Developing NFCbased Mobile Wallet services

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Abstract:

Embedded Near Field Communication wireless technology is one way of enabling payment for goods and services using a mobile device. The usage of mobile phones is widespread andmobile devices are frequently used for payments instead of payment cards. Numerous banks and payment providers are actively developing mobile wallet applications. This paper presents one such solution developed by Banca Intesa AD Beograd. This bank has identified the customers' needs to develop new product such as Wave2Pay Digital wallet. Digital wallet is service based on NFC technology and used for contactless payments. New Wave2Pay service is the beginning of a new payment method that is likely to contribute to increasing the level of digitalization of the banking system in Serbia.

Introduction

In the modern world, a mobile phone hasbecome an essential and most popular device. There is not a person who does not own at least one. In some world regions the number of mobile phones significantly increases the number of inhabitants. Statistics from The Statistic portal Statista [15] have estimated that 1.9 billion phones worldwide will have been NFC-enabled by 2018. With smartphones expansion according standard functionalities, mobile phones are used instead of cards, keys, identification documents, etc. According to Statistical Office of the Republic of Serbia [14] 90.3% of households have a mobile phone available.

Visa Europe Mobile Money research which was conducted last year showed that there is a high consumer demand for mobile payment solutions. It is expected that one in four Britons estimate spending more than £50 a week on mobile by 2020 and their level of consumption increased by an average of 10pounds a week to 27pounds per week [16].

Having researched the market and the needs of its customer, Banca Intesa ad Beograd has identified the need to develop new products such as Wave2Pay Digital wallet. The mail goal of implementing this project is to offer the Bank customer a new way of mobile proximity payments. Intesa Sanpaolo Card (ISPC) achieved solution to satisfy increasing costumers' needs.

Background

NFC (Near Field Communication) is a short-range technology which uses magnetic field induction to enable communication between two devices which are in close proximity. For communication via NFC, one device must be reader/writer, and the other NFC tag. The tag is actually an integrated circuit containing data that can be written and read by a reader. NFC communication is designed in a way that one device at one point can send or receive data. Precisely when one side sends data, the other listens.There are three types of devices that may be used in the transfer of data through the NFC technology:

- NFC reader –an initiator in the NFC communication;
- NFC mobile phone - an active and passive device, depending on the needs of applications in which it is used;
- NFC tag –a passive device that communicates with the active device.

Depending onthe operating way that exists between active and passive devices, three functioning modes are developed:

1) peer-to-peer - This model supports the direct exchange of information between the two active NFC chips. Devices operate on the principle that one initiates a transaction while others respond to requests. A good example is sharing content (video clips, music, contact information) by touching two phones.

2) read/write – This mode allows the initiator to read from or write to another NFC tag. An example of using this mode would be a situation when a user approaches a NFC phone to specific object then he/she gets certain information about this product (product description, technical specifications, price, special offers, marketing promotion, demo video, comments and recommendations of those who already use it, etc.).

3) Card emulation mode - This mode is mainly used to support mobile payments (m-payment), but is often used to simulate different cards (loyalty cards, medical cards, personal information cards, membership cards, season tickets etc.).

There are many technologies that are similar to NFC by their features, such as RFID, IrDA (Infrared Data Association Protocol) and Bluetooth. Each of them has its own specifics as well as the advantages and disadvantages compared to the other. The table provides a comparative overview of these technologies.

	NFC	**RFID**	**IrDA**	**Bluetooth**
Time to make a connection	<0.1 ms	<0.1 ms	~0.5 s	~6 s
Range	to 10 cm	to 3 m	to 5 m	to 30 m
Usability	Human-oriented, easy, intuitive, fast	Object oriented	Data oriented	Data oriented
Utility	Payment, Data access, Data exchange	Object tracking	Control and data	Data exchange

			exchange	
User experience	Easy connection (tap, wave)	Download information	Easy to use	System requirements

Table 1. Comparative overview of contactless technologies [11]

When talking about NFC technology, these systems are widely use for payments proposes.A large number of NFC based palyment systems has been implementedsince 2003, but many of these were soon put out. The reason for this is the small number of mobile phones based on this technology. Present situation on the mobile phone market is such that the number has significantly grown over the last several years. Mobile payment with the NFC based mobile phones may be made in places with POS terminals. Payment is made by bringing mobile phone near contactless POS terminal. The payment process is performed using a virtual payment cards to users' mobile phone.

Design and Implementation

Following trends and resulting from market and industry research, Banca Intesa AD together with Intesa Sanpaolo Card (ISPC) aim at achieving solutions to satisfy increasing needs of our clients. Bank Intesa AD has decided to enrich its offer with virtual cards in a Digital wallet. Every client who applied for Digital wallet and virtual card will be able to pay on POS terminals without the use of plastic cards.

These payments are based on HCE (Host Card Emulation) technology by virtualizing the payment card into a cloud thus enabling payment via smartphones. The service will enable customers using Android based smartphones with NFC capabilities running OS 4.4 (KitKat) or higher at first time. HCE service will be realized within mobile wallet application for specific payment cards with the use of tokenization.

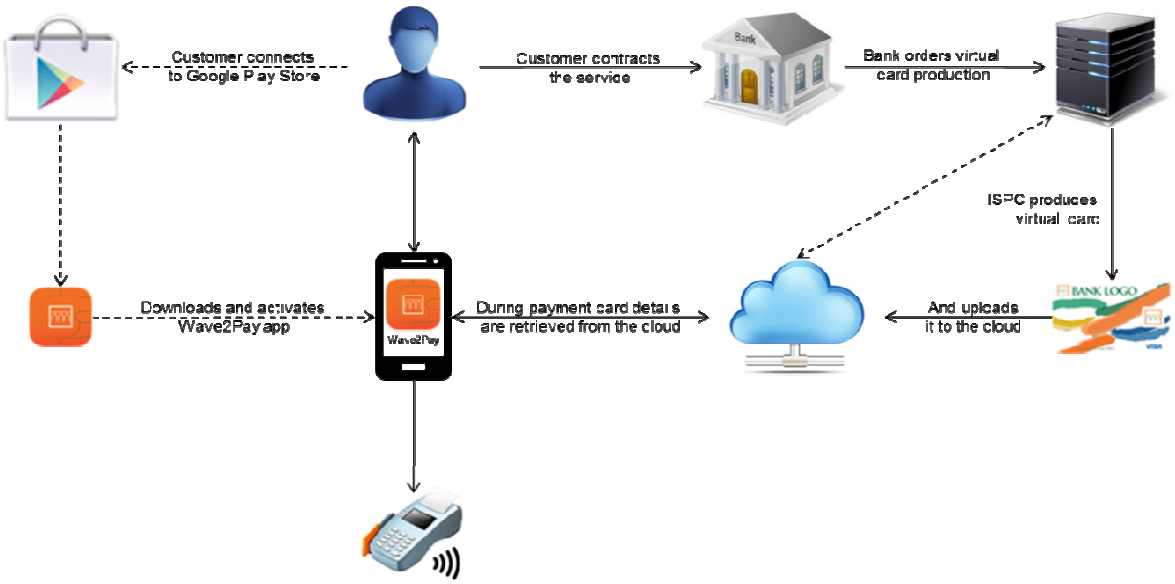

Figure 1. General workflow process [6]

The virtual card will be stored in the cloud and customer will retrieve payment credentials on his/her smartphone by accessing his Digital wallet which he/she downloaded from Google Play Store. The point is that using the virtual card and performing payments are possible only through the Digital wallet. Wallet application is a passcode protected and needs to be opened every time the customer makes purchase. Through Digital wallet the customer will be able to see the balance inquiry and the list of transactions made with virtual card qualified for this service.

The mobile phone must have the Internet access via mobile networks (Mobile Data) or Wi-Fi network for using certain features. Card details, as well as payment credentials, are not stored within Digital wallet and re-retrieved from the cloud every single time customer opens the application.

Virtual Banca Intesa AD Beograd payment card will be available on 30%ofits points of sale in Serbia, which represents one of the largest networks of POS devices in the country. The plan is that by July 2017 all POS terminals owned by Banca Intesa will be contactless.

Benefits of Banca Intesa Wave2Pay service are:

- ideal for fast contactless mobile payments,
- easy and safe for using,
- making a purchase with the virtual cards,
- payments review in the mobile application,
- balance inquiry on client's mobile phone,
- the ability to add other cards in the future,
- cash withdrawal in the future,
- confirmation for e-commerce transactions in the second phase.

It is very important to ensure a high security level when it comes to mobile payments. At start it is possible to lock the smartphone and no one can use it without authorization. When customer starts Wave2Pay application, which is necessary before making payment, he/she must enter the passcode consisting of four digits. The next element is the existence of the security chip that keeps encoded confidential data of users. This chip can be accessed only by authorized programs. From security aspect,it is also important to point out that some studies have shown that the average cardholder takes about eight hours to notice that his card was missing. When all the cards are on the phone, security is increased because it will certainly take less time to notice that his/her phone was stolen. In this way, the user will have the ability to react quickly and prevent the occurrence of potential undesirable consequences.

For the Digital Wallet service, a client (individual) can apply in the Banca Intesa branch. For mobile payment, in addition to Digital wallet, it is necessary that the client requires a virtual card from bank's offer intended for contactless payment. When digital wallet service is activated in the branch, it is required to generate a unique Activation code and provide it to the client. At the same time client gets Activation key.At that moment, when an account on the Wallet server is opened, mobile phone number is a mandatory data.

During the activation process client gets both credentials (Activation code and Activating key) through the different channels because of security reasons. Banca Intesa AD will generate the Activation key and deliver it to the customer printed on the sealed PIN envelope. Activation key is unique per customer and is considered as static data. It is the same for all actions related to Wave2Pay application. Processor (ISPC) will generate Activation code and deliver it by SMS. It is considered to be dynamic data, i.e. it will have different value every time.

After service activation client downloads Digital wallet (Wave2Pay) application from the Google Play Store. Application will be free of charge for download. The client has to enter his Activation code and mobile phone number to activate the application. Server will check whether wallet account has been created for the client and it will check client's phone number. If outcome is positive, the one-time Activation code will be generated by Wallet server and a SMS will be sent to the client's mobile device. When the client receives an SMS with the Activation code on his/her mobile phone device, Digital wallet application is automatically activated. Upon application activation the customer will be prompted by the application to define a passcode to access the mobile application and to authorizetransaction. Wallet server fetches card data for that particular client from back office application end enrolls them in a wallet account. Payment card is planned for mobile proximity payments virtualized into cloud using tokens and available for contactless payments.

Virtual payment card will be set up as a new product on the Bank system, using a sub-range of existing payment card BIN. Virtual card will have the same parameters as the physical product with exception of its usage which will be limited only to contactless POS terminals. Virtual card validity will follow the setup of the physical products. For this type of product PIN, which is commonly used with plastic cards and entered into POS and ATM, is not used and will not be generated.

Virtual card will be set to on-line and all transaction will require an on-line approval. The virtual card will be enabled for contactless POS purchase transactions. This profile of cards will be used for domestic and international payment. E-commerce, MO-TO and POS cash advance and ATM cash withdrawal will not be available for the virtual card at a first phase.

Every time when the client opens Digital wallet application, client and card data will be synchronized with back office application. Data which will be synchronized are: change of client's name, change of embossed name, mobile phone number, card status, card blocking, etc.

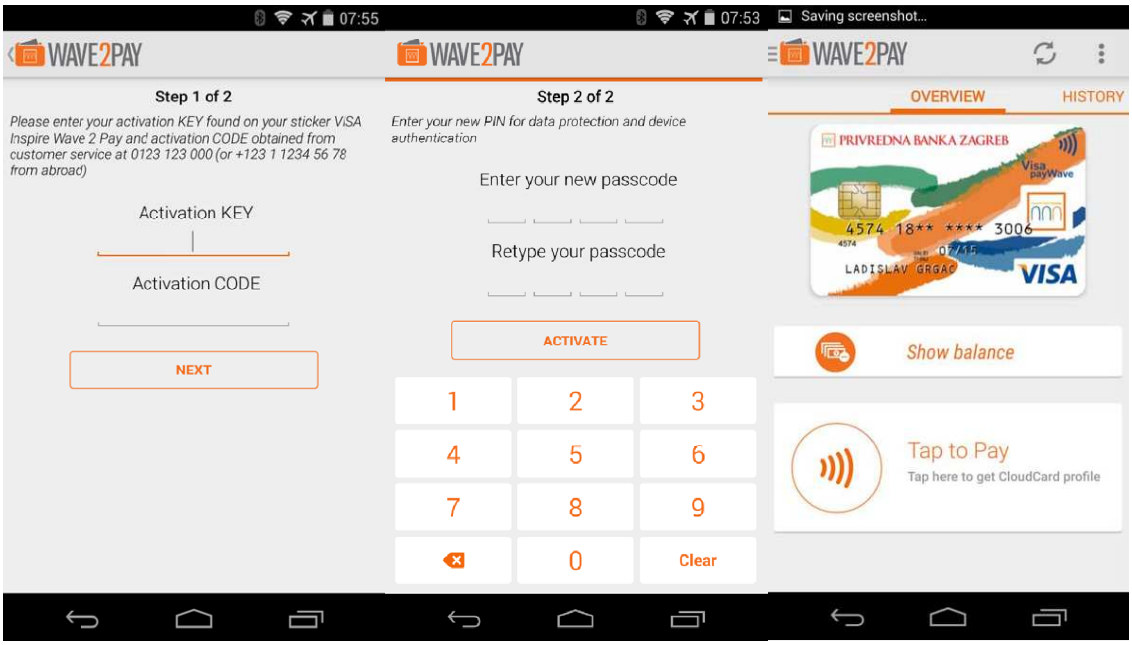

Figure 2. Digital wallet service displays at Banca Intesa AD

In the picture of the card in the Digital wallet application, customer embossed name and card expiry date are shown. The client can update such data manually in the mobile application, but those updates don't affect card's performance. If the card status has been changed in the back office application (when the card has been deactivated), card will be removed from Digital wallet and it will not be visible for the client. The client will receive notification about this event. The situation is the same in the case of a blocked card.

Each client can have Digital wallet application installed only on one mobile device. Activation of the application on the new device will automatically disable application on the old device. To activate the application on the new device client will have to enter Activation key and mobile phone number and processor will send an SMS with the Activation code.

In case when the client loses his/her mobile phones, he/she will have to report it to the Bank and all devices will be removed from the client's account. A new Activation code will be created. Digital wallet application on lost/stolen mobile device will become unusable and further application activation with the old Activation code will not be possible. After the client obtains a new mobile device, he will need to contact the Bank in order to get the newly generated Activation code and initiate the redistribution procedure.

Conclusion

The mail goal of implementing this project is to put into production Wave2Pay service for making contactless payments using mobile devices. Service will provide additional

functionalityin the next phase as ability to add other virtual cards to the wallet, cash withdrawal in the future, confirmation for e-commerce transactions, etc.

Banca Intesa is a pioneer of digital banking in domestic market and the introduction of Wave2Pay servicein the course of 2016 is the beginning of an entirely new payment method that will certainly contribute to increasing the level of digitalization of the banking system in Serbia.

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