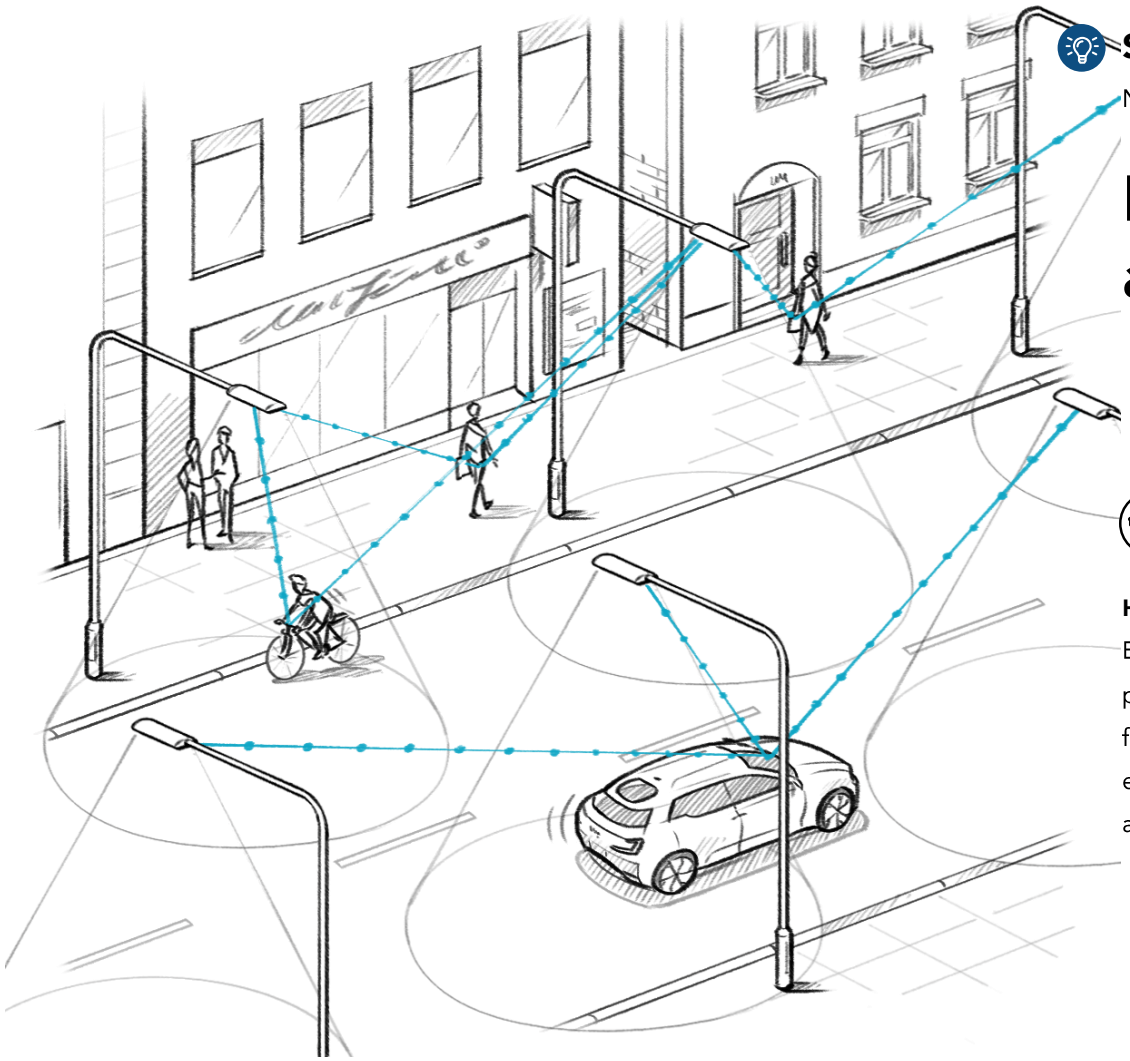
SMART LIGHTING VIRTUAL EXPERIENCE

SECURE CONNECTIONS FOR A SMARTER WORLD

Splashscreen

SECURE CONNECTIONS
FOR A SMARTER WORLD



SMART LIGHTING

Next generation of street lights with processing, connectivity & sensing features for easier & secure life

Pedestrians, bikers or drivers: smart lights are ready to help !

HIGH PERFORMANCE

Best of two worlds : cross-over processsors family (i.MX RT) or first i.MX 8M Plus SoC with NPU embedded enabling ML applications

PRIVACY PROTECTION

Capture data is anonymized, processed & stored in a digital safe at the edge, addressing privacy concerns

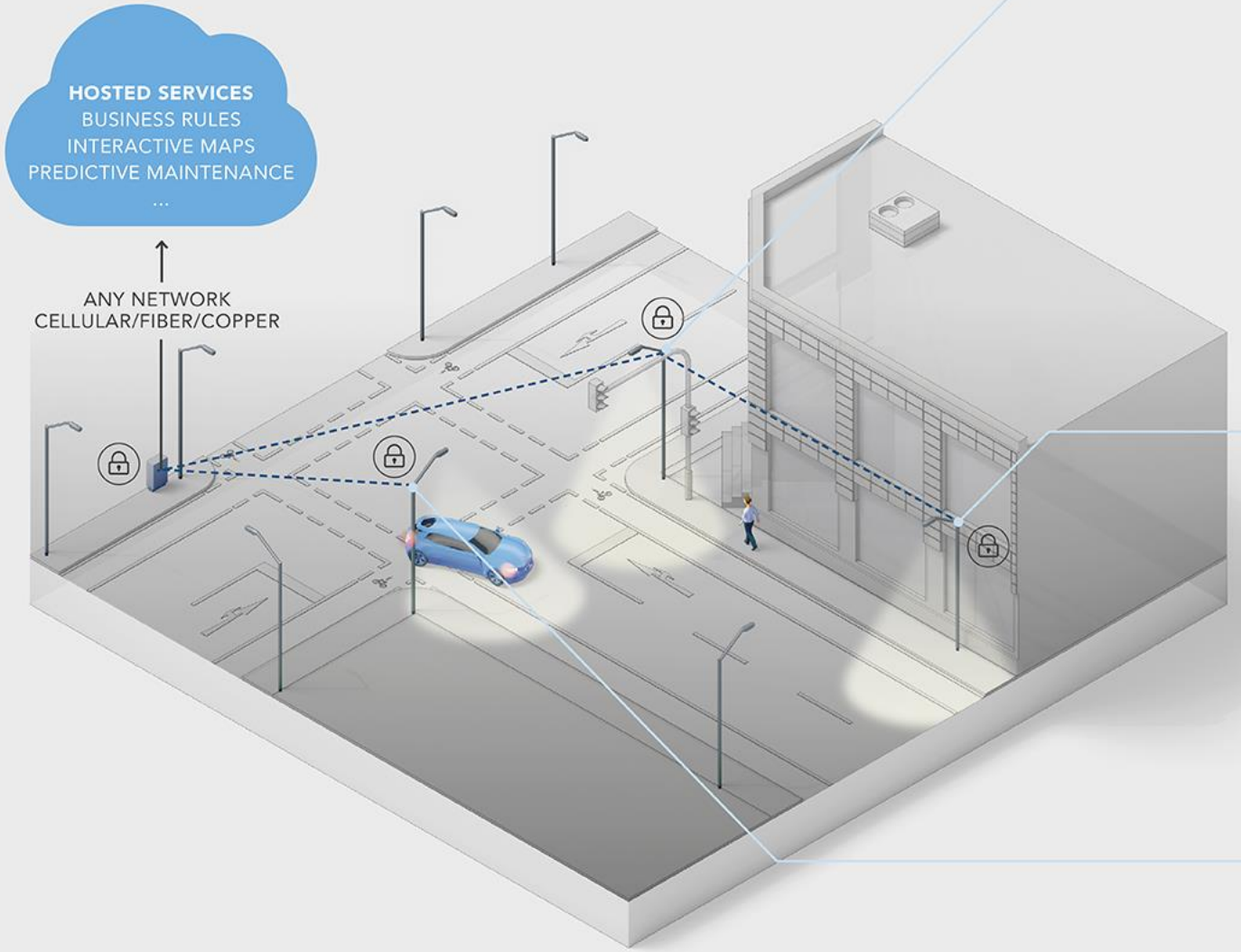
ENVIRONMENT

Smart lighting will accelerate energy savings, improve air quality control & optimize local maintenance

Layer 2 Flipbook – Demo Smart Lighting

SECURE CONNECTIONS
FOR A SMARTER WORLD

EVENTS DETECTION IN THE STREET

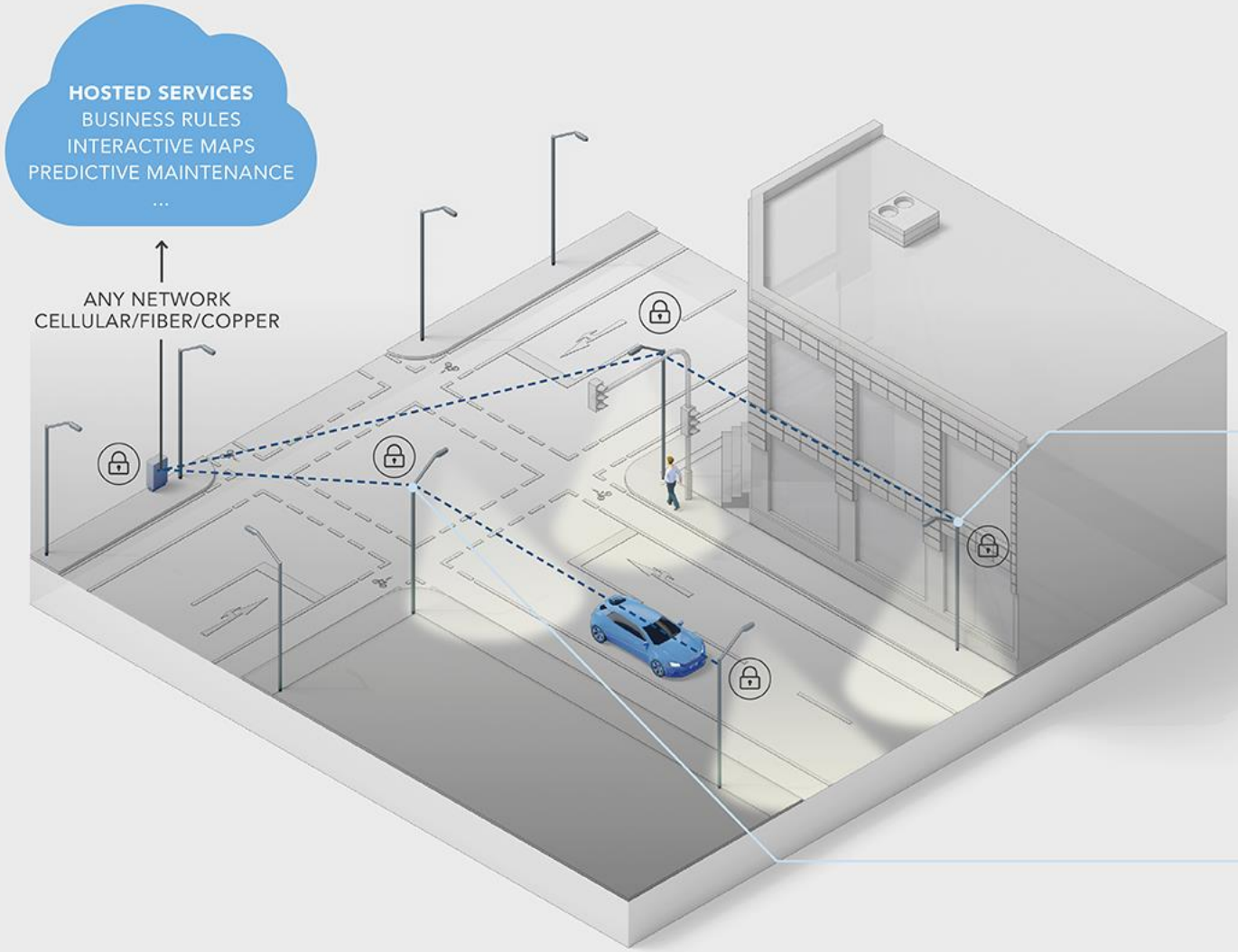


Sound detection – person
- Assault of individuals (public security)
- Car/bike accident history
- Vandalism prevention

Movement detection – person
- People Counting
- Access to Public Wi-Fi Hotspot
- Recognizing EV Charging Application
- Wild dumping

Movement detection – cars
- Vehicles counting & density (traffic analysis)
- Public Parking management (vacancy, duration of stay, car/motor/bikes differentiation)
- Road surface analysis (ice, leaves)

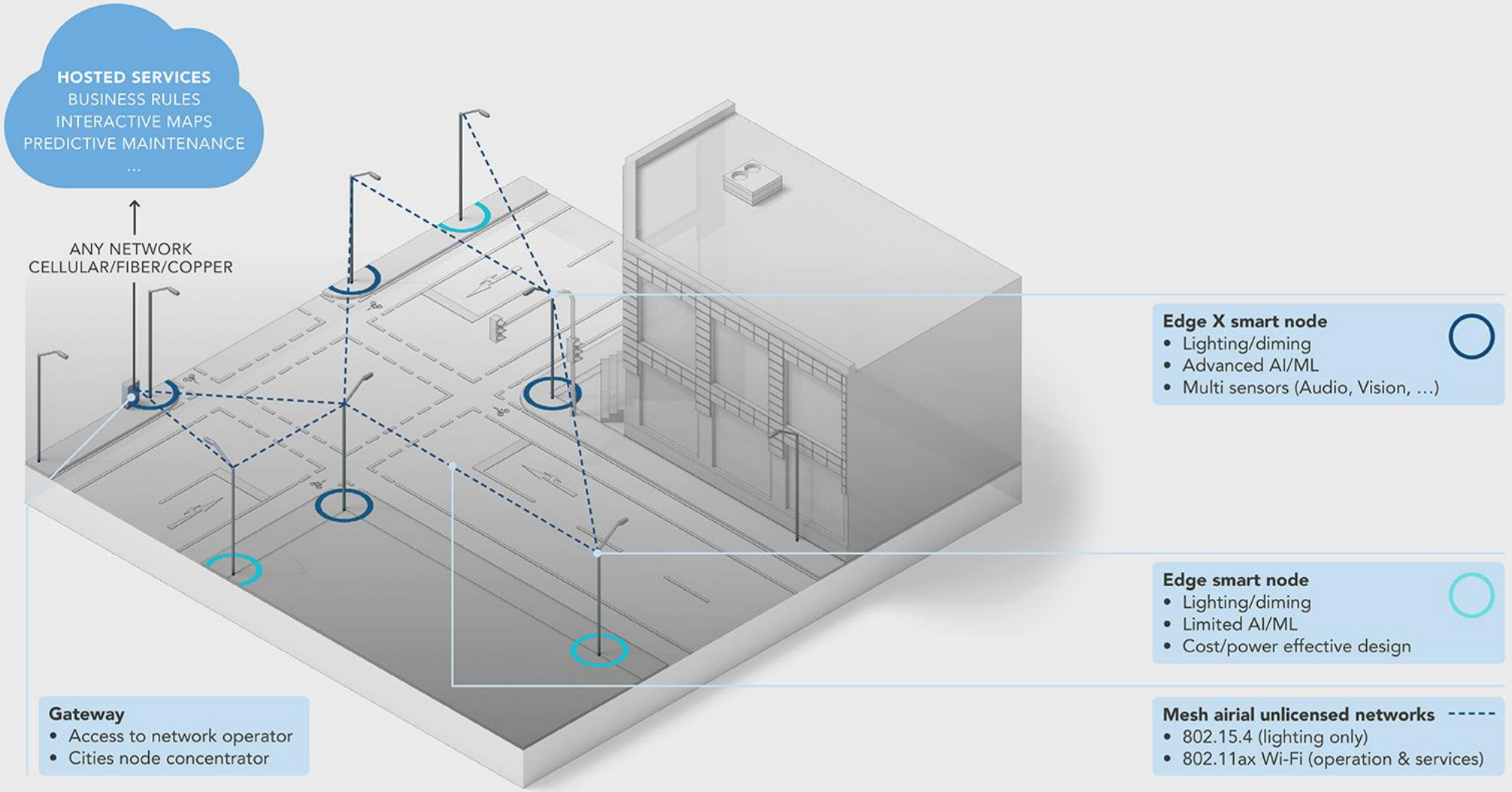
EVENTS DETECTION IN THE STREET



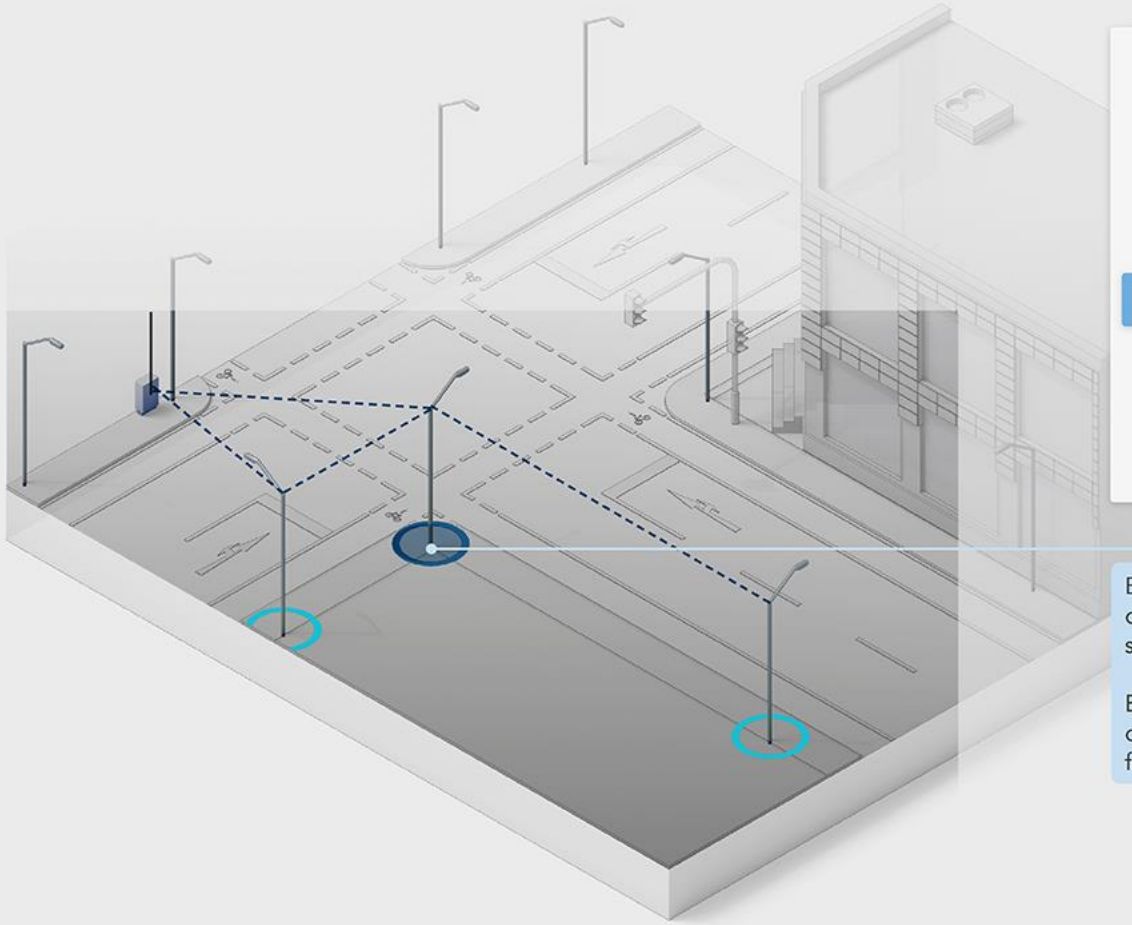
Air quality
- Small particles detection
- Temperature & humidity measures

Connectivity & Services
- Local mesh-network enablement
- Public Wi-Fi Hotspots deployment
- Easy security upgrades on the edge
- Localization services based on UWB technology
- V2X communication with cars

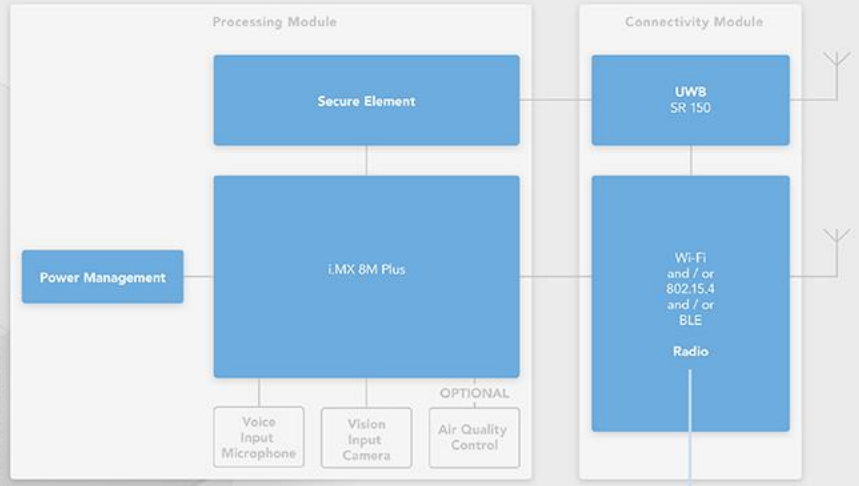
AN OPEN AND SECURE MESH-NETWORK



EDGE X SMART NODES – CONNECTIVITY AND LOCALIZATION SERVICES



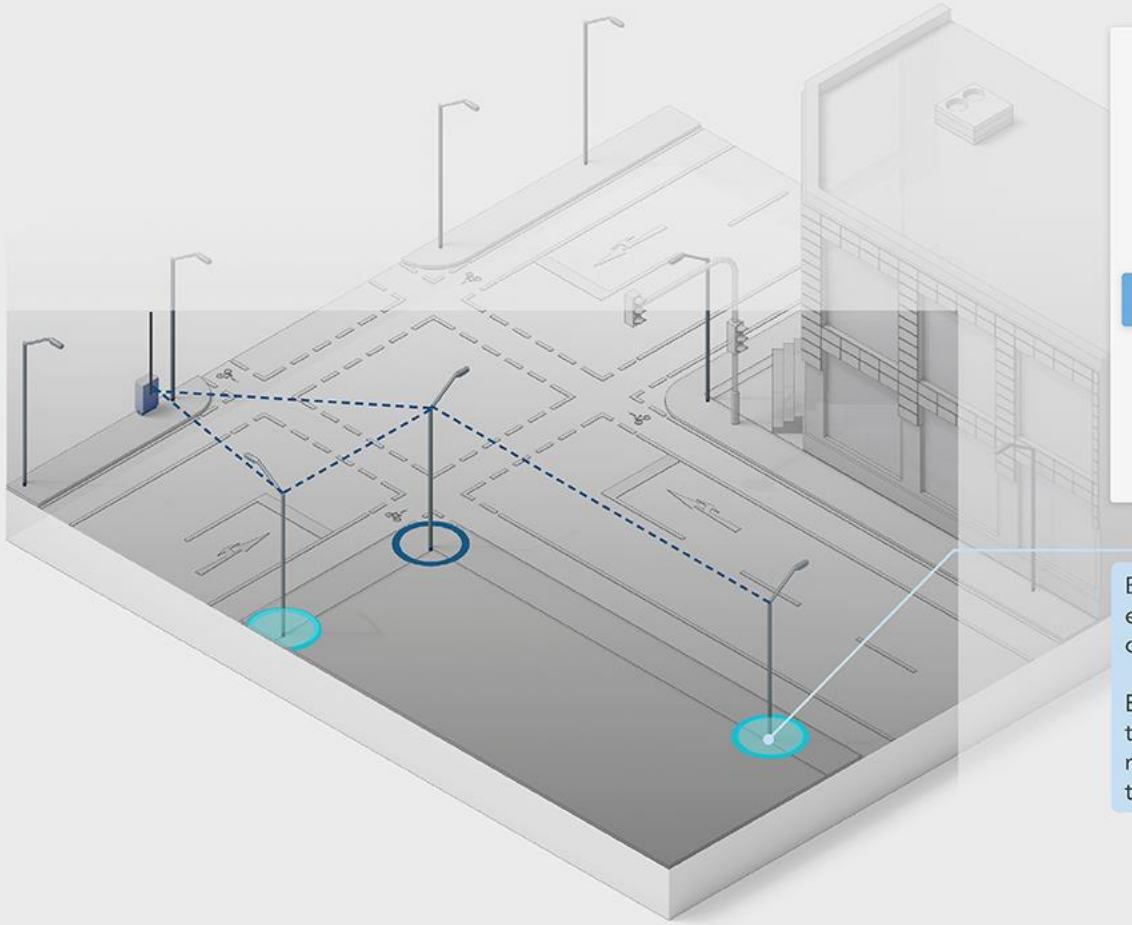
EDGE X (HIGH PERFORMANCE/DATA THROUGHPUT)



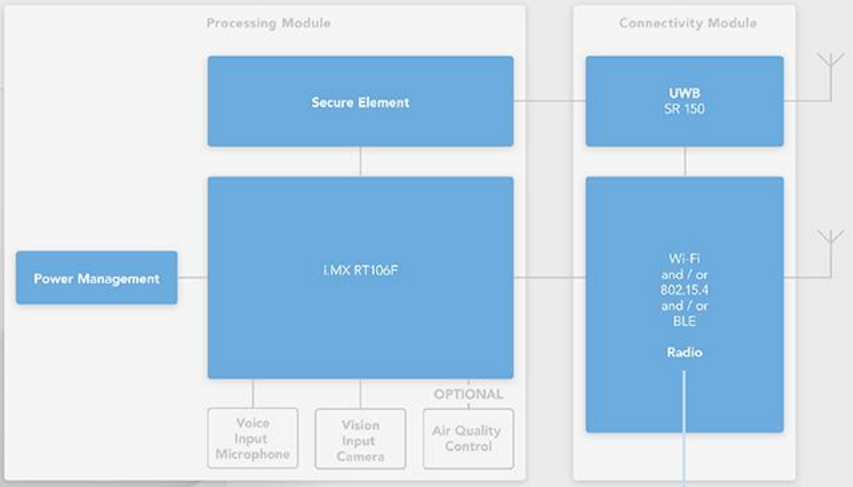
Edge X smart nodes actively monitor the street for activity, gathering data about traffic, amount of pedestrians or air quality and securely sending it to the cloud.

Edge X smart nodes can also provide higher levels of connectivity, creating Wi-Fi Hotspots or enabling smart cars to get traffic updates from their mesh-networks.

EDGE SMART NODES – SOUND AND MOVEMENT DETECTION



EDGE (LOW POWER/COST NODES)



Edge smart nodes have low power vision processing capabilities, enough to monitor the traffic, process small amounts of sound data or detect how many free parking spaces are left.

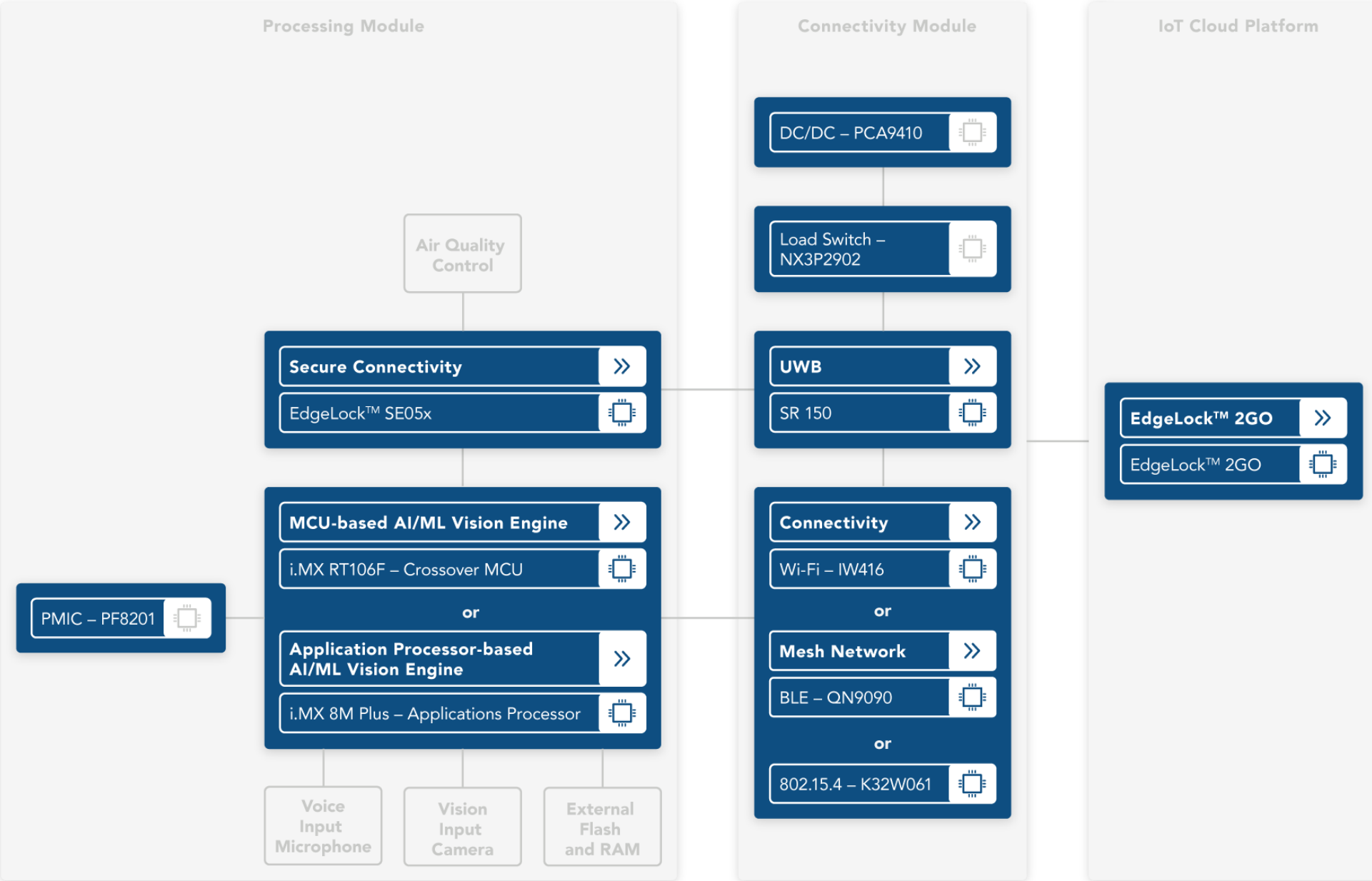
Edge smart nodes monitor the weather, air quality and light levels to adjust accordingly, saving energy and also detecting when maintenance is required. Thanks to the low power mesh-network, they can gather, process and share this data with the gateways.

Layer 3 Content

SECURE CONNECTIONS
FOR A SMARTER WORLD

Architecture

SECURE CONNECTIONS
FOR A SMARTER WORLD


Processing Module
Connectivity Module
IoT Cloud Platform
DC/DC – PCA9410
Load Switch – NX3P2902
Air Quality Control
Secure Connectivity
EdgeLock™ SE05x
UWB
SR 150
EdgeLock™ 2GO
EdgeLock™ 2GO
MCU-based AI/ML Vision Engine
i.MX RT106F – Crossover MCU
or
Application Processor-based AI/ML Vision Engine
i.MX 8M Plus – Applications Processor
PMIC – PF8201
Connectivity
Wi-Fi – IW416
or
Mesh Network
BLE – QN9090
or
802.15.4 – K32W061
Voice Input Microphone
Vision Input Camera
External Flash and RAM

System Solution Info

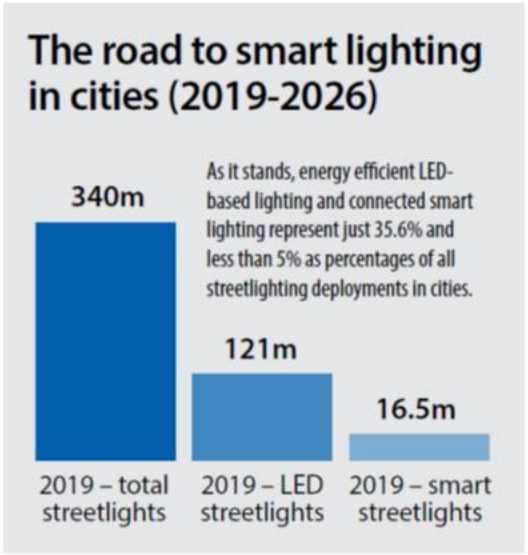
SECURE CONNECTIONS
FOR A SMARTER WORLD

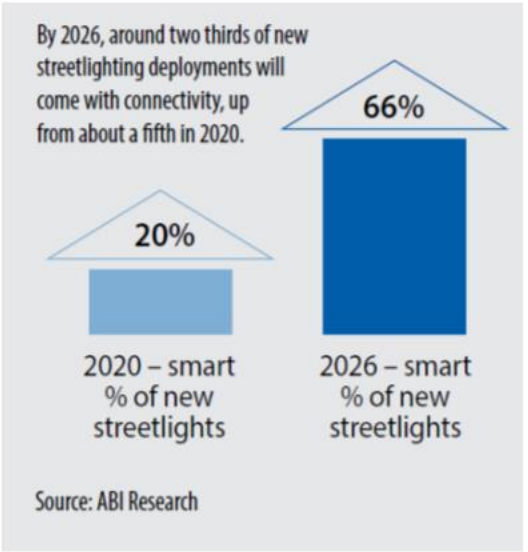
NEXT GENERATION OF STREET LIGHTS WITH PROCESSING, CONNECTIVITY & SENSING FEATURES FOR EASIER & SECURE LIFE

- Street lights have always been a major progress factor for citizen's life and security
- +75% of worldwide pop. lives in OECD countries, trend to increase over the 21st century
- +55% of worldwide pop. lives in urban areas
- +340 Million posts worldwide, ab. 25% in Europe

OPPORTUNITIES FOR FUTURE PROOF SOLUTIONS

- Street lights are evolving from light-only functional nodes to smart connected nodes with AI/ML capabilities
- Edge processing and sensors allow added value services for infrastructure operators and cities
- By 2026, 66% of new posts will come up with connectivity, e.g. +200M units





SEGMENTATION FOR NEW FEATURES IN SMART LIGHTING 4.0

Video | Audio | ML & Sensors | RF: Radar & Connectivity | Alarm | Safety | Other

4

Visionary Features

3

V2X
Connectivity

Drones
- Recharging place
- Dogging of temporary modules by drones
- Maintenance/service by drones
- OTA update and NFC

Service:
- Anonymized metadata collection and sharing with public or private operators

Vision & Audio:
- Automated parking surveillance for accident identification (sound pattern detection, video analysis)
- Acoustic pre-crash warning in parking by beam forming speaker array (parking and traffic)

Vision & Radar:
- "Matrix" lighting with presence localization/ motion detection

Connectivity:
- tracking of Bluetooth® LE (IMEI of mobile devices to follow up crime)

Service:
- Metadata from AI proc. for predictive maint.

Short-Term

Long-Term

Service:
- OTA SW & Security updates

Vision:
- Traffic classification & counting
- People counting

Vision / Radar:
- Parking occupancy detection

Audio & Alarm:
- event detection (e.g., escalation in voices, gun shot)
- Event localization by beam forming
- Emergency blue flashing upon crime detection (glass break, siren detection)

Vision & Alarm:
- Abandoned baggage
- fall detection of people
- wild dump

Motion & ML:
- Local earthquake sensing

Tunable white
- Weather based
- Timetable based
- De-escalation

Radar:
- Local precipitation detection

Motion & ML & Alarm:
- Vandalism detection (vibration monitoring)

Connectivity:
- Public Wi-Fi® hotspot

Vision & Sensor fusion:
- Icy road detection
- Dirty road detection (autumn leafs, dirt e.g. from agriculture, construction sites)

Sensors & ML: Outdoor sensing:
- Air quality
- Weather
- Radioactivity

Connectivity & Alarm:
- Panic button (e.g.+ Audio call)
- Pole opening detection

1

Features already available

2

ORCHESTRATING AN ECO-SYSTEM OF PARTNERS

NXP Technologies
- Edge processors
- Wireless connectivity
- Secure Element
- Radar

HW Partners
- Edge node Module design & Gateway Design
- Module Production

Street Light OEMs
- HW Modules requirements
- Integration to the Street Light chassis
- Street Lights production

Light System Operators
- System requirements
- Deployment
- Operations

Cities
- City light infrastruture owners
- Citizen policy
- City services
- Rescue services

3rd party Technologies
- LPWA radio modules
- 3G/4G modem

Applications Partners
- HW/ SW requirements
- Applications development
- Licensing

3rd party cloud provider
- AWS, Azure, etc.
- Hosting data

Components → HW/SW products & Modules, Engineering services → Lamps → Services → Data

Value proposition

Scalable system
- Software Upgradable
- Compliant with standard & private networks
- Optional modular radio

Positive impact for all
- Better power efficiency
- Optimized lighting management
- Higher sense of security

New capabilities
- First step for metadata usage
- Fitted to long-term vision

FOCUS POINTS

Next generation of street lights with processing, connectivity & sensing features for easier & secure life

HIGH PERFORMANCE

Best of two worlds : cross-over processsors family (i.MX RT MCUs) or first i.MX 8M Plus SoC with NPU embedded enabling ML applications

PRIVACY PROTECTION

Capture data is anonymized, processed & stored in a digital safe at the edge, addressing privacy concerns

ENVIRONMENT

Smart lighting will accelerate energy savings, improve air quality control & optimize local maintenance

TECHNOLOGIES

WiFi 6 SoC

NXP WiFi 6 + BT5.1 combo solution enables gigabit-level performance, superior reliability and enhanced security for flexible IoT solutions

AI/ML enablement

A dedicated hardware block to accelerate ML modele inference and reduce system power consumption

UWB in street lights

Anchors distributed in street lights enable future applications for accurate and personnalized customer engagement

Multiple Analog inputs

A modular design which allows system integrators and OEMs to connect appropriate sensors (camera, micro, air sensor, ...)

Mesh networks

Scalable and flexible technology to enable low cost devices to join the mesh and gain connectivity and direct addressability from internet.

Low power data processing

i.MX RT fmfeatures an Arm Cortex M7 at speeds up to 528MHz for high CPU performance

Secure data protection

EdgeLock SE05x Secure Element is a crypto companion chip offering CC EAL6+ HW & OS certification bringing trust for remote authentication

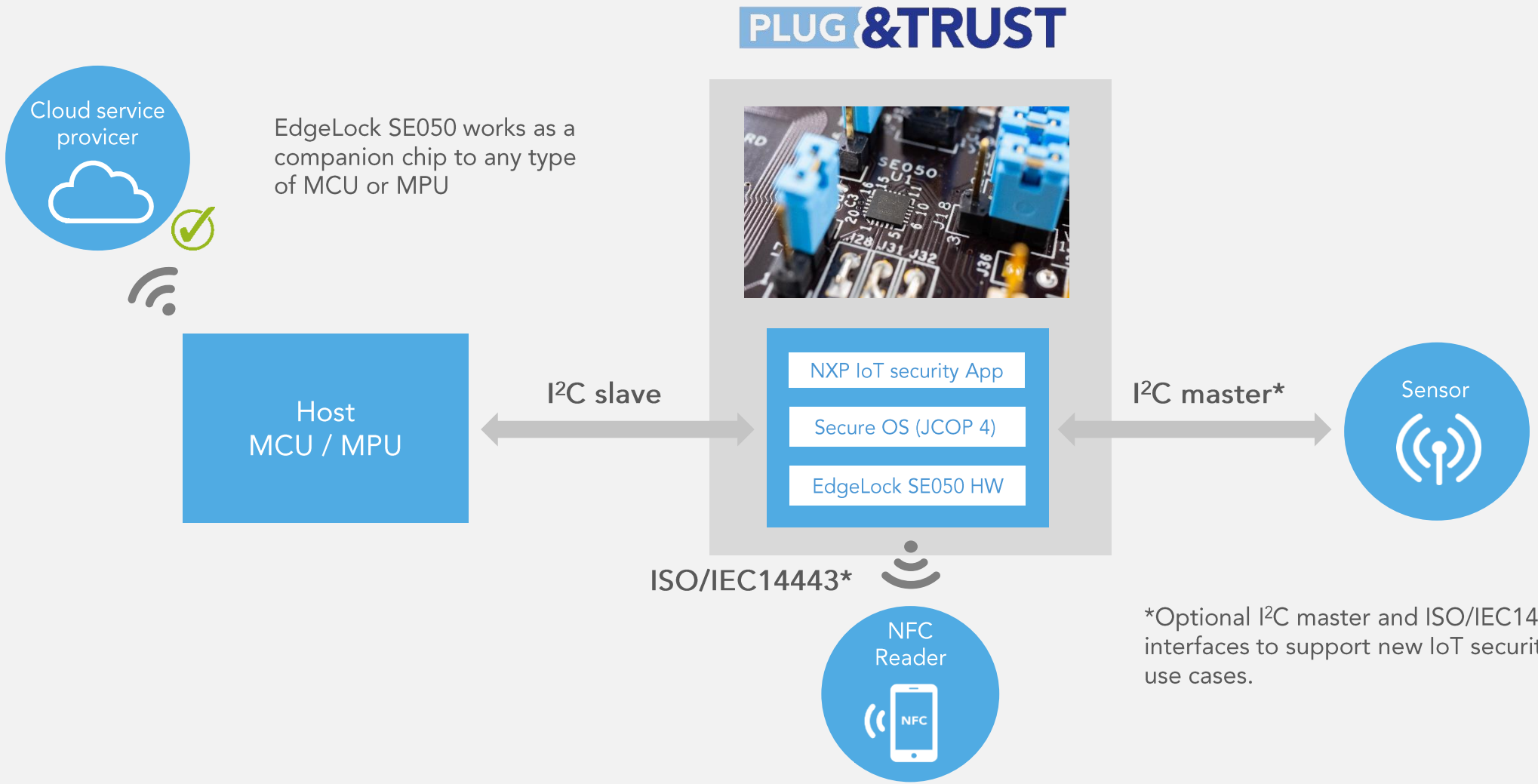
Tool support

NXP integrates all the SW stacks (Connectivity, security, AI/ML, drivers) into an easy to use IDE with examples to facilitate adoption.

Technologies

SECURE CONNECTIONS
FOR A SMARTER WORLD

A TRUSTED HARDWARE THAT CAN BE ADDED TO ANY IoT ARCHITECTURE FOR SECURITY



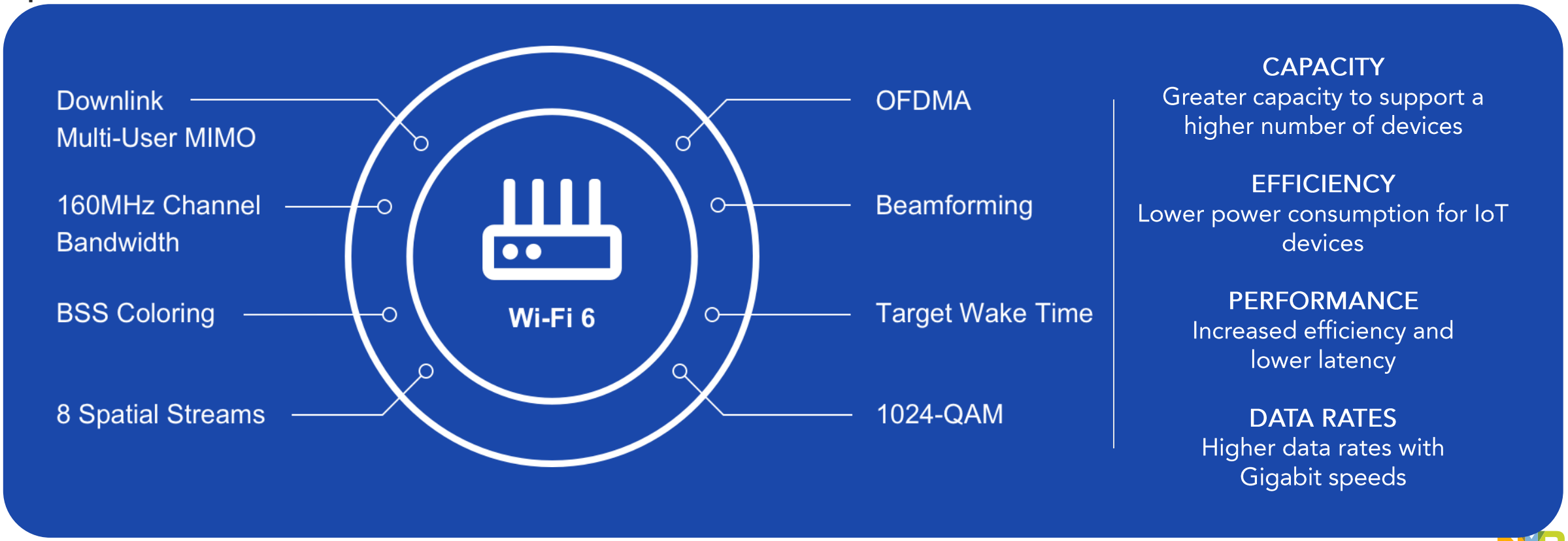
EDGELOCK 2GO – MANAGED

Onboard and manage the lifecycle of your devices

- **SECURE**
  - End-to-end security from chip to cloud
  - Leveraging NXP security infrastructure
  - Keys are diversified per device
- **ZERO-TOUCH**
  - No need to invest in a PKI
  - No key or certificate handled by OEM
  - Easy to configure
- **FLEXIBLE**
  - Supports multiple types of credentials
  - Apply different configurations depending on your customers or projects
  - Renew or add new credentials on devices in the field

THE Wi-Fi 6 DIFFERENCE

- Wi-Fi 6 delivers technical advancements over previous generations of Wi-Fi with several key features that enable significant increases in network capacity, power efficiency and performance.



NXP Wi-Fi 6 PORTFOLIO: ACCELERATING LARGE-SCALE ADOPTION

- Complete portfolio of Wi-Fi 6 and Bluetooth 5 combo solutions to accelerate large-scale adoption.
- Differentiated, cost- and power-optimized design approach delivers new levels of connectivity innovation across a range of markets.

Access

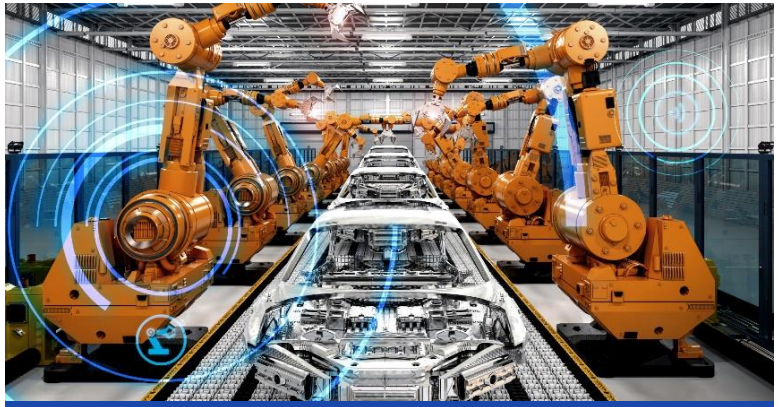
Performance leading 4x4 and 8x8-stream solutions with integrated Bluetooth 5 for home and enterprise access solutions.

(88W9064, 88W9068)

Automotive

Concurrent Dual Wi-Fi 2x2+2x2+Bluetooth 5 AEC-Q100 qualified solutions purpose-built for the highest performance infotainment and telematics automotive applications.

(88Q9098)



Industrial & IoT

2x2 Wi-Fi 6 + Bluetooth 5 optimized for cost and power.

Concurrent Dual Wi-Fi 2x2+2x2 + Bluetooth 5 solutions for multimedia streaming and consumer access applications.

(IW62X)

88W9098 OVERVIEW

The 88W9098 SoC is based on the latest IEEE 802.11ax standard with an innovative concurrent dual Wi-Fi and dual-mode Bluetooth 5.1 architecture. The 88W9098 combo solution enables gigabit-level performance, superior reliability and enhanced security to enable high performance, flexible solutions for the IoT, Access and Industrial markets.

- **Concurrent Dual 2x2 Wi-Fi Operation**
  - IEEE 802.11ax / IEEE 802.11ac
  - 20/40/80 MHz channel bandwidths
  - Zero Wait DFS
  - Implicit and explicit beamforming
- **Wi-Fi 6**
  - Downlink OFDMA and MU-MIMO
  - Uplink OFDMA and MU-MIMO
  - 1024 QAM
  - Target Wake Time
- **Bluetooth**
  - Bluetooth Class 1.5 and Class 2
  - Bluetooth Low Energy (LE) 1 Mbit/s & 2 Mbit/s
  - Bluetooth Low Energy Long Range

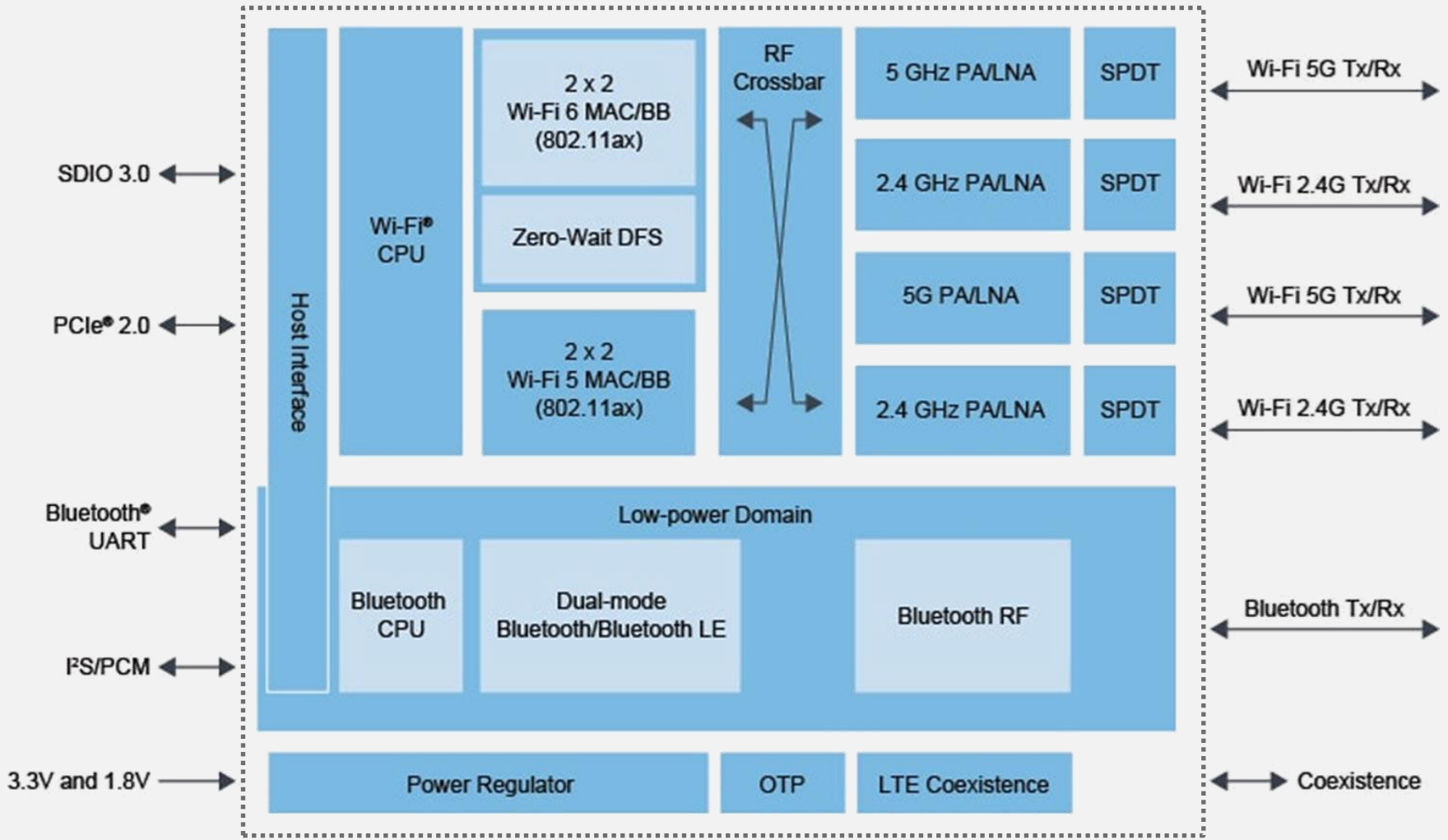
Operating Temperature

- Commercial (0°C to +70°C)
- Industrial (-40°C to +85°C)

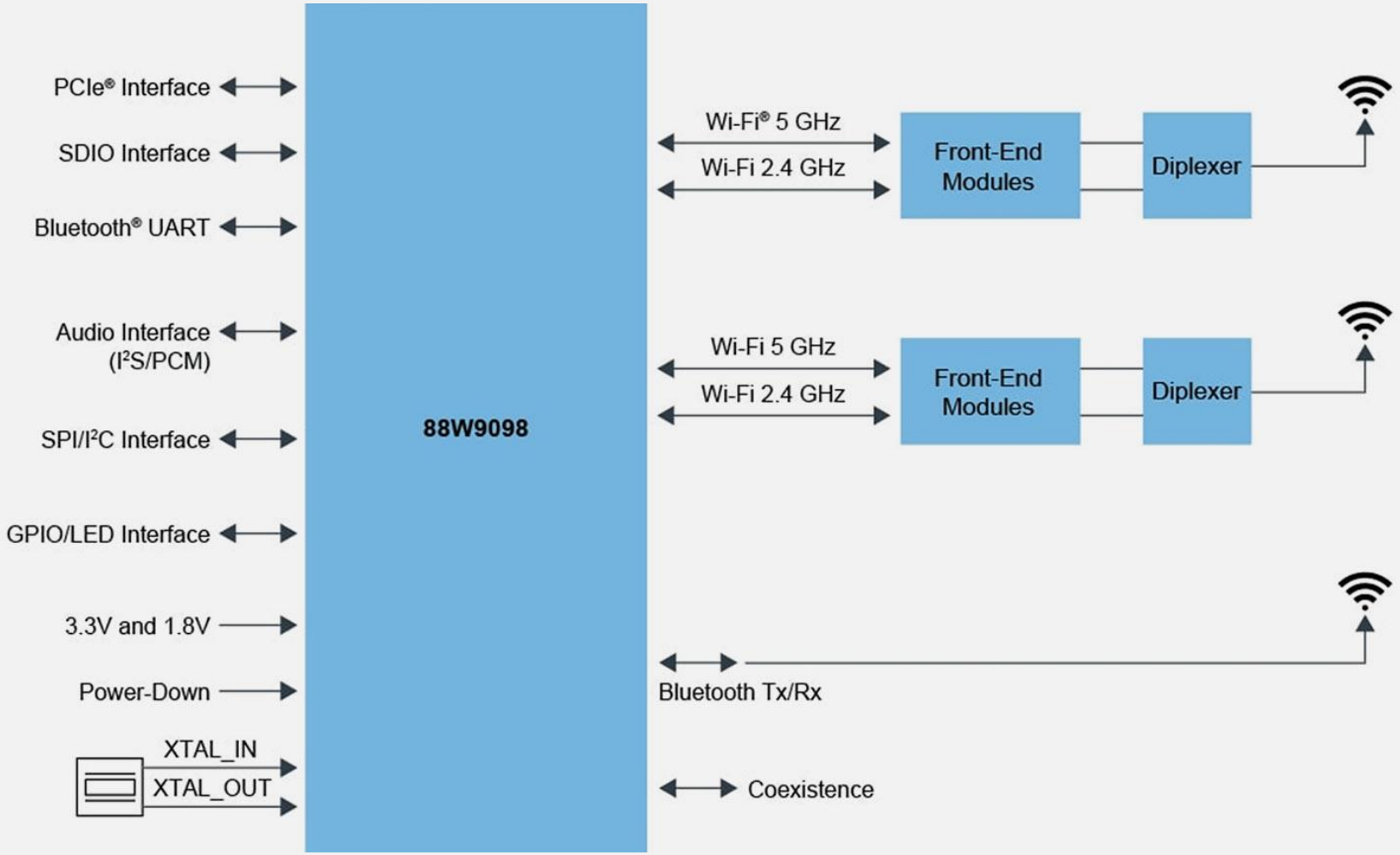
Host Interface (Wi-Fi + Bluetooth)

- PCIe 2.0 + UART
- SDIO 3.0 + SDIO 3.0
- SDIO 3.0 + UART
- USB 3

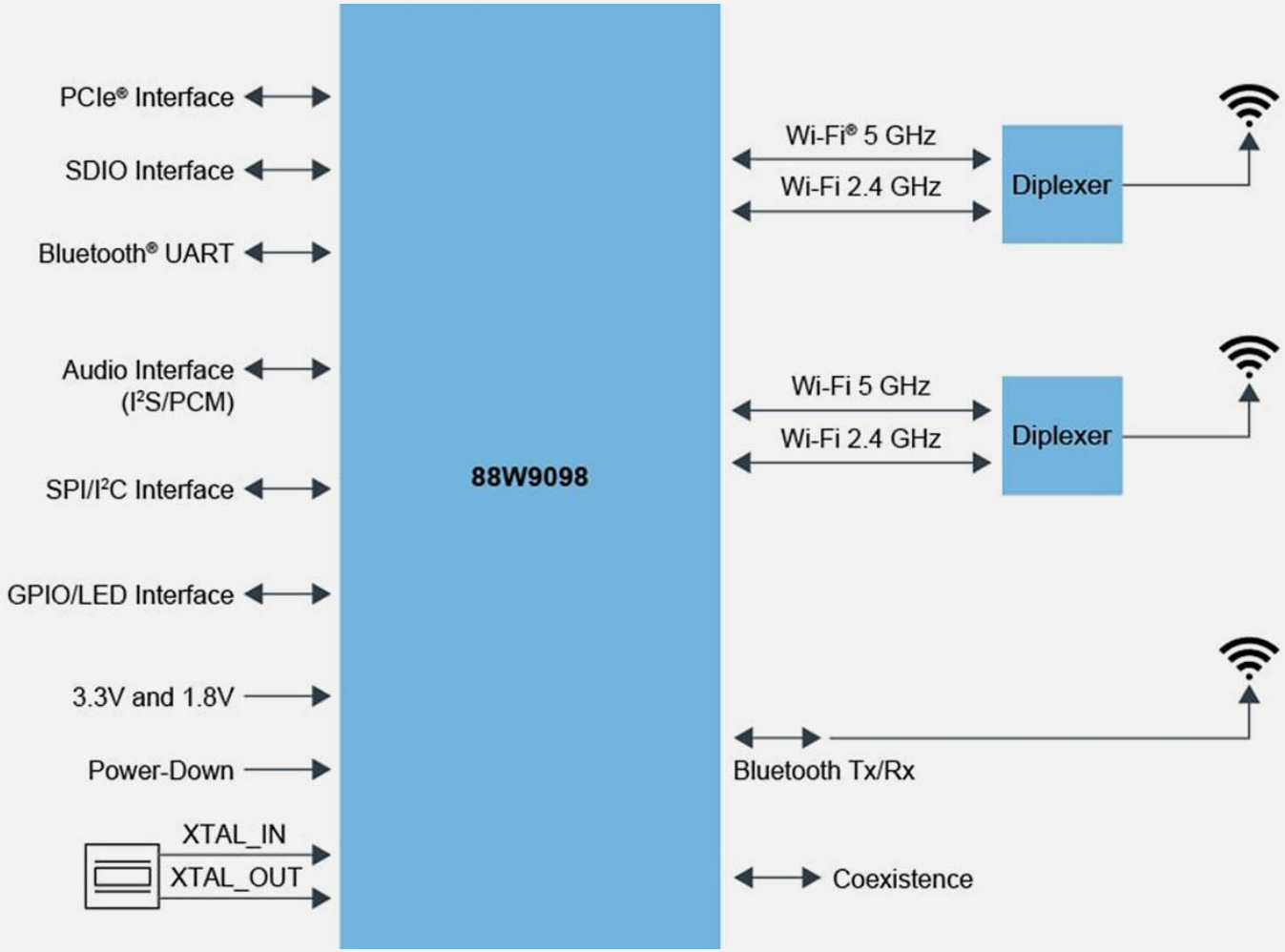
889098 SoC Internal Block Diagram



889098 SoC Application Block Diagram (EXTERNAL FEM)

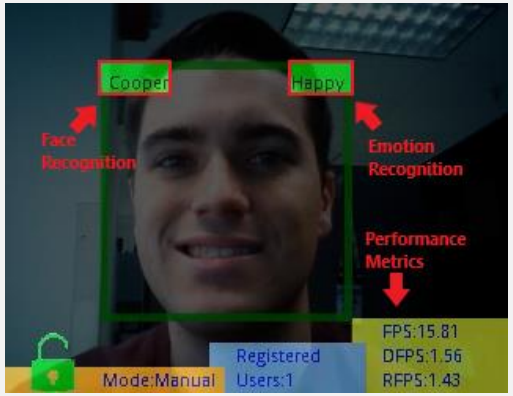


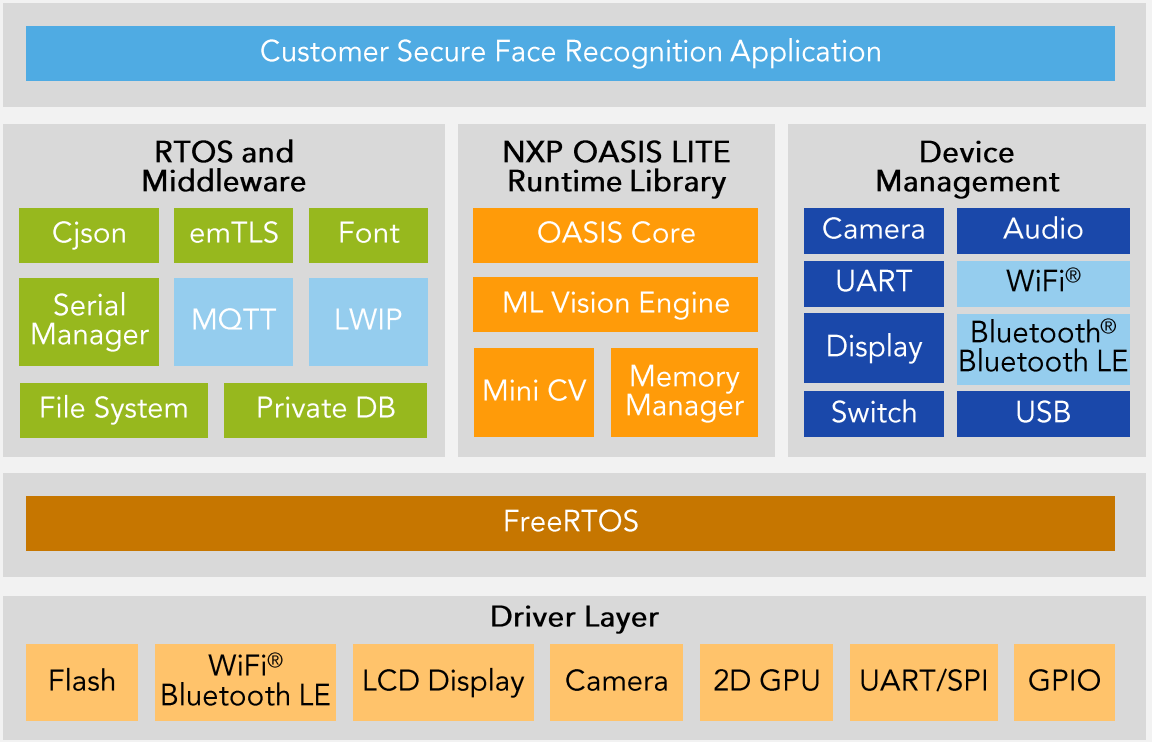
889098 SoC Application Block Diagram (Internal PA/LA/SW)



MCU-BASED AI/ML VISION TECHNOLOGY – A TURNKEY SOLUTION

- Pre-integrated software minimizes product development time
- MCU optimized face recognition pipeline
- Low cost – Uses inexpensive RGB camera
  - MCU based BOM cost ~50% lower than apps processor implementations
    - Eliminates SDRAM, eMMC Flash, PMIC, 6+ layer board
- Operates entirely offline – reduces cloud privacy issues
- Short MCU boot time enables face recognition from standby in less than 800 ms
- Familiar MCU/RTOS platform avoids steep apps processor/Linux learning curve for IoT developers
- NXP EdgeReady Solutions reduces time-to-market
  - Full reference design, software source, schematics, BOM and layout
  - Proof of customers going from concept to production in only four months





+ Smart Retail Video

EDGELOCK 2GO FOR EDGELOCK SE050

Simple — Onboard your devices to the cloud with zero-touch

Scalable — Manage credentials lifecycle over the lifetime of your devices

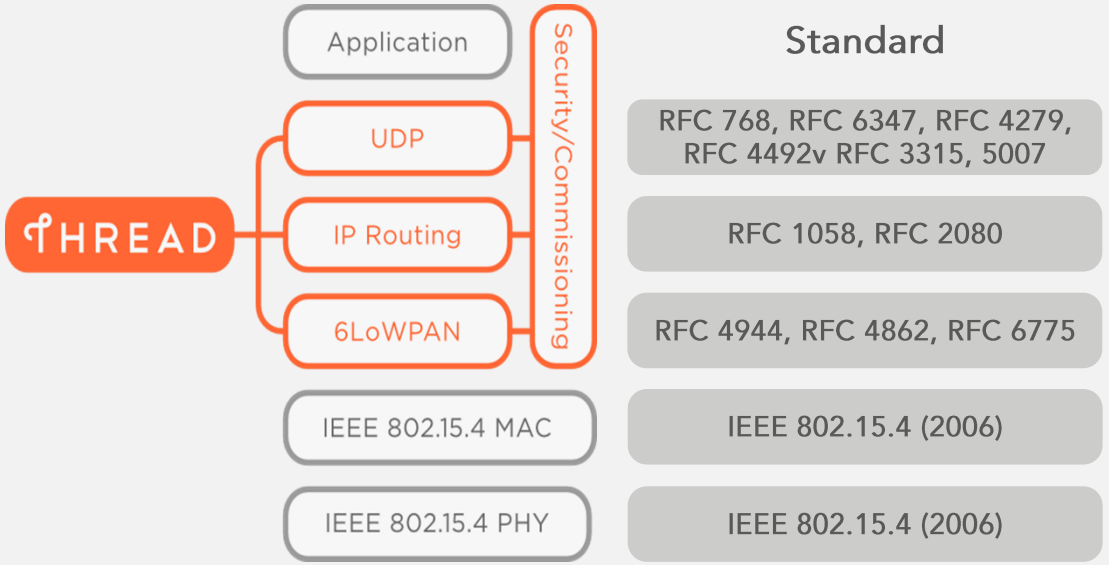
Secure — Leverage EdgeLock SE050 certified Hardware Root of Trust

OVERVIEW

THREAD

- IPv6 based
- Lightweight and low latency
- Not a whole new standard
- Collection of existing IEEE and IETF standards
- Runs on existing 802.15.4 based products
- 250+ devices on a PAN

- Direct Addressability of devices
- Flexible network with full point to point connectivity of all devices
- No single point of failure
- Enable low cost bridging to other IP networks
- Simple security and commissioning
- Low Power support for sleeping devices

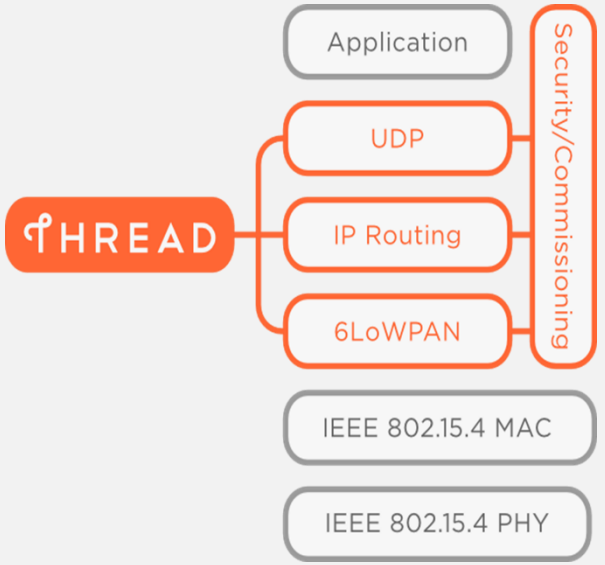


NETWORK ROUTING

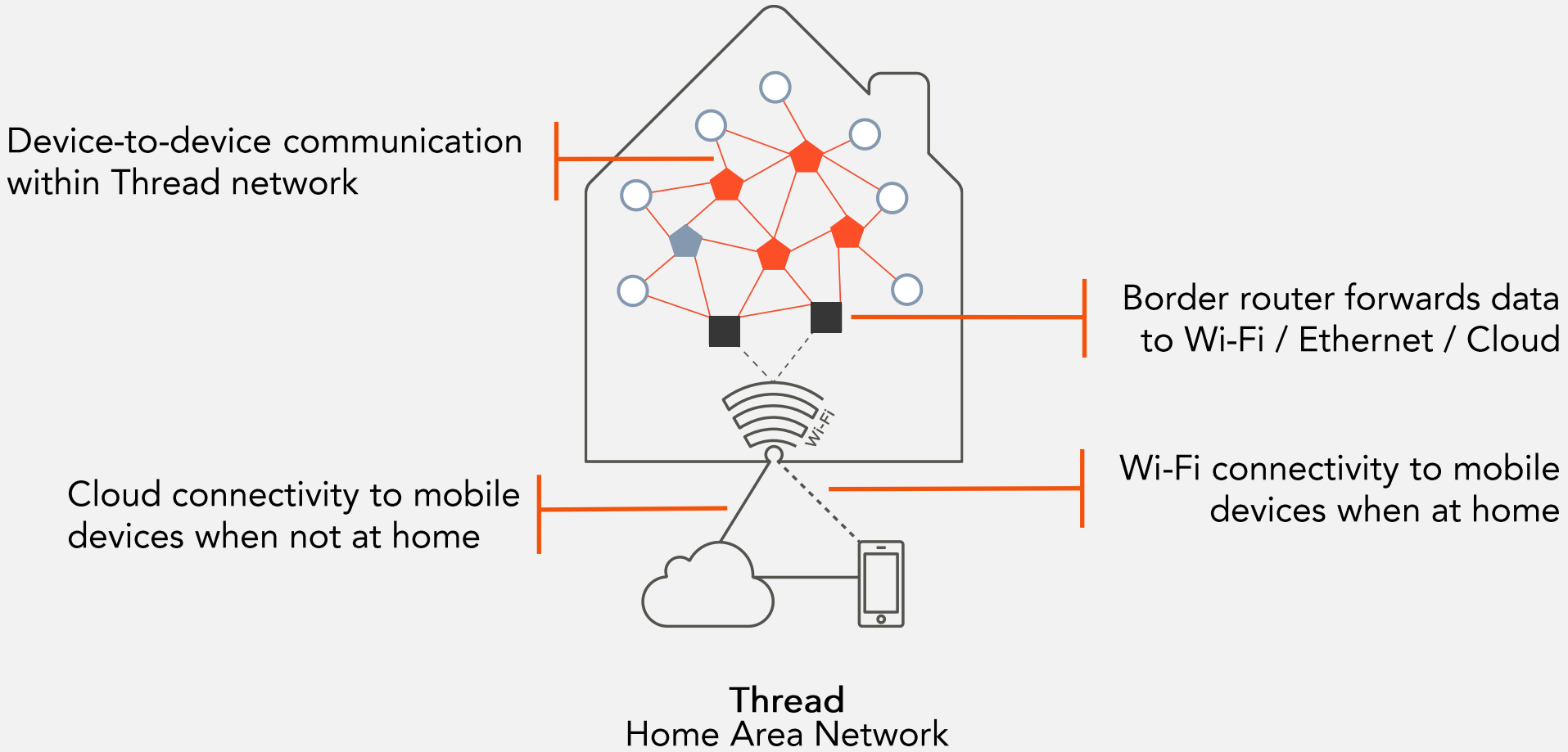
THREAD

Similar algorithm to Routing Information Protocol next generation (RipNG):

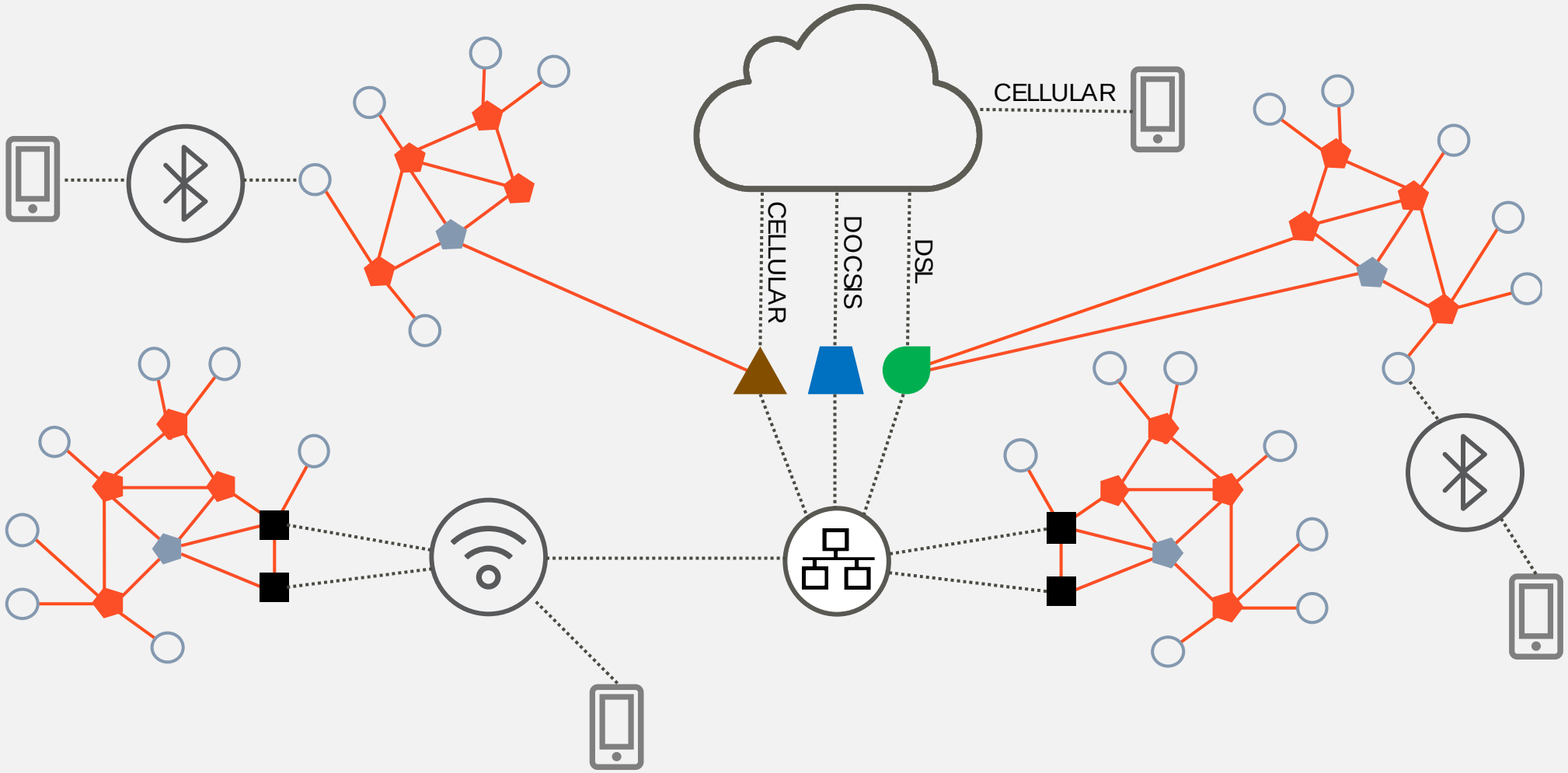
- Distance Vector routing protocol
- All routers exchange with other routers their cost of routing in the Thread network in a compressed format using MLE (Mesh Link Establishment).
- Devices use IP routing to compute the routing table which is populated with a compressed form of a mesh unique local address for all routers and the appropriate next hop address.
- Routers inform their neighbors of topology changes periodically
- Packets forwarding is assured via 6LoWPAN at Link Layer



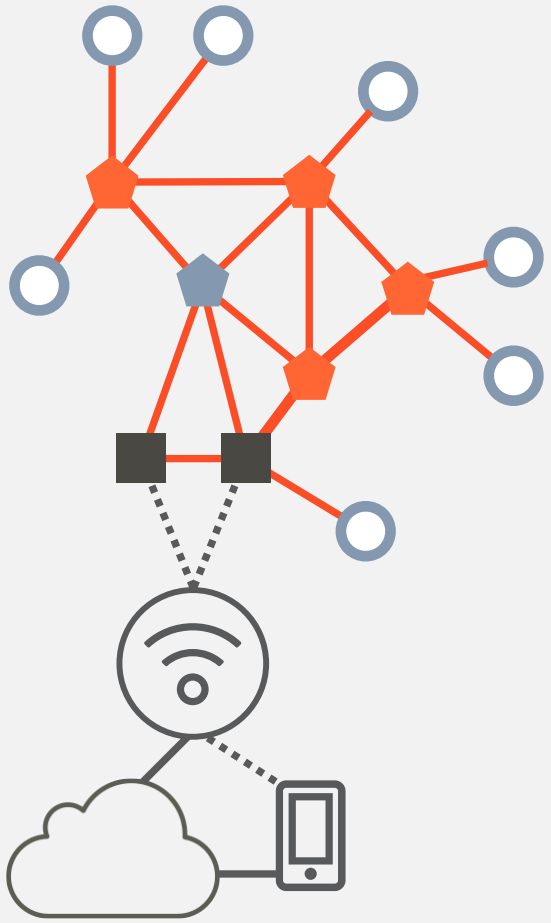
THREAD HOME AREA NETWORK



THREAD + ONE



NETWORK ARCHITECTURE



End Device or Router Eligible

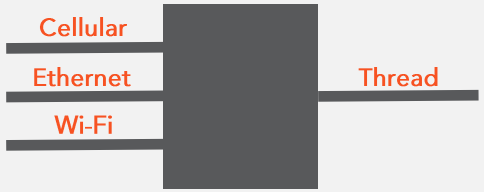
THREAD Router

Leader

Border Router

THREAD Link

NETWORK TOPOLOGY ROLES



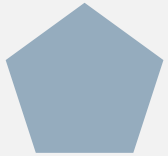
Border Router

Forwards data to and from the cloud/other networks

Provides optional Wi-Fi connectivity

Many

+



Thread Leader

Master of network parameters

Coordinates commissioners

Makes network decisions

One

+

Thread Router

Routes traffic among devices

Form the mesh topology

Eligible to become the Leader

Up to 32

+

End Device

Designed for low power operation

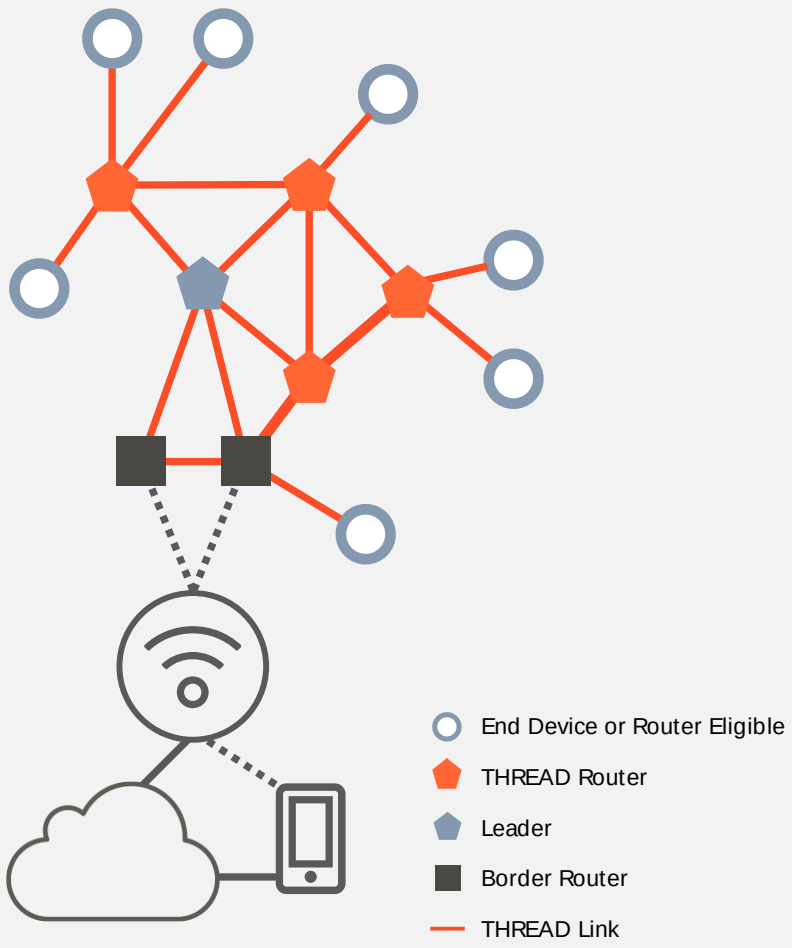
May be powered or sleepy

May be router-eligible if powered

Up to 64 per Router

= Hundreds of Devices per Network

THREAD BORDER ROUTER



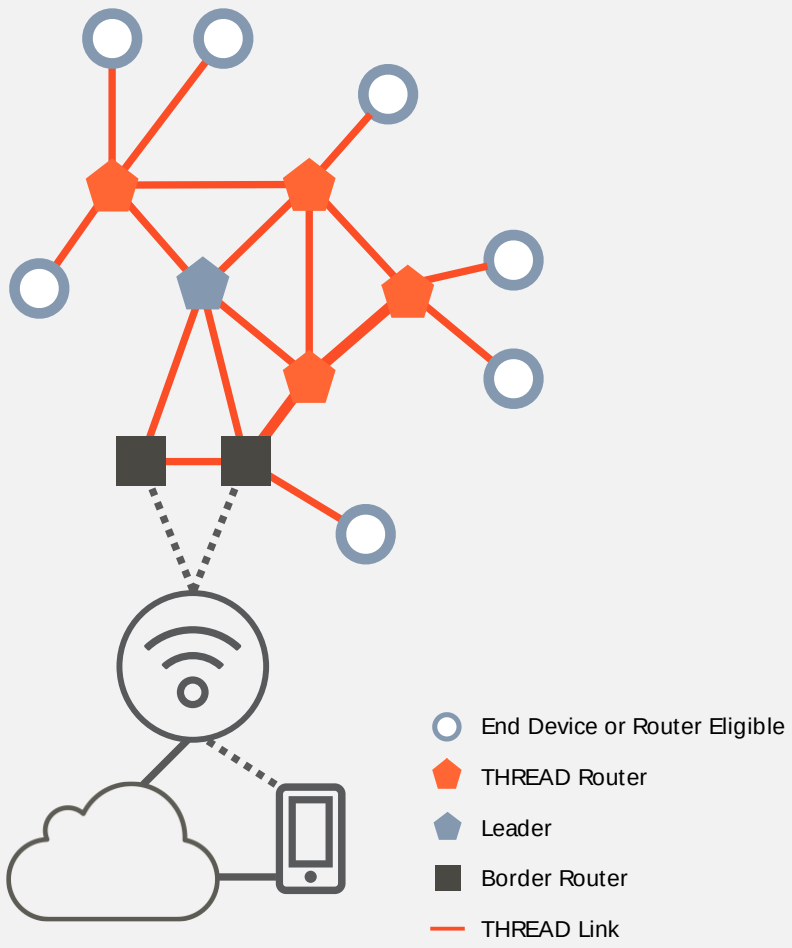
The Border Router

- Is usually a subset of Router Eligible Device
- Has at least one additional interface than IEEE 802.15.4 (e.g.: Wi-Fi, Ethernet, USB)
- Facilitates IP packet forwarding to and from the Thread network to home LAN or upstream IP infrastructure
- Can be multiple Border Routers in a Thread Network

The Border Router

- Can be a specialized networking device
  - Wireless Access Point (WAP)
  - Home Gateway
- Or can be embedded in a consumer product
  - Thermostat
  - Appliance

THREAD ROUTER ELIGIBLE DEVICE



A Router Eligible Device can play multiple roles at runtime

Leader
If it is the initial device in the network partition, or when the current leader is unavailable

Router Eligible End Device (REED)
Immediately after joining a network through an existing Active Routers or if the network has sufficient connectivity and does not need more routers

Active Router
A REED requests the Leader for it to become an Active Router when the network has relatively limited connectivity. e.g.: when total number of existing Active Routers is < 16

A Router Eligible Device is regularly a device meant to remain mains powered and always on

COMPREHENSIVE SOLUTIONS FOR THE IoT INDUSTRY

World-Class Connectivity Portfolio

Wi Fi™ Bluetooth™

UWB NFC

zigbee THREAD

5G Project CHIP

Multiprotocol

Secure OTA

Flexible architectures

Combined with Unique Processing Continuum

i.MX 6, 7, 8, 8M MPUs
High performance,
3D graphics

Layerscape MPUs
High-speed Ethernet, TSN

i.MX RT Crossover MCUs
Highest performance
Low power

LPC & Kinetis MCUs
Low cost to high integration

Adding Trusted Security & IoT Solutions

EdgeLock™ IoT Secure Elements: Plug & Trust

Secure Processors for IoT

eIQ™ Machine Learning Software Development

Locationing

Ecosystems support (Voice assistants, cloud)

Ease of Use with Unified Approach

Common Development Tools

Common network & protocol stacks

Wi-Fi Drivers for MCU/MPU Portfolios

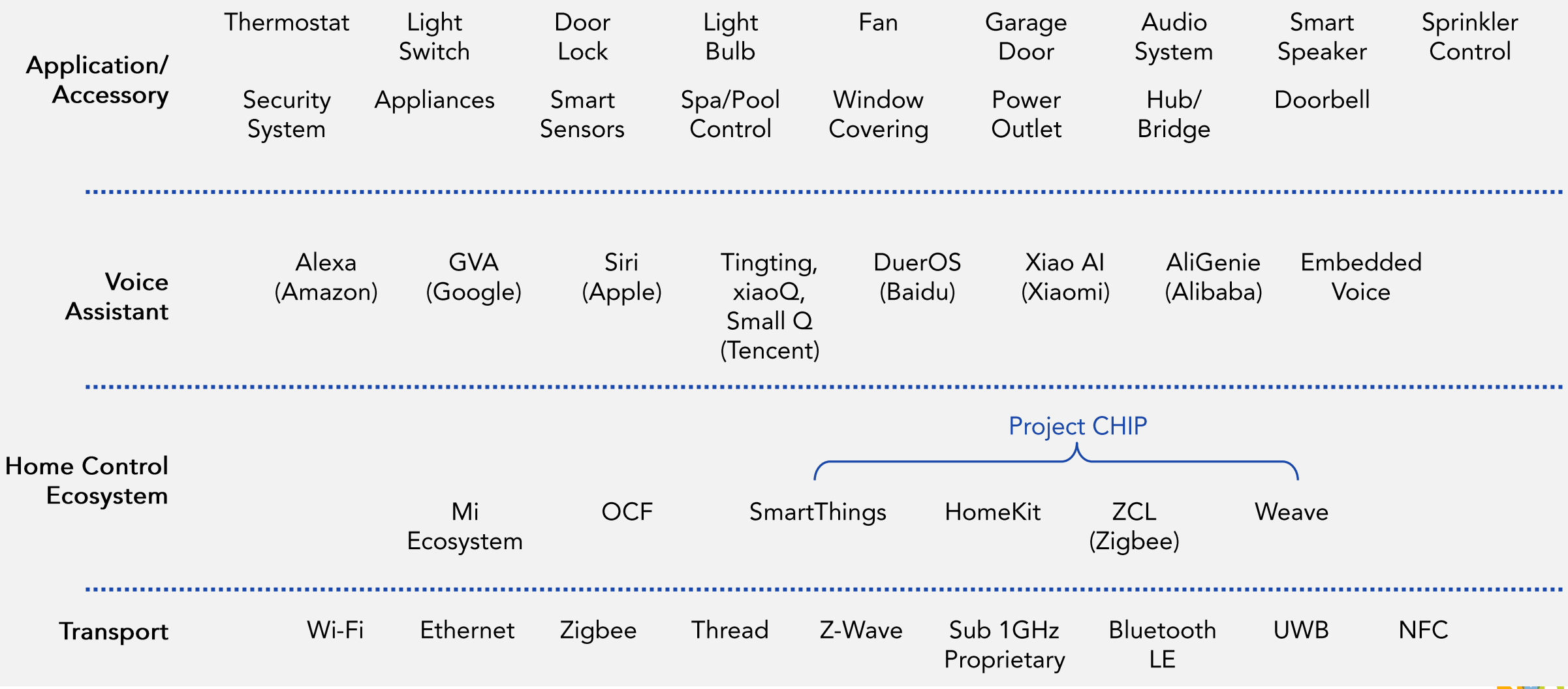
Interoperability & co-existence

Open Source & Software Compatibility

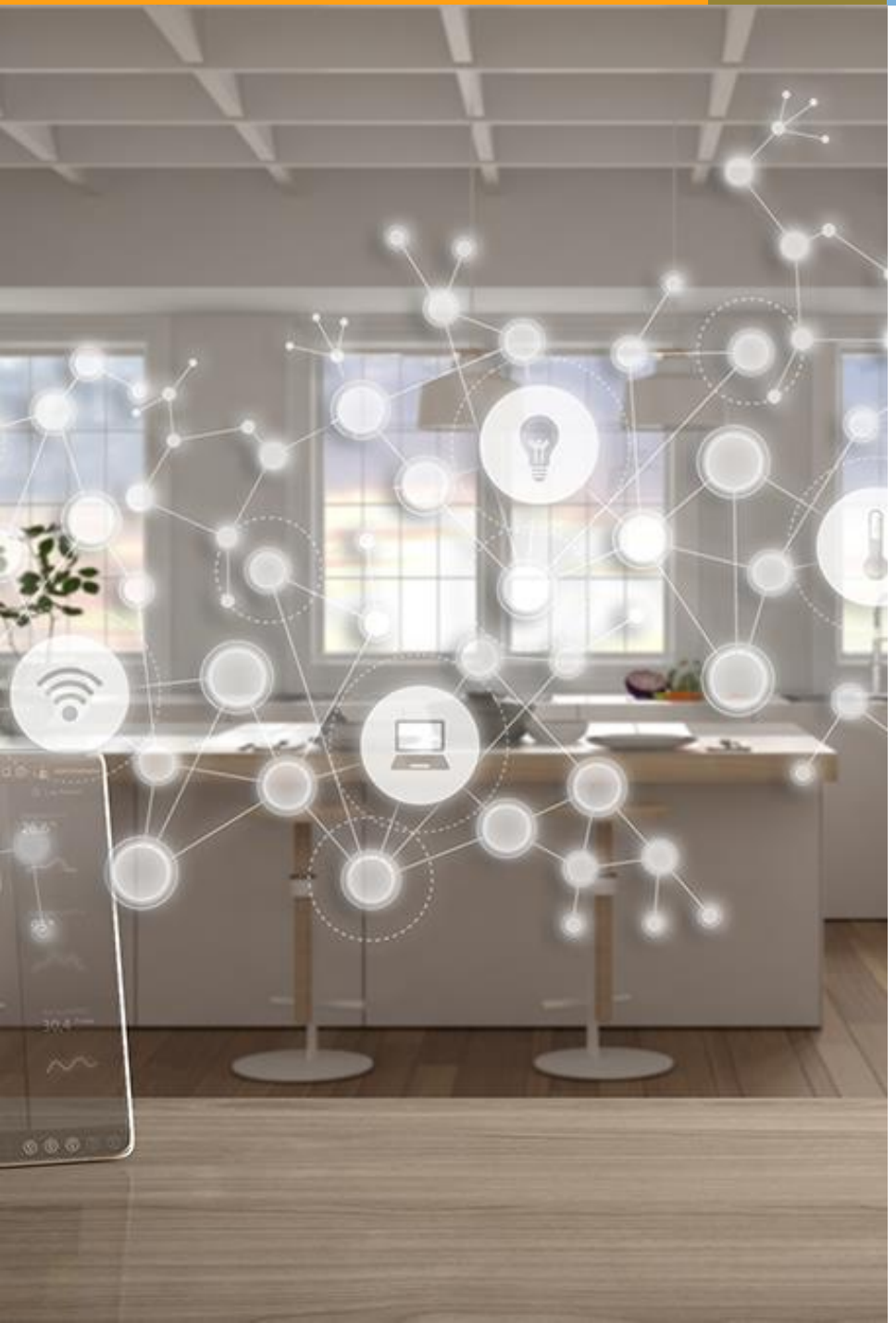
Pre-integration of h/w and s/w

Customer Commitment: Product Longevity, Quality, Global Support. Online Community, Standards & Open Source Leadership

SMART HOME TECHNOLOGY LANDSCAPE



Project CHIP Overview



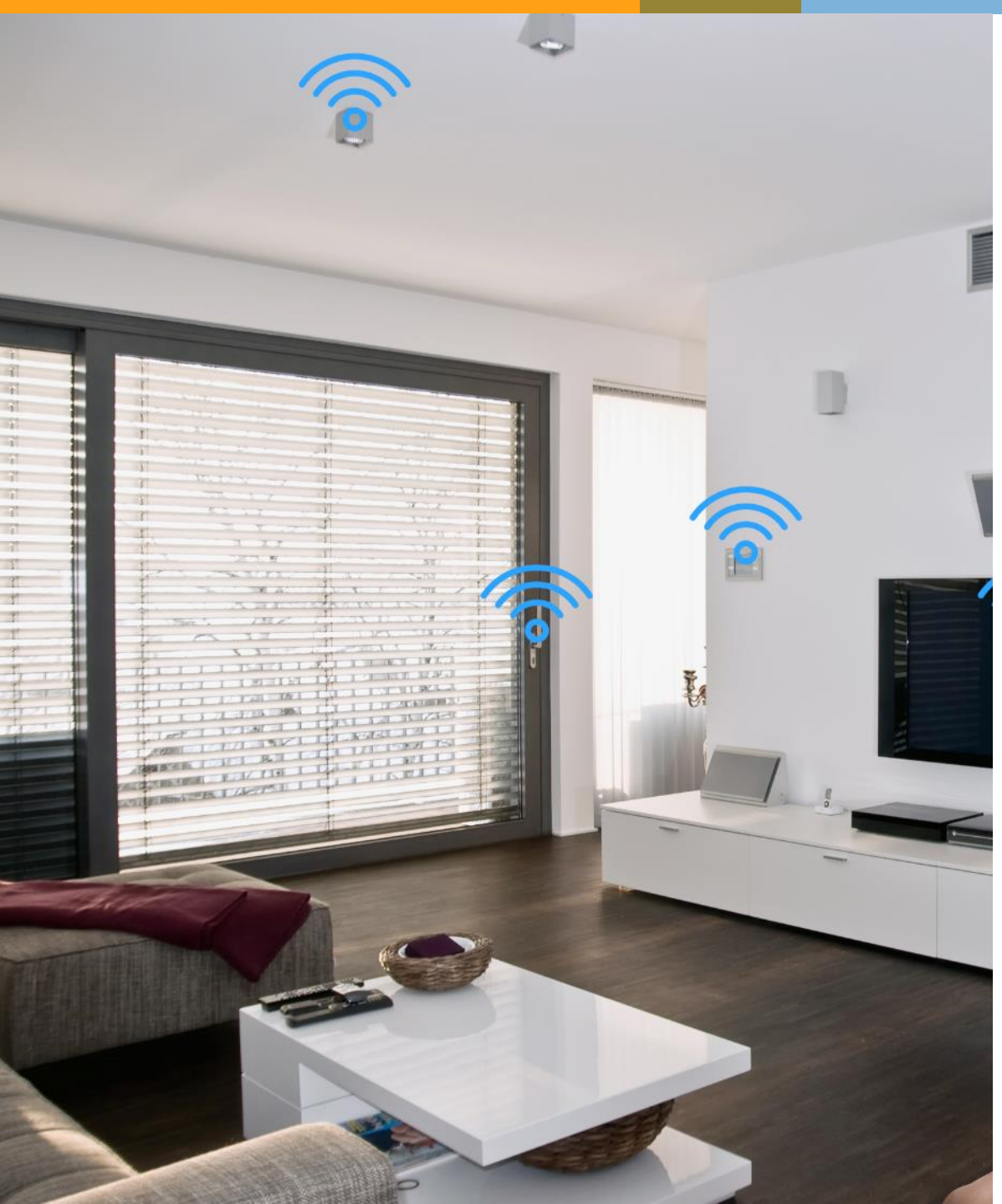
PROJECT CONNECTED HOME OVER IP (CHIP)

A single IP-based protocol to securely and robustly connect a large ecosystem of products and every smart home system.

- Simplify development for “things”
  - Increase compatibility for consumers
  - Ensure security and privacy
  - Create a truly smarter home

Led by the world’s biggest brands

amazon · ASSA ABLOY · COMCAST · Google · HUAWEI · IKEA · Kroger · legrand · LEEDARSON · NXP · resideo · SAMSUNG SmartThings · Schneider Electric · signify · SILICON LABS · somfy · Texas Instruments · tuya · Wulian

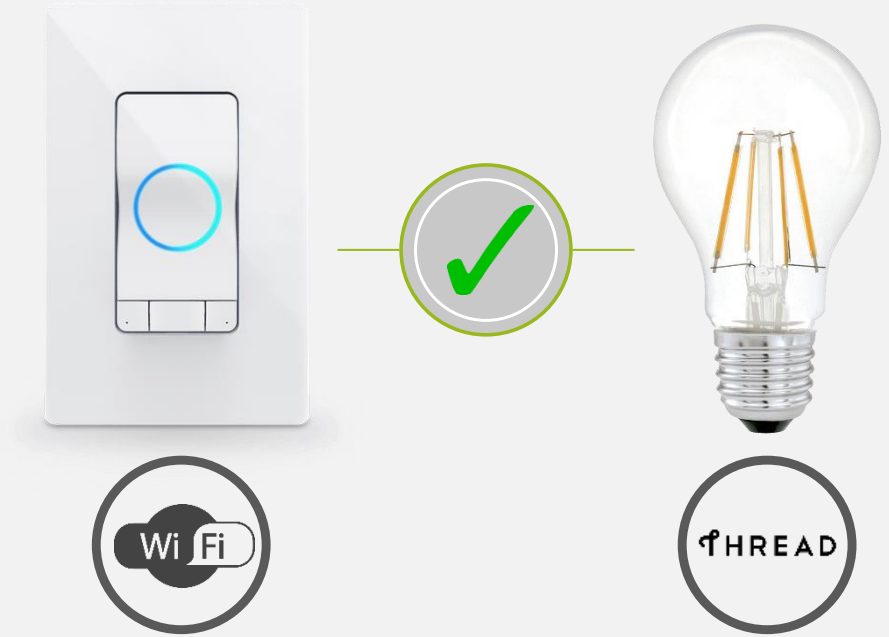


SIMPLIFIED DEVELOPMENT

- **Device manufacturers can focus on their products**
  - Easier integration with Amazon's Alexa, Apple's Siri, Google's Assistant, and others
- **Flexibility to choose appropriate network protocol(s)**
  - Wi-Fi for high bandwidth
  - Thread (15.4) for robust low-power, low-bandwidth
- **Standardization of lifecycle events**
  - Provisioning/onboarding, removal, error recovery, and software updates

SMART DEVICES COMPATIBILITY

- **Platform and ecosystem-agnostic technology**
  - All “Things” becoming interoperable by design
  - Common language so smart devices can speak to each other on any network
- **Built on market-proven technologies**
  - Elements of Apple’s HomeKit, Zigbee Alliance’s Dotdot, Google’s Weave
- **Interoperability across IP networks**
  - Enables devices to communicate across IP protocols
  - Consistent cloud and device data models



WEAVE

dotdot

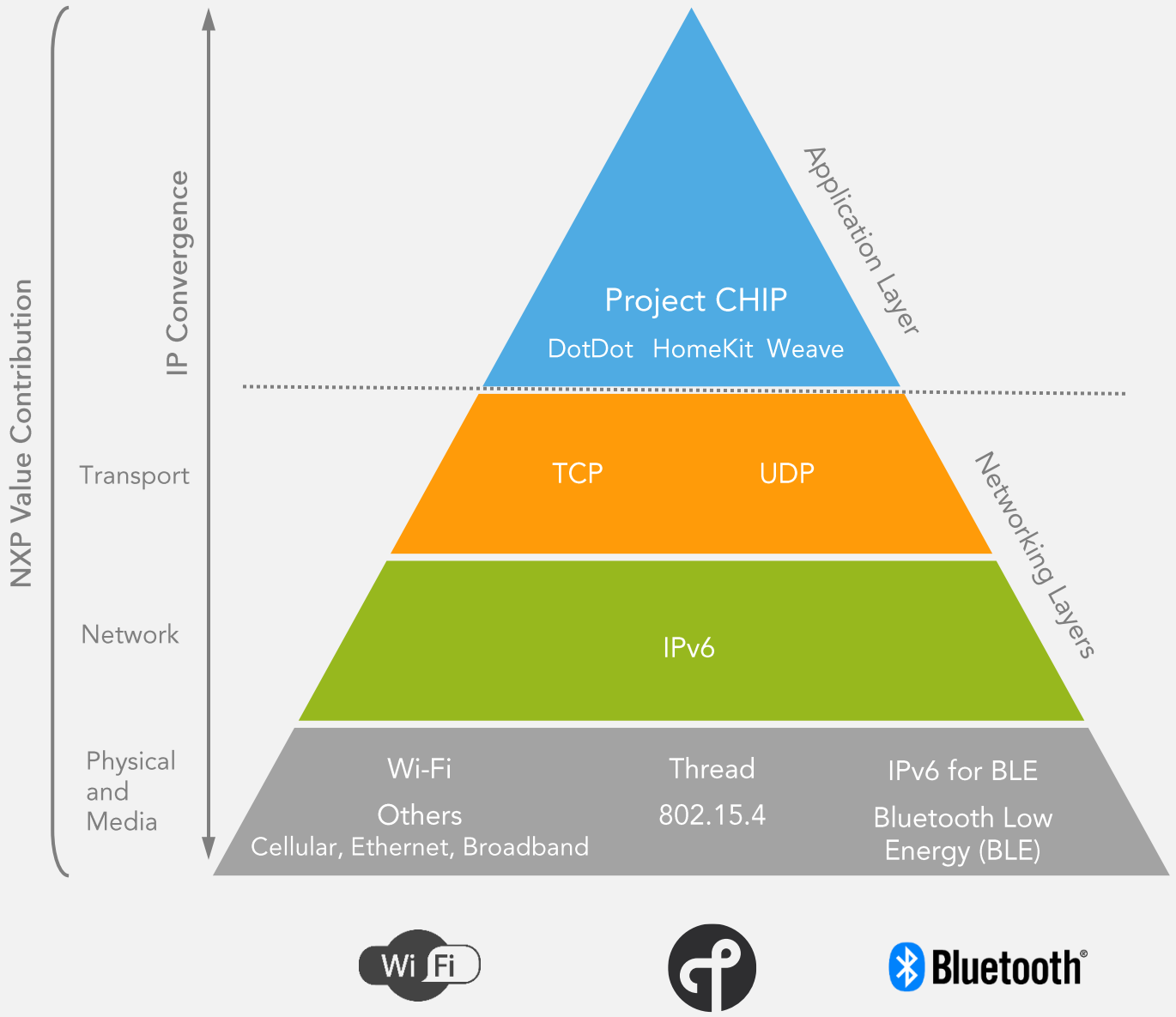
HomeKit

BUILT-IN SECURITY AND PRIVACY

- Simple and secure device commissioning
- Leverage security investment already part of IP
- Direct, private and secure end-to-end communications
- Enables application level privacy and integrity
- Cryptographically secure over-the-air s/w updates
- Reduces attack points

PROJECT CHIP STACK DIAGRAM

- **IP driving convergence**
  - Unified language
  - Co-existence
  - Market-proven technologies
  - Secure and scalable architecture
  - IT-compliant
  - Rich set of tools



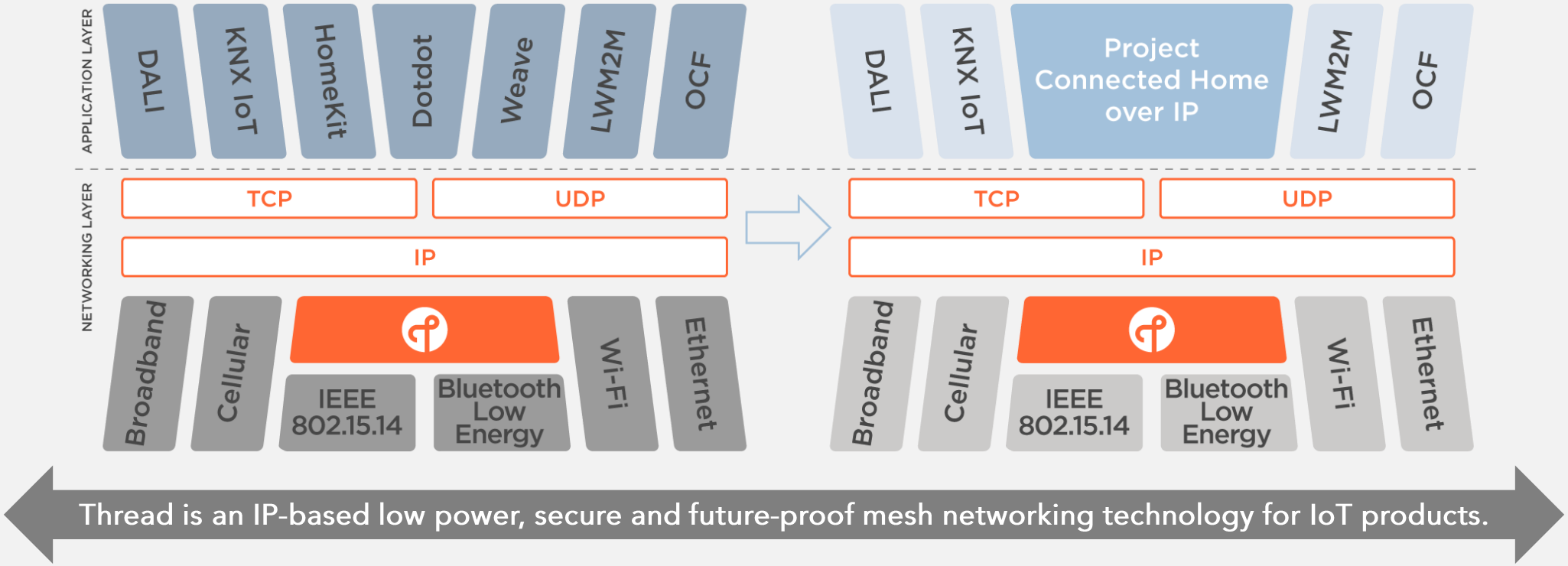
PROJECT CONNECTED HOME OVER IP TIMELINE

- **Milestones**
  - Targeted device types for v1 include lighting and electrical, HVAC controls, access control, safety and security, window coverings/shades, TVs, access points, bridges and others
  - New brand for the technology unveiled in Q4 2020
  - First release of specification and open source implementation targeted for early 2021
  - Goal for product manufacturers to deploy products with Project CHIP technology in 2021
- **Project CHIP Working Group is managed within the Zigbee Alliance**
  - Technical, Certification and Marketing & Product Sub Groups
  - Specification and open-source code development in parallel, Open Source github publicly available

NXP & PROJECT CHIP

- **NXP has a scalable and proven IoT portfolio**
  - Wi-Fi, Bluetooth LE, 802.15.4, NFC, UWB and Ethernet technologies under one roof
  - Thread, Zigbee and multiprotocol stacks, support for HomeKit
  - Widest processor portfolio for compute
  - ML/AI solutions for Ambient Computing: services and devices work together
- **NXP is a leader in IoT**
  - Marketing and Technical Leadership in relevant Alliances
  - Commitment to Open Source initiatives such as OpenThread, Zephyr, Linux
  - Market leading security expertise
- **NXP Project CHIP Solutions**
  - Wireless portfolio with Thread, Wi-Fi and Bluetooth LE ready to adopt Project CHIP
  - E-Lock Demo with Project CHIP on the K32W, in the github
  - Flexible Project CHIP Reference Platform in development

THREAD – NXP SUPPORT

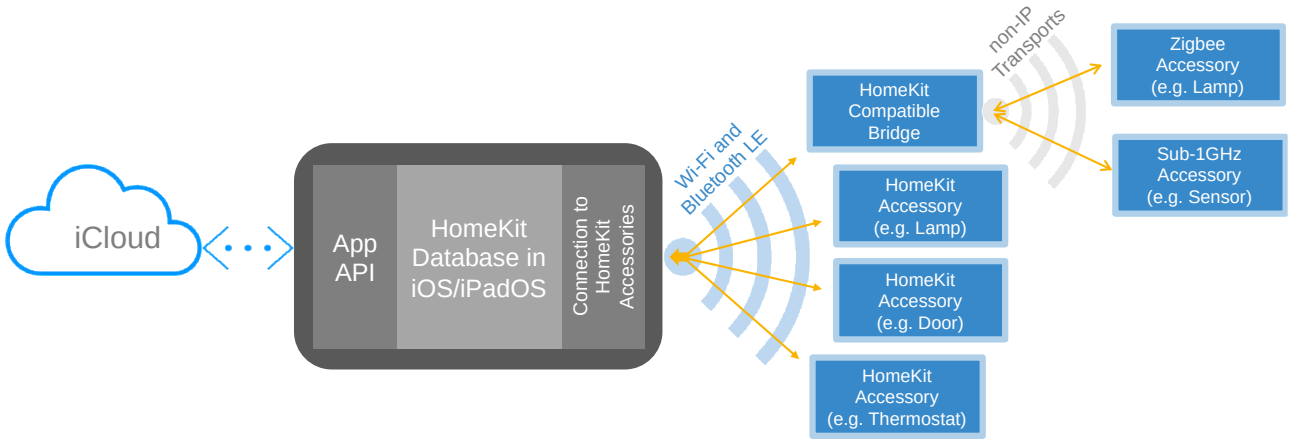


THREAD CERTIFIED COMPONENT

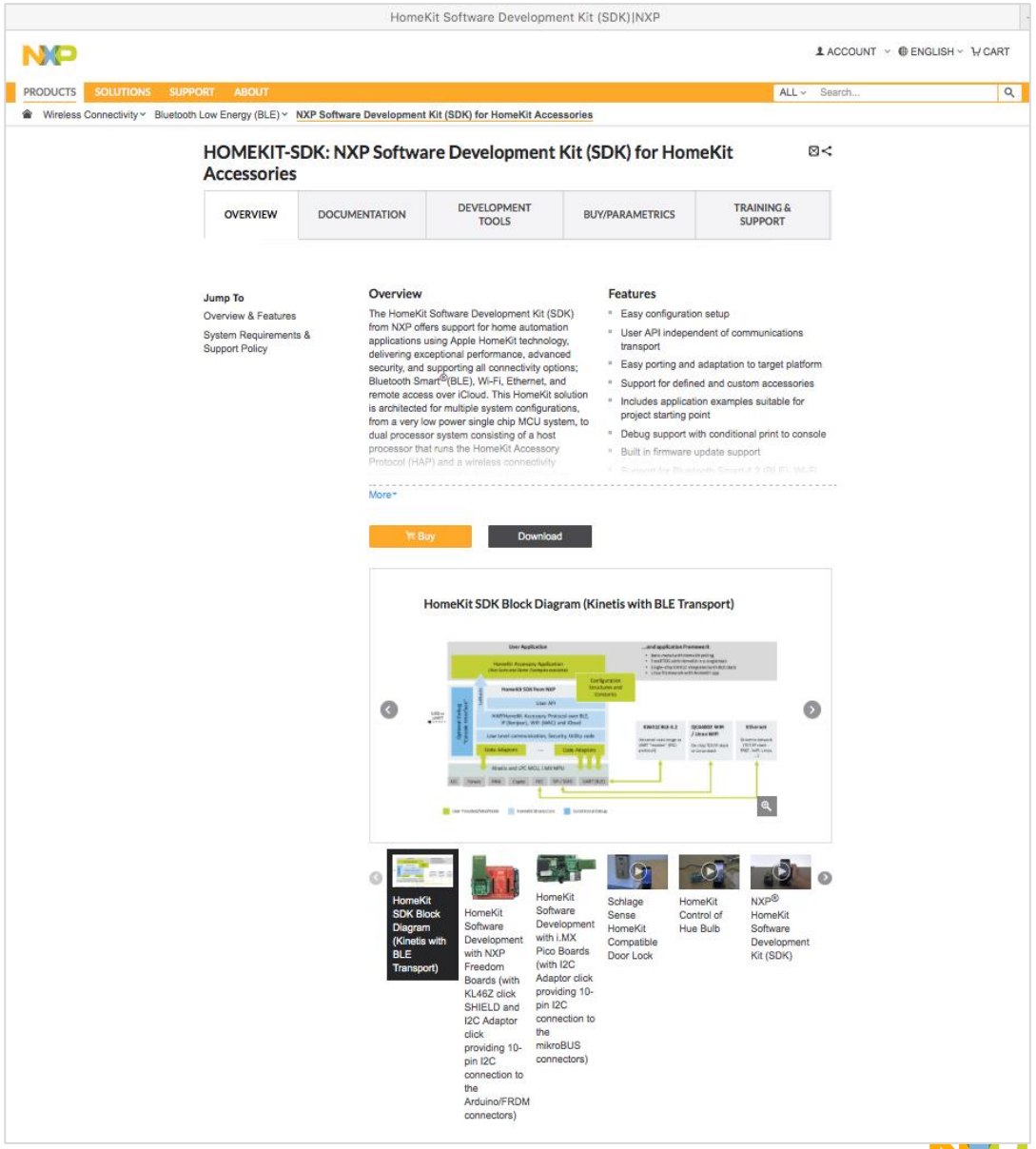
K32W061/41: High Performance, Secure and Ultra-Low-Power MCU

- Zigbee, Thread, and Bluetooth® LE 5.0 with Built-in NFC option
- OpenThread stack

HOMEKIT – NXP SUPPORT

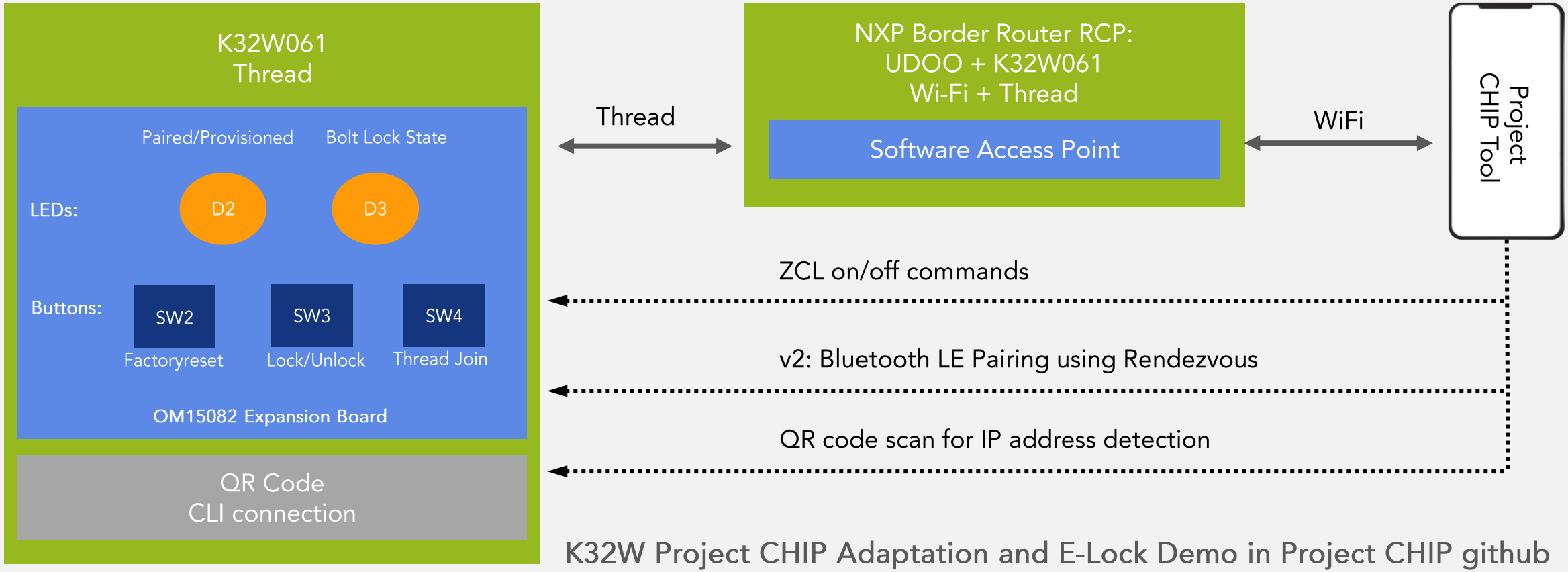


- **HomeKit SDK from NXP:**
  - Based on the ADK from Apple
  - Available for MCU and Linux MPU processors
  - Supports all IP transports
  - Bluetooth LE support available for select MCUs
  - NXP is implementing new HomeKit functionality, as added by Apple
  - Available NXP Professional Support for customizations and additional functionality
  - NXP website https://www.nxp.com/HomeKit



NXP PROJECT CHIP E-LOCK DEMO APP

- V1: Thread Joining parameters hard-coded on K32W
  V2: Bluetooth LE Pairing using Rendezvous



K32W Project CHIP Adaptation and E-Lock Demo in Project CHIP github

NXP PROJECT CHIP REFERENCE PLATFORM PLAN

- **Objectives**
  - Provide a flexible platform to develop Project CHIP devices
  - Leverage broad compute product portfolio
  - Implement using Thread and Wi-Fi
  - Support multiple architectures
  - Focus on software enablement and use existing hardware
  - Include security enablement, standalone and embedded options

SMART HOME EXAMPLE – MANY APPLICATIONS

Smart Sensors
(Temperature, liquid, door/window, smoke/CO2, air quality, etc.)

Thermostats

Ceiling Fans

Light Bulbs

Light Switches

Security Cameras

Power Outlets

Doorbell

Garage Door Control

Door Lock

Sprinkler Control

Security System

Hubs/ Bridges/Gateway

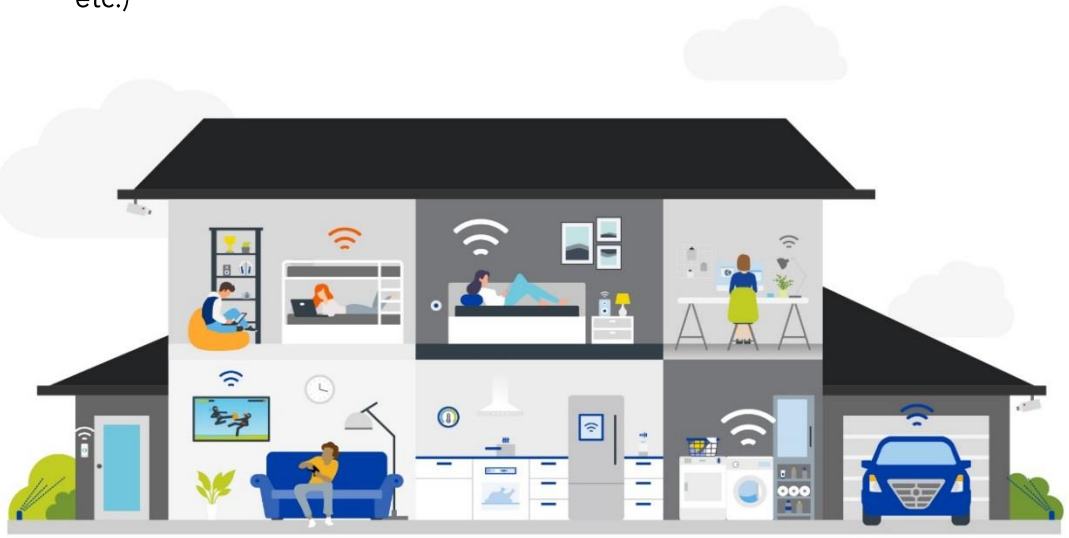
Appliances

Window Covering

Entertainment
(Smart TVs, IP Video, Smart Audio, Soundbars, AR/VR, Toy & Gaming)

Smart Speakers

Pet feeder/door

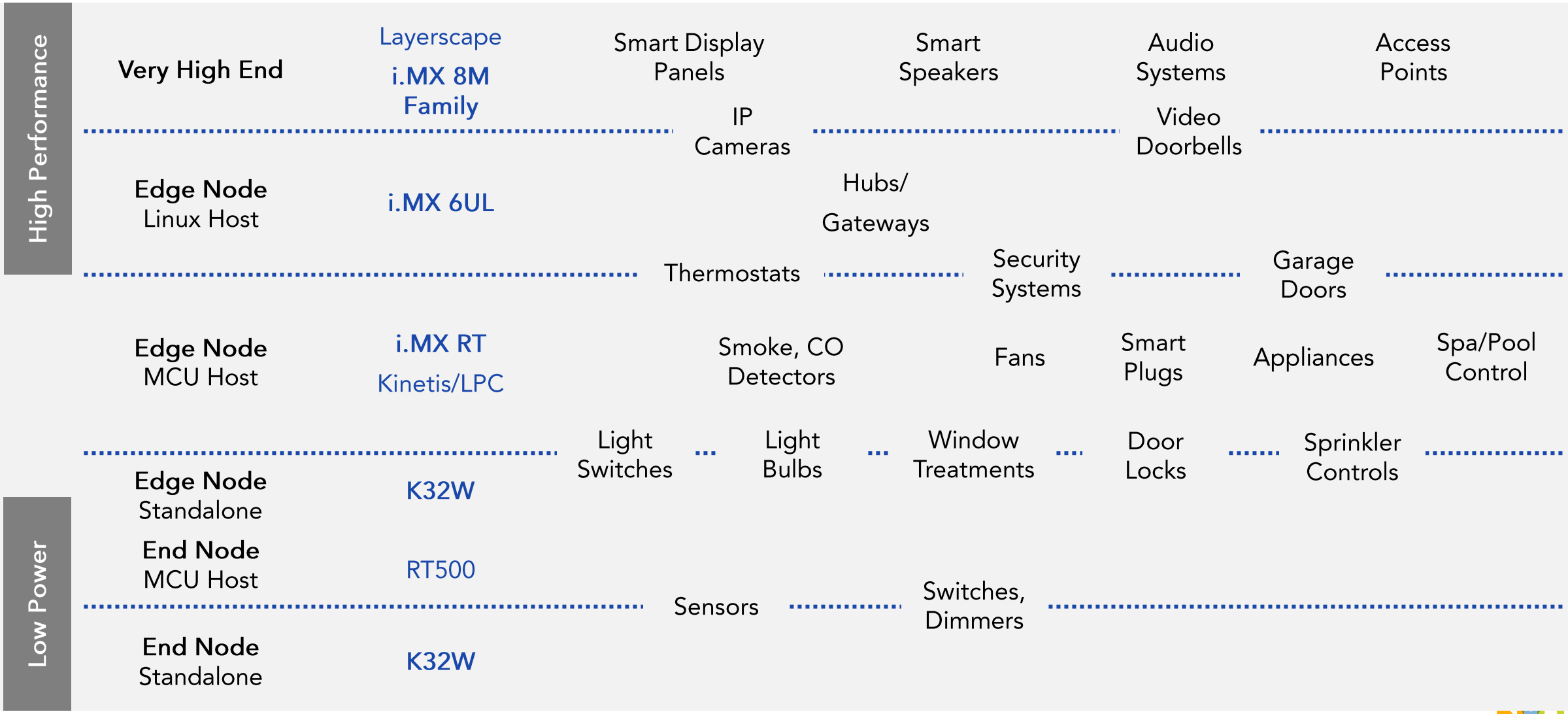


Smart Home may include:

- 3 outside doors with locks
- Video doorbell
- 2 garage doors
- 4 outdoor cameras
- 2 indoor cameras
- 5 smart speakers
- 8 appliances
- ~20 light switches
- ~30 light bulbs
- 3+ audio systems
- 3+ entertainment systems
- Security system with 20+ sensors
- 2 thermostats
- Sprinkler system
- Pet feeder/door
- 3+ hubs/bridges

>100 Devices

PROJECT CHIP REFERENCE PLATFORMS TYPICAL USE CASES



FLEXIBLE CONNECTIVITY ARCHITECTURES (I)

Wireless MCU architecture:

"Host-less", customer application runs on the Wireless device

Customer application

NXP Wireless HW

OR

Hosted architecture:

Customer application runs on a host system

Customer application

NXP MCU or MPU

Interface

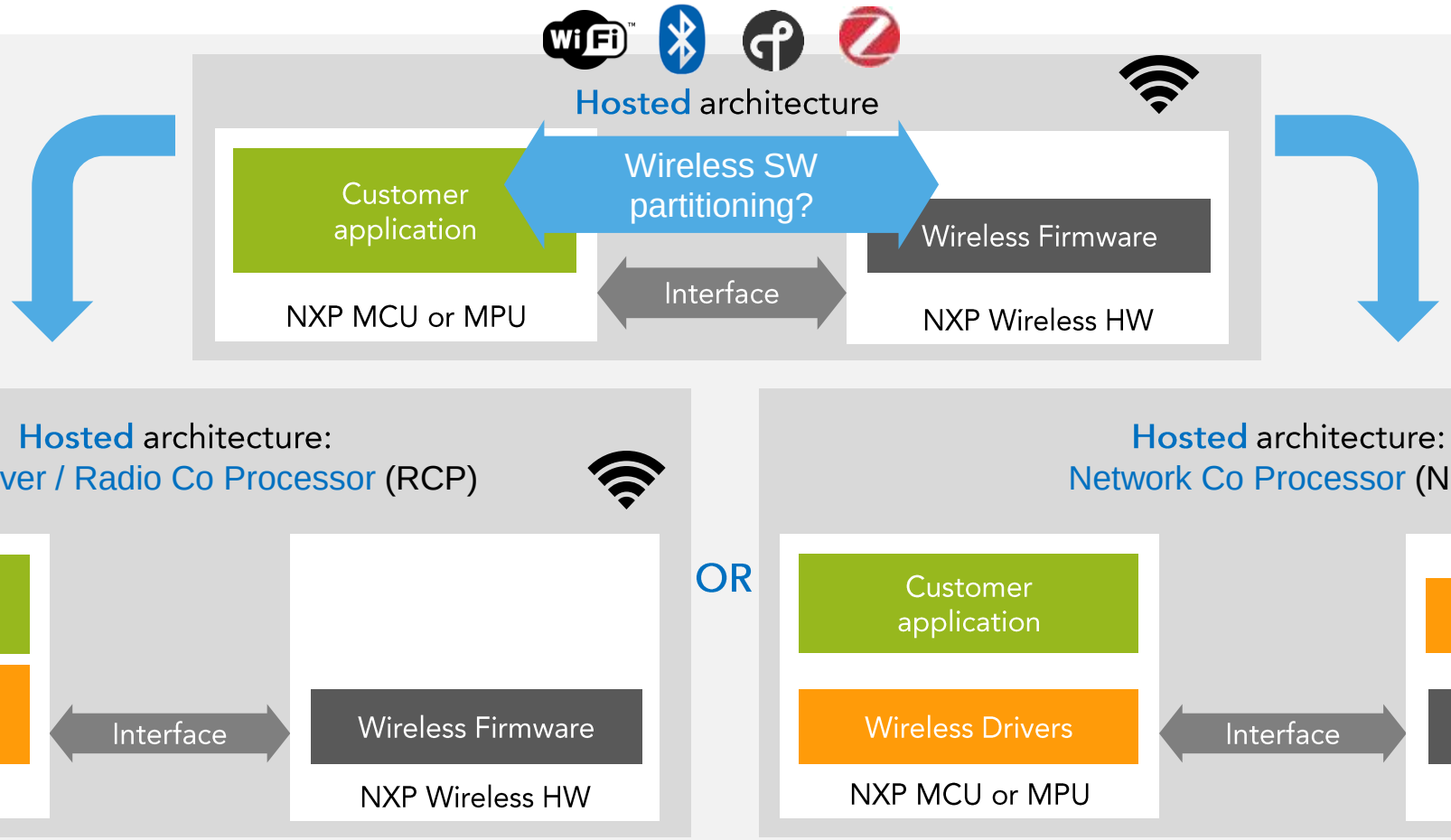
Wireless Firmware

NXP Wireless HW

Wide choice for memory size, I/O's, MCU/MPU features, multiple concurrent wireless protocols supported

Fully integrated solution (low power consumption, smaller size, lower cost, simpler HW design)

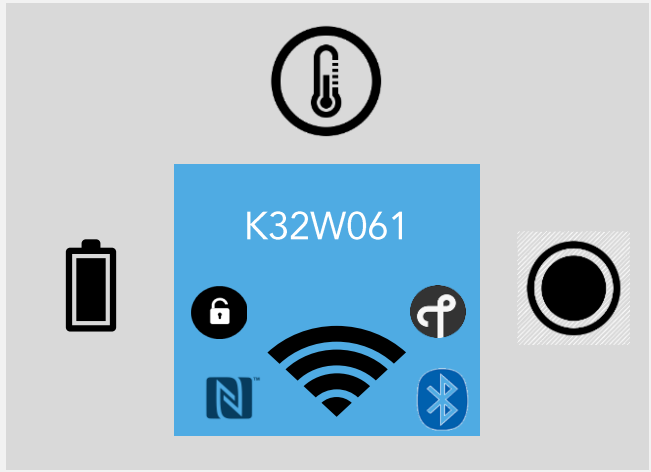
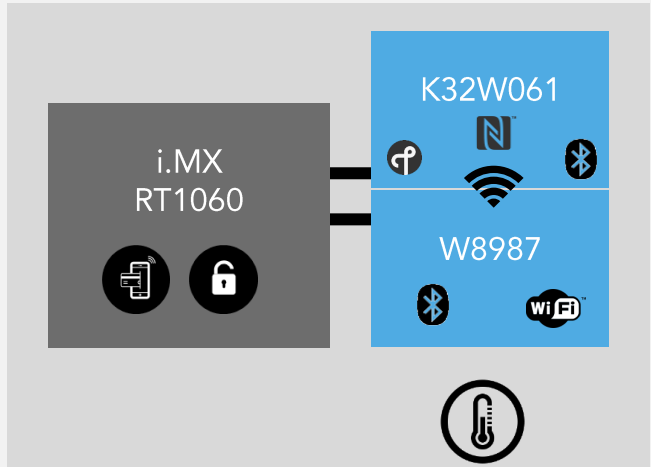
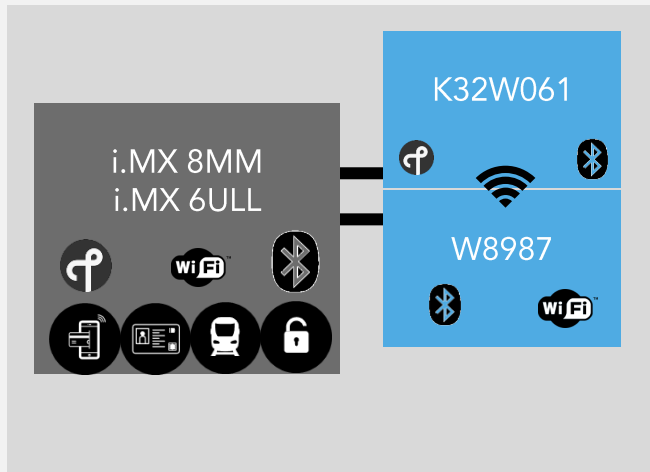
FLEXIBLE CONNECTIVITY ARCHITECTURES (II)



Lower cost / simpler host (but limited Wireless feature set over serial API)

Expanded Wireless feature set (but MCU needs enough memory to run Wireless stacks)

NXP PROJECT CHIP ENABLEMENT

Sensors / End Nodes	Edge & End Nodes	Gateways, Routers & Edge Nodes
Hostless: **Standalone**	Hosted: **MCU**	Hosted: **MPU**
		
Commissioning: NFC, Bluetooth LE, Wireless Radio + MCU Core	**Commissioning:** NFC, Bluetooth LE **Audio:** Bluetooth Classic **Architecture:** NCP or RCP	**Commissioning:** NFC, Bluetooth LE **Audio:** Bluetooth Classic **Architecture:** NCP or RCP

Proven security – embedded or discrete (SE051)

Network Co-Processor: Split Application
Radio Co-Processor: Unified Application

UWB: KEY DIFFERENTIATORS

Secure
Integrity of distance result due to PHY layer encryption

Real Time
Refresh rate of 200~1000 times/second

Co-Existent
Support bands different from Bluetooth/Wi-Fi

Reliable
Immune to narrowband fading or jamming

Accurate
Centimeter resolution in dense multipath environments

Low Energy
Ultra short air time

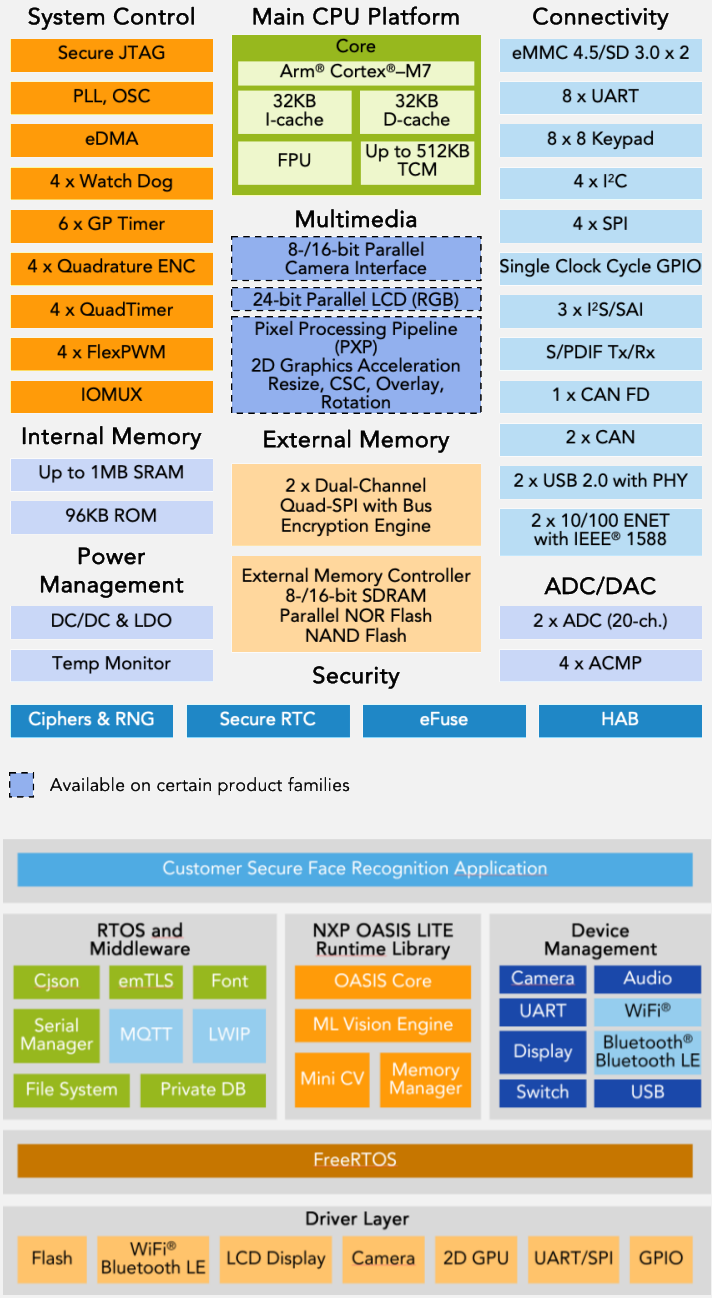
Source: FiRa Consortium

Products

SECURE CONNECTIONS
FOR A SMARTER WORLD

i.MX RT106F CROSSOVER MCUs

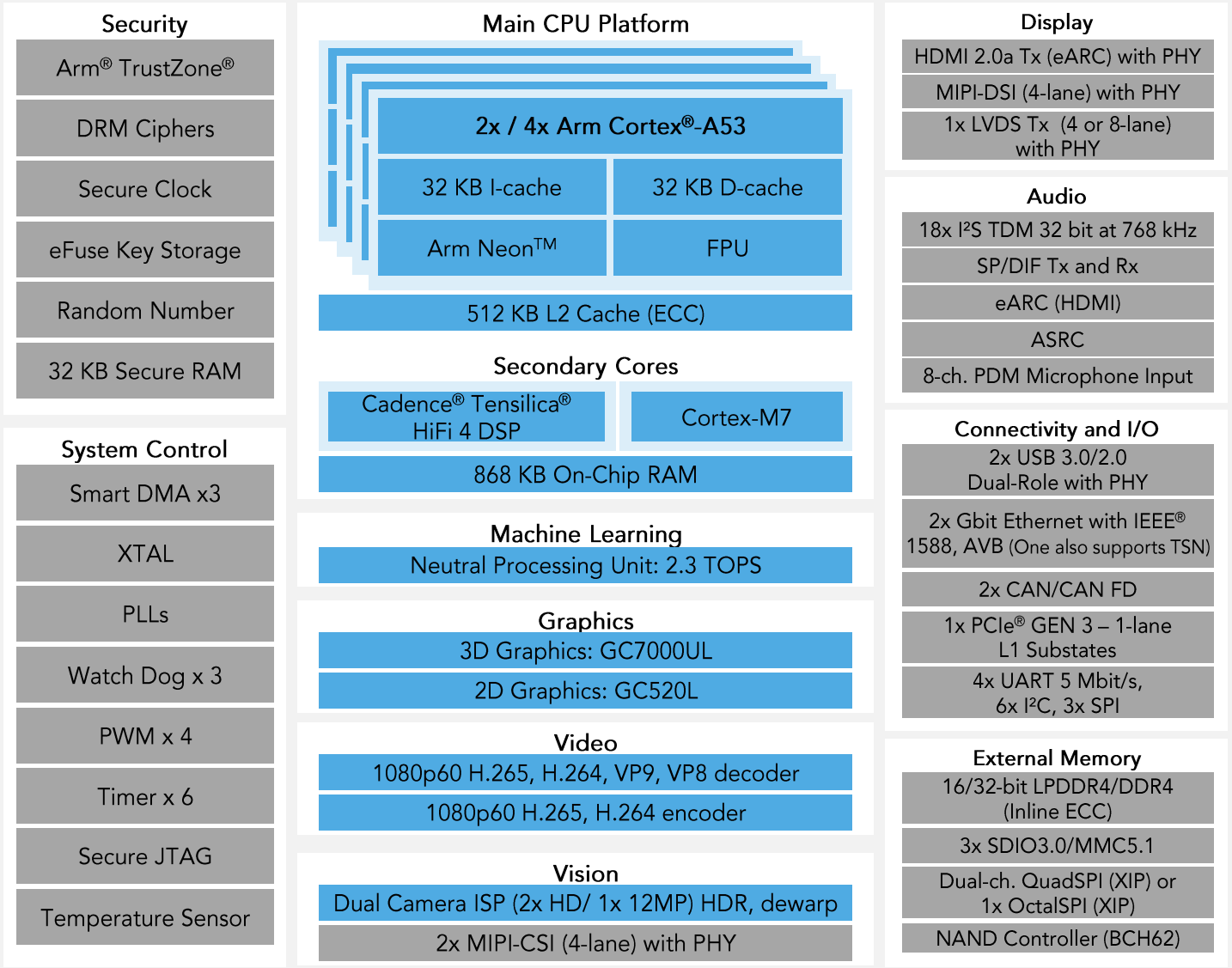
- Key Features
  - High performance 600 MHz Arm® Cortex®-M7 core
  - High performance 512 KB TCM
  - SDRAM interface for memory expansion
  - Parallel camera interface to capture image / video input
  - NXP ML Vision Engine Software Library as a full solution
- General Features
  - Up to 1 MB Internal SRAM
  - QSPI flash
  - 2D graphics LCD display
- Use Cases
  - Vision and voice-based AI/ML applications – low cost and low power
  - Face tracking, face recognition, emotion recognition, object recognition



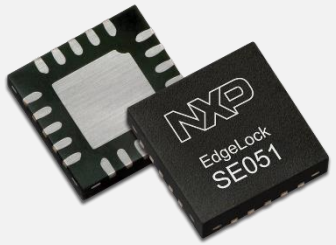
i.MX 8M PLUS APPLICATIONS PROCESSORS

- **Key Features**
  - Quad Arm® Cortex®-A53 1.8GHz high-performance core
  - 2.3 TOPS NPU ML accelerator
  - 2x MIPI-CSI with ISP (HDR, dewarping, scaling, image enhancement)
  - Multiple HD display interfaces (HDMI, MIPI-DSI, LVDS)
  - Graphics accelerator, 1080P video codec
- **General Features**
  - Cortex-M7 coprocessor
  - HiFi 4 DSP
- **Use Cases**
  - Vision and voice-based AI/ML applications – high performance
  - Multiple face, object tracking and recognition
  - Live video face, object recognition

i.MX 8M Plus Block Diagram



EDGELOCK SE PORTFOLIO – EXTENSION OF SE05x PLUG & TRUST PLATFORM



GAME CHANGER IoT SECURITY

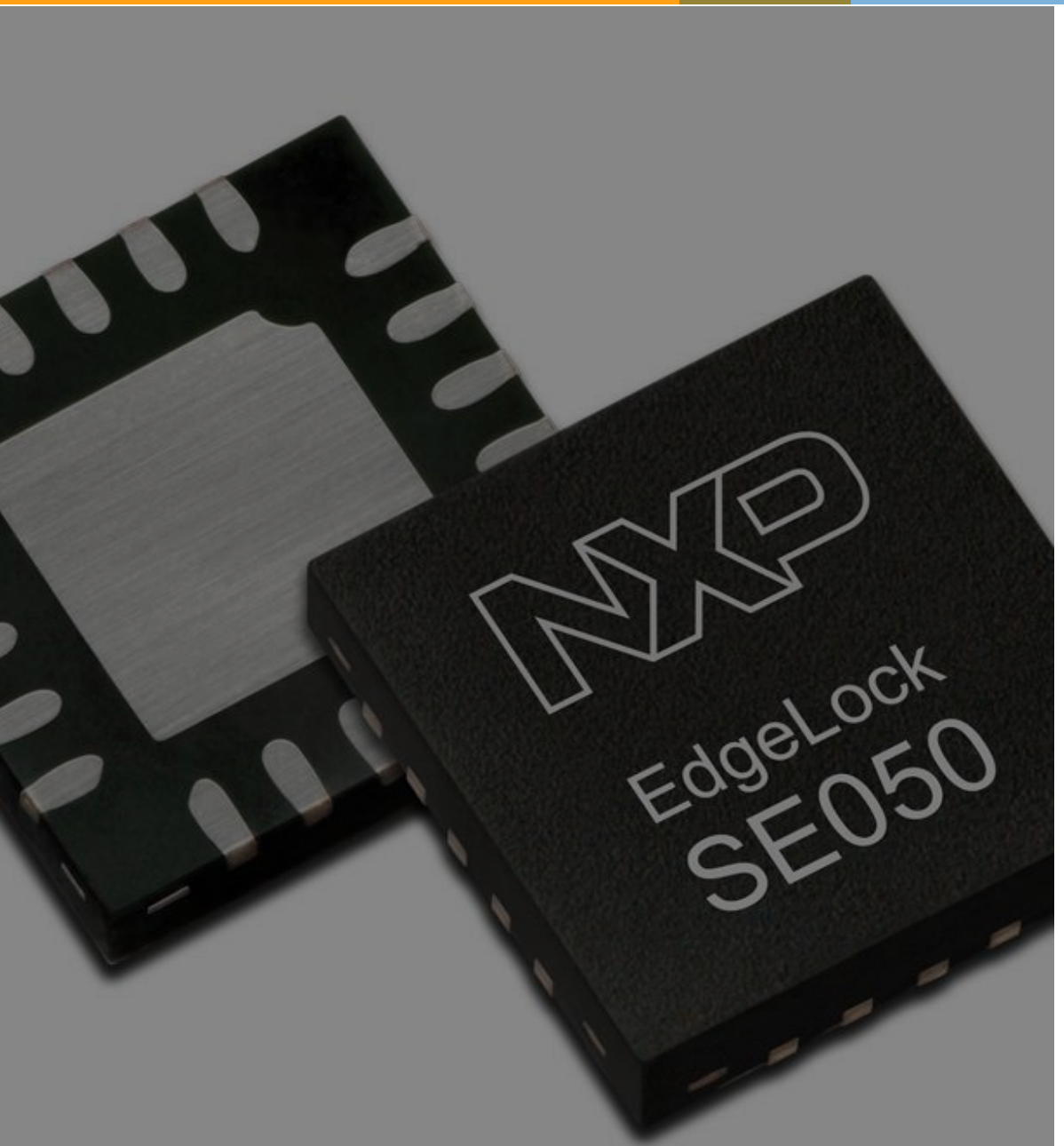
SE050 A/B/C (mass market)

- Pre-installed IoT Applet
- RSA & ECC in one chip
- Future proof curves
- Attestation
- 50kB user memory
- Multi Cloud support
- Many new SE use cases
- CC EAL6+

UPDATABILITY

SE051 A/C (non-mass market)

- Pre-installed IoT Applet
- SEMS Lite: Future proof security due to IoT applet updatability
- New features on top of existing SE050 features (e.g. GMAC, AES GCM, Curve448)
- 46kB user memory + Perso options



KEY POINTS TO HAVE IN MIND FOR CHOOSING EDGELOCK SE05X

PLUG & TRUST
Solution for fast design-in

PROVEN SECURITY
CC EAL 6+ & FIPS

UPDATABILITY
For security maintenance

HIGH FLEXIBILITY
Unique feature set

KEY RESOURCES ON EDGELOCK SE05X

Web Presence

EdgeLock SE050 Product Page

including documentation, app notes, middleware, video tutorials, etc.

www.nxp.com/SE050

EdgeLock SE051 Product Page

including documentation, app notes, middleware, etc.

www.nxp.com/SE051

Public Webinars

EdgeLock SE050 product introduction & new use cases (30 min)

https://nxp.surl.ms/SE050intro

Getting started with EdgeLock SE050 support package (30 min)

https://nxp.surl.ms/SE050psp

Getting started with EdgeLock SE050 for Industrial (30 min)

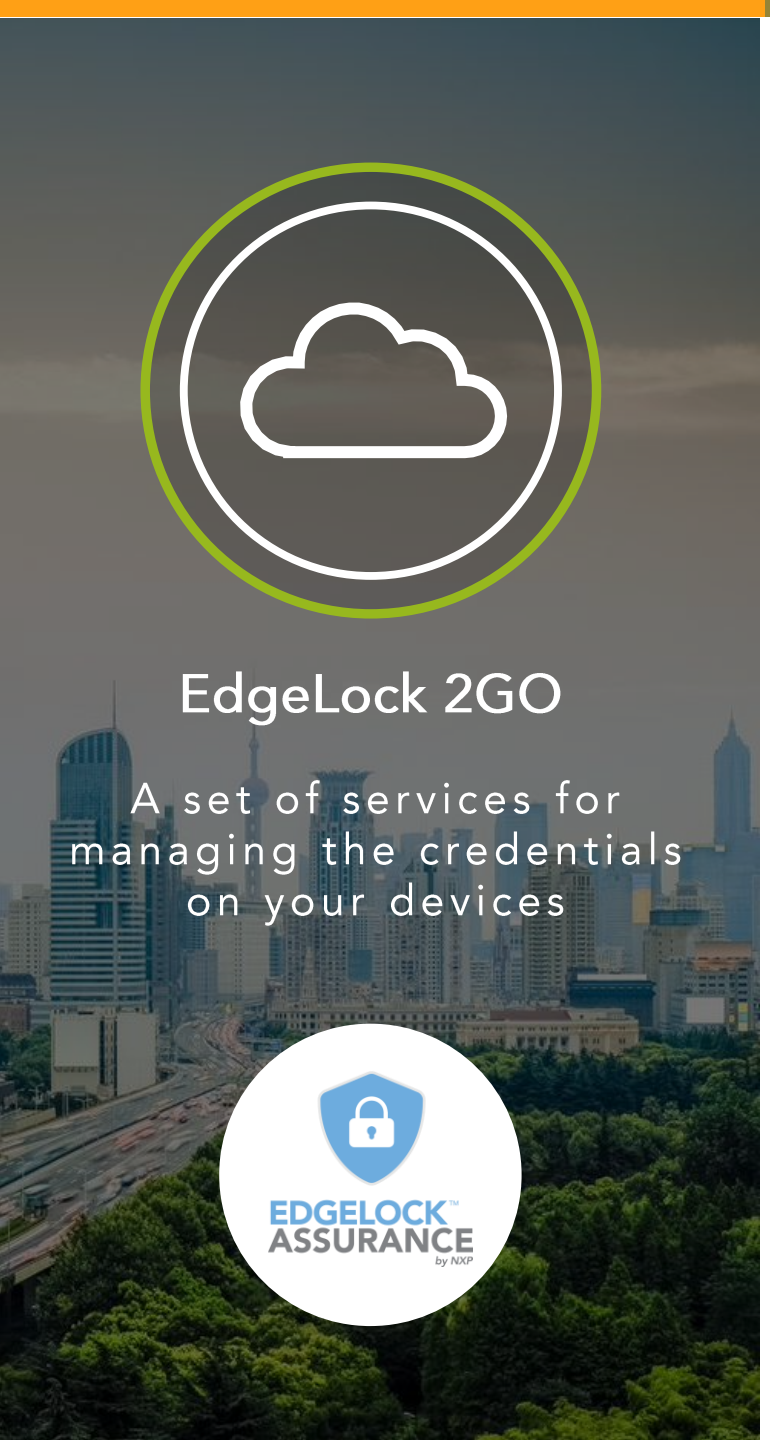
https://nxp.surl.ms/SE050industrial

Use Cases

Information on use cases

including one-pagers, app notes, demo videos, supporting documentation, etc.

https://nxp.surl.ms/SE050usecase



EdgeLock 2GO

A set of services for managing the credentials on your devices

EDGELOCK™ ASSURANCE by NXP

3 OPTIONS AVAILABLE

EDGELOCK 2GO READY

EdgeLock SE050 pre-provisioned with default keys and certificates

EDGELOCK 2GO CUSTOM

Custom provisioning of EdgeLock SE050 by NXP or its distributors and partners

EDGELOCK 2GO MANAGED

NXP cloud service for managing device identities over-the-air

For more information, visit www.nxp.com/EdgeLock2GO

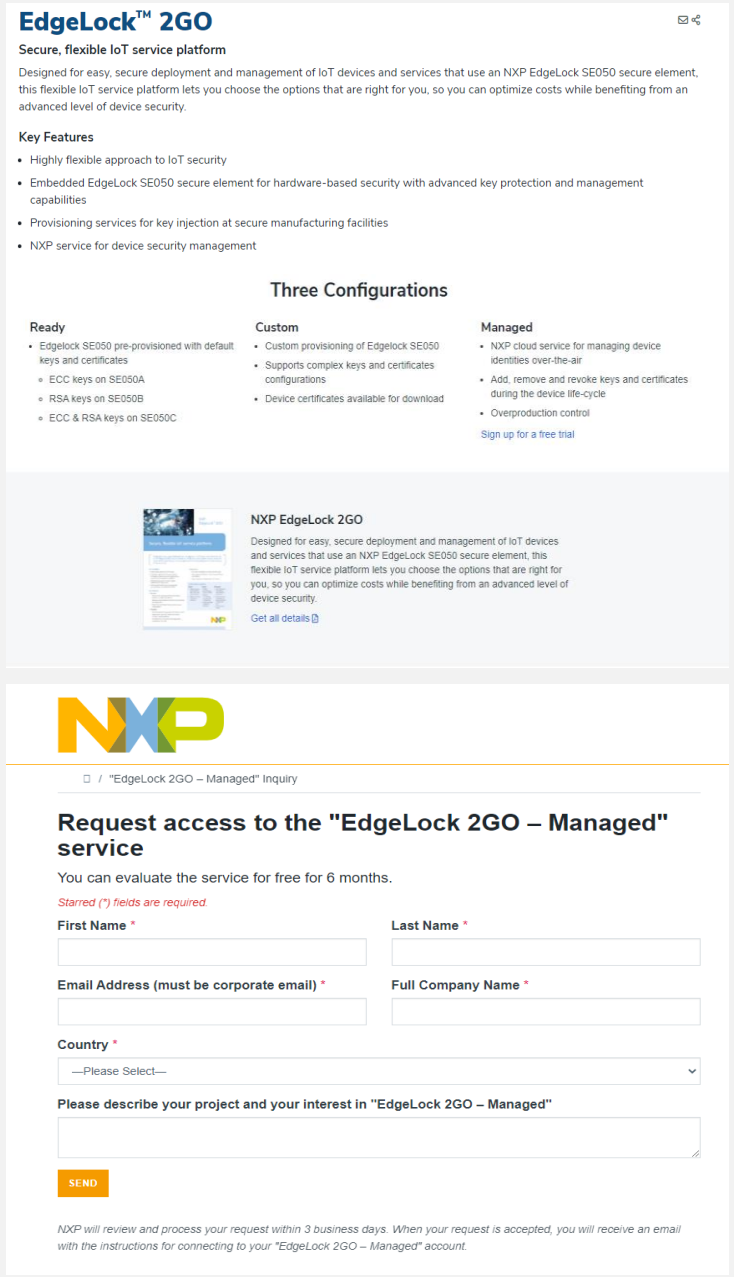
EDGELOCK 2GO – MANAGED

Onboard and manage the lifecycle of your devices

- **SECURE**
- End-to-end security from chip to cloud
- Leveraging NXP security infrastructure
- Leveraging EdgeLock SE050

- **ZERO-TOUCH**
- Easy to configure
- Automatically onboard your devices in your cloud account
- No key or certificate handled by OEM

- **FLEXIBLE**
- Supports multiple types of credentials
- Apply different configurations depending on your customers or projects
- Renew or add new credentials on devices in the field



EdgeLock™ 2GO

Secure, flexible IoT service platform

Designed for easy, secure deployment and management of IoT devices and services that use an NXP EdgeLock SE050 secure element, this flexible IoT service platform lets you choose the options that are right for you, so you can optimize costs while benefiting from an advanced level of device security.

Key Features

- Highly flexible approach to IoT security
- Embedded EdgeLock SE050 secure element for hardware-based security with advanced key protection and management capabilities
- Provisioning services for key injection at secure manufacturing facilities
- NXP service for device security management

Three Configurations

Ready
- Edgelock SE050 pre-provisioned with default keys and certificates
  - ECC keys on SE050A
  - RSA keys on SE050B
  - ECC & RSA keys on SE050C

Custom
- Custom provisioning of Edgelock SE050
- Supports complex keys and certificates configurations
- Device certificates available for download

Managed
- NXP cloud service for managing device identities over-the-air
- Add, remove and revoke keys and certificates during the device life-cycle
- Overproduction control

Sign up for a free trial

NXP EdgeLock 2GO

Designed for easy, secure deployment and management of IoT devices and services that use an NXP EdgeLock SE050 secure element, this flexible IoT service platform lets you choose the options that are right for you, so you can optimize costs while benefiting from an advanced level of device security.

Get all details

/ "EdgeLock 2GO – Managed" Inquiry

Request access to the "EdgeLock 2GO – Managed" service

You can evaluate the service for free for 6 months.

Starred (*) fields are required.

First Name * | **Last Name** *

Email Address (must be corporate email) * | **Full Company Name** *

Country *

—Please Select—

Please describe your project and your interest in "EdgeLock 2GO – Managed"

SEND

NXP will review and process your request within 3 business days. When your request is accepted, you will receive an email with the instructions for connecting to your "EdgeLock 2GO – Managed" account.

- **For more information, visit**
- **www.nxp.com/EdgeLock2GO**

- **Request a free evaluation account at https://contact.nxp.com/EdgeLock2GO-signup**

IW416:
2.4/5 GHZ DUAL-BAND 1X1 WI-FI® 4 (802.11N) + BLUETOOTH® 5.1 SOLUTION

– WLAN Key Features

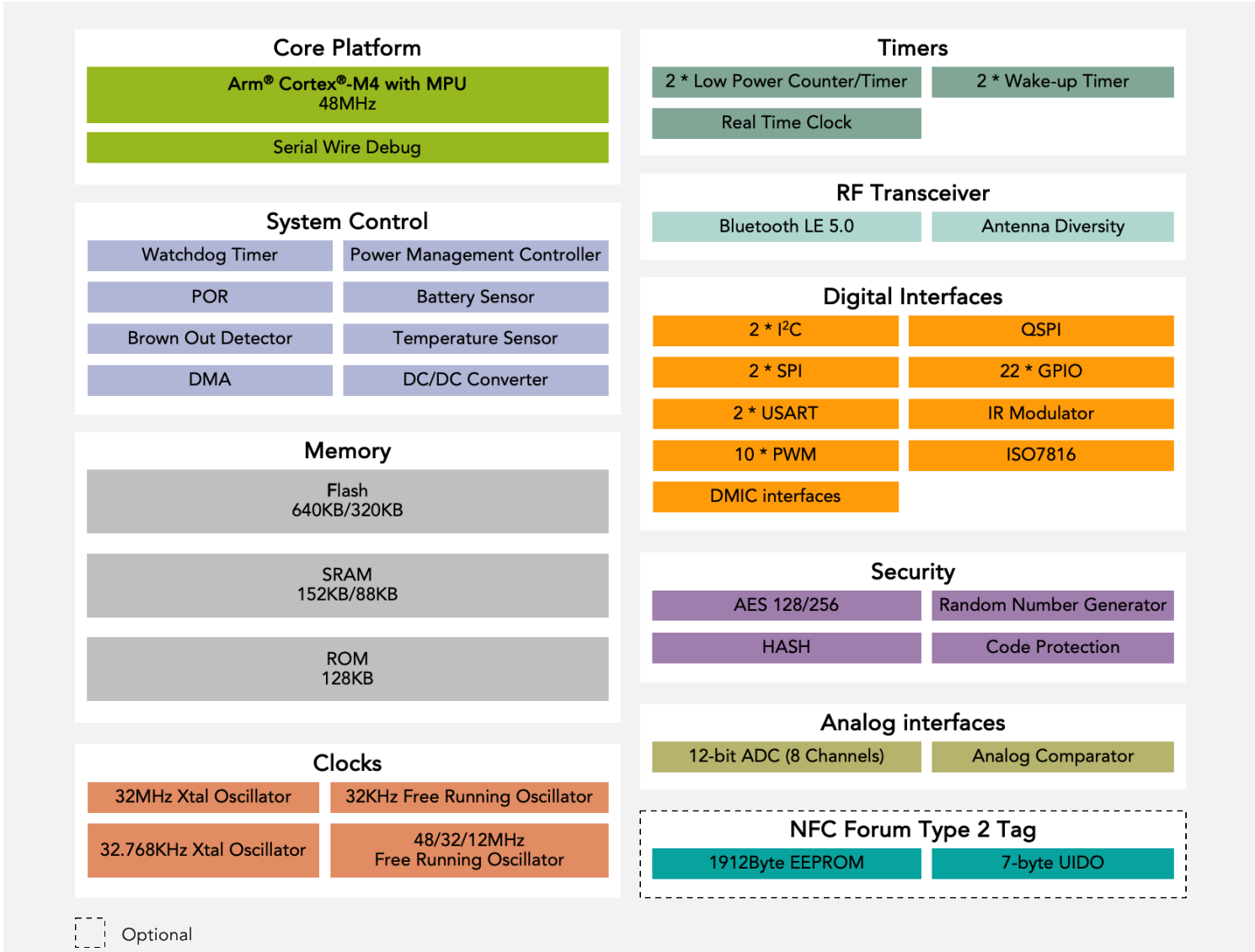
- 1x1, Dual band Wi-Fi 4, Bluetooth 5.1
- Host interface supported SDIO & USB
- Single stream 802.11n with 20MHz and 40MHz channels
- Support 802.11mc for location
- Dynamic Rapid Channel Switching (DRCS) for simultaneous and power efficient operation in 2.4GHz and 5GHz bands
- Interface to coexist with 802.15.4, LTE, or other radios
- Security: WPA3 and WPA

– Bluetooth Key Features

- Full Bluetooth 5.1 features
- Long range – 4x coverage
- 2Mbit/s data rate – 2x faster
- Connection/connectionless AoA & AoD
- Improved advertisement capacity – enables more IoT services
- Audio interface: I^2S and PCM
- Security: AES
- Host interface supported SDIO, USB, and UART

QN9090/30(T): BLUETOOTH LOW ENERGY MCU WITH ARM® CORTEX®-M4 CPU, ENERGY EFFICIENCY, ANALOG AND DIGITAL PERIPHERALS AND NFC TAG OPTION

- **CPU and Memory**
  - Up to 48MHz Cortex-M4
  - Up to 640kB flash, up to 152kB RAM, 128kB ROM
  - NFC NTAG option with EEPROM
  - Quad-SPI for execute in place or data storage in NVM
- **RF performance/power consumption**
  - -97 dBm RX sensitivity
  - up to 11dBm TX power
  - RX 4.3mA, DC/DC on at 3V
  - TX 7.4mA, 0dBm
  - BLE 5.0 with 2Mbps and up to 8 simultaneous connections
- **Digital and Analog Interfaces**
  - UART/SPI/I2C up to 2
  - ISO7816 interface for secure access module
  - 8 ch 12-bit ADC
  - 1 Analog comparator
  - Digital microphone interface and audio event detection
- **Clocks and timers**
  - 32MHz and 32.768kHz crystals
  - Low and high frequency internal clock sources
  - 4 x general purpose timer



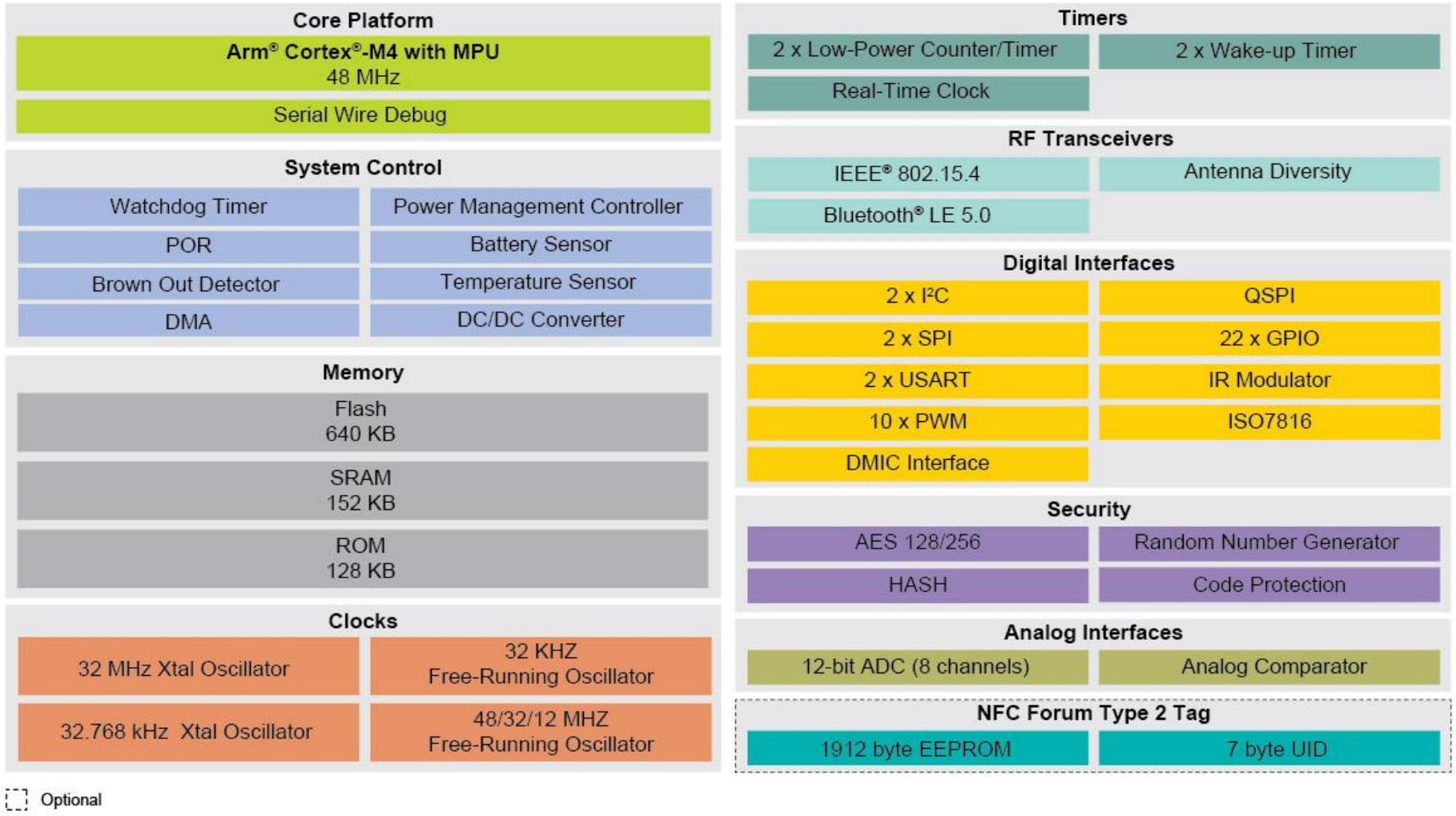
K32W061/41 MCUs
FEATURES AND BENEFITS

Connectivity Coexistence	ARM M4 core easily able to handle network stacks and application Fast Antenna Diversity for improved radio communications Switched and Dynamic multi-protocol
Interoperability	Zigbee, Thread and Bluetooth LE certified stacks for proven interoperability Mature networking stack provides robust performance Shipped millions of Zigbee chipsets
Energy Efficient	Industry leading low-power solution for connected applications provides extended battery life with a coin cell battery 4.3mA Rx, 7.4mA @ +0dBm Tx, 20.5mA Tx @ +10dBm
Ease of Use	Complete solution with large amount of onboard Flash (640KB) & SRAM (152KB) suitable for most Over-The-Air (OTA) scenarios Optional NFC NTAG support for Tap-N-Pair commissioning
Microcontroller Intelligence	Rich set of MCU capabilities including numerous low power modes, digital MIC interface with wake up on audio events, Crypto Hash and AES with HW protected key and Quad SPI NOR flash memory controller

K32W061/41 MCUs
TARGET APPLICATIONS

- Home automation
- Home security & access
- Home gateways
- Smart thermostats
- Smart locks
- Smart lighting
- Sensor networks

K32W061/41 MCUs
BLOCK DIAGRAM



K32W061/41 MCUs
KEY FEATURES

CPU and Memory

- Up to 48MHz Cortex-M4
- 640 kB flash, 152 kB RAM, 128 kB ROM
- Additional 1MB data Flash (K32W041AM)
- NFC NTAG Option with EEPROM (K32W061)
- Quad-SPI for code or data storage in NVM

RF Performance/Power Consumption

- -100 dBm RX sensitivity
- Up to 11dBm TX power
- Up to 15dBm TX power (K32W041A, K32W041AM - TBA)
- RX 4.3mA, DC/DC on at 3V
- TX 7.4mA @ 0dBm, 20.3mA @ 10dBm
- Zigbee 3.0, Thread 1.1, IEEE-802.15.4 compliant
- Bluetooth LE 5.0 with 2Mbps, up to 8 simultaneous connections
- Power down Mode current < 1uA

Security

- AES256 with hardware protected key
- Hash engine (SHA256)
- Code readout protection

Digital and Analog Interfaces

- UART/SPI/I2C up to 2
- ISO7816 Interface for Secure Access Module
- 8 ch 12-bit ADC,
- 1 Analog comparator
- Digital Microphone Interface and Audio Event Detection

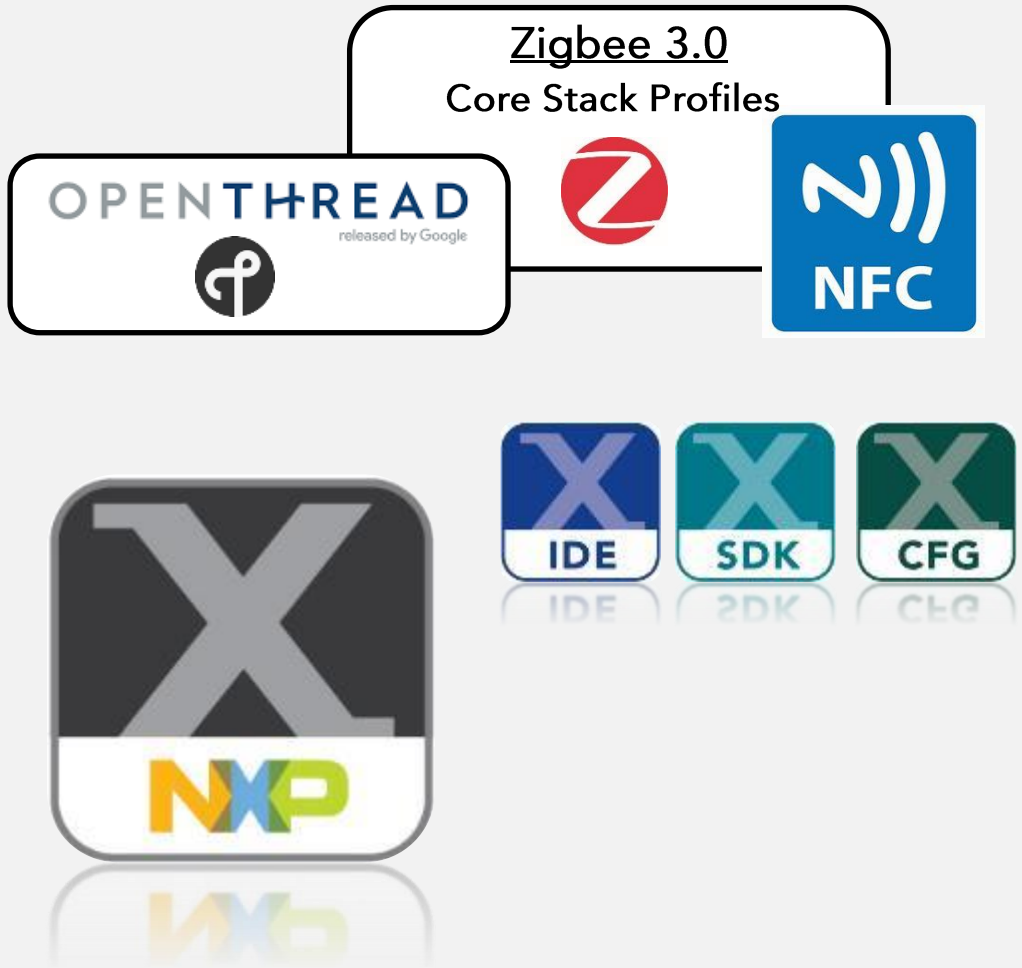
Clocks and timers

- 32 MHz and 32.768 kHz crystals
- Low and High Frequency Internal Clock sources
- 4 x general purpose timer
- 32K sleep timer
- Watchdog timer
- RTC with calibration

Operating Conditions

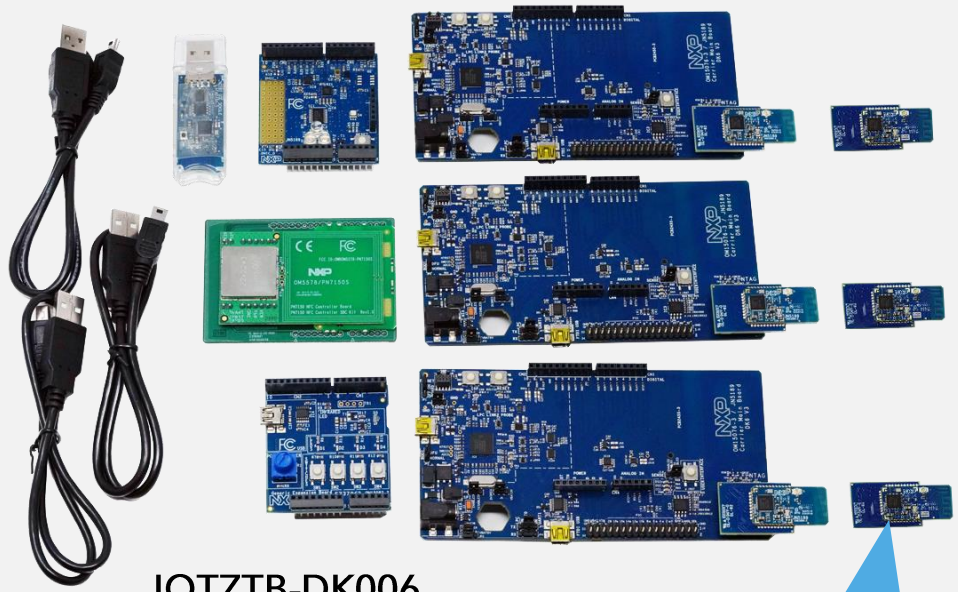
- Operating voltage: 1.9 to 3.6V
- Junction Temperature range: -40 to 125 °C

K32W061/41 MCUs
SOFTWARE ENABLEMENT



- Integrated programmer and debugger with rich suite of application examples
- MCUXpresso SDK releases with drivers, NTAG/Zigbee/Thread/802.15.4
- Shared toolkit across NXP microcontrollers for fast path to add IEEE 802.15.4 to existing code
- Supports MCUXpresso IDE
- OpenThread and common NXP Zigbee 3.0 stack included in SDK
- Supports FreeRTOS development

K32W061/41 MCUs
HARDWARE ENABLEMENT



IOTZTB-DK006

USB Dongle

K32W Upgrade Board

Note: K32W041A and K32W041AM
upgrade boards to be launched in late Q1

- **IoT Development Kit (PN: IOTZTB-DK006)**
  - 3 Motherboards
  - Generic Switch Node, Light/Sensor Node, NFC Reader/Writer boards
  - 3 JN5189 & 3 K32W Upgrade Boards
  - On-board CMSIS offering Serial Wire Debug (SWD) and UART interfaces
  - On-board 3.3V from USB port, batteries, or external power supply options
  - Arduino compatible interface to easy system prototyping
  - Price: **$599**
- **USB Dongle (PN:OM15080-K32W)**
  - Can be loaded with Sniffer or Zigbee Control Bridge app
  - Integrated PCB meander antenna
  - USB Type A Connector
  - Price: **$29**
- **K32W Upgrade Board (K32W-001-T10)**
  - Module on mezzanine board
  - Price: **$29**

K32W061/41 WIRELESS MCUs SUMMARY

Low Power Communications
4.3mA Rx current and 7.3mA Tx current @+0dBm, ideal for battery operated applications

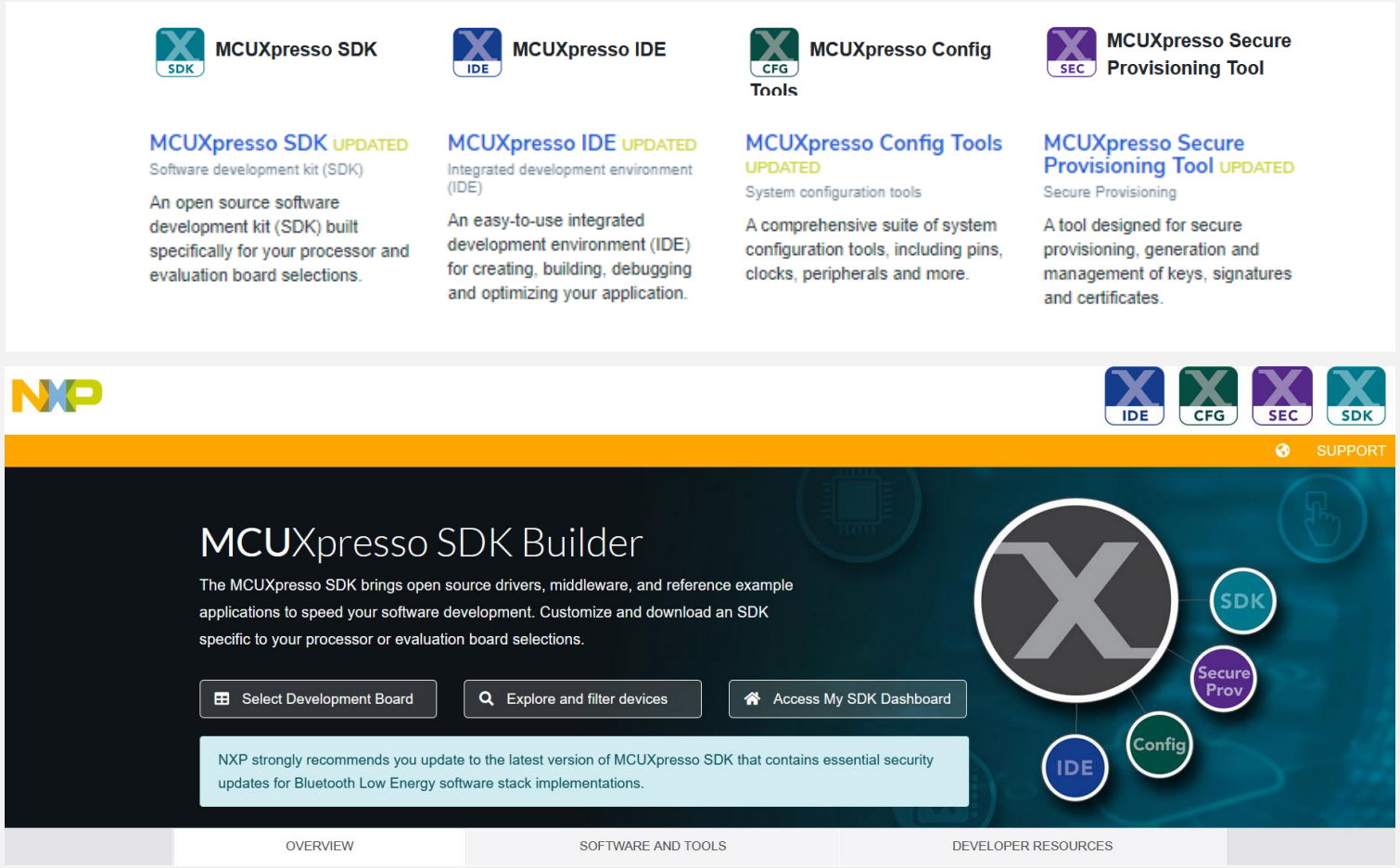
High Capability CPU with large and scalable Embedded Flash and SRAM
48 MHz ARM Cortex-M4
640KB of embedded Flash, 152KB of SRAM

Multi-protocol radio and Advanced Integration including NFC NTAG
Reduces system board footprint and cost of manufacturing with digital and analog integration

Complete Enablement
Comprehensive software tools though MCUXpresso Suite including SDK and IDE

Security
Hardware AES engine, Secret Encrypted Key Management, Hardware Hash Accelerator

RTOS BASED: MCUXPRESSO TOOLS



https://mcuxpresso.nxp.com/en/welcome

MCUXPRESSO BLUETOOTH/Wi-Fi SUPPORT

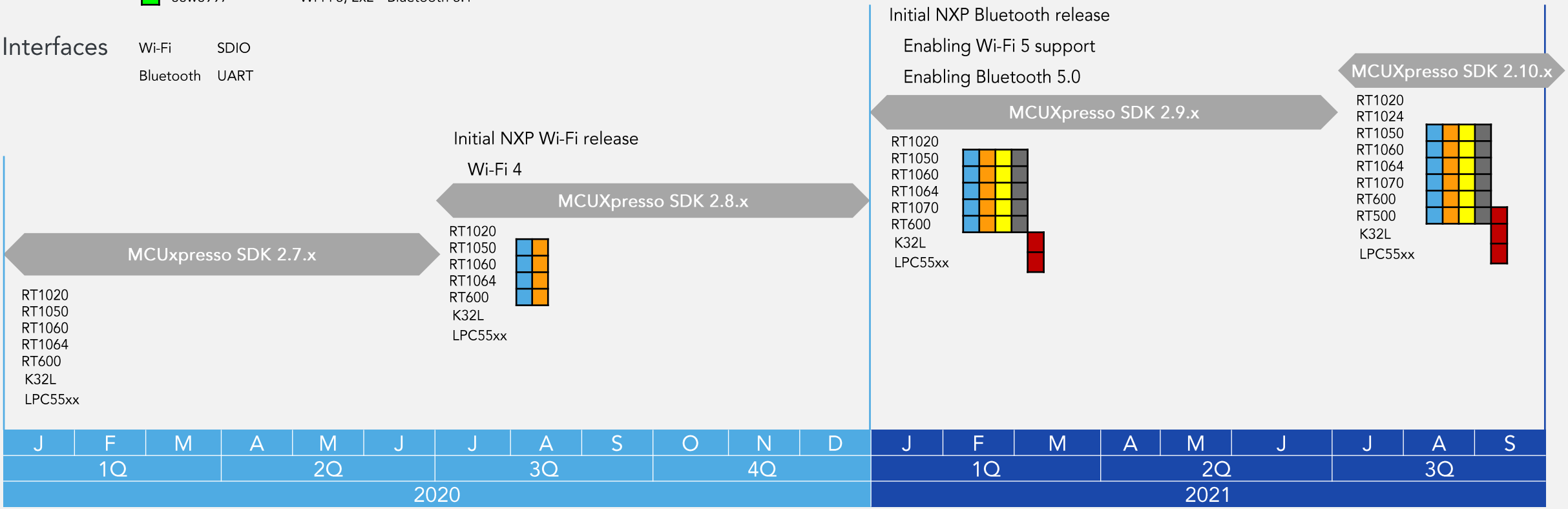
Supported Chipsets

88w8801	Wi-Fi 4, 1x1		IW620 (88w9097)	Wi-Fi 6, 2x2	Bluetooth 5.1
88w8977	Wi-Fi 4, 1x1	Bluetooth 5.0	88w9098	Wi-Fi 6, 2x2	Bluetooth 5.1
IW416 (88w8978)	Wi-Fi 4, 1x1	Bluetooth 5.1	MW320	Wi-Fi 4, 1x1	On-board TCP/IP stack
88w8987	Wi-Fi 5, 1x1	Bluetooth 5.1			
88w8997	Wi-Fi 5, 2x2	Bluetooth 5.1			

Interfaces

Wi-Fi SDIO

Bluetooth UART



TRIMENSION SR150 | SECURE UWB SOLUTION FOR IOT DEVICES

- Designed with the specific needs of IoT devices in mind, this solution adds Angle-of-Arrival (AoA) technology for an added level of precision. The pre-developed FiRa MAC by NXP ensure interoperability with the growing set of UWB devices to market.

- Trimension SR150 is ideally suited for the UWB enablement of all kinds of larger infrastructures, such as access control installations, indoor localization set ups, and payment schemes, as well as consumer products, including TVs and gaming consoles. Several SR150 IC devices can be placed in a room as UWB anchors to help localize people and objects as they move within the room.

  - Dual-RX for AoA functionality
  - 3D AoA possible
  - Connected to EdgeLock SE for Secure Ranging Use Cases
  - RTOS and Linux SW Solution for IoT integration
  - In accordance with FiRa™ certification development
  - IEEE 802.15.4 forward and backward compatible
  - Arm® Cortex®-based

SECURE CONNECTIONS
FOR A SMARTER WORLD