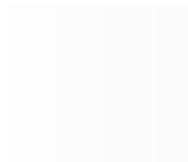# NFC Cube

How to demonstrate key NFC use cases with the NFC Cube

Version 1.2

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NXP | SECURE CONNECTIONS FOR A SMARTER WORLD

Introduction – What is this document for ?

You just received an NFC Cube. The goal of this document is to provide you with:

- A guideline on how to do the demonstration

- The key message to be delivered during the demonstration

- **Important**: The script is contained in the notes section of this presentation. Please use it to practice the demo before showing it to the customer.

- The presentation itself can be used to show NFC possibilities to customers while you demonstrate them with the NFC Cube.

The NFC Cube kit
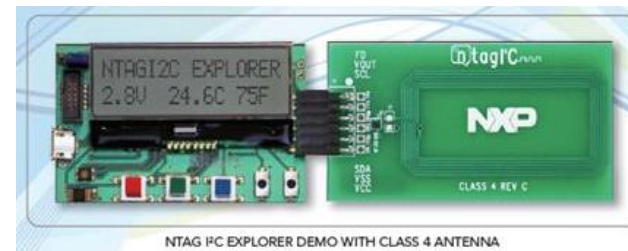# Demonstrate the NFC endless possibilities

The NFC Cube
NFC reader writer

A set of cards to
demonstrate
Legacy and NFC
use cases
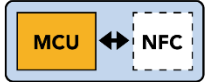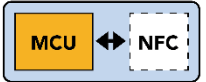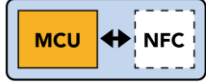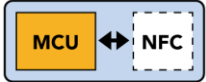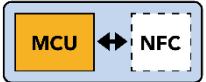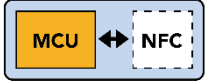
An Android NFC
phone with „NFC
Cube" app

To be used in conjunction
with the NTAG I²C *plus*
explorer board
(OM5569/NT322E or NT322ER)

nfc everywhere
Your source for everything NFC:
www.nxp.com/nfc

Typical NFC use cases to show with the NFC Cube

Use case	Access	Industrial & Appliances	Medical	Consumer & IoT	What do you need in addition to the NFC Cube
Identification/Authentication		●	●	●	COLOR CARD / COLOR CARD
Conditional access	●	●	●		ACCESS CONTROL GRANTED / ACCESS CONTROL DENIED
Device-to-device communication		●	●	●	NTAG I2C EXPLORER DEMO WITH CLASS 4 ANTENNA
Commissioning and pairing		●		●	NTAG I2C EXPLORER DEMO WITH CLASS 4 ANTENNA
Zero-power configuration / external user/service interface		●		●	

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1) Identification /Authentication of accessories and consumables

e.g. air filters, cartridges, water filters, brushes, tool heads, …

Customer and benefit

- Customer / products
  - Industrial equipment where accessories or consumables can be attached, e.g. tools, water/air filters
  - Healthcare or body care products with accessories or consumables, e.g. facial brushes, toothbrushes, blood glucose meters, …

- NFC Benefit
  - Adjust settings of the main unit based on accessory attached
  - Ensure authenticity of the accessory / fight counterfeits

- Reference cases on the market
  - Philips' Visapure facial brush adjusts settings based on the brush head installed
  - Roche's Accuchek blood glucose meter identifying the disposable measurement cartridge through an ICODE tag

2) Conditional access / access management
e.g. door locks (physical access), medical equipment, industrial, IT, … (logical access)

Customer and benefit

- Customer / products
  - Physical access management: Door locks
  - Logical access management: access to configuration, settings, operation panels in industrial and medical equipment

- NFC Benefit
  - Higher security and greater flexibility than mechanical locks
  - Easy key revocation when key is lost

- Reference cases on the market
  - Physical access: HID/Assa Abloy, Salto, eLock2 and many more
  - Logical access: Kärcher

ACCESS CONTROL DENIED

ACCESS CONTROL GRANTED

3) IoT – Introducing NTAG I²C *plus*

- The explorer board consists of 2 parts :
  - An antenna with an NTAG I²C *plus*
  - A board with Microcontroller, screen and buttons
  - Both are connected through an I2C connection

- NTAG I²C *plus* is an NFC Tag type 2
  - Any NFC reader, like a phone, can read and write data in NTAG I²C *plus*

- It can harvest energy to supply the explorer board

- It communicates with the microcontroller using the I²C interface

NTAG I²C *plus*

Energy

NFC Reader :
- RF data
- Energy

NTAG I²C *plus*
- Data
- Energy
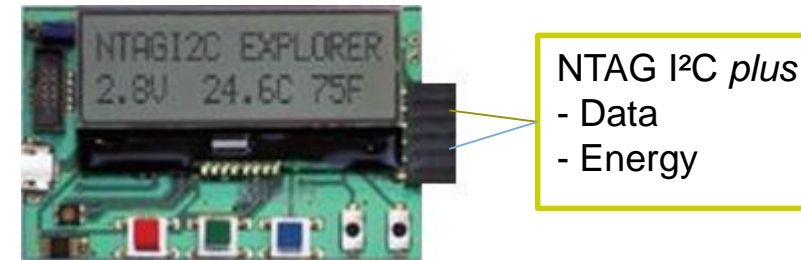
There is no battery in the Explorer board. All the energy comes from the RF field
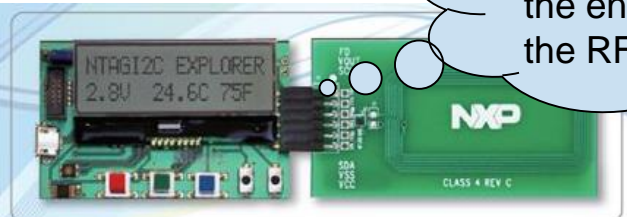
NTAG I²C EXPLORER DEMO WITH CLASS 4 ANTENNA

3) Showing communication between objects thanks to NTAG I²C *plus*

- NTAG is a standard NFC tag
  - Present the antenna in front of the cube: It is detected as an NFC Forum Type 2 Tag

- Assemble the explorer board and the antenna and present the board in front of the NFC Cube
  - The LED and screen turn on thanks to the energy harvesting feature of NTAG I2C *plus*
  - The board LED takes the color of the cube: Data goes from the cube to the board

- Press the board button
  - The cube color is modified: Data goes from the board to the cube
  - It is possible to press at the same time on 2 buttons to get more colors

3) Battery-less sensors
e.g. industrial equipment, metering, …

Customer and benefit

- Customer / products
    - Any machine or device, where sensors are inside or in close vicinity to the device, and the sensor cannot be connected by a cable for one of 2 reasons:
        - Sensor is on a moving / rotating part
        - Sensor needs to be completely sealed to be waterproof, dustproof etc.
    - Sensor types can be mechanical (bending, torque, …), temperature, flow meter, …
    - Metering applications

- NFC Benefit
    - The NFC reader can power the sensor with up to 20mW
    - NFC can establish a bidirectional interface with up to 4kBytes / second between the main unit (powered) and the sensor.
    - Sensor can remain completely sealed, dust proof, water proof

NTAG I²C EXPLORER DEMO WITH CLASS 4 ANTENNA
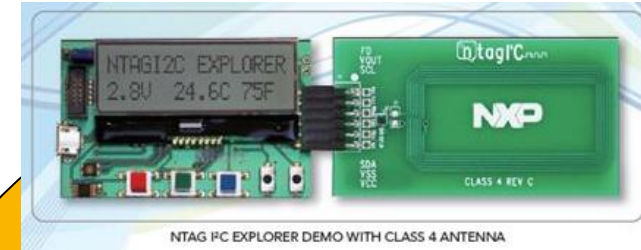
4) Commissioning

e.g. IoT / smart home, lighting, sensor nodes in industrial installations, …

Customer and benefit

- Customer / products
  - Companies in the IoT / smart home space, making gateways or (wireless) nodes
  - Lighting systems for professional or home installation
  - Industrial companies making sensor networks

- NFC Benefit
  - NFC makes the installation of wireless networks easy due to simple pairing and commissioning of network nodes, lights, sensors into the network via NFC
  - Inherent privacy of the secure network key due to short range NFC commissioning

NTAG I²C EXPLORER DEMO WITH CLASS 4 ANTENNA
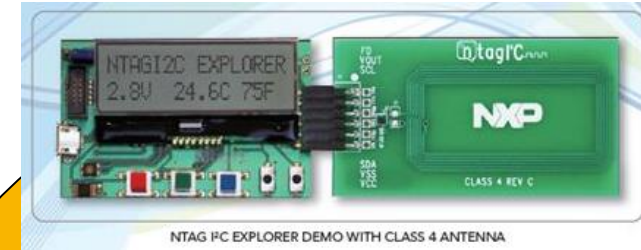
5) External service/maintenance interface
e.g. industrial equipment, metering, …

Customer and benefit

- Customer / products
  - Any electronic device where a cable-based maintenance interface is not possible (e.g. sealed devices) or not convenient

- NFC Benefit
  - Read out error logs or activity statistics. Can be done even when the device is completely dead and does not boot anymore
  - Upgrade/update firmware even without powering the device

In this demo, the cube is using card emulation mode to communicate with the phone. The phone acts as a simple card reader

MCU ↔ NFC

5) Adding touchscreen functionality / configuration possibility at very low cost

Customer and benefit

- Customer / products
  - Any product with very rudimentary user interface – a few buttons, a few LEDs – which would benefit from a touchscreen for more complex settings or readouts
  - Any product which needs to be completely sealed and has no user interface at all.

- NFC Benefit
  - Use the NFC phone as a momentary touchscreen to interact with or configure the device at little additional cost
  - Through the phone, the device can be also get Internet connection instantaneously

5) Zero-power configuration / late stage customization

Customer and benefit

- Customer / products
  - Products which come in a variety of feature variants determined by (software) settings
  - Products which need to be pre-configured to regional or language settings for easier use

- NFC Benefit
  - Produce generic product for easy stock-keeping, and change settings just before shipping – without powering the device
  - Even applicable to upgrading/updating the firmware

Background: NFC Forum standardized key use cases to simplify data exchanges

- Pairing : With a single tag an NFC device can be connected to a WIFI network or to a bluetooth device
  - Present the One Tap pairing card to the cube.

- Web links : Open web links with a single tap.
  - Present the Weblink card to the cube

- Business cards : Touch to exchange digital business card information
  - Present the Business card on the top of the Cube

Present the cards on your NFC mobile phone : They will be recognized !

More about the NFC Cube : an NFC reader based on the first NFC Microcontroller, developed by NXP

- Enables to communicate with all cards using all ISO / IEC protocols: 14443, 15693

- Compliant with all NFC Forum cards

- Based on the PN7462 „First all-in-one full NFC solution"

PN7462AU is an NFC Microcontroller Cortex M0 that supports all ISO protocols, NFC Forum technology, 7816 contact cards, and has a USB interface.

Questions, suggestions... Contact us!

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