



Near Field Communication and the NFC Forum:

**The Keys to Truly
Interoperable Communications**

ABSTRACT

This white paper highlights the capabilities of Near Field Communication (NFC) and its potential to enhance our everyday lives. It shows how NFC will transform standalone wireless networking resources into truly interoperable communications media for accessing public transportation and facilities, making retail payments, transferring data, gaining new information, and more. It further describes how the NFC Forum works to drive NFC standardization and encourage its adoption in the market.

Introduction

Think about the way in which mobile phones have made it so easy to be in touch with people – friends, family, co-workers – from just about anywhere: no cords, no coins, no laborious connections or tedious routines to remember. Then think about what it would be like if other electronic devices in your life worked as easily and as intuitively—if you could set up connections with a simple touch or transfer information from one device to another just by holding them close to one another.

This is the promise of Near Field Communication technology – to provide the key to ubiquitous wireless networking of all kinds. It is a powerful catalyst – a highly stable wireless connectivity technology – that provides intuitively simple and safe two-way interactions between electronic devices. It has the potential to make almost all wireless technologies easy enough so that everyone-- even the non-technical-- can use them.



The possibilities for using Near Field Communication are nearly limitless. The potent attraction of touch-less transactions will help weave NFC technology into the fabric of our daily lives.

What is Near Field Communication?

Near Field Communication (NFC) is a short-range wireless connectivity technology (also known as ISO 18092) that provides intuitive, simple, and safe communication between electronic devices. Communication occurs when two NFC-compatible devices are brought within four centimeters of one another. NFC operates at 13.56 MHz and transfers data at up to 424 Kbits/second. Because the transmission range is so short, NFC-enabled transactions are inherently secure.

NFC is distinguished by its intuitive interface and its ability to enable largely proprietary wireless networking platforms to interoperate in a seamless manner. The primary uses are to:

- **connect electronic devices**, such as wireless components in a home office system or a headset with a mobile phone
- **access digital content**, using a wireless device such as a cell phone to read a “smart” poster embedded with an RF tag
- **make contactless transactions**, including those for payment, access and ticketing

NFC Applications

Early uses of the technology are expected to be with NFC-enabled mobile phones, which can easily be configured to become the only thing anyone needs to carry. Everyone will be able to:

- make payments with a wave or a touch anywhere contactless card readers have been deployed
- read information and “pick up” special offers and discounts from smart posters or smart billboards
- store tickets to access transportation gates, parking garages or get into events
- store personal information that will allow secure building access
- take a picture and transfer it to an NFC-enabled printer or monitor
- share business cards with other NFC-enabled phones
- ... and perform many more functions

“One third of all mobile phones will be NFC-equipped in a span of three to five years”

– Frost & Sullivan, 3/07

Trials of this exciting new technology around the world have successfully illustrated how people carrying mobile phones with built-in NFC can make purchases, gain access, get directions, exchange information, and buy transportation simply by bringing them close to NFC-enabled devices embedded in information kiosks, retail registers, gate readers, advertising signs, vending machines, and thousands of other devices, systems and signage.

However, NFC has many other applications that could simplify interaction with a variety of consumer electronic devices, such as cameras, TV’s, PC components, etc. The uses of NFC are endless, and many exciting ideas are in development now.

Transit and Ticketing

Transportation is the initial leading use of NFC technology. Contactless tickets have already begun to revolutionize the speed and ease with which all consumers can use public transport and access controlled environments like parking garages. Users praise NFC transactions for their speed, security, and flexibility. With NFC-enabled mobile phones, you can buy tickets, receive them electronically, use them for seamless traveling (such as “Park and Ride”), and then go through fast track turnstiles while others wait. Later, you can check your balance or update your tickets remotely. The cost of providing mass transport or event ticketing will be driven down because NFC-based systems reduce the cost of card issuance and management. Commuter transit systems in Europe and a number of Asia Pacific countries already use NFC-compatible contactless technologies to speed travelers through to their destinations.



The convenience of NFC is gaining momentum as “seamless traveling” (bundled public transport, parking, etc.) emerges as a future trend.

Payment

NFC-enabled mobile devices can store a payment application that is compatible with the millions of installed contactless payment readers. The intuitive simplicity of holding a mobile phone close to a terminal to purchase products or services instead of swiping or handing over a payment card reflects NFC's potential to bring about the next major change in the way the average buyer pays for things. A phone can store information about multiple accounts, such as credit, debit and prepaid cards, allowing users to select payment instruments more easily than they would from their wallets. Transactions are also secure, with the payment application usually protected by a password. Payment information on lost or stolen phones can be remotely "deactivated," enabling a strong layer of security.

"Mobile phone-based contactless payments will facilitate over \$36 billion of worldwide consumer spending by 2011"

– Strategy Analytics, 9/06

Advertising

Finding and gathering information is easy to do with NFC, whether by bringing a phone to a point on an indoor retail display to obtain an electronic coupon or by holding it up to a poster to download the latest ring tone from your favorite musical group. NFC-enabled devices can be a great marketing tool and a source of new revenue for business. Users are surrounded with advertisements and offers of valuable information, making it easy to acquire and consume rich media content. Here lies one of NFC's major advantages as a marketing tool: The consumer initiates the contact by bringing an NFC-enabled mobile phone to an NFC tag, effectively self-qualifying for the product or service being offered. NFC will fuel the market for advanced personal electronic devices capable of purchasing, playing, storing, and sharing media. Mobile content providers earn revenue when users choose value-added services.

Travelers will find it easier to get around in an NFC-enabled world. Tourists from France can use an NFC-equipped tourism kiosk in Singapore to get information in French on their phone's display screen. Visitors to an unfamiliar location can bring their phones close to a street-side signboard outside a museum to find out about the latest exhibition inside, translated conveniently into several languages.

NFC tags can be placed nearly anywhere: inside product packaging, at cash registers and on point-of-sale equipment, or outdoors on access gates, parking meters, newspaper dispensers, offices, houses, garage doors, bus stops, or ATMs. The possibilities are as wide as the imagination.

Connectivity

Whether you are holding two phones together to exchange electronic business card information or photos, or bringing two laptop computers together to initiate a high-speed file transfer, NFC offers several ways to speed and simplify data exchange transactions between consumer electronics products.

As NFC technology penetrates throughout the office, WLAN settings, printer IDs and even maps of the building can be picked up by NFC-enabled devices, allowing mobile workers to quickly get to work in any office location. Staff members can synchronize calendars, exchange electronic business cards, and access online digital content. In short, NFC simplifies connections. To connect a Bluetooth headset to a mobile phone, for example, just place the two close together and a fast NFC "handshake" links the two devices.

Maximizing Other Wireless Platforms

Beyond the phenomenal success of the mobile phone, the adoption of mobile communications technologies has not progressed as quickly as many industry watchers have predicted. Thirteen years after its invention, Bluetooth® has become part of the everyday lives of technically progressive users, but it has by no means become ubiquitous. A similar story can be told for Wi-Fi® and ZigBee® communications protocols.

That is where NFC comes in, overcoming barriers to wireless technology platform adoption by making each easier to use. Using Bluetooth as an example, you can visit a client and leave behind a MS PowerPoint® presentation. Even if the presenter's computer and the target computer are Bluetooth enabled, it is still necessary to manually set up the link between the two systems using a password to secure the transfer. But if both Bluetooth systems have NFC chips built in, a Bluetooth peer-to-peer connection can be established simply by bringing the distinctive NFC "hot spot," or target mark, of the first computer to the corresponding NFC target mark of the second.

The Wireless USB Promoter Group will incorporate "touch-and-go" NFC technology into the second specification of Wireless USB, version 1.1. And recently, the Wi-Fi Alliance introduced NFC as the one of four ways to configure home networks. The NFC option is widely recognized as the simplest method for setting up home networks, making use of NFC's intuitive user interface for automated out-of-band pairings of Wi-Fi devices.



The NFC Target Mark helps users know where to hold their devices together to transfer data and key information.



NFC enables the two Bluetooth-enabled devices to exchange communications parameters, establish a secret key, and create a Bluetooth communication link automatically. The devices can then be moved apart as the picture copies securely from one device to the other at Bluetooth speeds.

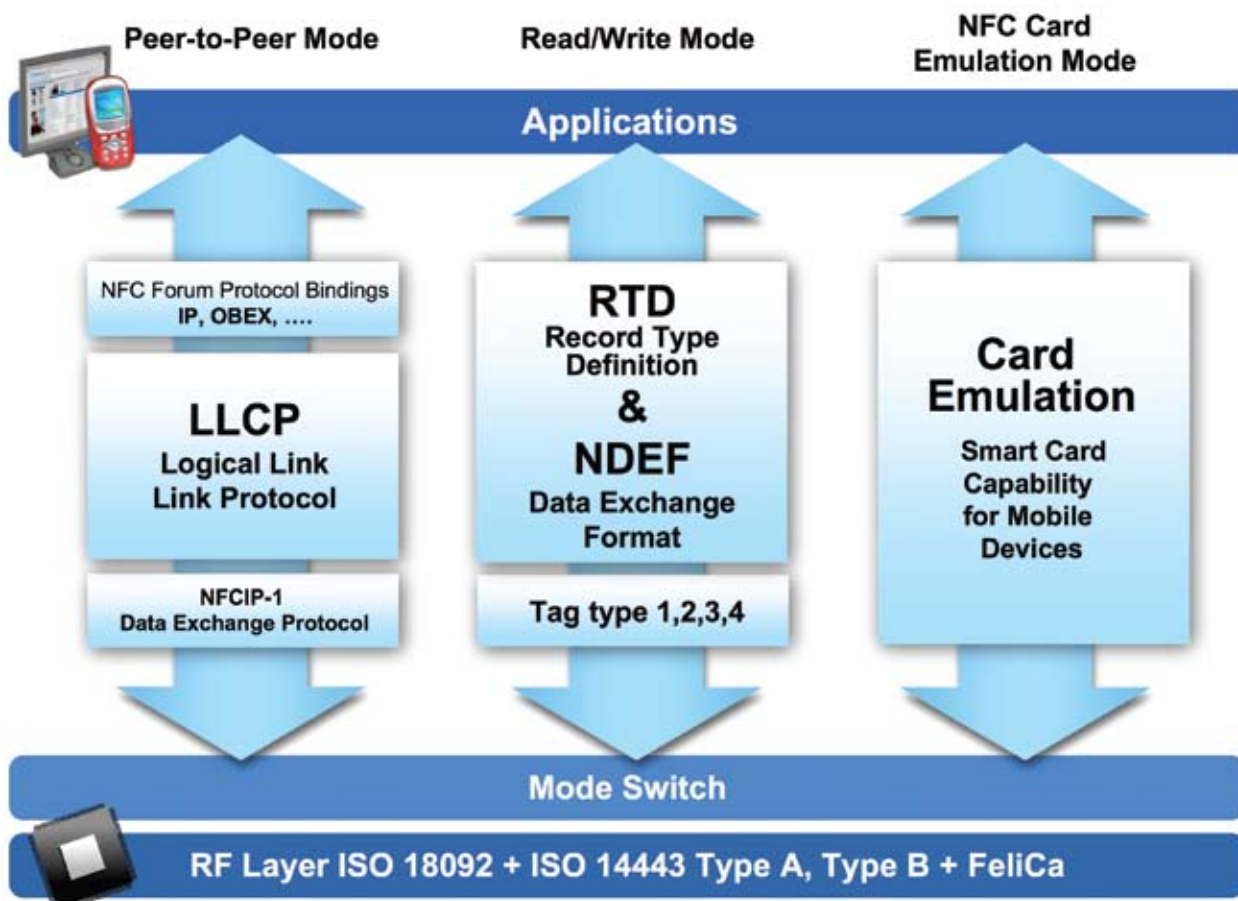
NFC Technology

Near Field Communication technology evolved from a combination of contactless identification and interconnection technologies. In June 2006, the NFC Forum took a significant step to enable manufacturers and applications developers to create powerful new consumer-driven products when it unveiled the NFC technology architecture and announced the first five Forum-approved specifications at a Web news conference.

Forum officials also announced four initial tag formats based on ISO 14443 Type A and 14443 Type B standards (ISO 14443 is a four-part international standard for contactless smart cards operating at 13.56 MHz in close proximity with a reader antenna), and on the NFC standard ISO 18092. NFC Forum-compliant devices must support these formats. These specifications are:

- NFC Data Exchange Format (NDEF)
- NFC Record Type Definition (RTD)
- NFC Uniform Resource Identifier (URI) Service Record Type Description
- NFC Text Record Type Description
- NFC Smart Poster Record Type Description

NFC Forum Technology Architecture



NFC Forum: Manufacturers, Developers, and Financial Institutions Working Together

NFC is already well on the path to widespread adoption because it clearly points the way to greatly expanded wireless communications. But for NFC to flourish on a truly wide scale, consumer-oriented companies need to work together. To that end, the Near Field Communication Forum was formed in 2004. An initial gathering of three companies has swelled to over 135 members representing manufacturers, applications developers, retailers, financial services institutions, governments, transport organizations, and non-profits.

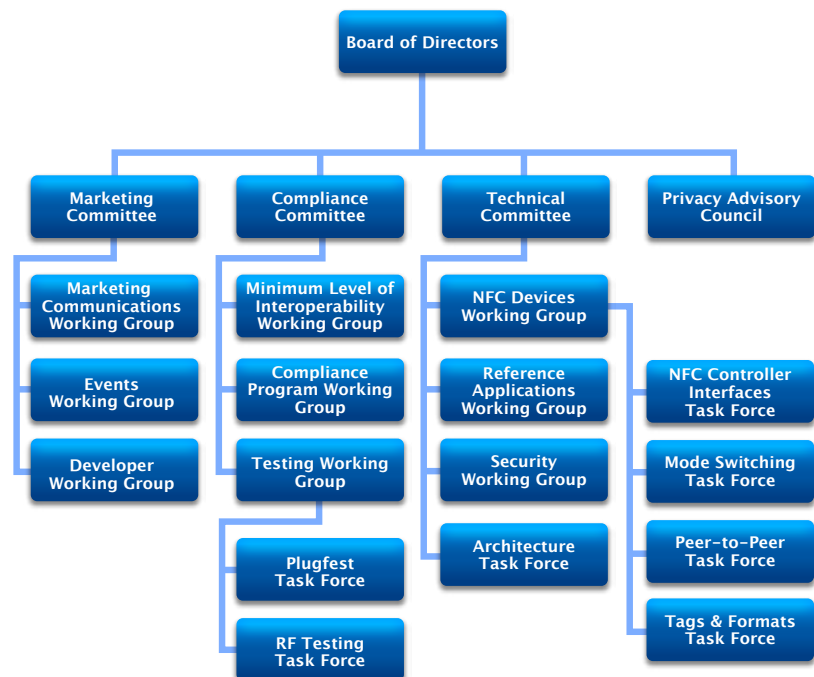
Working together, the Forum promotes the use of NFC technology in consumer electronics, mobile devices, and PCs by providing a highly stable framework for extensive application development, seamless interoperable solutions and extraordinary security. To meet that goal, the NFC Forum:

- Develops standards-based specifications that define NFC device architecture and protocols for interoperability
- Encourages the use of NFC Forum specifications
- Works to ensure that products claiming NFC capabilities comply with NFC Forum specifications
- Educates consumers and enterprises globally about NFC

NFC Forum-compliant products designed to work in concert with other wireless technologies, will offer intuitive access to content and services, making it possible for nearly any consumer to pay for physical goods, enter controlled environments like arenas or transit stations, and access digital services anywhere, at any time, using any NFC-Forum-compliant device anywhere, at any time.

NFC Forum Organization

The Forum's membership spans the full ecosystem of industries from electronics to finance to security and beyond. By pooling their expertise and their understanding of individual markets, Forum members have been able to develop the best possible solutions for advancing the use of NFC. Members have worked closely to forge a comprehensive set of common protocols and specifications from which many types of interoperable products and applications can be developed. All decisions are vetted by the voting membership to bring a wide range of perspectives to bear on the development of common protocols for basic links between devices, standards for interoperability based on common data structures and formats, and specifications for device-independent service delivery.



In addition to standardizing the NFC wireless communication protocol, data formats for tags, and information exchange between devices, the Forum is developing plans for conformity testing for NFC devices.

Under the direction of its Board of Directors, the Forum carries out its activities through three committees, various working groups, and ad hoc task forces as needed.

The **Marketing Committee** is the primary member-level group for marketing and education discussions. Responsibilities include educating the marketplace about NFC technology and the Forum's work, promoting the benefits of NFC technology to consumers, and supporting recruitment of new NFC Forum members. The Marketing Committee has three working groups: Events, Marketing Communications and one supporting the Developer Community.

The **Compliance Committee** is developing a product certification program with a consumer recognizable trademark guaranteeing the NFC brand promise of compliance and interoperability. The Compliance Committee has three working groups: Compliance Program, Minimum Level of Interoperability, and a group that is working on Testing.

The **Technical Committee** coordinates the efforts of the following Technical Working Groups, which host primary member-level meetings for technical discussions:

- The **NFC Devices Technical Working Group** handles baseline NFC functionalities, including a modular structure for NFC devices and specifications for interoperable data exchange and protocols for device discovery/capability.
- The **Reference Applications Framework Technical Working Group** develops and maintains a framework for applications and uses for NFC.
- The **Security Technical Working Group** defines the modular security architecture for NFC-based communications, defines all security requirements and specifications, and provides support to other working groups.

The **Privacy Advisory Council** is responsible for educating the NFC Forum members, technology creators who use NFC technology, their privacy officers, and the public in general about privacy issues surrounding NFC technology.

Join the Forum

We welcome participation from all organizations interested in furthering the mission of the NFC Forum whether they are for-profit companies or other industry associations with compatible technical interests. Find out more about Near Field Communication and the NFC Forum at www.nfc-forum.org or call +1 781-876-6216.

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