INCREASING IoT ADOPTION THROUGH SECURE & INTUITIVE COMMISSIONING

THE NFC SOLUTION

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HEAD OF MARKETING AND SALES
FTF-HMB-N1895
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AGENGA

- Current roadblocks for Mass Market IoT adoption
- The NFC solution for pairing
- NFC commissioning step by step
- NXP value proposition & how to get started

NXP

THE IoT ADOPTION TODAY

Smart Home Solutions Are Addressing a Clear Need

Non-Users Frequently Exhibit Behaviors That Indicate Latent Demand for Connected Security and Utility Solutions.*

51% accidentally left lights on

41% accidentally left TV/appliance on

36% wonder what's happening at home while away

35% leave a/c running (even when it's comfortable)

31% can't remember if they locked doors/windows

Source : McKinsey&Company

75% Broadband penetration
Two thirds of which interested in smart home products

~100M wearable devices – 20% of population (US)
>300M devices in 2018

20 % Alarm system adoption
28% in 2016 (US)

12bn bulbs sold each year
5% of to be smart in 2020

3M smart thermostats in 2014
1% household penetration (2014)
12% household penetration in 2019

4

Source: BI Intelligence, 2014

Interest and Awareness:
Value proposition not fully understood, despite clear needs

Interested Non-Users' Reasons for Not Purchasing

(% rating top 3 reason)

66% Too expensive

39% Not sure how well it works

37% Technology is still developing

27% Concerned about privacy

24% Security/utilities/health not a big concern

until recently

Top 3 Key Buying Factors*

SERVICE BUYERS

⚠ SAFETY AND SECURITY

82% Ease of use

81% Monthly service price

💡 UTILITIES MANAGEMENT

76% Monthly service price

74% Cost of device

71% Safety of my information

- – Price (total cost of ownership)
- – Technological maturity Ease of use
- – Technology not mature
- • Many are concerned about Privacy

Source : McKinsey&Company

A Consumer Perspective…
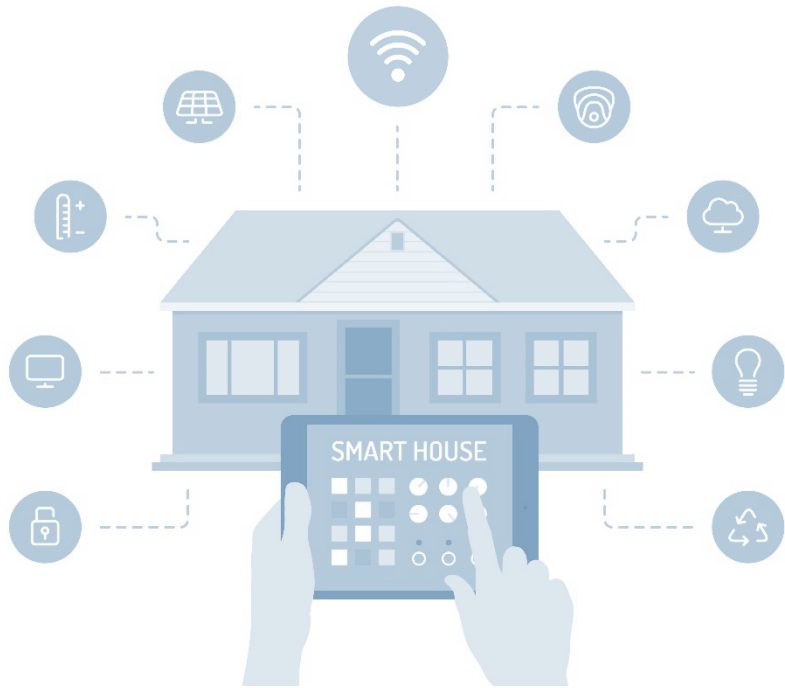
As consumer,

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
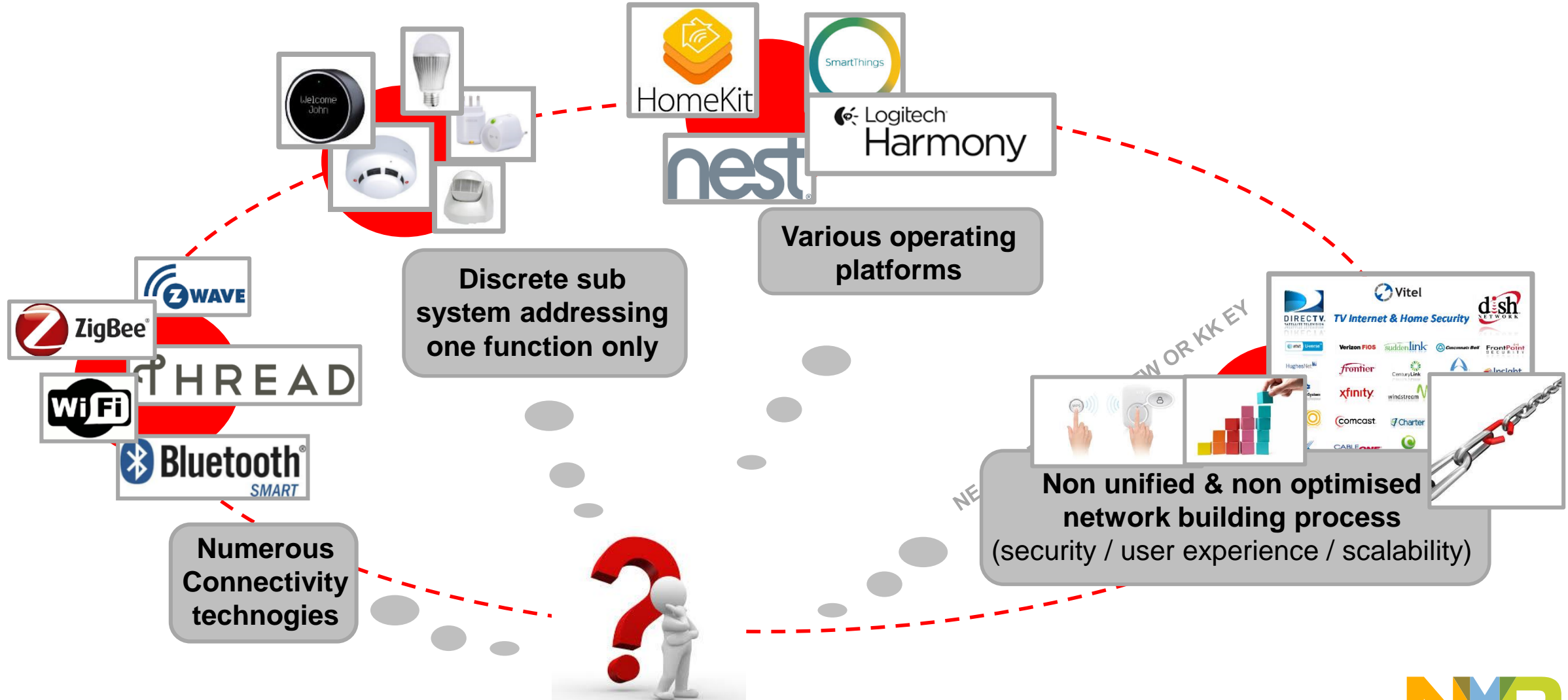
keeping convenience…

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*

Smart Home
Current roadblocks for mass market adoption

Discrete sub system addressing one function only

Various operating platforms

Numerous Connectivity technogies

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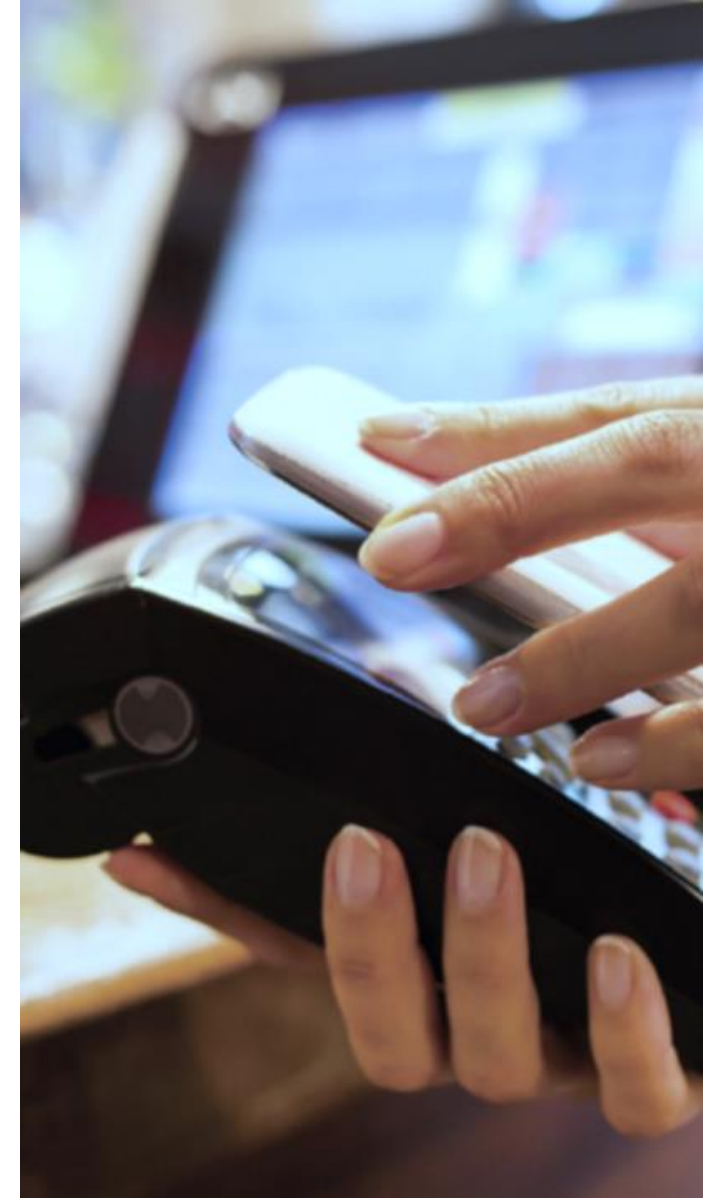(security / user experience / scalability)

A DIFFERENT KIND OF WIRELESS

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

Market Is Exploding

NFC Market outlook

(MPc, ABI Research 2015)

Phones, contactless cards, terminals have reached critical mass

Legend
Phones
Computing
Mobile
Networking
Consumer A&V
Health & Fitness
Industrial
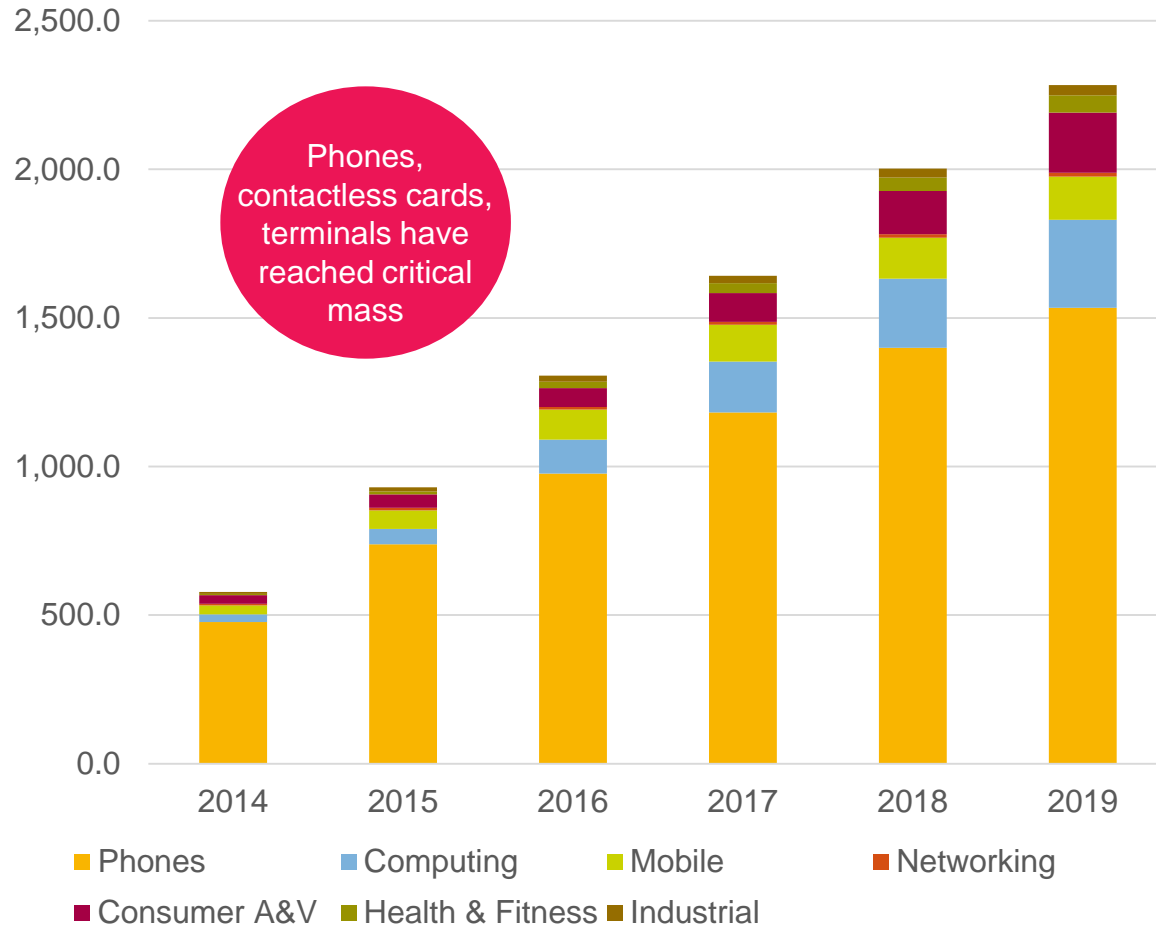
Typical use cases

Conditional access

Easy pairing
(of another RF technology)

Authenticity Check

Zero-power configuation

Contactless HMI

Payment

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3 NFC Product Families

Connected NFC tag solutions

Our connected NFC tag solutions include a NFC Forum RF interface, an EEPROM, and a field-detection function (NTAG F) or a field- detection function with an I²C interface (NTAG I²C).

Field detection

Connected NFC tag
Ntag I2C plus

I²C

Host with application
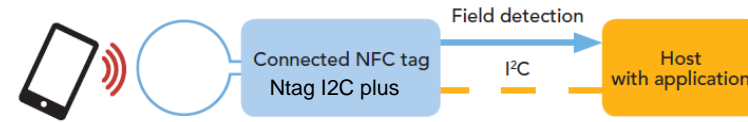
NFC frontend solutions

Our standalone frontends, which work seamlessly with the NFC Reader Library, are the most flexible way to add NFC to a system.
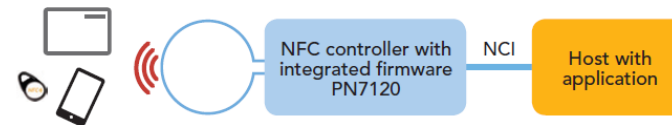
NFC frontend PN5180

Microcontroller with application

Application/ host processor (optional)
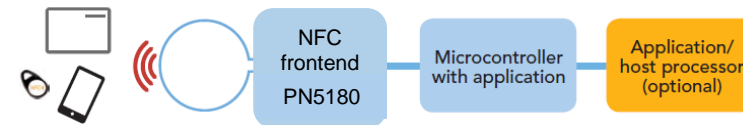
NFC controller solutions

Our NFC controller solutions enable higher integration with fewer components combining an NFC frontend with an advanced 32-bit microcontroller.

Options include integrated firmware, for an easy, standardized interface, or a freely programmable microcontroller with the ability to load fully-custom applications.

Integrated Firmware

NFC controller with integrated firmware PN7120

NCI

Host with application

Customizable Firmware

NFC controller with application PN7462
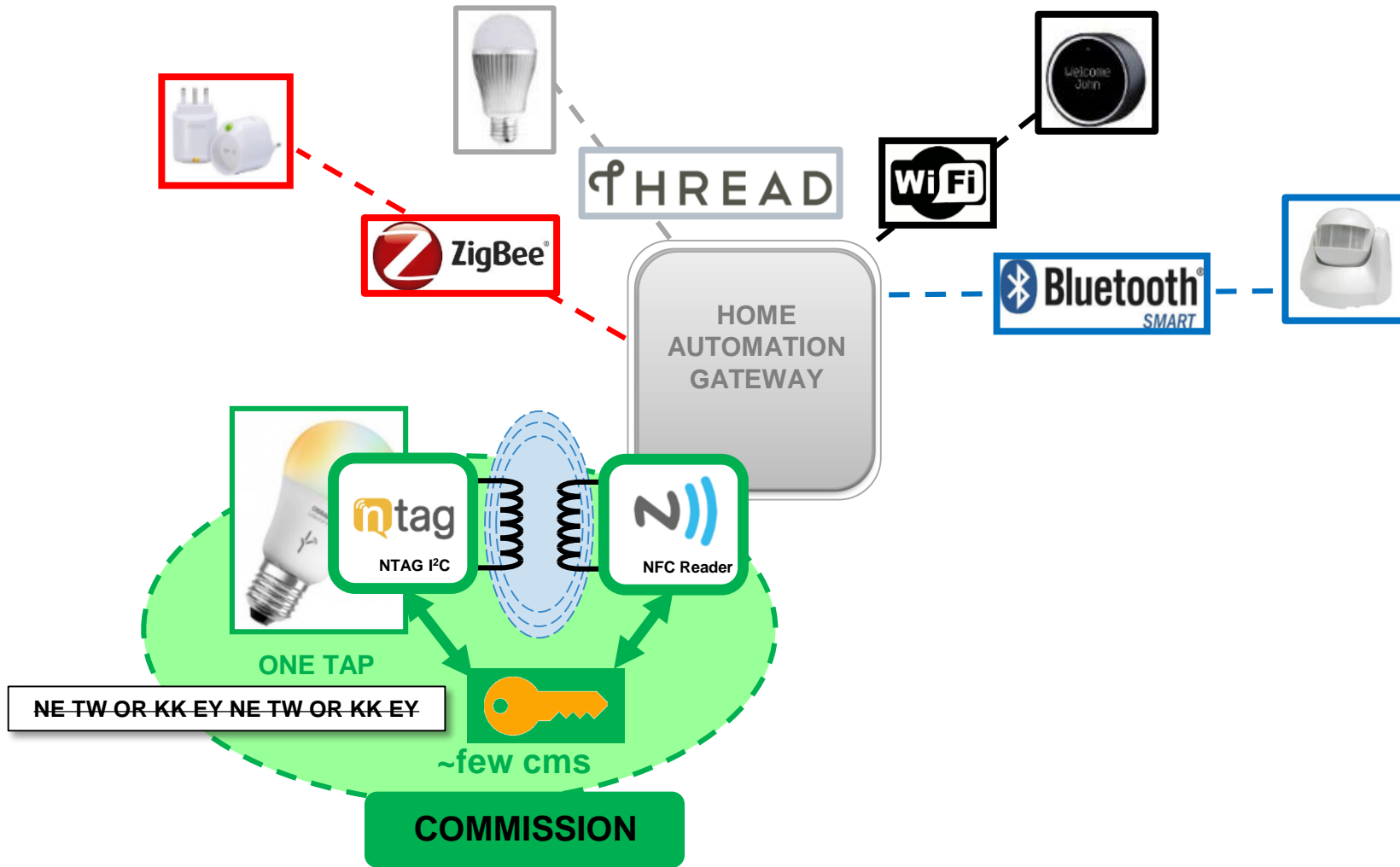
Host (optional)
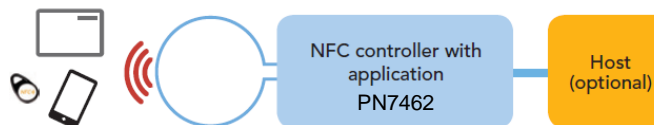
THE NFC COMMISSIONING SOLUTION

NFC One-tap Solution
Use NFC as out-of-band commissioning

CONFIDENTIALITY
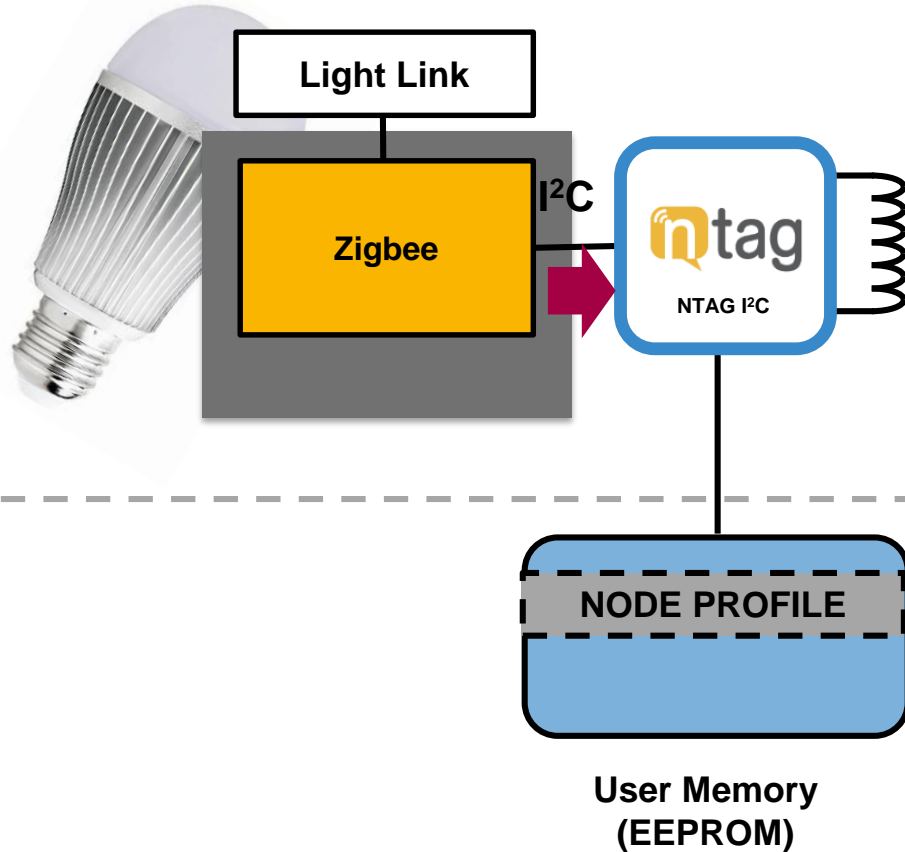Proximity vs. long range

EASE of USE
Just one tap

CONVENIENCE
Any protocol
No power supply required

NFC
COMMISSIONING
STEP BY STEP
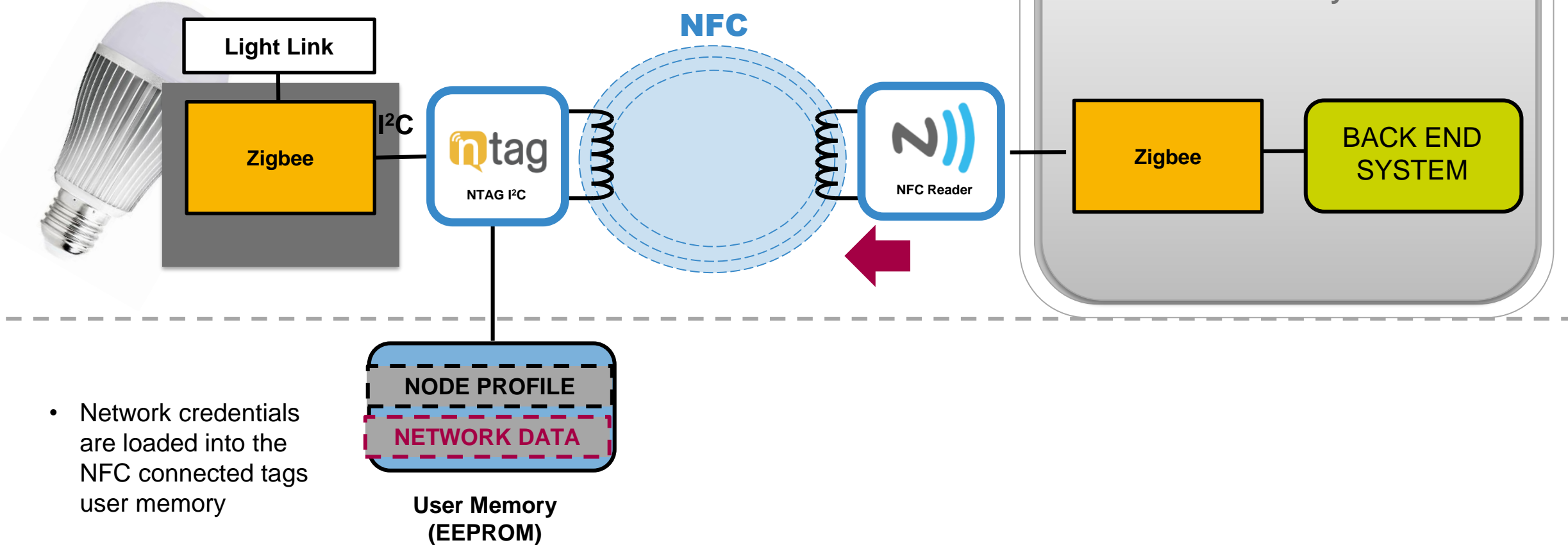
NFC Commissioning Concept (Zigbee Example)

1. Node initialization

- Load node profile into the user memory of the NFC connected tag via I^2C interface and the Zigbee module at manufacturing.
- Default profile being written by the node to the NTAG-I^2C after powering the device.
- Can be locked to avoid profile change.
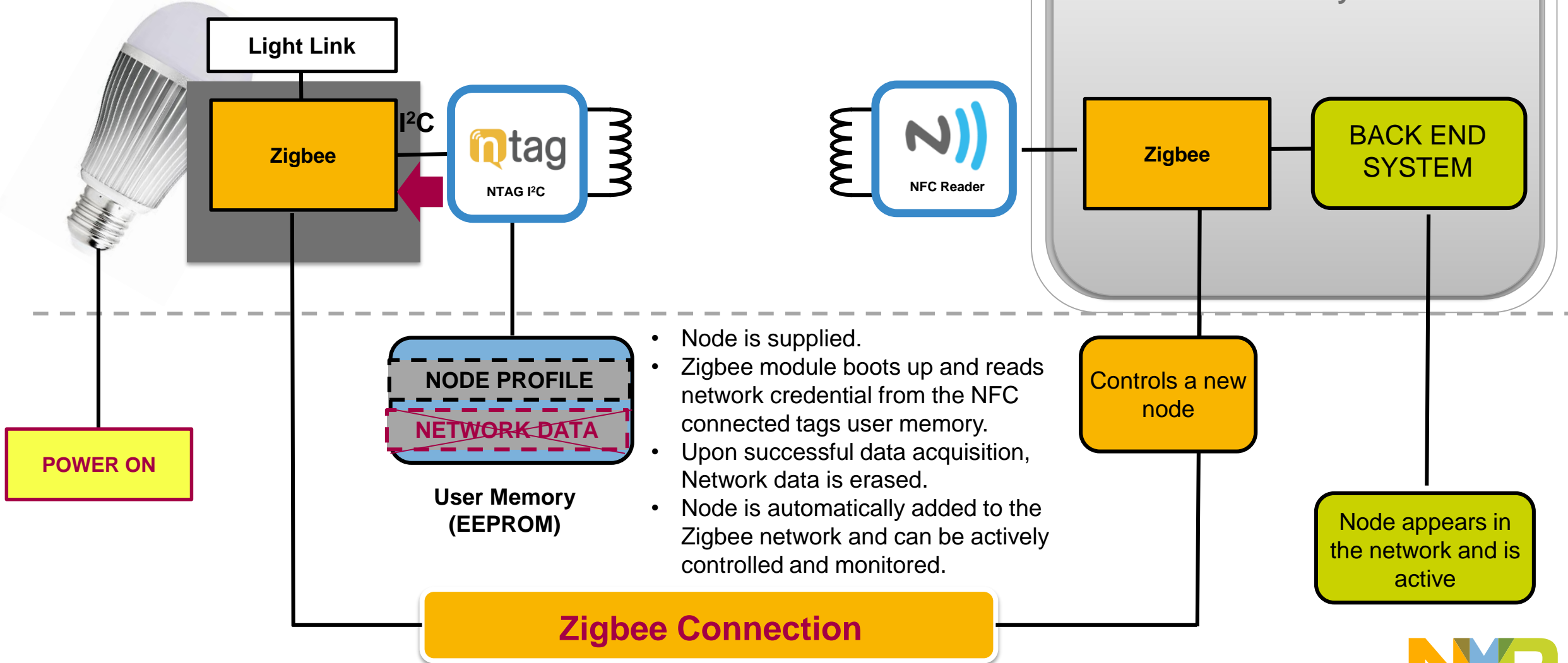- Data format can follow the NFC forum standard (NDEF message).

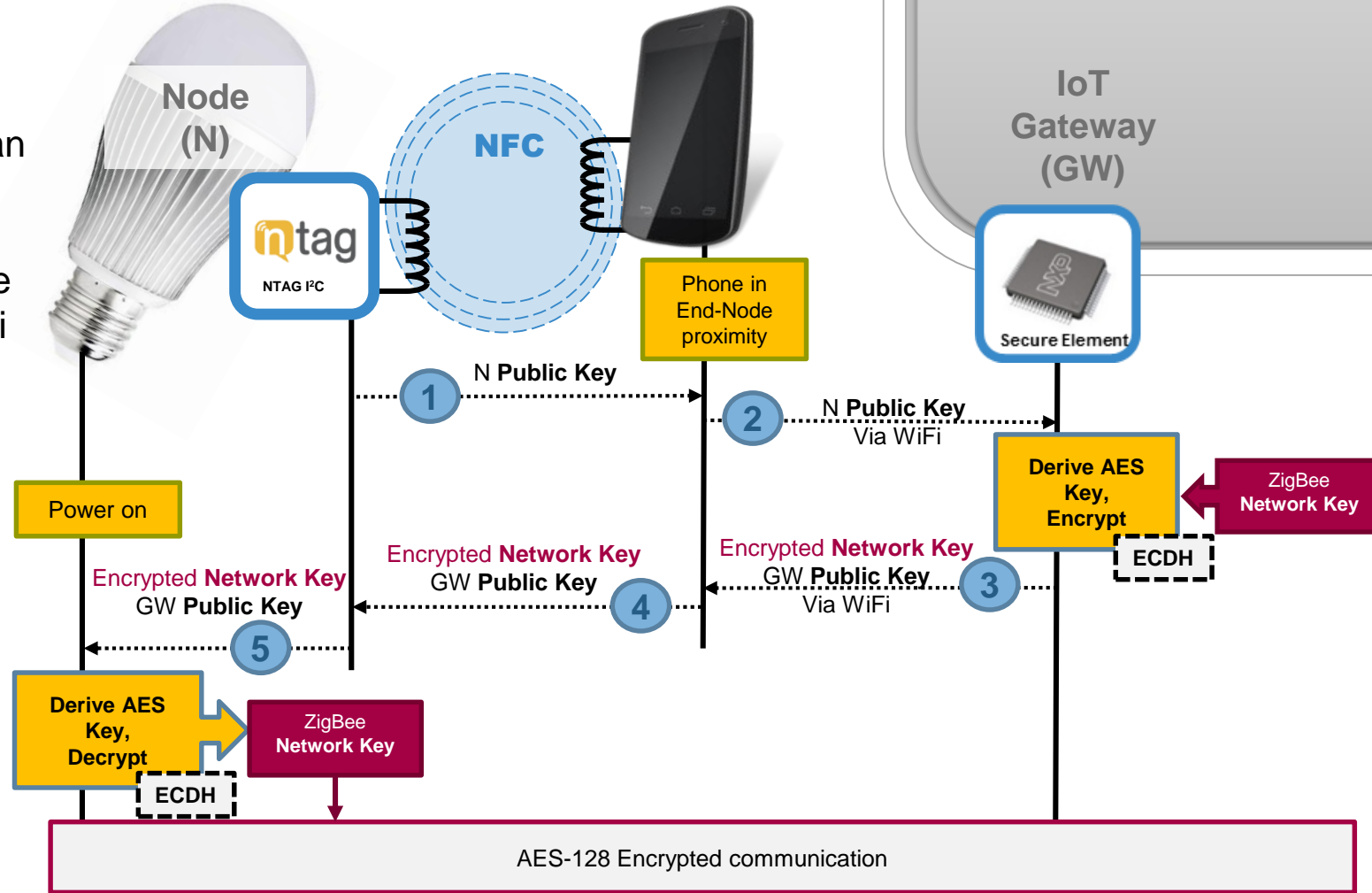# NFC Commissioning Concept

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

Light Link

I²C

Zigbee

ntag

NTAG I²C

NFC Reader

IoT Gateway

Zigbee

BACK END SYSTEM

POWER ON

NODE PROFILE

NETWORK DATA

User Memory (EEPROM)

- 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.

Controls a new node

Node appears in the network and is active

Zigbee Connection

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Alternative NFC Commissioning Concept
Tap your phone

- Use NFC phone as an intermediate mean to do NFC commissioning
- Connect to the home gateway via 3G/WiFi

Node (N)

NTAG I²C

NFC

Phone in End-Node proximity

IoT Gateway (GW)

Secure Element

① N **Public Key**

② N **Public Key** Via WiFi

Power on

Derive AES Key, Encrypt ◀ ZigBee Network Key

ECDH

Encrypted **Network Key** GW **Public Key**

④ Encrypted **Network Key** GW **Public Key**

③ Encrypted **Network Key** GW **Public Key** Via WiFi

⑤ Encrypted **Network Key** GW **Public Key**

Derive AES Key, Decrypt ▶ ZigBee Network Key

ECDH

AES-128 Encrypted communication

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

Interoperability

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

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INTERESTED?

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

APPLICATION-IN-A-BOX

PN7120 Controller SBC And NTAG I2C *Plus* Demo Kits
OM5577/PN7120S and OM5569/NT322E(R)

OM5577/PN7120S

- Demoboard for the PN7120 NFC controller
- Designed to work with Raspberry-Pi or BeagleBone
  - Can be adapted to other systems
- Drivers available for Linux and Android
- Linux images available for Raspberry-Pi and BeagleBone

Demoboard website
www.nxp.com/demoboard/OM5577.html

OM5569/NT322E(R)

- A simple all-in-one demonstrator kit for NFC connected tag chips
- **An all-in-one kit**
  - **Ready-to-use** demonstrator
  - **Complete** evaluation tools for all NTAG I^{2}C functionalities
  - **Flexible** development platform for your own application

Demoboard website
http://www.nxp.com/board/OM5569.html
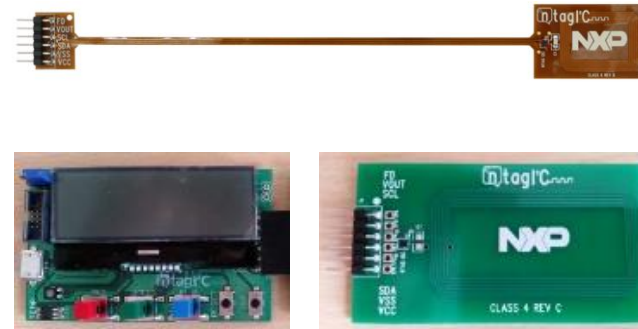
Get Started Today: Evaluation Kit EK004
Online NOW [here]()

NFC commissioning demo with PN7120 and NTAG I²C plus

Demonstration online

- 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

LINUX based (openWRT)

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

Find Your NFC Toolkit at www.nxp.com/nfc

NFC community
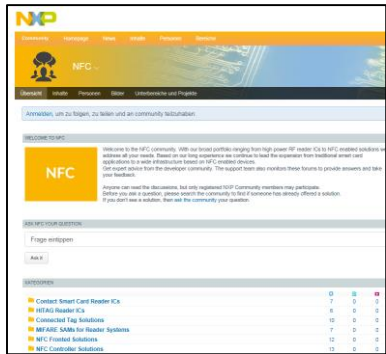
NFC use cases
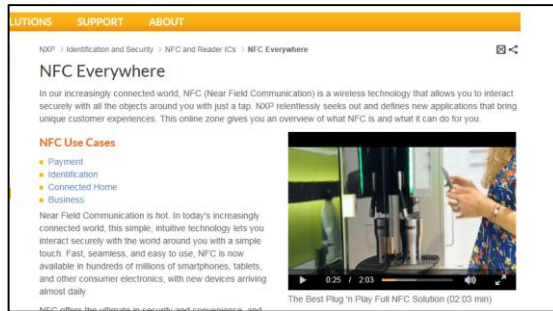
NFC Trainings
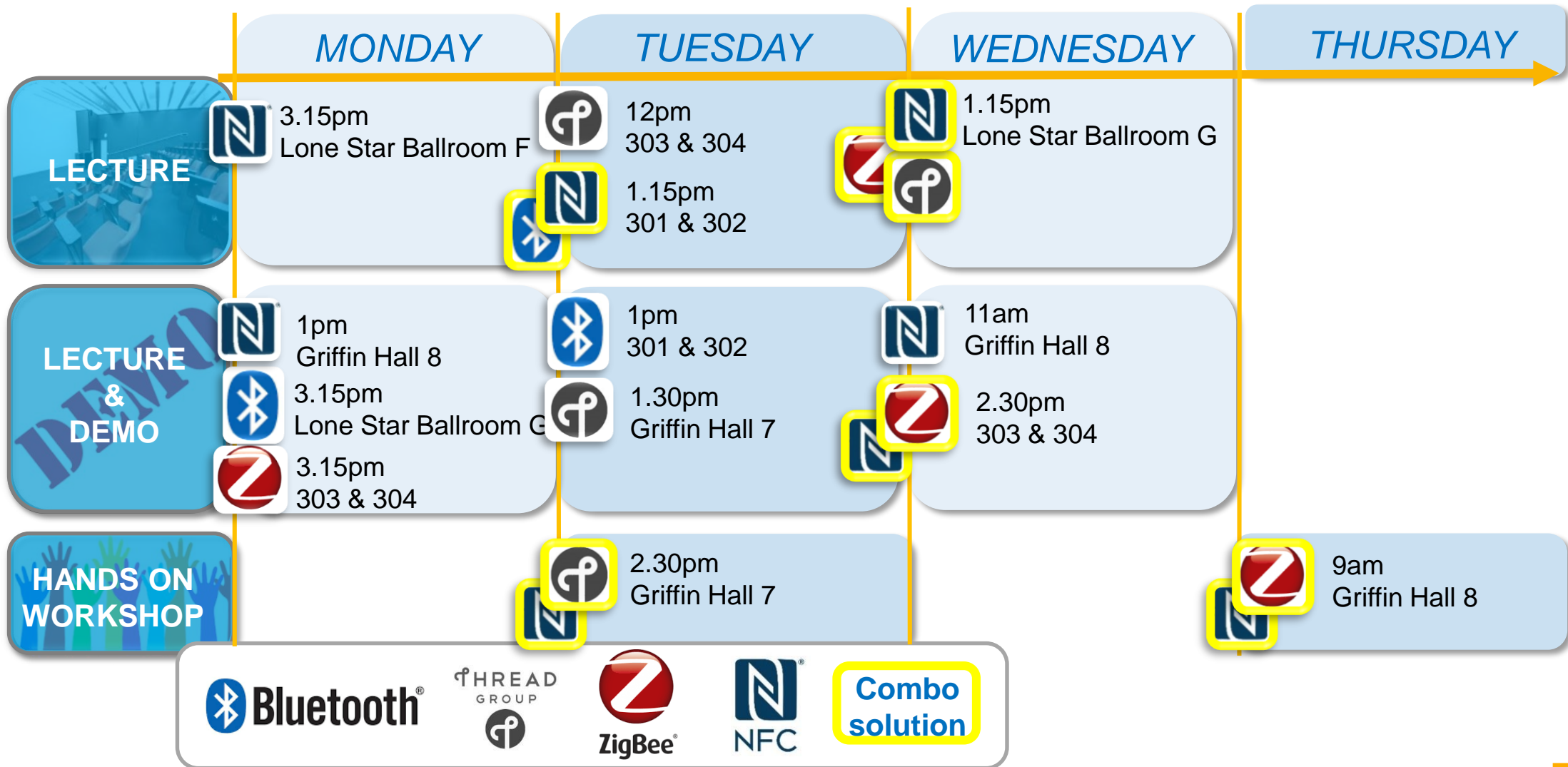
NFC IDH Partners

NFC Product selection guide
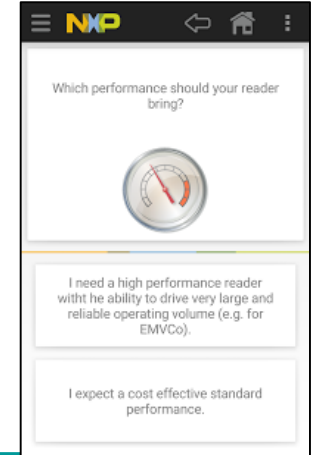
If you have an NFC question please contact:
nfc.readers@nxp.com

Check Additional Smart Home Sessions around Connectivity

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY
LECTURE	3.15pm Lone Star Ballroom F	12pm 303 & 304 / 1.15pm 301 & 302	1.15pm Lone Star Ballroom G	
LECTURE & DEMO	1pm Griffin Hall 8 / 3.15pm Lone Star Ballroom G / 3.15pm 303 & 304	1pm 301 & 302 / 1.30pm Griffin Hall 7	11am Griffin Hall 8 / 2.30pm 303 & 304	
HANDS ON WORKSHOP		2.30pm Griffin Hall 7		9am Griffin Hall 8

Bluetooth® **THREAD GROUP** **ZigBee®** **NFC** **Combo solution**

Current on Boarding Process for Smart Home

Process	Connectivity	User experience	Security
WPS	WiFI, Zwave		
Zigbee			
Thread			
Bluetooth			

2D Barcodes vs. NFC Tags

	QR	NFC
Ease of use	○○○	●●●
Native support in mobile OS	✗	✓
Read/write capability	✗	✓
Security	✗	✓
Supported data types	●○○	●●●
Cost effective	●●●	●○○
Robustness (weather/heat)	✗	✓
Visual integration	●○○	●●●
Response time	○○○	●●●

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NFC Standardisation for Connectivity

Connectivity	Standardisation	Native support
Bluetooth®	NFC FORUM	Android
Wi-Fi™	NFC FORUM	Android
ZigBee®		
THREAD GROUP		

NFC Commissioning
A variety of possible schemes

Mobile

Node · UI Device · IoT Gateway · Cloud

1 · **Node + NFC tag**
  – Tap the Gateway or NFC Phone
  – Send Network Key over ZigBee link

NFC · NFC Reader

2 · **Node + Connected NFC tag (NTAG I^{2}C)**
  – Tap the Gateway or NFC Phone
  – Send Network Key over NFC

NTAG I^{2}C · NFC Reader

Our focus

3 **Node + Connected NFC tag (NTAG I^{2}C) + secure key exchange**
  Tap the Gateway or NFC Phone
  Derive session key
  Send encrypted Network Key over NFC

NTAG I^{2}C · NFC Reader · NFC Reader · Secure Element

4 **Node + Connected NFC tag (NTAG I^{2}C) + secure key exchange + node authentication**
  Tap the Gateway or NFC Phone
  Authenticate end-node
  Derive session key
  Send encrypted Network Key over NFC

NTAG I^{2}C · NFC Reader · NFC Reader · Secure Element · DB

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

WIRELESS CONNECTIVITY & NFC

ZigBee

Bluetooth SMART

NFC

THREAD

Bluetooth Smart Mesh

ntag I²C

PROCESSING & SECURITY

Microcontrollers

Secure Element

Application Processors

PRODUCTS FOR

NXP

ATTRIBUTION STATEMENT