Web Berry

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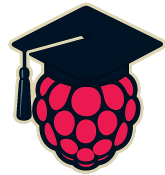
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0. CONTENTS

1. DOCUMENT SCOPE

This document is intended for stakeholders, clients and end users. Its goal is to provide them a clear overview of the project requirements, both technical, such as necessary devices or the applications that will be needed, and non-technical, such as learning requirements like programming languages or methodologies.

It defines the project's objectives and limits and outlines how its goals will be achieved. By establishing a shared understanding, with this document we want to minimize the risk of any obstacle or unexpected requirements.

2. BACKGROUND

1.

1.1. *Introduction*

To achieve this project's objective, the main technology used will be NFC, already studied and used by all team members. The NFC technology, Near Field Communication, as its self explanatory name may indicate, is a wireless communication that allows the exchange of short and secure data between two devices with a short distance between them.

Although it can have different modes, we will be using the reader mode, which reads information from a card or tag, in this project its purpose is to read the identifier number from any card and provide it to a server as a client.

1.2. *State of the art*

As every wireless technology works in different frequencies, and has different specifications, we will be working always with the same one, RC522, being its parameters:
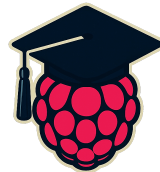
Frequency: 13,56 MHzs.

Voltage and current of operation and standby (DC): 3,3V - 20mA - 10mA.

Maximum distance of lecture: 60mm.

Nowadays technology is evolving everyday more and more, and so it is NFC technology, which can be found everywhere around us. It supposes a big advancement in the industry, it makes things so easier for us that it is used in each of our daily lives, for example:
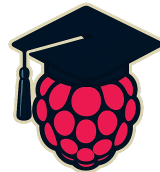
● **Streamlined Contactless Payments**: Customers can tap their NFC-enabled devices or cards to complete purchases, reducing wait times and improving satisfaction. This efficiency is particularly valuable for businesses in retail, hospitality, and service sectors.

- **Enhanced Access Control and Security:** Employees or authorised personnel can use NFC-enabled cards or devices to gain entry, ensuring security and minimising unauthorised access. Additionally, NFC technology supports secure logins for networks and workstations, protecting sensitive data.

- **Efficient Inventory and Asset Management:** Businesses are leveraging NFC tags to track inventory and manage assets effectively. By tagging items with NFC chips, companies can monitor stock levels, track item locations, and streamline logistics operations.

- **Public Transportation:** Contactless cards equipped with NFC technology, along with smartphones, are extensively utilized in fare collection systems in major cities such as London (Oyster Card), Tokyo, and Barcelona (T-Mobilitat). These technologies significantly enhance passenger convenience while simultaneously reducing operational costs for transportation authorities.

Bibliography:

- Tagify. 2025 NFC Technology Trends: https://nfctagify.com/blogs/news/2025-nfc-technology-trends?srsltid=AfmBOoqDXGsVqNI7Fbte6P0IIoiSx4J3OCywqiI6weE1AAK8dsYzZhz_
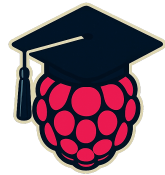
1.3. *Benchmarking*

We hope to make from our project so unique an application, but that does not mean there are no more products like ours, here are some:

Product	About it	Server features	Client features	Target audience
Moodle	Learning Management System	Manages courses, its tasks, marks, documents…	Depending on who, they can add documents, evaluate them, answer questionnaires…	Universities (Atenea), schools, etc.
Google Classroom	Tool for learning and teaching	Assignments and tasks are shared, in order to be done, using google tools connected to the accounts.	Answer and deliver tasks that can be evaluated, you can find other type of work.	Universities, schools, institutes, independents…
Canvas	Cloud open technologies	Courses with forums, with tasks to be done in the same app to be evaluated.	Answers the tasks, or is given a mark in the course you are added.	Universities, schools, etc.
Kahoot	Engaging evaluating games	The clients can create interactive quizzes about any theme, entertaining method of learning.	Creates quizzes, spaces with other people to be answered, can choose a quiz created by others…	Students, teachers, academies, organizations…

3. TECHNICAL SPECIFICATIONS

3.1. *System description:*

The system is distributed in three main parts:

Client: Using the language Ruby the client makes a request to the server HTTP with a JavaScript form, first of all giving the parameter uid to recognize it in order to get the other parameters such as courses, tasks, marks, etc.

Database: Using MongoDB, all the information we can provide to the client through the server is saved here.

Server: This is the main tool where the client gets access to their school information, written in JavaScript with the database in MongoDB, when the client gives the uid the server selects the information related to this identificator..
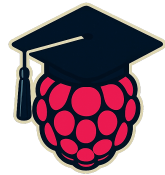
3.2. *Physical and operational specifications:*

In this project, the main part is the coding, but for it, we will be working with few technologies. Of course our laptops are included, also a Raspberry Pi, our NFC device RC522 and an LCD, these have their own physical and operational specifications that may condition the work:

Ranges and data format: Our module RC522 operates at an approximate distance of 6cm, transmitting the data it receives into ASCII or hexadecimal, as the LCD does, with the information it receives through the Raspberry, it translates the ASCII.

Operating Conditions and User environment: For the RaspberryPi that will be the computer we will be working with, we have to assure a temperature between 0ºC and 50ºC, and a maximum humidity of 80% (non-condensing), this condicions are ought to not be exceeded. Its user environment is scholar, given that it is similar to an agenda used mostly by universitary students.
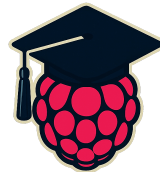
Size and weight: TThe Raspberry Pi has a dimensions of 85 mm x 49 mm with a weight of around 46g, the module RC522 is half the size of our little computer, and the LCD with a clear rectangular structure is so.

RaspberryPi 5 technical features: Dual-band 802.11ac Wi-Fi, Bluetooth 5.0/Bluetooth Low Energy (BLE), microSD card slot, with support for high-speed SDR104 mode, 2 × USB 3.0 ports, supporting simultaneous 5Gbps operation, 2 × USB 2.0 ports, Gigabit Ethernet, with PoE+ support (requires separate PoE+ HAT), 5V/5A DC power via USB-C, Raspberry Pi standard 40-pin header…

Safety Restrictions: It is important to avoid electromagnetic fields near the NFC module, it works with one that could be altered depending on the distance there were between both electromagnetic fields. Another warning is water and other liquids, it is known that no electric or electronic device, except waterproof ones, must be near any type of liquids that can destroy it or, most importantly, hurt the user.

3.3. *Final product specifications:*

The type and size of market we will be reaching:

Educational Sector:

Academic institutions, including schools, universities, and vocational training centers, are increasingly seeking NFC-based resources to make so dynamic an academic experience, searching also: secure access to resources as tasks or marks, the integration of e-learning platforms to enhance the educational experience, not only tracking the use of the application but also to track attendance to class
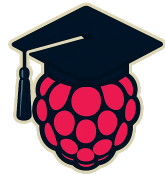
Small and Medium Enterprises (SMEs):

An application that functions as a task and assignment calendar, along with tracking potential grades or performance metrics, could face significant competition in the Small and Medium Enterprises (SMEs) market due to the presence of well-established productivity and project management tools. Not only its effectiveness but also the cost, cheaper than an application a big company can offer, it can be more affordable to those little companies.

Particular Developers and Innovators:

This could be especially valuable for developers who work across multiple devices or environments, offering a seamless, secure way to access their task calendars, assignments, and performance data on-the-go. To stand out in this competitive market, a new app would need to offer not only ease of use and flexibility but also innovative NFC integration, enabling a highly efficient and secure user experience.

Due to the confictive situation the international market is going through right now, the market size of this project will only be on a European scale. So bearing in

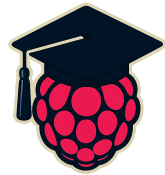mind our market type is also structured in three key segments, being optimistic our market size can be:

- **Small and Medium Enterprises (SMEs):**
  There are approximately 23 million SMEs in Europe, with a growing interest in digital productivity tools. Assuming 10% of these businesses (2.3 million) could benefit from the application, and each business has an average of 5 users at a subscription cost of €10 per month, the potential monthly revenue from this segment is €115 million.

- **Individual Innovators and Developers:**
  The European developer community, which includes independent developers and small teams, consists of roughly 5 million developers. If 5% (250,000 developers) adopt the application at €10 per month, the potential revenue from this segment is €2.5 million per month.

- **Educational Institutions:** With around 20,000 universities and educational institutions across Europe, and assuming 5% (1,000 institutions) could adopt this solution, with an average of 100 users per institution at €5 per user, the potential monthly revenue from this segment is €500,000.

Cost Range Estimation

- **Hardware Costs:**
  - Lanumber 5 (4 unidades, incluye Power Supply and Case): €120
  - RC522 NFC Module (por unidad): €1.50
  - Accessories (optional):
    - Miscellaneous (cables, connectors, etc.): €5–10

- **Software Costs:**
  - Open-source software stack (Python, PHP, MySQLi) keeps software costs minimal, generally free unless paid add-ons, premium libraries, or hosting services are required.
  - Licensing for paid software: €0–€500 (depending on tools and features)

- **Service Costs:**
  - Web Hosting: €5–20/month for small-scale or prototype projects (for basic functionality and limited traffic).
  - Cloud Storage: €5–30/month (if needed for large-scale data handling).
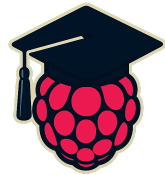
- **Development and Maintenance:**
  - Initial Development Costs:
    - Prototype/Basic System: €500–€2,500 (depending on features and complexity)
    - Fully Functional System: €2,500–€5,000 (including UI/UX design, backend, NFC integration)
  - Ongoing Maintenance and Support:
    - Monthly Support: €50–€500 (depending on the scope of maintenance, updates, and support required

Total Estimated Cost Range (Prototype):

Basic Setup (Hardware + Software + Hosting): €131.50–€160

Full Development (Including Development & Maintenance): €3,000–€6,500

4. TEST REQUIREMENTS

To test our project, we have been working previously on a few tasks, Puzzle 1 and 2, which are the basis of the whole point of this application we are making. Once we have dominated the use of the modules required in this journey, everyone of us is completely capable of testing each part we work on step by step.

So all the tests we will do through this process will mainly be to ensure the NFC, we previously worked with, works correctly and does the functions of reading properly. The tests will include detecting both registered and unregistered NFC tags, measuring the response time from tag reading to data display, and verifying that user-specific information loads correctly. Additionally, the platform must restrict access unless a valid NFC tag has been read, ensuring a basic level of authentication and data privacy. And not to mention that the added element LCD will be confirming that the ID is being read correctly by the NFC, showing the LCD the id number in its panel.

4   REGULATIONS

For an NFC-based system utilizing the PN532 module and a client-server architecture that manages personal and academic information, the following regulations and standards are essential:

- **Data Privacy and Security:**

  GDPR (General Data Protection Regulation – EU): This regulation mandates the secure collection, processing, and storage of personal data. It requires obtaining user consent and enforcing strong privacy measures to protect academic records and personal identifiers.

- **NFC Communication Standards:**

  ISO/IEC 14443: This international standard governs the operation of proximity cards and is directly applicable to the PN532 NFC module used for identification.

- **Radio Frequency Compliance:**

  CE Marking (EU): Ensures that the device complies with European requirements for electromagnetic compatibility and radio frequency emissions.

- **Application-Specific Security Measures:**

  Encryption Protocols: Data transmission between the client and server should be protected using encryption standards such as TLS to prevent interception and unauthorized access.

  Authentication Mechanisms: Secure user access should be enforced using methods such as NFC UID-based authentication, ensuring that only authorized users can retrieve academic information.