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techtalks

WELCOME

Get to Know OpenThread Resources and Examples

Mark Hallam – Sr. FAE

SILICON LABS

The Leader in IoT Wireless Connectivity

Standards Driven

Comprehensive Solution

Certified Hardware, Stack and & Tools

Scalable

IPv6

Innovation

Secure and resilient

Emerging Markets

ember	ENERGY micro	bluegiga	telegesis	Micrium	ZENTRI	Z-WAVE	REDPINE SIGNALS
2012	2013	2015	2015	2016	2017	2018	2020
Software ZigBee SoC	Low-power 32-bit MCUs	BT Smart Modules	ZigBee/Thread Modules	Software RTOS	Cloud Connected Wi-Fi	Smart Home Protocol	Ultra Low Power Wi-Fi

Thread – The pipeline to the next big thing

Background and Concepts

Thread Background

THREAD GROUP

Products to communicate with **each other**, **cloud services** and the **customer**.

- Requirements:
  - Secure
  - Scalable
  - Resilient
  - Low Power
  - IP-Based

Google

LUTRON

NORDIC SEMICONDUCTOR

NXP

OSRAM

Qualcomm

SIEMENS Ingenuity for life

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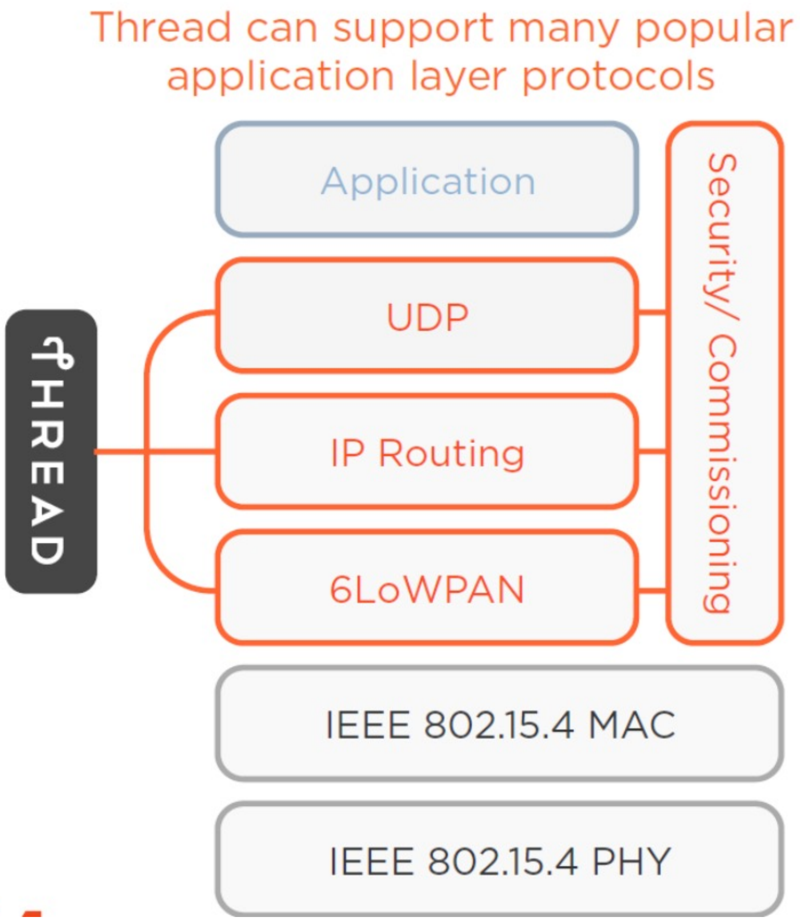
somfy.

Yale

Thread Overview

Build on Existing Technologies

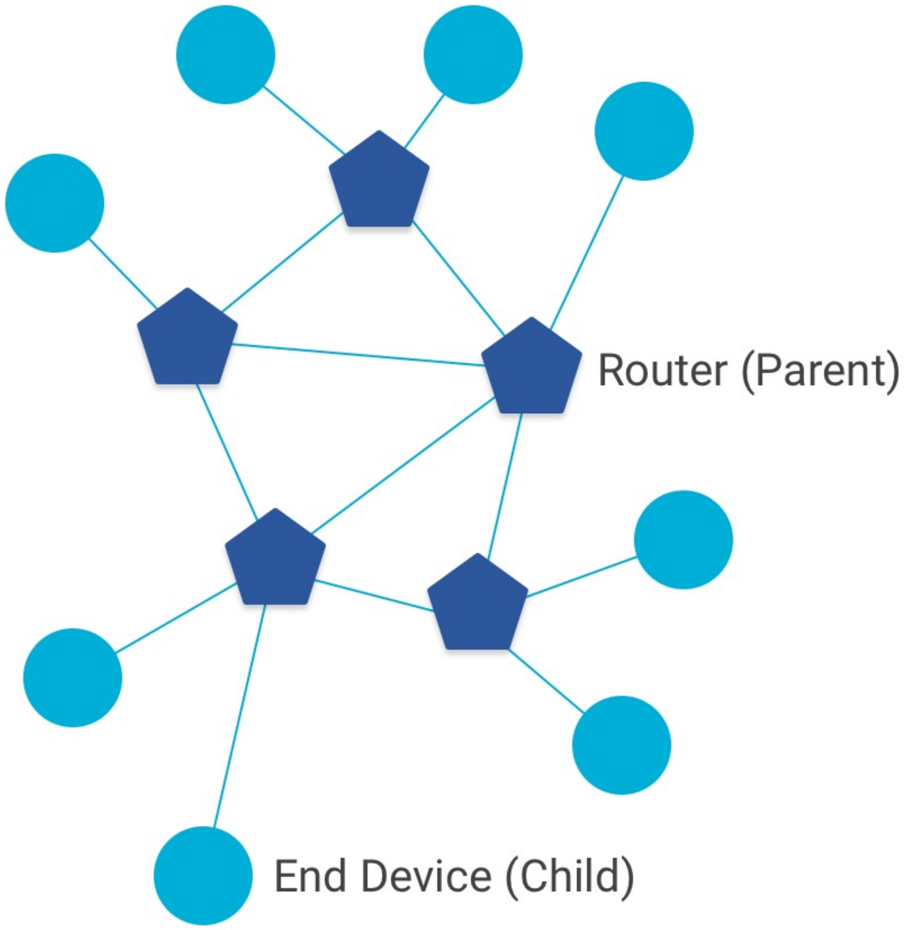
- Same PHY as Zigbee (802.15.4)
  - Fast time to market
- IETF Link layer standards (6LoWPAN)
- Security / Simplicity
- Efficiency
- Thread Specification (1.1)



Thread Network Overview

Scalable Mesh Network

- Up to **32 routers** per network
- Up to **511 end devices** per network
- **Parent-Child** relationship



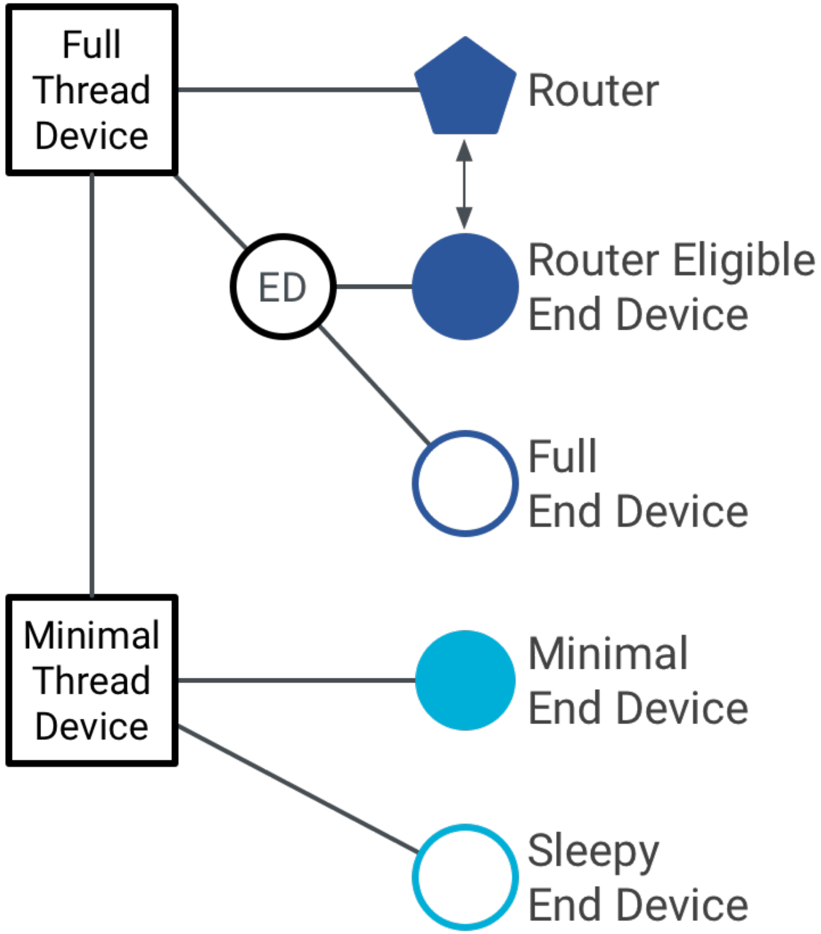
Thread Network Overview

Full Thread Device

- Radio on at all times
- Router multicast address
- 3 main types: **Router, REED, FED**

Minimal Thread Device

- All messages to the parent
- No Router multicast address
- 2 main types: **MED, SED**



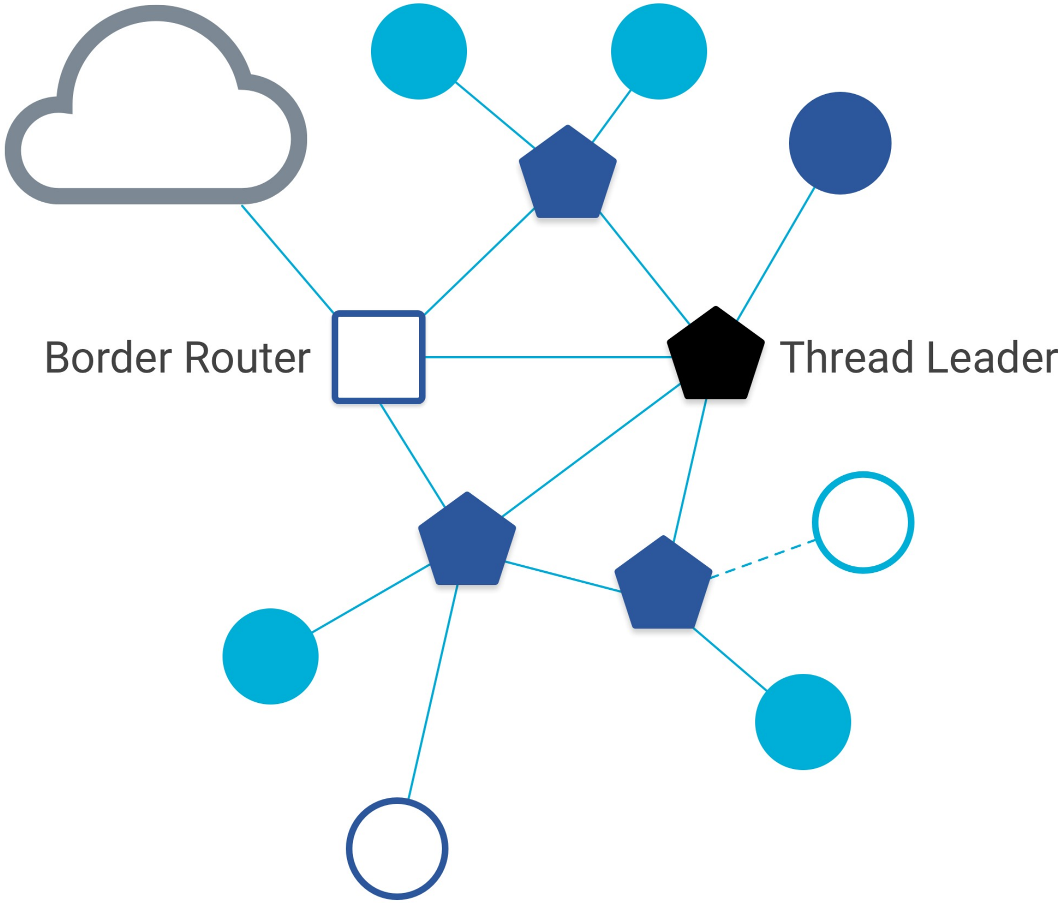
Other device roles

Border Router

- Bridge between Thread – non-Thread
- Configure external connectivity

Thread Leader

- Manage routers.
- Self elected dynamically.
- Aggregates and distributes network configuration.



OpenThread – The de facto implementation of Thread

OpenThread

- Open Source, C++ implementation of Thread
- OS and Platform agnostic
- Thread-Certified
- Supported on multiple platforms from different vendors

OPENTHREAD
released by Google

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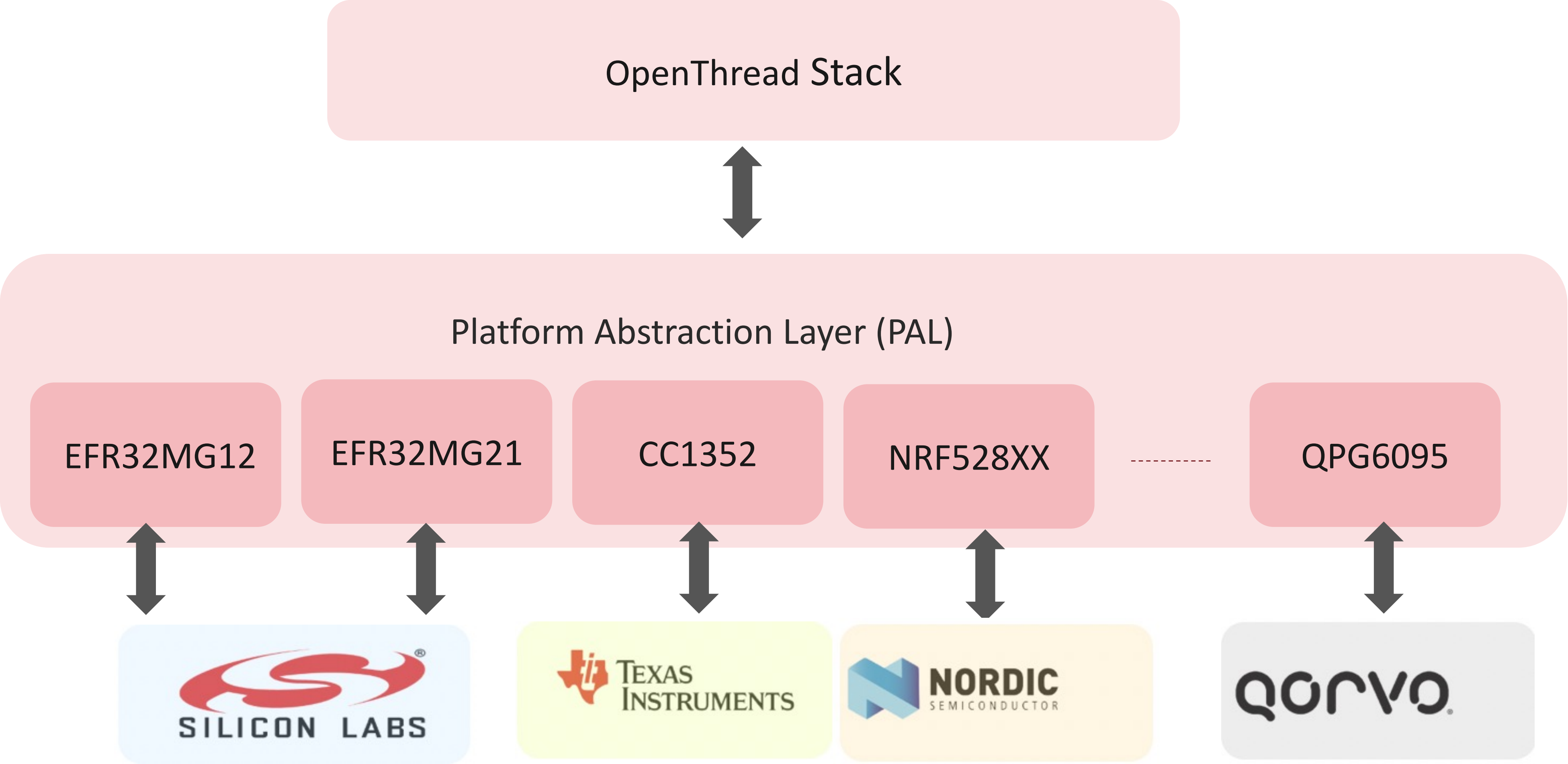
TEXAS INSTRUMENTS

NORDIC SEMICONDUCTOR

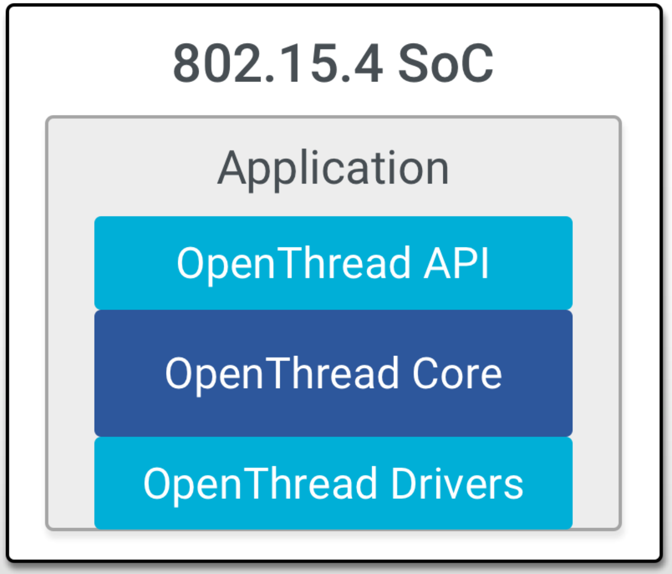
qorvo

OpenThread Architecture



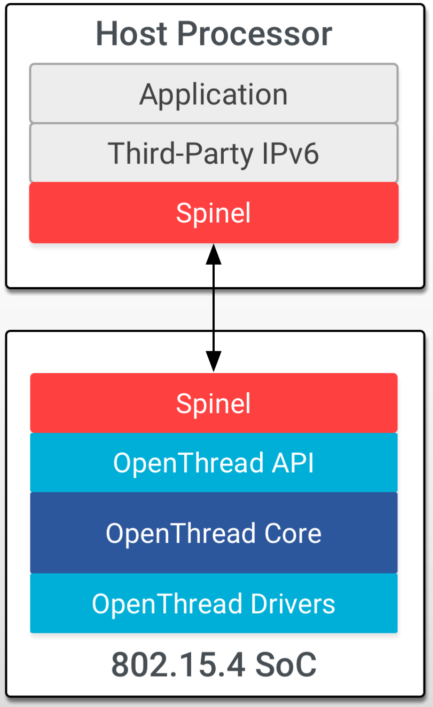
OpenThread Architecture

SOC



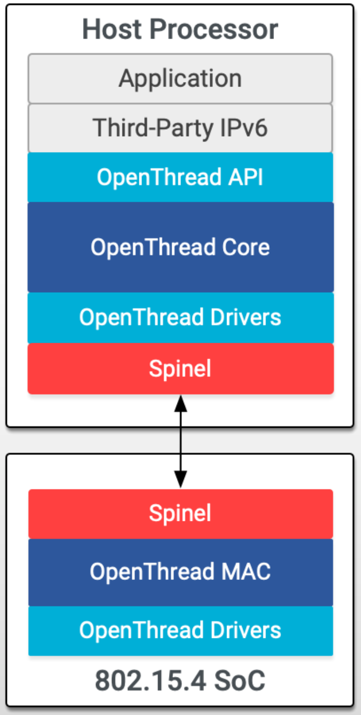
Everything on one processor.
Usually End Devices.
Other variant: Multi – interface.

NCP



Thread runs on SoC.
App layer on Host that can Sleep.
Usually Gateways.

RCP



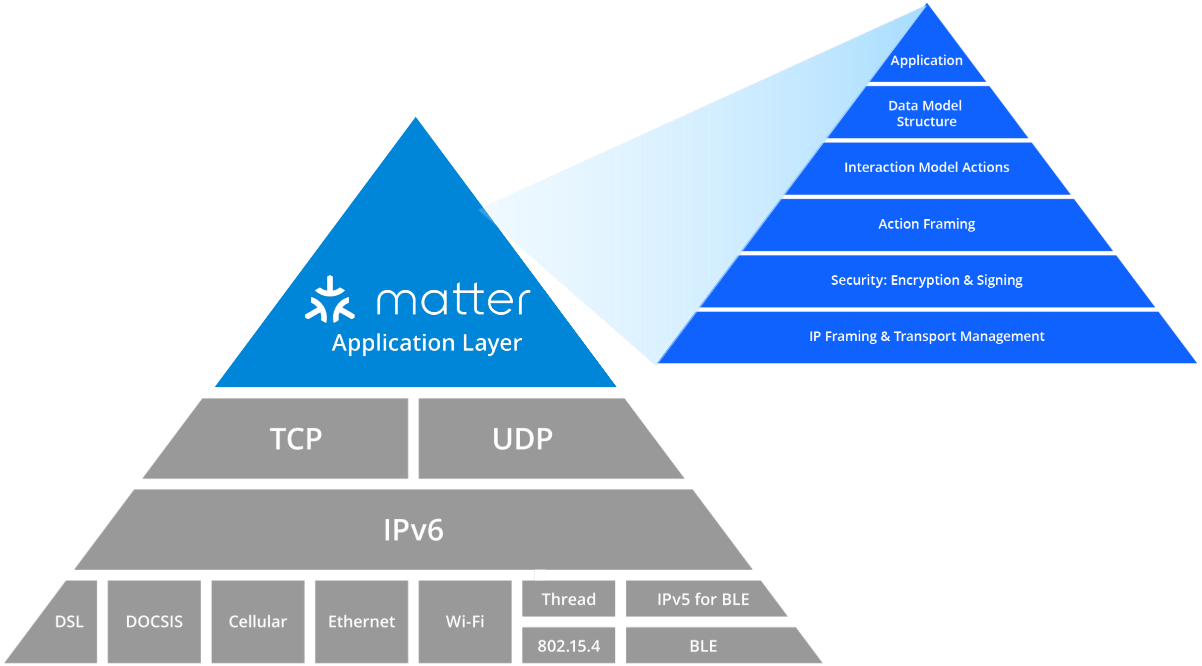
Thread and App layer on Host.
Low level MAC layer on SoC.
Thread can utilize more resources.

Matter – The makeup of the IoT Smarthome

Matter Overview

- Project CHIP rebranded to Matter on March 11, 2021
- New application layer based on market-tested technologies leveraging multiple network protocols like Wi-Fi, Thread, and Bluetooth
- Improves end user experience by simplifying interoperability between ecosystems & protocols
- Backed by 140+ member companies working to reduce complexities for IoT product developers across smart home & commercial markets

Matter Connectivity Standard



Application

Data Model Structure

Interaction Model Actions

Action Framing

Security: Encryption & Signing

IP Framing & Transport Management

matter Application Layer

TCP | UDP

IPv6

DSL | DOCSIS | Cellular | Ethernet | Wi-Fi | Thread | IPv5 for BLE | 802.15.4 | BLE

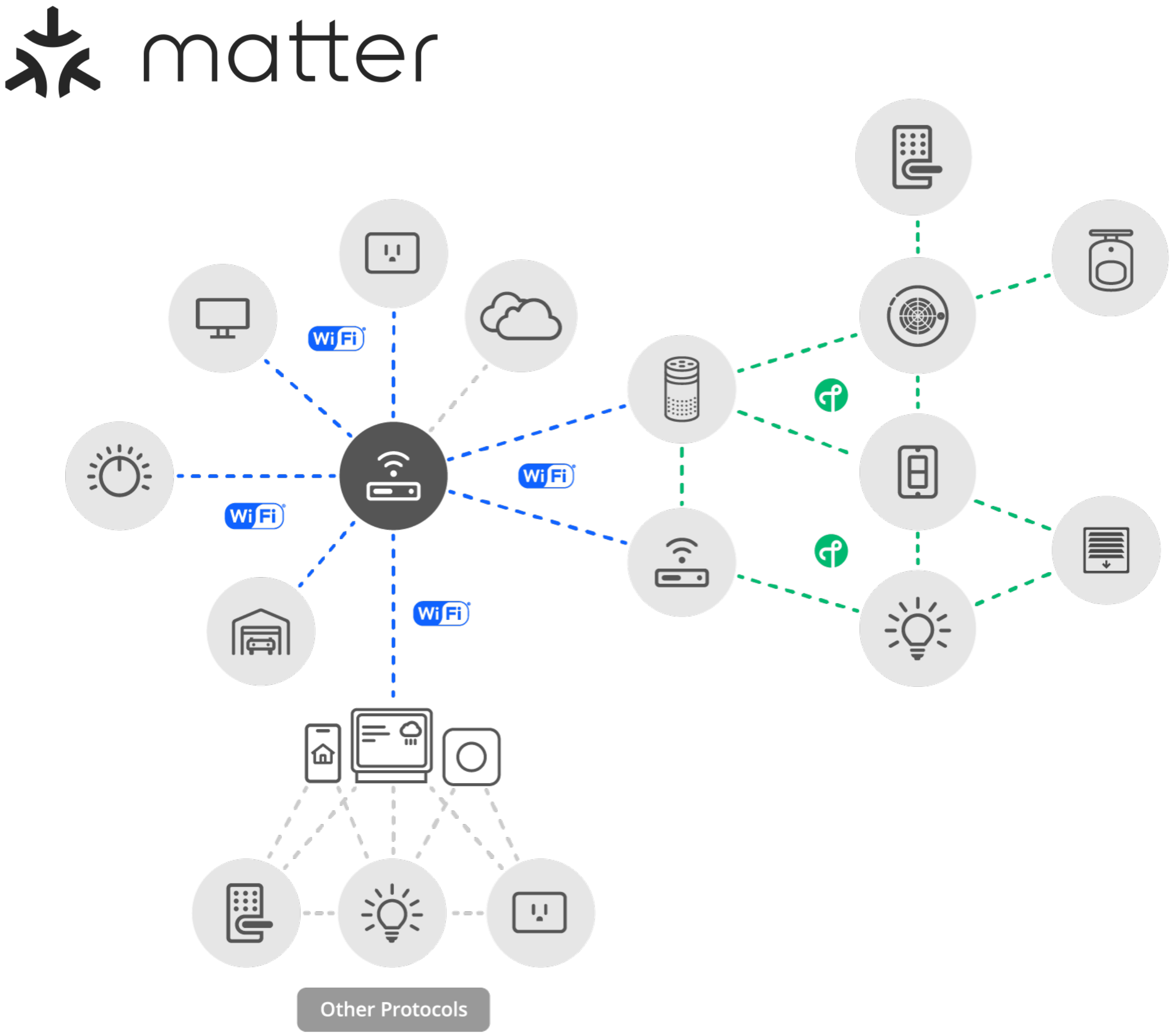
zigbee WEAVE

amazon Google zigbee alliance NXP resideo SmartThings Schneider Electric

IKEA legrand LEEDARSON MMB NETWORKS Signify SILICON LABS somfy Wulian

- Development led by key ecosystem vendors
  - Apple
  - Google
  - Amazon
  - And more…
- Common application layer + data model
  - Interoperability, simplified setup & control
- IP-based
  - Convergence layer across all compatible networks
- Secure
  - AES-128-CCM encryption with 128-bit AES-CBC
- Open-source development approach
  - Based on market-proven technologies
- Common protocol across device and mobile
  - Extendible to cloud
- Common data model
  - Core operational functions, multiple device types
- Low overhead
  - MCU-class compute, <128KB RAM, <1MB Flash

Network Topology



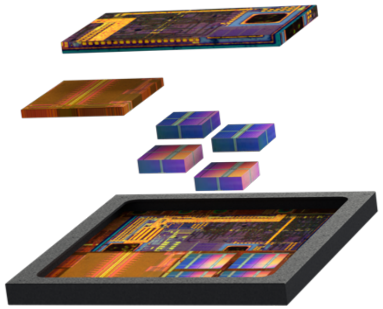
- Devices are commissioned onto a Matter network via Bluetooth
- Matter devices connect to the network over Wi-Fi or Thread
- Thread devices connect to other IP networks through Border Routers
- Bridges can link to other protocols like Zigbee and Z-Wave

Silicon Labs Matter Solution

THREAD

Bluetooth®

Wi Fi®



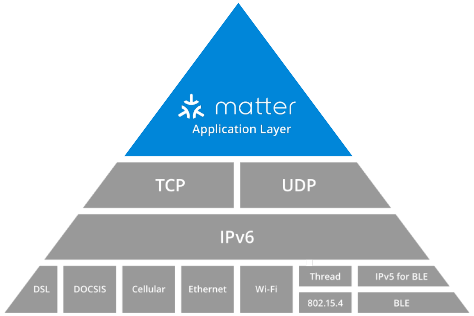
HARDWARE

Field Proven SoCs & Modules

Thread, Bluetooth & Wi-Fi

Certified Thread PHYs

matter



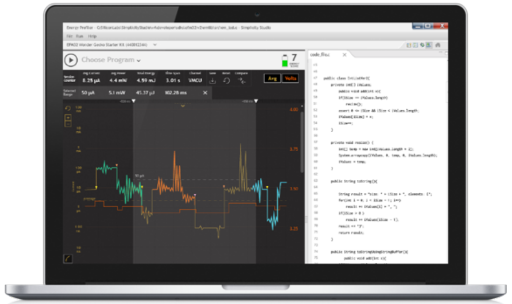
SOFTWARE

One-stop-shop for all software

Full featured Matter solution

Built on top of IP stacks

Simplicity Studio 5



TOOLS

Reference Applications

Command Line Interface support

LCD to display QR code

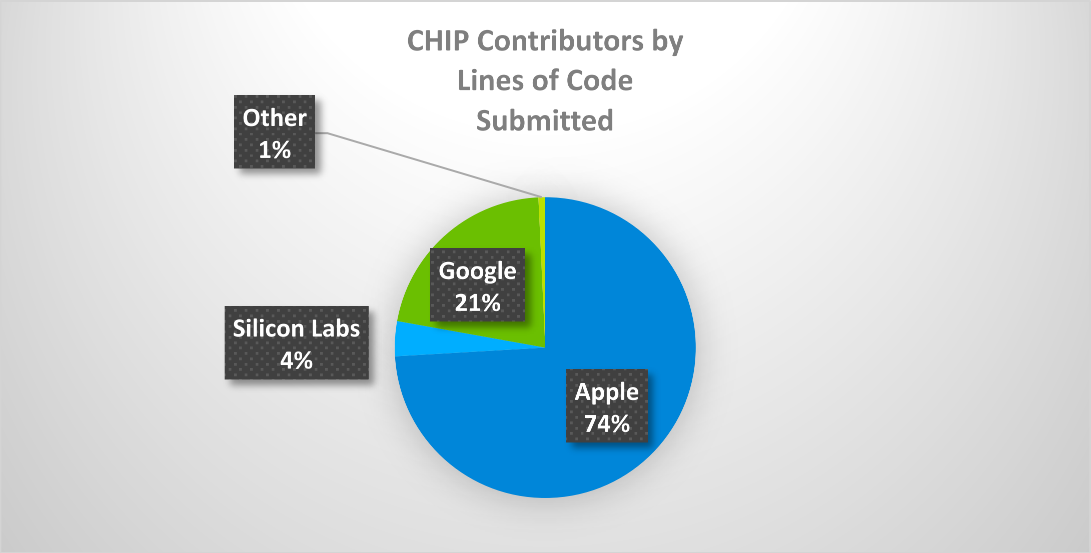
CERTIFICATION

+50,000 Wi-Fi & 802.15.4 end products deployed

Support for end-product certification

Matter certification at end of 2021

Silicon Labs Matter Development



- Development driven by Apple and Google
- Silicon Labs next largest contributor to Matter GitHub
  - Contributed ZCL parser (ZAP tool)
    - Replaces Application Builder
    - Standalone, no longer tied to Studio
    - https://github.com/project-chip/zap
  - Ported Zigbee application framework
    - https://github.com/project-chip/connectedhomeip/tree/master/src/app
  - Door lock example available
    - MG12 and MG21 support
    - https://github.com/project-chip/connectedhomeip/tree/master/examples/lock-app/efr32

SoC Selection Guidelines for Matter/OpenThread Ecosystems

Use Case	Software Mode	OTA Image Storage	EFR32MG1	EFR32MG13	EFR32MG12	EFR32MG21
			256kB Flash	512kB Flash	1MB Flash	768kB/1MB Flash
			32kB RAM	64kB RAM	256kB RAM	96kB RAM
Gateways	Single Protocol RCP Mode[1]	External Flash	✓	✓	✓	✓
Devices	Dynamic Multi-Protocol w/ BLE SoC Mode	External Flash			✓	✓
		Internal Flash				

EFR32MG12 and EFR32MG21 are the recommended devices for SoCs due to the large Flash requirements
Module support will be included though the GSDK

[1] NCP mode is not support by OpenThread Border Router moving forward

Consult Silicon Labs wireless support team or FAEs before making final architecture decisions.

How do I get started with OpenThread and Matter?

Let’s see if it works!

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THANK YOU

tech talks

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Q&A

Join our next Tech Talk

JUNE 8TH | 10AM CST

Implement a Bluetooth AoX Solution with BG22

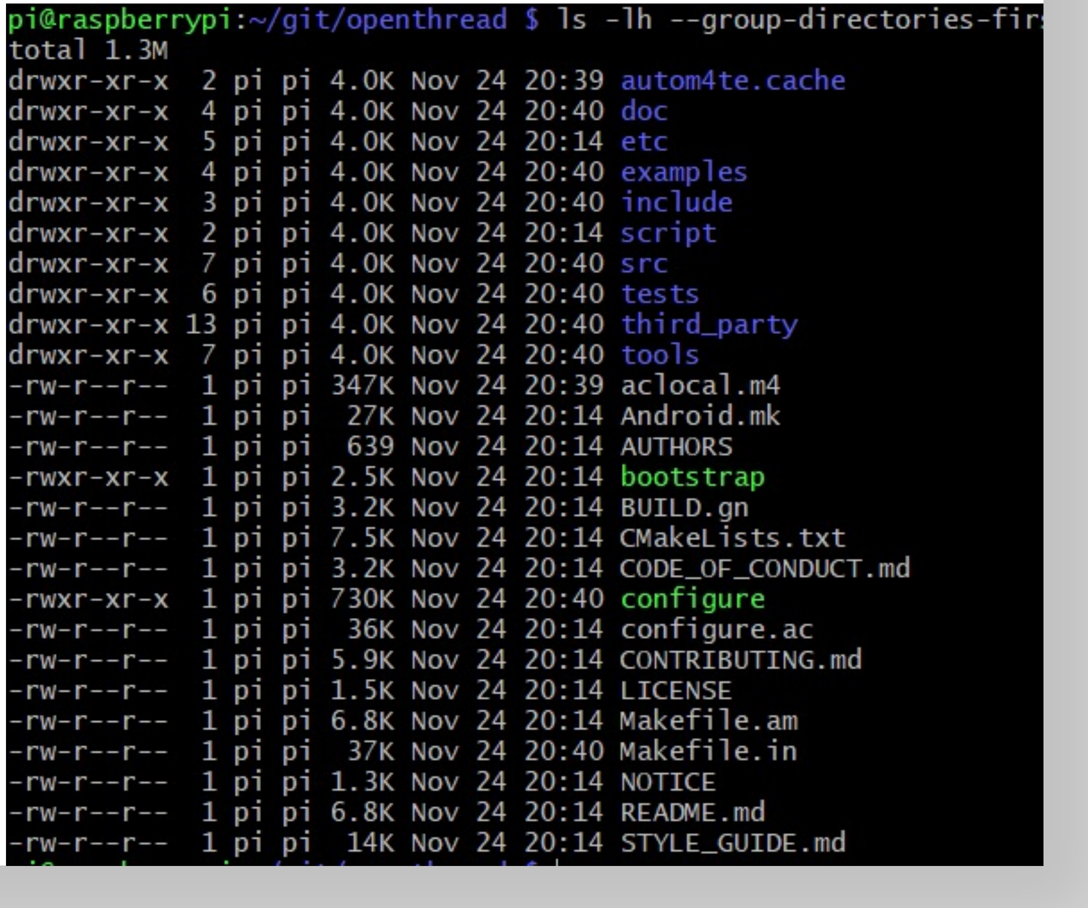
Register Today

Tech Talks Summer Series begins June 8th

REGISTER TODAY

How to get started

- Get a POSIX platform (MAC, Linux, Raspberry Pi, VM or Docker)
- Clone the repository
  - git clone –recursive https://github.com/openthread/openthread.git
- Setup the environment
  - cd openthread
  - ./bootstrap
- APIs in /include/openthread
  - API Reference information openthread.io/reference.
- Samples in /examples/apps and Gecko SDK
  - Make –f examples/Makefile-efr32mg12
- Binaries generated to /output/<platform>/bin



```
pi@raspberrypi:~/git/openthread $ ls -lh --group-directories-fir
total 1.3M
drwxr-xr-x  2 pi pi 4.0K Nov 24 20:39 autom4te.cache
drwxr-xr-x  4 pi pi 4.0K Nov 24 20:40 doc
drwxr-xr-x  5 pi pi 4.0K Nov 24 20:14 etc
drwxr-xr-x  4 pi pi 4.0K Nov 24 20:40 examples
drwxr-xr-x  3 pi pi 4.0K Nov 24 20:40 include
drwxr-xr-x  2 pi pi 4.0K Nov 24 20:14 script
drwxr-xr-x  7 pi pi 4.0K Nov 24 20:40 src
drwxr-xr-x  6 pi pi 4.0K Nov 24 20:40 tests
drwxr-xr-x 13 pi pi 4.0K Nov 24 20:40 third_party
drwxr-xr-x  7 pi pi 4.0K Nov 24 20:40 tools
-rw-r--r--  1 pi pi 347K Nov 24 20:39 aclocal.m4
-rw-r--r--  1 pi pi  27K Nov 24 20:14 Android.mk
-rw-r--r--  1 pi pi  639 Nov 24 20:14 AUTHORS
-rwxr-xr-x  1 pi pi 2.5K Nov 24 20:14 bootstrap
-rw-r--r--  1 pi pi 3.2K Nov 24 20:14 BUILD.gn
-rw-r--r--  1 pi pi 7.5K Nov 24 20:14 CMakeLists.txt
-rw-r--r--  1 pi pi 3.2K Nov 24 20:14 CODE_OF_CONDUCT.md
-rwxr-xr-x  1 pi pi 730K Nov 24 20:40 configure
-rw-r--r--  1 pi pi  36K Nov 24 20:14 configure.ac
-rw-r--r--  1 pi pi 5.9K Nov 24 20:14 CONTRIBUTING.md
-rw-r--r--  1 pi pi 1.5K Nov 24 20:14 LICENSE
-rw-r--r--  1 pi pi 6.8K Nov 24 20:14 Makefile.am
-rw-r--r--  1 pi pi  37K Nov 24 20:40 Makefile.in
-rw-r--r--  1 pi pi 1.3K Nov 24 20:14 NOTICE
-rw-r--r--  1 pi pi 6.8K Nov 24 20:14 README.md
-rw-r--r--  1 pi pi  14K Nov 24 20:14 STYLE_GUIDE.md
```

Configuration

- Compile-time constants /src/core/config
- Makefile build switches /examples/common-switches.mk
- Building samples with switches
  - Make –f examples/Makefile-efr32mg12 COMMISSIONER=1 JOINER=1
- Platform specific Build options
  - /examples/platforms/efr32/src/openthread-core-efr32-config.h
- Determine which sample is built
  - ./configure –enable-cli –enable-ftd ….