Near Field Communication (NFC) based Mobile Phone Attendance System for Employees

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Abstract: This article presents Mobile Phone Attendance system for small office employees. The core idea of this paper is to implement some of the emerging technologies like mobile computing, smart card technology and near field communications. In the trial the employees marked their arrival at and departure from office by NFC-enabled mobile phone with a contactless smart card. HR staffs were able to get and send their employee's attendance details as well as working hours and overtime hours via an online text-messages or email at end of month. We evaluate how various aspects identified in new technology adoption affect the design processes of Office Employee interaction systems by examining the findings from the viewpoint of two end-user groups (HR and Office Staff). Our analysis also shows that a technology supported Mobile Phone Attendance System for Employees can bring value for all end-user groups but it seems that the system will serve primarily the Employees and the HR staff.

Keywords- Android, NFC, Mobile Computing, Android SDK, MPA(Mobile Phone Attendance), contactless smart card, value-based design.

I INTRODUCTION

1.1 What is NFC?

Near Field Communication (NFC) technology makes life easier and more convenient for consumers around the world by making it simpler to make transactions, exchange digital content, and connect electronic devices with a touch. NFC is a radio communication standard that enables wireless data transfer between two devices at a very short distance -- less than 10 centimeters. NFC standards cover communications protocols and data exchange formats, and are based on existing radio-frequency identification (RFID) standards. NFC devices include a certain class of radio-frequency identification (RFID) tags and contactless smart cards. NFC devices operate within the 13.56 MHz frequency range, and they support extremely low data rates -- a maximum of 0.42 Mb per second. We require Android 2.3 for running NFC chip on the phone.

Figure -1

A standards-based connectivity technology, NFC harmonizes today's diverse contactless technologies, enabling current and future solutions in areas such as:

- ❖ Access control
- ❖ Consumer electronics
- ❖ Healthcare
- ❖ Information collection and exchange
- ❖ Loyalty and coupons
- ❖ Payments
- ❖ Transport

Developers can learn more about NFC in the section on interoperability.

Figure - 2

1.2 Key Benefits of NFC

NFC provides a range of benefits to consumers and businesses, such as:

- ❖ **Intuitive:** NFC interactions require no more than a simple touch

- ❖ **Versatile:** NFC is ideally suited to the broadest range of industries, environments, and uses.
- ❖ **Open and standards-based:** The underlying layers of NFC technology follow universally implemented ISO, ECMA, and ETSI standards

❖ **Technology-enabling:** NFC facilitates fast and simple setup
❖ **Inherently secure:** NFC transmissions are short range (from a touch to a few centimetres)
❖ **Interoperable:** NFC works with existing contactless card technologies
❖ **Security-ready:** NFC has built-in capabilities to support secure applications

1.3 Comparison between NFC and Bluetooth

Compared to Bluetooth and Wi-Fi, NFC technology operates at drastically reduced transfer rates and only within a very small proximity. NFC offers a low-speed connection with extremely simple setup, and can be used to bootstrap more capable wireless connections.[1] For example, the Android Beam software uses NFC to automatically complete the steps of enabling, pairing and establishing a Bluetooth connection when doing a file transfer.[2] NFC can be used in social networking situations, such as sharing contacts, photos, videos or files, [3]

If that's the case, why use NFC technology? Here are three reasons:

1.4 Difference between NFC and Other wireless technologies:

NFC is a technology that is distinct from other wireless technologies, not only in the technology used, but also the applications envisaged.

❖ **Bluetooth:** Although both Bluetooth and NFC can be used to transfer data. Bluetooth has

of wireless technologies, such as Bluetooth, Wi-Fi, etc.)

1. **Setup time.** NFC devices communicate instantly -- in less than 100 milliseconds -- when placed within range.
2. **Power consumption.** NFC tags and cards do not consume power, so their lifespan can be unlimited.
3. **Cost.** NFC tags and cards are inexpensive to manufacture compared to other wireless technologies.

	NFC	Bluetooth
RFID compatible	ISO 18000-3	Active
Standardization body	ISO/IEC	Bluetooth SIG
Network Standard	ISO 13157 etc	IEEE 802.15.1
Network Type	Point-to-Point	WPAN
Cryptography	Not with RFID	Available
Range	<0.2m	~10m(class 2)
Frequency	13.56MHz	2.4-2.5GHz
Set-up time	<0.1s	<6s
Power consumption	<15mA(read)	Varies with class

Table-1 Comparison between NFC and Bluetooth

been designed to transfer data over much greater distances. NFC is designed to be close proximity only.
❖ **Wi-Fi / IEEE 802.11:** Wi-Fi is designed for local area networks, and is not a short range peer to peer technology.
❖ **RFID:** Although RFID is very similar to NFC in many respects, RFID is a much broader

technology. NFC is a specific case which is defined by

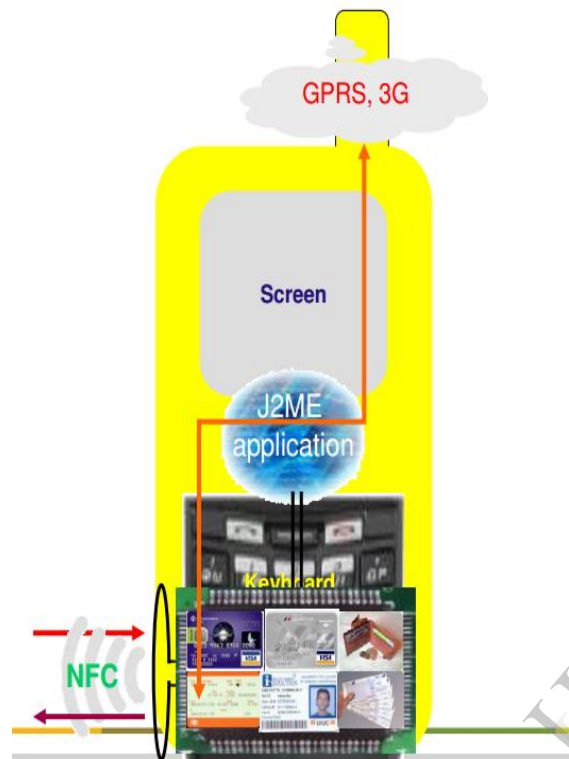## 1.5 HOW NFC CAN LOOK LIKE IN A MOBILE PHONE?

Figure - 3

Acting as a secure gateway to the connected world, tomorrow's NFC-enabled mobile devices will allow consumers to store and access all kinds

- ❖ reader. Also, for simple data capture applications, such as picking up an Internet URL from a smart label on a poster.
- ❖ **Touch and Confirm**: Applications such as mobile payment where the user has to confirm the interaction by entering a password or just accepting the transaction.
- ❖ **Touch and Connect**: Linking two NFC-enabled devices to enable peer to peer transfer of data such as downloading music,

standards enabling it to be interoperable.

of personal data – at home or on the move. Simply by bringing two NFC-enabled devices close together, they automatically initiate network communications without requiring the user to configure the setup. NFC-enhanced consumer devices can easily exchange and store your personal data – messages, pictures, MP3 files, etc. Delivering ease of use, instant intuitive connectivity, zero configurations and smart key access, NFC meets all the needs of today's connected consumer and creates opportunities for new mobile services.

1.6 Applications

NFC applications can be split into four basic categories.

- ❖ **Touch and Go**: Applications such as access control or transport/event ticketing, where the user only needs to bring the device storing the ticket or access code close to the

exchanging images or synchronizing address books.
- ❖ **Touch and Explore:** NFC devices may offer more than one possible function. The consumer will be able to explore a device's capabilities to find out which services are offered.

1.7 Android Architecture

In general Android is a software stack for smartphones and tablets. It consists of the kernel, the Android runtime,

libraries, an application framework, and the applications. Each of these parts will

Specially crafted Linux kernel. Google enhanced Linux to better address the needs of mobile platforms with improved power management, better handling of limited system resources and a special IPC mechanism.

Libraries Android provides a set of native libraries that are used by various components in the system. This includes libraries for media, 2D/3D graphics, and a custom C standard library (bionic). The functionality of these libraries is exposed to applications by the Application Framework. Many libraries are based on open source projects.

Examples are WebKit and SQLite. The Android Runtime is mainly made of the Dalvik VM, a register-based Java virtual machine. Dalvik runs Java code compiled to a special format (dex), which is optimized for low memory footprint. Everything on top of this layer is written in Java. Applications Android applications are written in Java. Android ships with a set of core applications for telephony, personal information management, and Internet browsing. For improved performance, applications can include native code written in the C language. Native code is integrated with the Java code through JNI. It does not benefit from the Java abstractions (automated memory management, garbage collection).

be described briefly in this section. Kernel Android is based on a

SYSTEM ARCHITECTURE AND ITS WORKING PRINCIPLES

This paper introduces a Near Field Communication (NFC) supported Mobile Phone Attendance System for Office Employees. Traditionally, Employee attempt to office and mark details (like Signature, Time In) in Hard copy register. Whenever he/she wants to go outside or leave time then again mark detail like Timeout in register entry. End of the month HR group uses these details (total working hours as well as overtime hours) to make payslip. The NFC-enabled MPA System has been designed to simplify attendance monitoring. The system replaces manual roll calls and gives to HR details of their Employee's attendance in real-time.

Figure- 4 shows the proposed system architecture. The detailed description of the MPA System working is given by introducing the different roles arising in office and the processes belonging for these actors. The main actors of the system are the Employee and the HR department. The HR department main task is to generate payslip after the month has ended. Inside the MPA system the above responsibility of the HR is aided by a number of services. The system operation is described below:
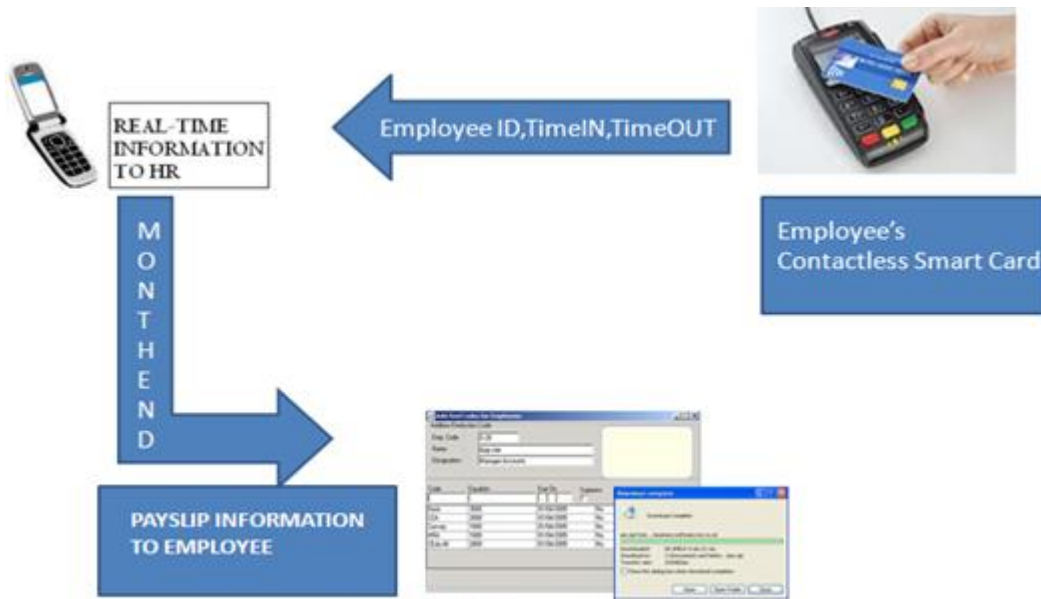
Overview of NFC Mobile Phone Attendance System

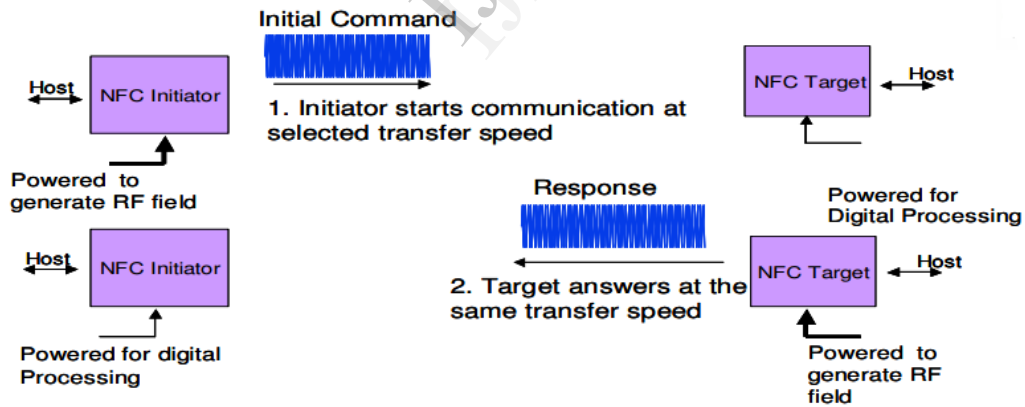**Figure - 4**

2.1 Communication Mode:

Figure – 5

STEP 1: Employee Come in the Office/left the office and Touch the Smart Card on the NFC-enable mobile device.

STEP 2: NFC Initiator starts communication at selected transfer speed.

STEP 3: All the detail of Employee Card scans and send to HR mobile using NFC Initiator. (ID, Photo , Time-In/Time-Out , Date)

STEP 4: Search employee's identity in permanent database with scanned data.

STEP 5: Check person designation and mark the presence with date and time.

STEP 6: Repeat step 1 to 5 for all present employees.

STEP 7: If No touch mark make absent entry.

STEP 8: Touching comes late, mark of delay time.

STEP 9: If Employee needs details regarding leave, over time hours, total working hours or payslip, they can send request through different command to targeted NFC-enable mobile device. So auto answering regarding related query.

STEP 10: NFC enable mobile device response answers by auto generated reports at the same transfer speed.
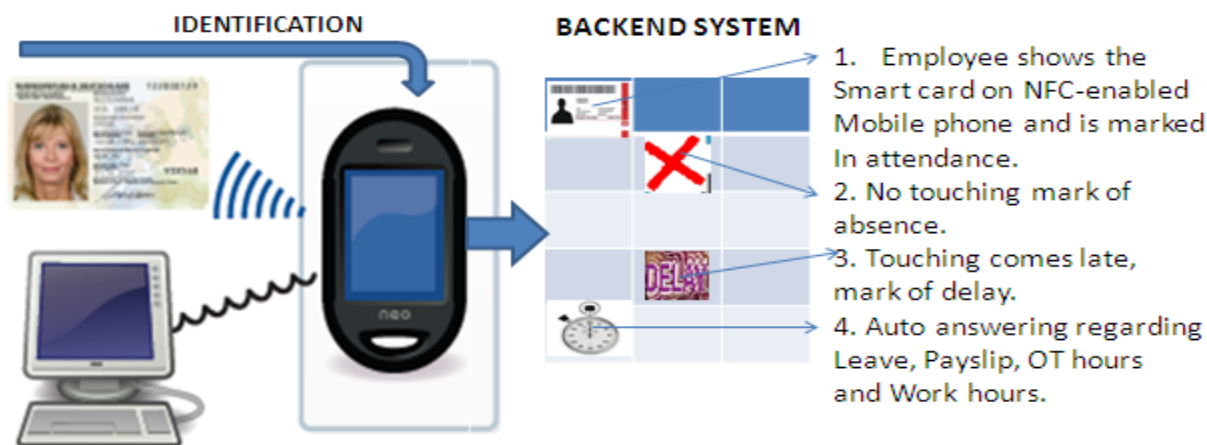
STEP 11: END.

Figure - 6

Role of Backend System:

The log of arrivals and departures was automatically compiled by a backend system, and could be read by HR in office in real time. If no touching occur, the employee was marked absent by default. If employee touched late, the back end system recorded the lateness. HR will able to get information of their employee attendance system through text-messages sent to HR mobile phone.

ADVANTAGES OF SYSTEM

This system is fast, fully automated, reliable, accurate, reducing paper based work, saving the time of attendance call, authentic attendance, no proxy attendance, employees would have a reason to go to office, easy way to let HR employees know if an employee is absent in office, employees don't have to carry multiple cards, office attendance management can easily find out the preferred choices of employees for instance, simple in use and potential to grow to add new features.

CONCLUSION

The Mobile Phone Attendance system can reduce unnecessary manual work by allowing HR person to receive real-time information about attendance or if an employee is late at office. The main benefits for the HR are that maintain all data about attendance of employee and keeping a log file about their possible reports. This Attendance tool can be further extended by adding feature to Print Payslip in doc file. NFC can also used as an attendance.

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