How to Combat Building Automation Obsolescence

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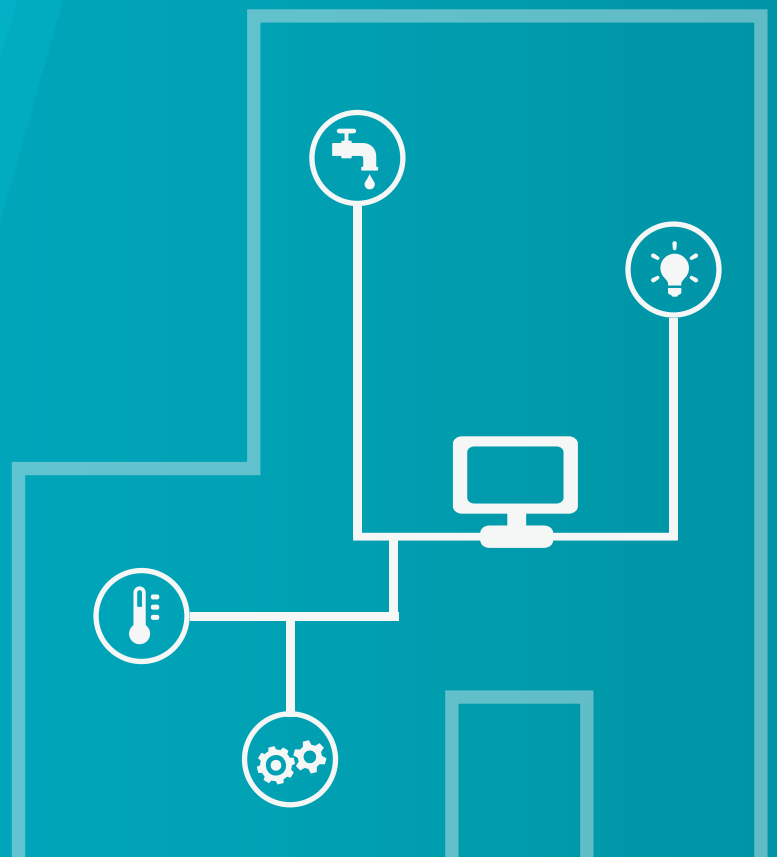
Building Automation System (BAS) Fundamentals

A Building Automation System is a centralized, control system that monitors and controls a building's facility systems such as mechanical, electricity, lighting, plumbing, HVAC, and water supply systems.

The reach of a BAS is extensive and is akin to the nervous system of the human body. It performs critical body functions in a manner typically unseen and unknown outside of the diagnostics generated by detailed medical testing.



5 ESSENTIAL COMPONENTS

1

Sensors

Devices that measure values such as temperature, humidity, daylight or room occupancy

Sensors act as nerve endings that send information back to the brain of the system

2

Controllers

The brain of the BAS, that receives input data and sends out a command based on processed data

HVAC controllers manage the temperature of building with air flow, similar to pace of breathing

3

Output devices

Relays and actuators carry out the commands from the controller

Output devices are the connecting nerves that carry commands from the controller to the system

4

Communication Protocols

The language spoken among the components of the BAS.

The most common protocols are BACnet and Modbus.

5

Terminal Interface

Point of interaction with the BAS where building data is reported

The brains of the BAS, digital controllers, receive input data, then send out a command based on processed data

Terminal interfaces can give you detailed diagnostic information like a medical exam

4
TASKS EVERY BAS SHOULD PERFORM

1. **Control building systems**
   The BAS provides access and control to data at the system, controller and device levels

2. **Monitor building system performance**
   The BAS monitors and alerts building managers of system performance with notifications and alerts

3. **Troubleshoot performance issues**
   The BAS detects, troubleshoots and records findings of any performance issues

4. **Optimize overall building system performance**
   The BAS optimizes processes and control based on schedules and user preferences such as, prioritized alarms, synced schedules, access levels, calibrated inputs and outputs, analyzed trends and reporting

Problem of Inevitable Obsolescence

Every building faces inevitable BAS obsolescence.
Obsolescence comes in two primary forms.

1 Technological Obsolescence

A natural, expected outcome of ageing. Typical commercial buildings have multi-decade service lifespans and are expected to function capably with outdated technology.

2 Functional Obsolescence

Anytime new customer demands cannot be met by the functional specifications of an initially commissioned BAS

Whether the BAS was commissioned 1, 10 or 20 years ago, any new customer demands for unsupported monitoring and control features in a commercial building will drive the BAS into functional obsolescence

Consider the example of monitoring air quality and CO_2 levels.

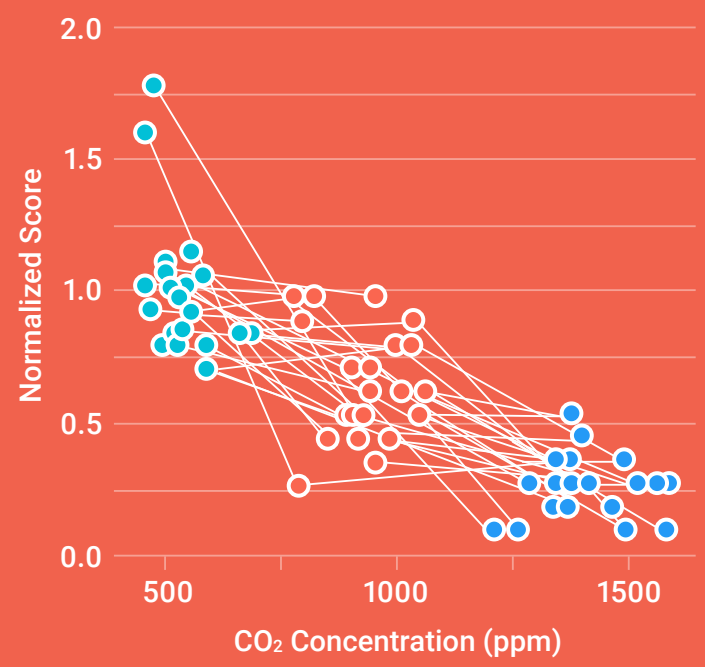
2016 study quantifies cognitive decline due to increasing CO_2 levels (see graphic)

New Jersey Department of Labor Indoor Air Quality Standard requires check of HVAC operation when CO_2 exceeds 1,000 ppm

California Labor Code requires measurement of CO_2 when occupants report the area as "stuffy," "close," or "stifling"

Should new government regulations (or new tenant demands) require the direct measurement and real-time control of CO_2 concentration levels in shared workspaces, virtually all commercial building owners and operators would be stunned by the immediate functional obsolescence of their BAS.

Information Usage



How do I rescue my building from obsolescence?

If your BAS is not providing you the actionable insights you want to proactively manage your building, you have two options.

OPTION A **High-cost Upgrades**	OPTION B **Low-cost retrofits**
When upgrading an existing BAS, the manufacturer of the installed BAS in a newly commissioned building is the incumbent. The traditional framework has always expected the incumbent to dictate the upgrade path of a legacy BAS when responding to the inevitable, yet predictable, obsolescence to come.	Layer cost-effective, wireless components on top of the obsolete BAS to add on to the existing system and fill in the performance gaps.
Upgrading to a new BAS altogether. Requires reinstallation of wiring and configurations.	As the Legacy BAS continues to carry out unseen, low-level functions as the building's central nervous system, dependence on the incumbent BAS vendor will be broken.
Demolishing and constructing a new building, with the risk of immediate functional obsolescence.	This alternative BAS upgrade path allows building owners and operators to shop their retrofit BAS needs to non-incumbents.

Visual Data Overlay (VDO)

Each facility system performs a unique and important function in the operation of a building. Similarly, each system in the human body performs a unique function. The digestive system does not perform the same functions as the circulatory system. The systems act separately, but without each other the body would not be able to function as a whole.

VDO & BAS Relationship or BAS Relationship

A BAS retrofit applies the same concepts as a unique and separate system by adding a new, but necessary, Visual Data Overlay (VDO). The legacy BAS performs the noncognitive functions by controlling HVAC, electricity, and mechanical systems. Alternatively, the VDO steps in to perform the real-time cognitive functions by processing the incoming data from the legacy BAS, and gives customer decision makers only the key abstractions of information that they need. **The noncognitive and cognitive functions that the legacy BAS and VDO executes together, produces a comprehensive building management and control system.**

What is a Visual Data Overlay?

An Operational Technology (OT) interface that takes and processes relevant real-time data from a BAS, then visualizes the data for you. This turns large volumes of logged data into insights and actionable data that can be used and optimized day-to-day.

VDO Interface

Take any wearable fitness tracker. It's a small sensor that collects real-time data on our body and gives insights into our health. Nothing is fundamentally changing our bodies by wearing a fitness tracker, but the data presented allows us to make adjustments based on individual needs and ultimately helps us reduce health risks. Individuals don't need the intimate details of every bodily function, what they need is a targeted, intelligible compilation of real-time data that enables them to make adjustments or take immediate action.

In order to function optimally, the BAS and VDO work together to create a streamlined communication between the building systems to the building managers. The data bottleneck that the legacy BAS has been facing is bypassed to a nimble and powerful VDO that translates data into insights, that presents the primary customer interface by which the customer will interact with the day-to-day actionable information for a building.

Legacy BAS	Senseware VDO
Focuses on running the building	Focused on producing tangible day-to-day outcomes for the customer
Dedicated to low-level processes of critical building systems	Simplified application-specific interface rescues building from obsolescence
Retains critical back office role	New vendors privileged with direct interaction with customer decision makers

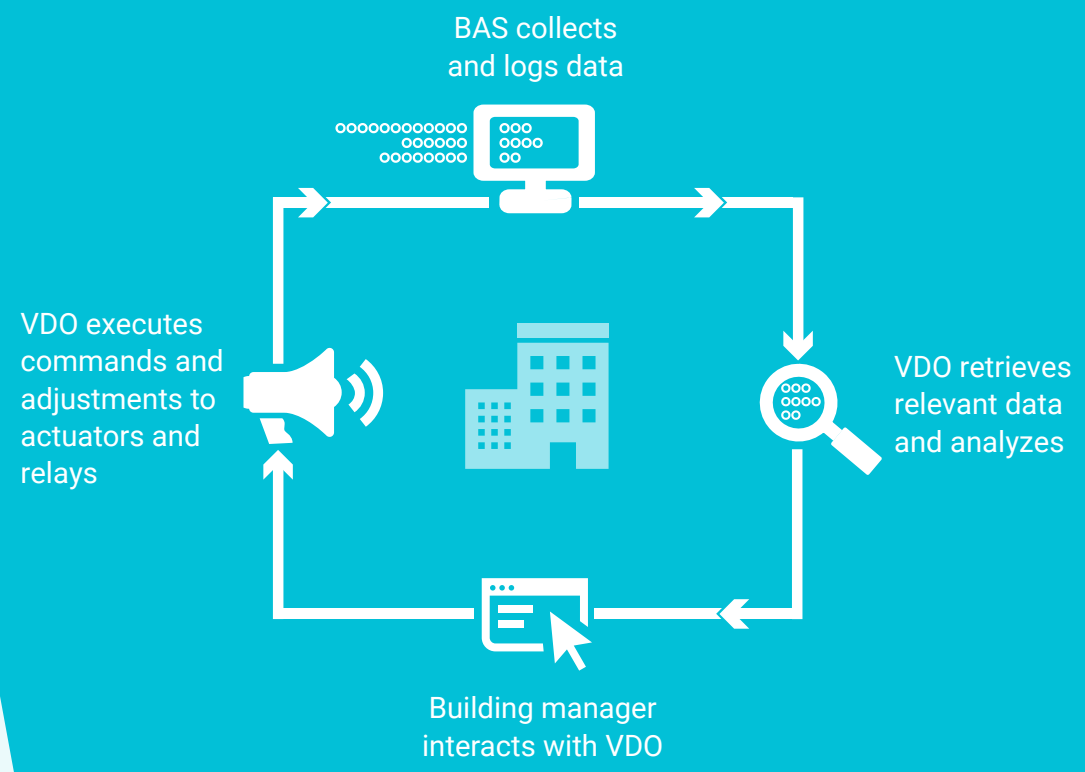
The Framework

The framework of a VDO is comprised of edge analytics, protocol gateways, and a visualization software. The use of software combined with hardware allows the OT interface to communicate with the BAS, and bypass the need to integrate with existing IT systems with machine-to-machine (M2M) communication.

Due to the low-costs of installation and upgrades of VDO, the capacity to provide insightful data doesn't require the capital-intensive investment a traditional legacy BAS requires.

The VDO allows the OT interface to bypass the need to integrate with existing IT systems.

Retrofitted VDO Functionality Loop



Glossary

Edge-Device	A device that exists at the edge of a network, and typically serves to collect data from sensors and provide commands to actuators
Ecosystem	The system that all IoT devices exist within
Framework	A blueprint for creating an IoT architecture. There are 3 primary frameworks that are used within the IoT market (edge analytics, protocol gateways, visualization software)
Edge Analytics	When data is processed closer to the sensor, where the analytics software will process the data and then decide whether the data needs to be sent up to a centralized analytics solution for further processing, reducing the time, bandwidth, and storage required to store the data.
Protocol Gateway	Messaging Bus connects to all systems to "normalize" collected data into a specific communication format before it arrives at the graphical user interface. Normalizes communication and the data model
Gateway	All IoT actuators and sensors tie into devices called gateways. Gateways exist across multiple zones. Its purpose is to capture, filter, and forward data from sensors and actuators to IoT applications
M2M	Machine-to-machine communication
Sensor	Device that provide feedback to the IoT network

Endnotes

[1] Associations of Cognitive Function Scores with Carbon Dioxide, Ventilation, and Volatile Organic Compound Exposures in Office Workers: A Controlled Exposure Study of Green and Conventional Office Environments. Environmental Health Perspectives, volume 124, number 6, June 2016. <https://ehp.niehs.nih.gov/15-10037/>

[2] http://www.state.nj.us/health/workplacehealthandsafety/documents/peosh/iaqstd.pdf

[3] http://www.dir.ca.gov/DOSHPol/P&PC-48.HTM

Contact our team at Senseware to request a demo and find out how about how our Platform can help you manage your buildings.

Senseware is a smart building solutions company offering an affordable facility monitoring and controls platform for the commercial and industrial building market. Our core team of engineers and business professionals are committed to making Senseware's platform the industry standard for accessing and controlling your building's systems. What began as a way to simply stream real-time energy data has blossomed into a full blown universally connected Internet of Things ecosystem capable of connecting any device, system, or piece of equipment.

Our advanced wireless platform delivers building owners, operators, and facility managers a simple and affordable way to integrate, monitor, and control all of their systems. Our wireless, cloud-hosted platform's combination of patent-pending hardware and software enables a wide range of applications from energy management, equipment-level asset management, and HVAC control solutions.

(571) 327-3120
sales@senseware.co
www.senseware.co