NFC Everywhere

Controller, frontend, and connected-tag solutions for the next generation of NFC applications
Near Field Communication, the tap-and-go technology co-invented by NXP more than ten years ago, has shifted into high gear. This simple, intuitive technology, which lets you initiate interactions with a simple touch, is now in millions of smartphones, tablets, and other consumer electronics, with new devices arriving almost daily.

Why is NFC such a hot topic? Because it’s fast, seamless, and easy to use – and like nothing else you’ve ever experienced.

NFC is a different kind of wireless. To begin with, it’s a proximity technology, which means it only works when two devices are brought close together. Eavesdropping is a near impossibility. Where other wireless technologies use the equivalent of a random shout to be heard, NFC speaks with intention, in a whisper.

What’s more, NFC is unique in the way it uses energy. Or, more to the point, the way it doesn’t. Only one of the two devices needs to be powered for an interaction to take place. The first can power the second, so the second can save its battery for other things – or not have a battery at all.

NFC offers the ultimate in convenience, and makes new experiences possible. It’s an evolution of contactless smartcard technology but, unlike its predecessor, which can only communicate in one direction, NFC supports two-way interactions. That opens up a whole new range of possibilities, from the simple exchange of business cards to more sophisticated things like personalized transactions, loyalty programs, and devices that can communicate and configure themselves.

Also, because NFC is fully compatible with the established, trusted infrastructure behind contactless cards and MIFARE, it’s ready to go. The same infrastructure that so many millions of people around the world rely on every day to make payments, access buildings, and ride public transport is also a solid platform for NFC, just waiting to launch new ideas.

NFC delivers
Convenience
Power savings
Lower customer-service costs

By 2018, there will be 1.7 billion NFC-enabled smartphones in the market (ABI Research, 2013). More than 90 percent of all NFC-equipped smartphone models use NXP technology.
**NFC in action**

NFC supports three communication modes: Read/Write, Peer-to-Peer, and Card Emulation. In all these modes, a simple tap is all it takes to initiate a transaction.

### Read/Write Mode

In Read/Write Mode, the system performs the functions of a contactless readers/writter. The systems’ NFC IC interacts with an NFC-enabled device – such as a contactless smartcard, an NFC-capable smartphone, or an NFC-enabled smartcard reader – and communicates with the device in a manner similar to that used in a contactless card transaction. The system’s NFC IC can receive data from the device’s RF field and send data back to the device. This mode uses a passive or active communication scheme.

#### Power savings

The reader in Read/Write Mode uses power from the initiator and doesn’t need its own battery. The receiving device switches off its field to listen. The receiving device receives its energy from the RF field.

#### Operating distance

10 cm

### Peer-to-Peer Mode

In Peer-to-Peer Mode, a simple tap on two NFC-enabled devices (such as a mobile phone and a NFC-capable smart card) can proceed. This mode enables two-way interactions between devices, so you can exchange business cards and contact information with a tap or use your smartphone to activate a lock on your door.

#### Power savings

The NFC-enabled device that initiates the transaction generates an RF field, and then cuts its field to wait for a response. It then switches off its field to receive data from the target device. The receiving device switches off its field to listen. Data rates are up to 424 kbits/sec. Operating distance is 10 cm. The reader and target both generate an RF field. Each side transmits data by modulating its own field using Amplitude Shift Key (ASK) modulation. To avoid collisions, only the sending device emits a magnetic field. The receiving device switches off its field to listen. This mode is ideal for secure transactions, such as sending/sending sensitive data to a server or another NFC-enabled device.

#### Operating distance

10 cm

### Card Emulation Mode

Card Emulation Mode lets the system behave as an ISO/IEC 14443-compliant contactless smartcard. This mode uses a passive or active communication scheme.

####CARD EMULATION MODE

The initiating device produces a 13.56 MHz carrier field, and the target device, when introduced to this field, uses it to draw energy. The initiator transfers data by directly modulating the field, while the target transfers data by load-modulating the field. The method, required by the NFC Forum, is compatible with other contactless smartcard formats, including ISO/IEC 14443.

#### Power savings

Battery-driven NFC devices that function exclusively in Card Emulation Mode consume very little power, since the system requires only enough energy to drive the onboard microcontroller. This results in very long lifetime in the field.

#### Operating distance

10 cm

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**PASSIVE communication scheme**

Read/Write, Passive Peer-to-Peer, and Card Emulation Modes

1. The initiating generates an RF field
   The initiating generates an RF field, which is used to communicate with the target device
   - The initiating device produces a 13.56 MHz carrier field
   - The initiating device sends commands
   - The target responds
   - The target uses backward modulation
   - The target responds
   - The target modulates the RF field
   - The initiating device receives the response

2. The target responds
   The target responds
   - The target device receives the commands
   - The target device generates a 13.56 MHz carrier field
   - The target device sends load modulation
   - The initiating device receives the data
   - The initiating device decodes the data

3. The target modulates the RF field
   The target device, when introduced to the field, uses it to draw energy. The target transfers data by load-modulating the field. The method, required by the NFC Forum, is compatible with other contactless smartcard formats, including ISO/IEC 14443.

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**ACTIVE communication scheme**

Active Peer-to-Peer Mode

1. The initiating generates an RF field
   The initiating generates an RF field, which is used to communicate with the target device
   - The initiating device produces a 13.56 MHz carrier field
   - The initiating device sends commands
   - The target responds
   - The target device switches off its field to listen

2. The target responds
   The target device switches off its field to listen
   - The target device receives the commands
   - The target device generates a 13.56 MHz carrier field
   - The target device sends load modulation
   - The initiating device receives the data
   - The initiating device decodes the data

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**NFC Everywhere**

Introducing NFC

**Read/Write, Peer-to-Peer, and Card Emulation.**

In all these modes, a simple tap is all it takes to initiate a transaction.

**Read/Write, Passive Peer-to-Peer, and Card Emulation Modes**

- **Read/Write Mode**
  - The systems’ NFC IC interacts with an NFC-enabled device – such as a contactless smartcard, an NFC-capable smartphone, or an NFC-enabled smartcard reader – and communicates with the device in a manner similar to that used in a contactless card transaction. The system’s NFC IC can receive data from the device’s RF field and send data back to the device. This mode uses a passive or active communication scheme.

- **Peer-to-Peer Mode**
  - A simple tap on two NFC-enabled devices (such as a mobile phone and a NFC-capable smart card) can proceed. This mode enables two-way interactions between devices, so you can exchange business cards and contact information with a tap or use your smartphone to activate a lock on your door. The mode uses either a passive or active communication scheme.

- **Card Emulation Mode**
  - The system behaves as an ISO/IEC 14443-compliant contactless smartcard. This mode uses a passive or active communication scheme. The initiating device produces a 13.56 MHz carrier field, and the target device, when introduced to this field, uses it to draw energy. The initiator transfers data by directly modulating the field, while the target transfers data by load-modulating the field. The method, required by the NFC Forum, is compatible with other contactless smartcard formats, including ISO/IEC 14443.
Inside an NFC-enabled system

Contactless reader architecture

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Where does NFC fit in the world of wireless?

NFC delivers short-range communication, similar to Bluetooth and WiFi, but with the ability to store and transmit data in much the same way that RFID tags and contactless smartcards do.

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Where did NFC come from?

Co-invented by NXP Semiconductors and Sony Electronics, NFC is a specialized subset of RF identification (RFID). It operates at 13.56 MHz and performs many of the same functions as RFID tags and contactless smartcards, while adding peer-to-peer communications.

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<table>
<thead>
<tr>
<th>Technology</th>
<th>Frequency</th>
<th>Range</th>
<th>Action/payload</th>
<th>Devices &amp; applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFC (ISO/IEC 18092, NFC Forum)</td>
<td>13.56 MHz</td>
<td>10 cm</td>
<td>All</td>
<td>Smartphones, tablets, portable devices in a peer-to-peer network</td>
</tr>
<tr>
<td>Contactless proximity smartcards (ISO/IEC 14443)</td>
<td>13.56 MHz</td>
<td>10 cm</td>
<td>All</td>
<td>Tokening, payment, access, passports, etc.</td>
</tr>
<tr>
<td>RFID (ISO/IEC 18000)</td>
<td>LF (120 to 150 kHz)</td>
<td>&lt; 40 m</td>
<td>All</td>
<td>Tagging and tracking of goods and items for manufacturing, logistics, retail, etc.</td>
</tr>
<tr>
<td>ISO 14443 (ISO/IEC 14443)</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>Smartphones, tablets, laptop, riot control, other devices in a local area network (LAN)</td>
</tr>
<tr>
<td>ISO 18092 (ISO/IEC 18092-4)</td>
<td>2.4 GHz</td>
<td>&gt; 100 m</td>
<td>All</td>
<td>Lighting networks, home automation, industrial control</td>
</tr>
<tr>
<td>2/3/5G cellular</td>
<td>450 MHz to 2.7 GHz</td>
<td>Several km</td>
<td>Several</td>
<td>Industrial devices, Internet of Things (IoT) devices</td>
</tr>
<tr>
<td>4G cellular</td>
<td>450 MHz to 2.7 GHz</td>
<td>Several km</td>
<td>Several</td>
<td>Smartphones, tablets, tablets, portable devices in a peer-to-peer network</td>
</tr>
</tbody>
</table>

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Generic term for contactless technology. Always used for applications relating to tagging of goods and items. Automatic identification of a unique identifier.

Range | 1 to 10 cm | Frequency | 13.56 MHz | Standard | ISO/IEC 14443 (includes MIFARE and FeliCA)

Contactless proximity technology

Subset of RFID, with more memory and more security. Action: remote read or remote write (e.g. person presents smartcard to reader). In widespread use for access control, ePassports, payment, parking, transport, and event ticketing, etc.

Range | 10 cm | Frequency | 13.56 MHz | Standard | ISO/IEC 18092, ISO/IEC 24712, NFC Forum

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NFC

Builds on contactless proximity technology to support three modes of operation: Read/Write, Peer-to-Peer, and Card Emulation.

Range | 10 cm | Frequency | 13.56 MHz | Standard | ISO/IEC 18092, ISO/IEC 24712, NFC Forum

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Introducing NFC

The diagram shows two NFC-enabled systems. The first, in the middle of the diagram, could be a POS terminal, a set-top box, or a consumer appliance like a microwave oven or a washing machine. It uses an NFC IC to support the three operating modes (Read/Write, Peer-to-Peer, and Card Emulation). The host controller manages the NFC process, and any transactions that require a higher level of security are performed in the optional onboard Secure Access Module (SAM). The contact reader IC is also optional. It adds support for contact-based smartcards, and makes the system compatible with contactless smartcards, and some other electronic device equipped with an NFC tag. For NFC transactions, this second system can use the RF field generated by the first system. As a result, the second system doesn’t need to be powered while the NFC transaction takes place.
NFC for payment

Today’s POS systems are mounted on a countertop or embedded in a piece of equipment, such as a gas pump or vending machine. Mobile versions (mPOS) are light enough and small enough to be carried by salespeople or connected to a smartphone, tablet, or laptop. mPOS systems let small businesses and individuals support cashless transactions with minimal investment, while large retailers use mPOS to enhance their retail and payment processes.

With NFC on board, the user interface couldn’t be simpler – you just tap your card or NFC-enabled smartphone to complete the transaction – so payments are quicker and easier than ever to make. No more waiting for a contact smartcard to complete the transaction, and no more entering PIN codes for small transactions or having to re-slide a magstripe card because the first try failed.

Enhanced services
NFC also lets you do much more than just process payments, since NFC can collect data from the customer’s smartphone or contactless card for use with direct marketing campaigns and loyalty programs. The POS system can then send a personalized present a receipt to the customer’s email account, push a personalized text message to their smartphone, add points to their loyalty account, or send them exclusive coupons. The POS system becomes an integral part of customer service.

NFC leadership
Eighty percent of all POS terminals use NFC technology. As the number-one supplier of NFC readers, NXP has long-standing partnerships with industry leaders and have developed NFC systems that enable fast, secure transactions.

POS design kit CM5597/RD2663
The 4.6x4.6 mm CM5597 integrates the PN5180, TDA8026, and CLRC663. The contact reader is analog/digital-compliant with EMVCo 2.3.1, and the contactless interface is RF/digital-compliant with EMVCo 2.3.1.

Recommended NXP products
- PN5180, MFRC522 (for top-up utility metering)
- Contact reader solution TDA8026 (for payment)

NFC in pre-payment metering

Using NFC to add pre-payment functionality to metering makes it easier to pay for a utility service, because consumers can use a smartcard or a mobile phone as a 24/7 payment option. The process is simple: buy the card, purchase a given amount of credits from the utility company, load the credits onto the card, and then tap the card to the meter to transfer the credits. The pre-paid amount can also be stored in the app of an NFC-enabled smartphone.

Using dynamic data ensures that, if the data is stolen, the content is rendered useless, since it can't be used again. Meaning new data is created for each transaction. Using dynamic data assumes that, if the data is stolen, the content is rendered useless, since it can't be used again. Using dynamic data assumes that, if the data is stolen, the content is rendered useless, since it can't be used again.

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NFC for access

Conventional keys can be copied inexpensively at corner shops, and research into 3D printing shows how easy it could soon be to replicate even sophisticated high-security metal keys. Plastic smartcards are cheaper than metal keys and harder to copy, and metal keys. Plastic smartcards are cheaper than metal keys. NFC-enabled smartphones can be used more than once, so it’s easier for visitors to come and go, and there’s less waste.

NFC Everywhere

NFC for access

- NFC can provide seamless connection to the Internet makes it easier to integrate each door into their building automation systems and security setups.
- NFC-based payment functions are already compatible with the existing contactless infrastructure, which means they’re easy to deploy in any of the 736 cities in 70 countries that already use MIFARE for transport ticketing. The same kinds of value-added services of paperless receipts, loyalty programs, couponing, and personalized messaging can be used for automatic fare collection (AFC) or at other venues, like amusement parks and sports arenas.

NFC for building automation networks

DOOR LOCK: A CLOSER LOOK

- Door lock
- Security
- SAM
- TDA
- Power (battery)
- NFC
- CLRC663
- PR601
- GPO
- Open the door
- RS232

The PR601, which combines a CLRC663 NFC IC with an advanced LPC1227 microcontroller, makes the door lock very compact. Also, because NFC uses the most robust, patented NXP technology, the PR601 minimizes interference from magnetic fields, which can come from metal in the door or doorway. Using a feature exclusive to NFC, called low-power card detection, the reader terminal’s microcontroller enters sleep mode while still polling for cards, thus ensuring energy-efficient operation.

NFC enables

- Tap-and-enter convenience
- Enhanced security
- Temporary access for specific people
- Counterfeit-proof keys
- Remote key distribution and management

Access microboard

The PR601/M microboard is a compact NFC-based solution that can be implemented in a door lock. Application notes, which cover key diversification and generic data models, simplify development.

Recommended NXP products

- NFC controller solution PR601 (for use with custom software)
- NFC frontend solution PRI601 (for use with limited Flash memory, as each the LPC800 or LPC1100 Series)

NFC for virtual access

Beyond providing access to brick-and-mortar buildings and other real-world venues, NFC can also provide access in the virtual world. Gamers, for instance, can use NFC to access specific gaming environments or to enter virtual rooms to join their friends online.

NFC for AFC

- NFC-based payment functions are already compatible with the existing contactless infrastructure, which means they’re easy to deploy in any of the 736 cities in 70 countries that already use MIFARE for transport ticketing. The same kinds of value-added services of paperless receipts, loyalty programs, couponing, and personalized messaging can be used for automatic fare collection (AFC) or at other venues, like amusement parks and sports arenas.

NFC for building automation networks

Individual door locks are just one part of the picture for large-scale facilities. Every door needs its own access privileges, and that means incorporating individual locks to a larger system. The fact that NFC can provide seamless connection to the Internet makes it easier for key diversification and generic data models, simplify development.
NFC applications

Security breaches relating to corporate data and personal information are becoming all too familiar in the daily news cycle, and are unsettling reminders of just how vulnerable we are when we go online or allow someone access to a device. Mobile payment systems (MPPs) offer a safer way to conduct transactions online, but even the most secure MPP systems are only as safe as the combinations of username and password used to access the account. When we go online or allow someone access to a device, we are essentially providing access to the system that is being used. The more secure the MPP system is, the more secure the device is to the user.

NFC Everywhere

In the near future, all set-top boxes or gaming stations will be configured to start up using preset configurations. In Peer-to-Peer mode, systems mean meeting specific design requirements, mandated by standards organizations, and NFC offers specific tools to help meet all of them.

NFC for Linux/Windows/Android systems

Higher efficiency

NFC enhances productivity, too. A simple tap is all it takes to pair a laptop or tablet with Bluetooth and WiFi networks, so workers don’t have to wait for username and password set-ups. NFC authentication allows users to log in to a system and the computer executes the login automatically. A simple tap of a smartcard or NFC-enabled smartphone, and the system and the computer execute the login automatically.

Verified access

When workers log into a VPN, they can use a smartcard or NFC to launch a desktop PC, a laptop, a tablet, or even a set-top box or gaming station. NFC can make it safe to go online, with just a tap of a card, an ID, or a dedicated smartphone.

NFC Everywhere

NFC enables

Tap-and-authenticate PC/VPN logins

Tap-and-connect password managers

Tap-and-pair Bluetooth/WiFi connections

NFC for home banking

NFC can make home banking and online purchases both safer and more convenient. Now, instead of typing in a PIN code or a credit-card number, you simply present your smartcard or an NFC-enabled smartphone. Authentication features ensure that only the right people have access to online accounts, gaming environments, or social media. OS support

Android was one of the first operating systems to support NFC. Android 8 now includes NFC as part of its standard operation. NFC is also gaining momentum in Linux, and several initiatives, including Linux, are working toward a complete, open-source and hardware-independent approach to supporting NFC within the Linux environment. Designing NFC to work with these operating systems means meeting specific design requirements, mandated by standards organizations, and NFC offers specific tools to help meet all of them.

NXP leadership

Our relationships with Google, Microsoft, and Intel were key to the introduction of NFC for Android, Linux, and Windows. We have long-standing partnership with major tech leaders in this industry and offer NFC drivers for all Windows and Android systems.

NFC Everywhere

We are fully qualified on Intel reference designs and new Intel chipsets, and offer NFC for Android, Linux, and Windows. NXP leadership is equipped with a PN7120 NFC controller, so it can process payments for pay TV, video-on-demand, and pay-per-view. The PN7120 is pre-configured with firmware that supports the NFC interface as mandated by the NFC Forum. NXP is the world leader in contact smartcard readers for pay TV, and the TDA8037 contact reader is the industry’s reference design for an encryption program for authorization of regional or pay-per-view channels.

NFC Everywhere

Help for manufacturers:
The NCI specification

NFC Everywhere

The NFC Controller Interface (NCI) specification, developed and maintained by the NFC Forum, defines a standard interface between the NFC controller and the system’s main application processor. The interface manages interactions between the CPU and NFC IC, and speeds time-to-market for NFC-enabled PCs, laptops, and tablets.

Recommended NXP products

NFC controller solution: PN2912 (with integrated firmware, NCI interface) Contact reader solution: TDA5307 (for interaction with pay-TV card)
Today's homes are increasingly connected. Everyday appliances are connecting to the Internet, and even things like lights and ceiling fans and thermostats can now be controlled using Internet-based protocols and hardware. The Internet of Things (IoT), which refers to the increasing number of devices that now use online connections, is redefining our at-home environment, and creating new ways to manage energy, increase comfort, and enhance entertainment.

NFC is an important part of this transition to connected living, and provides new levels of convenience and interaction throughout the home. New devices can be added to the home network with a single tap—no more manual entry of complex product codes or passwords to have the router accept a new arrival—and, with the right app on board, an NFC-enabled smartphone or tablet can be used to control or configure just about anything.

Parental controls can easily be applied to a set-top box or TV, to ensure that kids only watch suitable channels for a specified period of time.

NFC for connected home and the Internet of Things

NFC enables

Tap-and-go experiences
 Faster product registration
 Intuitive commissioning
 Quick pairing with Bluetooth and WiFi
 Extended user interfaces
 Personalized settings
 Parental controls
 Authentication and access rights
 One-step payments
 Easy access to online maintenance
 Efficient data tracking
 Interactive and personalized advertising

NFC applications

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5. Extended user interfaces
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7. Parental controls
8. Authentication and access rights
9. One-step payments
10. Easy access to online maintenance
11. Efficient data tracking
12. Interactive and personalized advertising

Smarter appliances

NFC equips appliances with an added level of intelligence, so appliances can do more for their owners. In the kitchen, for example, tap the package of a frozen dinner to the microwave, and the oven does the rest, using optimal settings to ensure the best results. Similarly, wine-storage cabinets can automatically download the perfect temperature settings for a particular collection of wines.

An NFC-equipped appliance can also send a message to the manufacturer, to register the product and set its warranty date. Machines can even be configured to contact their owners, sending SMS messages or emails that remind them to schedule periodic service, note them to renew their warranty, or offer personalized recommendations and discounts.

Improved supply chain

Manufacturers in the consumer segment can use NFC to support late product customizations, offer features on demand, and protect their brand. They can set the operating language or configure automatic software updates before the system leaves the factory, and they can scale the offering by adding features in the store or after the sale. Manufacturers can also use NFC for authentication, to ensure that consumers use only branded or certified accessories. Once the right item—a branded ink cartridge, battery, or coffee pod, for example—has been authenticated, the NFC-enabled appliance can also optimize operation to suit the part. What's more, a brief pass of an NFC-enabled smartphone or tablet over a particular product initiates a purchasing cycle for authentic replacements, with links to various sites that carry the item.
A growing number of homes use a WiFi router to make Internet access more convenient, and now, as homes become more connected and the number of Internet-ready devices continues to expand, the router is truly the heart of home-based IoT networks. The router acts as a home gateway, providing Internet access to everything from mobile phones and laptops to appliances like washing machines and refrigerators, wearables, thermostats, multimedia players, and even fish tanks. With NFC, the router can send credentials to any new device equipped with an NFC tag, for quick commissioning, and the consumer’s NFC-enabled smartphone or tablet can be used as a bridge, to make the interaction even easier. The NFC IC inside the router generates the necessary RF field for communication, so the device being commissioned doesn’t need to be powered, and that saves energy.

**THE HOME GATEWAY: A CLOSER LOOK**

Gaming, toys, and the entertainment industry

NFC makes gaming more enjoyable and brings toys to life. With just a tap, new purchases can perform service discovery, connect to the home network, or pair with other components, such as a big screen TV or high-end speakers. Potential controls can be tailored to each toy, to ensure that children are only allowed to play age-appropriate games, and different users can launch pre-set configurations with just a tap of a smartcard or tag.

Character-based toys can take on new life, too, by using NFC to connect to a gaming console. Update points, add new powers or additional weapons, and play with the newly added capabilities. The toy can remain in passive mode while using NFC, so less power is used overall and the battery lasts longer. The play environment becomes more mobile, too, because a toy can easily be connected to any network, whether it’s at a friend’s house, an Internet café, or a community gaming center or amusement park.

NFC can enhance the experience with any kind of toy, including classic board games. The board can react when it recognizes that a game piece has moved or landed on a particular card. Trading cards can be recognized by NFC-enabled smartphones, or NFC tags can be used to trigger actions, or different toys can interact with a single tap.

Homecare as an extension of healthcare

NFC makes the home a connected part of the healthcare system, with devices that can monitor and record vital statistics and then report the accumulated data to a care provider. Glucose meters, for example, can upload measurements for long-term monitoring. Bringing the meter close to an insulin pump can also set the wearer’s optimum dosage.

NFC can help at the doctor’s office or in an emergency situation, because an updatable NFC smartcard can store a person’s vital statistics, medications, allergies, or test results, for easy reference by clinicians and first responders.

NFC can also be used to track medications at home, to ensure patients are taking them when and how they’re needed. Prescription bottles equipped with an NFC tag can “talk” to the patient, using an NFC-enabled smartphone or tablet to play recorded messages about dosage, potential side effects, or interactions with other drugs. Medication packaging can even be configured to place a refill order when the supply is running low or nearing its expiration date.

**NFC for wearables**

Small, portable devices that can be worn on the wrist or attached to the body – items called wearables – are increasingly popular with consumers. Fitness-tracking bracelets, for example, help people set fitness goals and track progress against those goals. Tap a fitness-tracking bracelet, for example, help people set fitness goals and track progress against those goals. Tap a fitness-tracking bracelet, and launch an app on the bracelet to display your workout status. Wearables can provide heart rate monitoring, control backlights, and upload data to cloud systems. The wearable can operate in passive mode, without being powered, so battery life goes a lot further.

**Recommended NXP products**

- For systems that need a small footprint: PN7120 (with NCI interface)
- For systems with a dedicated MCU: PN512, CLRC663
- For peripherals with NFC connectivity: NTAG I2C

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NFC makes the home a connected part of the healthcare system, with devices that can monitor and record vital statistics and then report the accumulated data to a care provider. Glucose meters, for example, can upload measurements for long-term monitoring. Bringing the meter close to an insulin pump can also set the wearer’s optimum dosage.

NFC can help at the doctor’s office or in an emergency situation, because an updatable NFC smartcard can store a person’s vital statistics, medications, allergies, or test results, for easy reference by clinicians and first responders.

NFC can also be used to track medications at home, to ensure patients are taking them when and how they’re needed. Prescription bottles equipped with an NFC tag can “talk” to the patient, using an NFC-enabled smartphone or tablet to play recorded messages about dosage, potential side effects, or interactions with other drugs. Medication packaging can even be configured to place a refill order when the supply is running low or nearing its expiration date.
The emergence of smart manufacturing facilities—what some term the fourth industrial revolution, or Industrial 4.0—is creating a new level of automation in the factory, with intelligent object networking, independent process manufacturing, and frequent use of interactions between the real and virtual worlds. These trends are changing how manufacturers manage their production networks, and making it possible to operate in what is almost real time.

NFC has an important role to play in this new environment, because NFC helps reduce the time it takes to process items, can enable customization at any point in the production process, and simplifies logistics.

**Smart objects**

NFC creates smart, autonomous objects that can interact with machinery and contribute to the decision-making process. In a typical setup, NFC ICs are integrated into the manufacturing equipment, and products running along the assembly lines are outfitted with NFC tags, either as part of their onboard circuitry or as a sticker placed somewhere on the item. The tag can instruct each piece of equipment which steps to use at a given point, telling the machine, in essence, “this is what you should do with me.”

**More flexibility**

NFC tags give the product a smart memory, and can contain all the relevant information as the product passes through the factory, the warehouse, and beyond, throughout the supply chain. A single tag can be configured for different purposes at different points in the process, so the instructions can change as needed. Using NFC tags enables late customization, with manufacturers setting the language for the user interface or configuring other settings before shipping the product to a particular region. NFC tags can also be used to verify the authenticity of individual components or tools, to ensure that robots use the right item for a given task.

**Any environment**

Adding NFC functionality to just about any kind of tool, machine, or motor—whether it's in a state-of-the-art facility or in a more traditional manufacturing environment—makes it possible to add a display for enhanced interactions. The display on a worker’s tablet or on a piece of equipment can be used as the man-machine interface, so it’s easier to verify or change parameters, check calibrations, refine settings, or simply monitor activity.

**Cloud access**

NFC connectivity also enables tap-and-go cloud access from the manufacturing floor, for quick referrals to operating manuals, automatic firmware downloads, and other kinds of assistance.

---

**NFC for smart manufacturing**

**NFC Everywhere**

**SMART MANUFACTURING: A CLOSER LOOK**

As in any workplace, NFC can be used to restrict physical and logical access in the manufacturing facility, ensuring that only authorized people have access to production areas and the network that controls machinery.

**NFC enables**

- Smarter production lines
- Increased automation
- Extended display interfaces
- Authenticated components and tools
- Easy pairing with Bluetooth and WiFi
- Cloud access from the manufacturing floor
- Enhanced logistics
- Late customization

**NFC for a controlled environment**
Leadership, selection, and commitment
Nobody gives you more options for NFC than NXP. Our portfolio reflects our deep commitment to contactless technology and delivers best-in-class performance for the NFC infrastructure.

Our leadership in NFC is due, in part, to the fact that we now own more than 100 patent families relating to contactless proximity technology and NFC. In fact, contactless technology is one of our core strengths. We build on more than 20 years of success with MIFARE, the world’s first contactless (ISO/IEC 14443) memory IC with cryptography. MIFARE is now the foundation for dozens of applications in over 70 countries.

We are the identification industry’s #1 semiconductor supplier, with the top position in smartcards, smart cards, smart mobility (MIFARE) cards, tags and authentication, RFID/NFC readers, and, of course, NFC-enabled smartcards. This section highlights our portfolio for NFC frontends, controllers, and connected tags. For complete NFC product listings, with detailed specs and side-by-side comparisons, go to www.nxp.com/nfc.

This section highlights our portfolio for NFC frontends, controllers, and connected tags. For complete NFC product listings, with detailed specs and side-by-side comparisons, go to www.nxp.com/nfc.

Which NFC frontend, controller, or connected tag is right for you?
Each one of our frontends, controllers, and connected tags is designed to meet a particular set of application requirements. The decision tree can lead you to the right solution for your design.

NFC controller solutions
Designed for today’s compact systems, our NFC controller solutions enable higher integration with fewer components, since they combine an NFC frontend with an advanced 32-bit microcontroller. Options include integrated firmware, for an easy, standardized interface, or a highly programmable microcontroller with the ability to load fully-customized applications.

Product Description
PR601 High-performance multi-protocol NFC controller with customizable firmware
PN7120 32-bit µC with 128 kB on-chip Flash
PN7122 High-performance multi-protocol NFC controller with customizible firmware

NFC controller with INTEGRATED FIRMWARE
The PN7120 is an ideal solution for designers working in Linux, Windows, or Android environments, because the basics of the design are already there. The PN7120 comes pre-loaded with embedded NFC firmware and uses the NFC Forum’s NCI interface, which is required for designs that use a full OS. That means designers get a head start on their system, and can focus on system optimization and differentiation.

NFC controller with CUSTOMIZABLE FIRMWARE
The PR601 is the choice for designers who want to use their own, customer-developed software. Integrating a powerful, yet power-efficient LPC1227 microcontroller, the PR601 is supported by our NFC Reader Library, and makes it easy to create a fully tailored, one-of-a-kind application.

PN7120 Designed for today’s compact systems, our NFC controller solutions enable higher integration with fewer components, since they combine an NFC frontend with an advanced 32-bit microcontroller. Options include integrated firmware, for an easy, standardized interface, or a highly programmable microcontroller with the ability to load fully-customized applications.

PN7120 NFC controller solution

NFC controller with INTEGRATED FIRMWARE

NFC controller with CUSTOMIZABLE FIRMWARE

NFC Everywhere
Ordering options
<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PN7120</td>
<td>NFC controller with integrated firmware and NCI interface</td>
</tr>
<tr>
<td>PN7121</td>
<td>High-performance multi-protocol NFC controller with customizible firmware</td>
</tr>
</tbody>
</table>

NXP LPC1227 microcontroller
- 30 MHz ARM Cortex-M0 processor
- Memory: 8 kB SRAM, 128 kB on-chip Flash
- Timers: 4 general-purpose, 1 Watchdog, 1 syetck, 1 RTC
- Serial interfaces: 2 UARTs, 1 Fm+ FC, 1 SPI/SS
- Analog: 8 ch/10 to ADC, 2 comparators
- 29 or 55 GPIO
- Supply: 3.2 to 3.6 V
- Temp range: -40 to +85 °C
- Platform: LPC12F48/64
- Additional DMA controller
- CRC engine
- RS-485 interface

NFC Everywhere
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.

We offer a variety of options, so you can find the right fit for your requirements. Design-in is easier, since you don’t have to deal with extra operating modes you won’t need, and it’s more cost-effective, too, since you only pay for the features you’ll actually use. All our frontend solutions reflect our active involvement with regulatory bodies, including the FCC, CE, Pappas, and EMVCo, and build on our deep commitment to interoperability and environmental quality.

The PN512 and PN5180, which are specially designed for applications that need to comply with the NFC Forum, deliver full compliance with their standards. Our standard and high-performance reader IC solutions meet the “strong” requirements of contactless and NFC readers, and offer best-in-class robustness and range. They support all the relevant contactless reader and proximity standards – including ISO/IEC 14443 A and B, and ISO/IEC 15693 – and can connect in passive mode, to save power.

Connected NFC tag solutions
Our connected NFC tag solutions include a passive NFC Forum type 2 tag RF interface, an EEPROM, and a field-detection function (NTAG F) or a field-detection function with an I²C interface (NTAG I²C).

The NTAG F portfolio is particularly well suited for use with battery-powered systems, such as speakers and headsets, where it can wake the system and initiate Bluetooth or WiFi pairing. For more on NTAG F, please visit nxp-rfid.com/products/ntag.

The NTAG I²C portfolio supports full bidirectional communication between an NFC-enabled device and host systems, making it an ideal solution for NFC implementations that interface with a range of electronic devices. An innovative energy-harvesting function, which makes it possible for the NTAG FC tag to power external components, like a microcontroller, makes NTAG FC an excellent choice for low-power applications. For more on NTAG FC solutions, please refer to the brochure titled NFC for embedded applications, downloadable from nxp-rfid.com/tag-fc.

NFC FRONTEND

NFC frontend
Microcontroller with application
Application/host processor (optional)

AVAILABLE 2015

NFC product description
NFC frontends delivering full NFC Forum compliance
PN512 Full NFC Forum-compliant frontend
PN5180 High-performance multi-protocol full NFC Forum-compliant frontend

High-performance NFC frontends
CLRC663 High-performance multi-protocol NFC frontend
MFRC631 High-performance ISO/IEC 14443 A/B frontend
MFRC630 High-performance MIFARE frontend
SLRC610 High-performance ISO/IEC 15693 frontend

Standard-performance NFC frontends
MFRC523 Standard 3 V ISO/IEC 14443 A/B frontend
MFRC522 Standard 3 V MIFARE frontend

CONNECTED NFC TAG

NFC Frontend
Microcontroller with application
Application/host processor (optional)

NFC tag FC
Field detection
Host with application
**NFC products**

**TDABox contact smartcard reader ICs**

[NFC.com](https://www.nfc.com/products/identification_and_security/nfc_and_reader_ics/contact_smartcard_reader_ics/)

We are an industry leader in ISO/IEC 7816-compatible contact reader ICs, and are the world’s number-one supplier of contact reader ICs for pay TV. We can provide EMVCo L1 and NDS/Cisco-compliant smartcard reader interfaces for any application, and offer an extensive range of support tools, including demo boards and software libraries. Building on the proven performance of our existing product range, the extended TDABox family easily enables easy design-in for a range of applications.

**Products that complete the system**

**TDA80xx contact smartcard reader ICs**

We are an industry leader in ISO/IEC 7816-compatible contact reader ICs, and are the world’s number-one supplier of contact reader ICs for pay TV. We can provide EMVCo L1 and NDS/Cisco-compliant smartcard reader interfaces for any application, and offer an extensive range of support tools, including demo boards and software libraries. Building on the proven performance of our existing product range, the extended TDABox family easily enables easy design-in for a range of applications.

**Secure Access Modules (SAMs)**

[NFC.com](https://www.nfc.com/products/identification_and_security/nfc_and_reader_ics/mifare_sams/)

Our SAMs handle all the crypto-related functions inside a reader terminal, ensuring the highest levels of security, including 3DES and AES cryptography, for MIFARE applications of all kinds.

**LPC microcontrollers**

[NFC.com](https://www.nfc.com/microcontrollers)

NXP’s LPC portfolio includes more than 400 highly integrated devices that represent the very latest innovations in 32-bit microcontroller technology. Ten LPC product series enhance the ARM Cortex-M core architecture with patented features that deliver industry-leading performance, best-in-class connectivity, design simplicity, and power efficiency.

**Entry-level LPC microcontrollers**

For NFC applications that need exceptional power efficiency and a small footprint, with lower requirements for Flash memory, entry-level LPC MCUs are the ideal choice.

**High-performance LPC microcontrollers**

For NFC applications that are more complex – requiring advanced connectivity, sophisticated peripherals, and more memory – high-performance LPC MCUs offer a wide range of solutions.

<table>
<thead>
<tr>
<th>Series</th>
<th>ARM core</th>
<th>Flash/RAM (max kB)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPC800</td>
<td>Cortex-M0+</td>
<td>32/8</td>
<td>Exceptional power efficiency, small packages</td>
</tr>
<tr>
<td>LPC1100</td>
<td>Cortex-M0+ or M0</td>
<td>256/32</td>
<td>Low power, broad feature and package selection, USB, CAN</td>
</tr>
<tr>
<td>LPC1200</td>
<td>Cortex-M0</td>
<td>128/8</td>
<td>Noise immunity for industrial applications</td>
</tr>
<tr>
<td>LPC1300</td>
<td>Up to 72 MHz Cortex-M3</td>
<td>64/12</td>
<td>Performance and basic connectivity</td>
</tr>
<tr>
<td>LPC1500</td>
<td>Up to 72 MHz Cortex-M3</td>
<td>256/36</td>
<td>High-precision motor control, CAN, USB</td>
</tr>
<tr>
<td>LPC1700</td>
<td>Up to 120 MHz Cortex-M3</td>
<td>512/96</td>
<td>High performance, advanced connectivity, USB, graphic LCD controller</td>
</tr>
<tr>
<td>LPC4000</td>
<td>Up to 120 MHz Cortex-M4 or M4F</td>
<td>512/96</td>
<td>High performance with DSP options, advanced connectivity, USB, graphic LCD controller</td>
</tr>
<tr>
<td>LPC54100</td>
<td>Up to 100 MHz Cortex-M4F &amp; M0+</td>
<td>512/104</td>
<td>Best-in-class power consumption, scalable performance, small package</td>
</tr>
<tr>
<td>LPC1800</td>
<td>Up to 180 MHz Cortex-M3</td>
<td>1024/136</td>
<td>Best performance, multi-high-speed connectivity, USB, graphic LCD controller</td>
</tr>
<tr>
<td>LPC4300</td>
<td>Up to 204 MHz Cortex-M4F &amp; M0+</td>
<td>1024/136</td>
<td>Best performance with DSP and dual-core options, multi-high-speed connectivity, USB, graphic LCD controller</td>
</tr>
<tr>
<td>LPC14180</td>
<td>Up to 100 MHz Cortex-M4F &amp; M0+</td>
<td>512/104</td>
<td>Best performance, multi-high-speed connectivity, USB, graphic LCD controller</td>
</tr>
</tbody>
</table>

**Developers ecosystem**

The ecosystem for LPC microcontrollers offers advanced yet low-cost ways to evaluate and develop applications. The NXP LPCOpen IDE includes a complete Eclipse-based toolchain and is available for free and Pro editions. In addition, popular toolchains from IAR, Keil, and other vendors incorporate full support for LPC products. Developers gain easy access to MCU features through an extensive set of free, RTOS-agnostic libraries, called LPCOpen, which include chip- and board-level drivers, TTCP protocol stacks and other middleware, graphitis libraries, code examples, easy interfacing to third-party libraries, and more. For more information about NXP’s LPC development tools, visit lpcware.com.
Our support for NFC

Our support tools simplify design and reduce time-to-market. We make it easy to find the right product for your particular application, and we supply the hardware and software tools that help you develop firmware, manage protocols, and differentiate your design. We work with an established ecosystem of NFC experts, for best-in-class technology support, and we collaborate with industry leaders to drive the expansion of NFC.

1. CHOOSE A PRODUCT

NFC controller and frontend solutions

www.nxp.com/products/identification_and_security/nfc_and_reader_ics/

Click on the “Products” tab to see a list of available products. The page for each product type provides detailed information, including datasheets, application notes, evaluation boards, and software.

Connected NFC tag solutions

www.nxp.com/products/identification_and_security/smart_label_and_tag_ics/ntag/

Look for NTAG213F, NTAG216F, NT3H1101, and NT3H1201 in the list of available products. Information about NFC ICs is available in the “Reference design” tab.

2. ORDER SAMPLES FROM A LOCAL DISTRIBUTOR

Order portal for NXP’s global network of distribution partners

www.nxp.com/order-portal?topId=53420&subId=71110

The order portal lets you see the product number. You can download an order form from any product page by clicking the “Ordering” tab. Use the link to access the product page. Then click “Order” to see a list of local distributors and order samples.

3. FIND A DEMO BOARD, REFERENCE DESIGN, OR EVALUATION KIT

NFC controller and frontend solutions

www.nxp.com/products/identification_and_security/nfc_and_reader_ics/

Click on the “Demo boards” tab. This tab links to individual pages for each demo board. Available application notes and reference designs are listed on each demo-board page, on the “Documentation” tab.

Connected NFC tag solutions

www.nxp.com/products/identification_and_security/smart_label_and_tag_ics/ntag/

This page includes documentation and software relating to the NXP Connected NFC Reader and Display Kit. Click the “Documentation” tab to see details about the NTAG 213FNT production sample board. Click the “Documentation” tab to see the software that comes with the development kit.

Connected NFC tag solutions

www.nxp.com/products/identification_and_security/smart_label_and_tag_ics/ntag/NTAG216F

This page includes documentation and software relating to the NXP Connected NFC Reader and Display Kit. Click the “Documentation” tab to see the software that comes with the development kit.

Connected NFC tag solutions

www.nxp.com/products/identification_and_security/smart_label_and_tag_ics/ntag/NTAG213F

This page includes documentation and software relating to the NXP Connected NFC Reader and Display Kit. Click the “Documentation” tab to see the software that comes with the development kit.

4. DOWNLOAD SOFTWARE

NFC controller and frontend solutions

www.nxp.com/products/identification_and_security/nfc_and_reader_ics/

To access the software library, click on the “Demo boards” tab. Then click the relevant demo board, click the “Documentation” tab, then click the “Documentation” link for the demo board. Click the “Documentation” tab for the demo board. Then click the “Documentation” tab for the demo board.

Connected NFC tag solutions

www.nxp.com/products/identification_and_security/smart_label_and_tag_ics/ntag/NTAG216F

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5. GET DESIGN SUPPORT

Application notes and FAQs

www.nxp.com/products/identification_and_security/nfc_and_reader_ics/

Locate the FAQ tab on the relevant product page. Click on the relevant product page to go to the download page for the relevant product. Click the “Download” tab to download the available application notes and software.

NXP knowledge base

www.nxp.com/knowledge-base/53420/71110

Questions are listed in order of posting. Use the search field, at the top of the page, to locate a topic and its associated thread.

6. GET CE CERTIFICATION

Technical support from a local distributor

www.nxp.com/about/sales-offices-distributors.html

Many of our distribution partners provide dedicated technical support for NFC solutions. To find the partner nearest you, browse our list of distributors.

NFC training and webinars


Here’s where you'll find pre-recorded webinars that introduce NFC technology, antenna design, NXP solutions, and more. You can also use this site to download training schedules and register for an upcoming session.

NFC controller and frontend solutions

www.nxp.com/products/identification_and_security/nfc_and_reader_ics/

To access the software library, click on the “Demo boards” tab. Then click the relevant demo board, click the “Documentation” tab to see a list of all downloadable software for the board. Click the “Documentation” tab for the board. Then click the “Documentation” tab for the software.

Connected NFC tag solutions

www.nxp.com/products/identification_and_security/smart_label_and_tag_ics/ntag/NTAG216F

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Connected NFC tag solutions

www.nxp.com/products/identification_and_security/smart_label_and_tag_ics/ntag/NTAG213F

This page includes documentation and software relating to the NXP Connected NFC Reader and Display Kit. Click the “Documentation” tab to see the software that comes with the development kit.

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. The following links take you through the process.

Start here

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. The following links take you through the process.

Our NFC ICs are designed with CE certification in mind. Several of our development boards comply with the mandated directives and help prepare your design for submission. Most of our evaluation boards are CE certified, and many of them have FCC certification.

Order portal for NXP's global network of distribution partners

www.nxp.com/order-portal?topId=53420&subId=71110

The order portal lists items by product number. You can also place an order from any product page by clicking the “Ordering” tab. Use the link to access the product page. Then click “Order” to see a list of local distributors and order samples.

Application notes and FAQs

www.nxp.com/products/identification_and_security/nfc_and_reader_ics/

Locate the FAQ tab on the relevant product page. Click on the relevant product page to go to the download page for the relevant product. Click the “Download” tab to download the available application notes and software.

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NFC controller and frontend solutions

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To access the software library, click on the “Demo boards” tab. Then click the relevant demo board, click the “Documentation” tab to see a list of all downloadable software for the board. Click the “Documentation” tab for the board. Then click the “Documentation” tab for the software.

Connected NFC tag solutions

www.nxp.com/products/identification_and_security/smart_label_and_tag_ics/ntag/NTAG216F

This page includes documentation and software relating to the NXP Connected NFC Reader and Display Kit. Click the “Documentation” tab to see the software that comes with the development kit.

Connected NFC tag solutions

www.nxp.com/products/identification_and_security/smart_label_and_tag_ics/ntag/NTAG213F

This page includes documentation and software relating to the NXP Connected NFC Reader and Display Kit. Click the “Documentation” tab to see the software that comes with the development kit.
### DEMO BOARDS FOR NFC CONTROLLER SOLUTIONS

<table>
<thead>
<tr>
<th>Product</th>
<th>Board</th>
<th>Photo</th>
<th>Description</th>
<th>Product page for board</th>
</tr>
</thead>
<tbody>
<tr>
<td>PN5180</td>
<td>PNEV5180B</td>
<td>In development</td>
<td>NFC Forum-compliant development board with Raspberry Pi interface</td>
<td><a href="http://www.nxp.com/demoboard/PNEV5180B.html">www.nxp.com/demoboard/PNEV5180B.html</a></td>
</tr>
<tr>
<td>PN512</td>
<td>PNEV512B</td>
<td></td>
<td>Microboard with PN512 and 13.56 MHz antenna. Powered by a single battery, and supported by the NFC Reader Library.</td>
<td><a href="http://www.nxp.com/demoboard/PNEV512B.html">www.nxp.com/demoboard/PNEV512B.html</a></td>
</tr>
<tr>
<td>PN512</td>
<td>PNEV512R</td>
<td></td>
<td>An expansion board, designed for use with Raspberry Pi, which is a small board ARM-based computer running Linux.</td>
<td><a href="http://www.nxp.com/demoboard/PNEV512R.html">www.nxp.com/demoboard/PNEV512R.html</a></td>
</tr>
<tr>
<td>CLRC663</td>
<td>CLEV663</td>
<td></td>
<td>Evaluation board for multi-protocol CLRC663.</td>
<td><a href="http://www.nxp.com/demoboard/CLEV663.html">www.nxp.com/demoboard/CLEV663.html</a></td>
</tr>
<tr>
<td>CLRC663</td>
<td>CLEV663B</td>
<td></td>
<td>A two-board combination, with a CLRC663 board stacked on an LPC-Link prototyping board for use with NXP's LPC microcontrollers.</td>
<td><a href="http://www.nxp.com/demoboard/CLEV663B.html">www.nxp.com/demoboard/CLEV663B.html</a></td>
</tr>
<tr>
<td>PR601</td>
<td>PREV601M</td>
<td></td>
<td>Microboard with PR601 and 13.56 MHz antenna. Powered by a single battery, and supported by the NFC Reader Library.</td>
<td><a href="http://www.nxp.com/demoboard/PREV601M.html">www.nxp.com/demoboard/PREV601M.html</a></td>
</tr>
</tbody>
</table>

### DEMO BOARDS FOR NFC FRONTEND SOLUTIONS

These boards are supported by the NFC Reader Library, downloadable from each board’s product page.

<table>
<thead>
<tr>
<th>Product</th>
<th>Board</th>
<th>Description</th>
<th>Product page for board</th>
</tr>
</thead>
</table>

### DEMO BOARDS FOR CONNECTED NFC TAG SOLUTIONS

These boards are supported by dedicated software, downloadable from each board’s product page.

<table>
<thead>
<tr>
<th>Product</th>
<th>Board</th>
<th>Description</th>
<th>Product page for board</th>
</tr>
</thead>
</table>
NFC Reader Library
Written in C-language, the NFC Reader Library makes it easy to create a software stack and an application for an NFC IC, based on one of our NFC frontends or on the PR601, our NFC controller with customizable firmware.

Interfaces & protocols
The NFC Reader Library implements all the lower-layer functions, such as I2C and SPI interfaces. It also implements the contactless protocol, the drivers for an NFC frontend (including the one used in the PR601), and the command set for the card. Having all these up-front steps taken care of by the Reader Library lets you focus on the key features that differentiate your application.

NFC Reader Library
Written in C-language, the NFC Reader Library makes it easy to create a software stack and an application for an NFC IC, based on one of our NFC frontends or on the PR601, our NFC controller with customizable firmware.

Flexible layers
Everything is modular, so you can add or subtract components from a layer without disturbing the rest of the stack. The application layer and the protocol abstraction layer operate independently from the microcontroller, so they're not bound to or dependent on any specific hardware. Similarly, the application layer, the protocol abstraction layer, and the hardware abstraction layer are platform-independent, so they don't depend on any specific underlying communication interface with the host. You can use these layers seamlessly with any communication interface supported in the bus abstraction layer.

NFC Reader Library
Written in C-language, the NFC Reader Library makes it easy to create a software stack and an application for an NFC IC, based on one of our NFC frontends or on the PR601, our NFC controller with customizable firmware.

Software tools
Software for NFC controller solutions
To support designs that use a PN7120 in a Linux environment, we've released the required drivers to Linux NFC, an open-source community for drivers (https://01.org/linux-nfc). The drivers have been validated on Raspberry Pi with various versions of the Linux kernel (including v3.13, 3.11.10, and 3.14.16). For designs that use a PN601 with customized software, the necessary drivers are included in the NFC Reader Library.

Software for NFC frontends solutions
The NFC Reader Library supports our entire line of NFC frontends solutions.

Software for connected NFC tag solutions
We offer a number of support tools for use with our NFC tag solutions. For interaction with NFC ICs, an Android app is available on the Google Play website (play.google.com – search for “NFC Reader Library”), and source code can be downloaded from the NXP NFC product page (www.nxp.com/products/identification_and_security/smart_label_and_tag_ics/ntag/series/NTAG213.html). The NFC IC product page is also where you'll find firmware for use with an NFC microcontroller.

The MYFAR Software Development Kit (www.mifar.com/products/mifar-sdk) provides an easy way to make use of all the NXP NFC and NFC IC functions when developing an Android app.

Software tools
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To support designs that use a PN7120 in a Linux environment, we've released the required drivers to Linux NFC, an open-source community for drivers (https://01.org/linux-nfc). The drivers have been validated on Raspberry Pi with various versions of the Linux kernel (including v3.13, 3.11.10, and 3.14.16). For designs that use a PN601 with customized software, the necessary drivers are included in the NFC Reader Library.

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Where to learn more

NFC Everywhere
www.nxp.com/nfc

Intro to NFC technology / pre-recorded webinars

NXP knowledge base for NFC
www.nxp.com/knowledge-base/53420/71110

MiCommunity website for MIFARE and NFC
www.mifare.net/en/micomunity/forum/mifare-and-nfc-reader-ics

NFC white papers at the NFC Forum
members.nfc-forum.org/resources/white_papers/

NFC trainings
www.themobileknowledge.com/

NFC Everywhere
www.nxp.com/techzones/nfc-zone/products.html

NFC controller and frontend solutions
www.nxp.com/products/identification_and_security/nfc_and_reader_ics/

Connected NFC tag solutions
www.nxp.com/products/identification_and_security/smart_label_and_tag_ics/ntag/
www.nxp-rfid.com

MiFARE solutions portfolio
www.mifare.net

LPC microcontrollers
www.nxp.com/products/microcontrollers/

RFID portfolio
www.nxp-rfid.com

NFC Forum website
nfc-forum.org/

NFC community website
www.nearfieldcommunication.com

Google Play
play.google.com
(Search for NTAG I2C Demoboard, NFC Tag Info by NXP, or NFC TagWriter by NXP)

Windows Store
apps.microsoft.com
(Search for NFC TagWriter by NXP)

MiFARE SDK
www.mifare.net/en/products/mifare-sdk/

www.nxp.com