DESIGN AND IMPLEMENT NFC APPLICATIONS

SESSION 1: PRODUCT SUPPORT PACKAGE FOR NXP NFC READERS

September 2016
Agenda

Design and implement NFC applications

Session I, 7th September
Product support package for NXP NFC readers
https://attendee.gotowebinar.com/rt/2329750067403618817

Session II, 28th September
Antenna design considerations for NXP NFC reader solutions
https://attendee.gotowebinar.com/rt/282682617345186049

Session III, 18th October
The NFC Cockpit - the complete design tool for engineers
https://attendee.gotowebinar.com/rt/4665515186055692345

Session IV, 31th October
NFC Reader Library - SW support for NFC frontend solutions
https://attendee.gotowebinar.com/rt/7151741873899128067
Agenda

Design and implement NFC applications

Session I, 7th September

Product support package for NXP NFC readers

- NFC products in our portfolio
- Support material to choose the right NFC solution
- **HW support**: Demokits and reference boards
- **SW support**: Software tools and source code examples
- **More design support**: Antenna design, NFC community, online academy
- Wrap up of our support package for NFC readers
NXP has the best support package on the market

We reduce complexity, streamline tasks and add flexibility at every point in development

- We know each step in the NFC implementation process
  Our support package simplifies the process and reduces time to market

- We have the right material for each design step
  Full range of development kits, design files, sample code, app notes, online training, tutorials

- Directly find answers to your questions
  Through our technical NFC community and NXP certified Independent Design Houses (IDHs)

A unique combination of PCB boards, software tools, software examples, training material, documentation, tutorials and support community
Our support for NFC

The NXP website is your starting point for any NFC design. It’s where you’ll find online resources that help you select a product, order samples, and begin development.

Evaluate functionality & choose an NFC product
Investigate which NFC functionality you need and choose one NFC solution from our broad portfolio.

Evaluate features
Explore the possibilities with one of our development boards, then use the same board to start prototyping.

Start prototyping
Re-use design of NXP development boards and sample code examples.

Test & debug
We use standard-based design and support the most popular development tools to make it easy to fine-tune performance and catch errors.

Get certified
Our solutions are designed to meet CE and FCC, and make it easier to pass EMVCo certification.
CHOOSE AN NFC PRODUCT
Where to find our NFC portfolio

http://www.nxp.com/

NFC focus products addressing all your needs

Entry level NFC applications: Connected tag solutions

- Ideal for low power operations

Maximum flexibility: NFC frontend solutions

- Integration with an external MCU

Plug-and-play: NFC controllers with integrated FW

- Easy integration into any OS-environment

All-in-one: NFC controllers with customizable FW

- Contact and contactless interfaces, MCU and software in one chip
The product selection path

Passive solution
I will interact only with NFC phones
NTAG I²C plus

Active solution
What OS requirements do you have?

Linux
Android
Windows
Own application code

NFC controller with integrated FW
PN71xx

NFC controller with customizable FW
PN746x_736x

I will talk to any NFC-enabled system

RTOS
NullOS

I will interact with contactless cards

High performance full NFC with DPC

High performance multi-protocol reader

High performance ISO/IEC14443 reader

High performance ISO/IEC15693 and ISO/IEC18000-3M3 reader

PN5180 NFC frontend
CLRC663 NFC frontend
MFRC630 NFC frontend
SLRC610 NFC frontend
More support material to choose an NFC product

Plenty of technical details on our NFC solutions in our **recorded sessions**!

NXP NFC readers portfolio overview

NFC product selection app

NTAG I²C plus – Your entry way to NFC
http://www.nxp.com/support/online-academy/ntag-i2c-plus-your-entryway-to-nfc:NTAG-I2C-PLUS-ENTRYWAY-TO-NFC

PN5180 – The best full NFC frontend on the market

PN71xx family – Plug-and-play NFC solutions

PN7462 family – First all-in-one full NFC solution
FIND THE SUPPORT PACKAGE
Where to find the support package?


Our demokits are comprehensive packages with extensive support material

**Hardware PCBs**

**Reference source code and tools**

**IC samples**

**Documentation**
Application notes, User Manuals, Quick start guides
SUPPORT PACKAGE FOR: CONNECTED TAGS PORTFOLIO
OM5569: NTAG I²C plus Explorer kit and variants

**OM5569-NT322E**
- **Contents**
  - NFC Explorer board with Class 4 antenna
  - Field detector board
  - Additional NFC flex antenna (Class 6)
  - NTAG I²C plus package SO8 samples
- **Features**
  - Explorer kit to evaluate NTAG I²C plus and simple prototyping
- **Ordering details**
  - Orderable part number: OM5569-NT322E
  - 12NC: 935307849699

**OM5569-NT322ER**
- **Contents**
  - NFC Explorer board with Class 4 antenna
  - Identive CLOUD 3700F reader
  - Field detector board
  - Additional NFC flex antenna (Class 6)
  - NTAG I²C plus package SO8 samples
- **Features**
  - Explorer kit to including USB NFC reader to evaluate NTAG I²C plus and simple prototyping including
- **Ordering details**
  - Orderable part number: OM5569-NT322ER
  - 12NC: 935307848699
  - URL: [http://www.nxp.com/demoboard/OM5569-NT322ER.html](http://www.nxp.com/demoboard/OM5569-NT322ER.html)

**OM5569-NT322F**
- **Contents**
  - Class 4 flex antenna
  - Class 5 flex antenna
  - Class 6 flex antenna
  - 10 NTAG I²C plus SO8 samples
- **Features**
  - Add-on Flex antenna kit to be used with NFC Explorer board or your own microcontroller for easy prototyping with NTAG I²C plus
- **Ordering details**
  - Orderable part number: OM5569-NT322F
  - 12NC: 935307851699
NTAG I²C plus support tools and SW

NTAG I²C plus support tools and SW allow you to evaluate the IC capabilities, but also develop and test your own applications.

Mobile applications
- Explorer kit Android application

Desktop applications
- Explorer kit Windows application
- Peek and Poke

LPCXpresso & firmware
- NTAG I²C Explorer board firmware
  - NTAG I²C Explorer bootloader
  - NTAG I²C Explorer demo
  - NTAG I²C Explorer blink
SUPPORT PACKAGE FOR:

NFC FRONTENDS

&

NFC CONTROLLERS WITH CUSTOMIZABLE FW
OM25180FDK: PN5180 NFC frontend development kit

Contents
- PNEV5180B board with 65x65mm antenna optimized for EMVCo applications
- 30 mm x 50 mm antenna with matching components optimized for NFC applications
- Three small antenna matching PCBs for custom antenna matching
- NFC sample card (NTAG216)
- 10 PN5180 IC samples (HVQFN package)

Features
- Quick evaluation of PN5180 NFC frontend IC.
- Connect a custom antenna to PNEV5180 board
- Define and optimize the analog settings for any connected antenna
- Develop NFC applications based on the NFC Reader Library

Ordering details
- Orderable part number: OM25180FDK
- 12NC: 935307319699
- URL: http://www.nxp.com/demoboard/om25180fdk.html
CLEV663B: CLRC663 family development board

Features
- CLEV663B is an NFC frontend development board which can be used for embedded software development based on LPCXpresso
- Power supply by USB cable.
- Antenna can be separated from the reader IC section.
- Software development kit based on NFC Reader Library.
- Including examples such as: polling loop, MIFARE Ultralight, MIFARE Classic, MIFARE DESFire EV1.

Ordering details
- Orderable part number: CLEV663B
- 12NC: 935297815699

Supported ICs
- Development board for CLRC663, MFRC630 and SLRC610
PNEV512B and EXPLORE-NFC boards

**PNEV512B board**

- **Features**
  - PNEV512B is an NFC frontend development board which can be used for embedded software development based on LPCXpresso
  - Power supply by USB cable.
  - Antenna can be separated from the reader IC section.
  - Software development kit based on NFC Reader Library.

- **Ordering details**
  - Orderable part number: PNEV512B
  - 12NC: 935298199699
  - URL: [http://www.nxp.com/demoboard/pnev512b.html](http://www.nxp.com/demoboard/pnev512b.html)

**EXPLORE - NFC**

- **Features**
  - EXPLORE-NFC is a high performance full NFC expansion board for the Raspberry Pi
  - Based on PN512 NFC frontend reader IC
  - Integrated high performance antenna
  - Examples available for card polling, P2P communication and card emulation

- **Ordering details**
  - Orderable part number: PNEV512R
  - 12NC: 935303828699
OM27462CDK: PN7462 NFC controller development kit

Contents
- PNEV7462B NFC controller board with standard 65x65mm antenna
- 30x50mm antenna with matching components
- Three PCBs for individual antenna matching
- Two USB cables
- OM13054 LPC-Link2 debug adapter
- 10 PN7462 IC samples
- NFC sample cards and tags

Features
- Easy antenna design with NFC Cockpit software and PCB adaptors for antenna matching
- Easy application development with full NFC Forum and EMVCo compliant contact and contactless libraries
- Smartcard reader and SAM slot extensions

Ordering details
- Orderable part number: OM27462CDK
- 12NC: 935307673699
- URL: [http://www.nxp.com/demoboard/om27462CDK.html](http://www.nxp.com/demoboard/om27462CDK.html)
NFC Reader Library: software support for NFC frontend solutions

- The NFC Reader Library is a multi-layer library, written in ANSI C which makes it easy to create NFC-based applications.
- Each layer consists of different components having a generic interface and a specific implementation.
- The library structure provides a modular way of programming and is designed in a way to be easily portable to many different microcontrollers.

PN7462 family dedicated firmware and software examples
Based on the NFC Reader Library and NXP Contact Library

**PN7462 FW and SW examples**

- PN7462 is supported by contact and contactless (based on NFC Reader Library) software libraries that are validated and pre-certified for EMVCo and also comply with NFC Forum guidelines.
- Written in C language and provide an API that facilitates all the operations and commands required in contact and contactless applications.
- Multiple source code examples for the most popular use cases, including payment and access are available.
NFC Cockpit - the complete design tool for engineers

NFC Cockpit

- It is a PC-based GUI that can be used to explore the IC functionality and perform RF and antenna design related tests.
- It can be used to optimize antenna tuning to perform the DPC calibration and the related Tx and Rx optimization without touching any source code.
- It allows direct register and EEPROM modification and fine tuning

Supported NFC solutions

- PN5180 NFC frontend, delivering full NFC Forum compliance and high performance
- PN7462 NFC controller family, state of the art RF interface

Fig1. DPC feature in action after calibration with the NFC Cockpit tool
SUPPORT PACKAGE FOR NFC CONTROLLERS WITH EMBEDDED FIRMWARE
OM5578: Development kits for PN7150 plug-and-play NFC controller

PN7150 demokit cover integration with Raspberry Pi, BeagleBone Black and any board with Arduino-compliant header (including LPCXpresso, Kinetis and i.MX boards)

Contents
- PN7150 NFC controller board
- Arduino interface board
- NFC Forum Type 2 Tag

Ordering details
- Orderable part number: OM5578/PN7150ARD
- 12NC: 935309078699
- URL: [http://www.nxp.com/demoboard/OM5578.html](http://www.nxp.com/demoboard/OM5578.html)

Contents
- PN7150 NFC controller board
- BeagleBone Black interface board
- NFC Forum Type 2 Tag

Ordering details
- Orderable part number: OM5578/PN7150BBB
- 12NC: 935309077699
- URL: [http://www.nxp.com/demoboard/OM5578.html](http://www.nxp.com/demoboard/OM5578.html)

Contents
- PN7150 NFC controller board
- Raspberry Pi interface board
- NFC Forum Type 2 Tag

Ordering details
- Orderable part number: OM5578/PN7150RPI
- 12NC: 935309076699
- URL: [http://www.nxp.com/demoboard/OM5578.html](http://www.nxp.com/demoboard/OM5578.html)
OM5577: Development kits for PN7120 plug-and-play NFC controller

PN7120 demokits cover integration with Raspberry Pi, BeagleBone Black and any board with Arduino-compliant header (including LPCXpresso, Kinetis and i.MX boards)

Contents
- PN7120 NFC controller board
- RaspberryPi interface board
- BeagleBone Black interface board
- NFC Forum Type 2 Tag

Ordering details
- Orderable part number: OM5577/PN7120S
- 12NC: 935306352699
- URL: http://www.nxp.com/demoboard/OM5577.html

Contents
- PN7120 NFC controller board
- Arduino interface board
- NFC Forum Type 2 Tag

Ordering details
- Orderable part number: OM5577/PN7120ARD
- 12NC: 935308904699
- URL: http://www.nxp.com/demoboard/OM5577.html
### PN7150 Software images & examples vs hardware compatibility

**Development kits for PN7150 (OM5578)**

<table>
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<th>Development kit</th>
<th>Hardware platforms supported</th>
<th>Software images and software examples available</th>
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<tr>
<td>OM5578/PN7150ARD PN7150 SBC Kit for Arduino</td>
<td>Any development board with an Arduino compliant header (e.g. LPCXpresso, Kinetis &amp; Freedom boards, i.MX boards)</td>
<td>Linux SW image (for UDOO NEO board): OM5578 PN7150 ARD UDOO Linux demo image Android SW image (for UDOO NEO board): OM5578 UDOO Neo Android Lollipop demo image LPCXpresso SW example (LPC824, LPC11U37H, LPC1227 board): NXP-NCI LPCXpresso example Kinetis SW example (for FRDM-K64F board): NXP-NCI Kinetis Design Studio example</td>
</tr>
<tr>
<td>OM5578/PN7150RPi PN7150 SBC Kit for Raspberry</td>
<td>Raspberry Pi</td>
<td>Linux SW image: OM5578 PN7150 RPI Linux demo image WinIoT SW image: OM557x PN71x0 RPI2 WinIoT</td>
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<tr>
<td>OM5578/PN7150BBB PN7150 SBC Kit for BeagleBone Black</td>
<td>BeagleBone Black</td>
<td>Linux SW image: OM5578 PN7150 BBB Linux demo image Android SW image: OM5578 PN7150 BBB KitKat demo image</td>
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## PN7120 Software images & examples vs hardware compatibility

### Development kits for PN7120 (OM5577)

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<th>Development kit</th>
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<td>OM5577/PN7120S</td>
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<td>PN7120 SBC Kit for Raspberry Pi and BeagleBone Black</td>
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<td>Android SW image: OM5577 BeagleBone Android KitKat demo image</td>
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<td></td>
<td>Raspberry Pi</td>
<td>Linux SW image: OM5577 Raspberry Pi Linux demo image</td>
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<td>WinIoT SW image: OM557x PN71x0 RPI2 WinIoT</td>
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<tr>
<td>OM5577/PN7120ARD</td>
<td>Any development board with an Arduino compliant header (e.g. LPCXpresso, Kinetis &amp; Freedom boards, i.MX boards)</td>
<td>Linux SW image (for UDOO NEO board): OM5577 PN7120 ARD UDOO Linux</td>
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<tr>
<td>PN7120 SBC Kit for Arduino</td>
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<td>Android SW image (for UDOO NEO board): OM5577 UDOO Neo Android Lollipop demo image</td>
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<td>LPCXpresso SW example (LPC824, LPC11U37H LPC1227): NXP-NCI LPCXpresso example</td>
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<td>Kinetis SW example (for FRDM-K64F board): NXP-NCI Kinetis Design Studio example</td>
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MORE SUPPORT
More support material to get started with NFC demokits

Plenty of details on how to get started with our demokits and SW tools in our recorded sessions!

- **NTAG I²C plus** – product support package

- **PN71xx** – product support package

- **PN5180** – product support package

- **PN7462** – product support package
NFC antenna design support

AN11276 NTAG antenna design guide
AN14445 Antenna design guide for MFRC52x, PN51x, PN53x
AN11019 CLRC663, MFRC630, MFRC631, SLRC610 antenna design guide
AN11740 PN5180 antenna design guide
AN11564 PN7120 antenna design and matching guide
AN11755 PN7150 antenna design and matching guide
AN11706 PN7462AU antenna design guide
AN11741 How to design an antenna with DPC
AN11535 Measurement and tuning of a NFC and reader IC antenna with a miniVNA

Webinar session
28/09/2016
Use our technical community for your questions

Become a registered member and get expert advice from the developer community
https://community.nxp.com/community/nfc

How to get there
- NFC and Reader Ics → NFC Technology hub → NFC support → NFC community
- URL: https://community.nxp.com/community/nfc
Watch on-demand any recorded session

Tap into our free on-demand training library.

Hundreds of hours of webinars and presentations on NXP products, applications, software, and tools.

Find recorded sessions, among others, for:
- NFC essentials
- NFC use cases
- NFC standards
- NFC reader antenna design (6 sessions)
- NFC reader portfolio
- NFC in smart home, gaming, payments,

How to get there
- NFC and Reader ICs → NFC Technology hub → NFC support → NFC webinars
- URL: http://www.nxp.com/support/online-academy/nfc-webinars:NFC-WEBINARS
Find the right partner

How to get there
- NFC and Reader ICs → NFC Technology hub → NFC support → NFC IDH partners
- URL: http://www.nxp.com/pages/partner-list:PARTNER-LIST
More information about NFC

Visit **NFC knowledge base** to get familiar with NFC technology …

Visit our **blog** for more news about NFC…

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**NFC Knowledge Base**

NFC technology and devices that power NFC are a different kind of wireless. It is proximity technology. It only comes into action when devices are brought together so knowledge is always possible.

**NFC Operating Modes**

NFC is a standard subset of RFID technology. It operates at 13.56 MHz and performs many of the same functions as RFID tags and contactless smart cards. NFC operates on one of three communication modes: ReaderWrite, Peer to Peer, and Card Emulation.

*ReaderWrite Mode*:

An NFC device in ReaderWrite mode can receive a command over a link, enabling NFC devices to open another NFC device and information for operation such as binding, access control, tickets, and contactless payments.

*Peer to Peer Mode*:

In Peer to Peer mode, any NFC-enabled reader or NFC-equipped reader communicates with another NFC-enabled reader or NFC-equipped reader. Attributes of security, reliability, and simplicity are presented in a simple, easy-to-use interface. This mode uses the read/write interface as a way to create a communication link. For example, two devices (such as smartphone) with readerWrite capability can communicate with each other using ReaderWrite mode.

*Card Emulation Mode*:

Any NFC device in card emulation mode can receive a command over a link, enabling NFC devices to be used within the existing contactless card infrastructure for operation such as binding, access control, tickets, and contactless payments.

**Active or Passive Communication**

NFC can use a passive or active communication scheme. In the passive scheme, the reader provides power to the target. This makes energy, and it’s not necessary to have a power source. In the active scheme both devices require power, but more sophisticated interactions can take place.

**Passive Communication Scheme**

The reading device produces a carrier field, and the target device, which is introduced to the field, sends that information back to the reader. This is a typical operation in contactless cards. In this mode, both the reader and the target behavior are key, creating a communication link. For example, two devices (such as smartphone) with readerWrite capability use ReaderWrite mode.

**Active Communication Scheme**

The reader and the target generate their own radio frequency (RF) fields, which are transmitted by multiplying the power field with an amplitude that is controlled by the reader. The reader processes all of the signal data. The reader uses the data to control the readerWrite mode.

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**How to get there**

- NFC and Reader ICs ➔ NFC Technology hub ➔ NFC knowledge Base

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**How to get there**

- About NXP ➔ Blogs
- URL: [http://blog.nxp.com/?s=nfc](http://blog.nxp.com/?s=nfc)
OUR SUPPORT PACKAGE
IN A NUTSHELL
Reference boards and demokits

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Support for connected tags

**PC tools**
- Windows application for NTAG I2C plus Explorer board
- Peek and Poke
- RFID discover

**Development kit**
- NTAG I2C plus Explorer Kit

**Android applications**
- NTAG I2C demo app
- TagInfo
- TagWriter

**Source code examples**
- NTAG I2C Explorer board C firmware
- NTAG I2C demo app Android app source
- NTAG I2C PC app source code

**Development environment**
- LPCXpresso IDE for LPC MCUs
- MIFARE SDK

**Documentation**
- Application notes
- User Manuals
- Getting started guides
Support for **NFC frontend solutions**

**NFC Reader Library**
- Software support for NFC frontend solutions:
- Available for: PN512, CLRC663, PN5180, PN7462 and Linux

**Development kits and demoboards**
- CLEV663B
- OM25180FDK
- PNEV512R
- PNEV512B

**Source code examples**
- SW examples based on NFC Reader Library demonstrating frontend capabilities

**Development environment**
- LPCXpresso IDE for LPC MCUs

**Documentation**
- Application notes
- User Manuals
- Getting started guides

**NFC Cockpit**
- A PC tool that ease design process, antenna tuning and register configuration
- (only for PN5180)
Support for **NFC controllers with integrated FW**

### Single board computer kits
- SingleBoard Computer (SBC) kits with interface boards for Arduino, Raspberry Pi and BeagleBone Black

### Compatibility with development boards
- Integration with any boards featuring Arduino-compatible header, including many LPC, Kinetis and i.MxX boards

### SW images and SW examples
- For Windows 10 IoT, Android, Linux, RTOS, NullOS together with illustrative NFC SW examples

### Documentation
- Application notes
- User Manuals
- Getting started guides
Support for **NFC controllers with customizable FW**

**Fully customizable firmware**
- Based on the NFC Reader Library and NXP Contact Library

**Development kits**
- OM27462CDK NFC Controller development kit enabling easy and fast development of applications

**Source code examples**
- SW examples based on contact and contactless SW libraries demonstrating NFC controller capabilities

**Development environment**
- LPCXpresso IDE
- Keil and IAR tool chain

**Documentation**
- Application notes
- User Manuals
- Getting started guides

**NFC Cockpit**
- A PC tool that ease design process, antenna tuning and register configuration
NXP is the right choice for your design

We have the technology

We are NFC

We share our know-how

We enable easy design-in
Next sessions

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Software development in Android and iOS
Embedded software for MCUs
JCOP, Java Card operating Systems
Hardware design and development
Digital, analog, sensor acquisition, power management
Wireless communications WiFi, ZigBee, Bluetooth, BLE
Contactless antenna RF design, evaluation and testing

MIFARE applications
End-to-end systems, readers and card-related designs
EMVco applications
Readers, cards, design for test compliancy (including PCI)
Secure Element management
GlobalPlatform compliant backend solutions
Secure services provisioning OTA, TSM services

We help companies leverage the mobile and contactless revolution
Design and implement NFC applications
Session 1: Product support package for NXP NFC readers

Jordi Jofre (Speaker)
Angela Gemio (Host)

Thank you for your kind attention!

Please remember to fill out our evaluation survey (pop-up)

Check your email for material download and on-demand video addresses

Please check NXP and MobileKnowledge websites for upcoming webinars and training sessions

http://www.nxp.com/support/classroom-training-events
www.themobileknowledge.com/content/knowledge-catalog-0