NFC AS A MAINTENANCE INTERFACE

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INTRODUCTION NXP CONNECTED TAGS

A **connected tag** is

an **NFC tag in/on a system**

with an **electrical system interface**

that allows to **connect to** *something*

often via an **I²C bus**

device / system
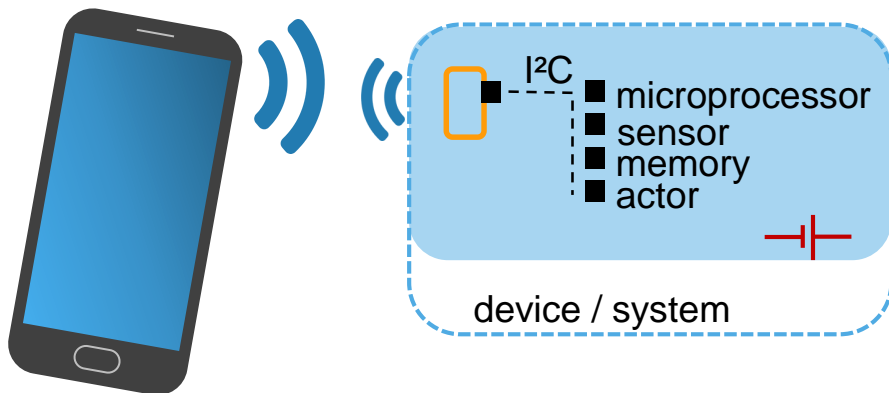
|	
NTAG 5 boost Type 5 tag, ISO/IEC 15693	I²C controller, AES authentication, event detection, Active load modulation (10x10 active antenna)
NTAG 5 link Type 5 tag, ISO/IEC 15693	I²C controller, AES authentication, event detection, passive antenna, 30mW energy harvesting
NTAG 5 switch Type 5 tag, ISO/IEC 15693	2x PWM output or GPIO, 1x event detection output, passive antenna, 30mw energy harvesting
NTAG I²C plus Type 2 tag, ISO/IEC 14443	I²C target, AES authentication, passive antenna, 10mW energy harvesting
UCODE I²C UHF / RAIN RFID	I²C target, AES authentication, 10m reading distance, requires system power
NTAG 2xx F Type 2 tag, ISO/IEC 14443	Field detection output

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NFC AS A SELF-SERVICE INTERFACE

End-user self service: gateway to remote maintenance triggered by the user, remote diagnosis, calling a technician, ability to order spare parts, commercial offer for replacement unit

…or as a general UI extender

- Make seldom-used functions easier to use
- Keep the UI simple and uncluttered
- Save the LCD display and input devices with the associated firmware stack – only transmit raw internal data to smartphone app and evaluate on the webserver

Edge computing for non-connected devices: local data capture and analysis in the NFC-enabled smartphone

Image: Elma Verhouden, Public domain, via Wikimedia Commons
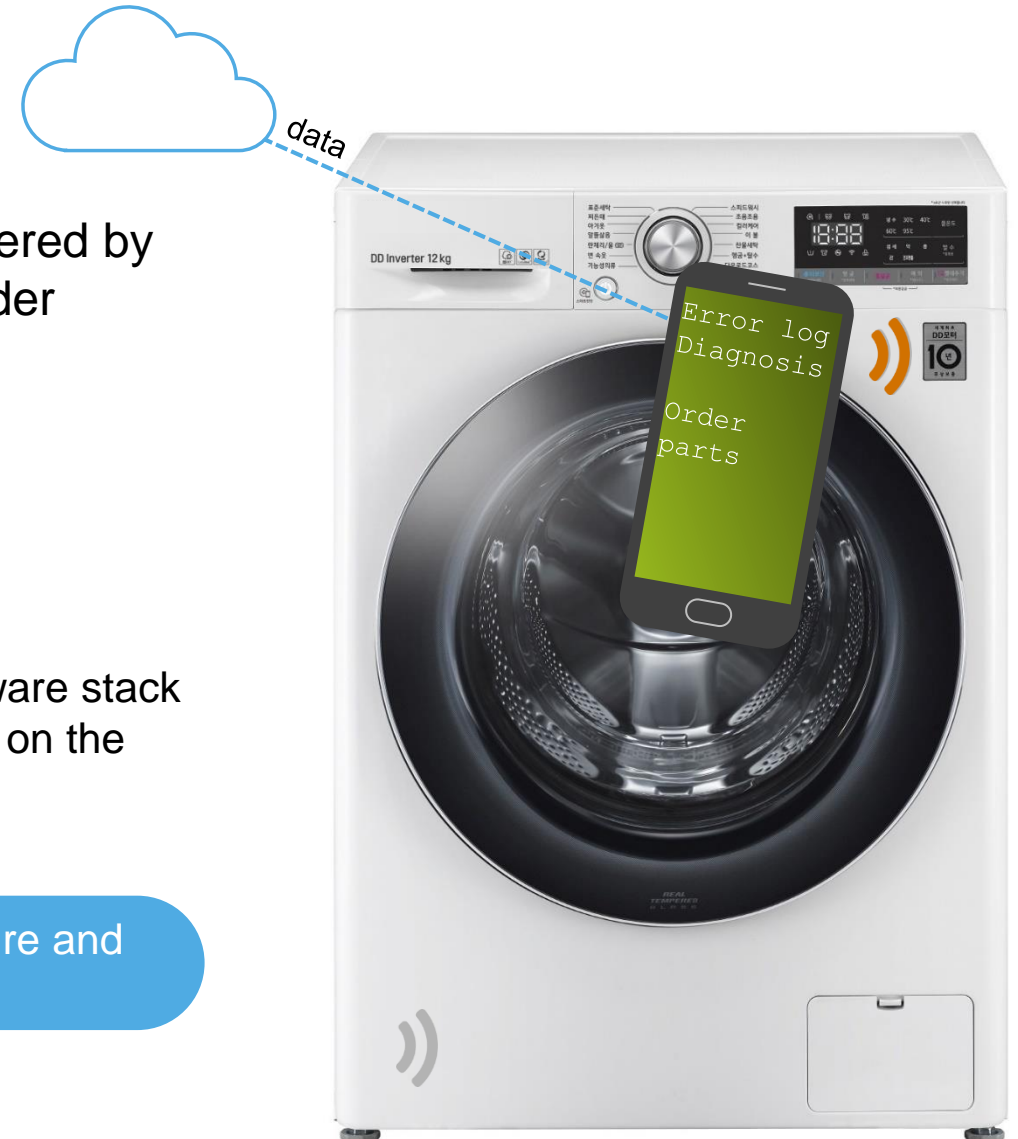
WHAT'S SO SPECIAL ABOUT MAINTENANCE INTERFACES ANYWAY?

- The normal UI is intended for the machine operator

- Maintenance functions intended for the operator belong to the normal UI

- Some maintenance functions need to be restricted to especially trained or authorized personnel

- They can be placed in „hidden menus" of the normal UI, but that may not always be desirable

- If there is a separate maintenance interface, diagnosis can happen without interrupting production

- Large 1980s mainframe computers used to have specific maintenance doors with built-in technician terminals for this purpose

NFC AS A MAINTENANCE INTERFACE - WHAT DO WE MEAN?

Note: this could also be an industrial CNC milling station; or any other home / industrial electric unit

MAINTENANCE INTERFACE

- Maintenance engineer „backdoor" after role authentication
  - Access to logs and detailed status data
  - Access to engineering settings and reconfiguration
- Second interface for role separation and data protection
  - Important for industry 4.0 use cases; ownership of manufacturing data, yield information

data

data

Data
Logs
Diagnosis

Configure
Run tests
Recom-
mission

OK... BUT COULD WE NOT DO THE SAME WITH A CABLE? WHERE'S THE BENEFIT OF NFC?

NFC AS MAINTENANCE INTERFACE

- With NFC smartphone, data rate limited to 106 kbit/s; higher with dedicated reader

- Neutral to environmental conditions

- Can be hidden in casing design

- No mechanical discontinuity in casing required (cleaning, hermetic enclosure)

- Use a simple NFC smartphone + matching app as mobile unit

- Compared to other RF standards (WIFI, Bluetooth, BLE, ZigBee, …) NFC is more intuitive to set up

CABLE-BASED INTERFACE

- Broadband, high-speed connection

- Sensitive to dust, dirt, solvents, aerosols, humidity, corrosion, mechanical damage

- Visible interface, takes up casing real estate

- Always requires enclosure perforation, mechanical adaptation

- Requires dedicated mobile terminal or laptop computer

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THE READER DOES NOT NEED TO BE AN NFC SMARTPHONE

With a mobile terminal that includes a dedicated contactless reader,
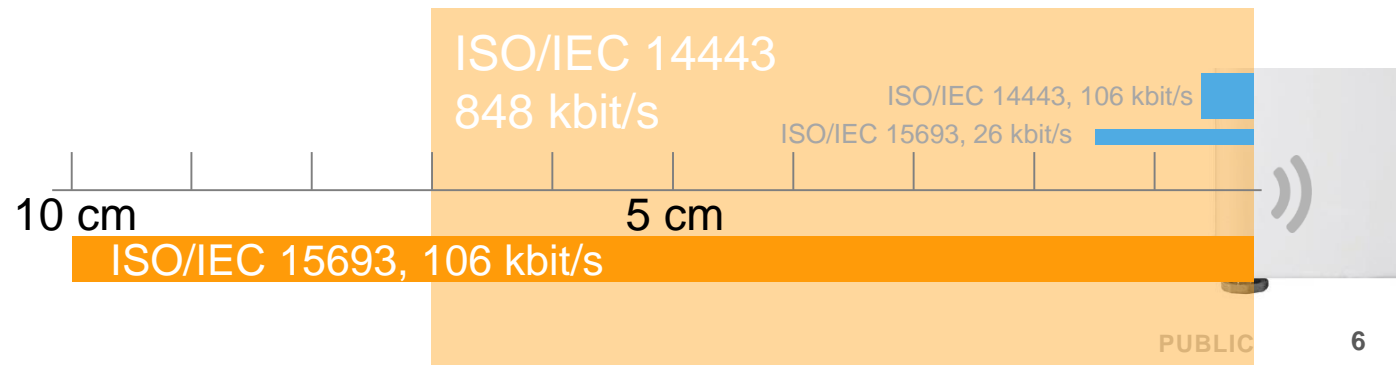additional performance and features can be unlocked:

Dedicated terminal using NXP PN5190 NFC frontend

- Higher bit rates up to 848 kbit/s (type 2, type 4 tag), 106 kbit/s (type 5 tag)

- Longer read range, easily 7 - 10cm for type 5 tags

- Terminal SW and security concept fully under control of manufacturer

- Possible to integrate also special industrial interfaces, operator features like fingerprint sensor

dedicated App / SW

NFC smartphone with minimal NFC solution

- Standard bit rates 106 kbit/s (type 2, type 4 tag), 26 kbit/s (type 5 tag)

- Typical read range 0.5 - 1.5cm, depending on phone model

- Hardware and OS cannot be customized, Apps allow only limited customization

- could be expanded by plug-in accessory

NDEF or App

ISO/IEC 14443
848 kbit/s

ISO/IEC 14443, 106 kbit/s

ISO/IEC 15693, 26 kbit/s

10 cm   5 cm

ISO/IEC 15693, 106 kbit/s

TASKS FOR CUSTOMER DEVELOPERS

- System architecture
  - Locate a physical position for the NFC interface, ideally close to the internal electronics unit
  - Perform a functional and security analysis for data and configurations
  - Develop business logic, use cases, data representation; develop interface to server database and central services

our app

I²C

microprocessor
sensor
memory
actor

device / system
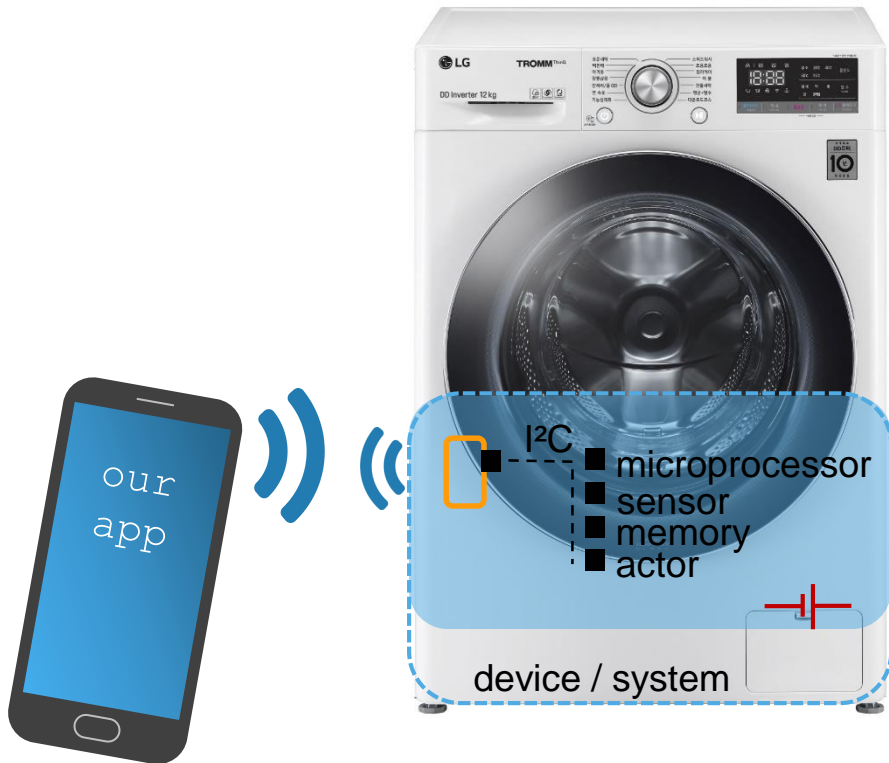
- Electrical side (I²C interface)
  - Connect the I²C of the connected tag to the existing I²C bus in the unit, or to a free I²C port of the system microprocessor
  - Define a suitable logical configuration
- RF side
  - Connect a suitable antenna to the connected tag
  - Use a Smartphone with NXP *TagInfo* or *TagWriter* Apps to check connectivity and perform basic tests
  - Define a suitable logical configuration
  - Develop a Smartphone / reader app for the purpose

Support resources available through NXP.com

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SUMMARY AND TAKEAWAYS

**1** Connected tags let you **add a user self-service interface to non-connected systems**

- NFC enabled smartphone acts as edge computing device

- Brings feature expansion, local analysis and aggregation

- Enables online remote support and maintenance, live ordering of parts or services

2 Connected tags can **open a maintenance interface into your existing system**

- Easily integrated into architecture

- Software and algorithms related to maintenance function are located in edge terminal, simplifying the system and making it more reliable

- Role separation between operator and maintenance user for data protection and isolation

- Select the right type of terminal according to local requirements
    - NFC smartphone for simple integration and smaller reading range
    - Dedicated industrial terminal for additional requirements and longer reading range

SOME GOODIES FOR YOU? ALL OF THESE AVAILABLE THROUGH NXP.COM
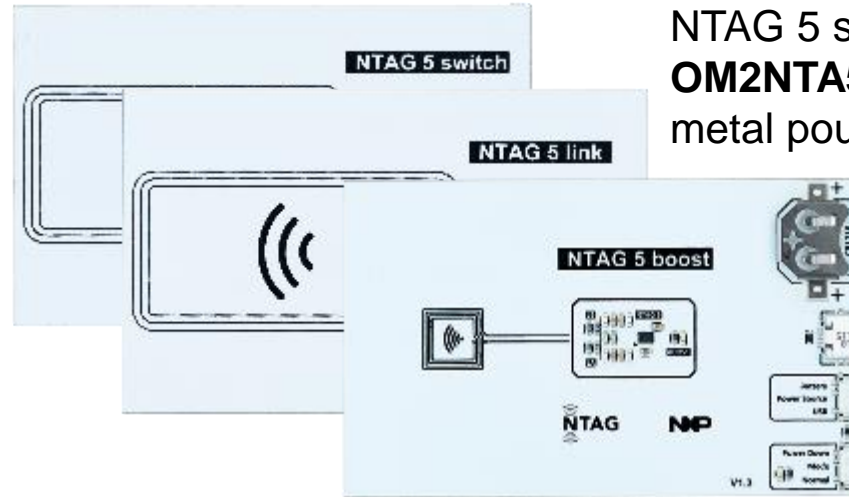
NTAG 5 switch/link/boost demo board **OM2NTA5KIT**, three credit-card-sized boards in metal pouch – ideal for quick customer demos; comes with matching smartphone app
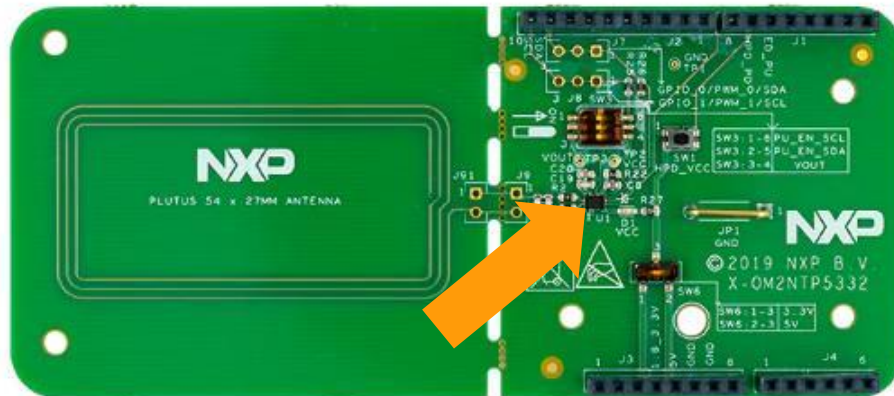
NTAG 5 link eval board **OM2NTP5332**, Arduino shield connectors

54x27mm antenna

NTAG 5 boost eval board **OM2NTA5332**, Arduino shield connectors

10x10mm(!) antenna