NXP WIRELESS MCUs

Symmetron

Q4 2020

SECURE CONNECTIONS FOR A SMARTER WORLD

Agenda

NXP Corporate Overview

Wireless MCU Target Markets

Wireless MCU Portfolio Overview

IoT Portfolio

Products

Low Power

Security

Enablement

Product Block Diagrams

BRINGING THE EDGE TO LIFE

MAJOR TECHNOLOGY VECTORS FOR ANY SMART DEVICE

SENSE	THINK	CONNECT	ACT
			
EVERYTHING Aware	EVERYTHING Smart	EVERYTHING Connected	EVERYTHING Efficient

EVERYTHING SAFE & SECURE

A UNIQUE VALUE PROPOSITION IN THE IOT INDUSTRY

WORLD-CLASS CONNECTIVITY PORTFOLIO

Wi Fi

Bluetooth

UWB

NFC

zigbee

THREAD

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

Wireless MCUs

SECURE CONNECTIONS
FOR A SMARTER WORLD

WIRELESS MCU PORTFOLIO

HS: 2Mbit/s PHY
LR: Long Range
Loc: Localization
Audio
#x: simultaneous connections

IOT

Auto and Industrial

Wi-Fi

1x1 **MW320/322**

200 MHz M4F, QSPI flash, 512 kB SRAM, 68QFN/88QFN

802.15.4/Multiprotocol

4.2, 2x **KW41/31/21**

48 MHz M0+, 512 kB Flash, 128 kB SRAM
48LQFN, 75WLCSP

JN5168/69

32-bit RISC, up to 512 kB Flash &160 kB SRAM, 40QFN

5.0 w/ HS , 8x **K32W061/41**

48 MHz M4, 640 kB Flash, 152 kB SRAM, 40QFN

K32W041AM

K32W041 + 1MB Stacked Flash, +15dBM

K32W041A

K32W041 with +15dBM

JN5189/88

48 MHz M4, 640 kB Flash, 152 kB SRAM, 40QFN

Bluetooth LE

5.0 HS, 16x **QN9083/80/80SIP**

32 MHz M4F, 512 kB Flash, 128 kB SRAM
48QFN, WLCSP

5.0 w/ HS, 8x **QN9090/30**

48 MHz M4, 640/320 kB Flash, 152/88 kB SRAM, 40QFN

5.2 w/ HS, Audio, 8x **NXH3675 (Audio)**

48 MHz M0+, 96MHz dual DSP, 640 kB Flash, 160 kB SRAM, WLCSP

5.0, 8x **KW36/35/34**

48 MHz M0+, 512 kB Flash w/ ECC, 64 kB SRAM, EEPROM, AES-128, CAN FD (KW36), LIN
4048 QFN, AEC-Q100 Grade 2, Industrial

48HVQFN Pin/Package Compatible

5.0 LR, HS, 8x **KW39/38/37**

48 MHz M0+, 512 kB Flash w/ ECC, 64 kB SRAM, EEPROM
AES-128, CAN FD (KW38), LIN
48HVQFN, AEC-Q100 Grade 2, Industrial

Legacy | 2019 | 2020 | 2021

WIRELESS MCU ROADMAP - NDA CONFIDENTIAL

Concept | Execution | Production
Samples → Launch

HS: 2Mbit/s PHY
LR: Long Range
Loc: Localization
#x: simultaneous connections

IOT

Auto and Industrial

Wi-Fi/Multi-protocol

1x1 **MW320/322**

200 MHz M4F, QSPI flash, 512 kB SRAM, 68QFN/88QFN

1x1 **RW610**

280 MHz CM33, 1.2 MB SRAM, QSPI flash, PSRAM, 176BGA
EdgeLock Secure Enclave (500B)

802.15.4/Multi-protocol

K32W061/41

5.0 w/ HS, 8x

48 MHz M4, 640 kB Flash, 152 kB SRAM, +10dBM
40QFN, W061 has NFC Tag

K32W041AM

K32W041A+ 1MB stacked Flash

K32W041A

K32W041 with +15dBM

5.2 w/ LR+HS+Loc, 16x

KW45 IoT

JN5189/88 (T)

48 MHz M4, 640 kB Flash, 152 kB SRAM, +10dBM
40QFN, (T) is NFC Tag option

Next Generation Wireless Platform

Bluetooth LE

5.0 w/ HS, 16x

QN9083/80/80SIP

32 MHz M4F, 512 kB Flash, 128 kB SRAM
48QFN, WLCSP

5.0 w/ HS, 8x

QN9090/30 (T)

48 MHz M4, 640/320 kB Flash, 152/88 kB SRAM
40QFN, (T) is NFC Tag option

5.2 w/ HS, Audio, 8x

NXH3675

48 MHz M0+, 96MHz dual DSP, 640
kB Flash, 160 kB SRAM, WLCSP

5.0, 8x

KW36/35/34 ⟷ **KW39/38/37**

5.0 w/ LR+HS, 8x

48 MHz M0+, 512 kB Flash w/ ECC, 64 kB SRAM,EEPROM, AES-128, CAN FD (KW36), LIN
40 HVQFN Wettable/48LQFN/48HVQFN Wettable
AEC-Q100 Grade 2, Industrial

5.2 w/ LR+HS+Loc, 16x

KW45

96 MHz M33 w/ TZ-M, Up to 1 MB Flash w/ ECC, 128 kB SRAM
EdgeLock Secure Enclave, CAN FD, LIN
40HVQFN, 48HVQFN Wettable
AEC-Q100 Grade 2

In Production | 2020 | 2021 | 2022 | 2023

LATEST AUTOMOTIVE & INDUSTRIAL WIRELESS MCUS

Automotive and industrial qualified wireless MCUs

- AEC Q100-Grade 2 qualified (“A” version only)
- Industrial qualified (“Z” version only)
- Operating Range (Ambient): -40ºC to +105ºC

Simplified integration of Bluetooth connectivity

- Bluetooth 5 and Generic FSK, 8 simultaneous connections
- Wi-Fi co-existence
- Direct access to radio registers to implement localization applications
- 3rd generation radio from NXP providing performance enhancements to Kinetis KW31Z

Includes Flex CAN FD and LIN

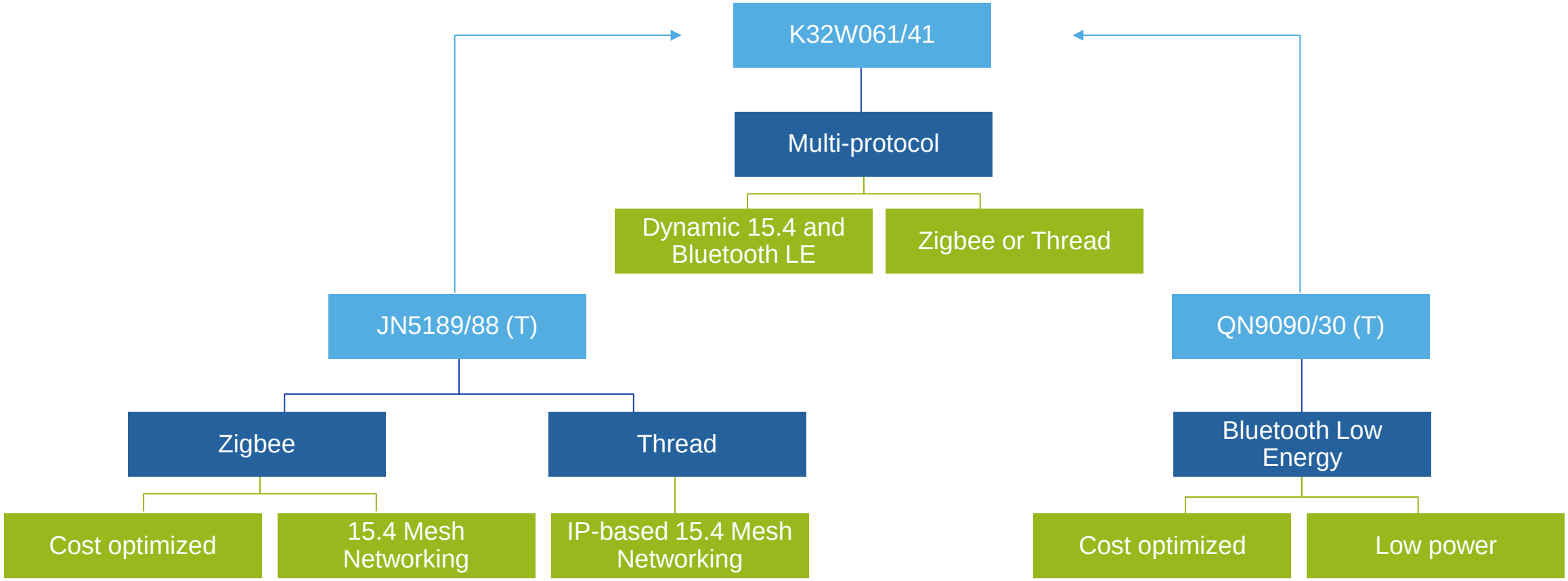
- CAN FD and two low power UARTs with LIN support
- Easy integration into automotive in-vehicle and industrial communication networks
- CAN FD for increased bandwidth and lower latency required by many automotive applications

KW36/35/34	KW39/38/37

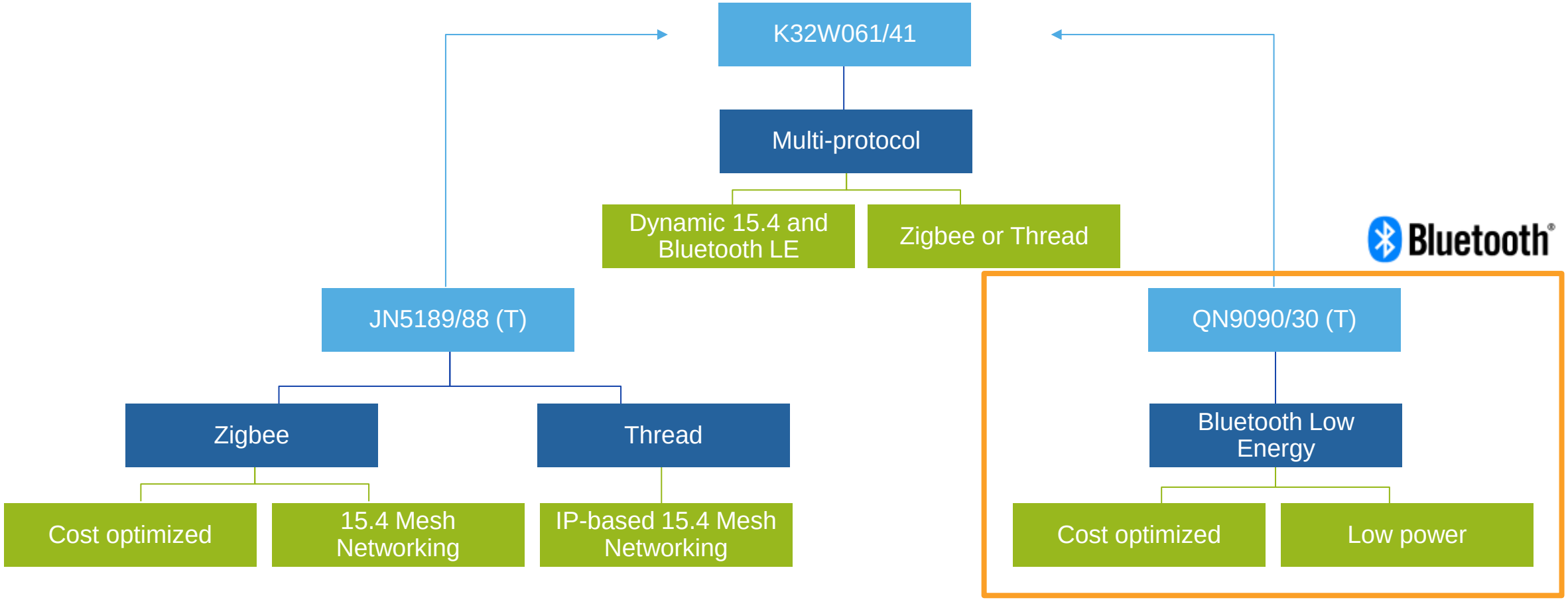
IoT Portfolio

SECURE CONNECTIONS
FOR A SMARTER WORLD

LATEST SMART HOME & BUILDINGS CONNECTIVITY PRODUCTS – 2.4GHZ NARROW BAND



LATEST CONNECTIVITY PRODUCTS – 2.4GHZ NARROW BAND



QN9090 MCUS
TARGET APPLICATIONS

- Smart home nodes
- Building and home automation
- Retail and advertising beacons
- Health devices
- Toys and Gaming
- Sports and fitness trackers
- HID devices such as controllers and remote control units

QN9090 MCUS FEATURES AND BENEFITS

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

Standardized Connectivity

2.4GHz radio supporting Bluetooth Low Energy 5.0, BT Low Energy 2Mbps PHY and up to 8 concurrent Bluetooth connections with antenna diversity support

Ultra-low Power

Industry leading low-power solution for Connected applications.
4.3mA Rx, 7.4mA @ +0dBm Tx, 20.5mA Tx @ +10dBm

Value

Optional NFC NTAG for standardized out-of-band communications along with integrated RF balun, power amplifier (up to +11dBm) and smart package for reducing cost of manufacturing

Portfolio

NXP offers pin-to-pin compatible solutions for 802.15.4 and Multiprotocol RF devices along with industry leading solutions across the spectrum of embedded processing

QN9090 MCUS HARDWARE ENABLEMENT

QN9090DK (PN: QN9090-DK006)

- QN9090T (with NFC NTAG)
- On-board CMSIS offering Serial Wire Debug (SWD) and UART interfaces for QN9090 debug and communication
- Mini USB port for power and communications
- Arduino compatible interface to easy system prototyping
- MSRP Price: **$115**

USB Dongle (PN:OM15080-QN9090)

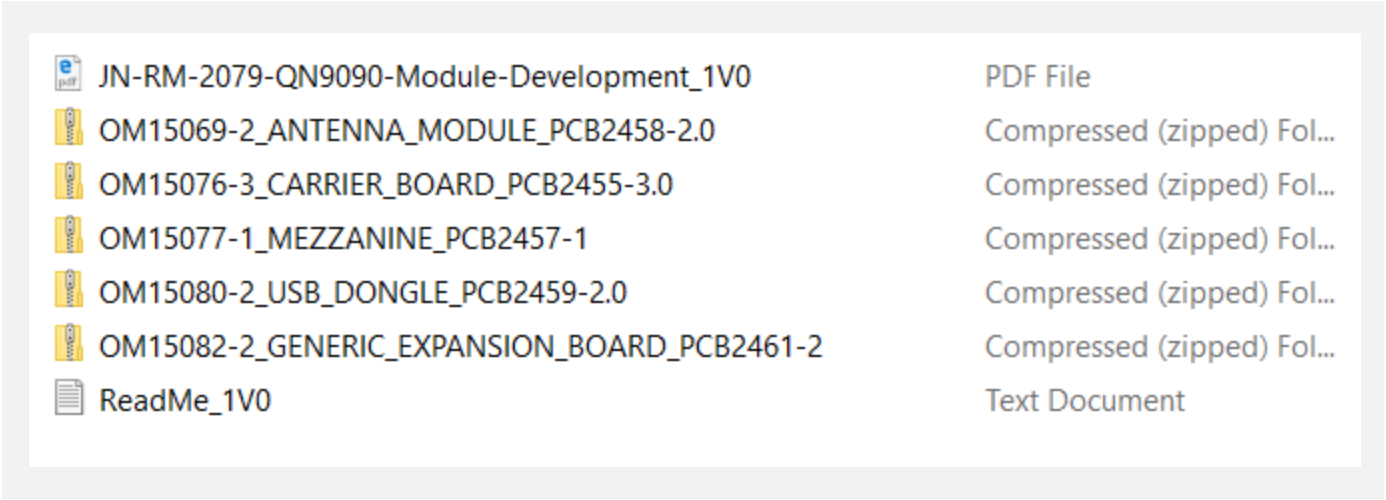
- Ideal for Bluetooth Low Energy test case development and/or connection to PC/Tablet
- Integrated PCB meander antenna
- RF regulatory certified
- USB Type A Connector
  - MSRP Price: **$29**

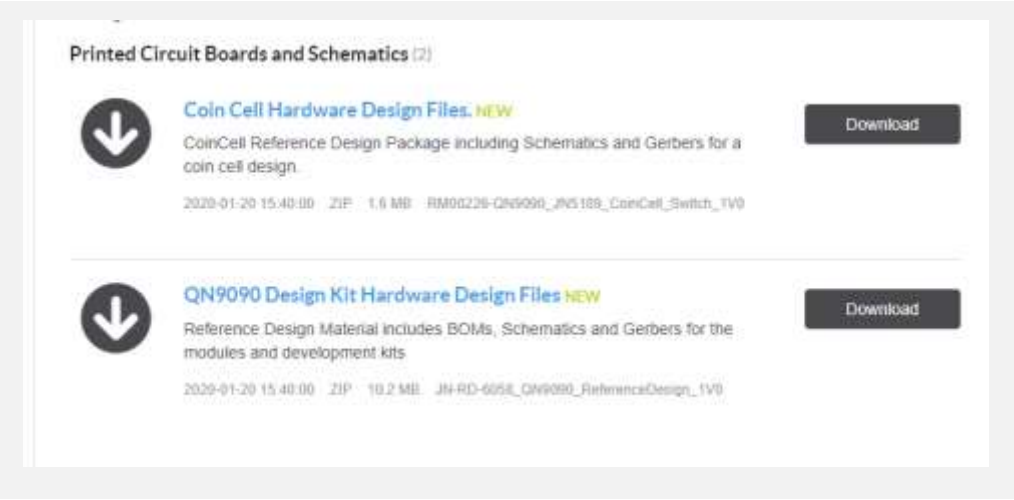
QN9090-001-T10

- Module on mezzanine board
- MSRP Price: **$29**

REFERENCE DESIGNS FOR MODULES/ COIN CELL

- Hardware design files to reduce effort and risk
- Two packages, one for all Design kit boards
- Coin Cell design for NFC + Bluetooth LE
- Click here to learn more



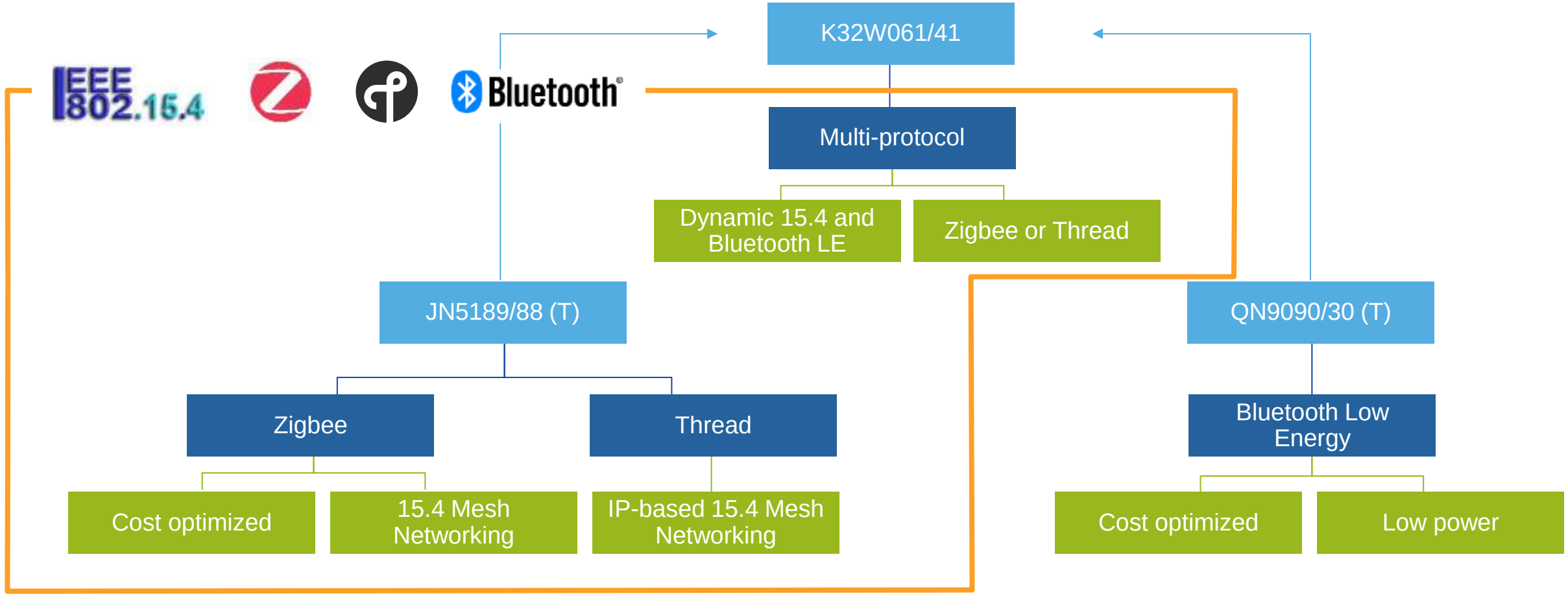


SUMMARY OF BLUETOOTH LOW ENERGY FEATURES QN9090/30(T) AND K32W061/041

Standardized Connectivity

VERSION OF STANDARD	FEATURES	DESCRIPTION	CATEGORY
BT 4.2	Errata	Core spec Errata of 4.1	Mandatory
	LE Secure Connections	ECDH key generation, add Numeric Comparison pairing	Optional
	Link Layer Privacy	Link layer resolve RPA	Optional
	LE Data Packet Length Extension	Payload increase to 255 bytes	Optional
BT 5.0	Errata	Core spec Errata of 4.2	Mandatory
	CSA 5 features	TX power up to 20dBm	Optional
	2Mbps PHY for LE	Higher data rate	Optional
	LE Long Range	Longer range, data rate support 125/500kbps	Optional
	LE advertising extensions	Enable longer advertising packet, more advertising channels, and more advertising type	Optional
	High Duty Cycle Non-connectable Advertising	Reduced the minimum advertising interval for non-connectable advertising, enable high duty cycle beacon	Optional
	LE Channel Selection Algorithm #2	Enable channel selection in sub-event	Optional

LATEST CONNECTIVITY PRODUCTS – 2.4GHZ NARROW BAND



JN5189/88 & K32W061/41 MCUS
TARGET APPLICATIONS

- Home automation
- Home security & access
- Smart lighting
- Smart metering
- Sensor networks

JN5189/88 & K32W061/41 DIFFERENTIATION

ROBUST CONNECTIVITY

ARM M4 core easily handle network stacks and application
Fast Antenna Diversity
Experience in Zigbee for over 2 decades

INTEROPERABILITY

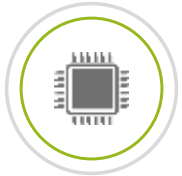
Zigbee 3.0, OpenThread & Bluetooth LE 5.0 certified stacks
Mature networking stack
Shipped millions of Zigbee chipsets

ENERGY EFFICIENT

Industry leading low-power solution for connected applications
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 OTA scenarios
Optional NFC NTAG support for seamless device commissioning



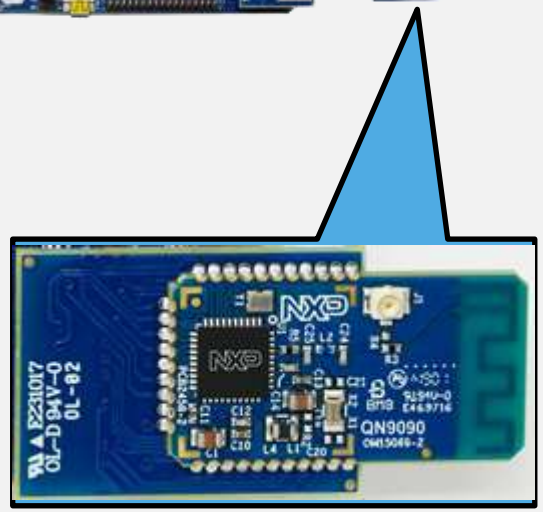
MICROCONTROLLER INTELLIGENCE

Rich set of MCU capabilities including numerous low power modes, digital MIC interface with wake-up audio events, Crypto Hash and AES with H/W protected key and Quad SPI NOR flash memory controller

K32W061/41 & JN5189/88 MCUS HARDWARE ENABLEMENT

IOTZTB-DK006

USB Dongle



K32W Upgrade Board

- **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**

NXP'S MULTI-PROTOCOL MCU PORTFOLIO

QN9090/30

K32W061/041

JN5189

Pin Compatible

Low-Power - Battery Operated Products

Applications that benefit from NTAG

Low-Cost with enough flash for OTA Updates

Free-RTOS Support for all stacks out of the box

Bluetooth LE 5

Programmable Multi-Protocol

Switched Multi-protocol

Dynamic Multi-protocol

MULTI-PROTOCOL CONFIGURATIONS

Programmable

- A device that is compatible with more than one protocol. Device is programmed at manufacturing.

Switched

- Only one stack connection maintained
- The application switches between protocols using a bootloader (dual-image)
- The application contains more than one stack and shares the radio hardware (single-image)

Dynamic

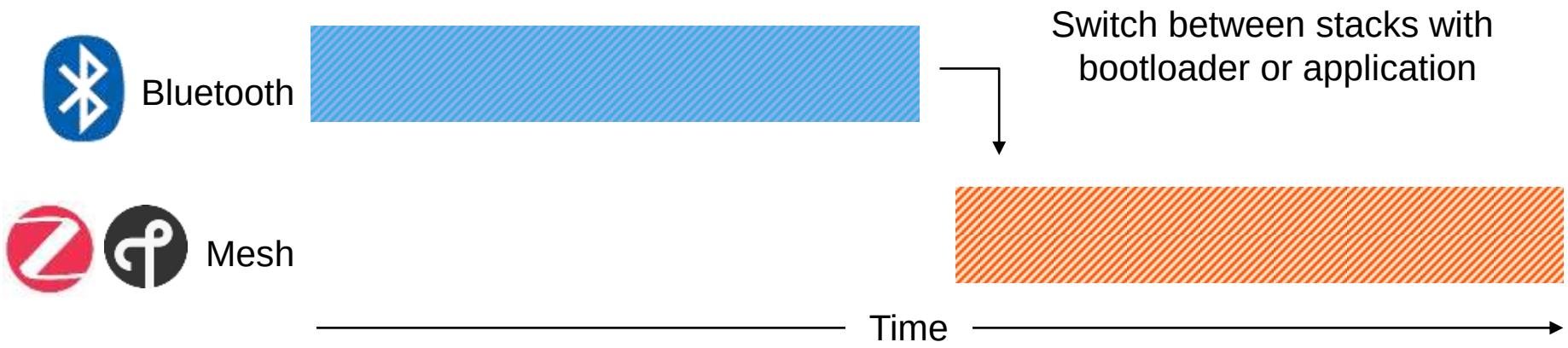
- Two stack connections maintained
- The application time-slices between two protocols (can transmit and receive simultaneously for 15.4 and BLE)

Concurrent

- Not supported in current 15.4/BLE products (Planned with future NXP devices; supported in WiFi/BT devices today)
- Similar to Dynamic Multi-Protocol but uses two independent radios

	MULTI-PROTOCOL	ZIGBEE	THREAD	BLUETOOTH LE
K32W061/41	✓(P,S,D)	✓	✓	✓
JN5189/88	✓(P)	✓	✓	
QN9090/30	-	-	-	✓

SWITCHED MULTIPROTOCOL

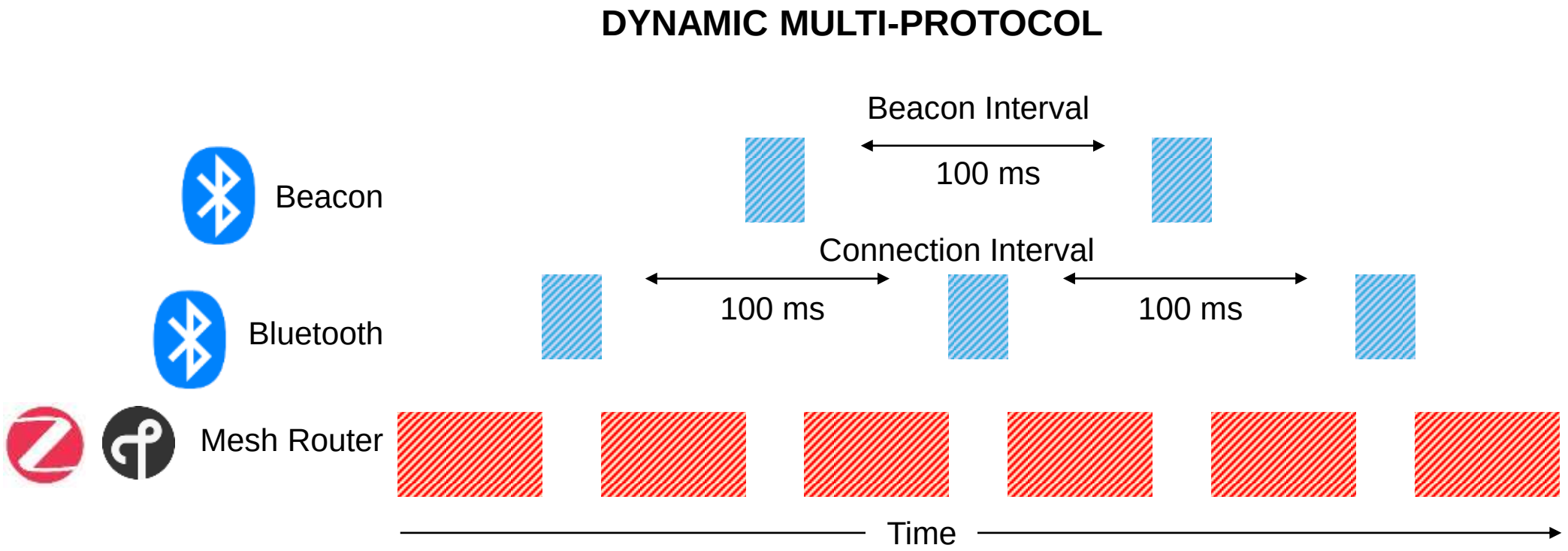


Switched

- Only one stack connection maintained
- The application switches between protocols using a bootloader (dual-image)
- The application contains more than one stack and shares the radio hardware (single-image)

Example: Commission an end device (i.e. Scene Controller) to a Thread network

- End Device connects with Bluetooth LE to a mobile phone to get added to a network
- Once on the network, the Bluetooth LE connection is closed and the Thread or Zigbee connection is open



Dynamic

- Two stack connections maintained
- The application time-slices between two protocols (can transmit and receive simultaneously for 15.4 and Bluetooth LE)

Example: Commissioning and monitoring

SUMMARY OF 802.15.4 TECHNOLOGIES

STANDARDS ORGANIZATION	TECHNOLOGY	DESCRIPTION
zigbee alliance	Zigbee 3.0	Full stack including Zigbee PRO network layer and Zigbee Cluster Library (ZCL) application framework.
	Zigbee PRO	Mesh network based on 802.15.4 radio
	Zigbee Smart Energy	Protocol for smart metering
	Dotdot	Universal IoT Language (ZCL over IP)
	Project Connected Home over IP	Working group to create a unified app layer for the smart home based on market-proven technologies such as Dotdot, HomeKit and Weave.
THREAD GROUP	OpenThread 1.1	Low-power, secure and IP-based mesh networking layer based on 802.15.4 radio
	OpenThread 1.2	Updated release of Thread enhancing low power capabilities, adding BLE and Commercial (Building) extensions

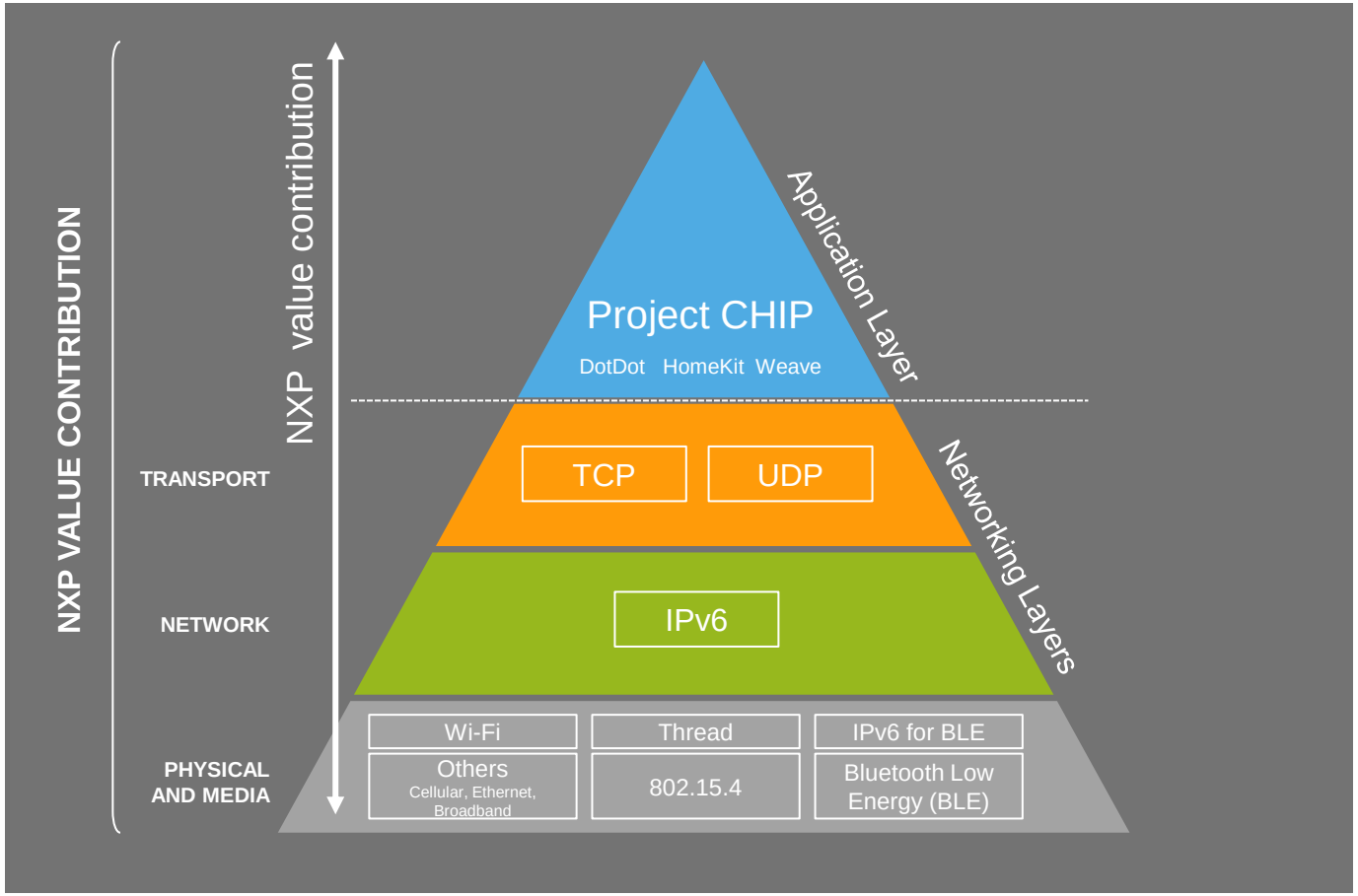
NXP leadership in driving these technologies – Board level member of both organizations

PROJECT CONNECTED HOME OVER IP (CHIP) IMPROVES SMART HOME DEVICE COMPATIBILITY WITH SECURITY, PROVISIONING AND COMPLIANCE AS FUNDAMENTAL DESIGN TENETS

IP-based connectivity specification
Royalty-free use
Open Source software

PROJECT CHIP FOR IOT DEVICES

A single IP-based protocol to securely and robustly connect a large ecosystem of products and every smart home system
Lighting and electrical, HVAC controls, access control, safety and security, window coverings/shades, TVs, access points, bridges



GOALS OF PROJECT CHIP

- Simplify development
- Increase compatibility
- Ensure security and privacy
- Create a truly smarter home (AIoT)
- Open-source approach

Led by the world's biggest brands

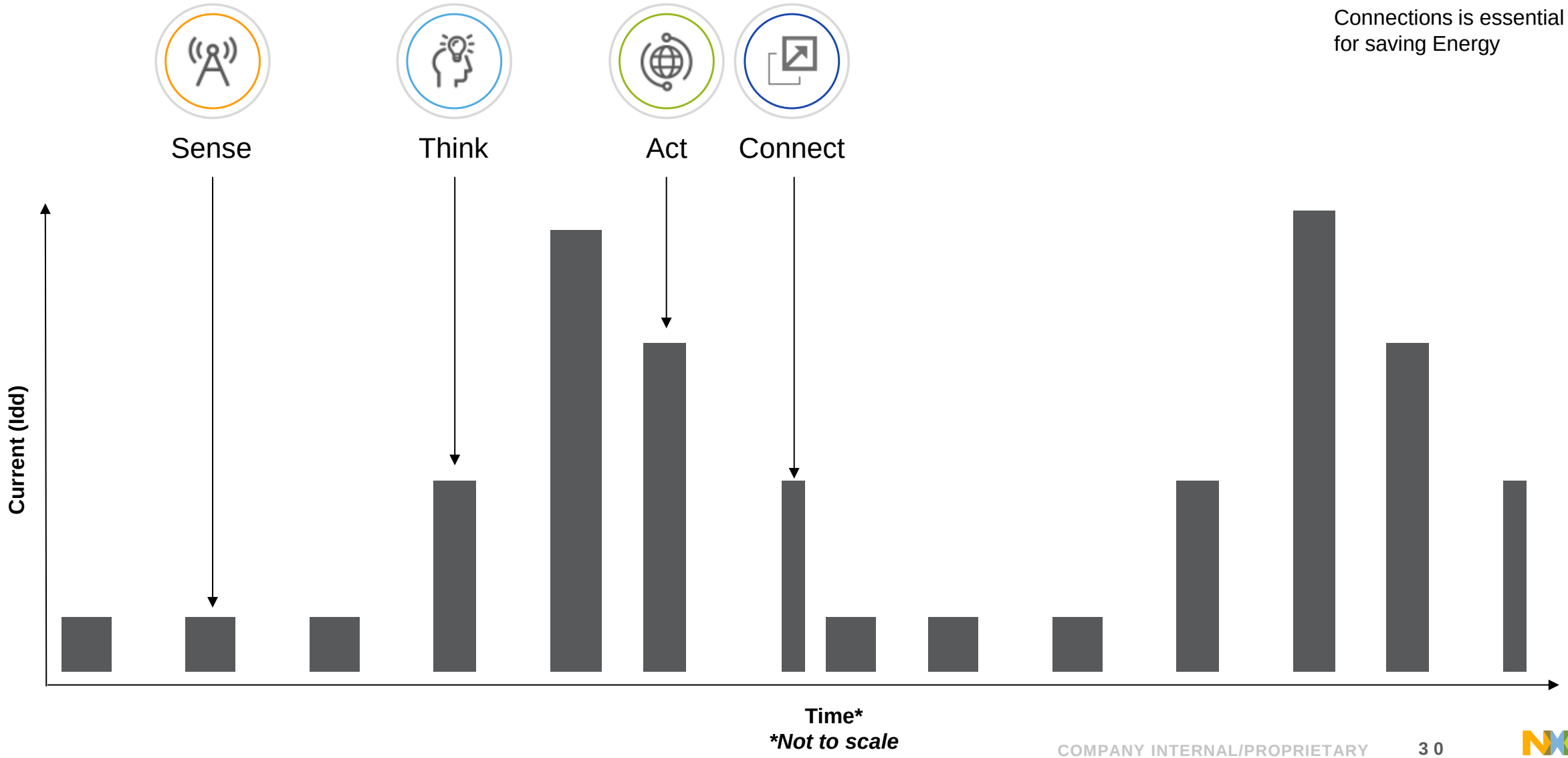
Low Power

SECURE CONNECTIONS
FOR A SMARTER WORLD

EDGE NODE – TYPICAL OPERATION

Ultra Low Power

Low TX and RX Currents for Bluetooth Connections is essential for saving Energy



AVAILABLE PERIPHERALS ACROSS POWER MODES

Ultra Low Power

Peripheral	Power mode			
	Active or sleep	Deep-sleep	Power-down	Deep power-down
FRO192M	On	Optional	Off	Off
FRO32K	Optional	Optional	Optional	Off
Radio	Optional	Off	Off	Off
CPU	On or Halted in Sleep	Halted	Off	Off
I2C0	Optional	Optional	Optional (with limited functionality)	Off
SPI0	Optional	Optional	Optional (with limited functionality)	Off
USART0	Optional	Optional	Optional (with limited functionality)	Off
Other digital peripherals	Optional	Optional	Off	Off
DMA	Optional	Off	Off	Off

WAKE UP SOURCES FOR POWER MODES

Ultra Low Power

SLEEP	DEEP SLEEP	POWER DOWN	DEEP PD
Any interrupt	PWM	USART0	I/O
	SPIFI	SPI00	NFC
	DMIC	I2C0	Brown Out Detect
	ISO7816	Compartor	
	ADC	LP WU Timers	
	IR Mod.	RTC (1Hz, 1KHz)	
	Watchdog		
	Pin Interrupts		

Increasing wakeup Increasing wakeup options

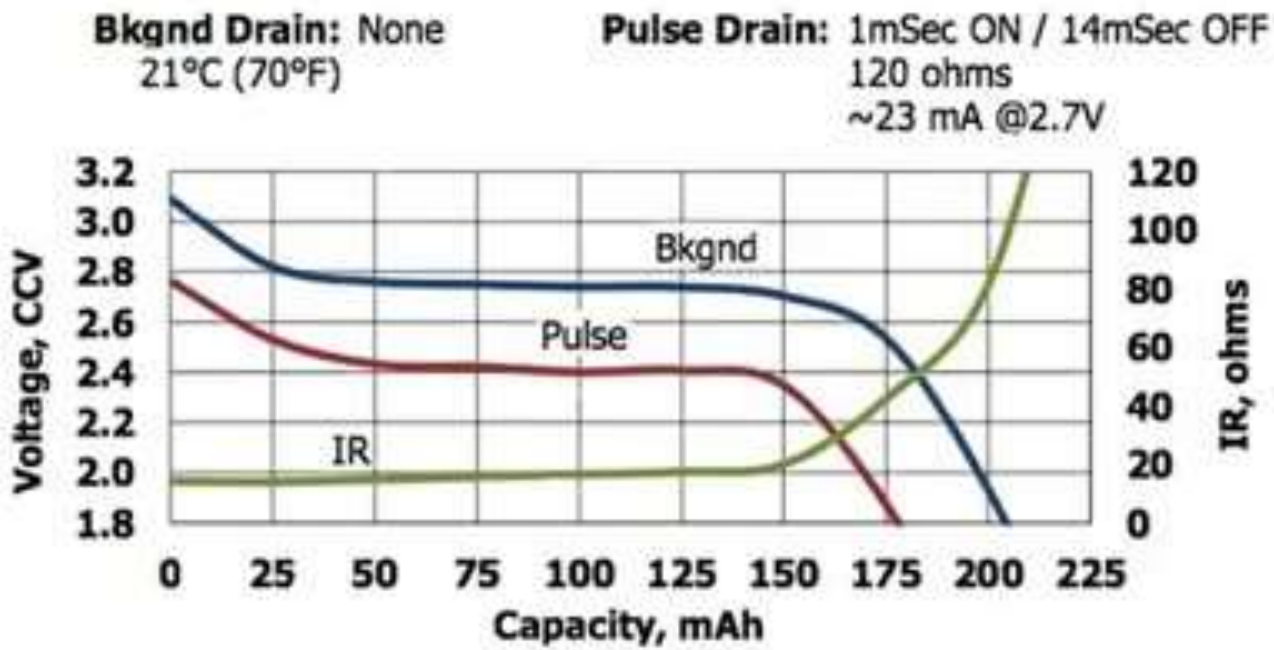
EXTREMELY LOW LEAKAGE IN LOWEST POWER MODES

Ultra Low Power

CONDITIONS	TYPICAL CURRENT
Deep Power-down mode (everything is powered off, wake-up on HW reset only)	250nA
Deep Power-down mode IO (everything is powered off, wake-up on HW reset only or an event on any of the 22 GPIOs and NTAG interrupt)	350nA
Power-down (wake-up on HW reset or an IO event, wake-up timer ON, 32 kHz FRO on, no SRAM rétention)	800nA
Power-down-4K (wake-up on HW reset or an IO event, wake-up timer on, 32 kHz FRO on, with 4 KB SRAM retention)	1150nA
Power-down-8K (wake-up on HW reset or an IO event, wake-up timer on, 32 kHz FRO on, with 8 KB SRAM retention)	1350nA

INTERNAL RESISTANCE OF CR2032 – USABLE BATTERY LIFE

- Batteries are not ideal and contain IR (Series Resistance)
- Current drawn from the battery must pass through the IR affecting the usable battery life
- Smaller pulse currents extend battery life



Security

SECURE CONNECTIONS
FOR A SMARTER WORLD

CRYPTO HASH AND AES WITH PROTECTED KEY

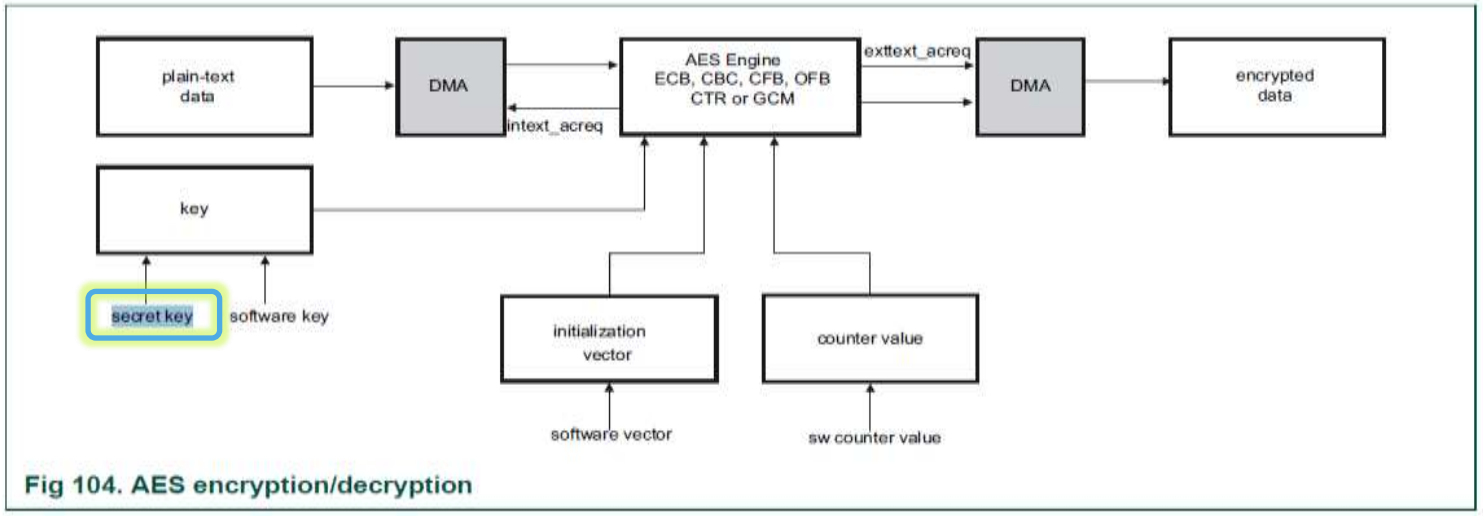


Fig 104. AES encryption/decryption

Cryptography is a fundamental capability needed to address edge device security

- Basis for protecting data at rest and in transit
- Provides robust identity for the end device by cryptographic authentication

The key material used for cryptographic operations must be protected by hardware

- Attacks against Confidentiality/Integrity/Authenticity are aimed at attaining the Cryptographic Key

Wireless MCU Features:

AES256/128 Hardware Engine

- Support for common AES modes including GCM
- DMA friendly design
- Accelerated In-Line Encrypt/Decrypt

Secret Key

- 128bit Random Number Key
- Unique per device
- Not accessible by software

Chip supported use cases

- In System Programming (ISP) Protection
  - ISP supports a Secure Handshake Using Device-Specific Key
    - Secure handshake uses Public Key Crypto
    - Root of Trust Public Key is stored Protected by AES Secret Key
  - ISP Supports Encrypted Transfer

Application use cases

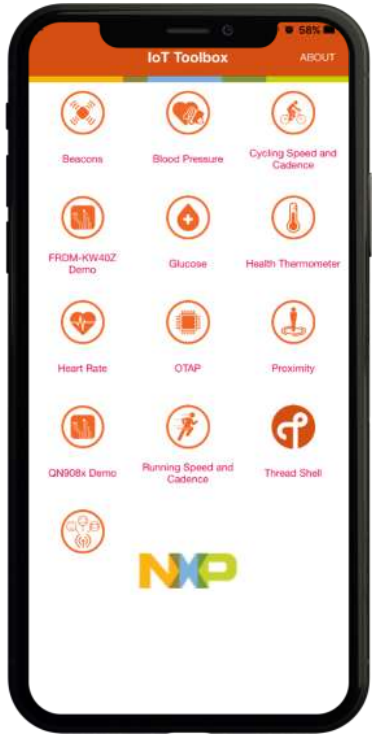
- Secret Key Protects
  - Firmware Update Key
  - Device Data Protection Keys
  - Network Protocol Persistent Keys
  - Network Credentials

Enablement

SECURE CONNECTIONS
FOR A SMARTER WORLD

CONNECTIVITY MCUS | SOFTWARE ENABLEMENT

- MCUXpresso SDK releases with drivers, NTAG/BLE and other example projects
- Common toolkit across Kinetis and LPC microcontrollers
- Support MCUXpresso, IAR IDEs
- Common NXP Bluetooth LE host, Thread and Zigbee stacks included in SDK
- Public iOS/Android App – IoT Toolbox



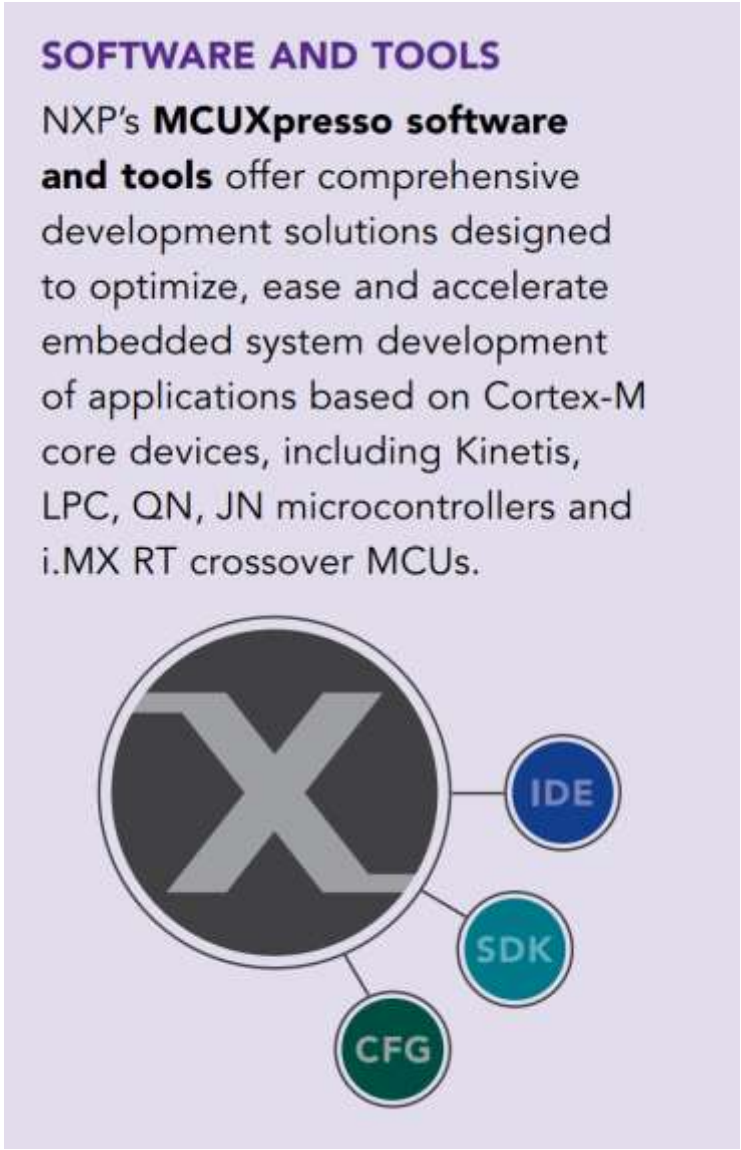
Bluetooth **Bluetooth Low Energy**
Core Stack 5.0 Profiles

NFC

zigbee **802.15.4 Mesh Networking**

Tools

- MCUXpresso IDE
  - Based on Eclipse, developed and maintained by dedicated NXP team in Cambridge
  - Includes integrated fully-featured debugger
  - Projects can be managed by IDE, or it can run make files
- **Toolchain**
  - Toolchain is GCC
- **SDK**
  - Peripheral API files provided as open source
  - Existing JN516x projects can be ported easily
- **Flash programmer**
  - ISP GUI and Command-line programmer
  - Can also program from within MCUXpresso IDE



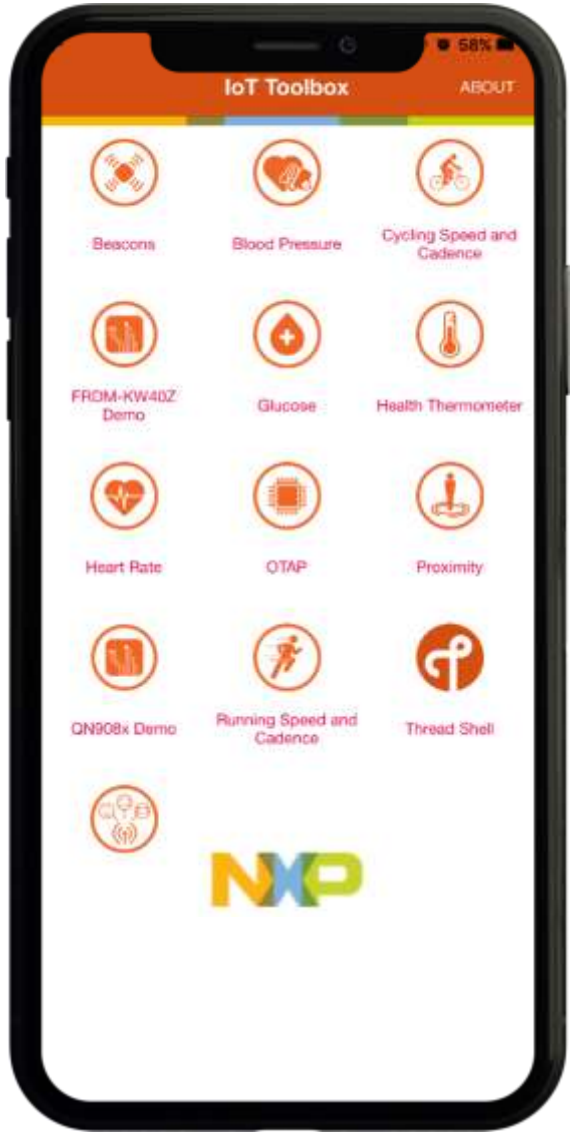
MOBILE PHONE APPLICATION – NXP IOT TOOLBOX

- **IoT Toolbox supports Bluetooth LE, Thread and Zigbee**

- **Supported Bluetooth LE profiles:**
  - Glucose
  - Blood Pressure
  - Cycling Speed and Cadence
  - Health Thermometer
  - Heart Rate
  - Proximity
  - Running Speed and Cadence

- **Also, will enable Beacon monitoring and support for customs profiles, including:**
  - Over the Air Programming (OTAP)
  - Wireless UART

- **Available for iOS (App Store) and Android (Google Play)**



- **NXP has extensive experience in low-power mesh networking**
  - Founding member of the Zigbee Alliance and Thread Group
  - Involved in spec and certification development
  - Implemented proprietary stacks, Golden Units for Zigbee and Thread certification programs

- **NXP's Open Source Leadership**
  - NXP has >10 years experience contributing to open source initiatives: OpenThread, Project CHIP, Zephyr, Linux, U-Boot, Trusted Firmware-A, OP-TEE, Gstreamer, Android, etc.
  - NXP provides the MCU Base SDK as open source
  - NXP is a strong believer in open source – community, scalability

NFC

- NFC is a contactless short range technology, based on inductive coupling (10cm / 4 in)
- Co-invented in 2002 by NXP and Sony
- Operating frequency 13.56MHz, speed < 848 kbits/s

Big reasons to consider NFC

More intuitive than any technology

It's like shaking hands

Use Power Very Efficiently

Only one of the two devices needs to be powered

Trusted addition to other technology

Especially for pairing devices

NFC USE CASES ARE GROWING

Identification & authentication of consumables and accessories to combat counterfeits or configure the main unit based on accessory

Parameterization & diagnosis using a phone as an extended user interface for small, sealed and unpowered devices

Pair with Bluetooth & Wi-Fi devices faster, without conflicts by just tapping your phone to them

Use your phone or smart card for **Access control** to open doors or give access to machine configurations

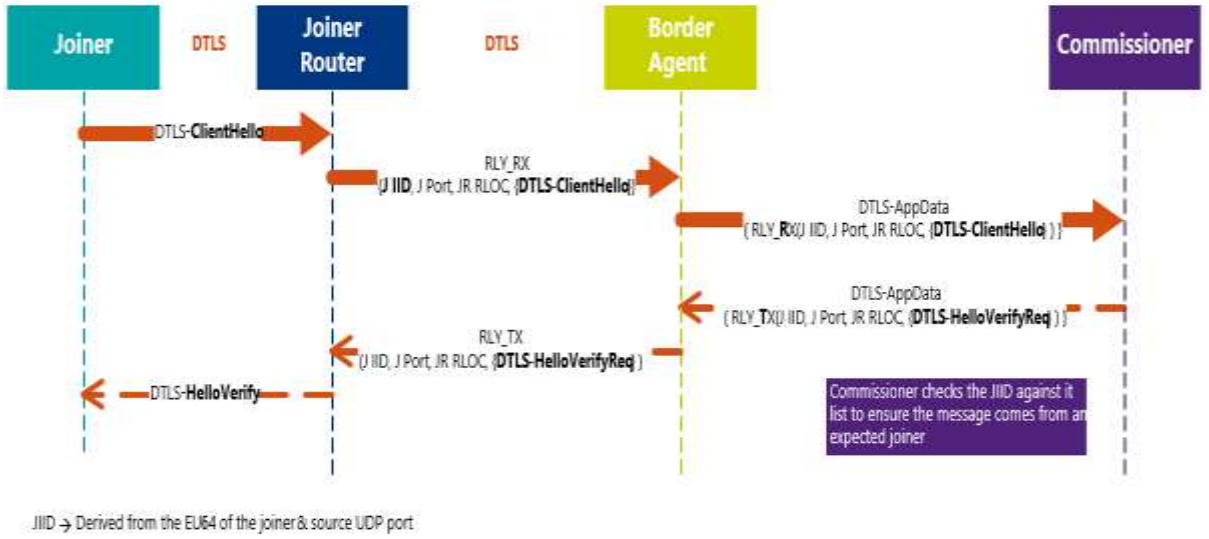
Company public

Click on pictures for more details

SIMPLIFIED COMMISSIONING WITH NFC TECHNOLOGY

JN5189T/88T and K32W061 integrates an NFC NTAG to implement contactless NFC commissioning, simplifying the network build-out, saving energy and increasing safety.

The user-friendless of commissioning is time consuming and complex.



VS

With NTAG, all you need to do is:
Just Tap It!

Product Block Diagrams

SECURE CONNECTIONS
FOR A SMARTER WORLD

JN5189 BLOCK DIAGRAM

CPU

- 48 MHz ARM Cortex-M4 core
- Up to 640kB/320kB Flash, 152kB/88kB RAM and 128kB ROM

2.4 GHz radio transceiver

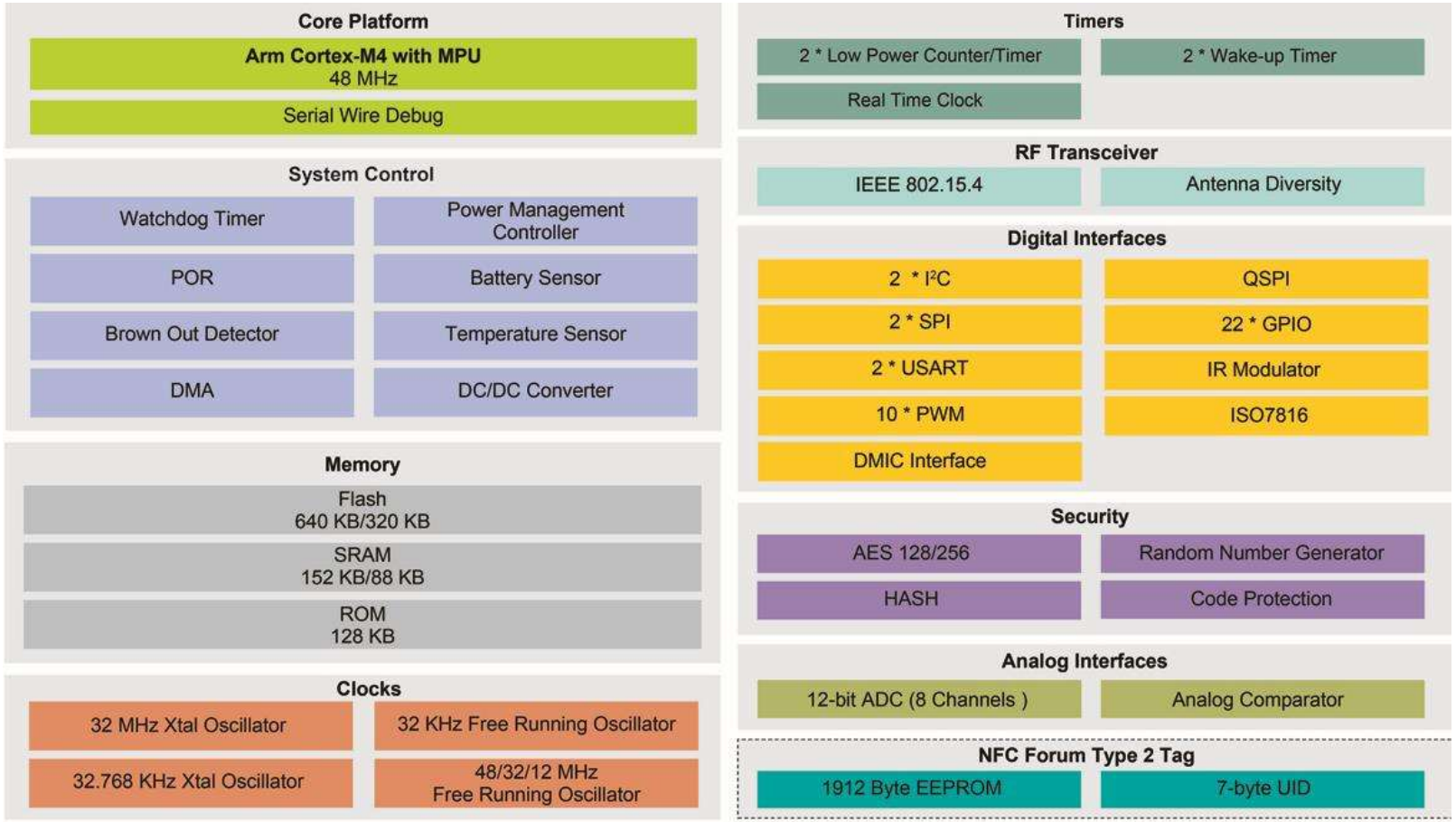
- Zigbee 3.0, Thread
- IEEE-802.15.4 compliant
- Antenna diversity control
- +10 dBm power amplifier
- -100 dBm Rx sensitivity
- Peak typical current:
  - 20.3mA Tx @ +10dBm, 7.4mA @ +0dBm
  - 4.3mA Rx
- Power down Mode current < 1uA
- 0.8uA Power Down Mode current with no RAM retention
- Improved Wi-Fi coexistence

Security

- Crypto engine: AES 128-256 , RNG

System

- NFC Tag (JN5189T and JN5188T)
- Supported by Over-the-Air Device Firmware Upgrade
- Tj: -40°C to +125°C
- HVQFN40 6x6 mm



K32W061/41 BLOCK DIAGRAM

CPU

- 48 MHz ARM Cortex-M4 core
- 640kB Flash, 152kB RAM and 128kB ROM

2.4 GHz radio transceiver

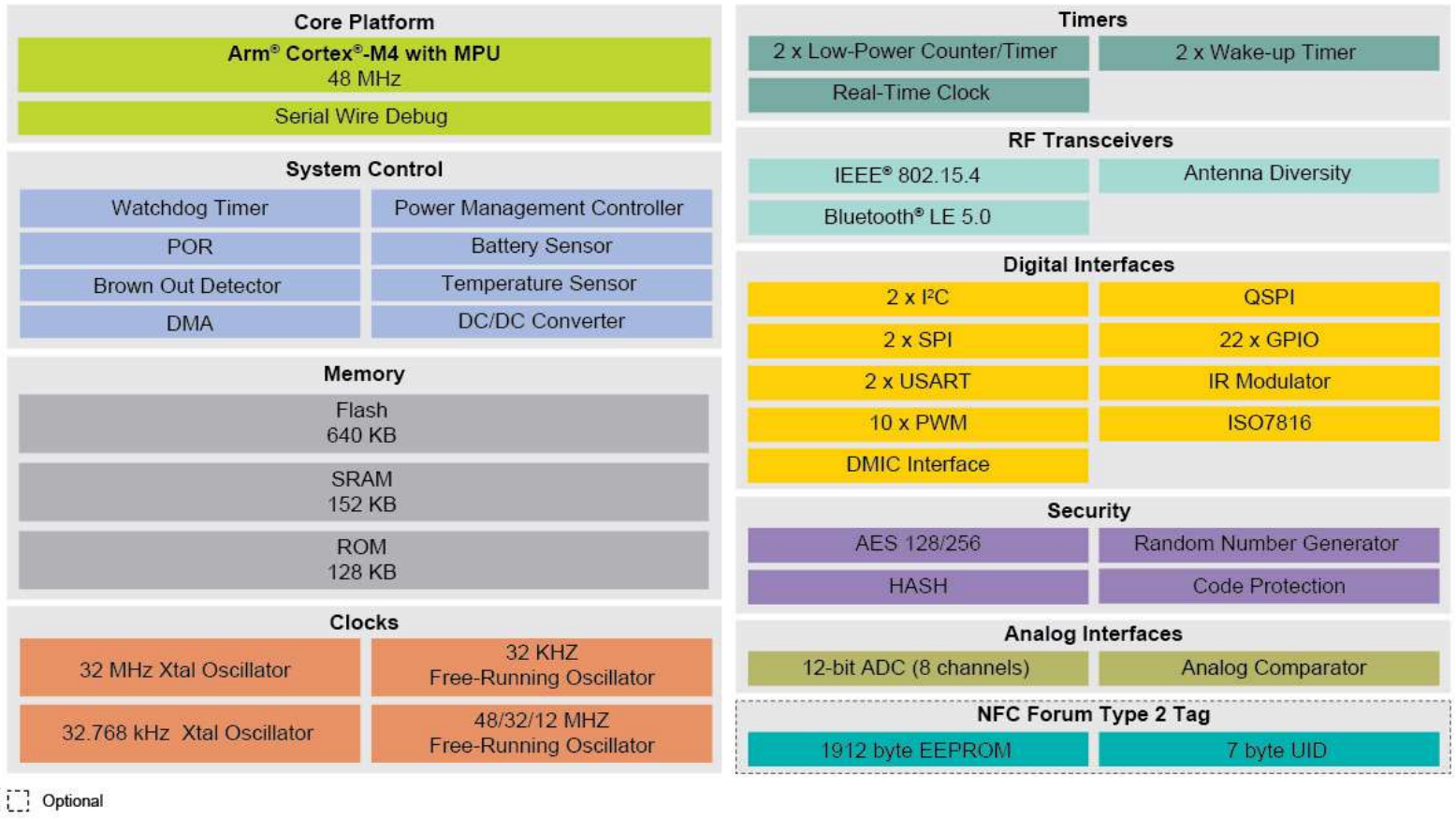
- Zigbee 3.0, Thread and Bluetooth 5 with High Speed support
- IEEE-802.15.4 compliant
- Antenna diversity control
- +10 dBm power amplifier
- 15.4: -100 dBm Rx sensitivity
- BLE:-97dBm Rx sensitivity
- Peak typical current:
  - 20.3mA Tx @ +10dBm, 7.4mA @ +0dBm
  - 4.3mA Rx
- Power down Mode current < 1uA
  - 0.8uA Power Down Mode current with no RAM retention
- Improved Wi-Fi coexistence

Security

- Crypto engine: AES 128-256, RNG

System

- NFC Tag (K32W0**6**1)
- Supported by Over-the-Air Device Firmware Upgrade
- Tj: -40°C to +125°C
- HVQFN40 6x6 mm



QN9090 MCUS BLOCK DIAGRAM

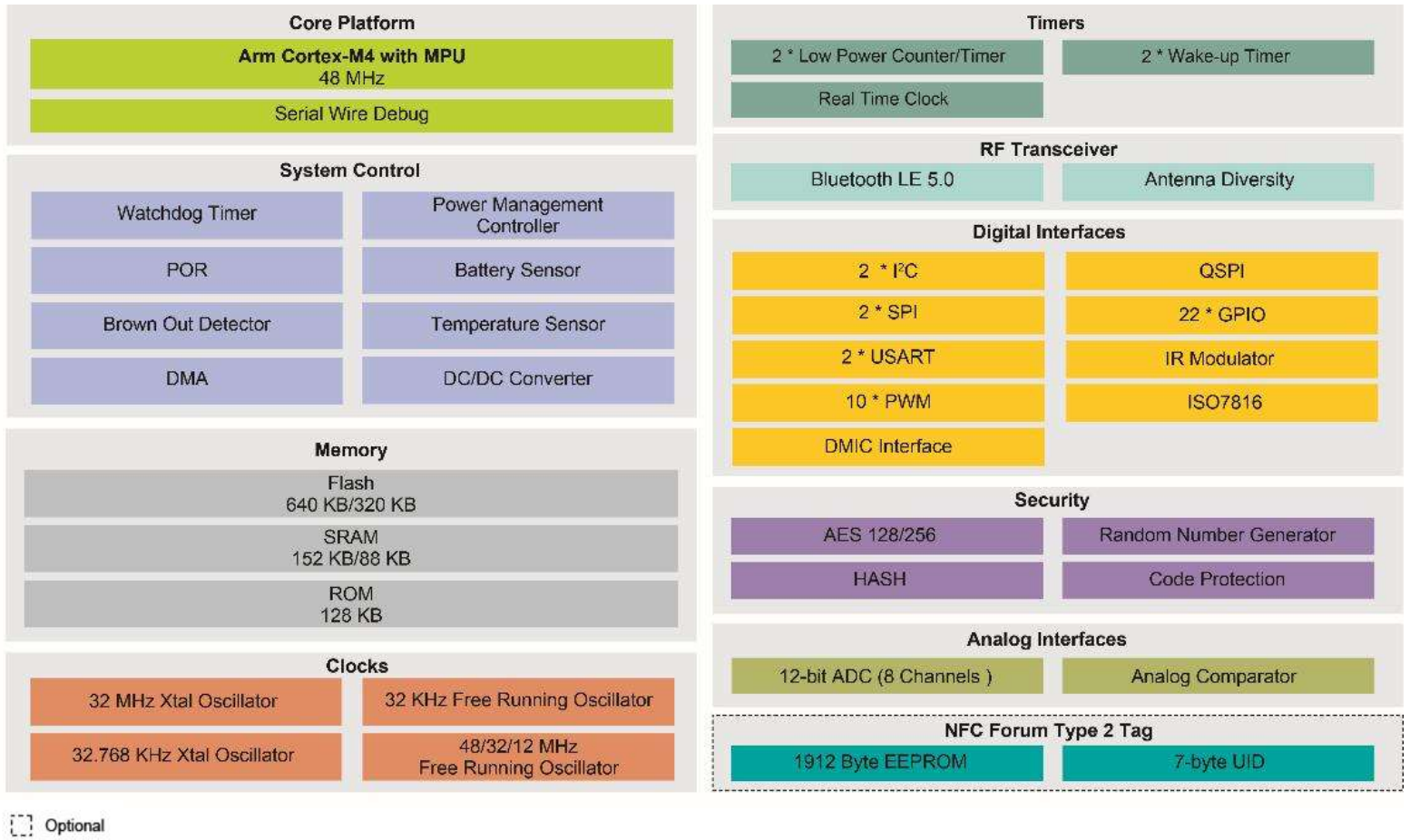
CPU and Memory
- Up to 48MHz Cortex-M4
- Up to 640 kB flash, up to 152 kB RAM, 128 kB ROM
- NFC NTAG Option with EEPROM
- Quad-SPI for execute in place or data storage in NVM

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
- 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

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



KINETIS KW34/35/36 MCU FAMILY | FEATURES

Core/Memory/System

- Cortex-M0+ running up to 48 MHz
- **KW35**: 512kB (2x256kB, swappable) Program Flash with ECC ***OR***
- **KW34/36**: 256kB Program Flash + 256kB FlexNVM both with ECC;
- 64 kB SRAM
- **KW34/36**: 8 KB of user-segment defined byte write/erase EEPROM
  - Allocation of FlexNVM (minimum 32KB) to EEPROM emulation will determine effective endurance

Radio

- Support for Bluetooth LE 5.0 & Generic FSK
- -97 dBm receiver sensitivity
- -25 to +3.5 dBm programmable output power
- 6.3 mA Rx & 5.7 mA Tx (0dBm) current target (DC-DC enabled)
- Support for 8 concurrent connections

Communications/HMI/Timers

- 2xSPI, LP-UART with LIN, 2xI2C, CMT, GPIO with IRQ capability (KBI)
- **KW36**: CAN-FD and 2nd UART with LIN
- 3x FlexTimer (TPM) with PWM & quadrature decode support
- Low Power (LPTMR), Programmable Interrupt (PIT) and RTC timers

Analog

- 16-bit ADC with integrated temperature sensor and battery monitor
- 6-bit High-speed Analog Comparator
- 1.2V voltage reference (VREF)

Security

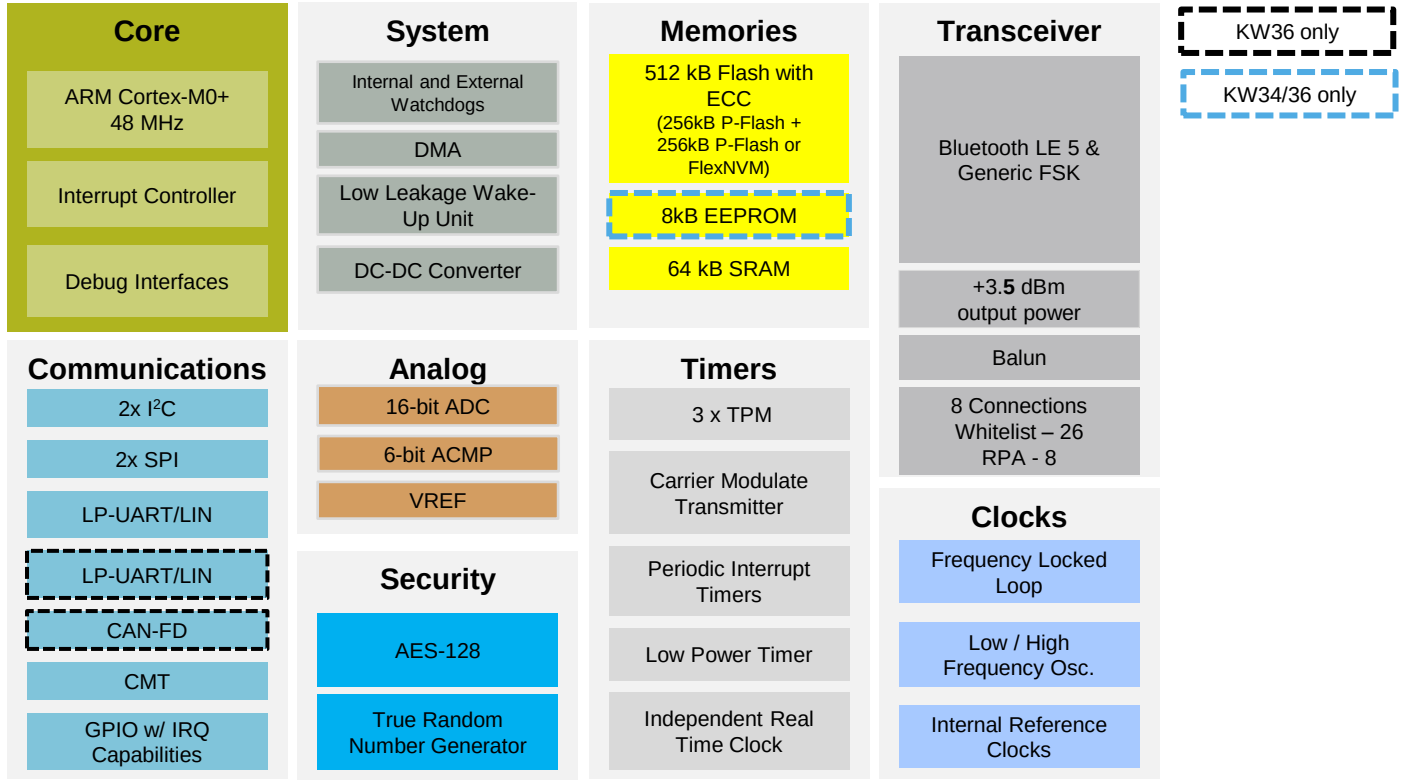
- AES Accelerator and True Random Number Generator

Unique Identifiers

- 80-bit device ID programmed at factory
- 40-bit unique number can be used for Bluetooth Low Energy IEEE address

Operating Characteristics

- Voltage range: Buck 2.1 V to 3.6V, Bypass 1.71 V to 3.6 V
- Ambient temperature range: –40 to 105 °C
- AEC Q100 Grade 2 Automotive (A version) Qualification
- Industrial (Z version) Qualification



DEVICE	TIER	CAN FD	2ND UART WITH LIN	8KB EEPROM	PACKAGE
MKW36A512VFP4	Auto	Y	Y	Y	6X6 40-pin “Wettable” HVQFN
MKW36Z512VFP4	Industrial	Y	Y	Y	
MKW35A512VFP4	Auto	N	N	N	
MKW36A512VFT4	Auto	Y	Y	Y	7x7 48-pin “Wettable” HVQFN
MKW35A512VFT4		N	N	N	
MKW34A512VFT4		N	N	Y	
MKW36A512VHT4	Auto	Y	Y	Y	7X7 48-pin Laminate QFN
MKW36Z512VHT4	Industrial	Y	Y	Y	
MKW35Z512VHT4	Industrial	N	N	N	

KINETIS KW37/38/39 MCU FAMILY | BLOCK DIAGRAM & IP REUSE

New IP vs KW34-36

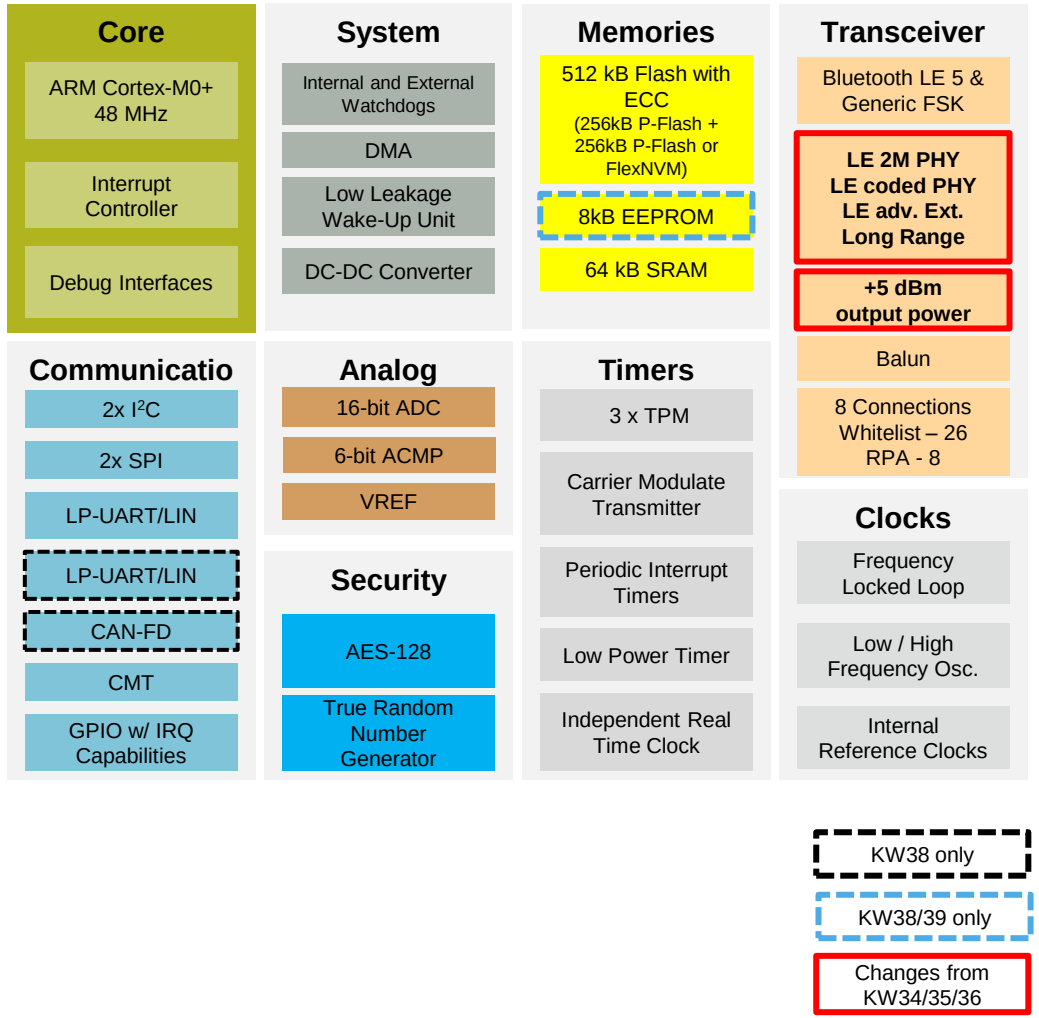
- **Full Bluetooth LE 5.0 compliant GFSK PHY** (Digital IP)
- **Bluetooth LE 5.0 Link Layer** (Digital IP)
- **Localization:** Enhanced Distance Estimation & Direction Finding support (i.e., improved DMA, antenna switching and time-stamping)

Modified IPs vs KW34-36

- Increase **output power** to +5dBm (Analog IP, option already available in KW36A that need to be qualified)
- **Enhanced Generic Link Layer** (with early support of Bluetooth LE 5.1 compliant Direction Finding Packet)

Pin-to-pin compatible with KW34-36

- 7x7 48HVQFN with wettable flanks



KINETIS KW37/38/39 MCU FAMILY | FEATURES (KW34/35/36 + FULL BLE 5.0)

Core/Memory/System

- Cortex-M0+ running up to 48 MHz
- **KW37**: 512kB (2x256kB, swappable) Program Flash with ECC ***OR***
- **KW38/39**: 256kB Program Flash + 256kB FlexNVM both with ECC;
- 64 kB SRAM
- **KW38/39**: 8 KB of user-segment defined byte write/erase EEPROM
  - Allocation of FlexNVM (minimum 32KB) to EEPROM emulation will determine effective endurance
- Four independently programmable DMA controller channels

Radio

- Support for Bluetooth LE 5.0 and Generic FSK
  - High Speed (2 Mbps), Long Range, Advertising Extensions
- -97 dBm receiver sensitivity in BLE 1Mbps mode
- -105 dBm receive sensitivity in BLE long range 125kbps mode
- -30 to +5 dBm programmable output power

Communications/HMI/Timers

- 2xSPI, LP-UART with LIN, 2xI2C, CMT, GPIO with IRQ capability (KBI)
- **KW38**: CAN-FD and 2nd UART with LIN
- 3x FlexTimer (TPM) with PWM & quadrature decode support
- Low Power (LPTMR), Programmable Interrupt (PIT) and RTC timers

Analog

- 16-bit ADC with integrated temperature sensor and battery monitor
- 6-bit High-speed Analog Comparator
- 1.2V voltage reference (VREF)

Security

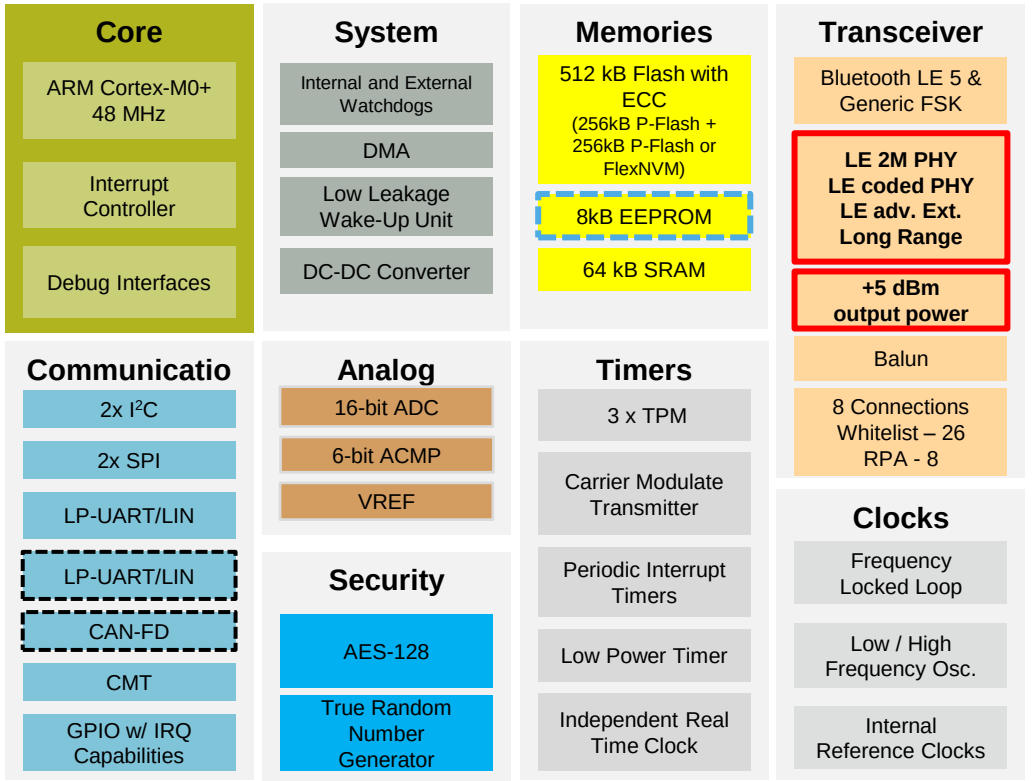
- AES Accelerator and True Random Number Generator

Unique Identifiers

- 80-bit device ID programmed at factory
- 40-bit unique number can be used for Bluetooth Low Energy

Operating Characteristics

- Voltage range: Buck 2.1 V to 3.6V, Bypass 1.71 V to 3.6 V
- Ambient temperature range: –40 to 105 °C
- AEC Q100 Grade 2 Automotive (A version) Qualification
- Industrial (Z version) Qualification



DEVICE	CAN FD	2ND UART WITH LIN	8KB EEPROM	PACKAGE	PIN/PACKAGE COMPATIBLE KW34/35/36
MKW37A512VFT4 MKW37Z512VFT4	N	N	N	7x7 48-pin HVQFN "Wettable"	**MKW35A512VFT4**
MKW38A512VFT4 MKW38Z512VFT4	Y	Y	Y		**MKW36A512VFT4**
MKW39A512VFT4	N	N	Y		**MKW34A512VFT4**

Success Stories

SECURE CONNECTIONS
FOR A SMARTER WORLD

INSULET
OMNIPOD INSULIN DELIVERY SYSTEM

Product Features

- Wearable device allowing active lifestyles for users
- Smart administration of insulin for diabetes treatment

QN9083

- Standardized Connectivity
- Longevity and Quality
- Cost Effective Integration
- Energy Efficiency

LUMI
AQARA SMART HOME SYSTEM

Product Details

- Reliable, eco-friendly, smart design products to improve people's homes and daily lives.
- Router, Lighting, Switches, Door and Window Sensors

JN5169, JN5189, K32W061/41

- Proven and robust Zigbee implementation
- Low power performance for battery operated devices
- Complete portfolio with BLE, Thread and Zigbee support

SECURE CONNECTIONS
FOR A SMARTER WORLD