THREAD

Connectivity Beyond the Home

June 2017

THREAD GROUP | Go To Webinar Overview

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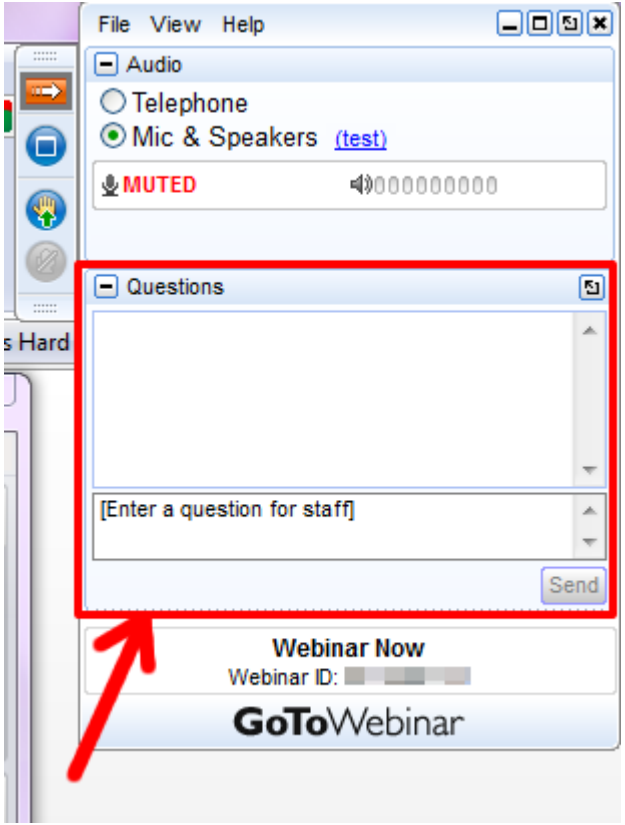
Audio pane: Use the Audio pane to switch between Telephone and Mic & Speakers

Questions pane: Post your questions for panelists

Questions will be read and addressed after the presentation

Recording of this webinar will be made available on the Thread Group website



THREAD GROUP | Today's Speakers

Grant Erickson
President, Thread Group
Principal Software Engineer, Nest

Grant Erickson is a principal engineer at Nest, where he oversees the technical development of software designed to support Bluetooth Low Energy, Thread, Wi-Fi, and Nest Weave.

Grant was also an early contributor to the formation of the Thread Group and Thread networking protocol. He is currently a member of the Thread Group Board of Directors.

Sujata Neidig
Vice President of Marketing, Thread Group
Senior Global Marketing Manager, NXP

Sujata Neidig has over 23 years of experience in the semiconductor industry and has served in a variety of roles ranging from product engineering to marketing and business development.

She is currently the MCU Global Marketing Manager responsible for NXP's microcontrollers and connectivity roadmap and portfolio - driving leadership and growth in multiple market segments. Prior to this role, Sujata worked in business development and product marketing for various groups within NXP. She earned a Bachelor of Science in Electrical Engineering from the University of Texas at Austin.

THREAD GROUP | Today's Speakers

Arnulf Rupp
Board of Directors, Thread Group
Senior Director of Business Development & Standardization, OSRAM

Arnulf Rupp has worked for OSRAM since 1997 and is currently Senior Director of Business Development and Standardization for the Business Unit Digital Systems. Prior to this position he worked as a Senior Director of product development for LED Light Engines. His work experience includes R&D management, strategy consultancy, strategic marketing, automotive product development and power.

Arnulf represents OSRAM in the board of directors and workgroups of multiple organizations including the Thread Group, the Digital Illumination Interface Alliance and the Module Driver Interface Special Interest Group.

Who Is Thread?

THREAD | The Need for a New Wireless Network

We are entering a new era of connected products

- The INTERNET of things
- Many consumer products need a low power mesh network in addition to Wi-Fi

We wanted to use an existing wireless mesh protocol

- But none fit our requirements well enough
- None were suitable for homes and CE products

We found that many companies shared the same concerns

- So we created a new wireless mesh network
- Built on existing standards using Internet protocols

Requirements:

New wireless home network

- ✓ Low power
- ✓ Resilient (mesh)
- ✓ Internet Protocol based
- ✓ Open
- ✓ Secure and user friendly
- ✓ Fast time to market
- ✓ Existing radio silicon

THREAD GROUP | Board of Directors and Team

President	Grant Erickson – Alphabet / Google / Nest
VP of Marketing	Sujata Neidig – NXP
VP of Technology	Skip Ashton – Silicon Laboratories
Secretary	Bill Curtis – ARM
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Director	Ben Flannery – Haiku Home
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Director	Greg Hill – Johnson Controls
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Director	Arnulf Rupp – OSRAM
Director	Cam Williams – Schneider Electric
Executive Director	Deepak Kamlani – Inventures
Director of Certification	Tom Sciorilli – Thread Group

THREAD GROUP | Liaisons

Organization	Liaison Type
CABA	Marketing
EEBus	App Layer
Fairhair Alliance	Standards
OCF	App Layer
zigbee alliance	App Layer

THREAD | Membership Tiers

Membership Benefits	Affiliate	Contributor	Sponsor
Receive member communications	✔	✔	✔
Participation in general or annual meetings	✔	✔	✔
Access to members only website	✔	✔	✔
Use of Alliance Member Logo	✔	✔	✔
Participation in press articles & interviews	✔	✔	✔
Access Final Deliverables	✔	✔	✔
Access Draft Deliverables	✔	✔	✔
Chair Committees and/or Work Groups		✔	✔
Certify Compliant Products and Utilize Certification Logo		✔	✔
Participate and Vote in Work Groups		✔	✔
Participation and Vote in Committees		✔	✔
Approve Operating Budget			✔
Approve Final Deliverables			✔
Initiate Work Groups or Committees			✔
Automatic Seat on Board of Directors			✔
Annual Fee	$2.5K	$15K	$100K

THREAD | Membership Benefits

ACCESS TO THE TECHNOLOGY
Reduce time for development and implementation using a proven solution

THREAD DEVELOPMENT ECOSYSTEM
Access to global member network to help you build your Thread solutions

THREAD CERTIFICATION PROGRAM
Guarantee network interoperability with other Thread devices & broaden your ecosystem

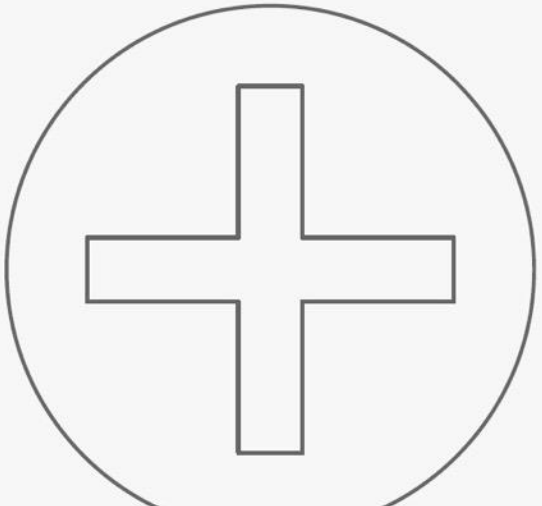
ACCESS TO IP
Gain IP rights for Thread technology with no royalty payments

THREAD TEST HARNESS & COMMISSIONING APP
Save time and resource investment by completing in-house testing for spec conformance and network interoperability

MARKETING & PR CAMPAIGNS
Leverage Thread's marketing, social media & PR tools to extend marketing efforts

MEMBER-DRIVEN COMMITTEES
Provide a voice to help influence the direction of Thread

VISIT the Membership Application Form

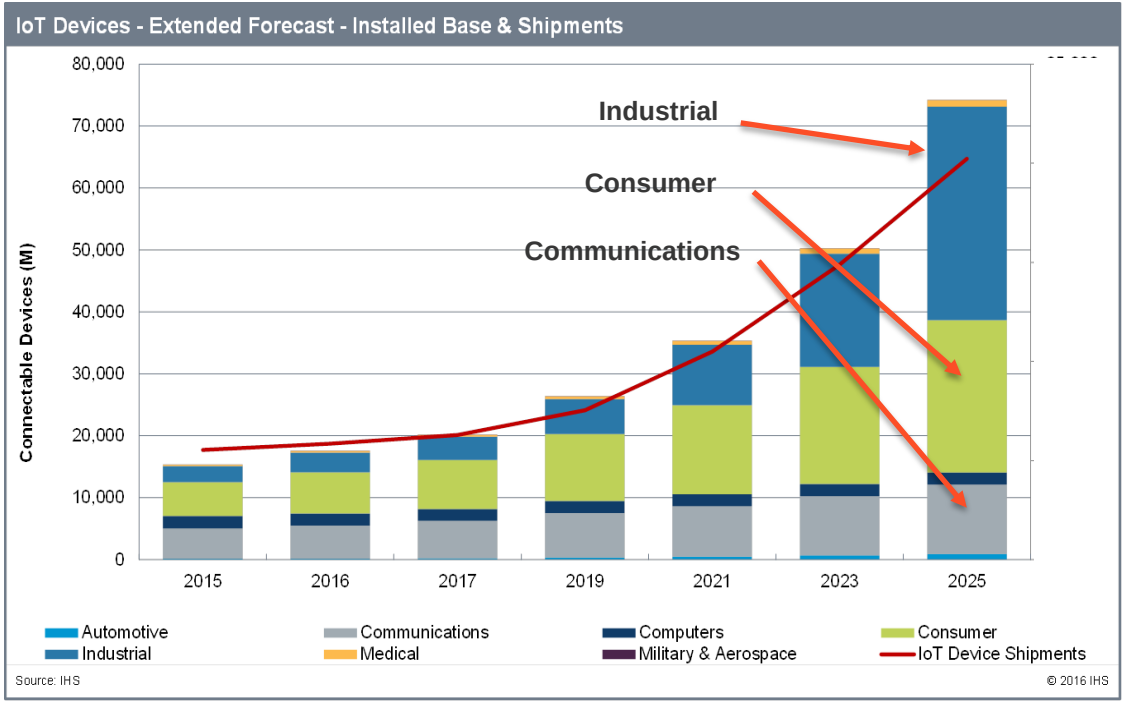


Market Landscape

THREAD GROUP | Market Landscape

Released initially with a focus on the consumer market, Thread is expanding its connectivity solution into the commercial and professional sectors.

- According to forecast by IHS-Markit, the commercial building segment is on pace to reach just over 1 billion connected devices by 2018.
- Demand is particularly steep for building automation and lighting control systems (BALCs) that control devices and enable improvements in operational and energy efficiency.



THREAD GROUP | Market Landscape

The opportunity: IoT Application segments

Industry analysts forecast explosive growth and spending in industrial IoT over the next 5 to 7 years.

- 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.
- The fastest growth will be in the industrial sector. From 2018 to 2025, IHS projects the number of connected devices in commercial buildings will skyrocket from approximately 1 billion to 12 billion devices.

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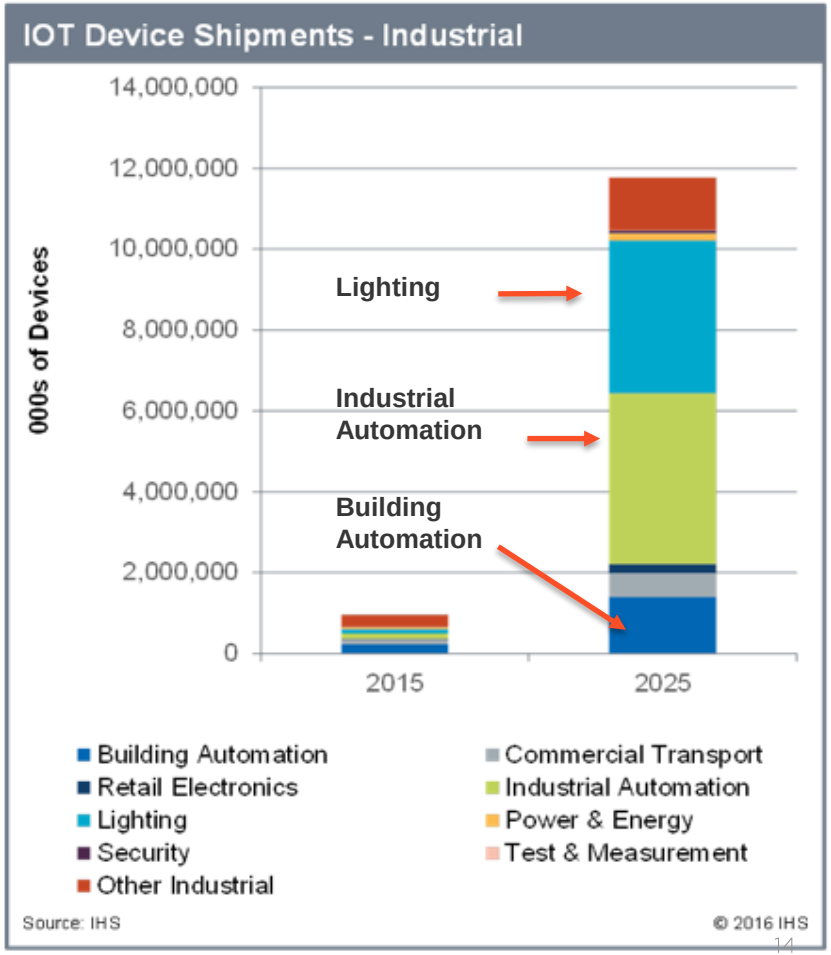
IHS breakdown of projected IoT device shipments in industrial segment for the next decade shows most rapid expansion in areas of:

- ✓ Lighting
- ✓ Building Automation
- ✓ Industrial Automation



The market for Thread Commercial Extensions addresses SOHO to enterprise buildings.

Unique requirements for network installation, commissioning devices, functionality and maintenance.

Benefits Thread Brings to the Commercial Sector

THREAD GROUP

CONNECTING DEVICES WHERE WE LIVE & WORK

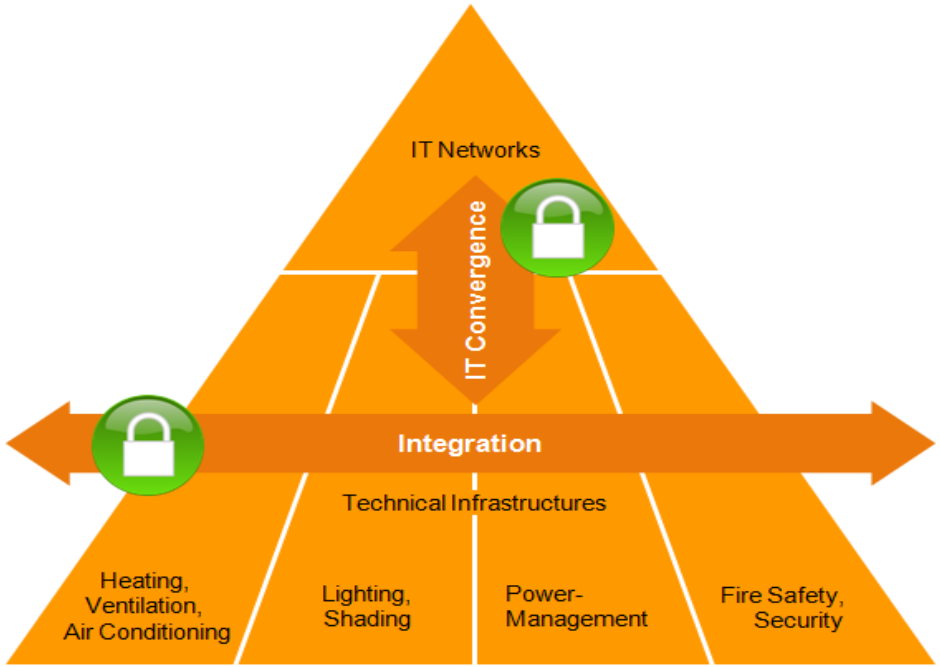
Thread's networking protocol is expanding connectivity beyond the home into the commercial building & professional sectors.

LEARN MORE

THREAD GROUP | Technology Opportunities

Thread Group sees multiple integration opportunities in the commercial building segment.

- IT converging network standardization (lower OSI layers)
- Technology cluster and silo standardization (upper layers)
- Standardization/interoperability between the silos (upper layers)



THREAD GROUP | Technology Opportunities

Standardized interfaces and Thread IP protocols benefit entire ecosystem

Enabling the wireless transformation	• Market is starting to recognize potential of IP-based wireless mesh communication
Accelerating professional services innovation	• Full end-to-end IP network will accelerate pace at which apps and services are developed
Creating a flexible, platform-agnostic ecosystem	• Availability of certified stacks marks important step in delivering on Thread's vision of true multi-vendor choice for connected device ecosystem

THREAD GROUP | Need for IPv6

Unified convergence layer across all networks in the home and beyond

- Reuse software stacks

Enables direct device-to-device, device-to-mobile, and device-to-cloud, and one-to-many communication

- Nodes can communicate directly with each other and with multiple apps or backend services

Support for many application layers

- Any low bandwidth application layer that can run over IPv6 can run over Thread

THREAD GROUP | Need for security

SECURE

Link layer security

All network traffic is encrypted

Only authenticated nodes can join the network

User-friendly commissioning

- DTLS Security session
  - Established between new device and commissioning device to authenticate and provide credentials
  - Once commissioning session is done, device attaches to network
- Application level security
  - Based on end-device requirements and application layer being used
- MAC security used for all messages

THREAD GROUP | Need for low power

LOW POWER

Extensive support for sleepy nodes

Based on power efficient IEEE 802.15.4 MAC/PHY

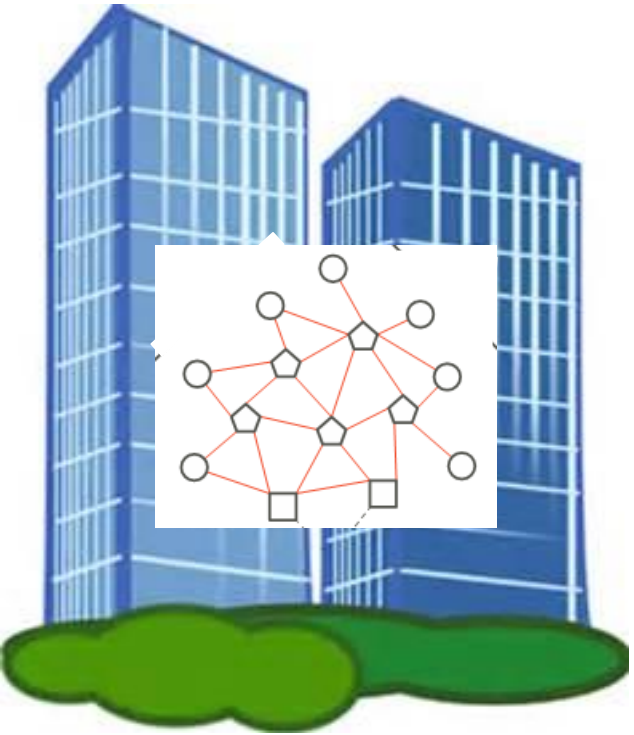
Short messaging conserves bandwidth and power

Streamlined routing protocol reduces network overhead and latency

- Designed from the ground up to enable extremely low power consumption and efficient device communication
  - Doesn't sacrifice a positive end-user experience
- Two technologies in particular, the 802.15.4 standard and 6LoWPAN, form the backbone of Thread's low-power solution.
  - 6LoWPAN also provides a compression mechanism that reduces the IPv6 headers sizes sent over the air and thus reduces transmission overhead
  - Another important feature of the 6LoWPAN layer is the ability to provide link-layer packet forwarding which provides a very efficient and low overhead mechanism for forwarding multi-hop packets in a mesh network
- Designed to run on readily available, low-power wireless system-on-chips

Thread Commercial Extensions: Key Benefits

THREAD GROUP | Why Thread?



Thread addresses requirements dictated by the varied characteristics of the full range of Building Automation & Lighting Control (BALC) implementation use cases

- ✓Thread is the only open standard mesh network with IPv6-addressing
- ✓Low-bandwidth and power
- ✓Security required to support building automation and critical infrastructure

THREAD GROUP | Commissioning in Homes

One person is in charge of whole process and system lifecycle

End User buys devices and physically installs them, then commissions them onto the network …

Purchase

Install

&

Commission

Use

&

Network Management

Dispose

… and changes the network settings when necessary during use of the system

THREAD GROUP | Commissioning in Commercial Buildings

Procurement

Dispose

Install

Electrician physically mounts and wires devices & performs a basic functional test of installed devices

Network Commissioning

Network Engineer commissions devices onto the network

Application Commissioning

Application Engineer commissions the Lighting/HVAC/security/... system

... while the system is 'used' by many End Users, ...

... and system behavior may be reconfigured by Application Engineer

Network Management

Network Engineer manages the network ...

THREAD GROUP | Benefits for BALC Installations

Thread's wireless mesh IPv6 solution offers further specific advantages to a variety of BALC applications:

Simplifies & Streamlines Network Installation	• Both small and very large building networks can use the same technology
Forward-Compatible & Sustainable	• Offers greater scales of economy resulting in cost-effective solutions with more functionality
Increased Flexibility and Installation Speed	• Less alteration during refurbishing; reduces installation costs and simplifies system-wide updates
Enables Advanced Analytics	• Near real-time ability to collect data from a broad range of connected, cross-sector devices

Thread Commercial Extensions: Key Capabilities

THREAD GROUP | New Capabilities

Alignment with enterprise-level security requirements

- ✓ Enterprise-level IT systems require the ability to assign a secure identity to each device in their managed network.
  - ✓ Thread Commercial Extensions will add…
    - ✓ Capability for network engineers to remotely commission devices and simultaneously commission multiple devices.
    - ✓ Ability to individually assign a secure identity to a device.

THREAD GROUP | New Capabilities

Alignment with enterprise-level security requirements

Support for 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 Commercial Extensions will add essential installation handover functionality and verification capabilities.

THREAD GROUP | New Capabilities

Alignment with enterprise-level security requirements

Support for installation handover from installer to network commissioner

Enterprise-level user permissions

- ✓ In a professional installation, the role of managing a network is associated with specific privileges.
  - ✓ Thread Commercial Extensions will add the ability to assign levels of network privileges to individual users or groups of users.

THREAD GROUP | New Capabilities

Alignment with enterprise-level security requirements

Support for installation handover from installer to network commissioner

Enterprise-level user permissions

Increased device capacity for large managed networks

- ✓ Devices in enterprise installations are associated with an operational domain, the scope and size of which is defined by the network administrator (often thousands of nodes).
  - ✓ Thread Commercial Extensions will add the ability to associate Thread devices to an operational domain spanning multiple Thread networks and IPv6 subnets.

THREAD GROUP | Conclusion

Thread Group sees strong opportunity in the Building Automation and Lighting Control (BALC) market.

- ✓ Thread is a cost-effective, reliable, secure, scalable IP solution.
- ✓ Thread Commercial Extensions brings Thread 1.1 spec into alignment with enterprise-level security and IT requirements.
- ✓ Release of the royalty-free Thread Commercial Extensions allows professional building owners to create an effective open network infrastructure.

OSRAM

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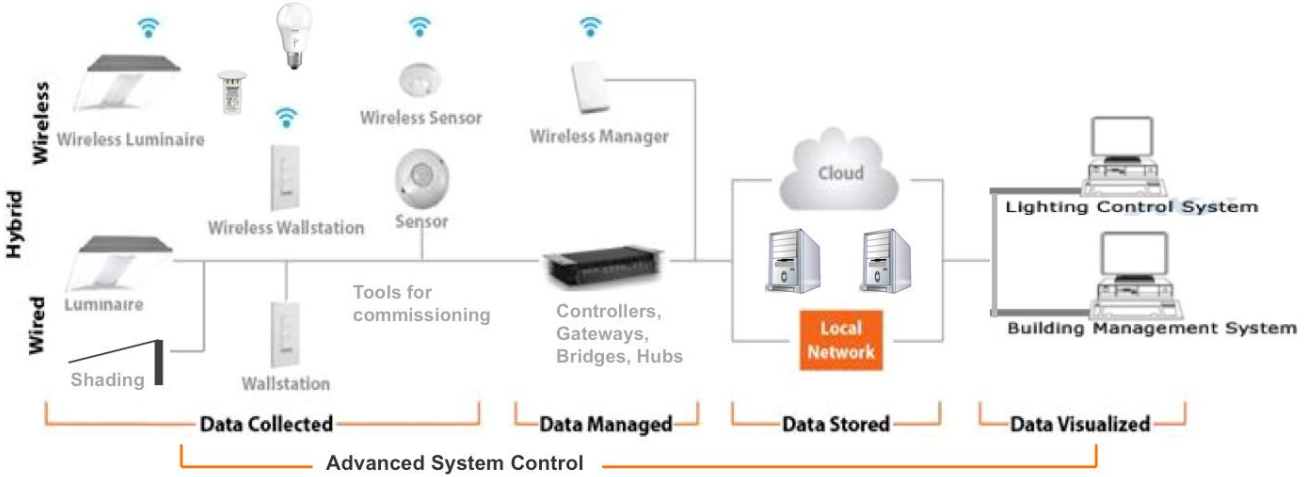
Topology of lighting solutions for the commercial market



The importance of wireless in hybrid networks is significantly increasing. To minimize cost and energy consumption, improve user experience and enable smart use cases, we must integrate our connectivity solutions and more effectively exploit E2E system data.

THREAD GROUP

OSRAM Insights: We have several years of “trial and feasibility” experience with wireless technologies like Zigbee, Bluetooth, KNX, proprietary, etc.

- Wireless functionality is sustainable. It has many true benefits in the lighting space.
- Market is ready and willing to invest and capitalize on the above.
- No more “semi-digital” solutions. Migration and convergence into digital is imminent.
- Today’s penetration of wireless is <1%. We see a double digit attainable market.
- IP based standards will further accelerate adoption.

THREAD GROUP

Why did we select Thread Commercial Extensions as our platform for the future?

- The unique design of Thread Commercial Extensions is based on many years of field experience and is designed for Lighting Control and Building Automation.
- We want to have one universal network, routing and transport platform for true IP based connectivity.
- We can only win the battle for robustness and security in partnership with the true leaders in the digital industry.
- Can now support all heterogeneous devices and applications of today and tomorrow because it will be operating on the same underlying IP-based Thread Commercial Extensions platform.

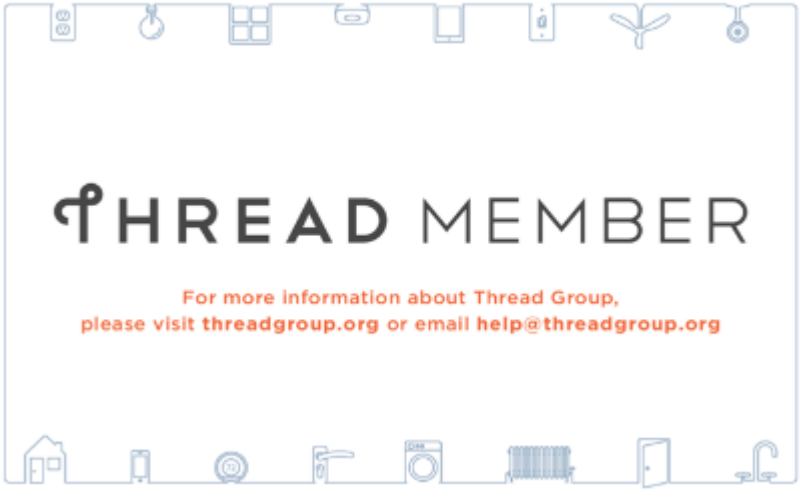
THREAD GROUP | Thank You!

Sign up for our newsletter to get quarterly updates

SIGN UP FOR OUR NEWSLETTER

For more information, please connect with us:

- help@threadgroup.org
- www.threadgroup.org
- linkedin.com/company/thread-group
- @TheThreadGroup
- Be sure to check out Thread Group's Blog!

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