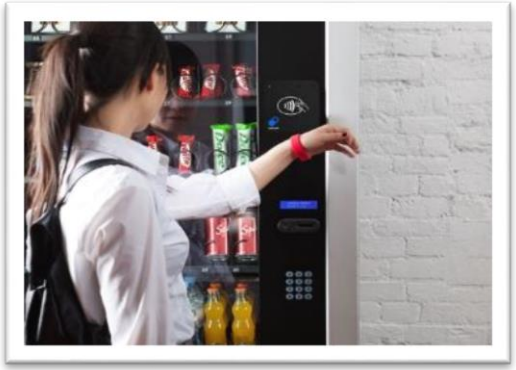
NFC for WEARABLE DEVICES

BL SMT, South APAC

Simon Wu – Aug 2016

SECURE CONNECTIONS FOR A SMARTER WORLD

Services will add value to your Wearable Devices



2.

NXP is offering a range of products allowing Services deployment

Open Devices – PN66T - *Full Wallet Applications*

- *Full Flexibility / High RF Performance*
- *Multiple Services / Full Wallet*
  - *Digitization of user's own card*
  - *Download new services in the field*
  - *Offline management by user*
- *One Global OEM Product across regions*
- *On-device user interaction (UI / User verification)*
- *Full NFC*
- *SW integration required*
- *Active device: Battery mandatory*

Single Service Devices – P60 *– A Card in Wearable Form Factor*

- *Devices dedicated to 1-2 pre-identified service*
- *Personalization in NXP production*
- *Proxy or Prepaid Card model*
- *Linked to pre-identified issuer*
- *Passive device: No Battery needed*

User Experiences

Single Service Device

- The Product comes with pre-defined cards
  - One Payment card from a predefined issuer
  - And/Or a Mifare Card for a predefined Service Provider
- *Ex: Pre defined transit application or Credit Card*

Open Device

- The Product can come with a set of predefined applications
- More applications / cards can be added later in the field
- Access to new services through Companion device application or dedicated applications
- *Ex: Add new city transit application, Add new credit card, Add access application*

SERVICES EXAMPLES

Enable services on your Wearable product with PN66T

Mastercard Payment

- Use the Wearable device for contactless payment
- Contact Mastercard to enable the service on your product

China Transit

- Top 10 Cities in China moving to contactless mobile ticketing
- NXP in the lead
- Easy integration based on NXP and Snowball deliveries

Innovate with Mifare based services

- Create Mifare applications with Mifare Open Platform
- Easily deploy Mifare based services on your product

More to come!

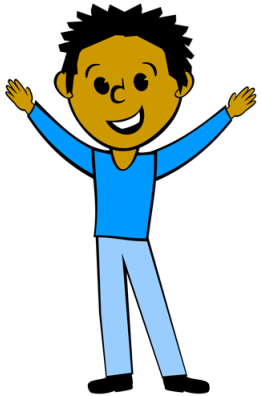
- NXP is working with partners to make more innovative services available for PN66T
- Payment, Transit, Access…

Mastercard Payment

- The user’s cards are digitized and stored in PN66T’s embedded Secure Element
- Use the Wearable device for contactless payment
- Easy integration based on NXP and Mastercard’s deliveries

Connected mobile chip-based payment solution

User experience



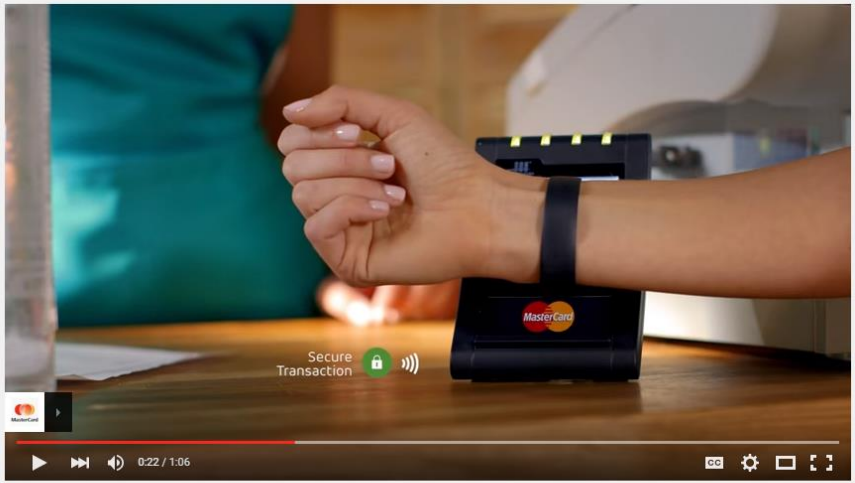
1 A User purchases a new „BestWear“ product

2 The User downloads „BestWear Wallet / Companion App“ on his Mobile Phone.

3 The User takes a photo of his card or manually enters the card details in to the his „BestWear Wallet / Companion App“.
His card gets **digitized and stored in the Secure Element** on his Wearable device.
Card digitization (including tokenization) is done by Payment Network Operators.

4 The User can now buy good in shops, using his cards stored in his wearable device to pay on contactless POS terminals.
The customer enjoys the same benefits as the ones linked to his original card.

MasterCard and NXP Partner to Bring Payments to Any Device



MasterCard to Turn Any Consumer Gadget, Accessory or Wearable into a Payment Device

https://www.youtube.com/watch?v=GSiBIFFwALU&feature=youtu.be

EINDHOVEN, Netherlands, Oct. 26, 2015 (GLOBE NEWSWIRE) -- NXP Semiconductors N.V. (NASDAQ:NXPI), co-inventor of near-field communication (NFC), today announced a collaboration with MasterCard to simplify the onboarding of secure element-based devices by integrating NXP's Loader Service solution into MasterCard's payment ecosystem. Through MasterCard's new program, which aims to enable any IoT device to become a payment device, the companies are revolutionizing how OEMs and banks deploy secure "pay" solutions to the market.

By incorporating NXP's Loader Service solution into MasterCard's ecosystem, device manufacturers can easily enable their customers to use their new devices, such as activity trackers, mobile phones, smart watches, smart jewellery, etc., for convenient and secure mobile payments. NXP's Loader Service provides the scalability and flexibility necessary for running highly secure services, which enables OEMs and Service Providers to easily deploy "Pay" solutions by significantly simplifying the value chain of deploying credentials to devices and lowering associated costs.

"With the mobile payment market evolving at an increasingly rapid pace, it is vital OEMs are able to quickly adapt to changing demands and deploy new technologies securely," said Jeff Miles, VP of Payments at NXP. "Through support from companies like MasterCard, we've simplified the process of deploying secure mobile services, such as payments, transit, or access control, to create a true plug-and-play solution, drastically reducing the time it takes for OEMs to bring products to market and providing consumers with a complete, industry leading security solution."

As the market leader in secure transaction technology, NXP's Loader Service provides the highest level of data protection and encryption to end users, issuers, payment network operators and manufacturers. By loading an applet into NXP's secure elements, the solution will work with NXP's full range of secure mobile transactions products, such as PN66T, providing an EMV certified solution deployable on a global scale and compatible with both legacy and future payment infrastructure.

"MasterCard is working closely with NXP and OEMs to ensure that the payments revolution gains momentum through turnkey solutions that make it easier than ever to establish a secure platform to do business," said James Anderson, Group Executive, Platform Management at MasterCard. "Bringing NXP's Loader Service Solution into our ecosystems enables manufacturers to spend more time focusing on the user experience and less time on supporting the infrastructure and maintenance when adding secure transactions to their devices."

China Transit

- Top 10 Cities in China moving to contactless mobile ticketing
- NXP in the lead
- Easy integration based on NXP and Snowball deliveries

NXP: The one-stop shop for mobile ticketing

PN66T, a true end-to-end solution

A new level of services:
Deep integration with Service Provider
Wallet server, Wallet SDK, User Interface, OEM SEI TSM

snowball

NFC Controller

Secure Element

MW & SW

JavaCard OS

JavaCard Applets

User experience matters

- NFC Controller leverages NXP's leadership in NFC
- Seamless RF performance delivering an outstanding user experience

Security matters

- Great interoperability with legacy infrastructure (on-line, offline)
- Good user experience (domestic, international, flexible amount limits)
- Proven level of security as adopted by EMV, the only global payments scheme

Innovate with Mifare based services

- Create Mifare applications with Mifare Open Platform
- Easily deploy Mifare based services on your product

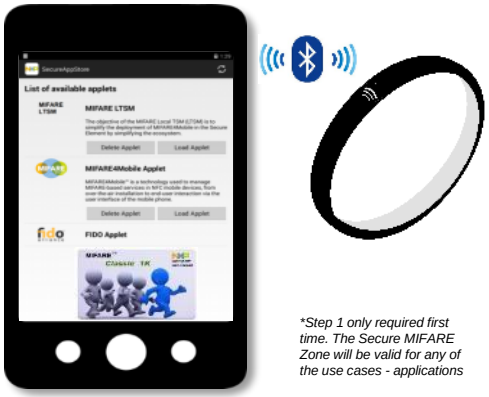
Three steps to deploy your MIFARE service

Install - Create - Personalize

1

Install the "MIFARE Secure Zone"
in your Device

That is the Security area where MIFARE cards will be stored (SE)



**Step 1 only required first time. The Secure MIFARE Zone will be valid for any of the use cases - applications*

2

Create a MIFARE Card
in the MIFARE Secure Zone

Your device is now able to behave as a plastic card

3

Personalize the MIFARE Card
Different options available

The service provider may select the most appropriate option depending on their requirements/capabilities

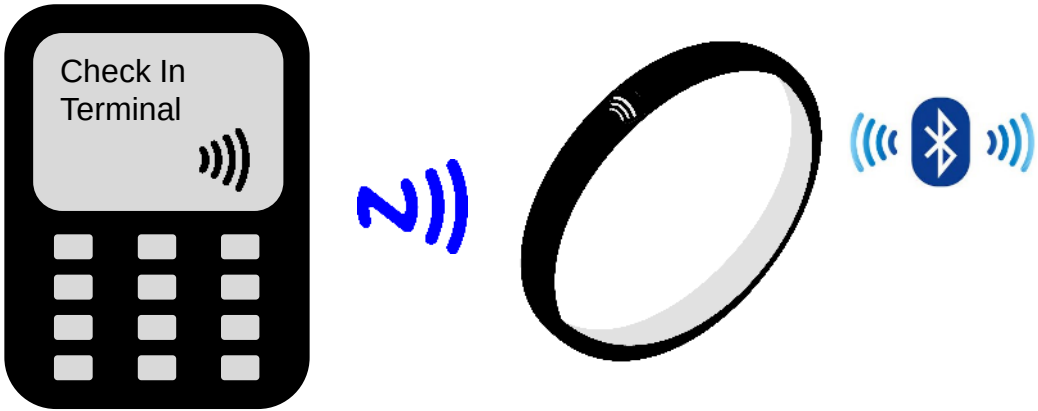
Use case: Hotel room key

USER EXPERIENCE

1. **User downloads Hotel Card**
   for a particular reservation
2. **Arriving at the hotel**
   User Checks-in at kiosk in hotel lobby by tapping with his mobile phone. Gets room number and virtual key.
3. **Ready to enter the room!!**

ANDROID APP ON Google play

Over the Air



Use case: Transport Card

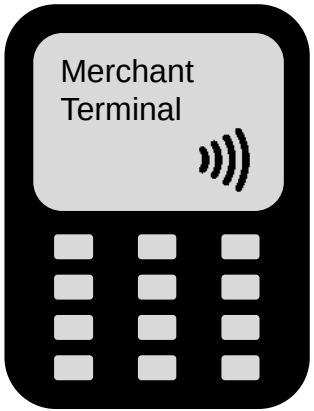
USER EXPERIENCE

1. **Arriving to a city**
   opens transport app and downloads (buys) city transport card

2. **Ready to go!**
   The selected transport card is ready to use on the Wearable Device

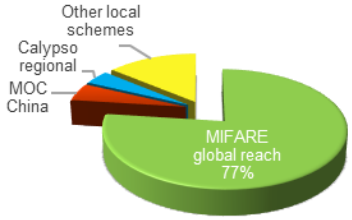
ANDROID APP ON Google play

Over the Air



The world's cities run on MIFARE

MIFARE technology has 77% market share with DESFire adoption growing



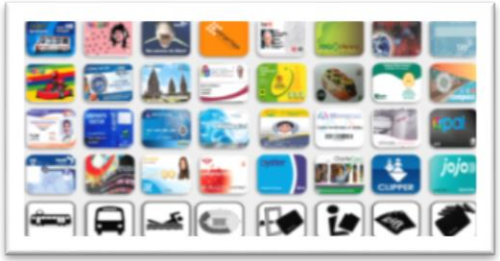
NXP is the partner to drive mobile transit WW

NXP Initiatives to Facilitate the Deployment of Services

- NXP is helping you get ***Fast and Easy*** access to Innovative Services
- With SSDP (Secure Service Development Platform), Service Providers have all they need for a quick deployment of Secure Element based Services, based on NXP Loader Service functionality
- NXP Partner Program gathers Service Providers offering applications based on the Loader Service
  - Benefits for OEMs: More applications can be enabled on Wearable Devices
  - Benefits for Application Developers: Easier and centralized access to OEMs

Any specific service you are thinking of, that is important for your market?

Let us know, so that we can help you!



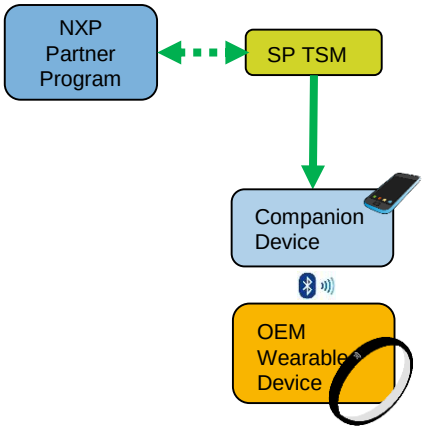
The SSDP Partner Program

Service providers or aggregators using the SSDP to define and develop their applications on the basis of Loader Service and MIFARE Open Platform features

NXP Open SE: How to enable services with PN66T?

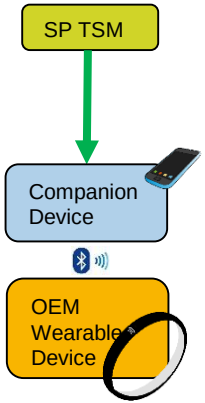
Through NXP Loader Service

- Recommended model for new services
- Easy to setup, Fast Time to Market
- No need for SEI TSM
- Service Providers can join NXP Partner Program for an easy deployment
- SP TSM just needs a signed certificate from NXP



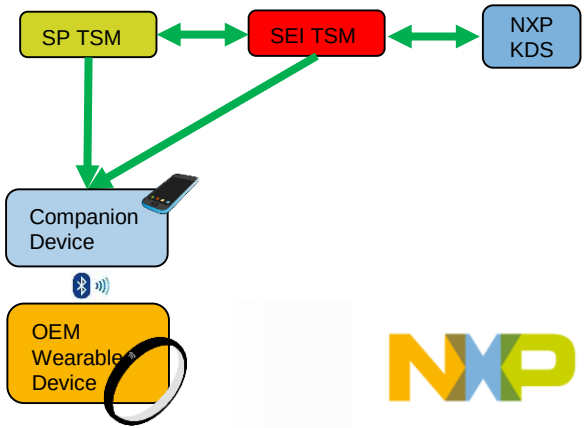
Through Mifare Local TSM

- Recommended model for Mifare based services
- No need for SEI TSM
- Card personalization can be done on device, through a NFC reader or online via SP TSM



Through a SEI TSM infrastructure

- Can be used for existing services using a legacy SEI TSM infrastructure
- OEMs can retrieve ISD keys for the SE from NXP KDS (Key Delivery System)
- Higher complexity and cost



Logical Access solutions

PN66T allows "SEOS Ready" Products

NXP is partnering with HID to offer Logical Access solutions

NXP Opens Doors with HID Global Collaboration (April 07, 2016)

Embedding HID Global® Seos® technology in NXP SmartMX Secure Elements enables a powerful turnkey physical access solution for wearables in enterprise, buildings and home electronic locks LAS VEGAS, April 07, 2016 (GLOBE NEWSWIRE) -- **(ISC West Conference 2016) –** NXP Semiconductors N.V. (NASDAQ:NXPI) today announced a strategic collaboration with HID Global®. The HID Global Seos® credential technology will be embedded in NXP's SmartMX-based secure element devices. Through the collaboration, NXP and HID Global aim to enable the use of wearable devices, to open electronic locks at commercial buildings, hotels and workplaces in the future. Additionally, NXP and HID Global are cooperating on a broad range of opportunities to expand the adoption of secure access to more applications and use cases.

Wearables manufacturers worldwide with the Seos-ready NXP chips can enable users with building and parking access, PC login, authentication to IT systems and cloud applications, secure print job collection, time and attendance, point of sale and automated cashless vending, along with numerous other use cases supported by Seos. HID Global's field programmers will support these use cases in Seos-ready wearables simply with the support of loading digital

....

HID Seos Ready

- What does Seos Ready mean?
  - Devices with Seos Ready chips from NXP can support the same range of access control use cases as HID RFID cards.
  - Devices with Seos Ready chips from NXP can be provisioned with HID credentials in the field using HID's standard field programming tools.
- Why is this important?
  - HID is the leading provider of solutions for managing access to doors and IT resources in enterprises.
  - Seos is HID's technology for deployment on a broad range of devices including RFID cards and smart devices (e.g. mobile phones and wearables).

HID Seos Ready

- How do Seos Ready devices fit into the HID Ecosystem?
  - Seos Ready devices can be provisioned using the same business processes and equipment used to program HID cards in the field.
  - Seos Ready devices can be used the same way that HID badges are used by employees to open doors in their offices.
  - Seos Ready devices can be used at the same doors that support HID Mobile Access solutions which enable the use of smart phones for door access.
  - HID is part of ASSA ABLOY, the world leader in door opening solutions. Seos is integrated throughout including support for enterprise locks, hotels and residential uses.

SOFTWARE OFFERING

SW Architecture

Companion Device
(Android Phone, iPhone, Windows Phone, Windows PC, MacBook …)

Wearable Device

OEM Wallet App

3rd Pty Wallet App

3rd Pty Transit App

…App

OEM Wearable App

Wearable Core SDK APIs (NFC and eSE APIs)

Loader Service Client

MIFARE Open Platform Client

JCOP Upgrade Client

Wearable Core SDK APIs (NFC only)

libnfc-nci for wearable

Reference Linux Kernel I2C driver (OS specific)

free RTOS

NFCC

P61 eSE (Various Applets

Communication mechanism between Wearable and Companion device is OEM specific.

NXP's Wearable Core SDK (To be ported on Target platform and OS)

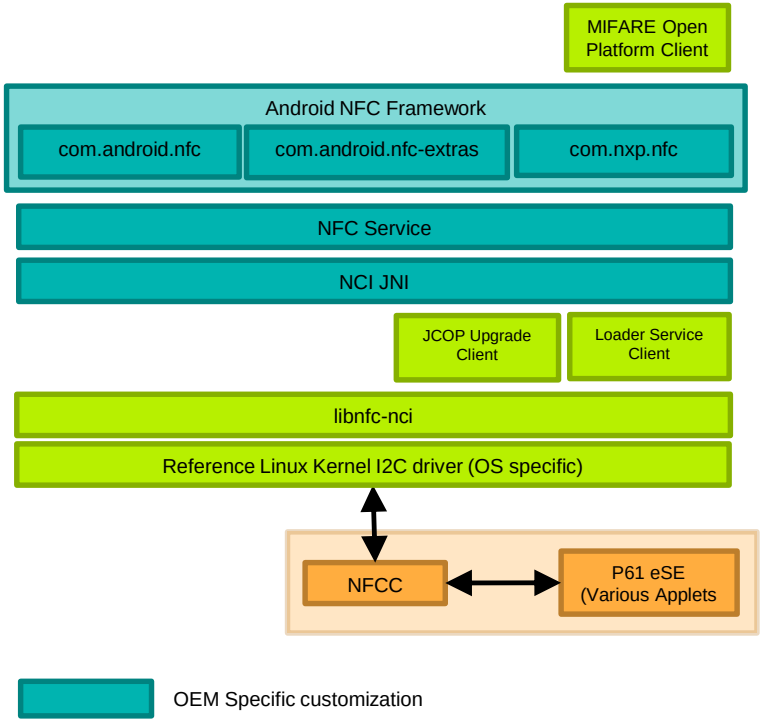
Wearable OEM App

NFC/eSE Apps

NFC SW for RTOS based Wearables

- NXP SW stack for PN66T validated on NXP Connected Device
- Free RTOS used for validation
- Card Emulation NFC stack
- OTA update of NFC controller FW and JCOP OS on eSE through companion device (e.g. Phone)
- Loader Service support through companion device for easy service onboarding (e.g. Payment applet download)
- MIFARE Open Platform support through companion device
- Alpha Release available
- Final Release planned for Mid’16

NFC SW for Android based Wearables



- Same NFC SW as used in Android Phones
- Support for Wearable use cases
  - Card Emulation
  - SE Wired Mode
- Also supports Reader/Writer and P2P modes
- Already part of tens of commercial phones
- Tested internally in Android context (more than 3000 tests)
- SW in C, easily portable to different OS
- Complete source code distribution under Apache License v2.0

INTEGRATION IN WEARABLES

Connected Device Demo Set

NFC Antenna 28x8mm=224mm2

Specifications	Value	Unit
Power consumption (stby:BLE+NFC+µC) (Target / In development)	~25	µA
EMVCo distance	> 4	cm
Loader service	Y	
MIFARE Open Platform	Y	
NFC chip	PN66T	
MCU	LPC5410	
BLE	QN9021	

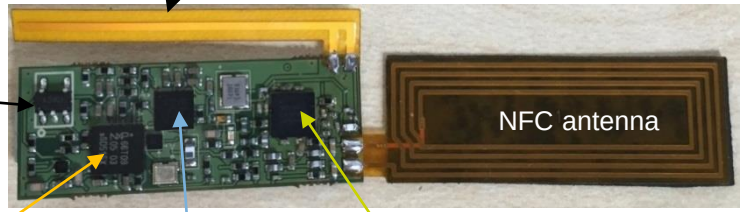
NXP Example Hardware Design

Battery 50mAh

Battery charger

BTLE antenna

30x11x5mm including 5 days battery & all antennas

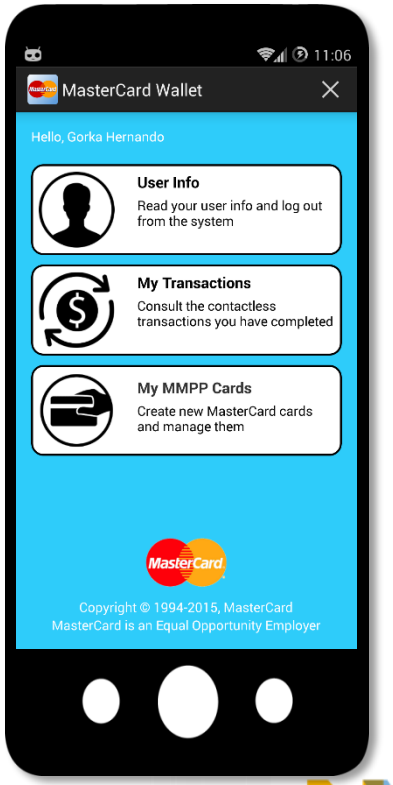


PN66T	MCU 5410	BTLE
NFC SW Wearable Core (C code)	Porting on LPC5410	QN9021 SW on LPC5410
Integrated in LPC5410 **Compatible with SSDP applications (all mobile OS)**	Low power Sensor Hub MCU **allowing adding various sensors**	SW Integration in LPC5410

MasterCard application

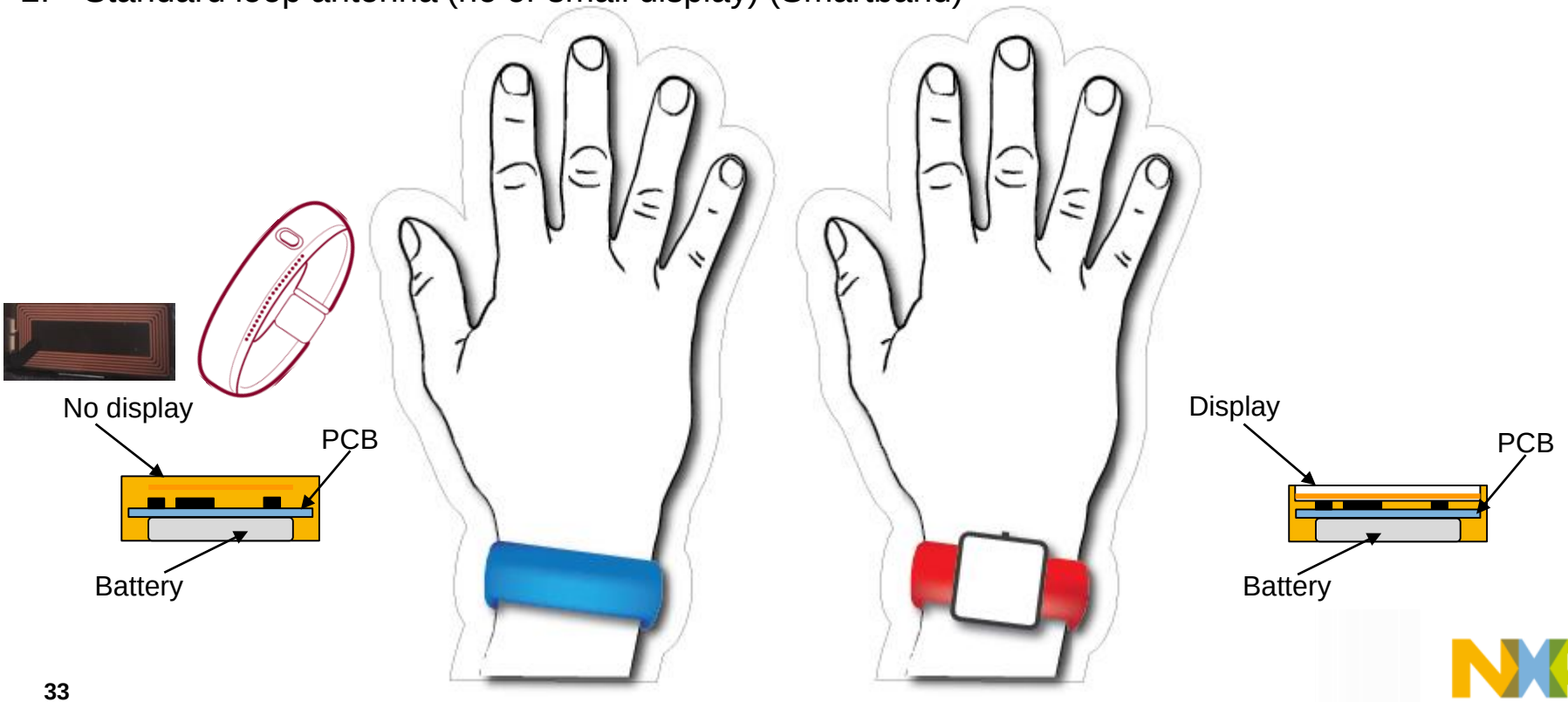
Home screen

- Main Screen where the user can:
  - Go to “My Credit Cards”
    - add, manage or delete MMPP cards
  - Go to “My Transactions” to
    - view the previous completed transaction with the available MMPP cards
  - Go to User Info
    - shows the name of the user that has been registered



Different antenna design vs device constraints:

1. 1 loop antenna Around display (Smartwatch)
2. Standard loop antenna (no or small display) (Smartband)



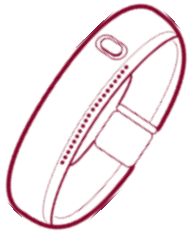
Example #1: Antenna for smartwatch

- ANTENNA
  - Antenna location: around and under glass of display
  - Antenna size and shaping: 38x38mm, **no ferrite sheet, 1 loop only**
  - Antenna cost < 20cts
- NFC configuration for test
  - PN66T with 3.3V or 4.7V TVDD (with ext DC/DC)
  - Distance & user experience with Payment reader
- Outcomes
  - user experience control

Performance with metal case and metal bracelet
EMVCo compliant
Typical performance (Vivopay) ~ 6cm
User experience: Display in front of the reader
~45° angle allowed

Example #2: Antenna on top (Smartband example)

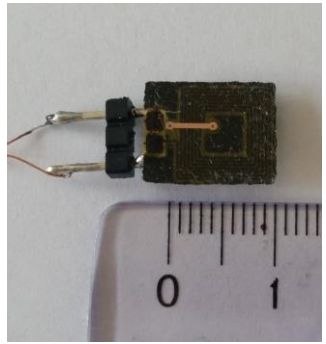
- ANTENNA
  - Antenna location: on top
  - Antenna size and shaping: ~30x10mm, ferrite sheet, 3 loops
  - Antenna cost < 40cts
- NFC configuration for test
  - PN66T with 3.3V
  - Distance & user experience with Payment reader
- Outcomes
  - Best user experience

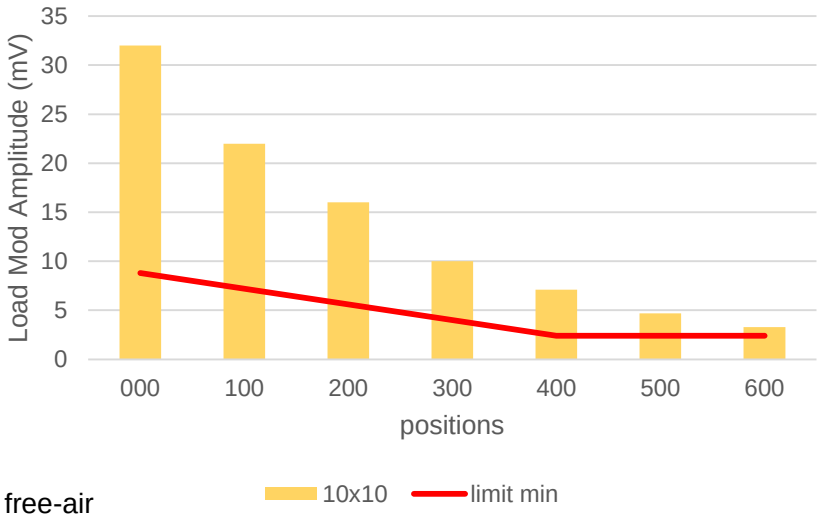


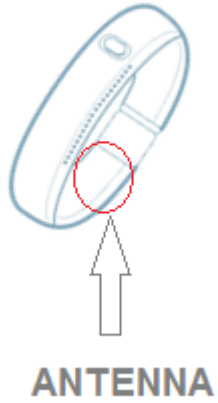
Performance with real band implementation
EMVCo compliant
Typical performance (VIVOPAY) ~8cm
User experience: top or bottom
>90° angle allowed

Small antenna performance

10mmx10mm







*antenna free-air

SECURE CONNECTIONS
FOR A SMARTER WORLD