Enlighted Surface Sensor IoT Infrastructure The Foundation For Smart Buildings User Guide

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Smart buildings depend on a robust infrastructure, based on the combination of the Internet of Things (IoT) building data and occupant activity data — ingested, managed, and correlated to drive applications, insights, and actions.

Our IoT infrastructure starts with a wireless network of patented sensors, installed into or adjacent to light fixtures, creating a dense grid of coverage that gathers data around people, movement, and activities within buildings. Information is collected 65 times per second, feeding a secured data store and enabling intelligent and responsive lighting and HVAC control systems. Occupant and employee interactions from workplace apps can be added to create a comprehensive, accurate, and time-based view of building occupancy and activities.

These massive volumes of building and occupant data are ingested and processed using our Workspace Intelligence Platform, creating a future-proof smart building infrastructure and unlocking a suite of advanced applications to benefit building occupants and operators, easily upgradeable for future improvements and developments.

Sensors, platform, data, and applications provide building operators and owners with:

- A deep understanding of building usage and occupancy patterns

- Operating cost reductions with our Lighting Control solution and HVAC integration

- Ability to meet ESG goals with measurable reductions in energy use

- Ability to meet health and safety guidelines and reporting requirements for energy code compliance

- Access to time-series building and occupant data via API for a multitude of analytics and applications

Future-proof buildings, reduce costs, gain business insights, and create a high-end, delightful occupancy experience with seamlessly responsive comfort, convenience, and efficiency.

Contents

Advanced sensors for advanced buildings

Patented sensors capture information about what is happening in the building, gathering data 65 times a second, 24/7, about ambient light, motion, energy consumption, and temperature, along with providing Bluetooth® capabilities and wireless connectivity. Thirdparty sensor or application data can also be integrated to provide additional views, insights, and use cases.

Data from these sensors drive analytics and intelligent software applications to improve operating efficiencies and occupant experiences, enhance productivity, and optimize resource and asset use. For example, sensor data supports applications for lighting control, HVACcontrol, space planning, asset tracking, conference room management, desk hoteling, and more

IoT Sensors

Enlighted Sensors are the key to transforming light fixtures into wireless IoT-enabled building intelligence solutions. Bymeasuring ambient light, motion (PIR), energy consumption,and temperature, along with providing Bluetooth® capabilities and wireless connectivity, Enlighted Sensors continuously capture robust, real-time data in the building. We offer four types of sensors to meet any type of workplace need.

Surface Sensor

The Surface Sensor is designed for quick and easy installation directly on workplace surfaces,such as conference room ceilings or under desks, and is powered by a standard USB interface, makingthe deployment completely independent of lighting systems

Micro Sensor

The Enlighted Micro Sensor,in either a 2-wire adaptor or8-pin configuration, is our fifthgeneration sensor. This lighting sensor advances lighting automation, with integratedwireless communications fordata transmission and remote configuration, as well as autonomous fixture-level control.

High Bay Sensor

The High Bay Sensor, available in either an 8-pin or 2-wire configuration, is designed for indoor applications with high ceilings, such as warehouses, atriums, and manufacturing facilities.

Ruggedized Sensor

The Ruggedized Sensor, availablein either an 8-pin or 2-wire configuration, is designed for outdoor applications, parking structures, and damp or wet locations that require a sensor with an IP65 rating

Ruggedized Micro Sensor

The Low Bay Ruggedized Micro Sensor is available in an 8-pin configuration. It is designed foroutdoor applications, parkingstructures, and damp or wet locations that require a sensor with an IP65 rating.

Sensing multiple aspects of an IoT-enabled space

- **Motion**

  A digital passive Infrared (PIR) sensor supports precise motion identification while minimizing false detection.

- **Light**

  Light-level schedules, preferences, and behavior profiles are locally stored to ensure continuous operation.

- **Temperature**

  Separate ambient sensing detects shifts in temperature.

- **Power**

  Enlighted Control Units, via the serial interface, capture energy consumption data

- **Bluetooth® LE**

  A BLE radio allows the sensor to receive and transmit beacons with lighting control devices and other sensors

## Integration with third-party sensors

Enlighted's open architecture connects with third-party sensors for additional value. Our IoT platform makes buildings smarter with integrations into building management systems and offers an extensible platform for smart sensor and device manufacturers to add their unique capabilities to solve client problems.

The sensor network

The scalable wireless mesh network using our IoT infrastructure is capable of managing over 18,000 sensors per building. In a mesh network, each node connects to one or more neighboring nodes instead of directly to the central hub. Therefore, the hub does not overload with connections from different devices. This purpose-built design uses mesh networking technology combined with robust security for a unique delivery mechanism of sensor information.

As depicted below, sensor data is collected and transferred via a gateway either to a cloud version of Manage or an on-premesis version. All data is transferred to the Workspace Intelligence Platform in the cloud for process, reporting, and application integration.
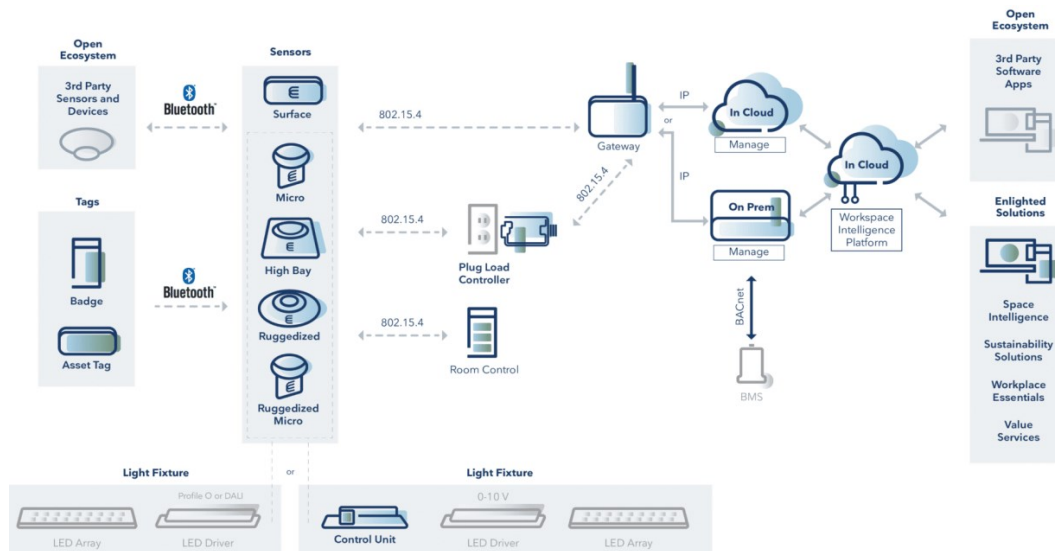
Dense sensor grid

Our patented sensors are installed in — and powered by — each lighting fixture in a building to create a dense and regular grid of coverage, gathering data from anywhere in the building. Additional sensors can be installed under desks for desk-level occupancy sensing.

Robust and scalable wireless network

Our robust wireless network has proven to scale to even the largest buildings in the world, including one over 3 million square feet.

Asset tags and badges

The IoT Infrastructure uses Bluetooth® LE in physical asset tags to locate equipment, and in visitor or staff badges to locate people, in real time

Multiple ways to deploy

Enlighted Sensors may be installed in — and powered by — each lighting fixture in a building. USB-powered Surface Sensors may be installed independently of lighting fixtures, for example under desks or on ceilings in conference rooms. Each sensor possesses temperature, light, motion-sensing, and Bluetooth® capabilities.

Lighting fixtures

Sensors installed into light fixtures allow 180 degrees of unobstructed sensing in a space. Sensors are powered by the lighting fixture. No battery changes are ever required.
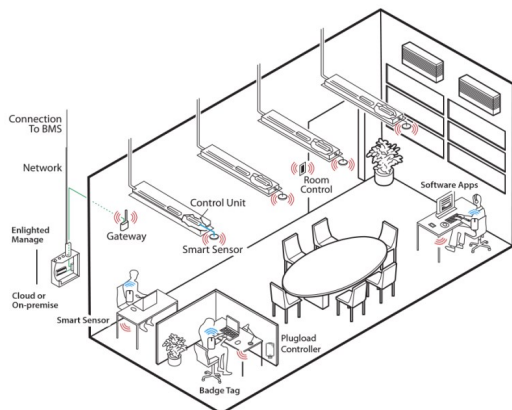

Surface-mounted

Surface Sensors offer flexible and easy deployment in any space — under desks,on conference room ceilings, store counters and aisles, and more.

Each sensor captures data within approximately 100-square-foot diameter

Asset tags and badges

Bluetooth® LE in physical asset tags canlocate equipment andin visitor/staff badgescan locate people — all in real time.

In the built environment, IoT platforms for smart buildings have a key role to play inhelping firms effectively collect, collate and analyse building data from sensors, energy meters, incumbent systems such as building management systems (BMSs) and HVAC units, and other internal and external data sources.

The Workspace Intelligence Platform'

Powered by our advanced sensors, a wireless mesh network, data management capabilities and secured cloud connectivity, our Workspace Intelligence Platform provides the means for data-powered lighting control, energy management, occupant comfort, and advanced usage analytics across multiple floors, buildings, and campuses

Cloud-based apps
Managing large volumes of data requires a scalable infrastructure. Placing data management at scale securely in the cloud ensures both the ability to add continuously updated time-series data and ubiquitous access.

Data modelling and correlation
One of the challenges of managing smart building data is ensuring there are relationships maintained from different sources of information. For example, occupancy data from different sensor sources and data from mobile applications must be linked by a designated location in the building to make sense of it and to derive valuable data. This correlation is accomplished within the Workspace Intelligence Platform via appropriate location tagging

Standard integrations
A comprehensive set of standard integrations include but arenot limited to multiple BMS from various vendors, lighting, parking, lockers, calendars, authentication, and other common building functions.

Standard data APIs
Time series data is available for a number of data types using APIs. With this data, companies can report on a variety of building and activity information, add additional operational data to derive further insights, or leverage for other internally developed applications.

Standards-based communications protocols
Industry-standard communication protocols provide robust and mature capabilities. REST-based APIs support GET, POST requests, and XML, JSON responses.

Data security
AES 128-bit encryption for wireless data transmission and TLS encryption for TCP/IP along with the use of a 2048-bit certificate and SHA-256 Cipher enable the highest standards of corporate data security requirements.

Data privacy
Occupancy data captured by our sensors and application activity data is captured and stored securely in the Workplace IoT Platform. The sensors do not directly reference, distinguish, or identify any identifiable person.

User details such as login and logout events, IP address, first name, last name, and application pages accessed by the user, along with the organization's name, occupancy data, and floor plans, are all stored securely. Within user apps, personal data sharing is opt-in.

Enlighted Solutions			
Workplace Essentials	Space Intelligence	Sustainability Solutions	Value Services
Workspace Intelligence Platform			
Spatial Context Data Modeling, Machine Learning Human Preference and Intention			
System Integrations (Open APIs)			

Building Systems		
Third-party APIs	BMS	HVAC System
Shade Systems	Lighting Systems	Elevator Systems

Sensor Ecosystem

- Enlighted Smart Sensors
- Third-party Sensors

Digital Workplace Systems		
Indoor Positioning Systems	Calendar Systems	Access / Security Systems
Visitor Management	IWMS	Locker Control Systems

Valued outcomes

Once buildings are outfitted with a mesh network of advanced sensors, the stage is set for implementing solutions with real business impact, such as data-powered lighting control, energy management, occupant comfort, and advanced usage analytics across multiple floors, buildings, or locations.

Intelligent lighting control
Our Lighting Control solution leverages the IoT infrastructure by implementing sensor-controlledlighting based on customized profiles, then capturing and responding to data that indicates changes in occupancy and ambient light levels. Each sensor maintains its own programmed behavior, even if outages effect network health.

Our sensors provide out-of-the-box compliance with energy use regulations. The sensors' capacity for vacancy detection, daylight harvesting, demand response, and energy savings reporting makes it easy to meet and exceed guidelines.

By configuring and defining zones and parameters via the system console, users can dynamically change configurations without accessing hardware components.

Occupancy-based HVAC control
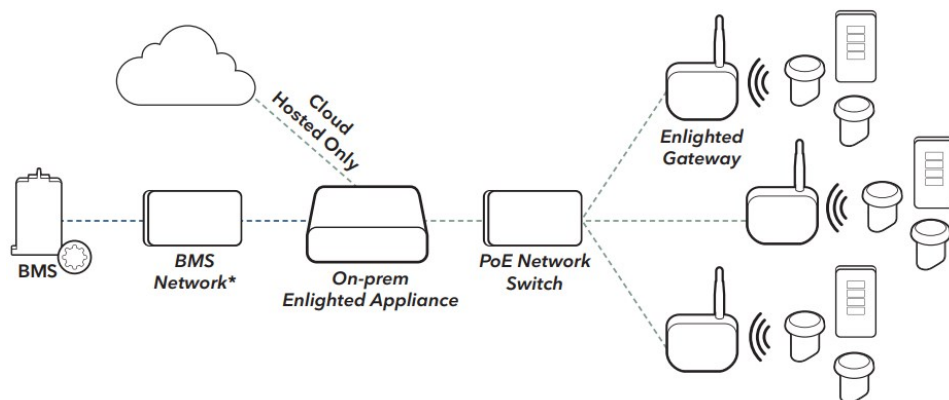
Seamless BACnet integrations

The Lighting BACnet®/IP interface enables seamless integration between the our Lighting Control network and any BACnet® compatible Building Management Systems.

The BACnet®/IP interface allows access to lighting control features such as dimming, emergency overrides, and demand response. The BMS with BACnet®/IP capabilitycan smoothly integrate, monitor, manage, and control the Enlighted Lighting system through group and Individual BACnet® points.

Intelligent HVAC integration
Beyond lighting, a significant cost factor for building managers is heating and cooling. However, occupant comfort and safety are critical to providing a productive and inviting environment. Our solutions solve for both requirements, requirements by configuring spaces for occupancy-based temperature control. Occupancy Sensing dynamically optimizes heating, air conditioning, and air flow based on occupancy. Customized time schedules can be configured by building zones to accommodate a balance between best occupant comfort and energy efficiency.

Energy management
More efficient, occupancy-based lighting control and HVAC management support dramatically affect energy use, with proven savings and positive impacts to ESG objectives. This is achieved by reduced lighting and heating/cooling in unused areas, while maintaining comfortable and productive levels in occupied areas.

Up to **90%** Lighting energy savings	Up to **35%** HVAC energy savings

When integrated with building management systems, the platform allows additional features, such as automated demand response, to help manage time-of-day utility costs and provide detailed energy reports about consumption and savings for compliance with mandated energy efficiency reporting

Use cases

Bring buildings into the future with flexible, responsive workplaces, reduced costs, and enhanced efficiencies. Our IoT infrastructure supports numerous use cases, while being expandable to accommodate future upgrades or changes to building usage.

Activity-based Work	Occupancy data can be used to identify when spaces are truly occupied, integrating with space reservation systems, such as our Flexible Spaces solution. Analytics at this degree of integration help facilities planners understand space utilization at a refined level of detail.
Intelligent Conference Rooms	Occupancy data informs conference room booking systems to release a reserved room when no one shows up to a meeting or when a meeting finishes early. Enables faster sanitization deployment for recently vacated space
Portfolio Right Sizing	Leverage time-series occupancy data to evaluate building use at a granular level to safely identify areas of underutilization and candidates for contraction.
Physical Safety & Securit	Motion data uncovers emergency situations to alert security when there is unexpected motion in a closed or restricted area.
Sanitation Guidance	Prioritize areas for cleaning based on daily occupancy levels to provide both the safest level of sanitation and the most efficient use of cleaning resources.
Reduced Capital Expenditure	Bluetooth-enabled location data helps reduce loss of high-value assets and prevent unnecessary equipment purchases by locating assets and people in real time, with a powerful search function across multiple facilities. Enable geofences for location-based alerts in real time, for people and assets.
Retail Insights	Gain keen insights about movement, traffic patterns, and preferences of your buyers. Discover which end-cap displays are garnering attention and discover which aisles are traversed to understand impacts of store layout modifications. See how checkout lines are processed and install real-time integrations with people-counting sensors.
Healthcare	Locate valued healthcare equipment easily when needed by using asset tracking data, ensure patient health and safety with automated patient tracking and reduce stolen medical equipment.
Manufacturing	Use asset-tracking data to easily locate needed medical equipment and reduce theft. Use automated patient tracking to ensure patient health and safety.

Enhanced building value across key areas

- **Sustainability** — Achieve ESG objectives by consistently reducing energy use based on building occupancy while creating a positive and safe environment for occupants.
- **Productivity** — Increase productivity of employees, processes, and assets by optimizing lighting and interior temperature control.
- **Real estate planning** — Optimize real estate investments with efficient building operations that reduce energy consumption and enhance user experience. Right-size portfolios with accurate occupancy insights.

- **Operating savings** — Reduce the cost of building operations with total energy savings of up to 80%.

Turn Everyday Spaces into Extraordinary Places

Wherever space, people and work meet, Enlighted empowers organizations with the technology to transform real estate spaces into regenerative places that fuel positive impact for people, portfolio, and our planet.

Email: info@enlightedinc.com
Website: www.enlightedinc.com

Documents / Resources

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