

BuildingIQ's IoT platform makes buildings smarter and more economical to operate

Next-generation building management solution powered by Intel® architecture optimizes energy savings, efficiency, and tenant comfort

Executive summary

For years, Internet of Things (IoT) solutions have provided a wealth of knowledge to building owners and operators. Today's challenge is not how to gather more data from IoT sensors and devices but rather how to better analyze and prioritize the data that is already available. BuildingIQ's innovative IoT platform—powered by Intel® architecture—turns masses of building data into clear, prioritized actions that can produce sustainable energy savings, make operations more efficient, and increase tenant comfort.

Challenges

Commercial buildings—including warehouses, retail stores, and medical buildings—were among the first to employ IoT solutions that utilize artificial intelligence (AI). From security sensors to temperature monitors, these solutions provide a wealth of data about a building's energy usage and operations. But for underfunded and understaffed facility teams, the massive amounts of data produced by smart devices can be more headache than panacea.

On a given day, a typical building system collects millions of pieces of data about everything from overflowing toilets to faltering air conditioning units. Which of dozens of issues should the team prioritize? The building management system (BMS) in most buildings can't track, analyze, and prioritize all the data, so facilities teams end up operating in "firefighting mode," with too few personnel racing to keep pace with the most urgent tenant complaint or equipment malfunction. In other words, teams react to issues as they go wrong instead of proactively preventing things from going wrong in the first place.

Midsized to large buildings offer additional challenges with complexities, capabilities, and costs far beyond that of a home or small business:

- Typical on-site systems overlook complicated connections between, for instance, slowly rising energy costs in one area of a building and a specific malfunction in the heating, ventilation, and air conditioning (HVAC) system.
- Many building systems do not store data for long time periods—often for only a week—making it impossible to identify longer-term trends, such as the declining performance of a boiler.
- Most building systems are designed to generate alarms only for known conditions and thus require an extensive knowledge of interactions between the building and its automation systems. Additionally, to augment the alarms, these systems require a bespoke fault detection system—one that amplifies the overwhelming amount of data and issues facility teams deal with.
- Because most building systems cannot identify root causes, facilities teams continue to tackle only the most immediate issues, resulting in higher-cost repair and replacement costs down the road.

Solution

Whether deployed for one building or a global portfolio, BuildingIQ provides an optimal blend of more efficient operations, energy savings, and improved tenant comfort.

Based on their site requirements and location, building owners and operators can select from services including visualizing energy use, predictive optimization and control, and Outcome-based Fault Detection (OFD), which uses artificial intelligence and machine learning to transform sensor data in building systems into corrective actions that are prioritized and justified.

BuildingIQ's platform and services are based on five major components that together constitute a comprehensive approach to a building's IoT:

- **Data capture analysis:** BuildingIQ collects information from multiple data streams, including the BMS, IoT sensors, and external sources such as tenant feedback.
- **Model:** BuildingIQ relies on sophisticated models of weather, building occupancy, thermal demands, and more. Using machine learning, the models are constantly updated for each building based on changing conditions.
- **Measurement and verification:** BuildingIQ's measurements are based on continual monitoring and storage of data. Through data analysis, the platform verifies the impact and efficacy of changes performed. This helps BuildingIQ optimize temperature control (when doing so directly) and target zone temperature set points as provided to the existing building systems.
- **Control:** With the cloud-based BuildingIQ platform, buildings can be intelligently and continually controlled and optimized to achieve maximum energy efficiency. For instance, the platform can provide BMS set points as frequently as every two minutes based on the building's thermal model, anticipated weather, occupancy, and more.
- **Human capital:** The BuildingIQ network operations center analyzes data from each building and provides clear insights and prioritized information to facilities teams. This relieves on-site teams of the need to analyze data, so they can focus on applying their expertise to solving problems that lower costs and improve tenant experiences.

Depending on the challenges and objectives of building owners and operators, BuildingIQ also provides 24/7 managed services that include site analysis, design, implementation, oversight, training, and reporting. The BuildingIQ team of



The BuildingIQ 5i* platform is built on five pillars that combine to deliver value across a range of use cases.

experts can serve as the first line of defense for one building or a portfolio of buildings, monitoring building systems, providing real-time anomaly detection and trend analysis, and reducing the data science workload for in-house experts.

Benefits of energy-based insights and intelligence

- **Reduced energy consumption and costs:** Across a wide range of installations, BuildingIQ has demonstrated that it can lower building energy consumption and associated costs.
- **Optimized operations:** BuildingIQ can help building owners and operators reduce operational costs while sustaining or even increasing tenant comfort levels.
- **Higher property values:** By identifying ways to increase efficiency without sacrificing tenant comfort, BuildingIQ can help increase property resale and leasing value while reducing the cost of operations.
- **Smarter every day:** The BuildingIQ platform is constantly learning and adjusting to provide better predictions, analyses, and recommendations.
- **Human expertise:** BuildingIQ can serve as a long-term trusted adviser, augmenting existing facilities teams to deliver an optimal balance of energy efficiency and tenant comfort.

A smarter energy management system

BuildingIQ's energy management system is uniquely capable of predicting energy demand and directly adjusting the HVAC system parameters in advance to optimize energy use. BuildingIQ's platform communicates with the existing BMS—factoring in weather forecasts, occupant comfort, peak demand, and demand response signals—to automatically reduce energy consumption, cost, and emissions while maintaining or even improving tenant comfort.

Sample use case

The breadth and depth of BuildingIQ's products and services can be seen in its ongoing project with a university in Australia. Across three buildings and more than 420,000 square feet of the university's campus, BuildingIQ has deployed three key services as part of a unified 5i* platform-based solution:

- Energy Worksite
- Outcome-based Fault Detection (OFD)
- Predictive Energy Optimization (PEO)

Energy Worksite

Energy Worksite is BuildingIQ's visualization and simple analytics software-as-a-service that monitors the energy consumption of a building on an hourly basis. The technology uses energy interval data to automatically detect and provide alerts for anomalies in energy consumption and potential savings. The reports give building managers and operators a quick overview of the energy consumption of a building or campus so they can identify outliers, conform to best practices, and know when a building is overconsuming, underconsuming, or on target.

At the university, BuildingIQ's energy monitoring and investigation showed that an oscillation in the power meter was contributing to excessive energy consumption in one building. As a result of that finding, the university was able to reduce the building's energy consumption by 11 percent in the first half of 2018.

Outcome-based Fault Detection

Traditional fault detection and diagnostic solutions inundate clients with masses of largely unactionable data. BuildingIQ's OFD service instead uses a three-tiered approach—featuring human monitoring, rules-based fault detection, and machine learning—to determine and communicate prioritized, actionable diagnoses and recommendations. OFD differs substantially from traditional fault-detection offerings in that

it is constantly looking for patterns and anomalies in data to ultimately point to the root cause of an issue. While its algorithms require human-informed training, once trained they can be applied to any data over any period of time to find causal relationships among equipment in a system.

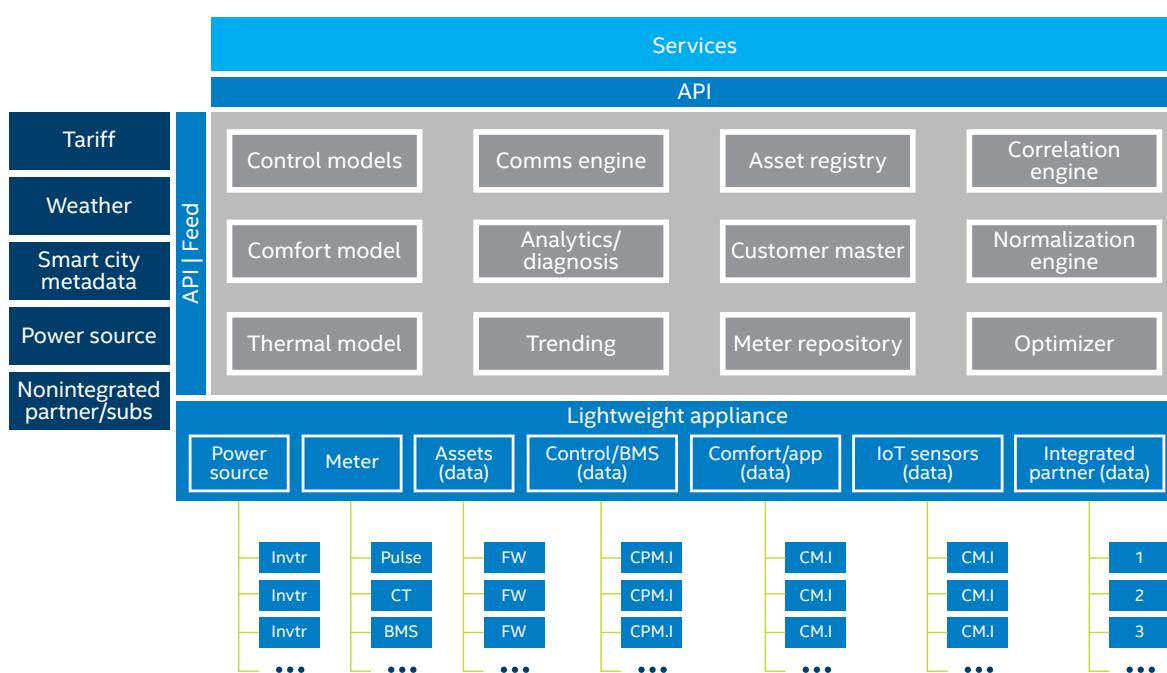
Using OFD, BuildingIQ has highlighted dozens of actionable operational and management issues within the three buildings it is monitoring at the university. Issues—such as a chiller intermittently switching on and off, or a hot deck temperature constantly hunting for a set point—and action recommendations are discussed with on-site experts as part of a biweekly consultation.

Predictive Energy Optimization

The PEO service builds upon the foundation of deep analytics and diagnosis and the building's thermal model by adding an optimization engine (the predictive part) and closed-loop control achieved by integrating with the BMS. The thermal model is based on historical data about energy consumption, control performance, weather, and occupancy. The optimization engine adds predicted outdoor air temperature, costs (tariffs), and humidity data to the thermal model to create an energy profile for the building.

BuildingIQ software effectively models building behavior for upcoming weather and usage, and converts that prediction into action. In anticipation of temperature changes throughout the day, the optimization engine outputs are translated into zone-temperature target set points that guide the BMS to help the system consume the least amount of electricity, using cost as a basis.

At the university, the PEO service was deployed across three buildings. In August 2018, two buildings had energy savings of 14 percent, and the third building reduced its energy costs by 19 percent.



BuildingIQ integrates multisensory data to increase insight and operational efficiency.

How it works in brief

BuildingIQ configures its solutions and services to meet the needs of a wide variety of organizations and building types, from a single warehouse to large campuses and distributed property portfolios.

The core of most BuildingIQ deployments is a small-footprint network appliance that is installed in each building. This intelligent gateway connects building assets—including the BMS, meters, and sensors—to the BuildingIQ platform. The hardware on which the BuildingIQ Site Agent* software operates is an Intel® NUC—a small form factor computer powered by an Intel® Celeron® or Intel® Core™ processor.

BuildingIQ chose the Intel NUC based on its established reputation, ability to run on the Windows* operating system, simplicity of operation, and low cost.

The gateway sits behind the customer's firewall and leverages their existing security model. It allows only outbound connections and buffers control sequences and data for transmission back to the BuildingIQ Cloud*, which is hosted in a data center with 99.999 percent uptime. Building owners and operators can adjust the system as needed using a web portal that is accessible via web browser on desktop and mobile devices.

Intel® NUC

BuildingIQ's intelligent, networked gateway is built on an Intel® NUC powered by an Intel® Celeron® N2820 processor or Intel® Core™ i3 or i5 processor. The Intel NUC powered by an Intel Celeron processor features 4 GB RAM, 64 GB SSD, and Gigabit Ethernet LAN. Intel NUC is a powerful 4 x 4-inch mini PC with entertainment, gaming, and productivity features, including a customizable board that is ready to accept a variety of memory, storage, and operating systems.



Conclusion

BuildingIQ's unique approach to building energy management gives building owners and operators greater control and flexibility, so they can achieve an ideal balance of energy savings, operational efficiency, and tenant comfort. A range of unique, purpose-built IoT applications and managed services are available that leverage the latest in AI-based analytics for predictive models and controls. Together, BuildingIQ and Intel are building intelligent solutions that optimize energy resources, empower facilities staff, and increase property values—all while reducing costs.

About BuildingIQ

BuildingIQ (ASX: BIQ) helps building owners and operators worldwide lower energy use, increase building operations efficiency, and enhance tenant comfort. The company's 5i* cloud-based platform and managed services deliver on the promise of the IoT for buildings with none of the drawbacks. Over 120 million square feet of building space is currently under management with BuildingIQ.



Learn more

For more information about BuildingIQ, please visit BuildingIQ.com or contact us at sales@buildingiq.com.

For more information about Intel® IoT Technology and the Intel® IoT Solutions Alliance, please visit intel.com/iot.

The foundation for IoT

BuildingIQ solutions exemplify the collaboration between Intel and the IoT ecosystem to help enable smart solutions based on standardized, scalable, reliable Intel® architecture and software. These solutions range from sensors and gateways to server and cloud technologies to data analytics algorithms and applications. Intel provides essential end-to-end capabilities—performance, manageability, connectivity, analytics, and advanced security—to help accelerate innovation and increase revenue for enterprises, service providers, and industry.



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