

THREAD GROUP

GETTING STARTED WITH THREAD WEBINAR



JUNE 28, 2016

THREAD | Agenda

Welcome

Go to Webinar overview and speakers

Thread overview – what and why is it?

Steps to take in creating a Thread solution

- Defining your product
- Selecting an application layer
- Navigating the Thread ecosystem
- Certification

Questions & Answers

THREAD | Go To Webinar Overview

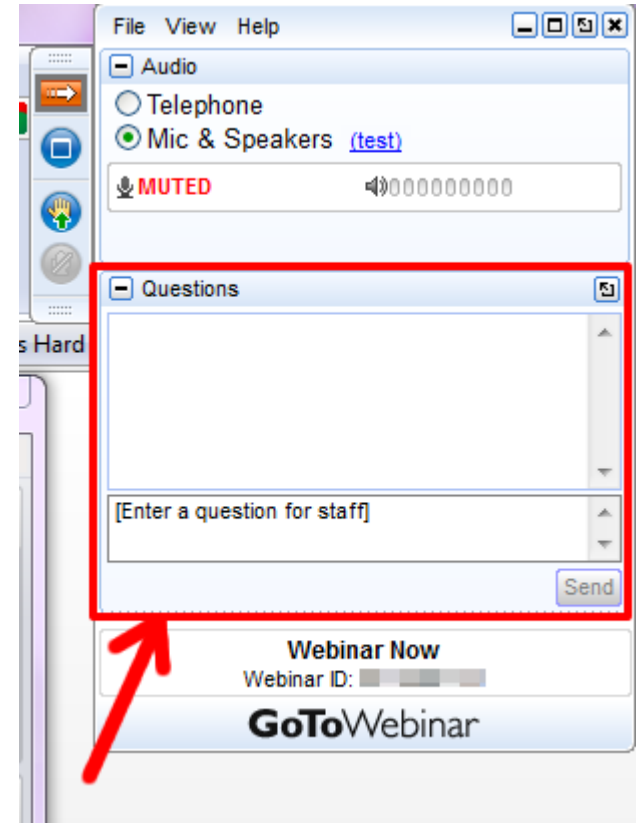
You will be defaulted to mute by organizer

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 | 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

MCU 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.

What is Thread?

WHAT IS THREAD?

Thread was designed with one goal in mind: to create the best way to connect and control products in the home.



DESIGNED FOR THE HOME

Securely and reliably connect products around the home



BUILT-IN SECURITY

Provides security at the network layer



BATTERY FRIENDLY

Based on the power-efficient IEEE 802.15.4 MAC/PHY



OPEN IPv6 BASED PROTOCOL

Provides device-to-device and device-to-cloud connections



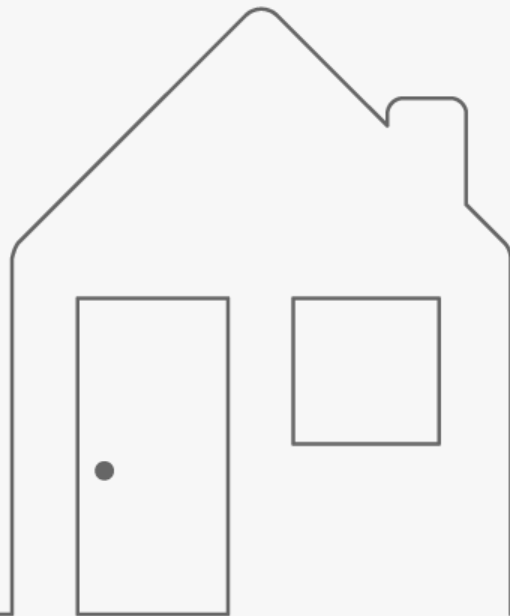
ROBUST MESH NETWORK

Devices can route messages with no single point of failure



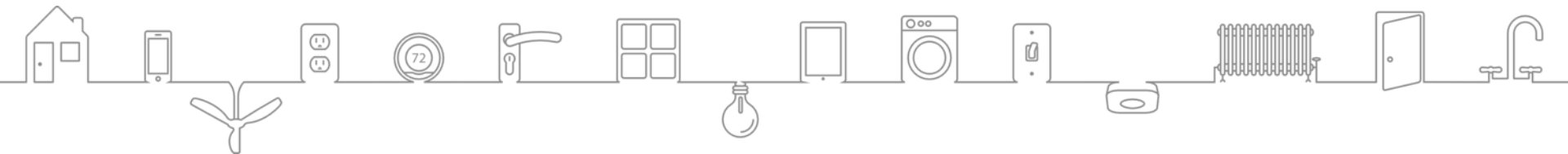
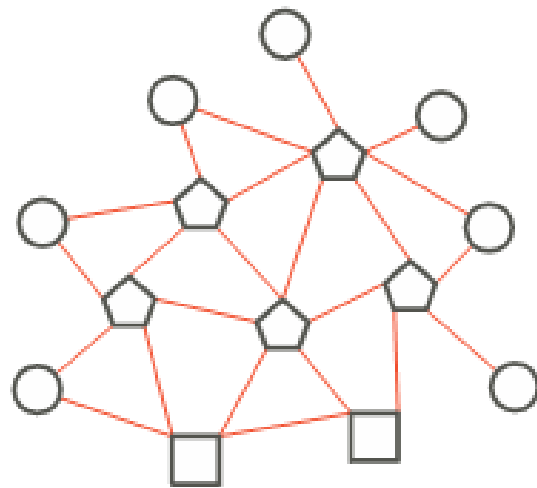
SIMPLE TO SET UP AND USE

Install using a smartphone, tablet, or computer



THREAD | Why Use Mesh?

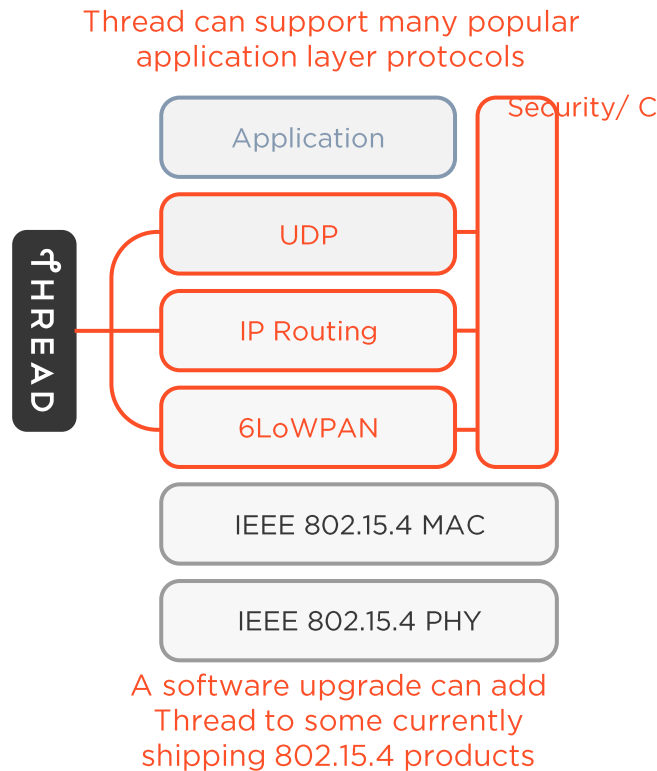
- ✓ Self-healing, no single point of failure
- ✓ Doesn't require dedicated repeaters
- ✓ Overcomes wireless interference
- ✓ Supports very low power nodes
- ✓ Reliable enough for critical devices and applications



THREAD | What it Delivers

A secure wireless mesh network for connected products in your home

- Built on proven, widely available and supported technologies
 - Uses IPv6 (6LoWPAN)
 - Runs on existing 802.15.4 silicon from multiple providers
- Legacy-free design with updated architecture
 - Designed with a new security architecture to make it simple and secure to add and remove products
 - Supports 250+ products per network
 - Designed for very low power operation



Why Thread?

THREAD | The Need for a New Wireless Network

We are entering a new era of connected products

- The INTERNET of Things
- Widely distributed, battery operated devices need a low power, mesh network

We wanted to use an existing wireless mesh protocol

- None fit our requirements well enough
- None were suitable for homes and consumer electronic products

We found that many companies shared the same concerns

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

Requirements:

New wireless home network

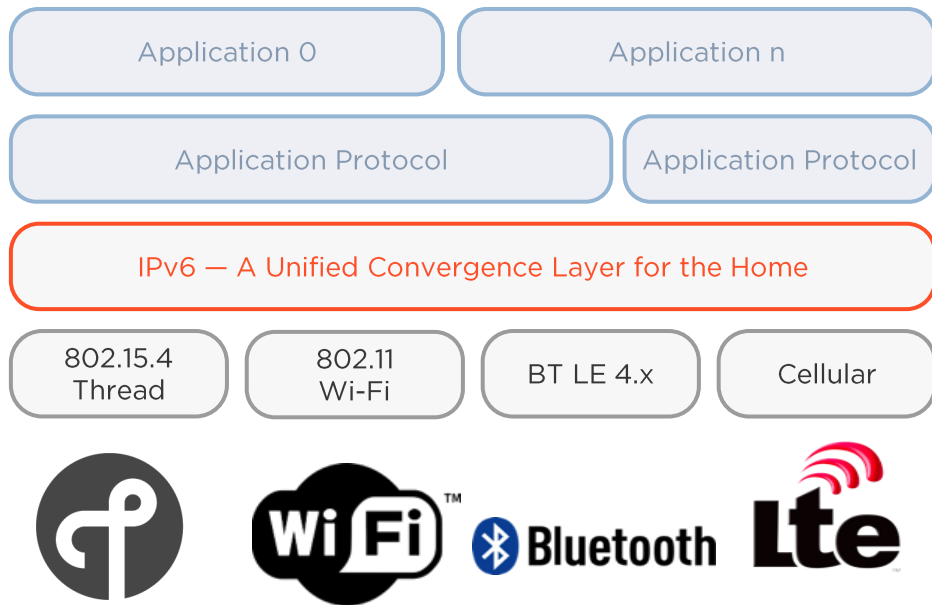
- ✓ Low power
- ✓ Resilient (mesh)
- ✓ Internet Protocol based
- ✓ Open
- ✓ Secure and user friendly
- ✓ Fast time to market
- ✓ Existing radio silicon

🧵 THREAD | Why is Internet Protocol (IP) so important?

Because we're building the INTERNET of Things

- Historically, “constrained” embedded devices have used specialized communication protocols
 - Low power, low bandwidth, fit-for-purpose app layer
- The Internet and WWW are built on a layered stack of open standards
 - Each layer is independent and NOT tied to a specific application
 - This is why the Internet is so flexible and pervasive
- Now, we have the technology to use Internet standards with constrained embedded devices
 - Devices and applications can be developed independently
 - Applications can run anywhere – cloud, controller, router, or endpoint device

THREAD | Thread is IP



Unified convergence layer
across all networks in the home

- Reuse software stacks

Enables direct device-to-device,
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

THREAD | Internet Protocol

The Internet: Today, mostly “large” devices

	Large devices Mains powered Fast networks	
Applications	Internet / Web applications	
Web Transfer	HTTP	
Transport	TCP	
Security	TLS	
Addressing	IPv6 / IPv4	

🌀 HREAD | Internet Protocol

The Internet: Now available in “small!”

	Large devices Mains powered Fast networks 	Small devices Battery powered Constrained networks 
Applications	Internet / Web applications can work with large or small devices	
Web Transfer	HTTP	CoAP
Transport	TCP	UDP
Security	TLS	DTLS
Addressing	IPv6 / IPv4	6LoWPAN

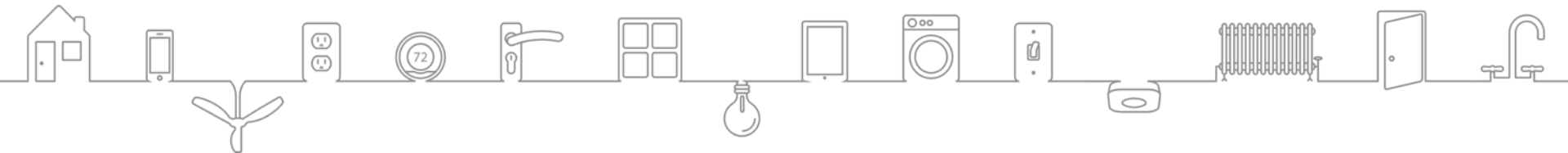
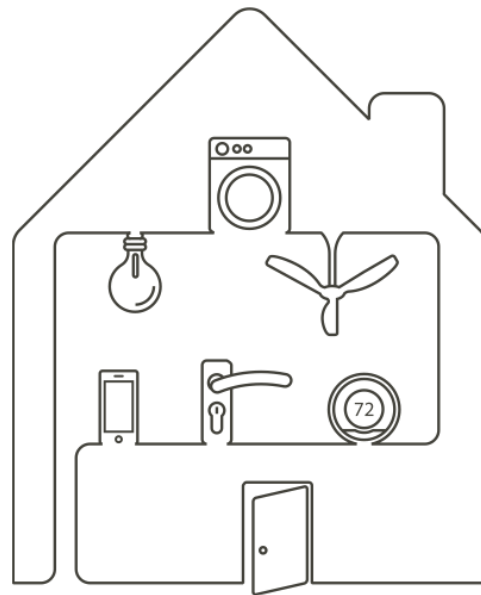
STEP 1:

Things to consider when defining your Thread-enabled product

THREAD | Identify Target Application

Thread is designed for all kinds of products and apps in the home, working together to form a cohesive mesh network.

- Appliances
- Access control
- Climate control
- Energy management
- Lighting
- Safety
- Security



THREAD | Things to Consider

IoT connectivity decisions have a much greater impact, short and long term:

- Number of connectivity technologies used
- Time and effort to get to market
- Supply chain and BOM cost
- Size and number of interoperable ecosystems for your product
- Value proposition and experience for your customers
- Long-term support obligations

Considered against the far longer life-cycles of IoT devices

THREAD | Many Wireless IoT Standards

Category 1: Connectivity layer

- Provide wireless connectivity
- Examples: Thread, Wi-Fi/HaLow, ZigBee PRO

Category 2: Application layer

- Provides interoperability with other devices or the cloud. Some can be run over multiple connectivity methods, or at different layers.
- Examples: AllSeen, IPSO, OCF (IoTivity), IIC, ZigBee Cluster Library, many vertical-industry alliances

Category 3: Full-stack technologies – connectivity layer combined with application layer

- Examples: Bluetooth, ZigBee 3.0, Z-Wave, ULE

🧵 HREAD | Which one do you choose?

	Wi-Fi 802.11 b/g/n	802.11ah (HaLow)	BT LE 4.x	BT-LE SmartMesh v1	ZigBee 3.0	Z-Wave Plus	ULE	Thread
Range / Topology	Long / Star	Long / Star	Short / Star	Short / Mesh	Short / Mesh	Short / Mesh	Short / Star	Short / Mesh
Bandwidth	1- 150Mb/s	100 kb/s	1Mb/s	1Mb/s	250Kb/s	40Kb/s	32Kb/s	250Kb/s
Support for IPv6	✓	✓	On 4.1+	✗	✗	✗	Planned	✓
Open Standard	✓	✓	✓	✓	✓	✗	Yes	✓
Application Layer	Multiple 3 rd party options	Multiple 3 rd party options	Multiple 3 rd party options	Multiple 3 rd party options	Native - ZCL	Native	Multiple 3 rd party options	Multiple 3 rd party options. Devices w/ different apps can be on same mesh
Use Cases	A/V equipment, mains-powered devices	Connected home products, mains- and battery-powered devices, A/V	One-to-one connections for portable devices or automotive speaker systems	Audio/Data, IoT devices built for the home.	Mission critical devices, such as security, on their own network	Security	Telephony, Physical Security, Home Automation (based on DECT)	Mission critical IoT devices built for the home
Benefits	Used almost universally in commercial and residential spaces	A more power-conservative, longer-range, sub-gig version of Wi-Fi	A power-conservative, user-friendly solution for control of devices tethered to your phone	A mesh version of BLE designed for collections of products	A purpose-built, device-to-device connectivity solution	A secure and closed device-to-device solution for connected products	Long-range, secure, low-latency, audio-capable	IP-addressable, low-bandwidth, secure mesh network designed to support today's connected devices
Availability	Support from multiple silicon vendors	Not yet available.	Support from multiple silicon vendors	Not yet available.	Support from multiple silicon vendors	Available, from a single silicon vendor who owns the technology	Support from multiple vendors	Support from multiple silicon vendors

🧵 THREAD | What kind of device are you building?

- Plugged in or battery operated?
- Always on?
- What kind of user interface does it have?
 - A screen or input device? Buttons? None?
- How frequently does it transmit/receive?
- What kind of data does it generate/accept and what are the bandwidth requirements?

THREAD | How will users interact with your device?

Is it passive (sensor) or active (light)?

User phone? An app? Web interface?

Physical button? All? None?

A first party (your) app or third party (platform) app?

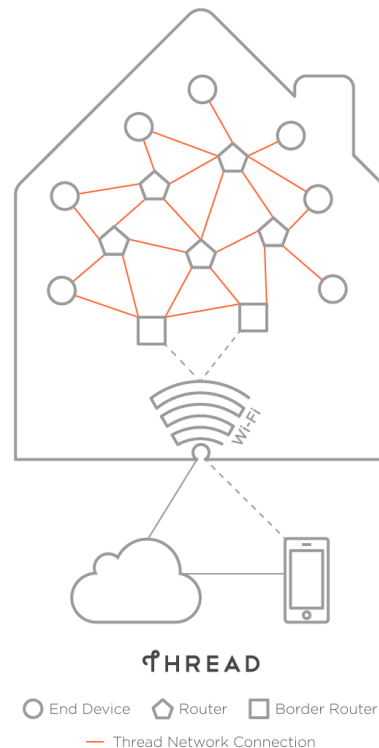
Are you interested in other people writing apps?

How mission critical is it?

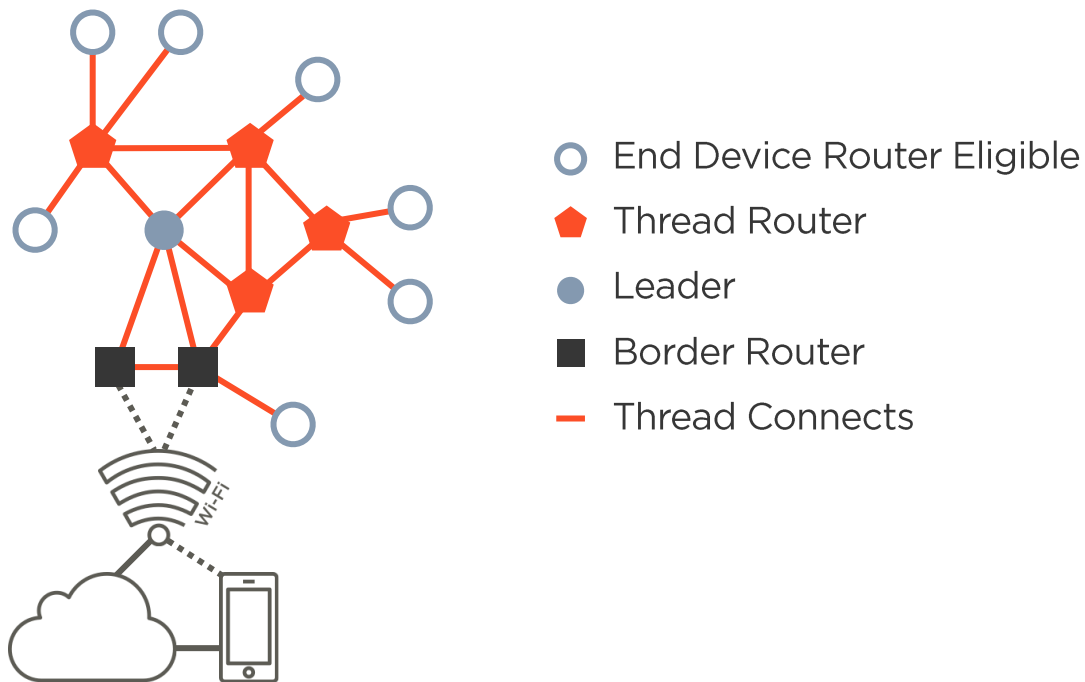
How easy is it to commission?

Will they access it only while proximate, or remotely?

Will multiple users access it at any time?



THREAD | Which Thread network role(s) are you building?



THREAD | What ecosystems and devices add value?

Does your device get more interesting/valuable/sticky when coordinating with other devices?

What ecosystems do you want your device to participate in? (Nest, HomeKit, SmartThings, Philips, Echo, your own)?

This will drive arguably the most important decision. Whether to use a proprietary or common language, and which one?

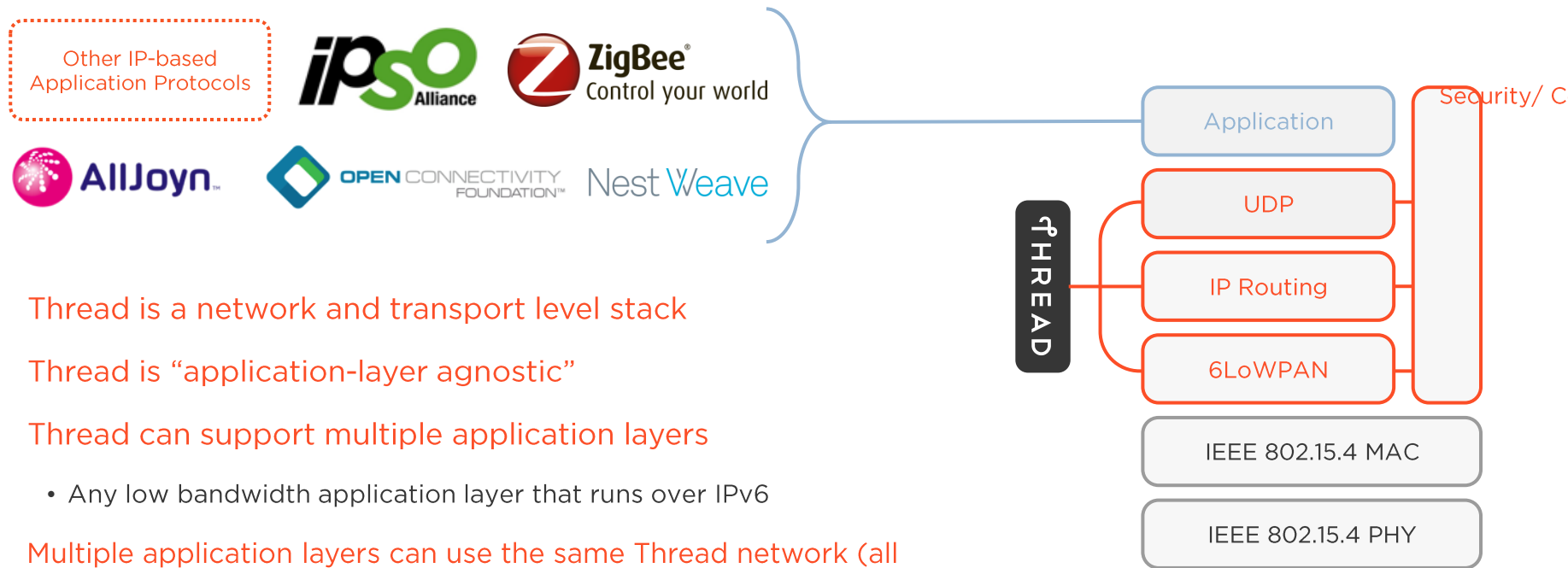


STEP 2:

You defined your Thread product.

Now, how do you select an application layer which provides the user experience?

Thread | Application Layers – Reducing the Complexity



Thread is a network and transport level stack

Thread is “application-layer agnostic”

Thread can support multiple application layers

- Any low bandwidth application layer that runs over IPv6

Multiple application layers can use the same Thread network (all Thread devices will route data through the mesh)

THREAD | Example Application Layers



Proven, widely-deployed application layer from the ZigBee Alliance. Adapted to run over Thread networks.



Open-source application solution designed to enable developers and device manufacturers to deliver interoperable products.



An open-source application solution designed for Linux-based systems.



Application layer specifically designed for connected products part of the Works with Nest ecosystem in the home.

Use Cases

Home Automation, Lighting

Connected Home

Mobile Devices

Connected Home

Benefits

Developers can build Thread-based solutions around a field-proven technology.

Spans multiple networking protocols and supports many product types.

Open source framework promotes interoperability regardless of transport layer.

Low latency; supports low-power devices. Devices can communicate even when an Internet connection is not available.

THREAD | Industry Partnerships

What is Thread Group's strategy for partnerships with other alliances?

Thread can support multiple application layers

- We want broad market adoption for application layers that align with member interests
- Partner agreements with application layer alliances accelerate adoption and integration
- Nothing prevents any IP based application layer from using Thread

Thread Liaison Agreements June 2016



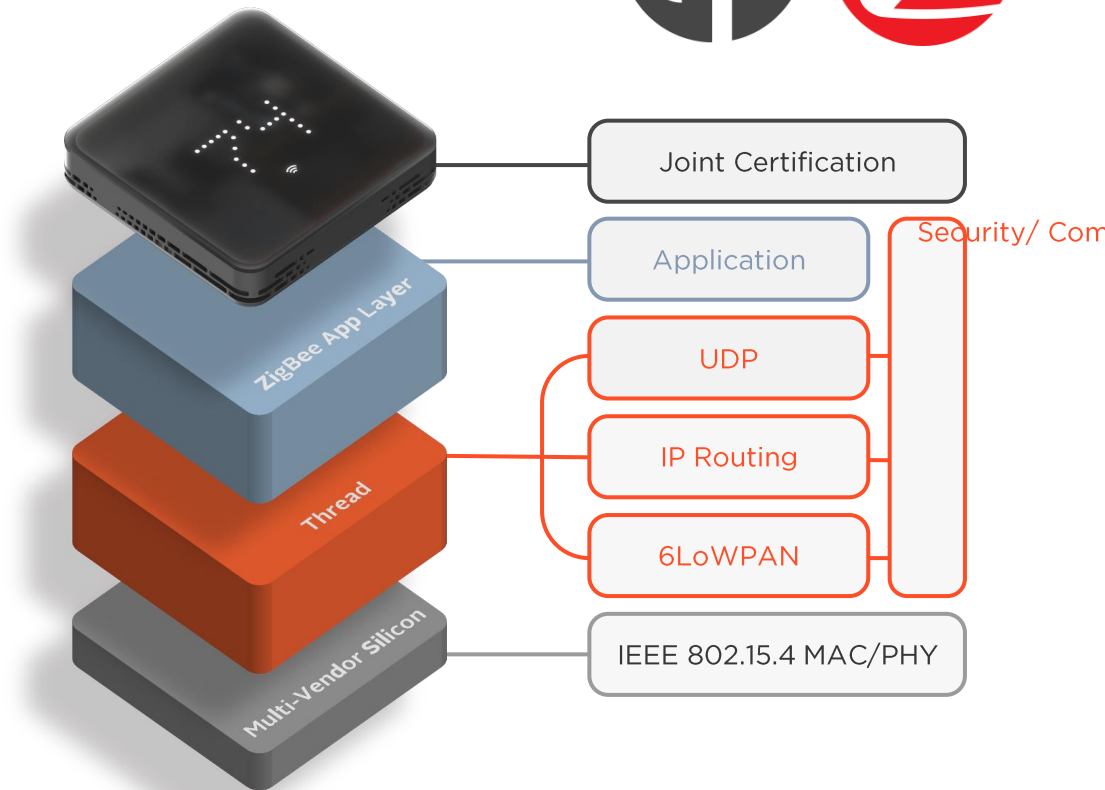
THREAD | Thread & ZigBee



The ZigBee Alliance is adapting their application layer to run over Thread networks.

This gives device vendors a robust, well-known, and widely-deployed option for device-to-device interoperability over Thread.

Through the liaison agreement, both groups will work together to enable members to easily adopt, deploy and certify products.

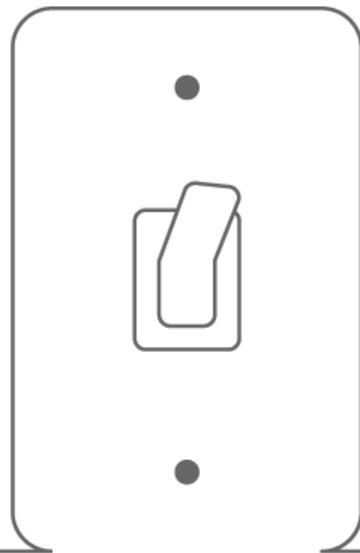
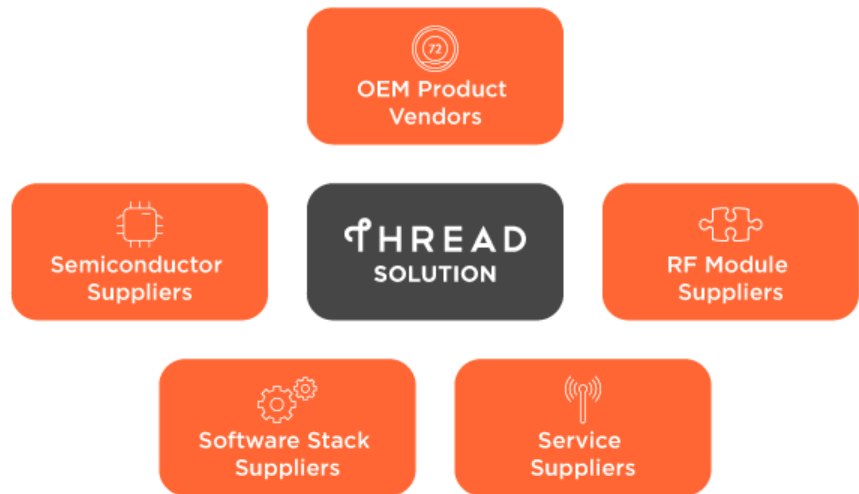


STEP 3:

Now, develop and market your product!

THREAD DEVELOPMENT ECOSYSTEM

Ready to get started? Many members offer a variety of products & services to help you build your Thread solutions.



THREAD | Silicon and Software Stack Providers

Product companies can start developing Thread-based products today

Compatible 802.15.4 silicon is already available

Many new products are in development

Pre-certified Thread chips and stacks are available from three silicon vendors



Please contact the above companies for Thread stacks that are scalable and optimized for their silicon platforms.

There will be more silicon and stack providers over time

Open Source Thread option



Nest has released OpenThread to GitHub

THREAD | Development Partners

RF Module Suppliers

- FCC and Thread Certified RF hardware modules to plug into your design
- A number of vendors also offer certified turnkey hardware solutions to complement your design (e.g., border routers)
- Some also offer software and/or design services



**MMB
Networks**

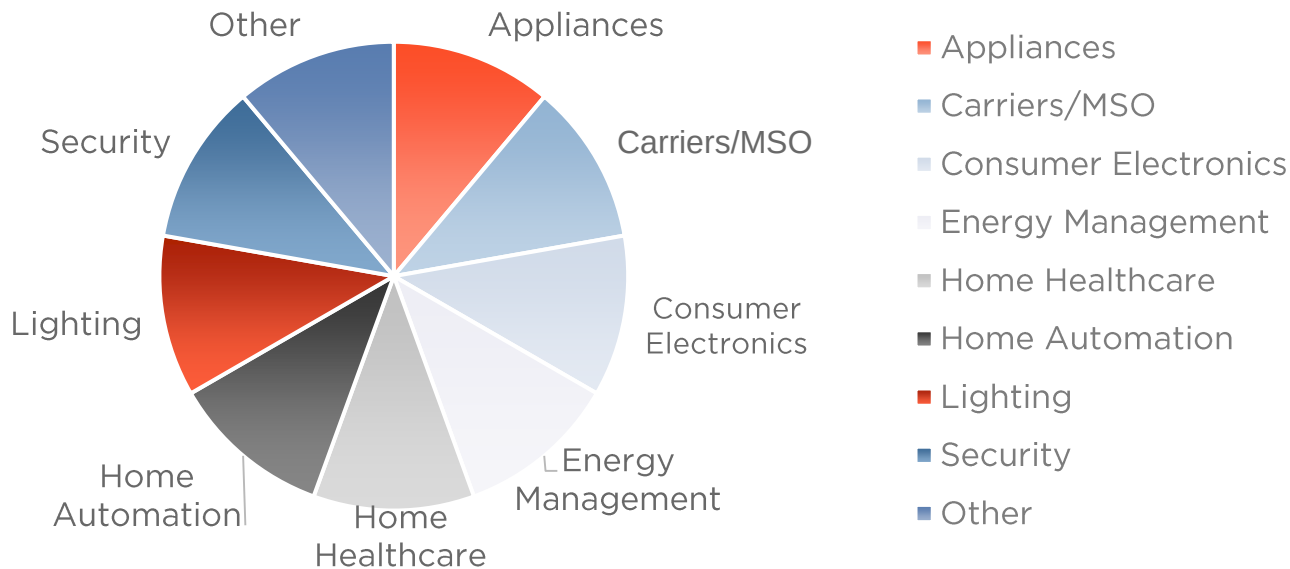


Service Suppliers

- Software stack providers or developers
- Software system integrators - integration of all networking and application layer technologies
- Manufacturing
- Hardware design
- Network testing

THREAD | OEM Product Vendors

- Thread Group OEM product vendors represent many different markets and applications
- Create a unique ecosystem or join an existing ecosystem by working with other OEMs



THREAD | Connect with Thread Members

Navigate the Thread Ecosystem through the Member page on threadgroup.org



OUR MEMBERS

Industry :	All
Segment :	All
Region :	All
Membership Level :	All
	Search Clear All

Network with Thread members by joining Thread Group, participating in committees and attending All Member Meetings

THREAD | Membership Tiers

MEMBERSHIP BENEFITS	AFFILIATE	CONTRIBUTOR	SPONSOR
Receive member communications	✓	✓	✓
Participate in general or annual meetings	✓	✓	✓
Access to members only website	✓	✓	✓
Use of Alliance Member Logo	✓	✓	✓
Participate in press articles & interviews	✓	✓	✓
Access Final Deliverables	✓	✓	✓
Chair Committees and/or Work Groups		✓	✓
Certify Compliant Products and Utilize Certification Logo		✓	✓
Access Draft Deliverables		✓	✓
Participate and Vote in Work Groups		✓	✓
Participate and Vote in Committees		✓	✓
Access to Thread Reference Commissioning App		✓	✓
Ability to purchase Thread Test Bed		✓	✓
Access to Thread Test Harness		✓	✓
Approve Operating Budget			✓
Approve Final Deliverables			✓
Initiate Work Groups or Committees			✓
Automatic Seat on Board of Directors			✓
Annual Fee	\$2,500	\$15,000	\$100,000

THREAD | Innovation Enabler Award

We recognize that much of the innovation in the connected home is coming from small start-up companies who can't necessarily afford membership fees.

- We want to help these small, innovative companies launch Thread-enabled products

To do this, we give away free one-year Thread Group Contributor membership quarterly

Get details and apply at <http://www.threadgroup.org/join/innovation-enabler-program>

Applicable Thread Affiliate members can apply



Rapport Network®



THREAD CERTIFICATION

Rigorous testing for products that use Thread ensures devices connect effortlessly & securely.



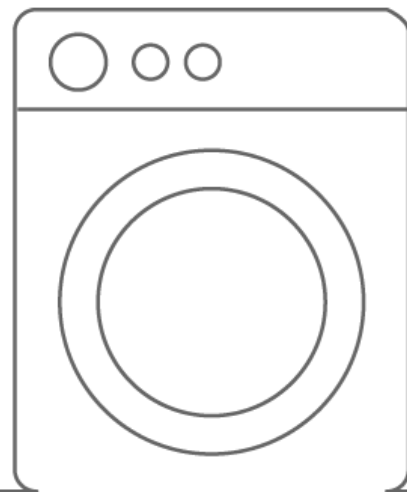
COMMISSIONING



**NETWORK FUNCTIONALITY
& INTEROPERABILITY**



**COMPONENT CERTIFICATION
PROGRAM**



Must be a Thread Group member to access Certification and to use the Thread technology (IP Rights)

THREAD | Connect With Us Today!

Sign up for our newsletter to get quarterly updates

 SIGN UP FOR OUR NEWSLETTER

For more information, please contact us:

- help@threadgroup.org
- www.threadgroup.org
- 1-925-275-6690
- [linkedin.com/company/thread-group](https://www.linkedin.com/company/thread-group)
- @TheThreadGroup
- Be sure to check out Thread Group's Blog!



THREAD GROUP

Thank You