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### Overview

Capitalizing on the Internet: That's what the next wave of convergence – the Internet of Things (IoT) – is set to do.

Billions of previously unconnected devices, from vending machines to nurse call systems, are moving to the network and communicating directly without any human interaction or intervention required. By 2020, Gartner estimates that at least 20.8 billion IP-enabled devices will be connected to our networks.

This IoT shift is occurring for several reasons:

- Move more real-time data at faster rates
- Enhance mobility and productivity
- Improve communications
- Maximize efficiency
- Improve safety and security
- Reduce energy consumption
- Increase operational efficiency

From financial institutions and hospitals to college campuses and government buildings, enterprises are taking a new approach to sharing information, communicating, delivering high-quality AV, ensuring life safety and improving building management.



## With IoT Comes Lots of Data

IP-enabled devices use sensors to gather and transmit massive amounts of data; it no longer makes sense for devices and systems to operate autonomously using proprietary, closed products and solutions when they have the capability to share one network.

When these devices communicate back and forth, the data generated can be turned into useful information that helps building owners and facilities managers make better decisions about everything from lighting systems to thermostats. Sometimes, these devices can even make decisions on their own, deciding and alerting you to when they need maintenance, when they should ramp up or shut down, etc.

To support and manage the signal transmission required to make IoT a reality – allowing billions of network-enabled devices to come on board – a common communications infrastructure is necessary, with reliable, high-performance structured cabling serving as the foundation to support intelligent buildings, homes and industry:



Access control



Energy management



Occupancy



AV



Equipment



Outlets



Concrete



HVAC



Parking



Data



Lighting



Thermostats



Elevators/escalators



Manufacturing



Voice



Emergency notification



Monitoring



Waterways

## What IoT Means for Networks

There are more than 7.7 billion mobile connections, according to data from GSMA Intelligence, which is more than our current population. With the number of mobile connections outpacing fixed connections and Power over Ethernet (PoE)-enabled connections exceeding locally powered connections, there's a new network on the rise. And more devices will be connected to it than ever before.

Thinking "mobile first," wireless local area networks (LANs) are a critical piece of the IoT puzzle as devices and systems connect. The devices need access to the network wherever they're located inside the building; users need access to the network at all times – from any location – to monitor, manage and control these systems and their data. This creates a need for new network hardware, from switches to wireless access points (WAPs), and new cabling. The infrastructure must connect WAPs, VoIP, IP cameras and access control systems – and that's just the start.

Expanding cabling infrastructure after initial cabling installation can be expensive and difficult to achieve; your structured cabling system should allow for sufficient connections and bandwidth.

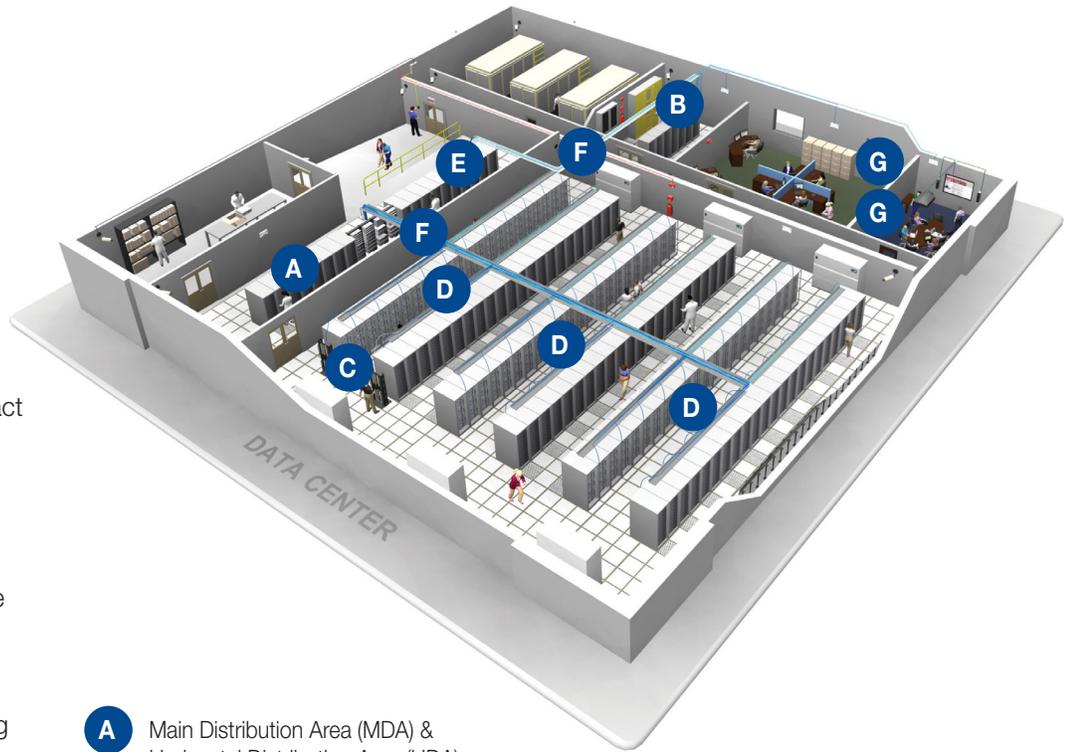


## What IoT Means for Data Centers

IoT won't just impact networks; it will also impact data centers. Important decisions must be made about whether to build or maintain your own data center, lease colocation space or take the data center to the cloud as storage demands, security needs, data-processing speeds and data volume increase.

For example, imagine the data center implications of 1,500 devices in your facility each creating data on a 10-second basis. How would that impact the performance of other applications on that same network? Now consider 1,500 devices growing to 15,000, and the impact those devices would have on your current data center. To handle this movement, data centers across the board are moving to the cloud due to virtually unlimited scalability and cost savings – you pay only for what you use. This off-premise form of computing stores data on the Internet, outsourced to a third-party provider that manages the updates and maintenance.

This movement to “as-a-service” will change how data center infrastructure, software and platforms are operated and managed; the capabilities required to support these types of services are vastly different from traditional business models.

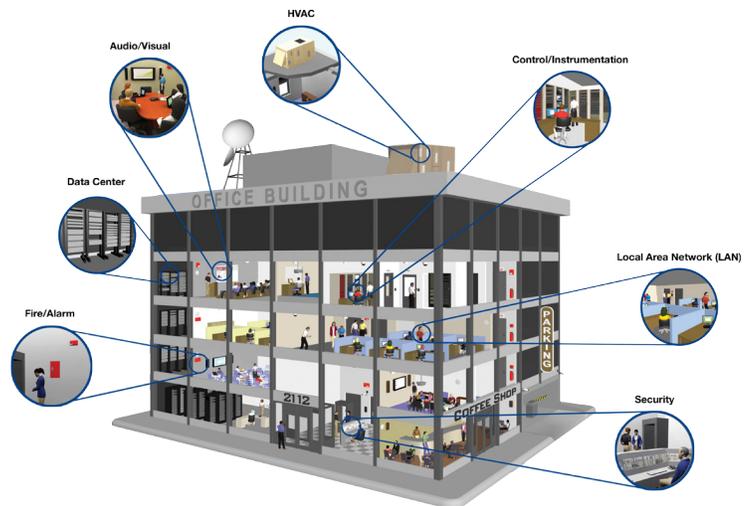


- A** Main Distribution Area (MDA) & Horizontal Distribution Area (HDA)
- B** Entrance Room/ Telecommunications Room (TR)
- C** Zone Distribution Area (ZDA)
- D** Equipment Distribution Area (EDA)
- E** Storage Area Network (SAN)
- F** Backbone Cabling & Horizontal Cabling
- G** Support Offices and Open Areas

## The Case for Converged Communications Infrastructures

Converged communications infrastructures support building management systems by merging signal transmission needs for a variety of applications: high-speed Ethernet, VoIP, PoE and broadband video. Multiple systems and applications transmit signals over one common cabling infrastructure rather than investing in several separate, proprietary infrastructures.

Using the same cabling media and sending data signals using a common protocol allows data from various systems to be centrally managed from one interface; the data is also more easily shared between applications.



IoT also makes it easier for building systems to work together for enhanced performance and value. For example, building owners and facilities directors obviously benefit from an access control system that can track who enters a building (and when). But imagine the possibilities when that access control system is integrated with surveillance cameras, allowing security personnel to monitor from anywhere to see details about who enters or exits the building. If, through machine-to-machine communication, the surveillance system and access control system discover that a potential breach has occurred, life safety systems integrated with the enterprise LAN can automatically send targeted notifications to phones, speaker zones, PCs, pagers and/or digital signage. When lighting is connected to the network, it can automatically turn on during an emergency evacuation; network-enabled air-handling units can automatically shut off when smoke is detected. The possibilities are endless.

## IP Infrastructure Deployment Challenges

Although the benefits of IoT are clear, deployment offers several challenges. Discover some of the most common challenges of deploying an infrastructure to support IoT, and potential solutions to keep moving forward.



### Challenge 1: Properly designing IoT infrastructure to support current and future technology

Enterprise facilities have a typical lifespan of 10+ years between major infrastructure retrofits. Without a scalable network that provides support for emerging technology and applications, an enterprise could face huge capital expenditures down the road. This shift may not happen all at once; at any given time, your facility's infrastructure could involve a mix of legacy and new (IP-enabled) devices and systems, copper and fiber cabling, passive and active equipment, and wired and wireless networks.

**Solution:** No one truly knows what IoT's future will look like – not even the experts. For this reason, the solutions that make up a building's infrastructure should be backed by a vendor with the financial strength, leadership and expertise to develop new solutions and innovative technologies as the world changes.

Seek partners that offer expertise and products to properly design and implement all levels of infrastructure convergence. Every environment has unique needs, but one truth remains: Enterprises should never get locked in to choosing a single solution for a specific application. In transmitting video signals, for example, it's important to have access to optical fiber, coax and twisted-pair cabling from the same supplier. Infrastructures should enable interoperability and easy system upgrades without having to alter cabling infrastructure or experience downtime when new equipment replaces the old. As your building transitions away from legacy systems to new IP-enabled systems, and away from wired connections and toward wireless connections, it's important to have a partner that supports and works with these hybrid systems – and makes the transition process seamless.

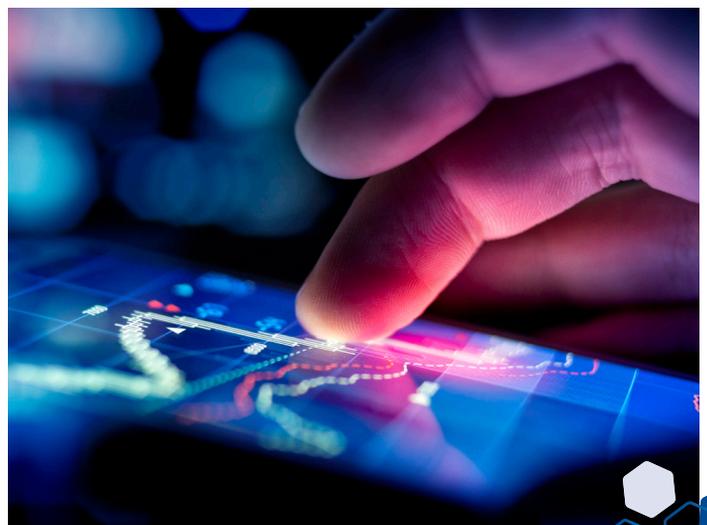
This partner should also offer value-added services that ensure ongoing service and support for the life of communications infrastructures so you're not left in the dark when maintenance, upgrades or advice are required.



### Challenge 2: Ensuring maximum performance and reliability of several building systems

System failure is unacceptable – especially with systems that are critical to health and safety. Many corporate LANs have achieved 99.999% availability (the five “nines”: five minutes and 15 seconds of downtime per year), but achieving that same performance for the infrastructure supporting an entire building or campus is a challenge. Enterprises will only have IoT success if their networks – wired and wireless – perform flawlessly, securely and reliably. The only way this is possible is with a cabling infrastructure that supports the network with appropriate speeds, growth and device capabilities.

**Solution:** Infrastructures comprised of products designed and manufactured to work together – such as an end-to-end structured cabling system versus individual components pieced together – is key to ensuring maximum performance and reliability. The structured cabling system should also provide unparalleled signal integrity across all building management systems and provide ample bandwidth and reliability to avoid downtime and unexpected failure.





### Challenge 3: Maintaining low financial risk and high ROI

IoT has clear lifecycle cost benefits, but many enterprise customers are concerned about proving the value of initial investments – and understandably so. Operating costs have the largest impact on lowering regularly occurring operating expenses, so taking the time to evaluate how specific products and solutions simplify and improve building operations is crucial to ensure a high return on investment (ROI).

**Solution:** Reduce risk and achieve high ROI by selecting systems and products designed and manufactured with ease of deployment, seamless integration and cost-effective management in mind. Then take into account the financial, resource and time savings you'll experience with a fully converged network. For example, remote monitoring of cooler temperatures can avoid thousands of dollars in food and beverage spoilage. Occupancy sensors that report to lighting and HVAC systems when no one is in the building can save thousands in utility bills. Alerts sent from a patient monitoring system directly to a handheld device carried by a nurse can save lives.



### Challenge 4: Meeting codes, regulations and standards

Standards and regulations will continue to increase and grow stronger as security and life safety concerns rise, and more environmental initiatives unfold. Higher-education facilities, for example, are already being targeted for regulations that require better evacuation systems. Standards are also changing for the amount of electrical power that can be passed along with data through structured cabling in PoE deployment.

**Solution:** Comprehensive knowledge of the codes and standards related to your building management systems and cabling requirements is the first step toward compliance. Partner with vendors that offer a broad range of products, have close ties to standards-making organizations (so they understand current requirements and changes that may occur in the future) and have a global presence to address needs across all locations as your enterprise grows.



## Why Belden?

The path to IoT is just that – a path – and every enterprise is at a different place along that path. There's no one-size-fits-all solution. Belden is uniquely positioned to help enterprises design and deploy communications infrastructures to support IoT at the level of convergence that best fits their needs and applications.



### Experience.

With proven experience and credentials, Belden delivered its first products more than 100 years ago. Today, as a global, multi-billion dollar public corporation, it's a trusted provider of LAN, AV, building management/security and data center cabling infrastructure solutions spanning all sectors.



### Expertise.

Belden designs and manufactures the widest breadth of products in the industry, which translates to unique end-to-end expertise. Our technology and products offer flexible migration from legacy-based systems to IoT infrastructures.



### Breadth of product line.

With more than 250,000 product part numbers, Belden has a solutions approach to technology infrastructure, with end-to-end connectivity and cable offerings that won't lock you in to one single technology. Our components seamlessly integrate into reliable, high-performance networks.



### Strong business partner network.

Fully trained, professional Belden business partners know how to optimize the design, installation, service and logistical supply of IoT systems. They provide superior guidance, flexibility and performance when designing and deploying converged networks.



### Support and service.

A complete suite of value-added services supports customers from initial concept and design to post-installation service and long-term maintenance. Belden systems are backed by warranties that suit the needs and expectations of enterprise customers.



### Research and development innovation.

With more than 600 current patents or patents pending, Belden has a proven track record of technology innovation and industry firsts, including innovative cable design and connection technologies for better performance, improved flexibility, and easy installation. Belden continues to invest in research and development, such as bonded-pair cabling, to ensure that your network remains at the forefront of current technology and is well positioned to adopt and adapt to future technology.



### Commitment to advance the industry.

Through participation in a wide spectrum of industry initiatives, Belden works closely with domestic and international standards organizations, industry associations, user groups and technology alliances to remain up-to-date on current and future technology and applications.



As data rates get faster, people and devices become more mobile, threats become more serious, environmental initiatives expand and costs continue to rise, enterprises can count Belden on for the high performance and reliability, expert care and advice, and lower total cost of ownership for IoT networks of all levels.

For more information  
call **1.800.BELDEN.1** (1.800.235.3361)  
or visit [info.belden.com/iot-solutions](http://info.belden.com/iot-solutions)