# Unifying Siloed Building Systems

## How a common information layer increases intelligent building efficiency

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A modern commercial building may contain dozens of independent systems, including HVAC/BAS, lighting controls, access control, video surveillance, fire/life safety, elevators, and power monitoring. Historically, these systems evolved independently; each often has its own controller, database, communications protocol, user interface, analytics platform, and maintenance staff or vendor. These separate systems all collect data, but this information exists only in these ‘data silos’. The silos contain vast amounts of useful data that building operators need, but often there is no easy way to share information across systems.

The badge system knows when an employee enters the building, but the lighting system does not have access to that information. The elevator knows hundreds of people have arrived on Floor 8, yet ventilation is still operating on yesterday's schedule. By providing a common communication layer across building systems, software can optimize controls across various systems based on data shared by other, traditionally unconnected systems. The goal is not to replace existing Building Management Systems (BMS), but to create a translation layer that allows building systems to speak a common language.

A unified information layer reduces operational friction in several ways:

- Reporting and analysis are streamlined because data is combined into a single, unified space.
- Multiple operational dashboards and software system views can be combined into a single operational dashboard for real-time monitoring.
- System integrations require a single API connection to the information layer, simplifying upgrades and broadening vendor choice.
- Providing building systems with context from other systems enables real-time optimization of maintenance planning and energy management.

### The Modern Approach to IOT

Over the past 30 years, the promise of digitizing every system has been realized. More systems collect and store data and are connected directly or via wifi to software controls than ever before. Traditionally, integrations of these systems had to be designed as 1-1 connections that became increasingly complex as more systems were integrated, since each new system required discrete custom connections to every other system. A universal communication layer within an intelligent building platform integration provides a single endpoint for every system, allowing each system to have only one discrete custom integration instead of dozens. This data orchestration layer standardizes and contextualizes data from each system, creating a shared building data repository that every system can contribute to and act on.

A unified data layer is not a new control system; it does not replace BAS, safety, or lighting controllers. The information layer provides normalized data with standardized timestamps and context, allowing each control system to access critical information gathered by other building systems. For example, lighting controls have traditionally reacted to occupancy, hard-coded schedules, or daylight detection. By sharing information across building systems and sensors, a control system can conclude from the data that 'No one has badged into the 5th floor today' and make control decisions based on that information. HVAC systems can achieve significant efficiency gains by understanding occupancy metrics from other systems. How many employees are in the building today? What HVAC zones are they occupying? Building systems already store the data needed to answer these questions, and the key is ensuring it is tagged and contextualized in a way that every system can use to make intelligent decisions.

With this shared information, building automation can leverage an unprecedented level of insight. Instead of isolated automated micro-systems, such as lighting controls that turn off when no motion is detected, buildings can increase efficiency by implementing cross-domain automation. For example, when the access control system detects that the last employee badges out at 6 PM, the lighting turns off, HVAC settings adjust, blinds close, and security arms unused zones. When the cleaning crew badges in at 9 PM, security deactivates, and the lighting is turned back on. Cross-domain automation, enabled by shared building data, enables new levels of intelligent building efficiency.

## Data Foundations

Integrating data into a unified layer provides more than guidance to human operators to make manual decisions. A unified data layer is the foundation for implementing software simulations of building systems or entire buildings. These simulations are often known as digital twins, exact digital replicas of entire buildings, including all systems, that are used to optimize operations and plan for changes in occupancy or HVAC load. If the building occupancy increases from 40% to 85%, how do energy demands change? Do certain elevators or access points become bottlenecks? What if occupancy doesn't change, but the building experiences climate extremes? Can the building HVAC function if it reaches 105 degrees outside? What changes in settings allow it to operate without any critical failures if not? Simulations can give operators insight into planning for future changes before problems arise.

Beyond providing human operators with insights for manual decisions through simulations, the unified data layer enables machine learning models to use simulations to determine the best actions to achieve a discrete set of desired outcomes. This prescriptive approach provides human operators with suggested best responses to current or future situations, rather than requiring them to manually simulate scenarios to test and decide on different approaches to handle changes in the building's status. Prescriptive maintenance software that uses machine learning can also streamline maintenance by scheduling work before systems fail catastrophically. By analyzing historical data and real-time information from building systems, predictive maintenance models can accurately estimate when parts are likely to fail and inform the prescriptive models that suggest actions to operators. Real-time machine learning models can also be allowed to directly adjust building controls autonomously, subject to strict

operational constraints. These fully autonomous systems enable buildings to realize the benefits of continuous real-time optimization, reducing power use and costs.

The evolution of intelligent building automation will not be defined by the number of connected systems, but by how effectively those systems can share information. Every major building system already generates valuable operational data, yet that data offers limited value when confined to data silos. A unified information layer transforms isolated data into a shared operational resource, enabling systems to work together rather than operate independently. This foundation supports far more than improved reporting or simplified integrations. By providing standardized, contextualized data across building systems, operators can automate cross-domain workflows, model future operating scenarios with digital twins, and deploy AI applications that continuously optimize energy consumption, maintenance schedules, occupant comfort, and overall building performance. As organizations continue investing in IoT technologies and intelligent infrastructure, the competitive advantage will increasingly belong to buildings that can turn information into coordinated action. Establishing a common information layer today creates the flexibility to integrate new technologies tomorrow, ensuring that intelligent buildings become more adaptive, efficient, and valuable throughout their operational life.