Methodology for the implementation of an interoperability protocol between RFID - NFC, applied to the registration of vaccines for COVID-19

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Abstract

In this context caused by COVID-19, there are many atypical conditions, one of them and the one that is causing the greatest concern is related to the vaccine, it is a concern on the part of governments to be able to acquire the largest number of vaccines, and a concern on the part of people to be vaccinated. The present of having a vaccine registry and knowing who has been vaccinated, in most countries physical vaccination cards are being delivered, which is essential to be able to carry them to be able to perform certain operations, one of them may be to be able to enter public places until you can travel to other countries, the methodology that is presented is related to having an RFID card where it can always be carried being safer and difficult to deteriorate due to its material, in the RFID device the basic data can be stored of the person as well as the data of the vaccines that he is supplying, the methodology also proposes the design of a mobile application using the NFS communication protocol, which can be connected directly with the RFID device for both reading and writing data. . The results show that the methodology can be applied and scaled according to the needs of each country, with this information a connection is achieved between different processes and thus achieve interoperability between these devices and many applications, using the same device and for the benefit of the population and those authorized in order to know the status of the people who have been vaccinated.

Keywords 1

RFID, NFC, Protocolo, Vacunas, interoperabilidad

1. Introduction

The use of NFC and RFID applications are being used very frequently, making a review of the state of the art of the aforementioned technologies, we can indicate that NFS technology is new and is in principle found in high-end cell phones, in consideration of the RFID technology, which is found in many innovations, as we can indicate in that they are used in processes related to the health sector to be able to identify people, improving the registration time in medical care [1]. We mainly find it in the processes of identifying people and accesses, achieving already having commercial solutions for access and activation of digital keys based on RFID technology [2]. All the information related to the care of patients in a health center is recorded in the medical records, therefore there are solutions that help the treatment of critical patients where it is recorded in these RFID devices to carry out issues related to traceability in order to find better processes in the treatment of certain pathologies [3]. In matters related to storage processes, RFID devices are commonly found, where the material that is stored can be located and traced, in the pharmaceutical industry we find this type of technological solutions more frequently [4]. In the inventory processes we find solutions where instead of

WCNC-2021: Workshop on Computer Networks & Communications, May 01, 2021, Chennai, India.
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registering the physical ones, these records are made in the RFID devices, where the intention is to be able to keep the inventory records in digital form, facilitating the registration, location and traceability of the equipment computing [5]. In the process of inventories in pharmacies, the registration of medicines is important and due to a characteristic that is the expiration date, they have to take special care, due to being able to locate the medicines that are close to expiration, in this process RFID technology is very helpful because it allows integrating all the information, allowing the location of the drug that is soon to expire quickly and information on the quantity, laboratory, date of purchase, among others [6]. In applications where RFID and NFC technology are used, we find in applications related to the issue of control of packages, where we try to better manage the control processes of bicycle parking places, to know the owner, time that is parked and its traceability, the fundamental development to use NFC technology was the Android operating system, in this work we try to solve a problem related to the control and traceability of people who have been vaccinated against COVID-19 in order to know the details of your vaccinations.

2. Materials and Methods

In the design of the proposed methodology, a series of steps were designed that we must consider in order to understand and understand the situation in which we find ourselves, in this way we can condition our resources to our needs, below are the steps to continue to implement the methodology, as well as in figure 1, we present the block diagram of the methodological proposal.

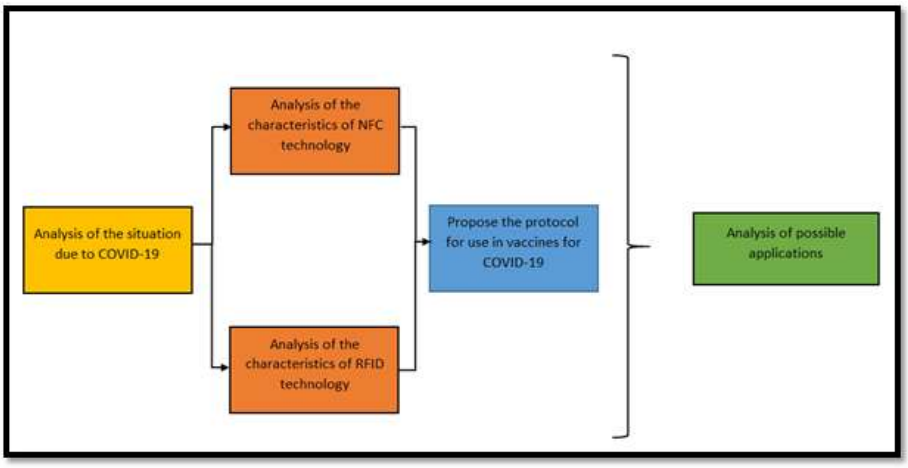

Figure 1: Diagram of the proposed methodology

2.1. Analysis of the situation due to COVID-19

The situation caused by COVID-19, has caused the closure of many activities that were commonly public, including cinemas, churches, among others, the closure of communication routes, such as air travel, have caused Health protocols are followed, such as testing to determine that they are not infected with COVID-19 before making the trip. Now international travel is being presented with the increase in more requirements, such as vaccines, where it is required to demonstrate that people are vaccinated, at present when people are vaccinated, they are given a physical vaccination card normally on paper, which by use can deteriorate and lose that information that is of vital importance, for future requirements.

2.2. Analysis of the Characteristics of NFC technology

Having as a need, the power to have a mechanism to read and record the information of the vaccines, the next step is to know a mechanism that is practical and easy to use for this task. The

methodology proposes the use of cell phones, which have the NFC communication protocol, which can communicate with the RFID protocol, in this way a mobile application must be created that can be installed on the cell phone, in this way the Mobile app can do read and write on the RFID device. In this way we can read the data found in the RFID device to know the data regarding COVID-19 vaccines. It must be taken into account, if the cellular equipment supports the NFC protocol.

2.3. Analysis of the Characteristic of RFID technology

As well as a description of the NFC protocol was made, RFID devices have the ability to store information permanently, having the characteristic of reading and writing, the information contained will depend on the size of the internal memory of the device. In the proposed methodology, it is recommended to use a mobile application where you can connect with the RFID device through the NFC protocol, in this way you can access the information contained in the FRID device.

Figure 2: FRID device image

In figure 2 you can see the FRID devices, in two presentations, one in the form of a keychain and the other in the form of a card, in both data reading and writing operations can be performed, according to a programming and the way in which the data is organized.

2.4. Propose the protocol for use in vaccines for COVID-19

Having the devices and the mobile application, the next step is to know the data that can be stored in the RFID devices, for this task a list of the possible data that can be used is presented in Figure 3, ordered under a criterion of order, as we can indicate, first the personal data, the data of the vaccine such as origin, purchase dates, expiration, and third group of data, we have the data of the vaccine supply, such as where the vaccine was made, data of the person who provides the vaccine, among others that is considered important, these data are referential, depending on the application they can increase as they are dispensed with.

In Figure 3, you can see the data that can be saved in the RFID device, organized according to an order of priority, such as personal data, data on the origin of the vaccine and finally data on the application of the vaccines.

Figure 3: Communication protocol data structure

2.5. Analysis of possible applications

The possible applications that can be worked on are related to being able to determine the information requirements that are required, depending on each organization, in order to be practical it is recommended to use mobile devices or cellular equipment as a reading mechanism. The classic RFID devices can be used as an information backup mechanism. The application to be developed can be on different platforms depending on the technical requirements, such as Android, IOS operating systems. As part of the data organization protocol, they can be modified according to the needs of the organization, it would be important to indicate that in the communication protocol it can be considered to indicate a legend about the organization of the stored data.

3. Results

The results that we present in the application of the methodology, is characterized by the presentation of a connectivity diagram, where you can see the connectivity between mobile devices with the NFC protocol and devices with RFID technology, depending on the application that can be used implement can be connected between different types of RFID devices, as well as the customization of the application, you can consider your own designs, considering the communication structure presented in figure 1.

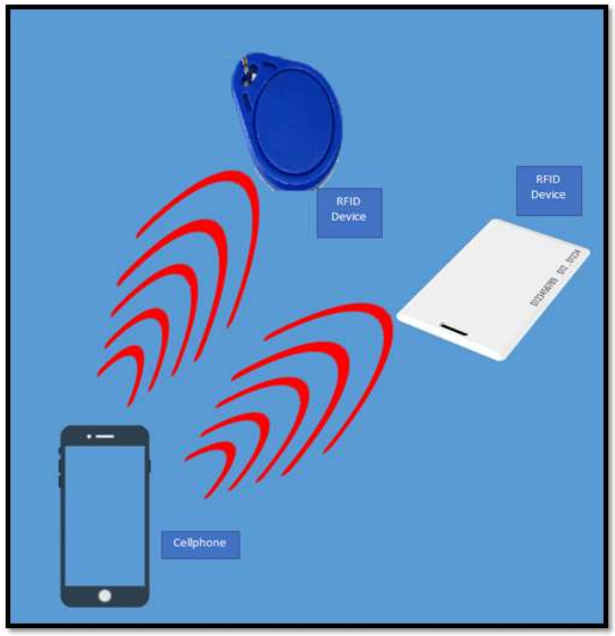

Figure 4: Connectivity diagram

4. Conclusions

At the end of the description of this methodological proposal, we can conclude that in these times of uncertainty, knowing the state of people and their situation in the face of COVID-19 is of vital importance in view of the many restrictions that are being presented in the face of the pandemic, at the moment we are facing many restrictions and each time the protection mechanisms for people are growing, with the presence of vaccines from different laboratories, it is important to know the details of the vaccine and where they have been vaccinated. The proposed methodology is practical because it can be applied and scaled. The necessary and indispensable requirement is to be able to have a mobile device that supports NFC technology and RFID devices.

Regarding the design of the applications, it is important to indicate that it can be developed using different programming languages and libraries, it should only be considered that the NFC protocol can be accessed and through this protocol it can be connected in read and write mode to read data From RFID devices, in this design an internal database can be considered in the cell phone to be able to store the information if you want to save those who have evaluated them, the application must have in reading mode to be able to access the data of the RFID device and in writing mode to be able to save and update the data.

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