

GUIDE

TELECOM SITE AUTOMATION

Applications Overview Guide



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Overview

Asentria SiteBoss products are Linux-based hardware appliances designed to manage and automate remote telecom communication sites to improve the resilience and efficiency of the network. The SiteBoss products are a category of products that we refer to as telecom site automation that have evolved from doing simple alarming, to monitoring, controlling, or getting remote or out-of-band access to underlying devices or sensors at the telecom site. The basic sub-systems that a SiteBoss appliance might be interfaced to at a telecom site can be categorized into five major types: **Power** (eg. Rectifiers, AC meters, or generators), **Security** (eg. Door access control, cameras), **Environment** (eg. HVAC or temp sensors), **Active Service Providing Equipment** (Reboot of RAN or microwave, or out-of-band access), and **Legacy Alarms** (eg. Existing Krone, 66, or 110 punch down blocks). The SiteBoss units might also fulfill some specialized function or need such as providing **additional Ethernet ports** within a telecom site to preserve physical Ethernet ports on a router or effectively increasing the number of IP addresses on an operator network. In cases where IP cameras or Ethernet based controllers for HVAC, rectifier, or diesel generators are present at a site, the SiteBoss may be used to keep those “smart controller” devices off the primary network via our ability to add Ethernet ports to the SiteBoss. This enables equipment that is considered to be a possible security risk off the primary network.



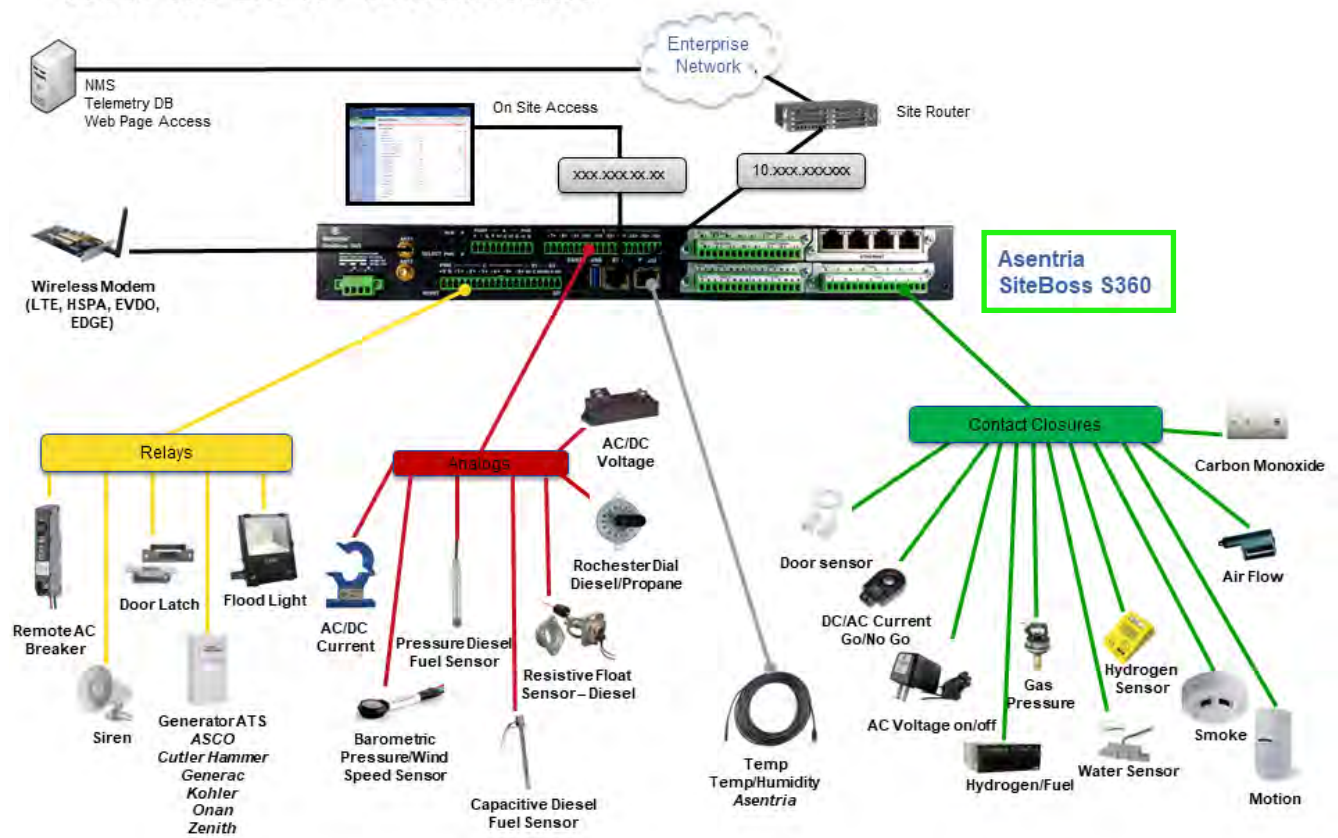
Southbound vs Northbound

It is helpful to first describe the difference between what we would refer to as “southbound” vs. “northbound” issues. Southbound functions are related to the interface from our SiteBoss units to other hardware or sensors located at a telecom site. Northbound relates to what data or communications is sent to or from the SiteBoss to what we will generically refer to as a Network Operations Center (NOC) located elsewhere than at a specific remote telecom site. The diagram below illustrates the north and south bound aspects of the units, showing different site related hardware or sensors at the bottom of the picture (southbound of the SiteBoss), all being integrated “up” to our SiteBoss unit in the center of the picture, and then the Siteboss unit communicating northbound across some type of IP network to a NOC, which could mean any number of different people or software.

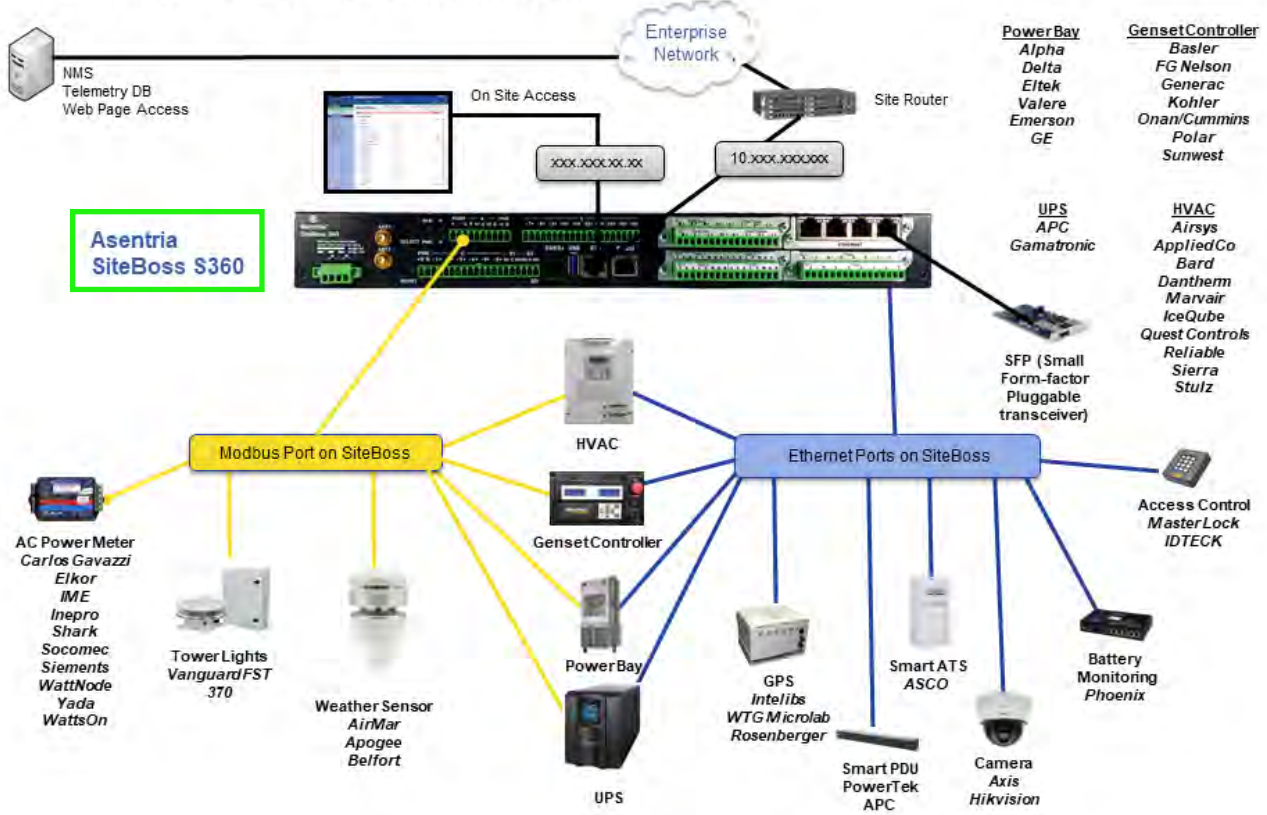
The SiteBoss base units are a chassis within which various cards are inserted to match whatever interface is needed to connect to devices or sensors at a particular site. Several examples of cards are in the picture at the upper right, showing examples of wireless modem and fiber interfaces. At the time this was written over forty cards were available.

The picture illustrates a basic topography of how a SiteBoss could be connected northbound and southbound, and rest of this document is meant to give a representative look at the types of applications possible.

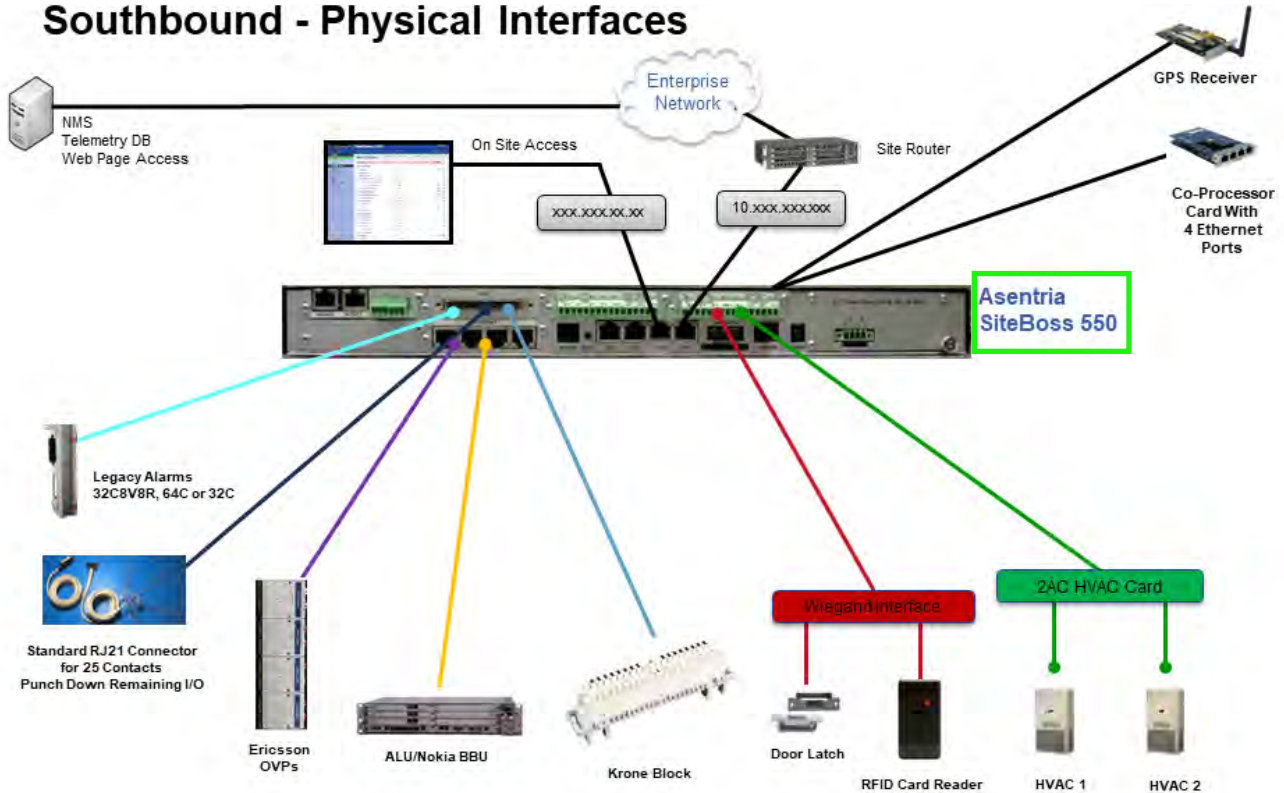
How We Do It - Southbound



How We Do It - Southbound



Southbound - Physical Interfaces



Telecom Site Normalization

One way to view the SiteBoss' application is for "normalization" or "flattening" of all data coming from the southbound devices, regardless of the make or model of that device. An example would be two telecom sites with different HVAC systems, one with an Ethernet based "smart" controller and one using a simple thermostat. From the HVAC smart controller the SiteBoss can get data on many functions of the units as well as control set points and run the HVAC systems by sending commands to the HVAC smart controller. If the SiteBoss was used to replace a basic thermostat, then the SiteBoss itself would behave as an HVAC smart controller also controlling the running of the HVAC, switching of lead/lag units, switching to free cooling, and being able to derive many variables like run time.

The important feature is that processes could be built from the northbound side or within the SiteBoss itself to make sites with different equipment in them run in a similar fashion. This normalization makes it possible for you to control HVAC set points across your entire network regardless of the make, age, or model of the HVAC system the SiteBoss is controlling, as well as remotely gather similar telemetry data on things like HVAC run times. This also extends to being able to look at different sub-systems together, for example measuring AC power usage across many sites for HVAC vs free cooling, or any other variables that the SiteBoss is gathering.

By normalizing all the underlying southbound systems, the SiteBoss enables automation to be done to do specific applications. A popular example is doing mass generator exercising, or alternately, suppressing mass generator exercise. If you know that a major weather event like a hurricane is imminent, you could run every generator within an entire region from a single command from the NOC and the SiteBoss would report back any generators that fail to start, which would allow the operator a chance to do priority service visits to sites prior to storm landfall. Alternately, during a high smog condition in a metro area, you could choose to suppress generators running until better weather conditions are present to avoid conflict with regulatory agencies.

Power Applications

Site power is one of the most critical variables at any telecom site. SiteBoss units enable automation related to power to increase site life and reduce costs. The list below is a representative list of variables that the SiteBoss can easily monitor, enabling various applications and automation to be created.

➔ Generator/ATS Control

The SiteBoss can centralize control and management of generators across all makes and models. We can provide operational data on fuel levels, detect fuel theft, and remotely or autonomously start and stop the generator. Application examples include remotely exercising all generators to search for generators that fail to start prior to hurricane landfall, measuring diesel during and immediately after a storm event to prioritize re-fueling, or checking on backhaul availability to determine whether to run the generator or to hibernate a site. Automation can be created to extend site life per liter of diesel when site is running on generator.

➔ AC Power Monitoring

The SiteBoss can be integrated to most power meters. See chart below for particular power meter integrations. One use is simplifying the billing by a towerco of AC charges in a multi-tenant site by delivering all AC usage to the NOC. Another use is for comparing site's power usage vs. one another to identify outlier sites.

➔ AC Power Sensing

Simple ability to sense presence or absence of current on a 120V/240V AC circuit.

➔ DC Current Monitoring

Ability to measure DC currents on circuits through use of current transformers.

➔ DC Rectifier Integration

Access and gather data from DC rectifier "smart controller."

➔ Battery Monitoring

Ranging from simple measurements up to controlling specialized battery monitoring sub-systems.

➔ Fuel Sensor Monitoring for Generators (Diesel or LP)

Measuring fuel levels using float, pressure, or ultrasonic fuel sensors, or by directly interfacing to an intelligent generator.

➔ Gas Pressure Monitoring for Generators

Measuring presence or absence of natural gas for natural gas powered generators common in roof-top site applications.

DC Reboot

Asentria has a range of abilities to directly reboot or shutdown DC circuits. The two most common applications are listed below. The SiteBoss can switch 10A, 30A, 60A, and 90A circuits (@ 48V) depending on configuration.

- ➔ **DC Reboot** – This application commonly involves a wireless modem as well. If the primary communications path to the site is disrupted, the wireless modem can be used as an alternate out-of-band method of communicating to the site. Troubleshooting can occur over this connection via the SiteBoss, and devices (eg. Microwave) can be re-booted to re-establish primary communication and prevent a truck roll.
- ➔ **Load-Shedding** – This application most often involves the SiteBoss detecting a loss of AC power to the site, and taking independent action to reduce power usage at the site by shutting down controlled equipment at the site in a certain order to extend site life and save power, as well as controlling the order in which equipment is powered up after power restoration to prevent possible damage to site equipment.

AC Reboot

Done less often than DC based reboot. In some cases the SiteBoss has been integrated to intelligent AC PDU's to control them through the SiteBoss interface.

Physical Security Applications

Direct physical security of a site can be directly related to site resilience. Theft or someone directly harming a site can both lead to network downtime and costly repairs. In some cases, without a method of measuring variables at the site, theft or damage could occur and not be known about until a crisis caused a site to fail. A simple example of this would be diesel fuel theft, with no knowledge of the low fuel condition until the generator fails to start when needed.

➔ Indoor/Outdoor Door Sensors

Simple monitoring of doors opening and closing.

➔ Simple Motion Detectors

Simple monitoring of motion within a site.

➔ Door Access Control

Simple control of door strike – Control door strike via a relay to allow access.

RFID Card Interface – Custom solutions to manage Wiegand controllable card reader access controllers, ranging from simple controls to large network-wide door access control utilizing Asentria's new Asentria Site Management software.

➔ Tower Lighting Alarms

Interface to tower light control systems for alarming and regulatory compliance.

➔ IP Camera Integration

Integrate to any IP based camera, with specialized features to reduce bandwidth usage from the remote site.

Environmental Applications

Site environment is a key variable in both the cost of operating the site as well as the resilience of the site. Several simple important variables can be measured, but the most interesting applications relate to the SiteBoss taking over network-wide control of the HVAC.

➔ HVAC Control

Smart Controller Interface – Interface to intelligent HVAC controllers to provide access and control of the smart controller.

Direct HVAC control – Replace old thermostats directly with functionality within the SiteBoss. Enables many advanced HVAC control functions, as well as allowing centralized control of HVAC from the NOC.

➔ Temperature/Humidity

Monitor temperature via Asentria's own pre-calibrated sensors.

➔ Smoke

Monitor for presence of smoke. Uses Asentria-provided smoke detector.

➔ Water

Monitor for presence of water. Uses Asentria-provided water sensor.

➔ Airflow

Monitor for presence or absence of airflow. Uses Asentria-provided airflow sensor.

➔ Hydrogen

Senses for presence of hydrogen gas.

➔ Weather Station

Integrated to weather stations for wind speed, outside temperature, etc.

Networking Applications

Many of the most interesting applications relate to the SiteBoss' onboard LUA scripting language and the RESTful API. The SiteBoss is connected to all major site sub-systems, and can make decisions based on complex logic. Several brief examples are listed below, but there are many new possible applications using these functions.

➔ Scripting

Site Hardening – SiteBoss recognizes AC main power is lost to a site. SiteBoss doesn't start generator unless battery charge is below a certain level, and temp is above a certain level, extending diesel fuel and site life.

Device Integration – Scripting is used extensively by the SiteBoss to interface to other power, security, and environmental devices found at telecom sites.

➔ RESTful API

Energy Efficiency – A SiteBoss with integrated HVAC card is controlling HVAC at sites. Using the RESTful API, network wide changes to set points can be made, and even made continuously, to optimize HVAC at sites and across the network. Via the API, telemetry data on HVAC performance across the entire network can be retrieved and analyzed.

Telemetry Representations – Any data that a SiteBoss is gathering at a telecom site can then be sent to various Business Intelligence software for dashboards, reports, site and equipment comparisons, etc.

➔ Custom Web Interfaces

Dashboard – It is common to do work to create a site dashboard within a SiteBoss unit's web interface based on underlying telemetry data the unit is gathering.

Custom Device Management – Asentria has created specific custom web interfaces so that associated systems can be directly controlled from a SiteBoss, with all the variables being represented in the SiteBoss web interface.

Network Growth

A common problem in mobile networks is a lack of Ethernet ports at the site or IP addresses on the network. A SiteBoss can be equipped with a four-port or eight-port Ethernet Layer 2 switch. This solves several problems:

- ➔ **Ethernet Ports** – More “smart” controllers are being added to sites and site routers don’t have the physical ports to accommodate them. The SiteBoss adds additional Ethernet ports for expansion at the site.
- ➔ **IP Addresses** – IP address management is complicated by the addition of networked devices at sites. The SiteBoss provides a separate network for attached devices with IP addresses served from the SiteBoss by DHCP. Only the IP address of the SiteBoss needs to be added to the network.
- ➔ **Security** – Many operators have network security concerns, and the SiteBoss can perform as the single approved secure device on the network, with non-approved devices on the separate network created by the SiteBoss.

Network Secure Remote IP Access

The primary methods for secure remote IP access are listed below. This function most often enables someone within the NOC to communicate securely to the SiteBoss unit, and then pass through the SiteBoss unit to communicate to other equipment at the site.

- ➔ **Ethernet to Ethernet (or Serial)** – In some cases intelligent devices (eg. HVAC, generator, or rectifier smart controllers) are not considered secure enough to be placed directly onto a network, and can be directly connected to the internal Ethernet or serial ports on a SiteBoss for access.
- ➔ **Wireless Modem to Ethernet (or Serial)** – A wireless modem option can be used to connect to the SiteBoss, and then connect through the SiteBoss unit to any attached Ethernet or serial based device.

SNMP Applications

- ➔ **SNMP Traps** – Sending SNMP traps based on recognizing a fault is one of the most common uses for a SiteBoss unit.
- ➔ **SNMP OID Creation** – If polling of the SiteBoss is preferred to SNMP traps, the SiteBoss also has OID's corresponding to all measured values that can be polled. New OID's can be created to create new values at the site.
- ➔ **SNMP Proxy** – Allows SNMP agents to poll devices that are connected to the SiteBoss, but which are not on the same network as the agent. A means of keeping smart controllers that aren't considered fully secure off the primary network.
- ➔ **SNMP Trap Capture** – SNMP traps can be sent from local devices at a telecom site directly to the SiteBoss. The SiteBoss can then take various pre-set actions based on the trap received, or information contained within the traps.
- ➔ **SNMP Polling** – SiteBoss can poll specific OID's from other SNMP devices, and build internal files of that data that can be used by our alarming or scripting functions.

Protocol Conversions

The following protocol conversions can be used in numerous ways. Below is just a simple list of some common conversions. With scripting and API, many other conversions could be possible.

- ➔ **ASCII to SNMP**
- ➔ **MODBUS to SNMP**
- ➔ **XML to SNMP**
- ➔ **HTML to SNMP**
- ➔ **Various to DNP3**

Legacy Alarm Applications

Asentria can provide support as an upgrade path for legacy alarms. Asentria can create custom cables or adapters to enable an easy way to move legacy contact alarms to the SiteBoss. This is common where alarm contacts have been terminated from a punch-down block to a legacy device (eg. Badger RTU, or 2G/3G RAN that is being decommissioned). The SiteBoss can simplify the removal of legacy devices by taking over these alarms with a minimum of new cabling labor.

Examples of Integrated (“Southbound”) Devices

Many integrations have already been accomplished. Being on the list below indicates that some additional data or control functions are available beyond simple alarming. This list is constantly expanding based on direct we do on the behalf of customers. The list below should only be considered an example, and not a comprehensive list.

Power

Product Type	Manufacturer	Model	Method
AC Power Meter		EM270	MODBUS, Firmware Web GUI
AC Power Meter	Carlo Gavazzi	EM210	MODBUS, Firmware Web GUI
AC Power Meter	Elkor	WattsOn 1100	MODBUS, Firmware Web GUI
AC Power Meter	Elkor	WattsOn Mark II	MODBUS, Firmware Web GUI
AC Power Meter	Elkor	i-Spy	MODBUS, Firmware Web GUI
AC Power Meter	IME	Nemo D4-le	MODBUS, Scripting
AC Power Meter	IME	Nemo 96HD	MODBUS, Scripting
AC Power Meter	Inepro	Pro380	MODBUS, Firmware Web GUI
AC Power Meter	Inepro	PRO2	MODBUS, Firmware Web GUI
AC Power Meter	Carlo Gavazzi	200	MODBUS, Scripting
AC Power Meter	Socomec	Diris Digiware 40; 50	MODBUS, Firmware Web GUI
AC Power Meter	Siemens	PAC3100	MODBUS, Scripting
AC Power Meter	WattNode	WNC-3Y-208-MB	MODBUS, Firmware Web GUI
AC Power Meter	WattNode	WNC-3Y-400-MB	MODBUS, Firmware Web GUI
AC Power Meter	Yada	YD2010	MODBUS, Firmware Web GUI
DC Power Meter	AccuEnergy	AccuDC240	MODBUS, Scripting
DC Plant	Alpha	CXci+	Ethernet/SNMP Scripting
DC Plant	Alpha	CXCM	Ethernet/SNMP Scripting
DC Plant	Delta	CSU503	Ethernet/SNMP Scripting
DC Plant	Delta	HDS3000	Ethernet/SNMP Proxy
DC Plant	Delta	Orion	Ethernet/SNMP Proxy
DC Plant	Eltek	Smartpack 2	Ethernet, Scripting

Product Type	Manufacturer	Model	Method
DC Plant	Eltek	Flatpack 2	Ethernet, Scripting
DC Plant	Eltek-Valere	NIC2000	Ethernet/SNMP Scripting
DC Plant	Eltek-Valere	BC1000	MODBUS or Ethernet/Scripting
DC Plant	Eltek-Valere	BC2000	MODBUS or Ethernet/Scripting
DC Plant	Emerson	Netsure 701, 710, 721 or 7000 series	Ethernet
DC Plant	GE	Infinity	Ethernet/SNMP Proxy
DC Plant	GE	Lineage Power Phoenix II	Ethernet/SNMP Proxy
Generator	Basler	DGC2020 & MGC1550	MODBUS, Scripting
Generator	FG Nelson	PowerWizard 2.0	MODBUS, Scripting
Generator	Generac	H-100	MODBUS, Scripting
Generator	Kohler	Decision Maker 3000	MODBUS, Scripting
Generator	Kohler	1500 ATS	MODBUS, Scripting
Generator	Kohler	550 Gen Controller	DI/DO
Generator	Kohler	340 Gen Controller	DI/DO
Generator	Onan/Cummins	Modlon Gateway II Controller	MODBUS, Scripting
Generator	Polar		Ethernet, Scripting
Generator	Sunwest	EA Gen Controller	RS232, Scripting
ATS	ASCO	300L	Relay
ATS	ASCO	300 Group G	Relay
ATS	ASCO	300 Group G w/72EE Ethernet Module	Ethernet (no remote gen start)
ATS	ASCO	7000L	Relay
ATS	Cutler Hammer	ATC-600	Relay
ATS	Generac		Relays
ATS	Generac ILS-200		Relay - Engine RUN ONLY, no transfer
ATS	Kohler	M340	Relay
ATS	Kohler	S340	Relay
ATS	Kohler	MPAC 750/1000	Relay
ATS	Kohler	MPAC 1200 / 1500	Relay

Product Type	Manufacturer	Model	Method
ATS	Onan		Relay
ATS	Zenith		Relay - Engine RUN ONLY, no transfer
PDU (AC)	PowerTek	IECPOMS6008C20x2-110VH	SNMP, Scripting
PDU (AC)	PowerTek	IECPOMS6008C20x2H	SNMP, Scripting
PDU (AC)	APC	AP8953	SNMP, Scripting
UPS	APC	Smart UPS Controller	SNMP, Scripting
UPS	Gamatronic	Centrix UPS	Modbus, Scripting

Security & Other

Product Type	Manufacturer	Model	Method
Camera	Axis	M3024-LVE	Ethernet
Camera	Axis	T94F02D (5900-021)	Ethernet
Camera	Axis	M1045-LW	Ethernet
Camera	Axis	M2025-LE (0911-001)	Ethernet
Camera	Hikvision	DS-2CD2032F-I	Ethernet
GPS	Intelibs	GPS over Fiber	Ethernet/SNMP Proxy
GPS	WTG Microlab	GPSRT116	Ethernet/SNMP Proxy
GPS	Rosenberger	GPS over Fiber	Ethernet/SNMP Proxy
Microwave Controller	Ceragon	IP-20	Ethernet, Scripting
RFID Reader	Kade	KDH-C100M	Wiegand Interface Card, Firmware GUI
RFID Reader	ProxPoint	Plus 6005	Wiegand Interface Card, Firmware GUI
RFID Reader	ProxPro	5355	Wiegand Interface Card, Firmware GUI

Product Type	Manufacturer	Model	Method
Remote Door Lock	Master Lock		Ethernet
Remote Door Lock	Supra Traccess	Trac-Lock	Relays
Tower Light Controller	Vanguard	FTS 370d, 370w, 370r	MODBUS, Scripting
VSWR meter	Antenna Monitor	Glob1	Ethernet/HTTP parsing

Environment

Product Type	Manufacturer	Model	Method
HVAC	Airsys	WPU	MODBUS, Scripting to Web GUI
HVAC	Applied Companies	ICBS	Scripting
HVAC	Bard	MV/MC4000	Ethernet, Firmware GUI
HVAC	Bard	MCU4000	
HVAC	Bard	MC/MV5000	Ethernet, Firmware GUI
HVAC	Dantherm		MODBUS, Scripting
HVAC	Marvair	Commstat 4	MODBUS, Scripting
HVAC	IceQube	IceQube-3-3	MODBUS, Scripting
HVAC	Quest Controls	RSC 1000	Ethernet/SNMP Proxy
HVAC	Reliable Controls	MACH-ProWebCom	Ethernet/SNMP Proxy
HVAC	Sierra	Model 2450 / 2490 / 2495	Scripting
HVAC	Stulz	WIB8000	SNMP, Scripting
HVAC	Stulz	C2020	MODBUS, Scripting
Weather Sensor	AirMar	120WXH	NMEA, Scripting
Weather Sensor	AirMar	220WXH	NMEA, Scripting
Weather Sensor	AirMar	220WX	NMEA, Scripting
Weather Sensor	Apogee	SB-100	NMEA, Scripting
Weather Sensor	Belfort	110 Weather Sensor	NMEA, Scripting

Conclusion

This document gives a broad overview of possible applications. Users of the products are able to combine these abilities in many different ways to improve network reliability or efficiency. Specific examples of applications are available in other materials on our website. For more specific information on Asentria products themselves, download the [Asentria Product Guide](#).

