



CASE STUDY

Smart Buildings
Intel PTK1,
Petah Tikva, Israel

Tech Giants Collaborate to Create Digital-Native Smart Building

Microsoft works together with Intel and LTTS to put user experiences first in intelligent building design and deployment

By creating the digital twin of the building's physical space and operations, Microsoft Azure and LTTS i-BEMS enabled Intel to have a truly state-of-the-art platform, allowing more safe and secure integration for new sensors and devices as requirements and technologies evolve.

Workers entering the workforce today were born into a world with internet connectivity. In five to ten years, the first generation of “digital first” children, who had smartphones and tablets before they could read, will become part of the job market.

Yet even as digital experiences expand in the outside world, workplaces have found transformation challenging. Buildings and office spaces largely operate as they did decades ago, and digital technologies are often added on top of an existing infrastructure rather than being a cohesive part of building operations. For workers, this creates inefficient, fractured experiences in the workplace that hinder productivity and don't match experience expectations outside of work.

When Intel designed PTK1, its new 11-story “campus in a building” in Petah Tikva, Israel, it aimed to create something entirely new: a building designed from the ground up to bridge the gap between digital and physical space. With over 14,000 sensors generating over 50 TB of data per day across 800,000 square feet of physical floor space and nearly 3,000 employees, PTK1 takes smart buildings to a new level, with far-reaching capabilities that improve the user experience while generating operational efficiencies and staying flexible for the future.

Designed with the user in mind from the start, PTK1 transformed design thinking into actionable insights that improve each part of a worker's day—from finding their way to a coworker's desk to optimizing their commute—and make it possible to improve sustainability and energy efficiency. PTK1 also serves as a first foray into true digital-native smart building design and is already being used to help design other smart buildings and scale intelligent building operations.

Intel's biggest allies in success on the PTK1 project were Microsoft, which provided consulting and use-case scenarios as well as the Microsoft® Azure IoT environment and integration platform hosting, and L&T Technology Services (LTTS), a smart building solution vendor and end-to-end systems integrator which delivered the integration platform (i-BEMS), as well as handling IoT systems implementation as part of the construction project.

A DAY IN THE LIFE

Smart building technology enables improved user experience

The user experience at PTK1 begins even before employees start their workday. As a worker approaches the parking garage, they are digitally issued and guided to a parking spot based on availability and work location. The parking system can also incorporate any opt-in information the worker has provided—allowing easy access to disabled, pregnancy and other parking options for eligible users.

As employees enter the building, they can see screens around the building that include information they need to start their workday. Interactive building maps provide guidance to help find specific coworkers' desks. When booking a meeting room, users can see real-time visualizations of occupancy and scheduling to select an optimal location.

After arriving at a conference room or cubicle, employees can use the smart building app on their smartphone to optimize their space for their needs. Users can tailor the climate control system to their personal preferences and make service requests. Lighting control presets offer options for relaxing discussions or more intense meetings, enabling users to customize their space for evolving needs.

Elsewhere, screens are displaying availability for services offered in the building, ranging from hair salon and gym areas to music rooms available for employee use. When special offerings are available, these appear alongside a schedule, allowing employees to use the building app to book services.

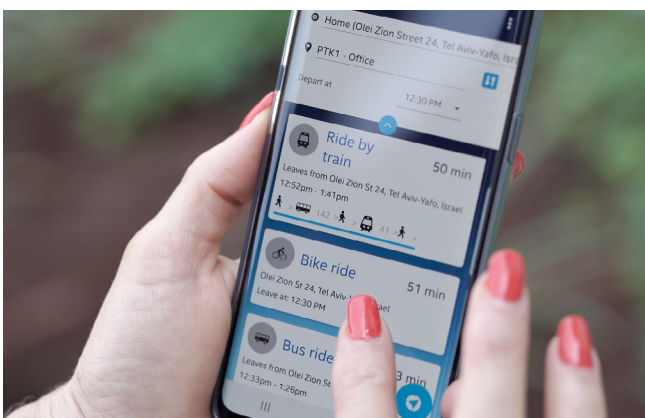
As midday approaches, the building's screens change to lunch mode. Live occupancy status updates—both for lunch lines and seating areas—

help workers decide when and where to eat. Menus and wait time information are also available, so employees can plan their meal while they are en route to their preferred location. The screens also provide workers past occupancy analysis to help them find the best time to visit the cafeteria.

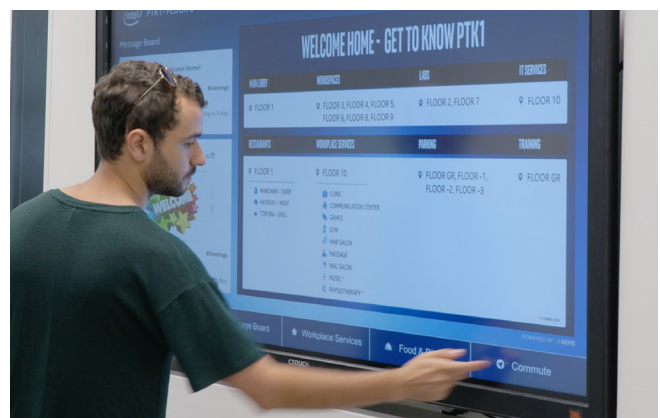
As employees make their way to restrooms, more smart features come into play. Restrooms and other common spaces stay clean with the help of smart technology that tracks restroom occupancy numbers and user sentiment, alerting cleaning staff to any issues that need resolution.

At 3 p.m., the screens change again: this time to commute mode. Bus and train schedules and departures are tracked automatically, so employees using public transit can plan a time to leave the building to minimize waiting times during their commute. Empowered by real-time maps of traffic in the area and information on traffic levels for main routes back to the most popular residential areas, employees who plan to drive themselves home can plan for the best time to leave and the fastest route to take.

For workers who want to carpool, an ad hoc internal carpooling system is available on the building app. With this system, app users can find other users who are planning to leave at a similar time, in a similar direction. The app allows users to contact one another and exchange information to plan their carpool commute on a day-to-day basis, rather than with preplanned schedules. The app also helps users find where they parked their car in the morning, so no one needs to wander.



Users can access PTK1 smart features with a mobile app.



Wayfinding and building information are available on touchscreens throughout PTK1.

How PTK1 delivers operational efficiency gains with centralized analytics

While user experience is at the heart of the PTK1 smart building design ethos, the brain of the building is the system of systems (SoS) that, in the future, will use a planned artificial intelligence (AI) integration to generate autonomous building management modules. With the centralized SoS and its common IoT platform, data generated by building sensors and devices can be understood holistically, to drive improved decision-making and productivity.

The IoT platform for PTK1, built with Microsoft Azure and the LTTS i-BEMS platform, acts as a digital twin—a digital replica of real assets—of the building’s physical space, allowing analytics to see the big picture and understand user behavior for further optimization. The system connects devices and sensors from every vendor, in every function. This shared IoT framework and platform makes use of both edge and cloud computing and analytics, enabling a range of improvements to drive operational efficiency on a day-to-day basis.

Some key opportunities for improvements identified at PTK1 include:

Cleaning cost reduction: Restrooms are a frequent source of cleaning-related complaints in many buildings, but restroom cleaning is typically done on the same scheduled basis regardless of occupancy. Analytics from restroom occupancy sensors at PTK1 indicated that some restroom spaces were used more than 10x more frequently than others. By changing cleaning processes to reflect actual data on usage and satisfaction, buildings can reduce cleaning efforts by 25 to 50 percent, allowing new usage-based cleaning contracts while improving user satisfaction.¹

Common area design improvement: Usage patterns of spaces across the workplace can help map the needs of different teams and business units. By analyzing occupancy patterns and overall usage data from smart sensors in the flooring, Intel realized that employees prefer more open, public common spaces, with more natural light. These areas attracted approximately 4x more users than more private, quieter spaces.² In future buildings, digital infrastructure will be floor based so spaces can be dynamic and respond to employee usage patterns over time.

Optimized space use: Real estate remains one of the most expensive assets a company owns. Space management based on real usage can increase the availability of meeting rooms and help find the right balance between desk allocation and hot-desking seating arrangements, to reduce unnecessary space use. With easy booking of unassigned space and information about usage patterns, these smart features can help companies create long-term strategies for more-effective use of their real estate.

Improved energy footprint: Over 65 percent of the lighting in PTK1 is directly connected to actual daylight and occupancy levels.³ PTK1’s smart lighting features, including daylight harvesting and color tuning, decrease energy use while improving employee satisfaction and reducing the building’s energy footprint. Advanced HVAC solutions monitor CO₂ levels to optimize fresh air ventilation while reducing energy use.



PUTTING IT ALL TOGETHER: HOW LTTS MADE PTK1 POSSIBLE

To define, design, and implement the PTK1 smart building, Intel called on [L&T Technology Services \(LTTS\)](#), a smart building solution vendor and systems integrator.

With existing experience working on other smart building projects, LTTS was ready to help Intel take a future-ready approach driven by design thinking. To achieve interoperability, LTTS needed to integrate a dozen different vendors from different markets to achieve objectives in a single platform—all while keeping latency low and responsiveness high.

LTTS managed both traditional vendors and smart technology vendors, while avoiding redundancy of multiple systems and vendors for the same capabilities. LTTS provided input on infrastructure to the construction team, ensuring the design process was considered at all times during building construction to avoid rework.

To ensure scalability and future-readiness, LTTS deployed IoT gateways with Intel Atom® processors E3900 series, IoT platform components including Microsoft® Azure IoT Hub, Azure Stack Edge powered by Intel and the Azure SQL database, as well as Azure VMs and database to host the i-BEMS Intel® IoT Market Ready Solution.

ENSURING HEALTH AND SAFETY

Adapting to emerging challenges

Designed from the start to be flexible and extensible to allow new technology to be integrated over time, PTK1 opened just before its full adaptability would be put to the test. As COVID-19 spread around the world, reaching pandemic levels, businesses shuttered to all but essential workers. To open for business again, buildings will need to comply with new regulations designed to limit the spread of disease.

In Israel, where PTK1 is located, occupancy levels were restricted to a limited percentage of available capacity. With its smart building sensors and occupancy tracking, PTK1 could monitor compliance with occupancy directives and shut down segments of the building that were not being used during low-occupancy times, reducing the need for cleaning services and other operations in those areas.

In response to COVID-19, Intel implemented opt-in systems in PTK1 that detect body temperature and mask compliance upon entering the building. Anomaly detection makes it possible for security teams to understand where compliance levels are higher or lower and identify any specific areas of concern, like an individual not wearing a mask.

While the building was designed with many touchscreens to assist users in wayfinding and planning, COVID-19 made public surfaces a potential source of contamination. The PTK1 building app makes it possible for employees to engage with the full range of building smart features, all on a personal device that risks less contamination from other users. To date, over 80 percent of PTK1 employees have downloaded the app, enabling a significant reduction in contact with public touchscreens.

With workstation usage tracking, Intel can also track which workstations have been occupied since the last time a room was cleaned and disinfected. This allows cleaning crews to perform disinfection on used workstations only, without recleaning already-cleaned workstations that have remained unused.

In the event of an emergency, PTK1 is designed to shift all home screens in the building to an emergency response screen, indicating a recommended course of action for employees and directing them to the nearest exit if necessary. With real-time occupancy detection, security teams can find which rooms have the most people in need of assistance and plan security routes accordingly.



Built for the future with extensible, adaptable technology

Designing and constructing a smart building comes with an inherent challenge: while building construction is typically designed to last decades before demolition, technology standards change at a far more rapid pace. One of Intel's goals in designing its smart building: avoiding obsolescence and the need for continuous retrofitting as new technologies evolve and old features are deprecated.

Intel and LTTS built the modular IoT platform for PTK1 on Microsoft Azure in order to ensure scalability and interoperability for today and tomorrow. Using Azure, IoT data can be analyzed and managed at scale, across a range of sensor and device types

with no need to worry about latency. Lighting and HVAC room controls operated via tablets act with similar responsiveness to physical, in-room switches. The system's modularity means that components can be swapped out, extended or expanded without the need for retooling any infrastructure beyond the changing component.

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SMART BUILDING BENEFITS

User experience



- Easy smartphone access to environmental controls
- Guided parking and wayfinding
- Special services (salon, gym) notifications
- Access to real-time occupancy and availability information
- Reduced necessity to touch shared surfaces
- Cafeteria information for easier decision-making
- Fast, ad hoc carpooling
- Improved user satisfaction with cleaning

Operational efficiency



- Occupancy detection for efficient cleaning
- Space management for improved planning
- Reduced energy costs with smart lighting and HVAC

Sustainability



- Daylight harvesting and color tuning for lower energy use
- Automated blinds for improved climate control
- Ad hoc carpool enablement

Health and safety



- Opt-in mask detection and temperature checks at entrance
 - Workstation occupancy tracking for cleaning and disinfection
 - Easy-to-close-off sections of building from occupancy for cleaning or security
 - Digital wayfinding signs in case of emergency
 - Monitoring to meet occupancy cap requirements
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A smarter building for a changing world

As the digital world has grown to encompass more of our lives, workplaces must catch up to the expectations and demands of a younger workforce. A smarter workplace environment also makes an organization more resilient and better prepared to handle disease outbreaks, pandemics, natural hazards and disasters and other unforeseen events and emergencies. With its new smart building, PTK1, Intel has ushered in a new era of integrated smart building design and cemented its position as a leader in using IoT technology to solve real-world problems.

The term “smart building” was coined in the 1980s after networking and connectivity expanded possibilities for what could be done in the built environment. Today that term has taken on a new meaning, driven by emerging technologies that empower a new, more-elevated idea of “smart.” The Microsoft vision for ambient intelligence in the modern workplace relies on the convergence of AI, IoT and productivity tools to help organizations create a more productive and collaborative workplace. But with changing workplace trends, increased focus on building health and safety and operating more sustainably, there is rapidly expanding interest in applying IoT and AI to transform the ways we experience and manage real estate.

PTK1 illustrates how IoT, AI and the ability to create a digital twin can help building owners, operators and occupants manage and dwell in buildings with greater efficiency and comfort. With new advanced services, like Microsoft’s Azure Digital Twins, it is now possible to create comprehensive digital models of entire environments and a living digital replica of real-world things, places, business processes and people. These models can help organizations gain new insights that

drive more functional and safer workspaces, save money and energy and organize space in a way that best fits a company’s culture and goals.

Using digital twin models and rich analytics, we will ultimately be able to simulate dynamic environmental conditions like space usage and traffic patterns—even before construction begins. From improving user experience throughout the workday to enabling operational efficiencies and adaptability in the face of rapid change, the smart building features of PTK1 represent a significant improvement vs. traditional building design. By creating a digital twin of the building’s physical space, Microsoft, LTTs and Intel enabled automated building management and predictive analytics, while design and system integrator teams from LTTs ensured interoperability among products from many vendors of IoT devices and sensors.

With infrastructure designed to swap out old features and incorporate new technologies as they emerge, PTK1 was built with future generations in mind. As businesses look to take the next step into a smarter future, PTK1 represents an extensible, adaptable building solution that can act as a model for cutting-edge smart workplaces.

LEARN MORE

- [Intel Smart Buildings >](#)
- [Microsoft Azure Digital Twins >](#)
- [Microsoft Azure IoT Hub >](#)
- [Microsoft Azure Time Series Insights >](#)
- [Microsoft Customer Stories >](#)
- [Dynamics 365 Connected Field Service >](#)
- [LTTs i-BEMS Platform >](#)



1. Based on existing cleaning contracts and data from a smart restroom management solution.
2. Based on internal data accumulated in the subject building (PTK1).
3. Based on internal Intel data.