NORDICTECH
WEBINARS

Introduction to Matter

Introduction to Matter

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Today's host

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NORDIC SEMICONDUCTOR

Matter

Why is it neccessary?

Smart home market – current landscape

- Smart home fragmentation has negative consequences
  - For consumers - no interoperability between ecosystems
  - For developers and manufacturers – costly development
  - For retail – multiple variants of the same products

Matter - Vision

- Address key pain points for interoperability, choice and ease of use
- Enable easier, faster, less costly IoT product development and innovation
- Ease and improve the retail / customer purchase experience
- Enable greater and more accelerated adoption in smart home, building and commercial uses

Matter

Primary features

What is Matter?

- Matter (formerly *Project Connected Home over IP* or *Project CHIP*) is the foundation for connected things
- Matter is an applications layer standard unifying the smart home industry
- Matter is a promise of reliable, secure connectivity where devices work seamlessly together. Matter simplifies development for manufacturers and increases compatibility for consumers

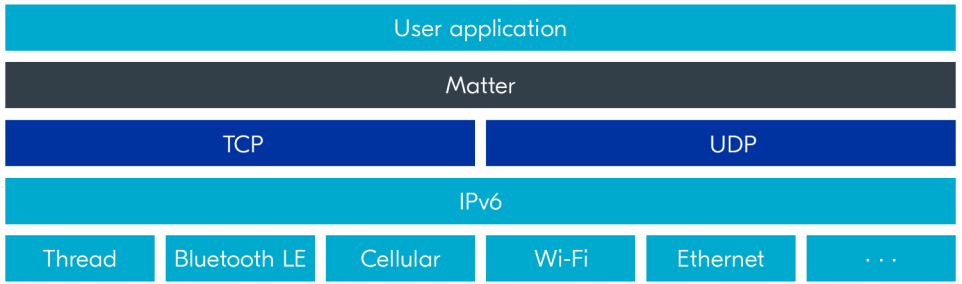
Who is behind Matter?

- This collaborative breakthrough is built on proven technologies and guided by the Connectivity Standards Alliance (formerly Zigbee Alliance)
- Currently more than 200 companies have joined Matter Working Group in CSA
- Over 2 000 individual members participates in efforts to create Matter

Some founding partners:

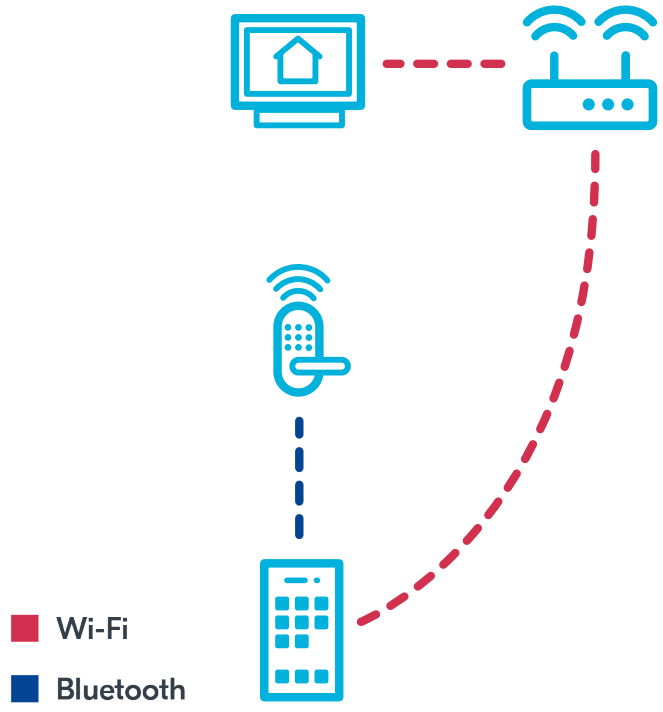
Matter charter

- Define, develop, and deliver a comprehensive application layer and data model which enable communication across smart home devices and mobile apps
  - Reuse contributions from market-proven technologies from Amazon, Apple, Google, Zigbee and others
  - Open-source development approach
  - Build upon Internet Protocol (IPv6)
  - Focus on security (AES-128-CCM encryption with 128-bit AES-CBC)
  - Extendible to cloud



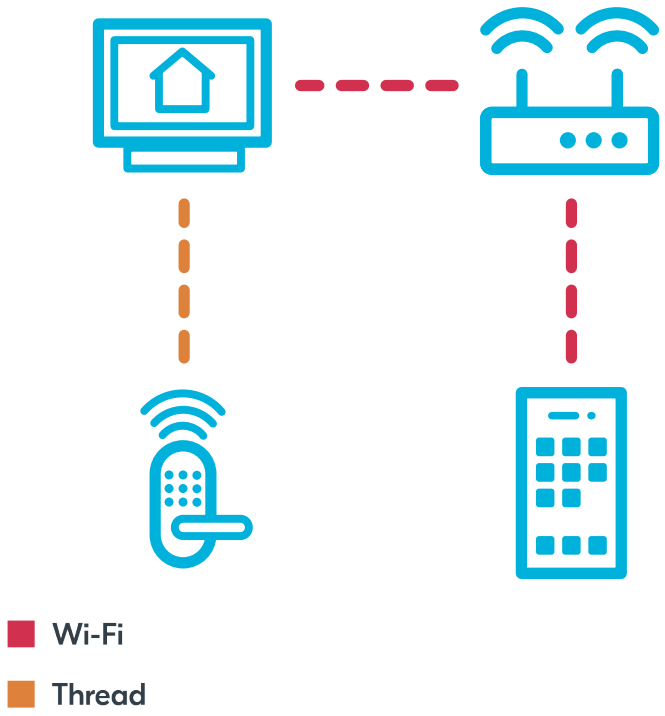
Role of Bluetooth Low Energy

- Bluetooth LE is used to commission a new device into the network using a Matter controller e.g. a mobile device or a home hub (smart speaker, smart display etc.)

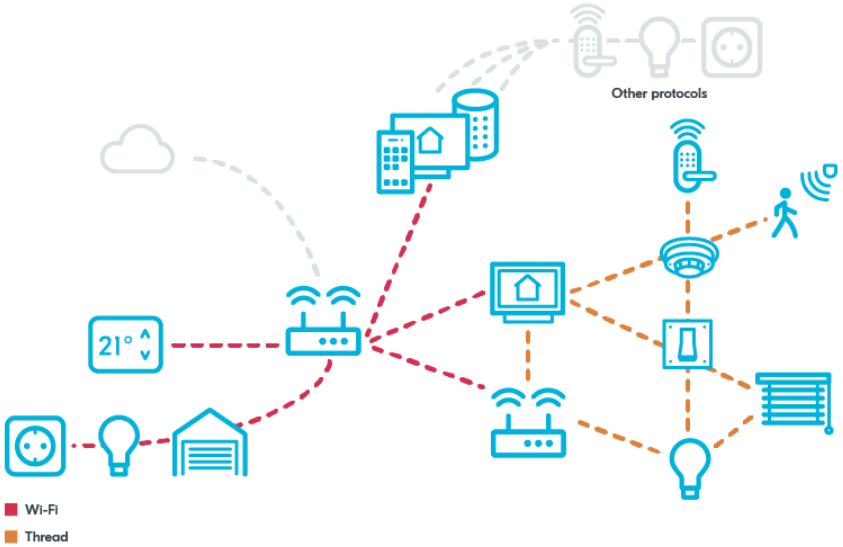


Role of Bluetooth Low Energy

- Bluetooth LE is NOT used for a device to device communication, or a device to controller communication after commissioning is finalized



Matter topology



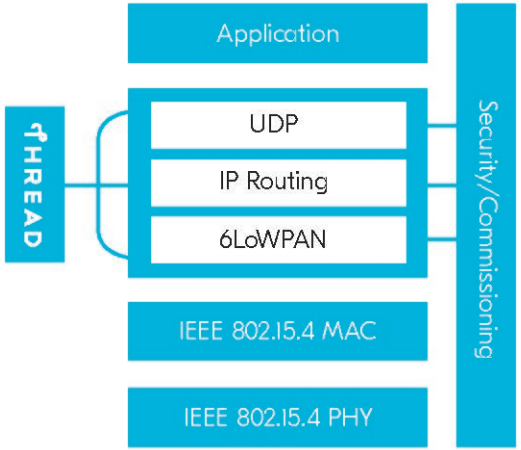
- Matter version 1.0 targets Wi-Fi and Thread as main wireless connectivity protocols
- Thread and Wi-Fi are complementary connectivity technologies for smart home
- Thread is usually used for battery-operated devices requiring the highest energy efficiency like sensors, door locks etc. or simple mains-powered actuators like smart plugs or light bulbs
- Wi-Fi is used for devices having a larger energy budget or requiring higher bandwidth like home appliances, security cameras or video doorbells

Thread networking protocol

Introduction

Thread – What it delivers

- Thread is secure wireless mesh network for connected product in homes and commercial buildings
- Build on proven, widely available and supported technologies
  - Uses IPv6 (6LoWPAN)
  - Runs on existing 802.15.4 silicon
- Legacy-free design with updated architecture
  - Designed with a new security architecture to make it simple and secure to add and remove products
  - Supports hundreds of products per network
  - Designed for very low power operation



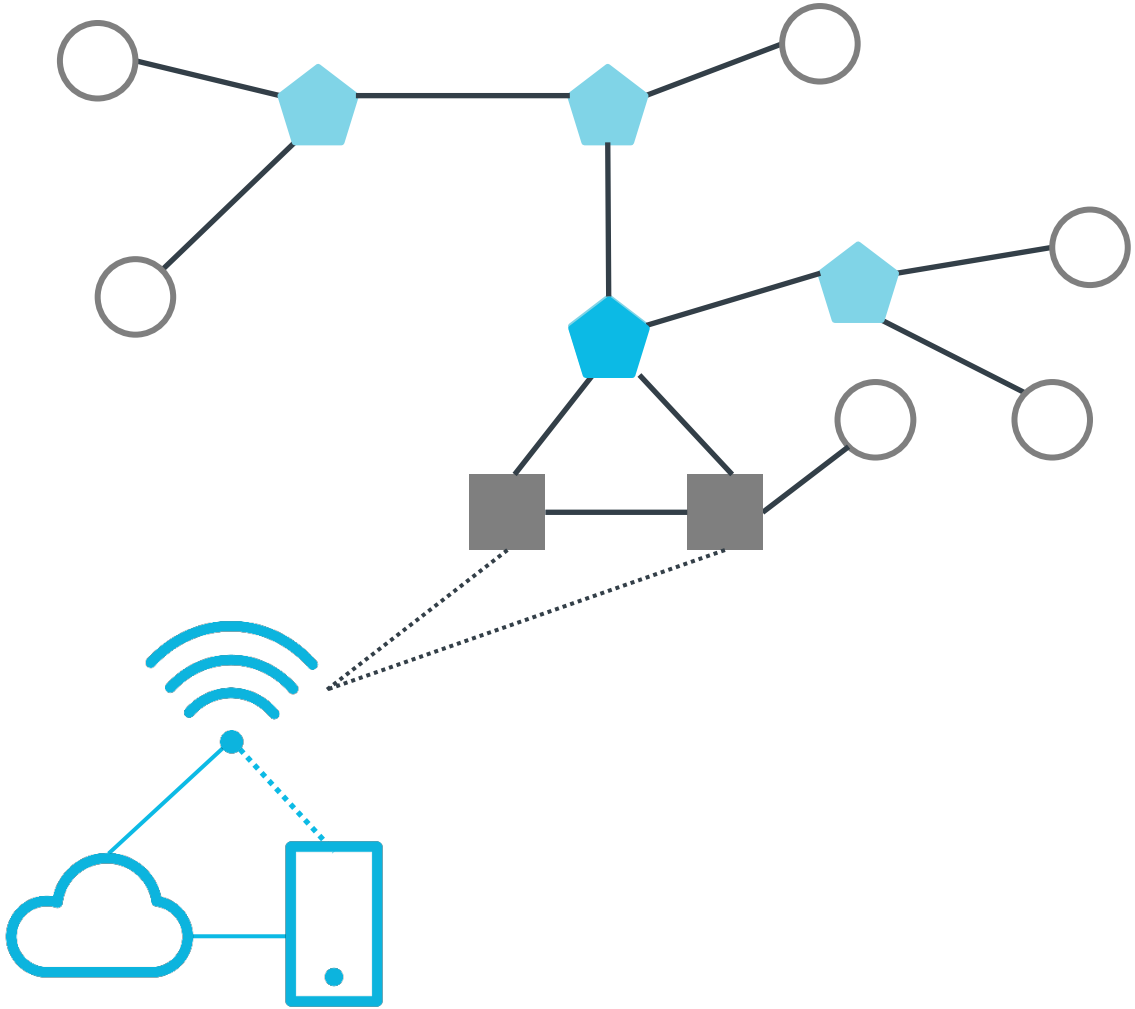
Thread devices types

Full Thread Device (FTD)

- most versatile in the roles
- autonomous role
- requires more HW resources e.g. memory size
- always has its radio on, so it is usually a mains-powered device

Minimal Thread Device (MTD)

- may perform certain roles
- affiliate - forwards all messages to its Parent
- has the lowest requirements for HW resources
- may sleep to preserve energy, so it is often a battery-powered device



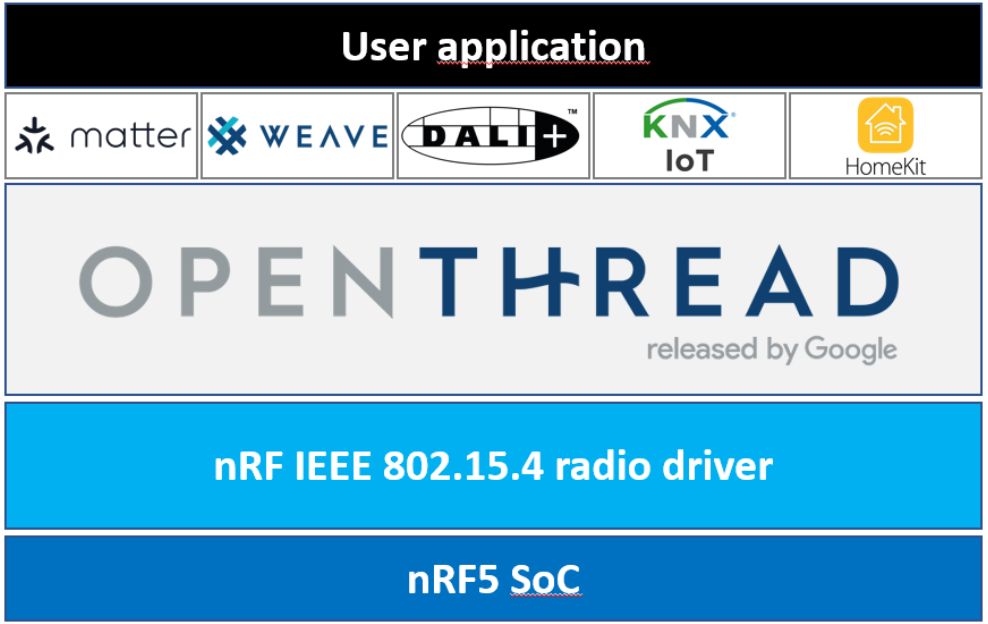
End Device

Thread Router

Thread leader

Border Router

Thread-based solutions



- Thread protocol is application layer agnostic and does not define application layer itself
- To create a full-featured product, a designer usually puts an IP-enabled application layer on top of a Thread stack

OpenThread project and Nordic involvement

- OpenThread released by Google is an open-source implementation of Thread networking protocol and other necessary components
- Nordic joined OpenThread project from the beginning of its public existence in 2016
- Nordic provides full support for its devices within OpenThread and actively participates in the development of OpenThread by co-authoring some core modules
- Licensed under 3-clause BSD license
- Open-source, community-based project hosted on GitHub: https://github.com/openthread/

OPENTHREAD
released by Google

Nordic Tech Webinars about Thread

- Webinar «Introduction to Thread networking protocol»
  https://webinars.nordicsemi.com/introduction-to-thread-networking-4
- Webinar «Developing Thread products with nRF Connect SDK»
  https://webinars.nordicsemi.com/developing-thread-products-with-nrf-1

Matter

Details

Target device types

Lighting,
Electrical

Blinds/Shades

HVAC
Controls

TVs

Access Control

Safety & Security

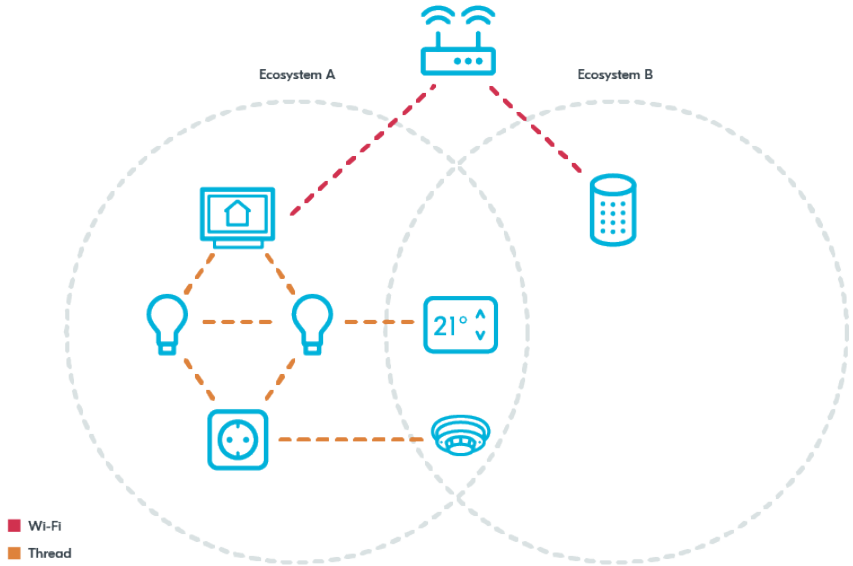
Access Points, Bridges

Matter controllers can be implemented in a variety of devices and interfaces

Scoping exercises for additional device types and use cases underway and continual.

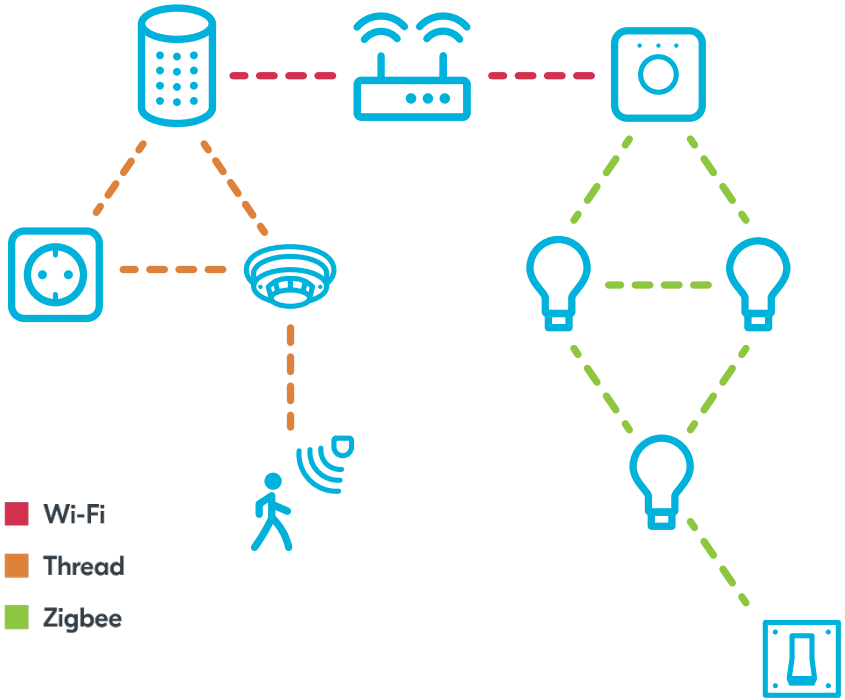
Support across & with multiple ecosystems

- Multi-admin is a foundational feature in Matter
- With multi-admin user can connect Matter devices to multiple apps and ecosystems locally, securely and even simultaneously
- Users can control which devices they share with which systems on individual level, and can easily add multiple devices to a new ecosystem to try out new experiences



Bridging non-Matter IoT devices

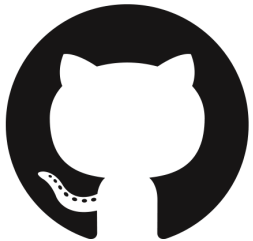
- A bridge serves to allow the use of non-Matter IoT devices (e.g. devices on a Zigbee network) to communicate and interact with Matter devices
- This enables the consumer to keep using existing non-Matter devices together with their Matter devices



What will Matter deliver?

Specification

- Public specification



https://github.com/project-chip/connectedhomeip

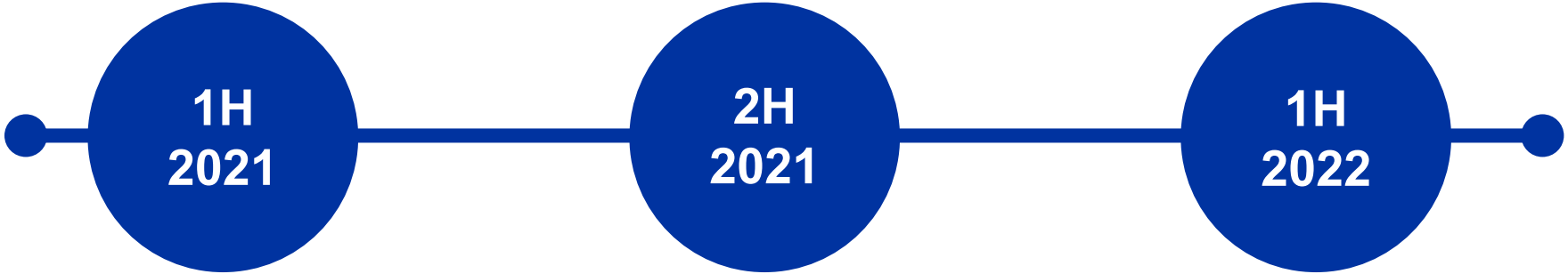
Implementation

- Open source available on GitHub
- Platform independent implementation
- Porting for POSIX platform (Linux)
- Porting for embedded platforms (IC vendors)
- Reference example applications e.g. a door lock app, a light bulb app
- Mobile app reference

Certification program

- Test specification
- Certification framework
- Certification program availabe via certification labs

Schedule



Initial technical specifications available to Members
Initial SDK and Test Event Efforts

Pre-balloting technical specifications available to Members
Ongoing SDK & Cert Program Dev
Test Events Continue

SDK Released
1st Products Certified
Certification Program Released
Members action GTM plans

Note: Timeline, subject to change

Nordic roles in Matter

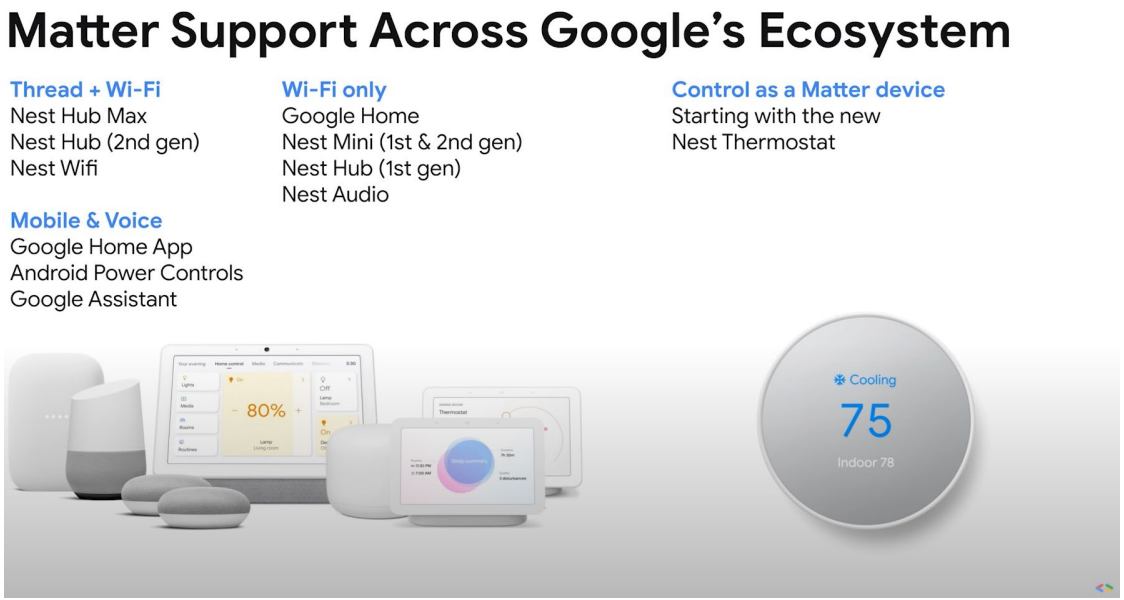
- Nordic Semiconductor takes active role in Connectivity Standards Alliance and in Matter development:
  - Participates in all sub-working groups (technical, marketing and certification) and in some subcommittees within them
  - Integrates Matter with Nordic's SW platform (nRF Connect SDK)
  - Cooperates with other companies to develop Matter implementation and example applications
  - Actively participates in test events organized by Matter's Certification Working Sub-group
  - Collaborates with major providers of ecosystems based on Matter

Matter

Commited ecosystems

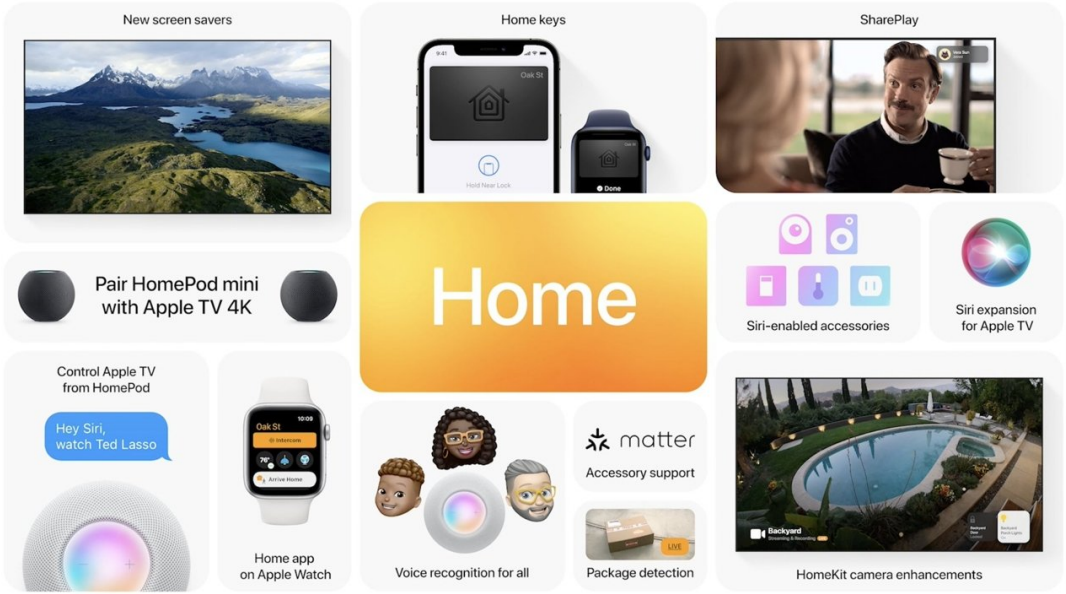
Google commitment to Matter

- During Google IO 2021 conference Google officially committed to support Matter in their ecosystem
- Currently access to beta firmware enabling Matter support in Google's home hubs is limited to selected partners



Source: Google IO 2021 conference, Smart Home keynote: https://www.youtube.com/watch?v=fWMDkIziINQ&t=722s

Apple commitment to Matter



- During WWDC 2021 conference Apple officially committed to support Matter in their ecosystem
- During the same conference Apple released a Developer Preview of Matter in iPhone and iPad (iOS/iPadOS 15.0 beta), and Apple TV (tvOS 15.0 beta) available to anyone with an Apple Developer account

Source: WWDC 2021 conference, Apple Keynote: https://www.youtube.com/watch?v=0TD96VTf0Xs&t=4704s

Amazon commitment to Matter

- During Alexa Live 2021 Keynote Amazon officially committed to support Matter in their ecosystem

Source: Alexa Live 2021 Keynote: https://www.youtube.com/watch?v=WgeiwI1XHeQ&t=3311s

Matter device

Nordic’s HW and SW

nRF Connect SDK

- All in one place
- One code base and toolchain for nRF91, nRF53 and nRF52 Series
- Includes Bluetooth Low Energy, Bluetooth mesh, Thread/HomeKit/Matter, Zigbee and LTE-M/NB-IoT/GPS
- Based on Zephyr RTOS which is governed by Linux Fundation

nRF 52 SERIES

nRF SERIES 53

nRF 91 SERIES

LTE-M

NB-IoT

Bluetooth®

THREAD

zigbee

GPS

Same SW for all ICs & Product Configurations

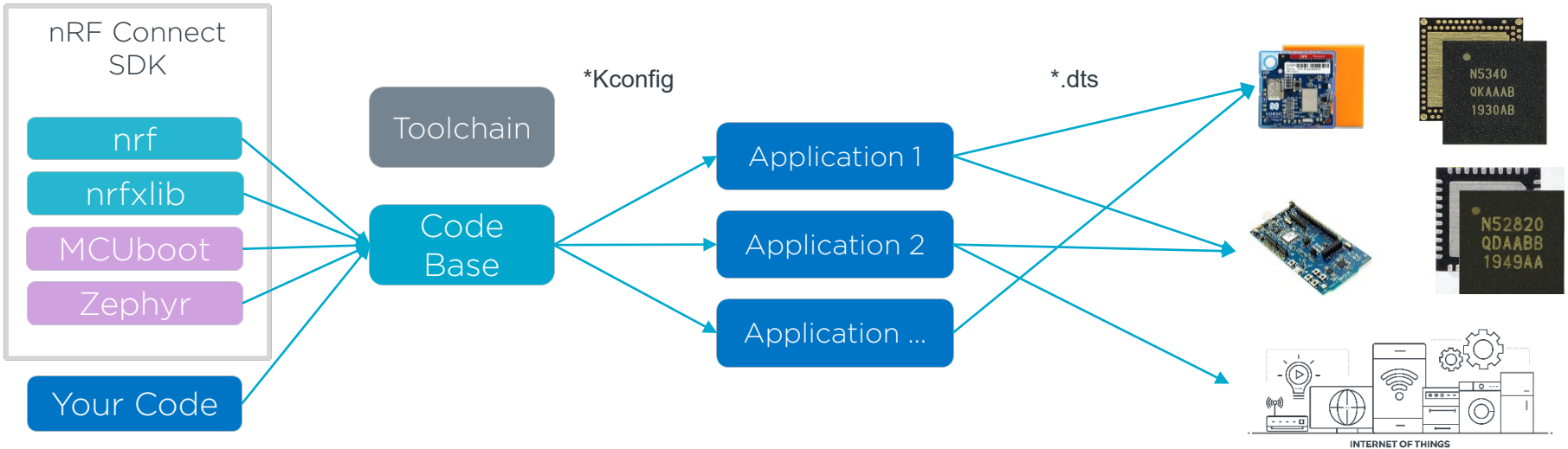
West
Multi-repository management tool

Toolchain manager
Verified toolchain management

Kconfig
Source module / feature configuration for compile

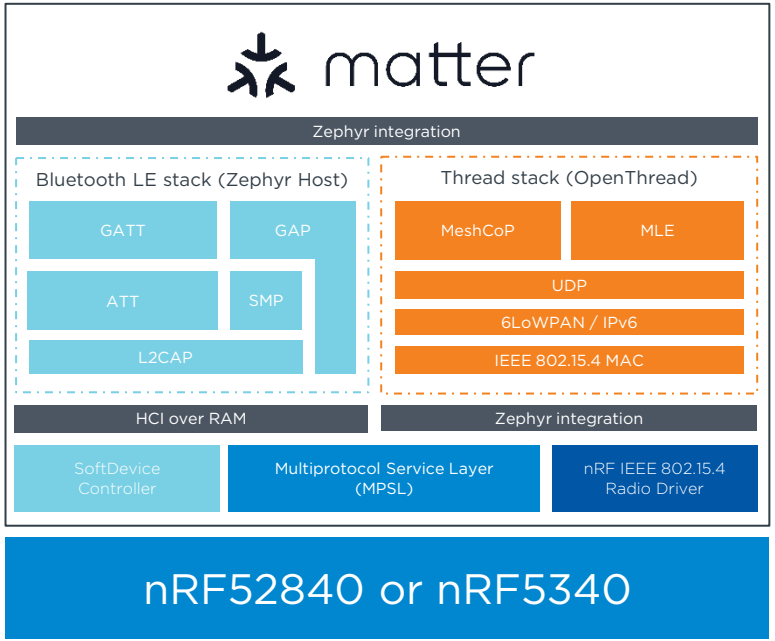
Device Tree
Target Board / Device description

Clone / update → Configure features → Configure target



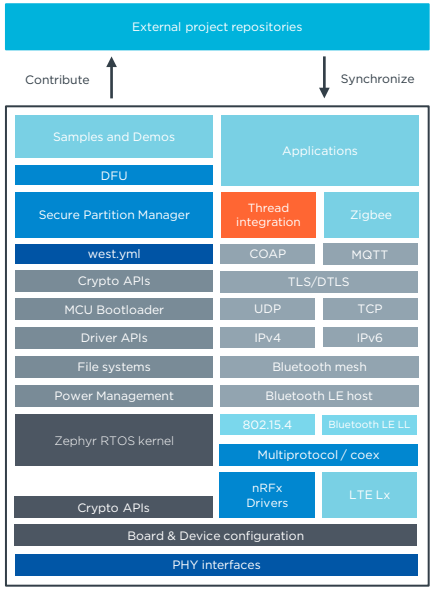
Architecture - Single-chip, multiprotocol

- Single-chip solution supporting simultaneous 802.15.4 and Bluetooth LE operations
- An application, Thread and Bluetooth LE stacks run on the same processor
- Low-cost and low-power consumption



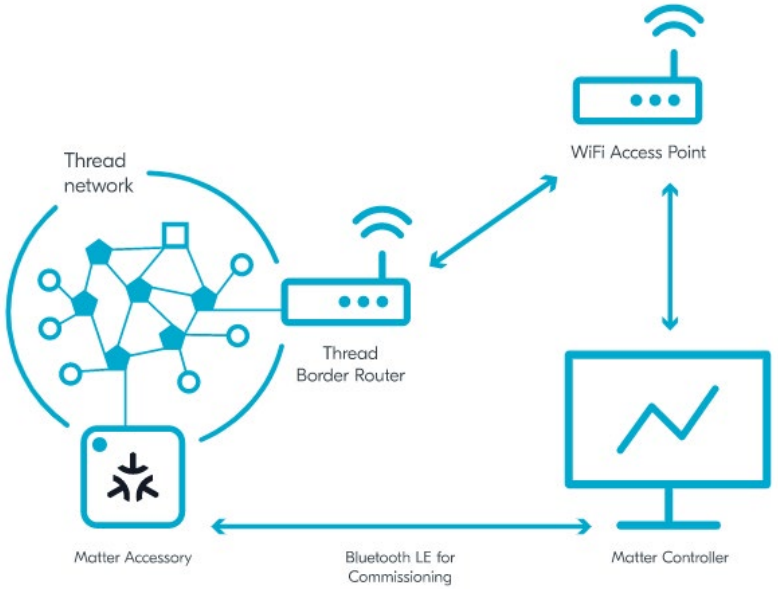
nRF Connect SDK - Matter

- Nordic's default SW platform for Matter (Project CHIP) and Apple's HomeKit ADK 5.x
- OpenThread stack integration
  - Support for pre-compiled libraries for Thread Certification by inheritance
- Certified Bluetooth LE protocol stack
- Support for multiprotocol operation of Thread and Bluetooth
- Support for commissioning with NFC tag
- Advanced build system
- Security components, bootloader, OTA DFU
- Drivers and generic libraries



Samples and applications

- nRF Connect SDK provides a complete support for developing a Matter device
  - A comprehensive user guide about configuring Matter development environment
  - Matter template
  - Matter door lock sample
  - Matter light switch sample
  - Matter light bulb sample
  - Matter weather station application
- An official technical support for Matter is available through Nordic's DevZone



Nordic HW suitable for building Matter device

- A Matter over Thread device must support both Thread and Bluetooth LE
  - Bluetooth LE is used for device onboarding (commissioning)
- Memory footprint of the solution (Thread protocol stack + Bluetooth LE protocol stack + the application layer) imposes SoCs with Flash greater than 512 KB + an external Flash memory for OTA DFU

nRF5340

Flash: 1 MB+256 KB
RAM: 512 KB+64 KB
Temp: -40 to 105 °C

nRF52840

Flash: 1 MB
RAM: 256 KB
Temp: -40 to 85 °C

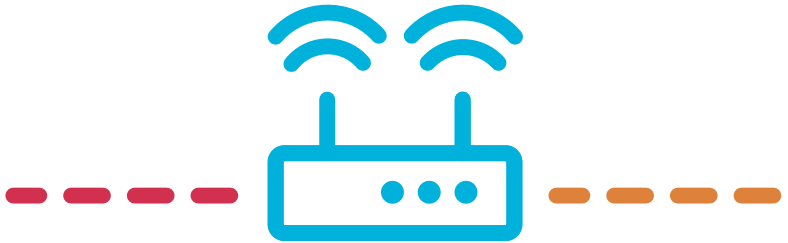
Upcoming webinar about Matter

- Webinar “Developing Matter products using nRF Connect SDK” - October 2021

Thread Border router

Architecture considerations

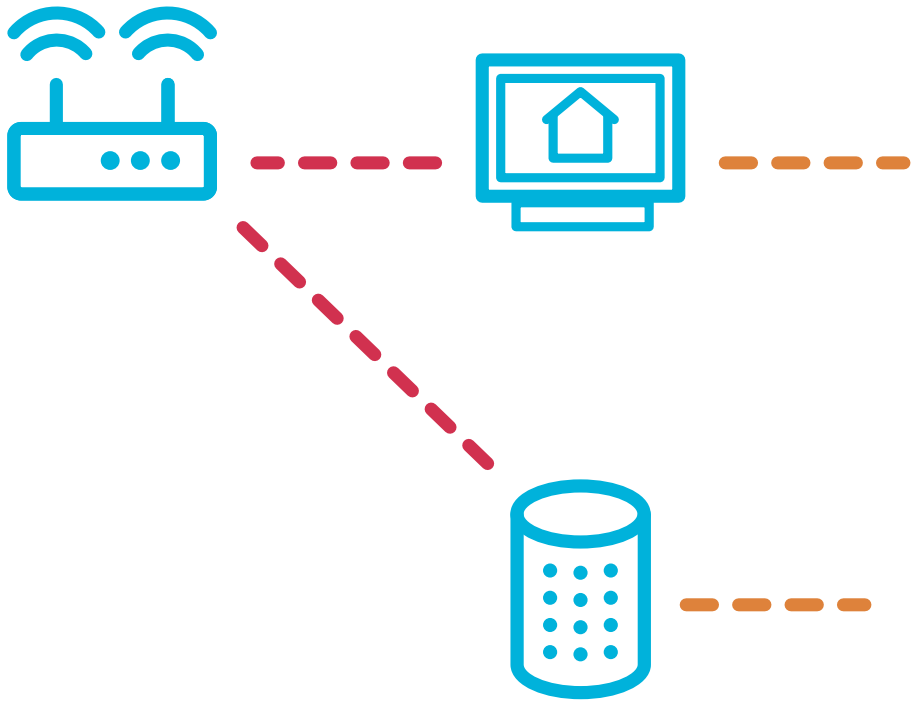
Wi-Fi access point



Wi-Fi

Thread

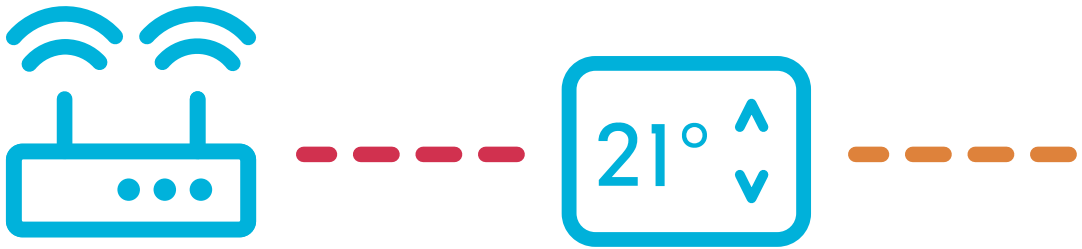
Home hub



Wi-Fi

Thread

Matter device



Wi-Fi

Thread

Thread Border router

Nordic’s HW and SW

Network Co-Processor (NCP) architecture

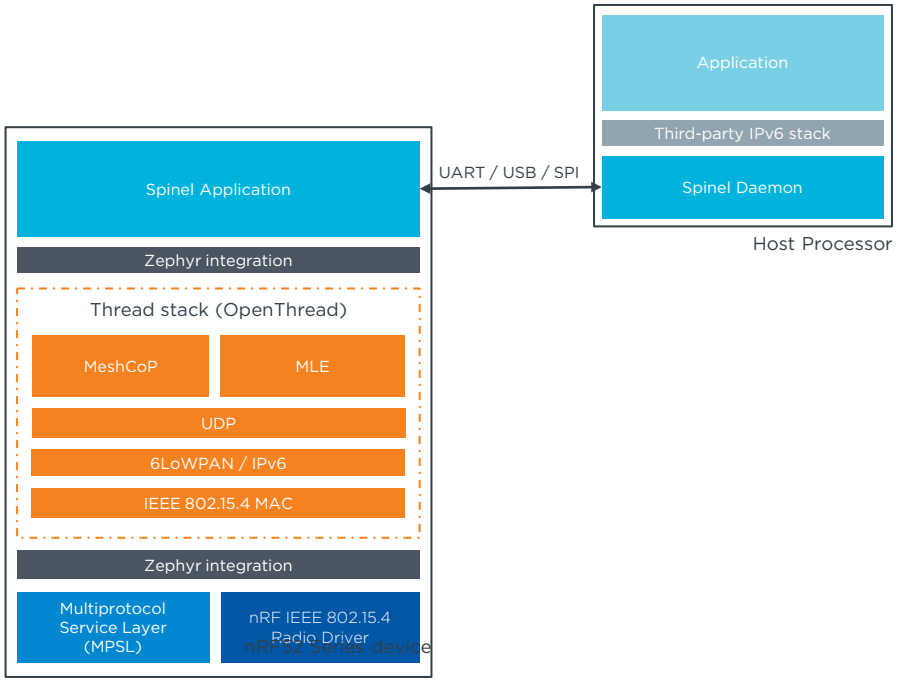
- Used mostly for Border routers and gateways
- Thread stack runs on the Nordic device
- An application runs on a host processor
  - NCP controllers: wpantund, pyspinel
- Clear logical separation – enables host to sleep
- Requires more expertise from a designer - a reference app for the host side does not exist
- Recommended nRF devices:

nRF52840

Flash: 1 MB
RAM: 256 KB
Temp: -40 to 85 °C

nRF52833

Flash: 512 KB
RAM: 128 KB
Temp: -40 to 105 °C



Radio Co-Processor (RCP) architecture

- Used mostly for Border routers and gateways or devices that have other processing demands like IP cameras
- Thread stack and application layer run on a host processor
- Minimal controller runs on the Nordic device – host cannot sleep
- A reference app for the host exists: https://github.com/openthread/ot-br-posix

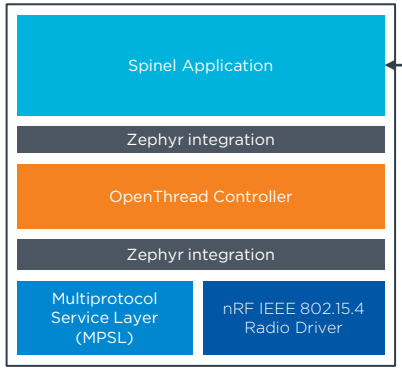
- Recommended nRF devices:

nRF52811

Flash: 192 KB
RAM: 24 KB
Temp: -40 to 85 °C

nRF52820

Flash: 256 KB
RAM: 32 KB
Temp: -40 to 105 °C



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Q&A