facilities monitoring

Cloud-based monitoring for BAS system expansion

SONICU™
MONITORING. MEASURED.

Table of Contents

Today’s BAS Systems

There's no doubt that centralized building automation and control systems (BAS) are efficient, environmentally friendly platforms that effectively monitor and control core facility functions and performance. Located on centralized IT servers and utilizing complex networks of sensors, smart devices, and controllers, BAS systems monitor valuable assets, environmental conditions, and life-safety variables including building security, fire-safety, temperature, energy consumption, HVAC operation, and maintenance.

BAS systems are evolving rapidly as hardware and software engineers continue to push the limits of what is possible. Many are incorporating artificial intelligence and machine learning algorithms into their operating systems to provide improved data analytics and trending analysis capabilities.

Today, the need for BAS systems goes beyond data collection for energy usage analysis and securing facilities. BAS systems that can provide broader insights about asset performance, staff productivity, cyber-security, and operational efficiencies, while also giving department managers and clinical teams the asset protection, alarming, and unrestricted 24/7 access to data and reporting tools, all without losing control of the BAS – are the emerging reality.

This push for innovation can render older BAS systems comparatively obsolete in only a few years, without many viable expansion choices due to the high infrastructure costs associated with BAS expansion.

Challenges of BAS Expansion

The 3.1 trillion dollar healthcare industry is constantly under scrutiny from government agencies, insurers, watchdog groups, and consumer advocates. Congress and the administration are calling for greater transparency for drug and hospital costs, while, at the same time, pressure to reduce costs and provide better, more sophisticated care has a direct impact on hospital budgets, leaving fewer dollars for infrastructure improvements.

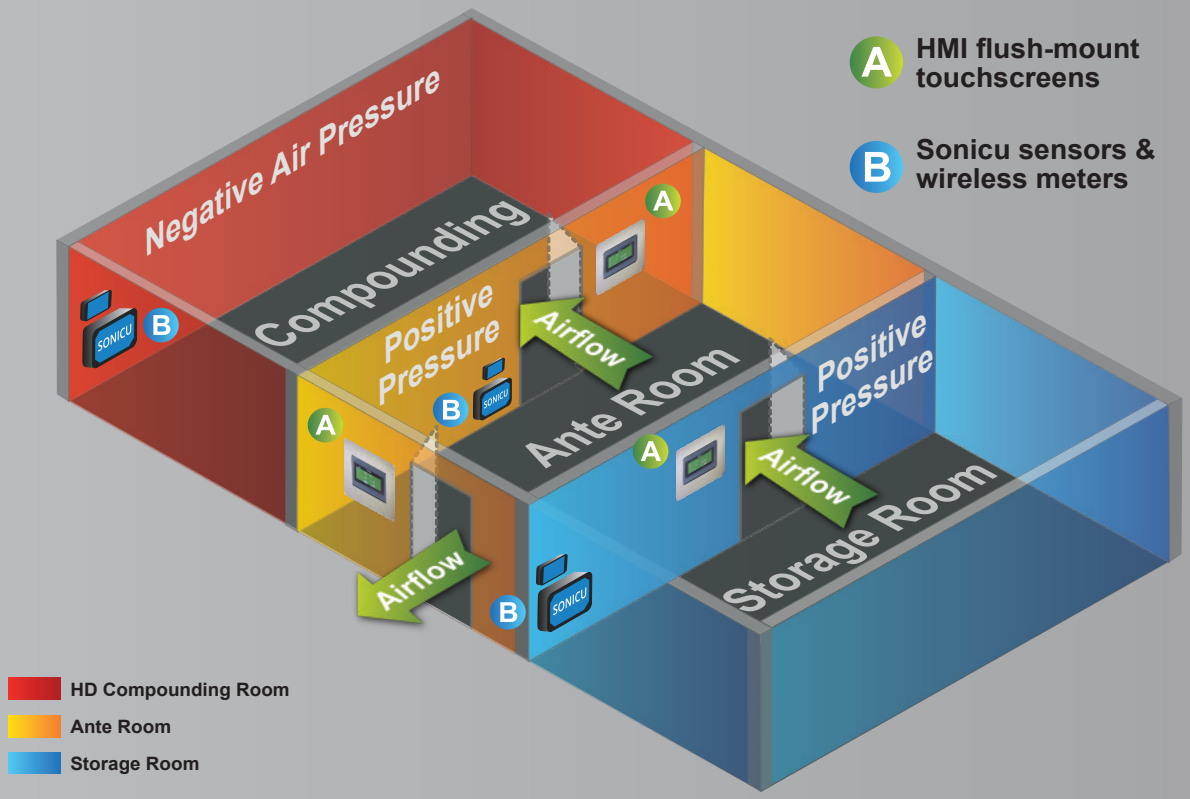
Facility managers are often faced with the responsibility of adapting an existing facility to meet the requirements of patient care or clean room standards. This can include temperature controls, humidity monitoring, differential air pressure, HVAC air monitoring, and more.

Once the controls are installed, they still have to be connected to the BAS. Modification or expansion of hard-wired BAS systems can be challenging, because sensors are fixed and monitoring devices are connected by miles of wire and cable through conduit and other planned pathways, into a central network hub.

Apart from the physical constraints, facility managers and their staff must also consider and resolve a variety of issues such as proprietary hardware, software compatibility, and custom protocol interfaces. Added to that, the trend is for complex regulatory requirements for healthcare facilities to become more and more stringent (USP <800> as example), and facility managers have to find new ways to achieve regulatory compliance.

The end-game result is that modification and expansion of a BAS system is labor-intensive, time consuming, and often impractical from an ROI perspective, due to associated costs. Facility managers need solutions that meet regulatory requirements and can also pass budgetary approval.

Monitoring Compounding Clean Room for USP < 800>



Cloud-Based Expansion

SoniCloud Dashboard Access 24/7

SoniCloud is a cloud-based software platform that provides organizations the tools they need to monitor and measure virtually any critical variable, asset, or KPI and improve operational excellence. SoniCloud is designed to meet any monitoring need, and is compatible with virtually any sensor for maximum flexibility to connect, acquire, and transmit data easily. SoniCloud is hosted on Amazon Web Services (AWS), to provide superior uptime and maintain strict compliance with U.S. Government requirements for data security and integrity. The SoniCloud platform easily scales up or down as needed to monitor everything from single-point locations, up to enterprise-wide networks that monitor and manage thousands of points.

Thanks to the widespread adoption of secure, cloud-based, monitoring platforms like SoniCloud, it is no longer necessary to hardwire sensors and controls into existing BAS architecture with miles of expensive cable to provide BAS expansion. The straightforward deployment of a sensor(s) with wireless data transmission capabilities is a much more efficient and cost-effective way to deploy monitoring technology in order to expand existing BAS monitoring capabilities.

"One of the biggest concerns right now is not going through the building control system network. Effective wireless is a big deal, and I like that Sonicu already has the cellular technology figured out. You don't have to go to another control system."

Chuck Blythe, Environmental Comfort LLC

"...remarkably closer to the elusive goal of a truly Smart Building."

Although Sonicu's hardware is deployed independent of the BAS system, the SoniCloud platform can connect to BAS systems using industry-standard API protocols. Once connected, BAS systems receive data streams from the SoniCloud platform, enabling them to collect, analyze, and back up data on equipment, machines, and locations previously unmonitored – greatly expanding BAS capability without the need for a retrofit.

This allows multi-generational campuses with wings and buildings built years apart to be easily monitored by adding Sonicu monitoring points and connecting the SoniCloud platform to your BAS. More and more hospitals, universities, research institutions, museums, commercial buildings, airports, etc., are deploying SoniCloud technology to expand and enhance their existing BAS systems, or as stand-alone monitoring solutions for remote facilities.

A BAS connected to a cloud-based monitoring platform becomes a scalable system, that can expand or contract easily to monitor and manage whatever future needs may dictate, far beyond the scope of the original BAS system, which comes remarkably closer to the elusive goal of a truly Smart Building.

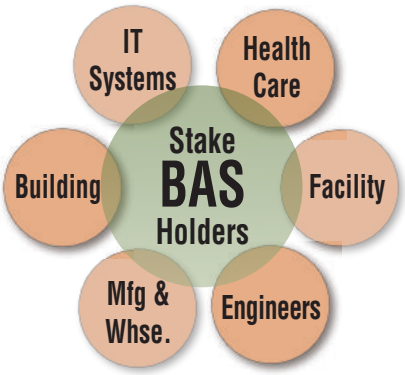
Cost Reduction

A significant strength of the SoniCloud platform is it brings down the cost of acquisition for monitoring remote facilities. When faced with the need to adapt existing wings or buildings for use in patient care, a cloud-based monitoring platform monitors just what is needed. The wireless hardware required for transmission to the cloud (sensor and meter in most cases) is minimal and very cost effective when compared to BAS implementation in a remote facility.

A flexible, scalable solution means initial capital outlay is minimized and return on investment happens much faster. Long-term costs are also minimized because a cloud-based monitoring platform does not require IT support or infrastructure alterations. Except for the one-time cost of the hardware, monitoring is a fixed cost due to the subscription based nature of cloud computing. Sonicu hardware is guaranteed for the life of your subscription, and software updates are free and handled by Sonicu.

The Problem of Access

Any expansive BAS will have many users simultaneously vested in the platform's operation, data distribution, facilities, and control functions. There are a myriad of stakeholders in individual departments, sub-operations, and applications who reqire asset protection, alarming, security, and data access, but they may not all have easy access to the BAS dashboard or control over their monitored data.



Network professionals such as IT software and hardware engineers tasked with installing, maintaining, and troubleshooting the system clearly have a prime ownership of BAS operation and control. In the event of power outage, network crash, security breach, system update, or other interruption, IT needs unfettered access and control of the system.

"There are a myriad of stakeholders in individual departments, sub-operations and applications"

This can translate into limited or no access to BAS system data for other departments or users in order to ensure stability of the system. For example, when it's time for the IT Team to take the system down for routine maintenance, or to update and optimize the system, it is not obvious to the affected departments and staff that they will lose all operational visibility, monitoring, and alarming (*no asset protection!*) while the system is down.

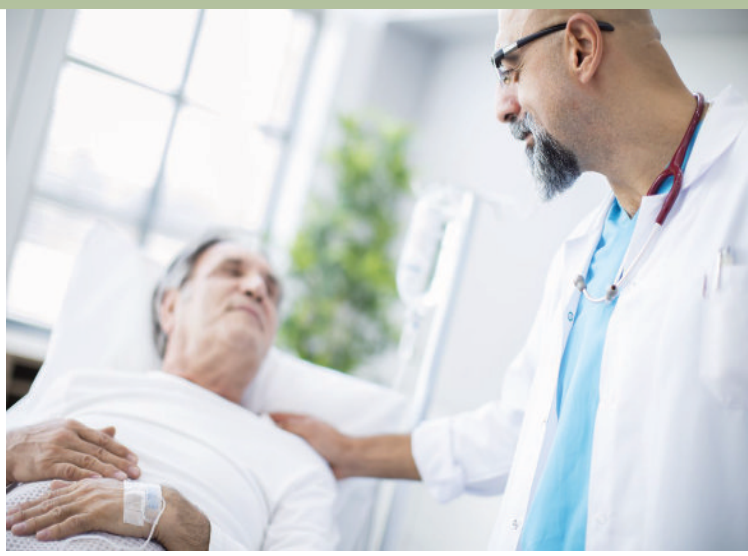
This can include department managers, group leaders, supervisors, clinical teams, maintenance teams, and facility managers. Facilities managers may or may not need the same level of administrative access as department staff, but they certainly need access to core facilities condition data and control for building operation, safety and compliance. All users would say that they have significant interest in system operations, especially monitoring and alarming functions, within their spheres of operations.

So who gets to make the call on adjustments, shutdowns, updates, and a host of other issues that affect the disparate interests of all system stakeholders? It's difficult to cover all the bases with a single, stand-alone system that is rarely compatible with all interests. IT needs security and uptime, facility managers need data and building control, while managers and team leaders need constant monitoring and alarming along with regulatory compliance reporting. Unfortunately, standard reports created through the BAS system at the discretion of BAS managers may not meet the needs of all stakeholders, hampering their ability to function effectively.

The numerous stakeholders competing for a piece of the BAS pie funnel down to a very small opening. That congestion can lead to gridlock and, in some cases, an impasse, with the possibility for disastrous consequences if the right people don't have access and control when they need it.

"it is not obvious to the affected departments and staff that they will lose all operational visibility, monitoring, and alarming"

Hospital BAS & SoniCloud Synergy



A comprehensive monitoring program that includes a BAS system enhanced with cloud-based monitoring can deliver deeper data-driven insights about the performance of key mission areas such as patient rooms, critical care, and surgery, while also providing improved asset protection and 24/7 visibility for pharmacy departments, clinics, labs, and assigned staff.

Aggregate data from a cloud-based monitoring program combined with BAS trends analysis capability provides the foundation for greater transparency and understanding of enterprise performance, leading to better work conditions, improved staff performance, and ultimately better patient outcomes with shorter stays.

Regulatory compliance is also enhanced with the ability to monitor more locations remotely and automatically generate compliance reports that document regulated activities, making note of any anomalies, along with error handling and confirmed resolution.

Clinical staff and healthcare professionals have full access to the data they need via the SoniCloud Dashboard 24/7, while building services personnel maintain control of the BAS, plus they can access all monitored data from the BAS dashboards. The net result is an enhanced BAS that provides full access to needed data for clinical and healthcare professionals while keeping secured access to vital building system controls.

"Regulatory compliance is also enhanced with the ability to monitor more locations remotely"

BAS Enters the Clinical Arena

Traditionally, the mission of BAS systems is to monitor and provide insights on core building systems such as lighting, sprinkler systems, HVAC optimization, and enterprise security. Enhanced by a cloud-based platform, a BAS can provide front-line protection in the war against infectious diseases by providing differential air pressure monitoring for isolation rooms, ensuring negative pressure is maintained in quarantined areas so the risk of infection is greatly reduced.

Hazardous drug compounding and handling areas are also monitored for air pressure, temperature and humidity to protect technicians and maintain product integrity.

The same monitoring technology is also used to maintain temperature and humidity levels in surgeries and intensive care units.

Sound monitoring plays an important role in patient rooms, surgeries, recovery rooms, ICUs, and in neonatal NICUs to ensure patients are not exposed to stress-inducing noise levels that would be detrimental to their healing process.

Cloud-based platforms like SoniCloud are an efficient way to expand the footprint of BAS systems into clinical areas that need to be monitored and managed to achieve regulatory compliance.

SoniCloud and HIPAA

Because a cloud-based monitoring platform operates completely independent of hospital networks, access to sensitive HIPAA data is impossible. The only data transmitted to the cloud consists of data readings from sensors for variables like temperature and humidity. There is no connection between the cloud platform and patient record systems.

Preventing Catastrophic Loss

Collectively, BAS systems and their software dashboards have revolutionized facility management by providing data and analysis tools to help management improve productivity and efficiency. Unfortunately, server based systems like BAS require periodic shut downs for routine updates, maintenance, and hardware servicing or replacement. If a power outage occurs or the BAS system or the network it relies upon goes down for any reason, loss of operational visibility for all stakeholders and all departments happens simultaneously.

Because BAS systems are more vulnerable to security breaches than cloud-based platforms, and they operate from the organizations main server, the threat of a security breach is especially problematic, and is an issue that is not going to go away. BAS systems create potential avenues of attack for hackers that provide access points into an organization's data network.

Smart building system information can include host ID/license, system version, host name, and even the name of the building where the smart device resides. Devices can potentially be accessed on the network by intruders. Once a device is located, hacking software utilities make breaking the device and compromising the BAS system a relatively easy task. Once the intruders are in the system they may be able to access sensitive data that also resides on the server.

"BAS systems are more vulnerable to security breaches than cloud-based platforms"

Several recent high-profile failures at leading university research institutions and bio-repositories have highlighted the need for redundant monitoring and alarming systems. One hacking exploit alone named "CryptoWall" cost victims $18 million in productivity loss, legal fees, IT services, network mitigation, and countermeasures, as well as the need to purchase credit monitoring services for employees or customers according to the FBI Internet Crime Complaint Center.

Impacts include:

- Catastrophic, unrecoverable asset loss
- Compromised data records / personal information
- Loss of asset monitoring and alarming capability
- Inability to perform compliance reporting due to data loss
- Regulatory sanctions for any of the above

In all cases, a specific fail point on the central system was not backed up, resulting in a loss of alarming with no notification to the appropriate stakeholders at the time of failure. By the time the incident was discovered, *catastrophic unrecoverable loss* had occurred.

While no system can fully prevent incidents like this, had a cloud-based monitoring system been in place to protect mission-critical assets, alerts would have been sent in real time at the moment a security breach caused a system failure, so an effective response would have been made much sooner, minimizing any losses

"CryptoWall cost victims $18 million in productivity, legal fees, ...and countermeasures"

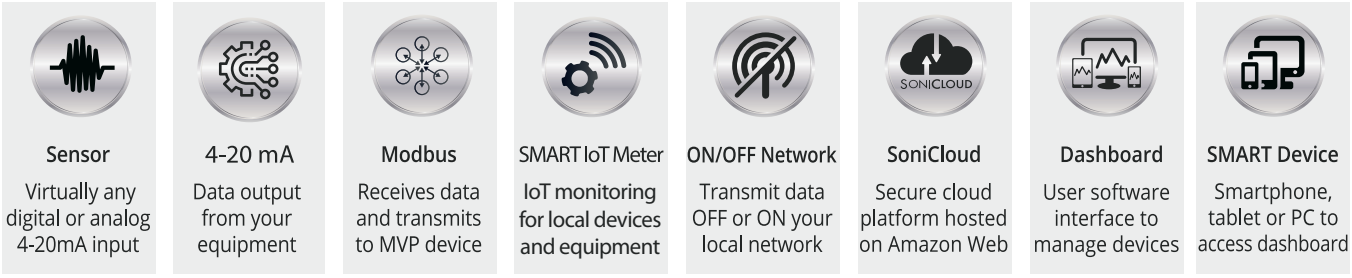
SMART IoT Solutions

Sonicu's SMART IoT is the most capable and flexible monitoring solution we offer. It provides organizations the ability to *Monitor What Matters*. This includes equipment, machines, locations, facilities, and systems that are not already included in a BAS system – without the need for costly installations or retrofits. SMART IoT connects unmonitored assets, equipment, machines, and facilities to the SoniCloud platform where users have 24/7 access to monitored data, and can receive alerts via phone, email, or text.

Example: 24/7 Monitor and Alarming for Lab Incubator Temperature

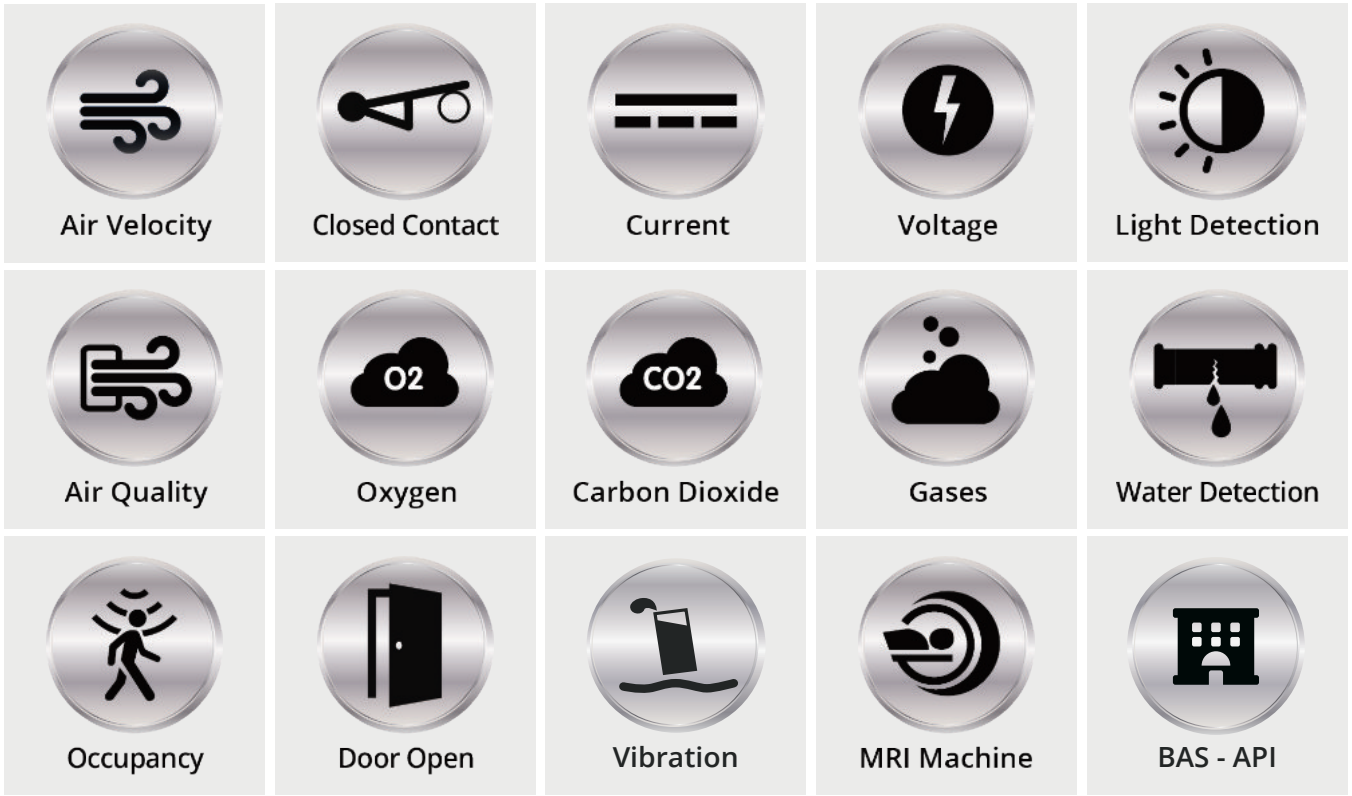
This example uses RS485 serial output or dry contacts to enable data connection. The modbus transmits live monitored data 24/7 to the MVP meter, which sends it to the SoniCloud platform which alerts the user if temperature excursion occurs. The user has complete dashboard access to all data 24/7.

Depending on your application, Sonicu's SMART IoT solution may utilize industry-standard analog and/or digital sensors, modbus serial connectivity, 4-20 mA low voltage, and, for some applications dry-contact switches. SMART IoT can receive data and monitor a huge range of equipment, machines, and assets. Refer to the applications table to see most applications. If you don't see what you need let us know. We probably have a solution.



Common SMART IoT Applications

In addition to the applications shown below, a SMART IoT solution may include temperature, humidity, air pressure, sound, storage tank levels, GPS location, and barometric pressure.

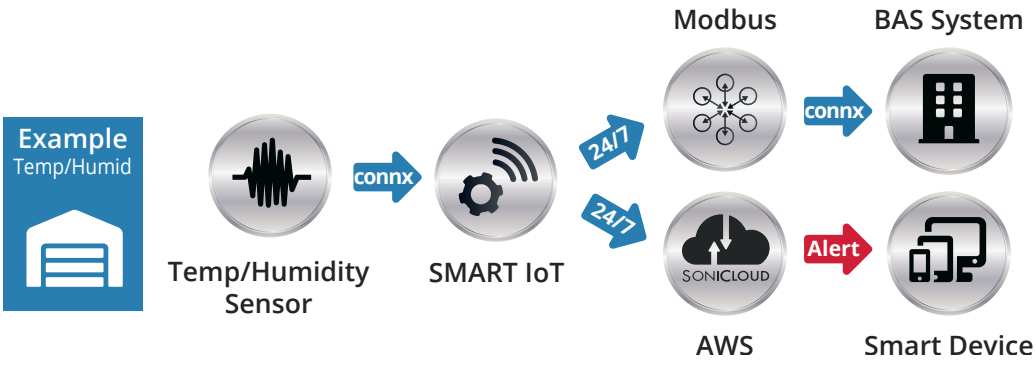


SMART API Integration With Your BAS

The SoniCloud platform connects live monitored data to your BAS system dashboard using SMART API. Connecting a BAS to the Sonicloud platform allows equipment, machine, and facility data to be collected, analyzed, and backed up from locations previously unmonitored simply by adding Sonicu monitoring points. A BAS connected to a cloud-based monitoring platform becomes a scalable system, that can expand or contract easily to monitor and manage whatever future needs may dictate.

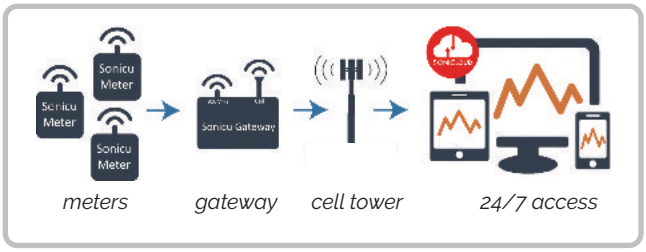
This allows facility managers and staff to monitor and manage all monitored data (including cloud data) right from the BAS system. Additionally, monitored data can be accessed through the SoniCloud dashboard remotely, on phone, tablet, or PC, 24/7.

Connect warehouse to BAS system via Modbus and API



This example shows a sensor transmitting temperature and humidity data 24/7 in a warehouse to the SMART IoT meter, which sends it to the BAS system and the SoniCloud platform simultaneously. Users receive alerts on their smart device if user-set temperature or humidity limits are exceeded in the warehouse. You can also connect equipment to your BAS/BMS system using RS485, dry-contact, or custom protocols.

Self-Healing Network Mesh



One of the advantages of the SoniCloud platform is that multiple sensors can be meshed into a powerful, self-healing network mesh, independent of the BAS system and LAN network. Data transmission is accomplished via 900 MHz gateways that transmit by 4G/5G LTE to the SoniCloud cloud-based platform. Cellular transmission is over an encrypted VPN connection for maximum security.

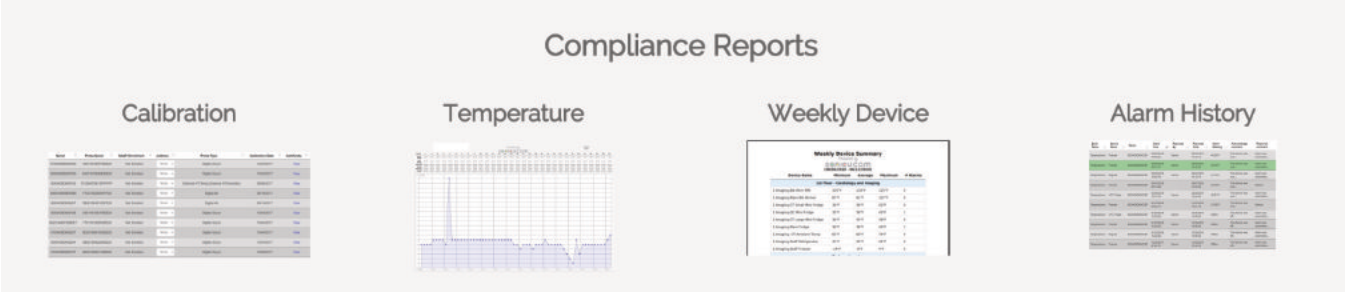
The SoniCloud platform provides 24/7 asset protection, even if the local BAS system goes down, with full visibility of all monitored locations, and unlimited dashboard access from phone, tablet, or PC. All monitoring, alarming, data preservation, and compliance reporting functions are protected and sustained by Sonicu's built-in redundancy. Sonicu hardware is equipped with onboard DataSync and battery backup which preserves monitored data and automatically resends it to the cloud should there be any form of interruption.

Because Sonicu hardware runs on a wireless platform, no IT network configurations or other special skills are needed to install Sonicu monitoring hardware. Deployment consists of plug-and-play sensors and small wireless meters that mount easily out of plain view. Sonicu offers a wide variety of sensor types, plus SMART IoT data acquisition options that allow virtually any asset, variable or KPI to be monitored and measured.

Streamlined Regulatory Compliance

All Sonicu systems include a full suite of SMART Reporting features that fully automate regulatory compliance reporting, including unlimited data storage and annotation features to document and preserve corrective action.

Sonicu compliance reporting helps clients in healthcare, life science, pharmacy (GxP), and food industries meet the stringent regulatory requirements of Joint Commission, CDC, AABB, AATB, CAP, HACCP, FDA, and other regulatory agencies.



Sonicu's SNAP Calibration Program is available for Sonicu digital sensors (below) to eliminate downtime and the expense associated with recurring recalibration requirements. New sensors are provided at the end of the original sensor's calibration lifecycle for plug-and-play calibration.

Sonicu is The Smart Choice

Sonicu's platform is a cost-effective, easy to deploy, flexible solution that expands existing BAS systems without costly retrofit upgrades. Compatibility with virtually any commercially available sensor means it can monitor and protect virtually anything or any variable, PLUS the most flexible transmission options in the industry adapt easily to any network requirements.

SoniCloud Dashboard Access 24/7

SoniCloud Provides:

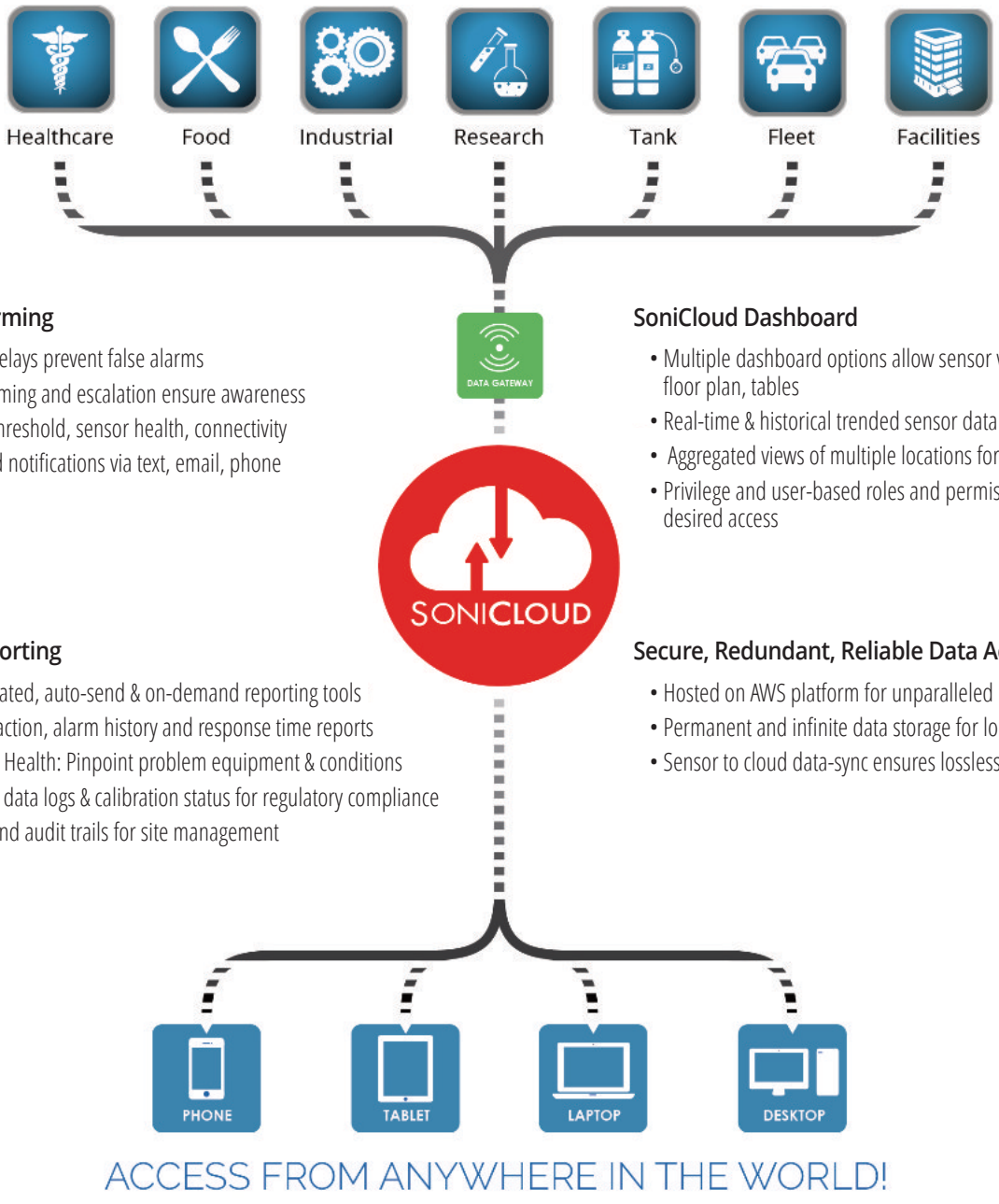
- *Cloud-based, 24/7 monitoring, data access, and system alerts via any smart device*
- *Mission-critical asset assurance in monitoring, alarming and compliance reporting when the prime platform is taken offline for maintenance*
- *Fast response to hacking and data loss as a result of a prime system breach*
- *Plug 'n play monitoring solution can be independent from, or integrate with, BAS*
- *Easy, cost-effective scaling and expansion compared to hardwired systems*
- *Easy to use dashboard with a full suite of reporting tools and auto-generated compliance reports saving time while maintaining regulatory compliance.*
- *Easy verification of existing BAS system*

For further information visit us at sonicu.com, or email sales@sonicu.com.

"Cloud-based, 24/7 monitoring, data access, and system alerts via any smart device"

How it Works

Monitor What Matters.



SMART Alarming

- Buffers & delays prevent false alarms
- Tiered alarming and escalation ensure awareness
- Alarm for threshold, sensor health, connectivity
- Customized notifications via text, email, phone

SoniCloud Dashboard

- Multiple dashboard options allow sensor views on floor plan, tables
- Real-time & historical trended sensor data graphs, analytics
- Aggregated views of multiple locations for full visibility
- Privilege and user-based roles and permissions for desired access

SMART Reporting

- Auto-generated, auto-send & on-demand reporting tools
- Corrective action, alarm history and response time reports
- Equipment Health: Pinpoint problem equipment & conditions
- Automated data logs & calibration status for regulatory compliance
- User logs and audit trails for site management

Secure, Redundant, Reliable Data Access & Storage

- Hosted on AWS platform for unparalleled reliability & security
- Permanent and infinite data storage for long term compliance
- Sensor to cloud data-sync ensures lossless data

ACCESS FROM ANYWHERE IN THE WORLD!