AN NFC BASED SOLUTION FOR DISCOUNT AND LOYALTY MOBILE COUPONS


Abstract:
Today, the success of the business model “deal-of-the-day” it’s not a secret; in fact, it is manifested by the large amount of economically stable companies that operate nowadays, always trying to bypass the traditional media through promoting the use of smartphones. In this project, we describe a complete ecosystem with similar purposes that makes completely expendable the paper support. The system is called Wing Bonus and it is responsible for dissemination, distribution, supply, validation, and managing of vouchers, loyalty point card and all kind of coupons using NFC. WingBonus is also a platform for advertising all kind of products and a great system for making market research. The system is accessible through its Website and a mobile application for managing coupons. The mobile application uses NFC technology to supply and exchange m-coupons. The Website allows the user to manage his/her account movements, providing a complete way of system data maintenance. NFC provides a higher degree of security than Bluetooth and makes NFC suitable for crowded areas where correlating a signal with its transmitting physical device.

Keywords- Wing bonus, NFC, Degree.

1. INTRODUCTION
The ambient intelligence paradigm (AmI) aims to develop environments able to interact with the user in an autonomous way in order to make life easier for people in different fields [1]. A technology that facilitates the achievement of the AmI objectives is Near Field Communication (NFC). NFC simplifies the users’ interactions with the context-aware services offered in intelligent environments, also promoting a new interaction model, called “touch paradigm”. This paradigm allows the construction of a complete information environment, where ubiquitous applications allow users to obtain any information or services from the surrounding objects, which are augmented with RFID Tags, just by touching them with a NFC device. Another important aspect that favors the development of intelligent environments is the current and future evolution of mobile devices and the number of terminals around the world. The increase in the number of phones in the world has followed an exponential curve, from about one thousand million mobile phones worldwide in 2001, to about five thousand million in 2011, which has led to the development of new applications based on NFC, applied to a wide variety of services. In addition to the obvious payment and security applications, NFC has provided a wealth of applications in transport, advertising and promotion of tourism businesses, ambient assisted living (AAL), elderly care, shopping, authentication, university of things, and oriented to a wide variety of scientific, as well as business areas. Besides this, the current global turmoil is forcing citizens to save money and to seek cheaper prices when they purchase products and services. Thus, marketing and loyalty techniques are changing, helped by the overwhelming power of smart phones over traditional mobile phones, creating the concept of m-coupons or mobile coupons. It is widely believed that coupons attract more consumers to buy the goods and lead to higher profits. There are many kinds of coupons, direct mail coupons, newspaper coupons, and package
coupons. Electronic coupons are the coupons that can be downloaded from Internet websites or received from other end users via peer-to-peer coupon pushing services and can be stored on mobile devices. This paper reviews existing coupon systems and introduce our design of a coupon system. Server components of our system include coupon management system, shopping system and distribution management system.

2. PROBLEM STATEMENT

In order to provide security to the information stored on both the server and the mobile device, we have decided to encrypt the information using a symmetric cipher called Blowfish. To date, no effective Blowfish analyzer has been found, maybe because more importance has been given to the decoding of larger blocks using programs such as AES or Twofish. Blowfish uses 64-bit blocks and a key size from 32 bits to 448 bits. Another important aspect is that Blowfish is not patented. The algorithm is publicly available and can be freely used by anyone. The WingBonus mobile application currently runs on the Android and RIM operating systems. Regarding environment infrastructure WingBonus considers different types of RFID Tags, several types of NFC readers, such as the ACR 122U, and any QR reader, to redeem vouchers if the user or the establishment does not use NFC. Thus, a driver and an API have been developed in Java. This API implements the communication between a mobile device and a reader at the point of sale (PoS). This communication allows: (a) redemption of vouchers, (b) distribution of vouchers, and (c) transactions with loyalty cards. Furthermore, this API enables communication processes using NFC and QR codes.

3. ARCHITECTURE OF THE SYSTEM

Offers and providers’ promotional campaigns are managed through Containers. Containers allow providers to group some vouchers, satisfying their business policies. Moreover, containers can be classified in Folders, the vouchers being assigned to a specific folder. A folder is used to define specifics providers’ campaigns. Thus, a provider can distribute their vouchers in different business activities and different campaigns using different provider’s images, requirements, and promotional, business and marketing policies using the same user environment. In addition, WingBonus functionality includes the management of electronic loyalty cards.

Fig.1. Class diagram corresponding to voucher information
The user can manage any number of loyalty cards in his/her mobile phone. Furthermore, a loyalty card is managed like a folder, restricted to storing only chits. When a user buys any product or service corresponding to a specific provider or retailer he/she receives economic or symbolic rewards that are accumulated in the loyalty card corresponding to the retailer or provider. Afterwards, the user can exchange those rewards wherever he/she wants for other products or services, always following the requirements of the loyalty card. Properties defined in containers and folders allow for use of different icons, images, etc., and to define the different type and characteristics of the voucher for each of them. WingBonus manages this information to generate tailored interface in the mobile application as we will describe later. The sourcing of a voucher can be performed automatically or on user demand. When a voucher is sourced to the user mobile, the voucher passes to the “Sourced voucher” status. The voucher sourcing is performed through a synchronization process in the WingBonus mobile application. Finally, the voucher passes to the “Redeemed voucher” status when the user redeems the voucher in one of the accepted stores or locations. The synchronization during the redemption process can be carried out in several ways depending on user and shop infrastructure. WingBonus’s database stores information about the whole voucher lifecycle. Vouchers have a unique identification in each status and all voucher statuses are related to each other. The synchronization process validates the mobile and server databases, maintaining one unique and congruent information flow over vouchers in their different status.

4. WINGBONUS WEBSITE

The WingBonus server subsystem is composed of several functional components: (a) the website responsible for the web interaction with the user and the administrators, (b) the database storing all the information involving users, vouchers, clients, establishments, etc., and (c) a set of web services that compose an API that is consumed by the mobile application and the web-client side. The WingBonus server has been built using the one-page paradigm, using Backbone.js that supports Model-View-Controller (MVC) [62], HTML5 and CSS3 for the page makeup and JQuery for DOM manipulation. All the work concerning interactions with the final user is made on the client side once the website has been loaded, letting the server be an API and a set of services that work against the database.
Like other JavaScript web applications, WingBonus uses several libraries such as Underscore, Require.js, etc. As mentioned previously, neither the mobile application nor the JavaScript part of the website should access the database directly. For this purpose, we have developed an API for performing any operation needed for the database; giving in addition facilities for logging, registration and user activation, as well as voucher retrieving. Thus, the information is protected as a layer over the database, normalizing the access and allowing the adaptation of the input/output to each scenario. The API acts on the server side and has been developed using PHP and giving outputs formatted as a JSON object. The web services provided by the API also agglomerate the operations for the synchronization. Generally, this kind of system gives an output based on a few inputs. WingBonus implements a complete system that receives all the data to be updated from the mobile application and operates over the database. Later, the services give a JSON response with the data requested by the mobile application, letting the device updated and fixing the date of the synchronization process.

5. RESULTS AND DISCUSSION

The combination of NFC with the growing success of mobile technology will allow, in the near future, the development of “ideally” smart environments, which were conceived decades ago. The application of NFC to marketing models of companies offers several advantages over existing systems. There are several and important companies that provide discount and offer services, however, getting and using coupons is not always easy. The main weak point is the client’s interaction with the coupon and the company or system that serves the product or service. The use of NFC and its application in mobile devices provides users with an easy way to acquire, store, manage and use vouchers. Besides, these features make the process fast, secure, efficient and transparent. The system described in this paper has the advantage of the consideration of any type of vouchers: discount coupons, bonds and chits. In addition, loyalty cards are also considered and the card operations such as chit operations are managed. Managing marketing campaigns in containers and folders, WingBonus provides a powerful diffusion tool for companies and their marketing activities, as well as an easy way for the users to manage offers. In addition, WingBonus can be fully tailored to different marketing strategies. Thus, each campaign and type of voucher can be adapted to a different security level, source of distribution and retailer infrastructure. This versatility allows its application for companies of different size and commercial sector. WingBonus allows consumers to take advantage of all offers made by companies. This guarantees a huge savings on the purchase of consumer products. Vouchers and loyalty cards are carried on the mobile phone without any possibility of fraud, loss or forgetting. For partner companies, WingBonus offers great advantages: cost reductions, elimination of paper and/or plastic supports, reaching more customers, elimination of forgeries, real time tracking, market analysis, study of trends, capability to build customer loyalty, etc. Moreover, the commerce where the vouchers are adopted benefits from the speed and safety of the process. Currently, we are working on the improvement of the system described in this paper in order to add new features and also allow the storage of the offers in the secure element of the NFC phone. In addition, we are combining the marketing based on vouchers and loyalty cards with marketing based on gaming, thus offering new models for attracting loyal customers to companies.
REFERENCES


