charge and site was sufficiently cool. This cycling enabled diesel fuel at a site to be considerably extended.

North American Mobile Network Operator

A large wireless operator has integrated the SiteBoss to the DC plant, generator, DC boost converters, temp sensors, and the overall network (for connectivity checks). When first installed the SiteBoss auto-configures certain of its own characteristics based on what it discovers attached to its Ethernet ports. In addition to basic alarming and telemetry data from these systems, the SiteBoss performs several automated processes. One example is radios being “hibernated” when no back haul is present to preserve site life. Another is to control site power as a site comes out of a low-voltage disconnect state by controlling DC plant float voltage.

Automation is Here

The broad integration experience of Asentria has given us an encyclopedia of capabilities and knowledge to integrate with any devices that might be used at a remote telecom site. Our value proposition includes integrating to anything found in these sites, normalizing the data from all these devices, and then enabling communication of data back and forth from some centralized location. Fifteen years ago this might have meant a simple contact closure generating an SNMP trap to a network management system, but now the possibilities are so much greater, with the SiteBoss capable of gathering data and allowing control of potentially hundreds of variables.

A SiteBoss in a modern shelter or cabinet might have access to literally hundreds of variables being generated by smart controllers at a site. There are current examples of a SiteBoss being interfaced to AC meters, generators, HVAC systems, door access control systems, rectifiers, battery monitoring systems, cameras, and even service providing equipment like routers, microwave, or RAN equipment.

Asentria has recently implemented an controller API which opens up entirely new possibilities regarding telemetry. It is now possible to deliver data from cell sites to build site telemetry databases. Using this data and off-the-shelf visualization software it is possible to create maps of power usage vs. HVAC run time, HVAC set points, and site temperature, and whatever else a bright mind can envision in order to provide “big data” on cell site operations and efficiency. The SiteBoss can control HVAC set points as well, so a human operator could view these maps and investigate outliers for excessive power use, and remotely change set points of the HVAC. In the near future it is possible to see where processes could be automated to “tune” the network without human intervention. There are no technical barriers to doing this today.

Network operators have an opportunity using telecom site automation to create competitive differentiation for themselves. The SiteBoss is an appliance that any operator could own, but the operational processes that are built around the SiteBoss are owned by the customer. Telecom site automation pairs well with existing initiatives to “harden” networks or achieve power efficiencies.