



Thread in Commercial White Paper

May 2018

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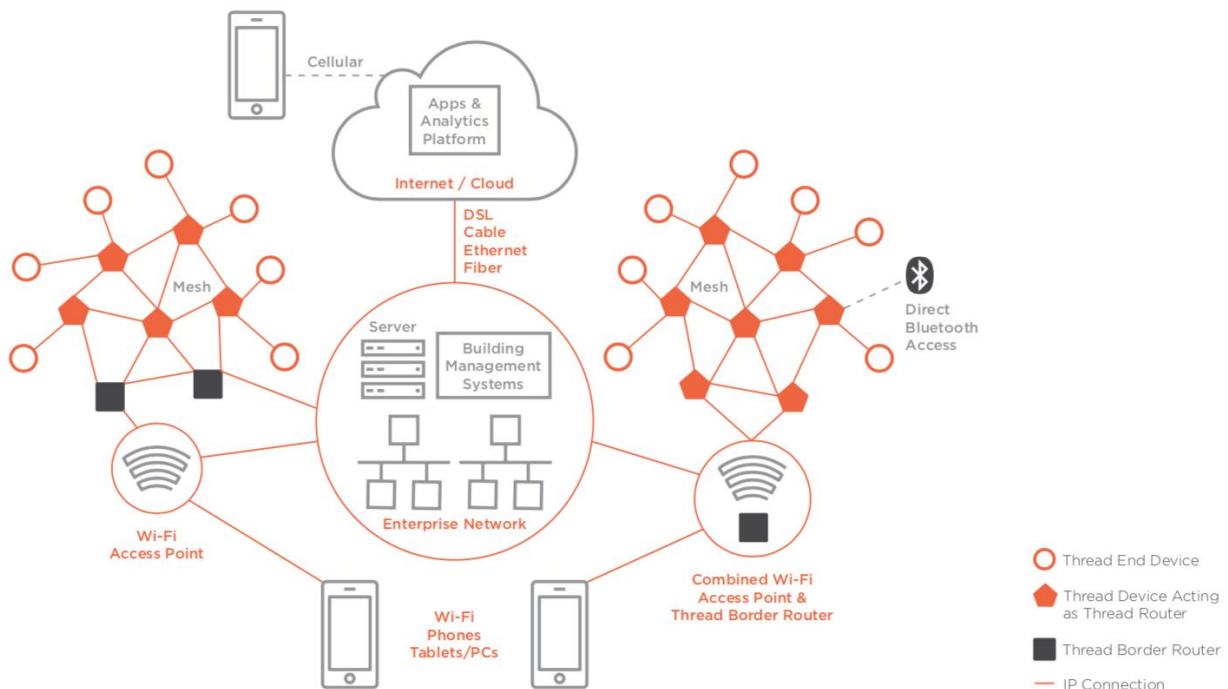
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Introduction – Extending Thread into commercial buildings

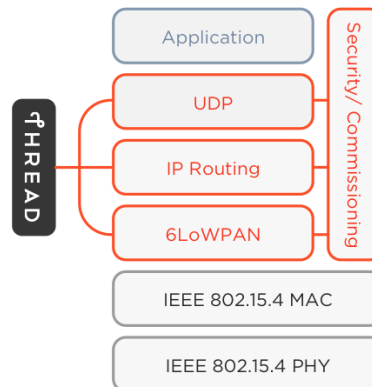
The Thread Group, an industry consortium that drives network standardization for connected homes, is poised to extend its networking specification into the commercial building sector. This white paper explains why Thread is the natural choice for connectivity beyond the home, and lays the foundation for the role Thread technology will play in the commercial segment.

The internet of things (IoT) aims to transform people's lives through smart homes and businesses. In the home, the goal is a network of connected appliances, lights, climate controls, security, and entertainment systems, all of which work together to make life more convenient and rewarding for consumers. Beyond the home, IoT aims to improve the efficiency, functionality, automation, and safety of intelligent buildings which encompass commercial applications in buildings such as offices, healthcare facilities, hotels, and schools.

Thread is the leading wireless mesh networking protocol that underlies it all. It is built on open standards, providing a native IPv6 solution for reliable, secure, cost-effective, wireless device-to-device communication. It is designed to reliably connect hundreds—or thousands—of products where people live and work. Supported by banking-class AES encryption and an advanced device-authentication scheme, Thread provides robust wireless security at the network layer. Designed from the ground up for extremely low power consumption and low latency, Thread networks have no single point of failure, scale easily, self-heal when a device drops off, and are simple to set up and use.



Thread is an IPv6 networking protocol built on open standards, designed for secure, low-power IEEE 802.15.4 mesh networks. Because of its IPv6 foundation, Thread can support existing popular application layers and IoT platforms, provide end-to-end security, ease development and enable flexible and future-proof designs.



Released initially with a focus on the residential market, Thread is the leading IP mesh networking protocol for IoT and is backed by hundreds of members worldwide, from innovative startups to the leading brands that define the IoT lifestyle (e.g., Nest, ARM, NXP, OSRAM). There is considerable interest among the group's members, as well as key industry alliances, to expand Thread's connectivity solution into the commercial buildings sector. Many member companies—including Schneider Electric, Siemens, Philips Lighting, and Haiku Home—build products for both residential and commercial markets. A common, backwards-compatible wireless networking technology will enable them to leverage their product designs in both markets and benefit from economies of scale.

A major challenge for companies trying to implement connected automation systems in the professional space is the poor coordination between disparate, siloed systems, and the lack of a common network infrastructure which belongs to the building. Proprietary cables, non-IP-based wireless communication, and competing protocols complicate the situation, limit options to address new use cases, and compromise enterprise security.

In recent months, however, there has been significant movement in the industry to reduce fragmentation. The Thread Group has led efforts to reach out to a number of industry groups, including the Open Connectivity Foundation (OCF), as well as established consortiums such as the Zigbee Alliance. Liaison agreements between the Thread Group and organizations such as CABA and the Fairhair Alliance represent a significant step forward for the industry. In the BALC (Business Automation/Lighting Controls) segment in particular, a handful of Thread-friendly established ecosystems represent a considerable share of the market: BACnet, KNX, and ZigBee-based systems and components account for nearly half of the BALC business. These companies and alliances jointly recognize the need for a cost-effective, secure, IP-based, common network infrastructure that supports interoperability for resource-constrained devices.

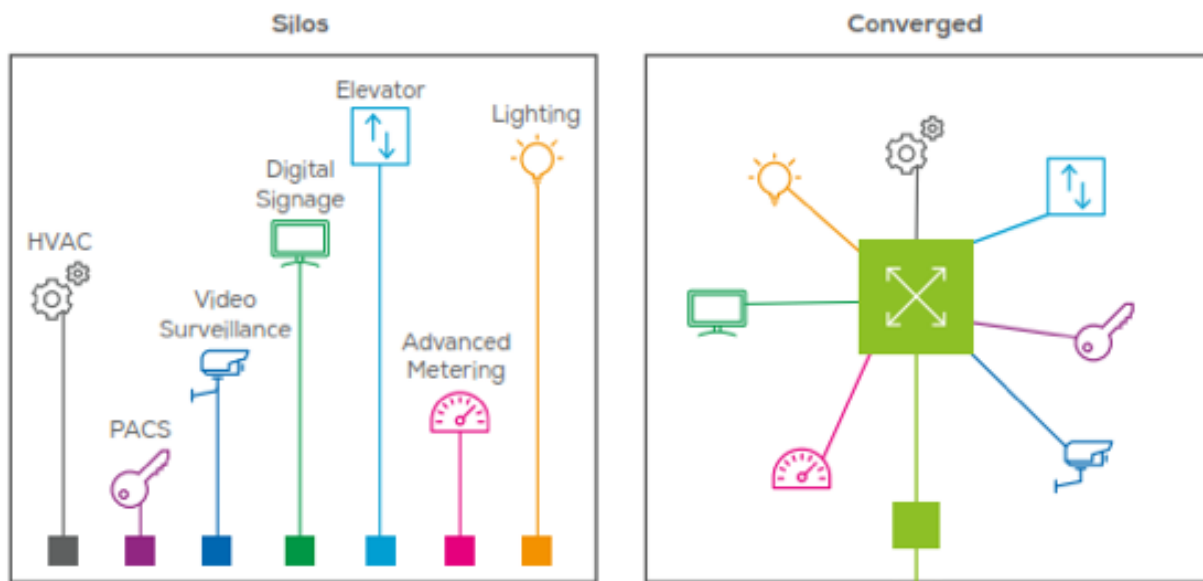
The Thread Group has released a spec that provides a solid foundation and starting point for the commercial building space and further developed it to address specific needs and challenges of this market that will:

1. support enterprise-level security
2. add industrial scale functionality to support commercial commissioning methods
3. support commercial network management and maintenance
4. add the ability to manage large (1,000s of nodes) Thread networks by dividing over multiple subnets
5. improve power-management functionality to reduce (standby) power consumption

Thread's commercial functionality is backwards-compatible with the already widely employed Thread standard so early development can start today. It addresses the additional needs of specific use cases in vertical markets such as healthcare, education, and professional spaces, and are designed to support lighting systems, climate control, building systems monitoring and automation, and energy management.

2 Solving security and fragmentation

Today, the planning of the technical equipment within most commercial buildings is not well coordinated between the various disciplines. For example, the planner of a building's HVAC equipment usually does not collaborate with the planner of the lighting equipment. Upgrades to a building's lighting automation system may not be scheduled to coordinate with updates to its energy management system. The same is often true for all other disciplines in buildings.



There are various efforts throughout the industry to reduce siloed systems and to encourage converged solutions that feature a common network and coordinated planning for system installation and maintenance. One regulatory agent that shows some promise is the gradual implementation of Building Information Modeling (BIM) worldwide, which promises to give vendors and manufacturers a common language and reliable, shared information in a standardized format about any facility's physical and functional characteristics.

Another driver to reduce silos is the ownership and control of the infrastructure. There are clear advantages in industrial installations for having a common network infrastructure that belongs to the building. The use of proprietary cables and non-IP based wireless communication is problematic for businesses, due to both security and cost considerations.

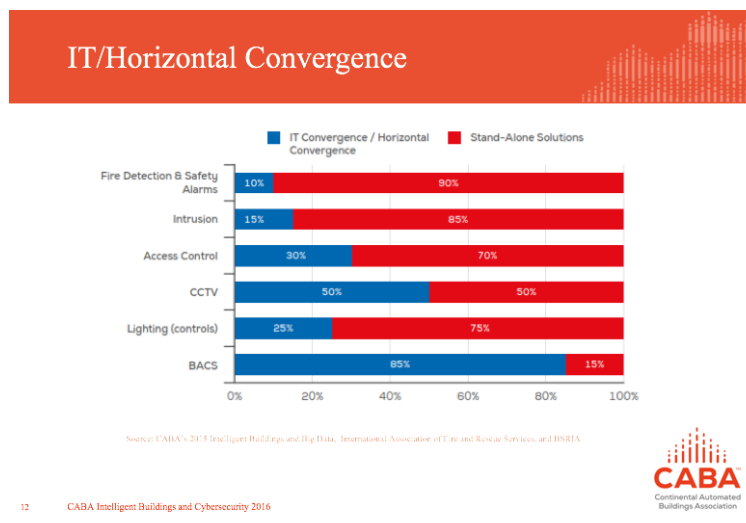
A third factor is feasibility. In order to qualify for building automation, any device to be used in an industrial infrastructure must support some common network services (such as a common security architecture). Standardization on reliable, secure, scalable communication standards becomes paramount as installations grow to encompass thousands of devices in coordinated systems with interlocking functions.

Thread's Initial focus: Building Automation and Lighting Controls (BALC)

There is significant movement in the BALC (Business Automation/Lighting Controls) to reduce fragmentation. The Thread Group has led efforts to reach out to a number of industry groups, including the Open Connectivity Foundation (OCF) and the Continental Automated Buildings Association (CABA), as well as established consortiums such as the Zigbee Alliance.

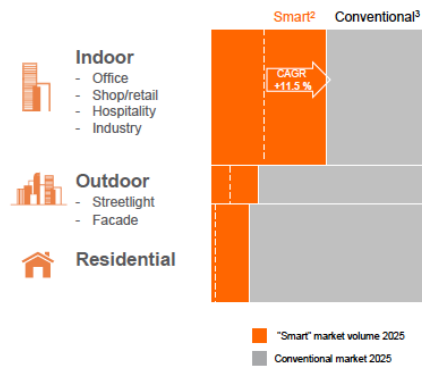
Liaison agreements between the Thread Group and organizations such as CABA and the Fairhair Alliance represent a significant step forward for the industry. With these agreements, both developers and IT administrators will have the tools to roll out standards-based lighting and building automation systems that not only support the smallest constrained mission-critical wireless building infrastructure devices, but also support familiar and required (IT) management and authentication platforms. These liaisons have the potential to impact a wide range of use cases in commercial buildings.

According to 2016 research commissioned by CABA, Building Automation and Control systems (BAC) are far ahead of any other type of industrial system in terms of worldwide implementation of converged solutions.



Intelligent buildings within the industrial space are also the leading segment for lighting in terms of absolute size and growth, according to IHS research:

The market for smart lighting in 2025



Key observations

- Today, the market for smart infrastructure with smart lighting is **at an infant stage**
- **Growth, however, is twice as fast** as the overall lighting market
- **Smart building is the leading segment**

Thread-friendly ecosystems such as BACnet, KNX, and Zigbee-based systems and components already account for nearly half of the worldwide BALC business providing a simplified path for upgrading to Thread.

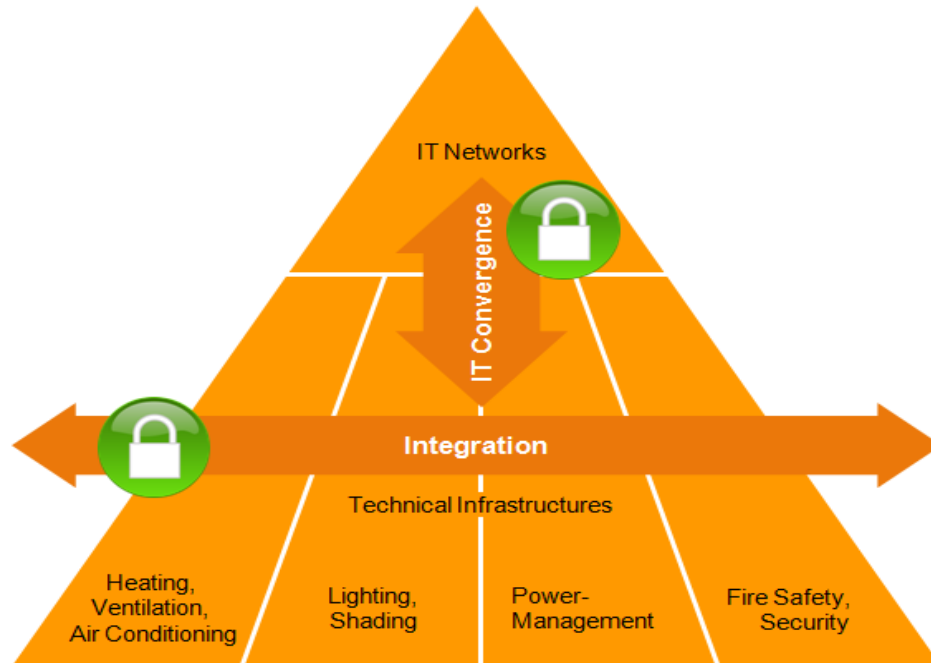
Professional and SOHO Markets

The Thread Group will focus initially on the requirements for the Professional and SOHO segments. We view these as the two areas of greatest immediate opportunity for the following reasons:

- Demand continues to rise fastest for building automation and control systems (BACs) that control devices and enable improvements in operational and energy efficiency. BAC systems are found predominately in professional buildings and installations.
- Two areas in particular—lighting controls and energy management—offer the greatest immediate opportunity for efficiencies and improvement.
- The professional building technology sector is a significant market. It accounts for an annual global turnover of more than \$10 billion per year.
- There is room in the professional and SOHO markets for rapid improvement and significant ROI. Most building technology silos currently operate in isolation from each other, with proprietary solutions that do not intercommunicate well and are difficult and expensive to install, secure, and maintain.
- There is recent movement within the industry to capitalize on the opportunity of IoT in indoor professional buildings, and recognition among key companies, industry alliances, and regulatory agencies that the various silos will need to cooperate.

For these reasons, the Thread Group has determined that the initial focus of the Thread in Commercial will be to deliver the features and functionality required by the BALC market in the professional and SOHO segments. Thread's member companies and the various industry alliances with which Thread is working are committed to standardizing on a common, cost-effective, secure, IP-based network infrastructure that supports interoperability for resource-constrained BALC devices in the professional building segment.

3 Technology Opportunities



The Thread Group sees three integration opportunities in the commercial building segment, and more immediately in the BALC space:

1. IT convergence and network standardization (lower OSI layers)
2. Technology cluster and silo standardization (upper OSI layers)
3. Standardization / interoperability between the silos (upper OSI layers)

Standardized interfaces and Thread IP protocols benefit the entire ecosystem in several ways.

- Enabling the wireless transformation
The market is beginning to recognize the potential of IP-based wireless mesh communication to deliver reliable, secure, feature-rich networking with substantially reduced cost, lower power consumption, and easier commissioning and maintenance. Previous concerns about the reliability of wireless communication have been addressed by the IEEE 802.15.4 mesh architecture and Thread's IPv6 protocol.
- Accelerating professional services innovation
A full end-to-end IP network will accelerate the pace at which apps and services are developed, because the Thread ecosystem provides more, better, faster and cheaper service opportunities. For example, services such as device configuration and firmware updates can be delivered from anywhere in the network – gateway,

local server, enterprise datacenter, or cloud. This provides future-proof designs to minimize development costs.

- Creating a flexible, platform-agnostic ecosystem

4 The need for a secure, low-power, IPv6 networking solution

Historically, the network of constrained embedded devices that we now call the “Internet of Things” typically used specialized, and often proprietary, communication protocols. By contrast, the internet and world wide web are built on a layered stack of open standards, with each layer independent and not tied to a specific application. This is why the internet and its applications are so flexible and pervasive.

In recent years, technology has emerged that enables manufacturers to use internet standards with these constrained embedded devices, allowing devices and applications to be developed independently and run anywhere: the cloud, mobile devices, and in-home and in-business devices. At the same time, developments in compression and packet-handling standards and mechanisms, such as the IEEE 802.15.4 standard and 6LoWPAN, enabled great leaps forward in low power consumption and network efficiency.

Since we're building for the Internet of Things, the Thread Group incorporated the internet and its open standards to create an Internet Protocol (IP) version 6 (IPv6)-based mesh networking protocol with 6LoWPAN as its foundation, running on standard IEEE 802.15.4 radios.

The need for IPv6

IPv6 is the internet's next-generation network protocol, designed to supplement and eventually replace the current protocol, IP version 4. IPv6 provides a number of critical advantages:

- **Extreme address scalability:** In order to communicate over the internet, computers and other devices must have sender and receiver addresses. These numeric addresses are known as Internet Protocol (IP) addresses. IPv6 allows for literally trillions of IP addresses, providing virtually unlimited address scalability.
- **End-to-end routing and addressability:** Two IPv6 endpoints, whether on the same Thread mesh, across networks, or across the world, can communicate end-to-end with straightforward and well-understood internet routing, moving the packets from one endpoint to the other.
- **Easy manageability:** Unlike IPv4 networks, IPv6 networks are inherently auto-configuring, removing the need for users and system administrators alike to worry about address assignment, DHCP servers, etc.
- **Well-known and familiar:** IP networks are well known by engineers, developers, technicians, and system administrators alike, leveraging a rich base of tools, knowledge and experience.
- **Flexible:** IPv6 supports a rich variety of upper-layer protocols, including transports, sessions, security, and applications, and IPv6 is supported over a wide range of wired (e.g., Ethernet) and wireless (e.g., Thread, Wi-Fi) networking protocols.

- **Compatible:** IPv6 and IPv4 can coexist using well understood and widely deployed techniques. IPv6 networks such as Thread can be deployed within IPv4 infrastructures.

The need for low power

The Thread specification is designed from the ground up to enable extremely low power consumption and efficient device communication, without sacrificing a positive end-user experience. Two technologies in particular, the IEEE 802.15.4 standard and 6LoWPAN, form the backbone of Thread's low-power solution.

As a point of comparison, in Ethernet links, a packet with the size of the IPv6 MTU (1280 bytes) is typically sent as one frame over the link. In the case of 802.15.4, 6LoWPAN acts as an adaptation layer between the IPv6 networking layer and the 802.15.4 link layer. It solves the issue of transmitting an IPv6 MTU by fragmenting the IPv6 packet at the sender and reassembling it at the receiver. 6LoWPAN also provides a compression mechanism that reduces the IPv6 headers sizes sent over the air and thus reduces transmission overhead. The fewer bits sent over the air, the less energy is consumed by the device. Thread makes full use of these mechanisms to efficiently transmit packets over the 802.15.4 network. The methods by which fragmentation and header compression is accomplished are described in detail in the [Thread Usage of 6LoWPAN](#) white paper.

Another important feature of 6LoWPAN is the ability to provide link-layer packet forwarding. It provides a very efficient and low overhead mechanism for forwarding multi-hop packets in a mesh network. Thread uses IP layer routing with link-layer packet forwarding. It makes use of the 6LoWPAN link-layer forwarding capabilities to forward a packet, which avoids having to send it up to the network layer during packet transit. Thread makes full use of the ability of the MAC layer to provide addressing based on short addresses (16-bit length) to further reduce the information sent over the air, to provide efficient packet forwarding. This saves processing cycles and improves power efficiency, while still using an IP-based routing protocol.

Thread's low-power advantages include:

- Extensive support for sleepy nodes allows for years of device operation, even on a single AA battery
- Based on the power efficient IEEE 802.15.4 MAC/PHY
- Short message size conserves bandwidth and power
- Streamlined routing protocol reduces network overhead and latency
- Designed to run on readily available, low-power wireless system-on-chips

The need for end-to-end security

The Thread Network is protected with a network-wide key, which is used at the MAC (Media Access Control) layer to protect the IEEE 802.15.4 MAC data frames. This is an elementary form of security used to prevent casual eavesdropping and targeted disruption of the Thread Network from outsiders without knowledge of the network-wide key. As it is a network-wide key, compromise of any Thread Device could potentially reveal the key; therefore, it is not typically used as the only form of protection within the Thread Network. In addition, Thread uses the DTLS protocol for internet-grade end-to-end security.

From the point of view of joining new devices into a network, the possession of the network key is used to discriminate between an authenticated and authorized Thread Device and the joining device (in its initial state). The network-wide key, along with other network parameters, is delivered securely to a joining device using a KEK (Key Encryption Key) to secure it. This way, the network key is never exposed in the clear on a wireless link.

Authentication

Because the Joiner is untrusted at the point of joining, it is common practice to enforce some sort of policing mechanism to ensure the Joiner can be verified and at the same time limit the effect of rogue devices attempting to join the Thread Network. In a Thread Network, this requires the Joiner to identify a Joiner Router and to communicate solely in a point-to-point fashion with the Joiner Router. The Joiner Router polices any traffic from the Joiner and forwards it to the Commissioner in a controlled manner to allow the authentication protocol (DTLS handshake) to execute.

Thread benefits for BALC installations

In addition to the general benefits of IPv6 and low power consumption, Thread's wireless mesh IPv6 solution offers further specific advantages to a variety of BALC applications:

- Professional building owners will be able to install both small networks (such as a quick-fix retrofit RF solution) and very large building networks (1,000s of nodes) using the same networking technology, simplifying and streamlining network installation and management processes and overhead.
- Wireless IPv6 technology is forward-compatible, more sustainable, and offers greater scales of economy than competing technologies, so networking solutions become cheaper and add functionality more easily.
- Network managers, application managers, and system integrators can independently execute tasks on the system, easing network management bottlenecks.
- A native IP system has the ability to collect and process vast amounts of data, from a broad range of intelligent connected devices, in near real-time. System data can then be accessed directly or via the cloud. Unique value can be extracted through advanced analytics.
- The flexibility of the application stack enables more sophisticated occupant individual control possibilities, increasing the levels of convenience, productivity, and operational efficiency.
- The network is easier to reconfigure than competing technologies, implying decreased refurbishment costs and lower churn cost in buildings.
- The technology further enables remote- and predictive maintenance, provides more opportunity for notifications on maintenance tasks, and promises to simplify system-wide fixes and updates.
- During building refurbishing, wireless technology requires less physical alteration of the site, reducing installation costs and offering increased flexibility and installation speed.

5 Key benefits of Thread in Commercial

In designing Thread for commercial applications, the Thread Group seeks to address the requirements dictated by the varied characteristics of the full range of BALC use cases in the commercial segment.

The standard Thread specification offers the following capabilities that will benefit BALC implementations:

- ✓ **IPv6 based.** As an Internet Protocol version 6-based mesh networking protocol, Thread networks are extremely scalable, reliable, and easy to manage. They're also flexible, supporting a rich variety of upper-layer protocols, including transports, sessions, security, and applications. And they are familiar: IP networks are well known by engineers, developers, technicians, and system administrators alike, allowing businesses to leverage a rich base of knowledge and experience.
- ✓ **Low Power.** Thread networks are designed from the ground up for extremely low power consumption without sacrificing device user experience. Based on the power efficient IEEE 802.15.4 MAC/PHY standard with 6LoWPAN at its foundation, Thread provides extensive support for sleepy nodes, short messaging that conserves bandwidth and power, and streamlined routing that reduces network overhead.
- ✓ **Simple network installation, start-up and operation.** The simple protocols for forming, joining, and maintaining Thread networks allow systems to self-configure and fix routing problems as they occur. IPv6 networks are inherently auto-configuring, removing the need for users and system administrators alike to worry about address assignment or DHCP servers.
- ✓ **End-to-end routing and addressability.** Two IPv6 endpoints, whether on the same Thread mesh, across networks, or across the world, can communicate end-to-end with straightforward and well-understood internet routing, moving data packets from one endpoint to the other. Over IPv6, Thread devices can also seamlessly communicate with Wi-Fi or Ethernet connected devices.
- ✓ **Security.** Devices cannot join a Thread network unless authorized, and all communications are encrypted and secure.
- ✓ **Scalable networking.** The network layer is designed to intelligently optimize network operation based on the expected device use. IPv6 provides extreme address scalability, allowing for trillions of IP addresses. Typical devices in conjunction with mesh networking provide ample wireless communication range for anticipated installations. Spread-spectrum technology is used at the physical layer to reduce interference.
- ✓ **Robust.** The stack is designed to provide secure and reliable operations even with the failure or loss of individual devices.

Thread in Commercial

Thread in Commercial offers these advantages specifically for BALC and large enterprise installations:

- ✓ **End-to-end IP benefits.** Since Thread uses IP, all devices can reach the internet directly, no endless gateways are needed making IP devices truly universal and economical. The end-to-end IP security integrates with existing enterprise security solutions and network management systems. For developers, this means that it can talk device- to-device, device-to-cloud and device-to-mobile, all with one universal platform.
- ✓ **Ultimate migration strategy towards true IP systems.** Thread ties things together due to its future-proof IP technology and integrates seamlessly with existing enterprise networks like Ethernet, Wi-Fi and LTE. One networking layer for several building verticals results in easier management, lower maintenance, lower complexity and lower costs.
- ✓ **Enterprise-level security requirements.** Thread offers the capability for network engineers to remotely commission devices and simultaneously commission multiple devices.
- ✓ **Increased device capacity for large managed networks.** Thread offers the ability to associate devices with an operational IT domain as typically used in enterprise networks, and will scale up to support thousands of devices. It can run multiple application standards on multiple subnets in parallel, allowing multi protocol networking.
- ✓ **Automatic roaming to nearby networks.** Devices can seamlessly and automatically switch to the network that is closest in proximity, or administrators can set prioritized networks. This allows for unmatched scalability when the network is extended with additional nodes, for example to accommodate higher network throughput demands, without the need to replace the entire system.
- ✓ **Enterprise-level IT requirements.** Enterprise-level IT systems require the ability to assign an identity to each device in their managed network. Thread offers the capability to assign a secure, verifiable identity to each individual device.
- ✓ **Enterprise-level user permissions.** The role of managing a network in a professional installation is associated with specific privileges. Thread will add the ability to assign levels of network privileges to individual users or groups of users. Administrators can adapt the network easily to change user requirements without the need to recommission applications.

- ✓ **Installation handover from installer to network commissioner.** Handover typically requires that the installer demonstrate to the network engineer the correctly mounted and wired installation. Thread will add essential installation handover functionality and verification capabilities.
- ✓ **Advanced analytics.** One end-to-end network generates coherent data, due to its ability to monitor a broad range of cloud-connected, cross-network and cross-sector devices without conversions or the need for multiple network-interfaces.

6 Conclusion

In the exploding universe of IoT application segments, the Thread Group sees the greatest market opportunity in the rapid near-term growth forecasted for the Industrial sector—and more specifically, the Building Automation and Lighting Control (BALC) market within the professional building space.

Thread's global network of member companies, and the various industry alliances with which Thread works, are committed to standardizing on a common, cost-effective, secure, IP-based mesh networking infrastructure that supports interoperability for resource-constrained BALC devices in the professional building segment. With an established base as the leading mesh networking protocol in the residential IoT space, Thread is ready to scale from consumer to business, and is well positioned to provide a strong foundation for robust and secure wireless networks in critical commercial building infrastructures.

The initial focus of Thread in Commercial will be to deliver the features and functionality required by the BALC market in the professional and SOHO segments. Positioned to become the standard for professional buildings, Thread is a cost-effective, reliable, secure, scalable IP solution that's essential for any automated building system. With Thread's incorporation of next-generation IPv6 and low-power technologies, the groundwork is laid for an open, routable IPv6 mesh network infrastructure with end-to-end security for the connected commercial building. Thread in Commercial will add capabilities to bring the Thread specification into alignment with enterprise-level security, IT requirements, and user permissions, as well as support for installation handover and capacity for very large managed networks.

The release of the royalty-free Thread in Commercial will allow professional building owners to create an effective open network infrastructure that will not only support the heterogeneous devices and applications of today but, as with the internet at large, the heterogeneous devices and applications of tomorrow that will develop and evolve over time, all operating on the same underlying IP-based network.

Appendix A

The market landscape of IoT

Industry analysts forecast explosive growth and spending in the industrial IoT space over the next 5 to 7 years. Here are some key takeaways:

- Gartner defines the industrial segment to include multiple markets – from building automation to lighting, transportation and security.
- Gartner estimates a worldwide IoT universe of about 6.4 billion connected things in use today, and predicts a threefold increase to 20.8 billion connected things by 2020.
- IHS predicts an even sharper increase after 2020, with a total IoT universe of about 72 billion connected things by 2025.
- BCG (Boston Consulting Group) forecasts that business-to-business spending on IoT technologies, apps, and solutions will reach \$267 billion by 2020. That's a 20% compound annual growth rate in revenue from all layers of the IoT technology stack from 2015 to 2020.
- The fastest growth will be in the industrial segment. From 2018 to 2025, IHS projects the number of connected devices in commercial buildings will skyrocket from approximately 1 billion to 12 billion devices.

Universe of IoT Application Segments

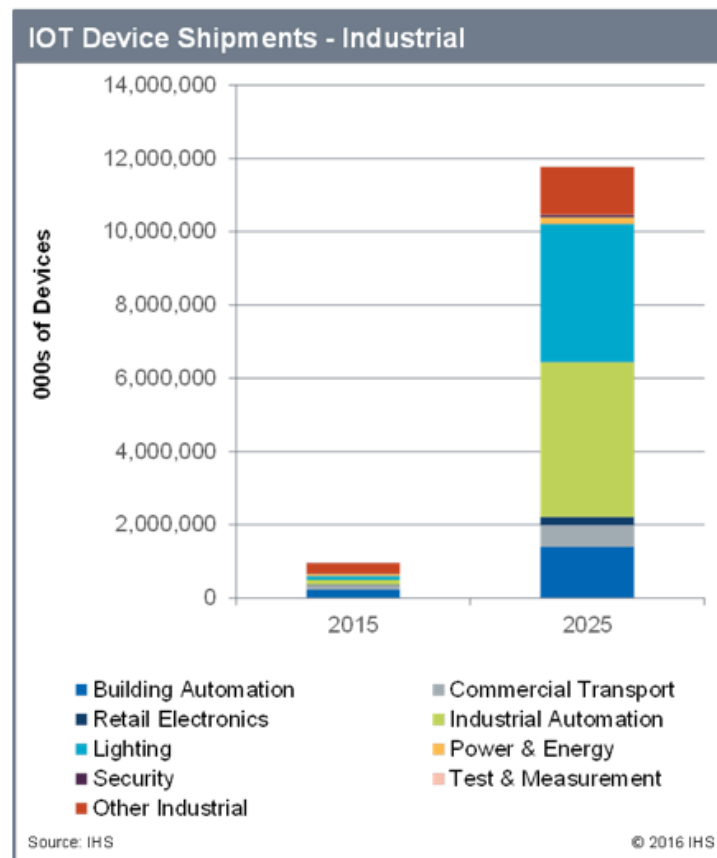


Source: *Intelligent Buildings and IoT*, CABA. www.caba.org

Industrial IoT Market Landscape

Within the Industrial sector, analysts agree the most immediate IoT opportunities today are in three areas: building automation and control systems (BACs), automated lighting, and energy management.

- IHS-Markit research indicates the industrial segment has made the greatest progress to date in the areas of lighting, access controls, HVAC (heating, ventilation, and air conditioning), and energy management
- Lighting and building automation, in particular, are projected to show explosive growth through 2025
- By 2025, these categories will be joined by another leader: industrial automation



An IHS breakdown of projected IOT devices shipments in the industrial segment over the next decade shows the most rapid expansion in the areas of lighting, building automation, and industrial automation.

The commercial market can be divided into several business segments:

1. Industrial: Factories, distribution centers, manufacturing plants, parking garages, greenhouses.
2. Professional: This space includes offices, retail stores, shopping malls, educational facilities, health care facilities, hospitals, hotels, and leisure facilities.
3. SOHO: Small business/home office, which is often serviced by professional installers. It represents the first level of professional solutions beyond consumer self-service home electronics.
4. Outdoor: Outdoor area lighting, parking lots, facades and signage, irrigation.

Each of the segments listed above have unique requirements for network installation, device commissioning, functionality, and maintenance. In addition, there is a considerable difference between installing a system in a new building versus retrofitting a system into an existing building.

In fact, retrofit installations could be considered a sub-segment of each category. One advantage of wireless networks is the relative ease with which they can be integrated into existing buildings and legacy systems, as installing wireless sensors and switches typically requires less alteration of physical walls, cabling, and infrastructure than does installing hard-wired systems.

Appendix B

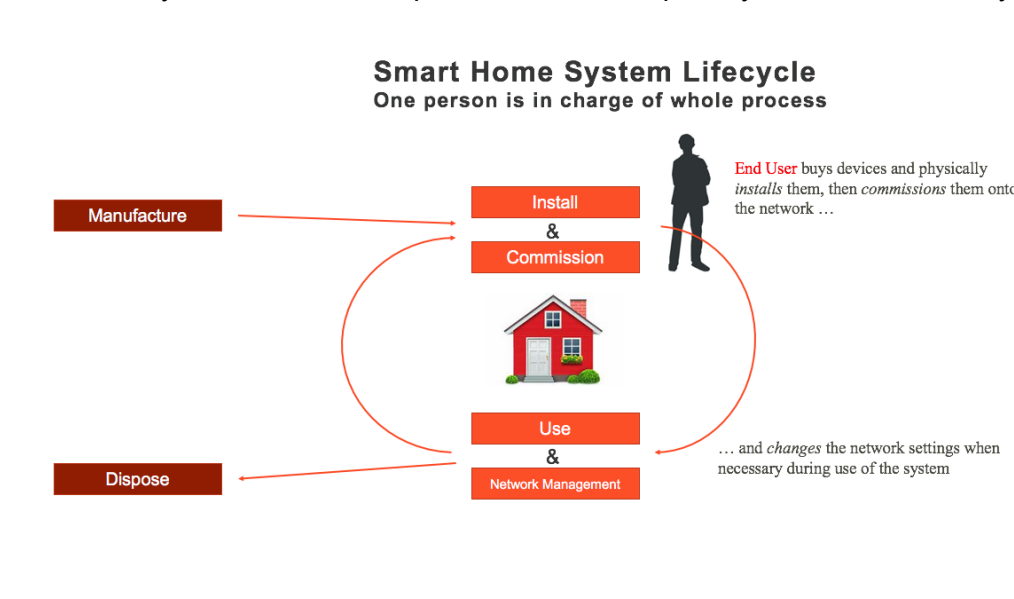
Consumer versus Professional networks

The Thread 1.1 specification has established a strong position as the leading IP-based IoT networking protocol in the residential market, and is backed by [hundreds of members](#) worldwide, from innovative startups to the leading brands that define the IoT lifestyle (e.g., Nest, ARM, NXP, OSRAM).

There are, of course, key differences between a residential versus a professional installation:

Residential installation characteristics

- ☐ One person in charge of whole process
- ☐ Dozens of devices
- ☐ End User installation cycle: “install & scan device”
- ☐ Security solution needs to protect End User’s privacy and smart home system integrity



Professional installation characteristics

- ❑ Many actors in different roles, with different privileges
- ❑ 1000s of devices
- ❑ Professional installation cycle: Cannot assume access to device for commissioning;
Requires support for handover between actors.
- ❑ Security solution needs to meet enterprise-level IT security specs



In a typical residential setting, the same person is usually in charge of the network installation and commissioning. The network consists of a handful of physically-accessible devices and security is focused on the privacy of the end user. Therefore, the ideal home networking solution places a premium on ease of installation and management; fail-free operation; self-healing and self-configuring networks and routing; and end-user security.

In a professional installation, these same features are all equally necessary, but some new capabilities must be added. Since multiple actors play roles in installing and managing a professional network, support for clear communication during handoffs from one task to the next becomes critical. Because enterprise installations consist of thousands of devices which often cannot be accessed physically, any professional network must support remote device commissioning methods and device management on an industrial scale. And because enterprise security has priorities beyond just end-user privacy, a professional networking solution must support multiple levels of permissions as well as enterprise-IT-level security specifications.

It is also useful to examine specific use cases of BALC implementations in the professional market to gain an understanding of the specific characteristics and needs of typical installations. A networking solution for this market segment needs to be flexible enough to account for the following varied conditions and characteristics:

Type of Installation	BALC characteristics
Small Office/Home Office (SOHO)	Business owner may own or rent both the property and the equipment; owner may self-install or hire a professional installer. Solution must be easy to install & maintain, scale from dozens to hundreds of devices.
Office/Hotel	Facilities have industrial-grade HVAC & lighting systems and professional facility managers. Periodic changes of room usage is typical. Commissioning continues over the whole building lifecycle. Reliability, security, flexible commissioning, and cost savings are the priorities.
Retail Outlet	Often rented or leased, shops and stores need a flexible solution for the controls of lights and HVAC that is both easy for the end user and can be managed centrally. Due to frequent refurbishing, the periodic replacement of existing lamps and HVAC equipment is common.
Shopping Mall	Malls offer infrastructure services to their shops, such as HVAC, security, and power management. Permanent commissioning is needed, as well as the flexibility to handle periodic shop refurbishing.
School/Educational facility	Schools often have only basic HVAC and lighting with older infrastructures. Changes in room usage and refurbishment are infrequent. External monitoring and control is often required.
Hospital	Hospitals have longer refurbish cycles than offices or hotels, but require a higher level of specialized facility services. There are many rooms with very different requirements for lighting and HVAC.
Healthcare facility	These specialized sites combine the SOHO facility's need for scalability and ease of use with a hospital's requirements for highly specialized rooms and services.
Distribution center	Equipped with basic, simple HVAC and lighting, these are very large buildings. External monitoring is required, and local facility managers are not always present.
Leisure facility	Stadiums, concert halls, and TV studios are examples of leisure facilities. They require extremely flexible, sophisticated solutions for HVAC and lighting with very high reliability and centralized control.