RESEARCH ARTICLE

International Journal of Multidisciplinary and Scientific Emerging Research

Available at http://www.ijmser.com/ (ISSN 2349 – 6037)

NFC vs Bluetooth

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Accepted **04** March 2015, Available online **05** April 2015, **Vol. 4, No. 1 (April 2015)**

Abstract

In today's world as most of the work is being digitalized, demand for faster data transmission has drastically increased. People look forward to those applications that can ease their work. Transferring of data at a faster rate from one point to another has become a crucial part in one's day to day job. One such application is NEAR FIELD COMMUNICATION (NFC). NFC is based on Radio Frequency Identification (RFID) technology. NFC helps to transfer data from one point to another in a fraction of a second. This paper provides a comparison between Bluetooth and NFC systems to highlight merits of NFC over Bluetooth and why NFC will have a greater demand over Bluetooth in the near future. The paper also highlights on how NFC can be used that will benefit the industry and consumer alike.

Keywords: *Near Field Communication, Bluetooth, Radio Frequency Identification (RFID, digitalised.*

1. INTRODUCTION

Among the latest technology NFC is the only technology which is developing at a faster rate and accepted worldwide. Nokia, BlackBerry and Sony have used NFC technology to pair with Bluetooth headsets, media players and speakers. The pairing of such devices with NFC is done with one tap with its NFC-enabled devices. The same principle can be applied to the configuration of Wi-Fi networks.

2. NFC VS BLUETOOTH

NFC and Bluetooth are both short-range communication technologies that are integrated into mobile phone. NFC operates at slower speeds than Bluetooth but consumes far less power and doesn't require pairing.

NFC sets up more quickly than standards Bluetooth but has a lower transfer rate than Bluetooth low energy. With NFC, instead of performing manual configurations to identify devices, the connections between two NFC devices are automatically established quickly in than tenth of a second. With a maximum working distance of less than 20 centimeters, NFC has a shorter range, which reduces the likelihood of unwanted interception whereas in Bluetooth system there is Bluetooth Hacking Software wherein anyone could hack into our device without prior knowledge of the user. In NFC devices must be at a short range, so there is no chance of third person hacking into your device.

Aspect	NFC	Bluetooth	Bluetooth Low Energy
RFID compatible	ISO 18000-3	active	active
Standardization body	ISO/IEC	Bluetooth SIG	Bluetooth SIG
Network Standard	ISO 13157 etc.	IEEE 802.15.1	IEEE 802.15.1
Network Type	Point-to-point	WPAN	WPAN
Cryptography	not with RFID	available	available
Range	< 0.2 m	~100 m (class 1)	~50 m
Frequency	13.56 MHz	2.4–2.5 GHz	2.4–2.5 GHz
Bit rate	424 Kbit/s	2.1 Mbit/s	~1.0 Mbit/s
Set-up time	< 0.1 s	< 6 s	< 0.006 s
Power consumption	< 15mA (read)	varies with class	< 15 mA (read and transmit)

Table 1: COMPARISON OF BLUETOOTH AND NFC

3. DIFFERENT MODES OF NFC

NFC can be used in various ways and it is growing continuously. Following figure shows how many ways we can use NFC technology. There are basically three main categories of NFC technology:

3.1 Card Emulation Mode

In this mode, NFC enabled phones appears reader much the same as a traditional contactless smartcards. For instance, some confidential data such as Visa card number is written in the secure element of the phone and data is read by external reader and send the information for further processing.

3.2 Peer to Peer Mode

In this mode two enabled NFC devices can exchange data with each other at a faster rate than Bluetooth and other system. When we touch two devices with each other both devices can exchange business card. Another example is pairing Bluetooth headset with help of NFC enabled phone.

3.3 Read/Write Mode

In this, NFC enabled devices can read and write data to NFC tag. Device read and acts accordingly what is written in the tag.

Since NFC has such various modes of operations, NFC can be used in various fields of technology, and can be more secure than other systems like Bluetooth.

4. DIGGERENT MODES OF BLUETOOTH

4.1 Active Mode

Here, the device is actively in the transmission. The piconet is formed by a master who sets the clock frequency. This master keeps polling the other slave devices in order to offer a chance for them to send data.

4.2 Sniff Mode

This one is a mode when the consumption is low. When the Bluetooth module is in the Sniff mode, it stays synchronized in the piconet. Tsniff is the time interval at which it listens to the piconet at regular intervals. This ensures it stays in sync with the piconet and be able to use this Sniff window to send or receive data. The consumption is inversely proportional to Tsniff (compared to the Sniff window). The average consumption is usually about 1-5 mA approximately. However, if Tsniff is in the region of a second and the duration of Sniff (Twin) is in the region of several milliseconds; the consumption is only about 1-5% of the maximum transmission consumption. Large Tsniff reduces the consumption, but causes a delay in sending the bar code.

The whole idea of maintaining the connection is to avoid the Paging/ Create Connection phase which consumes high amount of power.

4.3 Hold Mode

Here the power consumption is lower than that of sniff mode and device stays synchronized. All functionalities are disabled except the counter on the Bluetooth chip. Once it completes the Hold period, the device enters the active mode.

4.4 Park Mode

Here, a device stays synchronized with the master and is able to listen to broadcasts but is not an active member of the piconet.

5. DESIGN OF NFC

NFC is designed in such a way that each person can send data to other NFC enabled devices which are couple of inches away from each other. Bluetooth devices are designed in such a way that the results are one-size-fits-all and do not take into consumers preferences. Bluetooth limits the opportunity to personalize an experience to provide anything of value to shoppers. Using a customer's location alone comes with the heavy risk of sending unwanted message. NFC enabled devices connect with other devices in fraction of a second while Bluetooth pairing and transfer of data takes significantly longer. NFC can work with passive devices which don't require power supply like travel card readers. NFC technology is much simpler than Bluetooth and closely related to RFID (Radio Frequency Identification) technology. Setting up of NFC is very easy compared to Bluetooth, since Bluetooth requires users toanually set up connection between smart phones and takes several seconds. The close proximity that devices connected using NFC must be to each other actually proves useful in crowded locations to prevent interfaces caused when other devices are present and trying to communicate.NFC provides low handshake/setup times than Bluetooth.

6 BLUETOOTH STACK PROTOCOL

6.1 Radio Layer

The RF block is similar to the physical layer of the OSI model. It is responsible for transmitting packets over a physical channel. A control path is established between the RF and baseband blocks to set the parameters for data transfer such as timing and frequency carrier. The RF blocks converts a data stream into the required communication format.

6.2 Baseband Layer

It consists of a link controller, resource manager and a device manager.

6.2.*1 Link Controller*:

It encodes and decodes the packets as per the parameters of the physical channel, logical transport, and logical link.

6.2.2 *Baseband Resource Manager*:

This controls all access to the radio medium. It grants time on the channels to all the participating entities.

6.2.3 *Device Manager***:**

It is responsible for such as finding and connecting to other devices and making the device visible or connectable to other devices. It requests permission from the resource control to access the transport medium**.**

6.3 Link Manager Layer

The link manager communicates with the link Manager of other devices using the Link Management protocol to create, modify and release logical links.

6.4 HCL

The Host Controller Interface acts as an interface between the host containing the application layer, L2CAP layer, SDP layer, Link Manager Layer, Baseband Layer and Radio Layer

6.5 L2CAP Layer

The Logical Link Control and Adaptation Layer lies over the Baseband Protocol. It gives both connection oriented and connectionless data services to the upper layer protocols. The different forms of L2CAP requests and responses include connection, configuration, disconnection etc.

6.6 SDP Layer

The Service Discovery Protocol allows an application to seek out the available services and the characteristics associated with them. As in L2CAP, there are various SDP requests and responses such as SDP attribute and SDP search service

6.7 Identify the Headings

Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

ADVANTAGES OF BLUETOOTH OVER NFC

1. NFC requires less power or even no power as compared to Bluetooth. NFC tags are passive RFID tags which mean they take power from nearby sources but Bluetooth can consume reasonable amount of power.
2. NFC is anonymous. No user data is collected while setting up a connection using NFC, thus keeping you anonymous.
3. NFC can be used to make payment that is through Google Wallet application.
4. NFC is faster than Bluetooth. With a mere touch of your phone is required for data transmission.

THE POWER OF NFC

While NFC technology can do many things, the task most people think of tends to be making payments with a smart phone. You've finished shopping and you walk up to pay for your purchases. You whip out your Smartphone, hold it up to a receiver at the register, type in a quick PIN to identify yourself and the purchase charges to your electronic credit card.

There are already applications existing today that make this method of payment successful. In 2011, Google announced Google Wallet and Google Offers a pair of products that uses NFC technology. The basic function of Google Wallet is replacing your physical credit card. It can also store other information like customer loyalty cards and special offers.

Another potential use is in marketing. It's possible to incorporate an NFC tag inside a poster, for example if you see an ad for something that interests you; you can hold up your Smartphone with an NFC chip up to it and receive more information. Other potential uses could include using NFC to communicate health records or synchronize data between devices. The following figure indicates various fields in which NFC can be used

7 RESULT

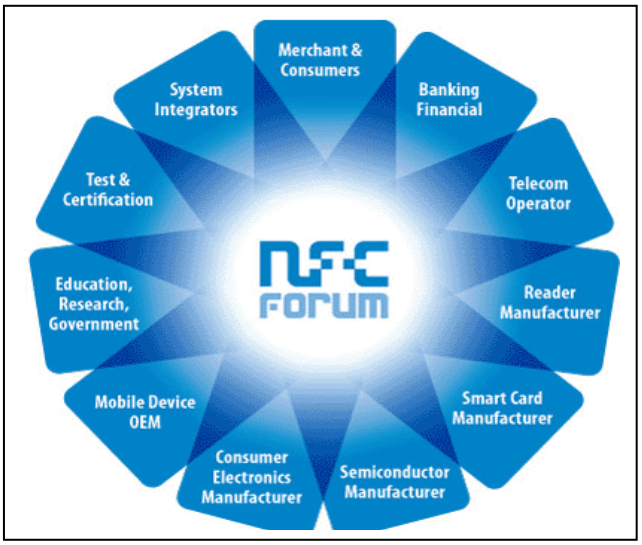

Figure 1: Applications of NFC

8.1 One of the biggest applications of NFC is Google Wallet. Google Wallet stores information of your credit cards, debit cards etc.

This technology can be used by the Railways. When an individual wants to travel by train, he/she will have to just type in the journey details and purchase the ticket with a simple touch of his /her mobile phone to the ticket machine. This can reduce length of long queues and process of buying a ticket will become easy.

8.2 NFC tags can also be installed in the shelves of library, so when you want to take any specific book just tap your phone on the shelf to get information of the right book before you borrow it.

CONCLUSIONS

We hereby conclude that in the near future NFC will be used widespread in various fields of technology. With the merits of NFC against Bluetooth it is undeniably true that NFC has better application than Bluetooth. NFC has also very little limitation than Bluetooth and has the capacity to replace it.

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