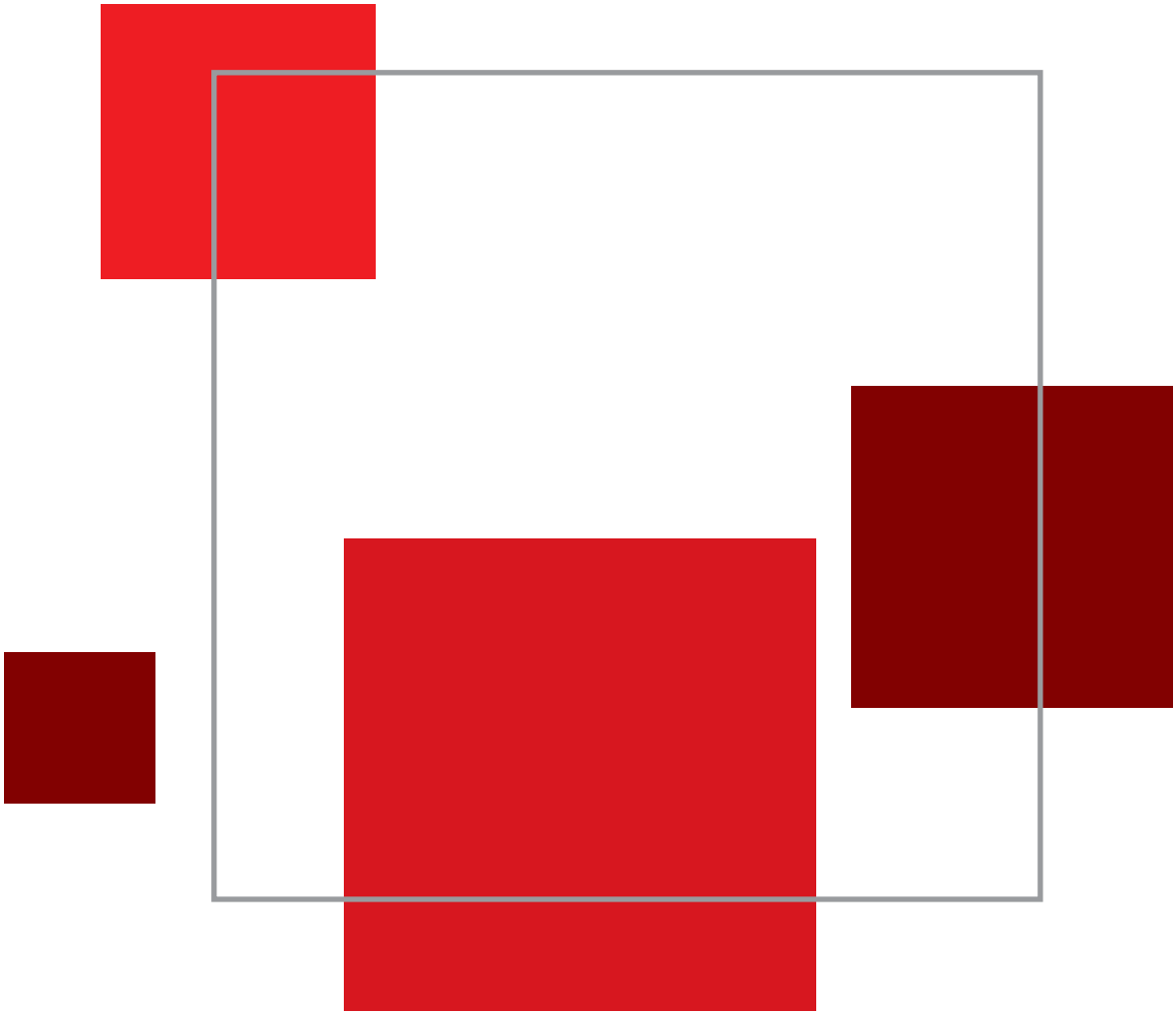
GSM ASSOCIATION

mobile NFC services



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Mobile NFC Services

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Section 1: Executive Summary

"Contactless technology" is a term defined by the Smart Card industry. It applies to short-distance communications between two devices that are not physically connected. This permits a range of contactless services to be developed.

Many different variations of "Contactless technology" exist today. Of most interest to Mobile Network Operators (MNOs) is Near Field Communication (NFC) technology. NFC is designed to operate over very short distances, typically less than 4 cm and provides a fast, simple and secure means for the user to experience a range of new contactless services with their mobile phone.

Mobile NFC is a combination of Contactless services with mobile telephony based on NFC technology.

Several customer trials have confirmed that the mobile phone is the preferred form factor for contactless services. The demand for this new range of contactless services is applicable across all user and market segments. Furthermore, customers want to keep the same ease of use, "look & feel", security and confidence as experienced with existing mobile services

Nineteen of the largest MNOs have been working together, in a GSM Association (GSMA) initiative, to develop a common vision on Mobile NFC services, promoting the development of a stable and efficient ecosystem and to prevent market fragmentation.

In this GSMA initiative, MNOs have analysed several key mobile NFC services and performed use case analyses, ecosystem analyses and have derived key business requirements that need to be factored in to the emerging standards, currently under development by various Standardisation Bodies, including the European Telecommunications Standards Institute-Smart Card Platform (ETSI-SCP) and the NFC Forum.

The key findings are as follows:

- **Mobile NFC will be successful provided that the mobile NFC ecosystem:**
  A. Is steady, providing value for all entities within it
  B. Is efficient, by introducing a new role of the Trusted Service Manager

- MNOs promote and recommend the UICC as the most appropriate NFC Secure Element (SE) in mobile phones, offering many unique advantages for the customer, including: universal deployment, portability, remote management, standards based solution and a long operational lifecycle.

- Inter-operability, backwards compatibility and hence standardisation are essential to provide convenient and cost-effective mobile NFC services.

The purpose of this document is to provide input to the various entities involved in the NFC ecosystem, such as: Service Providers, Trusted Service Managers, handset manufacturers, chipset manufacturers, UICC makers, contactless reader manufacturers and standardisation bodies, including fora such as ETSI-SCP and the NFC Forum.

MNOs are an integral part in the realisation of mobile NFC services on a global scale. Cooperation between MNOs and all other ecosystem entities (e.g. Service Providers, Trusted Services Managers and manufacturers etc) will be essential for the success of mobile NFC.

Next Steps in this initiative are:

- Validate key findings with industry players (starting Q1 2007)

- Deliver a Mobile NFC Technical Guidelines White Paper (Q2 2007)

- Liaison with Standardisation Bodies and Industry fora (starting Q1 2007)

Section 2: Introduction

"Contactless technology" is the term applied to short-distance communications between two devices that are not physically connected. Such devices can communicate peer-to-peer or on a client-server basis and typically embody a smart card (chip with processing capability) and short-range radio frequency technology.

Several varieties of "Contactless technology" exist today. Of most interest to Mobile Network Operators (MNOs) and to third party Service Providers is Near Field Communication (NFC) technology. NFC is designed to operate over very short distances, typically less than 4 cm and is foreseen as a strong enabler to meet new customer needs and drive value added business models.

NFC provides an intuitive and easy method for users to access services, as demonstrated by the rapid deployment of contactless public transport systems globally with many users. NFC has also been identified as a key sector for payment solutions with Amex, Mastercard and Visa actively driving forward contactless payment.

Mobile NFC is defined as the combination of contactless services with mobile telephony, based on NFC technology. The mobile phone with a hardware-based secure identity token (the UICC) can provide the ideal environment for NFC applications. The UICC can replace the physical card thus optimising costs for the Service Provider, and offering users a more convenient service.

Strategy Analytics forecasts that mobile phone based contactless payments will facilitate over $36 billion of worldwide consumer spending by 2011.

Section 3: Purpose of the Document

Nineteen of the worlds largest MNOs, have been working together, in a GSMA initiative, to create and define a global approach to enable NFC services on mobile phones. This initiative will serve to answer key customer requirements for new NFC services on mobile phones. Furthermore, it aims to provide a common MNO viewpoint, which is key to enable the development of a new market and to prevent market fragmentation.

The purpose of this document is to:

- Share the MNO view on the mobile NFC market opportunities and the requirements, which need to be fulfilled to make it a success on a global scale.
- Provide mobile NFC business requirements from a customer viewpoint.
- Define the mobile NFC ecosystem and the potential roles of the different entities.
- Promote the development of mobile NFC technology that supports interoperability via standardisation.

This document is intended to provide input to the various entities involved in the NFC ecosystem, such as: Service Providers, Trusted Service Managers, handset manufacturers, chipset manufacturers, SIM makers, contactless reader manufacturers and standardisation bodies, including fora such as ETSI-SCP and the NFC Forum.

MNOs understand the need for cooperation with the above entities in order to enable mobile NFC services to become a business reality on a global scale.

Section 4: The Customer Vision for Mobile NFC

Customer feedback from usage of contactless services in Japan and trials and surveys conducted throughout the world show that there is a strong desire for mobile users to enhance the capabilities of their mobile phone to perform more than just voice/multi-media communication.

Several trials throughout Europe show early signs of success and rapid customer take-up, for example:

- Germany (Frankfurt/Hanau) – Including: Vodafone, Rhein-Main-Verkehrsverbund (RMV), Nokia and Philips Semiconductors – public transport ticketing trial - end 2005 to end 2006
- France (Caen) – Including: Orange, Cofinoga, Vinci and Fly Tag - M-Payment, car park subscription and tag reading services trial - From Q3 2005 to Q2 2006
- France (Paris) – Including: Bouygues Telecom, RATP, NEC, Inside Contactless, Gemalto – public transport ticketing trial Q3 2006 to Q1 2007
- Netherlands (Kerkrade) – Including: KPN, Roda JC – stadium access/ticketing mobile payment trial – Q3-2005 to Q1 2006
- Netherlands (Amsterdam) – Including: KPN, JCB, Nokia – mobile payment trial – Q4 2006 to Q1 2007
- Finland (Tampere) – Including: TeliaSonera, City of Tampere, Nokia – public transportation ticketing trial – Q2-Q3 2006.

These trials have concluded that there is great demand and anticipation of the customer to receive a wide range of contactless services all housed in their mobile phone. Customers see the benefits of mobile contactless services and are quick to adopt them.

The demand for this new range of contactless services is applicable across all user and market segments. Furthermore, customers want to keep the same "look and feel" as experienced with existing mobile services, while preserving:

- Ease of use
- Security and confidence
- Customer care

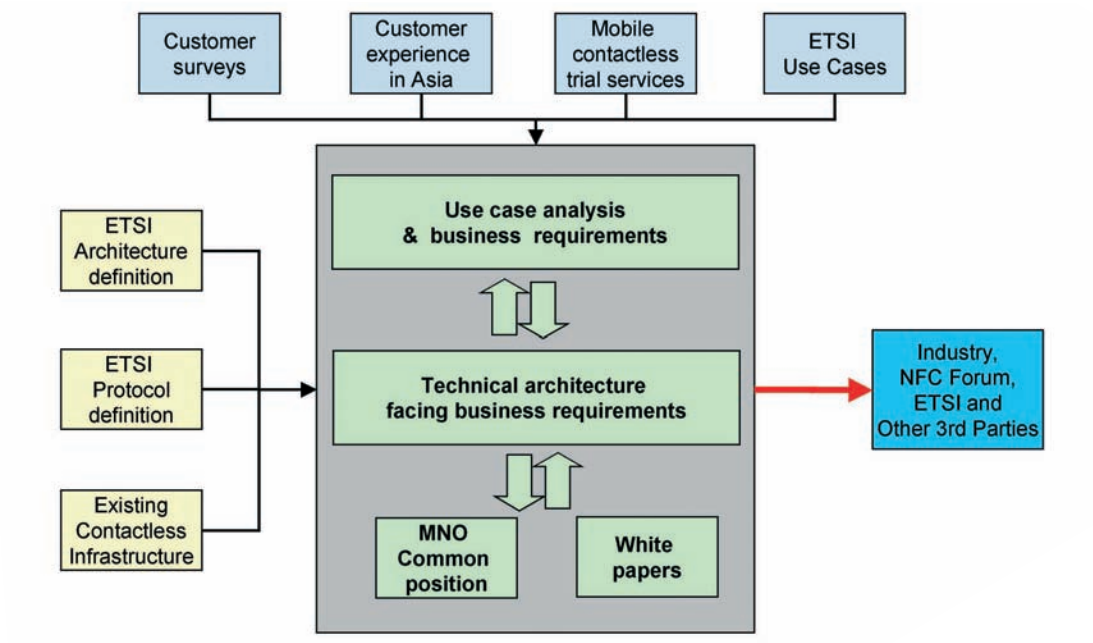
Mobile NFC is set to revolutionise the way customers use their mobile phone. This is analogous to the take-up of SMS a few years ago. Mobile NFC will take the user experience in to new sensory areas such as "touch".

Currently, the customer's daily life routines are enabled by an ever increasing plethora of cards, keys, tickets and cash. Having the possibility to house all of them in one's mobile device will bring greater convenience to the customer.

Customers have confirmed that the mobile phone is the preferred form factor for contactless services. This has sparked remarkable industry-wide interest in the creation of a new mobile NFC ecosystem, which will involve more players and hence new roles will appear.

The participation of the MNO in the value chain is logical in order to meet customer expectations. Mobile network operators have established a strong and long-term relationship with the customer, and have several services in place, which are required to make mobile NFC a success.

GSMA Mobile NFC Project Approach



Section 5: Project Definition

5.1 GSMA

The GSMA is the global trade association representing over 700 GSM mobile phone operators across 215 countries of the world. The primary goals of the GSMA are to ensure mobile and wireless services work globally and are easily accessible, enhancing their value to individual customers and national economies, while creating new business opportunities for operators and their suppliers. Hence the GSMA provides the ideal forum to represent the MNO community for the purposes of defining mobile NFC services.

MNO collaboration in this area ensures a consistent approach in the development of mobile NFC services among mobile operators and other involved parties in the industry and hence promotes interoperability, leading to standardisation on a global scale and prevents market fragmentation.

5.2 Stakeholders

Nineteen of the largest MNOs are working together to develop a common vision on mobile NFC services, promoting MNO's capabilities and value add for the mobile NFC ecosystem.

The MNOs involved in this mobile NFC initiative are: Bouygues Telecom, China Mobile, Cingular Wireless, Elisa, KPN, KTF, Mobilkom Austria, NTT DoCoMo Inc., Orange, Rogers, SFR, SKTelecom, Telefonica Móviles España, Telenor Mobile, TeliaSonera, Telecom Italia Mobile, TMN, Vodafone and 3. They represent about 45% of the worldwide GSM market, which addresses over 800 million customers.

5.3 Approach

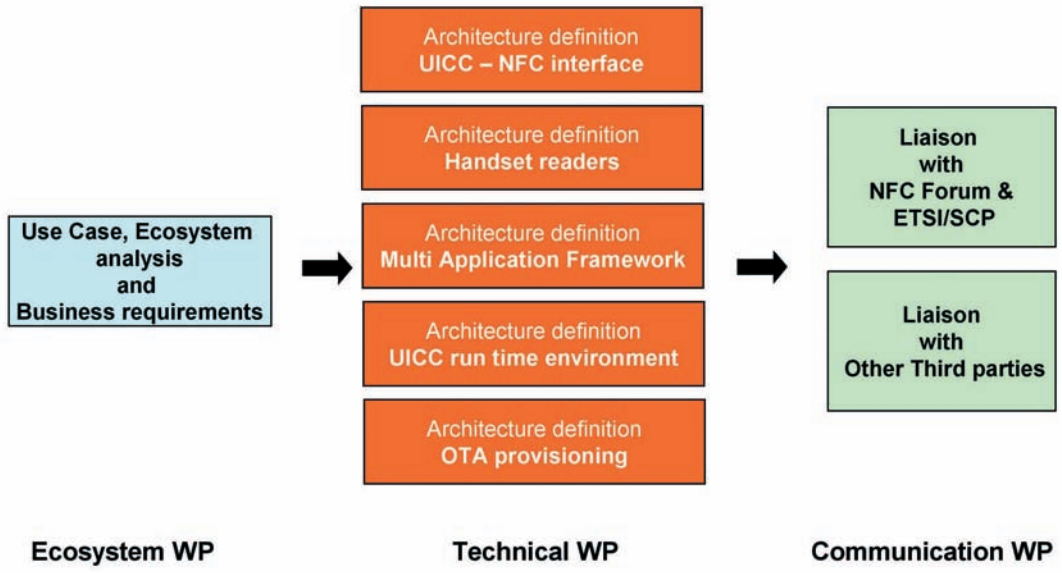
The following approach has been adopted in this project:

- Analyse the key mobile NFC use cases
- Analyse the mobile NFC ecosystem and perform an end-to-end value chain analysis
- Analyse the MNO's role within this ecosystem
- Extract the mobile NFC business requirements needed to make mobile NFC a success and deliver value to all entities in the value chain
- Assess the impact of the business requirements to the current NFC standards

Several Work Packages (WPs) have been defined in this project. These are summarised below:

- Mobile NFC Use Case Analysis and Business Requirements
- Architecture Definition UICC-NFC Chip
- Architecture Definition Handset-Reader
- Architecture Definition Multi-Application Framework
- Architecture Definition UICC run-time environment
- Architecture Definition OTA provisioning

GSMA Mobile NFC Project Structure: Work Packages



5.4 Deliverables

The project started in early September 2006 and aims to deliver several outputs in early 2007.

The deliverables from this project are a series of White Papers, which are:

- An Ecosystem White Paper derived from the NFC Ecosystem analysis and related Business Requirements, - this document;
- A Technical Guidelines White Paper including the architectural vision of the MNOs for aMobile NFC Solution

The following mobile NFC Use Cases were analysed:

- Mobile Ticketing – for example to access public transport systems
- Mobile Payment – for example for credit/debit/pre-paid stored value card payments at merchants/retail stores
- Physical Access – for example to control access to home or office
- Logical Access – for example to control access to a computer network
- Loyalty Application – for example to award loyalty points at a supermarket or hotel
- Health Care Application – for example storage of medical information for use in emergencies
- Digital Rights Management – for example to allow controlled exchange of purchased music or multi-media data
- Automotive Application – for example to control access to a car
- Smart Advertisement Application – for example to access information from a smart poster at a bus stop

The output of the analysis was a set of generic and specific business requirements.

Section 6: NFC Ecosystem Key Findings

This section presents the key findings of the work conducted by MNOs regarding the Mobile NFC ecosystem. It describes the MNO vision regarding mobile NFC and how to make it a market success.

6.1 Mobile NFC Ecosystem Entities

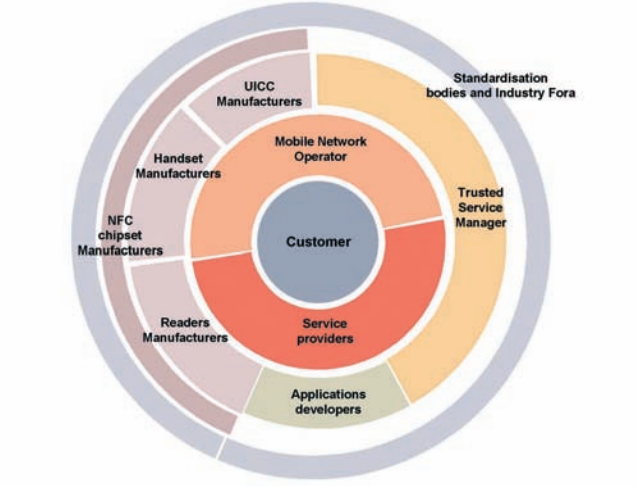


Figure 1 shows different entities that are considered to be involved in the Mobile NFC ecosystem. These are defined below:

- **Customer** – uses the mobile device for mobile communications and mobile NFC services. The customer subscribes to an MNO and uses mobile NFC services.
- **MNO** – provides the full range mobile services to the Customer
- **Service Provider** – provides contactless services to the Customer (e.g. Banks, Public Transport companies, Loyalty programs owners etc).
- **Retailer/Merchant** – not shown in figure as it is service dependent.
- **Trusted Service Manager (TSM)** – securely distributes and manages the Service Providers services to the MNO customer base.
- **Handset, NFC Chipset and UICC Manufacturer** – produce Mobile NFC/Communication devices and the associated UICC hardware.

- **Reader Manufacturer** – produces NFC reader devices.
- **Application developer** – designs and develops the mobile NFC applications.
- **Standardisation Bodies and Industry Fora** – develop a global standard for NFC, enabling interoperability, backward compatibility and future development of NFC applications and services.

The following factors will influence the shape of the mobile NFC ecosystem and the roles of the players:

- Customers expect convenient, friendly and secure services, within a trusted environment.
- Service Providers want their applications to be housed and used in as many mobile devices as possible and hence across as many mobile networks as possible.
- Service Providers want to maximise the use of the existing infrastructures, which are already deployed using different (reader) technologies.
- Handset manufacturers want to make their mobile devices more appealing to the Customer.
- MNOs want to provide new mobile contactless services that are secure, high quality and consistent with the existing services experienced by the Customer.
- MNOs and UICC manufacturers want to leverage the unique capabilities provided by the UICC to guarantee security and privacy to the customer.
- MNOs want to leverage their long-standing customer relationship to provide a seamless service to both the Customer and the Service Provider.

6.2 Key Finding 1:

The role of the Trusted Service Manager

Mobile NFC will be successful provided that the mobile NFC ecosystem:

- Is steady, providing value for all entities within it
- Is efficient, by introducing a new role of the Trusted Service Manager

The success of NFC services will heavily depend on the ability of the industry to establish a steady ecosystem and to achieve a critical mass.

Prior to the allocation of different roles to entities within the mobile NFC ecosystem, an end-to-end process analysis was performed.

The NFC service process was broken down into three major parts (as described below and shown in Figure 2):

1. NFC enablement, to provide the basis for any NFC services
2. Trusted Service Management, to meet the NFC security and service life cycle requirements
3. Application, to provide the NFC application

Figure 2: NFC process areas

6.2.1 The role of the Trusted Service Manager

To increase the efficiency of business relationships, the role of Trusted Service Manager (TSM) is proposed. The TSM's role is to:

- Provide the single point of contact for the service providers to access their customer base through the MNOs.
- Manage the secure download and life-cycle management of the mobile NFC application on behalf of the service provider.

The TSM will need to fulfill certain requirements. Those are in particular:

- Ability to contract with and support a high number of partners
- A good business reputation in handling services securely
- Being seen as a trusted partner in the ecosystem

The TSM does not participate in the transaction stage of the service, thus ensuring that the service provider's existing business model is not disrupted. Depending on the national market needs and situations, the TSM can be managed by one MNO, a consortium of MNOs, or by independent Trusted Third Parties. The number of operating TSMs in one market will depend on the national market needs and circumstances.

The TSM role needs to be defined and agreed between the main players (for instance, Service Providers and MNOs) in order to deploy mobile NFC services efficiently to the customer.

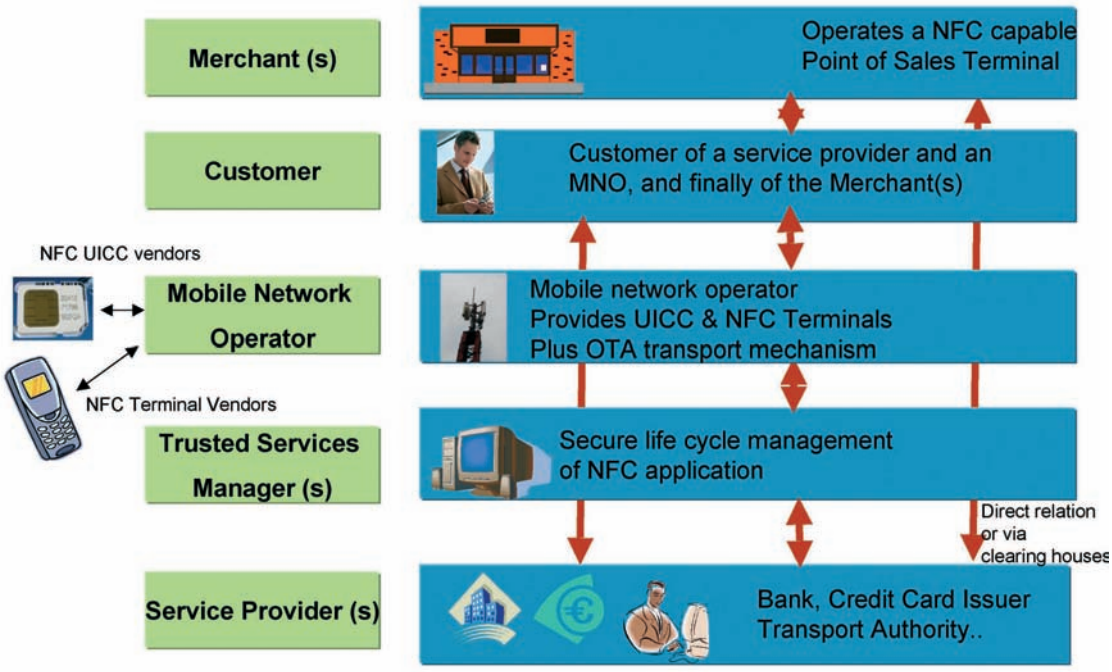


Figure 4 shows an example of the roles and relationships between entities involved in a mobile-payment service.

6.2.2 The role of the MNO in the Mobile NFC Ecosystem

The MNO provides reassurance to the customers by preserving the following features:

- End User trust.
- Quality of Customer Care support.
- Revocation and Restoration of lost/stolen device, whilst blocking further transactions until a new device has been re-provisioned and re-activated (with the associated service settings).
- Service Portability (e.g. the ability to transfer service capabilities across different devices).
- State-of-the-art services, meeting the MNO design standards.
- Integration of NFC services in the mobile services suite.

- Customer peace-of-mind that the device can be used for mobile NFC services without impacting existing services.

- Provides the full range mobile services to the Customer and issues the UICC (One of the main enablers for Mobile NFC Services).

As mentioned in section 6.2.1, the MNO can perform the role of the Trusted Service Manager. The concrete roles of the different entities in the NFC ecosystem, as well as whether the MNO performs the role of the Trusted Service Manager, will depend on national market situations and circumstances.

6.3 Key Finding 2:

The UICC as the most appropriate NFC Secure Element (SE) for the Mobile Phone

Mobile NFC applications need to be performed in a secure environment (SE). The UICC provides both logical security (i.e. command encryption) and physical security (i.e. tamper proof and copy protection). Furthermore, the UICC has been identified by MNOs as the recommended SE for NFC because of the following unique advantages that it offers to the market place:

- **Universal:** The UICC has the widest available deployment of any SE, with more than 2 billion users worldwide – hence it is cost effective to use the existing UICC as an SE rather than to develop, implement and deploy a new alternative.

- **Portable:** The UICC is portable – hence Customers can easily transfer their applications and rights from one NFC enabled mobile device to another.

- **Dynamic Remote Management:** MNOs already operate secure remote UICC management systems and processes (Over the Air). These can easily be leveraged to manage the whole life cycle of mobile NFC services. Furthermore, services loaded onto the UICC can be immediately blocked, activated or suspended.

- **Standardised:** UICC Security is based on global, well-established standards (such as ETSI-SCP, 3GPP, Global Platform) covering application storage, OTA communication, privacy and the entire life cycle management.

- **Long Lifecycle:** The UICC has a longer lifecycle than a mobile device - hence it is more suitable to house the NFC applications on it rather than on the mobile device. This permits the Customer to easily transfer and use their mobile NFC services over time.

Additional benefits of using the UICC as the SE include:

- **Business synergies:** UICC manufacturers that already supply contactless cards to service providers will benefit from their expertise and their operational excellence.
- **Customer care service:** In addition to providing high quality customer care for mobile telephony and data services, the MNO can also provide high quality mobile NFC customer care services to the customer – for instance the MNO can be the single point of contact to a customer for managing their mobile NFC services if their mobile device is lost, stolen or damaged.
- Consistent approach By deploying mobile NFC applications in the UICC, the MNO can leverage existing capabilities to provide OTA management of services to customers.
- **Battery independent:** The UICC mobile solution also allows NFC services to work even when the battery is off.

6.4 Key Finding 3:
Inter-operability, Backwards compatibility and Standardisation are essential

Existing contactless infrastructure implementations are based on different ISO standards (e.g. ISO/IEC 14443) as well as on existing de-facto proprietary solutions. In the vast majority of cases it will not be possible to request that Service Providers change or upgrade their existing contactless infrastructure. All of these existing systems have been designed to be mono-applications (e.g. Oyster is supported in London and NaviGo in Paris etc). A mechanism has to be found that enables the correct NFC application to be activated within the context of the appropriate NFC system.

The required critical mass will heavily depend on positive customer acceptance. This will need to be achieved through an exciting service experience meeting customer needs, combined with economy of scale leading to appealing handset and application development costs. Standardisation of the NFC handset and the related interfaces will decrease costs and is therefore of utmost importance.

In order to achieve interoperability with many existing legacy systems and those currently under development, appropriate standards need to be defined and implemented.

Factors that need to be considered in the standardisation process are:

- Ease of use by the customer
- Time to market
- IPR issues

Other key points that need to be considered are:

- Design of new mobile handsets for mobile NFC devices – these have to integrate NFC capabilities with the NFC chipset and antenna.
- Interface between the UICC as the NFC Secure Element with the NFC chipset in the mobile device
- Further details are provided in the Technical Guidelines White Paper.

Section 7: Conclusions and Next Steps

The MNO vision is to enable the frequent use of mobile NFC services to the benefit of the customers. MNO's want to enrich the user experience by providing a range of new contactless services that are highly secure and easy to use. This will result in a successful mobile NFC business model, providing value for all participants in the mobile NFC ecosystem.

However, a consistent approach is required to ensure that the needs of the customer are met.

A number of business requirements need to be fulfilled to make this vision a reality. In particular, the following are recommended:

- To create a trusted and efficient mobile NFC ecosystem by introducing the new role of the Trusted Service Manager
- To implement the UICC as the Secure Element (SE)
- To achieve interoperability, backward compatibility and standardisation

7.1 Next Steps

1. Validate key findings with industry players (starting Q1 2007)
2. Deliver a Mobile NFC Technical Guidelines White Paper (Q2 2007)
3. Liaison with Standardisation Bodies and Industry fora (starting Q1 2007)

Section 8: Acronyms

Acronym	Meaning
3GPP	Third Generation Partnership Project
ETSI	European Telecommunications Standards Institute
ETSI-SCP	European Telecommunications Standards Institute-Smart Card Platform
GSM	Global System for Mobiles
GSMA	GSM Association
IPR	Intellectual Property Rights
ISO	International Standards Organisation
MNO	Mobile Network Operator
Mobile-TV	Mobile Television
NFC	Near Field Communication
OTA	Over The Air
SE	Secure Element
SIM	Subscriber Identity Module
SMS	Short Message Service
SP	Service Provider
TSM	Trusted Services Manager
UICC	**Universal Integrated Circuit Card** The UICC is a smart card which contains account information and memory that is used to enable GSM cellular telephones. One of the applications running on the smart card is the SIM, or Subscriber Identity Module. In common parlance the term "UICC" is not used but the phrase "SIM" is used to describe the smart card itself.

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