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White Paper

The Connected and Efficient Building

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Contents

Executive summary

Driven by an evolving work force, technology advances, and increased pressure to reduce operating costs, workspaces inside today's business facilities are undergoing dramatic change. Traditional assumptions regarding how space is designed, used and managed are being re-evaluated. This presents new opportunities and challenges for those responsible for creating and maintaining the infrastructure to support these increasingly dynamic environments.

Connected and efficient buildings leverage emerging technologies such as remote powering over twisted-pair cabling, granular data collection, and high-speed wired and wireless connectivity to provide an integrated, intelligent infrastructure to drive greater productivity and efficiency.

Effects of a changing workforce

With 72 percent of corporate real estate executives now responsible for productivity improvements, decision makers are focusing on modifying their facilities to support more creativity, focus, and teamwork.[1] Traditional perimeter executive offices and assigned desks are giving way to more open floor plans and flexible seating strategies like hot desking and hoteling. Collaboration areas and open spaces are replacing the rigid, closed layouts of the past.

These changes are also being driven by research showing the average cost to outfit and maintain a desk is now $10,000 a year[2], while average office space utilization is less than 50 percent[3] and conference room utilization averages about 33 percent.

Evolving workspace requires advanced building infrastructure

The design and function of the business workspace are undergoing seismic changes as the result of evolutions in technology, the workforce, and workplace design. Taken individually, these forces present challenges for the enterprise; but, when looked at in aggregate, they create new opportunities to reduce costs and improve efficiencies.

Remote powering technologies have evolved to accommodate a more diverse universe of devices—bringing wireless, automation and energy efficiency solutions to the network. At the same time, the workforce has become more mobile and collaborative, requiring network connectivity regardless of where employees are, what they're doing, or what device they're using. As a result, the workplace itself is becoming more open and flexible.

For those responsible for designing and maintaining today's intelligent buildings, these changes mean rethinking the building's infrastructure. In addition to the growing number and diversity of personal and distributed devices that are part of the connectivity landscape, building networks are increasingly deploying the infrastructure to enable Internet of Things applications. This is driving a growing mix of wired and wireless technologies, including Ethernet, Power over Ethernet, Wi-Fi, and LTE—as well as broadening the definition of infrastructure to include granular data collection through emerging sensor-based technologies. This dictates an infrastructure that can support a variety of applications, meet bandwidth needs exceeding 1 gigabit per second (Gbps), and adapt quickly and easily as new technology and applications emerge.

In today's increasingly connected enterprise, the distinction between facility management systems and the IT systems upon which organizations depend is becoming blurred. The result is a smarter, integrated digital infrastructure that is less of a fixed cost and more of a strategic asset.

The connected and efficient building

Although there are multiple and evolving perspectives on the subject, the definition of an "intelligent building" can be distilled to buildings with two essential traits—connectivity and efficiency.

In connected and efficient buildings, the focus is on leveraging emerging technologies to connect people, information and devices in order to drive greater productivity and efficiency. In moving away from a device-centric approach—and toward an application-centric approach—connected and efficient buildings address the key concerns of facility managers, IT managers and corporate real estate teams, while providing an improved experience for today's hyper-connected and mobile workforce.

Connected and efficient buildings consist of three elements: an integrated low-voltage infrastructure, a permanent infrastructure for collecting granular occupancy data, and high-speed wired and wireless connectivity.

Integrated low-voltage infrastructure

At the heart of the connected and efficient building is a shared infrastructure that combines power and data, and is planned and deployed using a grid-type approach. Twisted-pair copper cabling provides the optimal platform for connected and efficient buildings, supplying bandwidth in excess of 1 Gbps as well as up to 95 watts of power—enabling support for building automation systems, wireless access points, security cameras, access control systems, digital displays, networked sensors, LED lighting and many more. As studies have shown, leveraging a common infrastructure for data and remote powering can deliver installation savings of up to 50 percent compared to traditional network powering infrastructures.[4]

The growing breadth and diversity of networked endpoints is not only expanding the applications and value of the twisted-pair infrastructure, but also extending it beyond the work area to physical locations in or near the ceiling. For the greatest flexibility and easiest integration of multiple low-voltage systems, connected and efficient buildings utilize a grid-based approach for distributing connectivity. The universal connectivity grid (UCG) is an evolved approach to horizontal zone cabling that divides the usable floor space into a grid of evenly sized service areas, or cells. Horizontal cabling runs from the telecommunications room (TR) to a consolidation point located within each cell, which supports the various system devices within its cell. This enables the infrastructure to utilize in- or near-ceiling cable pathways that help minimize installation and upgrade costs as well as workplace disruption.

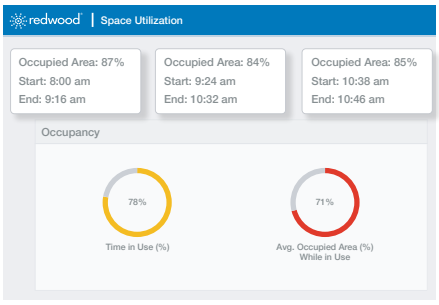
By integrating multiple building systems over a shared infrastructure, network administration and management can be consolidated, increasing operational efficiency. Automated infrastructure management (AIM) solutions provide an additional level of visibility and control over the physical-layer infrastructure, maximizing the efficiency of tasks such as troubleshooting and conducting moves, adds and changes.

Once in place, this infrastructure provides a flexible and intelligent pipeline that can handle changes, growth and upgrades cost-effectively and well into the future. The collective benefit of these technologies is a cohesive, dynamic foundation that easily adapts to new technologies, changes in the workforce, and evolving workplace designs.

AIM Standards

Automated Infrastructure Management (AIM) technology has been deployed for well over a decade and is becoming part of the structured cabling standards. ANSI-TIA 606-B was published in 2011 with a chapter dedicated to AIM. The ISO/IEC 18598 AIM standard is expected to be published in early 2016.

Occupancy-based intelligence



Traditionally, building automation has been based on schedules or single, intermittently placed occupancy sensors. While these methods provide a basic level of automation, their limitations do not reflect what is actually happening in a space at any given time, limiting efficiency gains in systems such as lighting or HVAC. By deploying a granular network of occupancy sensors, these systems can be automated to more accurately reflect the real-time conditions of the building, and reduce system costs through increased efficiency.

Granular occupancy data is not limited to comfort system automation. Collecting data on room or desk occupancy over time enables historical analysis of how frequently, or infrequently, spaces within the building are actually used. Armed with this knowledge, facilities and real estate managers can make better informed decisions about adding or repurposing spaces. As real estate is typically the second-largest expense of an enterprise, this data can be very useful in containing costs.

In workplaces employing alternative seating strategies like hoteling or hot desking, granular occupancy data also provides a more efficient means of locating or reserving unoccupied desks. A similar strategy can be used with conference rooms. Rather than requiring

occupants to book rooms in advance, real-time, granular occupancy data can provide a quick way to identify available rooms—resulting in less time trying to reserve, or locate, an unoccupied room.

Given the variety of uses and benefits of occupancy data, networked occupancy sensors will increasingly be thought of as a necessary and permanent part of the infrastructure.

Enhanced mobility

Ubiquitous wireless coverage and open platform solutions are critical in being able to support the BYOD policies being implemented across the board. This includes the ability to support the growing demand for high-capacity Wi-Fi and in-building wireless traffic.

Wi-Fi coverage is now considered a basic requirement for intelligent buildings. To meet the increasing demands for Wi-Fi coverage and capacity, the latest generation of Wi-Fi—IEEE 802.11ac—provides for data rates up to 6.9 Gbps. As a result, horizontal bandwidth demands are increasing from 1G to 2.5G, 5G and 10G and are optimally served by a Category 6A horizontal infrastructure that provides the required bandwidth for these high-capacity wireless networks, today and in the future.

In addition to supporting current and advancing Wi-Fi technologies, connected and efficient buildings must also enable the facility to take advantage of rapidly advancing indoor coverage solutions. As the user's needs evolve from 3G to 4G and LTE networks, coverage and capacity requirements in buildings are best served by distributed antenna systems (DAS). Newer DAS systems are increasingly taking advantage of low-voltage twisted-pair cabling for power and communication to access points distributed throughout the facilities—with the most versatile systems relying on technologies based on 10GBASE-T and Power over Ethernet running over Category 6A cabling in the horizontal.

Conclusion

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The workplace is undergoing wholesale changes, driven by a younger workforce, smarter buildings and greater pressure to reduce OpEx and increase productivity and efficiency. With a wide variety of building automation, management and systems, sensor-based lighting, unified wireless coverage solutions and more, the individual components needed to manage these new challenges are available. What is missing is a coordinated model for connecting these systems with a single easy-to-manage infrastructure.

Connected and efficient buildings allow facilities to deploy an integrated digital infrastructure that can support and enable the new breed of workplace intelligence and connectivity solutions—providing organizations the insight and control to improve operational efficiency, reduce OpEx and begin managing their facility's infrastructure as a strategic business asset.

For more information about connected and efficient buildings—or the underlying technologies—visit the CommScope website.

References

1 Workplace design trends: Make way for the Millennials; Building + Design Construction; May 2014

2 Workspace Utilization And Allocation Benchmark; U.S. General Services Administration, 2011

3 CBRE 2013

4 Use PoE to Reduce Energy Consumption; Cabling Installation & Maintenance, 2011

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