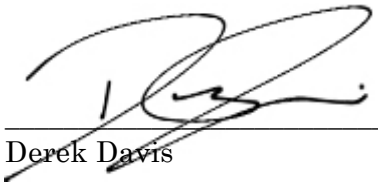
Derek Davis
IT 103-013
February 28, 2012

Near Field Communication

The Future of Mobile or Merely a Fantasy?

By placing this statement on my paper/webpage, I certify that I have read and understand the GMU Honor Code on http://academicintegrity.gmu.edu/honorcode. I am fully aware of the following sections of the Honor Code: Extent of the Honor Code, Responsibility of the Student and Penalty. In addition, I have received permission from the copyright holder for any copyrighted material that is displayed on my site. This includes quoting extensive amounts of text, any material copied directly from a web page and graphics/pictures that are copyrighted. This project or subject material has not been used in another class by me or any other student. Finally, I certify that this site is not for commercial purposes, which is a violation of the George Mason Responsible Use of Computing (RUC) Policy posted on http://universitypolicy.gmu.edu/1301gen.html website.



Derek Davis

I. Introduction

"Build it into something you always carry — a phone — and then you have something (Wired)." Near Field Communication, or NFC, is a simple technology that has blossomed into a hot-topic discussion in today's world of mobile devices and technology. NFC is essentially a short-range wireless technology that transfers small types of data, but with the introduction of two-way communication and data encryption, it is sure to be a household name in no time.

While NFC is successful across a range of different uses, the most important has become the transfer of payment information for contactless mobile purchases. By encrypting the data as it flows, NFC has stood out as the go-to technology for major mobile device manufacturers and financial service companies that are desperately attempting to enter into the world of mobile-commerce.

II. Background

In 1983, the first patent involving Radio-Frequency Identification, or RFID, technology was granted to Charles Walton (Wikipedia). And up until just a few years ago, RFID continued to remain the industry standard: used for retail inventory tags, toll road "E-Z Passes," and ExxonMobil's SpeedPass™. But in 2004, a new technology came onto the scene when Nokia, Philips and Sony formed the NFC Forum (NFC Forum). The three companies immediately began working on what would eventually become the specifications for NFC; paying close attention to making certain that the specs were universally compatible with any NFC-integrated device. Two years later, in 2006, the NFC Forum completed their initial specs for the technology (NFC Forum) and in the same year, released the first-ever NFC-integrated device: the Nokia 6131 mobile phone (NFC Forum).

Several milestones have been reached since the 6131 though. The first of which being a monumental development in 2009: the creation of the Peer-to-Peer standards. This new standard would allow for more specific data transfer and controls, including Bluetooth™ initiation (Wired). Today, more than 100 companies and organizations represent the NFC Forum, including new players such as Intel, Google, MasterCard, Microsoft, PayPal and Visa (The Globe And Mail). The list continues to grow, and with it as does its reach. If all goes according to plan, NFC chips will be the industry standard, and come within every mobile device. Soon, mobile-commerce will finally be efficient, simple and secure.

III. Potential Benefits

The simplistic nature of Near Field Communication is where its benefits can be found. Already in many countries abroad, companies and consumers alike are integrating NFC into their lifestyles. Germany has introduced "NFC[-based] ticketing systems for public transportation" (Wikipedia). In China, it's used everywhere for their public bus systems (Wikipedia). And India is also following suit, implementing "NFC-based transactions […] in box offices for ticketing purposes" (Wikipedia).

The NFC Forum here in the U.S. is also carefully considering new applications, some of which may be seen as soon as this year. Among these applications are six main types: mobile transactions, authentication, data transfer, technology initiation, digital access and ticketing.

Mobile transactions continue to be the NFC Forum's main focus, with benefits including wireless purchases by credit card at retail stores and coupons. By using a phone rather than a wallet, purchases are simplified, always available and much

more accessible. For example, using taxis and ATM's will be quicker and more secure.

Authentication is also a major focus, especially among security-based organizations in both the private and public sectors. Integrating NFC devices into access control would allow for several applications including building/room access, computer logins, and locking/unlocking vehicles (Source Security).

Data transfer and technology initiation would be a mainstream success in both business and personal aspects of consumers' lives. From exchanging business cards, files, and photos, to controlling Bluetooth™ devices and more. The wireless/contactless aspects of NFC would bring ease to many digitally based activities that to this day take an exorbitant amount of time.

Today's society is already seeing signs of digital information access via mobile devices. Technologies like QR Codes and Microsoft's TAG allow mobile users to scan an unpowered "code" and instantly be delivered or navigated to specific digital information such as websites, videos and more.

And lastly, ticketing will be a key success of NFC if the technology goes mainstream. Accessing, purchasing and scanning tickets wirelessly at movie theaters, sporting events and other attractions will be instrumental in reducing wait times and increasing purchase volumes.

IV. Legal & Ethical Issues

Near Field Communication technology is going to revolutionize the way consumers and organizations transfer data, but at what price? Already today, many groups are concerned with the legal ramifications of mobile transactions occurring almost immediately and with little institution of control and management. The NFC Forum continues to establish parameters for the technology, especially in the transaction

environment. Time will tell whether this technology will be built and managed well enough to withstand some key legal concerns, and blend well with today's legal norms in transactions and other data transfers.

V. Security Concerns

Going forward, the NFC Forum has identified several key vulnerabilities within the technology. Despite the severely limited physical distances required for successful data transfer using NFC, a few main concerns still remain for security analysts. The first and most severe is eavesdropping. Typically, data eavesdropping occurs when the data that is being wirelessly transferred is intercepted by an antenna and relayed to a device outside of the original transaction environment. In the case of purchases and other sensitive data, this can involve the wrong people getting their hands on private financial information, and is a major security issue that must be addressed. The second is known as "jamming," or data modification. This involves an outside device stopping or modifying the data being transferred. And the third is lost property. When an NFC-based device is lost, analysts are concerned about the procedure in which the owner will disable access and authentication to their personal information.

VI. Social Problems

The possible social problems with Near Field Communication are intertwined with the security concerns. First is the immediacy of access to a user's personal information. Whether it's an expert intercepting a mobile purchase or a stranger finding a phone on the subway, the consequences can be severe. How do consumers blindly trust mobile device manufacturers and financial companies to protect their credit card information and refund unauthorized transactions? Or better yet, how do they even identify the difference between authorized and unauthorized transactions?

These answers and more will be up to the group defining the future and standards of Near Field Communication: the NFC Forum.

VII. Further Required Research

From the many uses to the many social and security concerns, there is still much to be decided when it comes to Near Field Communication. Companies and consumers planning to use NFC technologies in the future will have tough decisions to make between speed and security.

The NFC Forum and device manufacturers have their work cut out for them as well. Increasing its uses while maintaining little to no security vulnerabilities is no small feat. So despite its years in the making, the NFC technology is still considered to be in its infant stages and continues to be beta-tested among several leading devices. Rumors state that Apple, a leading mobile device manufacturer here in the United States, is continuing to trail the sidelines. The key for many companies is to not invest an un-recoverable amount of capital into research and development of NFC, especially if the platform doesn't fully go mainstream.

VIII. Conclusion

Discoveries and advancements in the specifications and standards of NFC are yet to be realized, but will come with time. It's definite though that this technology is poised and capable of revolutionizing mobile data transfer, both for purchases and several other everyday uses. Such a simple and straightforward technology will most likely prove successful in the mobile world, but the unknown seems to continue to outweigh the known. For now, consumers are left waiting to see what will become of this powerful new technology. Will Near Field Communication be the future of mobile or just merely a fantasy?

References

Gustin, S. (2011, May 25). Wired.com FAQ: Near Field Communications' Big (Money) Moment. Wired. Retrieved February 28, 2012, from http://www.wired.com/epicenter/2011/05/wired-nfc-faq/

In this article, Gustin gives a detailed overview of what Near Field Communication is as well as specific details regarding the technology. Some of the topics discussed in the article include the current list of NFC-based devices, the leading companies surrounding the technology and examples of NFC-related devices already in use today.

Minihold, R. (2011). Near Field Communication (NFC) Technology and Measurements. *Rohde & Schwarz*. Retrieved February 28, 2012, from http://www2.rohde-schwarz.com/file_15687/1MA182_2.pdf

In this white paper, Minihold goes into great detail regarding what NFC is, how it works and what its main uses are and will be. With graphs and other visual representations, Minihold explains the basics of data, transmitting data with NFC, what technologies are involved with NFC, as well as some detail on how it is built.

Near field communication. (n.d.). *Wikipedia, the free encyclopedia*. Retrieved February 28, 2012, from http://en.wikipedia.org/wiki/Near_field_communication

In this article, the entire gamut of information on Near Field Communication is discussed. From an overview, to the history of NFC, to essentially how it works and what it could be used for. The article then delves into some comparisons, including with Bluetooth, and several security aspects of NFC.

NFC in Action. (n.d.). *NFC Forum*. Retrieved February 28, 2012, from

http://www.nfc-forum.org/aboutnfc/nfc_in_action/

This website is the main hub for all things Near Field Communication. Several articles from this site gave extraordinary detail on how NFC came to be what it is today, including background details, technical representations and a wealth of knowledge in applications and future devices.

Rayment, J. (2007, September 11). Near Future Of Near Field. *The Globe And Mail.* Retrieved February 28, 2012, from http://www.theglobeandmail.com/news/technology/article781161.ece

In this article, Rayment delves into the list of financial and technology companies that are now involved in NFC. The article outlines how initial NFC beta tests worked and provides statistics on current mobile device trends in relation to the technology.

Sa, R. (n.d.). Access control with mobile phones: the future with Near Field Communication. *Security Products, Companies, News and Events | SourceSecurity.com - the complete security industry guide.* Retrieved February 28, 2012, from http://www.sourcesecurity.com/news/articles/co-3108-ga.5735.html

In this article, Sa outlines the advantages and disadvantages that come with a new technology such as Near Field Communication. Several key applications are explained and many scenarios are depicted in which NFC would be instrumental. The basics and a general explanation of the technology are also provided as well.