FTF 2016
TECHNOLOGY FORUM

DEVELOPING TAP-TO-CONNECT EXPERIENCES WITH SMART HOME AUTOMATION SOLUTIONS

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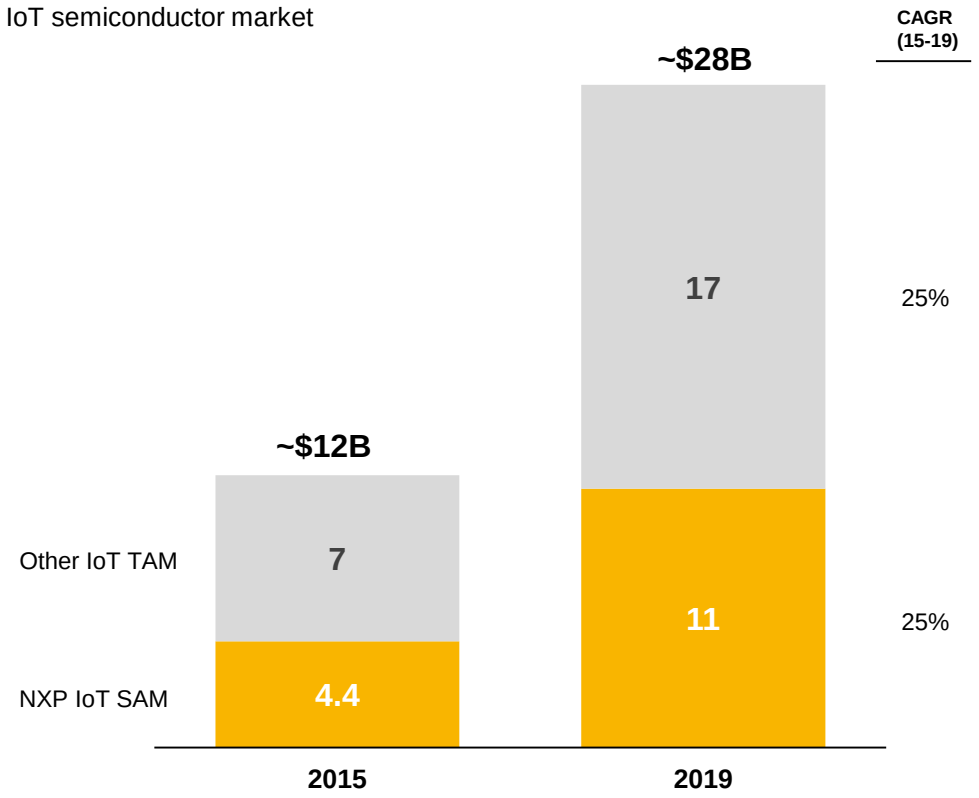
SESSION FTF-HMB-N1982
18, MAY, 2016

AGENDA

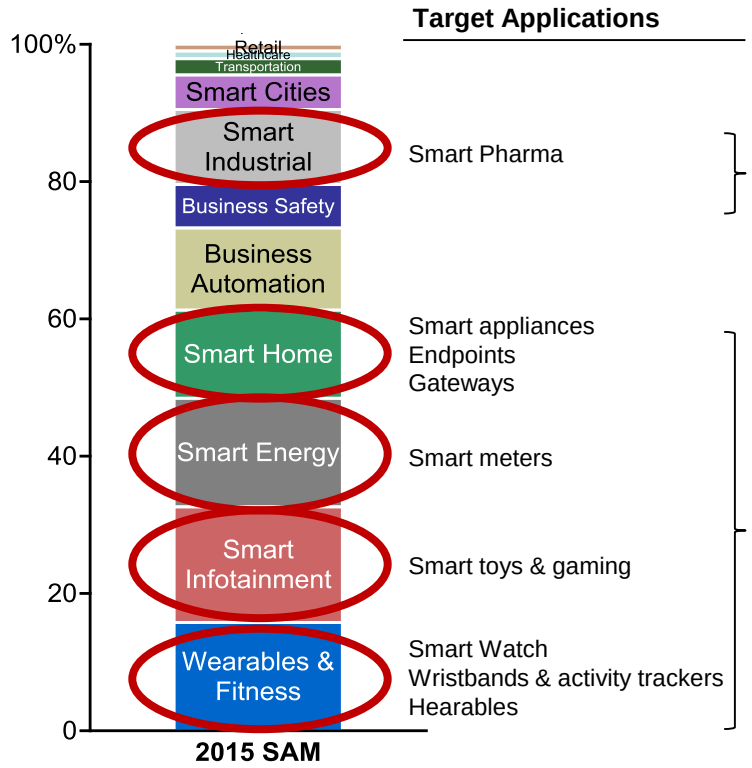
- Market Adoption
- NXP’s – Integrate technology for better use-case
- Tap N Connect
- Wireless Product Portfolio
- Enablement

IoT Offers a Huge Opportunity for Growth

IoT market expected to grow 25% per year



Initial focus on consumer segments; to further explore B2B this year



Industrial IoT – cold chain logistics, therapy adherence, factory automation, smart cities

Consumer verticals – home automation, wearables, connected accessories, hearables

Notes: NXP IoT SAM excludes FPGA, ASIC/ASSP, image sensors, Automotive, STB & TV processing. Source: IoT TAM based on Gartner forecast (Nov 2015).

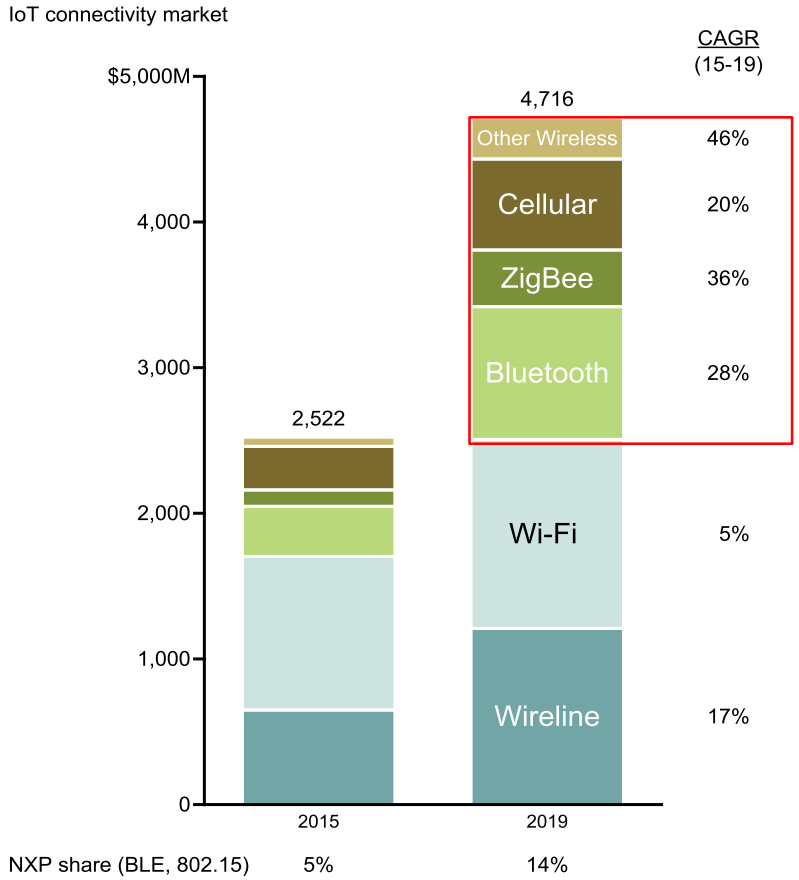
Low-power Wireless Connectivity Driving Growth

Connectivity is ~60% of NXP IoT SAM; a range of solutions cover different use cases

Category	Standard	Strengths	Usage
Wi Fi	**.ac**	Highest connection speed. Established standard	Gateway
	.b/.g/.n	High throughput, high power. Established standard	Endpoints
	.ah	Proposed low-power IoT standard	tbd
Bluetooth	**Classic**	High-throughput streaming. Mature standard	Legacy audio streaming
	Low Energy / Smart	Low power emerging standard	Device to smartphone comms
	Mesh	Standard in development	Home (<250 nodes)
802.15.4 ZigBee	**ZigBee**	Low-throughput local area network; mesh	Commercial buildings
	Thread	New 802.15.4 standard from Nest	Home & business automation
Cellular	**LTE-m**	Low-power LTE	Mobile IoT

Notes:
- IoT forecast (incl. connectivity) based on Gartner forecast for Internet of Things Endpoints, 2015
- BLE forecast based on TSR Wireless Connectivity, 1Q16; ZigBee on internal analysis
- Current SAM includes Bluetooth Low Energy, ZigBee

Low-power wireless to drive growth



Consumer Behaviors Indicate Latent Demand for IoT

51%

ACCIDENTALLY LEFT THE LIGHTS ON

41%

ACCIDENTALLY LEFT TV/APPLIANCE ON

36%

WONDER WHAT'S HAPPENING AT HOME WHILE AWAY

35%

LEAVE A/C RUNNING (EVEN WHEN ITS COMFORTABLE)

31%

CANT REMEMBER IF THEY LOCKED DOORS/WINDOWS

However, So Far Adoption Has Remained Low

16%

16% OF US HOUSEHOLDS SAY THEY HAVE AN IOT DEVICE

8%

ONLY 8% HAVE MORE THAN ONE

Q: WHAT WAS YOUR **EXPERIENCE?**

A: “A bit cumbersome; not sure if it was worth the effort”

DO I NEED THIS?

- “Connectivity” alone offers little benefit
- Difficult to explain / sell new experiences
- Few established channels

WHY PAY SO MUCH MORE?

- Significantly more expensive
- Cost savings gradual and hard to quantify

WILL THIS JUST CAUSE MORE PROBLEMS?

- Difficult to install
- Difficulty to troubleshoot – creates more problems than it solves
- Incompatible standards
- Security and privacy concerns

Smart Home *Current roadblocks for mass market adoption*

Discrete sub system addressing one function only

HomeKit
SmartThings
nest
Logitech Harmony

Various operating platforms

Z-WAVE
ZigBee
THREAD
Wi Fi
Bluetooth SMART

Numerous Connectivity technogies

Non unified & non optimised network building process
(security / user experience / scalability)

OVERALL MCU PORTFOLIO

SECURE CONNECTIONS
FOR A SMARTER WORLD

NXP value proposition for IoT applications

LOW POWER

- Ultra-efficient dynamic power
- Ultra-low static power consumption with full retention
- Low-power peripherals
- Tools for low power design, e.g. the power estimation, power profiler, and consumption calculator

SECURE

- Multiple levels of scalable security for ultimate flexibility and protection
- Ensuring communications, software and physical system are protected from threats

CONNECTIVITY

- State-of-the-art RF performance
- Choice of connectivity to fit application
- Interoperable connectivity
- Integrated RF transceiver supporting: Bluetooth Smart 4.2, IEEE802.15.4, Thread, ZigBee

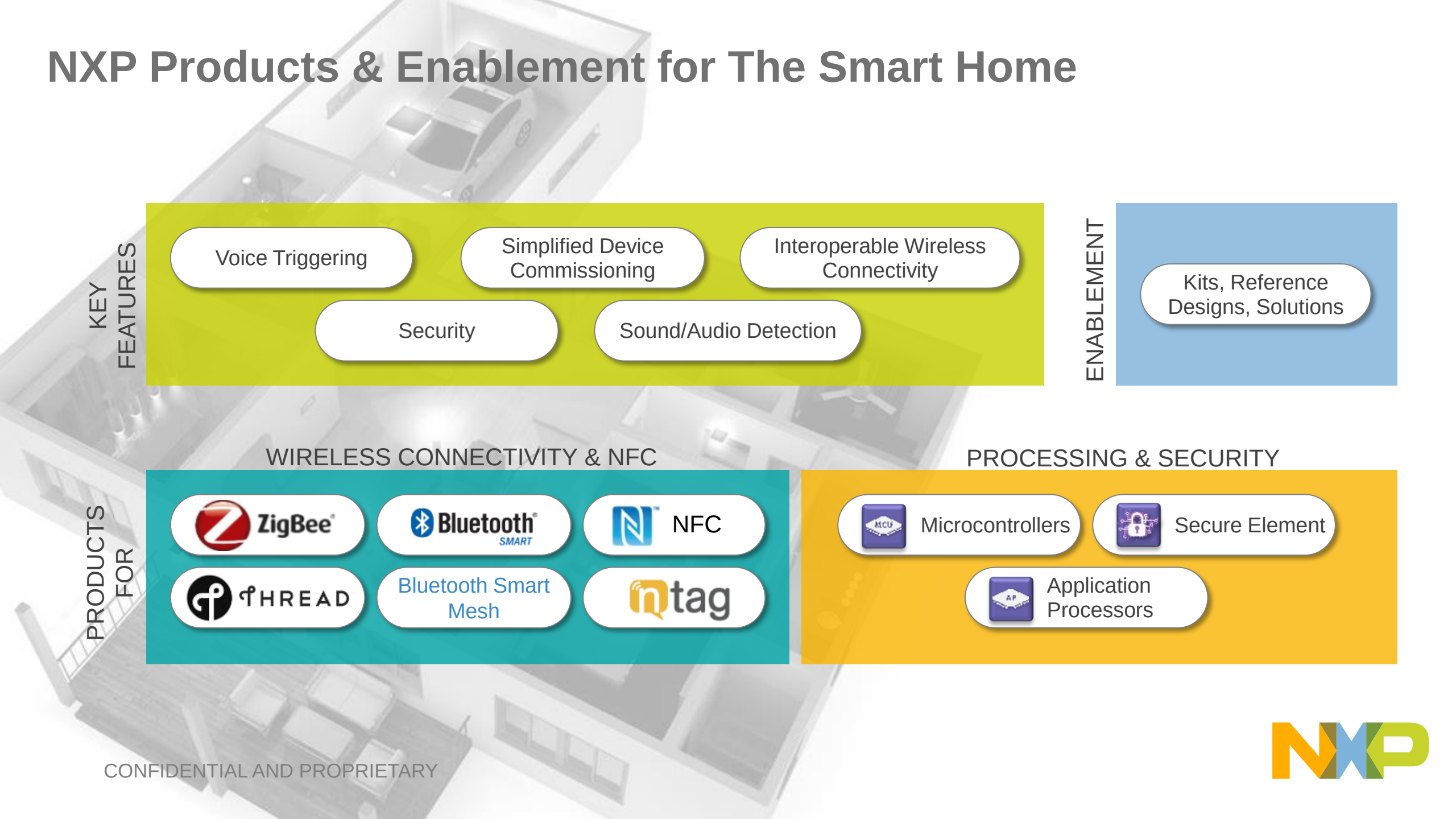
EASY TO USE

- 'Tap-N-Pair' NFC Commissioning for best-in-class consumer experience
- Bring voice detection & triggering features to wide range of products

QUICK TO MARKET

- Complete kits simplify design and lower risk – get to final product design quickly
- Full ecosystem including application software and cloud connectivity

NXP Products & Enablement for The Smart Home



KEY FEATURES

- Voice Triggering
- Simplified Device Commissioning
- Interoperable Wireless Connectivity
- Security
- Sound/Audio Detection

ENABLEMENT

- Kits, Reference Designs, Solutions

PRODUCTS FOR

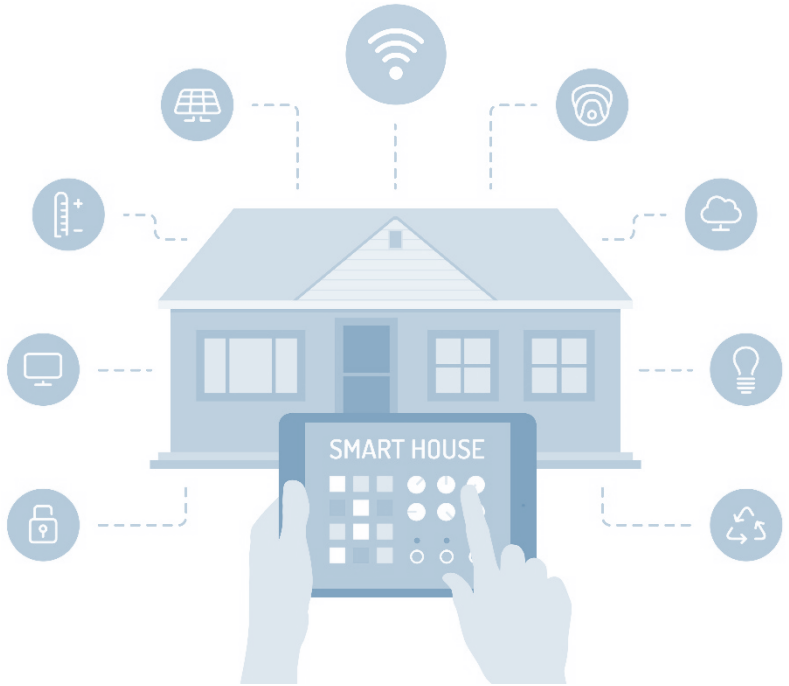
WIRELESS CONNECTIVITY & NFC

- ZigBee
- Bluetooth SMART
- NFC
- THREAD
- Bluetooth Smart Mesh
- ntag

PROCESSING & SECURITY

- Microcontrollers
- Secure Element
- Application Processors

A consumer perspective….



As consumer,

1. I don't want my devices being compromised by malware or viruses
2. I don't want my devices being accessed (other than by me/my family)
3. I don't want my private data being exposed
4. I don't want my devices perform unwanted transactions with the Cloud
5. I don't want devices to be added to my network without my consent

keeping convenience…

Lowe's survey'14

57% of Americans prefer a DIY smart Home system

Fortune '15:

Consumers perspective on smart home system issues: *cost, interoperability, ease of installation*

Near Field Communication: Initiate interactions with a simple touch

Technology at a glance:

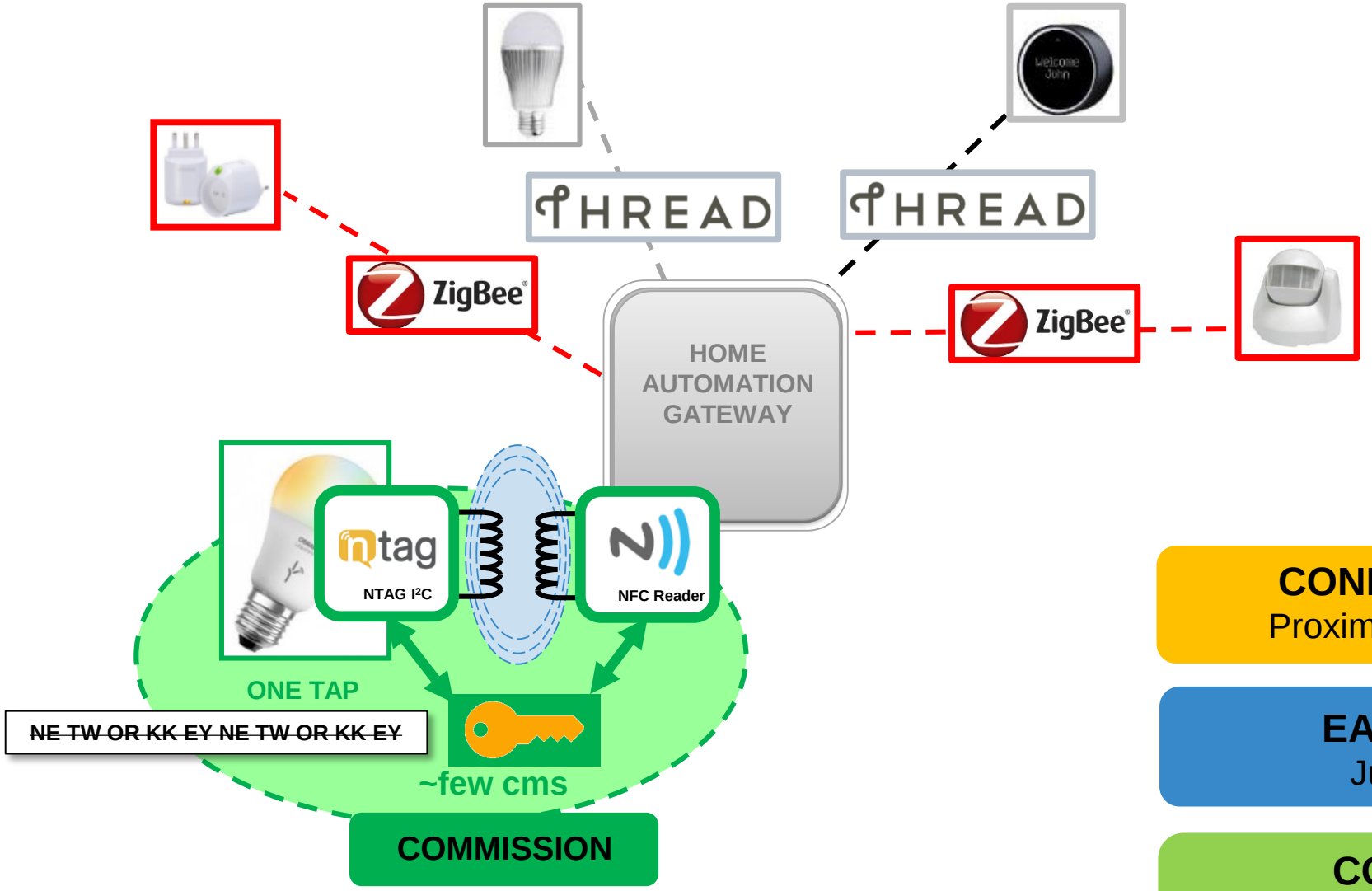
- Contactless proximity technology based on inductive coupling (10cm / 4 in)
- Operating frequency: 13.56 MHz
- Max. speed: 848 kbits/sec
- Co-developed by NXP and Sony
- Origins in payment and access control

Unique Benefits:

- Ease of use (“Tap to initiate an action”)
- Act of will
- Zero-power
- Highest Security

THE NFC COMMISSIONING SOLUTION

NFC one-tap solution *Use NFC as out-of-band commissioning*



CONFIDENTIALITY
Proximity vs. long range

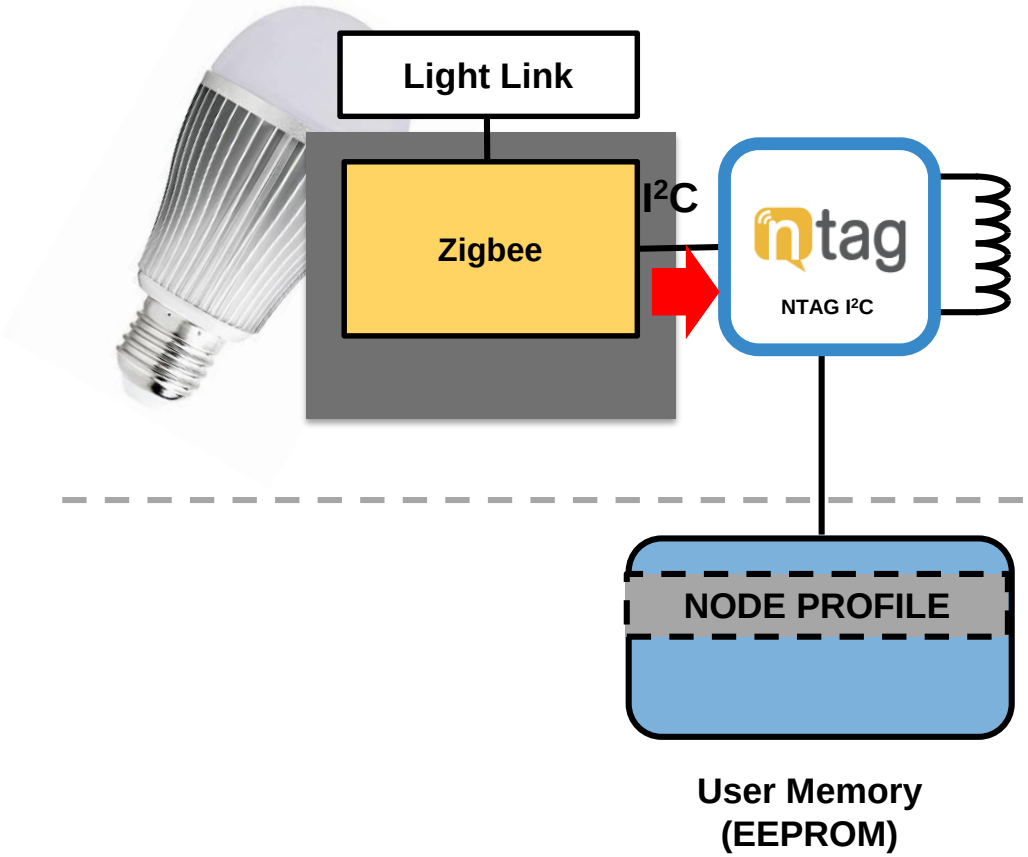
EASE of USE
Just one tap

CONVENIENCE
Any protocol
No power supply required

NFC COMMISSIONING STEP BY STEP

NFC commissioning concept (ZigBee example)

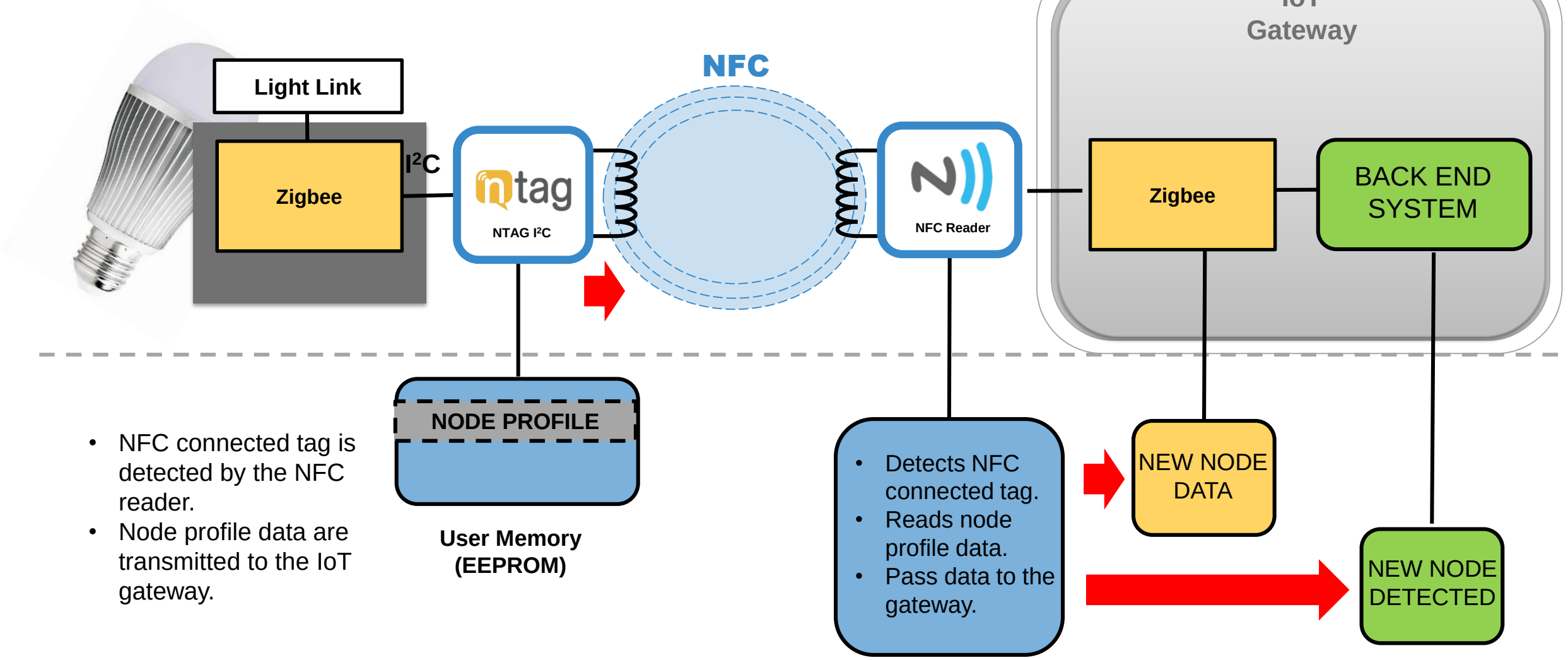
1. Node initialization



- Load node profile into the user memory of the NFC connected tag via I²C interface and the Zigbee module at manufacturing.
- Default profile being written by the node to the NTAG-I²C after powering the device.
- Can be locked to avoid profile change.
- Data format can follow the NFC forum standard (NDEF message).

NFC commissioning Concept

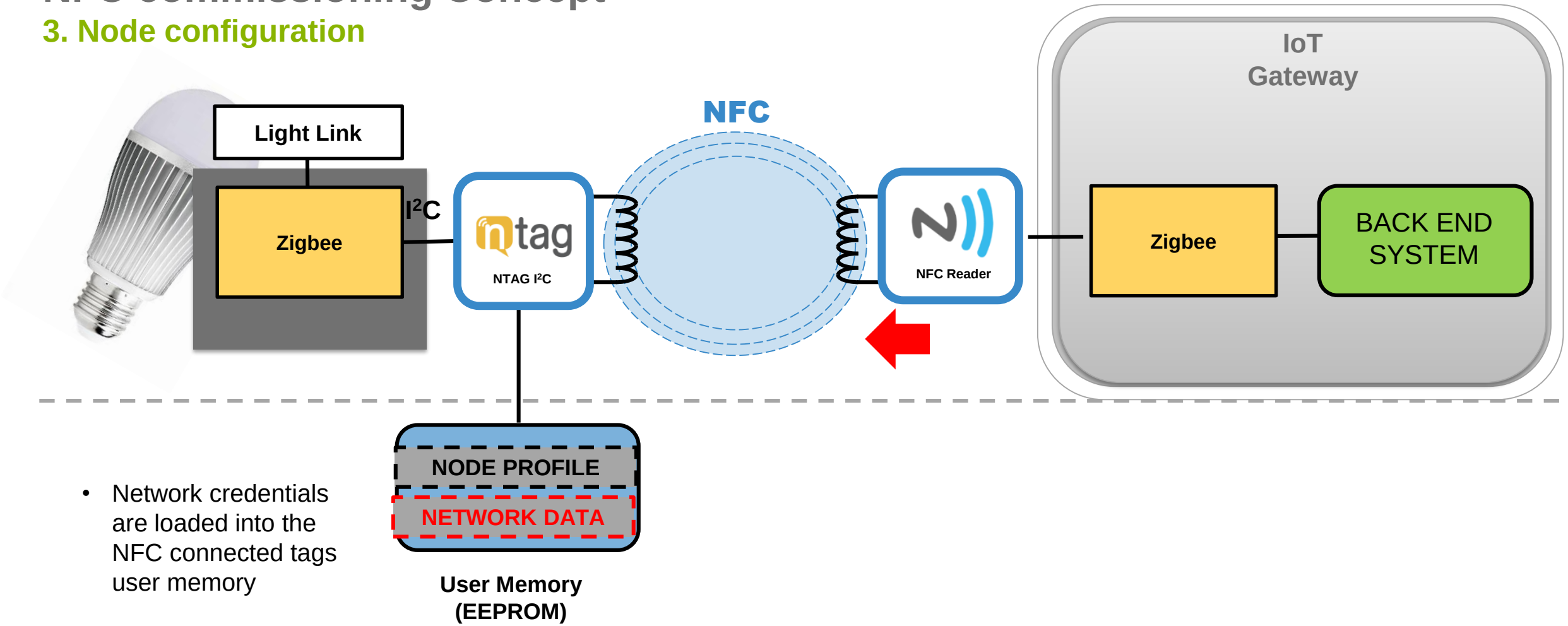
2. Node detection



- NFC connected tag is detected by the NFC reader.
- Node profile data are transmitted to the IoT gateway.

NFC commissioning Concept

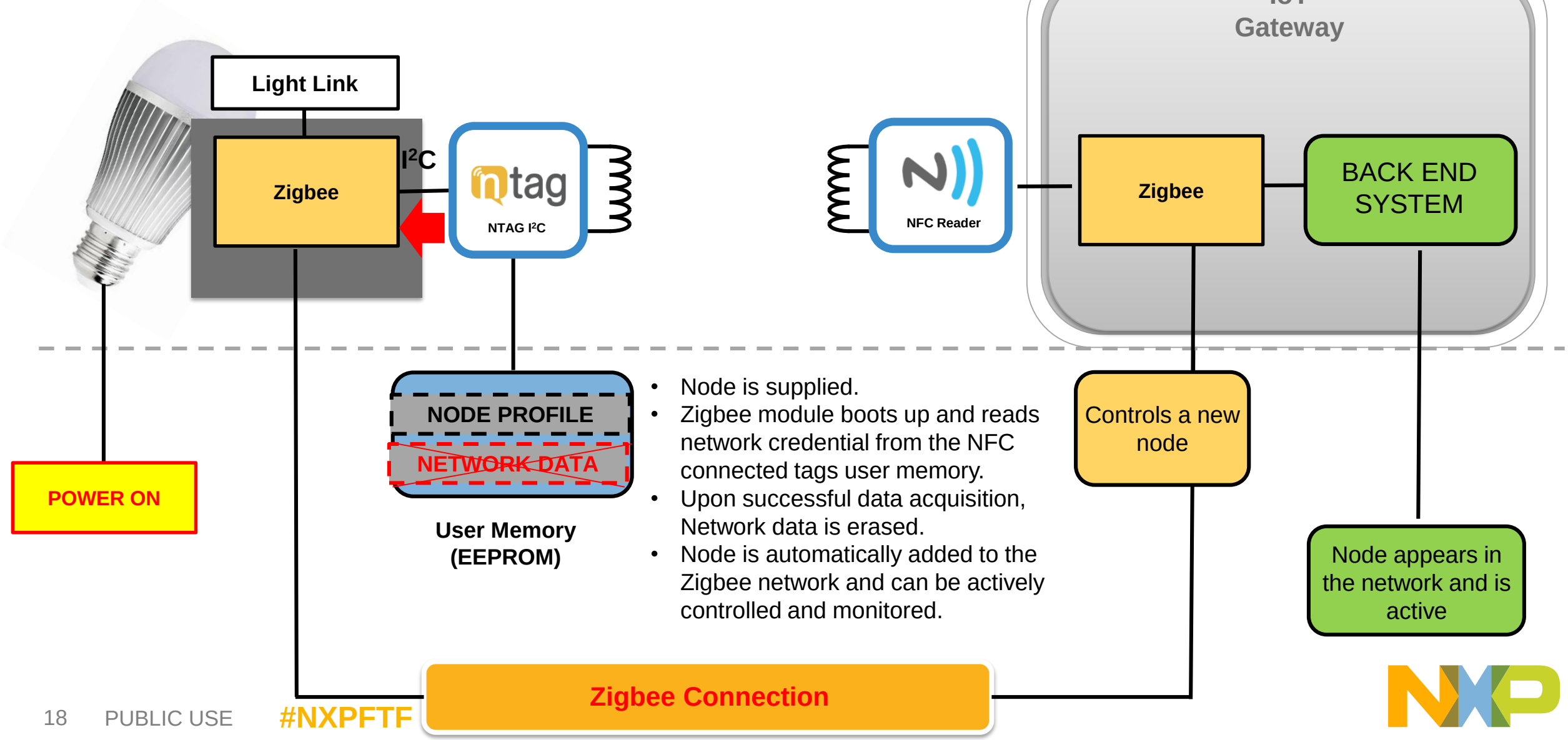
3. Node configuration



- Network credentials are loaded into the NFC connected tags user memory

NFC commissioning Concept

4. Node activation



- Node is supplied.
- Zigbee module boots up and reads network credential from the NFC connected tags user memory.
- Upon successful data acquisition, Network data is erased.
- Node is automatically added to the Zigbee network and can be actively controlled and monitored.

NFC one-touch commissioning

Easy, flexible, and protocol agnostic

- **Protocol & platform agnostics**
  - NFC supports any kind of protocol
  - NFC supported by a large population of smart phones and tablets
- **Easy**
  - No manual entry
  - Exchange network keys in one tap
- **Flexible**
  - No need for power supply for the nodes to exchange credentials
  - No direct network connection with the gateway required when powering the node for the first time – directly connecting to the network
  - Pre-configuration of the nodes possible (“in the box” customization)
- **Secure through proximity**
  - Network key exchange is done via proximity versus long range network
  - Can be further enhanced by secure element OTA connection

NFC one-touch commissioning

Benefits

MSOs / MNOs

- Increase end user satisfaction
- Limit technicians effort / after sales service
- Smooth bridging of multi network systems (e.g: WiFi with Zigbee)

OEMs/ODMs

- Ensure max interoperability with all existing standards
- Ease DIY kits adoption enabling retail distribution

End user

- Confidentiality through proximity
- Simple handling
- Plug & play set-up

ENABLEMENT

MODULES: JN516x RANGE

- **All modules include JN5168 chip plus support components**
  - Surface mountable on motherboards
- **Standard power modules**
  - With integrated printed antenna — 16x30mm — **JN5168-001-M00**
  - With uFl connector — 16x21mm — **JN5168-001-M03**
  - Medium power module — 16x30mm — **JN5168-001-M05**
    - uFl connector
    - +9.5dBm
  - High power module — 16x30mm — **JN5168-001-M06**
    - uFl connector
    - +22dBm
- **Modules with JN5169 will be available by end Q1’16**
- **Modules with JN5179 will be available by end Q2’16**
- **Module value proposition**
  - Fast time to market
  - Reduced support burden
  - Ready approved to FCC and EU regulations
  - No need for RF design resource for board and test design
  - Overall lowest cost of implementation up to 20-50ku

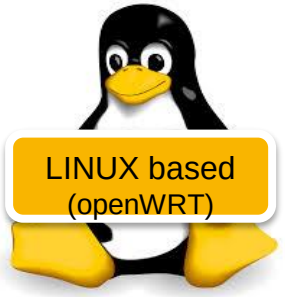
JN5168-001-M00

JN5168-001-M03

JN5168-001-M05 and M06

Evaluation Kit EK004
Hardware

- Easy development of ZigBee and IEEE802.15.4 applications with NFC
- All necessary hardware components to demonstrate, evaluate and develop ZigBee solution with NFC commissioning
- All firmware preloaded for both nodes and gateway



IoT Gateway

- Raspberry Pi
- NFC reader (PN7120)
- Wi-Fi USB dongle
- ZigBee USB dongle (JN5169)

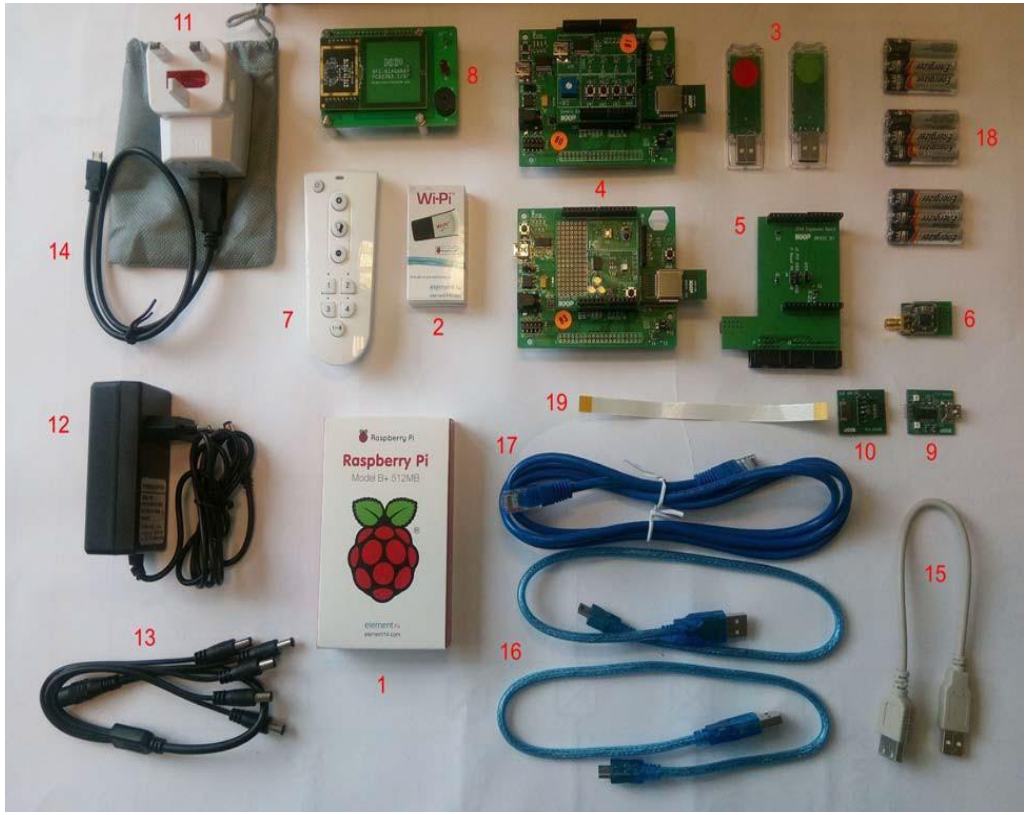
Smart node

- Generic PCBs with ZigBee module (JN5169) and NFC connected tag (NTAG I²C) including NFC antenna
  - Generic expansion board
  - Lighting/Sensor generic expansion board

Tools

- ZigBee remote control
- Cable for Power supply (gateway and nodes)
- Programming cables
- Ethernet cable
- SD card

Hardware Development Tools Overview



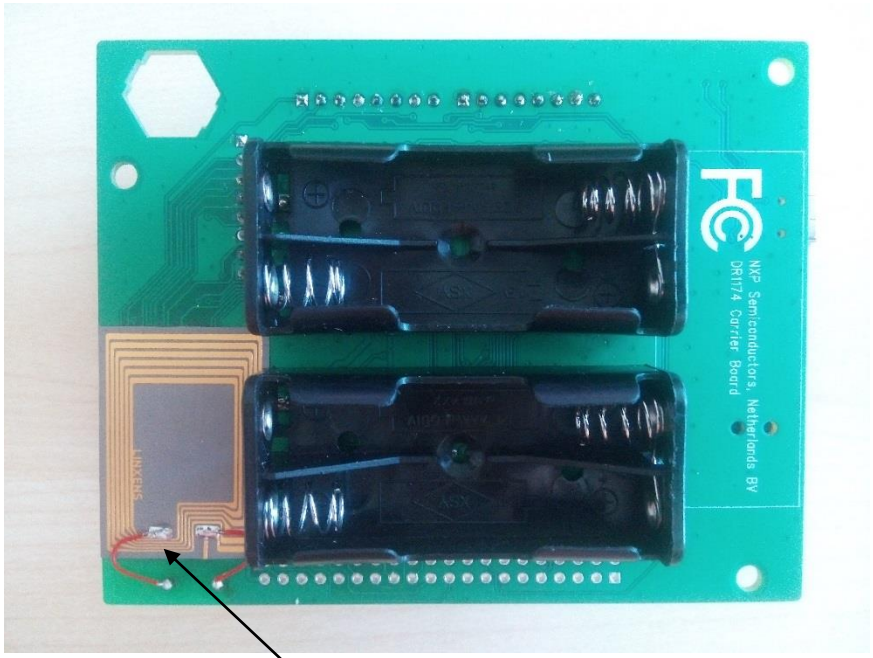
1. Raspberry Pi single-board computer
2. Wi-Pi Raspberry Pi 802.11n wireless adaptor
3. 2 JN5169 USB Dongles with integrated antenna
4. 2 Carrier Boards containing NFC tag
    1. one pre-fitted with a Generic Expansion Board (DR1199) and a JN5169 module with integrated antenna (JN5169-001-T00)
    2. one pre-fitted with a Lighting/Sensor Expansion Board (DR1175) and a JN5169 module with integrated antenna (JN5169-001-T00)
5. JTAG Expansion Board (DR1222)
6. JN5169 module with SMA connector
7. Leedarson Remote Control Unit based on JN5168 wireless microcontroller
8. NXP PN7120 NFC Controller Board with Raspberry Pi Interface Board
9. USB Programming Dongle (DR1128) for Remote Control Unit
11. 5V DC power supply unit (universal type) with USB ports for Raspberry Pi
12. 12V DC power supply unit (universal type) for Carrier Boards
13. 5-way 2.1mm daisy-chain power extender-cable (for use with Carrier Boards)
14. ‘USB to Micro USB’ cable (for powering Raspberry Pi from 5V PSU)
15. 'USB to USB' extension cable (for use with Wi-Pi adaptor)
16. 2 'USB A to Mini B' cables
17. RJ45 Ethernet cable
18. 3 packs of AAA batteries
19. 8-wire flex foil for use with Programming Adaptor

S

Hardware Development Tools Overview

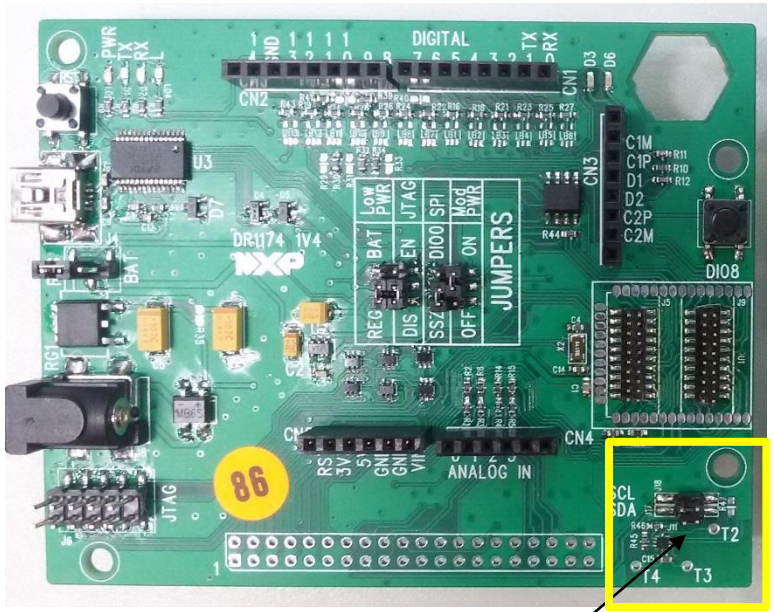
- DK4 board (DR1174_NFCtag)

Bottom view



NFC antenna

TOP view



NTAG I²C NT3H1101

Hardware Development Tools Overview

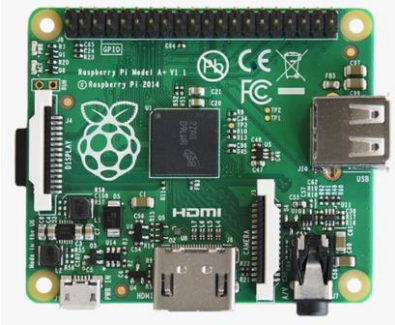
Raspberry Pi + NFC reader (new PN7120)

USB dongle control bridge Zigbee

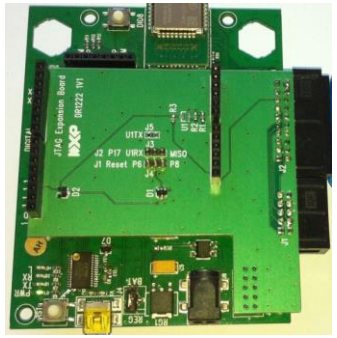
Wifi Dongle

Hardware Development Tools Overview

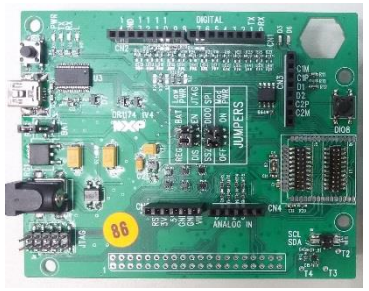
Raspberry
Pi gateway



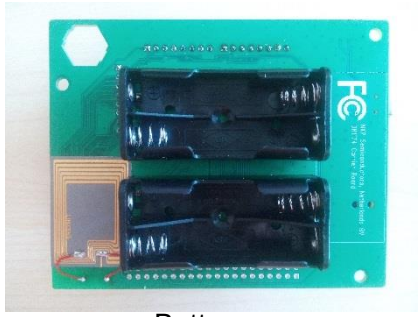
JTAG adaptator
DR1222



2 x Carrier Board DR1174 + NFC TAG I2C
NFC antenna sticker on PCB



TOP



Bottom

Generic board
DR1199

Lighting/Sensor
DR1175

module SMA
DR1185

2 module MO0
DR1178

PN7120 NFC kit

USB Dongle – DR1198

Sniffer Dongle – DR1198

Wireless Modules for Smart Lighting

White & Tunable White lamps 1 & 2 channel radio board

Radio-only

OM15008 module

(18x17mm excl. antenna)

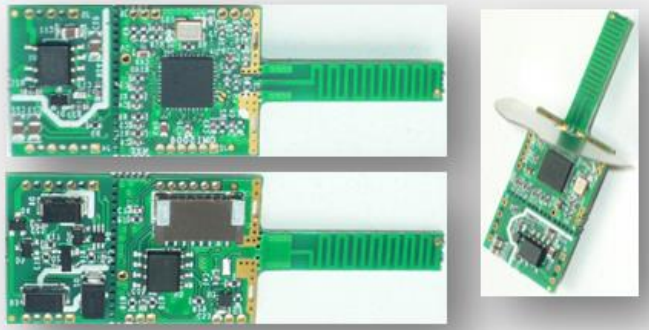
- For low cost ref designs
- JN5168, 2 PWM channels, can be low pass filtered for analog dimmable drivers
- 28 components, e-BOM ~1.4$
- optional serial-flash, NFC-tag & program connector (+23 components)

Radio & radio supply

OM15006 module

(18x29mm excl. antenna)

- For low standby power ref designs, like DR1192 but with TEA1721 buck converter
- 52 components, e-BOM ~1.8$
- same options as OM15006 (+23 components)

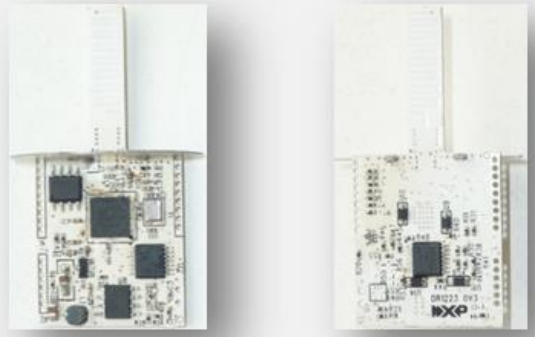


RGB & RGBW lamps 3 & 4 channel radio board

Radio & radio supply

DR1223 module

- JN5168, 4 PWM channels, 4 ADCs, 20V-to-3V DCDC supply, sensorless sensing circuit and PCB antenna
- several GPIOs for optional lamp features, DALI & DMX
- optional serial-flash and NFC-tag
- 78 components including options

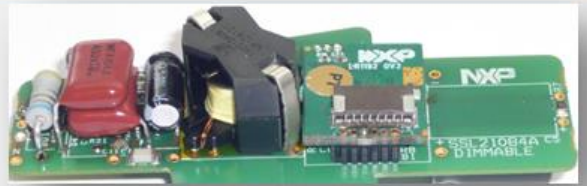


LED Driver Boards

White LED lamps

Low standby power, non-isolated
SLN44 & 43 (120V & 230V)
e-BOM LSB / lamp ~1.1$ / 2.9$

Low cost, non-isolated Gen2
SLN38 (230V, 120V also possible)
e-BOM LSB / lamp ~1.2$ / 2.5$



Low cost, isolated Gen2
SLN32 & 35 (120V & 230V)
e-BOM LSB / lamp ~1.4$ / 2.7$

Tunable White

Warm-Dim: NXP patented circuit added to LED plate, fits with all white LED lamp ref designs. SLN42 LED plate ref design

e-BOM adder
WD-circuit <0.20$

Color Changeable TW Gen2: NXP patented circuit fits with all white lamp ref designs. Eg: low cost, isolated SLN45 & 49 (120V & 230V) with SLN46 LED plate ref design. e-BOM adder CCTW-circuit ~0.20$

RGB (W) Lamps

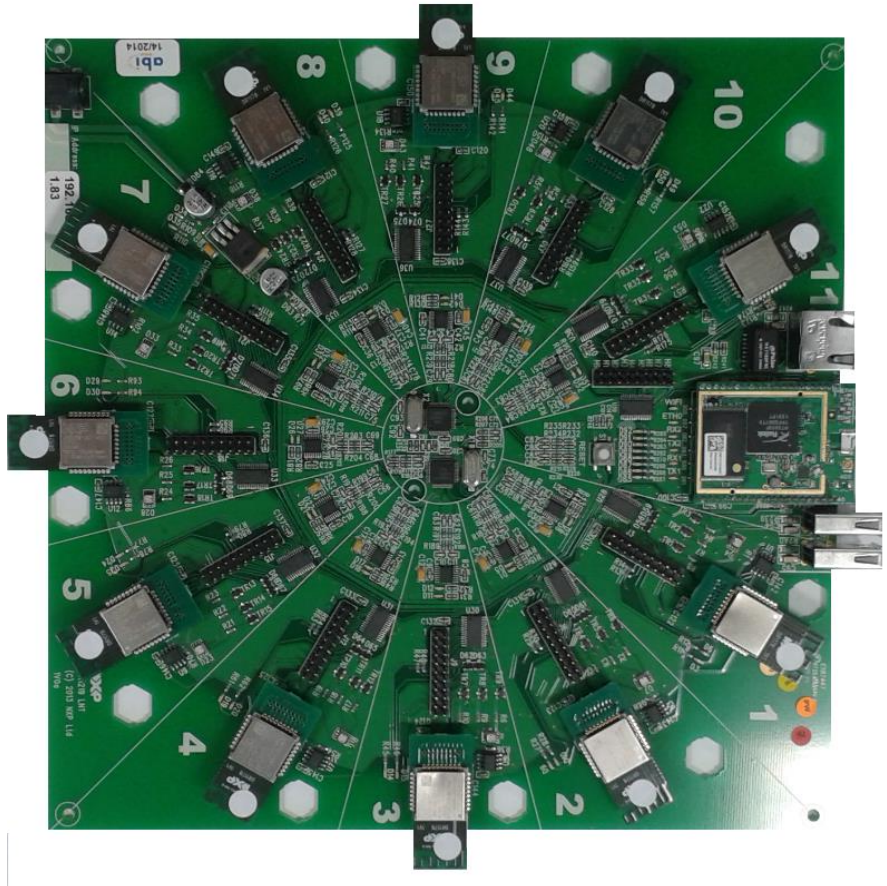
Low cost, isolated, high power: NXP patented sensor-less sensing technology enables superior color control, thermal management and very short calibration times.
SLN53 (120V & 230V) with
SLN54 LED plate ref design

ZigBee HA / ZLL / ZigBee 3.0 Large Network Testing (LNT)

- ZigBee Certification is a small component within our device verification
- Verification Components
  - Unit Tests
  - Stack Regression
  - Cluster Regression
  - LNT

  R&D Activity

  - Application Acceptance
- The current benchmark for the ZigBee LNT is ~250 nodes
  - This the SDK benchmark, not the maximum



WIRELESS PRODUCT PORTFOLIO

ZigBee | THREAD

JN5169

Low power, High Performance 802.15.4 wireless microcontroller

32b RISC @32MHz
32kB RAM
512kB flash
Tx Power +10dBm
Rx Sensitivity -96dBm
Tx 23.3mA, Rx 14.7mA
QFN40 6x6mm
Tamb -40°C / +125°C

Development Kit

HA and lighting integrating **easy and secure NFC** commissioning

Modules

NXP Modules

Target Applications

HBA, Lighting., Smart meters
Energy metering

Availability

Now

JN5174/78/79

Low power, High Performance 802.15.4 wireless microcontroller

Cortex M3 @32MHz
32kB RAM,
160/256/512kB flash
Tx Power +10dBm
Rx Sensitivity -96dBm
Tx 22.5mA, Rx 14.8mA
QFN40 6x6mm
Tamb -40°C / +125°C

Development Kit

HA and lighting integrating **easy and secure NFC commissioning**

Modules

NXP Modules

Target Applications

HBA and Lighting

Availability

Sampling Now
Full Release June 2016

KW2xD

High Performance 802.15.4 wireless microcontroller

Cortex M4 @50MHz
64kB RAM,
512kB flash
Tx Power +8dBm
Rx Sensitivity -102dBm
Dual-PAN, Antenna Div.
Tx 19mA, Rx 17mA
LGA 8x8mm
Tamb -40°C / +85°C

Development Kit

FRDM, USB Dev Boards

Modules

From Partners

Target Applications

Home and Building Automation

Availability

Now

KW21Z

Very Low power, High Performance 802.15.4 wireless microcontroller

Cortex M0+ @48MHz
128kB RAM,
512kB flash
Tx Power +4dBm
Rx Sensitivity -101dBm
Dual-PAN, Antenna Div.
Tx 6.5mA, Rx 6.5mA
QFN 7x7mm, WLCSP
Tamb -40°C / +105°C

Development Kit

FRDM, USB Dev Boards

Modules

From Partners

Target Applications

Home and Building Automation

Availability

Sampling April 2016
Full Release Sept 2016

Bluetooth SMART

KW31Z

Very Low power, High Performance BLE 4.2 wireless microcontroller

Cortex M0+ @48MHz
128kB RAM,
512kB flash
Tx Power +4dBm
Rx Sensitivity -96dBm
TRNG
Buck Boost DC/DC from 0.9V to 4.2V
Tx 6,5mA,Rx 6,5mA,
QFN 7x7mm, **WLCSP**
Tamb -40°C / +105°C

Development Kit

FRDM, USB Dev Boards

Modules

From Partners

Target Applications

Secure BLE applications, Home Automation

Availability

Sampling April 2016
Full Release Sept 2016

QN9080

Ultra Low Power, High Performance BLE 4.2 wireless microcontroller

Cortex M4 **with FPU**
128kB RAM,256kB ROM
512kB flash
Tx Power +2dBm
Rx S -95dBm w/o DC-DC
Rx S -93dBm w/ DC-DC
Tx 3.4mA, Rx 3.6mA,
ADC: 14 ENOB @ 32 kHz
Fusion Sensor processor
QFN 6x6mm, **WLCSP**
Tamb -40°C / +105°C

Development Kit

EVB, miniDK

Modules

To be defined

Target Applications

Watches and wristband

Availability

Q1 2017

ZigBee | THREAD | Bluetooth SMART

KW41Z

Very Low power, High Perfs '15.4 / BLE 4.2 wireless microcontroller

Cortex M0+ @48MHz
128kB RAM,
512kB flash
Tx Power +4dBm
TH Rx Sens -101dBm
BLE Rx Sens -96dBm
Dual-PAN, Antenna Div.
Tx 6.5mA, Rx 6.5mA,
QFN 7x7mm, **WLCSP**
Tamb -40°C / +105°C

Development Kit

FRDM, USB Dev Boards

Modules

From Partners

Target Applications

Home and Building Automation

Availability

Sampling April 2016
Full Release Sept 2016

JN5180

Ultro Low power, High Perfs '15.4 / BLE 5.0 wireless microcontroller

Dual Cortex M4 @48MHz
Integrated NFC
152kB RAM,
640kB flash
Tx Power +10dBm
TH Rx Sens -101dBm
BLE Rx Sens -96dBm
Dual-PAN, Antenna Div.
Tx 17mA, Rx 3.5mA,
QFN 6x6mm, 4x4mm
Tamb -40°C / +125°C

Development Kit

HA &Lighting dev Kit

Modules

NXP modules

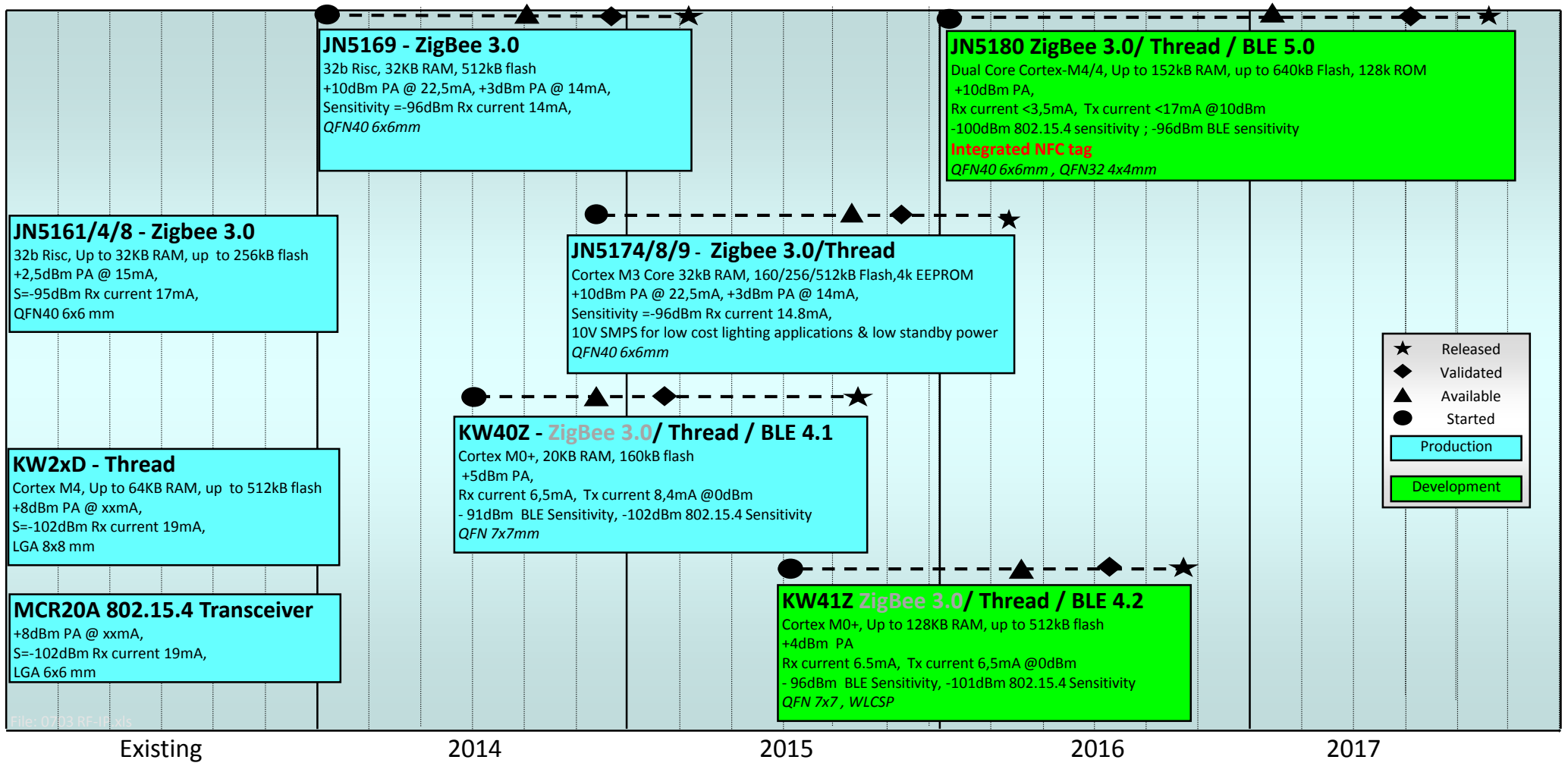
Target Applications

Home and Building Automation

Availability

Sampling Q1 2017
Full Release Q4 2017

ZigBee/Thread/BLE SoC Roadmap



ZigBee 3.0 Requires ZigBee PRO Stack R21

- NXP has R21 certified Zigbee PRO Stack
- Sleepy child maintenance – previously vendor/application specific
- New protection for the Trust Centre Link key
- Removed mandatory support for ‘End Device Bind Server’
- Removed optional support for ‘Network Layer Multicast

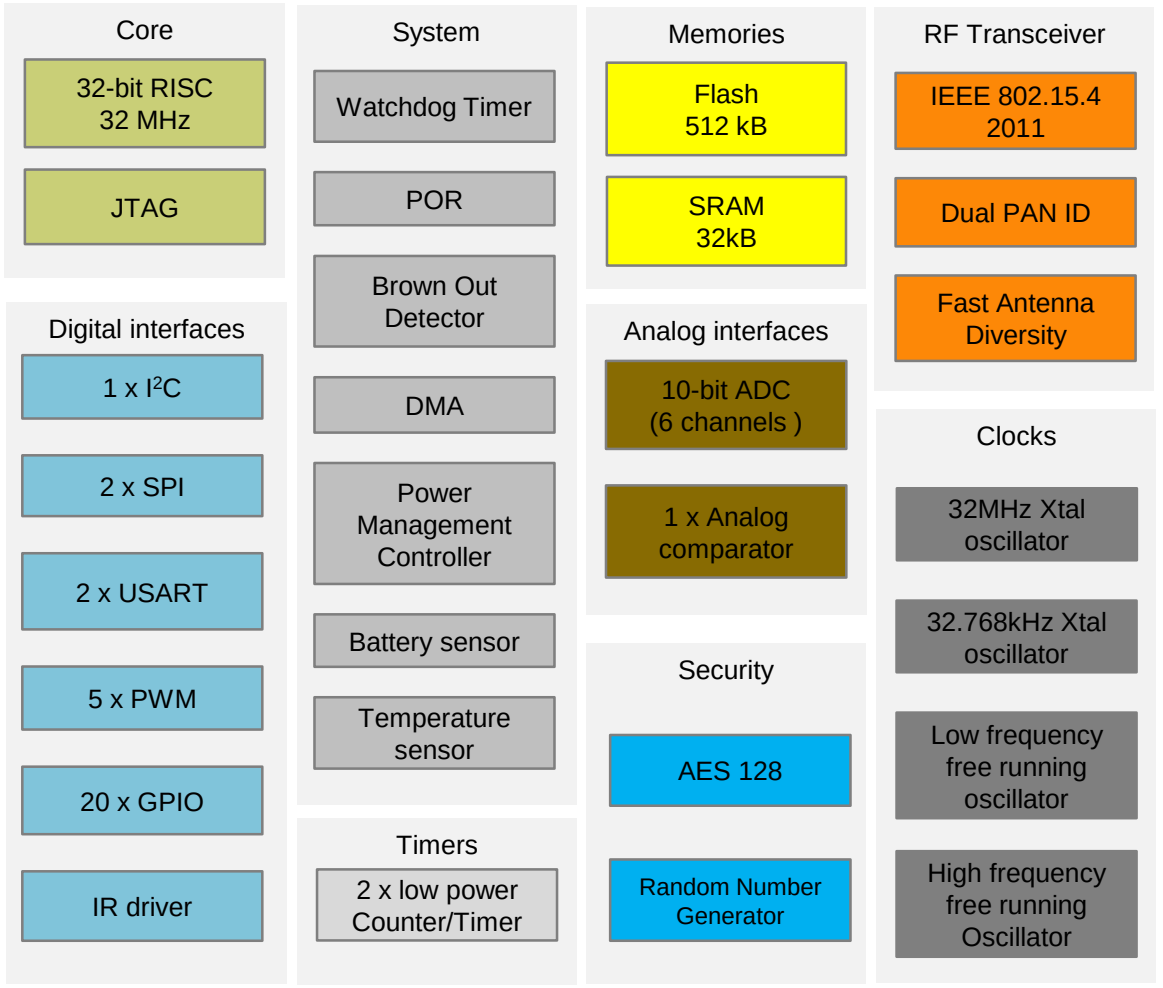
802.15.4 WIRELESS MICROCONTROLLER

SECURE CONNECTIONS FOR A SMARTER WORLD

JN5169 Block Diagram

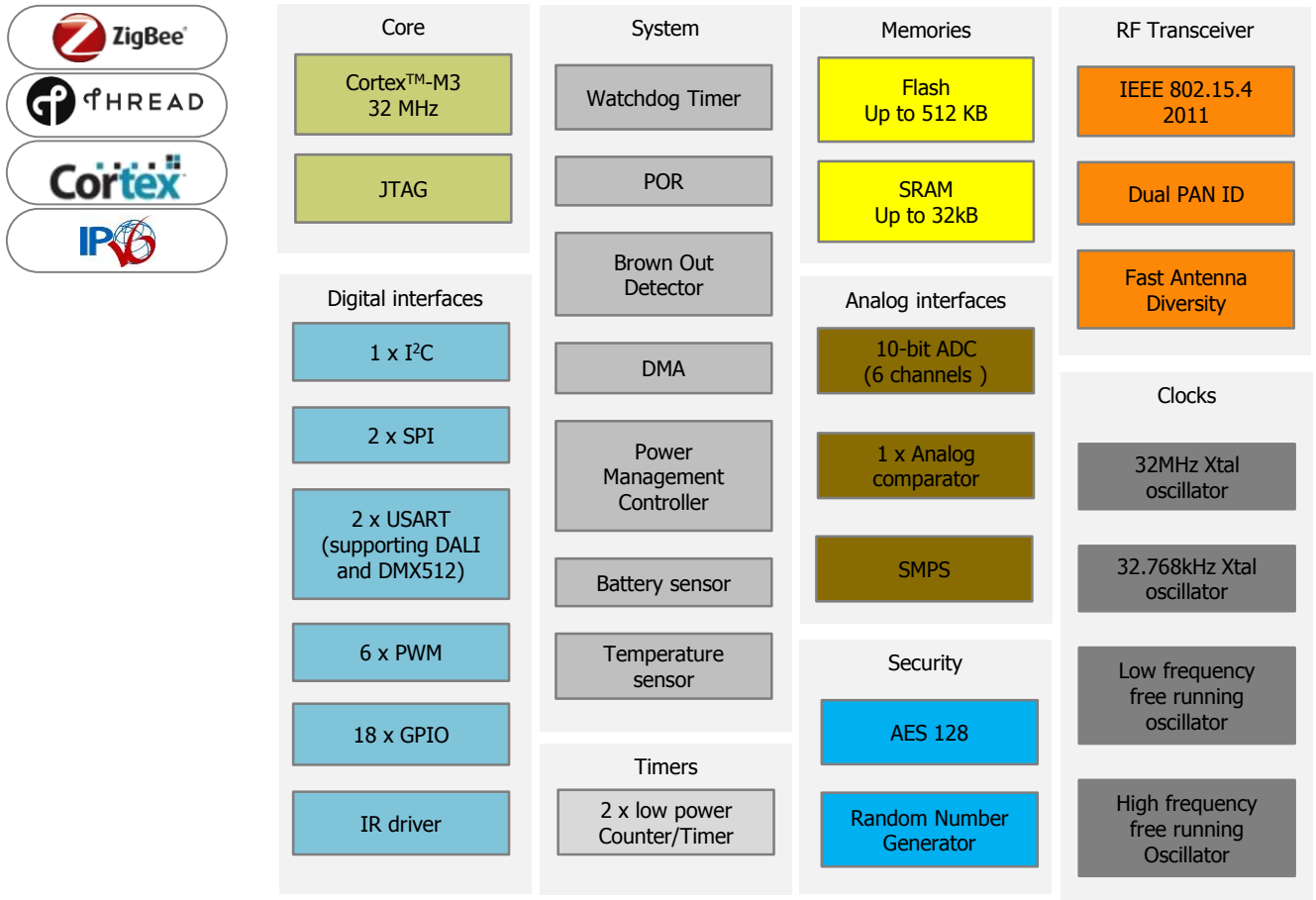
32-bit RISC, 512 kB Flash / 32 kB RAM, Integrated PA

- **CPU**
  - 32 MHz, 32-bit RISC CPU core
  - 512 kB Flash & 32kB RAM & 4KB EEPROM
- **2.4 GHz radio transceiver**
  - IEEE-802.15.4 compliant
  - Antenna diversity
  - +10 dBm power amplifier
  - -96 dBm RX sensitivity
  - Peak typical current:
    - 23.3mA TX @ +10dBm, 14mA @ +3dBm
    - 14.7mA RX
- **Security**
  - Crypto engine: AES 128-256, RNG
- **System**
  - USART, SPI, I²C, PWM, IR
  - 10-bit ADC, Analog Comparator
  - Battery operating range: 2.0V to 3.6V,
  - Ambient temperature : -40°C to +125°C
  - HVQFN40 6x6mm



JN517x: Wireless MCU

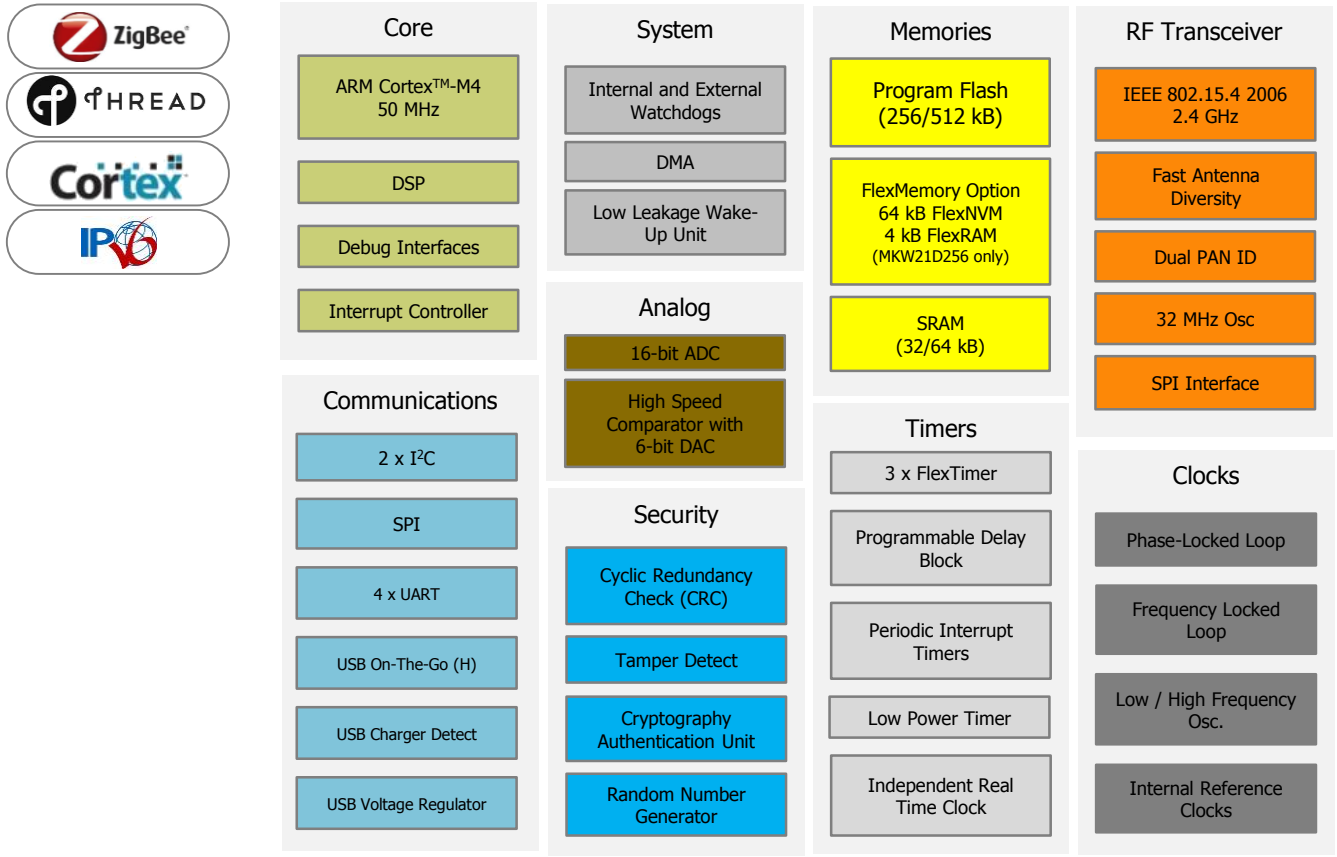
- **CPU**
  - 32 MHz ARM Cortex-M3 core
  - Up to 512 KB Flash & up to 32 KB RAM & 4KB EEPROM
- **2.4 GHz radio transceiver**
  - IEEE-802.15.4 2011 compliant
  - Dual PAN support
  - Antenna diversity
  - +10 dBm power amplifier
  - -96 dBm RX sensitivity
  - Peak typical current:
    - 22.5mA TX @ +10dBm, 14mA @ +3dBm
    - 14.8mA RX
- **Security**
  - Crypto engine: AES 128, RNG
- **System**
  - Ambient temperature: -40°C to +125°C
  - HVQFN40 6x6 mm



KW21D/22D/24D/ Block Diagram

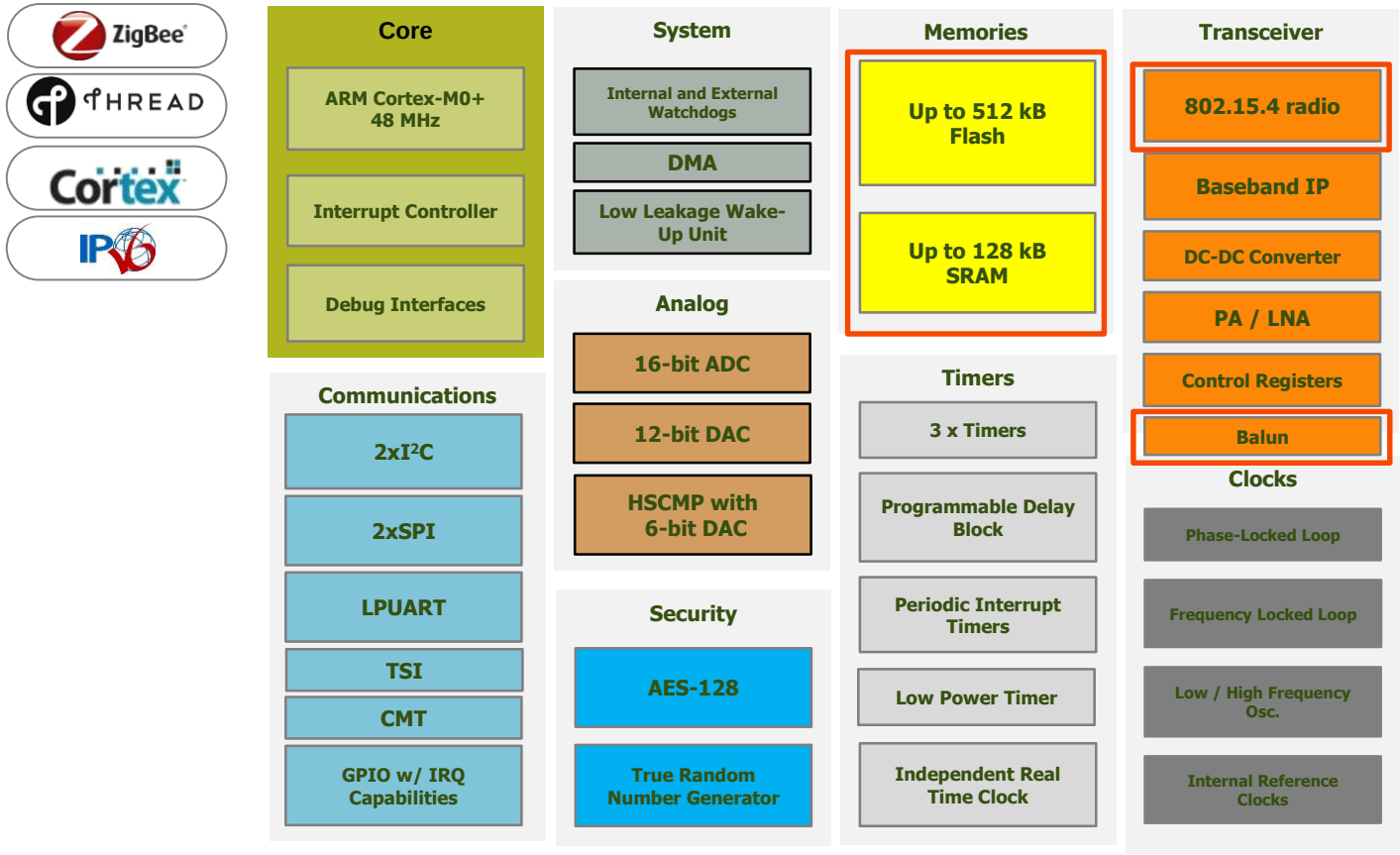
Cortex M4, 256/512/512 kB Flash - 32/64/64 kB RAM

- **CPU**
  - 50 MHz ARM Cortex-M4 core
  - Up to 512 kB Flash & up to 64 kB RAM
- **2.4 GHz radio transceiver**
  - IEEE-802.15.4 2011 compliant
  - Dual personal area network (PAN) support in hardware
    - Run two RF networks simultaneously
  - Antenna diversity with automatic antenna selection
  - +8 dBm power amplifier
  - -102 dBm RX sensitivity
  - Peak typical current:
    - 17mA TX @ +0dBm
    - 19mA RX
- **Security**
  - Active and passive tamper detection with RTC timestamp
  - Crypto engine: DES, 3DES, AES 128-256, SHA-1, SHA-256, MD5, RNG
- **System**
  - Operating range: 1.8 V to 3.6 V
  - Ambient temperature: -40°C to +105°C
  - LGA 8x8 mm



KW21Z

- **CPU**
  - 48 MHz ARM Cortex-M0+ core
  - Up to 512 kB Flash & 128 kB RAM
- **2.4 GHz radio transceiver**
  - IEEE-802.15.4 2011 compliant
  - Dual PAN & Antenna diversity support
  - Programmable output power : -30 to +4 dBm
  - -101 dBm RX sensitivity (IEEE 802.15.4)
  - Peak typical current: 6.5mA TX @+0dBm and 6.5mA RX with DC/DC activated
  - Integrated balun (~9% board area saving)
- **Security**
  - Crypto engine: AES-128, TRNG
- **System**
  - Buck Boost DC/DC working from 0.9V to 4.2V
  - Ambient temperature: -40°C to +105°C
  - QFN 7x7mm, WLCSP

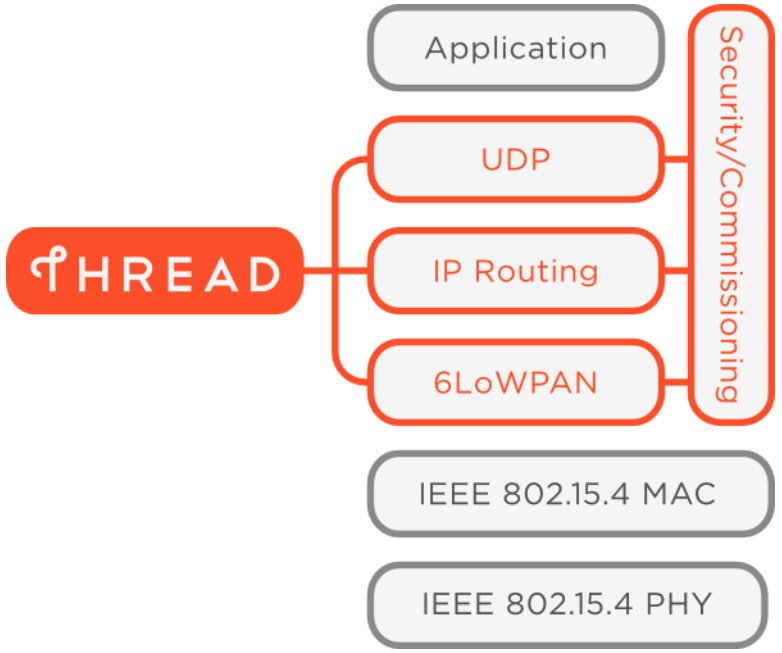


Thread

- A secure wireless mesh network for your home and its connected products
  - Built on well-proven, existing technologies
    - Runs on existing 802.15.4 silicon
    - Uses 6LoWPAN with IPv6 addressing
    - UDP Transport
  - New mandatory security architecture
  - Simple and secure to add / remove products
  - Scalable to 250+ products per network
  - Designed for very low power operation
  - Reliable for critical infrastructure

THREAD

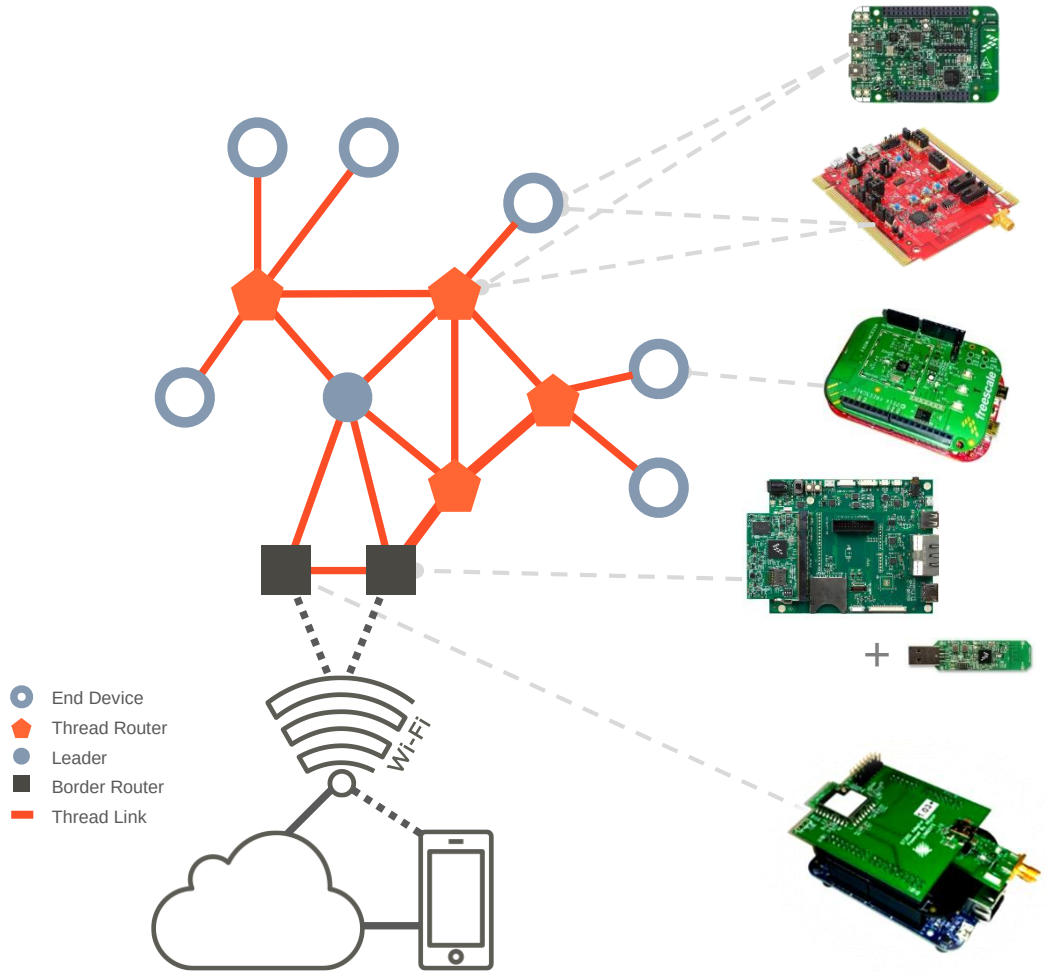
Can support many popular
application layer protocols and platforms



A software upgrade can add Thread to currently
shipping 802.15.4 products

Thread Specification is available to Thread Group members

NXP’s Thread Offering



NXP Kinetis KW2xD
Mesh Network Router / End Device
Thread and IEEE 802.15.4 compliant
Tower Board and Freedom Board coming up soon
Runs FreeRTOS and MQX for Kinetis SDK

NXP Kinetis KL46 + MCR20A Transceiver
Mesh Network End Device
Thread and IEEE 802.15.4 compliant
Freedom Board format
Runs FreeRTOS and MQX for Kinetis SDK

NXP i.MX6 UltraLite EVK
NXP Kinetis KW2xD USB
Border Router / Cloud gateway
Provides IP data routing and infrastructure integration
Runs Linux operating system

NXP Kinetis K64F + MCR20A Transceiver
Border Router with Ethernet support
Thread and IEEE 802.15.4 compliant
Freedom Board format
Runs FreeRTOS and MQX for Kinetis SDK

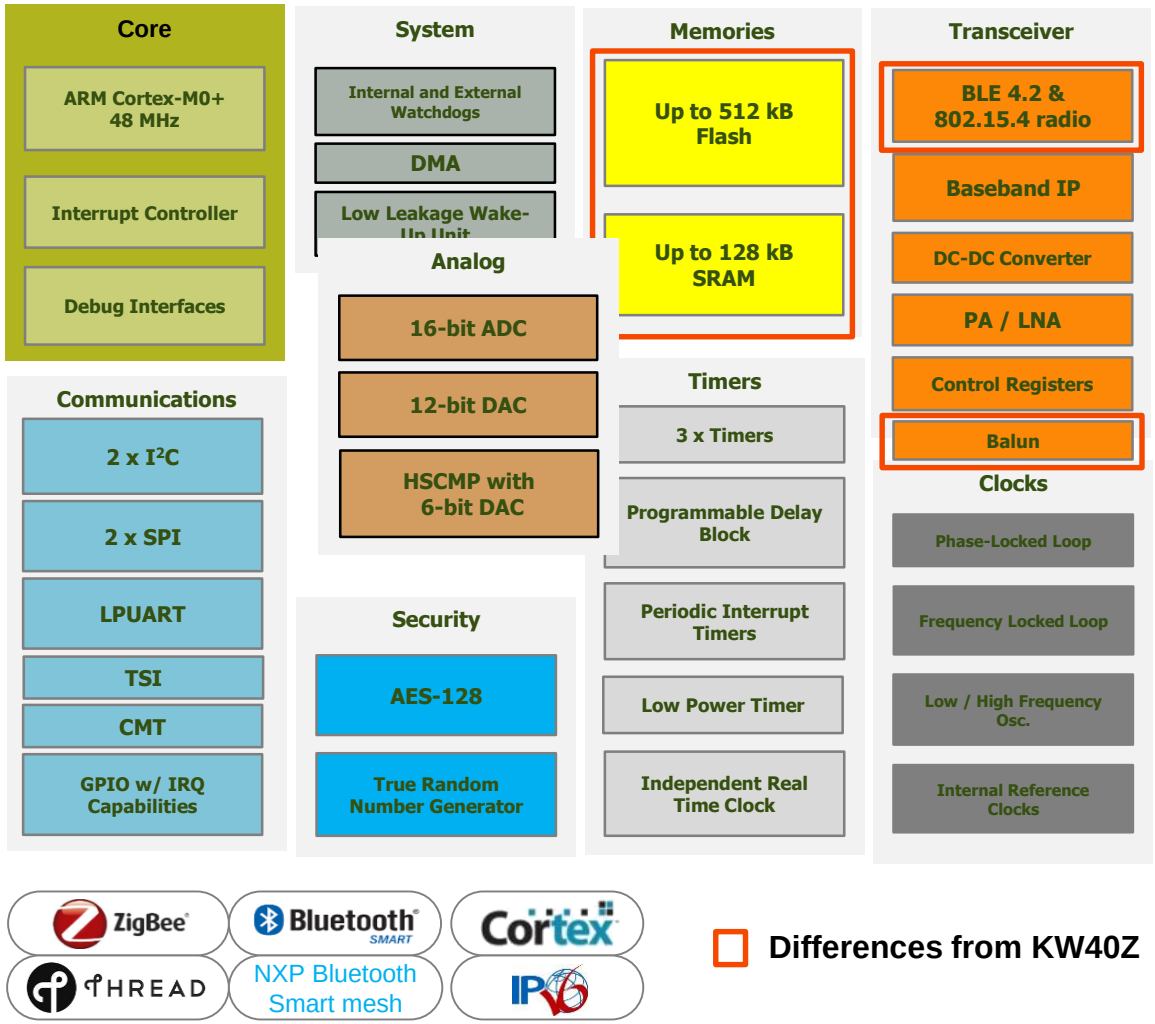
COMBO 802.15.4/BLE WIRELESS MICROCONTROLLER

NXP

SECURE CONNECTIONS FOR A SMARTER WORLD

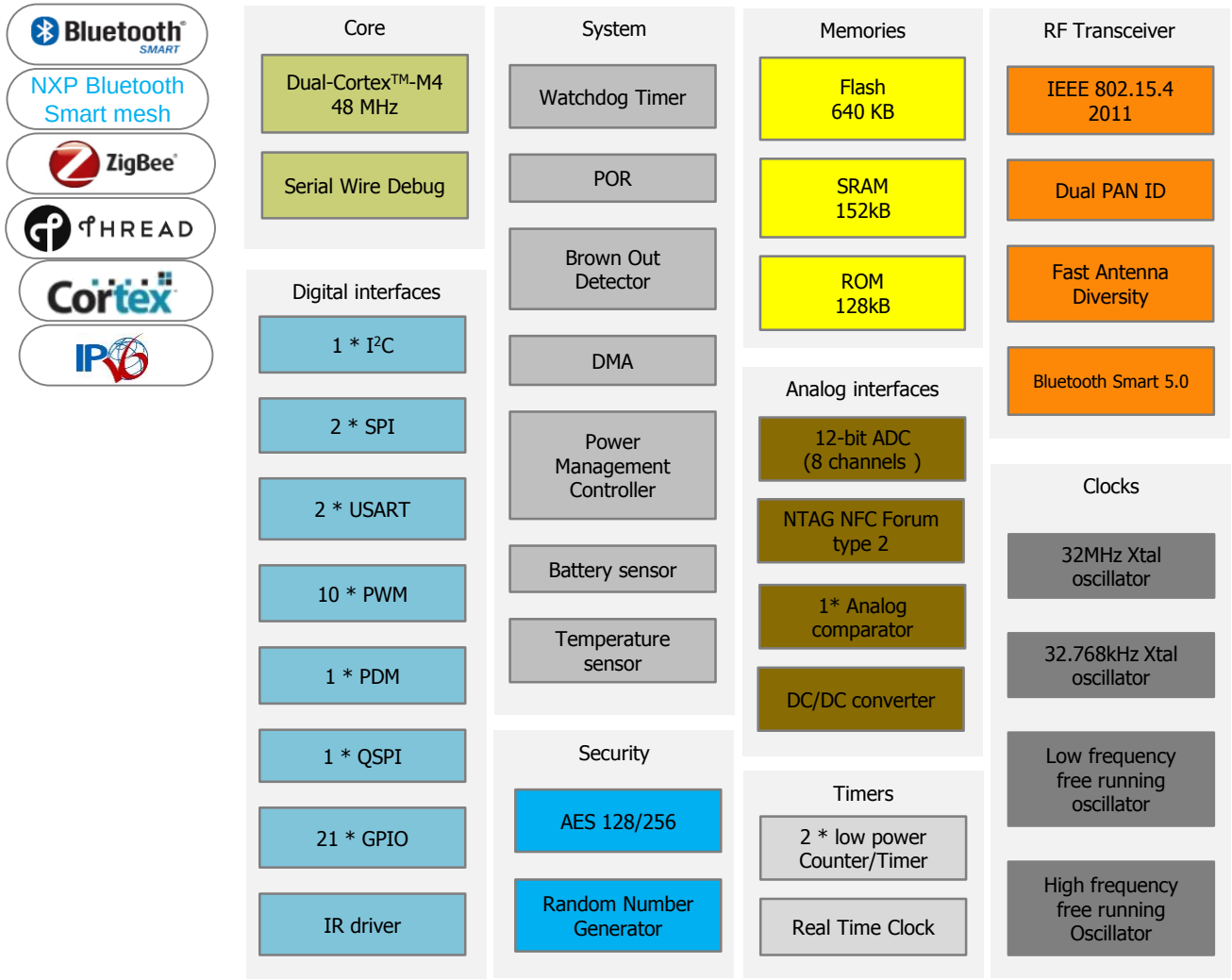
KW41Z

- **CPU**
  - 48 MHz ARM Cortex-M0+ core
  - Up to 512 kB Flash & 128 kB RAM
- **2.4 GHz radio transceiver**
  - IEEE-802.15.4 2011 compliant
  - Dual PAN & Antenna diversity support
  - Bluetooth Smart 4.2 compliant
  - Programmable output power : -30 to +4 dBm
  - -101 dBm RX sensitivity (IEEE 802.15.4)
  - -96 dBm RX sensitivity (Bluetooth Smart)
  - Peak typical current: 6.5mA TX @+0dBm and 6.5mA RX with DC/DC activated
  - IEEE 802.15.4 & Bluetooth Smart concurrent mode supported
  - Integrated balun (~9% board area saving)
- **Security**
  - Crypto engine: AES-128, TRNG
- **System**
  - Buck Boost DC/DC working from 0.9V to 4.2V
  - Ambient temperature: -40°C to +105°C
  - QFN 7x7mm, WLCSP



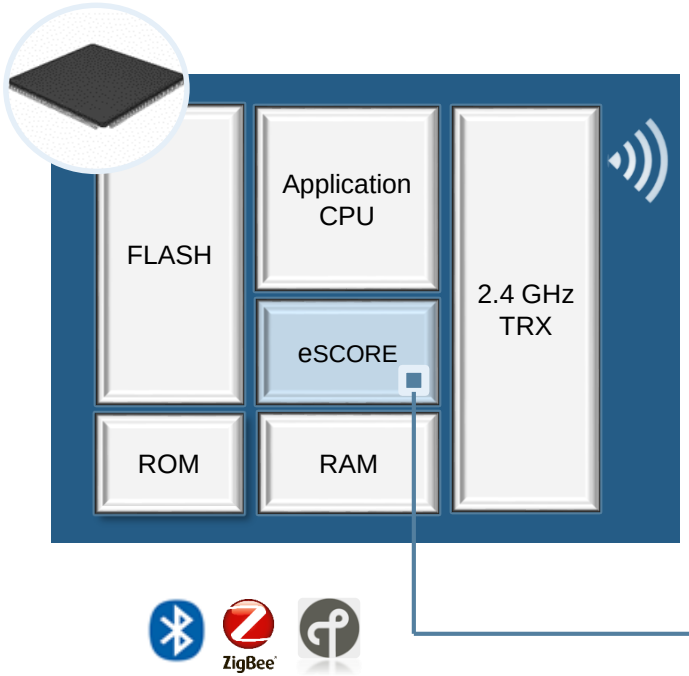
JN518x: Wireless MCU

- **CPU**
  - 48 MHz ARM Dual-Cortex-M4 core, up to 640 KB Flash & 152 KB RAM
- **2.4 GHz radio transceiver**
  - IEEE-802.15.4 2011 compliant
  - Dual PAN support
  - Antenna diversity
  - Bluetooth Smart 5.0 compliant
  - Programmable power amplifier: +10 dBm TX output power, 35dB dynamic
  - -100 dBm RX sensitivity (IEEE 802.15.4)
  - -96 dBm RX sensitivity (Bluetooth Smart)
  - Peak typical current: 17mA TX @+10dBm and 3mA RX
  - IEEE 802.15.4 & Bluetooth Smart **concurrent mode** supported
- **Security**
  - Crypto engine: AES 128-256, RNG,
  - Embedded Security Core : eScore
- **System**
  - Ambient temperature: -40°C to +125°C
  - HVQFN40 6x6mm, HVQFN32 4x4



Embedded Security Core (eSCORE) for JN518x

- Isolated Security Core (Cortex M4) with dedicated memories
- High Performance & Flexibility
- Resistance against remote SW attacks



Integrated HW Trust Anchor: Key Benefits of eSCORE

High performance device pairing (<2.0 sec) and connection (<100 ms) associated with **integrated protection** of pairing keys as recommended by Apple for accessories

Protection of IP-based Home Networks **against Cloud attacks** (hardware isolation from connectivity stacks, **platform security**)

No exposure of network keys and pairing passwords

Clear isolation of security functionality leading to **easy certification** of solutions for different ecosystems (Apple, Google, etc) and **proven security** (certification)

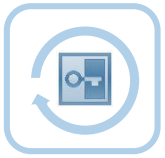
Independent Embedded Security Guard enabling direct security services to Smart Home Service Providers (e.g. security analytics, feature activation, device commissioning, etc); parallel execution to Application Processor.

Security SW on Wireless MCU (and eSCORE)

Verification of Firmware upgrades (signature) sent Over the Air & secure boot to prevent loading of unauthorized/compromised SW.

Secure administration and configuration of devices with mechanisms of back-up and recovery of settings, single sign-on; Associated phone App.

Role based and Time based Access Control to devices, network type agnostic (prevent a bulb deactivating a security door sensor!); End-to-End security pairing Phone-Device.



Secure Management of network keys to prevent unauthorized recommissioning of devices (network key rotation management)

Security Analytics Agent monitoring executed SW and platform, network & application behaviors

Security IC

Binding Devices to Services and Ecosystems

Trusted connection to Cloud with secure transport of service enrollment keys across supply chain (protection of Cloud Servers)

Protection of brand, business models and system integrity thru tamper resistant IC certifying device origin and user experience

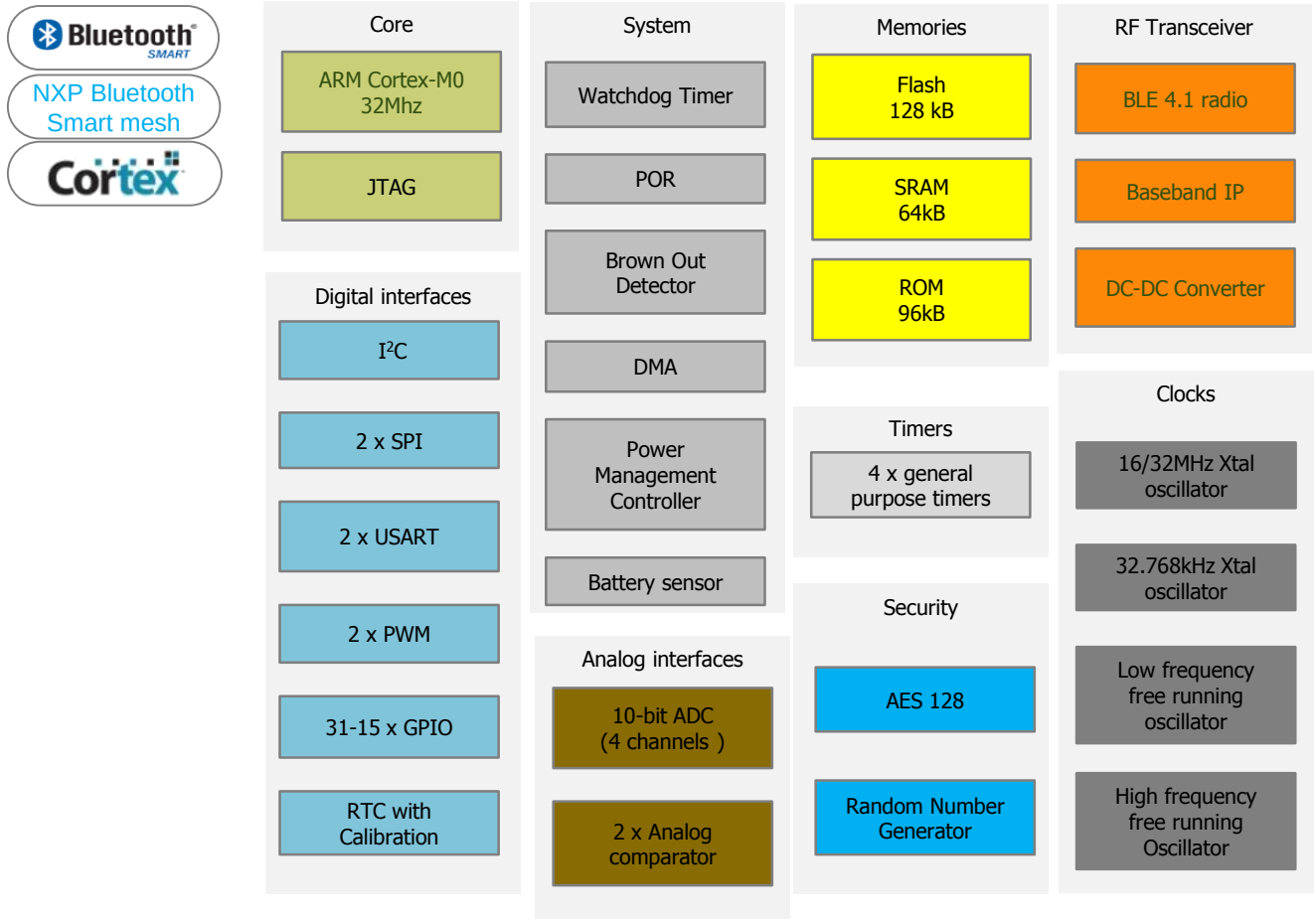
BLE WIRELESS MICROCONTROLLER

NXP

SECURE CONNECTIONS FOR A SMARTER WORLD

QN902x

- **CPU**
  - 32 MHz ARM Cortex-M0 core
  - 128 kB Flash & 64 kB RAM & 96kB ROM
- **2.4 GHz radio transceiver**
  - Bluetooth 4.1 LE single mode
  - Support master and slave roles
  - Master can support up to 8 simultaneous links
  - Programmable output power : -20 to +4 dBm
  - -95 dBm RX sensitivity (Bluetooth Smart)
  - Peak typical current: 8.8mA TX @+0dBm and 9.25mA RX with DC/DC activated
- **Security**
  - Crypto engine: AES-128, RNG
- **System**
  - DC/DC working from 2.4V to 3.6V
  - Ambient temperature: -40°C to +85°C
  - QFN48 6x6mm, QFN32 5x5mm



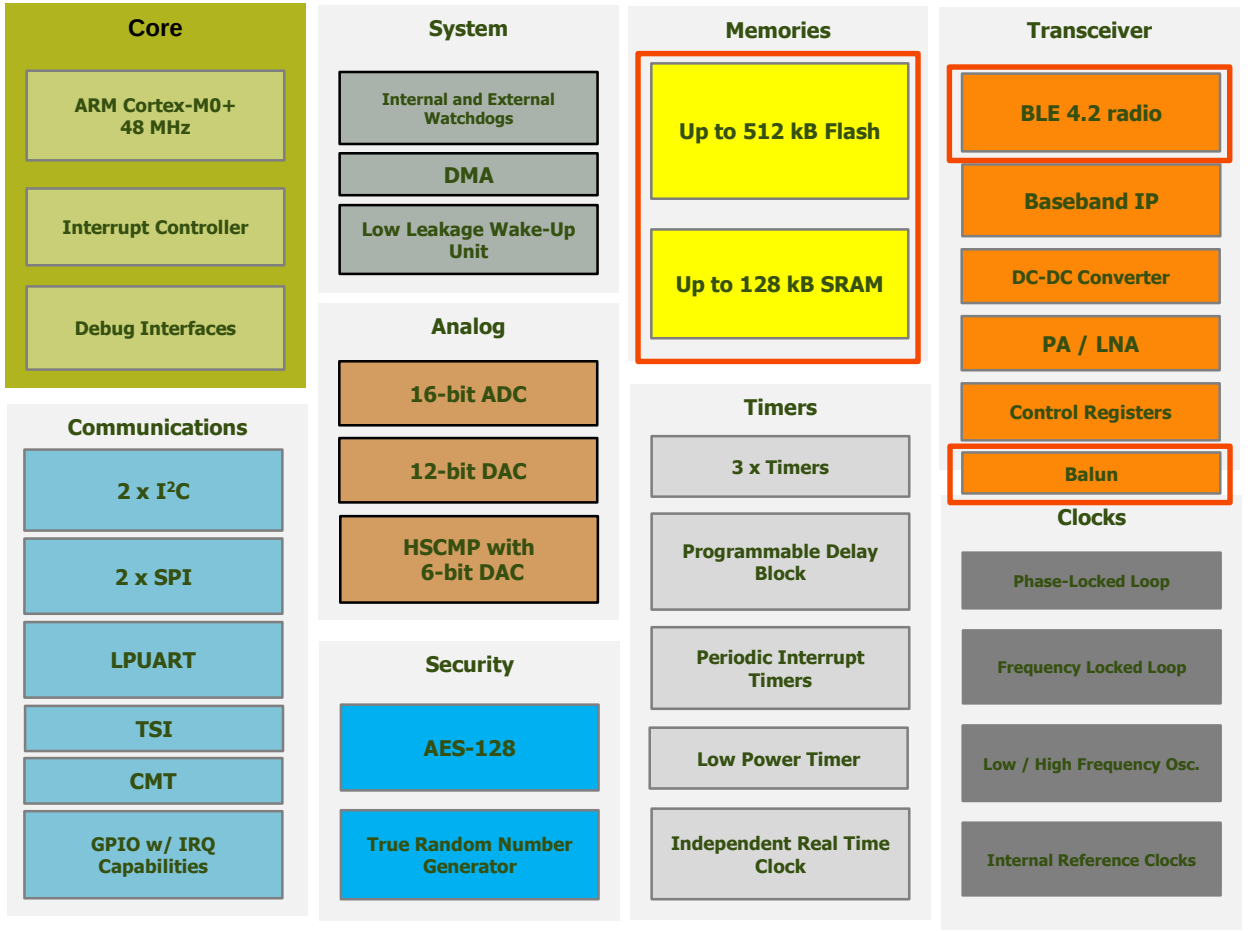
KW31Z

- **CPU**
  - 48 MHz ARM Cortex-M0+ core
  - Up to 512 kB Flash & 128 kB RAM
- **2.4 GHz radio transceiver**
  - Bluetooth Smart 4.2 compliant with 20+ GATT profiles
  - Programmable output power : -30 to +4 dBm
  - -96 dBm RX sensitivity (Bluetooth Smart)
  - Peak typical current: 6.5mA TX @+0dBm and 6.5mA RX with DC/DC activated
  - Integrated balun (~9% board area saving)
- **Security**
  - Crypto engine: AES-128, TRNG
- **System**
  - Buck Boost DC/DC working from 0.9V to 4.2V
  - Ambient temperature: -40°C to +105°C
  - QFN 7x7mm, WLCSP

Bluetooth SMART

NXP Bluetooth Smart mesh

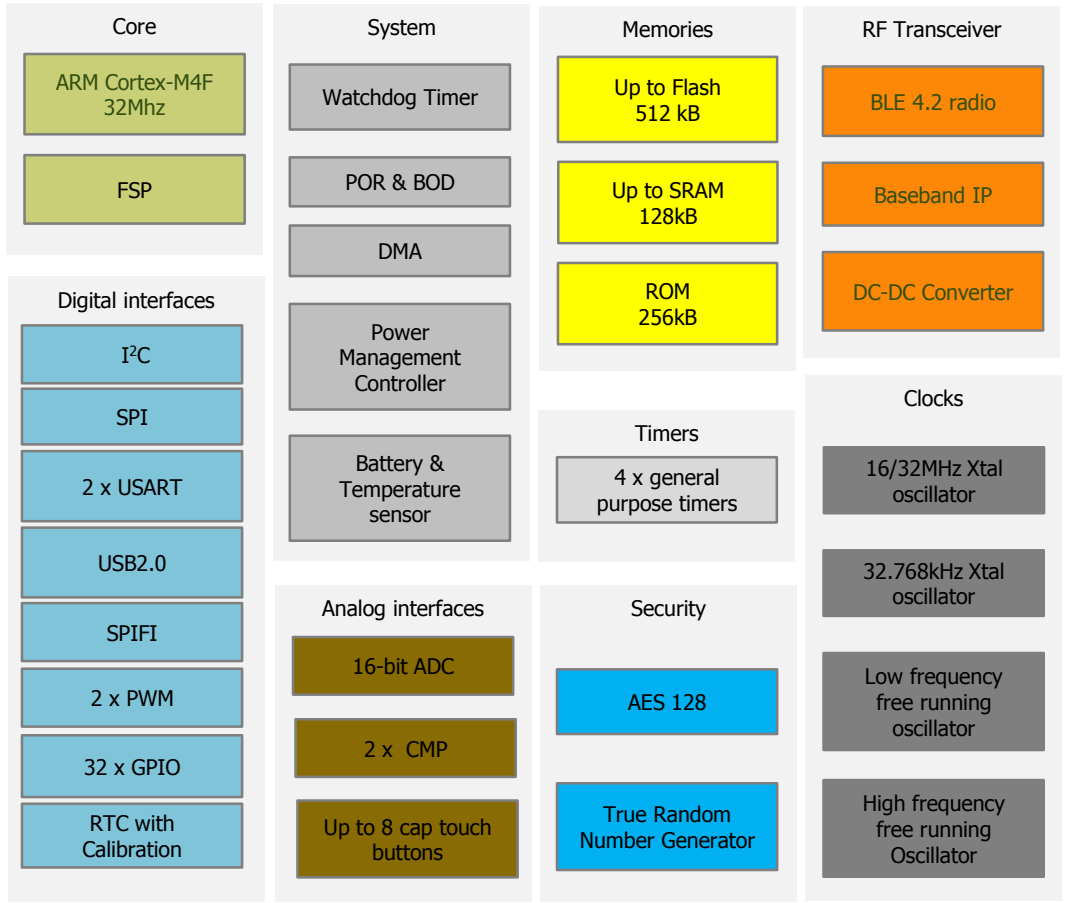
Cortex



QN9080

- **CPU**
  - 32-bit ARM Coretex-M4 with FPU
  - Up to 512 kB Flash & 128 kB RAM, 256 kB ROM
- **2.4 GHz radio transceiver**
  - Bluetooth 4.2 LE single mode
  - Programmable output power : -20 to to +2 dBm
  - -95 dBm RX sensitivity (Bluetooth Smart)
  - Peak typical current: 3.4mA TX @+0dBm and 3.6mA RX with DC/DC activated
  - 1 uA sleep current with RAM/register retention
- **Security**
  - Crypto engine: AES-128, TRNG
- **System**
  - Fusion Sense Processor (FSP), for high efficiency and low power
  - DC/DC working from 1.8V to 3.6V
  - Ambient temperature: -40°C to +85°C
  - QFN48 6x6mm, 3.2x3.2 WLCSP

Bluetooth SMART
NXP Bluetooth Smart mesh
Cortex



SECURE CONNECTIONS
FOR A SMARTER WORLD