SMART BUILDING INFRASTRUCTURE

THE BENEFITS OF CONNECTING PEOPLE, PROCESSES, DATA, AND THINGS WITH INTEGRATED NETWORK SOLUTIONS

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WHAT IS A SMART BUILDING?

Today's network is the center of any organization, regardless of size, geography, and mission. This is why organizations continue to do whatever is necessary to ensure their networks are available, reliable, cost-effective, and otherwise suited to their mission-critical role. It is essential to ask what additional elements of organizational operations benefit from a network-centric strategy. One obvious direction, already seeing broad adoption across every industry and application, is the rise of the smart building.

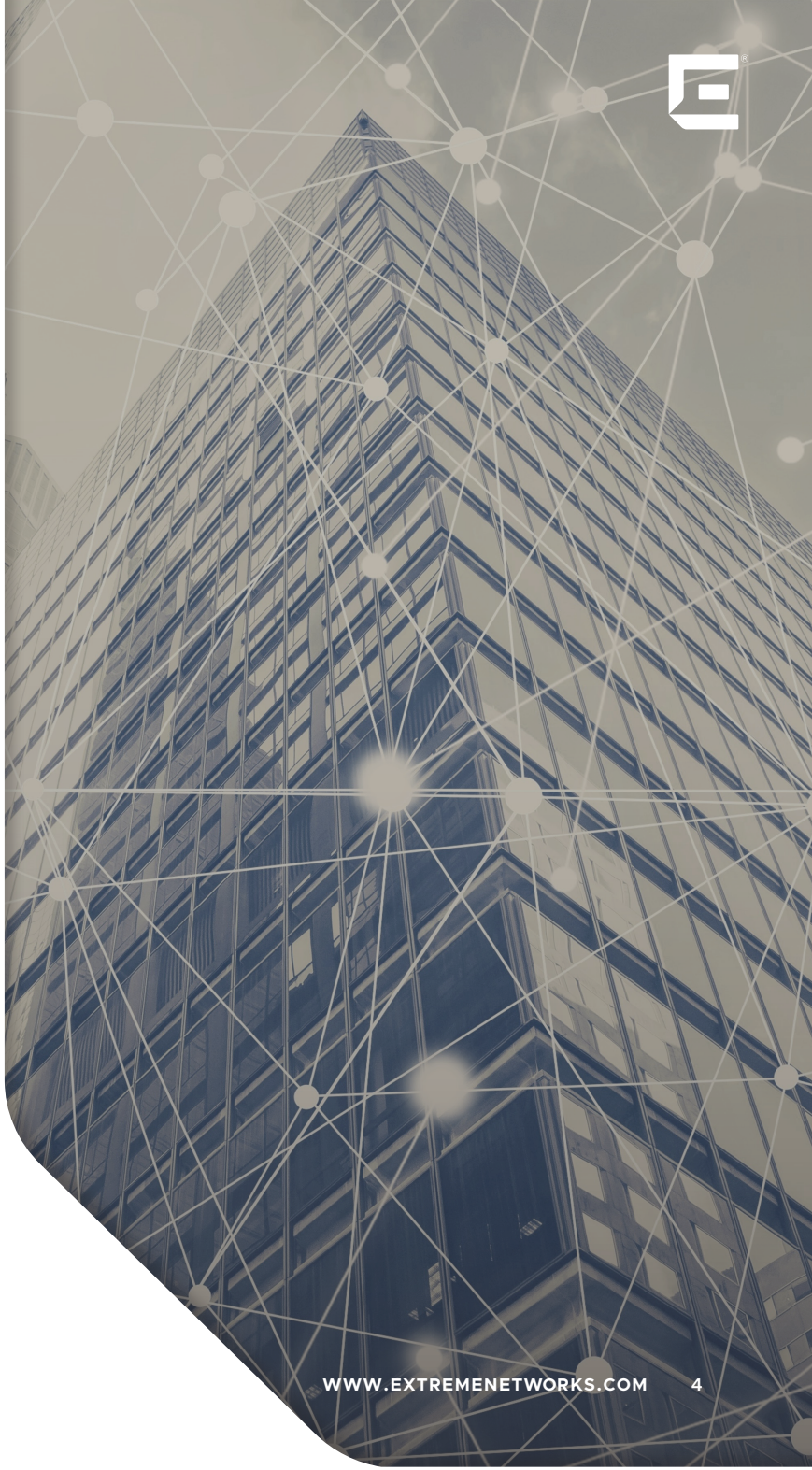
WHY NOW?

While smart building concepts and applications have been around for years, more recent developments in networking, cloud management, and Internet of Things (IoT) have made the real benefits of them more attainable. Add in the accelerated adoption of hybrid-work, facilities and real estate management is increasingly critical to most organizations.

A recent study showed that **over 90% of facilities managers see remote building management as a primary driver of smarter buildings** – driving efficiency or sustainability, including data aggregation, machine learning and artificial intelligence. *(Honeywell)*

With the state of commercial and enterprise real estate under stress, **nearly one-third** of organizational real estate executives cite **reducing costs in facilities as the number one priority**. IoT is also changing the game for smart buildings as we discuss later in this ebook. Nearly half of these executives are using IoT solutions to better manage energy consumption and many of the rest are trialing or investigating its benefits. Compliance, space utilization, physical security are just a handful of the use cases enabled by smart buildings. *(Verdantix)*

And the network sits at the center of it all.



REQUIREMENTS OF A SMART BUILDING

SUSTAINABILITY, ENERGY, AND ENVIRONMENTAL

First and foremost, a smart building optimizes energy use. Most new construction today is designed around the concept of a "green" building, minimizing energy consumption and optimizing energy efficiency via inherent architectural design, construction materials, layout, and operation. Adding intelligence can dramatically reduce the impact of energy use. As people move throughout the facility and as localized demands for energy use change instantaneously and in patterns over time, this intelligence can monitor and adjust HVAC, lighting, and many more elements of facilities management through automation and optimization.

INTEGRITY, SAFETY, AND SECURITY

Smart buildings can use advanced security mechanisms, from physical access control to video surveillance, fire alarm, fire suppression, and other emergency, health, and safety situations across multi-building campus settings. As security requirements vary, given an organization's operations and the specifics of an organizational security policy, flexibility in the techniques and degree of automation is essential. And, as this element cannot tolerate failures, integrity is also critical to this aspect of any smart building.

PRODUCTIVITY AND SOCIAL RESPONSIBILITY

Smart buildings are optimized for the productivity of the staff occupying them. Worker comfort, minimizing unnecessary motion, and otherwise assuring a productive environment is essential, with the bonus of being able to advertise a high degree of social responsibility and all of those productivity gains.

The smart building leverages the same network already at work, optimizing productivity, supporting all required applications, maintaining information security, and minimizing costs. Think of the smart building as another app on the network, enabling and optimizing the flow of a new type of traffic.

RISE OF THE SMART BUILDING

With these different responsibilities, what new requirements might be placed on the network? While many think of smart building operations as presenting only minimal traffic and duty-cycle demands, the opposite can be the case – video surveillance comes to mind here. Still, the myriad of sensors, along with new applications and their servers, will likely necessitate an audit of current network resources and operations and thus drive new planning activities, network enhancements and upgrades, and even modifications to operational strategies, policies, and procedures as appropriate.

Properly functioning smart buildings are not a sure thing. Smart building networks manage and optimize the complex flow of information, people, and, as required, material. Smart building implementations must be cost-effective and synchronized with overall strategies and objectives, just like any other major organizational initiative.

OPPORTUNITIES, DEMANDS, AND REQUIREMENTS

Modern smart buildings have specific demands and requirements that must be met to provide benefits, operate efficiently, and enhance the experience of users and guests within the building.

DEMANDS AND REQUIREMENTS

COVERAGE

Coverage used to mean having an ethernet port within reach, but today it more often refers to the reach of an organization's Wi-Fi network. More specifically, the key metric here is rate-vs.-range, or how much throughput is realized at a given distance between the endpoints of any given wireless connection. Smart buildings usually demand adequate service to the structure's exterior walls, and often with universal coverage between those walls – and, sometimes, beyond, as in the case of campus-area deployments where outdoor service is often required.

CAPACITY

As throughput requirements vary by application, capacity is even more important. Capacity relates to handling all required traffic with the throughput required by each application and with minimal connection latency. Wi-Fi 6/6E, the latest standards, ensures that high-demand, smart building networks can cope with the onslaught of corporate, guest, bring-your-own-device (BYOD), and IoT devices that organizations require today.

COST CONTROL

A real advantage of a smart building strategy is leveraging the existing network infrastructure to meet smart building objectives. Inevitably, some network upgrades are expected, benefiting all applications beyond smart building requirements alone. These upgrades are likely to be few, enabling the cost of any smart building upgrade to be amortized as easily as any other network application.

OTHER UPGRADES

Some upgrades to wired infrastructure may be required. This is typically in the form of additional switch ports for provisioning connectivity and power for additional access points, along with enhancements to management systems. These upgrades typically demonstrate remarkable price and performance benefits with each new generation of switches.

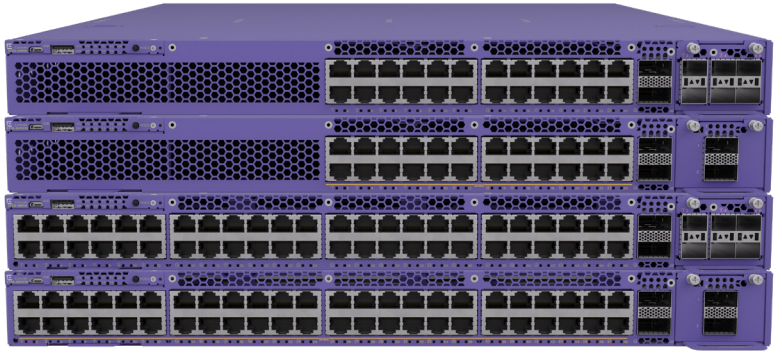
For management software, enhanced productivity of operations staff and the end-users they support is a key requirement. A cost-benefit analysis is required in each case. These upgrades are typically limited, very cost-effective, and likely needed regardless of the deployment of a smart building initiative. The bottom line is that smart building deployments will have minimal impact on IT capital and operating budgets, with the benefit of leveraging the existing network. And, of course, the rise of the smart building presents yet another opportunity to look into private and public cloud-based services. It is a direction that will benefit many IT activities, from app deployment to network management and beyond.

SPECIFIC NETWORK REQUIREMENTS FOR SMART BUILDINGS

WIRED NETWORK

Besides the additional network traffic, smart building applications run transparently across existing ethernet infrastructure with added volume dependent on type of venue and required services. While some smart building solutions today are still based on proprietary networks for historical reasons, wireless technologies other than Wi-Fi and unusual system architectures should be avoided. The potential pitfalls can include complex and difficult installations and deployments, limited functionality, limited support, rapid obsolescence, and increased capital and operating expenses. Increasingly, a software-defined network (SDN) is already playing an important role in organizational networks. Smart building applications will benefit from this evolution. A modern wired network can help increase agility and simplify operations to provide capabilities such as:

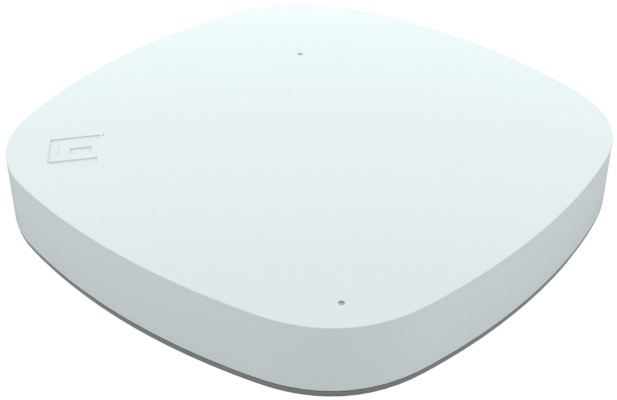
- Fabric-enabled ensures a faster, more flexible and more secure foundation for your building initiatives.
- Dynamic role–based policies that travel with the user, device, and application as they move through the network and building.
- Application hosting to provide network insight through on-board analytics applications and even enable new network applications without the need for a separate hardware device.
- Rich analytics/AI/ML-based insights offer the ability to fine-tuning the network, before issues become service impacting.



Extreme 5720 Series Universal Edge and Aggregation Switch Platform

WIRELESS NETWORK

The standard access points (AP) already in place to provide IP services may easily handle some smart building applications with no changes, modifications, or rethinking operational strategies. However, more APs may be required to ensure coverage within and across a given facility and to support new applications. While existing Wi-Fi 5 APs may have sufficient capacity for some smart building applications, Wi-Fi 6/6E provides a new set of capabilities. Wi-Fi 6 provides nearly four times the capacity of Wi-Fi 5 and better supports IoT and smart building applications—future-proofing the wireless infrastructure. Wi-Fi 6E adds the 6Ghz spectrum providing faster speeds, lower latency and more security.



Extreme Universal Wireless AP5010 (Wi-Fi 6E)

We expect most commercial-grade, smart building devices and applications to use wireless access to leverage the existing network. At the same time, proprietary, limited, and ad-hoc building automation solutions have traditionally been deployed. These are best viewed simply as closed implementations and, thus, no longer a cost-effective option. A modern wireless infrastructure can support all smart building technologies, boost IT efficiency, and deliver seamless user experiences with intelligent, cloud-driven wireless with capabilities such as:

- High-speed efficiency to deliver uncompromising performance in the most demanding environments.
- Visibility and control to optimize and protect through network management capturing meaningful performance and security insights about devices, users, and clients.
- Context-based optimization that identifies associated users, devices, and applications, and applying contextualized network policies to prioritize, restrict, or limit network performance at an individual or group level.
- Secure access for all with secure authentication for guest, BYOD, and IoT devices.

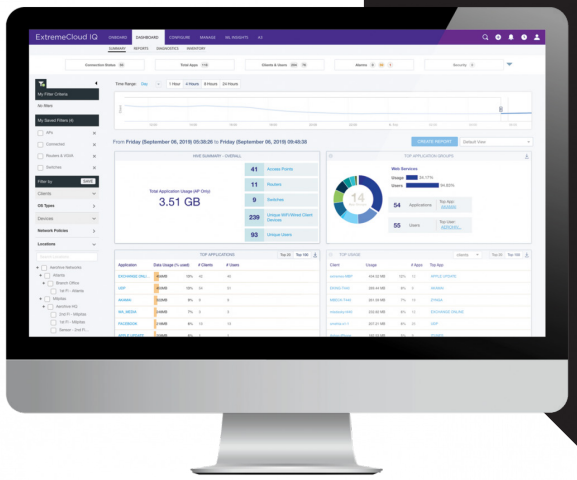
CLOUD MANAGED NETWORKS

Organizations of all types are moving to the cloud to manage their network, applications, and other devices. Smart buildings are just another technology that can be managed by cloud-based networking. While some industries will require or prefer on-premises network management, cloud management allows for a more unified, automated, and secure network. Smart building initiatives offer an excellent opportunity to explore how cloud-based networking can support new mission-critical applications without any increase in workload for operations staffing.

Existing management systems that can be upgraded include cloud-based deployments for access anywhere, convenience, and productivity. This includes:

- Centralized and uniform access control, automated deployment, updates, and troubleshooting.
- APIs for extensibility, customization, and futureproofing.
- Monitoring and enforcement of proper regulatory policies.
- Unified operating and control software implementations across all functional units.

The primary goals remain high visibility, rapid resolution of issues as they occur, maintaining security per policy, maximizing staff productivity, and minimizing costs across the board.



Extreme Cloud™ IQ Dashboard

Analytics tools have increasingly become an essential tool in managing and operating smart buildings. These solutions take large amounts of uncorrelated, disparate, and often multi-variate and multidimensional operational data and look for patterns that can show, just for example, congestion, security issues, problems just appearing, and much more. It can present this information in an easily understandable format to operations staff members. In addition to obvious benefits in terms of productivity, cost control, and other goals, analytics provide a simple way to monitor for quality of experience (QoE) across the entire user base – including any functions related to smart building services.

SECURITY

Security is a critical part of any smart building initiative. Some have minimized security requirements for smart building components with cavalier statements like “it’s only a light bulb; what kind of security challenge could that be?” The answer here is – a big one. Intelligent hackers with a fervent desire to cause mischief and much worse are hard at work every day. This requires all networks, systems, and solutions that depend on them to be hardened against attacks, single points of failure, and even unforeseen and unknown threats.

The key starting point here is an organizational security policy and extending the provisions of that policy to smart buildings. It should be straightforward in most cases. The security capabilities of the network itself are also key here, including access control, authentication, identity management, and traffic encryption.

For example, wireless sensors such as motion detectors, security cameras, and badge or other ID readers can continuously and cost-effectively monitor any part of a smart building. The same goes for environmental monitoring (for example, thermal anomalies, fire, water metering or flooding conditions), emergency services (panic button, directing medical staff, etc.), and beyond.

But equally important are the security benefits that smart buildings bring to organizations everywhere.

SMART BUILDINGS: THE INTERNET OF THINGS (IOT)

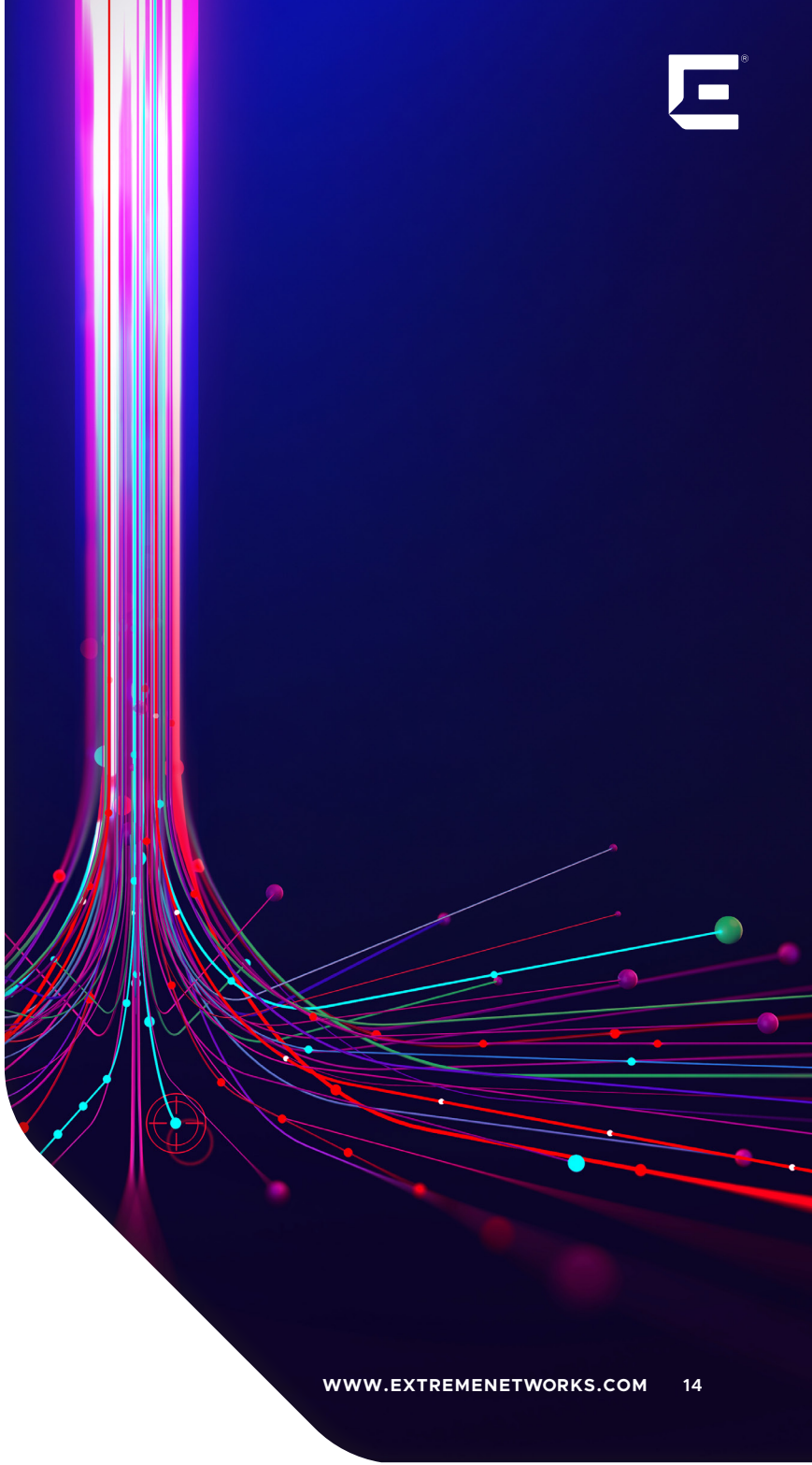
The Internet of Things (IoT) is rapidly becoming the heart of smart building devices and applications. IoT builds on a rich history of monitoring, telemetry, sensor-based computing, and automation that has been a part of many industries for decades. IoT also builds machine-to-machine (M2M) capabilities but adds the fundamental element of IP-based communications, making IoT instantly compatible with organizational networks and the internet. Though relatively minor in complexity, its long-term benefits are enormous.

IoT benefits every telemetry and M2M application, consequently dominating the smart building opportunity. That opportunity is enormous, with nearly 15 billion IoT devices deployed as of 2023, expected to grow to 27 billion by 2025 (IoT Analytics).

Note, however, that not all of these devices will be of the low-demand/low-duty-cycle nature that is often associated with remote sensing and control applications. Many will involve, for example, high-resolution and high-frame-rate video surveillance and continuous monitoring of environmental and security conditions. And regardless of application, adequate bandwidth for low-latency operations is essential in meeting user expectations and application performance constraints.

Growing in interest is the use of wireless networking technologies for in-building (and, again, even campus) location analytics, wayfinding, and other uses that provide visibility of people and assets as they move throughout a facility. Wi-Fi and Bluetooth Low Energy (BLE) beacons are already at work here, with asset tracking a straightforward addition to any network. For healthcare facilities, this may be helping monitor key staff, patients, and vital equipment. For manufacturers, visibility into the flow of materials and finished goods. Across all organizations, a smart building can use location and tracking information to automatically adjust HVAC, lighting, and other environmental factors, minimizing energy consumption and reducing operating expenses while increasing staff productivity.

IoT enables enhanced data collection for better business decisions, ease-of-use for customers and employees, the use of real-time data to increase productivity, and, when based on Wi-Fi, further leveraging existing infrastructure and minimizing costs. With the benefits of advanced network management capabilities, cloud management, and services, operations staff can easily manage even extensive, multi-site facilities and their related smart building capabilities with minimal added effort and cost.



SMART BUILDINGS: MARKET-SPECIFIC BENEFITS

It is easy to see how the market drivers and technological requisites for smart buildings are already present. Key industries can use smart building applications to benefit their specific use cases.

Keep in mind that while the cost models of IoT and smart buildings are still evolving. Core capabilities of telemetry, control and automation have a long history of making incredibly positive contributions to cost control. The relatively minor shift in thinking in moving to IoT-based smart buildings will quickly demonstrate enormous benefits regarding the end-user quality of experience, comfort, productivity, and overall competitive advantage. It is also important to note that user privacy is a growing concern and is, unfortunately, often a moving target based on regulations by various government entities. This factor is best addressed today via common-sense local policies, staff agreements, and proper legal advice.

HOW SMART BUILDINGS CAN IMPACT A VARIETY OF INDUSTRIES

RETAIL

The retail industry faces many challenges in the post-pandemic world, with changing consumer preferences at the top of that list. Smart buildings, or in this case smart stores, can support enhanced consumer experiences as well as help the store operate more efficiently. Smart store capabilities can enhance physical security, support loss prevention, provide visibility into people's movement to name just a few. Innovative technologies, such smart cameras and IoT sensors can reduce energy costs, minimize productspoilage, track assets and inventory and much more.

IMPROVED WIRELESS CONNECTIVITY
Create a strong wireless connection to improve shopper experience

MAINTAIN APPLICATION PERFORMANCE
Keep applications for scheduling drop-offs and pickups up and running, maintaining overall operations

TRACKING SENSORS
Sensors in the building can track visit count, temperature, spoilage avoidance, inventory tracking, etc.

ENABLE MOBILE ENGAGEMENT
Give shoppers the opportunity to shop online and utilize savers site

CONNECTED DISTRIBUTED LOCATIONS
Support a variety of locations and remote users, employees and more.

ADAPT TO CHANGING DEMANDS
From varying amounts of visitors in store to growing operations, Savers built a future proof network that could evolve with their business

SIMPLIFY NETWORK MANAGEMENT
With a small network team, Savers needed a simplified network management tool that would help them gain time back in their day

HEALTHCARE

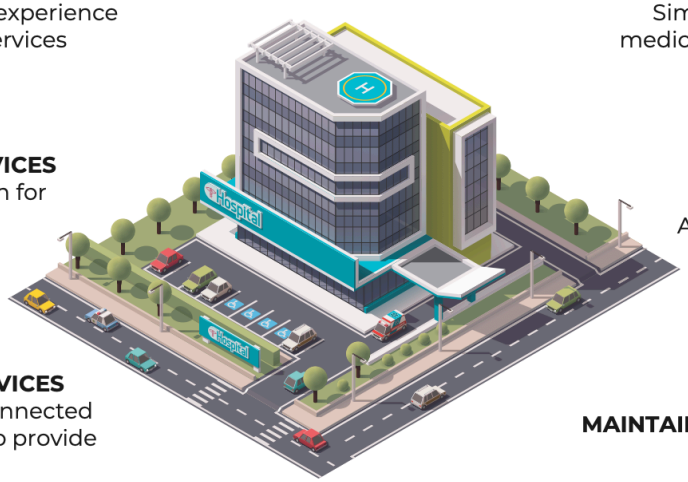
A hospital network is mission critical. Not only do lives depend on a functioning network, but so do patient and clinician experiences and outcomes. The 'smart hospital' builds on smart building technologies to reduce costs, manage specialized environments, track patients and equipment, enable advanced clinical communications and provide a safe environment, all while supporting the main goal of better patient outcomes.

NOVANT HEALTH

TELE-HEALTH SERVICES
Create a flexible patient experience by offering tele-health services

CONNECT PATIENT DEVICES
Offer a strong connection for patients to access digital medical information and appointment alerts

CONNECT MEDICAL DEVICES
Keep medical devices connected and running efficiently to provide patient care



DEPLOY NEW MEDICAL DEVICES
Simplify the process of deploying medical devices to get them up and running as soon as possible

ANALYZE NETWORK DATA
Analyze data from the network to find ways to improve the patient experience

MAINTAIN NETWORK PERFORMANCE
Keep the network performing seamlessly to ensure strong connectivity to keep operations running

MANUFACTURING, TRANSPORTATION, AND DISTRIBUTION

Smart building technologies and industrial IoT are being adopted by manufacturers to build out the factory of the future. Wi-Fi 6, 5G and LPWA (Low Power Wide Area) networks will play pivotal roles in creating attractive service offerings to the manufacturing industry. These and other innovative technologies are making the smart factory real. Real-time data transmission and high connection densities allow highly autonomous operations for manufacturers and utilize many of the smart building technologies discussed.

THE KRAFT GROUP

MANAGE OPERATIONS
Manage manufacturing operations simply and securely by tracking performance of different equipment

LOCATE TRUCKS ON PREMISE
Manage and track location of different trucks on premise to assist with logistical planning

PROMOTE COLLABORATION
Support your staff and enable them to effectively communicate through devices in real-time

VIRTUAL WAREHOUSES
Track inventory and stock in order to keep operations running smoothly and efficiently

K-12 AND HIGHER EDUCATION

The student is at the center of our education institutions. Smart buildings, or in this case smart campuses and smart districts, can enhance student life and improve the experiences of faculty and administrators. Numerous benefits include increasing student engagement, providing a more personalized learning environment, promoting learning from anywhere on mobile devices, and more. For administrators and faculty, smart campus applications can lower operating costs, improve security, and enable faculty with innovative tools to improve student achievements. These capabilities include network-based video surveillance cameras, online help, tutoring and testing, wearables for athletics and attendance tracking, environmental control, monitoring, and more

Green Bay Area Public School District

MANAGE SEVERAL BUILDINGS
Green Bay Public School District is responsible for 43 different school buildings throughout the city

LIMIT WEBSITE ACCESS
Built out separate networks for staff and students so staff can access what they need and students can't go on sites they shouldn't be on

CONNECT DEVICES
The school district supports over 19,000 students who have access to in-class devices, Chromebook, tablets, and more that need to connect to the network

CONNECTED EDTECH TOOLS
Provide staff and students with connected technology to help enhance learning

STRONG DATA PRIVACY
Ensure the safety and security of student data to protect students

SUPPORT VIDEO ASSETS
Enable strong connectivity to support staff showing students videos in classroom environments

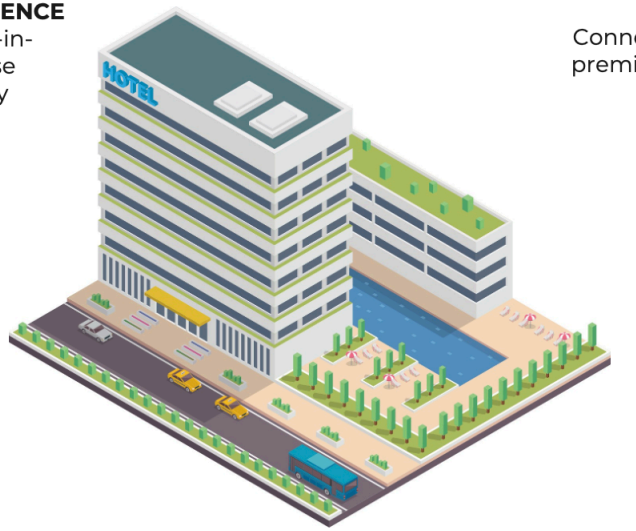
HOTEL

The travel and hospitality industry face the same "experience" demands as other consumer-facing industries. Having a smart building strategy can be a key differentiator. Whether a hotel, conference center, rental car center, or even an airport, it is all about exceeding customer expectations while minimizing costs. Secure access, energy efficiency, digital signage, and wayfinding can all be implemented through smart building applications.

CROWNE PLAZA
ANTWERPEN

SEAMLESS GUEST EXPERIENCE
Provide guests with a best-in-class experience on premise with the help of technology

VOICE ACTIVATED TECHNOLOGY
Integrate voice activated devices in guest rooms



CONNECT GUEST DEVICES
Connect guest devices throughout the premise, in the 262 guest rooms or one of the 14 conference rooms

MOBILE CHECK IN AND CHECK OUT
Give guests the opportunity to check in and out virtually to eliminate time spent in line at front desk and enhance guest experience

SPORTS AND ENTERTAINMENT

Wi-Fi is rapidly becoming essential in sporting and other entertainment venues. Imagine providing fans or theater goers with new services such as ordering food and refreshments from your seat, or wayfinding to the nearest restroom or first-aid center. These venues benefit by providing fans with new services. For sports, the fan experience is elevated digital content on signage or your mobile device, delivering replays, statistics, targeted offers, and more.

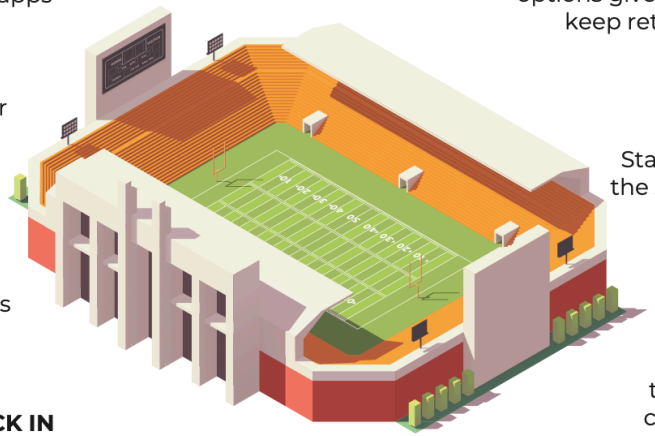
Gillette STADIUM

MOBILE FAN EXPERIENCE
Provide seamless connectivity so fans can access team information, social media, and sports betting apps

EXPRESS ORDERING
Allow fans to preorder their food and drinks to reduce time spent in lines

MOBILE TICKETING
Transition to complete mobile ticketing to get fans into the stadium faster

DIGITAL EMPLOYEE CHECK IN
Enable game or event day staff to check in on mobile application so they can get to where they need to be in the stadium



VIRTUAL PAYMENT AND POS SYSTEMS
Digital POS systems and mobile payment options give fans options for how to pay and keep retail and concession lines moving

UNDERSTAND YOUR FANS
Digital systems enabled Gillette Stadium to understand who was in the stadium and how to personalize the experience for them

REAL-TIME UPDATES
Through their stadium app, Gillette Stadium provides wait times for bathrooms so that fans can minimize time spent waiting and spend more time enjoying the game

GOVERNMENT

A big area of focus for the public sector is the development of smart cities and communities that utilize smart building technologies. Smart cities apply various network-based techniques for parking management, traffic control, lighting, utilities, environmental monitoring, surveillance, and smart municipal buildings. The main goals include improved cost-effectiveness, better intelligence and management, and overall quality of life for constituents.

City of Milwaukee

Maintain Buildings Across City
Connect buildings and departments all across the city to one, simple to manage and secure network

Address Security
Keep the dispersed network secure and protect citizen data and private information

Connect SCADA Systems
Connect SCADA systems to ensure they are running smoothly for traffic lights, streetlights, water and more

Connect Public Safety Devices
Integrate a variety of devices to help promote public safety throughout the city such as security cameras

Cross-Department Communication
Network needs to be reliable enough to connect all different government agencies and departments

Consolidate Public Safety
The City built a strong network to support the consolidation of their 911 dispatch centers for emergency services

CONCLUSIONS

Moving forward we envision every building is going to be a smart building. The key to smart building success is leveraging network infrastructure with coverage and management to make this outcome a reality. Smart buildings can be viewed as just another application on the organizational network. While they may represent new network traffic, adding wired and wireless devices with proper planning minimizes any risks. Smart building return on investment (ROI) is considered quick to many, with the new data supporting organizational decisions only adding to the benefits.

Ultimately one simple rule applies, smart building success depends upon planning, configuring, installing, operating, and leveraging the network infrastructure already hard at work for your organization.

LEARN MORE

Access customer stories and case studies to learn how Extreme Networks has partnered with organizations across industries to drive better outcomes and experiences.

Smart Stadium
The Kraft Group - Winning Off the Field with Wi-Fi

Smart Manufacturing
Streamlining the Kraft Group's Manufacturing Operations

Smart Campus
City, University of London Modernizes Wireless for a Superior Campus Experience

Smart Hotel
Crowne Plaza Antwerp Delivers Memorable Guest Experiences

Smart Venue
World-Class Venue Transforms IT Into a Profit Center

Smart School
Delivering a Secure Experience for the Modern K-12 Environment

To learn more about how Extreme Networks can help you on your smart building journey, visit extremenetworks.com or contact sales today!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