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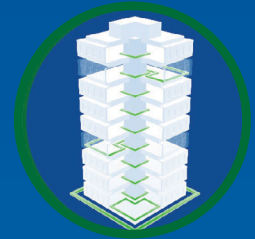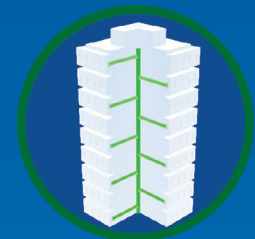
SMART BUILDING INFRASTRUCTURE BEST PRACTICES

RISK MANAGEMENT

NETWORK PERFORMANCE

WORKFORCE PRODUCTIVITY

SPACE UTILIZATION

BIoT ENABLEMENT

Infrastructure as a Platform
by Anixter

# How do you define best practices in your commercial building?

Introducing Infrastructure as a Platform by Anixter for an agile, flexible and scalable commercial building.

Commercial buildings are evolving to cater to changes in technology and workplace behavior, while presenting new opportunities to maximize efficiency and productivity. Industry-leading companies are demanding versatile buildings that serve as virtual gateways to connect people within an office and around the world. Smart buildings of the future integrate people and systems in a dynamic and functional way.

Infrastructure as a Platform addresses the key building blocks for smart commercial buildings that can provide agility for budgets, scalability for demand and flexibility for technology choices.

This approach not only addresses the five key technology areas, but it also integrates innovative solutions to meet your assessment and deployment needs.

Anixter's site-specific deployment solutions allow you to accurately plan projects and improve scheduling, reducing non-productive labor and on-site assembly challenges.
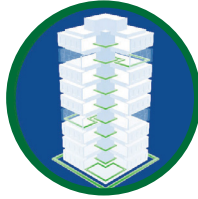
Commercial Building Infrastructure Solutions

RISK MANAGEMENT: Anixter has defined a **five layered approach to physical security** that provides you with the ability to deter, detect, delay, defend and deny at every layer of your commercial building. This approach reduces the risk of breach and increases your peace of mind.

NETWORK PERFORMANCE: More than ever before, a high-performance structured cabling system plays an essential role in operating a smart building. Without it, you cannot achieve the best practices of **versatile physical layer connectivity**, which is required to support multiple applications, cope with increased bandwidth and eliminate network downtime.

WORKFORCE PRODUCTIVITY: Social and economic drivers are placing a larger focus on how workforce behavior can be improved with technology. This presents many challenges to providing **advanced mobility and communications**, including supporting a BYOD environment that enables collaborative business communication with seamless network availability.

SPACE UTILIZATION: With more employees concentrated in smaller spaces and increased demand for dynamic, collaborative areas, **optimizing real estate effectiveness** is important for the productivity and efficiency of employees as well as the building itself.

BIoT ENABLEMENT: Enabling the Building Internet of Things (BIoT) allows you to analyze your environment, and make real-time adjustments to improve efficiency and productivity. The **five senses of an intelligent building** address the challenges of open architecture design, supplier integration and migrating to an IP platform.

To learn more about Anixter's approach to helping you solve these challenges, visit **anixter.com/commercialbuilding.**

CONTENTS

INTRODUCTION

What Is a Smart Building?

A smart building is a philosophy. By that, we mean it is a perspective on building design that continuously looks for new tools and technologies that allow a commercial building to achieve its goals. Those goals can change over time, but are most commonly defined by efficiency, productivity and connectivity.

A smart building is also a philosophy in that it is organic and must be uniquely applied to every situation. It is not a set standard that defines a building as smart or not. It is instead a concept that encourages building managers to look at each division of their operation through the lens of smart technology and find real solutions to real challenges. If executed properly, with specialized attention to open architecture interoperability, building operators will be prepared to apply new technologies to the challenges of today and tomorrow.

Understanding This Resource

This report provides insight into various industry trends and explores the particular environments of commercial buildings, ultimately addressing the fundamental elements required to migrate to a smart building platform. It will be helpful for anyone tasked with the challenge of providing safe and secure environments, enhanced network connectivity, modern functional spaces and a more automated environment for business productivity.

In each section, you will uncover key trends in the industry, explore the top challenges faced by building managers and gain insight into clear solutions that can solve the most difficult of challenges.

THE EVOLUTION OF COMMERCIAL BUILDINGS

People in industrialized countries spend as much as 90 percent of their lives in buildings. This includes residential, recreational, retail, public service, and of course, commercial. If you think about a standard 40-hour job, the average person spends a quarter of their working life in some kind of commercial setting. So it's important to understand the unique demands of that environment and how they have changed dramatically over time.

Gone are the days when simple reception security, functional ergonomics and heating and cooling were the only concerns. With changes in workplace behavior, new tools for dynamic engagement designed to increase productivity, and technological innovations that allow for energy savings, the scope and potential of a commercial building has never been higher.

Industry experts estimate that by 2020, one in five buildings will be smart buildings, supporting 50 billion connected devices, with cloud-based software and services growing at a rate of 33 percent.

Technological Innovation

Technology is a main driver for change no matter the industry. In commercial buildings specifically, major technological innovations have occurred both in infrastructure and in the tools utilized by employees to perform their daily tasks. Everything from the guard charged with monitoring entrances and exits to the building, to an administrative assistant, who must handle tasks with speed and efficiency.

Innovation responds to needs in the environment, and as we have evolved into a globalized and digital world, new tools have been developed that respond to changing needs.

Workplace Behavior

Workplace behavior goes hand in hand with technological innovation, as both propel rapid change and trends in one other. The modern workplace has been dramatically transformed in the way information is shared across digital platforms, and in how employees think of themselves in relation to an organization's physical spaces.

In a freelance or "gig" economy, where increasingly more people have temporary contract relationships with an organization, it is important to consider how that impacts the understanding of the core commercial setting. Building managers must account for open working environments and seamless and secure remote access, among other logistical considerations for a decentralized workforce.

Source: Honeywell and IHS, Inc., Put Your Buildings to Work: A Smart Approach to Better Business Outcomes. October 2015.

INTERNET OF THINGS

The Internet of Things refers to the interconnectivity of physical "connected" or "smart" devices, buildings and other electronics or software, which enables them to send and receive data across the network.

The trend toward the Internet of Things (IoT), and more recently the Building Internet of Things (BIoT), which addresses the unique demands of a commercial environment, allows building managers to analyze their building and make real-time adjustments to improve operational efficiency and productivity.

Just as information is what makes people smart, data is what makes a building smart. The challenge here is understanding how to capture, analyze and act upon this data across what can often be a series of disparate systems.

Urbanization and Smart Cities

In the U.S., the 10 biggest cities account for one-third of the entire population, and that proportion is only increasing. It is part of a worldwide phenomenon of urbanization, where people are moving towards cities, whereas in decades past the trend has been to move away from them.

This phenomenon puts an enormous strain on urban environments, which have to provide an adequate amount of physical and technical infrastructure to support sustainability and the quality of urban life, while also accommodating and driving economic growth. A number of countries around the world, including India, Singapore, the U.K. and the U.S. have launched smart-city initiatives.

In September 2015, the U.S. announced plans to invest more than $160 million in federal research for programs that will act as testing grounds for smart cities, developing new collaborative models that can support IoT applications.

Green Impact

Present in many discussions surrounding smart innovations is the collective social desire to counteract the negative effects commercial buildings can have on a community. Case in point, worldwide, buildings consume 42 percent of all electricity—more than any other asset. By 2025, buildings will be the largest emitters of greenhouse gases on our planet.

It is also estimated that around 50 percent of all energy in a commercial building is wasted. Industry leaders are taking advantage of smart technologies to not only reduce their negative impact on the environment, but also to generate enormous cost savings.

REALITIES OF THE COMMERCIAL MARKET

Lack of Adoption

Despite all of the cost savings and productivity potential within a smart building, the reality is, even if predictions are true, by 2020 only one in five buildings in the U.S. will be a smart building, which means that four in five buildings will still not have made significant progress.

This low adoption rate is likely a result of the prevalent lack of understanding throughout the industry on exactly what constitutes an IP-enabled open architecture environment, as well as what are the key elements of its functionality.

Cost a Top Barrier to Adoption

Prominent surveys have found time after time that most respondents cite cost as a chief barrier to migrating to a smart building platform. Although there is a wide variance in the cost of open architecture solutions, many budgets don't account for this expense.

Another barrier as it relates to cost is implementation. This differs from the cost of the product, yet is as much of an obstacle for deployment as any initial product investment. Facility managers need to consider the costs beyond deployment, such as:

- Time
- Dedicated internal resources
- Education
- Installation
- Integration

IT and facility team collaboration (or lack thereof) can have an impact on moving forward with commercial building interoperability. That's because getting the budget finalized for such a large purchase could mean competing interests and priorities. Although interoperability bridges the gap between these traditionally siloed groups—IT and facilities—sourcing funding from them can be problematic.

Proving Return on Investment

Proving return on investment (ROI) is essential to intelligent building design because this is not a one-time-fix-all solution. A smart building platform can support technological innovation and respond to the needs of a commercial environment well into the future. Energy savings and workforce productivity are the two key elements to consider in terms of ROI, and each present their own unique challenge in analyzing outcomes. If executed properly and aligned with business goals, a smart building approach can save money or be cost neutral in the short term.

When businesses try to bring everything under one centralized solution and take on all issues at once, it makes proving ROI even more difficult. Sometimes the best approach is to find small wins or to solve one particular challenge first. Once the challenge is identified along with an estimate of how much it costs the business, building managers can estimate how an intelligent solution would help the business fix the problem. Those can be hard numbers (e.g., inefficient cooling systems tied to electricity costs) or they can be softer numbers (e.g., productivity gains from better business processes).

ROI and Getting Approval from Finance

There are some key lessons that can help gain approval for smart building solutions.

- Understanding common, costly commercial building challenges that can be fixed with intelligent solutions

- Identifying the high-value problems inside a commercial building

- Measuring what these problems actually cost

- Learning to align the smart building project with corporate objectives

- Building, identifying and selling an ROI model to the decision makers

- Identifying the challenges with traditional systems, such as cyber security, access to data and supplier lock-in for maintenance

SMART BUILDING CHALLENGES

In order to develop a road map that will propel your premises towards a smart building platform, it's important to identify the key challenges and considerations within commercial spaces, which can then be broken down further depending on your unique situation.

Based on trends, industry leaders are looking for ways to make progress in the following areas:

Managing Risk

In today's world, there is a strong emphasis on providing a safe and secure environment for a modern workforce. The future of commercial security will see a split between practicing reactive security and proactive security, which is especially crucial given the risks associated with building automation and cyber threats. Reducing risk and increasing peace of mind allows staff to focus on the task at hand.

Enhancing Network Performance

By 2020, an estimated 26 billion devices will be connected to the Internet. More than ever before, a high-performance structured cabling system plays an essential role in operating a smart building. Versatile physical layer connectivity guides the creation of an open system platform, where the right media selection and cabling topology will increase the productivity of the network.

Increasing Workforce Productivity

Social and economic drivers are placing a larger focus on how new technology can improve workforce behavior. Adequate bandwidth is required to facilitate the escalating usage of high-definition video and the new ways that people deliver and consume information.

Optimizing Space

Recent studies have shown a significant trend towards downsizing commercial portfolios. With more employees concentrated in smaller spaces, the transition toward remote enablement, and increased demand for dynamic, collaborative areas, optimizing space is important for the performance and productivity of employees, as well as the efficiency of the building itself.

Enabling a BIoT Environment

The Building Internet of Things (BIoT), brings into focus all the components in a building that could be connected to the network (the Internet) for the purpose of creating operational efficiencies, reducing energy consumption, improving occupant experiences, achieving sustainability goals, and effectively optimizing financial performance. Enabling the Building Internet of Things allows you to analyze your environment and make real-time adjustments to improve operational efficiency and productivity.

Sources: Security Magazine, Finding a Balance in Property Management Security. February 2015.
Forbes, A Simple Explanation of the Internet of Things. May 2014.
Memoori, Big Data for Smart Buildings: Market Prospects 2015 to 2020. 2015.

PREPARING FOR A SMART BUILDING

A Uniter, Not a Divider

A smart solution should give all teams the opportunity to collaborate and work toward a common goal of optimum building productivity and efficiency.

Open the Lines of Communication

Smart building design holds the promise to open the lines of communication between IT and facilities groups. However, IT will need to take certain steps in order for a holistic approach to be implemented throughout the building.

IT and facilities teams don't always make talking and working from common sources a priority. When interoperability is determined to be the way forward, it should be integrated into existing systems so duplication of functionality doesn't occur, which could potentially create a whole new set of operational silos.

Deploy Intelligent Hardware

In order for most interoperable tools to work properly and at their maximum potential, the current building must feature at least a baseline of intelligent hardware that will collect data at the level of granularity required to solve the business' specific challenges.

It's crucial that commercial building operators invest in physical infrastructure devices and intelligent hardware that can feed the intelligent solution what it needs. The most effective smart buildings work off the continuous input of live data from the physical infrastructure devices and other management systems. These may include intelligent hardware pieces that could communicate on an ongoing basis in order to effectively monitor and plan.

Turning Information into Action

AGREEMENT
IT and facilities agree on operating parameters, metrics and objectives

REVIEW
Evaluate existing processes

DEFINE
Formally define new processes (who, what, when, where), resources needed and owners
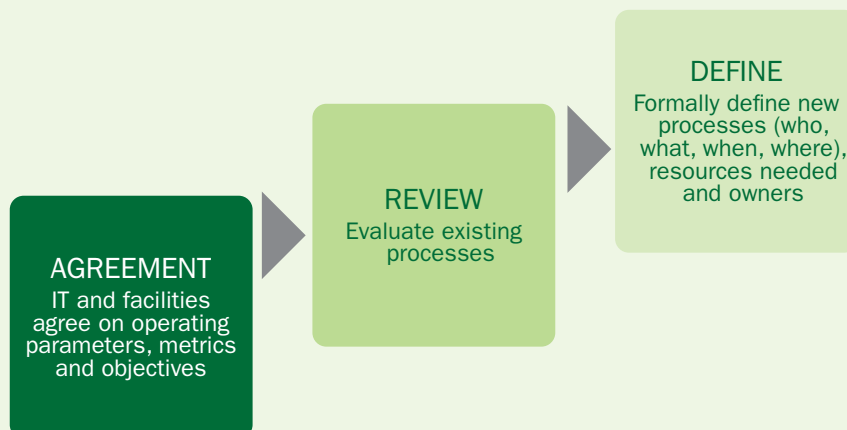
Determine and Distribute Staff Levels

It's paramount for all stakeholders, including management, to agree upon and commit the necessary resources to implement and operate the various solutions. All of this upfront discussion and buy-in allows for ongoing cooperation and participation well beyond the implementation phase.

Also, owners of the tools and their associated processes should be explicitly named before solutions are implemented. This may be tricky because facilities personnel may be unfamiliar with IT systems, while IT personnel may have little knowledge of the various elements of facilities. For this reason among others, it is recommended that evaluation and operation teams include people from both sides to help close any knowledge gaps.

Working closely with manufacturers to understand staffing and workforce requirements will help to make the solutions work effectively. Another consideration is who will use the solution if crucial users leave their role. This information will help the evaluation team decide what level of manufacturer-provided (or consultant-provided) training and support might be needed.

Define Actionable Business Processes

Having business processes in place to take action on the gathered intelligence is important. Without established processes and a plan to act on the information, all that is left is data—good data, albeit, but no clear path and resources in place to use that data to increase productivity and efficiency.

A business process that responds to smart building design should be addressed in a manageable way, perhaps starting out with core functions and features that are most important, as opposed to attempting to address all processes at once.

Eight Building Blocks for the Digital Workplace

In a recent paper, Gartner outlined eight essential components of building a business case for organizational leaders on the need for a digital transformation. Careful attention to each stage creates the blueprint for an organization to prepare for a smarter building.

1. Digital workplace vision: Why, what and how

2. Digital workplace strategy: Write a comprehensive road map

3. Workplace employee engagement: Encourage a corporate culture of autonomy, accountability and empowerment

4. Digital workplace organizational change: This changes everything

5. Digital workplace processes: How to be the right kind of enabler

6. Digital workplace information: On demand and on target

7. Digital workplace metrics: Measurement as a tool for change and evaluation

8. Digital workplace technology: Get smart

This approach moves beyond basic understandings of tactical technological innovations, and utilizes a strategic approach to organizational culture and societal trends. A dynamic vision of this kind can enable an organization to respond to technological innovations and cultural shifts well into the future.

Source: Carol Rozwell and Achint Aggarwal, Attention to Eight Building Blocks Ensures Successful Digital Workplace Initiatives. 2015.

CONSIDERATIONS FOR SELECTION

Develop Individual Goals

When goals are defined, diving deeper and answering more specific questions should naturally lead to a list of product objectives and requirements.

That being said, there are several considerations that a building manager should think about before looking at specific solutions.

- What problems need to be solved?
- Of these problems, which are particularly pressing?
- Why are the current methodologies not working?
- What is the desired end state?

As these questions are answered, the scope of requirements will be defined. Use these requirements and goals as a starting point to evaluate smart building solutions.

Consider Other Stakeholders' Goals

It is important for facilities, IT and other management teams to work together early on and come to an agreement on the adoption and use of various tools.

Conversely, it's a mistake for management to move forward with intelligent solutions without the buy-in from those who will be required to implement and operate it. All sides should be involved in the early evaluation phase to make certain everyone's needs and expectations are met. Not only will this secure the right selection for the entire building, but it's also a positive step in nurturing collaboration with other stakeholders and teams that include the following:

- Infrastructure and operations
- Facilities
- IT architecture
- Business and technology analysts
- CSR
- Finance

Establish Baseline Criteria

No matter what solution is selected for individual environments, these tools should have certain essential attributes in order to be effective today and in the future:

- Scalable, modular, flexible system
- Open communication architecture
- Standardized, pre-engineered design
- Active manufacturer support structure

Using these four characteristics as a high-level baseline for evaluating tools may certify that the business' processes, data and methods will be in line with expectations moving forward.

Start with the Basics, Then Move Forward

When selecting a smart building solution, consider how the integration will be achieved and how it will be supplied. It is important to highlight that the more systems that need to be integrated, the more expensive and complex the project becomes and the longer it will take to implement.

A lot of smart building implementations become stalled because businesses try to take on too much at once. They attempt to pull everything together under one platform in a short time, but find the difficulties of such an endeavor overwhelming. This can lead to frustration and a lack of clear wins along the way, causing the deployment to stall or stop entirely.

As the solution is evaluated, consider the most important dashboards that are a priority for the different stakeholders that were involved in the selection process. Taking a more simplified, realistic and pragmatic approach will help to avoid overwhelming an organization—both in terms of costs and workforce hours—as well as prevent information overkill and project fatigue.

NEXT GENERATION COMMERCIAL BUILDING INTEROPERABILITY

As you have seen, commercial buildings are rapidly evolving to cater to changes in workplace behavior, while presenting new opportunities to maximize efficiency and productivity. Industry-leading companies are demanding versatile buildings that serve as virtual gateways to connect people within an office and around the world. Buildings of the future integrate people and systems in a dynamic and functional way.

Our approach addresses the key building blocks for smart commercial buildings that can provide agility for budgets, scalability for demand and flexibility for technology choices.

This approach not only addresses the five key technology areas, but it also integrates innovative solutions to meet your assessment and deployment needs.
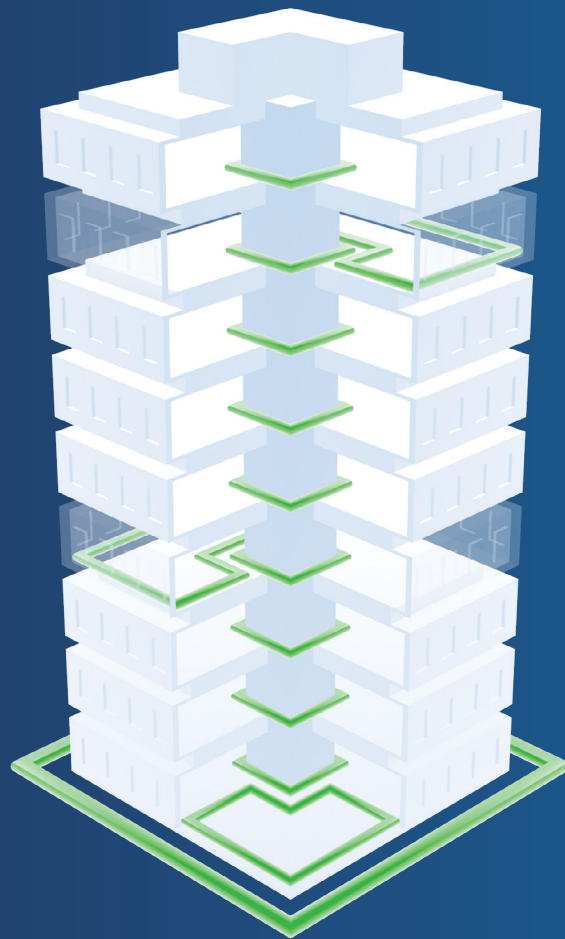
GLOBAL TECHNOLOGY BRIEFING

RISK MANAGEMENT BEST PRACTICES

FIVE LAYERS OF PHYSICAL SECURITY

INTRODUCTION

A successful organization manages risk throughout its various divisions—everything from finance to human resources to facilities. Managing risk is also a central component of smart building design, where the right approach can holistically address physical and cyber challenges, reducing the risk of breach and increasing your peace of mind.

Without a solid foundation of a safe and secure environment for employees and visitors, organizations cannot devote the amount of energy and attention required to handle their important everyday challenges.

Commercial spaces, and the organizations that occupy them, exist for a particular purpose. Safe and secure environments enable an organization to focus and ultimately achieve that purpose.

Proactive vs. Reactive Security

The future of commercial security will see a split between practicing reactive security and proactive security. Proactive security anticipates risk and finds solutions while the threat is still manageable. Reactive security is costly, both in terms of the potential for tragedy and the potential for debilitating financial costs. Case in point, in the U.S. alone, workplace violence, just one of many elements of risk management, accounts for an annual price tag of $5 billion.

The National Crime Prevention Institute identifies three steps to move towards a proactive security approach:

- A vulnerability assessment to identify the deficiencies and excesses in the security process

- A cost/benefit analysis to determine if recommendations are affordable, feasible and practical

- A test of the system to confirm that everything is working properly and determine if changes need to be made to achieve the desired level of security

Sources: Booz Allen Hamilton, "The Role of Buildings in Mass Shootings" in Buildings.com. 2014.
   Marianna Perry, National Crime Prevention Institute (NCPI),
   "Proactive vs. Reactive Security" in Buildings.com. 2010.

CONSIDERATIONS

From Analog to IP Video Surveillance

A prominent trend in the security industry is an evolutionary shift from the traditional analog-based video surveillance technology first deployed in the 1950s to newer network-based digital systems. This migration provides many functional and financial benefits to companies who need to provide better protection for people and assets.

Video monitoring, recording and analysis can be made available to responsible parties, wherever and whenever needed, thanks to advances in microprocessors and other computer technologies. High-quality cameras may now be plugged in wherever there's a suitable port, enjoying the flexibility and manageability of today's telephone and computer systems. Live and recorded video can be accessed from network attached PCs across local area networks (LANs) or the Internet using familiar network technologies such as Ethernet and Internet Protocol (IP).

Investment vs. Risk: Striking a Balance

Physical security deployments are significant investments with the majority of costs incurred upfront. Once installed, these security systems are often considered adequate, receiving little to no maintenance post installation. However, processes become outdated while those with malicious intent become more sophisticated. By building a scalable interoperable security solution, proactive updates and upgrades are simpler, quicker and more cost-effective than complete system revisions, helping you effectively balance the costs of maintaining a robust physical security system with reduced risk of attack and breach.

Steps You Must Take

1. Create a Battle Plan
What are the plans and procedures to defend against threats that are increasing in sophistication and complexity?

2. Invest the Time to Stay Informed
Being properly plugged in with the commercial building security world should be a priority for an organization. Join some of the active, vibrant communities of security professionals, who share updates on the latest threats and ways to overcome them. Attend industry conferences and join, participate, listen, learn and share.

3. Complete Organizational Commitment, Including the Budget
From the boardroom to the front lines, an organization must have complete buy-in and commitment to the level of security it requires. To stay ahead of the risk factors, the strategy must be to exceed the requirements, not to simply accomplish the minimum.

Maintaining Sound Policies and Procedures

It is critical to maintain and follow sound policies and procedures. This is part of an overall security plan that balances best practices with a willingness to evolve to properly defend against new threats.

- A policy document is a living, breathing thing. Policies are not static. Policies should be frequently reviewed and updated.

- Security protocols should be understood by all and followed closely.

- Complacency must be avoided throughout the organization.

- Logical security and physical security policies are interrelated and support one another. The logical security strategy should have a physical component to it.

Investment vs. Risk

COST
RISK

$ Investment in Physical Security

$ CAPEX or Major Upgrade

$ Maintenance & Management

Managed Risk

Managed Investment

Time

Key

| | Cost | | Risk |
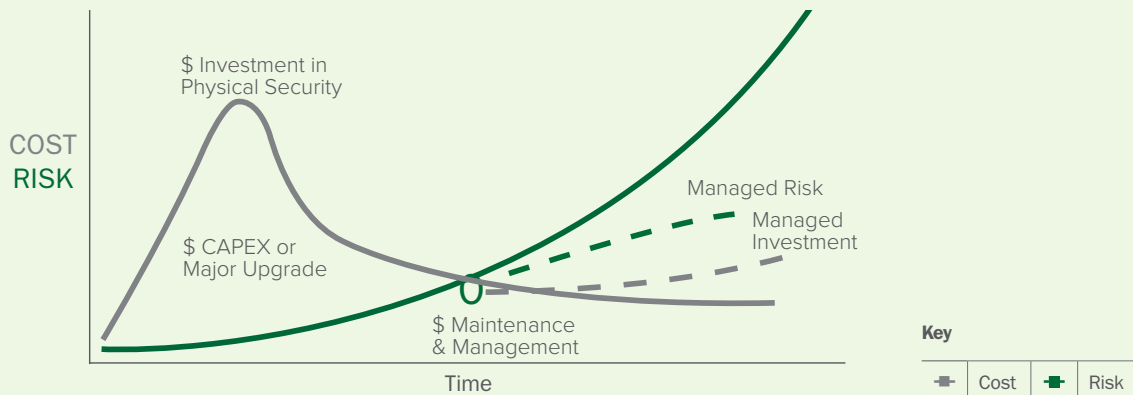
Prevention, Detection, Response

While it may not be possible to ensure complete protection at all times, employing an approach that responds to each stage of a threat is crucial in mitigating serious harm. It is important to consider your approach to the "Five Ds" of protection in a commercial setting:

- Deter
- Detect
- Delay
- Defend
- Deny

Defense in Depth: "Five Ds" of Protection
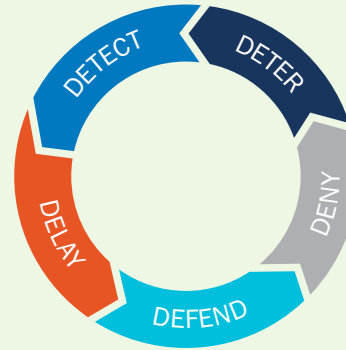
A layered approach to security
for critical infrastructures

The Necessity of Interoperability

The entire ecosystem that serves the commercial building security market is continuing to evolve to provide more interoperable solutions that will eventually support standards based open architectures. However, today there are still disparate systems that do not integrate with one another. This creates security gaps that are an impediment to the mission of keeping people and facilities safe.

Commercial security has made great interoperability progress by developing network-based solutions that have the same communication protocols.

Formerly, manufacturers built proprietary systems without regard to integration with other systems or manufacturers. Today they are opening up their application programming interfaces (API) to allow integration with many other security subsystems. There is still one host system, usually the access control system, which releases their API so other subsystems can integrate to it. This requires the manufacturers to work together to keep everyone updated on new software and firmware upgrades and hardware enhancements.

Clearly, the future of commercial building security will include smart security systems that have standards-based open architecture environments with a multifaceted, layered approach, allowing components from multiple manufacturers to work as one seamless interoperable system. This will enable a scalable, flexible, long-term security solution and put the end user in control. The length of time it takes to get to a true standards-based open architecture is dependent on the end user's requirements for such a solution.

Safety-Critical Is Security-Critical

According to Gartner, there are three core lessons for organizations seeking to create a safe and secure experience for their customers, employees and partners.

1. Safety and security planning and governance must be aligned to account for security's impact on safety technologies and services.

2. Cyber-physical security practice can be enhanced by embracing some safety cultural principles, behaviors and attitudes.

3. Focus on the cyber-physical security lessons being learned today in the convergence of IT/OT and the deployment of security for the Internet of Things.

Source: Earl Perkins, Gartner. The Marriage of Cybersecurity and Safety for Organizations.

Cyber Security and Automation

With the massive benefits for a company from automation within a commercial building, it is important to consider the potential threats as well, and develop a proactive strategy to address building automation systems, safety systems and critical environmental technology from a security perspective.

Data breaches to obtain credit card information are the most common and publicized cyber threat, though other potential dangers include the following:
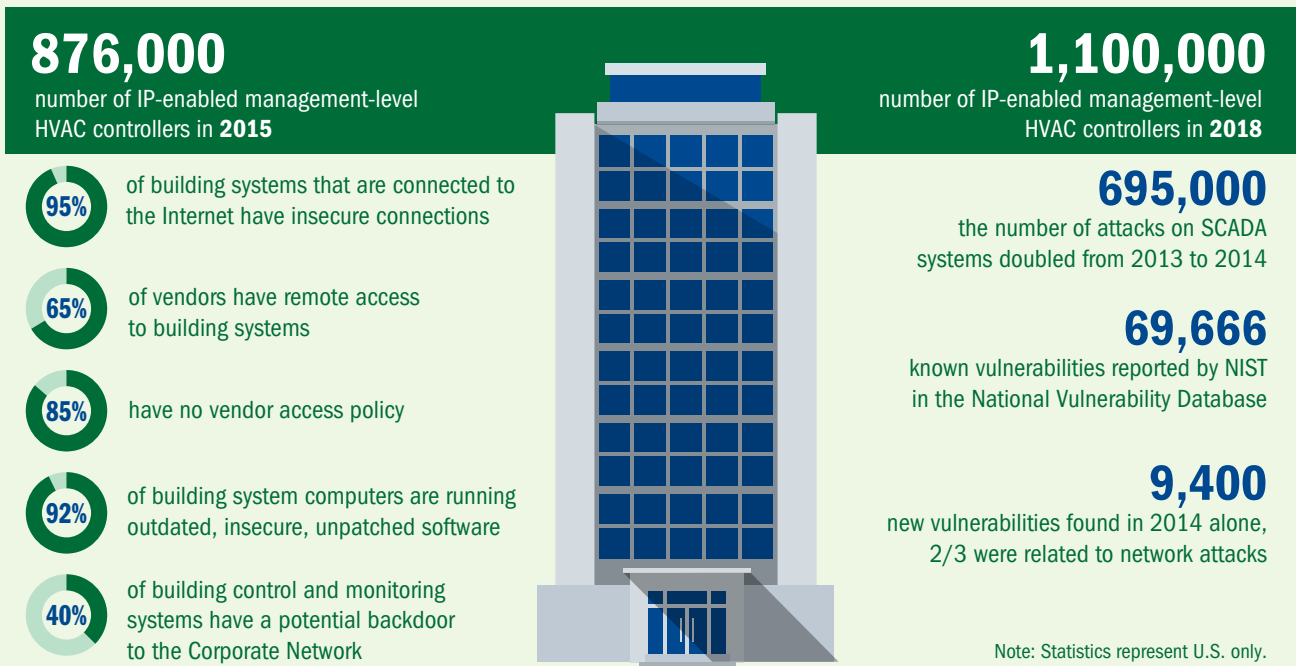
1. Shutting down heating or cooling for sensitive locations such as pharmaceutical or food processing plants

2. Manipulating cooling settings on an HVAC system in a corporate building, creating significant business disruption and lost productivity

3. Shutting down cooling or power management functions for a data center, destroying IT equipment and taking business critical applications offline

4. Gaining unauthorized access to an Internet-connected physical security system to enable kinetic attacks

The cyber-related threats pose increased economic burden on an organization if not handled proactively. The United States Department of Defense recently developed the Unified Facilities Criteria, which states:

"While the inclusion of cyber security during the design and construction of control systems will increase the cost of both design and construction, it is more cost-effective to implement these security controls starting at design than to implement them on a designed and installed system. Historically, control systems have not included these cyber security requirements, so the addition of these cyber security requirements will increase both cost and security. The increase in cost will be lower than the increase in cost of applying these requirements after design."

Source: Johnson Controls and Booz Allen Hamilton Inc., CyberSmart Buildings: Securing Your Investments in Connectivity and Automation. February 2017.

876,000
number of IP-enabled management-level HVAC controllers in **2015**

1,100,000
number of IP-enabled management-level HVAC controllers in **2018**

95% of building systems that are connected to the Internet have insecure connections

65% of vendors have remote access to building systems

85% have no vendor access policy

92% of building system computers are running outdated, insecure, unpatched software

40% of building control and monitoring systems have a potential backdoor to the Corporate Network

695,000
the number of attacks on SCADA systems doubled from 2013 to 2014

69,666
known vulnerabilities reported by NIST in the National Vulnerability Database

9,400
new vulnerabilities found in 2014 alone, 2/3 were related to network attacks

Note: Statistics represent U.S. only.

Source: Intelligent Buildings, CyberSafe. 2016.

CHALLENGES

Challenge 1:
Providing a Safe Workplace

Employees today expect at a minimum to be provided with a safe working environment. This is essential not just in attracting and retaining key talent, but also allows staff to focus on daily tasks, which can improve business productivity.

The challenge for employers is to leverage technology and policies to protect against internal and external threats.

Additional trends include the following:

- Violence is becoming more common in today's workplace, representing billions of dollars in liability around the world.

- The prevalence of smart devices is a major cause of theft in the workplace. At risk is not only sensitive personal information but also any company data stored on these mobile devices.

- Cyber threats are a reality for all businesses, not just large corporations.

Key Commercial Building Risk Trends

WORKPLACE VIOLENCE	VISITOR SAFETY	MOBILE DEVICE THEFT	CYBER THREATS
Annual estimated price tag of $5B in the U.S. alone	Commercial security will see a split between practicing reactive security and proactive security	60% of IT admins reported a lost or stolen smart phone in the last year	It's not a matter of IF a company is hacked, it's only a matter of WHEN
Source: Booz Allen Hamilton	Source: Security Magazine	Source: lookout.com	Source: OccamSec

Challenge II:
Preventing Theft

Trust is crucial to growth within a successful organization. An approach that relies on a reactive response to theft can easily erode this trust.

Employers have the responsibility to protect both personal and business assets.

The challenge is to maintain privacy while also monitoring for potential criminal activity.

Variance in Valuables Adds Complexity

Certain technologies and policies can assist in theft prevention of personal items like phones and purses. Very different kinds of technology can be more effective in theft prevention of company consumables, which includes everything from office and janitorial supplies to kitchenware.

This challenge is also informed by considering what the building is used for, when it is used and particularly who will be using it.

Challenge III: Achieving Regulatory Compliance

Regulatory compliance can be complex in a commercial setting, involving accessibility, energy use, data management and physical design.

Organizations must consider how to meet audit requirements to comply with various regulations. Depending on the industry and its objectives, this may include SOX, HIPAA, PCI-DSS, OSHA and ADA, among others.

OSHA

The OSH Act created the Occupational Safety and Health Administration (OSHA), which sets and enforces protective workplace safety and health standards. OSHA also provides information, training and assistance to employers and employees.

OSHA standards for commercial buildings include:

1910.36a	Exit routes must be permanent
1910.36a2	Exits must be separated by fire-resistant materials
1910.36a3	Exits must be a self-closing and latching fire door
1910.36b	Adequate number of exit routes required
1910.36c1	Exits must discharge to a refuge area
1910.36d	Exit doors must be unlocked from the inside
1910.36e2	Doors must swing in direction of egress
1910.36f	Capacity of an exit route
1910.36g	Exit route height and width requirements
1926.34a	Obstructed means of egress
1926.34b	Clearly marked exit signs
1926.34c	Continual maintenance of egress pathways
1926.35a	Written emergency action plans
1926.35b1	Emergency escape procedures and routes
1926.35b2	Emergency critical operations procedures
1926.35b3	Emergency mustering procedures

ADA

The Americans with Disabilities Act (ADA) defines and enforces requirements for all new commercial building construction and alterations. Its purpose is to remove accessibility barriers in all state and local government buildings as well as public accommodations, transportation and commercial facilities.

NFPA

The National Fire Protection Association (NFPA) develops and publishes more than 300 consensus codes and standards intended to eliminate death, injury, property and economic loss due to fire, electrical and related hazards. NFPA codes and standards, administered by more than 250 Technical Committees comprising nearly 9,000 volunteer committee member seats, are adopted and used throughout the world.

Code examples include:

101 NFPA 101 is the Life Safety Code that is the most widely used source for strategies to protect people based on building construction, protection, and occupancy. Its purpose is to minimize the effects of fire and related hazards. It is the only document that covers life safety in both new and existing structures. It includes provisions for all types of occupancies, with requirements for egress, features of fire protection, sprinkler systems, alarms, emergency lighting, smoke barriers, and special hazard protection.

80 NFPA 80 addresses general requirements and provisions for care and maintenance of fire doors and other opening protectives including swinging doors, horizontally sliding doors, vertically sliding fire doors, rolling steel doors, fire shutters, service counter fire doors, hoistway doors for elevators and dumbwaiters, chute doors, access doors, fire windows, glass block assemblies, fire dampers and fabric fire safety curtains.

72 Rules cover the application, installation, location, performance, inspection, testing and maintenance of fire alarm systems, supervising station alarm systems, public emergency alarm reporting systems, fire warning equipment and emergency communications systems (ECS), and their components. Provisions are expressed in prescriptive requirements with performance-based design methods and risk analysis requirements provided and essential for the proper design and integration of mass notification systems.

Challenge IV: Preventing Cyber Threats

When a single data breach can cost the average company $4 million, preventing cyber threats in an IoT environment is crucial to managing risk and reputation.

This may be the biggest challenge for businesses today due to the vulnerability of the increasing number of networked devices and sensors. Even in existing buildings, there are likely multiple systems connected to the outside world via an Internet connection. They may have been put in by a system supplier to provide remote monitoring to reduce the cost of an operations service contract, or they may require connectivity to a cloud service. There are many opportunities to use the experience of the IT world to mitigate the risk of these connected systems using best practices on policies, monitoring and hardware.

It's essential to consider best practices to prevent hacking of IP devices that reside on your network. For example, cameras and similar devices typically hold predefined security measures that always should be changed. A best practice would be to customize the settings to match the requirements for the rest of all IT infrastructure.

The reality of BYOD (Bring Your Own Device) environments creates additional challenges, as a person bringing multiple devices into a building is essentially bringing multiple new doors that could be opened for a costly breach.

In the future, smart buildings will provide an open architecture where sophisticated security technologies and protocols will combat new and evolving threats.

Source; IBM, Cost of Data Breach Study. 2015.

Challenge V: Limiting Physical Building and Network Accessibility
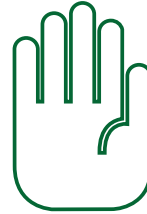
Directing the flow of traffic among employees and visitors is essential to providing a safe environment, made all the more challenging with the goal to provide seamless and secure network access.

This comes down to an ability to authenticate the identity of who is accessing the building and the network.

Today, advancing technologies and malicious strategies require another question to be considered—how do you ensure the person using the credential is in fact the person assigned to that credential?

The Key Is Biometrics

Access control credentials only identify the credential, not the person who is holding it. Biometrics positively authenticate an individual by identifying their measurable physiological traits, such as fingerprints, iris patterns and facial or hand geometry, before granting access to a restricted area. Biometrics has two modes: verification and identification.

VERIFICATION

Verification uses a one-to-one comparison and requires a secondary credential. In this case, the biometric element simply confirms that the person using that credential is the individual to whom it was issued as well as holds the authority to enter. One-to-one verification can be achieved by storing biometric templates in the reader database or storing the biometric template on a credential. Storing the biometric template on a credential maintains privacy regulations that prevent storage of biometric data; it also serves as dual authentication. Triple authentication includes a pin code along with the credential and biometrics. The user enters their pin code to recall their template in the reader to be matched to their live biometrics. Storing a biometric template on a credential works well but if the end user is seeking to eliminate credentials, then this method will not be ideal.

IDENTIFICATION

Identification is the process of determining that the person requesting access is who they say they are. This involves matching the biometric characteristic to a template called up from a central database. Biometric identification uses a one-to-many comparison in order to ascertain whether a given user is authorized for entry. The biometric characteristic alone is used, and is compared to all templates in the database until a match is found or the data is rejected as unidentified. Since the stored template and the live biometric are converted to an encrypted algorithm, matching occurs instantaneously.

SOLUTIONS

The Anixter Approach
Five Layers of Physical Security

In today's world, there is a strong emphasis on providing a secure and safe environment for a modern workforce. Reducing risk and increasing peace of mind allows staff to focus on the task at hand. Anixter's layered physical security approach provides you with the ability to deter, detect, delay, defend and deny at every layer of your commercial building.

In addition to micro-segmentation of logical security, our approach provides commercial building managers with a clear set of guidelines and best practices for macro-level security implementation.

Property Perimeter
Reception Area
Floor Levels
Specialized Zones
Technical Space

FACILITY ASSESSMENT

PROJECT DEPLOYMENT

CONTROLLED REPEATABILITY
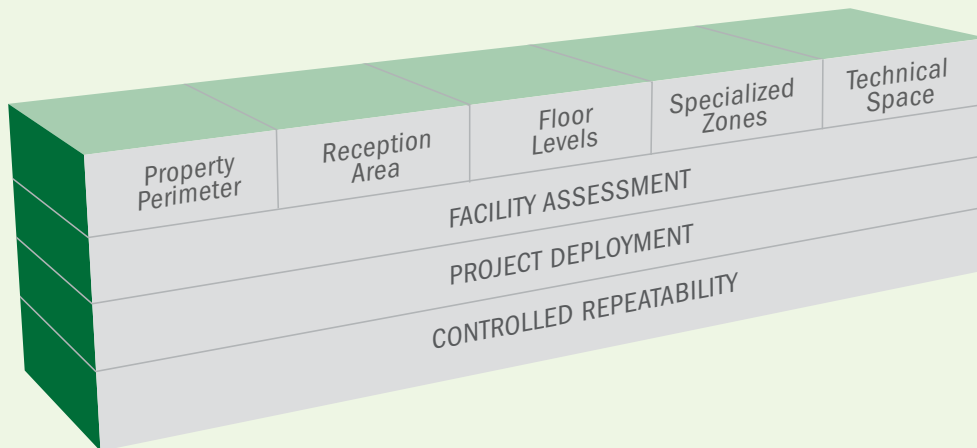
Best Practice I:
Property Perimeter

Establish a physical defense around the property perimeter and building exterior doors to deter external threats.

Considerations

When protecting the property perimeter, it is important to consider:

☐ How do you manage vehicle and pedestrian entrances and exits during and after business hours?

☐ How do you monitor and control parking facilities?

☐ What methods do you use to prevent unauthorized access to the building?

☐ How do keep the building accessible to the handicapped and emergency personnel?

Recommended Solutions

Parking Lots and Parking Structures

Access to medium security commercial building parking areas can be managed with unattended drop-arm gates and UHF readers with window tags that allow for extended read ranges. Readers can be configured as standalone systems or connected into the building's access control system. Drop-arm gates with self-service ticket dispensers control access to visitor parking. IP intercoms with or without video integration are used for authorization before entering the parking area.

High security commercial buildings typically have guard shacks and rolling gates to control traffic, while active vehicle barriers and ram-resistant cable barriers prevent vehicles from penetrating the property perimeter.

Parking Structure Emergency Communications Systems

Emergency call stations, identified by high-visibility colored lighting, allow for contact directly to emergency personnel. Integrated video enables security personnel to see what is happening. The stations are connected to the building's VoIP phone system and can even roll over to smartphones.

Building Perimeter

Fixed bollards or heavy cement planters prevent vehicles from breaching the building perimeter. Bollards can be manually retractable to allow for maintenance vehicles.

Loading Docks

Loading dock doors are vulnerable to unauthorized access and should be locked and monitored. Wide dynamic range (WDR) cameras are appropriate due to the fluctuation in light levels. Door prop alarms can prevent doors from being left unsecured, while intercoms with or without integrated video allow authorized couriers into the building for deliveries.

Lobby Entry Doors

Access control with automatically scheduled unlock and lock times allow the doors to be open during business hours but locked to the general public after hours. The First Person In (FPI) function prevents the doors from unlocking until the first tenant enters, which is important on snow days or holidays for example. Access control is used after business hours to allow tenants in and record their entry. Often the same access control system manages both the building perimeter and the tenant suites, so tenants can use one credential for both.

Stairwells and Emergency Exits

To control pedestrian access, all secondary doors and stairwell exits should be exit only with night latch function hardware that is locked from the outside or with no exterior hardware at all. These doors should have exit devices on them for unimpeded egress and door closers to close and relock after exiting. They should also be monitored and/or alarmed to prevent them from being propped open.

Key Control

A patented restricted key system prevents unauthorized key duplication of the master keys and suite keys while providing building management, maintenance and cleaning crews access throughout the building. Doors with electronic access control should have a mechanical key bypass and lockdown capability for emergencies.

Handicap Access

The Americans with Disabilities Act (ADA) requires that all commercial building provide unimpeded access for handicapped persons. Automatic door operators using a chain drive motor can open heavy lobby doors upon the push of a wired or wireless handicap button.

Video Surveillance

To monitor the exterior of the building with changing levels of light, wide dynamic range (WDR) cameras are effective. High-resolution, multi-sensor panoramic cameras can monitor critical areas and entranceways. Video surveillance can be sent to mobile devices, such as smartphones or tablets, to enable security personnel to monitor the video on the go. Video analytics enhances efficiency by creating automated parameters that filter out normal motion events and detect events that security should review. License plate recognition (LPR) software can be used to monitor traffic and access to specific parking areas on the property.

Emergency Key Boxes

Required for most commercial buildings, these are mounted on the exterior of the building near the main lobby doors. Master keys are stored inside for emergency first responders. Access is restricted to police and fire rescue personnel.

Emergency Voice Systems (EVS)/Mass Notification

Located in a security command center or in the reception area of the building, emergency voice systems can allow emergency personnel to reach all building occupants with specific instructions for evacuation or shelter in place situations. Advanced features can send alerts to digital signage, desktop computers and VoIP phones. Phone, text or email alerts can also be sent to individuals.

Best Practice II:
Reception Area

Control access beyond the lobby area and access to tenant or office spaces on higher floors within the building.

Considerations

When protecting the reception area, it is important to consider:

☐ What role does reception play in enforcing your security policy?

☐ How do you manage visitors and contractors?

☐ Does your building contain multiple tenants?

☐ Are there restricted floors within the building?

Recommended Solutions

Electronic Visitor Management

Electronic visitor management systems enable preregistration of visitors and contractors. Visitors can use a kiosk to accept company policies, NDAs or other criteria, and badges can be printed as temporary credentials. Coupled with an employee/tenant badging system, this creates an environment of alertness as visitors are identified and deterred from entering restricted areas. Electronic records are kept to quickly reregister return visitors, flag barred visitors and account for visitors in case of emergencies.

Glass and Optical Turnstiles

Turnstiles restrict unauthorized personnel from going past the lobby. Glass turnstiles use a physical glass barrier that is waist or full height, while optical turnstiles may have only an arm to restrict access. Both use beam optics to verify that only one person is going through the turnstile with the card read.

Credentials

Depending on the building's security requirements, credentials to operate turnstiles can range from low-security temporary barcodes to permanent card badges to advanced biometric readers.

Video Management System

Video surveillance in the reception area monitors and records during business hours as well as afterhours. The video management system (VMS) can be integrated with the access control system to provide a visual record of activity. Choosing a VMS is critical, as all video surveillance footage is viewed and extracted through the VMS. VMS software must meet the facility's current and growth needs, allowing for management of not just video surveillance but other linked operational technology systems.

Video Analytics

Analytics can monitor pedestrian traffic flow, detect people entering through an exit and identify parcels left in the reception area. The video monitoring station in the lobby should be optimized to support processing of the video footage.

Best Practice III:
Floor Levels

Manage floor access to office/tenant areas and building operations rooms.

Considerations

When protecting restricted floor levels, it is important to consider:

☐ How do you manage floor access through elevators and stairwells?

☐ How do you keep tenant spaces secure while allowing building services to have full access?

☐ How do you maintain a clear stairwell egress and ingress path during building emergencies?

Recommended Solutions

Visitor Management
In a multi-tenant building, visitor management systems can be deployed at the suite level with basic features. Requirements may only include onsite registration, visitor badge printing and electronic visitor records.

Mechanical Access Control
Tenants in most cases only require mechanical keys to enter their suite. Their keys do not operate in other tenant spaces or utility and janitorial rooms. Master keys can gain access to tenant and utility spaces on all floors, or the key system can be designed with individual floor masters.

Electronic Access Control
Building electronic access control systems can be partitioned so that the individual departments or tenants can only view and manage their individual areas or suites. However, the property manager has the ability to manage the complete system. This allows the tenant to use the same credential to access the parking area, building entry and their own space.

Elevators

Card readers in elevator cabs allow access to individual floors based on access control permissions. Usually only tenants have credentials that operate readers in the cabs.

Stairwells

Stairwells need to be locked from the stairwell side, but upon alarm activation, the doors must unlock on both sides on all floors to allow free ingress and egress for evacuation and emergency personnel. Stairwell doors must also close and latch every time to prevent fire from spreading through the stairwells. Specialized "high-rise" locks are required that are dual failsafe. These can be energized to lock under normal access conditions and unlock under emergency conditions. Building access control systems can connect into the high-rise locks and have readers in the stairwells for access.

Elevator Video and Communications

Cameras in vandal-resistant enclosures monitor events in the individual elevator cabs. Video transmission can be done through the elevator cable bundle or wirelessly with a transmitter on the top of the cab and a receiver at the top of the elevator shaft. Emergency intercoms are required in all elevator cabs for two-way communication to emergency personnel.

Video Surveillance

Doors that access floors and suite entrances should deploy video surveillance to record all access and egress events. Set to record on motion, video surveillance can be standalone or integrated with an electronic access control system for video verification. Lower resolution (720p) can be used in small spaces.

Best Practice IV:
Department Zones

Secure assets and comply with privacy regulations with attention to specialized departmental zones.

Considerations

When protecting department zones, it is important to consider:

☐ What are your key business areas you need to protect?

☐ How do you secure departmental assets and records?

☐ How do you comply with privacy regulations?

Recommended Solutions

Electronic Access Control
Electronic access control can prevent unauthorized personnel from entering restricted departments, such as human resources, legal or finance. If a suite already has electronic access control integrated into the building, then adding access control to a department entrance is done through the existing system. Otherwise, standalone battery-powered access control locks can be installed on the door.

Mechanical Key Bypass
Access controlled doors should always have a mechanical key bypass, and keys should be restricted to prevent unauthorized duplication and use.

Company Records Protection

External file cabinet locking bars attached to existing file cabinets allow extra security for critical files and records. This can help you maintain compliance with company policy or regulations requiring higher security methods or dual control practices. Additionally, fireproof file cabinets and records safes can be used to protect critical documents from fire and theft.

Mechanical Key Management

Key management boxes are used to organize keys to doors, file cabinets and desks, while electronic key records management keeps track of what the keys operate and who they are issued to.

Video Surveillance

Careful consideration should be taken when actively monitoring employees in work areas, as this has an adverse effect on morale. In work areas, video surveillance can be deployed to monitor critical assets and records—for example, monetary collection and handling.

Corporate Day Lockers

With more employees working remotely and using shared resources, day lockers can optimize work space for multiple users by allowing employees to store their personal items at the end of a day's work.

Workplace Asset Management

In higher security applications, passive RFID is used to ensure company assets remain in the building. High-value assets use active RFID tags to be able to track their location in real time.

Best Practice V:
Technical Space

Protect networking infrastructure, IT servers and data storage in technical areas.

Considerations

When protecting technical spaces, it is important to consider:

☐ How do you secure IT equipment?

☐ What is your procedure for server room access?

☐ How do you manage contractor access to data suites and cabinets?

☐ How are you maintaining compliance with SOX and PCI-DSS?

☐ How do you ensure the environmental requirements are being met inside the technical spaces?

Recommended Solutions

Data Centers

Standard data center security protocols apply for tenant data centers. Electronic access control with biometric readers can positively authenticate authorized users before access is granted, while man traps with anti-tailgating systems verify that only one person is entering the data center per valid credential. Free egress through both doors of the man trap is required to comply with life safety regulations.

Computer Rooms

In multi-tenant buildings, a small room within the tenant suite usually holds the IT equipment and servers, often on racks rather than in data cabinets. The level of security at this entry point is reflected by the risk or compromise of the information on the servers in the room. Access to the computer room may be restricted by any of the following methods:

• A restricted key system that has a master key level or is keyed different from all other locks in the suite

• A single-code mechanical push button lock that provides 24/7 access but no access records
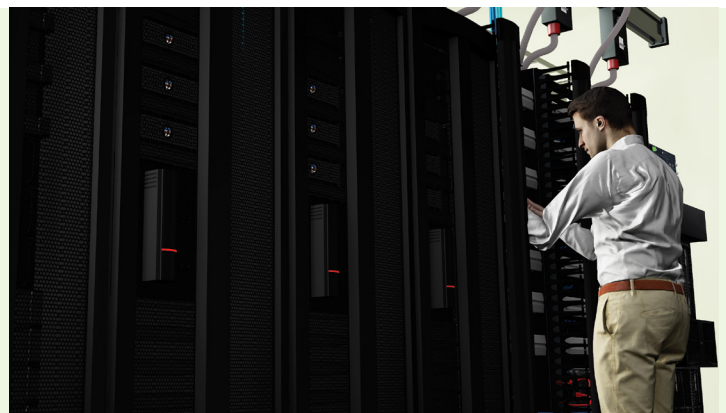
- A battery-powered standalone lock with multiple codes that has no access records but can be put into a lockout mode that requires a specified manager code to access or activate/deactivate

- A battery-powered standalone lock with multiple codes and/or credentials plus time zone restrictions and access records

- Hard-wired networked access control with real-time monitoring and video integration, providing the ability to retrieve access records, change user permissions from anywhere in the network and implement dual custody access, dual authentication and biometric credential security

Data Cabinet Security

Keeping records of who entered a data cabinet and when is critical to maintaining company and regulatory compliance. Electronic access control at the data cabinet level captures all access records in addition to regulating who has access. It can even restrict contractors' access to specific days and times. In higher security applications, biometric readers at the cabinet can positively authenticate the individual before allowing access to the cabinet.

Electronic Key Management

For smaller data centers or computer rooms, electronic access control may not be cost effective. Electronic key management boxes secure the data cabinet keys in the cabinet. Only authorized persons can open the cabinet and can remove only the keys that they are authorized to use. The key management box records who removed the key, what time it was removed and what time it was returned. Access records are stored in the box and can be downloaded onto a flash drive for analysis.

Video Surveillance

Video surveillance provides a visual record of who has accessed the data center and data cabinets. Since IT spaces typically feature low light due to limited human presence, surveillance cameras should be able to capture usable images in low light conditions. Corridor format cameras focus on the space between rows of cabinets.

Additionally, the IT space is where the video is being stored. The switches, servers, and storage for video surveillance need to be optimized for that application, and the devices need to meet specific criteria to continuously perform their functions in a secure manner.

Environmental Monitoring

Ensuring the IT equipment is running within a defined temperature range could also be part of the risk management process. Monitoring temperature, power and potential water leakage inside these spaces is a recommended best practice for all communications room spaces.

Open Architecture Security Solution

The concept of open architecture security systems suggest flexibility with best-of-breed options and the latest technology. This view represents the challenge of these technologies working together.

Open Architecture Access Control Software

Access Control Client Workstation

Access Control Application Server

Access Control ODBC Data Server

HR Database

OSDP Compliant Smart Card Reader

with BLE enabled

Wiegand Compliant Biometric Reader

ONVIF and OSDP Compliant PoE Door Controllers

Electrified Door Hardware

Wireless Access Point

Elevator Controller

Integrated Wireless Electronic Door Lock

Mobile Device Thin Client

Temperature Sensor

ID Badging Software

SIP and ONVIF Compliant Video Intercom

IP Speaker

PoE Lighting

IP Paging System

Digital Signage

Mass Notification Software

Intrusion Controller

Intrusion Sensors

ONVIF Compliant IP Fixed Camera

PoE Switch

Video Optimized Workstation

Storage (NAS)

Video Management Server

NVR Appliance

Open Platform Video Management Software (VMS)

ONVIF Compliant IP PTZ Camera

TECHNOLOGY SUMMARY

Technology Solutions

The chart below details the technology solutions that can
support a layered security approach in a commercial building.

TECHNOLOGY	Property Perimeter	Reception Area	Floor Level	Specialized Zones	Technical Space
Emergency call boxes	✓				
Access control		✓	✓	✓	✓
Intrusion detection	✓	✓	✓	✓	✓
Fire detection and suppression		✓	✓	✓	✓
Visitor management software	✓	✓	✓		
Mass notification	✓	✓	✓	✓	✓
Surveillance solutions	✓	✓	✓	✓	✓
Server storage and workstations					✓
Video management software					✓
Content analytics					✓

Anixter's Technology Support Services can offer further insight to your specific
application. For more information, contact your local Anixter representative.

anixter.com/commercialbuilding

SUPPLY CHAIN SOLUTIONS

As you develop a smart building roadmap, it's also important to consider the physical migration from the existing environment to the building's future state. This entails identifying the challenges and risks during the installation phases of technology deployment. Coordination between material deployment and installation schedules can have an impact on the productivity, efficiency and connectivity of work environments.

Properly coordinated deployments allow for tangible savings in time, reduced installation costs and increased efficiencies, all while reducing the risks of lost productivity associated with the physical migration of the building environment.

Challenge	Service	Save Time	Reduce Costs	Increase Efficiency	Mitigate Risk
Coordinating the deployment of the right system components that corresponds with the integrator installation schedule	Deployment and technical services	✓	✓	✓	✓
Confirming all system components work properly as an integrated solution	Interoperability testing		✓	✓	✓
Video camera deployment and on-going maintenance	IP addressing and serial number tracking	✓	✓	✓	
Coordinating installations by kitting similar solution components	Custom part number for each unique configuration	✓	✓	✓	✓
Managing integrator SLAs and maintenance agreements	Life cycle management, asset management and managing maintenance costs and upgrades		✓		✓

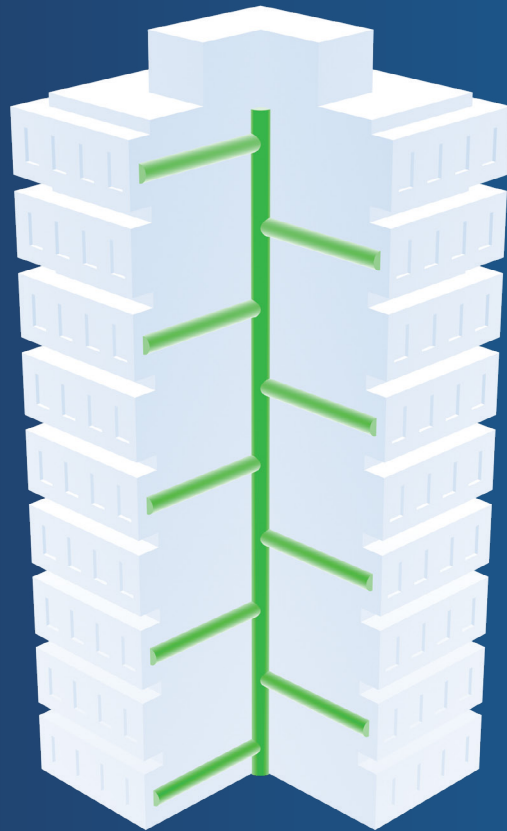**For more information, contact your local Anixter representative.**

anixter.com/services

NETWORK PERFORMANCE BEST PRACTICES

VERSATILE PHYSICAL LAYER CONNECTIVITY

INTRODUCTION

By 2020, an estimated 26 billion devices will be connected to the internet. Many of these devices will be operated within a commercial setting, requiring building operators to determine what kind of foundational network will be required to support increased connectivity levels. Furthermore, the complexities resulting from the increase in multi-screen and BYOD environments, as well as automated building technologies, require careful attention to ensure adequate support.

Smart building design optimizes network performance, utilizing a broader set of elements that can empower today's transformations in technology and workplace behavior.

Source: Forbes, A Simple Explanation of the Internet of Things. May 2014.

A Smart Building Approach

Adequate network performance occurs with a holistic approach, examining the foundations and backbone infrastructure that will support a variety of productivity tools in a commercial setting, while allowing for additional capacity to provide flexibility and near future scalability for tomorrow's technology.

Within a building, there are different ways to transport data, specifically a wireless or wired infrastructure. Innovations are happening on both sides, but particularly with wired infrastructure the industry is experiencing innovations such as increased power and bandwidth delivered to different devices.

Today's Building Applications

FIXED LINE VOICE & DATA

DEVICE MOBILITY

CONFERENCING

SURVEILLANCE & ACCESS CONTROL

BUILDING CONTROLS

DATA CENTER (IN BASEMENT)
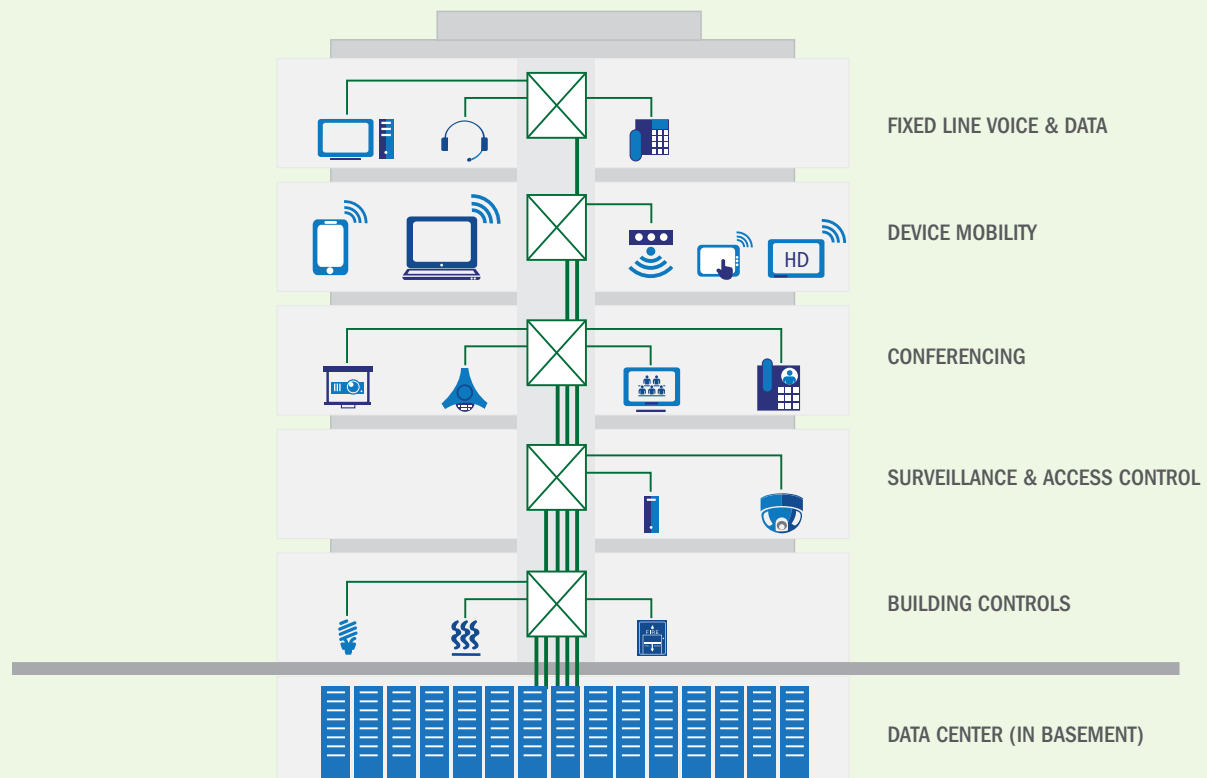
CONSIDERATIONS

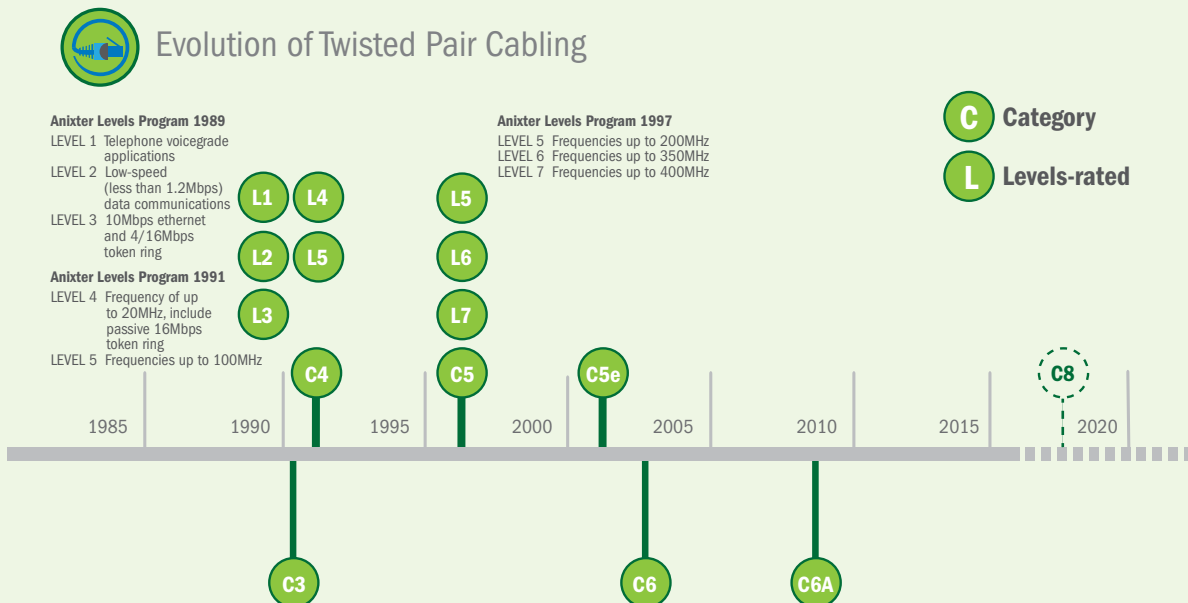## Migration of Legacy Systems

Navigating through the myriad of network-infrastructure choices needed to support high-speed data rates ranging from 10 Gbps to 40 Gbps (and soon 25/100) can be a challenging undertaking. For this and several other practical reasons, it's vital to have a well-planned network migration strategy that will enable a commercial building to support modern functionality now and in the future.

During the original Levels program in the 1990s, which led to the development of cabling performance standards such as current Category 5e and Category 6, Anixter recognized the challenges faced by designers of low-voltage communications cabling systems when choosing the type and grade of cabling

that would best support the emerging Ethernet protocol being deployed across enterprise networks. Today, the industry has evolved from 10 Mbps systems to industry standards that support data rates up to 100 Gbps in data center environments. Still, media selection, cabling architecture and cable management choices remain complex. Choosing the right high-density cabling architectures and equipment is mission-critical as commercial building managers try to control costs by maximizing floor space.

Faster, denser technology is driving costs, and the right high-performance cabling is needed to provide stability in the network. Unsuitable infrastructure can become an expensive problem, delaying necessary upgrades and creating other potential obstacles needed to stay competitive.

Evolution of Infrastructure Technologies

Evolution of Twisted Pair Cabling

Anixter Levels Program 1989
LEVEL 1 Telephone voicegrade applications
LEVEL 2 Low-speed (less than 1.2Mbps) data communications
LEVEL 3 10Mbps ethernet and 4/16Mbps token ring

Anixter Levels Program 1991
LEVEL 4 Frequency of up to 20MHz, include passive 16Mbps token ring
LEVEL 5 Frequencies up to 100MHz

Anixter Levels Program 1997
LEVEL 5 Frequencies up to 200MHz
LEVEL 6 Frequencies up to 350MHz
LEVEL 7 Frequencies up to 400MHz

C Category
L Levels-rated

L1 L4
L2 L5
L3

L5
L6
L7

C4 C5 C5e C8

1985   1990   1995   2000   2005   2010   2015   2020

C3   C6   C6A

Evolution of Infrastructure Technologies

Evolution of PoE

Cisco 7W prestandard **7W**	Cisco PoE+30W **30W**	Cisco UPoE (Universal PoE) 60W **60W**		IEEE802.3BT 4pair PoE 60W **70W**	

1985   1990   1995   2000   2005   2010   2015   2020

IEEE802.3AF PoE 15W **15W**

IEEE802.3AT PoE+ 30W **30W**

Evolution of Wi-Fi

IEEE802.11a 5GHz 20MHz 54Mbps **a**

IEEE802.11b 2.4GHz 20MHz 11Mbps **b**

IEEE802.11n 2.4/5GHz 20/40MHz 150Mbps **n**

2018? IEEE802.11ad 60GHz?? **ad**

1985   1990   1995   2000   2005   2010   2015   2020

IEEE802.11g 2.4GHz 20MHz 54Mbps **g**

IEEE802.11ac 5GHz 20/40/80/160 MHz Up to 866Mbps **ac**

Evolution of Cellular Networks

AMPS (Advance Mobile Phone System) **1G**

IMT2000 (International Mobile Telecommunications) **CDMA** (Code Division Multiple Access) **3G**

3GPP **5G**

1985   1990   1995   2000   2005   2010   2015   2020

GSM (Groupe Spécial Mobile) **2G** **TDMA** (Time Division Multiple Access)

LTE (Long Term Evolution) **4G**
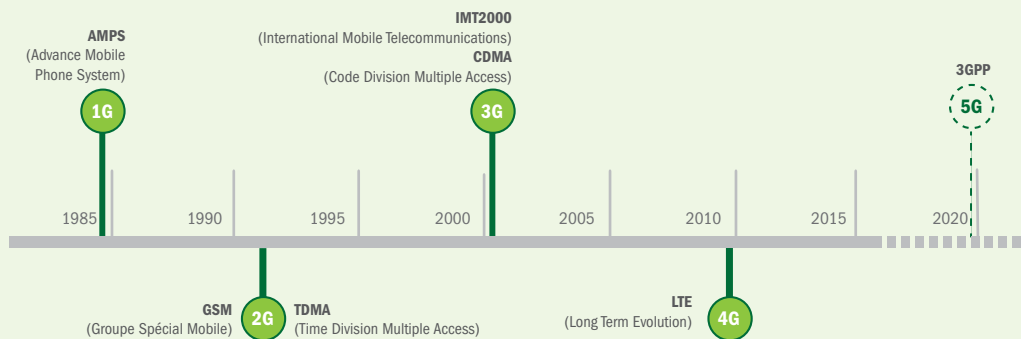
Monetizing Building Efficiencies

Buildings and commercial real estate typically rank high on a business' balance sheet. There is continuous pressure to reduce these costs and deliver savings through the business while remaining aware that savings cannot be gained at the expense of productivity or the attraction and retention of talent in a competitive economy. This usually means doing more with less—building a better space for less capital cost than previous iterations, allowing for more efficient use of the space, and using less energy and utilities, while also having a space that espouses the corporate mission, vision and values.

Driving cost out of a building is a well worn path to driving business outcomes, and it can be achieved either by investing in capital equipment (like LED lighting) or through operational improvements (like scheduling or maintenance procedure changes) or, better yet, a combination of both approaches. Regardless, data should be the driving factor to determine a course of action.

Building Analytics and Intelligence

Building systems are generating more data than ever before, representing an enormous opportunity to turn this data into insight and action that helps monetize building efficiencies for the business. There are excellent solutions in the market today to crunch this vast quantity of data, identify trends, issues and opportunities, and visualize it in ways that help facility operators digest the data and understand what is required of them. Examples include fault detection diagnostic toolkits, "single pane of glass" system interfaces, the brave new world of intersystem sequences of operation, and access to data through network convergence, open protocols and standards-based normalized data. These are tools that deliver the experience that developers, operators and occupiers are looking for.

CHALLENGES

Challenge I: Keeping Up With Evolving Technologies

There is a continuous drive for rapid innovation throughout the industry, which affects not only the business tools that drive productivity, but also the infrastructure that supports those tools.
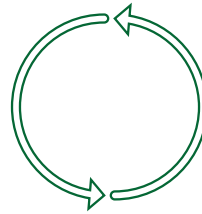
Migrating to an IP Platform

When migrating from traditional building management systems using serial or analog interfaces to an open IP platform, it can be challenging to respond to the variety of protocols and equipment interfaces.

It is important to aggregate new technologies with building intelligence in a useful and meaningful way, which can demonstrate efficiency and return on investment.

Considerations when Evaluating Technology

Technical Performance

Business Disruption

Life Cycle Costs

Technology Evaluation

Risk

Future Use

Stakeholder Concerns

Regulatory Compliance

Replace vs. Retrofit

One decision building operators have to consider is whether to replace a piece of equipment or retrofit new technologies with existing equipment. Both options carry their own unique cost and integration challenges.

For example, using VFD (Variable Frequency Drives) instead of ON/OFF controllers to support fans in HVAC equipment may cause unwelcome noise that could disrupt other equipment, including monitor disturbance, sound and paging RF interference.

When it comes to mechanical plant and equipment technology, it's important to integrate new technology without impacting other infrastructures, in addition to managing separation between power systems and data systems.

An IP platform can be a key component to the life cycle of an existing asset. When existing systems are updated or retrofitted, the new or upgraded system should be specified to use the IP-based network in the building. This will reduce the capital cost of the system update, supporting the economics of the project. When necessary, the network can be scaled in an efficient manner to accommodate increased bandwidth or number of connected endpoints as required.

Telecommunications Pathways and Spaces

Test configuration for noise immunity measurements
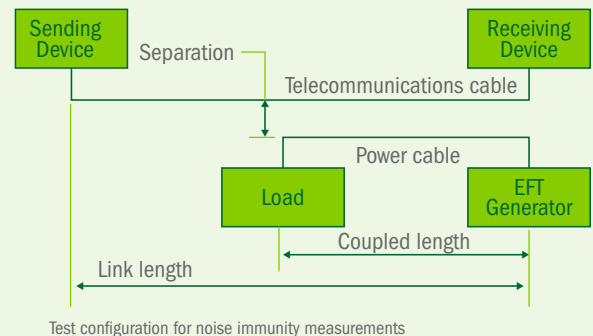
Source: ANSI/TIA-569-D

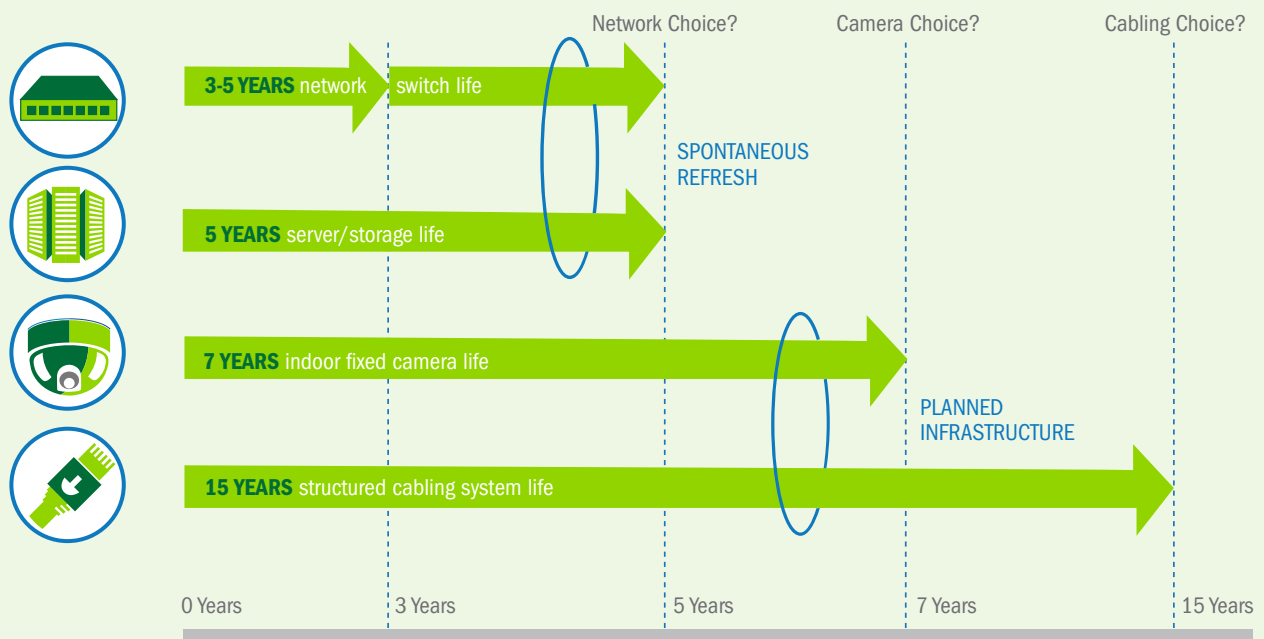# Challenge II: Amortization of Cabling Investment

Cabling is expected to outlive most network components, but it might be the most difficult and cost-intensive component of a network to replace.

Infrastructure amortization periods run for an average of 10 to 15 years. When looking at commercial building cabling costs, you should consider both initial and long-term costs.

You also should understand the full life cycle and industry trends of other technologies and note that cabling represents only two to three percent of the initial network hardware investment.

In many ways, the proper investment serves as a necessary insurance, providing protection for the innovations of the future.

Lifecycle of Key Technologies

Network Choice?   Camera Choice?   Cabling Choice?

3-5 YEARS network   switch life

SPONTANEOUS REFRESH

5 YEARS server/storage life

7 YEARS indoor fixed camera life

PLANNED INFRASTRUCTURE

15 YEARS structured cabling system life

0 Years   3 Years   5 Years   7 Years   15 Years

Rip and Replace

In determining when to rip and replace cabling, you should also consider the timing of departmental refurbishment, building upgrades or relocation. This is in addition to the continuous emergence of new technologies.

Your justification for an infrastructure upgrade can also take the following into account:

- Spreading the cost of facility upgrade versus CAPEX of IT hardware

- Sharing the efficiency of structured cabling to support non-traditional applications besides voice and data (i.e., lighting, HVAC, security and other building controls)

Cost of Not Acting

The ultimate question should not focus solely on the cost to upgrade; it should quickly turn to the cost of not upgrading your infrastructure. In other words, the opportunity cost.

Those costs include the following:

- Slower adoption of digital technology

- Loss of competitive advantage

- Long-term risk and increased complexity

- Limited use of valuable information from sensors, monitors and logistics systems

- Higher costs without enterprise standards for hardware, software and communication protocols

- Limited innovation in traditional IT and operational systems by failing to share engineering knowledge

- Complicated compliance and security efforts by limiting transparency and "auditability" of OT information by managers dependent on IT business systems

- Conflicts of interest and unnecessary duplication of development and management costs between the two fields

- "Lock-in" for system life with older, proprietary systems that make access to data more expensive or difficult
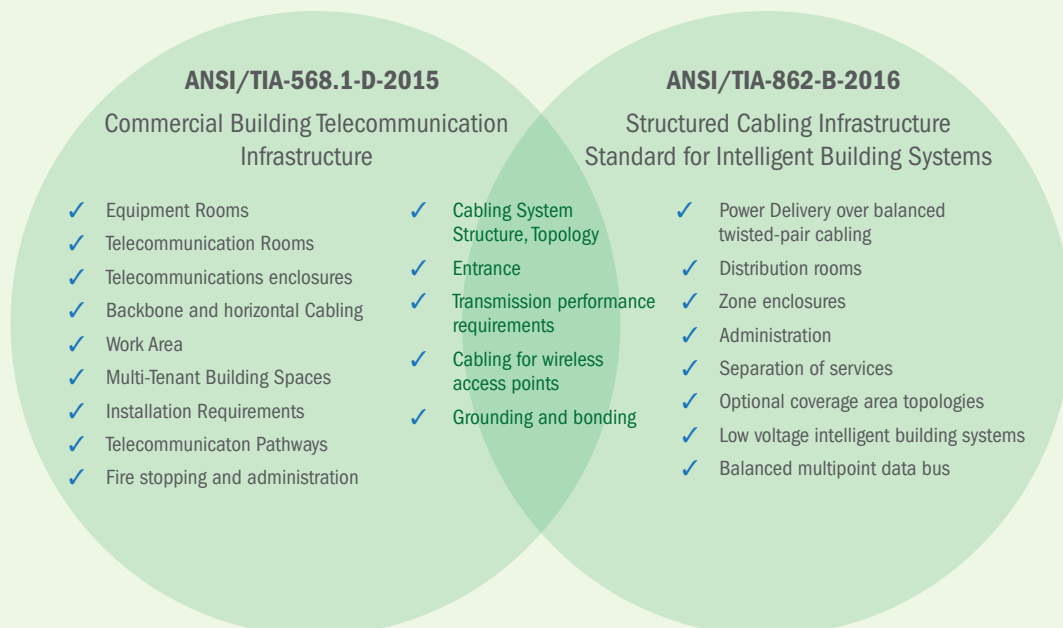
Challenge III: Supporting Multiple Applications
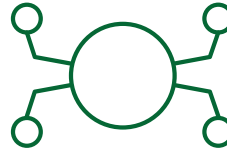
Today's enterprise applications are increasingly a large collective of distributed software components that enable complex business services. With so many components, often monitored in different silos, it can be difficult to manage a business service or application as a whole.

An Interval Approach

The goal is to quickly migrate towards a unified open architecture. The reality is that this migration will most likely become an ongoing process that may include multiple stages and intervals.

During this process, it is important to consider who is responsible for managing the various applications and systems. Historically, IT, voice and facilities all had individual agendas and priorities. The challenge is to figure out how IT and OT align for better collaboration.

Relevant Standard References

ANSI/TIA-568.1-D-2015

Commercial Building Telecommunication Infrastructure

✓ Equipment Rooms
✓ Telecommunication Rooms
✓ Telecommunications enclosures
✓ Backbone and horizontal Cabling
✓ Work Area
✓ Multi-Tenant Building Spaces
✓ Installation Requirements
✓ Telecommunicaton Pathways
✓ Fire stopping and administration

✓ Cabling System Structure, Topology
✓ Entrance
✓ Transmission performance requirements
✓ Cabling for wireless access points
✓ Grounding and bonding

ANSI/TIA-862-B-2016

Structured Cabling Infrastructure Standard for Intelligent Building Systems

✓ Power Delivery over balanced twisted-pair cabling
✓ Distribution rooms
✓ Zone enclosures
✓ Administration
✓ Separation of services
✓ Optional coverage area topologies
✓ Low voltage intelligent building systems
✓ Balanced multipoint data bus

Source: ANSI/TIA and ISO

Challenge IV: Reducing Network Downtime

There's little to no margin for error when it comes to network performance, so it's crucial to prevent costly, unplanned service outages or performance degradation.

Identifying critical and non-critical assets is foundational, but organizations can make strategic decisions in the ranking of equipment to determine what takes priority.
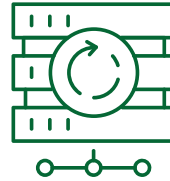
Causes of Unplanned Outages

Hardware, OS, Security, Power, Disasters

20%

40%

Operation Errors

40%

Application Failures
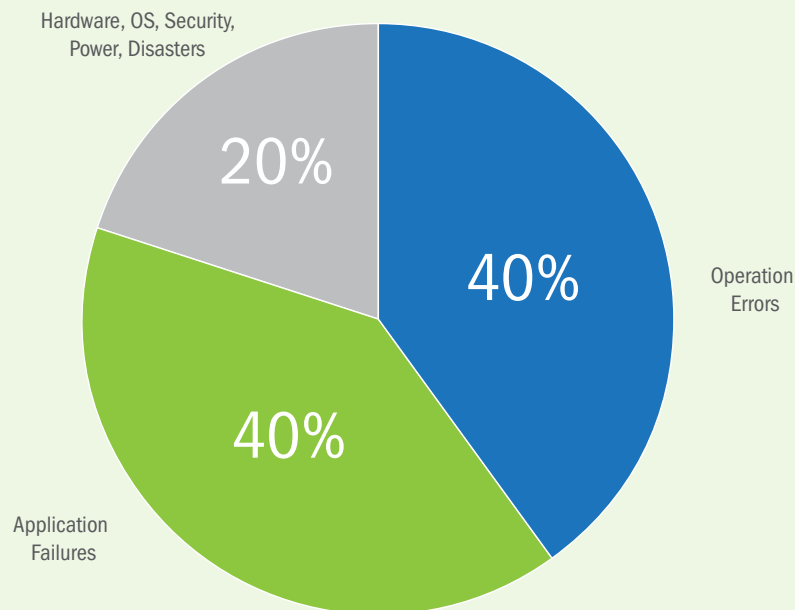
Source: Gartner (September 2014)

Availability Levels

Outages can cripple business operations, yet many IT departments have lower availability levels for critical applications than their businesses require. IT organizations often wonder how their availability levels compare to industry standards, but in reality such comparisons and benchmarks are often limited.

Through a better understanding of the causes for IT service downtime, many departments have improved availability levels over the years. Still, the demand will only continue to increase, as complex systems are deployed and the cost of business downtime increases.

IT Service Availability Assessment Metrics (Unplanned Downtime)

Category	Hours of Unplanned Downtime by Year per IT Service Current Assessment Metrics	Former Assessment Metrics
Acceptable	Up to 43.8 hours – 99.5%	Up to 61 hours – 99.3%
Outstanding	Up to 17.5 hours – 99.8%	Up to 26 hours – 99.7%
Best in Class	Up to 1.8 hours – 99.98%	Up to 4 hours – 99.95%
100%	Zero – 100%	Zero – 100%

Source: Gartner (September 2014)

Challenge V:
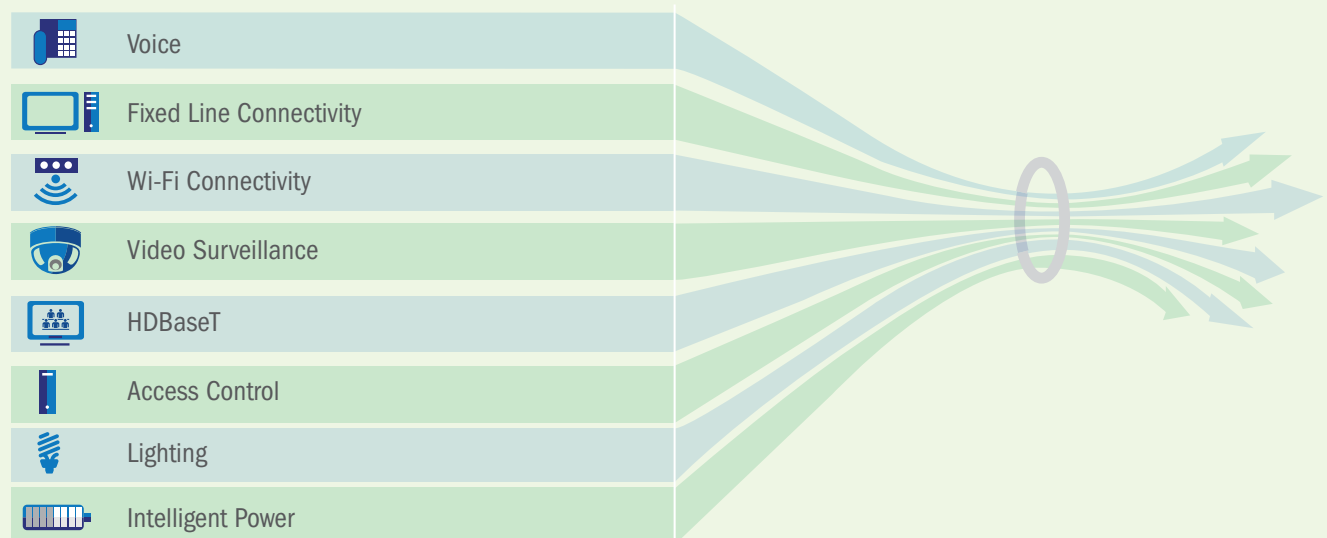# Coping With Increasing
Bandwidth Demands
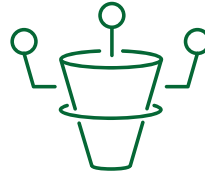
The explosion of high-definition, multi-screen and BYOD environments have triggered an equally proportionate intensity on potential strain to the network.

Building operators are asking themselves:

- How can I cater to increased network traffic within the building caused by BYOD environments, media rich applications and the integration of additional systems?

- How can I ensure connectivity while maintaining security?

- How can I create pathways and spaces to scale and upgrade the cabling infrastructure to support more coverage areas, and in doing so, increase the number of consolidation points?

- Do I have a plan in place to avoid bottleneck and network congestion?

- How can I support non-employee bandwidth demands, including the needs of visitors, suppliers, customers and non-staff based users?

Increased Application Traffic

	Voice
	Fixed Line Connectivity
	Wi-Fi Connectivity
	Video Surveillance
	HDBaseT
	Access Control
	Lighting
	Intelligent Power

SOLUTIONS

The Anixter Approach
Versatile Physical Layer Connectivity

More than ever before, a high-performance structured cabling system plays an essential role in operating a smart building. Versatile physical layer connectivity guides the creation of an open-system platform, where the right media selection, cabling topology and density of interfaces will increase the scalability of the network.

They key is to build a strong foundational layer, as it becomes integrated into the bricks and mortar and influences long-term functionality and usefulness of the space.
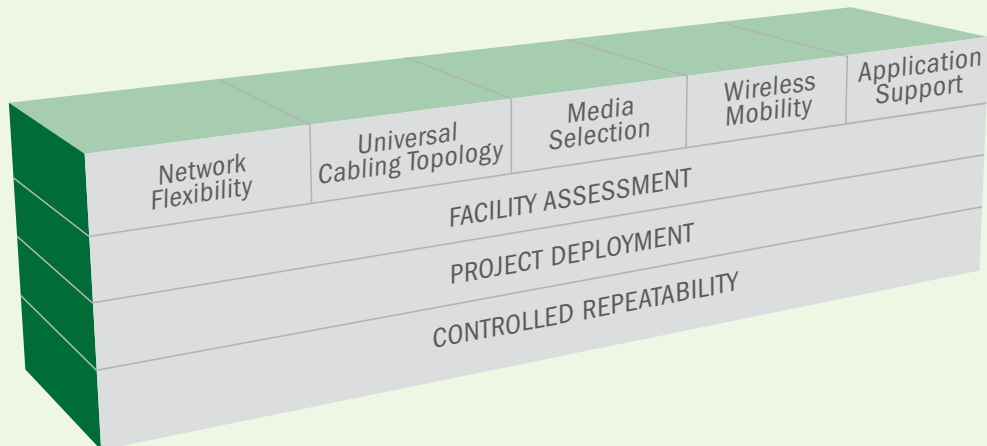
Best Practice I:
Network Flexibility

Apply open-architecture designs to accommodate your performance requirements for a highly scalable network. The flexibility of the foundational layer creates ripple effects throughout the network.

Considerations

When enabling network flexibility, it is important to consider:

☐ Can your cabling infrastructure adapt to the application?

☐ How do you manage moves, adds and changes?

☐ What is your device scalability expectation?

☐ How do you balance wired versus wireless connectivity?

Recommended Solutions

Zone Wiring Techniques
Due to the 100 m (328 ft.) maximum length limitation for balanced twisted-pair copper cabling, it is not practical at times to construct multiple telecommunications rooms to service devices that require network connectivity. Zone cabling solutions provide flexibility where the physical constraints of the building dictate extended reach for the low-voltage cabling plant to support applications such as video surveillance and Wi-Fi.

Intelligent Patching Solutions
Adapting and managing the network infrastructure effectively can be a difficult task for modern commercial buildings. Utilizing intelligent patching solutions to deliver detailed visibility of the physical layer can provide a dynamic platform that enables efficient moves, adds and changes to the network infrastructure while improving network resilience.

Migration from 802.11n to 802.11ac

As more mobile devices require network connectivity in enterprise environments, high capacity wireless systems are needed in order to relieve the traffic bottlenecks that can occur when multiple users attempt to access the network simultaneously. Ensuring a seamless migration to high data rate Wi-Fi systems such as 802.11ac require a structured cabling design that can deliver upwards of 10 Gbps throughput to the wireless access points. Category 6A cabling solutions become the logical choice as they are able to support 10GBase-T applications up to 100 meters.

Sourcing

Regardless of the application space being designed, the ability to source multiple product solutions and utilize flexible supply chain solutions reduces scrap and improves the speed of deployment.

Communications Cabling Design and Installation Services

Selecting the right installation partner is just as important as selecting the right technology solutions for a commercial building project. Having a partner with the knowledge required to design and implement highly flexible network cabling solutions is critical to success.
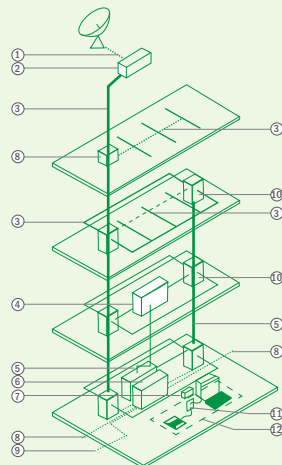

Plan for Network Flexibility

Figure 2 – Example of pathways and spaces in a single-tenant building

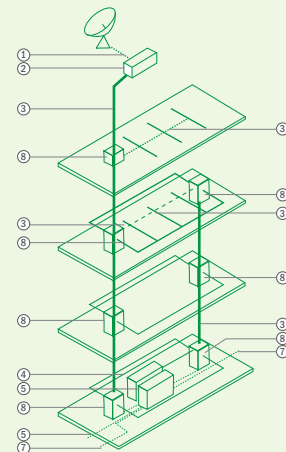| Description	Clause or subclause		Description	Clause or subclause
1 Wireless service entrance pathway	6.5.2		7 Distributor enclosure	6.6
2 Entrance room	6.5		8 Service entrance pathway	6.5.2
3 Building pathways	9		9 Diversity of entrance routes	5.5
4 Distributor room	6.3.10		10 Distributor room	6.3.10
5 Access provider space, service provider space	7		11 Equipment outlet	6.6
6 Entrance room	6.5		12 Equipment outlet location	6.7.3

Figure 3 – Example of common pathways and spaces in a multi-tenant building

Description	Clause or subclause		Description	Clause or subclause
1 Wireless service entrance pathway	6.5.2		5 Entrance room	6.5
2 Entrance room	6.5		6 Service entrance pathway	6.5.2
3 Common building pathways	9		7 Diversity of entrance routes	5.5
4 Access provider space, service provider space	7		8 Common distributor room	8.2

Source: ANSI/TIA-569-D

Best Practice II:
Universal Cabling Topology

Determine the right choice for an open architecture environment by adopting commercial building wiring and building automation standards.

Considerations

When planning for network performance, it is important to consider:

- ☐ How do you implement TIA-568-D or ISO 11801 standards?
- ☐ What is your current network cabling standard?
- ☐ How do you ensure design will support growth?
- ☐ What level of cabling administration do you provide?

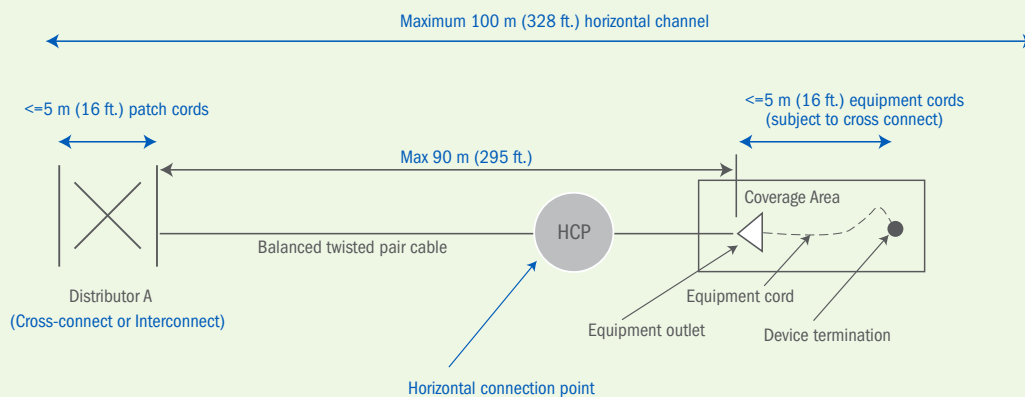## Recommended Solutions

Star Topology

In this topology the telecommunications cables are distributed from a central point. An advantage of the star topology is the simplicity of adding additional nodes. The primary disadvantage of the star topology is that the centralized hub represents a single point of failure.

Horizontal Cabling (Cabling Subsystem 1)

The horizontal cabling system extends from the work area's telecommunications information outlet to the telecommunications room (TR) or telecommunications enclosure (TE). It includes horizontal cable, mechanical terminations, jumpers and patch cords located in the TR or TE and may incorporate multiuser telecommunications outlet assemblies (MUTOAs) and consolidation points (CPs). The maximum horizontal cable length is 90 m (295 ft.), independent of media type.

Horizontal Twisted Pair Topology

Horizontal twisted pair link requirements

Maximum 100 m (328 ft.) horizontal channel

<=5 m (16 ft.) patch cords

<=5 m (16 ft.) equipment cords (subject to cross connect)

Max 90 m (295 ft.)

Coverage Area

HCP

Balanced twisted pair cable

Distributor A
(Cross-connect or Interconnect)

Equipment cord

Equipment outlet

Device termination

Horizontal connection point

Source: ANSI/TIA/EIA/568

Backbone Cabling (Cabling Subsystem 2 or 3)

Backbone cabling is the inter-building and intra-building cable connections in structured cabling between entrance facilities, equipment rooms and telecommunications rooms. Typical media type is multimode or single-mode fiber, but shorter backbone cabling distances can use multi-pair copper cabling.
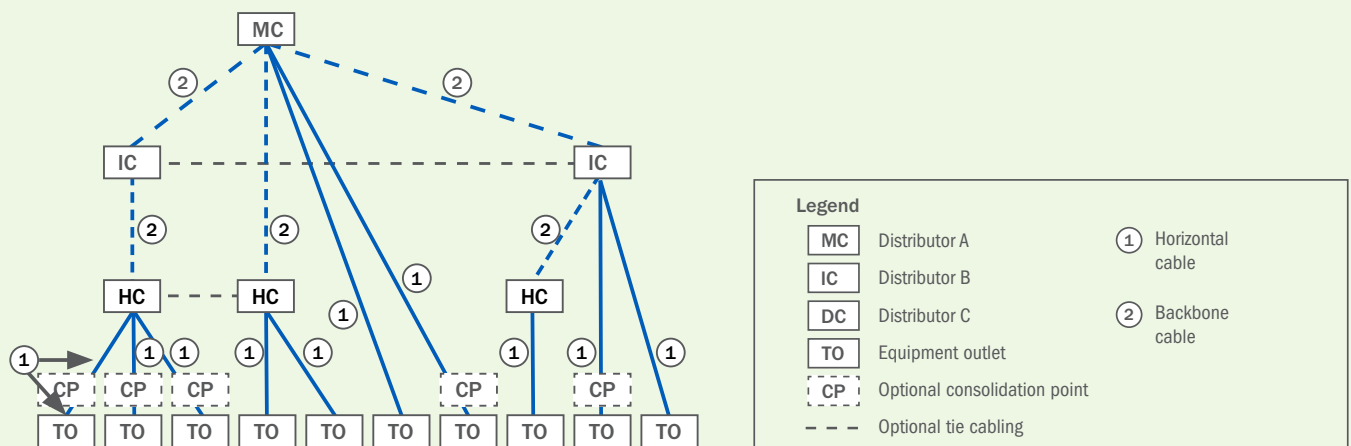
Structured Cabling Expertise

Choose partners that are credentialed to the latest ICT industry certifications such as the Registered Communications Distribution Designer (RCDD®). This credential is awarded to individuals who have demonstrated knowledge in the design, integration and implementation of telecommunications and data communications transport systems and related infrastructure.

Pre-labeled Hardware and Bundled Cable

Pulling cables individually is often impractical and inefficient. Bundling and binding together different types of color-coded or numbered copper, fiber and electronic conductors into one compact, flexible, multiconductor cable can deliver cost savings of up to 30 percent.

Cabling System Architecture for Commercial Buildings

Legend

MC	Distributor A	①	Horizontal cable
IC	Distributor B		
DC	Distributor C	②	Backbone cable
TO	Equipment outlet		
CP	Optional consolidation point		
– – –	Optional tie cabling		

Source: ANSI/TIA/EIA/568

Best Practice III:
Media Selection

Choose the appropriate physical media from twisted-pair, optical fiber and direct-attach cables to address high-speed bandwidth requirements.

Considerations

When choosing the right cabling media, it is important to consider:

☐ What is your plan to migrate from 1GbE to 10GbE?

☐ How do you deploy PoE today?

☐ What is your copper and fiber specification?

☐ How do you balance cost with performance?

Recommended Solutions

High-Performance Structured Cabling
Commercial buildings are typically designed for a minimum 20-year useful lifespan. As seen over the last 20 years, technology evolves quickly, and building owners and designers must have foresight to avoid near-term obsolescence of the cabling infrastructure. Deploying high-performance structured cabling solutions such as Category 6A cabling in the horizontal and laser-optimized multimode fiber (OM3/OM4/OM5) in the backbone maximizes the utility of the network infrastructure.

802.3af (15W), 802.3at (30W), 802.3bt (100W)
Twisted-pair copper in the horizontal has the advantage over other media types such as fiber and wireless in its ability provide a physical transport for both data communications and low-watt power delivery. Since the advent of the first Power over Ethernet (PoE) Standard IEEE 802.3af in 2003, the ICT industry has seen a breathtaking array of PoE enabled devices and applications, such as Wi-Fi, surveillance cameras, commercial lighting and sensors, proliferate commercial buildings.

Cable Type and Main Features

Cable Type	Main Features
Category 5e/Class D Unshielded Shielded Twisted Pair TIA | ISO Designation: (UTP) | (U/UTP)	• Originally designed to support 100 MHz operation • This media is used the most for 100BASE-T & 1000BASE-T applications • Conductor gauge size is typically 24 AWG • Patch cords are available with solid or stranded conductors
Category 6/Class E Unshielded Shielded Twisted Pair TIA | ISO Designation: (UTP) | (U/UTP)	• Originally designed to support 250 MHz operation • This media is used the most for 100BASE-T & 1000BASE-T applications • Conductor gauge size is typically 23-24 AWG • Patch cords are available with solid or stranded conductors
Category 6A/Class E$_A$ Unshielded Shielded Twisted Pair TIA | ISO Designation: (UTP) | (U/UTP)	• Originally designed to support 500 MHz operation • This media is used the most for 10G BASE-T applications • Conductor gauge size is typically 22-23 AWG • Patch cords are available with solid or stranded conductors

NETWORK PERFORMANCE BEST PRACTICES

Independent Validation

To aid in media selection and mitigate risk, utilize a distributor that conducts independent product testing and proof-of-concept testing.
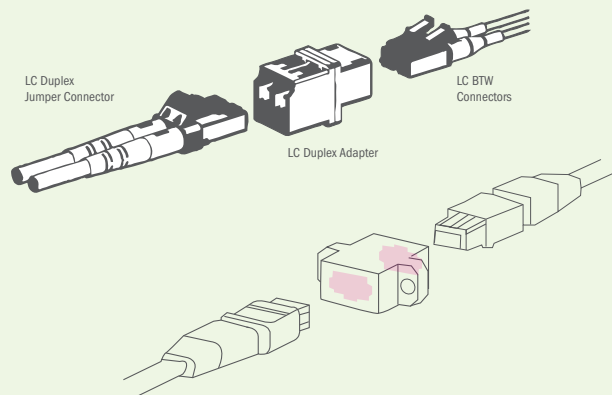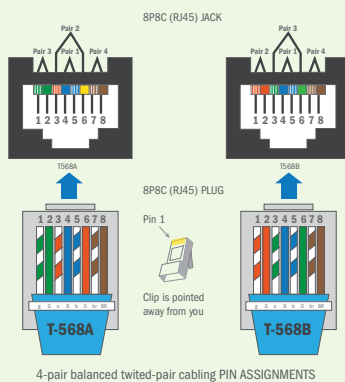
Sourcing

Make sure your distributor sources integrated, comprehensive high-quality products from trusted manufacturers.

Certification of Installation

Selecting the right installation partner is just as important as selecting the right technology solutions for a commercial building project. Having a partner with the knowledge required to properly test the integrity of the installed cabling solution is vital in ensuring that it is performing in accordance with the manufacturer's specifications.

Common Connector Interfaces

8P8C (RJ45) JACK

T568A

T568B

8P8C (RJ45) PLUG

Pin 1

Clip is pointed away from you

T-568A

T-568B

4-pair balanced twited-pair cabling PIN ASSIGNMENTS

Source: ANSI/TIA/EIA/568

LC Duplex Jumper Connector

LC Duplex Adapter

LC BTW Connectors

Best Practice IV:
Wireless Mobility

Determine your migration path for Wi-Fi and cellular connectivity to support a multi-screen environment.

Considerations

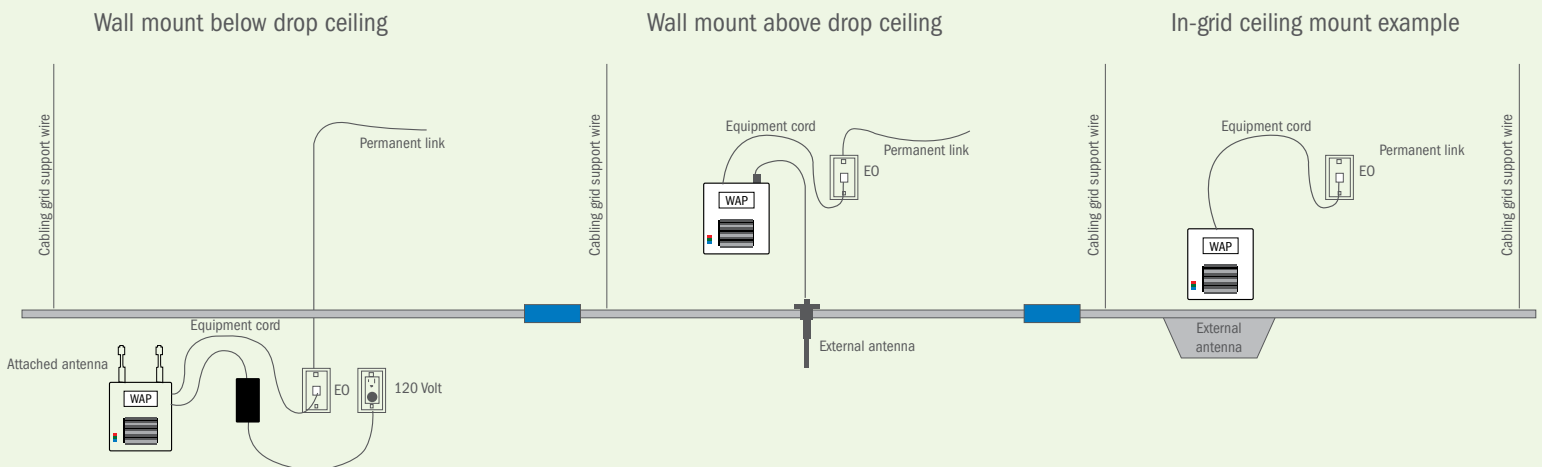When delivering wireless mobility, it is important to consider:

- ☐ Where are the wireless coverage gaps in your building?

- ☐ How do your occupants use mobile devices on premise?

- ☐ What is your migration path to 802.11ac, including wave 1 and wave 2?

- ☐ How does PoE support your wireless infrastructure?

Recommended Solutions

Distributed Antenna Systems (DAS) and Small Cell
The growing reliance on mobile devices from commercial building occupants, including employees, guests and first responders, requires consistent coverage throughout the interior and select outdoor spaces. DAS and small cell solutions have the principal function of ensuring adequate RF coverage for multiple cellular service providers.

Mounting and Installation

Wall mount below drop ceiling

Cabling grid support wire

Permanent link

Attached antenna

Equipment cord

WAP

EO

120 Volt

Source: TIA-162-A

Wall mount above drop ceiling

Cabling grid support wire

Equipment cord

Permanent link

EO

WAP

External antenna

In-grid ceiling mount example

Cabling grid support wire

Equipment cord

Permanent link

EO

WAP

External antenna

Cabling grid support wire

Indoor Wi-Fi Systems

With the bring your own device (BYOD) trend changing the way people work, the exponential growth of data usage in facilities requires a scalable network to meet the significant demand on Wi-Fi networks.

Cabling Solutions to Support Wireless Infrastructure

With the increasing number of licensed and unlicensed bands available, utilizing the spectrum is essential. Fiber and copper cabling, point-to-point, point-to-multipoint, mesh and microwave products, as well as antennas and ancillary products can help address growing broadband and microwave demands.

Direct cabling from the telecommunications room to WAPs

13 m (42 ft.) Range

18.3 m (60 ft.)
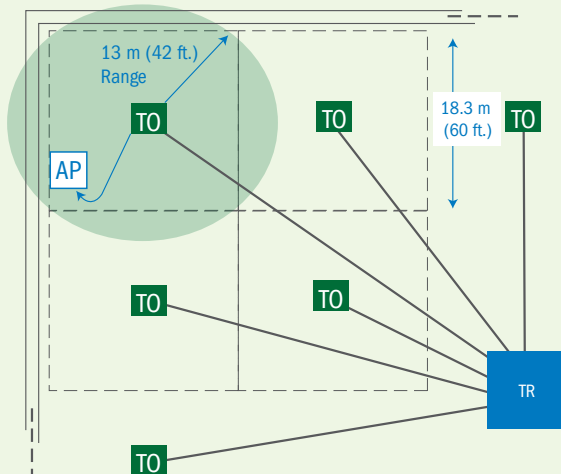
Source: TIA-162-A

WAP density for places of assembly (TIA-4966)	
1-25	1
26-50	2
51-75	3
76-100	4
101-125	5
126-200	9
201-300	14
301-400	18
401-500	21

Best Practice V:
Application Support

Deploy scalable designs that can support multiple and varied applications over a high-performance, IP-based structured cabling system.

Considerations

When providing application support, it is important to consider:

- ☐ How do you support lighting controls?
- ☐ Where do you deploy environmental and occupancy sensors?
- ☐ What is your AV migration strategy (analog vs. digital)?
- ☐ How are you integrating access control and video surveillance?

Recommended Solutions

Connected LED Lighting Solutions

Various migration strategies are available to deliver controlled LED lighting solutions within a commercial building. If deploying traditional line voltage lighting fixtures, there are overlay control systems using serial-based relay or wireless Zigbee controls. Low-voltage LED fixtures leverage the Ethernet network to deliver lighting control and power via PoE.

IP-based Network Sensors

Internet of Things (IoT) is expected to add $19 trillion to the global GDP with the addition of nearly 20 billion connected devices in commercial buildings by 2020. Access to sensor data throughout the commercial building will give building managers unprecedented visibility into their operational systems such as HVAC, lighting and power distribution.

Source: Forbes. G. Press, Internet of Things By The Numbers: Market Estimates and Forecasts. 2015.

NETWORK PERFORMANCE BEST PRACTICES

Networked Video and Audio Solutions

Today's digitally focused employees and customers want rich audio/visual experiences to engage audiences, boost productivity and deliver immersive experiences in the most powerful and productive way. Integrating audio and video solutions into multiple applications is the latest step in the evolution of building performance, security and sustainability. This integration is creating complex systems that require full IP-based networks.

Video Surveillance and Access Control Solutions

Video surveillance is a mission-critical, bandwidth-intensive technology. The right infrastructure—structured cabling, fiber optic cabling or wireless—is critical for maximum performance. When selecting a copper cabling solution, make sure it is robust enough to run video and power simultaneously, as many IP technologies support PoE. No matter the infrastructure, using a standards-based structured cabling system will allow for integration with other security, sound, building and data systems in the future.

Applications for Power over Ethernet

ORGANIZATION/STANDARD	WATTS REQUIRED	APPLICATIONS
IEEE 802.3AF2-Pair PoE	Up to 15.4W	802.11n WAPs, Access control, thin clients, IP phones, fixed IP cameras
IEEE 802.3AT 2-Pair PoE+	Up to 30W	PTZ IP Cameras, alarms, video IP phones, RFID readers
IEEE 802.3BT (Type 3)* 4-Pair PoE	Up to 60W	Access control, PTZ IP cameras, 802.11 ac WAPs, point-of-sale readers
Cisco UPOE	Up to 60W	Access control, PTZ IP cameras, 802.11 ac WAPs, point-of-sale readers
IEEE 802.3BT (Type 4)* 4-Pair PoE	Up to 100W	Televisions, desktop computers
Power over HDBaseT (PoH) Draft IEEE 1911 Standard**	Up to 100W	Televisions, desktop computers

TECHNOLOGY SUMMARY

Technology Solutions

The chart below details the technology solutions that can support
a layered security approach in a commercial building.

TECHNOLOGY	Property Perimeter	Reception Area	Floor Level	Specialized Zones	Technical Space
Category 6 structured cabling systems	✓	✓	✓	✓	✓
Category 6A structured cabling systems		✓	✓	✓	✓
Fiber optic structured cabling systems	✓	✓	✓		✓
Distributed Antenna Systems (DAS)		✓	✓	✓	✓
Small cell wireless connectivity		✓	✓	✓	✓
Wi-Fi connectivity		✓	✓	✓	✓
HDBaseT video		✓	✓	✓	✓
VoIP and unified communication		✓	✓	✓	✓
Video surveillance and access control	✓	✓	✓	✓	✓
Intelligent LED lighting	✓	✓	✓	✓	✓

Anixter's Technology Support Services can offer further insight to your specific
application. For more information, contact your local Anixter representative.

anixter.com/commercialbuilding

SUPPLY CHAIN SOLUTIONS

As you develop a smart building roadmap, it's also important to consider the physical migration from the existing environment to the building's future state. This entails identifying the challenges and risks during the installation phases of technology deployment. Coordination between material deployment and installation schedules can have an impact on the productivity, efficiency and connectivity of work environments.

Properly coordinated deployments allow for tangible savings in time, reduced installation costs and increased efficiencies, all while reducing the risks of lost productivity associated with the physical migration of the building environment.

Challenge	Service	Save Time	Reduce Costs	Increase Efficiency	Mitigate Risk
Creating a functional roadmap for material deployment from our site, contractor site or the job site to limit disruptions in business operations	Material staging and inventory management solutions	✓	✓	✓	✓
Reducing on-site installation time and interruptions	Pre-assembly and configuration	✓	✓	✓	✓
Coordinating deployment of multiple system components that correspond with the contractor installation schedule	Scheduled deliveries and specialized delivery services (lifts, etc.)	✓	✓	✓	✓
Reducing critical component failure at start-up	Off-site burn in and DOA check			✓	✓
Confirming installation adheres to uniform standards	Work area outlet kitting options	✓		✓	
Reducing on-site waste removal and enhancing critical system deployment schedules	Rack/cabinet/enclosure pre-assembly and configuration	✓	✓	✓	✓
Maintaining standards-based labeling schemes for ongoing asset utilization and maintenance	Patch panel and patch cord labeling	✓		✓	
Delivery tracking for on-site components between trades and technologies	Color-coded floor consolidation solutions	✓	✓	✓	✓

For more information, contact your local Anixter representative.
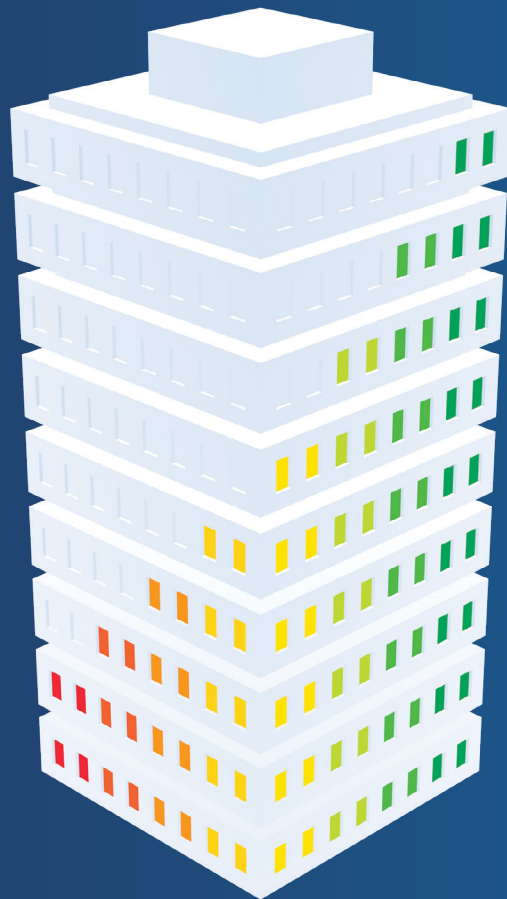
anixter.com/services

GLOBAL TECHNOLOGY BRIEFING

WORKFORCE PRODUCTIVITY BEST PRACTICES

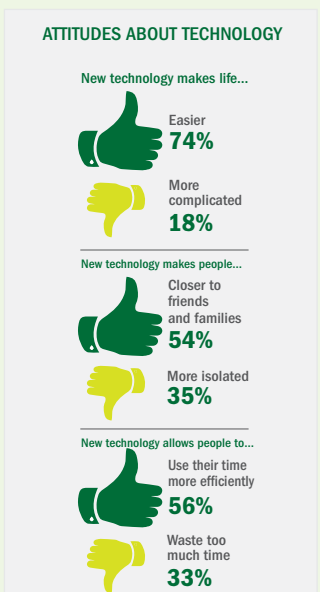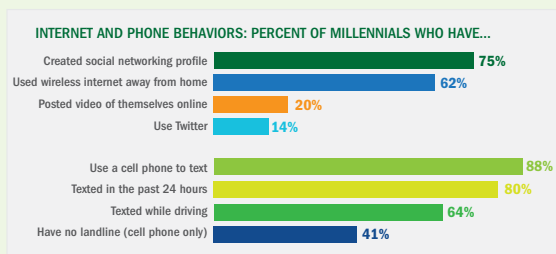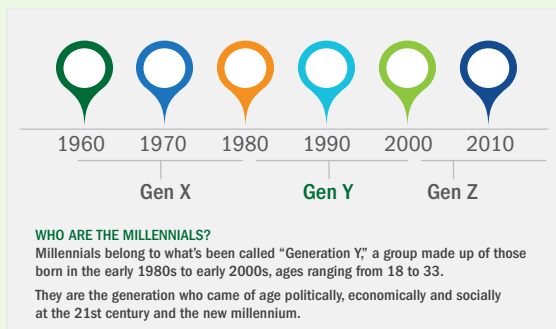## ADVANCED MOBILITY AND COMMUNICATIONS

INTRODUCTION

Social and economic drivers are placing a larger focus on how workforce behavior can be improved with technology. In other words, organizations now have a generation of employees who grew up in a digital age. These employees have advanced technological understandings and have shown an ability to adapt to new tools quickly.

They also come with their own set of logistical and interpersonal preferences, which industry leaders must understand in order to maximize the potential of their employees.

In the same way a building can utilize technology to optimize operational performance, a smart approach to workforce dynamics can lead to enhanced employee engagement, which increases productivity, performance and ultimately business returns.

Source: Gartner, Visual Collaboration in the Digital Workplace. 2015.

Tomorrow's Workforce

1960	1970	1980	1990	2000	2010
	Gen X		Gen Y		Gen Z

WHO ARE THE MILLENNIALS?
Millennials belong to what's been called "Generation Y," a group made up of those born in the early 1980s to early 2000s, ages ranging from 18 to 33.

They are the generation who came of age politically, economically and socially at the 21st century and the new millennium.

INTERNET AND PHONE BEHAVIORS: PERCENT OF MILLENNIALS WHO HAVE...

- Created social networking profile — 75%
- Used wireless internet away from home — 62%
- Posted video of themselves online — 20%
- Use Twitter — 14%
- Use a cell phone to text — 88%
- Texted in the past 24 hours — 80%
- Texted while driving — 64%
- Have no landline (cell phone only) — 41%

TOP 4 THINGS THAT MAKE MILLENNIALS UNIQUE
(According to Millennials)

- TECHNOLOGY USE
- MUSIC & POP CULTURE
- LIBERALISM & TOLERANCE
- CLOTHES & FASHION

ATTITUDES ABOUT TECHNOLOGY

New technology makes life...
- Easier 74%
- More complicated 18%

New technology makes people...
- Closer to friends and families 54%
- More isolated 35%

New technology allows people to...
- Use their time more efficiently 56%
- Waste too much time 33%

CONSIDERATIONS

As task-oriented jobs continue to shift towards automation, there is an equally important shift towards non-routine jobs and knowledge work, which involves the use or handling of information. Everyday tasks are now often done on smartphones and in real time. Many processes involved in capturing, collating and processing information are also being automated — all because the relevant data is digital and can be freely shared, while be accessible from anywhere and on any device.
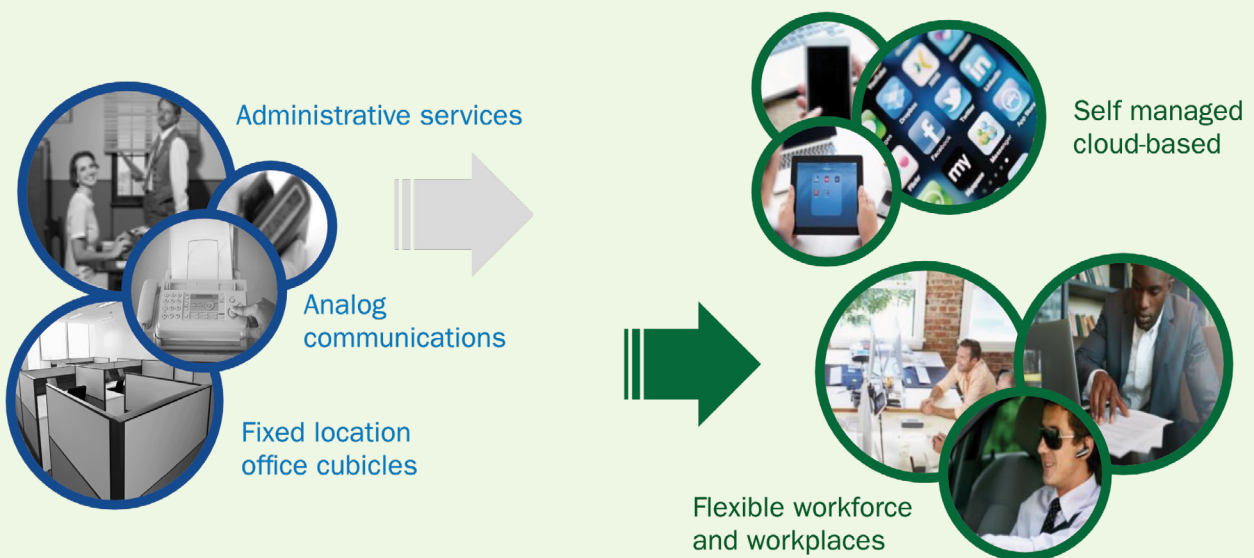
Multigenerational Workforce

By 2025, millennials will make up 75 percent of the workforce. Many of the trends that drive a mobile and gig-based economy are a result of their cultural preferences. At the same time, they don't represent the entirety of workplace dynamics, and it is important to consider the technology required to support a multigenerational workforce.

Human resource leaders battle to attract young talent, yet also need to maximize the knowledge and expertise of industry and organizational veterans.

Source: Social Chorus, Rethinking Communication for a Multigenerational Workforce. 2016

Digital Workplace Transformation

Administrative services

Analog communications

Fixed location office cubicles

Self managed cloud-based
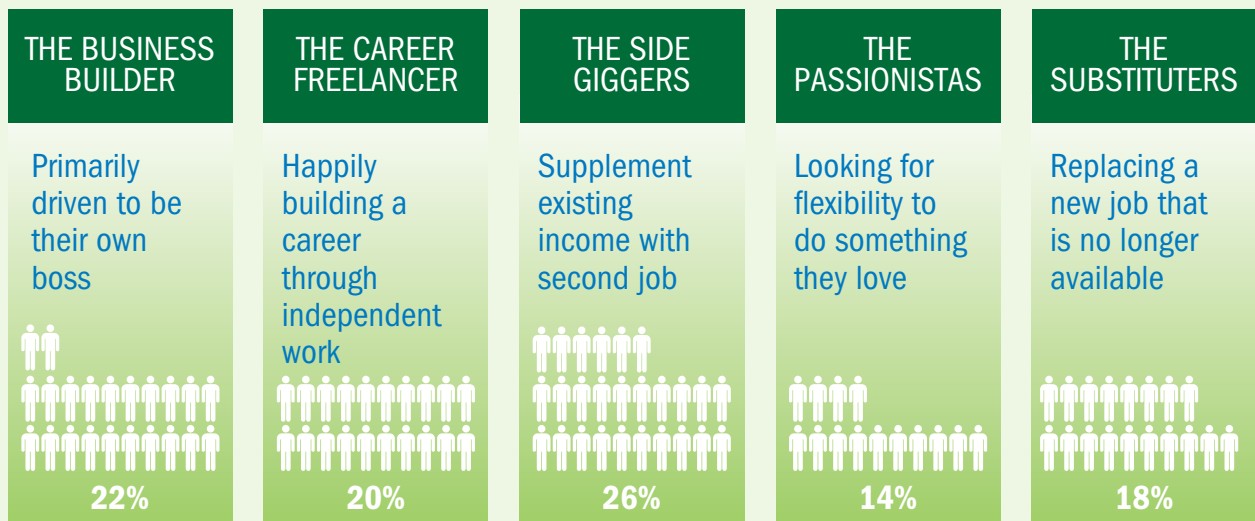
Flexible workforce and workplaces

Whenever and Wherever

In the modern labor force, work is an activity that people expect to be able to do whenever and wherever they are.

Knowledge work is increasingly characterized by virtual teaming, where projects and partners constantly change. In many cases, the partners are in other offices or geographies and never meet face-to-face. Involvement in multiple projects of varying lengths and levels of difficulty is becoming the norm. This goes beyond the in-building desk worker. Route delivery staff, formerly responsible for simply delivering and dropping off product, are now being trained in both sales and merchandising. As a result, the kinds of tasks and the required skill sets are changing.

Digital literacy is being emphasized, including analysis, collaboration and the ability to work with and manage others. In many instances, specialists are giving way to generalists, who can work in a variety of situations and cope with frequent change.

Non-Routine Work Identities

THE BUSINESS BUILDER	THE CAREER FREELANCER	THE SIDE GIGGERS	THE PASSIONISTAS	THE SUBSTITUTERS
Primarily driven to be their own boss	Happily building a career through independent work	Supplement existing income with second job	Looking for flexibility to do something they love	Replacing a new job that is no longer available
22%	20%	26%	14%	18%

Source: CEB, Gauging the Gig Economy. 2016.

Urbanization

More than half of the world's population lives in an urban area, a trend that has risen exponentially in recent decades. The reality is this phenomenon is projected to continue at an even stronger rate, with upwards of 70 percent of the world's population occupying urban areas by 2050.

Urban environments create unique challenges for commercial buildings. These include energy and network considerations.

Coworking

By 2020, 40 percent of the workforce will be freelancers, temps, independent contractors and solopreneurs. Yet these individuals still need quality environments to complete unique and personalized tasks. Coworking has emerged as part of a modern lifestyle in which individuals can utilize a common space and benefit from shared equipment, ideas and knowledge. These kinds of spaces can enable increased productivity and work-life balance; in fact, 64 percent of coworking participants claim to be better equipped to complete tasks on time.

Sources: MIT Center for Advanced Urbanism, Health and Urbanism. 2013.
Officevibe, The State of Coworking in 2015.

Employment Share

Percent
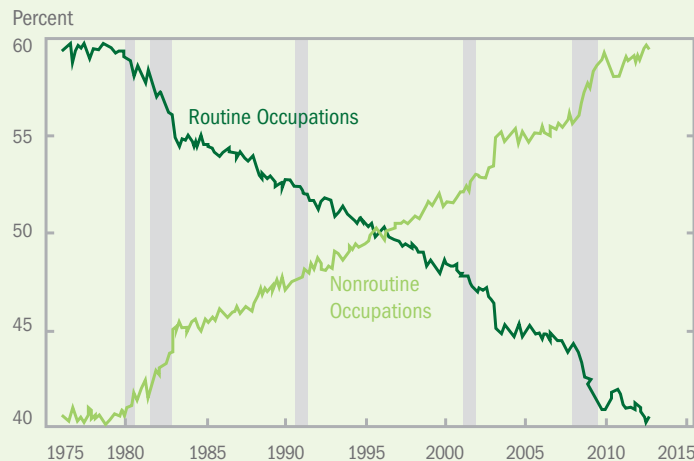
Source: U.S. Census Bureau, Current Population Survey.

Note: The bands indicate recessions as defined by the National Bureau of Economic Reasearch.

Invest in Multimodal Collaboration Environments

In the digital workplace, collaboration presents a spectrum of challenges, from real-time telepresence of videoconferencing to the async/time shift mode of email. Sessions may be transient or need to be archived, available for editing to one or many, or simply available for viewing — and everything in between. The ultimate goal is to make friction-free, anytime/anywhere/any device collaboration available. Solutions require the supporting infrastructure of the physical world, along with a variety of collaboration enablers from the digital world.

Today's digital workplaces must:

- Leverage unified communications and collaboration (UCC) infrastructures to provide support of audio and video data presentation across a variety of device types, locations and communications channels.

- Ensure that adequate bandwidth is provided for the explosion of high-definition video and deployment of multiple screens on desktops, in conference rooms and in public spaces.

- Enable a variety of collaboration tools that address a range of collaborative scenarios.

- Be ready to support and embrace new consumer and social media tools as they become available.

- Enable connectivity everywhere, including areas like parking garages, elevator vestibules and common areas of the building.

The Evolution of Work

ADP Research Institute conducted a 2016 survey that looked at workplace trends for 2,000 individuals across 13 countries. The results show that the workplace is evolving faster than ever before, and they highlight five overarching employee demands:

1. Greater choice and flexibility

2. Access to real-time learning

3. Increased autonomy

4. Sense of stability

5. Ability to work on personally meaningful projects

An organization's ability to meet these demands will determine its ability to attract and retain top talent, as well as improve employee productivity and performance.

Mobile Connectivity

Trends indicate that the use of mobile devices in the workplace will continue to grow. The question is whether commercial buildings will keep up with the need for everywhere connectivity and increasing bandwidth demands.

- 50 percent of employers will require employees to supply their own device for work purposes by 2017.

- 89 percent of employees access business applications through mobile technology (including laptops, smartphones and tablets).

- More than half of buildings in the U.S. consist of dead zones with no communication signal availability.

- Average monthly data usage per smartphone in North America will increase from 2.4 GB today to 14 GB by 2020.

Sources: Gartner, Ibid.
Cisco Unified Access
OSP Magazine, Reviving In-Building Dead Zones.
Ericsson Mobility Report, 70 percent of world's population using smartphones by 2020. 2015.

CHALLENGES

Challenge I: Supporting a BYOD Environment

There are very few things that nearly every employee and visitor carries with them at all times. With the exception of a wallet and a form of identification, the main thing that everyone has on them at all times is a cell phone.

A robust mobile program that allows personal devices to be used in a work capacity can raise productivity and be a competitive advantage. It also introduces new costs and increases the potential for risk.
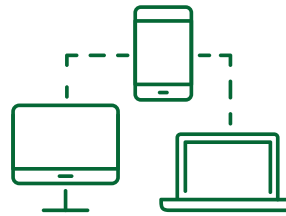
Mobile Zones

At the end of the day, an organization is concerned about controlling the data that employees have access to.

There is a **controlled zone** within which the organization can understand what apps and information it owns and can govern them.

Outside that, there is a **porous zone,** where the organization is not completely aware of the apps, devices and information its employees are using and can only govern part of the space.

Outside the porous zone, there is the rest of the world, an **uncontrolled zone**, where the organization isn't aware of the devices, information and apps that are being used, and has no way of understanding or controlling anything, other than by relying on its employees to behave responsibly.

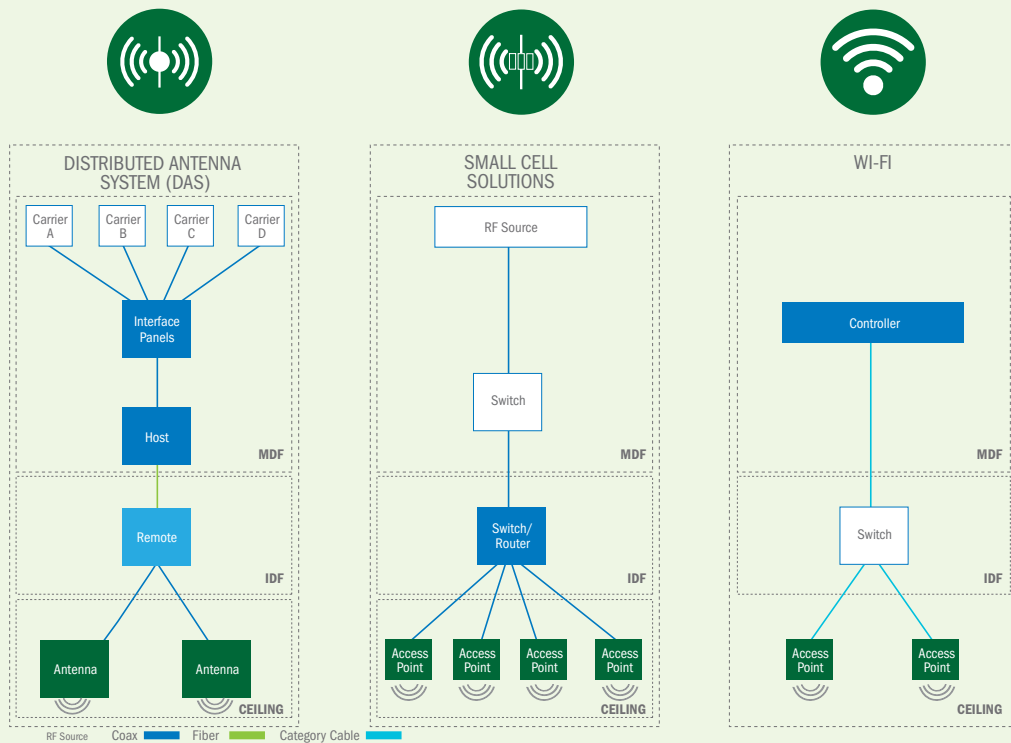Mobile Zones

Controlled Zone

Porous Zone

Uncontrolled Zone
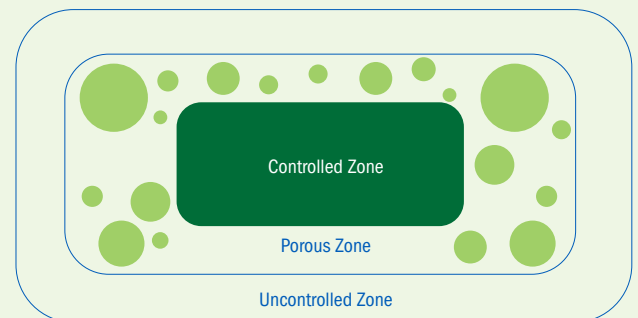
Challenge II: Providing Seamless Network Availability

The goal is to provide the same access to information and business tools no matter if an employee is in a fixed setting, shared space or remote location.

Common Wireless Topologies

DISTRIBUTED ANTENNA SYSTEM (DAS)

| Carrier A | Carrier B | Carrier C | Carrier D |

Interface Panels

Host

MDF

Remote

IDF

Antenna   Antenna

CEILING

RF Source   Coax   Fiber   Category Cable

SMALL CELL SOLUTIONS

RF Source

Switch

MDF

Switch/ Router

IDF

Access Point   Access Point   Access Point   Access Point

CEILING

WI-FI

Controller

MDF

Switch

IDF

Access Point   Access Point

CEILING

Challenge III: Achieving Regulatory Compliance

Organizations today must comply with a maze of complex labor regulations based on evolutions in the relationship between employees and organizations, and trends in the modern workforce.

Public Safety DAS and NFPA 72

One key regulation concerns public safety distributed antenna systems (DAS), which enables communication with first responders during an emergency. The National Fire Protection Association drafted NFPA 72: National Fire Alarm and Signaling Code, providing the latest safety provisions to meet changing fire detection, signaling and emergency communications demands.

While DAS can be essential for tenants or personnel within your building to communicate effectively on an everyday basis, public safety DAS must be on a different spectrum than commercial wireless and cover the entire building, including basements and stairwells – areas you likely aren't concerned with having commercial wireless. Public safety DAS must also have backup in case of an outage.

Current NFPA 72 code consists of the following:

24.5.2.2.1
Critical areas, such as the fire command center(s), the fire pump room(s), exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations, and other areas deemed critical by the authority having jurisdiction, shall be provided with 99 percent floor area radio coverage.

24.5.2.3.1
A minimum inbound signal strength of -95dBm, or other signal strength as required by authority having jurisdiction, shall be provided throughout the coverage area.
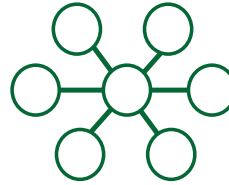
24.5.2.3.1
A minimum outbound signal strength of -95 dBm at the donor site, or other signal strength as required by authority having jurisdiction, shall be provided from the coverage area.

24.5.2.2.3
Buildings and structures that cannot support the required level of coverage shall be equipped with radiating cable system or distributed antenna system (DAS) with FCC-certified signal booster, or both, or with a system that is otherwise approved, in order to achieve the required adequate coverage.
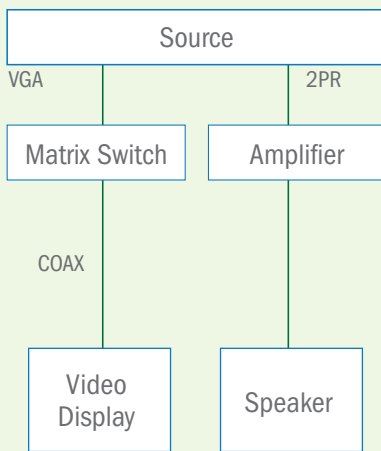
Challenge IV: Restrictions of Legacy Systems

When you are trying to implement new technology within the context of outmoded systems, consider how this may affect workforce efficiency. Legacy systems, including cabling infrastructure, signage or wireless, can be an obstacle to a smooth network migration. Planning and decisions regarding exactly how legacy systems will be migrated or interfaced into consideration systems' inherent restrictions, especially as they relate to the functionality and innovations of the building.
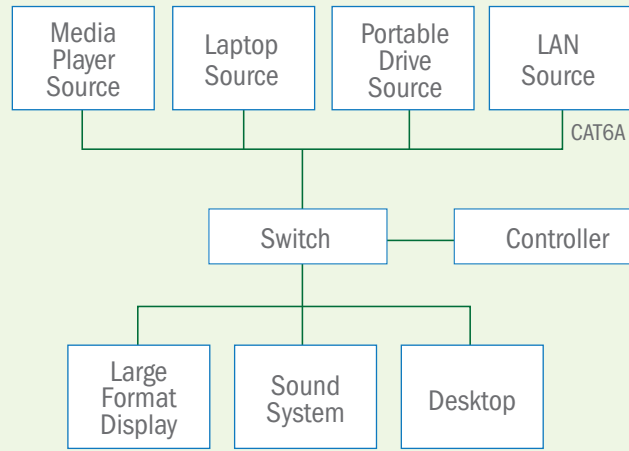
Digital Signage Topology

LEGACY DISPLAY SYSTEMS

```
Source
VGA          2PR
Matrix Switch    Amplifier
COAX
Video Display    Speaker
```

VS

IP-ENABLED DIGITAL SIGNAGE

```
Media Player Source   Laptop Source   Portable Drive Source   LAN Source
                                                              CAT6A
Switch                Controller
Large Format Display   Sound System   Desktop
```
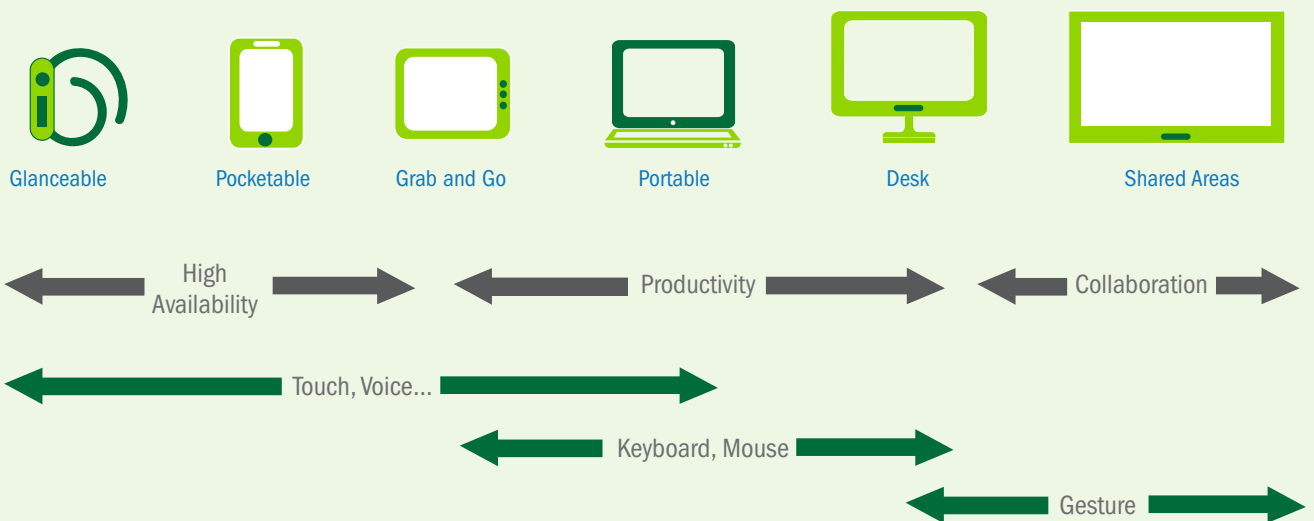
Challenge V: Enabling Collaborative Business Communication

The ease of sharing ideas is particularly important given the increasing complexity of problems that workers are addressing and the demands of global collaboration. Employees need seamless access to business applications across various locations and devices.

As work is becoming more non-routine, commercial building managers need to focus on technologies that allow people to form dynamic teams that can advance business goals.
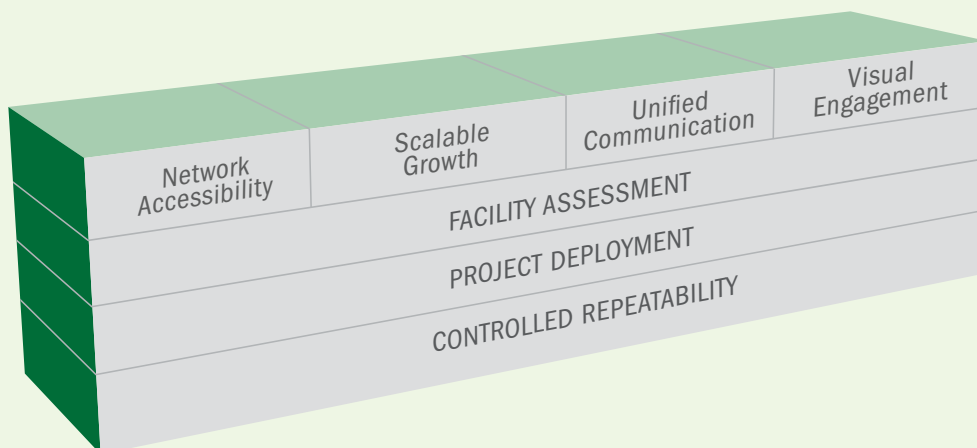
More Screens in More Places

Glanceable	Pocketable	Grab and Go	Portable	Desk	Shared Areas

← High Availability → ← Productivity → ← Collaboration →

← Touch, Voice... →

← Keyboard, Mouse →

← Gesture →

Source: Gartner (April 2015)

SOLUTIONS

The Anixter Approach
Advanced Mobility and Communications

The evolution of workforce behavior, multiple work locations and device management and mobility is driving an enormous amount of change within commercial organizations. Our approach provides a clear set of guidelines and best practices for supporting advanced mobility throughout the building, which can lead to increased business productivity.

Network Accessibility — Scalable Growth — Unified Communication — Visual Engagement

FACILITY ASSESSMENT

PROJECT DEPLOYMENT

CONTROLLED REPEATABILITY

Best Practice I:
Network Accessibility

Apply designs to accommodate your performance requirements and overall cellular coverage in your building.

Considerations

When enabling network accessibility, it is important to consider:

☐ How do you manage multiple operators on your network?

☐ Can you describe the cell coverage in your building?

☐ Do you want to have control of your wireless infrastructure?

☐ What generation of Wi-Fi technology are you adopting?

Recommended Solutions

Distributed Antenna System (DAS)

DAS is increasingly critical in a BYOD environment. This system of connected antennas provides consistent cellular coverage and ensures the ability to use a mobile device anywhere in the building. One important consideration when implementing a DAS network is how to fund the deployment. It is a best practice for the building owners and operators to fund their own multi-operator system that allows them to negotiate independently with carriers. This provides flexibility with installation and long-term technology choices.

Small Cell

Small cell technology connects small radiating points back to a central head end to provide coverage for a single carrier within a building. This central head end contains an integrated RF source. From a network accessibility standpoint, the carrier only has to provide backhaul into the carrier network. The benefit of small cell is in the ease of implementation, which allows for quick deployment and minimal disruption, especially in already occupied buildings. Small cell is the proper choice when looking to deploy a single carrier, whereas DAS supports a multiple-carrier environment.

Wi-Fi

Wi-Fi acts as a complementary technology to cellular coverage in a building. Customers and visitors alike expect wireless connectivity for the range of devices they carry, such as smartphones, tablets and laptops. Wi-Fi extends Ethernet service throughout the building, and allows for the management of different levels of access for employees and visitors, assisting security and behavior preferences. There is also a cost-saving element of Wi-Fi with limiting data usage on organization-sponsored devices.

Relationships with Carriers and Wireless Integrators

The key to a successful wireless deployment is getting carriers to provide or approve the RF source. Since carriers own the spectrum, their approval is required to turn on a system and ensure quality and access across the network. A qualified wireless integrator will have the carrier relationship to help achieve this requirement.

Best Practice II:
Scalable Growth

Determine the right choice to support the capacity increases of a BYOD and multi-device environment.

Considerations

When planning for scalable growth, it is important to consider:

☐ What type of multi-device connectivity do you provide?

☐ How do your security polices allow for BYOD?

☐ How do you manage BYOD bandwidth demands?

☐ How do you plan for employee and facility expansion?

Recommended Solutions

Cabling Considerations—Future Expansion
As projections for bandwidth demands continue to skyrocket, a key tactic to ensure scalable growth is over-provisioning the initial cable deployment. It is much simpler and less expensive to upgrade edge wireless technologies than to undergo the disruption necessary to upgrade infrastructure.

Distributed Antenna System (DAS)
A well planned DAS can allow for expansion in capacity, coverage and the carriers involved. As the need for more space or employees drives additional requirements, DAS is able to grow with additional remotes and carriers.

Small Cell
This system is based on category cable and allows for additional radiating points to be deployed by pulling additional cable.

Wi-Fi
With an over-provisioning of the initial cabling, Wi-Fi allows for densification of the system with an easy installation of additional access points. It is important to support the latest generation production with the greatest bandwidth, currently 802.11 AC. As technology evolves to 802.11 AD and beyond, the bandwidth and speed will continue to increase in the access points.

Best Practice III:
Unified Communication

Choose the appropriate communications equipment to provide a high-quality voice, data and video experience for employees.

Considerations

When enabling unified communication, it is important to consider:

☐ How do you ensure a high-quality voice and video experience?

☐ What type of architecture do you adopt for voice, data and video communication?

☐ How do you support and ensure a consistent experience across current and future business applications?

Recommended Solutions

VoIP Telephones
VoIP technology is mature and allows for easy movement or provisioning of phones to support the needs of the business.

Additional cost of VoIP is minimal, and it provides flexibility for employees to work from a variety of locations and according to their own work preferences. VoIP can be used to access different business applications and provide a consistency of experience for the user across devices.

Wired and Wireless Headsets
With more offices heading towards an open configuration, employees and visitors may feel the need to move to a private space while on a call. At other times, multitasking requires hands-free capabilities. Offering both wired and wireless capacity on a VoIP-enabled device provides an adequate amount of flexibility to support the specific needs of employees.

Audio Conferencing Equipment
As the demand to collaborate with multisite teams increases, the ability to effectively communicate with a group becomes more and more important. VoIP-enabled audio conferencing equipment should be able to support the application of choice for particular organizations, and provide a consistent experience in different kinds of meeting environments.

Elements of Unified Communications
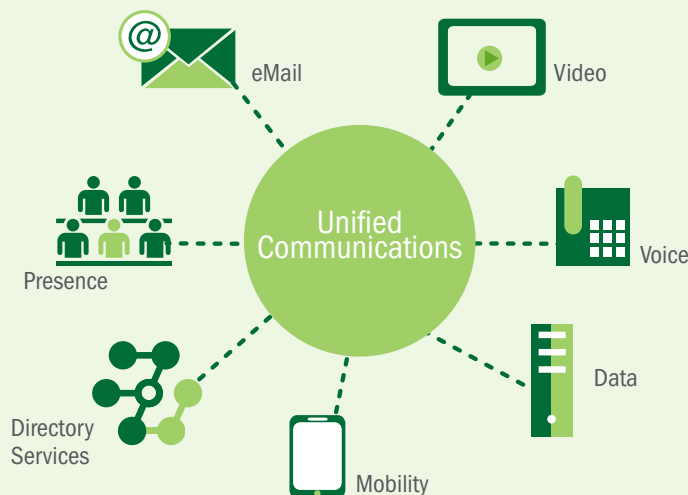
Best Practice IV:
Visual Engagement

Capture the attention of staff and visitors and deliver vital information through digital signage and mass notification solutions.

Considerations

When providing visual engagement, it is important to consider:

☐ How do you share content with visitors and employees?

☐ What is your digital signage strategy?

☐ How do you communicate in an emergency event?

☐ Where do you control centralized content?

Recommended Solutions

Networked Digital Signage Infrastructure
Networked digital signage allows for directed messaging to employees and customers based on need and location. It also allows employees to used content stored on network drives. Managed within a single building or across multiple locations, a networked system provides fresh content on a regular basis, empowering the delivery of the right information to the right audience at the right time.

High-Definition Large-Format Displays
With a networked digital signage infrastructure in place, high-definition displays represent the best way to communicate a corporate message in a short amount of time to employees and visitors. It is important to utilize commercial-grade displays specific to the behavior and usage projections of a particular location, as this will provide longer life for the product and more flexibility for use.

Video Walls
Many commercial settings are enhancing the impact of high-definition large-format displays through organization on a multi-display wall, often arranged in patterns of three by three or five by five. This collection of screens can be used to analyze multiple pieces of data at once, for instance in a control room or security environment, or in a public setting to deliver or expand corporate messaging in a dynamic way.

Mass Notification Solutions
When an emergency event takes place, mass notification allows for audio and visual communication to be distributed to customers and visitors. With a networked digital signage infrastructure, an organization can deliver unique content and instructions to signage, in addition to overhead speakers, individual devices and computers, all based on predetermined zones.

TECHNOLOGY SUMMARY

Technology Solutions

The chart below details the technology solutions that can support advanced mobility and communications in a commercial building.

TECHNOLOGY	Network Accessibility	Scalable Growth	Unified Communication	Visual Engagement
DAS	✓	✓		
Small cell	✓	✓		
Wi-Fi	✓	✓		
Public safety DAS	✓	✓		
VoIP	✓	✓	✓	
Mass notification		✓	✓	✓
Digital signage	✓	✓	✓	✓
Sound and paging	✓	✓	✓	
Conferencing		✓	✓	✓
Control systems	✓	✓		✓

Anixter's Technology Support Services can offer further insight to your specific application. For more information, contact your local Anixter representative.

anixter.com/commercialbuilding

SUPPLY CHAIN SOLUTIONS

As you develop a smart building roadmap, it's also important to consider the physical migration from the existing environment to the building's future state. This entails identifying the challenges and risks during the installation phases of technology deployment. Coordination between material deployment and installation schedules can have an impact on the productivity, efficiency and connectivity of work environments.

Properly coordinated deployments allow for tangible savings in time, reduced installation costs and increased efficiencies, all while reducing the risks of lost productivity associated with the physical migration of the building environment.

Challenge	Service	Save Time	Reduce Costs	Increase Efficiency	Mitigate Risk
Creating an installation schedule that maximizes business productivity	Staged deployment	✓		✓	
Kitting similar solution components for coordinated installation	One part number for each unique configuration	✓	✓	✓	✓
Managing integrator SLAs and maintenance agreements	Life cycle management, asset management and managing maintenance costs and upgrades		✓		✓
Creating a functional roadmap for material deployment that limits disruptions in business operations	Inventory management	✓	✓	✓	✓
Reducing on-site installation time and interruptions	Site-ready equipment	✓	✓	✓	✓
Critical component failure at start-up	Off-site burn in and DOA check			✓	✓

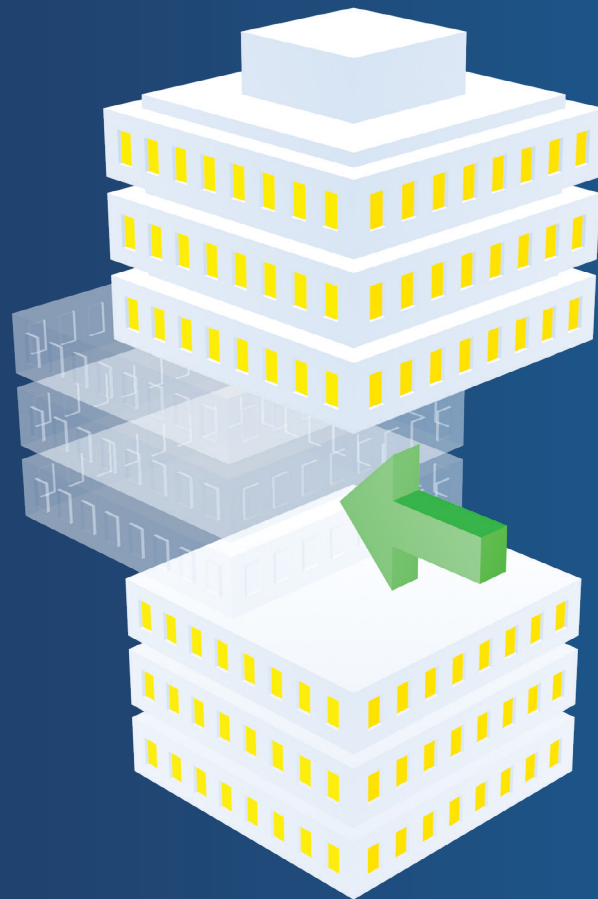For more information, contact your local Anixter representative.

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ANIXTER

SPACE UTILIZATION
# BEST PRACTICES

OPTIMIZING REAL ESTATE EFFECTIVENESS

INTRODUCTION

With the competing realities of more employees concentrated in smaller spaces and the increased desire for useful, collaborative areas, optimizing already limited space is important for the productivity and efficiency of employees and of the building itself.

Commercial buildings contain a number of functional spaces, including the main reception, common work areas, meeting environments, private office locations, technical rooms and various departmental zones. It is important to understand the unique challenges and potential of each space in order to maximize the technology within the space to achieve optimal levels of productivity.
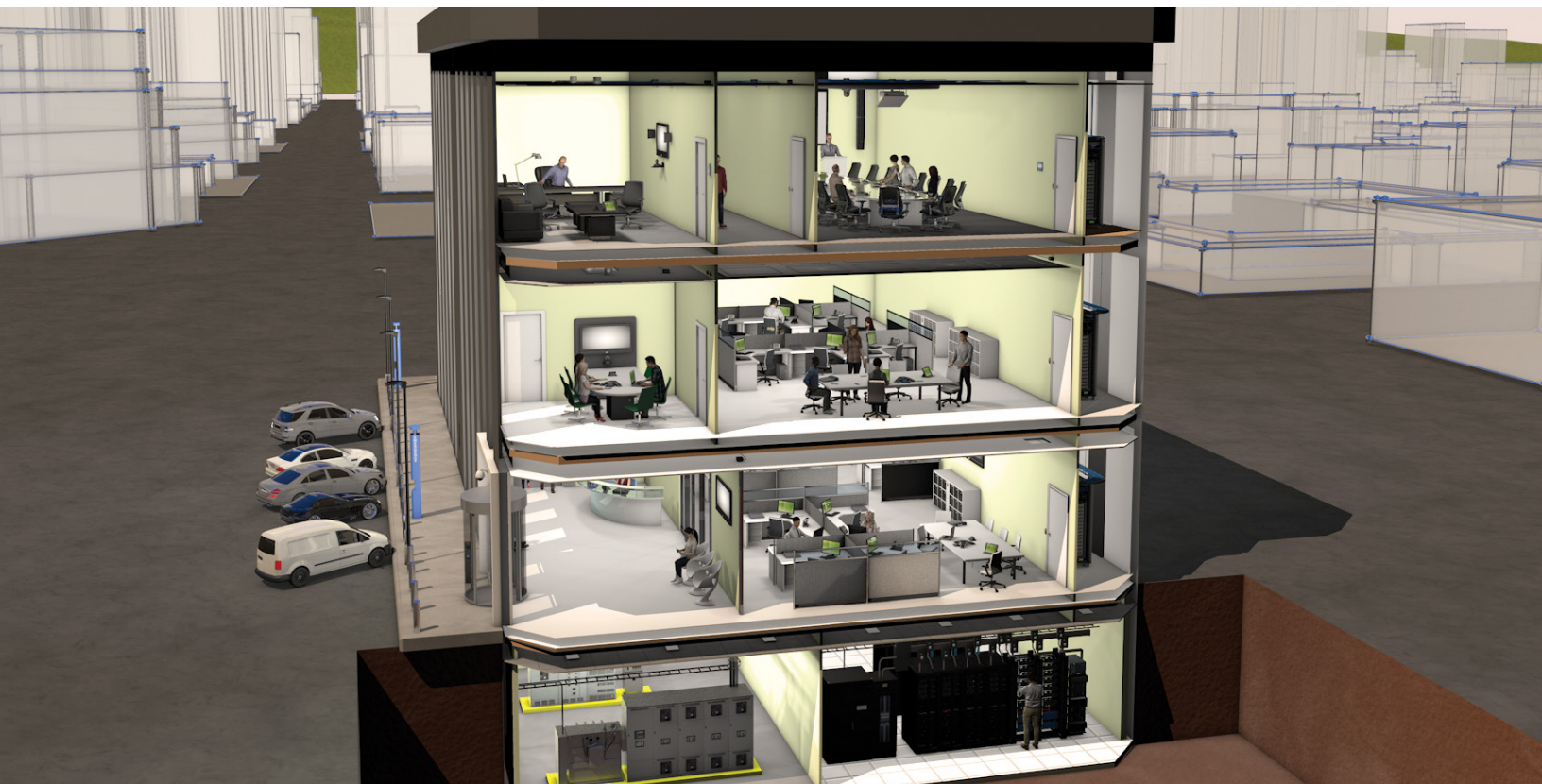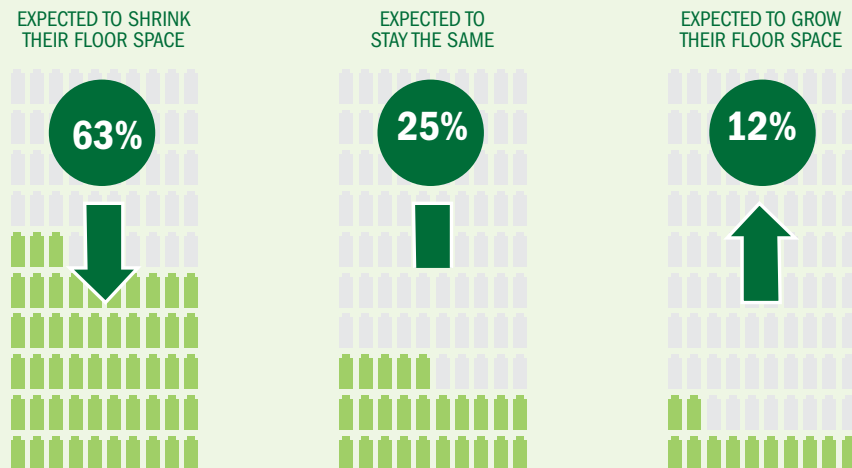
The Reality of Consolidation

A survey of corporate real estate professionals shows 63 percent expect their company's real estate portfolio to contract this year. This is compared to 12 percent who expect growth and 25 percent who believe it will remain the same.

Meanwhile, many organizations are moving towards alternative work strategies:

• Home offices on a full-time or part-time basis

• Hoteling or free address work spaces

• Mobile work at multiple spaces

• Satellite offices

Commercial Consolidation

EXPECTED TO SHRINK
THEIR FLOOR SPACE

63%

EXPECTED TO
STAY THE SAME

25%

EXPECTED TO GROW
THEIR FLOOR SPACE

12%

Source: CoreNet Global/ Steelcase, Reducing the Portfolio & Maximizing the Use of Existing Space.

CONSIDERATIONS

Space Utilization and Productivity

Employees spend less time in the office and more time in alternative workplaces than ever before. Leading companies have been able to embrace this trend and, through a smart building strategy, enhanced employee productivity up to 18 percent.

For example, improved air quality, just one element of staff comfort, can boost worker productivity from .05 to 5 percent, according to a study by Lawrence Berkeley National Laboratory.

Workplace Trends

Employee engagement initiatives are driving the IT requirements in physical office workspaces.

Wireless networks are becoming more intricate as more employees are concentrated in smaller spaces.

Conference rooms are frequently the focal point for introducing new technology solutions.
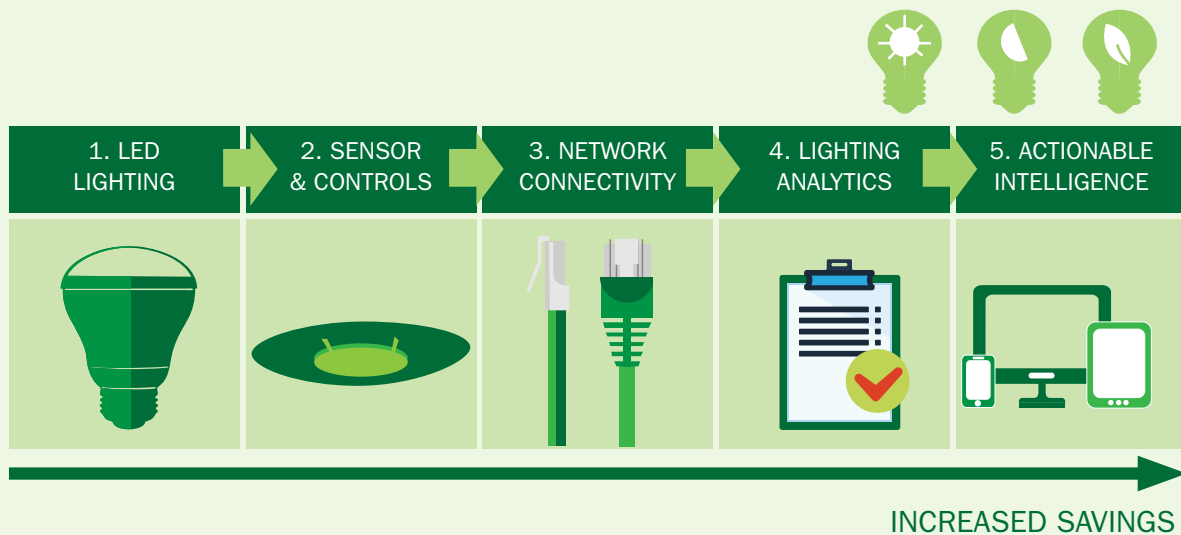
IT interaction with the corporate real estate group is growing.

Sources: IBM and Honeywell.

Enabling Smart Lighting

Smart lighting is a key technology, where intelligent sensors capture information that can drive essential building productivity performance. Smart lighting is enabled through Power-over-Ethernet (PoE) or network controls.

Enabling Smart Lighting

1. LED LIGHTING	2. SENSOR & CONTROLS	3. NETWORK CONNECTIVITY	4. LIGHTING ANALYTICS	5. ACTIONABLE INTELLIGENCE

INCREASED SAVINGS

Source: Gartner. The five phases that smart lighting providers must address.

The 3/30/300 Rule

According to commercial real estate leader Jones Lang LaSalle (JLL), there is a 3/30/300 rule for understanding cost in terms of employees and commercial buildings.

Organizations on average spend approximately $3 per square foot annually for utilities, $30 for rent and $300 for payroll. While these numbers are not true for every organization, especially a few key in-demand markets, they are useful to understand the drastic difference between the three areas of expenditure.

JLL explains it like this:

According to the 3-30-300 model, the greatest financial savings of greening a workplace may not be energy but productivity.
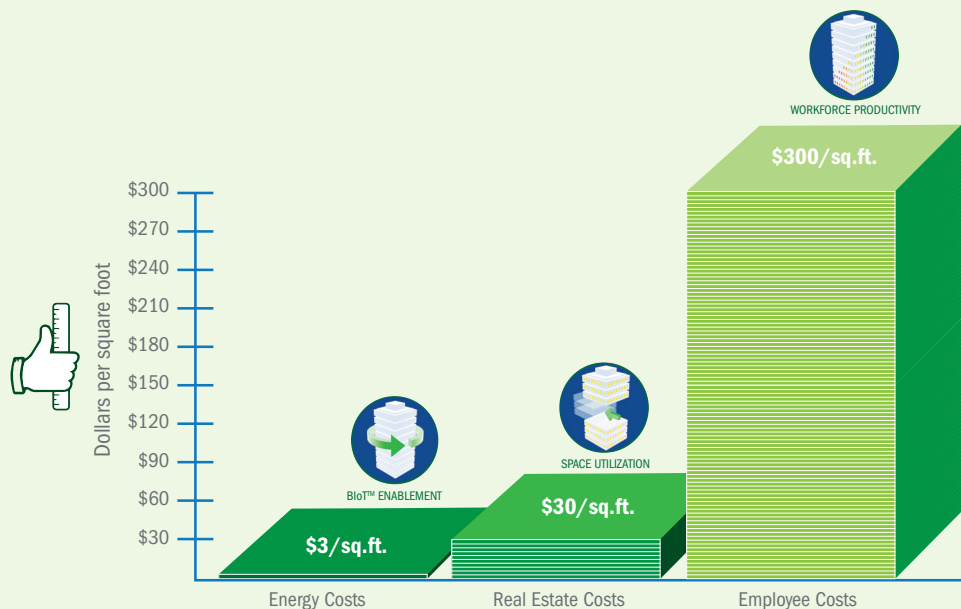
- A two percent energy efficiency improvement would result in savings of $.06 per square foot.

- A two percent gain in productivity is worth $6 per square foot.

The best strategy, therefore, is to identify measures that improve employee productivity and will also result in space efficiency, resource conservation or energy efficiency.

The purpose of better utilization of space in a commercial setting includes the following:

- Reduce costs of occupancy – either the rent or capital cost of the building due to reduced footprint.

- Reduce operating costs through energy efficiency.

- Provide a comfortable and efficient workplace where employees can safely and effectively perform their assigned tasks.

3/30/300 Rule in Commercial Buildings

Dollars per square foot

BIoT™ ENABLEMENT — $3/sq.ft. — Energy Costs

SPACE UTILIZATION — $30/sq.ft. — Real Estate Costs

WORKFORCE PRODUCTIVITY — $300/sq.ft. — Employee Costs

Source: Jones Lang LaSalle, Perspectives on Workplace Sustainability. 2015.

CHALLENGES

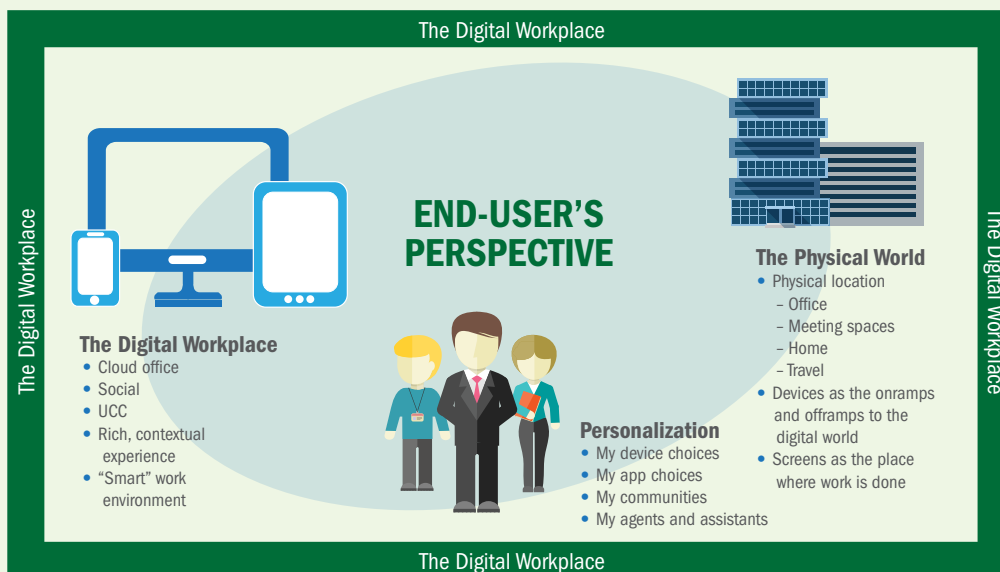## Challenge I: Adapting to a Changing Workforce

It is crucial to understand the particular economic and social drivers of the modern workforce so you are able to position your physical spaces as an asset.

Gartner defines a digital workplace as a business strategy to boost employee agility and engagement through a more consumerized work environment. Just as in a retail environment you would pay attention to consumers' preferences and habits to achieve the end goal of sales, in an office environment you must pay attention to the preferences and habits of the workforce to achieve the end goals of efficiency and productivity. Technology supports the environment, but it alone is not sufficient to build a digital workplace. An awareness and understanding of workforce trends is also necessary.

Source: Gartner. The Recipe for a Digital Workplace. 2016.

The Digital Workplace from the End-User Perspective

The Digital Workplace

END-USER'S PERSPECTIVE

The Digital Workplace
- Cloud office
- Social
- UCC
- Rich, contextual experience
- "Smart" work environment

Personalization
- My device choices
- My app choices
- My communities
- My agents and assistants

The Physical World
- Physical location
  – Office
  – Meeting spaces
  – Home
  – Travel
- Devices as the onramps and offramps to the digital world
- Screens as the place where work is done

Challenge II: Growing Cost of Real Estate

The cost of commercial real estate is up 16 percent across the United States in the last decade and is even higher in urban areas. With the phenomenon of urbanization, that trend will more than likely continue at a rapid pace in many competitive areas.

Specific drivers of cost include increased utility costs, increased environmental awareness and increased regulatory requirements.

Real Estate Alternatives

Today's employees have been freed from the constraints of a desk. They can perform key tasks remotely, at a secondary site, in a cafe or while traveling.

Source: Forbes. Neil Howe, The Reality of the Commercial Real Estate Boom. 2016.

Alternatives to the Traditional Commercial Setting

cafe?
conference?
in transit?

at the office   in the branch   from home   ...or just offsite

Challenge III:
Rising Energy Costs

The Department of Energy notes that 20 percent of all energy used in the United States last year was consumed by commercial buildings, costing companies a collective $180 billion.

## Challenge IV:
Offering Functional
Meeting Environments

With increasing limitations in space, it becomes even more difficult to create settings that allow for simplified sharing of ideas, which leads to improvements in productivity.

In some cases, organizations have an adequate amount of square footage to create functional meeting environments, but the area is not being utilized in the most efficient manner. A first step is to locate specific rooms that are heavily utilized, and look for ways to capitalize on them.

Challenge V: Meeting Employee Comfort Requirements
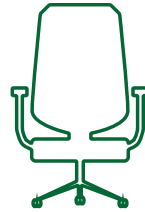
Improved air quality, just one element of staff comfort, has been shown to boost worker productivity by anywhere from .05 percent to 5 percent, according to a study by Lawrence Berkeley National Laboratory.

Other factors to employee comfort include seating and desk arrangements, lighting, and fitness and health opportunities.
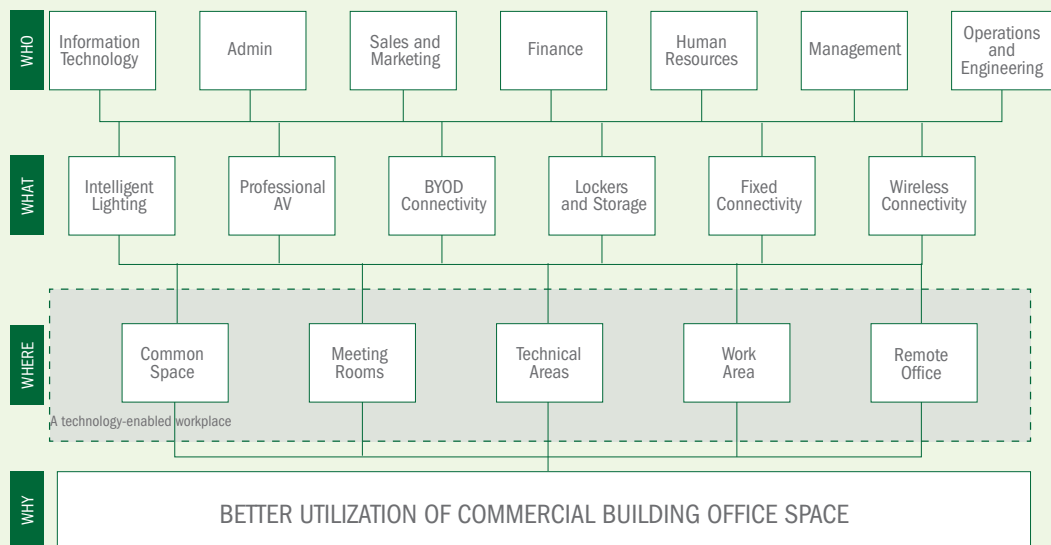
So what is the goal, and how do we get there?

In order to achieve better utilization of commercial building office space, we need to better understand:

• WHO are the various departments of the business?

• WHAT current systems are being used or considered?

• WHERE are the best areas and spaces to get the most ROI?

This is a role-based view of employee functionality, which recognizes that people perform multiple types of work practices over the course of the day. Knowing the work they do is important to overall understanding.
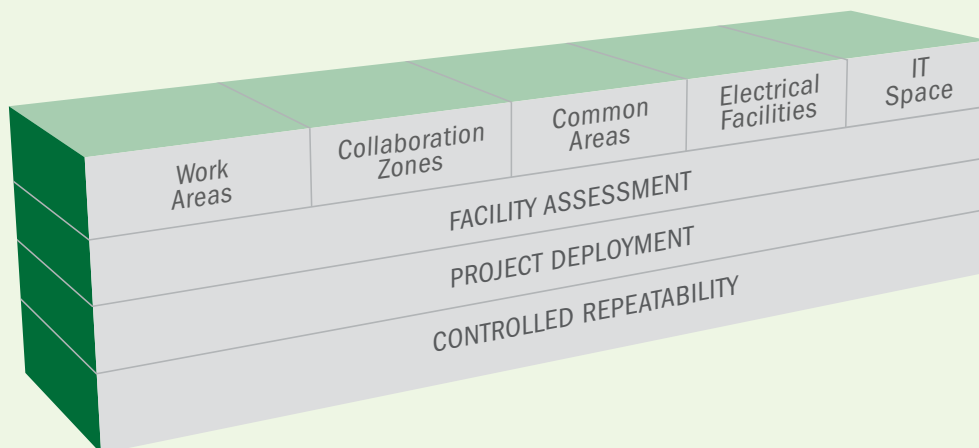
A Technology-Enabled Workplace

WHO	Information Technology	Admin	Sales and Marketing	Finance	Human Resources	Management	Operations and Engineering

WHAT	Intelligent Lighting	Professional AV	BYOD Connectivity	Lockers and Storage	Fixed Connectivity	Wireless Connectivity

WHERE	Common Space	Meeting Rooms	Technical Areas	Work Area	Remote Office

A technology-enabled workplace

WHY	BETTER UTILIZATION OF COMMERCIAL BUILDING OFFICE SPACE

SOLUTIONS

The Anixter Approach
Optimize Real Estate Effectiveness

Reducing real estate costs, adjusting to changes in employee behavior and efficient resource allocation are the main drivers behind the need to optimize real estate effectiveness. Our approach provides a clear set of guidelines and best practices for supporting this optimization, which can lead to increased employee performance and building energy efficiency.

Work Areas — Collaboration Zones — Common Areas — Electrical Facilities — IT Space

FACILITY ASSESSMENT

PROJECT DEPLOYMENT

CONTROLLED REPEATABILITY

Best Practice I:
Work Area

Create open and flexible work areas that can support permanent and visiting employees. Many organizations achieve optimization in work areas through the adoption of "hoteling" or "hot desking." By limiting dedicated work stations while also thoughtfully attending to private and public zones, it is possible to reduce square footage requirements and their associated costs.

Considerations

When optimizing work areas, it is important to consider:

- ☐ What is your risk of unsecured storage or employee belongings?
- ☐ How do you manage hot desking and hoteling?
- ☐ What is your ergonomics policy/strategy?
- ☐ How do you control your lighting?

Recommended Solutions

Mobile and Fixed Network Connectivity
As people move to different areas of the building, they expect similar network connectivity for their corporate and employee-owned devices (laptops, tablets, smart phones, etc). The same is true as people come and go from the building itself. Scheduling becomes an important factor in managing space and network access.

Locker Facilities
In an environment where nobody has an assigned location, it is important to provide secure storage for personal items. Lockers are a great way to provide that. This can be in the form of permanent or mobile lockers, the latter of which allow for more flexibility in managing space for non-permanent or traveling employees.

LED Controllable Lighting and Sensor Network
Personalization of IP-based systems, like PoE lighting, device activation, VoIP, room controls and others, helps maximize building efficiencies and personal productivity. Lighting is the easiest way to get sensors into a space that can enable occupancy tracking, temperature and humidity measurement and daylight harvesting. This solution is about the collection of data to develop actionable intelligence for building owners and administrators.

Best Practice II:
Collaboration Zone

Provide dynamic environments that simplify sharing of content and conferencing demands. These environments include small and medium-sized conference rooms, huddle rooms, as well as more customized executive and auditorium presentation areas.

Considerations

When providing collaboration zones, it is important to consider:

☐   Where do you currently share ideas and content?

☐   What is/are your conferencing method(s)?

☐   How do you maximize user experience?

☐   What are your meeting room standards?

Recommended Solutions

IP-enabled Professional AV
The best-in-class solutions now run on IP networks and allow for the best options for collaboration zones. Solution categories include digital signage, sound and paging, conferencing, collaboration and control, and allow for a professional A/V solution with seamless use across locations.

HDBaseT Transmission
The latest generation of A/V transmission for commercial spaces provides audio, video, control, Ethernet and power over a single Category cable. By doing so, a number of previously unusable spaces are now free to be utilized.

Standards-based Infrastructure
Following standard structured cabling guidelines makes the process of future-proofing easy to understand. As A/V technologies evolve, a high-performance structured cabling allows you to support the latest edge devices with minimal disruptions.

Best Practice III:
Common Area

Establish consistent communication and connectivity in high-traffic areas of the building. Examples include corridors, reception and cafeterias. These spaces need to be flexible enough to adapt to a number of functions, including business and guest utilizations.

Considerations

When planning for common areas, it is important to consider:

☐ What is your visitor management process?

☐ How do you share information in common space?

☐ What are your "way finding" capabilities?

☐ How do you provide public network access?

Recommended Solutions

Automated Visitor Registration Tools

As concerns over emergency events increase, it is important to identify visitors and ensure their location is known within the building. A benefit can also be found in non-emergency situations, where visitor registration tools can assist in the guidance and control of the preferred experience for the visitor.

Networked Digital Signage Infrastructure

Networked digital signage allows for directed messaging to employees and customers based on need and location. It also allows employees to used content stored on network drives. Managed within a single building or across multiple locations, a networked system provides fresh content to common areas on a regular basis, empowering the delivery of the right information to the right audience at the right time.

High-Definition Large-Format Displays

With a networked digital signage infrastructure in place, high-definition displays represent the best way to communicate a corporate message in a short amount of time to employees and visitors in common areas. It is important to utilize commercial-grade displays specific to the behavior and usage projections of a particular location, as this will provide longer life for the product and more flexibility for use.

DAS, Small Cell and Wi-Fi Solutions

A robust wireless coverage solution allows employees and visitors to use common areas as overflow work spaces when necessary. It also addresses the way people utilize personalize devices throughout their time in a commercial setting.

Best Practice IV:
Electrical Facilities

Monitor room-by-room electricity consumption and performance with intelligent power solutions.

Considerations

When supporting electrical facilities, it is important to consider:

☐ How do you currently monitor electricity in your facility?

☐ What are the main areas of energy consumption?

☐ What is the expected savings using LED lighting?

☐ Have you adopted multi-speed fans for HVAC?

Recommended Solutions

Intelligent Power Backup
As more applications rely on remote powering methods such as Power-Over-Ethernet (PoE) and HDBaseT, centralized power backup is needed to ensure application resiliency. At a minimum, line interactive smart UPS backup provides protection for the most common power anomalies such as power failure, sag, surge and under/over-voltage events. For higher levels of protection, consider double conversion UPS solutions. For facilities such as healthcare that may require additional resiliency from power anomalies, UPS platforms that support A and B power feeds can be considered.

Intelligent LED Lighting
Connected Power-over-Ethernet or network control lighting fitted with sensors can collect a variety of data and provide building owners and administrators with actionable insight into their spaces. Sensors can monitor energy consumption in addition to tracking occupancy, measuring temperature and humidity and harvesting daylight. LED lighting should be utilized to maximize energy savings. From an intelligent power backup perspective, emergency lighting should have at least 90 minutes of runtime during a power outage.

IP-based Environmental Sensors
Ethernet connectivity is commonplace among many building subsystems such as video surveillance, access control and connected lighting platforms. Utilizing a single protocol communications framework to exchange information across multiple BMS and physical security platforms is the principal advantage of IP-based networks. This approach is extending further to the building edge as more BMS devices are becoming IP-enabled. While native Ethernet device interfaces provide for a more seamless integration path to building management, there are solutions that can provide the necessary conversion from common building protocols such as BACnet, LonWorks and Modbus to Ethernet. Consideration should be given to the migration strategy that optimizes cost with the technical benefits of a fully integrated building management platform.

Best Practice V:
IT Space

Plan for the appropriate floor space to support telecommunications rooms, data centers and IT resources.

Considerations

When utilizing IT Space, it is important to consider:

☐ How do your IT closets cater for growth?

☐ What are your considerations for wireless coverage?

☐ How do you use IP technology in meeting rooms?

☐ Do you use an on- or off-premise data center?

Recommended Solutions

Standards-based TR and Equipment Room Design

The industry standards committees such as the TIA, ISO and BICSI provide guidance on structured cabling design for commercial buildings. A telecommunications room should be designed and sized according to the area that it is serving within the building structure, but consideration should be given to the number of devices that need to be supported up to and above the basic production network applications. The ANSI/TIA-568.1-D Commercial Building Telecommunications Infrastructure Standard and the ANSI/TIA-862-B Structured Cabling Infrastructure Standard for Intelligent Building Systems can be referenced when designing the TR and ER spaces.

Allowances for Future Proof Pathways and Spaces

The rapid pace of technology innovation increases the complexity of pathway and space design, as it is difficult to anticipate the technical needs of a commercial building over its lifespan. Early planning and adopting a cross-functional design approach across facilities and IT can work to ensure a building layout that supports the current and future application requirements of an organization. The ANSI/TIA-568-D Telecommunications Pathways and Spaces Standard provide best practice recommendations for pathway and space design in support of telecommunications media and equipment within buildings.

Integrated Structured Cabling for Meeting Room Furniture

In many commercial building environments, space can come at a significant cost premium, as the floor layouts may not accommodate the additional TRs or pathways needed to support the number of devices and applications being deployed into either a new or existing structure. Zone cabling can provide flexibility by extending network distribution nodes needed for devices such as wireless access points, surveillance cameras, door controllers and connected LED lighting from the TR further into the work area.

Enterprise, MTDC and Edge Data Center Solutions

Data center design is not a one size fits all proposition. Traditional on-premise data centers optimize capital spend around physical security of an organization's computing assets coupled with lower density computing environments. Multi-tenant data centers provide cost-effective off-premise computing for organizations looking to control their IT spend and improve operational efficiency. Distributed or edge-based computing has advantages in delivering network computing and storage closer to the user.

TECHNOLOGY SUMMARY

Technology Solutions

The chart below details the technology solutions that can support optimizing real estate effectiveness in a commercial building.

TECHNOLOGY	Work Area	Collaboration Zones	Common Areas	Electrical Facilities	IT Space
LED lighting	✓	✓	✓	✓	✓
Sensor networks	✓	✓	✓	✓	✓
Conferencing	✓	✓			
Sound and paging	✓	✓	✓	✓	✓
Digital signage	✓	✓	✓		✓
Fixed network connectivity	✓	✓		✓	✓
DAS | Small Cell | Wi-Fi	✓	✓	✓	✓	✓
Pathways and cable management	✓	✓	✓	✓	✓
Intelligent power				✓	✓

Anixter's Technology Support Services can offer further insight to your specific application. For more information, contact your local Anixter representative.

anixter.com/commercialbuilding

SUPPLY CHAIN SOLUTIONS

As you develop a smart building roadmap, it's also important to consider the physical migration from the existing environment to the building's future state. This entails identifying the challenges and risks during the installation phases of technology deployment. Coordination between material deployment and installation schedules can have an impact on the productivity, efficiency and connectivity of work environments.

Properly coordinated deployments allow for tangible savings in time, reduced installation costs and increased efficiencies, all while reducing the risks of lost productivity associated with the physical migration of the building environment.

Challenge	Service	Save Time	Reduce Costs	Increase Efficiency	Mitigate Risk
Coordinating installations by kitting similar solution components	Headset, workstation, wireless, lighting and patch cable kits	✓	✓	✓	✓
Creating a functional roadmap for material deployment from our site, contractor site or the job site to limit disruptions in business operations	Material staging and inventory management solutions	✓	✓	✓	✓
Reducing on-site waste removal and dust contaminates	Product pre-assembly and off-site configuration	✓	✓	✓	✓
Utilizing standards-based labeling schemes for ongoing asset utilization and maintenance	LED lighting assembly, labeling and kitting	✓		✓	

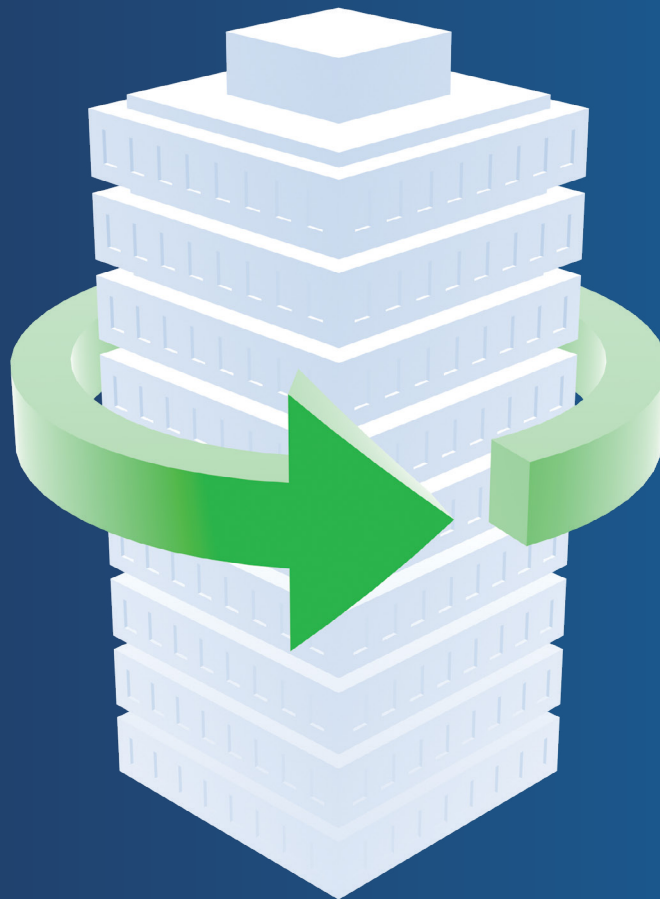For more information, contact your local Anixter representative.

anixter.com/services

BIoT ENABLEMENT
BEST PRACTICES

THE FIVE SENSES OF AN INTELLIGENT BUILDING

ANIXTER®

INTRODUCTION

People make decisions based on information. This is the ultimate goal of intelligent building design. By looking for ways to acquire information about the building environment, analyze it and make real-time adjustments, smart commercial buildings are able to maximize their potential for productivity and efficiency.

When a building can understand occupant preferences and control disparate systems, it is then able to provide a unique and specialized experience for building operators and end users.

To this point, we have explored the various components for migrating to a smart building platform. The final element brings them together, leveraging an open architecture environment to simplify the task of managing risk, enhancing performance, increasing productivity, improving utilization of space and reasonably future-proofing an asset to adopt new technologies over its life cycle.

Simplifies Risk

A proactive approach to safety and security provides security professionals with enhanced analytics and risk detection.

Enhances Performance

Powerful network infrastructure can enable innovative solutions to the most complex business challenges.

Increases Productivity

A commercial building that maximizes the potential of the Internet of Things unleashes the technological prowess and skills of a digital workforce.

Maximizes Space Utilization

An environment that responds to the demands of limited space and the desire for collaboration will see gains in productivity and efficiency of employees and assets.

CONSIDERATIONS

Information Management

The core of smart building design is useful information, or in other words, actionable data that can help a building run more efficiently. Building owners and operators are under pressure to run a more efficient operation and do more with less, and as the old adage states, you can't manage what you don't know.

Commercial buildings increasingly house mountains of data, and industry leaders are discovering ways to unleash its potential.

The Risk of a Paralyzed Operation

Collecting and analyzing information is critical to the decision-making process. Not doing so can increase the risk of paralysis, making it difficult to make predictive decisions, plan for the future and have an understanding of the building's current state.

For example, without collecting, monitoring and analyzing the right information, there can be no basis for current and future planning, which can potentially lead to a state of confusion or disorder in a critical environment. Without timely and comprehensive reports, it's difficult to highlight inefficiencies that are costing the business. Without live feeds, there is an overall lack of awareness, keeping the team out of touch with its environment.

Vulnerabilities Across Control Systems

In a 2015 Industrial Control Systems Cyber Emergency Response Team (ICSCERT) report, 74 percent of critical infrastructure members reported an increase in security vulnerabilities across connected control system infrastructures.

While cyber attacks on customer records and credit card information receive more public attention, building operators, who increasingly have automation systems, safety systems and critical environmental technology all connected to the same network, face the need to guard against life-threatening and catastrophic events.

Source: Johnson Controls and Booz Allen Hamilton Inc., CyberSmart Buildings: Securing Your Investments in Connectivity and Automation. February 2017.
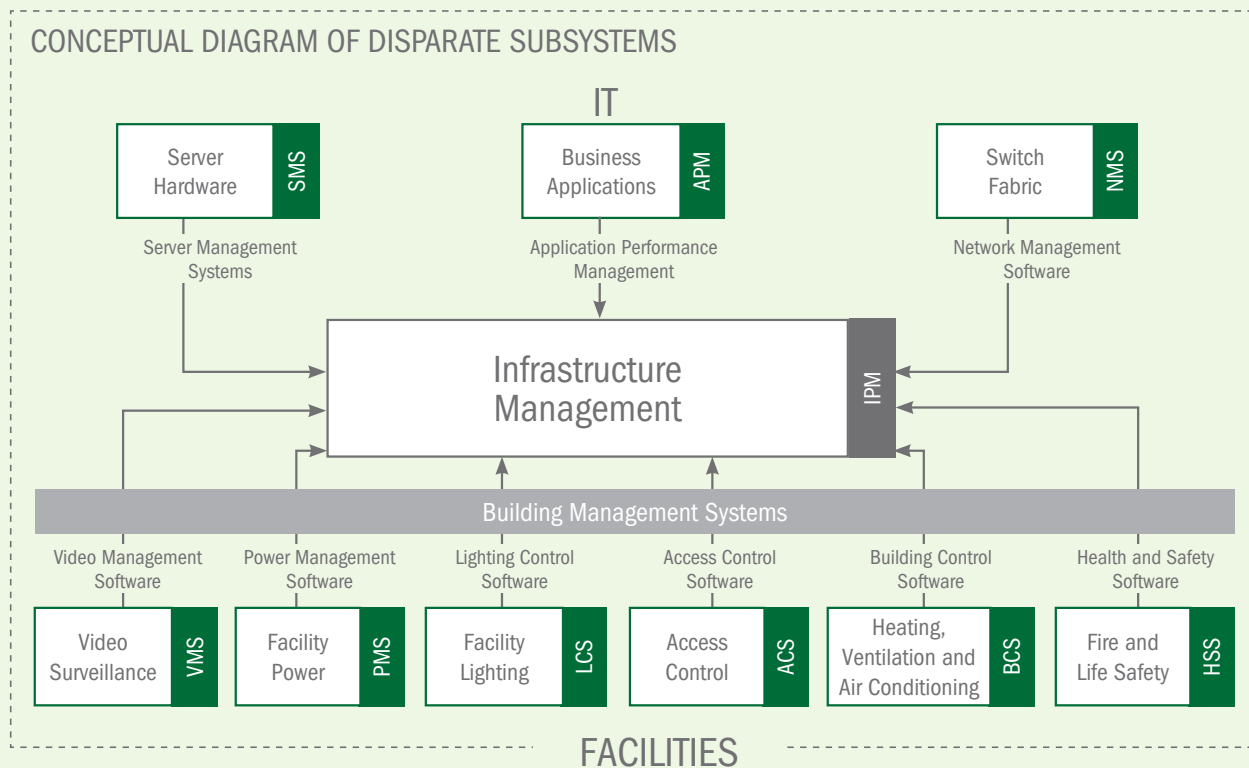
Operating in Silos

Some building owners and operators can be frustrated with the lack of interoperability and integration between infrastructure management tools and current IT systems, or the high costs of doing so.

Infrastructure management systems between facilities and IT have traditionally operated in silos, whereby functions overlap but don't talk to each other, resulting in poor workflow practices.
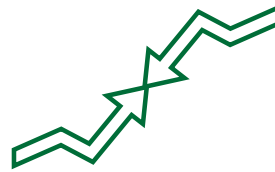
Building Management Systems

Existing building management system (BMS) protocols such as BACnet, LonWorks and Modbus provide for device connectivity across a wide variety of building subsystems. While each has distinct advantages and disadvantages relating to scalability, cost and device interoperability, there isn't a single approach that facilities managers can use to deploy BMS systems that can seamlessly integrate into IT management platforms. As the building controls market evolves from traditional serial-based applications that are present in many BMS platforms deployed today towards fully connected Ethernet-based systems, it's important for building planners to assess the technical and financial trade-offs associated with the various communications design approaches.
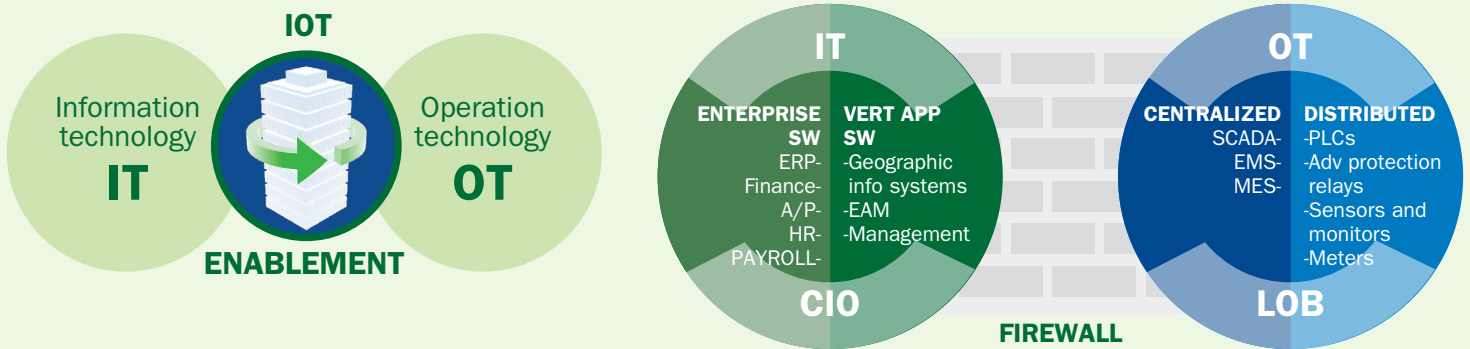
Infrastructure Management Topology

CONCEPTUAL DIAGRAM OF DISPARATE SUBSYSTEMS

IT

Server Hardware — SMS
Server Management Systems

Business Applications — APM
Application Performance Management

Switch Fabric — NMS
Network Management Software

Infrastructure Management — IPM

Building Management Systems

Video Management Software
Power Management Software
Lighting Control Software
Access Control Software
Building Control Software
Health and Safety Software

Video Surveillance — VMS
Facility Power — PMS
Facility Lighting — LCS
Access Control — ACS
Heating, Ventilation and Air Conditioning — BCS
Fire and Life Safety — HSS

FACILITIES

CHALLENGES

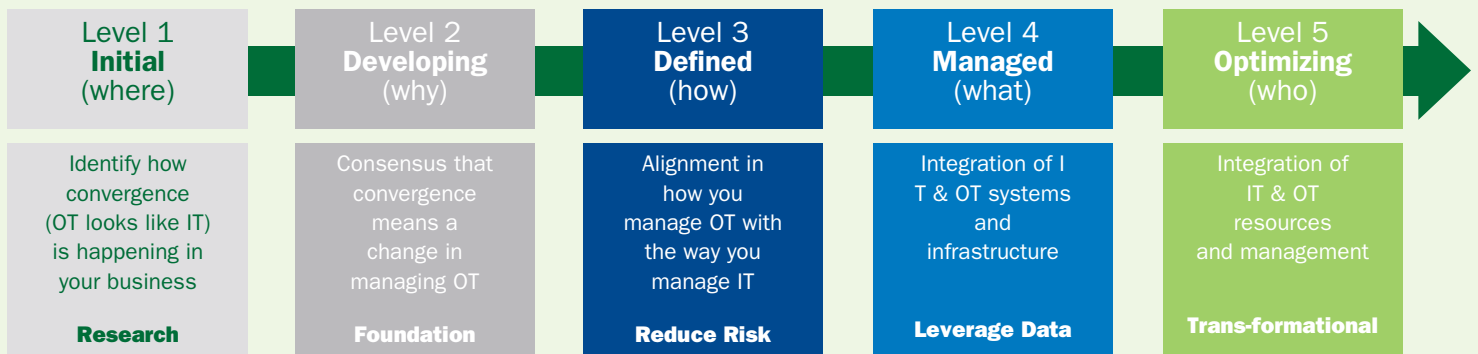## Challenge I:
Interdepartmental Conflict

Despite the potential of automated solutions, there is an equally notable potential for interdepartmental conflicts to occur between facilities and IT.

This is an opportunity to use the knowledge of IT, including network design and cyber security best practices when adding or retrofitting building systems, which increasingly require network connectivity for modern functionality. It does not make sense to rely on a traditional vendor (for example mechanical or electrical) who may not have the experience to provide a network that meets the standards expected of IT infrastructure. Reinventing the wheel could be a risky proposition in this case!

IOT

Information technology
IT

Operation technology
OT

ENABLEMENT

IT

ENTERPRISE SW
ERP-
Finance-
A/P-
HR-
PAYROLL-

VERT APP SW
-Geographic info systems
-EAM
-Management

CIO

FIREWALL

OT

CENTRALIZED
SCADA-
EMS-
MES-

DISTRIBUTED
-PLCs
-Adv protection relays
-Sensors and monitors
-Meters

LOB

Levels of IT and OT Management

Level 1 **Initial** (where)	Level 2 **Developing** (why)	Level 3 **Defined** (how)	Level 4 **Managed** (what)	Level 5 **Optimizing** (who)
Identify how convergence (OT looks like IT) is happening in your business	Consensus that convergence means a change in managing OT	Alignment in how you manage OT with the way you manage IT	Integration of IT & OT systems and infrastructure	Integration of IT & OT resources and management
Research	**Foundation**	**Reduce Risk**	**Leverage Data**	**Trans-formational**

Source: Gartner. Strategic Roadmap for IT/OT Alignment. 2016.

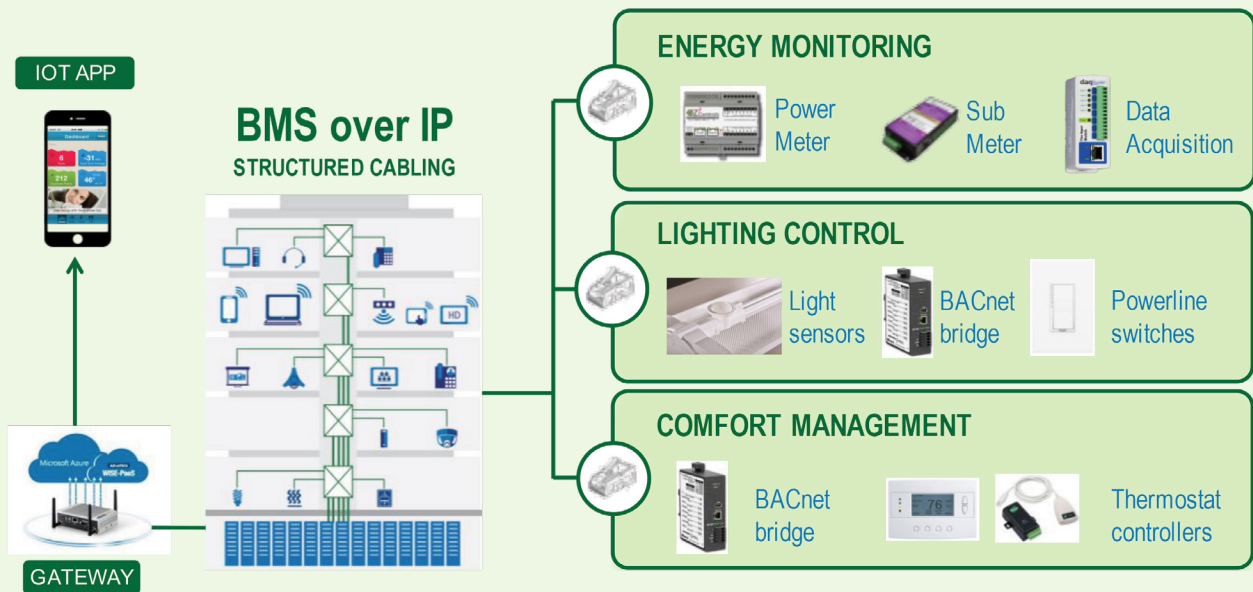## Challenge II: Supplier Integration Competency
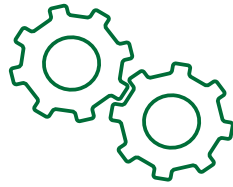
Selecting the right solution relies heavily on how well the technology integrates with existing and future systems. Determining integration capabilities can be difficult because there are a number of intelligent implementation models.

Challenge III: Migrating to an IP Platform
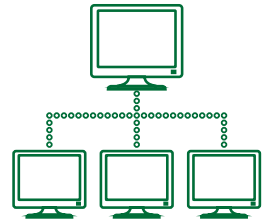
In addition to restrictions of legacy systems and the necessary investment, the lack of a clearly identified standards-based approach increases the complexity of migrating to an IP-based platform.

IP-Enabled Sensors

IOT APP

BMS over IP
STRUCTURED CABLING

GATEWAY

ENERGY MONITORING
Power Meter | Sub Meter | Data Acquisition

LIGHTING CONTROL
Light sensors | BACnet bridge | Powerline switches

COMFORT MANAGEMENT
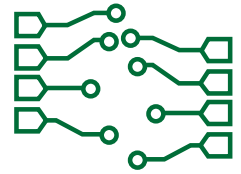BACnet bridge | Thermostat controllers

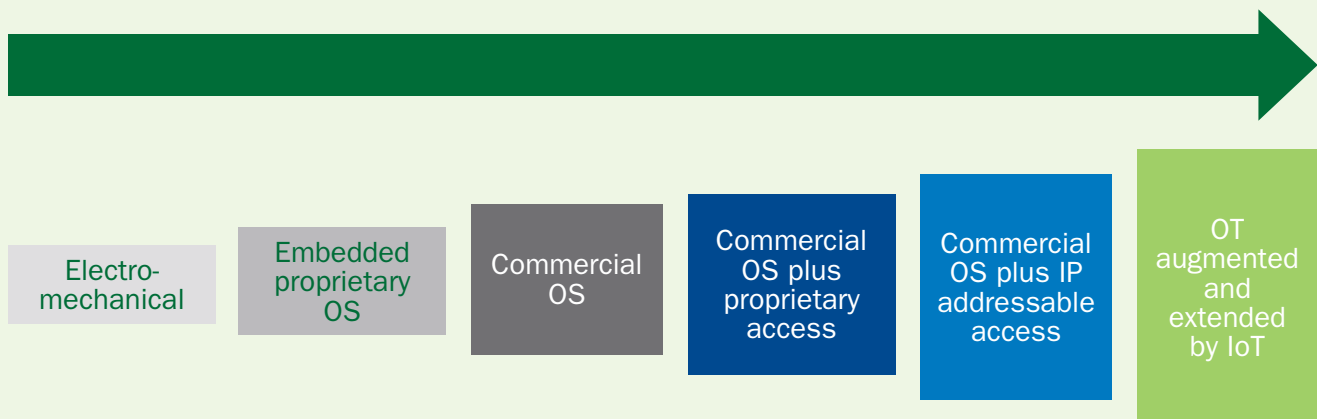## Challenge IV: Justifying the Cost of Efficiency

Establishing ROI metrics and key data points in advance, which enable continual justification of efficiency, requires a proactive approach to the solution.

Challenge V: Limitations of Existing Infrastructure

A sufficient foundation that can support increased bandwidth and multiple applications is essential to an approach that enables the potential of a BIoT environment.

Increasing Asset Sophistication

| Electro-mechanical | Embedded proprietary OS | Commercial OS | Commercial OS plus proprietary access | Commercial OS plus IP addressable access | OT augmented and extended by IoT |

Source: Gartner. Strategic Roadmap for IT/OT Alignment. 2016.

SOLUTIONS

The Anixter Approach
The Five Senses of an Intelligent Building

Cost and efficiency, life-cycle management and improved sustainability are the main drivers behind the need to enable a BIoT environment. By defining the various elements that provide valuable information about your building, our approach tailors a solution that can meet your specific challenges.

The five sense of an intelligent building include the following:

• Environmental monitoring

• Visual management

• Communication enablement

• Security integration

• Network connectivity

Additional opportunities include decreasing capital costs of construction through network convergence, driving operational efficiencies from better access to the data in connected systems and create enhanced user experiences in commercial settings.
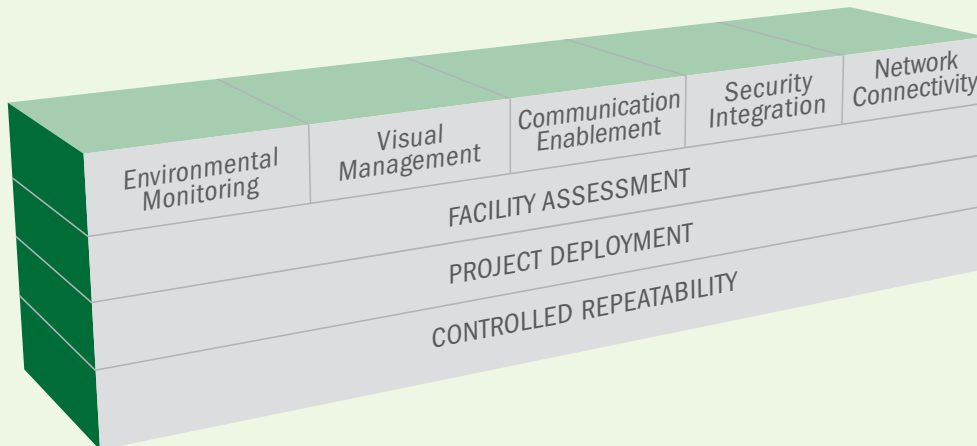
Best Practice I:
Environmental Monitoring

Use occupancy, intelligent lighting and temperature sensor technology to achieve optimal comfort and energy efficiency.

Considerations

When monitoring your environment, it is important to consider:

☐ How do you currently manage electricity, gas and water?

☐ What is your ability to manage equipment scheduling?

☐ How does your building cater for user comfort?

☐ What are your optimum building energy profiles?

☐ What tools do you use to manage your building?

Recommended Solutions

Energy, Metering and Management
More than 50 percent of a building's power budget can be tied to operation of the HVAC and lighting systems. Effective monitoring and management of these systems is critical to ensuring the building is operating as energy efficiently as possible.

Equipment Protocol Bridges
While the migration to IP-based systems is becoming the norm for traditional analog systems such as video surveillance, the movement to native Ethernet platforms is occurring much more slowly for building management systems (BMS). In order to deliver the interoperability advantages that an IP-based solution can provide, the use of protocol conversion bridges or gateways is required.

Smart Thermostat, Occupancy Sensors and Lighting Control
Building IoT sensors that can acquire data on how building spaces are utilized can transform the way BMS platforms operate.

Sustainable Infrastructure Solutions
LED lighting, energy efficient UPS systems, and BMS controls that operate over the Ethernet network create efficiencies in commercial building operations by provisioning services as required to building occupants.

Best Practice II:
Visual Management

Support centralized management of content through integration of digital signage, projection technology and mobile devices.

Considerations

When providing visual management, it is important to consider:

☐ How do you collect and analyze data for movement?

☐ How does digital signage integrate into your network?

☐ How does your safety and privacy policy adopt video features?

☐ What is your ability to leverage cloud-based video content?

☐ What is your strategy to run your building A/V over IP?

Recommended Solutions

Video Analytic Software
Creating a safe and secure environment can be enhanced through the use of video analytics such as motion detection, facial recognition and license plate reader (LPR) technology.

Integrated Digital Signage Platforms
Integrating video content databases with digital signage over the IP network provides for a more scalable platform to deliver information throughout a commercial building.

Professional HDbaseT A/V Solutions
Leveraging the structured cabling systems to support HDbaseT reduces cost and complexity to the A/V platforms within a commercial building.

Large-Format Screen and Connectivity Kits
Large HD displays can deliver visual information to building occupants across a broad spectrum of vertical market applications such as finance, transportation, hospitality and healthcare.

Media Adapters and Converters
While many commercial building applications are migrating onto the IP-based network, there are many legacy infrastructure A/V, security and BMS platforms that support legacy protocols. One strategy to consider is the use of protocol converting gateways or transceivers that can adapt serial-based protocols such as RS-422, RS-485, and BacNet into an IP-based transport that can be delivered over an Ethernet network.

Best Practice III:
Communication Enablement

Adopt a flexible wired and wireless network architecture to integrate voice, data and video experience.

Considerations

When planning for communication enablement, it is important to consider:

- ☐ What is your preferred video conferencing method?
- ☐ How do you integrate VoIP with access control?
- ☐ How does your CRM work with unified communications?
- ☐ What is your experience with the quality of voice over IP?
- ☐ Do you separate your ISP for voice and data?

Recommended Solutions

QoS Networking Switches

Without the use of Quality of Service (QoS) on networks, all network traffic would be treated with equal levels of priority. To avoid performance degradation, time-sensitive applications such as real-time voice and video should receive higher priority over standard data-centric applications such as email and web browsing.

Category 6/6A PoE Cabling

Due to the larger 23 AWG conductor size that is typical of many Category 6 and 6A cable constructions compared to 24 AWG Category 5e cable, these Category 6 and 6A cable types are better suited to dissipate heat due to remote powering applications over communications cabling such as Power over Ethernet (PoE) and HDBaseT.

Networked Digital Signage Infrastructure

Networked digital signage allows for directed messaging to employees and customers based on need and location. It also allows employees to used content stored on network drives. Managed within a single building or across multiple locations, a networked system provides fresh content on a regular basis, empowering the delivery of the right information to the right audience at the right time.

IP-Enabled Professional AV

The best-in-class solutions now run on IP networks and allow for the best options for collaboration zones with seamless use across locations. Solution categories include digital signage, sound and paging, conferencing, collaboration and control.

Collaborative Furniture with Integrated Cabling

Modular furniture solutions that integrate both power and communications cabling enhance the ability of an office area to adapt and scale with the needs of its occupants.

Best Practice IV:
Security Integration

Create interoperability between video surveillance, access control and intrusion detection systems.

Considerations

When supporting security integration, it is important to consider:

- ☐ How do you record, store and manage video surveillance activity?

- ☐ How does your video surveillance work with access control?

- ☐ What is your VMS software capability?

- ☐ What is your ability to act on video analytic alerts and alarms?

- ☐ How is mass notification supported by your security network?

- ☐ What is your strategy for protecting building automation systems, safety systems and critical environmental technology from cyber threats?

Recommended Solutions

Video Management Software Tools
IP-based video management platforms allow for quick retrieval and storage of surveillance footage captured at the perimeter, clear zones, visitor entry points, building interior area and technical spaces.

Video Analytics
Simple video analytics such as motion detection can enhance the physical security of a commercial building by delivering information on whether occupants are in a given space. More complex analytics such facial recognition offers an additional layer of authentication and verification of individuals within the building.

Integrated IP Video and Access Control
Ethernet networks provide the foundation for open-architecture video surveillance and access control systems by allowing them to exchange data in an integrated fashion.

DAS, NAS and Video Optimized Servers
A number of storage methods can be used to store IP-based surveillance footage. These include directly attached storage devices that are only accessible from the host (DAS) and networked storage servers that allow for convenient file sharing (NAS).

Best Practice V:
Network Connectivity

Provide a standards-based IP platform that can run multiple applications and be remotely managed and measured.

Considerations

When establishing network connectivity, it is important to consider:

- ☐ How do you connect legacy non-IP sensors?
- ☐ What is your PoE strategy for your building?
- ☐ What building applications do you manage remotely?
- ☐ What is your strategy for intelligent lighting?
- ☐ How do you monitor and manage energy consumption?
- ☐ What are your EMS, BAS, and BMS plans?
- ☐ What is your wireless and wired network strategy?

Recommended Solutions

Cross Connect and Port Administration

Utilizing intelligent patching solutions to deliver detailed visibility of the physical layer can provide a dynamic platform that enables efficient moves, adds and changes to the network infrastructure while improving network resilience.

Entrance Facility Solutions

The environmentally controlled centralized space for telecommunications equipment is usually more complex than a telecommunications room (TR) or telecommunications enclosure (TE). It usually houses the main cross-connect (MC) [Distributor C] and may also contain the intermediate cross-connects (ICs) [Distributor B], horizontal cross-connects (HCs) [Distributor A], or both.

Category 6/6A PoE Cabling

Due to the larger 23 AWG conductor size that is typical of many Category 6 and 6A cable constructions compared to 24 AWG Category 5e cable, these Category 6 and 6A cable types are better suited to dissipate heat due to remote powering applications over communications cabling such as Power over Ethernet (PoE) and HDBaseT.

IP-based LED Lighting Sensors and Controls

LED fixtures have the advantage over traditional fluorescent fixtures in longevity and luminous efficacy. Coupled with PoE lighting controls, these LED systems increase installation simplicity and long term operational efficiency.

Metered, Managed and Switched PDUs

Intelligent Power Distribution Units (PDU) that provide metered, managed, and switched capability in the Telecom Room (TR) allow integration into the building management systems that improve energy efficiency.
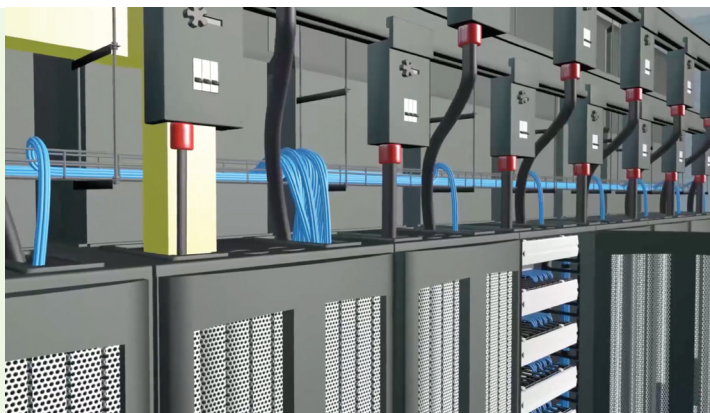
TECHNOLOGY SUMMARY

Technology Solutions

The chart below details the technology solutions that can enable
a BIoT environment in a commercial building.

TECHNOLOGY	Property Perimeter	Reception Area	Floor Level	Specialized Zones	Technical Space
Category 6 structured cabling systems	✓	✓	✓	✓	✓
Category 6A structured cabling systems		✓	✓	✓	✓
Fiber optic structured cabling systems	✓	✓	✓		✓
Distributed antenna systems (DAS)		✓	✓	✓	✓
Small cell wireless connectivity		✓	✓	✓	✓
Wi-Fi connectivity		✓	✓	✓	✓
HDBaseT video		✓	✓	✓	✓
VoIP and unified communication		✓	✓	✓	✓
Video surveillance and access control	✓	✓	✓	✓	✓
Intelligent LED lighting	✓	✓	✓	✓	✓

Anixter's Technology Support Services can offer further insight to your specific application. For more information, contact your local Anixter representative.

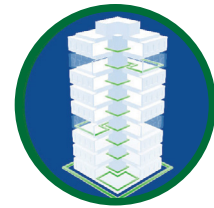**anixter.com/commercialbuilding**

THE FUTURE OF SMART BUILDINGS

Industry estimates claim that by 2020, one in five buildings in the U.S. will be intelligent buildings, relying on open architecture environments to increase productivity and efficiency throughout the building.

As we said from the outset, smart design is a philosophy. This means it can be applied to any number of settings, whether they are new constructions or retrofitting existing structures.

As the smart building approach grows, so too will the technological standards that enable an open architecture environment.

Commercial buildings and the people who occupy them are inherently part of a surrounding environment. The future of smart buildings lies not just in the interconnectedness within the building, but in how the building is connected to its surrounding environment—its city, region, and ultimately, the world.
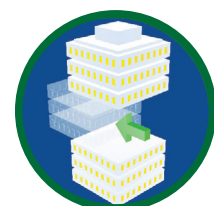
RISK MANAGEMENT

NETWORK PERFORMANCE

WORKFORCE PRODUCTIVITY

SPACE UTILIZATION

BIoT ENABLEMENT

CONCLUSION

As the complexities of managing a commercial building continue to grow, so do the vast opportunities to improve the overall environment with enhanced productivity and efficiency.

Smart building design and interoperability are subject to a lack of standards and contradictory definitions which can result in varied expectations, so it is critical to define and set your own companywide criteria and success metrics for a smart building solution. Once a smart platform path is defined and implemented, the enhancements to current capabilities and future potential can far exceed the alternative of continuing with unproductive and inefficient technologies that are not aligned with company objectives.

Identifying smart solutions can help building managers run their facilities more effectively and efficiently, providing the process of selecting and evaluating a solution that adheres to the many principles and guidelines outlined in this report. The right smart building solution should be adaptable to future technological innovations, as it is a vital tool in helping achieve growth in the fastest way possible.

NOTES

NOTES

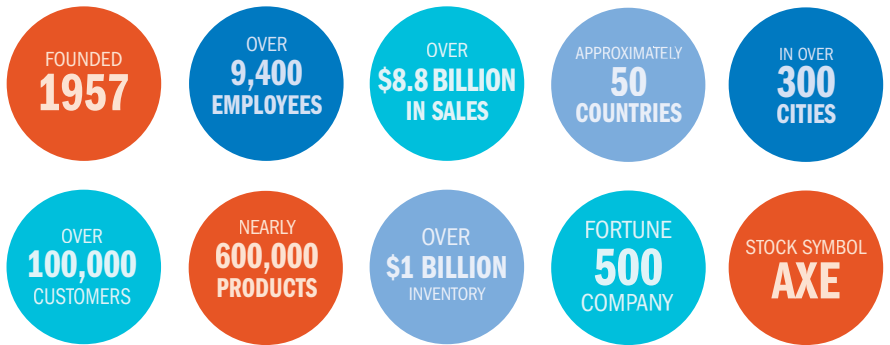## SPONSORED BY ANIXTER'S TECHNOLOGY ALLIANCE PARTNERS℠

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